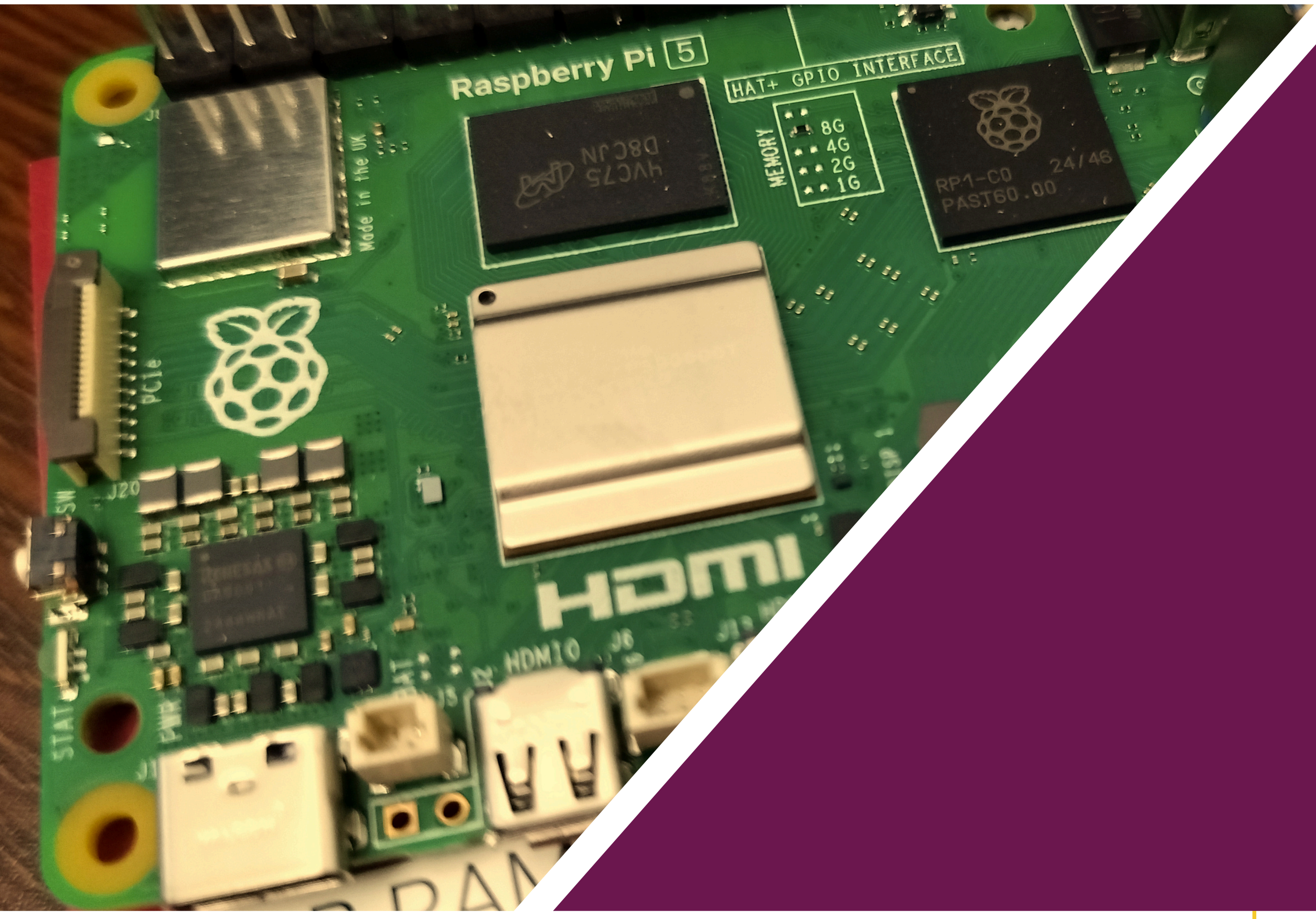
UNIVERSITI TEKNOLOGI MARA

EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

VOLUME 1



FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
JOHOR BRANCH
PASIR GUDANG CAMPUS

10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025 (EESEE 2025)

Engineering Excellence: Bridging Technology and Life

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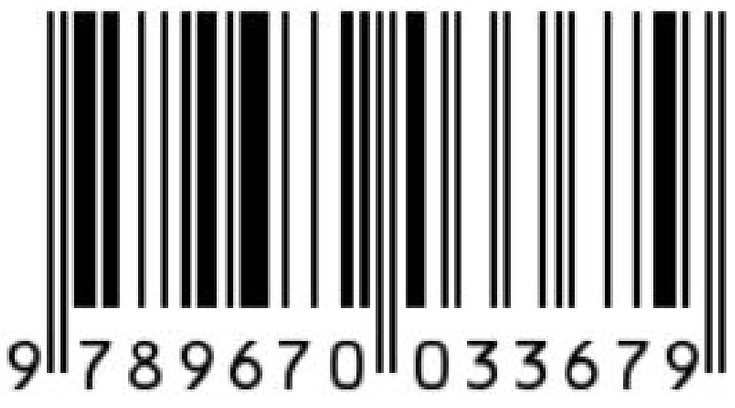
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EESEE 2025 10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

eISBN 978-967-0033-67-9



Universiti Teknologi MARA, Cawangan Johor Kampus Pasir Gudang (Online)

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Published in Malaysia by Universiti Teknologi MARA Cawangan Johor
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FOREWORD BY THE PROGRAM CHAIR





Greetings from the Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025).

As the Program Chairs, it is our great pleasure to present this compilation of extended abstracts, showcasing the remarkable projects developed by our final-semester students from the Diploma in Electrical Engineering (Power) and Diploma in Electrical Engineering (Electronics) programs at Universiti Teknologi MARA, Cawangan Johor, Pasir Gudang Campus.

This exhibition marks a significant milestone in our students' academic journey, representing the culmination of years of dedication, perseverance, and learning. It also serves as an essential step toward the successful completion of their diploma studies. The projects featured this year are centered on the theme *Engineering Excellence: Bridging Technology and Life*, reflecting current trends and innovations in the engineering field.

This extended abstract book highlights not only the students' technical expertise but also their creativity, problem-solving skills, and ability to engage meaningfully with peers and industry professionals. Within these pages, you will find a diverse range of projects that embody a unique blend of knowledge, innovation, and practical application.

We warmly invite you to explore this collection, which celebrates the achievements of our aspiring engineers. Welcome once again to the Electrical, Electronics, and Systems Engineering Exhibition 2025. May the insights shared here inspire and pave the way for the next generation of innovative engineers.

Warm regards,

Dr. Fatimah Khairiah binti Abd Hamid
Dr. Atiqah Hamizah binti Mohd Nordin
Program Chairs
Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025)

FOREWORD BY THE UNDERGRADUATE COORDINATOR



The Faculty of Electrical Engineering (FKE), UiTM Johor Branch, Pasir Gudang Campus, continues its commitment to nurturing innovation through final-year student projects. In 2025, our students are once again provided with a platform to present their work to industry representatives, UiTM staff, and fellow students at the 10th Electrical, Electronics, and Systems Engineering Exhibition (EESEE 2025).

This annual event, organized by FKE, not only fulfills the final-year project presentation requirements but also builds students' confidence in showcasing their work to a wider audience. For the second consecutive time, all projects have been compiled into a single extended abstract book, marking another milestone in documenting our students' achievements.

EESEE 2025 highlights the capabilities of FKE students to undertake and complete contemporary engineering projects, particularly those related to *engineering excellence — Bridging Technology and Life*. This year, the exhibition proudly features 113 projects from two diploma programs: Diploma in Electrical Engineering (Electronics) and Diploma in Electrical Engineering (Power).

On behalf of the management team of FKE, UiTM Johor Branch, Pasir Gudang Campus, I would like to extend my sincere appreciation to all final-year students for their hard work and dedication. My deepest gratitude also goes to the organizing committee for their tireless efforts in ensuring the success of this event. We look forward to even more innovative ideas from our students in the years ahead.

Thank you.

ASSOCIATE PROFESSOR TS. DR. MOHAMAD ZHAFRAN MOHD HUSSIN
Undergraduate Coordinator
Faculty of Electrical Engineering
Universiti Teknologi MARA Johor Branch
Pasir Gudang Campus

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FINAL YEAR PROJECT
DIPLOMA IN ELECTRICAL ENGINEERING (POWER)
CEEE112/EE112

Modelling and Development of Grid-Connected PV System Tool with Variation of Irradiation using Pvsyst And Matlab App Designer

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ABSTRACT

This study focuses on the modeling and development of a tool for grid-connected photovoltaic (PV) systems under varying irradiation conditions using PVSYST and MATLAB App Designer. The primary goal is to create an integrated solution that combines the robust simulation capabilities of PVsyst with the user-friendly interface and computational power of MATLAB GUI. The modelling and development were carried out on two parts: i) PVsyst is used to model four PV systems, accounting for geographic location and irradiation factors to predict energy production accurately; ii) MATLAB App Designer is employed to develop an interactive tool that allows users to input specific parameters and visualize real-time performance metrics based on results generated from PVsyst modeling in the first part. The tool integrates PVsyst simulation results and enables users to modify system parameters dynamically, facilitating detailed analysis. The results show the developed tool successfully generates outputs expectedly and validated with the results from PVsyst. This tool offers user-friendly interface to aid understanding of PV system performance based on variation of irradiation through its simplicity and suits for educational purposes for beginners in PV education.

KEYWORDS: MATLAB, PVSyst, PV system, GUI, irradiation

PRODUCT DESCRIPTION

The Grid-Connected PV System Tool, developing by utilizing PVsyst and MATLAB App Designer, is a user-friendly platform for simulating and analyzing photovoltaic (PV) systems under varying irradiation conditions. This tool combines PVsyst's precise energy simulation capabilities with MATLAB's interactive design environment, enabling users to assess energy performance, system efficiency, and real-time variability. Designed for education, it incorporates a user-friendly environment for testing scenarios under varying irradiation to enhance understanding on this effect on PV performance.

BLOCK DIAGRAM

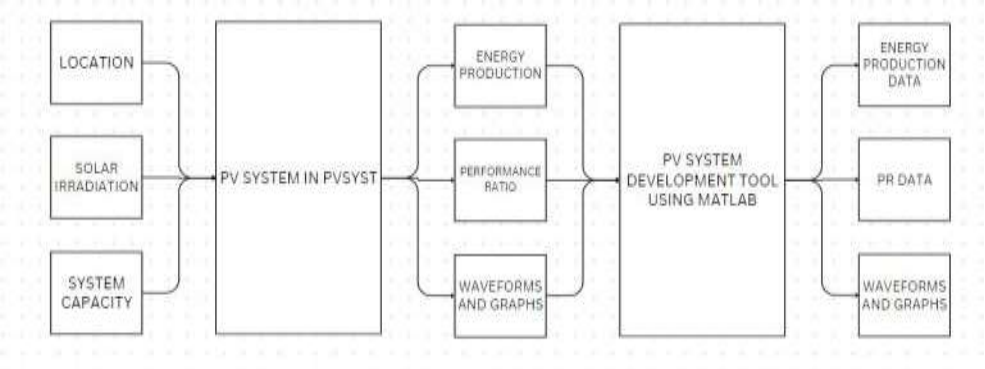


Figure 1: Block diagram of PV system tool using PVSyst and MATLAB App Designer

FLOWCHART

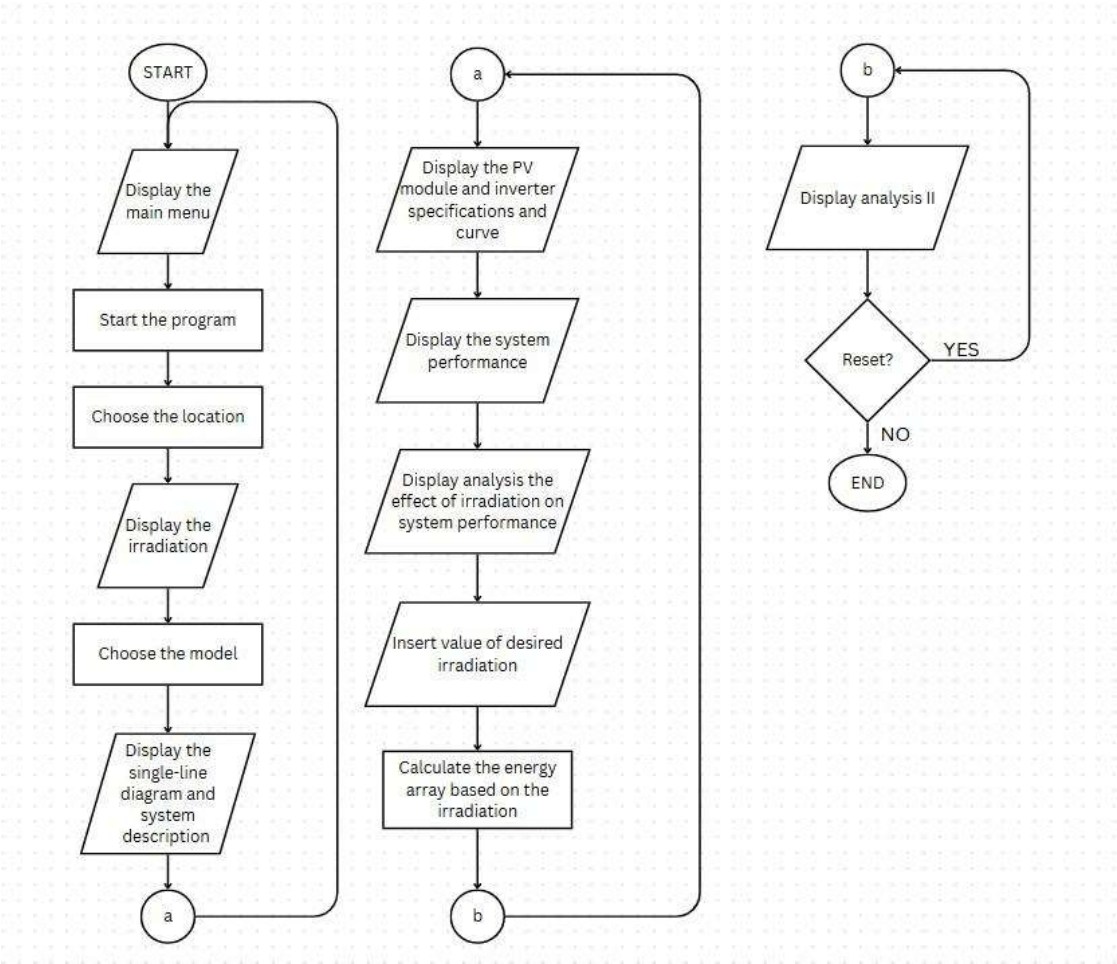


Figure 2: Project flowchart

PICTURES

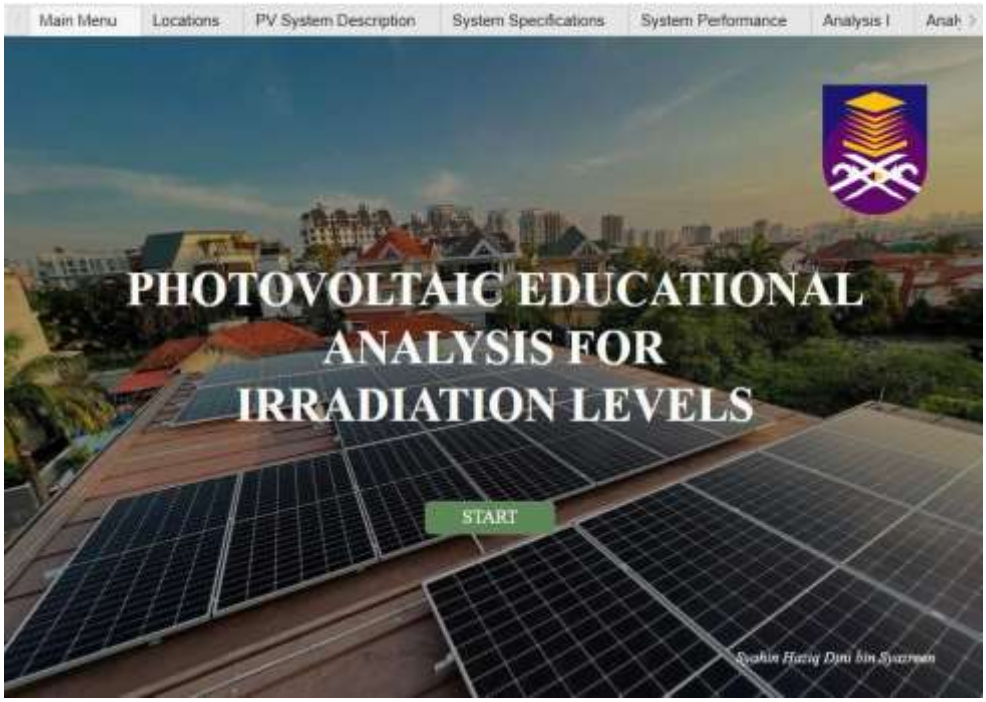


Figure 3: Main menu

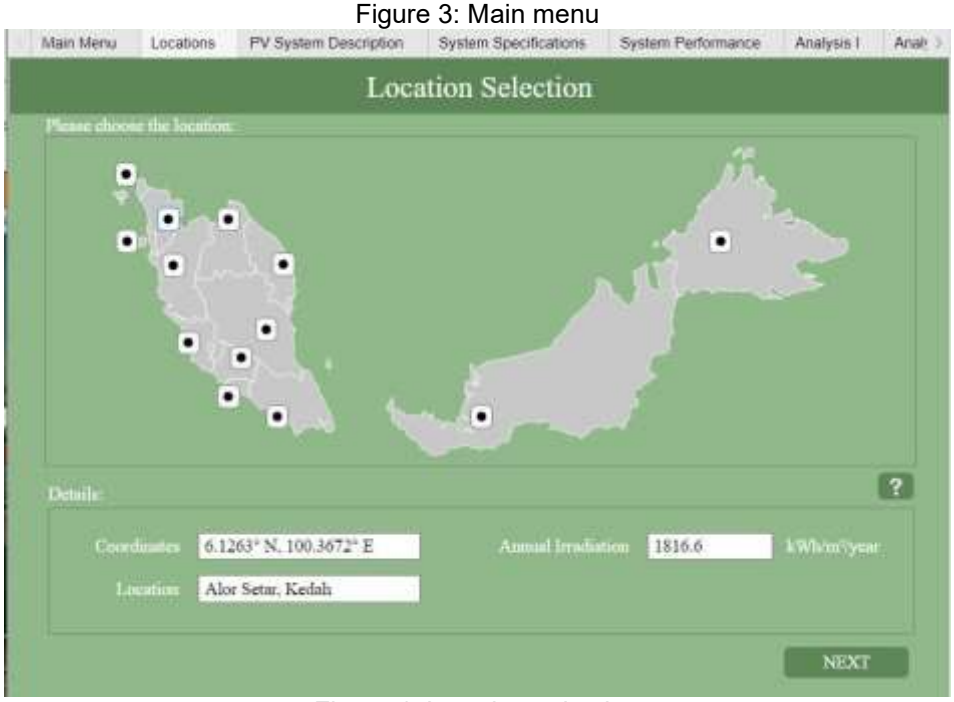


Figure 4: Location selection

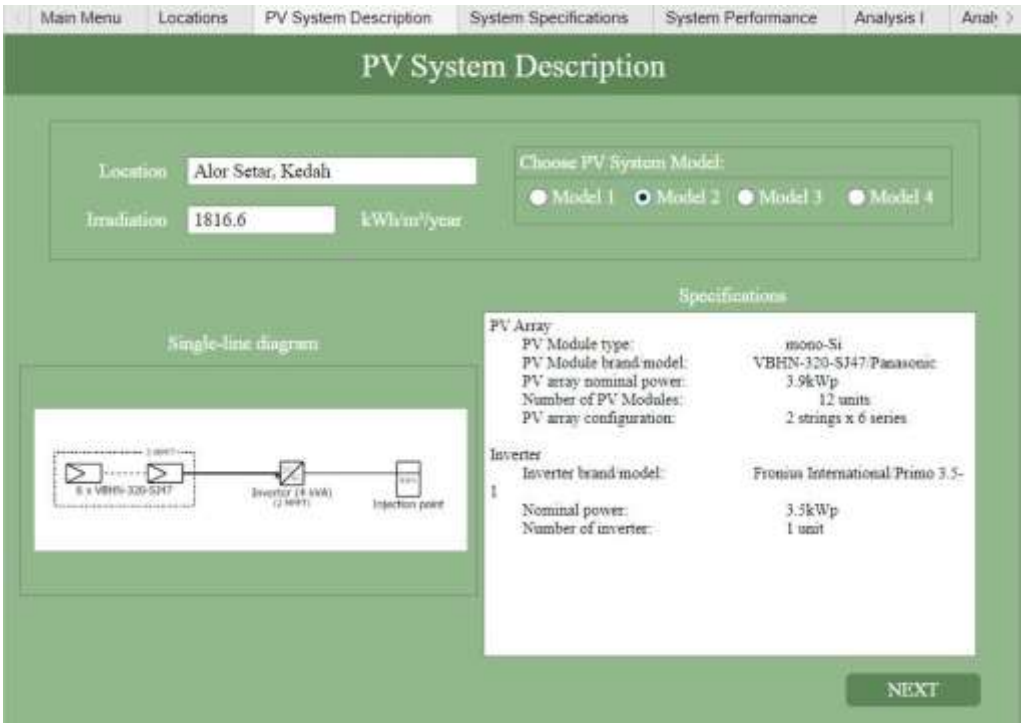


Figure 5: PV system description

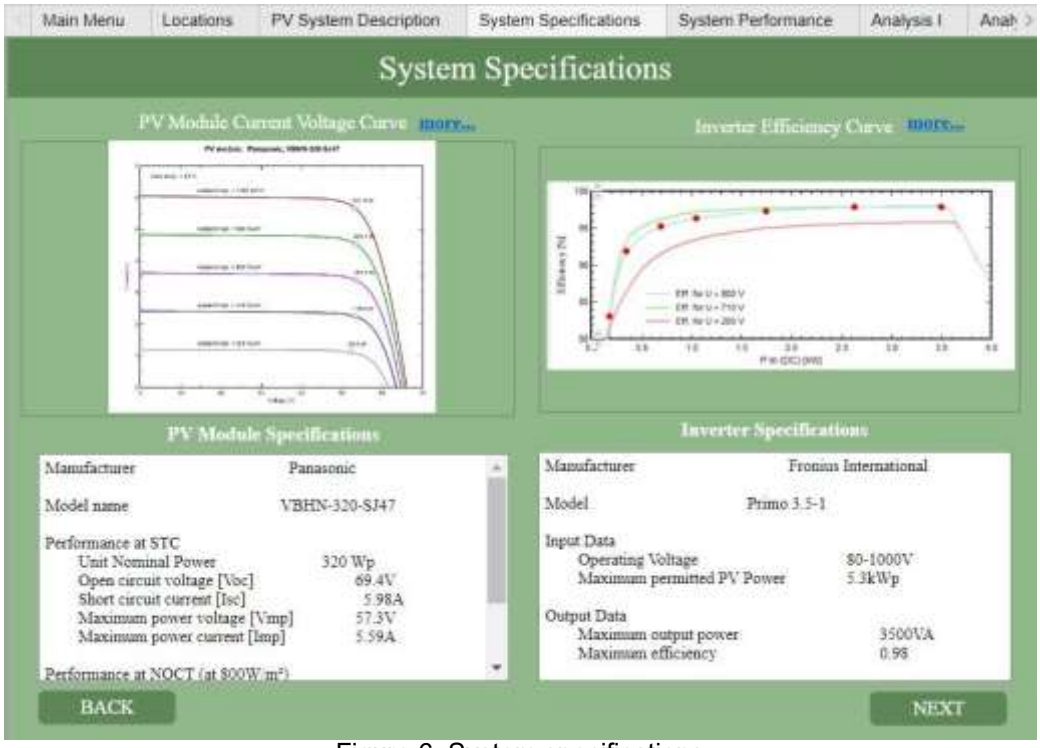


Figure 6: System specifications

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Grid-Connected PV System Tool lies in its integration of PVsyst and MATLAB App Designer for comprehensive and user-friendly simulation of photovoltaic systems under varying irradiation conditions. The combination of PVsyst's precise energy modeling capabilities with MATLAB's interactive GUI ensures a unique platform that facilitates both real-time data comparison and detailed performance analysis. Unlike conventional tools, this system allows seamless customization and visualization of grid-connected PV operations, enabling precise predictions despite of its simplicity. This tool presents a distinct approach to aiding PV education by experiential learning.

BENEFIT TO MANKIND

The Grid-Connected PV System Tool benefits the educational sector by offering user-friendly tool for enhancing understanding of PV behavior to irradiation through GUI environment with interactive features.

COMMERCIALIZATION POTENTIAL

The Grid-Connected PV System Tool possesses significant commercialization potential due to its innovative features and user-friendly design. It is an ideal educational tool for universities students and educators offering a hands-on platform to learn and teach renewable energy concepts. Key markets include universities, technical colleges, and solar photovoltaic communities. Future improvement of the system with additional features could potentially be commercialized to solar system developers, and energy management companies looking to enhance PV system design and efficiency.

CONCLUSION

In summary, the Grid-Connected PV System Tool, which combines the capabilities of PVsyst and MATLAB App Designer, serves as an effective platform for simulating and analyzing photovoltaic systems under diverse environmental conditions. Its innovative approach ensures precise energy performance predictions, facilitates real-time data comparison, making it a valuable resource for academic and research. By advancing renewable energy adoption, enhancing grid stability, and encouraging innovation, this tool plays a significant role in promoting sustainable and efficient energy solutions worldwide.

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Home Automation with Monitoring System Using ESP8266 and Blynk for Energy Conservation Measure

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ABSTRACT

This project, "Home Automation with Monitoring System Using ESP8266 and Blynk for Energy Conservation Measure," tackles the need for energy-efficient homes by integrating IoT technology to automate and monitor appliances. The ESP8266 microprocessor controls the system's sensors, which include the PMS5003 for air quality monitoring, the DHT22 for temperature and humidity, the LDR for detecting light, and an ultrasonic sensor for manual system on/off. The technology ensures a healthier and more efficient living environment by optimizing energy usage, cutting expenses, and improving indoor air quality through the collection of real-time data. The Blynk app, which is accessible on PCs and smartphones, allows users to remotely schedule, monitor, and control appliances, providing flexibility, convenience, and control even while they are not at home. Relays and LCDs are essential parts that allow for smooth device control and status updates, guaranteeing the system's dependability and efficiency. This integrated solution is a useful and effective strategy for contemporary, energy-conscious households looking to lessen their environmental impact because it reduces energy waste, promotes sustainable living habits, and improves user comfort.

KEYWORDS: real-time data, energy optimization, IoT technology.

PRODUCT DESCRIPTION

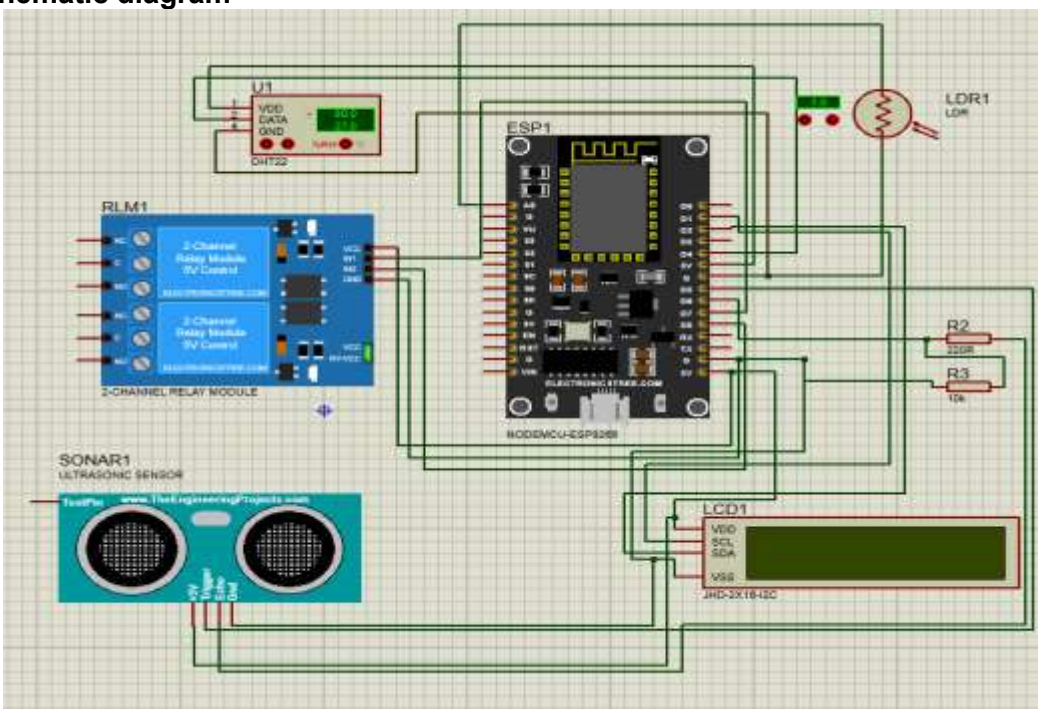
The Home Automation with Monitoring System, powered by the ESP8266 microcontroller and IoT technology, is a creative approach to smart living and energy conservation. This system reduces energy waste by automating and monitoring household appliances in real time [Singh, S., Matharu, H., & Mishra, S. (2017). Internet of things (IoT) based home automation system. International Journal of Engineering Sciences & Research Technology, 6, 239–244]. It does this by integrating high-precision sensors such the DHT22 for temperature, the LDR for light intensity, the PMS5003 for air quality, and an ultrasonic sensor for system on/off. It provides smooth device scheduling and remote control via the intuitive Blynk app, which is available on PCs and smartphones. Relays and OLED screens are used in this system, which was designed with ease and sustainability in mind. The ESP8266 guarantees dependable data transfer and intelligent automation. This system encourages economical living and establishes a new benchmark for environmentally friendly smart home technology by providing adaptive energy-saving modes, real-time notifications, and effective appliance control.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

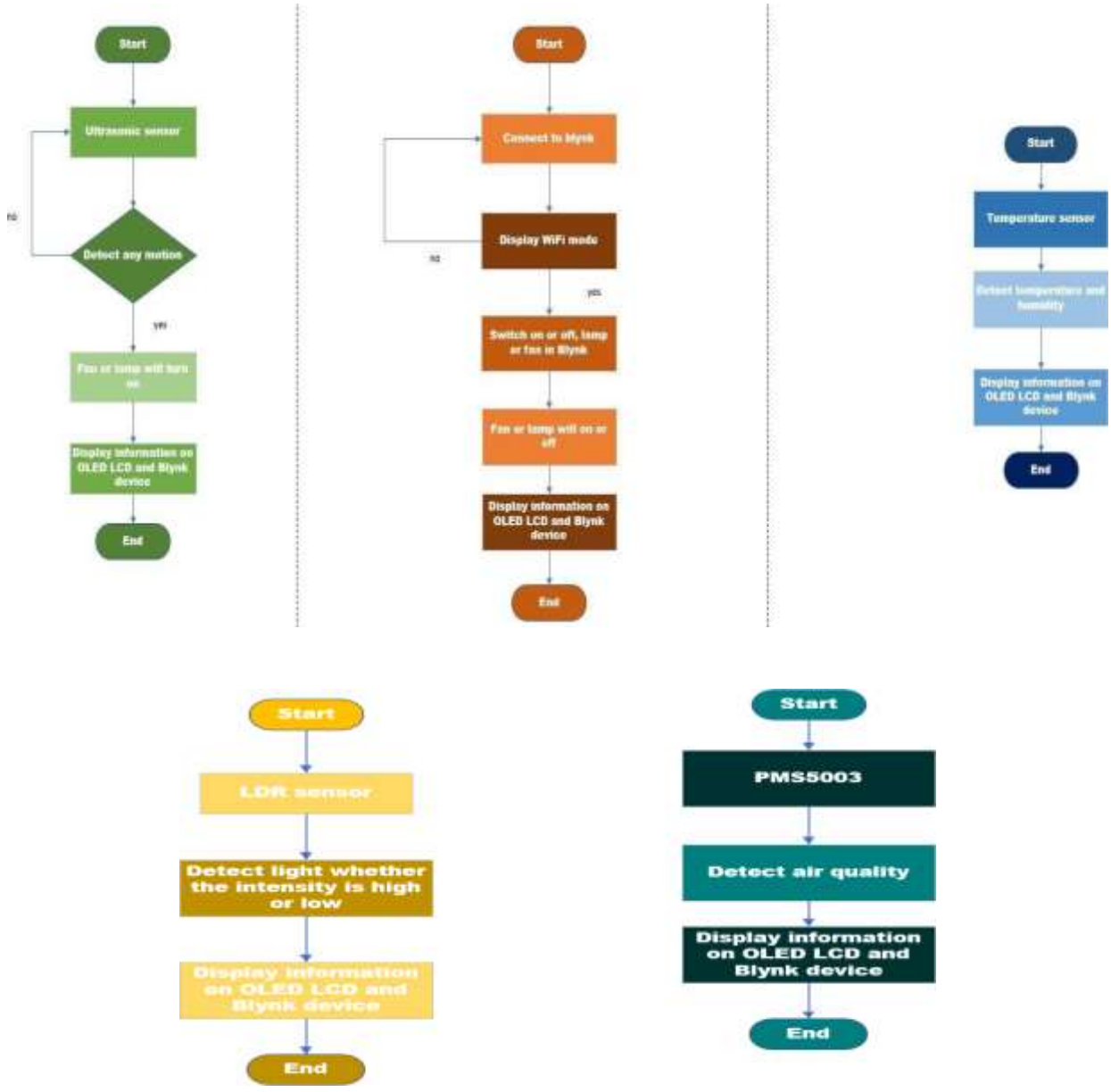
1. Blynk dashboard



2. Schematic diagram



3. Flowchart



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Home Automation with Monitoring System lie in its seamless integration of IoT technology with advanced energy conservation measures, making it a complete answer to contemporary living. In contrast to traditional systems, this project uses sensors such as DHT22, LDR, and Ultrasonic in conjunction with the ESP8266 microcontroller to allow for remote control, adaptive automation, and real-time monitoring via the Blynk application. It differs from other smart home technologies in that it can dynamically modify appliance usage based on environmental conditions. It also has user-friendly features like scheduling and real-time notifications. Its emphasis on sustainability, scalability, and affordability also guarantees wide accessibility and adaptability, meeting a range of demands in both residential and commercial applications. This system's unique contribution to smarter and more environmentally friendly living options is highlighted by its creative approach to energy management.

BENEFIT TO MANKIND

The Home Automation with Monitoring System promotes energy efficiency in homes and ecological living, which helps humanity greatly. The solution lowers needless energy use, which lowers utility bills and lessens the carbon footprint of contemporary homes by utilising IoT technology and real-time monitoring. Its remote appliance automation and control feature promotes greater independence and improves convenience, especially for the elderly and those with mobility issues. Additionally, by promoting sensible energy consumption and lowering greenhouse gas emissions, the system helps to protect the environment. In addition to enhancing quality of life, this system's incorporation of smart technology aids international initiatives for resource conservation and sustainability.

COMMERCIALIZATION POTENTIAL

The Home Automation with Monitoring System has significant commercialization potential in the growing smart home market driven by rising consumer demand for sustainable and energy-efficient living options. It appeals to tech-savvy homes due to its combination of Internet of Things technology and user-friendly features including remote control, real-time monitoring, and adjustable energy-saving modes. It can also be widely adopted in both residential and business settings because to its affordability and scalability. This system has the potential to reach a number of market niches, such as luxury residences, rental properties, and environmentally concerned consumers, thanks to its capacity to adapt functionalities to user needs. Its market attractiveness is further increased by its alignment with global sustainability goals, which makes it a viable solution for collaborations with energy firms, IoT developers, and merchants of smart homes.

CONCLUSION

In conclusion, the Home Automation with Monitoring System shows how Internet of Things technology can transform smart living and energy management. The ESP8266 microcontroller and sophisticated sensors work together to efficiently manage and monitor home appliances, reducing energy waste, cutting expenses, and improving convenience. Its user-friendly design, remote control capabilities, and real-time monitoring make it the perfect tool for encouraging economical and sustainable energy use in contemporary houses. By lowering carbon footprints and encouraging users to adopt more energy-conscious behaviours, the system promotes wider environmental and economic objectives in addition to its immediate advantages. An important step towards smarter, greener living spaces has been taken with this creative approach.

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Residential Grid-Connected Photovoltaic System Tool for Different Module Technologies Using Pvsyst and Matlab App Designer

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ABSTRACT

This project developed a user-friendly residential grid-connected photovoltaic (PV) system using PVsyst and MATLAB App Designer with different module technologies. Existing tools like PVsyst require technical expertise, making them inaccessible to non- engineering users. The tool development comprises of two parts: i) PV systems are first modeled in PVsyst to gather essential performance data, such as energy generation and efficiency, ii) then, the results from the first part are utilized to develop MATLAB-based GUI tool. The tool enables users to input key parameters, including module type, location, and solar irradiation and to simulate, analyze the systems to enhance understanding on PV system performance. Results demonstrate that the developed tool successfully outputs the expected system performance based on the inputs defined, hence showing the tool's ability to simplify system design. The developed tool provides a user-friendly environment suitable to promote PV educational.

KEYWORDS: Photovoltaic System, Grid-Connected, Performance Analysis,GUI

PRODUCT DESCRIPTION

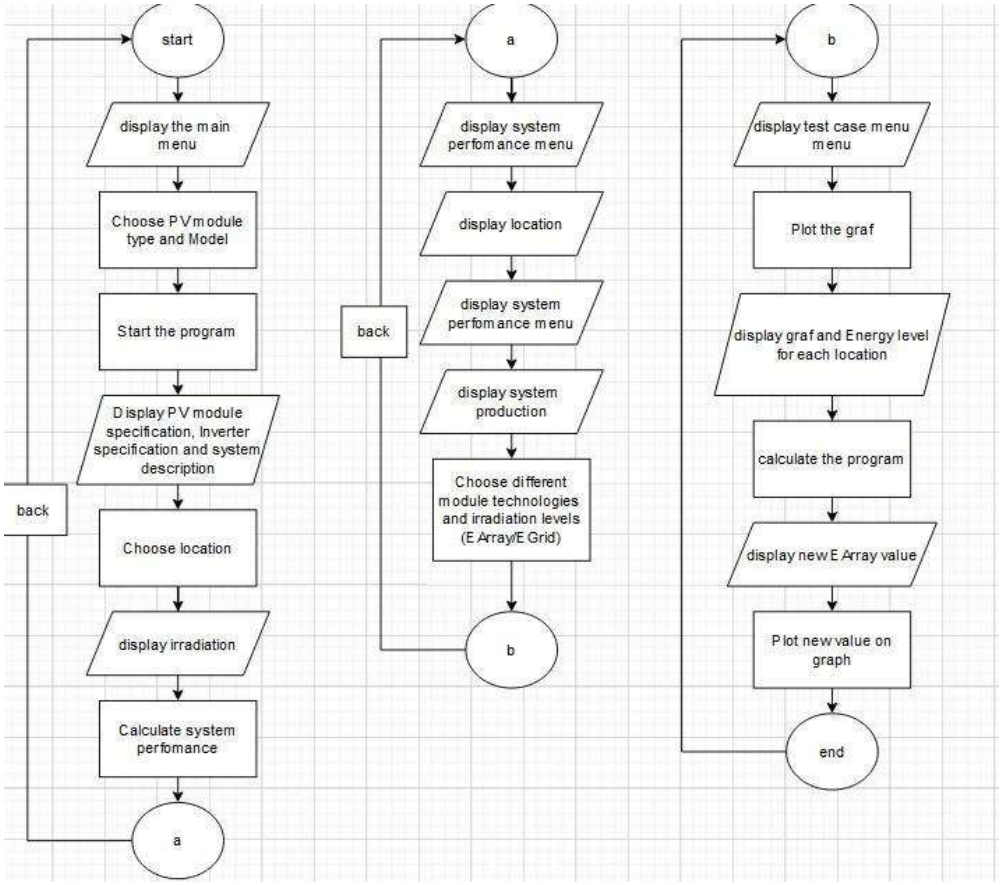
The Residential Grid-Connected Photovoltaic System Tool is an innovative software application designed to simplify the design and performance analysis of PV systems for residential use. Developed using MATLAB App Designer and integrated with PVsyst, a renowned software for solar energy simulation, the tool enables accurate modeling and assessment of PV system performance under various conditions. Users can compare monocrystalline (Si-Mono) and polycrystalline (Si-Poly) PV module technologies by analyzing the performance, power generation, and characteristics.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

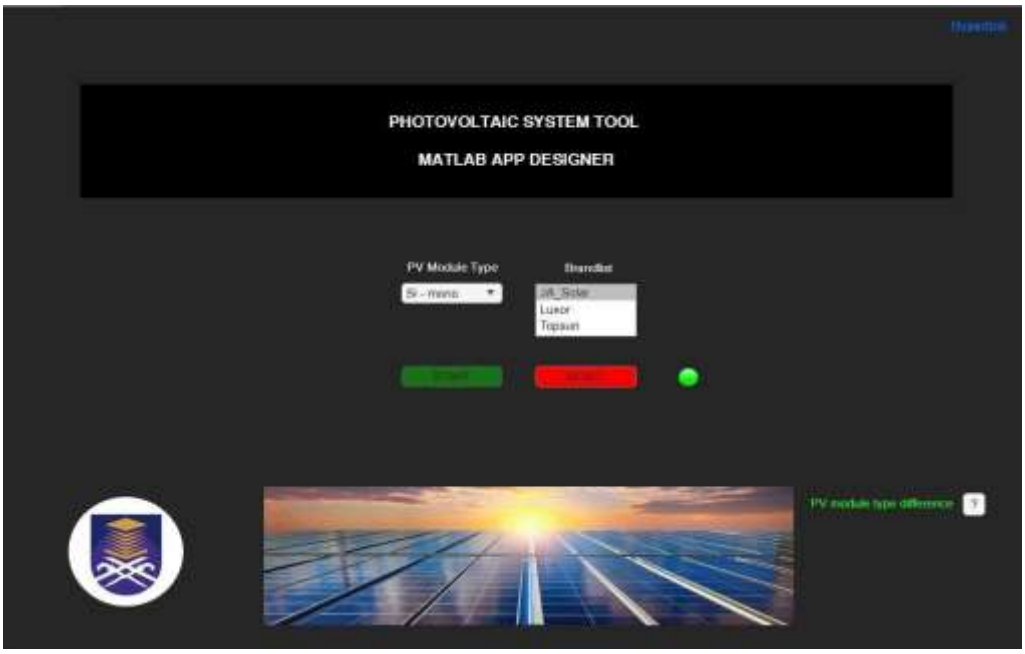
1. Block Diagram

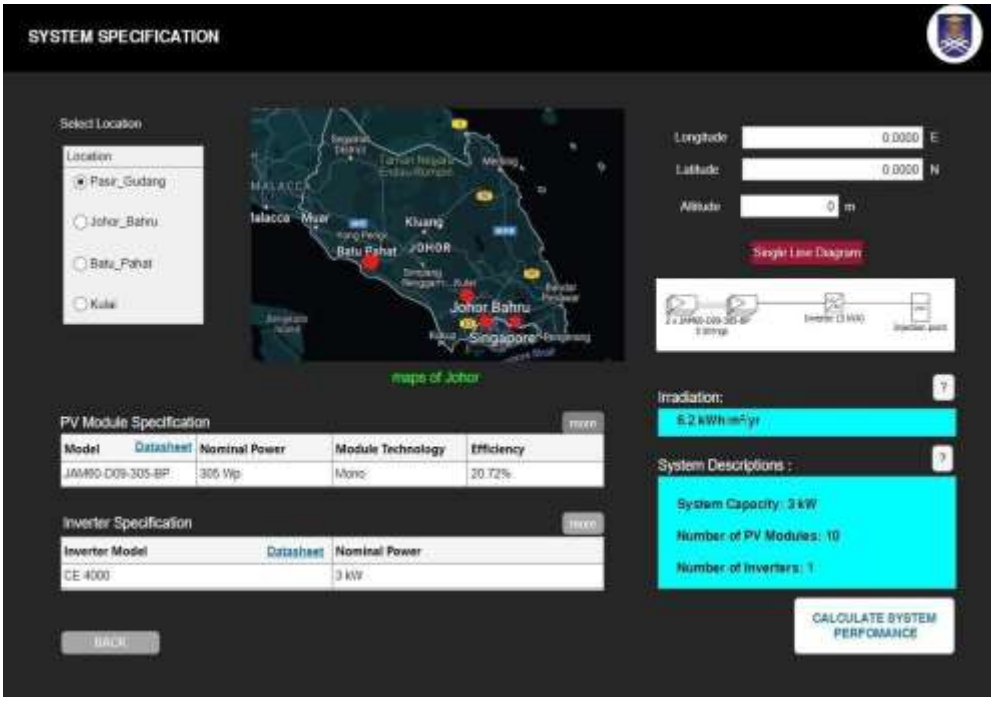


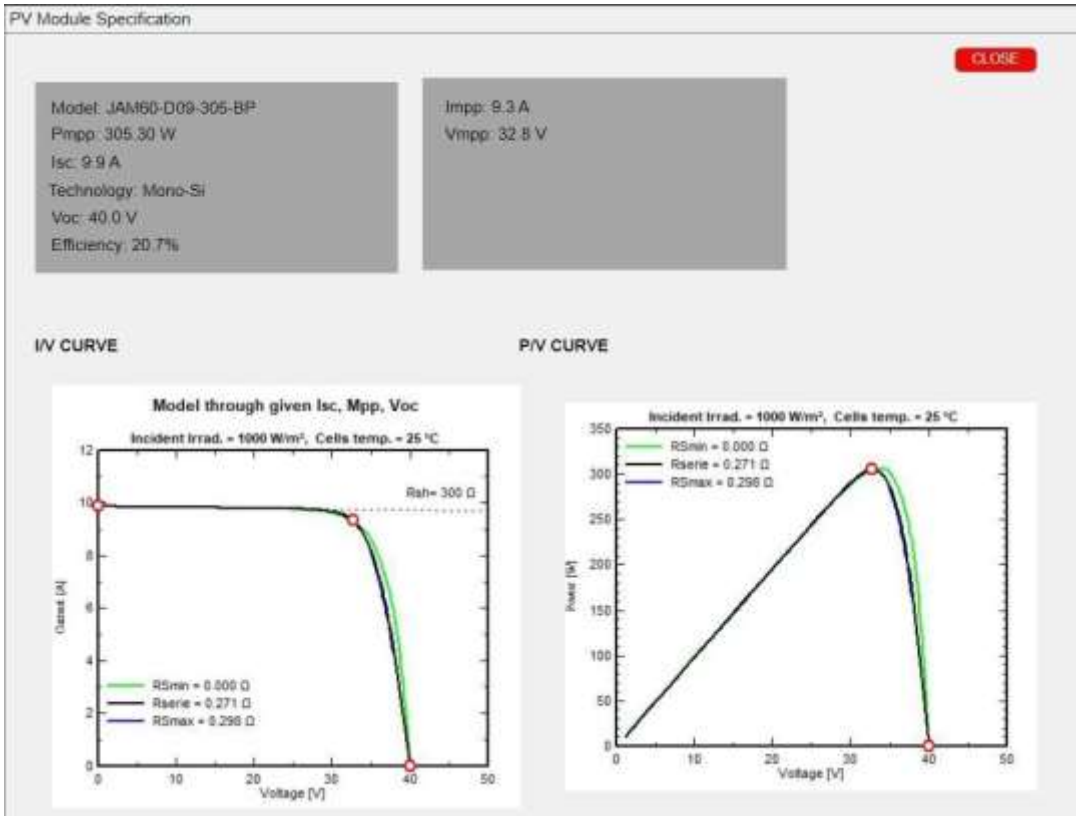
2. Main result simulation in PVsyst

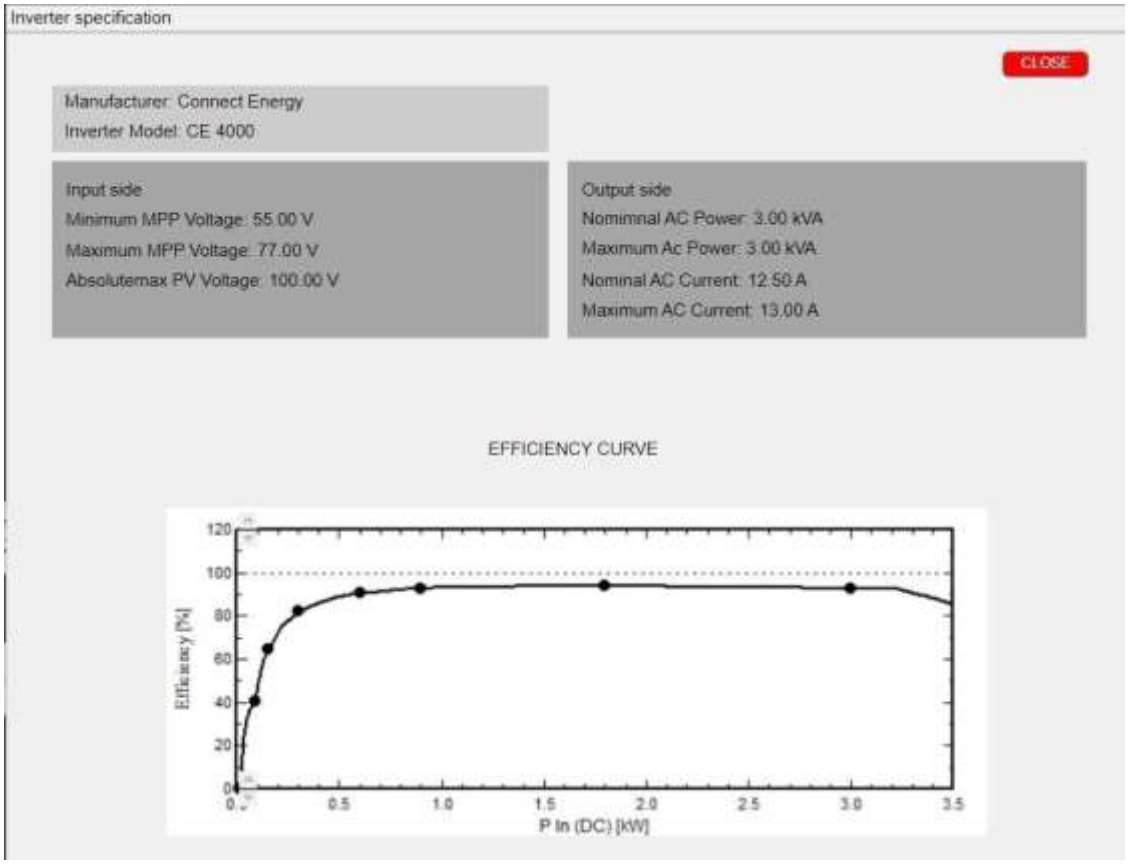


3. Residential Grid-Connected Photovoltaic System Tool layout

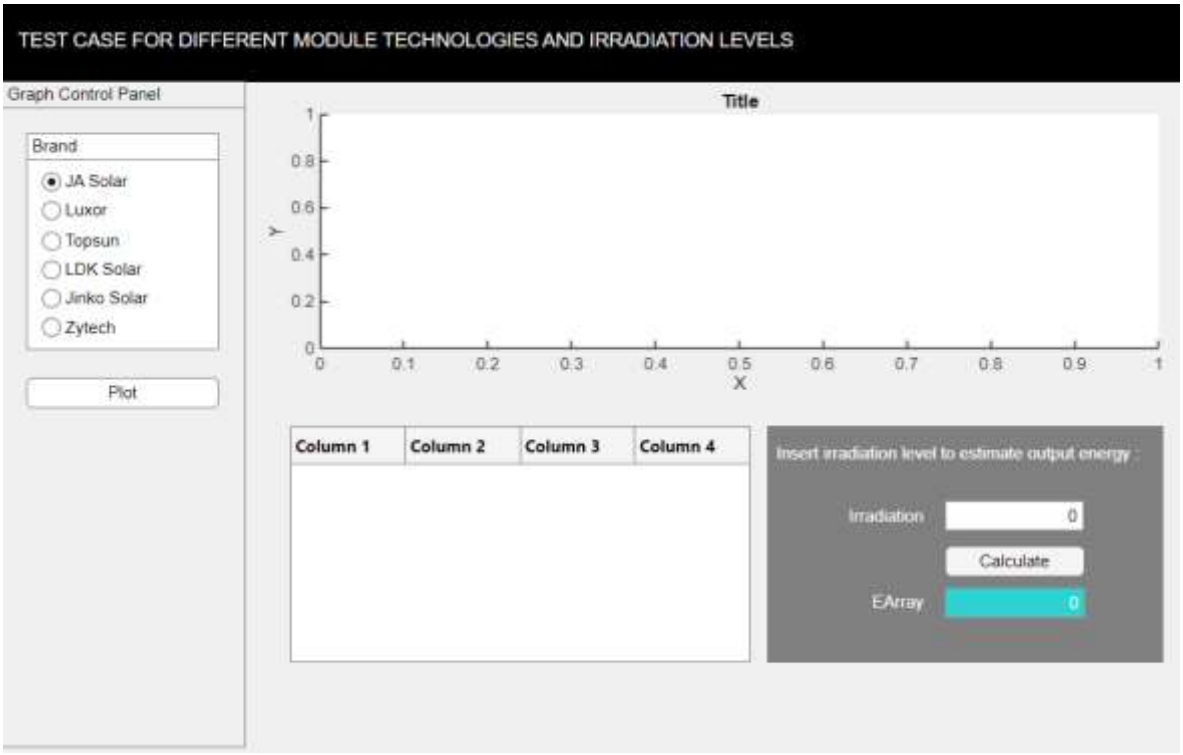



SYSTEM SPECIFICATION
Select Location
Location
Pasir_Gudang
Johor_Bahru
Batu_Pahat
Kulai
Melaka
Muar
Batu Pahat
Kluang
JOHOR
Johor Bahru
Singapore
maps of Johor
Longitude
0.0000
E
Latitude
0.0000
N
Altitude
0
m
Single Line Diagram
Irradiation:
6.2 kWh/m²/yr
PV Module Specification
more
Model
Datasheet
Nominal Power
Module Technology
Efficiency
JAM60-D09-305-BP
305 Wp
Mono
20.72%
Inverter Specification
more
Inverter Model
Datasheet
Nominal Power
CE 4000
3 kW
System Descriptions :
System Capacity: 3 kW
Number of PV Modules: 10
Number of Inverters: 1
BACK
CALCULATE SYSTEM PERFOMANCE


PV Module Specification
CLOSE
Model: JAM60-D09-305-BP
Pmpp: 305.30 W
Isc: 9.9 A
Technology: Mono-Si
Voc: 40.0 V
Efficiency: 20.7%
Impp: 9.3 A
Vmpp: 32.8 V
I/V CURVE
P/V CURVE
Model through given Isc, Mpp, Voc
Incident Irrad. = 1000 W/m², Cells temp. = 25 °C
Rsh= 300 Ω
RSmin = 0.000 Ω
Rserie = 0.271 Ω
RSmax = 0.296 Ω
Output [A]
Voltage [V]
Incident Irrad. = 1000 W/m², Cells temp. = 25 °C
RSmin = 0.000 Ω
Rserie = 0.271 Ω
RSmax = 0.296 Ω
Power [W]
Voltage [V]


Inverter specification
CLOSE
Manufacturer: Connect Energy
Inverter Model: CE 4000
Input side
Minimum MPP Voltage: 55.00 V
Maximum MPP Voltage: 77.00 V
Absolutemax PV Voltage: 100.00 V
Output side
Nominnal AC Power: 3.00 kVA
Maximum Ac Power: 3.00 kVA
Nominal AC Current: 12.50 A
Maximum AC Current: 13.00 A
EFFICIENCY CURVE
Efficiency [%]
P In (DC) [kW]


SYSTEM PERFOMANCE
Maps of Location
Pasir Gudang
SYSTEM PRODUCTION
Performance Ratio PR
Normalized productions (per installed kWp)
GlobHor Global horizontal irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temprature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio
BACK
DIFFERENT MODULE TECHNOLOGIES AND IRRADIATION LEVELS
EArray
EGrid



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Grid-Connected PV System Tool lies in its integration of PVsyst and MATLAB App Designer for comprehensive and user-friendly simulation of photovoltaic systems under varying irradiation conditions. A unique platform that enables both real-time data comparison and in-depth performance analysis is ensured by the combination of MATLAB's interactive GUI and PVsyst's accurate energy modeling capabilities. In contrast to traditional tools, this system makes it easy to customize and visualize grid-connected photovoltaic operations, allowing for accurate forecasts despite its simplicity. This application offers a unique method for supporting experiential learning in PV education.

BENEFIT TO MANKIND

The Grid-Connected PV System Tool benefits educational sector by offering user-friendly tool for enhancing understanding of PV behavior to irradiation through GUI environment with interactive features.

COMMERCIALIZATION POTENTIAL

The Grid-Connected PV System Tool's novel features and intuitive design make it a promising product for commercialization. It provides a practical platform for teaching and learning about renewable energy ideas, making it the perfect instructional tool for college students and instructors. Universities, technical colleges, and solar photovoltaic villages are important markets. Future feature additions to the system may be commercialized to energy management firms and solar system developers who want to increase the efficiency and design of PV systems.

CONCLUSION

This project has strong potential for practical applications, particularly in addressing the growing interest in renewable energy solutions among residential users. Photovoltaic (PV) systems are environmentally friendly and reliable, playing a crucial role in green energy generation. This tool provides students, educators, and entry-level engineers with a user-friendly and cost-effective platform to design and analyze grid-connected photovoltaic systems.

As the global shift towards clean energy accelerates, the tool's intuitive interface and simulation capabilities make it ideal for use in academic settings, workshops, and training programs. Its ability to accommodate various PV module brands and locations enhances its appeal for research and learning purposes. Additionally, the tool could serve as a foundation for collaborations with solar energy companies or further development into more advanced applications for commercial and industrial PV system design.

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An Interactive Three-Phase Electrical System Educational Tool Using Matlab App Designer

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ABSTRACT

This project develops an interactive educational tool using MATLAB App Designer to enhance the understanding of three-phase electrical systems, addressing the limitations of traditional teaching methods in conveying concepts such as phase sequence, balanced loads, and power relationships. The tool features intuitive layouts for phase sequence determination, balanced load analysis, three-phase system parameter calculations, power triangle visualization, and one-line diagram modelling, enabling users to input values, simulate system behaviour, and observe detailed voltage and current waveforms, power calculations, and phase relationships in real time, altogether six layouts development. The methodology includes designing a user-friendly interface, structured workflows with block diagrams and flowcharts, and iterative testing to ensure accuracy and usability. The tools also equipped with pre-defined inputs for user as reference. Results show that the developed tool successfully generates outputs accurately for each developed layout and they were validated theoretically. In addition, this tool offers detailed simulations with the aids of waveforms and diagrams to enhance users' understanding on the three-phase system. Ultimately, this comprehensive tool serves as a valuable resource for electrical engineering students and educators as educational tool by improving engagement and comprehension by experiential learning.

Keywords: Three-Phase Electrical Systems, MATLAB App Designer, Interactive Educational Tool, Graphical User Interphase

PRODUCT DESCRIPTION

The Interactive Three-Phase Electrical System Educational Tool is a MATLAB App Designer-based software developed to enhance the understanding of complex three-phase electrical systems. It integrates multiple features, including phase sequence determination, balanced load analysis, power triangle visualization, parameter evaluation in three-phase systems, and one-line diagram representation. This tool allows users to visualize and manipulate system parameters, observe real-time voltage and current waveforms, and perform power-related calculations. The user-friendly interface, combined with interactive layouts, bridges the gap between theoretical concepts and practical applications, making it a useful resource for students and educators in the electrical engineering.

PICTURES



Figure 1: Main Page

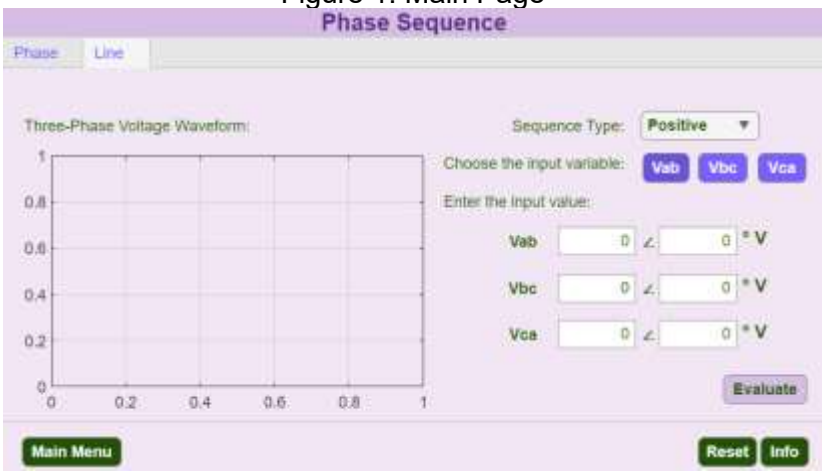


Figure 2: Page Layout for Phase Sequence

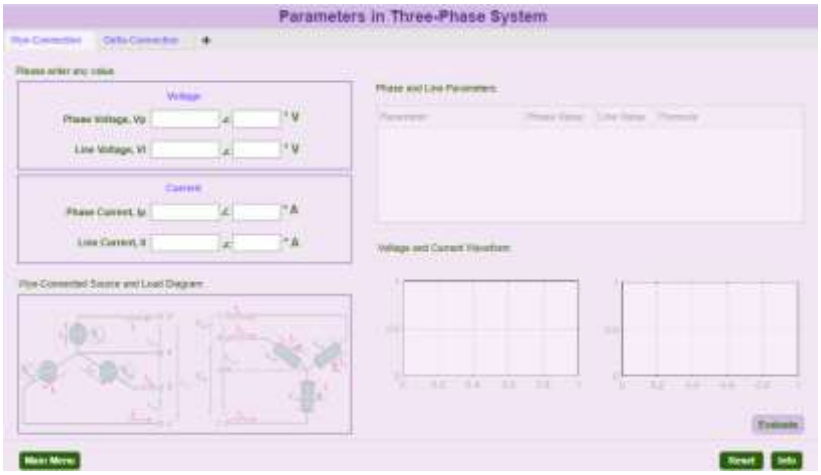


Figure 3: Page Layout for Parameters in Three-Phase System

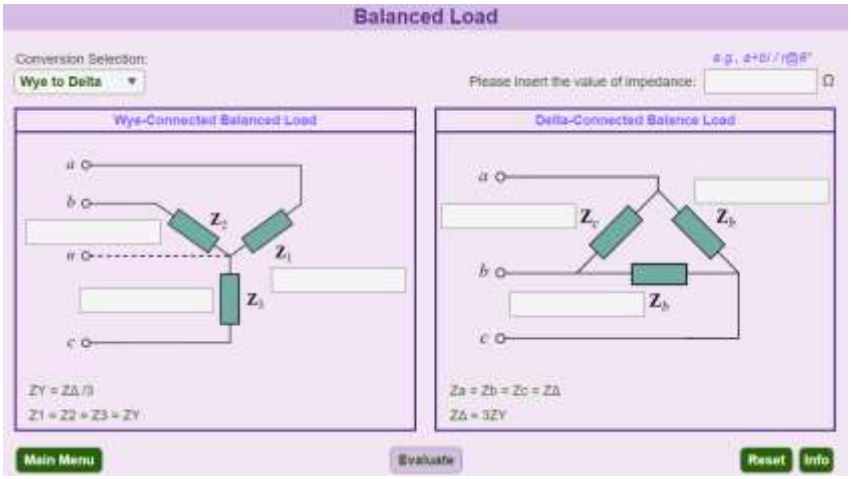


Figure 4: Page Layout for Balance Load

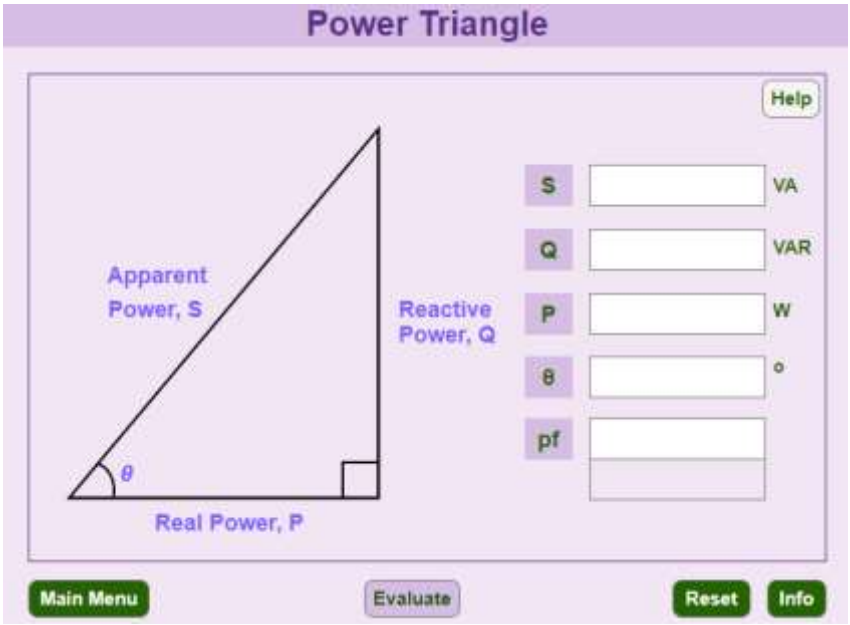


Figure 5: Page Layout for Power Triangle

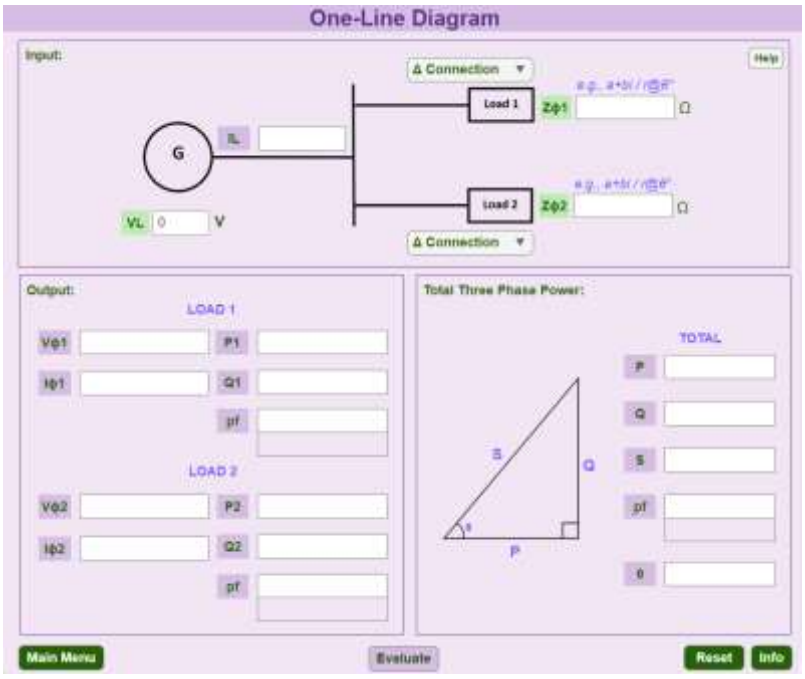


Figure 6: Page Layout for One-Line Diagram Case Studies

NOVELTY AND UNIQUENESS

This project stands out for its comprehensive integration of multiple essential topics in three-phase electrical systems into a cohesive educational tool. This project provides an interactive platform for analysing phase sequences, visualizing waveforms, performing power calculations, and studying balanced loads, all with real-time feedback. Its structure allows users to dynamically explore interrelated concepts, making it both innovative and highly user focused, hence promoting experiential learning.

BENEFIT TO MANKIND

The tool addresses the challenge of effectively teaching and learning complex three-phase electrical concepts. By offering a visual, hands-on approach, it enhances comprehension for students, improves teaching methods for educators. Ultimately, it contributes to producing better-trained electrical technician/engineers.

COMMERCIALIZATION POTENTIAL

The tool has strong commercialization potential as an educational software product targeted at universities and technical institutions. It can be offered as a standalone simulation tool or included in electrical engineering courses. Adding extra features like advanced analysis options or connections to real hardware could make it even more attractive. It could generate income through subscriptions, licenses for schools, or partnerships with training programs.

CONCLUSION

The Interactive Three-Phase System Educational Tool Using MATLAB App Designer marks a significant innovation in electrical engineering education. By integrating interactive layouts for phase sequence analysis, balanced load evaluation, power triangle visualization, three-phase parameters, and one-line diagrams, the tool delivers a comprehensive learning experience. Its user-friendly interface, practical functionality, and real-time simulations effectively bridge the gap between theoretical knowledge and practical application, enabling students to gain a deeper understanding of three-phase electrical concepts. This project not only enhances education but also paves the way for innovative teaching methodologies and industry applications.

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Hybrid Renewable Energy-Controlled System for an Urban Eco Greenhouse

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ABSTRACT

Urban gardening, especially in apartments or townhouses, faces significant challenges such as limited natural light due to scarce windows or surrounding tall buildings. This often hampers the ability of residents to grow healthy plants, which are desired for their aesthetic, air-purifying, and therapeutic benefits. To address this issue, a sustainable system utilizing solar and wind energy is proposed to provide adequate lighting for indoor plants. This technical report documents the design and simulation of an Hybrid Renewable Energy Controlled System for an Urban Echo Greenhouse. The primary of this project are to design a prototype for an Eco Greenhouse system that provide UV light to plant and monitor their condition that incorporates hardware components. The Hybrid Renewable Energy-Controlled System for Urban Eco Greenhouse is an innovative solution designed to enhance the sustainability and productivity of urban agriculture. Utilizing the ESP32 microcontroller, this system integrates multiple sensors and renewable energy sources to create a self-sustaining and responsive greenhouse environment. Key components include an LDR (Light Dependent Resistor) sensor and a PIR (Passive Infrared) sensor, which together enhance the system's security and environmental monitoring capabilities. The LDR sensor ensures efficient UV light provision for plants, while the PIR sensor detects unauthorized movements, triggering alerts through a buzzer and visual notifications on an LCD display. The system is powered by a combination of solar and wind energy, ensuring a renewable and reliable energy source that reduces dependency on conventional power supplies. This multi sensor, renewable energy-based approach provides a comprehensive and adaptable solution for urban greenhouses, promoting eco-friendly practices and ensuring optimal plant growth. The integration of advanced sensor technologies and renewable energy sources not only improves system efficiency but also contributes significantly to environmental sustainability. This abstract encapsulates the core functionalities and benefits of the Hybrid Renewable Energy-Controlled System, highlighting its potential impact on modern urban agriculture.

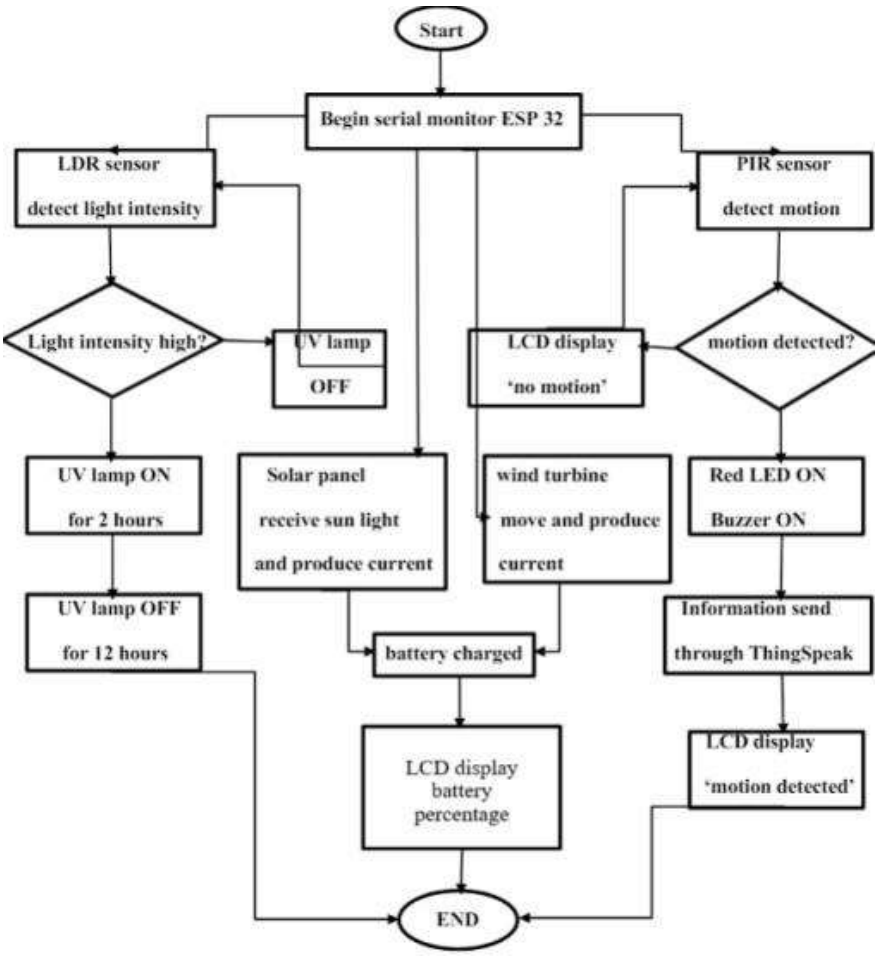
KEYWORDS: Solar energy, wind energy , Urban area, Eco greenhouse safety, ESP 32

PRODUCT DESCRIPTION

The Hybrid Renewable Energy-Controlled System for an Urban Eco Greenhouse is a cutting-edge solution designed to address the challenges of indoor gardening in urban environments, particularly in spaces with limited natural light. This system combines solar and wind energy to power UV lamps that simulate natural sunlight, ensuring plants receive consistent light necessary for photosynthesis and healthy growth, even in low- light conditions. The integration of solar panels and a wind turbine allows for a continuous and renewable energy supply, optimizing energy efficiency and reducing the reliance on traditional electricity sources. The system is equipped with a Light Dependent Resistor (LDR) sensor, which detects insufficient natural light and automatically activates the UV lamps, ensuring optimal lighting for plant health. Additionally, a Passive Infrared (PIR) motion sensor is included to monitor the environment for potential threats, such as intruders or animals, providing real-time alerts to safeguard the plants. With the integration of ThinkSpeak, the system enables remote monitoring, allowing users to track and manage their greenhouse conditions from anywhere. This hybrid system not only supports sustainable energy practices but also helps reduce carbon footprints and electricity bills, making it both environmentally friendly and cost-effective. Combining high-tech automation with renewable energy, the Hybrid Renewable Energy-Controlled System for an Urban Eco Greenhouse provides an innovative, reliable solution for urban gardeners seeking to maintain a healthy, thriving indoor garden regardless of

external weather conditions

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS



NOVELTY AND UNIQUENESS

The Hybrid Renewable Energy-Controlled System for an Urban Eco Greenhouse is unique and novel due to its innovative combination of solar and wind energy, which ensures a reliable, continuous power supply for indoor gardening, even during cloudy weather or at night. Unlike many traditional systems that rely on a single energy source, this hybrid approach makes it more robust and energy-efficient. The system also incorporates advanced sensor technology, such as the Light Dependent Resistor (LDR) sensor, which automatically detects low light conditions and activates UV lamps to ensure plants always receive the optimal amount of light for growth. Additionally, the Passive Infrared (PIR) motion sensor enhances security by detecting movement around the greenhouse, alerting users to potential threats like intruders or animals. Another standout feature is its integration with ThinkSpeak, which allows users to remotely monitor and control the system, offering real-time updates and alerts for easy management. This combination of renewable energy, smart sensors, and remote monitoring makes it a highly adaptable and sustainable solution for urban gardeners, particularly in spaces with limited natural light. The system's compact and customizable design also makes it suitable for a wide range of users, from individual homeowners to businesses looking to grow their own plants. Overall, the product's focus on energy efficiency, sustainability, and convenience sets it apart as an innovative solution in the growing field of urban agriculture.

BENEFIT TO MANKIND

The Hybrid Renewable Energy-Controlled System for an Urban Eco Greenhouse offers significant benefits to mankind by promoting sustainable urban living and contributing to environmental preservation. By harnessing renewable energy sources like solar and wind power, this system reduces dependence on non-renewable energy, helping to lower carbon emissions and combat climate change. It provides an innovative solution for growing fresh, healthy plants in urban areas where space and natural light are limited, enhancing food security and encouraging local, sustainable agriculture. Additionally, the system's energy-efficient design lowers electricity consumption, which can reduce household energy bills and help individuals adopt more eco-friendly lifestyles. With the ability to monitor plant health and safety remotely, the system also empowers people to easily integrate gardening into their busy lives, improving access to green spaces and supporting mental well-being. By fostering self-sufficiency in food production and promoting environmental stewardship, this system contributes to a healthier, more sustainable future for urban communities and the planet as a whole reliable energy even at night or on cloudy days.

CONCLUSION

The system uses smart sensors like the LDR sensor, which detects low light and activates the UV lamps to keep plants properly lit. The PIR sensor also improves security by detecting movement around the greenhouse and alerting users to potential threats. With the ThinkSpeak platform, users can remotely monitor and control the greenhouse, receiving alerts for quick action when needed. To make the system even better, adding sensors for humidity, soil moisture, and temperature could help provide a more complete picture of the growing environment. Using predictive technology could also help the system better anticipate plant needs. Conducting trials and gathering feedback from urban gardeners would ensure the system works well in real-life situations. Overall, this system offers a sustainable and efficient solution for urban gardening, combining renewable energy with smart technology to support plant health and promote a greener, more sustainable urban lifestyle.

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RFID-Enabled Electromagnetic Door Lock System Powered by Solar Panel

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ABSTRACT

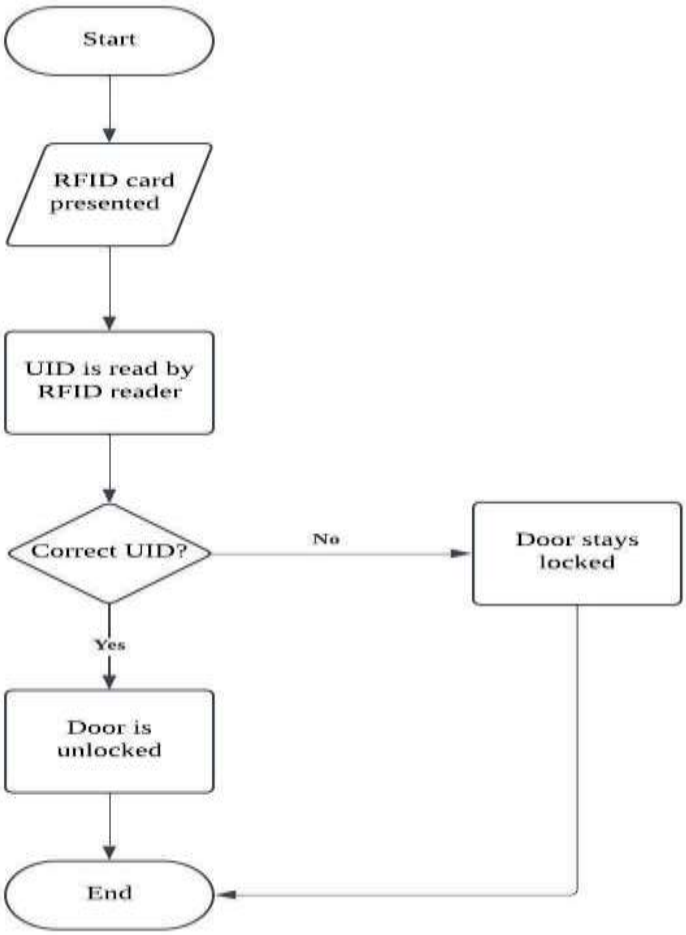
Most doors that use traditional lock systems, which utilize mechanical locks, are being replaced by electrical and control-based lock systems that offer more capabilities and features compared to traditional lock systems. One of the most important features of these lock systems is their high efficiency. In this project, an electromagnetic lock system was constructed by combining mechanical and electronic components into a functional device. A microcontroller ESP32 was used to control every function, process information, and relay signals to all the other components in the device. The inputs for this device include an RFID module, a push button, and a mobile app. The RFID module reads the UID of the RFID tag or card presented by the user. The push button functions as a way of opening the lock from the inside, while the mobile app serves as a remote control to open the lock without presenting an RFID tag or card. An electromagnetic lock secures the door during the lock state. The main system performances include a read range of approximately 20 mm and the ability to detect RFID tags or cards through thin materials like paper, plastic, glass, and cloth. However, materials like aluminum and iron interfere with the RFID reader, preventing it from reading the RFID UID.

KEYWORDS: RFID, Electromagnetic Lock, ESP32, Button, IoT, Mobile App

PRODUCT DESCRIPTION

The RFID Electromagnetic Lock System is a simple, fast, and reliable lock system that uses an electromagnetic lock integrated with RFID for control of the lock and unlock state. It utilizes renewable energy by drawing power from a solar-charged battery [1]. The system's key feature is its reliability, ensuring security even during power outages. Even in the case of a blackout, the lock system remains fully operational [2]. Another significant feature is the ability to operate the lock remotely, enabled by integrating a mobile app. This feature proves beneficial in scenarios where users cannot access their RFID tag or card but still need to unlock the door. Additionally, it allows users to authorize access remotely in situations where they cannot be physically present but need someone to retrieve items.

FLOW CHART AND TABLE



RFID Detection Range Test Results (mm)						
Range	**05**	**10**	**15**	**20**	**25**	**30**
Functioning	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**

NOVELTY AND UNIQUENESS

The RFID-Enabled Electromagnetic Access Control System with solar power integration is a novel and sustainable solution for modern security needs [2]. It offers a unique combination of energy efficiency, user interaction, and scalability. By employing a solar panel and battery backup, the system ensures eco-friendly operation and reliability, even in off-grid locations [1]. Robust security mechanisms, including relay-controlled electromagnetic locks, are complemented by visual (LCD and LEDs) and auditory (buzzer) feedback, enhancing user interaction [4]. The use of commonly available components such as the ESP32 and MFRC522 ensures cost-effectiveness and adaptability [4]. Its customizable authentication system supports dynamic updates to authorized RFID credentials, making it versatile for various applications, from smart homes to rural setups [6]. This project bridges the gap between traditional access systems and advanced, sustainable, intelligent security solutions [5].

BENEFIT TO MANKIND

The RFID-Enabled Electromagnetic Access Control System powered by solar energy benefits humanity by enhancing security, sustainability, and accessibility [1]. Its use of renewable energy reduces dependence on conventional power sources, promoting environmental conservation. This makes it suitable for deployment in remote or underdeveloped regions [6]. Its user-friendly design meets the growing demand for efficient access control in diverse settings like homes, offices, and public facilities [5]. The system's affordability and scalability ensure accessibility for a wide audience, while its IoT integration potential supports smart living through remote monitoring and control [4]. This project demonstrates the potential of combining technology with sustainability to address modern security challenges effectively [3].

COMMERCIALIZATION POTENTIAL

This project demonstrates strong commercialization potential by merging security, sustainability, and affordability into a single solution [2]. Unlike traditional access control systems reliant on grid electricity, its solar-powered design ensures functionality in off- grid areas and regions with unreliable power supplies [6]. The integration of RFID technology addresses the growing need for smart, user-friendly security systems [5]. Compared to existing market products, it offers reduced operational costs while prioritizing environmental sustainability, positioning it as an eco-conscious and cost- effective alternative. Its modular and scalable design makes it adaptable for diverse applications, ranging from small households to large corporations [4]. Moreover, its compatibility with IoT devices enhances its market relevance, allowing for seamless integration into advanced smart home or industrial systems. By addressing the gaps in current access control solutions, this project stands out as a competitive and innovative option in the renewable energy and smart security markets [3].

CONCLUSION

In conclusion, the RFID-enabled electromagnetic access control system powered by a solar panel represents a step forward in sustainable and secure access management. By leveraging renewable energy and advanced RFID technology, it addresses energy efficiency, environmental impact, and robust security challenges. Its seamless integration of components, user-friendly interface, and modular design ensure adaptability for diverse applications. This project highlights the potential of modern technology combined with sustainability to address global security needs . It serves as a testament to how innovation can enhance quality of life while contributing to a greener and more secure future.

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The Distribution Box Overheat Monitoring System

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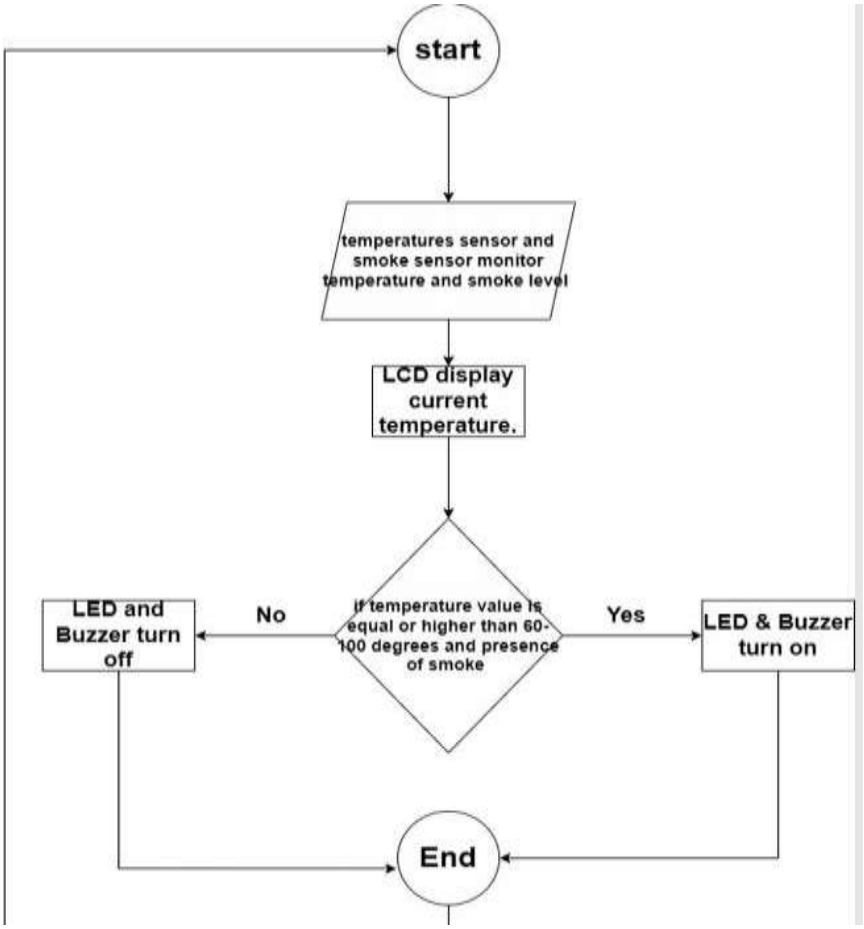
ABSTRACT

In industrial settings, electrical distribution boxes are necessary for power distribution and control. They are at risk for overheating, though, which brings a risk to safety as well as the potential for equipment failure and downtime. In order to solve this problem, this project develops the construction of an Arduino-based overheat monitoring system. Heat and smoke within distribution boxes will be continuously monitored by the system due to the combination of temperature sensors, smoke sensors, and an Arduino microcontroller. When temperature rises from a predetermined level, or smoke is detected the system will alert the operator by sounding the buzzer and blinking the light emitting diode (LED). In addition, Liquid Crystal Display (LCD), will provide continuous status updates, while the system can be manually controlled by switch. By minimizing overheating-related issues and guaranteeing continuous and safe operations, this comprehensive real-time monitoring and automated response system will improve the dependability and safety of electrical distribution systems.

KEYWORDS: overheat monitoring system, electrical distribution box, home safety.

PRODUCT DESCRIPTION

The Electrical Distribution Box Overheat Monitoring System is a progressive safety application made to guard against circuit breaker failures, smoke accumulation, and overheating in electrical distribution systems. A temperature sensor, smoke sensor, LCD display, LED indication, buzzer, manual reset switch, and parts are integrated with an Arduino microcontroller in this system to offer real-time alerts and continuous monitoring. The distribution box's temperature and smoke levels are measured by the system. The system automatically alerts users by activating the buzzer and LED if the temperature rises over a certain level, smoke is detected, indicating the circuit breaker malfunctions, enabling prompt action. The LCD shows real-time system status updates, making sure users are aware of all important circumstances. After resolving the issue, users can deactivate alerts and reset the system using the manual reset switch.A practical and efficient method to improve the security of residential electrical systems is with this monitoring system. It ensures the stable operation, safety, and durability of electrical systems by addressing the risks of smoke, overheating, and circuit breaker faults, hence reducing the potential of electrical fires and other hazards.



PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarized as follow: Material Selection and Acquisition

The project's needed parts, including Arduino microcontrollers, circuit breakers, temperature sensors, smoke sensors, LEDs, buzzers, and LCD screens, were sourced and their compatibility and quality checked.

1. **Circuit Assembly**

The designed schematic was followed when integrating the hardware components. Using jumper wires, breadboards, and soldering procedures as needed, connections were made between the Arduino board, sensors, and output devices.

2. **Programming**

The Arduino IDE was used to program the Arduino microcontroller. The code contained algorithms for gathering sensor data, processing it, and sending out signals when certain thresholds were reached.

3. **Testing and Calibration**

Simulations were used to test the system. To ensure exact temperature and smoke level detection as well as output responses (buzzer, LED, and LCD).

4. **Error Identification and Debugging**

Any problems that developed during programming or assembly were fixed by over time debugging, improving the code, and modifying the hardware configuration.

NOVELTY AND UNIQUENESS

With its new options, the Electrical Distribution Box Overheat Monitoring System was designed to improve electrical safety. It includes several sensors, such as a smoke and temperature sensor, and shows real-time data on an LCD. In addition to providing instant alerts through an LED and buzzer, the system also has a manual reset feature for ease of usage. It is unlike traditional methods due to a focus on identifying circuit breaker failures and its affordable scalability through the use of Arduino. This general method is a unique and significant addition to electrical safety systems since it guarantees accurate hazard detection and prevention.

BENEFIT TO MANKIND

By minimizing any electrical hazards the Electrical Distribution Box Overheat Monitoring System enhances safety in residential environments. It assists in identifying overheating, smoke, and circuit breaker malfunctions before they become major problems like fires by offering real-time temperature and smoke level monitoring. By reducing hazards to people and property, this approach makes the environment safer. Because of its flexibility and cost, it may be used widely, encouraging safer electrical installations all around the world. By warning users of problems early on and encouraging proactive management of electrical systems, it also helps to lower maintenance costs and downtime.

COMMERCIALIZATION POTENTIAL

The system's scalability enables adjustment for a range of settings, from massive industrial panels to tiny home distribution boxes. This product can be positioned as an essential safety device given the growing demand for smart monitoring systems, regulatory compliance requirements, and worldwide awareness of electrical safety. Working together with utility providers, building contractors, and electrical manufacturers could expand its market reach and make it a product that can be widely adopted.

CONCLUSION

The Electrical Distribution Box Overheat Monitoring System is an economical and practical way to improve electrical safety. It efficiently detects overheating, smoke, and circuit breaker failures by combining temperature and smoke sensors with real-time warnings and monitoring. Despite coding difficulties, the system shows great promise in reducing property and life hazards, making it a useful instrument for both home and commercial use.

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Solar-Powered Weather Monitoring System

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ABSTRACT

This project introduces an Internet of Things (IoT)-based weather station designed to collect and analyze quantitative weather data for accurate and timely short-term forecasts. There is a demand for a cost-effective, real-time weather monitoring system that integrates multiple parameters such as temperature, humidity, gas concentration, and light intensity into a unified and user-friendly platform, while also enabling cloud- based data logging, weather analysis, and visualization through computer applications like mobile apps to mitigate risks, and facilitate proactive management of weather-related challenges. The project incorporates ESP32 microcontroller which integrates various sensors.to monitor temperature, humidity, rain, gas concentration, and light intensity. DHT22 sensor to monitor ambient temperature, MQ2 sensor for detecting gases like smoke, a light dependent resistor (LDR) to observe light levels, and a rain sensor to detect precipitation. LCD screen equipped with I2c module are deployed to display real- time data and alerts coming from processed data of ESP32. These components enable the system to dynamically respond to environmental conditions. The project is powered by a solar cell which excess energy are stored in rechargeable lithium-ion batteries, providing sustainability and convenience. A battery management system, including a voltage regulator and battery charger, ensures safe and efficient operation. The system generates sound alerts using a piezo buzzer upon detecting hazardous conditions such as gas leakage or extreme weather. By connecting to the internet, the weather station can upload data to a cloud service and send alerts remotely. This innovative approach enhances weather monitoring and safety by providing users with real-time data and alerts, facilitating prompt responses to potential hazards.

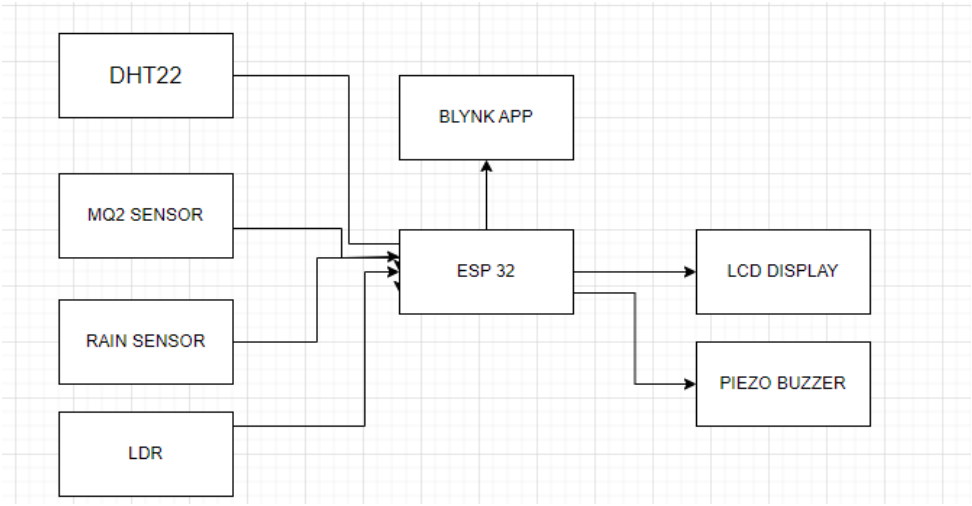
KEYWORDS: Weather forecasting, IoT, ESP32 microcontroller, sensors, real-time monitoring, LCD display, gas detection, seismic activity, solar cell, internet connectivity, data analysis, weather station, hazard detection.

PRODUCT DESCRIPTION

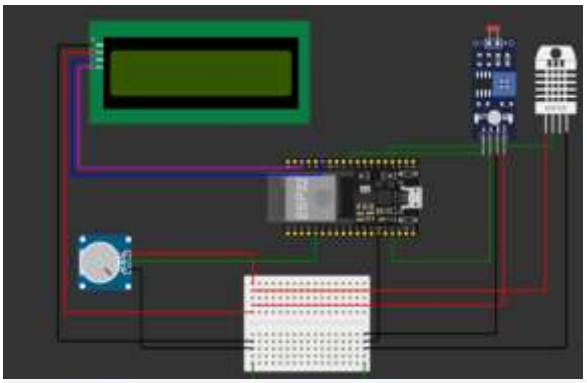
The Solar-Powered Weather Monitoring System is an innovative device engineered to collect quantitative data about a location's weather conditions. This machine provides a cost-effective, easily deployable solution that integrates multiple environmental parameters (e.g., temperature, humidity, gas concentration, light intensity) into a unified system. There is a crucial need for a system that can monitor and display real-time weather data, detect hazardous conditions, and alert users promptly to mitigate potential risks. It is crafted because of a gap of the availability of systems that not only monitor weather conditions but also log data over time for trend analysis and historical study, especially people in areas susceptible to weather fluctuations, require an IoT-based solution that can log weather data to a cloud platform such as Blynk, enabling the study of weather patterns and aiding in better planning and decision-making. To address the challenges of unpredictable weather patterns and the need for real-time, localized weather data, an IoT-based weather monitoring system utilizing the ESP32 microcontroller are developed. The system will integrate sensors to measure temperature, humidity, gas concentration, and light intensity, and will provide immediate hazard alerts such as when temperatures exceed 36°C. Data will be transmitted to the cloud via platforms like Blynk, allowing for continuous logging and histogram of weather trends through an intuitive mobile app. This solution aims to offer a cost-effective, easily deployable weather station that delivers comprehensive, accessible weather data and alerts, enhancing safety and decision-making capabilities for users.

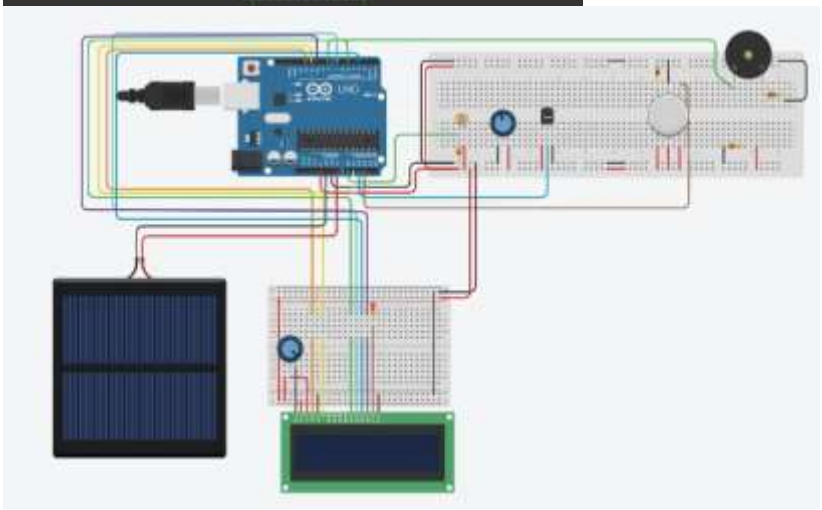
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

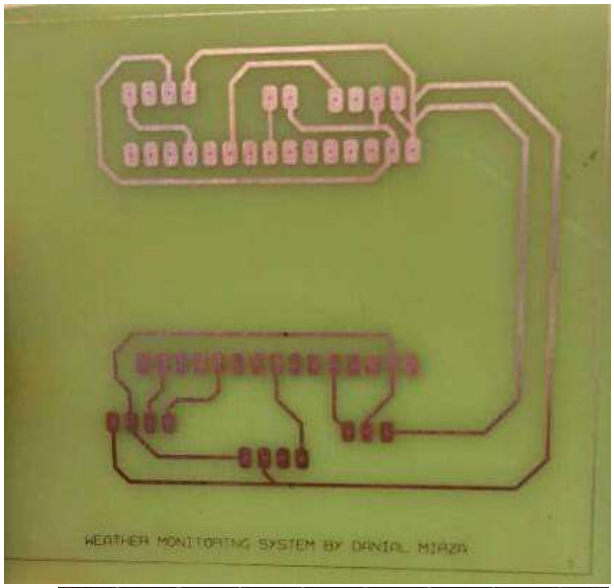
1. BLOCK DIAGRAM

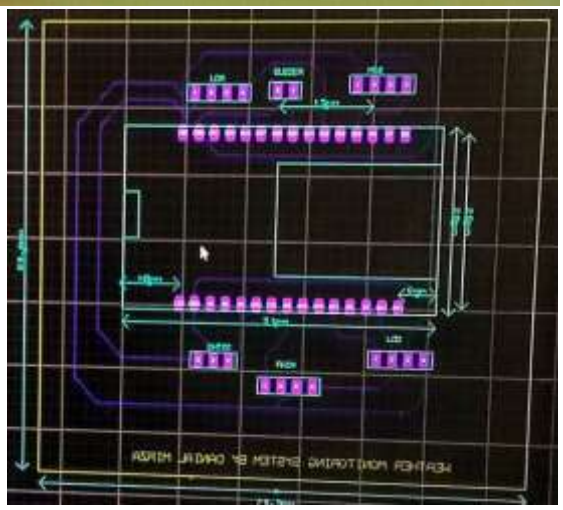


2. SIMULATION DIAGRAM









NOVELTY AND UNIQUENESS

The novelty and uniqueness of The Solar-Powered Weather Monitoring System monitoring lies in its integration of diverse sensorsinto one system enables environmental monitoring in a comprehensive compact device. Along with a battery management system which the machine using solar cells paired with rechargeable batteries for energy, it promotes sustainability and allows it to operate in remote areas off the grid. Piezo buzzer for sound alerts upon detecting hazardous conditions like gas leakage or extreme weather adds an extra layer of safety compared to standard weather monitoring systems. Gas sensor (MQ2) with alert mechanisms for gas leakage detection goes beyond conventional weather stations, broadening its utility for indoor and outdoor safety. ESP32 microcontroller ensures affordability while providing robust computational power for IoT applications, making this system accessible to everyone.

BENEFIT TO MANKIND

The Solar-Powered Weather Monitoring System offers noteworthy to society by enhancing safety, promoting sustainability, and improving quality of life. Its real-time alerts for dangerous gas leakage and vicious weather cycle enable prompt action and better decision-making based on data given. The solar-powered system operates independently of rechargeable power cell from the solar energy, making it environmentally friendly and ideal for areas off the grid. In urban and industrial settings, it aids air quality monitoring for workers. IoT connectivity ensures remote access to data for users to make informed decisions, while its user-friendly design ensures accessibility for all. Additionally, the system supports education and research, enables the society to learn of the one's location weather pattern which would be crucial for weather forecasting and prediction.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Weather Monitoring System has strong commercialization potential because of its versatility, affordability, and wide range of applications. Its low-cost components and its solar-powered nature make it attractive for both individual users and businesses. Farmers can use it to ease the crop management, while usual customers can benefit from its gas detection and hazard alerts for safety. Its ability to work in remote areas without external power also makes it ideal for disaster zones and off-grid communities. With growing demand for real-time weather data and sustainable solutions, this device is well-suited for widespread adoption in global markets.

CONCLUSION

In a nutshell, the Solar-Powered Weather Monitoring System combines cost- effectiveness, environmental friendliness, and real-time monitoring to address critical needs across agriculture, urban safety, and remote applications. Its solar-powered design, myriad sensors, and wi-fi connectivity make it a versatile solution for modern challenges, offering safety, efficiency, and environmental responsibility. With its strong potential for commercialization and ability to adapt to various sectors, this system not only improves daily life but also supports global efforts toward smarter, more sustainable communities.

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Solar Wireless Mobile Phone Charging System

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ABSTRACT

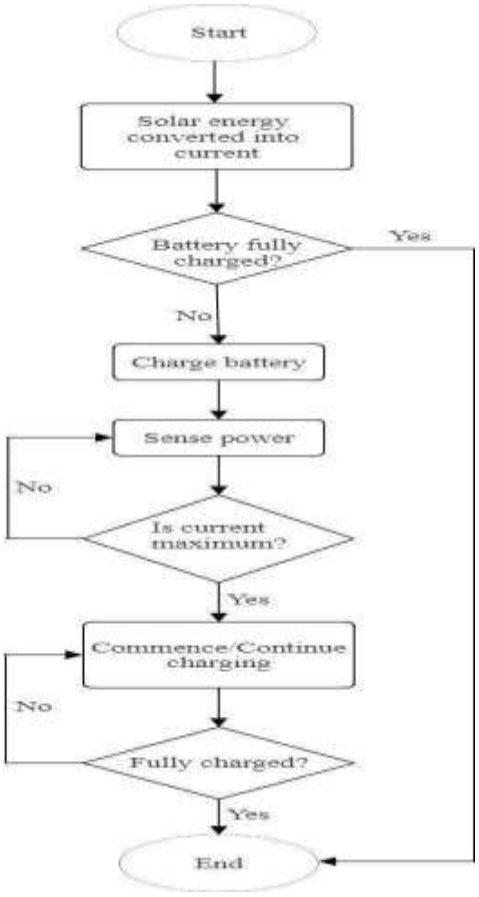
Solar power is one of the renewable energies that has been commonly used to replace nonrenewable energy sources such as fossil fuel since years ago. Besides, solar systems are also suitable for small applications such as solar toy cars, remote control planes and for phone charging applications that are important for the user to charge their electronic devices. This paper provides the design of a mobile charger that uses solar energy to provide sufficient electricity to charge mobile phones. There is no need for any kind of communication wire to connect the power supply to charge it. The device can charge smartphones or smart devices wirelessly in a short range of distance. This paper proposed method utilizes a non-conventional source of energy (solar cell) to wirelessly charge the device. A wireless charger increases the life span of a mobile as compared to ordinary charger. The proposed device is environmentally friendly, user friendly and cost effective. This technology proposed can charge any smart phone, anywhere at any time.

KEYWORDS: solar powered charging, wireless charging, mobile phone charging, renewable energy, Arduino

PRODUCT DESCRIPTION

Solar Wireless Mobile Phone Charging System is implanted to study the performance of the solar-based wireless system. One of the objectives of this project is to design and develop a prototype which could charge a mobile phone using wirelessly transmitted energy with the use of solar energy as input. The basic structure of the model consists of a solar panel, battery, transmitter circuit and receiver circuit. This study provides the design of a mobile charger that uses solar energy to provide sufficient electricity to charge mobile phones. The aim of using a wireless solar mobile charger is that we are using a renewable energy source so that we generate electricity free of cost, and it will give a better solution to people who travel long distances with their mobile phones. The best renewable energy source for this project is solar energy. It is a highly efficient energy source with significant implications for business and society. Any device can be charged without using energy with the suggested model. People who solely use mobile phones or reside in remote areas often find it difficult to charge their gadgets due to a lack of time and electricity.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS



NOVELTY AND UNIQUENESS

The aim of using a wireless solar mobile charger is that it is using a renewable energy source so it can generate electricity free of cost, and it will give a better solution to people who travel long distances with their mobile phones. For wireless charging it is used to transfer power between transmitter and receiver wirelessly. As solar energy is free and abundantly available the proposed device will provide the best solution for outdoor mobile phone charging. It is portable and doesn't require electric supply as it uses solar energy from the solar panel. Wireless charging reduces the use of cables & chargers for charging mobile phones, and it is ideal for charging any electronic gadgets like camera and cell phones. This system helps the rural area people or where huge power cuts occur. This independent charging system will overcome that problems. While travelling people were facing mobile charging issues but with this system it can be rectified. This system is effective and eco-friendly.

BENEFIT TO MANKIND

Wireless charging innovation is progressively progressing in two significant directions, which are radiation wireless charging or radio frequency (RF) type wireless charging and inductive charging. Radiative wireless charging embraces electromagnetic waves, and large microwaves and RF waves are utilized to convey energy in a type of radiation. Inductive charging depends on the idea where the magnetic field couples between two loops. Likewise, the magnetic field of an electromagnetic wave weakens a lot quicker than the electric field thus the power transfer distance is generally restricted.

COMMERCIALIZATION POTENTIAL

The usage of wireless technology is expanding and is now prevalent in many electrical appliances, displacing wired equipment, particularly in mobile phone charging systems. In addition to being one of the most widely used forms of communication available today, mobile phones are also among the most reasonably priced technological devices. The cell phone has become a multifunctional device that can process emails, photos, and other data due to the integration of numerous systems and devices. However, cell phones, like many other electronic devices, depend on electric power to perform their numerous tasks, necessitating periodic charging.

CONCLUSION

A thorough assessment of the literature has been updated to include an analysis of earlier studies on magnetic resonance coupling theory and practice. Gradually, this proposed approach highlights the value of solar-powered wireless charging. Wireless charging is perfect for charging any electronic device, including cameras, cell phones, and other devices, and it minimizes the need for cords and chargers while charging mobile phones. Residents in rural areas or areas with frequent power outages benefit from this approach. This self-contained charging station will solve those issues. People have trouble charging their phones when traveling, but this solution fixes the problem. This system is both efficient and sustainable. To further improve accessibility to sustainable energy sources in underserved regions, future work should concentrate on scalability, incorporate energy storage solutions for extended device use during nighttime or adverse weather conditions, and investigate potential applications in other low-power electronic devices.

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The Ventilation Fan and Measurement Energy System

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ABSTRACT

This project focuses on developing an IoT-based system to control and monitor a 5V fan using an ESP8266 microcontroller and the Blynk platform. The system integrates a DHT11 temperature sensor, an INA219 sensor, and a relay to provide real-time monitoring of temperature, voltage, current, and power. Data is displayed on the Blynk app for easy remote access, enabling efficient control and energy management. The project aims to promote energy efficiency, affordability, and accessibility while serving as an educational tool for IoT applications. It demonstrates the potential of smart technology in home automation and environmental monitoring.

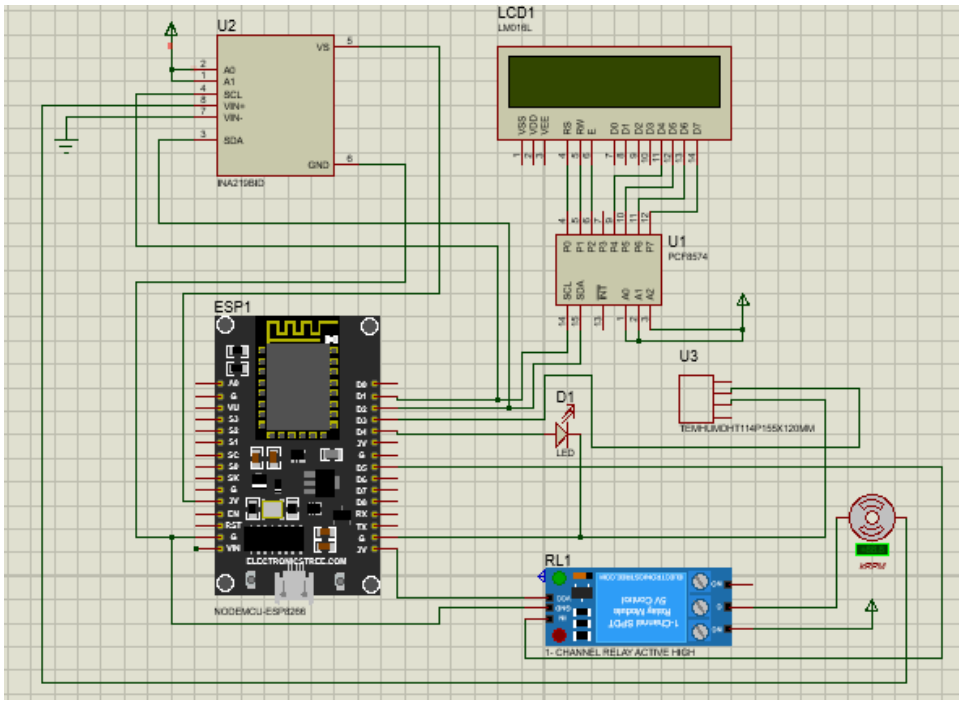
KEYWORDS: ESP8266, DHT11, INA219,Fan 5V, Relay, Blynk

PRODUCT DESCRIPTION

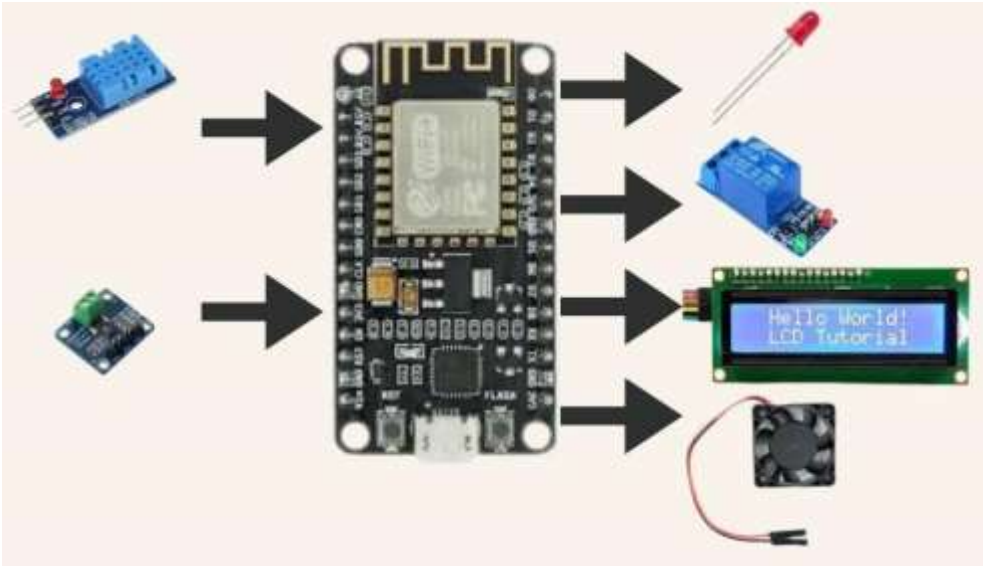
The Ventilation Fan and Measurement Energy System is a smart, energy-efficient solution designed for remote control and real-time monitoring of a 5V fan. Powered by the ESP8266 microcontroller and integrated with the Blynk app, this innovative system provides users with seamless control and detailed insights into environmental conditions and fan performance. Key features include a DHT11 temperature sensor to measure ambient temperature, an INA219 sensor to monitor voltage, current, and power, and a relay for precise fan operation. The system's data is displayed in real-time on the Blynk app, allowing users to access vital information and control the fan from anywhere. The device is powered by a 3.7V battery, ensuring portability and energy efficiency. Ideal for applications in home automation and environmental monitoring, this product offers affordability, accessibility, and ease of use. Whether for educational purposes or practical implementation, it demonstrates the integration of IoT technology in everyday life, contributing to sustainable and smarter living solutions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

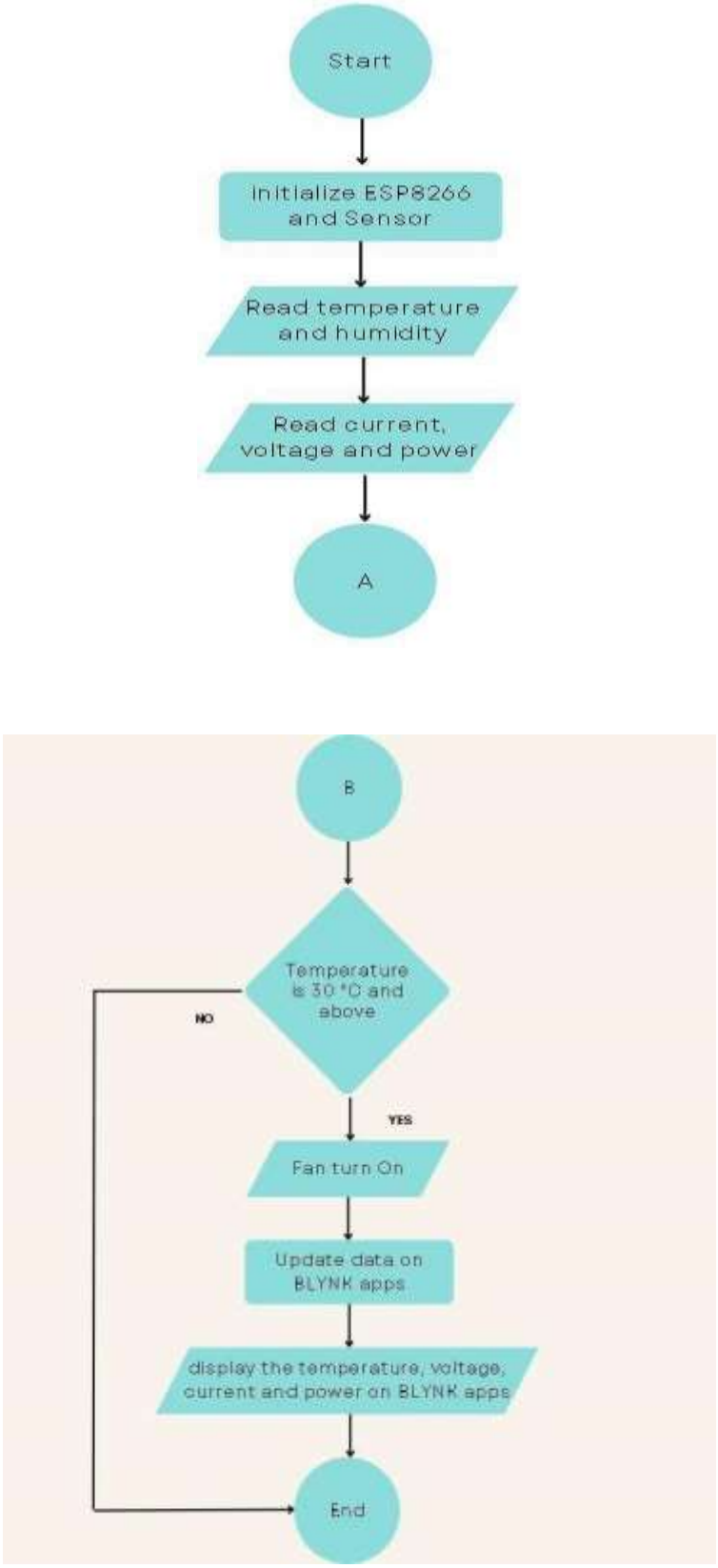
1. Schematic diagram of ventilation fan and measurement energy



2. BLOCK DIAGRAM



3. Flowchart


Start
Initialize ESP8266 and Sensor
Read temperature and humidity
Read current, voltage and power
A
B
Temperature is 30 °C and above
NO
YES
Fan turn On
Update data on BLYNK apps
display the temperature, voltage, current and power on BLYNK apps
End

4. Data Collection



NOVELTY AND UNIQUENESS

The Ventilation Fan and Measurement Energy System is a unique and innovative project that combines real-time monitoring, remote control, and portability. It uses the Blynk platform to allow users to monitor temperature, voltage, current, and power consumption while controlling the fan remotely. The integration of a DHT11 temperature sensor and an INA219 power sensor provides detailed performance and environmental data, making it stand out among similar systems. Its compact and portable design, powered by a 3.7V battery, makes it convenient for use in various locations. Additionally, the project is cost- effective, using affordable components like the ESP8266 while remaining functional and scalable for future upgrades. This system demonstrates how IoT can enhance everyday devices for better energy management and environmental monitoring.

BENEFIT TO MANKIND

The Ventilation Fan and Measurement Energy System provides significant benefits to mankind by promoting energy efficiency and convenience. By enabling real-time monitoring of power consumption and environmental conditions, it helps users make informed decisions to optimize energy usage, ultimately reducing electricity costs and minimizing environmental impact. The system's remote-control functionality, accessible through the Blynk platform, enhances convenience by allowing users to operate the fan from anywhere, improving comfort in various settings. Furthermore, the project showcases the potential of IoT in everyday life, serving as an affordable and portable solution for efficient cooling and environmental monitoring, which can be particularly beneficial in areas with limited resources or high energy costs.

COMMERCIALIZATION POTENTIAL

The Ventilation Fan and Measurement Energy System holds promising commercialization potential due to its practical features, cost-efficiency, and adaptability to diverse settings. With the growing demand for smart home devices, this project aligns perfectly with the trend toward energy-efficient and user-friendly appliances. Its compatibility with mobile applications like Blynk enhances its market appeal by providing real-time monitoring and remote control functionalities. The system's affordability and ease of integration into existing setups make it attractive to households, offices, and small businesses looking for smarter and greener cooling solutions. Additionally, its portability and customizable features open opportunities for mass production and tailored applications, further increasing its market viability.

CONCLUSION

In conclusion, the IoT-Based Fan Control and Monitoring System effectively integrates smart technology to provide a user-friendly, energy-efficient solution for temperature management. By utilizing components like the ESP8266, DHT11, INA219, and Blynk, the project demonstrates real-time control, monitoring, and data visualization. Its innovative design enhances convenience, safety, and efficiency, addressing practical needs while showcasing potential for future improvements and scalability. This project represents a meaningful step toward smart home automation and contributes to the advancement of accessible IoT solutions.

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Solar Power Station for Portable Device Charging

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ABSTRACT

The Solar Power Station for Portable Device Charging is designed to provide an efficient and sustainable energy solution for charging electronic devices in various environments. This project harnesses solar energy through solar panels, converting sunlight into electricity that is stored in batteries for later use. The innovative addition of a cooling system ensures that the charging station operates within optimal temperature ranges, enhancing the performance and longevity of both the charging mechanism and the devices being charged.The cooling system is activated by temperature sensors that monitor the internal environment of the power station. When temperatures exceed a predetermined threshold, a fan is triggered to dissipate heat, preventing overheating and ensuring safe operation. The system's performance is displayed on an LCD interface, providing real-time feedback on temperature and operational status, which enhances user interaction and monitoring capabilities. This project not only addresses the growing need for renewable energy solutions but also improves device safety through active thermal management. The combination of solar energy technology and a cooling system positions this solar power station as a versatile solution for outdoor activities, emergency situations, and remote locations where access to conventional power sources is limited.

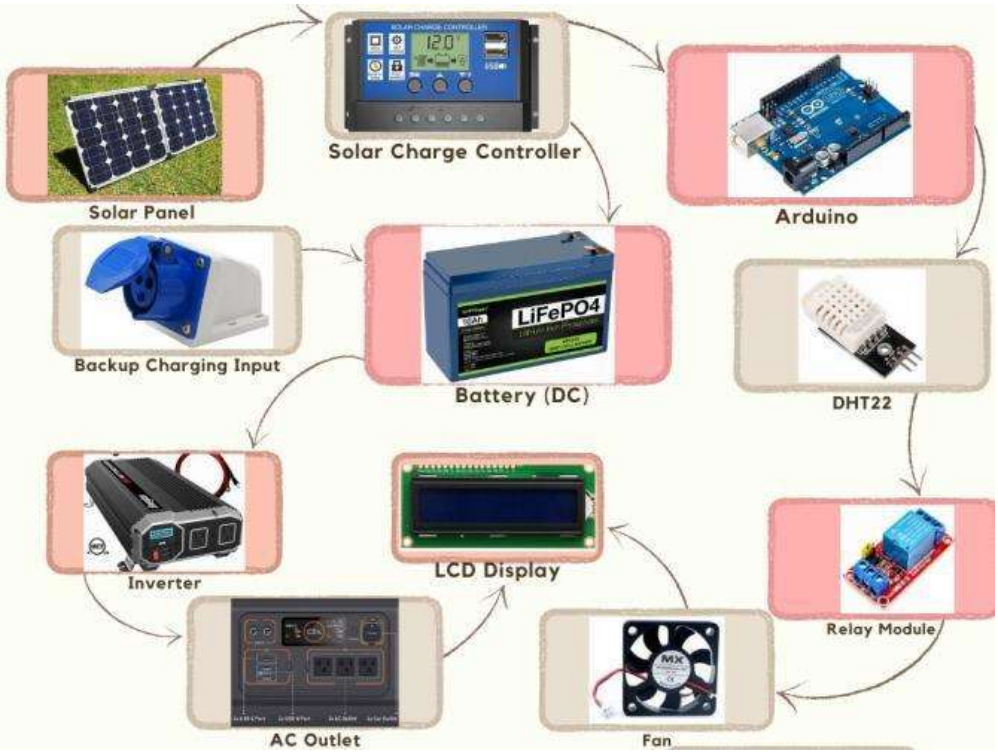
KEYWORDS: Solar Power Station, Portable Charging, Cooling System, Renewable Energy, Temperature Monitoring.

PRODUCT DESCRIPTION

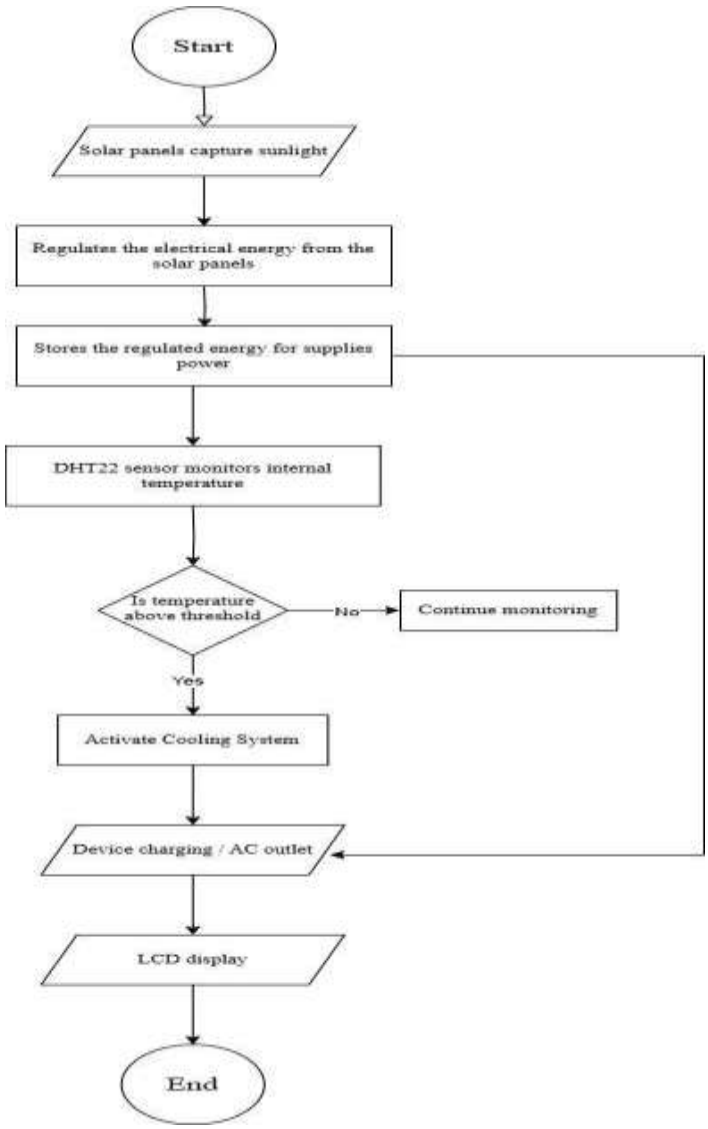
The Solar Power Station is an innovative device designed for charging portable electronic devices using renewable solar energy. It features photovoltaic panels that capture sunlight and convert it into electrical energy, which is stored in batteries for later use. The addition of a cooling system ensures that the internal components remain within optimal operating temperatures, enhancing efficiency and preventing damage to sensitive electronics. The cooling mechanism consists of temperature sensors that continuously monitor the internal environment. When temperatures rise above a specified threshold, a fan activates to circulate air and dissipates heat. This proactive approach to thermal management not only prolongs the lifespan of the charging station but also protects connected devices from overheating.The user-friendly LCD interface displays real-time temperature readings and the operational status of the fan, providing users with immediate feedback on system performance. This integration of solar technology with active cooling represents a significant advancement in portable charging solutions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Block Diagram



Flow Chart



NOVELTY AND UNIQUENESS

The uniqueness of this project lies in its dual functionality: combining solar power generation with an active cooling system tailored for portable device charging. This innovative approach addresses common challenges associated with overheating in electronic devices while promoting sustainable energy practices. By integrating these technologies, this project offers a comprehensive solution that enhances user experience and device safety in various applications.

BENEFIT TO MANKIND

This solar power station significantly benefits society by providing a clean and renewable energy source for charging portable devices. It promotes environmental sustainability by reducing reliance on fossil fuels while offering a practical solution for outdoor enthusiasts, emergency responders, and individuals in remote areas. The integrated cooling system further enhances safety and reliability, making it an ideal choice for diverse applications.

COMMERCIALIZATION POTENTIAL

The commercialization potential of this solar power station is substantial due to its versatility across multiple markets. Key sectors include outdoor recreation (camping, hiking), emergency preparedness (disaster relief), and everyday consumer electronics. Its ability to operate independently of traditional power sources positions it favorably in an increasingly eco-conscious market focused on renewable energy solutions.

CONCLUSION

The Solar Power Station for Portable Device Charging represents a significant advancement in sustainable energy technology. By effectively managing heat while harnessing solar energy for device charging, this project addresses critical issues related to efficiency and safety. Future developments may focus on enhancing battery capacity, improving cooling efficiency, and expanding application scopes to further benefit users across various sectors. Continued research and development will be essential to refine this technology and maximize its impact on renewable energy solutions.

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Automatic Solar-Powered Aquaponics System

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ABSTRACT

This project aims to design and build an Automatic Solar-Powered Aquaponics System to create a sustainable and efficient way to grow food. Aquaponics combines raising fish (aquaculture) and growing plants without soil (hydroponics). The fish waste provides nutrients for the plants, and the plants help clean the water for the fish. Using solar power makes the system eco-friendly and reduces energy costs. The main goal is to develop a system that works on its own, optimizing conditions for both fish and plants with minimal human effort. The system will include solar panels, ESP32 microcontrollers, and various IoT sensors to monitor soil moisture and water pH levels, as well as other factors like temperature and light. These sensors will control water flow and aeration automatically, adjusting conditions in real-time to keep the environment ideal for growth. By combining renewable energy with automated aquaponics and Internet of Things (IoT), this project aims to show a feasible model for sustainable agriculture. Expected results include lower energy costs, better growth rates for both plants and fish, and a system that can be scaled up for different applications. This could be especially useful for urban farming and areas with limited resources.

KEYWORDS: Automatic Aquaponics System, Renewable Energy, Internet of Things (IoT), Real-Time Monitoring.

PRODUCT DESCRIPTION

The Automatic Solar-Powered Aquaponic System is an innovative solution that combines plant cultivation and aquaculture into a seamless, sustainable ecosystem. Powered by renewable solar energy, this system is ideal for eco-conscious gardeners, urban farmers, and enthusiasts of sustainable agriculture. The system is equipped with advanced IoT technology, using the ESP32 microcontroller for efficient monitoring and control. Real-time data on soil moisture, water quality, and pH levels are accessible with the Blynk platform, ensuring optimal growing conditions for both plants and aquatic life. A relay-controlled water pump circulates water efficiently, powered by clean and renewable energy. Compact, efficient, and easy to manage, this aquaponic system is a perfect blend of technology and sustainability, making it an excellent choice for those seeking to grow fresh produce and fish in a self-sufficient, environmentally friendly way.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

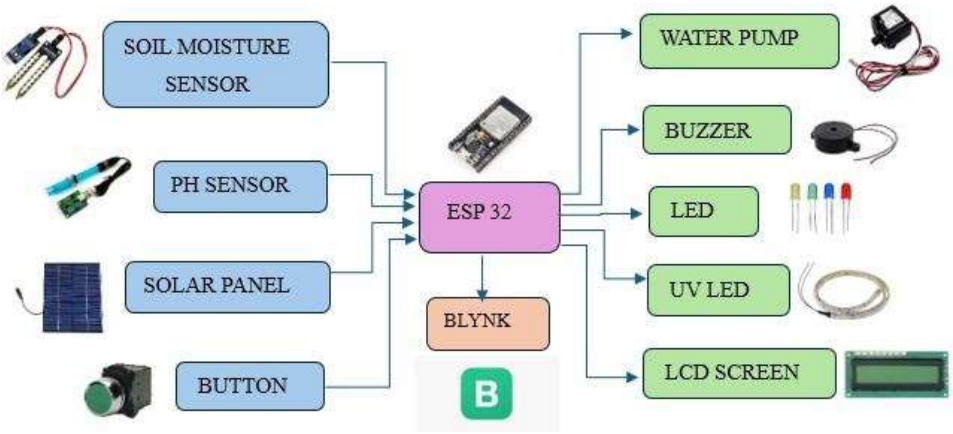


Figure 1: Block Diagram of Automatic Solar-Powered Aquaponic System

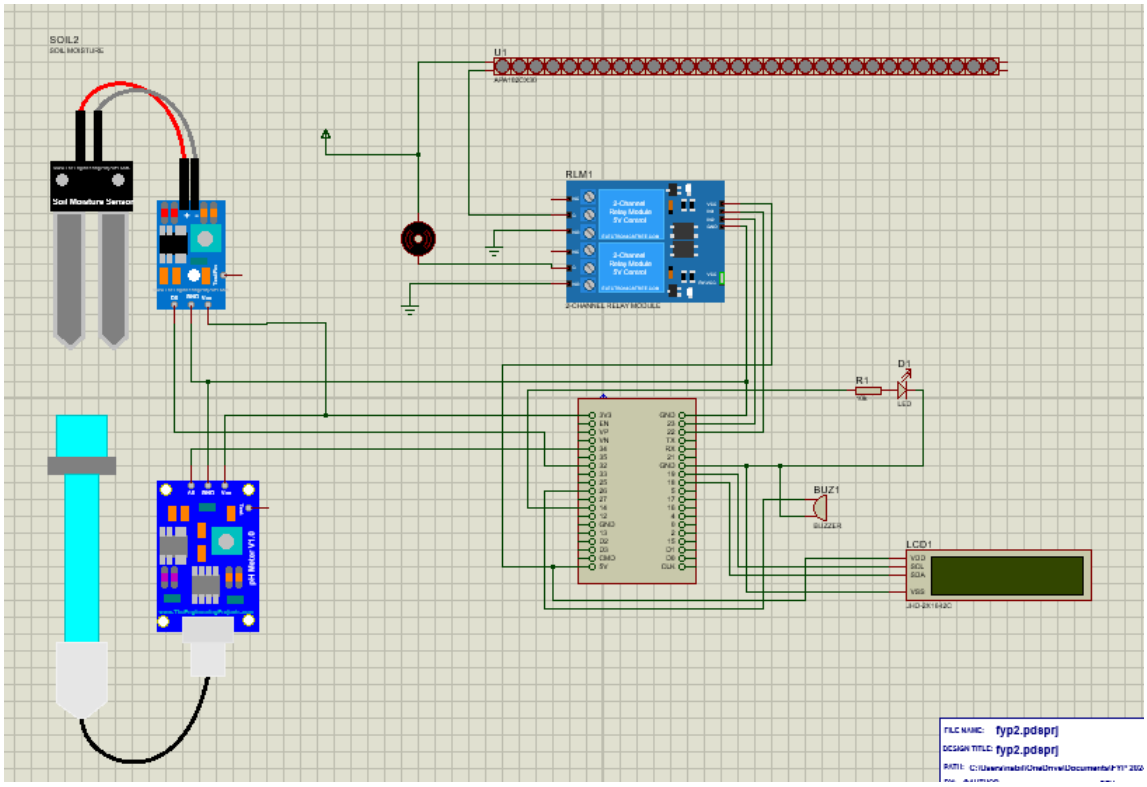


Figure 2: Schematic Diagram of Automatic Solar-Powered Aquaponic System

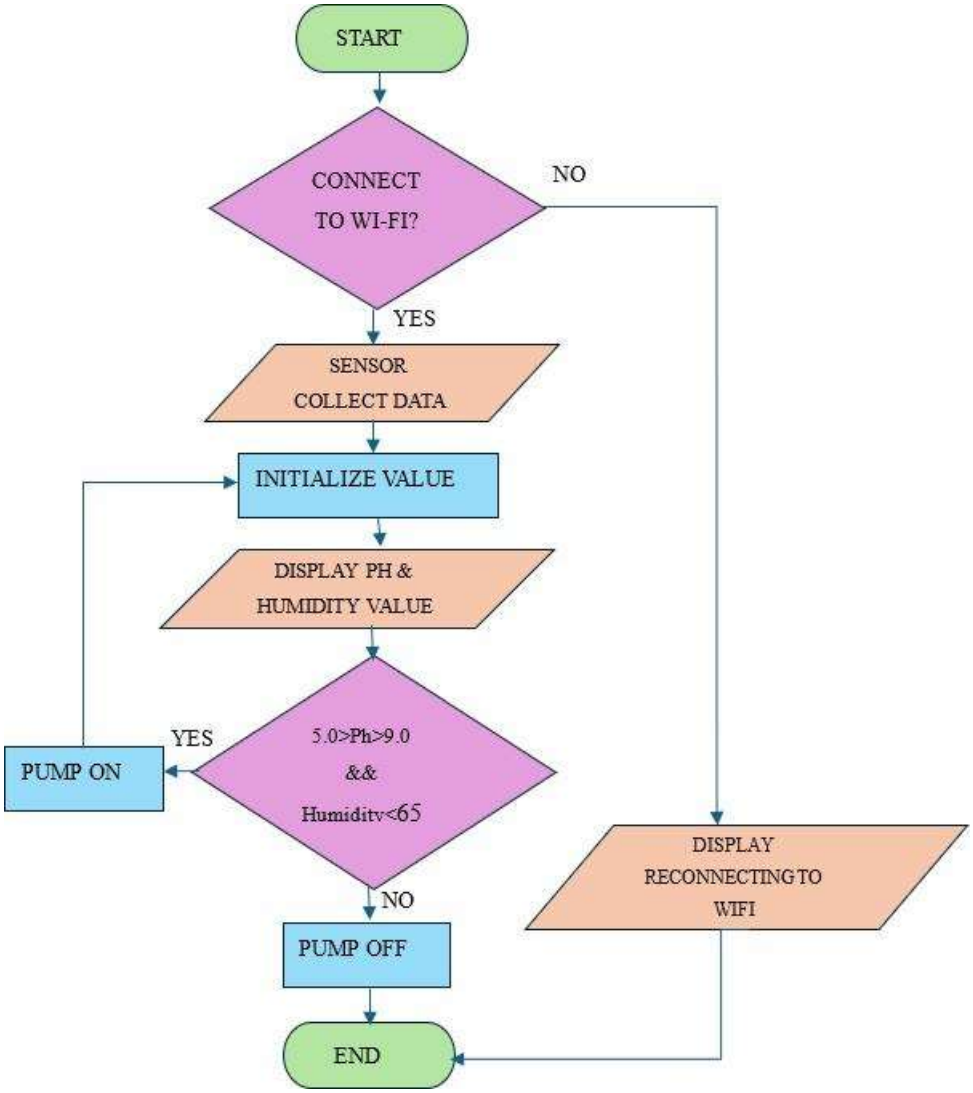
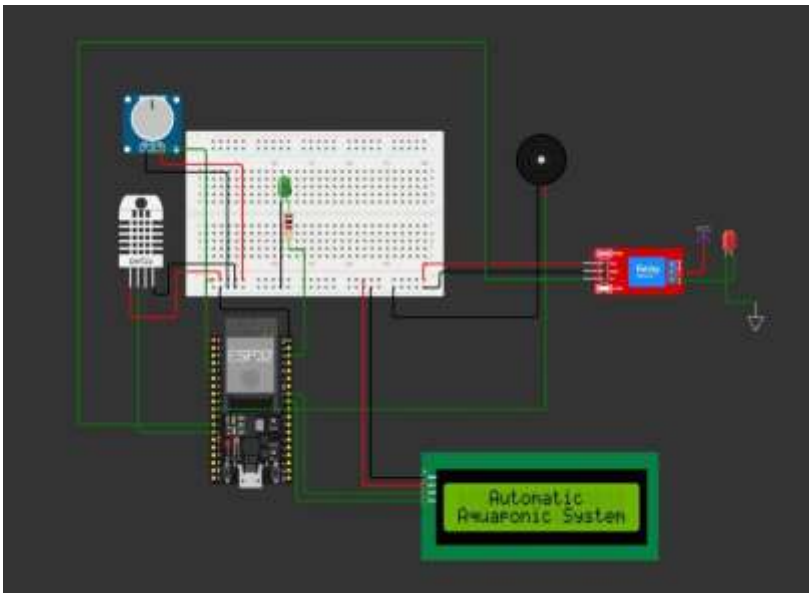


Figure 3: Flowchart of Automatic Solar-Powered Aquaponic System



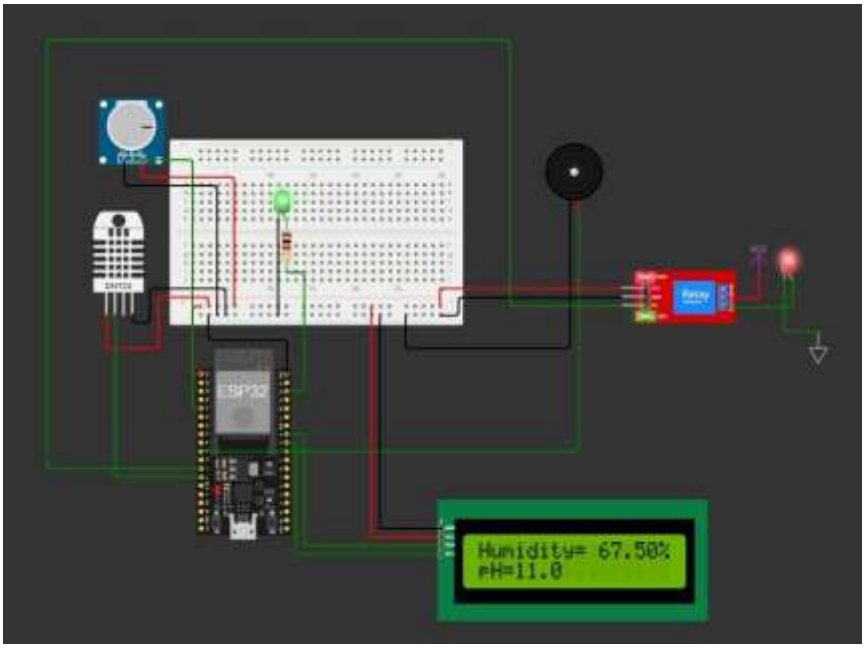


Figure 4: Simulation Result of Automatic Solar-Powered Aquaponic System in Wokwi Simulation.

NOVELTY AND UNIQUENESS

This Automatic Solar-Powered Aquaponic System stands out for its complete reliance on renewable energy, functioning entirely on solar power and a battery without any external energy input. Unlike conventional aquaponic systems, this design integrates IoT-based monitoring and control through the ESP32 microcontroller and the Blynk platform, enabling users to remotely manage the system in real time. The combination of advanced automation, sustainable energy sourcing, and compact design makes this system highly efficient and eco-friendly. By eliminating the dependency on external power sources, it offers a truly independent and self-sufficient solution for sustainable agriculture, setting a new benchmark for urban farming and small-scale food production.

BENEFIT TO MANKIND

This Automatic Solar-Powered Aquaponic System has the potential to make a real difference in how we grow food. By relying entirely on solar energy, it helps reduce the use of fossil fuels and lowers our impact on the environment. It's a step toward creating a greener, more sustainable way of farming. The system is easy to use and accessible to everyone, even people who don't have a lot of experience with farming or technology. It's especially helpful for those living in cities or areas where land and electricity are limited. With this system, they can grow fresh vegetables and raise fish in a way that's both efficient and eco-friendly. Overall, this project shows how renewable energy and simple technology can help solve global challenges like food security and climate change, making life better for people everywhere.

COMMERCIALIZATION POTENTIAL

The Automatic Solar-Powered Aquaponic System has strong commercialization potential due to its sustainability, affordability, and ease of use. Its complete reliance on solar energy and a battery makes it ideal for remote areas, urban environments, and eco- conscious consumers who want to reduce their environmental impact. The system's IoT integration with the ESP32 and Blynk app offers real-time monitoring and control, appealing to modern users who value smart and connected devices. Its compact design and low operating costs make it suitable for small-scale farmers, educational institutions, and hobbyists interested in sustainable agriculture. With growing demand for eco-friendly and self-sustaining solutions, this system could capture significant interest in both residential and commercial markets, particularly in regions prioritizing renewable energy and local food production.

CONCLUSION

The Automatic Solar-Powered Aquaponic System demonstrates how renewable energy, IoT technology, and sustainable practices can come together to create an efficient and eco-friendly farming solution. By relying solely on solar power and a battery, the system achieves energy independence while promoting environmental conservation. With features like real-time monitoring and automated control, it offers a practical and user-friendly way to grow plants and raise fish in a symbiotic ecosystem. This project not only addresses key challenges in agriculture and energy but also inspires innovation in sustainable food production. Ultimately, the system serves as a model for future advancements in eco-friendly farming, showing how technology can help meet global needs for food security and environmental sustainability.

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Solar-Powered Garage System By Using Radio-Frequency Identification (RFID) Technology

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ABSTRACT

The rapid advancement of technology has facilitated the development of automated systems for diverse applications. This study introduces the design and implementation of a Solar-Powered Garage System utilizing Radio Frequency Identification (RFID) technology to enhance security, convenience, and sustainability. The system integrates solar panels as a renewable power source, ensuring eco-friendly and reliable operation, even in remote areas with limited electricity access. RFID technology enables secure, contactless access control, restricting garage access to authorized users. The system incorporates an Arduino microcontroller to manage inputs and outputs, seamlessly automating gate operations based on RFID data. Additional features include infrared sensors for motion detection, LED indicators for operational status, and a buzzer alarm for unauthorized access alerts. IoT integration via the Blynk app facilitates real- time remote monitoring and control, providing notifications and enhancing user convenience. By merging renewable energy with advanced automation, this project demonstrates significant potential for application in residential and commercial settings. The Solar- Powered Garage System underscores the importance of sustainable innovation in modern infrastructure, offering a scalable, eco-friendly, and secure solution tailored to meet the evolving needs of smart home automation.

KEYWORDS: RFID technology, Arduino microcontroller, solar power, smart home automation, garage system, sustainable energy, access control.

PRODUCT DESCRIPTION

The Solar-Powered Garage System Using RFID Technology is an innovative solution designed to enhance security, energy efficiency, and user convenience. It integrates solar power technology and RFID (Radio Frequency Identification) for sustainable and secure garage access. Solar panels serve as the primary energy source, converting sunlight into electricity to power the system, ensuring reliable operation even in remote areas or during outages, while reducing energy costs significantly. RFID technology acts as the core security feature, allowing only authorized vehicles with registered RFID tags to access the garage. When a valid tag is detected, the system triggers a servomotor to automatically open or close the garage gate, providing seamless access control. Additional features include an infrared (IR) sensor for motion detection, LED indicators for status updates, and a buzzer alarm for unauthorized access alerts, improving overall safety, functionality, and reliability.The system also supports IoT integration via the Blynk app, enabling real-time remote monitoring and control through smartphones. Notifications ensure users are always informed about the garage's status, including any suspicious activity or unauthorized entry attempts. Combining security, automation, and sustainability, this system offers a reliable, user-friendly, and eco-friendly solution for modern homes, addressing energy efficiency, advanced access control needs, and environmental responsibility.

BLOCK DIAGRAM

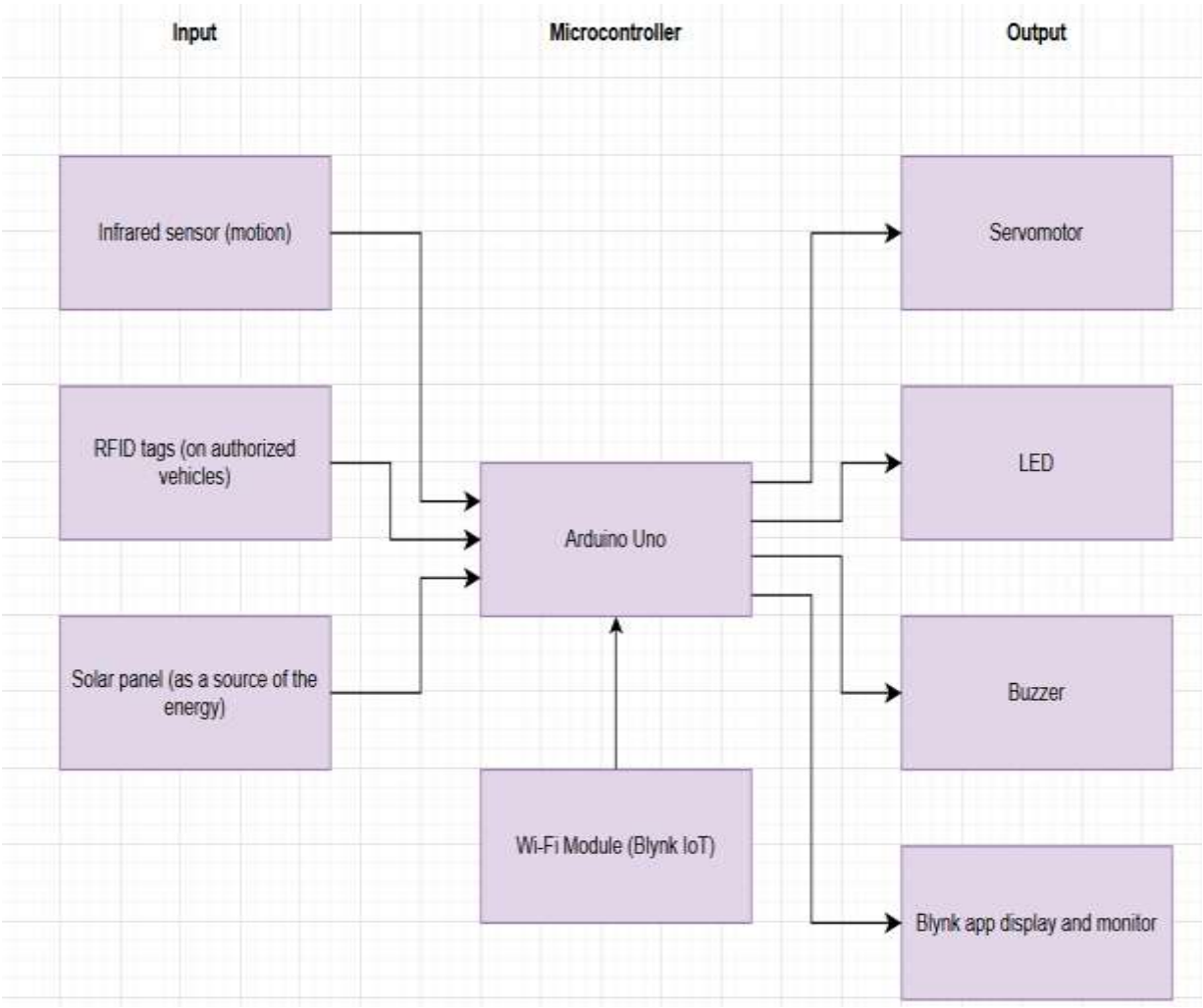


Figure 1: Block Diagram of Solar-Powered Garage System By Using Radio-Frequency Identification (RFID) Technology

FLOWCHART AND PCB LAYOUT

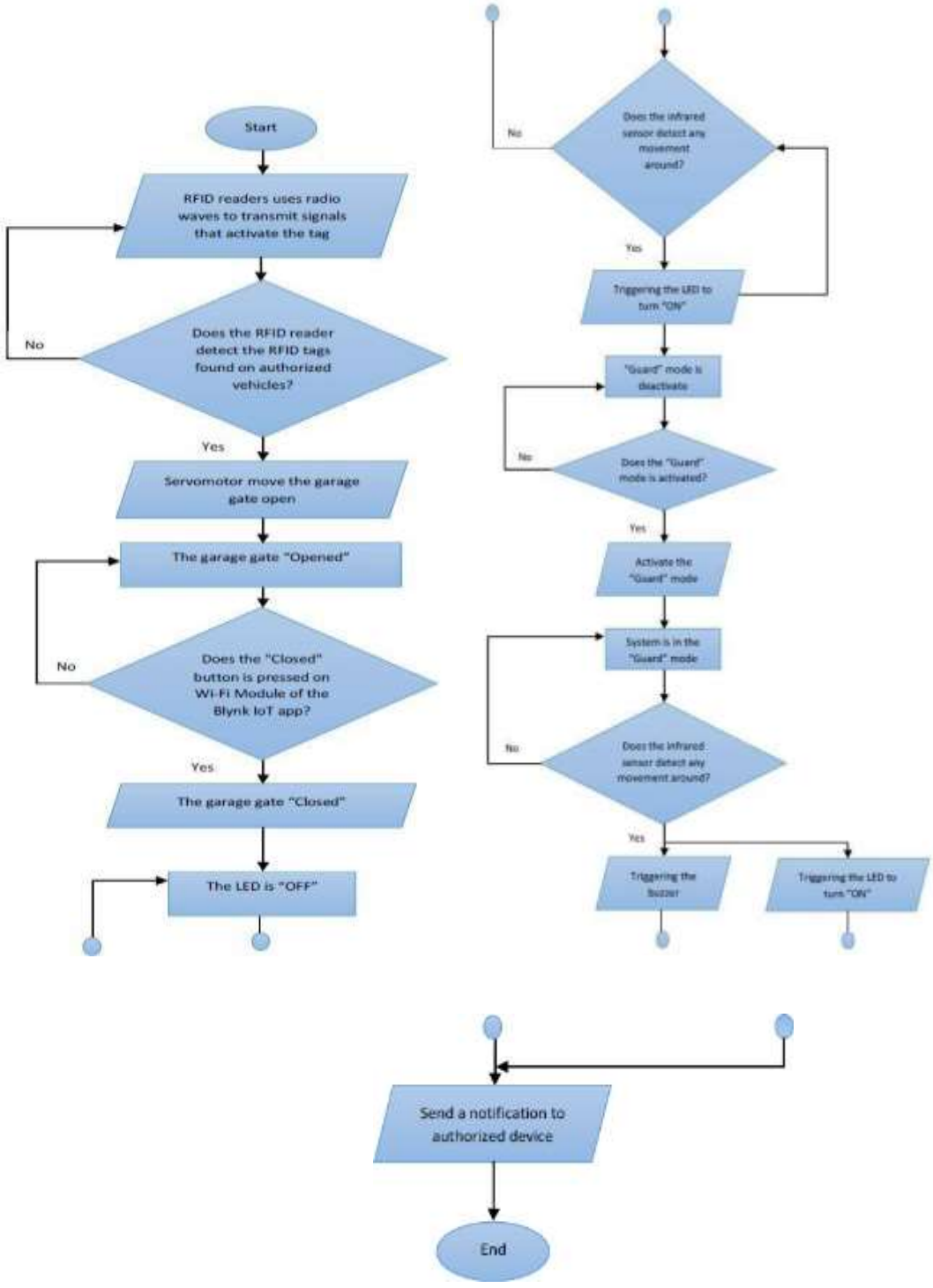


Figure 2 : Flowchart of Solar-Powered Garage System by Using Radio-Frequency Identific (RFID) Technology

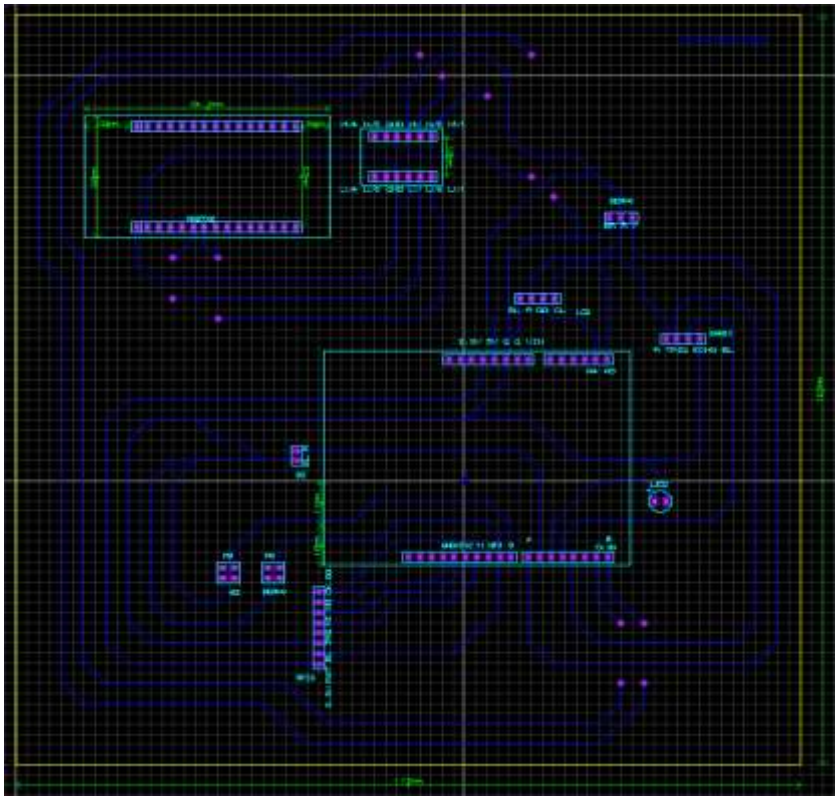


Figure 3 : PCB Layout of Solar-Powered Garage System By Using Radio-Frequency Identification (RFID) Technology



Figure 4: Simulation of Solar-Powered Garage System By Using Radio-Frequency Identification (RFID) Technology

NOVELTY AND UNIQUENESS

The Solar-Powered Garage System Using RFID Technology combines renewable energy, advanced security, and IoT capabilities into one integrated system. Unlike traditional garage systems, it utilizes solar panels as a sustainable power source, reducing reliance on conventional electricity while ensuring uninterrupted operation and lower energy costs.The RFID technology enhances security by allowing only authorized vehicles with registered RFID tags to access the garage. Additionally, an infrared (IR) sensor detects movement, while LED indicators and a buzzer alarm provide immediate visual and audio alerts for unauthorized access attempts.The system also features IoT integration via the Blynk app, enabling remote monitoring and control through smartphones, ensuring real-time updates, notifications, and user convenience. This unique combination of energy efficiency, smart automation, and enhanced security sets it apart as a reliable and eco-friendly solution for modern homes.

BENEFIT TO MANKIND

The Solar-Powered Garage System By Using RFID Technology offers significant advantages by enhancing safety, convenience, and sustainability. By utilizing solar power, the system reduces dependency on non-renewable energy sources, promoting environmental conservation and significantly lowering operational costs. This feature is particularly beneficial in areas with limited electricity access and high energy demands. The integration of RFID technology ensures secure, contactless access to garages, allowing only authorized users to operate the system. This improves household and property security while providing seamless, automated user experience. Additionally, the system's IoT capabilities enable real-time monitoring and remote control via mobile applications, enhancing user convenience and situational awareness. The notification feature in "Guard" mode provides an added layer of security.This innovative system combines renewable energy, automation, and security, offering an eco-friendly, reliable, and efficient solution for modern smart homes and infrastructure.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Garage System using RFID Technology has strong commercialization potential due to the demand for eco-friendly, automated solutions. Powered by solar energy, it appeals to environmentally conscious consumers, while its RFID access control enhances security for residential and commercial use. IoT integration allows remote monitoring and control, aligning with the rise of smart home technologies. The system's scalability makes it ideal for applications like parking lot management and secure storage. Focusing on sustainability, security, and convenience, it meets the growing market demand for green, automated solutions, positioning it for success in the market.

CONCLUSION

The development of a Solar Powered Garage System using RFID technology and Arduino microcontrollers presents a comprehensive solution for enhancing security, efficiency, and convenience in smart home systems. RFID technology, utilizing electromagnetic fields to identify and track tags, ensures secure and accurate identification of authorized vehicles. Arduino microcontrollers efficiently process and manage inputs and outputs, automating the gate operation based on RFID data received from the system. The integration of solar power reduces reliance on non-renewable energy sources, lowers operational costs, and ensures uninterrupted operation during power outages. By combining RFID technology, Arduino microcontrollers, and solar energy, the system enhances security, operational efficiency, and long-term sustainability. This innovative project represents a significant step in advancing smart home automation, offering a robust, cost-effective, and eco-friendly solution tailored to meet modern infrastructure needs.

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Automated Sun Tracking Solar Panel for Residence

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ABSTRACT

This study presents the design and simulation of an Automated Sun Tracker Solar Panel system aimed at enhancing energy efficiency for residential applications. The system integrates Node MCU microcontroller technology with photoresistors for light detection, current sensors for power monitoring, and a Liquid Crystal Display (LCD) for real-time data visualization. Employing Internet of Things (IoT) functionality via a Wi-Fi module, the system enables remote monitoring and control. Using Proteus simulation, the Node MCU processes sensor inputs to dynamically adjust the orientation of the solar panel using servo motors for optimal sunlight exposure. Additional features include Light-Emitting Diodes (LEDs) for operational status alerts and intelligent motor control to maximize energy output. The IoT connectivity further extends system versatility by allowing real-time tracking of performance metrics such as power output and efficiency. This scalable and cost-effective solution demonstrates significant potential for improving residential energy sustainability and accessibility. By addressing challenges in renewable energy utilization, the proposed system contributes to global efforts in reducing carbon footprints and promoting sustainable living.

KEYWORDS: Sun Tracker, Node MCU, WiFi module, Liquid Crystal Display

PRODUCT DESCRIPTION

The final product in the design is an advanced sun tracker solar panel system which is more environmental and contributes to increasing the conversion efficiency of solar energy for residential applications. It makes use of dynamically connected LDRs and servo motors within the system for tracking the sun during its position throughout the day in keeping the solar panel oriented correctly for maximum energy input. The system is based on the ESP8266 microcontroller, driving two-axis tilting and rotation, which can increase energy output more than a stationary panel. The efficiency and status of the system in real time are displayed on an LCD I2C display. There are also red and green LEDs showing operation states. Compact, the system is cost-effective for residential rooftops, small-scale solar farms, and educational demonstrations. It has inbuilt sustainability to ensure a reduction of energy dependence on conventional sources, therefore fostering the adoption of renewable energy resources-a key feature of the current global drive in the fight against climate change. This smart solution combines advanced automation, energy efficiency, and user friendliness in a practical and effective renewable energy system.

BLOCK DIAGRAM / FLOWCHART / SCHEMATIC DIAGRAM / PCB LAYOUT

Figure 1 shows the block diagram of the Automatic Sun Tracker Solar Panel for Residence project. ESP8266 Node MCU will be the main component and work as the brain of this project for the entire time, controlling the other components by inserting the coding of this project. The system's architectural framework is illustrated in a comprehensive block diagram, outlining the fundamental components of this project system.

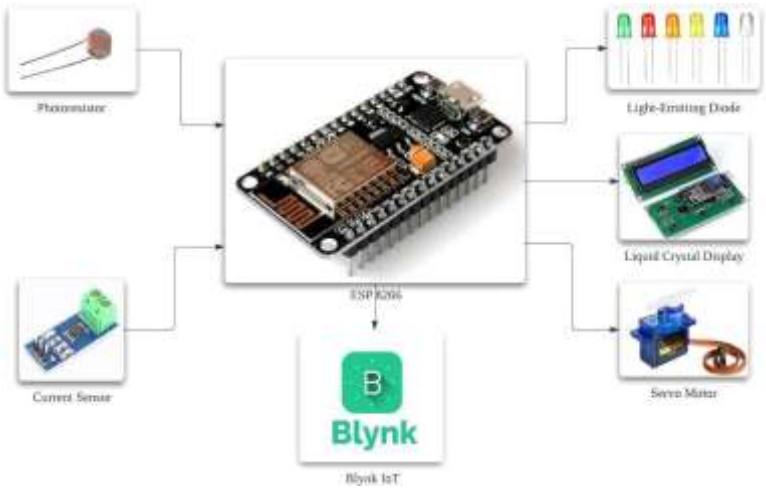


Figure 1 : Block Diagram of Automatic Sun Tracking Solar Panel for Residence

Figure 2 shows a flowchart describing the operation of an Automated Sun Tracker Solar Panel System. The process starts with inputs from light-dependent resistors (LDRs) and a current sensor. The microcontroller initializes and compares LDR values to adjust the servo motors, aligning the solar panel towards maximum sunlight. If no light is detected, the system holds its position and displays data such as efficiency and power output on an LCD. The system integrates Blynk IoT for real-time monitoring, enabling efficient solar tracking and energy optimization.

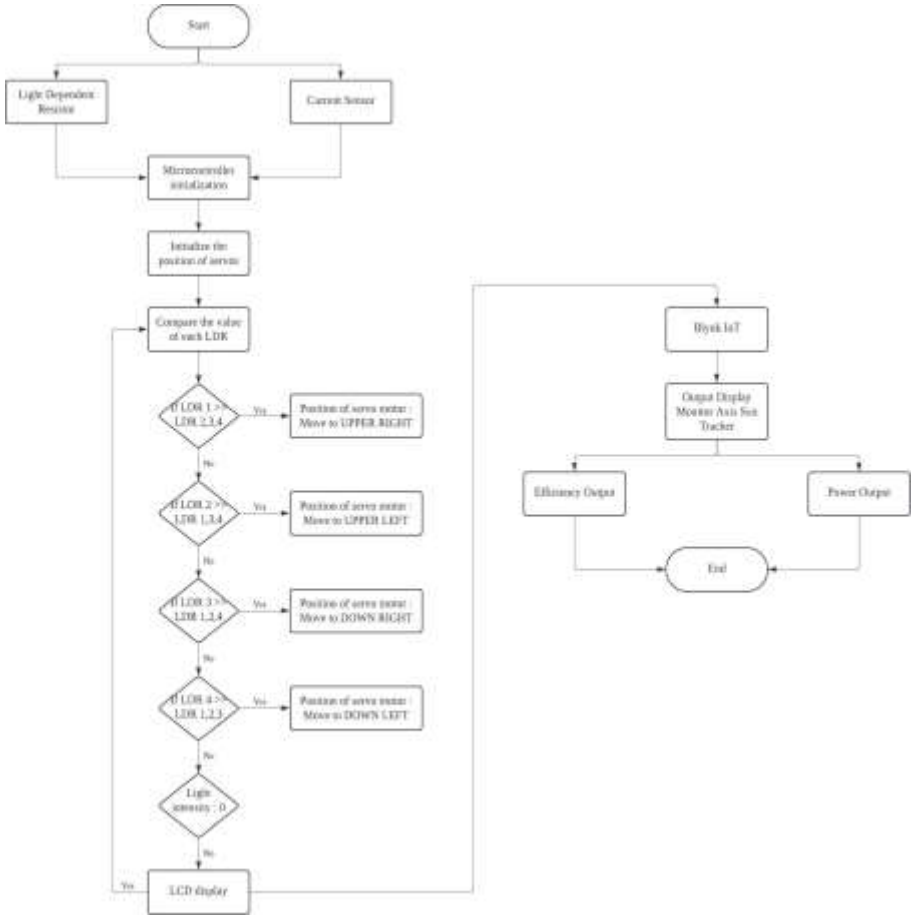


Figure 2 : Flowchart of Automated Sun Tracking Solar Panel for Residence

Figure 3 shows a schematic diagram representing the wiring of an Automated Sun Tracker Solar Panel System using an ESP32 microcontroller. Four light-dependent resistors are connected to analog inputs to detect sunlight intensity. Two servo motors are linked to control the panel's movement along two axes. An I2C LCD is used to display system outputs such as power and efficiency, while red and green LEDs indicate system status. The setup integrates resistors for LED operation and proper wiring for all components to ensure seamless tracking and monitoring.

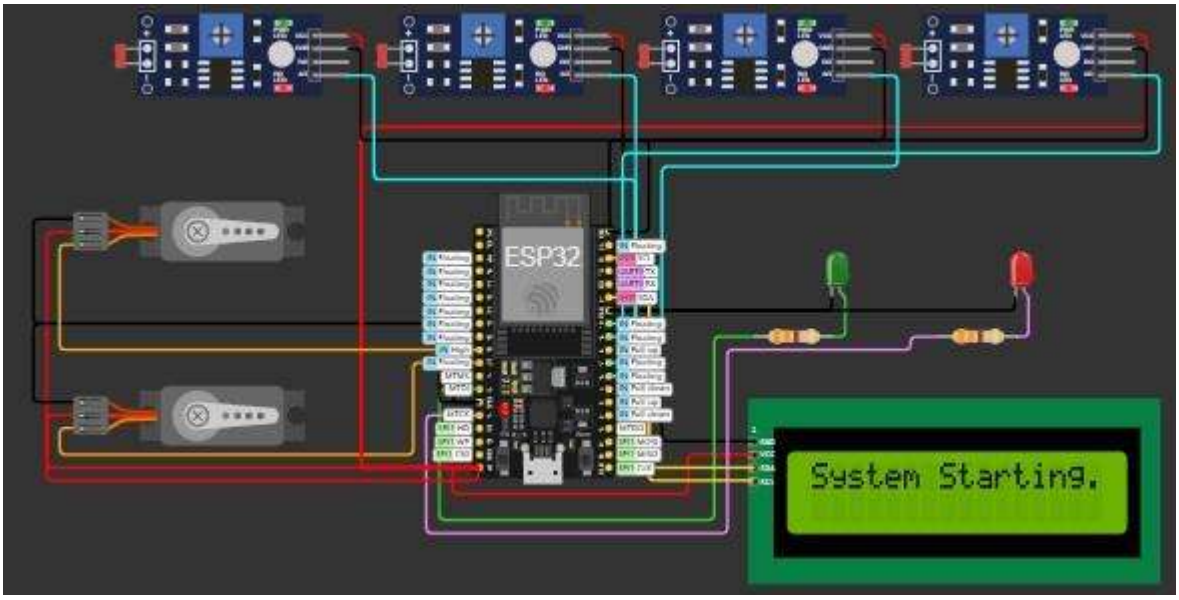


Figure 3 : Schematic Diagram of Automated Sun Tracking Solar Panel for Residence

Figure 4 shows a printed circuit board layout designed for an Automated Sun Tracker Solar Panel system. It features connections for four light-dependent resistors to detect sunlight intensity, an ESP8266 microcontroller for processing, and interfaces for servo motors to adjust the solar panel's position. The layout includes connections for LED indicators red and green and a battery power source. The PCB design ensures organized and efficient routing of components for reliable operation of the sun tracking system.

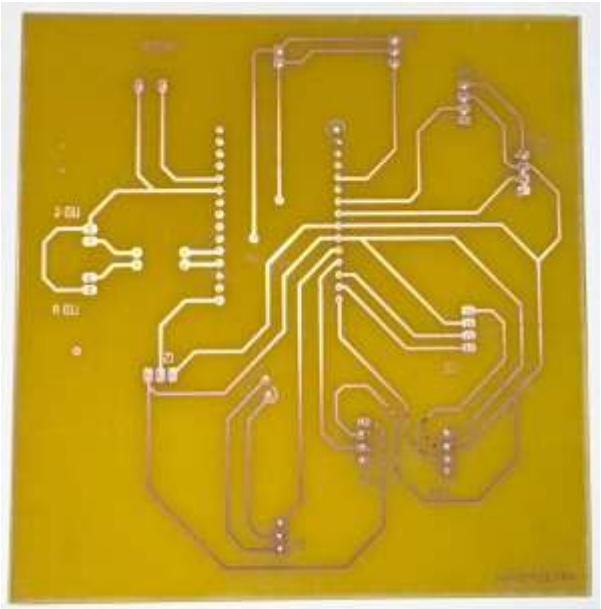


Figure 4 : Printed Circuit Design of Automated Sun Tracking Solar Panel for Residence

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Automated Sun Tracker Solar Panel System is that for the first time, it attempts to develop an efficient way to have maximum solar energy with precision and intelligence in tracking. This is unlike what happens in static solar panels. Hence, it uses LDRs to track light intensity from multiple directions and changes the angle of the solar panel automatically, using servo motors for capturing maximum energy. This uniqueness of the system also encompasses IoT technology integration using the Blynk software for real-time monitoring, remote control, and logging of data on the system in a very accessible and user-friendly manner. It also involves an LCD I2C display for immediate feedback on power output, efficiency, and system status for maximum transparency and ease of operation. This is an interesting project, putting together renewable energy generation with advanced automation and IoT connectivity to provide a practical smart-efficient solution for residential solar power installations for independence from energy supply and environmental conservation.

BENEFIT TO MANKIND

The Automated Sun Tracker Solar Panel System brings a lot of benefits to humans by encouraging the use of renewable energy and increasing the conversion efficiency of solar power. With the exact tracking of the sun, this system increases energy capture, thus decreasing the consumption of non-renewable energy sources, which leads to a cleaner and greener environment. It will enable households and small businesses to reduce their electricity costs and carbon footprints, thus helping people and businesses become more energy-independent and environmentally conscious. This project will also bring awareness about renewable energy solutions and encourage people to move toward green technologies. This innovation is important in the advancement of a sustainable future, as it solves some of the global challenges facing humanity in relation to climate change and energy scarcity.

COMMERCIALIZATION POTENTIAL

The Automated Sun Tracker Solar Panel System has excellent commercialization potential as there is a steadily increasing demand for effective and feasible energy solutions around the globe. Equipped with the intelligent tracking of the sun's path during the day, it increases the quantity of energy tapped from the sun and amplifies the capture of traditional fixed solar panels. Such systems have wide appeal to both residential and commercial or industrial markets. Besides that, with IoT integration for real-time monitoring and control for example, using Blynk comes modern convenience and functionality to make the system very attractive to the tech-savvy customer or one interested in renewable energy. Besides, affordability and scalability are in place to make it appropriate for wide diffusion in both developed and developing regions. This is because the project addresses the pressing need for energy efficiency and sustainability. Thus, it may accelerate the usage of renewable energy, reduce dependence on fossil fuels, and enable the attainment of global energy and environmental objectives.

CONCLUSION

In conclusion, the automated sun tracker solar panel system is thus one of the most effective and innovative solutions for the utilization of maximum solar energy both at residential and commercial levels. The system will orient the solar panel equipped with LDRs, servo motors, and IoT technology for utmost improvement in energy efficiency compared to the traditional fixed ones during the daytime. The integration of any IoT platform, such as Blynk, enables the user to monitor and control the system in real time hence making the system more usable and user-friendly. This project contributes toward the SDGs of the world by facilitating the use of renewable energy, reducing carbon footprints, and reducing energy costs. It holds much promise, being scalable, cheap, and adaptable, in addition possibly to contribute much to a large-scale greening and sustainable future of mankind.

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Transformer Overload Protector

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ABSTRACT

The protection of transformers from overcurrent is pivotal to the overall reliability and stability of a power distribution system. Serious accidents, expensive repairs, or other awful events can arise as a result of such overloading. An Arduino-based monitoring system for overload protection of transformers is presented within this project. Using the ACS712 current sensor, the system automatically checks the current in real time and evaluates it against reference values for overloads. In overload conditions, a relay mechanism interrupts the transformer to prevent damage. Furthermore, the project also includes an LCD screen which indicates the status of the transformer, relay, and circuitry as useful information to the operators. For testing, empirical evidence established that the system was able to sense overload conditions and take preventive action without delay. This inexpensive and expandable design improves the security and operational performance of modern power distribution systems and will be useful in the field of electrical engineering.

KEYWORDS: Arduino-based monitoring system, prevent damage, overload condition

PRODUCT DESCRIPTION

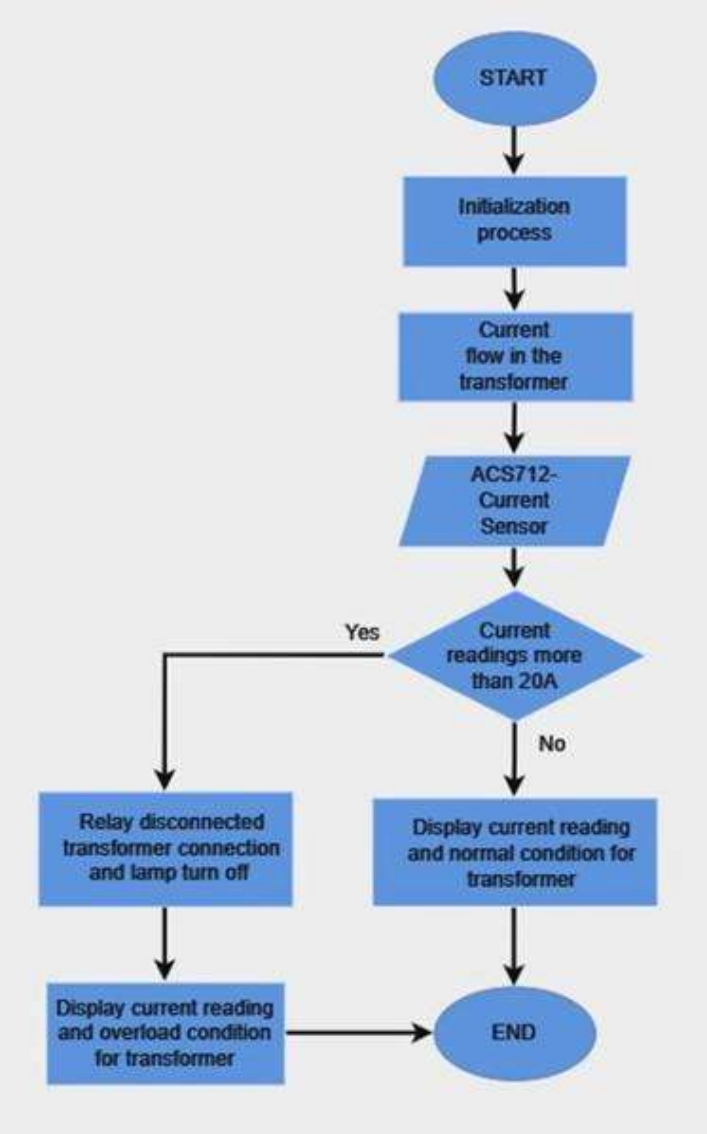
The Overload Protector of Transformer is an efficient as well as revolutionary system that is used for the protection of transformers from high load conditions. The system uses an Arduino microcontroller for the current monitoring throughout the system in real-time, processing, and controlling. The ACS712 current sensor is used to determine the current passing through the transformer and this is passed to the Arduino which compares these values with programmed values. When any overload condition is sensed, the transformer protection relay trips, thus preventing outage to the transformer. It also has an LCD display that shows real time values/status of the transformer to the operator. The system is aimed to ease the operation and flexibility of the design thus allowing a variety of use in industrial, residential, and renewable energy applications. Using efficient components and up-to-date technology, this product increases the efficiency, security and the effective life time of the transformers.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

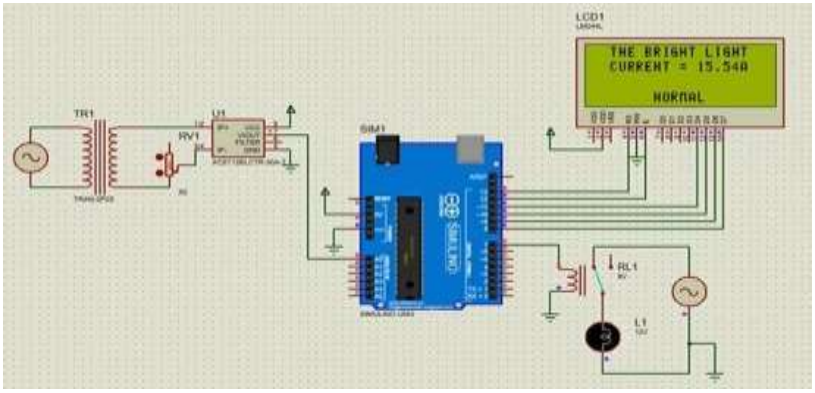
1. Block diagram



2. Flow Chart



3. Simulation Diagram



4. Coding

Code_Transformer_Protection_copy_20240610165822.ino

```
// include the library code:
#include <LiquidCrystal.h> //library for LCD

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(13, 12, 11, 10, 9, 8);

//Measuring Current Using ACS712
const int Sensor_Pin = A0; //Connect current sensor with A0 of Arduino
int sensitivity = 66; // use 100 for 20A Module and 66 for 30A Module
int offsetvoltage = 2500;

void setup()
{
  pinMode(7,OUTPUT); //Relay Pin as a OUTPUT
  lcd.begin(20, 4); // set up the LCD's number of columns and rows:
  lcd.setCursor(0,0);
  lcd.print("  THE BRIGHT LIGHT    ");
}
void loop()
{
 //****************** Measure Current ***************************
 unsigned int temp=0;
 float maxpoint = 0;
 for(int i=0;i<500;i++)
 {
  if(temp = analogRead(Sensor_Pin), temp>maxpoint)
  {
    maxpoint = temp;
  }
 }
 float ADCvalue = maxpoint;
 double Voltage = (ADCvalue / 1024.0) * 5000; // Gets you mV
 double Current = ((Voltage - offsetvoltage) / sensitivity);
 double AC_Current = ( Current ) / ( sqrt(2) );

 lcd.setCursor(0,1);
 lcd.print("  CURRENT = ");
 lcd.print(AC_Current,2);
 lcd.print("A          "); //unit for the current to be measured

 //********** Tranformer Overload Protection **********************
 if(AC_Current > 20) //if Tranformer Current is Greater Than 20A
 {
  lcd.setCursor(0,3);
  lcd.print("     OVERLOADED       ");
  digitalWrite(7,LOW);  //Shut Down Transformer
 }
 else
 {
  lcd.setcursor(0,3);
  lcd.print("       NORMAL      ");
  digitalWrite(7,HIGH);
 }
}
```

NOVELTY AND UNIQUENESS

The novelty and uniqueness from this project includes the integration of an Arduino-based system for real-time transformer overload protection, considering the affordability, scalability, and efficiency. Different from other protection methods by using fuses or simple relays, this work applies the ACS712 current sensor and relay control in overload detection precisely and automatically. Inclusion of an LCD display for real-time monitoring adds interactivity with the user and operational transparency. The novelty in the approach, besides improving safety, is a guarantee of quicker response to overload conditions; hence, this is outstanding as a modern cost-effective solution for power distribution networks.

BENEFIT TO MANKIND

It enhances the safety, reliability, and efficiency of electrical power distribution systems for the benefit of mankind. It reduces the risk of expensive repairs, power outages, and safety hazards such as electrical fires by preventing damage to the transformer through real-time monitoring and automatic disconnection in case of overload conditions. Because of its affordability and scalability, it becomes accessible for industrial and residential usage, renewable energy inclusive, to allow for better sustainably resilient energy infrastructures. This invention therefore supports the power supply uninterruptedly and helps improve the quality of life and technological progress in energy management.

COMMERCIALIZATION POTENTIAL

Transformer Overload Protector has very good commercialization potential that is cost-effective, scalable, and applicable in many different industries. The Arduino-based design integrates real-time monitoring with automatic overload detection, thus offering a modern solution to an age-old problem in power distribution systems through its user-friendly features, including an LCD display. This will make the system very attractive to industries, residential networks, and renewable energy applications that rely on the reliability of transformer protection. Besides, because of its modular and scalable architecture, easy customization to various market needs is possible; hence, it will be a feasible product for mass production and dissemination.

CONCLUSION

In conclusion, the Transformer Overload Protector is an innovative and cost-effective solution to the critical need for reliable transformer protection in modern power distribution systems. Its unique integration of Arduino-based real-time monitoring, automatic overload detection, and user-friendly features like an LCD display sets it apart from traditional protection methods. The system improves the safety and efficiency of transformers while offering a number of considerable benefits to mankind, including reduced risk of damage, costly repairs, and power outages, and improving energy sustainability. Strong commercialization potential, scalable design, and a wide variety of applications within industrial, residential, and renewable energy sectors are the reasons this product could see widespread adoption and help drive progress in energy management and infrastructure reliability.

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The Thermal Overload Alert System

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ABSTRACT

The Thermal Overload Alert System is an innovative solution designed to mitigate the risks of overheating in electrical machinery such as motors, transformers, and generators. Overheating poses significant threats, including insulation damage, efficiency loss, operational downtime, and safety hazards. This system incorporates advanced sensors for temperature, vibration, and current monitoring, coupled with Arduino-based processing for real-time analysis and proactive responses. The system features multi-modal alert mechanisms, including LEDs for visual indicators, a buzzer for auditory alarms, and an LCD display for precise parameter readings. A GSM module extends functionality by enabling remote notifications, ensuring timely interventions and enhanced reliability. This user-friendly design facilitates effective hazard mitigation. Developed using simulation-driven methodologies, the system enhances machinery performance through continuous monitoring and predictive maintenance, reducing downtime and maintenance costs while extending equipment lifespan. An innovative zoning framework categorizes operating conditions into safe, caution, and danger zones, promoting operational safety and efficiency. The emphasis on sustainability is evident in the system's ability to minimize energy waste and prevent equipment failures. Its modular and scalable design supports cost- effective customization and seamless integration into a variety of applications, from small-scale operations to complex industrial setups. By addressing critical challenges in machinery management, the Thermal Overload Alert System sets a benchmark for safety, efficiency, and sustainability. It provides a robust, eco-friendly solution that safeguards machinery, protects human lives, and reduces environmental impact. This system holds significant promise for widespread adoption and future advancements in smart industrial technologies.

KEYWORDS: Temperature sensor,safety hazards,LEDs,Buzzer,LCD display,Vibration sensor

PRODUCT DESCRIPTION

The Thermal Overload Alert System is one of the new solution designs in the protection of electrical machinery from overheating, which is usually a factor compromising efficiency, damaging insulation, and even involving some elements of safety. It also includes advanced sensors used in temperature, vibration, and current sensing, with a processing unit based on Arduino for real-time monitoring and proactive alerting of users in case of impending damage. Equipped with multi-modal alert mechanisms, this system issues warnings through LEDs for visual alerts, a buzzer for auditory alerts, and an LCD display for accurate temperature readings. In addition to this, the GSM module would send notifications even from remote locations for timely interventions. By developing this through simulation-driven design, it optimizes machinery performance, prolongs equipment life, cuts down maintenance costs, and advances safety and sustainability. The intelligent design and advanced functionality raise the bar in terms of effective management and protection against electrical machinery.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

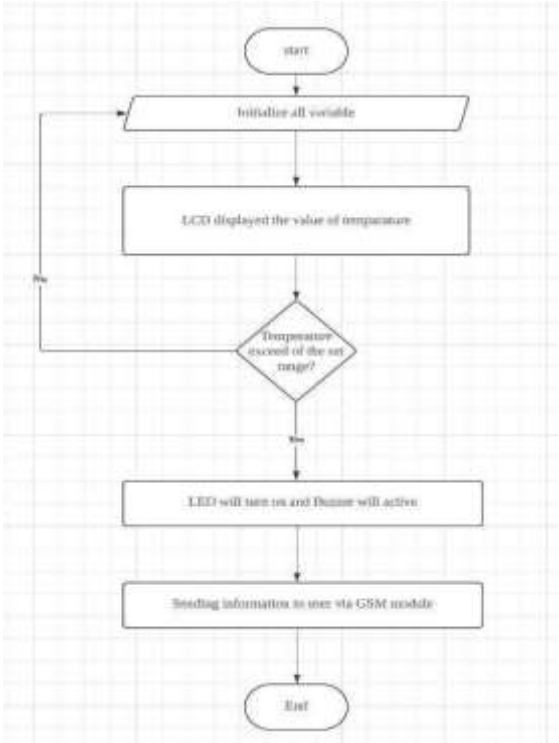


Figure 1 flow chart of thermal overload alert

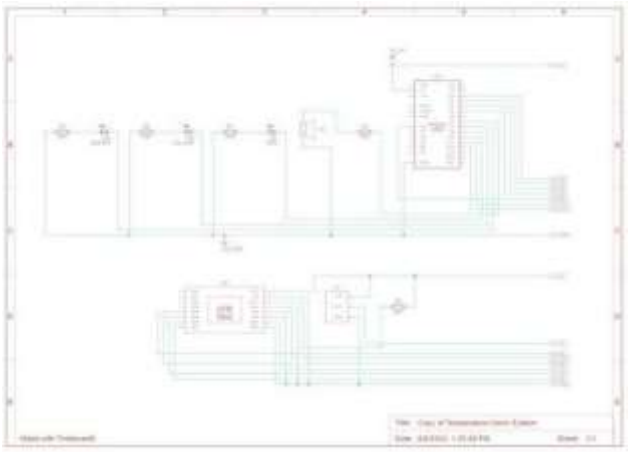


Figure 2 schematic diagram

NOVELTY AND UNIQUENESS

The Thermal Overload Alert System is new and special in tackling the critical problem of overheating in electrical machinery by integrating advanced technologies. It differs from all other conventional systems in applying a combination of temperature, vibration, and current sensors for comprehensive and precise real-time monitoring. It uses Arduino- based processing for seamless control and interpretation of data in order to proactively approach maintenance and safety. With its multi-modal alert mechanisms that include LEDs, a buzzer, an LCD display, and a GSM module, this system stands out for immediate and remote notifications. The intelligent zoning system that categorizes operating conditions into safe, caution, and danger zones makes the system user-friendly and efficient. Moreover, development and validation were performed through Tinkercad simulation, making it reliable and practical. It combines sustainability, efficiency, and safety, raising the bar with regard to protection for electrical machinery and pointing toward innovative solutions with the potential for generalization in industry.

BENEFIT TO MANKIND

The Thermal Overload Alert System offers many advantages to humanity in improving safety, efficiency, and sustainability in industries and day-to-day applications. By preventing overheating in electrical machinery, it reduces risks of fire, electrical hazards, and equipment failure, thus making for safer workplaces and protection of human life. Proactive monitoring by the system reduces costly downtimes and maintenance, hence improving operational efficiency and contributing to economic savings. Its intelligent design promotes eco-friendliness by considering the optimization of energy consumption, a longer life span of machinery, and waste reduction due to damaged equipment. By providing a more modern integration, the system introduces innovation towards smarter and more reliable industries. Finally, the Thermal Overload Alert System protects human lives, improves the quality of life, brings economic stability, and cares about the environment.

COMMERCIALIZATION POTENTIAL

The Thermal Overload Alert System has tremendous potential for commercialization in manufacturing, power generation, and transportation industries that rely on electrical machinery. It offers solutions to the increasing demand for smart and sustainable industrial solutions, such as real-time monitoring, proactive alerts, and intelligent control. Accommodating a modular design that's cost-effective to build in blocks, such as using Arduino, sensors, and GSM modules, allows this system to be applied to various sized operations, from the most minute to the most industrially complex. Emphasizing safety, efficiency, and sustainability, the system addresses firms that want to meet some very stringent regulatory standards using the least operational costs as much as possible. It solves some very critical problems, like downtime, energy wastage, and safety hazards; hence, manufacturers, facility managers, and utility providers will make up the customer base for the system, which will become indispensable in modern industrial operations.

CONCLUSION

The Thermal Overload Alert System is one milestone in electrical machinery protection and management. Advanced sensors, Arduino-based processing, and multi-modal alert mechanisms together help in real-time monitoring with proactive interventions that respond to overheating, operational inefficiencies, and safety hazards. Its intelligent design allows for optimization of the performance of machinery, reducing the maintenance cost and prolonging equipment life span with minimal energy waste in ways that are sustainable. Due to user-friendly features, the system has met stringent safety standards via simulation-driven development and raises the new standard in industrial and commercial use. Further refinement of this technology in the future and wider application could make a sea change in the use of electrical machinery by industries in general with safety, efficiency, and environmental concern.

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Automatic Irrigation with Solar Tracking System

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ABSTRACT

The Automatic Irrigation with Solar Tracking System integrates the renewable application of solar energy with automation to address the agricultural problems and challenges such as inefficient irrigation system, energy scarcity and inefficiency of water distribution to the crops. By using an Arduino UNO R3 microcontroller, the system processes data from the soil moisture sensors, DHT11 temperature sensor and photoresistors to optimize water distribution and increase the maximum solar energy intake. The single-axis solar tracker which tracks the movement of the sun according to the light intensity ensures solar energy capture with the addition of a 5V relay that acts as an automatic switch to the DC water pump for precise irrigation. This project also includes a real-time monitoring display through the LCD I2C display module. This displays real-time data of the moisture level percentage in the soil and the surrounding temperature during usage. This innovative, eco-friendly solution boosts agricultural productivity, conserves resources and operates effectively in off-grid areas, making this a valuable tool for sustainable agriculture.

KEYWORDS: Arduino UNO R3, renewable energy, sustainable agriculture, solar tracker, automation, solar energy

PRODUCT DESCRIPTION

The Automatic Irrigation with Solar Tracking System is an innovative solution designed to improve the traditional agricultural practices by integrating renewable energy with automation and real-time data monitoring. This system uses a single-axis solar tracker to maximize solar energy intake and efficiency, ensuring consistent energy is available for powering the irrigation processes. This product is equipped with sensors for monitoring moisture of the soil and environmental temperature which real-time data will be displayed on an LCD screen, allowing users to adjust the amount of water to be pushed out during the irrigation process according to the seasons and temperature. The Arduino UNO R3 microcontroller acts as the central processor, coordinating input data with outputs such as the servo motor which aligns the solar panel to its light intensity condition, and the relay-controlled DC water pump which ensures efficient irrigation.

BLOCK DIAGRAM

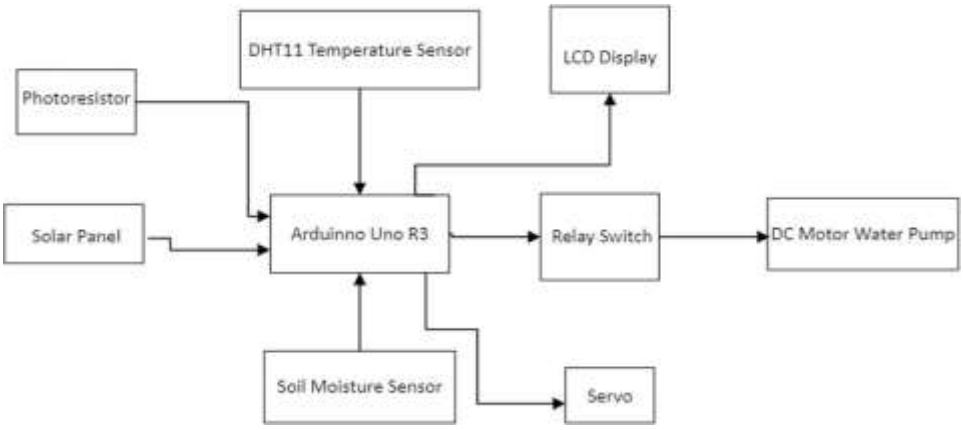


Figure 1: Block Diagram of Automatic Irrigation with Solar Tracking System

FLOWCHART

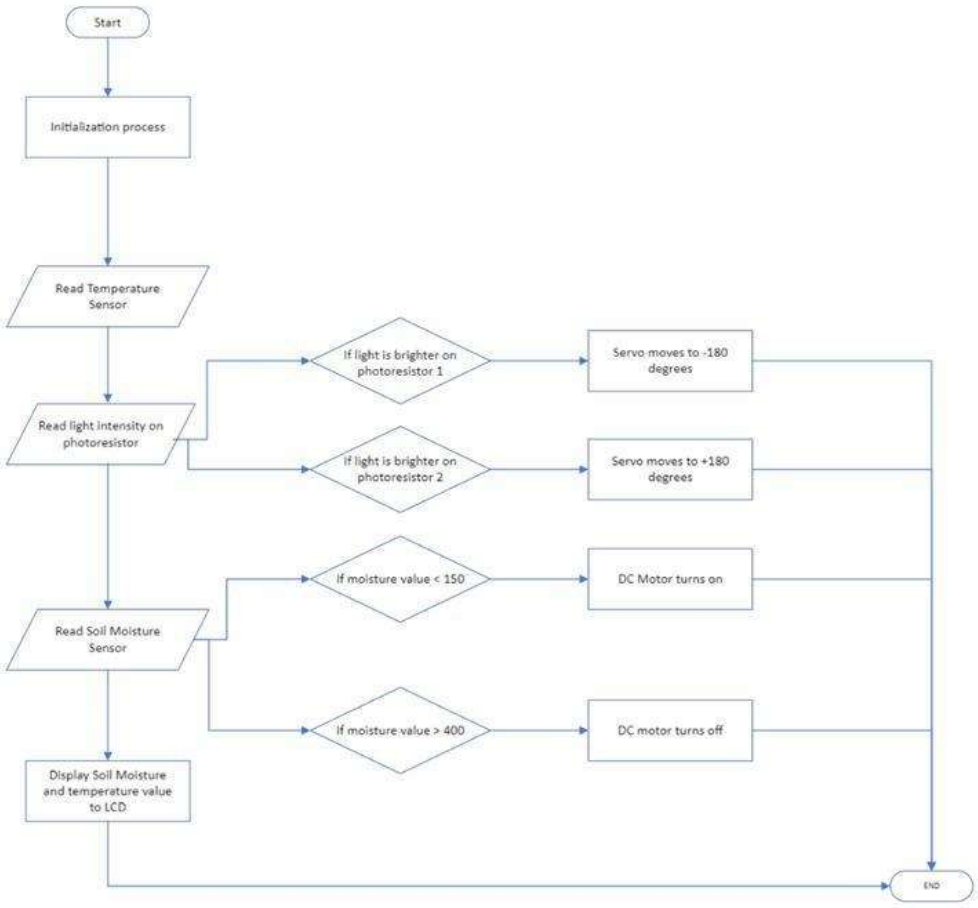


Figure 2: Flowchart of Automatic Irrigation with Solar Tracking System

PCB LAYOUT

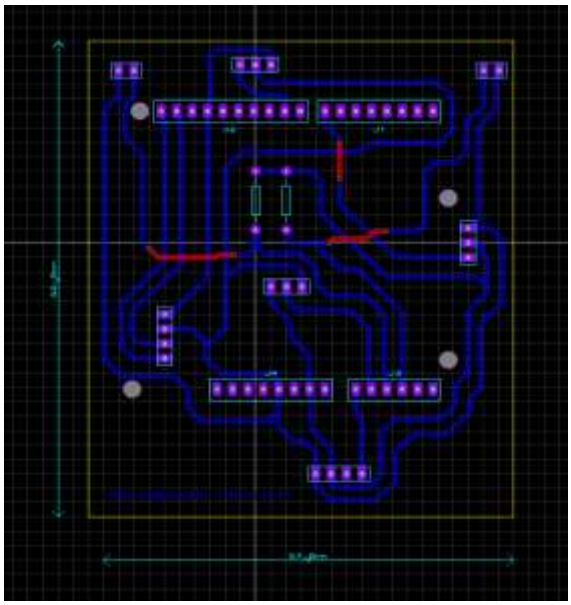


Figure 3 : PCB layout of Automatic Irrigation with Solar Tracking System

NOVELTY AND UNIQUENESS

The novelty of this system lies in its seamless combination of solar tracking technology with smart irrigation system taking hold with common issues such as water wastage, scarcity of energy on remote areas and harsh seasonal environments. Unlike the conventional irrigation systems, this project incorporates a single-axis tracker, which enhances the energy harvesting efficiency. The integration of the moisture and temperature sensors ensures precise water distribution, reducing wastage and promoting sustainability. With the use of an Arduino UNO R3 microcontroller, this adds flexibility, user-friendly customization and scalability. The automatic irrigation with solar tracking system is designed to function on remote areas with limited access to electricity, making
it a unique and practical solution for modern agriculture.

BENEFIT TO MANKIND

The automatic irrigation with solar tracking system offers significant benefits to humanity by addressing the critical agricultural challenges and problems farmers faced. By using automation in the irrigation process, this reduces manual labor and ensures efficient water distribution to the crops, therefore supporting the framers in managing resources sustainability. The reliance towards the renewable solar energy minimizes carbon emissions and operational costs, contributing to environmental preservation. In addition, the system's ability to enhance crop yields can help meet the growing food demands of an increasing global population. This irrigation system also provides a reliable solution for farmers in regions with limited access to electricity, improving their quality of life and economic stability.

COMMERCIALIZATION POTENTIAL

The Automatic Irrigation with Solar Tracking System has vast commercialization potential across various agricultural sectors on the globe. The ability to operate in off-grid environments without an electrical distributor makes it an attractive solution for rural and developing areas. The system's modular design allows for customization based on specific agricultural needs, making this a suitable small to medium scale farms in the agricultural sectors. Its cost-effectiveness and sustainability appeal to markets emphasizing eco-friendly practices and reduction in carbon footprints. In addition, the growing trend towards smart automation in agriculture sectors positions this system as a
valuable addition to modern agricultural technologies.

CONCLUSION

In summary, the Automatic Irrigation with Solar Tracking System represents a significant leap forward in the sustainable agricultural practices and methods. By leveraging renewable energy and advanced automation, the system enhances resource efficiency and agricultural productivity while minimizing environmental impacts. Its compact design and adaptability ensures reliable performance in diverse agricultural situations which addresses the challenges such as inefficient water distribution and energy scarcity. As a scalable and eco-friendly solution, this system aligns with the global efforts toward clean sustainable development and offers a promising pathway for future advancements in smart agricultural technologies.

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PWM Solar Charge Controller

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ABSTRACT

The project outlines the design and construction of a PWM- (Pulse Width Modulation)-based solar charge controller to enhance the efficiency of solar energy systems by proper charging of batteries. The controller, based on the Arduino Nano microcontroller, is also designed to limit the voltage and current from solar panels to avoid overcharging or deep discharge of batteries. Integration of a buck converter allows the solar system to set its output according to battery requirements, providing consistency in power supply. Real-time monitoring of solar panel and battery voltage, coupled with temperature sensing, is achieved through different sensors feeding their data to the Arduino for, consequently, a real-time adjustment of the charge cycle. The charge controller uses three charging stages-i.e., bulk, absorption, and float-to achieve maximum battery life and energy storage efficiency. An LCD display in the GUI works as an interface, providing updates on system status, such as battery level and solar input. This design presents a cheaper yet expandible alternative for solar applications, right from off-grid energy settings up to portable solar appliances. The project further asserts the viability of adopting more advanced, cheaper technologies to promote renewable energy development. This invariably will lead to the greater adoption of sustainable energy solutions all over.

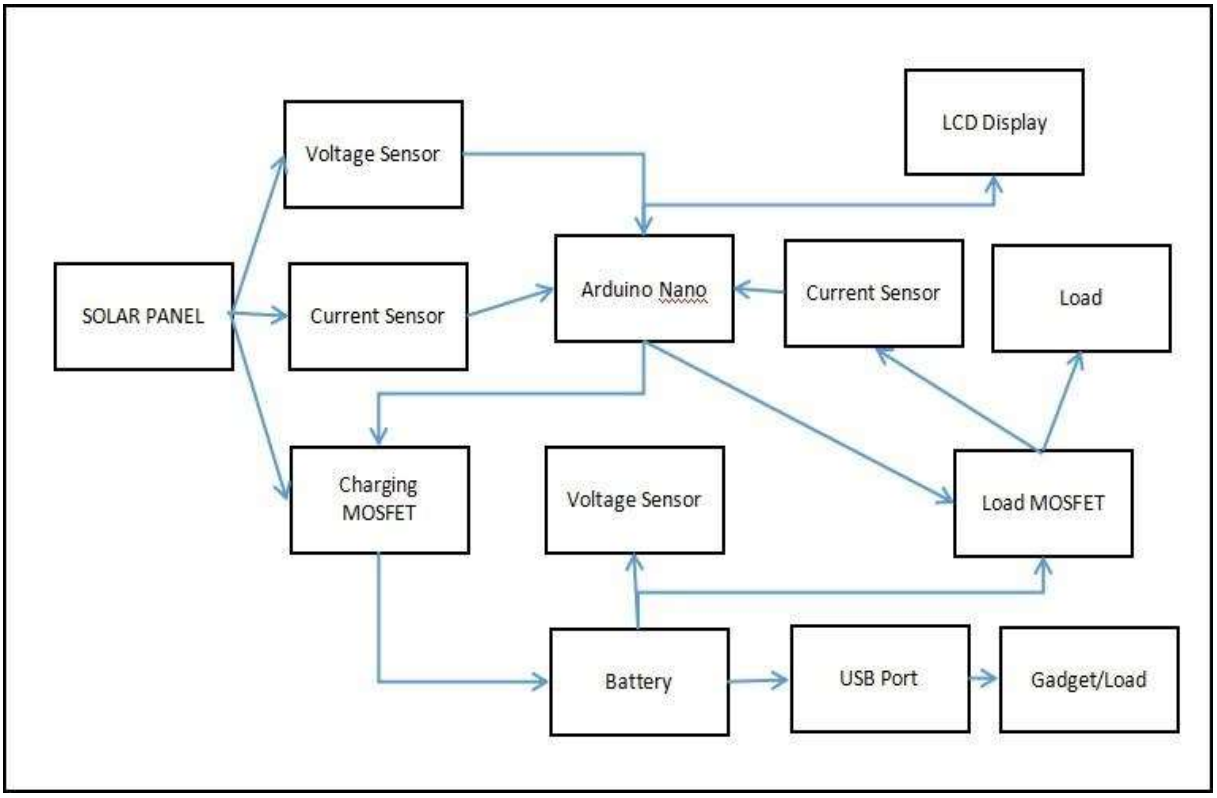
KEYWORDS: PWM, solar charge controller, Arduino Nano, renewable energy, battery management, solar energy efficiency.

PRODUCT DESCRIPTION

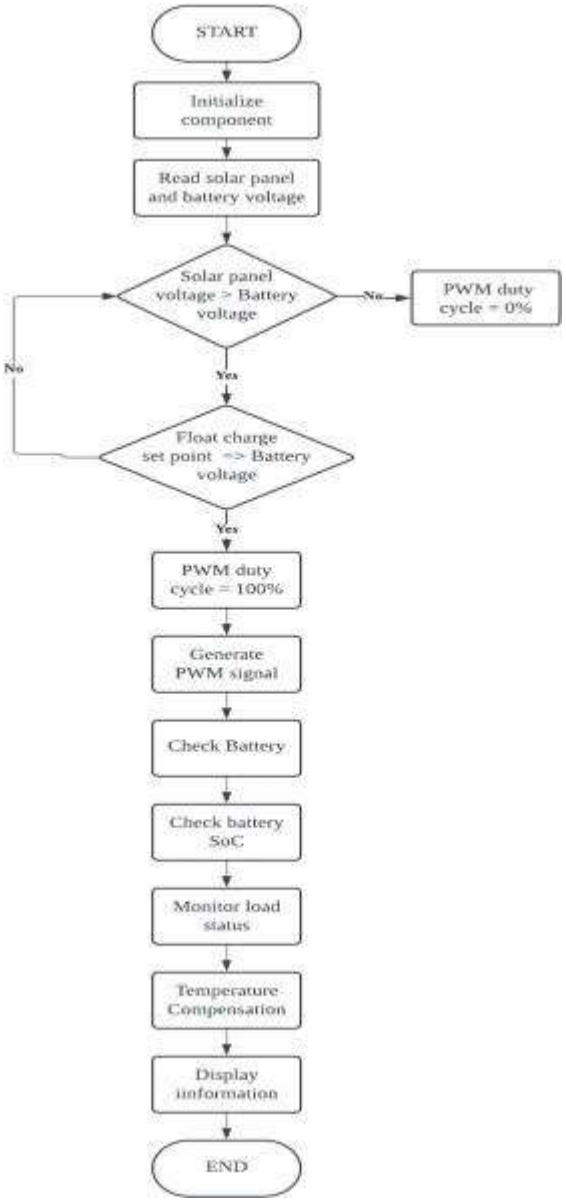
PWM Solar Charge Controller is an intelligent energy management tool meant to control the charge on batteries being charged by solar panels. At the core of the system is an Arduino Nano microcontroller, which guarantees accurate control of the charging process by generating pulse-width-modulated signals to regulate the charging current according to the battery's voltage levels. The system employs a buck converter to step down voltage from the solar panel, ensuring compatibility with battery specifications. Key components include MOSFETs for switching, temperature sensors for thermal monitoring, and voltage/current sensors for tracking energy flow. The system is designed to have a three-stage charging process including bulk, absorption, and float mode, such that batteries are continuously charged in an optimal float condition without fear of damage. The LCD interface displays vital data, such as battery status, solar panel voltage, and charging mode, providing users with real-time feedback. Temperature compensation has been incorporated to further enhance efficiency by modifying charging parameters depending on the surrounding conditions. The system in question is the perfect low-cost solution for small-scale solar energy projects, portable solar systems, and off-grid installations balancing the importance of affordability with performance.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Block Diagram



Flowchart



NOVELTY AND UNIQUENESS

The novelty of this PWM Solar Charge Controller lies in its combination of modern control algorithms and inexpensive components, offering an efficient and reliable alternative to traditional solar charge controllers. An Arduino Nano microcontroller allows implementing modern sophisticated charge management usually found in more advanced systems. This design is different compared with basic solar controllers. Here, there are although it depends upon environmental aspects, real-time temperature sensing and variable charging stages to accommodate for such changes. This modular design means that it will be easy to cheaply source these components, keeping costs down and allowing for expansion, a welcome feature for both DIY solar works and bigger installations within the renewable energy field.

BENEFIT TO MANKIND

This project provides an array of benefits such as promoting the transition towards cleaner and renewable sources of energy. The PWM Solar Charge Controller minimizes energy waste and prolongs the life of batteries by supporting effective battery management. This technology can be adopted in remote areas to give off-grid communities a reliable supply of power. The installation and maintenance of the system contributes toward minimizing carbon footprints, thus promoting environmental sustainability. In addition, this will empower the users with affordable, self-sustaining energy solutions, thus supporting energy independence and reducing the burden of dependence on fossil fuels.

COMMERCIALIZATION POTENTIAL

The PWM Solar Charge Controller has significant commercial potential, especially in the renewabl energy sector. Its low-cost design that can be scaled easily makes it appealing to small and mediur solar providers, DIY enthusiasts, and off-grid energy solution companies. Some possible markets ar rural electrification projects, portable solar devices, camping gear, and emergency backup systems Increased demand for affordable and efficient solar technology, particularly in developing zones, furthe augments the commercial viability of this product.

CONCLUSION

The development of the PWM Solar Charge Controller surely is the most significant advancement made so far in solar energy management. Through the integration of adequate charge control mechanisms, real-time monitoring, and adaptive charging stages, this project attempts to combat critical limitations associated with conventional charge controllers. This is done with the aim of educating users regarding sustainable practices to enhance battery lifespan and utilization of energy from solar panels. Future efforts might work on improving the design of large-scale controllers, building IoT capabilities for remote monitoring, and developing compatibility for all kinds of battery and solar panel arrangements. This advance will make significant contributions to the penetration of renewable energy and aid global sustainability initiatives.

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Automatic Stray Cat Feeder

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ABSTRACT

This project presents the development of an automated cat feeder system capable of classifying and dispensing food portions tailored to kittens and adult cats based on their weight and height measurements. The system integrates multiple sensors and actuators, including a load cell paired with an HX711 amplifier to accurately measure the cat's weight, an ultrasonic sensor (HC-SR04) to assess the cat's height, and a PIR motion sensor to detect the presence of a cat. A 16x2 I2C LCD is used to display real-time feedback to the user, such as motion detection, cat classification, and feeding actions. The classification logic ensures that kittens receive smaller portions, while adult cats are given larger portions, with additional checks to identify non-cat entities for safety. The system is powered by an Arduino Uno, which acts as the central processing unit to read sensor inputs and control two servo motors for precise food dispensing. The project demonstrates the potential of smart pet care automation by reducing human involvement, ensuring proper feeding schedules, and minimizing overfeeding risks. Designed as a cost-effective and efficient solution, this feeder offers scalability and adaptability to diverse pet care scenarios. The use of load cell technology, combined with ultrasonic sensing and motion detection, provides accurate classification and feeding processes, emphasizing reliability and user-friendly operation.

KEYWORDS: Automated Cat Feeder, Arduino Uno, Load Cell, HX711 Amplifier, Ultrasonic Sensor, PIR Motion

PRODUCT DESCRIPTION

The Automated Cat Feeder is a smart, user-friendly device designed to ensure the proper feeding of stray or domesticated cats. This innovative system utilizes advanced sensor technologies to classify cats into kittens or adults and dispenses food portions tailored to their needs. The feeder is powered by an Arduino Uno microcontroller, ensuring seamless integration of multiple components and reliable operation. Key features include:

- **Weight Measurement**: A load cell with an HX711 amplifier accurately measures the weight of the cat, ensuring precise classification.
- **Height Detection**: An ultrasonic sensor (HC-SR04) evaluates the cat's height, aiding in distinguishing between kittens and adult cats.
- **Motion Detection**: A PIR motion sensor identifies the presence of a cat and initiates the feeding process.
- **Tailored Feeding**: Two servo motors control the food dispensing mechanism, adjusting portions based on the cat's classification.
- **Real-Time Display**: A 16x2 I2C LCD provides instant feedback, displaying information such as cat type, feeding status, and motion detection.

Designed for both simulation and real-world use, the system prioritizes efficiency, accuracy, and adaptability. It minimizes human intervention in feeding stray cats while promoting proper portion control to prevent overfeeding or underfeeding. The device is compact, cost-effective, and scalable, making it suitable for pet shelters, urban areas with stray cat populations, or personal use by pet owners. Whether as a standalone unit or part of a larger pet care system, the Automated Cat Feeder exemplifies the potential of smart automation in addressing everyday challenges in animal care.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. Block Diagram

The block diagram Figure 1 represents an automated cat feeder system using an Arduino Uno microcontroller. The system is powered by a solar panel to ensure energy efficiency and sustainability. The **input section** includes key sensors for data collection: a motion sensor detects the presence of a cat, a weight sensor measures the cat's weight to differentiate between an adult cat and a kitten, and an ultrasonic sensor measures the height of the cat for additional confirmation of its type. These inputs are processed by the Arduino Uno, the system's core microcontroller, which analyzes the collected data. Based on the analysis, the **output section** executes specific actions. The LED indicates the system's status, such as standby, processing, or dispensing. The LCD provides visual feedback to display relevant information, such as the cat type or the food dispensing process. The servo motor smartly controls the feeder mechanism, dispensing the appropriate type and amount of food based on the cat's weight and height measurements. This system ensures tailored feeding for cats of different ages and sizes, preventing overfeeding or underfeeding. The integration of sensors with the Arduino and the solar-powered design makes the feeder both intelligent and eco-friendly, providing a sustainable solution for pet care automation.

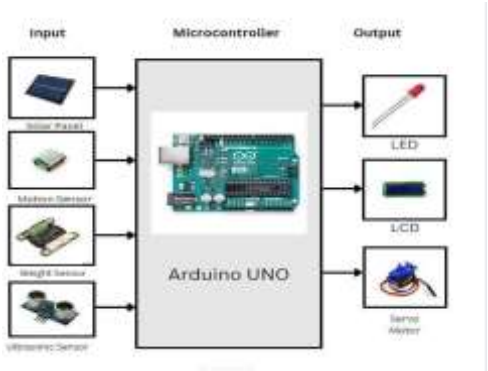


Figure 1. Block diagram of the system

2. Flowchart

Figure 2 represents the flowchart of the designed system. In comparison to conventional feeders, the design specializes in dispensing the proper type and amount of food based on input readings from sensors, including weight and height measurements, ensuring precise feeding tailored to kittens and adult cats. The system begins by absorbing solar energy, making it sustainable and eco-friendly. After initialization, it detects motion to confirm the presence of a cat. Once motion is detected, the ultrasonic sensor measures the height, and the weight sensor records the weight of the cat. These inputs are analyzed to classify the cat as a kitten or an adult. If the measurements match the criteria for an adult cat, the servo motor moves to the right, and the appropriate type and quantity of food are dispensed. Simultaneously, the LED indicator is activated to show the system is operating. If the cat is classified as a kitten, the servo motor moves to the left and dispenses food suited for a kitten. After dispensing, the servo motor returns to its original position, completing the process. This innovative design ensures precise feeding while maintaining energy efficiency and reducing user intervention, making it a smart and sustainable pet care solution.

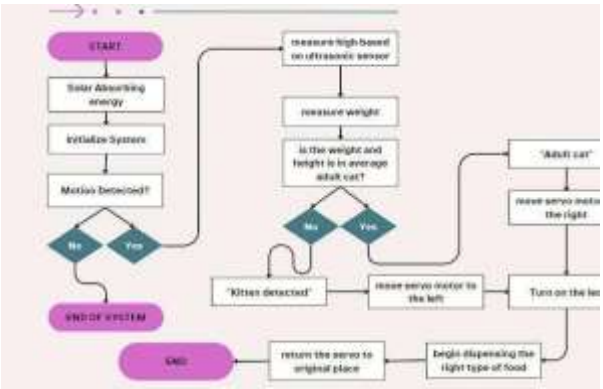


Figure 2. Flow chart of the system

3. Simulation

Figure 3 shows the schematic diagram of the designed system. The Arduino Uno microcontroller interfaces with an ultrasonic sensor, weight sensor, and motion sensor to detect and classify the cat's type. Outputs include an LCD for status display, an LED for indication, and servo motors for dispensing the appropriate type and amount of food.

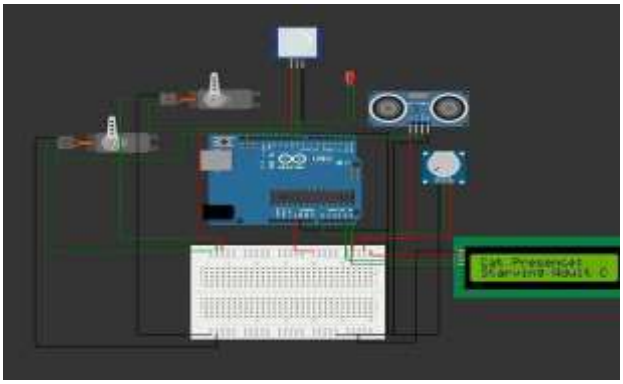


Figure 3. Schematic of the system

BENEFIT TO MANKIND

The Automated Cat Feeder contributes to mankind by promoting humane and efficient care for stray and domestic cats. By automating the feeding process, it reduces the burden on caregivers, allowing them to provide consistent nutrition to animals with minimal effort. The feeder's ability to classify cats based on weight and height ensures that each animal receives appropriate portions, preventing overfeeding or underfeeding. This innovation is particularly valuable in urban areas with large stray populations, as it supports community efforts to manage and care for these animals, reducing food waste and fostering a healthier environment. Additionally, the device encourages responsible feeding practices and raises awareness about animal welfare, inspiring more individuals to contribute to the well-being of stray cats and enhancing the coexistence of humans and animals in shared spaces.

COMMERCIALIZATION POTENTIAL

The commercialization potential of this cat feeder system is particularly promising for addressing the needs of stray cats. Stray cat populations are a growing concern globally, with many cities facing challenges in managing their care and well-being. This automated, smart feeder system can be deployed in areas with high stray cat populations, providing a sustainable way to feed them based on their specific needs, such as weight and size. By incorporating motion sensors, weight measurements, and height detection, the system can ensure that food is dispensed appropriately, preventing overfeeding and ensuring that different types of cats—whether kittens, adults, or nursing mothers—receive the right amount of nutrition. This technology could be integrated into community-led efforts for animal welfare, helping non-profits, local governments, and animal shelters to better manage stray cat populations. Additionally, the system could be used in conjunction with trap-neuter-return (TNR) programs to improve the health and control of feral cat colonies, making it a key tool in humane animal management. With its potential to reduce food waste and support the health of stray cats, this solution could attract both funding and partnerships from animal rights organizations, municipalities, and environmental groups.

CONCLUSION

In conclusion, the automated cat feeder system developed in this project offers a practical and innovative solution to address the growing issue of stray cat populations. By incorporating sensors to detect weight and height, the system can accurately determine the type and nutritional needs of each cat, ensuring that the right amount of food is dispensed without waste. This technology holds significant potential for improving the health and welfare of stray cats, making it a valuable tool for animal shelters, non-profit organizations, and municipalities involved in managing feral cat populations. Furthermore, the system's integration with community-based programs, such as trap-neuter-return (TNR), could contribute to sustainable, humane approaches to controlling and caring for stray cat populations. With its scalable and adaptable design, this project paves the way for a more efficient and compassionate solution to the ongoing challenge of stray cat management, benefiting both animals and communities alike.

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Solar Powered Recycle Product Procurement Vending Machine

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ABSTRACT

In Malaysia, recycling faces significant challenges due to inefficient infrastructure and limited accessibility. The "Solar Powered Recycle Product Procurement Vending Machine" addresses this issue by introducing an automated and energy-efficient recycling system. This machine uses Arduino-based sensors, including an inductive proximity sensor, a color sensor, and an ultrasonic sensor to identify, measure, and sort recyclable materials (metal, plastic, and paper). Integrated with an LCD for real-time display and an OLED to generate QR codes for rewards, the system provides both convenience and user incentives. A solar panel and rechargeable battery supply sustainable energy, enhancing the system's environmental benefits. Wokwi and TinkerCAD simulations validate the machine's effectiveness in identifying and sorting material values dynamically. This project offers a scalable solution for recycling infrastructure, fostering sustainability, and incentivized participation in the community.

KEYWORDS: Recycling infrastructure, Reverse Vending Machine, Arduino-based sensors, OLED display, Servo motor, Solar energy.

PRODUCT DESCRIPTION

The Solar Powered Recycle Product Procurement Vending Machine has the capability to aid recycling infrastructure with its automated sorting and rewarding capabilities. Utilizing Arduino MEGA as the microcontroller, it detects recyclable materials through sensors (inductive proximity, color, and ultrasonic). Users insert recyclable items, and the machine identifies their type, sorts it, calculates the price value, and displays the information of the process on an LCD Display. Rewards are provided as a QR code on an OLED display, which will take users to a website. The rewards then can later be redeemed there. The system's operation is powered by a solar panel and rechargeable battery, ensuring eco-friendly and sustainable functionality. Servo motors organize sorted materials efficiently. Simulated and tested using Wokwi, this vending machine presents a user-friendly, energy-saving solution that encourages recycling participation.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS / GRAPHS VISUALS

1. Block Diagram of the Solar Powered Recycle Product Procurement Vending Machine:

Figure 1 shows a solar cell that generates energy and stores it in a rechargeable battery to power the entire system. The Arduino MEGA microcontroller manages inputs and outputs as the central processing unit. Input devices include an inductive proximity sensor for detecting metallic objects, a color sensor to identify the color of recyclable items (for plastic objects), and an ultrasonic sensor to detect item placement. The microcontroller processes these inputs to control the outputs. Output consists of an OLED display and LCD for user interface and information display, and a servo motor to facilitate operations of items dispensing. The system is designed to operate sustainably using renewable energy sources.

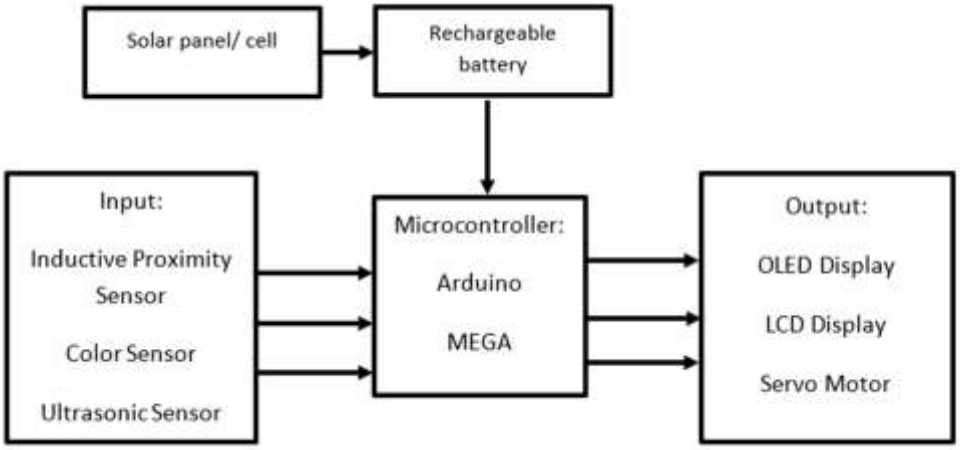


Figure 1. Block diagram of the overall system

2. Flow Chart of the Solar Powered Recycle Product Procurement Vending Machine:

The flowchart in Figure 2 outlines the operation of the designed system. It begins by detecting an inserted item type either metal, plastic, or paper. The system uses sensors as described in the block diagram (Figure 1) to identify the item type and activates the servo motor to sort it into the appropriate sections/boxes. After successfully sorting, the system displays a "Thank You" message on the LCD and generates QR code on the OLED display for user appreciation. If no item is detected, the LCD shows "No item inserted".



Figure 2. Flow Chart of the system operations

3. Schematic Diagram of the Solar Powered Recycle Product Procurement Vending Machine:

Figure 3 represents the schematic diagram of the solar powered recycle product vending machine built using Arduino MEGA, integrating components such as an ultrasonic sensor for object detection, servo motors for sorting, an LCD and OLED for displays, and push buttons for user input. Simulating the schematic is essential to validate the circuit design, identify potential issues, and ensure smooth functionality before physical implementation, saving time and resources.

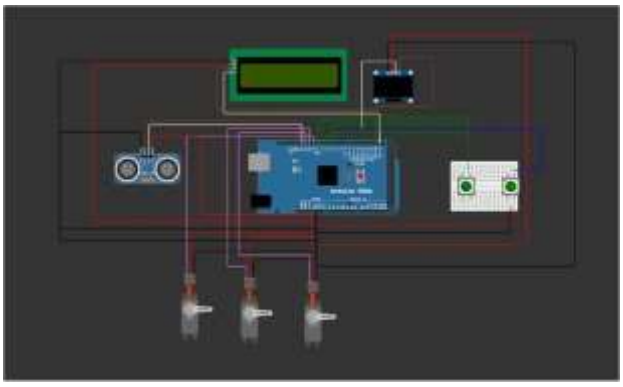


Figure 3. The Schematic Diagram

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Solar Powered Recycle Product Procurement Vending Machine in the multi-sensor approach to detect recycling materials and identify them. The project utilized servo motors to operate the sorting operation which makes the system neat. Visual aid using LCD Display makes the project user-friendly for users to acknowledge the processes such as identification, sorting and pricing. The main highlight of this project is the reward system as it uses OLED Display to display a QR Code which will take users to a well-organized website (https://sites.google.com/view/nakrecycle) where the reward can be redeemed. Additionally, the system integrates with solar power and rechargeable batteries for energy efficiency and sustainability. From a different perspective, the project is also cost-effective as it utilizes Arduino MEGA as the microcontroller and the components related are inexpensive and accessible in the ordinary market. Unlike conventional systems, this project introduces a versatile machine that promotes renewable energy use while incentivizing recycling behavior.

BENEFIT TO MANKIND

The Solar Powered Recycle Product Procurement Vending Machine offers transformative potential to bring environmental impact. It provides a new alternative to address the recycling issue in Malaysia as well as tackling environmental issues. It also increases the chance of user engagement by offering incentives to recycle with rewards, encouraging public participation. From here community awareness would also increase as it promotes recycling awareness and encourages sustainable behavior. Lastly, the project uses renewable energy (solar panels) to power operations, and benefits from the aspect of sustainability.

COMMERCIALIZATION POTENTIAL

The Solar Powered Recycle Product Procurement Vending Machine possesses significant commercialization potential. Key markets are urban and rural recycling centers to reduce logistical barriers, making the project more efficient. Opportunities also exist in public spaces such as commercial spaces like shopping malls and convenience stores to promote sustainability efforts. This project also can be implemented at public and educational institutions to teach recycling practices. Additionally, it can also be utilized in smart cities and IoT applications in the aspect of integrating real-time data for waste management. Lastly, both government and corporations can implement this as their sustainability projects or social responsibility (CSR) programs. Its adaptability and low operational costs make it an ideal solution for enhancing recycling infrastructure.

CONCLUSION

The Solar Powered Recycle Product Procurement Vending Machine addresses Malaysia's recycling challenges through innovation and sustainability. By combining automated sorting, real-time price calculations, and solar-powered operations, it provides a scalable, eco-friendly solution. Future recommendations include integrating IoT for remote monitoring, mobile app support for user rewards, and expanding to cloud-based data analysis. This project has the potential to transform recycling behaviors while contributing to a cleaner, sustainable environment.

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Solar Powered Self-driven Grass Cutter

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ABSTRACT

Solar Powered Self-driven Grass Cutter is an innovative and eco-friendly approach for lawn maintenance, aimed at reducing human labor and environmental impact. The device harnesses solar energy through a solar panel to charge its batteries, making it a sustainable alternative to conventional gas or electric-powered mowers. It is equipped with a motor-driven cutting mechanism and operates autonomously using a programmed navigation algorithm, ensuring systematic and even grass-cutting. Safety and precision are enhanced with an ultrasonic sensor, which detects obstacles and adjusts the device's path accordingly. The user interface is designed for simplicity and includes buttons for control, an LCD screen for battery status updates, and LED indicators for alerts. Unlike traditional mowers, this device eliminates the need for continuous manual operation, making it especially beneficial for individuals with limited physical mobility or busy lifestyles. The project addresses the growing demand for sustainable solutions in everyday life by combining renewable energy and autonomous technology. The absence of IoT integration ensures privacy and simplicity, appealing to users seeking straightforward functionality. This project shows the potential of green technology in transforming routine tasks and contributes to the wider goal of reducing carbon footprints in residential and community spaces.

KEYWORDS: Autonomous lawnmower, Solar-powered, Ultrasonic sensor, Renewable energy.

PRODUCT DESCRIPTION

The Solar Powered Self-driven Grass Cutter is a compact, efficient, and sustainable device designed to revolutionize lawn care. It integrates a solar panel that charges the device's batteries, ensuring an uninterrupted power supply during daylight hours. This sustainable energy source reduces dependency on conventional electricity or petroleum, promoting environmental conservation. The device autonomously navigates a lawn by following a predefined algorithm, ensuring even and systematic grass-cutting. Safety and accuracy are maintained by an ultrasonic sensor, which detects obstacles in its path and dynamically adjusts the mower’s direction to prevent collisions or damage. A user-friendly interface enhances the device's usability, incorporating physical buttons for operational control, an LCD screen displaying status updates such as battery level, and LED indicators to provide visual alerts. This straightforward interface eliminates the complexity of IoT-enabled systems, focusing instead on reliable, accessible technology. The device is best suited for small to medium-sized lawns and is an excellent choice for homeowners seeking a hands-free, eco-friendly lawn maintenance solution.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Figure 1 represents the block diagram of the complete system. Arduino Uno is used as the microcontroller because it has the required amount of pins, and the cost is adequate. The input part consists of an ultrasonic sensor for obstacle detection, a push button to start the system, and a voltage sensor to measure the power consumption by the overall system operations. Moreover, the outputs section consists of a DC motor to move and control the movements of the tires, LCD, and LED. Both the LCD and LED are used for interface purposes. The system is powered by batteries that are charged with solar panels.

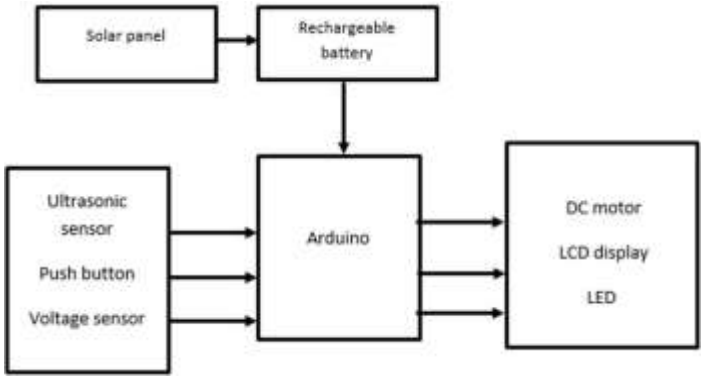


Figure 1: Block diagram of the complete system.

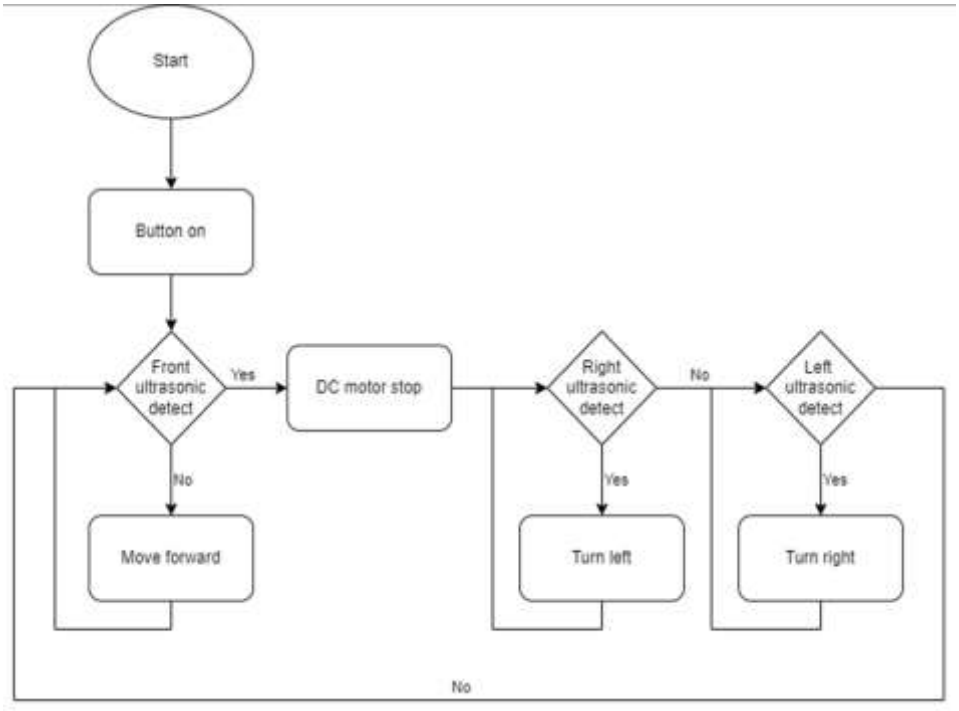


Figure 2: Flow chart of the Solar Powered Self-driven Grass

Figure 2 shows the flow chart of the driven algorithm for the grass cutter. The system begins with the user pushing the button and the system will start to operate. Then, if the ultrasonic sensor detects any obstacle within 30 cm length of the machine body, the DC motor controls the wheel and blade to stop and turn left or right based on the detection of both side ultrasonic sensors.

NOVELTY AND UNIQUENESS

The Solar Powered Self-driven Grass Cutter is distinguished by its combination of renewable energy and autonomous operation, offering a practical and environmentally friendly alternative to traditional lawnmowers. Its innovative design incorporates solar energy for power, eliminating the reliance on petroleum and reducing greenhouse gas emissions. Additionally, the autonomous navigation system is programmed to follow an efficient cutting algorithm, ensuring systematic grass trimming without human intervention. Unlike IoT-based devices, this grass cutter emphasizes simplicity with its intuitive interface, consisting of buttons, an LCD display, and LED indicators, making it accessible to users of all technical backgrounds. This design prioritizes sustainability, operational efficiency, and ease of use, setting it apart from conventional and modern alternatives alike.

BENEFIT TO MANKIND

This grass cutter offers significant benefits to individuals and society. Its solar-powered operation reduces reliance on non-renewable energy sources, contributing to environmental sustainability by lowering carbon emissions. The autonomous functionality eliminates the physical labor associated with manual lawn mowing, providing convenience and time savings, especially for individuals with mobility challenges or busy schedules. The device is cost-effective in the long term, as it requires minimal maintenance and uses renewable energy. Its simplicity and intuitive interface make it accessible to users of all ages and technical expertise, enabling widespread adoption. By promoting green technology in household applications, this project contributes to the global shift toward sustainable living.

COMMERCIALIZATION POTENTIAL

The Solar Powered Self-driven Grass Cutter demonstrates substantial potential for commercialization across multiple markets. It is particularly well-suited for residential applications, offering an eco-friendly and labor-saving solution for homeowners with small to medium-sized lawns. The device can also be utilized in maintaining community parks and gardens, where its autonomous and sustainable features would reduce the need for manual labor and external power sources. In rural areas with limited access to electricity, the grass cutter’s reliance on solar energy makes it an ideal alternative to conventional mowers. By prioritizing simplicity, sustainability, and affordability, the device appeals to a broad consumer base, ensuring strong market potential and adaptability to diverse environments.

CONCLUSION

The Solar Powered Self-driven Grass Cutter combines the principles of renewable energy and autonomous operation to offer an innovative, efficient, and sustainable lawn maintenance solution. Its integration of solar panels, ultrasonic sensors, and a simple user interface demonstrates a practical application of green technology in everyday tasks. The device addresses key environmental and labor challenges, making it a valuable tool for both individuals and communities. Future improvements could include refining the navigation algorithm for greater efficiency and optimizing the design for expandability to take in larger lawns. This project highlights the transformative potential of sustainable technologies in creating a greener and more convenient future.

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Rent And Safety Enforcement Helmet

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ABSTRACT

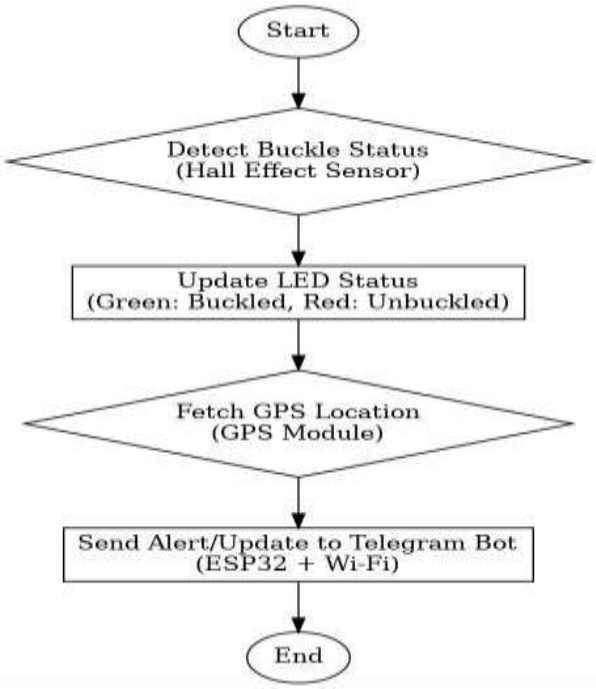
This project aims to develop a comprehensive smart helmet safety system combining advanced technologies to ensure secure usage and real-time monitoring. The system integrates a Hall effect sensor, magnetic coins, LEDs, Arduino Uno, GPS, ESP32, and a Telegram bot to detect whether the helmet is securely buckled and provide location tracking. The Hall effect sensor identifies the magnetic field from the buckle, triggering LEDs to indicate the status—green for securely fastened and red for unfastened. Additionally, the ESP32 interfaces with a GPS module to track the user's real-time location, sending updates and safety alerts via a Telegram bot. If the helmet is not properly buckled or an emergency occurs, the system notifies the user or concerned personnel. This cost-effective and user-friendly solution demonstrates the potential of IoT and embedded systems to enhance safety for applications in transportation, construction, and sports.

KEYWORDS: Helmet Safety, Hall Effect Sensor, GPS, ESP32, Arduino Uno

PRODUCT DESCRIPTION

Helmets are essential for ensuring safety in activities like motorcycling, construction, and sports. Despite their critical role, improper use of helmets, such as failing to buckle them securely, often compromises their effectiveness. This project introduces a smart helmet safety system that combines a Hall effect sensor, magnetic coins, LEDs, Arduino Uno, GPS, ESP32, and a Telegram bot. The system not only detects whether the helmet is properly buckled but also provides location tracking and real-time alerts. By merging IoT and sensor-based technologies, this project addresses the need for innovative safety solutions in a user-friendly and cost-effective manner.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS



NOVELTY AND UNIQUENESS

This project uniquely combines two critical safety aspects—buckle detection and real- time location monitoring—into a single, efficient system. The integration of a Hall effect sensor for buckle detection and GPS with an ESP32 for communication via Telegram bot enhances both safety and convenience. Unlike conventional helmet systems that focus solely on impact detection, this system ensures proactive safety by verifying proper usage and providing location-based alerts, making it a novel approach in smart helmet technology.

BENEFIT TO MANKIND

The smart helmet system addresses the global concern of safety in activities such as motorcycling, construction, and sports. By ensuring helmets are properly buckled and providing real-time alerts and location tracking, it reduces the risk of injuries caused by improper helmet usage. In emergency situations, the system's location-sharing capability can expedite response times, potentially saving lives. This project empowers users with technology that promotes safety and accountability.

COMMERCIALIZATION POTENTIAL

The smart helmet safety system has strong commercialization potential due to its practical applications across multiple industries. It can be marketed to motorcyclists, construction companies, and sports organizations as an affordable and efficient safety solution. Its ability to integrate with existing helmet designs ensures ease of adoption. By targeting markets with high safety regulations and raising awareness about helmet compliance, the system can achieve significant market penetration and profitability.

CONCLUSION

The smart helmet safety system developed in this project successfully integrates advanced technologies to enhance safety and usability. By combining a Hall effect sensor for buckle detection, GPS for real-time location tracking, and a Telegram bot for instant alerts, the system addresses critical safety concerns in various applications, such as motorcycling, construction, and sports.

The project demonstrates how IoT and embedded systems can be harnessed to create a cost-effective, user-friendly solution that ensures helmets are securely fastened and provides timely notifications in case of emergencies or improper usage. The dual functionality of buckle detection and location tracking enhances its practicality and adaptability.

This system represents a significant step towards promoting safe helmet usage and reducing preventable injuries. Its scalability and potential for customization make it a promising candidate for commercialization, contributing to the broader goal of improving personal safety through technology

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RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption

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ABSTRACT

The Smart RFID Security and Energy Management System deals with the design and simulation of an RFID-based office security system for energy efficiency. The system handles the security of access effectively along with conserving energy by making use of components like Arduino Mega, RFID module, servomotor, IR sensors, and LCD display. The RFID module, therefore, controls entry-opening up for valid cards and sounding an alarm on invalid attempts. The availability of motion sensors and the tracking of occupancy enables dynamic energy management as the lights and fans automatically switch off in unoccupied rooms. The proposed system simulated on the Wokwi platform, can exhibit how real-time monitoring and intelligent control improve security while reducing energy costs. This solution links occupancy to energy use for sustainable living with reduced operational expenses with a low carbon footprint but will ensure that all essential services are not disrupted.

KEYWORDS: RFID module, Arduino Mega, Servomotor, IR sensor, LCD Display, energy efficiency

PRODUCT DESCRIPTION

The Smart RFID Security and Energy Management System is a completely new idea that enhances office security and develops energy consumption. This project integrates advanced technologies, including an RFID module, Arduino Mega, servo motor, IR sensors, and LCD display, for smooth access control with energy efficiency. The system allows access only through secure ways using RFID cards to unlock the doors, wherein valid cards allow the servo motor to open the door, and invalid attempts sound a buzzer for added security. It also monitors the occupancy of rooms using a motion sensor and automatically switches off light and fans in case a room is unoccupied, saving energy to a huge extent. It also shows real-time updates of the status of doors and any motion detection on an LCD screen, with a WiFi module for remote monitoring. The system not only reduces electricity costs by tailoring energy usage according to the actual occupancy of rooms but also minimizes the carbon footprint, therefore being sustainable for modern offices. The system is ideal for use in offices, conference rooms, and other areas needing secured access and efficient energy management. It offers a user-friendly experience, enhances security, and supports a greener, cost-effective workplace.

BLOCK DIAGRAM

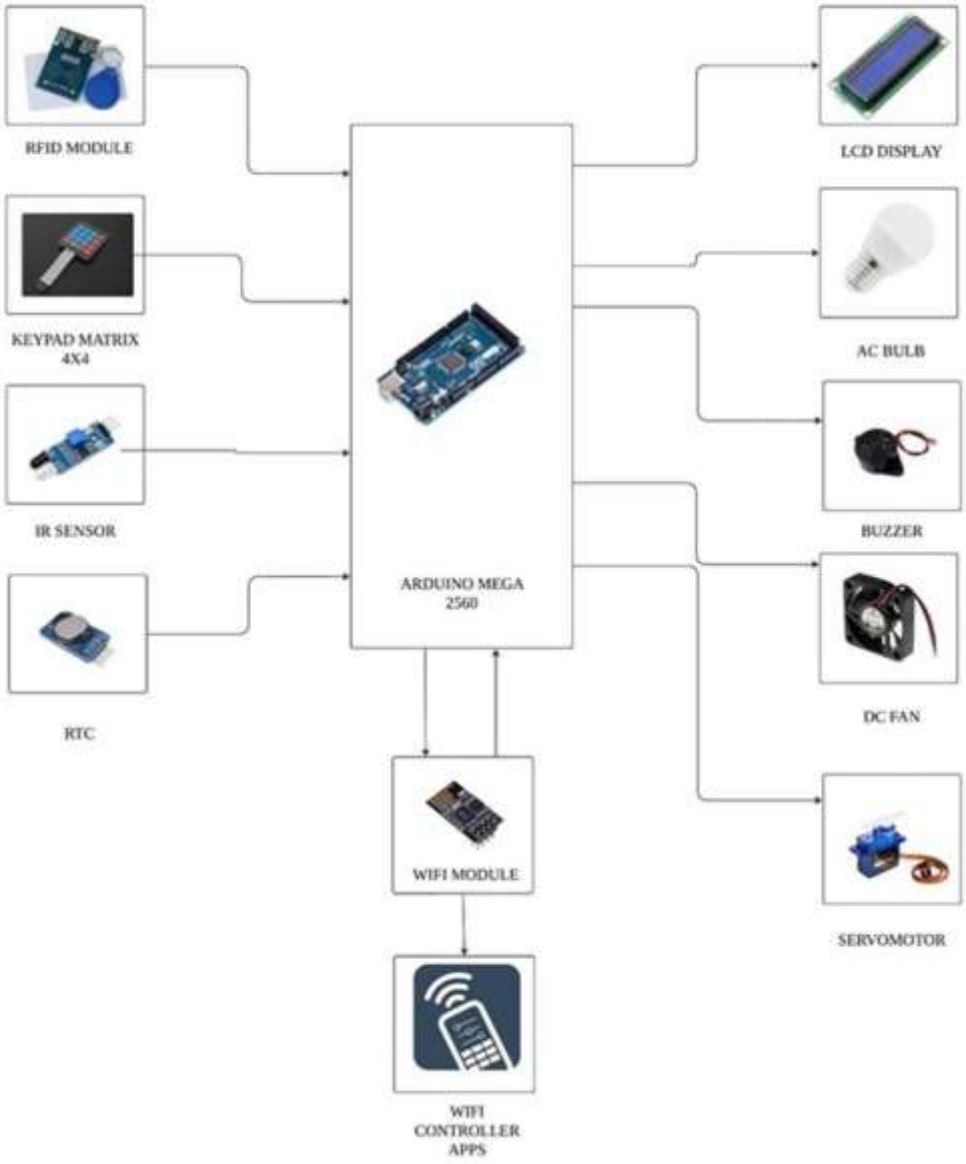


Figure 1: Block Diagram of the RFID Energy Efficiency : Optimizing Office Room and Power Consumption.

FLOWCHART

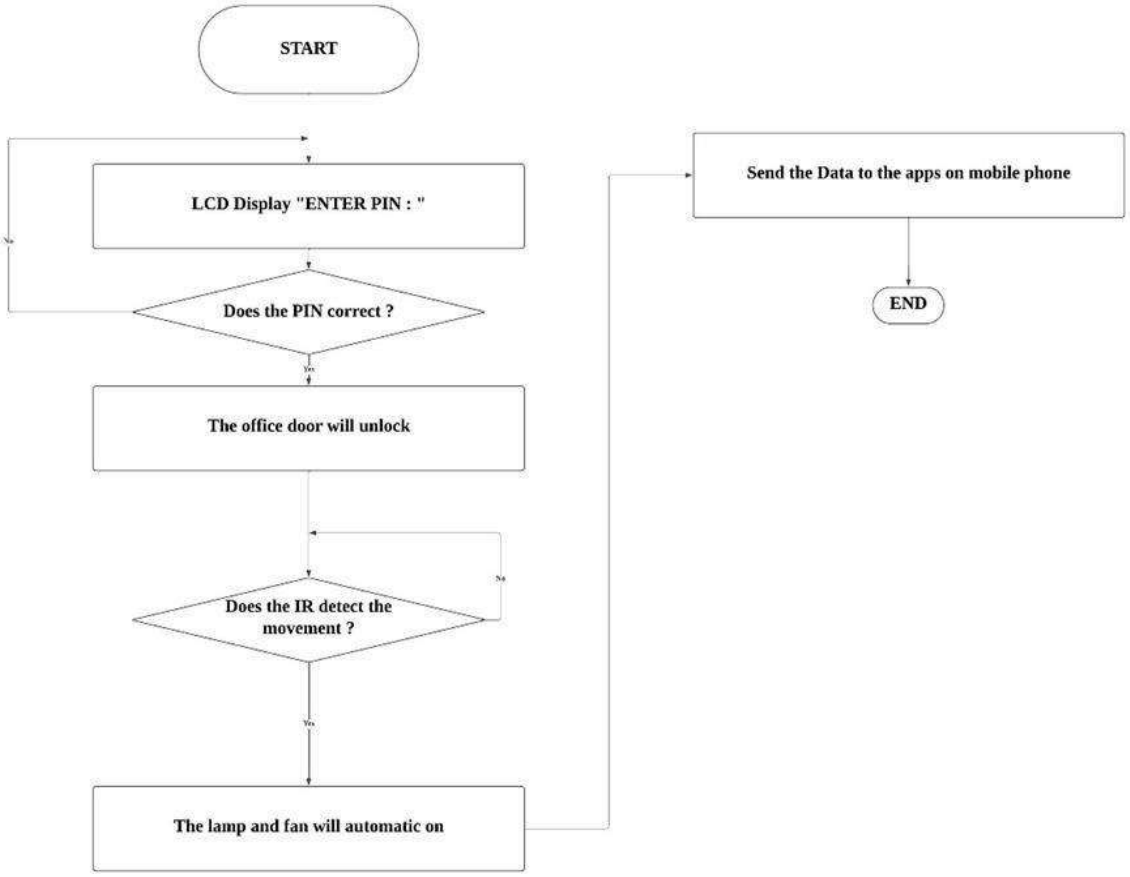


Figure 2 : Flowchart of the RFID Energy Efficiency: Optimizing Office Room and Power Consumption for Keypad Function

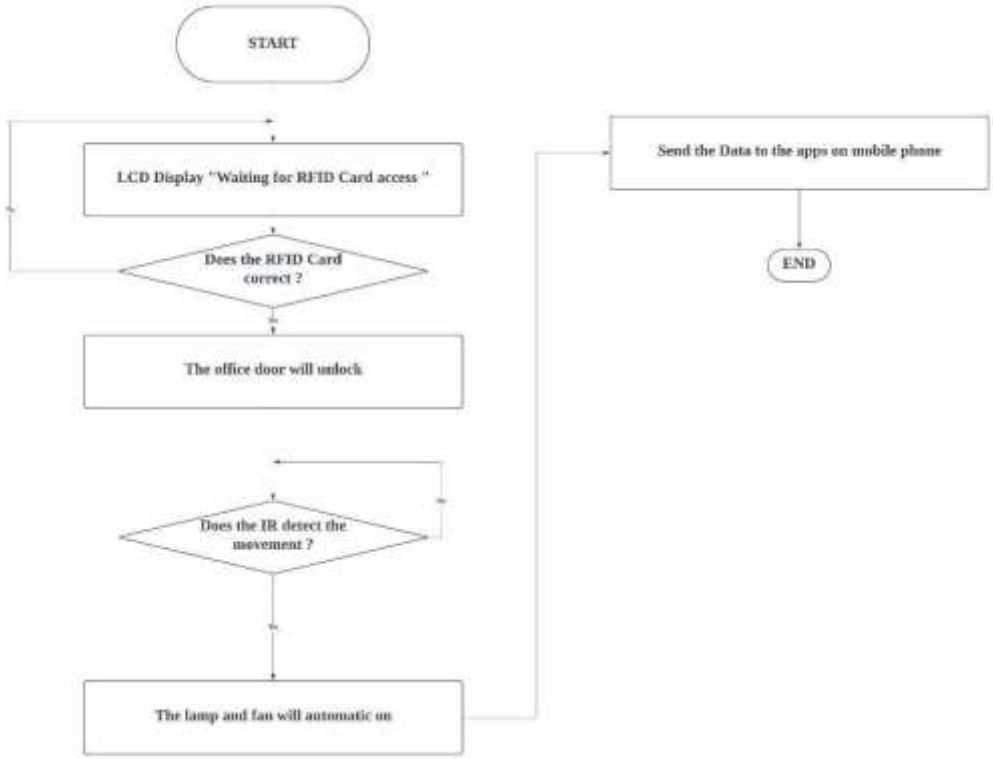


Figure 3: Flowchart of the RFID Energy Efficiency: Optimizing Office Room and Power Consumption for RFID Card Function

SCHEMATIC DIAGRAM

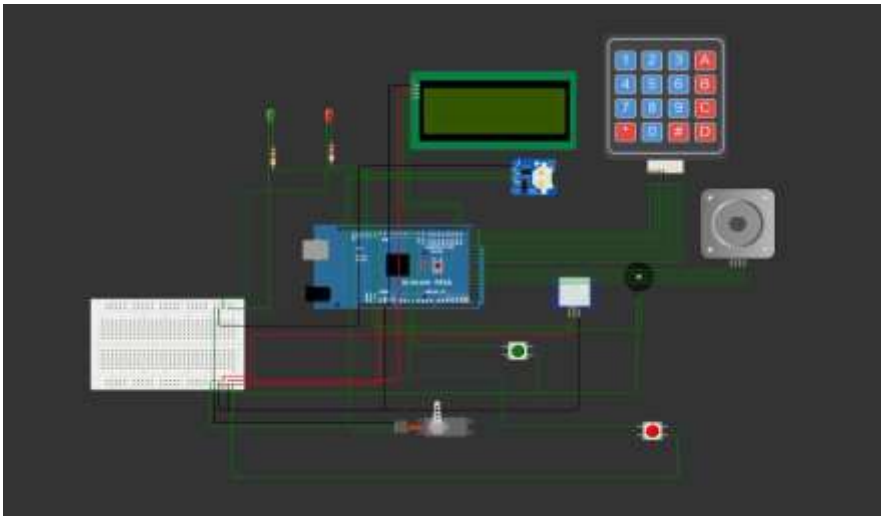


Figure 4 : The Schematic Diagram of the RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption.

The schematic shows the strategic connection of each component to the Arduino Mega. Each input and output components has been connected with the corresponding pins on the Arduino Mega. The LCD Display connected to communication pin at SDA and SCL. After that, the LEDs are tied to digital pins 12 and 13. The stepper motor that tied to digital pins number 40, 42, 44, and 46 acts as a DC Fan. The 4x4 Keypad Matrix is linked to digital pin 22, 24, 26, 28, 30, 32, 34, and 36. Besides that, the buzzer only connect on VCC and GND while the PIR Sensor is same as buzzer component but the PIR Sensor has connection with digital pins 10. The PIR sensor acts as an IR sensor because in this software there are no IR sensor. The pushbutton that acts as a RFID Module and the pushbutton function for exit the office room using 2 and 3 at the digital pins. The servomotor pins has connection with 9 at digital pins and the rest of the pin connect at VCC and GND. Besides that, the RTC connect at SDA and SCL pin. All this arrangement highlights the important of each component to the microprocessor that can make a good projects call RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption.

PCB LAYOUT

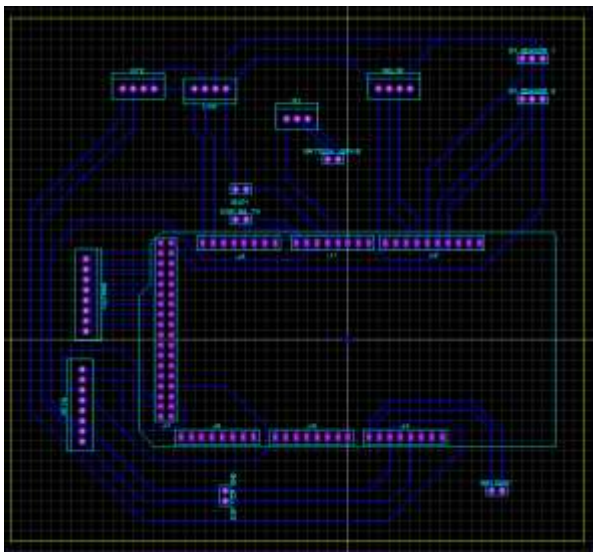


Figure 5: The PCB layout of the RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption.

NOVELTY AND UNIQUENESS

The Smart RFID Security and Energy Management System combines RFID access control with dynamic energy optimization in a unique manner. It utilizes motion sensors that track occupancy and further switch off lights and fans in unoccupied rooms to reduce unnecessary wastage and conserve energy. It consists of an Arduino Mega, IR sensors, and an LCD display for immediate feedback, which can be monitored using Wi-Fi, hence making it secure and sustainable. This is an innovative solution with the best balance between security and energy efficiency for offices in modern times.

BENEFIT TO MANKIND

The Smart RFID Security and Energy Management System offers bountiful benefits to humanity through higher security using RFID access control, saves wasted energy by automatically switching off lights and fans in a room when it is unoccupied, and reduces electricity bills. It contributes toward promoting efficiency and sustainability for reducing carbon footprints that lead toward a greener, eco-friendly future. It offers long-term cost efficiency for businesses and organizations, while making building management much easier through automation. Ultimately, the system contributes to global efforts toward energy conservation, reduced environmental impact, and the creation of safer, more sustainable workplaces.

COMMERCIALIZATION POTENTIAL

Due to its dual focus on security and energy efficiency, corresponding to the growing demand for sustainable and cost-effective solutions in commercial and office environments, the Smart RFID Security and Energy Management System holds a great potential for commercialization. Indeed, with companies trying to increasingly reduce their carbon footprints and operational costs, this system is sure to offer an added advantage by catering to both needs at once. Its scalability allows the system to suit all application needs, from small offices to large commercial buildings, thus making it appealing to property managers, office managers, and facility maintenance providers. Advanced technologies integrated into the system, such as RFID, motion sensors, Wi-Fi connectivity, and real-time monitoring, position the system to be among the latest solutions in the smart building and IoT growing market.

CONCLUSION

The advanced features of security and energy efficiency combine in the Smart RFID Security and Energy Management System, hence presenting a very feasible solution for modern offices. The system, with RFID access control, motion sensors, and real- time monitoring, reduces energy waste, cuts costs, and carbon footprints. Its innovative approach to safety and security makes it a perfect fit for businesses willing to increase their security and sustainability credentials. This system thus provides an intelligent, eco-friendly solution for the future of workplace management, considering its strong commercialization potential.

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Solar-Powered Visitor Counting System with Infrared Technology

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ABSTRACT

Solar-powered visitor counting-system with infrared technology is an improved visitor counting system that uses a lithium battery powered by a solar panel and an infrared sensor integration to communicate information in real time. For motion detection, the system uses sensors such an infrared (IR) sensor. In addition, it includes a Real-Time Clock (RTC). The system may react dynamically to the presence of a vehicle or person via these components. While LCD is used to send information to the person in charge of the system, LEDs and buzzers are utilized to act as a signal for information detection, enabling it to notify them and ensure everything functions properly. The system is easy to install anywhere due to its solar-powered source. Then, an ESP8266 is used to relay information to telegram in real time. Lastly, an Arduino UNO is used as the microcontroller for the whole system.

KEYWORDS: solar-powered, infrared sensor, RTC, ESP8266, telegram, Arduino UNO,

PRODUCT DESCRIPTION

The Solar-Powered Visitor Counting System with Infrared Technology is an innovative solution designed to efficiently monitor vehicle or pedestrian traffic at entry and exit points. Whether for residential gates, building entrances, or other access points, this system combines sustainability with advanced technology for reliable performance.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

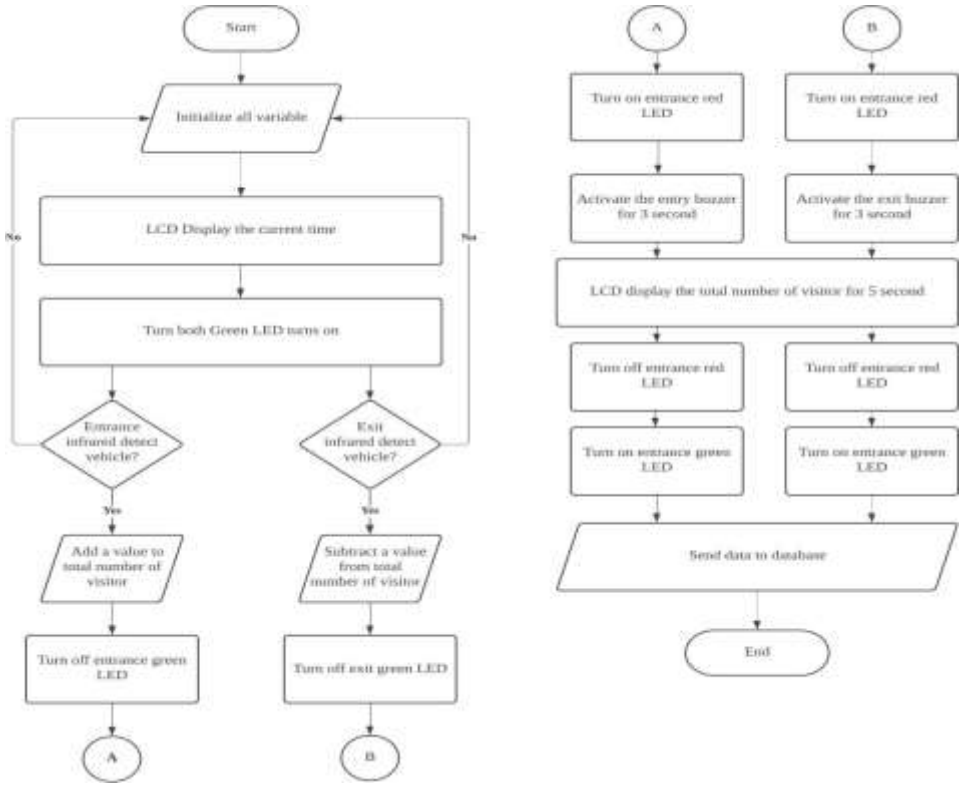


Figure 1: Flowchart of the Solar-Powered Visitor Counting System

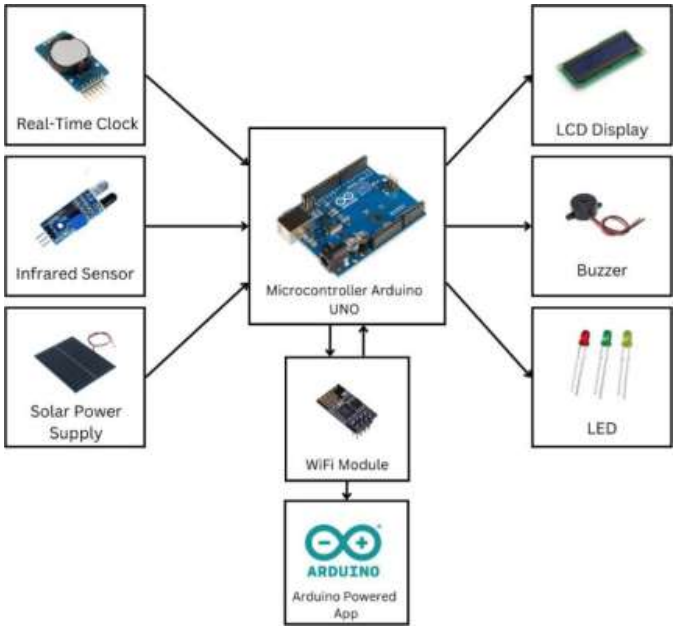


Figure 2 : Block Diagram of Solar-Powered Visitor Counting System

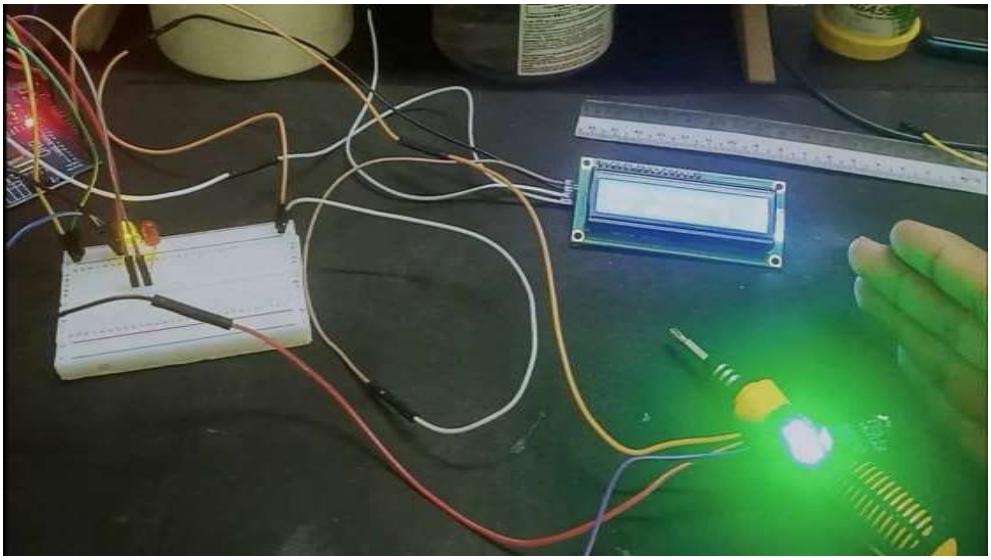


Figure 3 : The prototype of the system on Protoboard

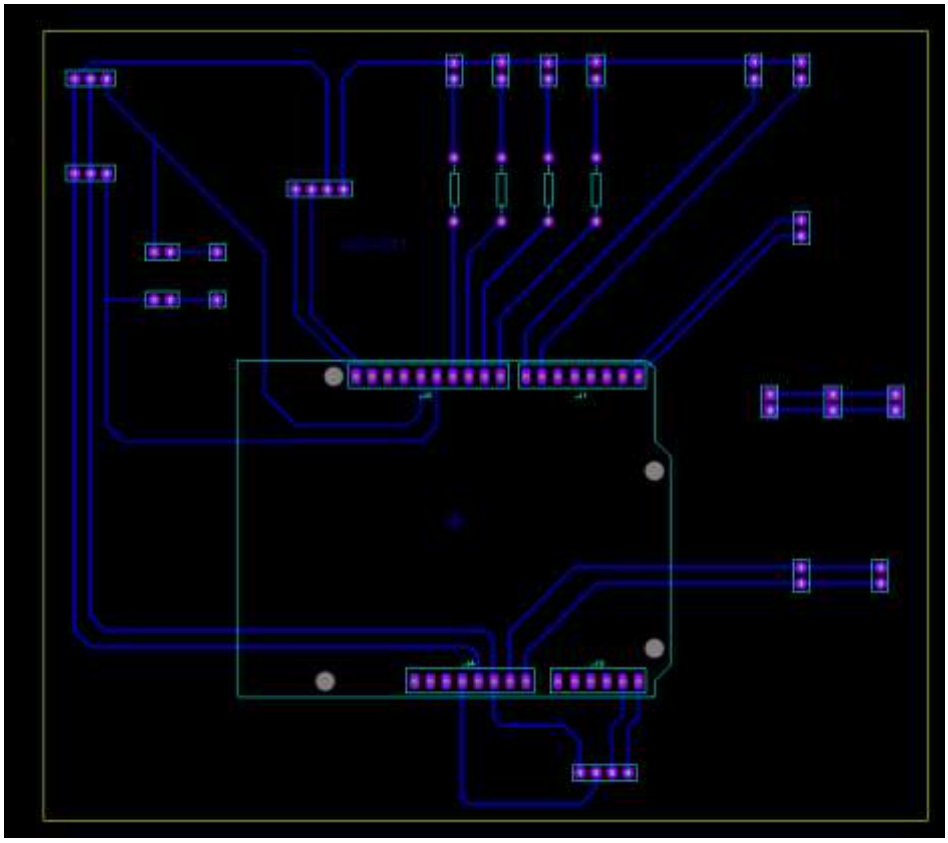


Figure 4 : PCB Layout of the system

NOVELTY AND UNIQUENESS

The Solar-Powered Visitor Counting System is unique in that it sends data straight to users' phones by integrating renewable energy and the Internet of Things. It differs from conventional visitor counting systems due to its special integration of solar power, sensors, and Internet of Things connectivity. With the Arduino UNO microcontroller and ESP8266 serving as its Wi-Fi module, precise control and real-time monitoring become possible. This creative method ensures both long-term energy sustainability and real- time information.

BENEFIT TO MANKIND

The Solar-Powered Visitor Counting System offers a workable answer for a residential area's or an individual's home's safety. Buzzers and LEDs can be used to help improve security wherever it is required. The user may concentrate on other duties while still maintaining the necessary level of security thanks to the automated functions, which save time and effort. The system's usage of pure solar energy also lowers operating costs and helps to conserve the environment.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Visitor Counting System has a large market potential in home security, especially in luxury residential areas or areas with apparent high crime rates. Its eco-friendly design, scalability, and affordability make it ideal for both major home- building companies and mid-to-high-end individuals. The system is ideally positioned for installation in local as well as global markets, given the growing interest in sustainable solutions and smart security technology. Because of its flexibility, it can be installed anywhere, increasing its commercial potential.

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CONCLUSION

The Solar-Powered Visitor Counting System solution integrates renewable energy, automation, and technology to improve security techniques. It is necessary for people since it addresses important problems like information accessibility, energy efficiency, and the highest possible level of security. The Solar-Powered Visitor Counting System is a progressive approach to home security that ensures both environmental protection and economy for the future through increasing safety while promoting sustainability.

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Solar-Powered Automated Irrigation System

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ABSTRACT

Solar-powered Automated Irrigation System presents a solar-powered automated irrigation system designed for efficient water management in agriculture. It utilizes solar panels, DHT22 sensors for temperature and humidity, LDRs for light intensity, soil moisture sensors, an ESP32 microcontroller, LEDs, LCDs, DC water pumps, IoT, and UV lights. The solar panels provide eco-friendly energy, while sensors monitor environmental conditions and soil moisture to optimize irrigation. The microcontroller controls the system based on sensor data, with real-time feedback from LEDs and LCDs. Water pumps deliver water as needed, and UV lights ensure clean water. This system promotes water conservation, crop health, and environmental sustainability.

KEYWORDS: solar-powered, soil moisture sensor, Esp32 Microcontroller, water conservation

PRODUCT DESCRIPTION

The Solar-Powered Automated Irrigation System is a sustainable solution designed to simplify and optimize farming. Powered by solar energy, it uses advanced sensors to monitor temperature, humidity, soil moisture, and light levels, ensuring precise irrigation. Controlled by an ESP32 microcontroller with IoT connectivity, the system enables remote monitoring and efficient water management. Features like UV light for water sterilization and a user-friendly LCD display make it practical and eco-friendly. This system helps save water, reduce costs, and improve crop health, making it ideal for modern agriculture.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

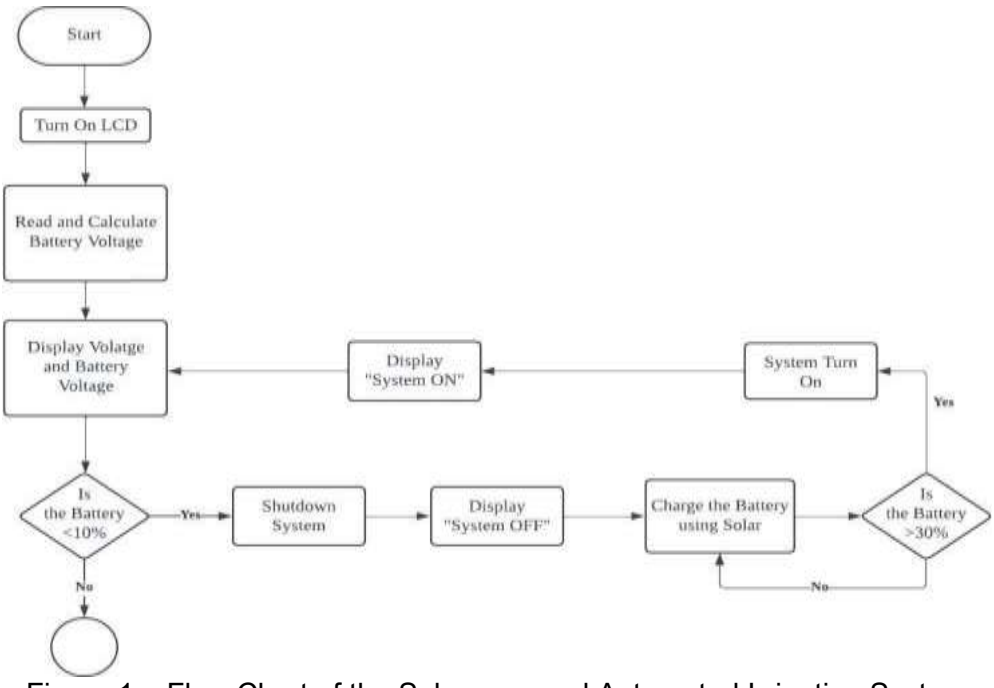


Figure 1a: Flow Chart of the Solar-powered Automated Irrigation System

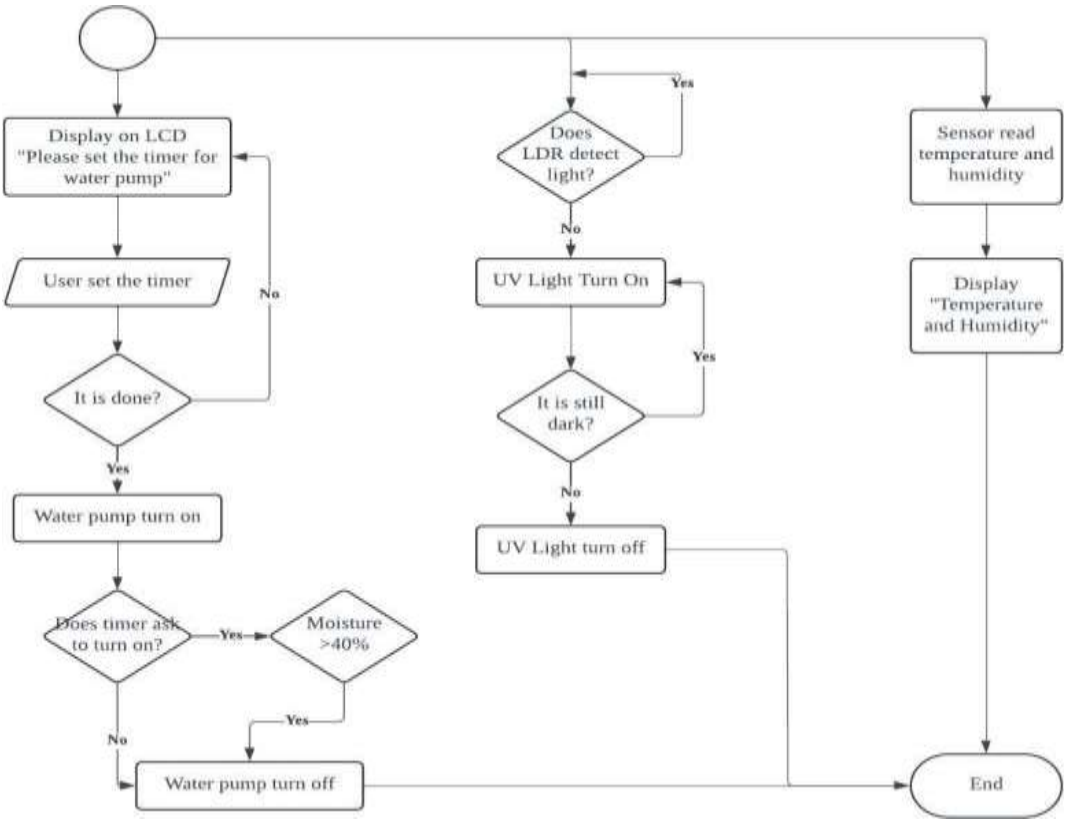


Figure 1b: Flow Chart of the Solar-powered Automated Irrigation System

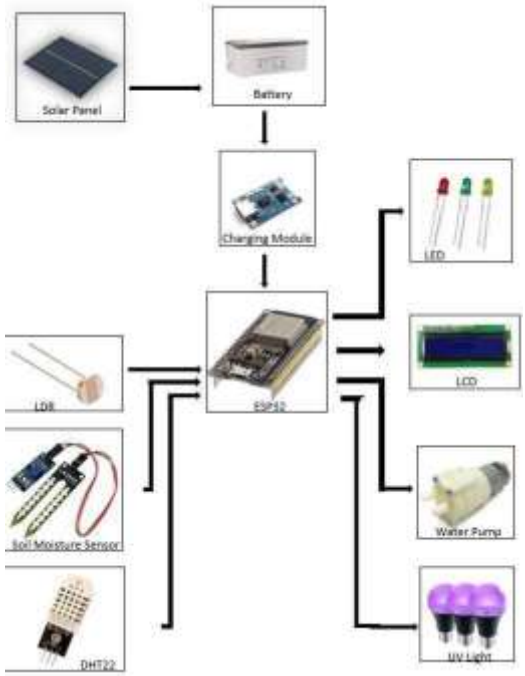
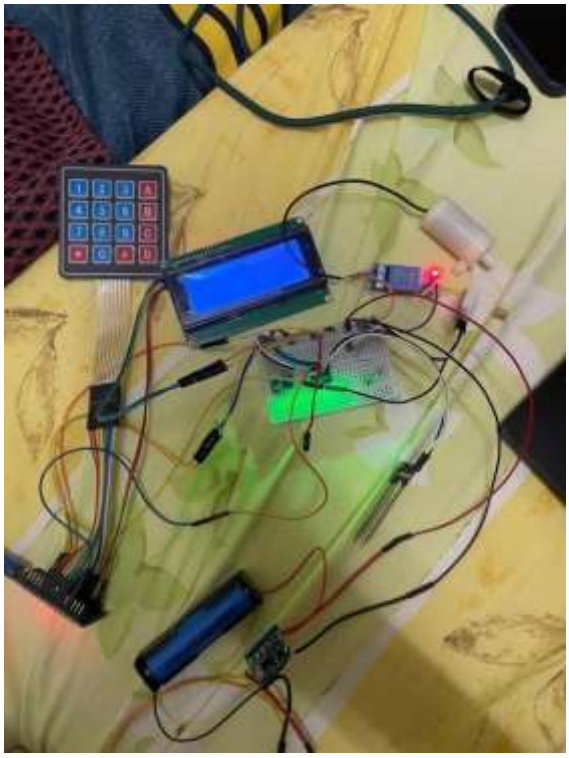
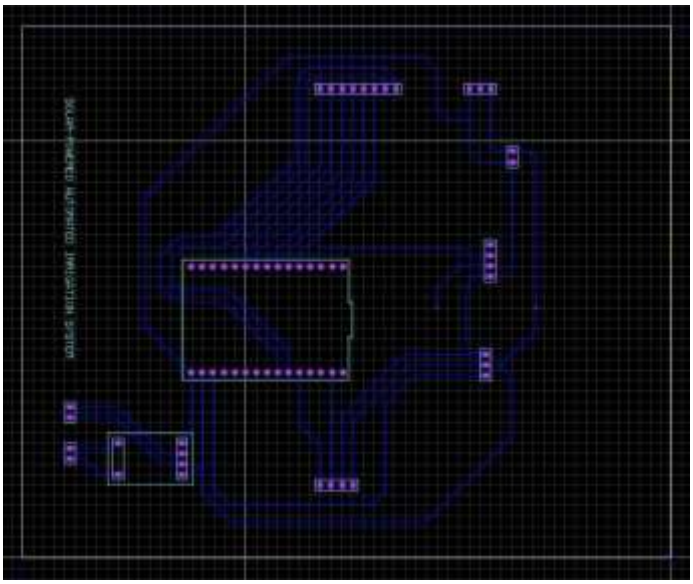


Figure 2: Block diagram of the Solar-powered Automated Irrigation System





NOVELTY AND UNIQUENESS

The Solar-Powered Automated Irrigation System stands out with its integration of renewable energy and smart automation to address water management challenges in agriculture. Its unique combination of solar power, advanced sensors, IoT connectivity, and UV sterilization sets it apart from traditional irrigation systems. The inclusion of the ESP32 microcontroller allows for precise control and real-time monitoring, ensuring optimal irrigation tailored to environmental conditions. This innovative approach reduces water waste and energy consumption, promoting sustainable farming practices.

BENEFIT TO MANKIND

This system provides a practical solution to global challenges like water scarcity and inefficient farming practices. By optimizing water usage and reducing dependency on conventional energy sources, it not only supports sustainable agriculture but also helps farmers lower costs and improve yields. The automated features save time and labor, allowing farmers to focus on other tasks while maintaining healthy crops. Additionally, the system's use of clean solar energy contributes to environmental conservation and addresses climate change concerns.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Automated Irrigation System has significant market potential in agriculture, particularly in regions with water shortages or unreliable electricity access. Its affordability, scalability, and eco-friendly design make it attractive to small-scale farmers and large agricultural enterprises alike. With growing interest in smart farming technologies and sustainable solutions, the system is well-positioned for adoption in both local and global markets. Its adaptability to diverse crops and environmental conditions further enhances its commercial viability.

CONCLUSION

This innovative system combines renewable energy, automation, and modern technology to revolutionize irrigation practices. It addresses critical issues like water conservation, energy efficiency, and crop productivity, making it a valuable tool for farmers worldwide. By promoting sustainability and improving agricultural outcomes, the Solar-Powered Automated Irrigation System represents a forward-thinking solution for the future of farming, ensuring environmental stewardship and economic benefits for generations to come.

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Fault Calculation in Power System with GUI Interface

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ABSTRACT

Detecting faults in power systems is crucial for maintaining system stability and ensuring the proper operation of protective devices such as switchgear and relays. This project presents a user-friendly Graphical User Interface (GUI) toolbox developed using MATLAB. The toolbox to accurately classify and analyse both balanced and unbalanced faults .The design to enhance educational outcomes, it simplifies fault detection processes while providing hands-on learning opportunities for students. The project demonstrates the tool's effectiveness in identifying fault currents using various network configurations, such as 3-bus and 11-bus systems.

KEYWORDS: Fault Analysis, Power Systems, MATLAB, GUI, Symmetrical Components, Educational Tool

PRODUCT DESCRIPTION

The developed GUI toolbox facilitates efficient fault calculation in power systems by combining precision and usability with an interactive design. It enables users to input system parameters, faulty bus details, and impedance values through a user-friendly interface. The toolbox features visualisation tools for displaying positive, negative, and zero sequence networks, which are critical for understanding fault behaviour. Output values such as fault current calculations and voltage magnitudes at each bus are presented in a clear and structured format. Additionally, the interactive design allows users to add or remove data entries, analyse different fault scenarios—including single-line-to-ground, line-to-line, and double-line-to-ground faults—and visualize results effectively. This innovative tool ensures accessibility for both professionals and students, making fault analysis processes more efficient and educational.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

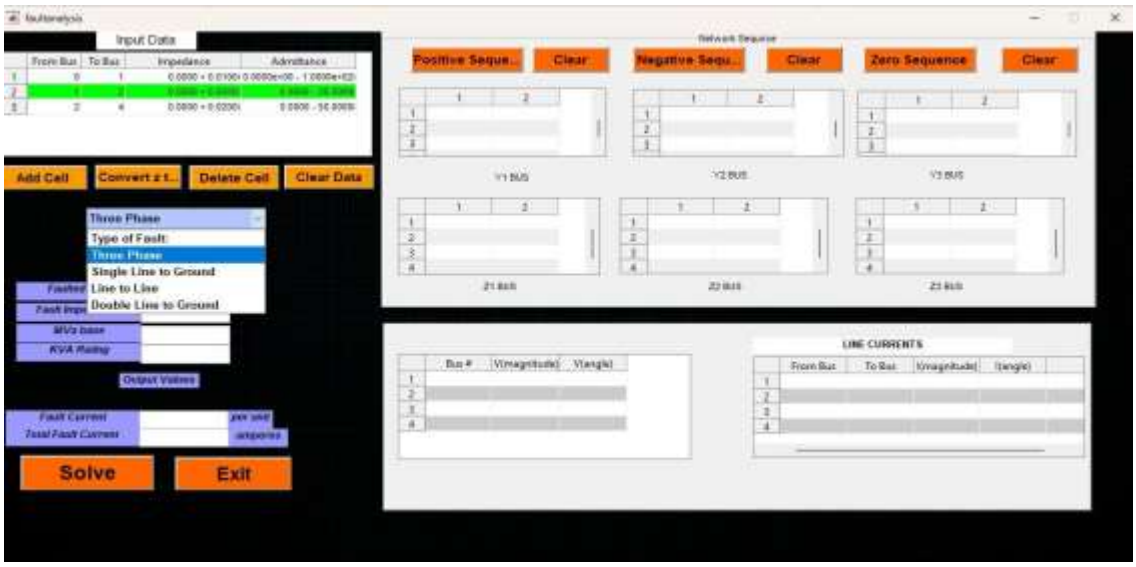


Figure 3.2: Flow Chart of the GUI interface

This graphical user interface (GUI) for a fault calculation tool, is designed to help users analyze faults in electrical networks. The interface allows users to input various parameters required for fault analysis. The main section, labeled "INPUT DATA," includes a table where users can specify the connections between buses by entering the "From Bus" and "To Bus" numbers, as well as the corresponding impedance and admittance values. There are buttons to add new cells, convert data, delete cells, and clear all data, making it flexible for different scenarios and easy to manage data entries. The GUI also has a dropdown menu to select the type of fault being analyzed, such as a three-phase fault. Users can input specific values for the faulted bus number, fault impedance, MVA base, and KVA rating in the "Input Values" section. These inputs are essential for accurately modeling the fault conditions in the network. Above the input values, there are buttons for visualizing the positive, negative, and zero sequence networks, which are critical for understanding the behavior of the system under fault conditions. The results of the fault analysis, such as fault current and total fault current, are displayed in the "Output Values" section, with measurements in per unit and amperes.

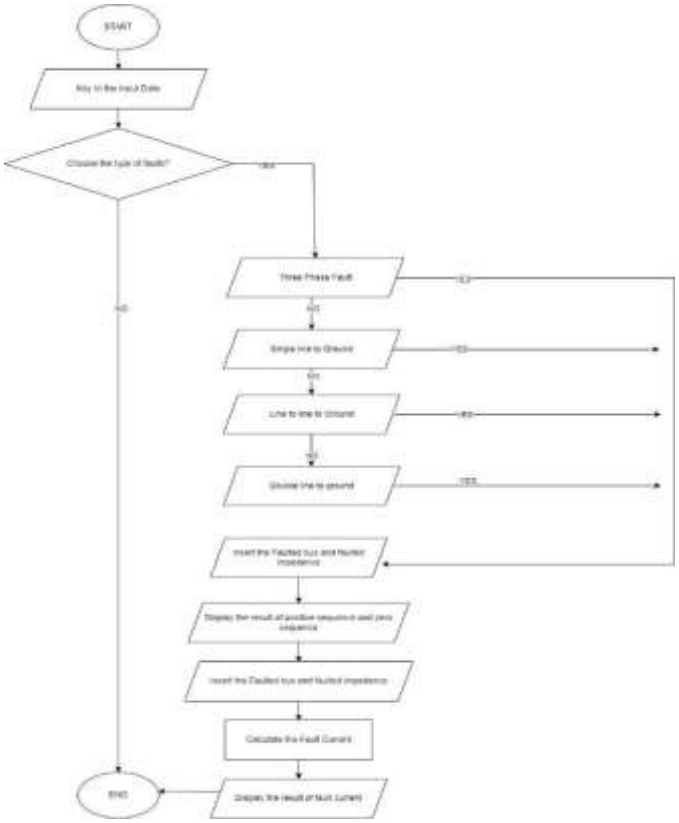


Figure 3.2: Flow Chart of the GUI interface

The flow chart in Figure 3.2 shows the operational flows begins with the user entering all the necessary input data, such as system parameters and voltage levels, into the interface. Following this, the user selects the specific type of fault they wish to analyze, such as single line-to-ground (SLG), line-to-line (LL), or double line-to-ground (DLG) faults. Next, the user inputs the faulted bus location and the faulted impedance, which is the resistance at the point of fault. The toolbox then processes this information and displays the results of the positive sequence and zero sequence components. This intermediate result helps in understanding the initial impact of the fault. The user then re-enters or confirms the faulted bus and impedance details to refine the analysis. The system proceeds to calculate the fault current based on the provided data. Finally, the toolbox displays the fault current results, offering a comprehensive view of the fault's impact on the power system. This structured approach ensures an accurate and thorough fault analysis, facilitating both practical applications and educational purposes.

NOVELTY AND UNIQUENESS

The toolbox stands out due to its integration of MATLAB's computational power with a user-friendly GUI. Unlike traditional manual fault calculation methods, this tool reduces complexity and the likelihood of errors. The educational design promotes a better understanding of power systems for students, bridging the gap between theory and practice.

BENEFIT TO HUMANKIND

Fault calculator using GUI approach helps students by providing a practical learning platform to better understand power systems. It enhances the stability and reliability of power networks through accurate fault analysis. Additionally, it simplifies complex calculations, saving time and enabling engineers to focus on critical decision-making tasks.

COMMERCIALIZATION POTENTIAL

The toolbox could be marketed as an educational and professional tool for universities, training institutions, and power system engineers. It has potential expansions such as integrating real-time data acquisition systems and incorporating power flow and economic dispatch analysis, which would significantly enhance its value and practicality in both academic and professional settings.

CONCLUSION

Fault analysis using a MATLAB-based GUI toolbox offers both educational and practical benefits by streamlining the process of analyzing balanced and unbalanced faults in power systems. This toolbox not only provides accurate results but also helps users gain a deeper understanding of fault behavior in electrical systems. Future enhancements could expand its functionality to cover additional types of power system analyses, making it even more versatile and valuable for both academic and professional use.

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GUI PV Model using MPPT Solar Charge Controller and Boost Converter in MATLAB App Designer

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ABSTRACT

This project introduces a user-friendly Graphical User Interface (GUI) designed for a Photovoltaic (PV) system model featuring a Maximum Power Point Tracking (MPPT) solar charge controller and a boost converter. The GUI enables simulation and analysis of the PV system's performance under various environmental conditions. The MPPT algorithm ensures maximum energy extraction from the PV array, while the boost converter regulates the output voltage to meet load demands. Users can input environmental parameters, such as solar irradiance and temperature, to visualize real- time performance metrics, including power output, voltage, and current for both the solar panels and the load. Additionally, the GUI provides educational insights into the system's components and functionality, enhancing the user's understanding of PV systems. This tool is particularly valuable for researchers, educators, and anyone interested in understanding and optimizing solar power systems, offering a powerful platform for designing and improving efficient, reliable PV systems.

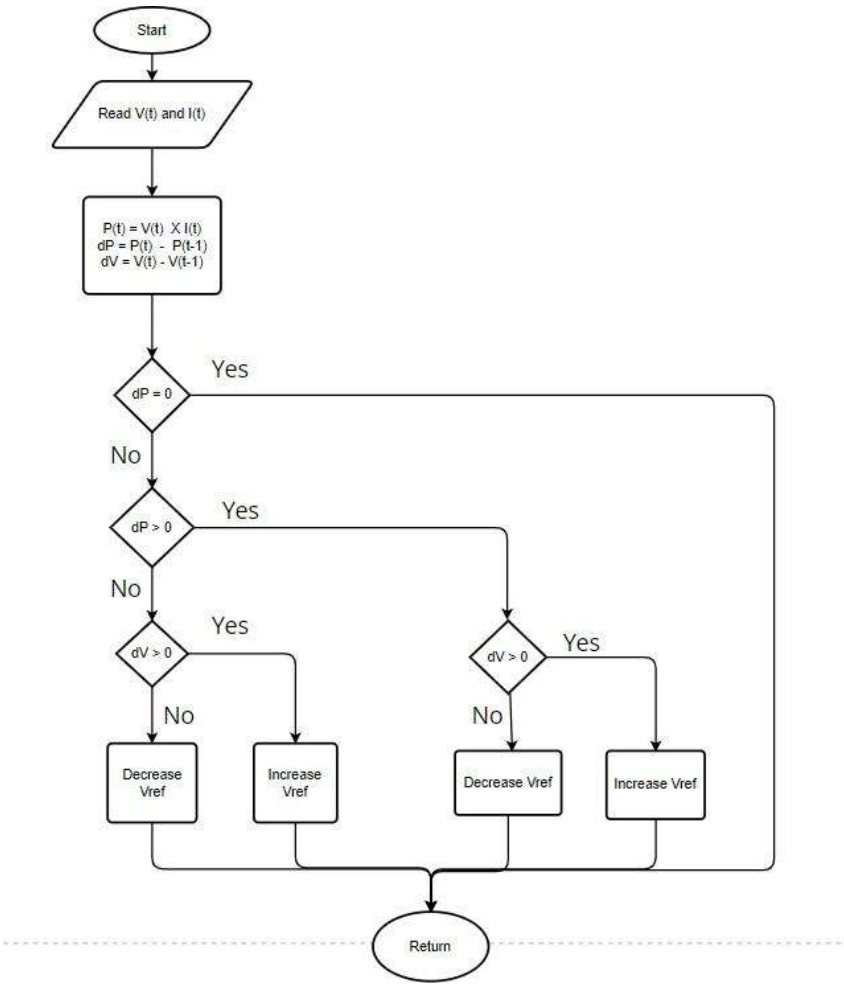
KEYWORDS: MATLAB Interface, MPPT Algorithm, Boost Converter, Perturb And Observe Method, PV Model

PRODUCT DESCRIPTION

The GUI-Based PV System Model with MPPT Solar Charge Controller and Boost Converter, designed using MATLAB App Designer, provides an interactive platform for simulating and studying photovoltaic systems. It combines a PV array model, the Perturb and Observe (P&O) MPPT algorithm for efficient power extraction, and a boost converter for voltage control, all within a user-friendly interface. Users can adjust parameters like irradiance and temperature, visualize real-time plots of system performance, and evaluate behaviour under varying conditions. Perfect for education, research, and prototype development, this tool seamlessly connects theoretical knowledge with
practical application, supporting the optimization of renewable energy systems.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

MPPT Algorithm (Perturb & Observe Method) Flowchart:



NOVELTY AND UNIQUENESS

The GUI PV Model using MPPT Solar Charge Controller and Boost Converter in MATLAB App Designer stands out for its innovative integration of advanced photovoltaic system modeling, interactive visualization, and real-time performance analysis. It provides a user-friendly graphical interface that simplifies parameter adjustment, system monitoring, and results interpretation, making it more accessible than traditional script-based simulations. The model incorporates a highly efficient Perturb and Observe (P&O) MPPT algorithm for optimal power extraction, coupled with a boost converter for voltage regulation, enabling users to study modern solar power management techniques. Its ability to simulate dynamic environmental conditions, such as varying irradiance and temperature, offers practical insights into real-world performance. As a comprehensive tool combining PV modelling, MPPT control, and DC-DC conversion, it serves as a versatile platform for education, research, and prototype development, bridging the gap between theoretical knowledge and practical applications in renewable energy systems.

BENEFIT TO MANKIND

The GUI PV Model using MPPT Solar Charge Controller and Boost Converter in MATLAB App Designer provides valuable educational benefits by offering an interactive platform for exploring and understanding the fundamentals of solar energy systems. It allows users to simulate and analyze the behavior of photovoltaic systems, MPPT algorithms, and boost converters, making complex concepts more accessible. Through real-time visualizations and simulations, users can gain a practical understanding of how solar systems function and how optimization techniques are applied. This tool enhances the learning experience by making theoretical knowledge more tangible, making it a useful resource for anyone looking to deepen their understanding of renewable energy technologies.

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COMMERCIALIZATION POTENTIAL

The GUI PV Model using MPPT Solar Charge Controller and Boost Converter in MATLAB App Designer has significant commercial potential in both the renewable energy and education markets. It can serve as an effective educational resource for universities and research institutions, simplifying the understanding of PV systems and MPPT algorithms. The model also offers valuable support for R&D in solar technology, helping companies optimize PV systems and power electronics. It can be marketed to solar energy businesses for improving system efficiency and can be offered as a service or SaaS (Software as a service) platform for energy consultants and installers. Furthermore, integrating the model with commercial software and hardware solutions creates additional opportunities for engineers, generating diverse revenue streams in the expanding renewable energy sector.

CONCLUSION

The GUI PV Model using MPPT Solar Charge Controller and Boost Converter in MATLAB App Designer is a valuable and easy-to-use tool for simulating and understanding photovoltaic systems, with a focus on integrating MPPT algorithms and DC-DC converters. It offers an intuitive platform to explore solar energy principles, system optimization, and power management in practical settings. By bridging theoretical concepts with real-world applications, the model provides significant benefits for education, research, and the advancement of more efficient renewable energy solutions. This tool enhances the learning experience, supports system design and optimization, and contributes to the development of solar energy technologies.

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Solar Power Generation for Home Using Matlab Simulink

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ABSTRACT

Solar power generation for home using MATLAB Simulink uses a graphical user interface (GUI) to show solar energy turn into usable power and adapt to varying load requirement. It incorporates photovoltaic (PV) panels, a buck converter, and a boost converter to optimize energy conversion and distribution. A custom GUI allows users to monitor and control key parameters such as irradiance and temperature. The integration of MATLAB Simulink provides accurate modelling and simulation to validate the system's performance. This project demonstrates efficient and solar energy utilization, making it suitable for applications in residential to the advancement of renewable energy solutions.

KEYWORDS: MATLAB, GUI, Power System, Buck converter, Boost Converter**.**

PRODUCT DESCRIPTION

This Solar Power Generation System is a simple and effective method of using solar energy. Designed and simulated using MATLAB Simulink with GUI to better understand how the generation will function. Users may choose the required irradiance and temperature and view the voltage measurement when it comes out of the PV panel, buck, or boost converter. The system's solar panels provide direct current power. A buck converter reduces voltage for lesser loads, whereas a boost converter boosts voltage for larger power needs. Both converters are managed to provide steady and efficient functioning under varying situations. The GUI allows users to monitor system metrics such as voltage and power output, giving an easy approach to manage performance. This system is practical, dependable, and appropriate for home, commercial, or industrial use. It provides a cost-effective method to renewable energy, facilitating the move to cleaner and more sustainable power sources.

SCHEMATIC DIAGRAMS & FLOW CHARTS

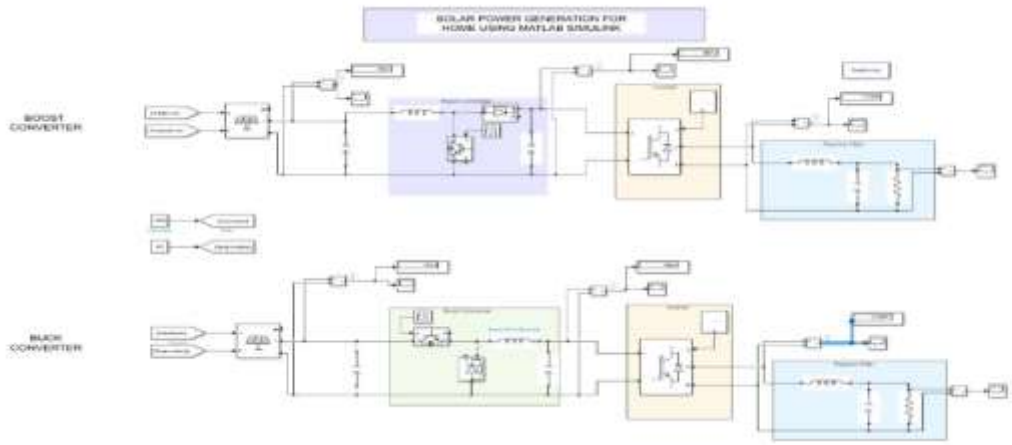


Figure 1: Circuit diagram Solar Power Generation For Home Using MATLAB Simulink



Figure 2: Main page for Solar Power Generation For Home Using MATLAB Simulink

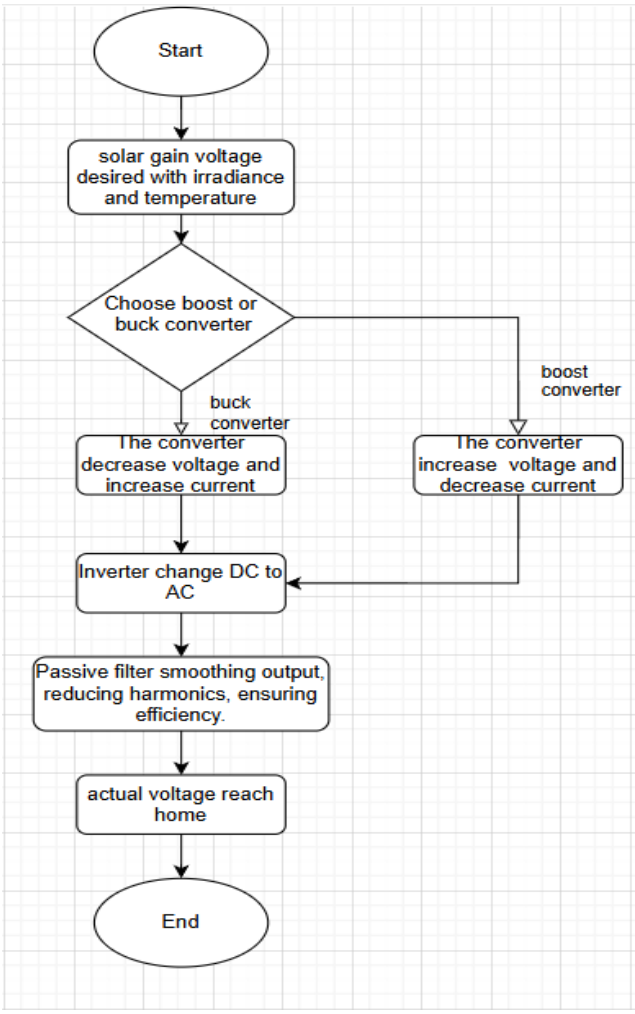


Figure 3: Flowchart Of Solar Power Generation for Home Using MATLAB Simulink

NOVELTY AND UNIQUENESS

The novelty of this solar power generation system lies in its efficient design, integrating both buck with boost converters to handle a wide range of voltage requirements, ensuring adaptability for various applications. Unlike conventional systems, it operates without complex Maximum Power Point Tracking (MPPT), to simplify the control. The user- friendly GUI usability, enabling real-time monitoring and control of system parameters without the need for advanced technical expertise. The system ensures accurate performance testing and allows for easy customization to meet specific needs. The MATLAB Simulink and GUI system and design allow for students greatly understand about the usage solar power generation.

BENEFIT TO MANKIND

This MATLAB-based solar power generating simulation has important teaching and research applications. It is a useful tool for learning about renewable energy ideas, power electronics, and control systems since it models a working solar energy system with integrated buck and boost converters. Users may use the simulation to experiment with different situations, optimize designs, and anticipate system behavior without having to invest in expensive hardware. It advances information diffusion by making renewable energy ideas more accessible to students, researchers, and engineers. Technology also helps to find creative solutions to global energy concerns by offering a virtual platform for testing and refining new ideas. In the long run, these models encourage the use of renewable energy technology.

COMMERCIALIZATION POTENTIAL

The system can be marketed to engineering firms and training centres as a platform for prototyping and testing solar power system designs. It supports the development of custom energy solutions by allowing users to experiment with different configurations and control strategies in a risk-free environment. The user-friendly graphical interface adds to its appeal, making it accessible to a broader audience, including those with limited technical expertise. By packaging the system as a software application or toolkit, it can be offered as a cost-effective alternative to hardware-based testbeds. This aligns with the growing demand for virtual simulation tools in the renewable energy market, making it a viable product for commercial deployment.

CONCLUSION

The Solar Power Generation for Home using MATLAB Simulink is a useful tool for studying and designing renewable energy systems. By seeing buck and boost converters with an easy-to-use graphical interface, it provides an efficient and accessible approach to analyze solar power systems without the need for expensive hardware setup. The simulation's capacity to simulate and evaluate many situations facilitates research, teaching, and innovation in renewable energy technology. This study demonstrates the potential of simulation tools for tackling global energy concerns, spreading information, and promoting the adoption of sustainable solutions. The system's cost-effective design, scalability, and practical uses make it an ideal instructional resource as well as a platform for future renewable energy improvements.

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Automated Room Control and Monitoring System with Solar Power

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ABSTRACT

Automated room control and monitoring systems that use solar energy play a crucial role in promoting energy-efficient and sustainable solutions for modern living. Solar panels, which harness the photovoltaic effect, produce clean, renewable electricity, helping to lessen environmental impacts and decrease dependence on conventional energy sources. This work proposes the design of an Automated Room Control system that uses temperature and motion sensors to automate the operation of fans and lamps, with power supplied by solar panels. By utilizing a Wi-Fi module, the system can monitor and record energy consumption in real-time, enabling continuous optimization. The solar-powered setup not only works independently without constant intervention but also enhances user comfort and convenience. Components like surface-treated temperature sensors and optimized microcontroller configurations greatly enhance system efficiency. The system uses a Blynk application to make connectivity and monitoring easy, showing how solar energy can power smart systems. With its ability to collect and control data effectively, this system combines renewable energy with automation, creating smarter and more sustainable living spaces.

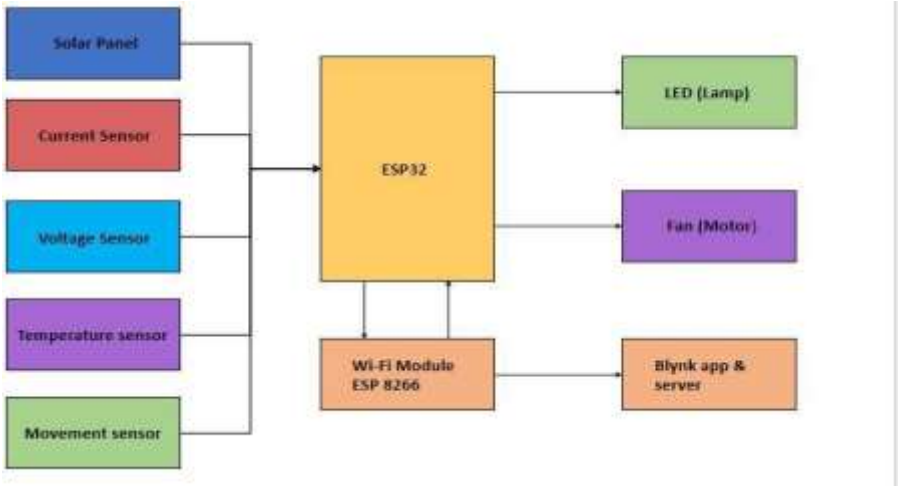
KEYWORDS: Motion sensors, Solar energy, Temperature sensors, Blynk application, User comfort

PRODUCT DESCRIPTION

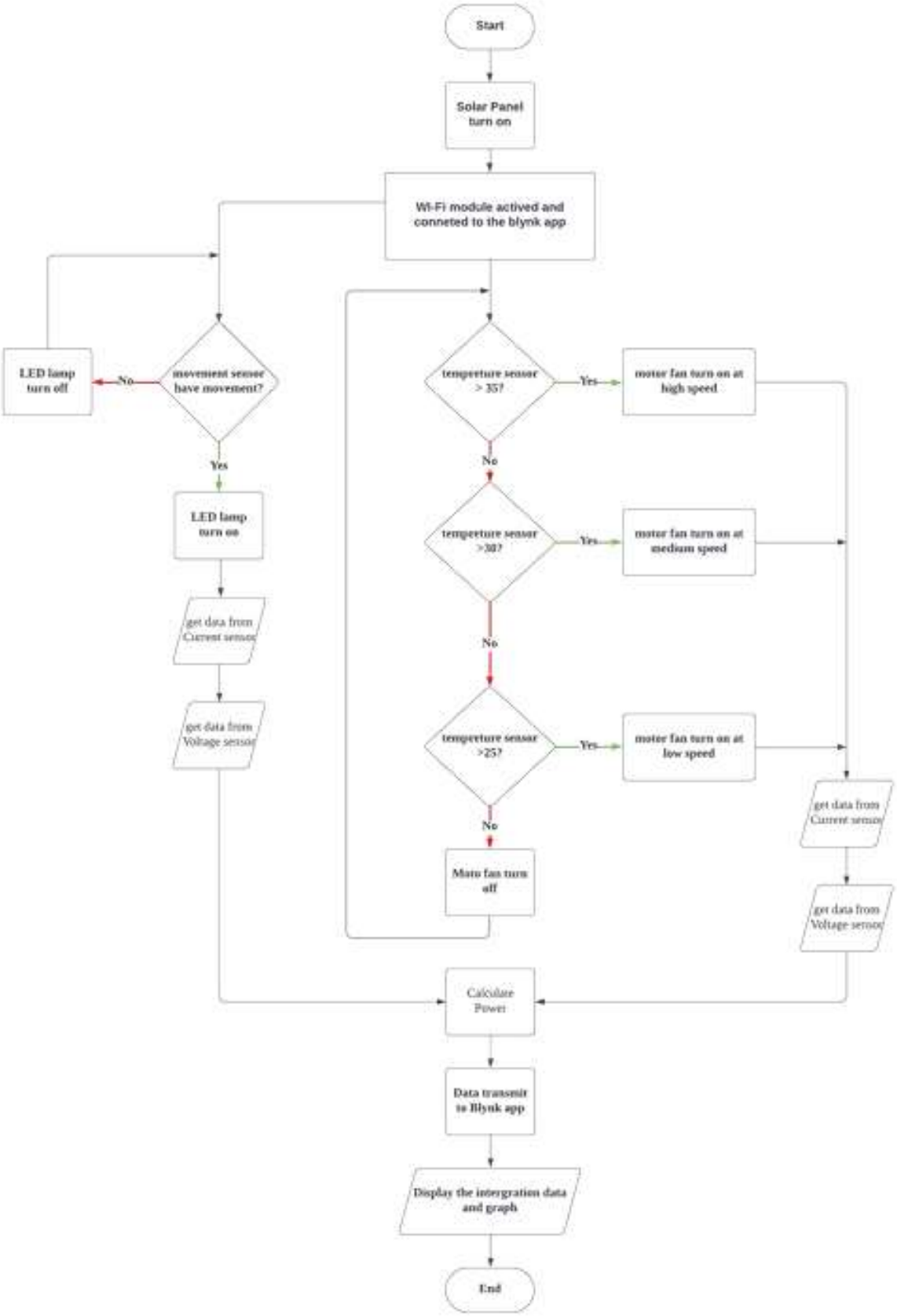
For modern living spaces, the solar-powered Automated Room Control and Monitoring System offers a smart and eco-friendly solution. By harnessing clean, renewable energy from solar panels, it reduces environmental impact and reliance on traditional energy sources. The system utilizes motion and temperature sensors to automatically adjust lighting and fans based on occupancy and room conditions, promoting energy savings and enhancing convenience. With an easy-to-use Blynk app, users can monitor and track energy consumption in real-time, thanks to its built-in Wi-Fi module. This autonomous system merges advanced technology with sustainable energy, creating smarter and greener living environments that are designed for reliability and ease of use.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

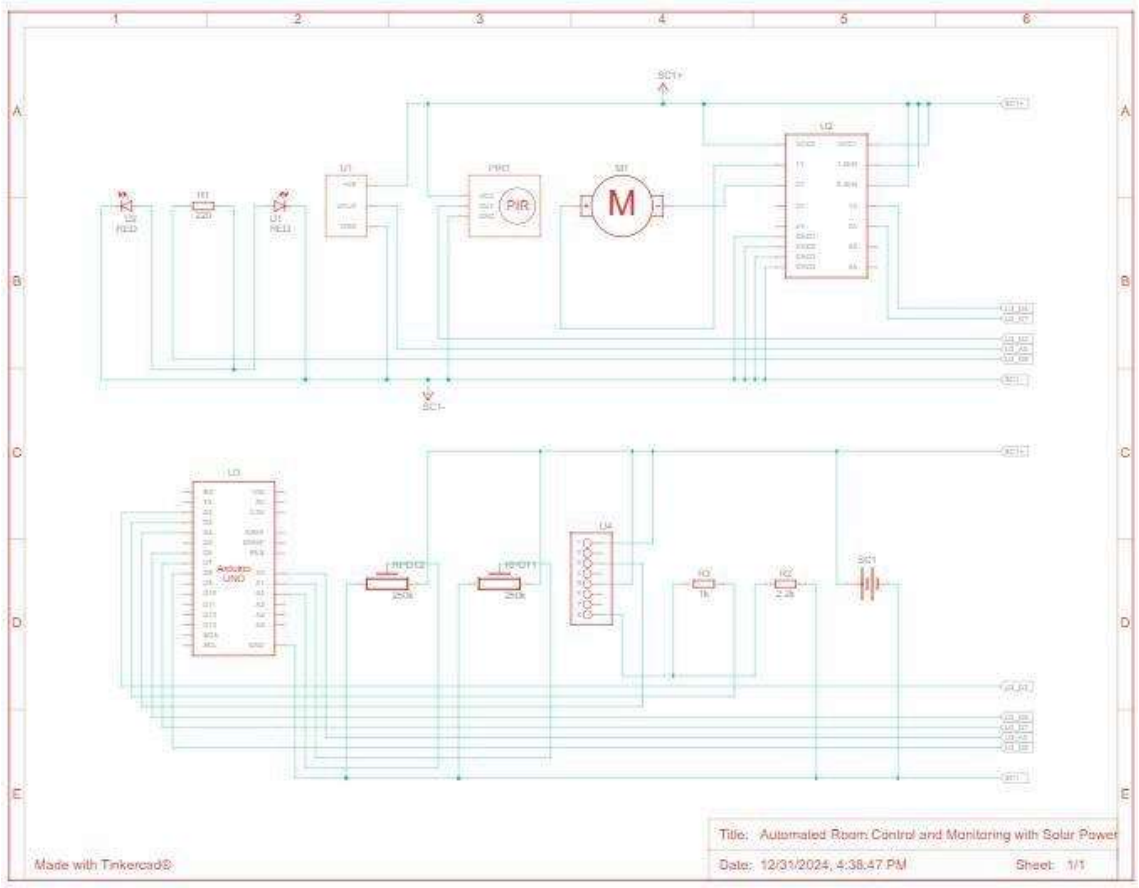
Block Diagram



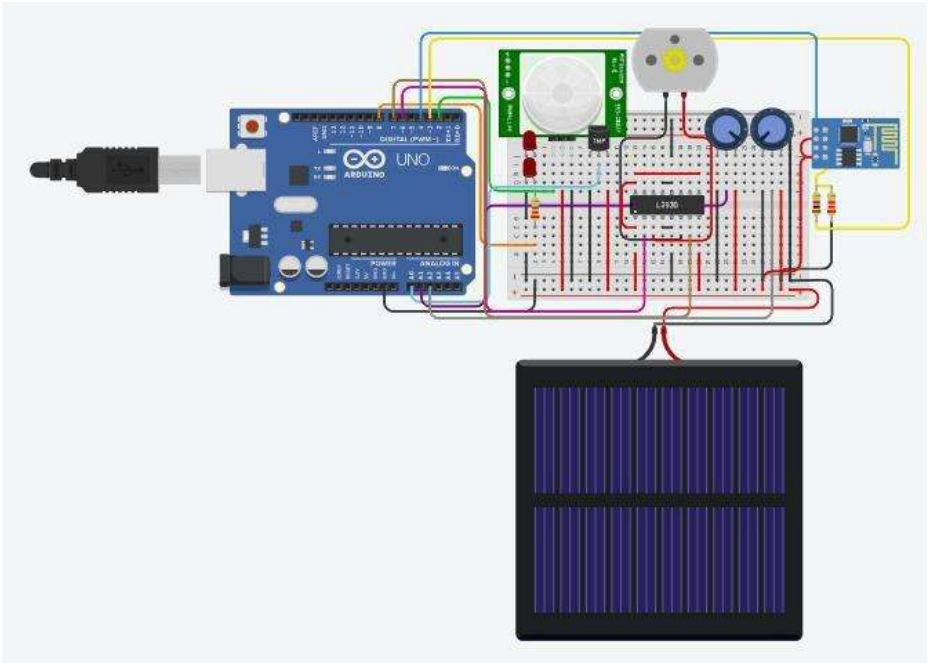
Flow Chart


Start
Solar Panel turn on
Wi-Fi module actived and conneted to the blynk app
LED lamp turn off
No
movement sensor have movement?
Yes
LED lamp turn on
get data from Current sensor
get data from Voltage sensor
temperture sensor > 35?
Yes
moter fan turn on at high speed
No
temperture sensor >30?
Yes
moter fan turn on at medium speed
No
temperture sensor >25?
Yes
moter fan turn on at low speed
No
Main fan turn off
get data from Current sensor
get data from Voltage sensor
Calculate Power
Data transmit to Blynk app
Display the intergration data and graph
End

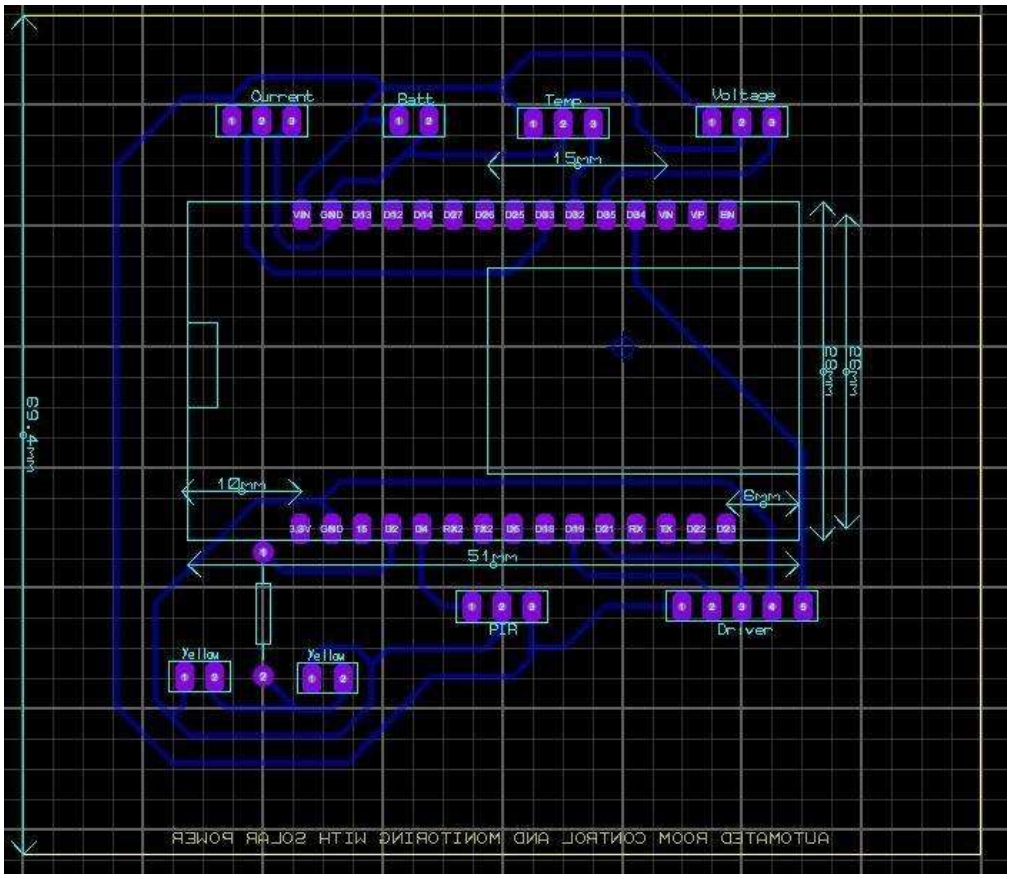
Schematic Diagram



Simulation



Pcb Layout



NOVELTY AND UNIQUENESS

The solar-powered Automated Room Control and Monitoring System is remarkable for being self-sufficient and sustainable, unlike standard systems that rely on external power grids. This eco-friendly approach helps lower its carbon footprint. The system features a Wi-Fi module and the easy-to-use Blynk app, enabling real-time monitoring and control of energy consumption, which is very convenient. It uses a blend of temperature and motion sensors to manage lights and fans effectively, optimizing energy use and improving user comfort.

BENEFIT TO MANKIND

The Automated Room Control and Monitoring System, which runs on solar energy, offers numerous advantages by enhancing sustainability, efficiency, and comfort. By utilizing solar power, it decreases dependence on fossil fuels, contributing to a reduction in greenhouse gas emissions and aiding in the fight against climate change. Intelligent sensors adjust fans and lights according to the conditions in the room, minimizing energy waste and lowering costs. This system not only ensures comfort but also allows users to monitor and manage their energy consumption through a Wi-Fi- connected app, promoting responsible energy use. Its solar-powered design is particularly beneficial for remote locations lacking access to conventional electricity. By merging renewable energy with smart automation, this system paves the way for a greener and more intelligent future for all.

COMMERCIALIZATION POTENTIAL

The Automated Room Control and Monitoring System, which operates on solar energy, holds great promise for commercialization in various sectors. Its environmentally friendly design appeals to industries that prioritize sustainability and energy efficiency. Key markets include smart homes and offices, where there is a strong demand for energy-saving solutions and automated comfort control. This system can also be utilized in educational institutions and healthcare facilities, offering effective energy management while maintaining optimal environmental conditions. By harnessing renewable energy, it can significantly reduce energy costs and lessen environmental impact. Furthermore, its real-time monitoring and control capabilities make it an excellent choice for businesses and industries aiming to enhance energy usage and boost operational efficiency. The increasing focus on green technologies and smart building solutions positions this system for success in a rapidly changing market.

CONCLUSION

The Automated Room Control and Monitoring System powered by solar energy showcases how smart technology can work hand-in-hand with renewable resources to offer sustainable, efficient, and user-friendly solutions. By utilizing solar energy and integrating motion and temperature sensors, this system minimizes environmental impact while improving comfort and convenience through intelligent automation. Its Wi- Fi connectivity and real-time energy monitoring through the Blynk app highlights its practicality and importance in contemporary living environments. With great potential for commercialization in green technology sectors, this innovation marks a meaningful advancement toward a more sustainable and energy-efficient future.

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Automatically Portable Solar Powered Fan With Monitoring System

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ABSTRACT

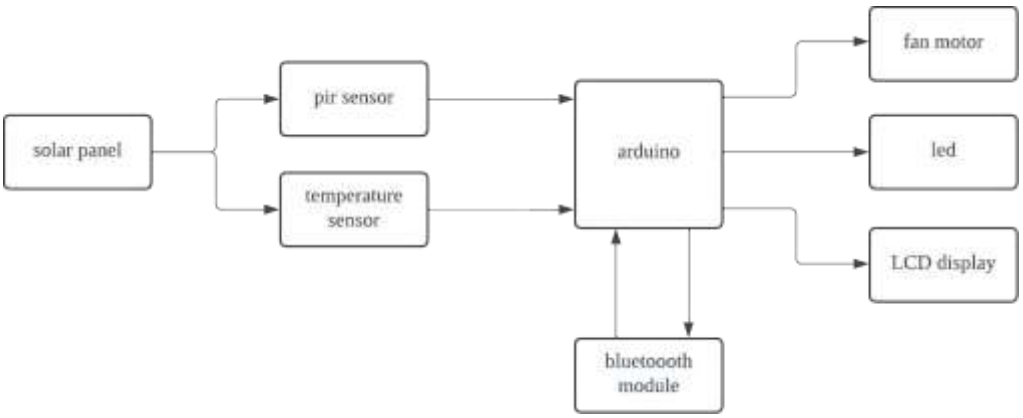
In response to increasing concerns overheat-related illnesses and the environmental impact of traditional portable fans, this project introduces an innovative solution: the "Automatically Portable Solar Powered Fan with Monitoring System." Designed specifically for the Malaysian climate, where heat management is critical, this system integrates solar power utilization and real-time temperature monitoring to provide efficient and sustainable cooling. The fan operates autonomously based on temperature inputs from a sensor, controlled by an Arduino Uno microcontroller and powered by solar panels. This approach not only enhances convenience but also reduces reliance on non-renewable energy sources, aligning with global sustainability goals. A monitoring system equipped with a Wi-Fi module enables real-time tracking of performance metrics such as fan speed and energy consumption, empowering users to optimize efficiency. By combining renewable energy technology with modern monitoring capabilities, this project offers a practical solution that promotes energy efficiency and environmental stewardship in every day cooling applications. It addresses current limitations in portable fan technology, providing a model for integrating sustainability into consumer electronics effectively

KEYWORDS: renewable energy, optimize efficiency, sustainability

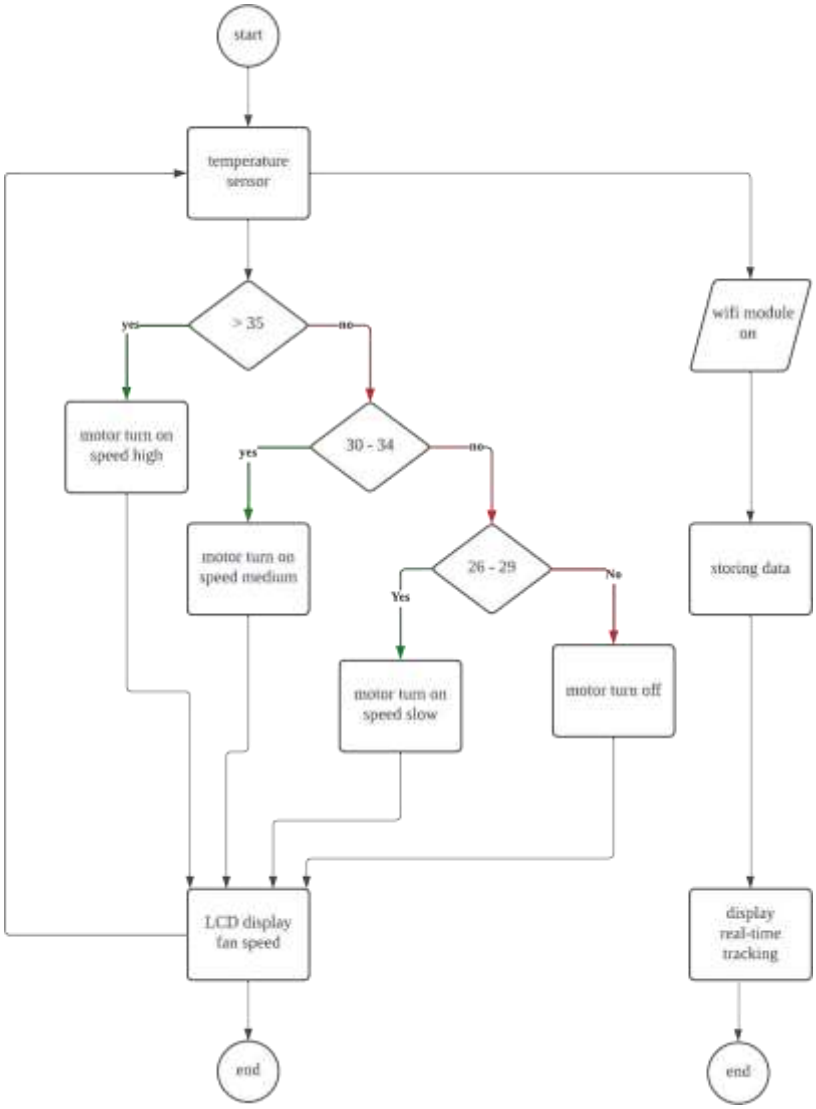
PRODUCT DESCRIPTION

In recent years, concerns about climate change have increased due to the rising cases of hea stroke in people. This has made portable fans more popular in Malaysia as a way to stay cool. To address this need, we are developing an automatic portable solar-powered fan with a monitoring system. The project aims to design a fan that turns on and off automatically using a temperature sensor and is powered by solar energy. This solution is both cost-effective and environmentally friendly because it uses renewable energy from the sun. Additionally, the fan includes a monitoring system to track its performance in real-time, helping to use resources efficiently. This project no only provides a practical way to stay cool but also supports energy efficiency and sustainability. By using solar power and modern monitoring technology, this project offers a simple and effective solution that promotes the use of sustainable energy in daily life.

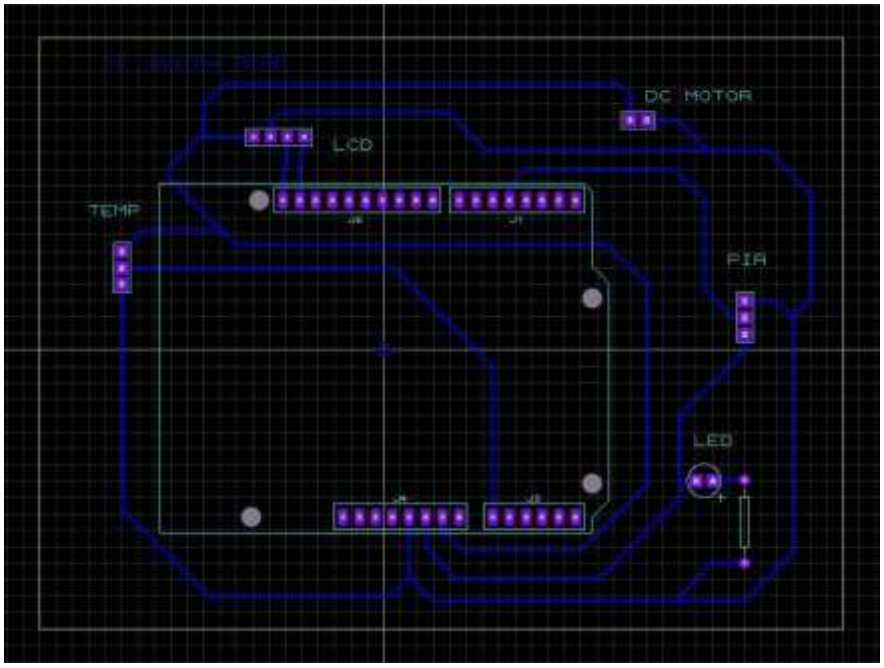
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS



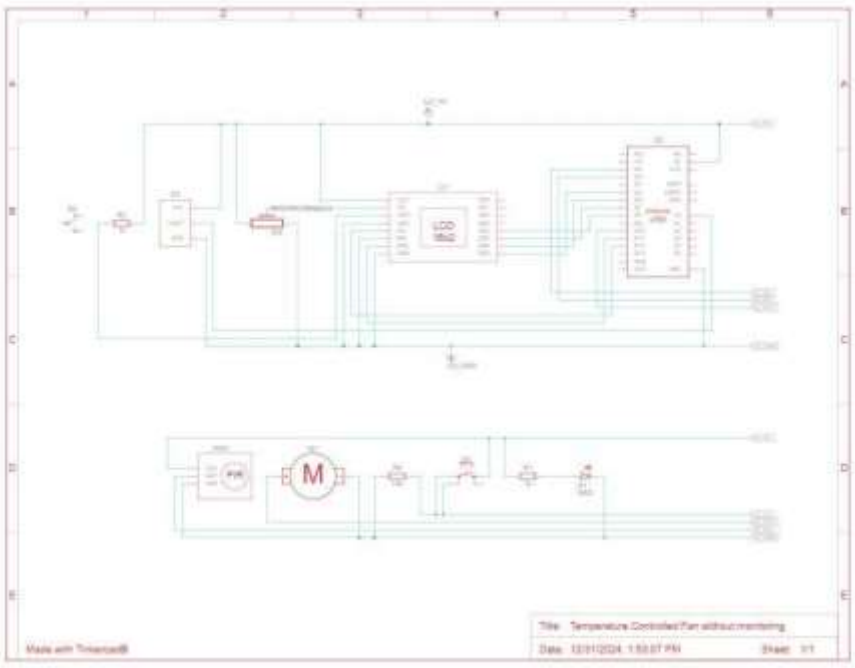
Block diagram



Flowchart



PCB Layout



Schematic Diagram

NOVELTY AND UNIQUENESS

This project is unique because it combines solar power with a real-time monitoring system, making it different from regular portable fans. The solar panels provide an eco- friendly power source, and the monitoring system allows users to track things like battery health, solar efficiency, and fan performance. Its portability makes it useful for areas without electricity or during power outages. Plus, it's versatile and can be adapted for different purposes like outdoor use, emergency relief, or even agricultural needs, making it an innovative and practical solution.

BENEFIT TO MANKIND

The portable solar-powered fan benefits people by providing a reliable cooling system, especially in areas with no electricity. It is environmentally friendly, as it uses renewable solar energy and reduces pollution. This project is especially helpful for people in rural or off-grid areas, as it improves their quality of life. It can also be used in emergency situations, offering relief in disaster-hit areas. Overall, it helps promote the use of clean energy, supports sustainable living, and inspires others to think of similar eco-friendly solutions.

COMMERCIALIZATION POTENTIAL

This project has a lot of potential for commercialization because it can be useful to many people, including those living in rural areas, outdoor enthusiasts, or disaster relief teams. It's affordable because solar technology is becoming cheaper, and it doesn't require much maintenance, making it a good long-term solution. Governments or NGOs could also support its use in rural electrification programs. Since the design can be customized for specific needs, it can attract different markets, and there's even a chance to sell it internationally in places where electricity is limited.

CONCLUSION

The project "Automatically Portable Solar Powered Fan with Monitoring System" represents a significant advancement in sustainable cooling technology. By harnessing solar energy for power and integrating real-time temperature monitoring, the system ensures efficient operation tailored to environmental conditions. The Arduino microcontroller serves as a versatile hub, coordinating inputs from sensors and driving adaptive fan control mechanisms.

Through the implementation of tiered fan speed adjustments based on ambient temperature, the system optimizes energy usage while maintaining comfort levels. The inclusion of an LCD display provides users with intuitive feedback, enhancing usability, while a Bluetooth module enables remote monitoring and control, expanding the system's flexibility and accessibility.

Data logging capabilities enable the accumulation of temperature and operational data, facilitating informed decision-making and performance optimization over time. This integrated approach not only promotes sustainability through renewable energy utilization but also exemplifies smart technology's potential in creating user-centric, environmentally friendly solutions. In conclusion, the "Automatically Portable Solar Powered Fan with Monitoring System" demonstrates a robust framework for future developments in eco-conscious cooling technologies, promising enhanced efficiency, user convenience, and environmental stewardship.

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Sun-Tracking Solar Panel for Household

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ABSTRACT

The increasing demand for efficient renewable energy solutions has driven advancements in solar energy technology. This project focuses on the design and implementation of a Sun-Tracking Solar System for Household use, a single-axis solar tracker designed to enhance solar energy collection efficiency. The system dynamically adjusts the position of the solar panel based on sunlight intensity, ensuring optimal alignment with the sun throughout the day.The project utilizes a microcontroller-based mechanism built with components including two photoresistors for light detection, a servo motor for panel movement, and an Arduino Uno for control. Additionally, an ESP8266 NodeMCU Wi-Fi module is integrated to enable IoT functionality, allowing real-time monitoring of the solar panel angle and output voltage. A user-friendly interface, displayed on an LCD with I2C support, provides localized feedback, while the IoT feature facilitates remote data access and monitoring.This innovative system demonstrates an effective solution for maximizing solar energy harvesting while incorporating IoT capabilities for data tracking and improved system management. The project encompasses hardware design, circuit implementation, and software development, resulting in a reliable and practical application for residential solar energy systems.

KEYWORDS: Solar tracking panel, Wi-Fi module, Microcontroller, Light Dependent Sensor (LDR).

PRODUCT DESCRIPTION

Sun-tracking solar panel for household project was create to improve the efficiency of solar energy collection. Unlike traditional fixed solar panels, this system dynamically adjusts the position of the solar panel throughout the day to follow the sun's movement, ensuring maximum exposure to sunlight. The system uses Light-Dependent Resistors (LDRs) to detect the direction of the strongest sunlight and a servo motor to move the panel accordingly. This automatic tracking ensures optimal energy capture at all times. To make the system more user-friendly, a ESP8266 NodeMCU Wi-Fi module is included, allowing users to monitor and collect data such as energy output and panel status, can be accessed through a simple web interface or a mobile app using the Telegram platform. Additionally, the system can send alerts to notify users of any issues, enabling timely maintenance and reducing downtime. The project covers the design, assembly, and programming of the solar tracker. It combines hardware components like sensors, motors, and a microcontroller with software that handles tracking, communication, and data display. This solar tracker is an efficient, modern, and easy-to-use solution for increasing solar energy collection and making renewable energy systems smarter.

CIRCUIT DIAGRAM

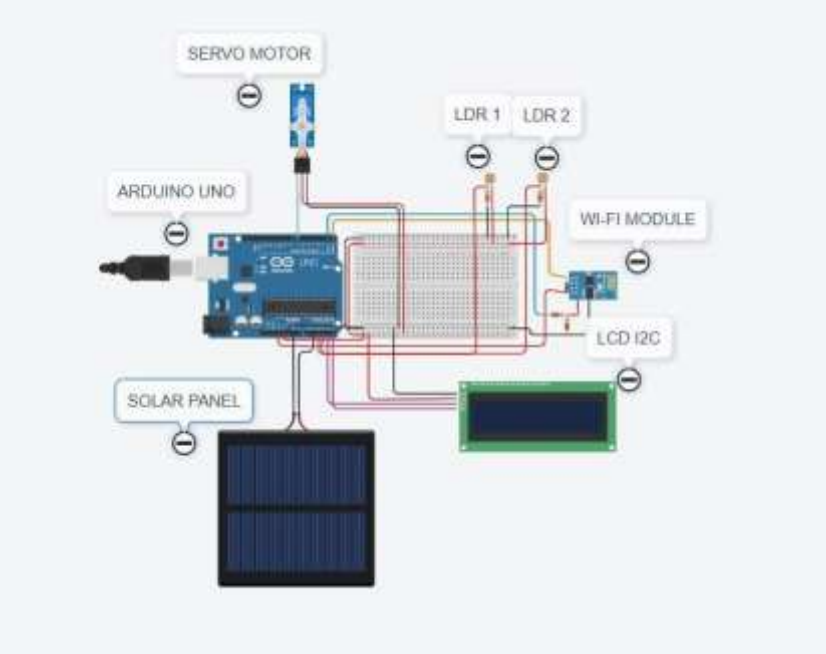


Figure 1: circuit design of “sun-tracking solar panel for household” project

PCB LAYOUT

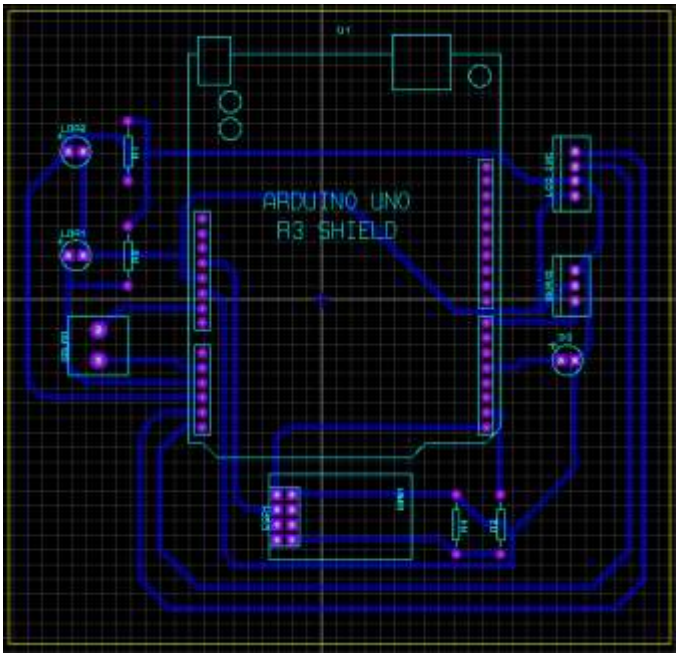


Figure 2 : pcb layout of “sun-tracking solar panel for household” project.

FLOWCHART

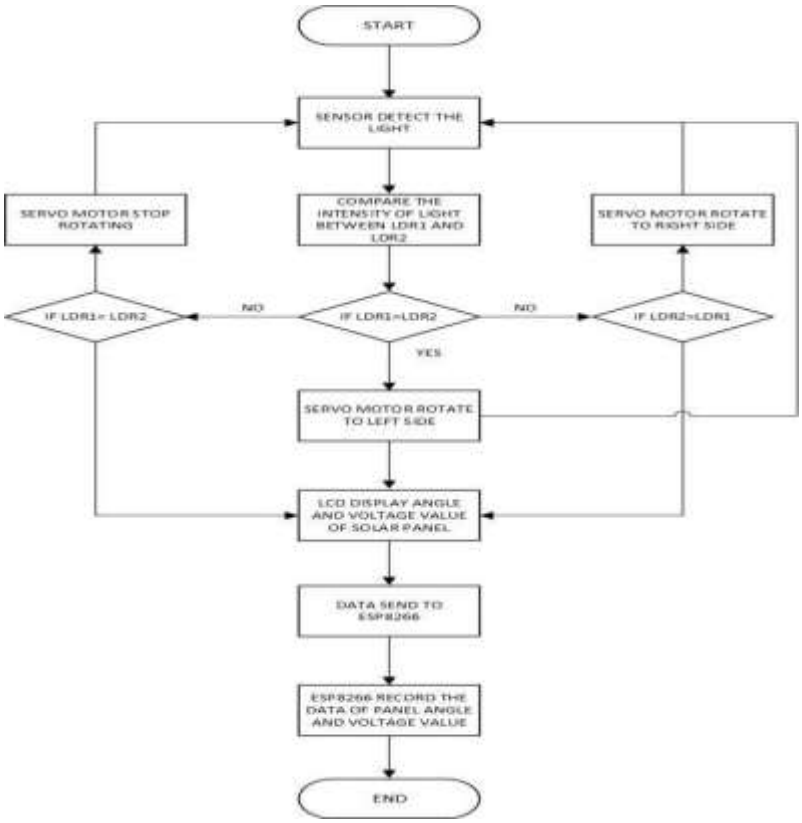


Figure3: flowchart of “sun-tracking solar panel for household” project.

NOVELTY AND UNIQUENESS

The Sun-Tracking solar panel for households introduces a unique combination of dynamic solar tracking and IoT-enabled remote monitoring to enhance energy efficiency and user convenience. Unlike traditional fixed panels, the system uses Light-Dependent Resistors (LDRs) to dynamically align the panel with the sun throughout the day, maximizing energy collection. Its integration with a Wi-Fi module allows real-time monitoring and control through a web interface or mobile app, enabling users to track performance and receive alerts for predictive maintenance. This user-friendly, cost-effective solution combines readily available components with advanced functionality, offering a reliable and innovative approach to modern renewable energy systems.

BENEFIT TO MANKIND

The Sun-Tracking solar panel for households provides significant benefits by promoting the efficient use of renewable energy, contributing to a more sustainable and environmentally friendly future. By maximizing solar energy collection, the system reduces reliance on non-renewable energy sources, helping to lower carbon emissions and combat climate change. The inclusion of real-time data collecting and predictive maintenance ensures reliability and minimizes downtime, making solar energy systems more practical and accessible for both residential and commercial users. Additionally, its cost-effective design encourages wider adoption of solar technology, empowering communities with clean energy solutions and reducing energy costs, ultimately improving quality of life and supporting global sustainability efforts.

COMMERCIALIZATION POTENTIAL

The Sun-Tracking Solar Panel for households has great potential for commercialization thanks to its efficiency, affordability, and ease of use. By boosting solar energy collection, it offers a valuable solution for homes. The added benefit of IoT-enabled real- time monitoring and control makes it even more appealing, meeting the increasing demand for smart energy systems. With low-cost, widely available components, it's priced competitively, making it accessible to a wide range of customers. Its predictive maintenance features also help reduce operational costs and downtime, providing long- term value. As the world shifts towards renewable energy and smart technology, this system is well-positioned to thrive in the growing solar energy market.

CONCLUSION

In conclusion, this study developed a sun-tracking solar panel system for household use, capable of adjusting the panel's position to follow the sun's movement throughout the day. By incorporating a real-time monitoring system, the project also enables users to track important data such as the panel's angle and solar voltage. This solution not only maximizes the efficiency of solar energy collection but also provides an accessible, user- friendly system that can be easily integrated into residential settings. The combination of smart tracking and monitoring makes this system a valuable and sustainable choice for households looking to enhance their solar energy use.

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Solar Panel Positioning System

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ABSTRACT

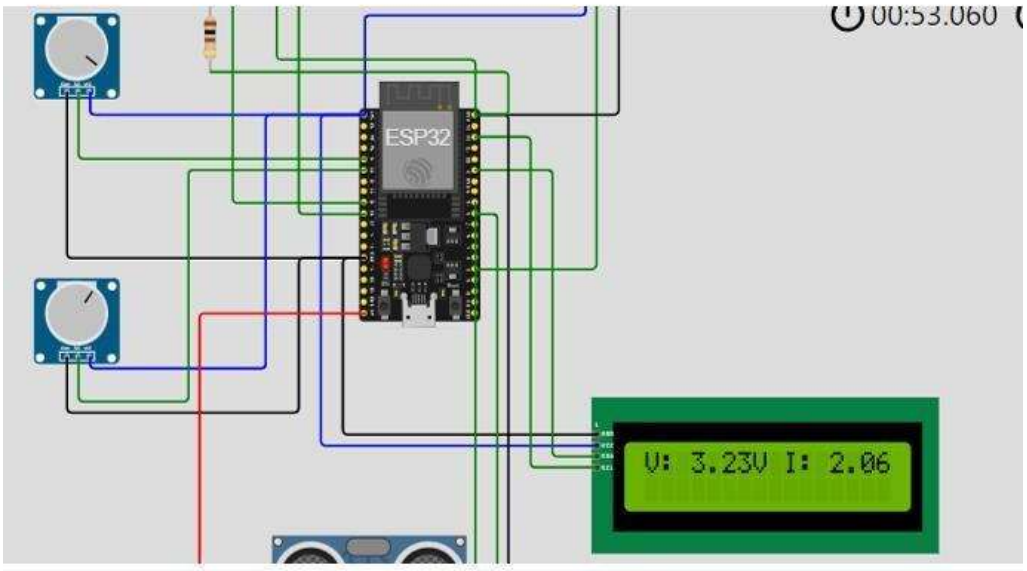
This study presents the design and implementation of a solar panel positioning system using the ESP32 microcontroller. The system is developed to measure and display essential parameters of a solar panel setup, enhancing its performance analysis and enabling efficient energy management. The hardware-based approach integrates key components such as a Light Dependent Resistor (LDR) to detect ambient light intensity, current and voltage sensors to monitor electrical parameters, and a Liquid Crystal Display (LCD) to provide real-time data on solar panel current, voltage, power output, and the angle of servo motor rotation. Additionally, the system is capable of recording solar panel angles at different times of the day, offering valuable insights into solar tracking efficiency and optimizing energy capture. By dynamically adjusting the solar panel's orientation based on light intensity, the system maximizes solar energy utilization, contributing to improved renewable energy solutions

KEYWORDS: Real time data display, Wi-Fi module, Internet of Things (IoT), ESP32 microcontroller, ESP32 based sensor and solar energy optimization

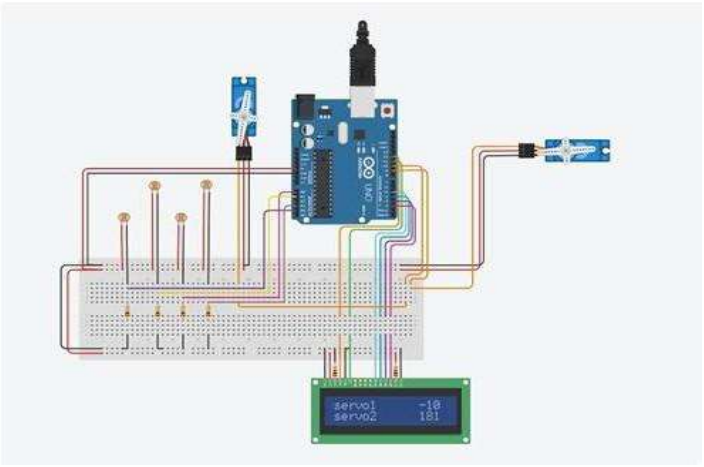
PRODUCT DESCRIPTION

The Solar Panel Positioning and Monitoring System employs advanced IoT technology and the ESP32 microcontroller, representing a cutting-edge solution aimed at maximizing solar energy capture and enhancing performance. Engineered with precision, this system integrates multiple sensors, including a Light Dependent Resistor (LDR) for detecting light intensity, and current and voltage sensors for monitoring electrical parameters. The system calculates critical values such as voltage, current, power gained, and panel angle, delivering real-time data through an LCD display and the Blynk IoT platform for remote access. At the core of the design, the LDR dynamically guides the solar panel's orientation to achieve optimal light exposure, while the current and voltage sensors measure energy output with high accuracy. The ESP32 microcontroller processes these inputs to control servo motor adjustments, ensuring efficient tracking of sunlight throughout the day. This system’s ability to record and analyze solar angles at various times provides valuable insights for improving solar energy utilization. The inclusion of Blynk IoT technology further enhances its functionality, enabling users to monitor panel angle and power output from a connected device. Compact, reliable, and equipped with high-performance components, the Solar Panel Positioning and Monitoring System is ideal for applications in renewable energy research, education, and sustainable energy solutions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS



Measuring current and voltage



Displaying angle of the tilt of the solar

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Solar Panel Positioning and Monitoring System lie in its integration of advanced IoT technology and precision hardware components to optimize solar energy capture and provide comprehensive performance analysis. Unlike conventional systems, this project leverages the ESP32 microcontroller to process real-time data from multiple sensors, including an LDR, current, and voltage sensors, ensuring dynamic solar panel orientation based on ambient light intensity. A distinguishing feature is the system's capability to record solar panel angles at different times, offering unique insights into sunlight tracking efficiency. By combining this functionality with the Blynk IoT platform, the system enables remote monitoring of solar angles and power output, making it exceptionally user-friendly and accessible for analysis and optimization. This project's use of real-time calculations for voltage, current, power gained, and servo motor angles ensures precise tracking and efficient energy utilization. The seamless integration of high sensitivity, adaptability, and IoT connectivity makes it a groundbreaking approach for renewable energy research and education, setting it apart from existing solar tracking solutions.

BENEFIT TO MANKIND

The Solar Panel Positioning and Monitoring System offers benefits to humanity by advancing renewable energy efficiency and sustainability. By optimizing solar energy capture through precise panel orientation, it promotes the adoption of clean energy solutions, reducing dependency on fossil fuels and contributing to environmental preservation. This system empowers users with real- time data on solar energy performance, fostering informed decision-making for energy management. It provides valuable insights for researchers and educators, supporting the development of innovative solar technologies and enhancing the understanding of renewable energy systems. For communities and regions striving for energy independence, this system delivers a cost-effective and reliable solution for maximizing solar energy utilization. By integrating IoT technology for remote monitoring, it increases accessibility, enabling widespread adoption and scalability in urban and rural settings alike. Overall, the system represents a significant step toward a sustainable and eco-friendly future.

COMMERCIALIZATION POTENTIAL

The Solar Panel Positioning and Monitoring System, powered by the ESP32 microcontroller, possesses significant commercialization potential due to its applicability across various industries. Key markets include residential and commercial renewable energy systems, where efficient solar energy capture and real-time performance monitoring are critical. It offers value to the education sector, enabling hands-on learning and research on sustainable energy technologies. Opportunities also exist in agriculture, where solar-powered systems can optimize energy use for irrigation and lighting, and in remote areas, where reliable and efficient solar energy systems are vital for off-grid applications. The system's integration with IoT platforms like Blynk aligns with the growing demand for smart energy management solutions, further enhancing its appeal in the smart home and energy monitoring markets. As governments and industries worldwide increasingly adopt renewable energy policies, the system's adaptability, real-time tracking capabilities, and user-friendly design position it for strong market success. Its ability to provide actionable insights into solar energy performance makes it a valuable tool for optimizing energy efficiency across multiple sectors.

CONCLUSION

The Solar Panel Positioning and Monitoring System has demonstrated significant advancements in optimizing solar energy capture and performance analysis. Its integration of real-time data processing, IoT connectivity, and dynamic solar tracking highlights its potential to enhance energy efficiency and promote renewable energy adoption. The system’s success underscores its value in sectors such as residential energy solutions, research, education, and off-grid applications. By providing accurate insights into solar panel performance and enabling remote monitoring, this project lays the groundwork for smarter energy management systems. Future recommendations include refining the system for scalability and affordability in mass production, enhancing IoT features for broader functionality, and exploring additional applications in agriculture and industrial energy optimization. Continued R&D will be crucial to improving efficiency, durability, and user experience, ensuring the system’s role in advancing sustainable energy technologies

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Smart Irrigation System for Sustainable Agriculture

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ABSTRACT

One of the main challenges that many farmers and gardeners face is the need to carry heavy watering cans or repeatedly fetch water from sources to irrigate their plants. This task is physically demanding and can leave them feeling exhausted, requiring significant energy. For example, elderly individuals may experience joint pain and body aches due to the repetitive strain, while younger adults may be too busy with their jobs to consistently water their houseplants. As a result, plants may suffer from insufficient watering and eventually begin to wither and die. Therefore, the irrigation system offers a practical solution by streamlining the watering process and reducing the physical effort required. To address these issues an innovative irrigation system for agriculture was developed. The water pump system is designed to distribute water efficiently across the entire plantation equipped with many sensors like pH sensor, moisture sensor and water level sensor that make the system become more efficient. Additionally, the system incorporates effective water storage and distribution mechanisms, ensuring a consistent and reliable water supply for the plants. This solution not only saves energy and time but also promotes healthier and more sustainable plant growth that significant advancement in optimizing agricultural practices.

KEYWORDS: Renewable Energy, Water Management, Solar Powered System, Remote Monitoring, IoT, Sustainable Agriculture.

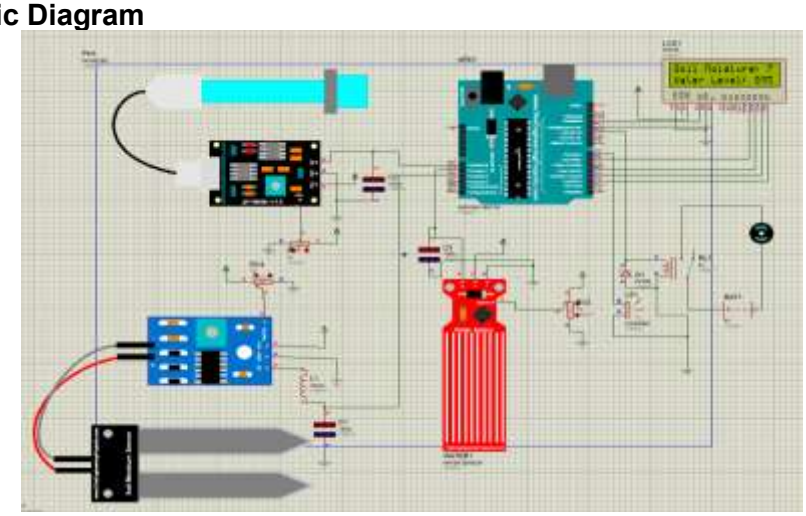
PRODUCT DESCRIPTION

This project introduces an advanced irrigation system designed to support agricultural practices. The system addresses a common challenge the time-consuming and physically demanding task of manually watering plants, often requiring the transportation of heavy water containers across large plantation areas. The irrigation system offers a practical solution by streamlining the watering process and reducing the physical effort required. It features a water pump that efficiently distributes water across the plantation. Users can also schedule watering times, enhancing convenience and ensuring timely irrigation. This promotes healthier plant growth while saving time and energy, making it an ideal solution for managing large-scale plantations. A standout feature of the project is its ability to pump water both day and night, powered by a battery that stores energy. Equipped with a wireless transceiver module, data from soil moisture sensors and DHT11 sensors to the Blynk application. These sensors monitor the soil's moisture levels and provide updates on water levels, enabling users to remotely control the pump through their smartphones. With this innovation, users can switch the motor on or off from remote locations. Environmentally friendly and cost-effective, the system uses solar panels to harness sunlight for powering the DC motor pump. This eliminates fuel costs and minimizes maintenance requirements, making it a sustainable and affordable solution for farmers and gardeners alike.

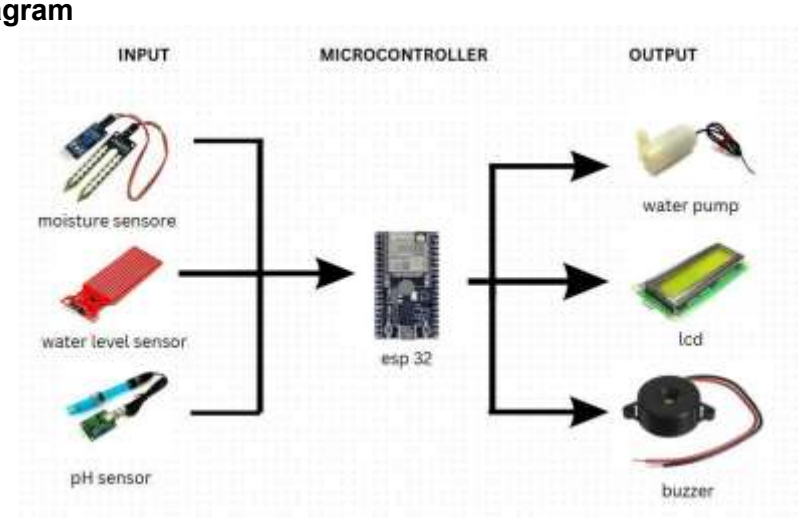
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarised as follow:

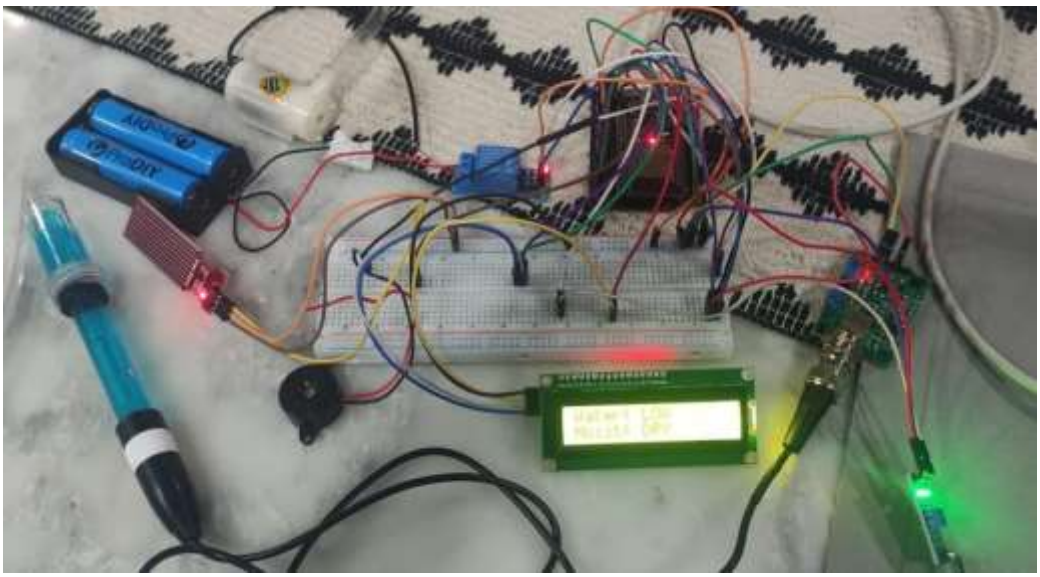
1. **Schematic Diagram**



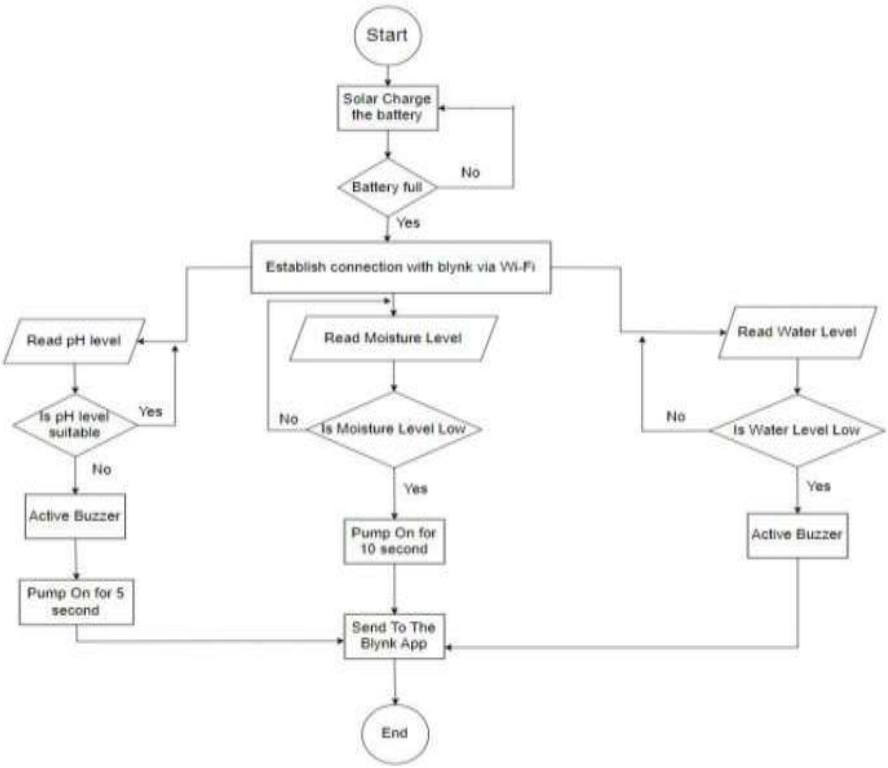
2. **Block Diagram**



3. **Hardware**



4. Flowchart



NOVELTY AND UNIQUENESS

The development of the innovative irrigation system for agriculture represents a significant advancement in optimizing agricultural practices. Through the utilization of pump water with equipped other sensors like moisture sensor, water level sensor and pH sensor, the system effectively and efficiently distributes water across the plantation and the feature of the project is its ability to pump water both day and night, powered by a battery that stores energy. Furthermore, this project integrates user to remotely control the pump through their smartphones which be more convenient and easier for the user to access and control their plantation and overall improves the sufficiency in plantation.

BENEFIT TO MANKIND

The successful implementation of this system highlights its potential to address common challenges faced by farmers in plantation sector which particularly benefiting gardeners and farmers cultivating crops like fruits and vegetables. By automating the access control process, the system reduces the physical burden and time spent on the labor-intensive task of watering large plantations. The system allows users to schedule watering at specific times, making the process much more convenient.

COMMERCIALIZATION POTENTIAL

In combining smart technology with renewable energy, this cutting edge irrigation system not only reduces the drudgery of manual watering, but also brings about the more sustainable ways of farming. It guarantees proper use of water, improves the quality of
crops, and encourages environmentally friendly agricultural practices.

CONCLUSION

The Smart Irrigation System truly stands out with its remarkable features such as IoT enabled sensors and renewable energy. Not only the crops are healthier but the system also ensures that less water is quarried in an attempt to balance the efficient use of local resources. It is self-sustaining as its system is designed to run on solar energy adding to the place's resourcefulness. The Smart Irrigation Solution, instead, thanks to its modular and scalable architecture, is suitable for both private home gardens as well as serving large farms. It helps reduce the human effort that is manual and makes the process ecological, making this system an effective solution for food shortages and resource wastage. This shows the impact of how technology and society can combine to bring out a positive transformation.

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Solar Plant Agriculture Monitoring System

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ABSTRACT

The "Solar Plant Agriculture Monitoring System" was designed to improve the management and tracking of agricultural activities within solar power plants. This system improves irrigation methods by integrating a variety of sensors such as soil moisture sensors, rain detectors, temperature sensors, and sun irradiance sensors. The soil moisture sensor detects dry soil conditions, allowing the water pump to activate and irrigate the plants. The rain detection sensor, on the other hand, stops the water pump from working during rainfall, thus making sure effective water use.Data acquired from these sensors is processed and analyzed using the Blynk app, an IoT platform that allows for real-time monitoring and control. This solution offers farmers with actionable knowledge, allowing them to make the best irrigation decisions remotely. The Solar Plant Agriculture Monitoring System encourages sustainable agricultural practices, improves resource management, and increases crop yields through the use of IoT technology and renewable solar energy. The use of advanced decision-making algorithms provides precise irrigation scheduling, which improves the overall efficiency and productivity of agricultural activities within solar power facilities.

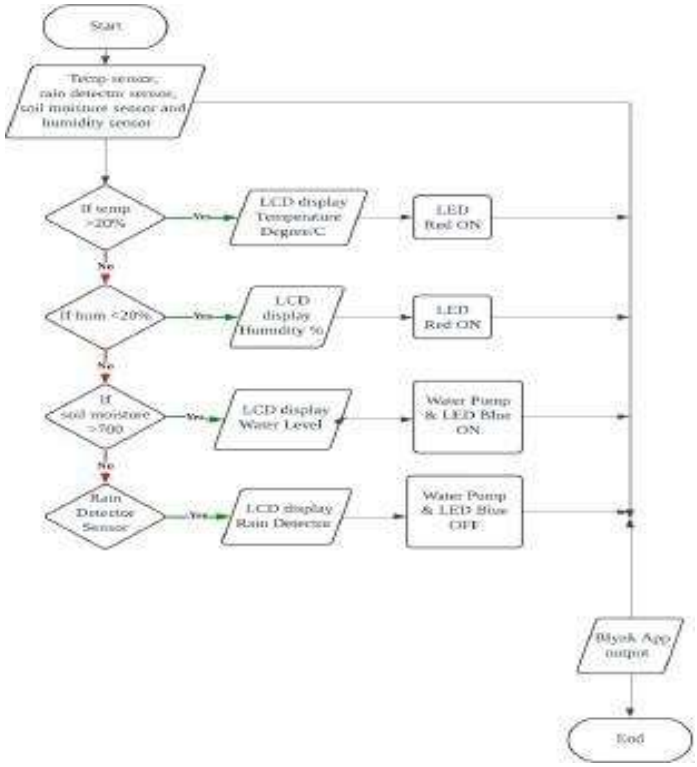
KEYWORDS: Solar Agriculture, Internet of Things (IoT), Blynk App, Soil Moisture, Rain Detectors.

PRODUCT DESCRIPTION

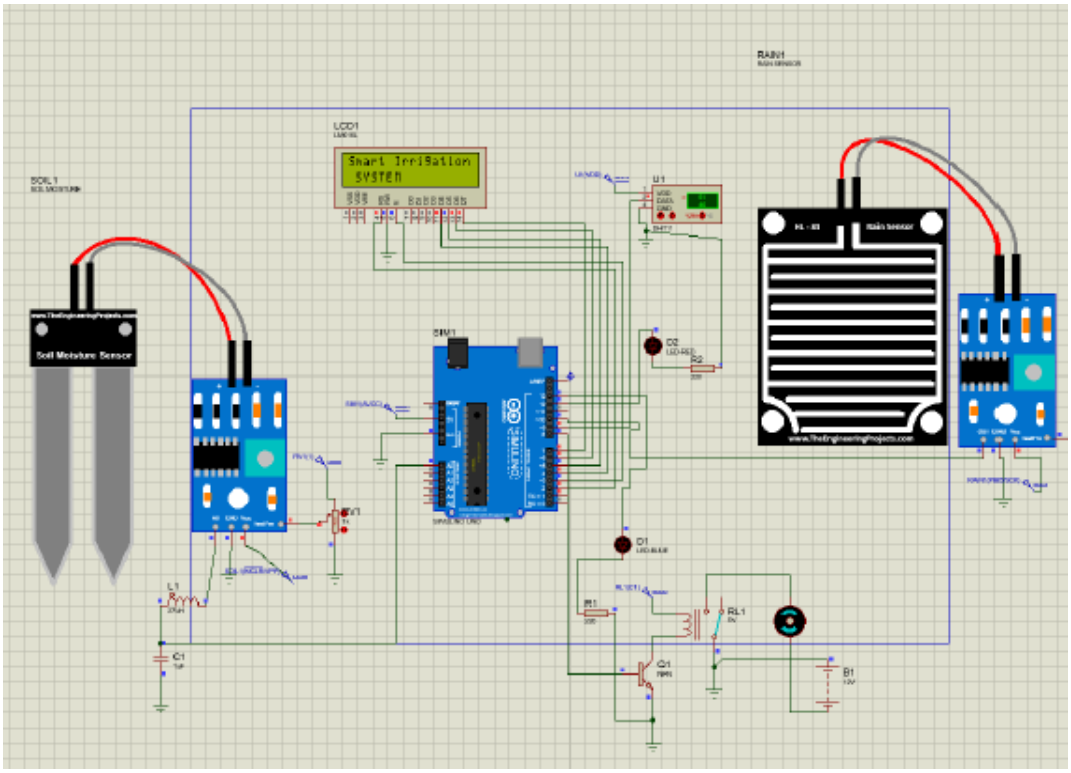
The “Solar Plant Agriculture Monitoring System” is intended to improve the management and monitoring of agriculture operations within solar power plants. Water shortage in Morocco is a serious worry in 2022-2023, with water reserves reduced by 59%, exposing them to geographical and temporal irregularities. Given the huge evolution of irrigated agricultural areas that consume massive amounts of water, rainfall unpredictability may make more worst and deepen the problem of water availability, as well as failure to meet crop irrigation needs, resulting in rising drought areas and a decline in agricultural productivity. For this product, a soil moisture sensor is a device that used to detect a dry soil and water

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. Flowchart



2. Schematic Diagram



NOVELTY AND UNIQUENESS

The Solar Plant Agriculture Monitoring System is unique when it detects rain and immediately turns off the water pump to save water. It combines many different sensors to measure soil moisture, temperature, humidity, and rainfall, offering farmers a complete overview of their agricultural land. The system is cheap, simple to use, and can be upgraded with additional functions as needed. With its easy display and automatic controls, it saving farmers time, reduces water waste, and improves crop productivity. It splits itself from other systems by focusing resource efficiency and simple use.

BENEFIT TO MANKIND

The Solar Plant Agriculture Monitoring System benefits mankind through advancing environmentally friendly farming practices that maintain precious resources such as water and electricity. It reduces farmers' work and helps crops receive the proper amount of water, which results in greater production and improved food quality. This method promotes effective land use and reduces waste, helping to solve the worldwide food crisis and protecting the environment. Furthermore, it makes advanced farming tools available for small-scale farmers, motivating communities while improving economies.

COMMERCIALIZATION POTENTIAL

The Solar Plant Agriculture Monitoring System has a high commercialization potential since it can handle critical agricultural issues such as shortages of water, complicated irrigation, and unbalanced crop yields. Its cost-effective design and ability to adjust make it beneficial to both small and large farms. The system can be offered as a ready-to-use device or an adjustable solution, allowing customers to be able to add features such as IoT connectivity or mobile app integration based on their requirements. The program's focus on sustainable farming is consistent with current worldwide movements toward environmentally friendly technologies, making it acceptable to governments, NGOs, and agricultural organizations. By providing an economical, user-friendly, and efficient solution, the system has the potential to become an effective instrument in the agriculture business, raising production while saving resources.

CONCLUSION

The Solar Plant Agriculture Monitoring System is a practical and unique solution that improves farming efficiency and sustainability. The system provides real-time monitoring and automatic irrigation control through the addition of sensors for soil moisture, temperature, humidity, and rain detection, resulting in optimal usage of water and improved yields of crops. Its low cost, user-friendly design, and to grow make it affordable to farmers of all sizes, allowing them to adopt modern agricultural practices. Using this method not only saves both time and money, but it also helps with worldwide efforts for sustainable agriculture and sustainability, making it an important instrument for the future of farming.

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Contactless Switch for Load Switching

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ABSTRACT

This project introduces a contactless switch for switching load designed for improved safety, convenience and efficiency. It integrates multiple sensors with an ESP32 microcontroller to enable intelligent automatic operation. A sound sensor is used to control the LED, an ultrasonic sensor automates the DC motor, a gas sensor activates the buzzer This system eliminates physical interaction, making it ideal for environments that require contactless operation. It improves safety by minimizing the risks associated with direct contact while increasing operational efficiency. An ESP32 microcontroller serves as the core, enabling seamless integration and real-time data processing.This contactless system exemplifies the combination of IoT and smart sensing, showing how advanced technology can optimize load management. It is energy efficient, intuitive and suitable for a wide range of applications, paving the way for innovative solutions in automation and control.By combining simplicity and functionality, this system redefines the modern approach to load control.

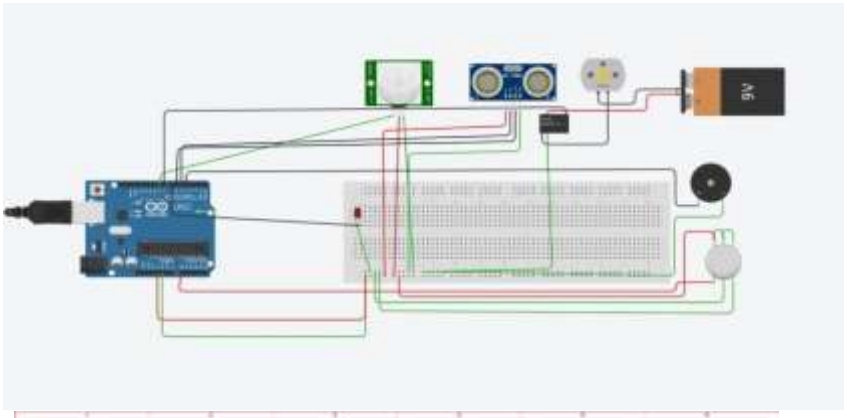
Keywords: Iot,smart sensing,contactless system

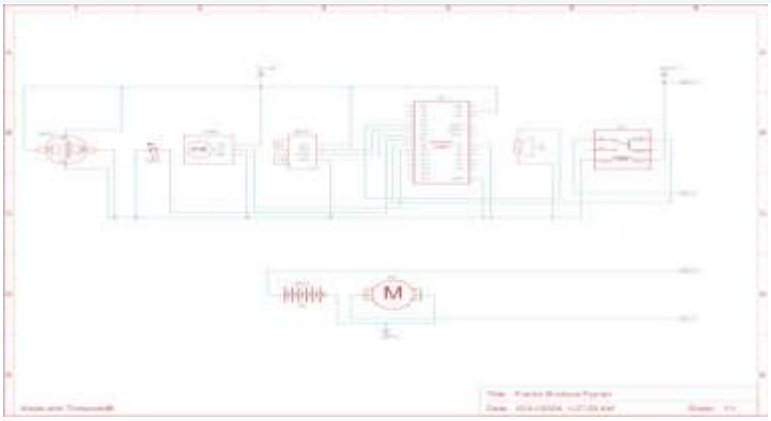
PRODUCT DESCRIPTION

The Contactless switch for load switching aims to improve safety, efficiency and automation in load management by integrating smart technology. The system combines a sound sensor to control the LED, an ultrasonic sensor to control the motion-triggered DC motor, a gas sensor to activate the buzzer ..The ESP32 microcontroller acts as the core of the system, enabling seamless integration of sensors and real-time data processing. Users can monitor and control the system remotely through the Blynk app, increasing convenience and accessibility .Intelligent design ensures automatic response based on environmental conditions, eliminating the need for physical interaction. This not only improves safety but also improves operational efficiency. The integration of IoT technology enables remote monitoring and diagnostics, increasing reliability and simplifying maintenance. This innovative contactless solution shows how advanced technology can optimize load control, providing a practical, energy-efficient and user- friendly approach to automation.

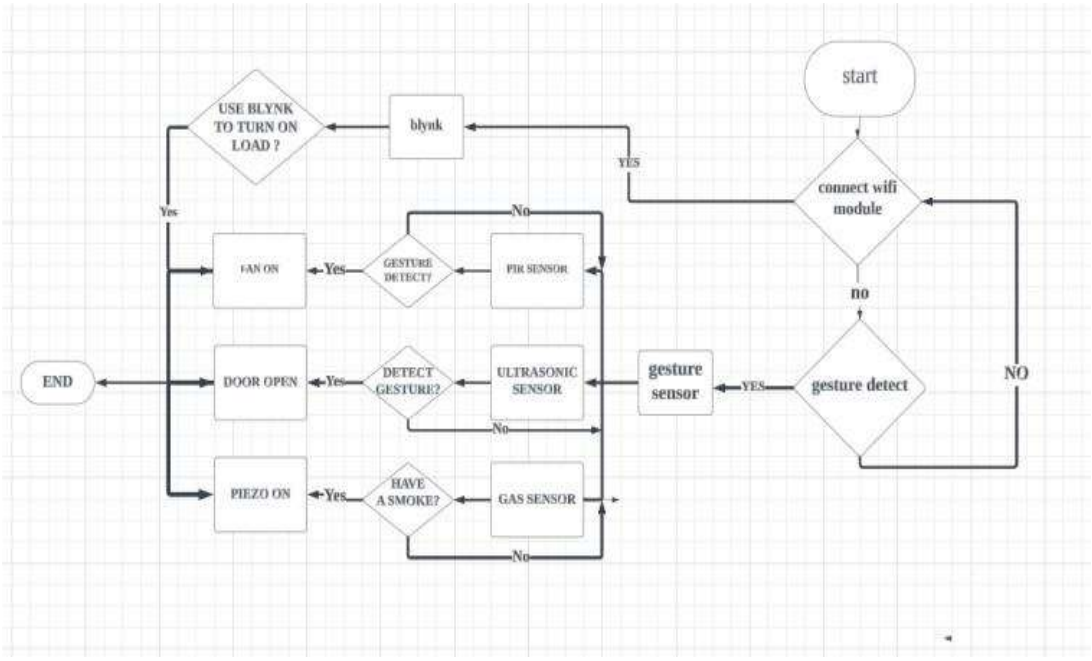
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1)Schematic diagram

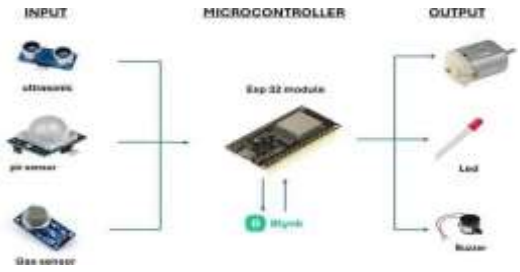




2) flowchart



3) Block Diagram



NOVELTY AND UNIQUENESS

Innovation of this system lies in its integration of IoT and advanced sensors to enable fully contactless load control. Unlike traditional systems, it offers automated, touch-free operation, enhancing safety and efficiency. Real-time remote monitoring via the Blynk app ensures ease of control and maintenance. The system's diverse sensors sound, PIR, gas, and ultrasonic provide a unique and adaptable solution, making it highly reliable and versatile for various applications.

BENEFIT TO MANKIND

The Contactless switch for load switching enhances safety, energy efficiency, and operational convenience. By eliminating physical interaction, it reduces the risk of contamination and accidents, making it ideal for sensitive environments. The integration of IoT enables remote monitoring and control, simplifying maintenance and saving time. Its automation reduces energy waste, contributing to environmental sustainability. With versatile applications in homes, industries, and public spaces, this system promotes the adoption of smart technologies, improving quality of life while fostering innovation and efficiency.

COMMERCIALIZATION POTENTIAL

Contactless switch for load switching have strong commercial potential, especially in the automation, smart home and industrial sectors. Using IoT and advanced sensors, it offers energy-efficient and automated load management with minimal physical interaction, reducing operational costs and increasing convenience. Its modular design allows customization and scalability, making it suitable for residential, commercial and industrial applications. This flexibility aligns with the growing demand for smart solutions that prioritize safety, efficiency and sustainability. As the industry increasingly focuses on automation and energy efficiency, this innovative system presents a marketable product in the fast-growing IoT sector, smart technology and green solutions, offering both environmental and economic benefits.

CONCLUSION

In conclusion, contactless switch for load switching represent a significant advance in automation and energy efficiency. By integrating IoT and advanced sensors, the system provides a contactless intelligent solution to control multiple loads, improving safety, convenience and operational efficiency. This system not only reduces the need for physical interaction, minimizing the risk of pollution and accidents, but also contributes to energy savings and sustainability. With remote monitoring and real-time data processing capabilities, it simplifies maintenance and ensures reliability. The project highlights the potential of combining smart technology with energy-efficient automation to meet the growing demand for safer, more efficient and environmentally friendly solutions.

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Household Electricity Monitoring System

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ABSTRACT

This technical report documents design and simulation of Household Electricity Monitoring System. The system contributes an Ultrasonic Distance Sensor, INA219 voltage and current sensor, LM35 temperature sensor and display LCD for real time data visualization and enhance by Wi-Fi module ESP32 which capable consumer to monitor their electricity consumption remotely by using Blynk application. Leveraging Proteus simulation platform, by using Arduino as microcontroller can processes data from these sensors to monitor and display electricity consumption which is value of voltage, current, temperature and power consumption at certain load. Responsive components, including lamp for visual the load in simulation will help the project simulation to display electricity consumption in real time data visualization. The Arduino IDE will be the coding platform incorporates intelligent decision making on activating the lamp or LED based on the value of certain distant and turning it off if the value above the threshold as power saving system and display all electricity consumption and the distant in real time visualization.

KEYWORDS: Household Electricity, monitoring, power consumption**.**

PRODUCT DESCRIPTION

The Household Electricity Monitoring System is an innovative solution designed to empower consumers with real-time insights into their electricity usage, promoting energy efficiency and conservation. The system integrates multiple sensors, including an Ultrasonic Distance Sensor, INA219 Voltage and Current Sensor, and LM35 Temperature Sensor, alongside a 0.96-inch LCD display for data visualization. Enhanced with Wi-Fi connectivity via the ESP32 module, users can remotely monitor electricity consumption through the Blynk application on their smartphones.

This advanced system utilizes an Arduino microcontroller to process sensor data, providing real-time readings of voltage, current, temperature, and power consumption. The integration of a Proteus simulation platform ensures accurate system design and testing, with interactive components such as a lamp to represent load simulation.

Key features include intelligent decision-making capabilities, where the system activates or deactivates the lamp or LED based on distance thresholds, optimizing energy usage. The Arduino IDE serves as a development platform, ensuring robust and efficient programming.

Ideal for households seeking to monitor and manage their energy consumption effectively, the system combines modern technology and user-friendly interfaces for a seamless experience.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

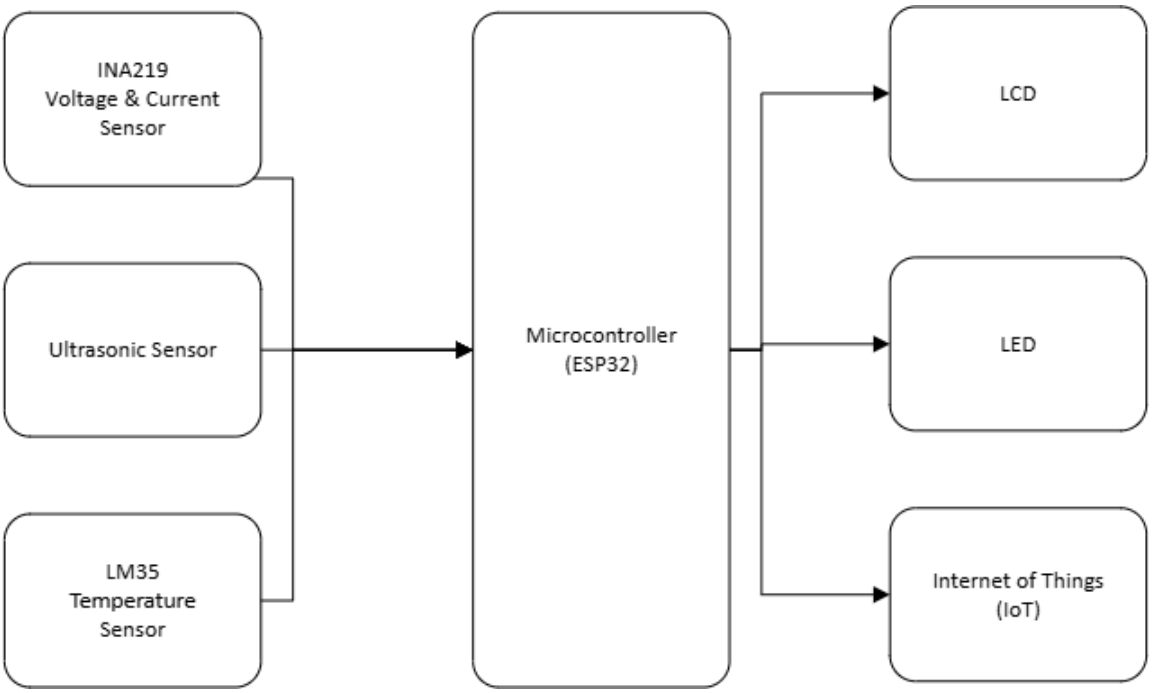


Figure 1.1: Block Diagram of Household Electricity Monitoring System

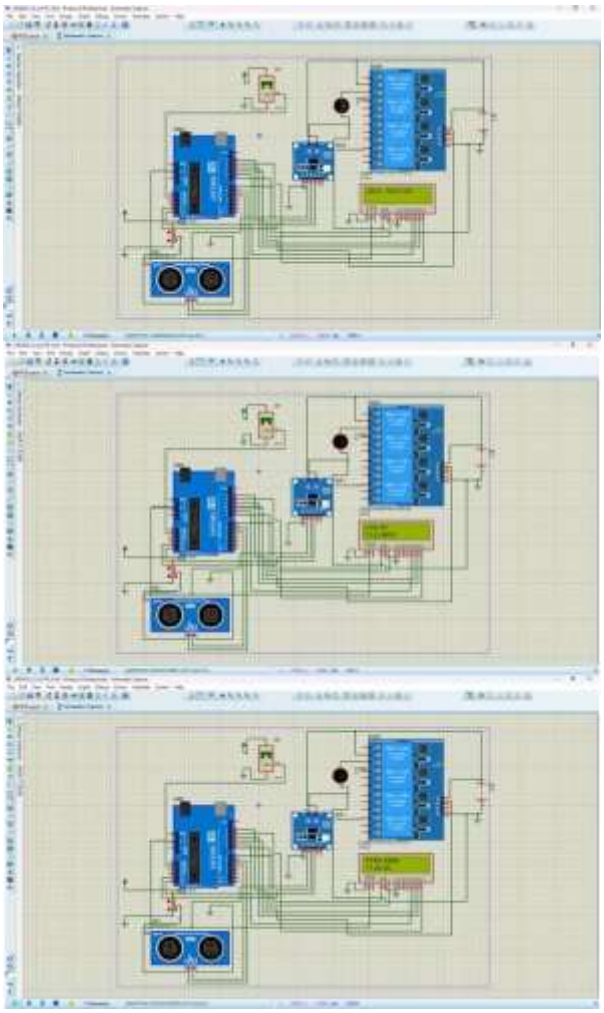


Figure 1.2: Simulation of Household Electricity Monitoring System

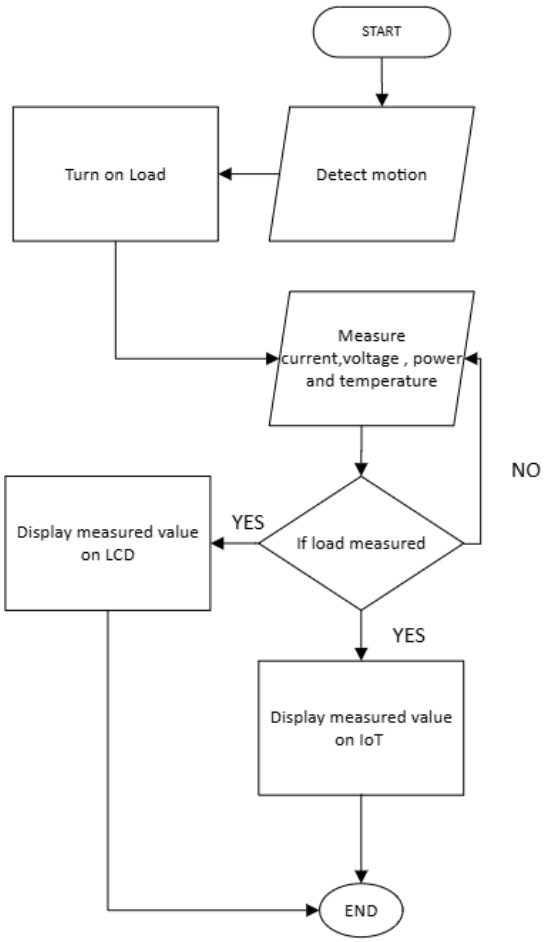


Figure 1.3 : Flowchart of Household Electricity Monitoring System

NOVELTY AND UNIQUENESS

The Household Electricity Monitoring System stands out with its unique combination of real-time data visualization and remote monitoring via the ESP32 Wi-Fi module and Blynk application, enabling users to track electricity consumption conveniently. Unlike conventional monitoring systems, this project integrates an ultrasonic distance sensor for motion detection, adding intelligent energy-saving capabilities by controlling appliances based on proximity thresholds. The use of Proteus simulation ensures precise testing, while the Arduino microcontroller seamlessly integrates voltage, current, and temperature sensors for comprehensive insights. This innovative approach not only empowers users to monitor energy usage but also promotes sustainable practices through intelligent automation.

BENEFIT TO MANKIND

The Household Electricity Monitoring System promotes energy efficiency and sustainability by providing real-time insights into electricity consumption and enabling remote monitoring. Its intelligent automation reduces energy wastage, lowers electricity costs, and encourages responsible usage. By fostering awareness of energy consumption patterns, it inspires individuals to adopt eco-friendly habits, conserve resources, and reduce carbon footprints. This innovation not only benefits individual households but also contributes to global efforts in addressing energy crises and environmental challenges. Its affordability and ease of implementation make it accessible for widespread use, empowering communities to embrace smarter, more sustainable energy management practices for a better future.

COMMERCIALIZATION POTENTIAL

The Household Electricity Monitoring System has significant commercialization potential due to the growing demand for energy-efficient solutions in residential and commercial sectors. Its affordability, user-friendly design, and integration with widely used platforms like the Blynk app make it highly marketable. The system's real-time data visualization and remote monitoring capabilities cater to modern consumers seeking convenience and control over their energy consumption. With increasing global emphasis on sustainability and cost-saving measures, this product can be marketed as an essential tool for energy- conscious households. Its scalability also allows adaptation for larger applications, making it a versatile solution for promoting energy conservation worldwide.

CONCLUSION

The Household Electricity Monitoring System combines sensors such as the Ultrasonic Distance Sensor, INA219, and LM35 with an LCD for real-time data display and an ESP32 module for remote access via the Blynk app. Utilizing Arduino and Proteus simulation, the system efficiently monitors and showcases voltage, current, temperature, and power usage while automating load control based on distance thresholds. By intelligently managing load activation and deactivation, the system encourages energy conservation. This project highlights an effective solution for tracking and managing electricity consumption through real-time visualization and remote monitoring, promoting greater consumer awareness and energy-saving habits.

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Power Factor and Phase Angle Monitoring System for Household

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ABSTRACT

Systems for measuring power factor and phase angle are essential for maximizing energy economy and enhancing electrical system performance, particularly in settings with a combination of resistive and inductive loads. Despite its significance, creating such systems presents difficulties in obtaining precise real-time measurements while preserving system simplicity and dependability. In order to determine the power factor phase angle in AC circuits, a thorough setup utilizing a microcontroller, a voltage sensor, and a current sensor was created for this project. Measured voltage and current values were used to calculate the power factor, and zero-crossing detection methods were used to determine the phase angle. Data filtering and averaging techniques were used to reduce noise in sensor readings in order to guarantee accurate results. To further its adaptability, the system also included a variable resistor to mimic various load scenarios. The results showed that adding phase angle data greatly enhanced the system's capacity to distinguish between reactive and resistive loads, offering precise information on energy consumption. In order to improve power quality awareness, the study classified power factor ranges into "Bad," "Good," and "Excellent" with practical advice. This work highlights the importance of integrating phase angle analysis into monitoring systems to optimize energy consumption and reduce inefficiencies.

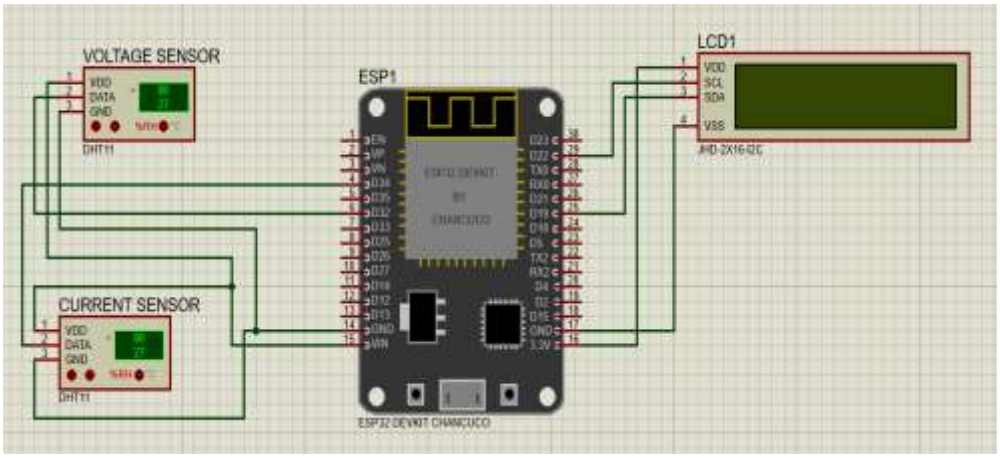
KEYWORDS: Power factor measurement, Current sensor, Voltage sensor

PRODUCT DESCRIPTION

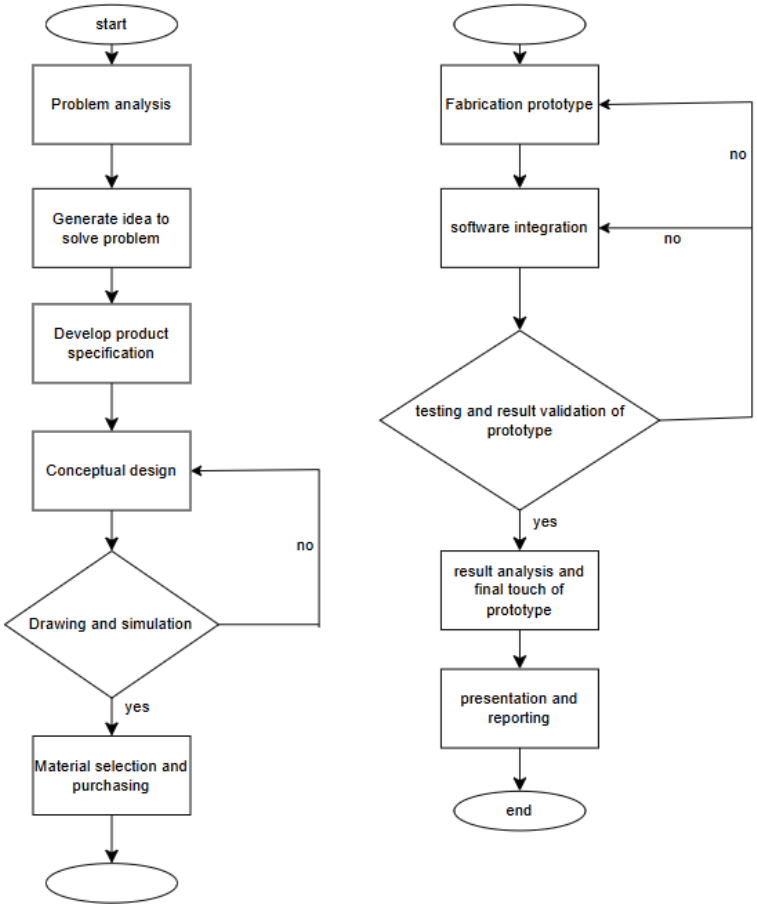
The Power Factor and Phase Angle Measurement System is an advanced tool designed to maximize electrical system performance and improve energy economy. This multipurpose, high-precision gadget uses a microprocessor, current and voltage sensors, and real-time computing to precisely calculate power factor and phase angle. Its creative design makes it easy to include into industrial, educational, and residential monitoring systems. The system reliably distinguishes between resistive and reactive loads by precisely detecting phase variations between voltage and current by utilizing sophisticated zero-crossing detection techniques. A strong data filtering mechanism on the gadget reduces noise and produces results that are steady and reliable. By simulating varied load levels, a variable resistor demonstrates the system's versatility for a range of situations.By classifying power factor into useful ranges like "Bad," "Good," and "Excellent," this monitoring technique raises awareness and provides useful information for enhancing energy use. An essential tool for anyone trying to maximize power quality and minimize energy inefficiencies is the Power Factor and Phase Angle Measurement System.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Schematic diagram



2. Flow chart



NOVELTY AND UNIQUENESS

The Power Factor and Phase Angle Measurement System is distinctive and unique because it creatively combines cutting-edge computational methods for energy optimization with real-time monitoring. In contrast to conventional techniques, this system provides extremely accurate power factor and phase angle measurements by fusing precise current and voltage sensing with microcontroller-based computation. Its versatility is increased by adding a variable resistor

for load simulation, which enables the system to simulate a range of electrical circumstances and assess performance in various scenarios. The system guarantees accuracy and dependability in differentiating between reactive and resistive loads by utilizing sophisticated noise-filtering and zero-crossing detection techniques. It stands out for its capacity to classify power factor into useful ranges with customized suggestions for enhancement, encouraging energy consciousness and economical usage. It is an essential tool for contemporary energy management applications in residential, commercial, and educational contexts because of its small size, adaptability, and ease of use.

BENEFIT TO MANKIND

By increasing energy efficiency and lowering electricity costs through precise real-time monitoring, the Power Factor and Phase Angle Measurement System offers significant advantages. By locating reactive and resistive load inefficiencies, it improves electrical system performance and lowers energy waste. Users can learn more about energy management and power quality with the aid of this technology. It benefits homes, businesses, and educational institutions by promoting more intelligent energy use, which promotes environmental sustainability and lowers the carbon footprint of electricity consumption.

COMMERCIALIZATION POTENTIAL

Because of its wide range of applications across multiple industries, the Power Factor and Phase Angle Measurement System has substantial commercialization potential. The system is a useful tool for energy-conscious consumers and enterprises since it may optimize power usage, lower expenses, and enhance overall efficiency in industrial and residential energy management. Because of its instructional value, it is also a perfect product for academic institutions, as it aids researchers and students in understanding system performance and power quality. It can also be included into IoT-enabled products and smart grid technologies to improve real-time energy management and monitoring. This system satisfies market expectations by providing an affordable and adaptable way to increase energy efficiency and lessen environmental impact, especially in light of the increased emphasis on sustainability and energy conservation.

CONCLUSION

For a variety of applications, the Power Factor and Phase Angle Measurement System provides accurate and dependable energy monitoring, maximising efficiency and detecting load inefficiencies. It encourages energy awareness and improved consumption habits by classifying power factor with useful insights. Scalability, improved user interfaces, and interaction with smart grid technologies may be the main areas of future development. Its accuracy and adaptability will be strengthened by continued development, making it an essential tool for contemporary energy management and sustainability.

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Advanced Closed Lock System with 240V Led Bulb

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ABSTRACT

The "Smart Closet Lock" is a security solution designed to address the prevalent issue of theft and unauthorized access to personal belongings in shared living environments such as university dormitories. This innovative system integrates modern technologies, including RFID authentication, a numeric keypad, and a relay-controlled locking mechanism, to provide dual-layered security for individual closets. By leveraging a microcontroller-based design, the Smart Closet Lock ensures ease of use, reliability, and cost-effectiveness. The solution is particularly tailored for university students living in shared accommodations, where privacy and security are often compromised. With its real-time feedback mechanisms, compact design, and customizable features, this product not only enhances personal security but also fosters a sense of trust and accountability among users. Additionally, its scalable design and affordability make it an ideal candidate for widespread adoption in various communal living spaces, further solidifying its role as a practical and impactful security tool.

KEYWORDS: RFID, esp32, servo motor, lcd 12c, buzzer, keypad, led bulb, relay 5v

PRODUCT DESCRIPTION

The Smart Closet Lock is an IoT-based security system comprising a microcontroller (ESP32), an RFID reader, a 4x4 keypad, and a relay-controlled locking mechanism. The system functions through dual authentication-a unique RFID card and a user-defined password. Once authenticated, the lock toggles to secure or grant access to the closet. The system is complemented by a liquid crystal display (LCD) to guide users and a buzzer to provide audio feedback. Compact and easy to install, the Smart Closet Lock is ideal for shared living environments such as university dormitories.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

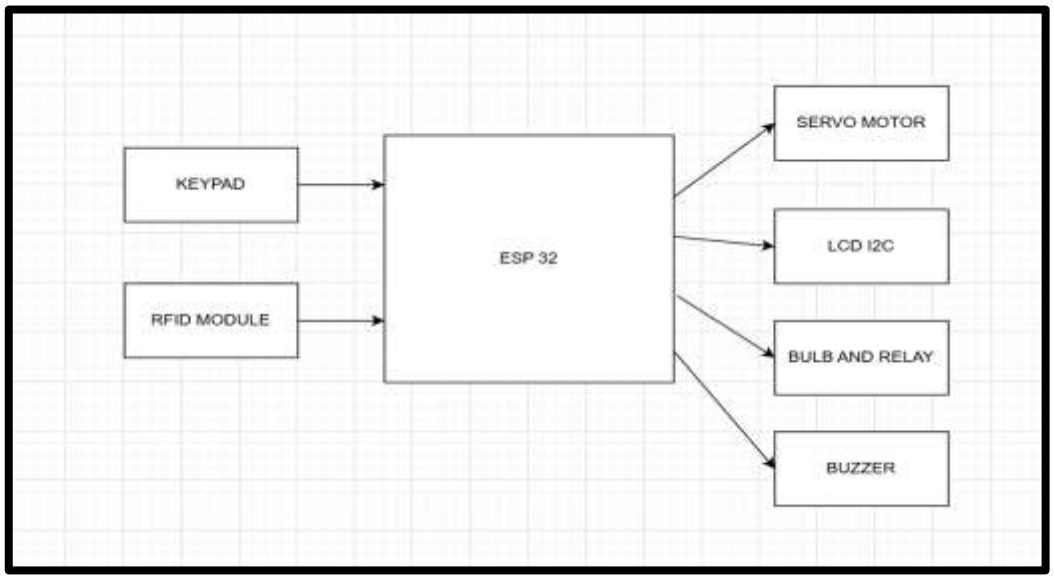


Figure 1: Flow chart of advance closed lock system with led bulb

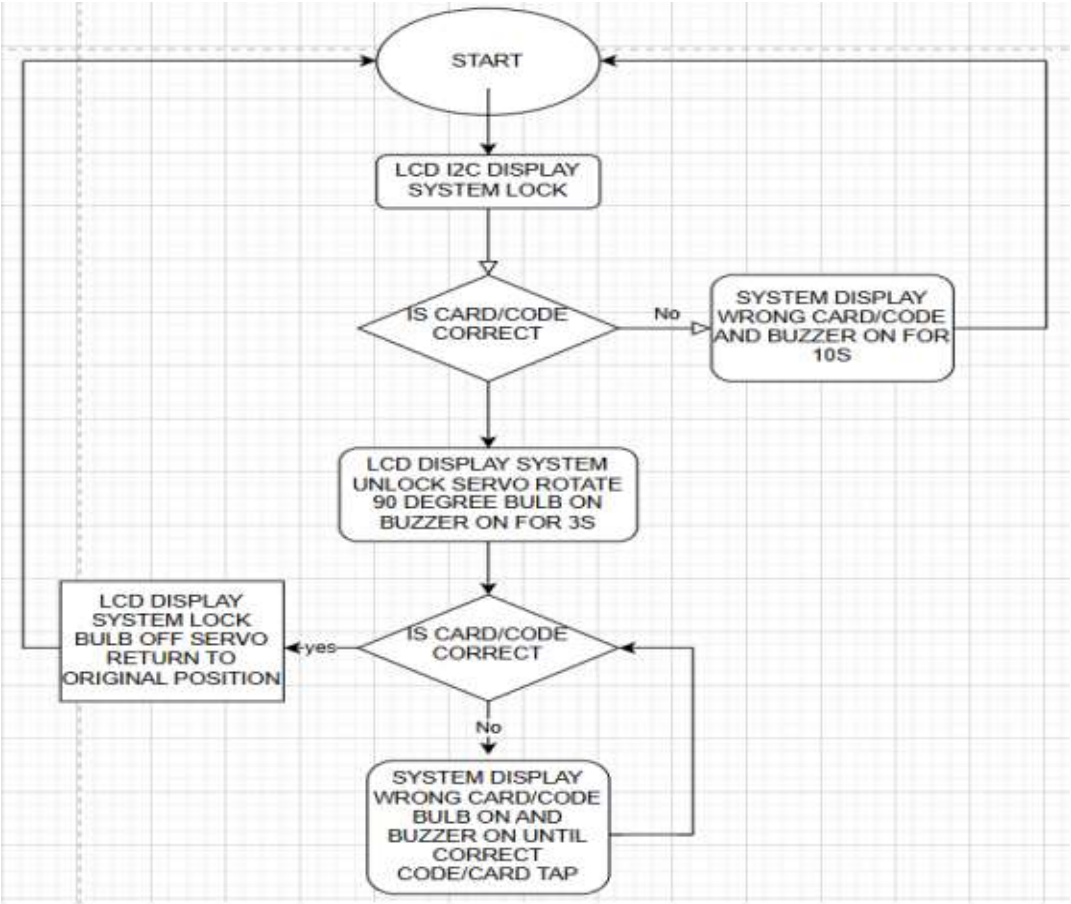


Figure 2: flow chart of advanced closed lock system with 240v led bulb

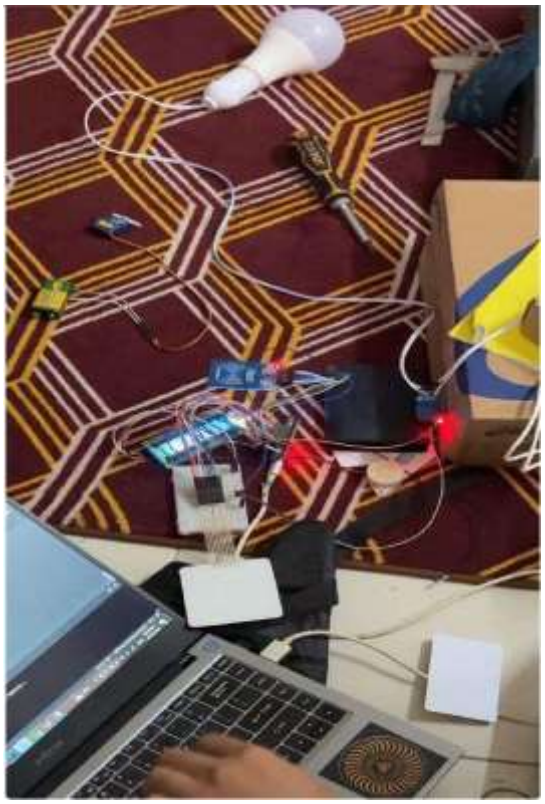


Figure 3: connection of advanced closed lock system with 240v led bulb.

NOVELTY AND UNIQUENESS

The Smart Closet Lock distinguishes itself through its innovative combination of features designed to meet the specific security needs of shared living spaces. The dual authentication mechanism-a blend of RFID technology and keypad input-provides a higher level of security than traditional locking systems. Unlike conventional locks, this system offers real-time feedback via an LCD and a buzzer, ensuring users are immediately informed of authentication success or failure. Its compact and modular design simplifies installation and makes it adaptable to various closet types. Additionally, the Smart Closet Lock offers customizability, allowing users to update passwords and tailor security preferences. This blend of advanced features and user-centric design sets it apart from existing solutions, making it a unique and highly effective tool for personal security

BENEFIT TO MANKIND

This advanced closed lock system addresses a critical issue of theft and privacy invasion in shared living spaces. By providing a secure and reliable solution, it enhances students' peace of mind, allowing them to focus on their academic and personal growth. The Smart Closet Lock also promotes a culture of accountability and respect in community living.

COMMERCIALIZATION POTENTIAL

The Advanced Closet Lock has strong commercialization prospects in educational institutions, hostels, co-living spaces, and offices. By addressing the need for personal security in shared environments, this product can cater to a wide audience. Affordable manufacturing costs and scalable design make it suitable for mass production. Partnerships with educational institutions and property management companies can facilitate widespread adoption.

CONCLUSION

The Smart Closet Lock represents a practical and innovative solution to a common problem in shared spaces. Its dual authentication mechanism, ease of use, and potential for widespread adoption make it a promising addition to the security products market. With further development, the system can incorporate additional features such as mobile app integration for remote monitoring and control, increasing its appeal to tech-savvy users. Strategic partnerships with educational institutions and property managers can accelerate its deployment, making it a staple in shared living environments. Furthermore, the product's scalability ensures its applicability in other sectors, such as office lockers and co-working spaces, broadening its market potential. By addressing an essential need for privacy and security, the Smart Closet Lock sets a benchmark for innovative security solutions, enhancing quality of life and fostering trust in communal settings.

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240V 50HZ AC Lamp Touch Sensor, Sound Sensor, Motion Sensor and Remote Switching System for Bedroom Purpose

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ABSTRACT

Manual switches in homes often cause problems like safety risks, energy waste, and lack of security. This project focuses on creating a better system for bedroom lighting using touch, sound, and motion sensors, along with a remote control feature. The touch sensor removes the need to physically press a switch, making it safer and reducing the chance of electrical shocks or accidents. A sound sensor allows the lamp to be controlled with simple sounds, like claps, while the motion sensor detects movement to turn the light on or off automatically, saving energy and improving security. An ESP8266 Wi-Fi module is incorporated into the system for monitoring, allowing for remote access to real-time control and status updates using the Blynk app. The system also demonstrates its ability to integrate with IoT cloud platforms like Blynk, enabling results to be displayed on both desktop and mobile dashboards. Additionally, the hardware includes an LCD 16X2 display to show sensor readings, such as which sensor is active, giving users a clear understanding of the system's operations. This smart system makes lighting more convenient, safer, and efficient, solving problems caused by traditional switches while adding modern features for a better home experience

KEYWORDS: Bedroom Lighting , Arduino Uno, Motion Detection, Blynk IoT Integration , Switching System , Remote Access , Touch Sensor , Sound Sensor

PRODUCT DESCRIPTION

The 240V 50Hz AC Lamp Touch Sensor, Sound Sensor, Motion Sensor, and Remote Switching System is a modern lighting control solution designed to enhance safety, convenience, and efficiency. The touch sensor eliminates the risk of electric shocks, offering a safer alternative to traditional switches. Additionally, the integration of sound and motion sensors provides hands-free control, enabling the lamp to respond to claps, ambient sounds, or movement. This innovative design creates a versatile and user-friendly experience for homes, offices, and other spaces. One of the standout features is the remote switching capability, powered by the ESP8266 Wi- Fi module. This feature allows users to control and monitor the lamp through a smartphone or web app, making it possible to turn the lamp on or off from anywhere. By preventing unnecessary energy use, the system promotes energy efficiency while adding convenience especially in situations where reaching the switch is inconvenient.Beyond its convenience, the system also enhances security with motion detection, alerting users to unauthorized activity. By combining touch, sound, and motion sensors with remote connectivity, this lighting system offers a comprehensive solution for modern automation needs. It's a perfect fit for smart homes and other applications where safety, energy savings, and security are priorities.

BLOCK DIAGRAM

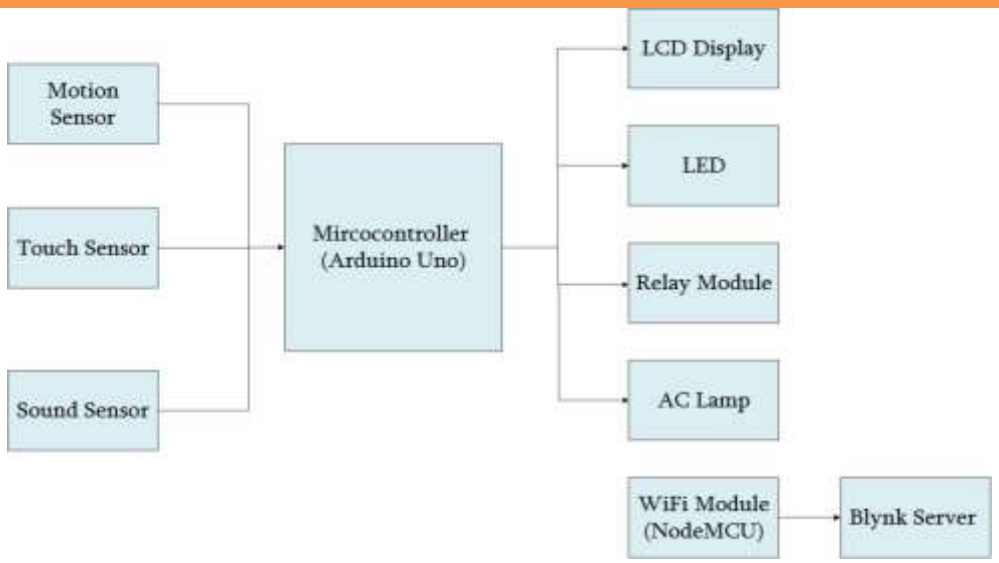


Figure 1 : Block Diagram of 240V 50HZ AC Lamp Touch Sensor, Sound Sensor, Motion Sensor and Remote Switching System for Bedroom Purpose

FLOWCHART AND PCB LAYOUT

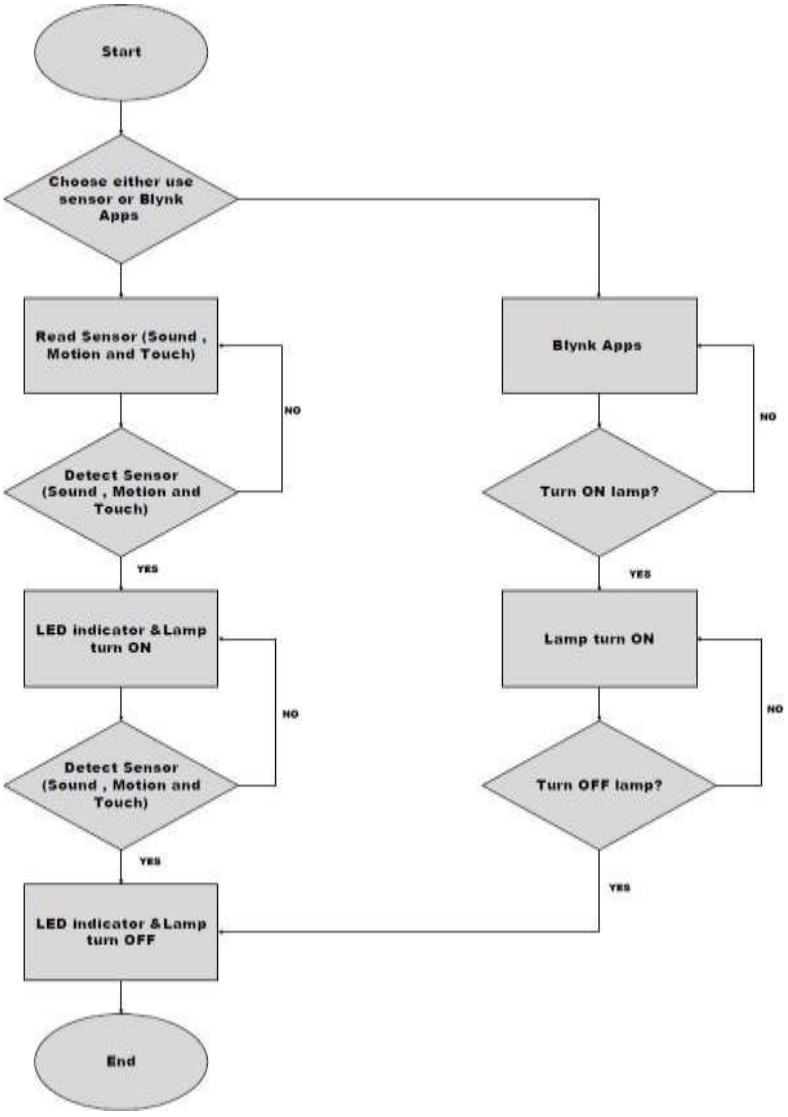


Figure 2 : Flowchart of 240V 50HZ AC Lamp Touch Sensor, Sound Sensor, Motion Sensor and Remote Switching System for Bedroom Purpose

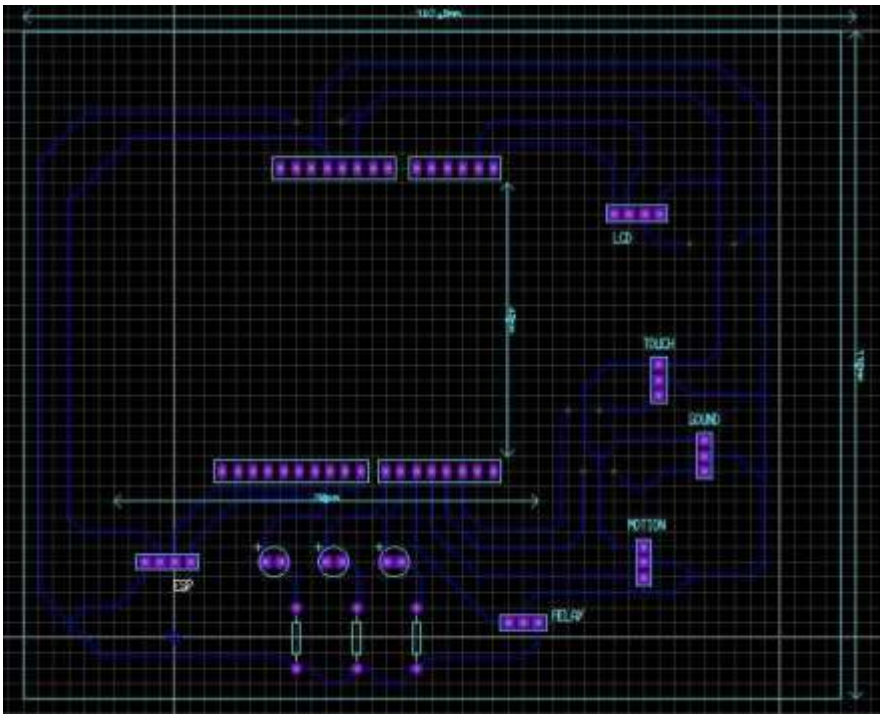


Figure 3 : PCB Layout of 240V 50HZ AC Lamp Touch Sensor, Sound Sensor, Motion Sensor and Remote Switching System for Bedroom Purpose

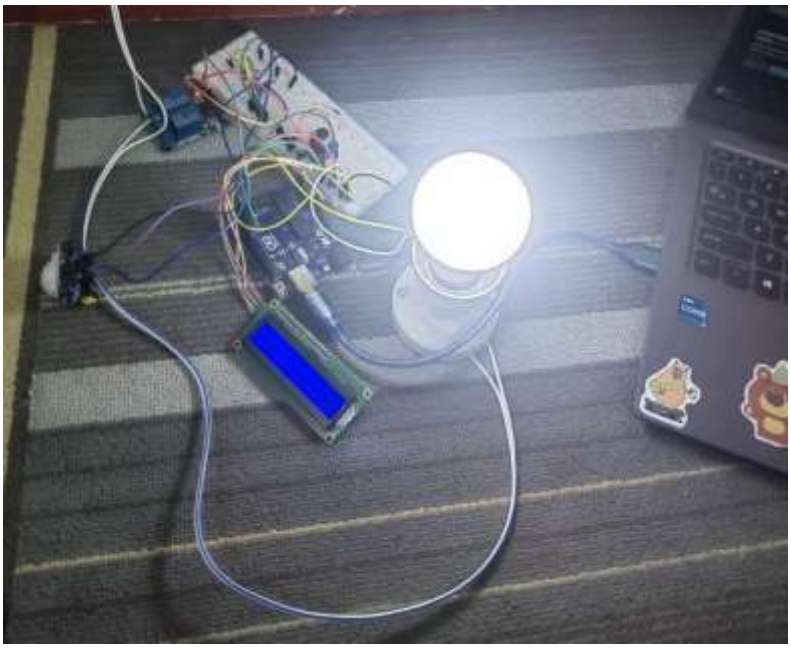


Figure 4 : Connection of 240V 50HZ AC Lamp Touch Sensor, Sound Sensor, Motion Sensor and Remote Switching System for Bedroom Purpose without NodeMCU

NOVELTY AND UNIQUENESS

The innovation and uniqueness of this project stem from the seamless integration of touch, sound, and motion sensors with remote switching capabilities, creating a versatile and advanced lighting control system. Unlike traditional systems that rely on individual functionalities, this project combines multiple sensor technologies to provide hands-free, safe, and efficient lighting control. The system also alerts users immediately through LCD and LED indicators, as well as remotely via a mobile application, enabling timely responses to potential

hazards. Additionally, the integration of an ESP8266 Wi-Fi module allows real-time remote operation through a smartphone app, a feature not commonly found in similar solutions. The system's ability to enhance safety by eliminating manual switches, conserve energy through automation, and improve security with motion detection makes it a comprehensive, cutting-edge solution for modern smart homes and automation applications.

BENEFIT TO MANKIND

This project provides significant benefits by enhancing safety, convenience, and energy efficiency while addressing common problems with manual switches in homes, such as safety hazards, energy waste, and lack of security. The touch sensor eliminates the need for physical interaction with a switch, reducing the risk of electric shock and improving system safety. Similarly, the sound and motion sensors enable hands-free control, making the lamp more user-friendly while saving energy by automatically turning it on or off when needed. The integration of an ESP8266 Wi-Fi module allows for remote monitoring and control via the Blynk app, promoting energy conservation and providing real-time updates. Furthermore, the motion detection feature enhances security by preventing unauthorized access. This smart lighting control system integrates seamlessly with IoT platforms, making it an excellent choice for modern homes that prioritize safety, efficiency, and convenience.

COMMERCIALIZATION POTENTIAL

This project is significant due to the growing demand for home automation and energy-efficient solutions. It can be marketed to homeowners, businesses, and security-conscious consumers who seek a safer and more convenient way to control lighting. Its hands-free operation, energy conservation features, and remote monitoring via the ESP8266 Wi-Fi module make it an excellent choice in the expanding IoT market. Additionally, its security features, such as motion detection, address the increasing demand for home automation systems that prioritize both safety and efficiency, positioning the product for strong growth in the smart home and security markets.

CONCLUSION

In conclusion, the 240V 50Hz AC Lamp Touch Sensor, Sound Sensor, Motion Sensor, and Remote Switching System for bedroom use successfully integrates modern technology to improve security, energy efficiency, and convenience. The system utilizes touch, sound, and motion sensors for hands-free operation, reducing the risk of electric shocks and promoting energy conservation by only using power when needed. The addition of a Wi-Fi module through the ESP8266 enables remote control and monitoring, increasing user convenience and flexibility. Additionally, the motion sensor enhances security by detecting unauthorized movement, while the sound sensor allows for easy on/off operation via sound cues like claps. This project effectively enhances user safety and quality of life by creating a more intuitive, responsive, and energy-efficient environment, making it an ideal solution for modern homes and businesses.

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Solar-Powered Temperature-Based Fan Speed Controller

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ABSTRACT

This technical report documents the design and simulation of a Solar-Powered Temperature-Based Fan Speed Controller utilizing Arduino-based sensors and actuators. The system includes an Ultrasonic Sensor, TMP36 Temperature Sensor, and a solar panel, complemented by a Liquid Crystal Display (LCD) for real-time data display. The system features a photovoltaic (PV) panel to capture solar energy, which powers a microcontroller which brain of this project. The fan's working is managed by an integrated switch, which makes sure the fan doesn't turn on unless the switch is turn on. Additionally, the fan will only turn on when the Ultrasonic Sensor detects movement within its range. An L293D motor driver, which allows for accurate motor control, is used to manage the fan's speed. The output of the system depends on the variable fan speed, which dynamically adjusts in response to temperature changes. Using the Tinkercad simulation platform, the Arduino microcontroller processes temperature data and adjusts fan speed to maintain a consistent temperature environment. Responsive components, including LEDs that activate when the Ultrasonic Sensor detects motion in it range, enhance functionality. The LCD displays real-time temperature readings and fan speed status.

KEYWORDS: Liquid Crystal Display (LCD), Ultrasonic Sensor, fan speed, photovoltaic (PV) panel, Arduino microcontroller

PRODUCT DESCRIPTION

The Solar-Powered Temperature-Based Fan Speed Controller is an eco-friendly and intelligent cooling solution powered by a solar panel that charges a battery, enabling renewable energy use. Controlled by an Arduino microcontroller, the fan activates when motion is detected by an ultrasonic sensor, provided the switch is turned on, and its speed adjusts based on ambient temperature measured by a TMP36 sensor. An LED indicates motion detection, while an LCD displays the fan's speed and surrounding temperature. The system includes a battery fuel gauge to show the percentage of solar charge, ensuring efficient energy monitoring.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

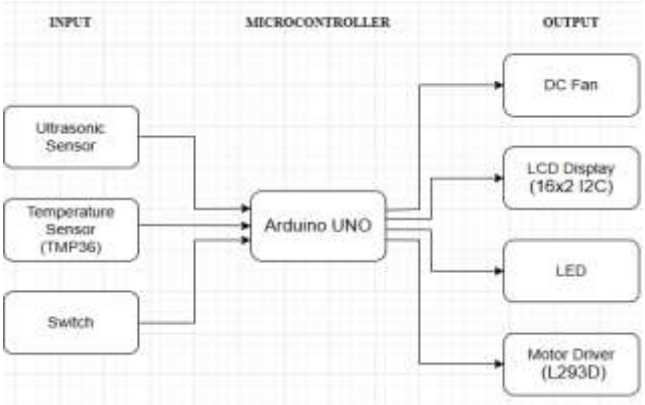


Figure 1: Block Diagram

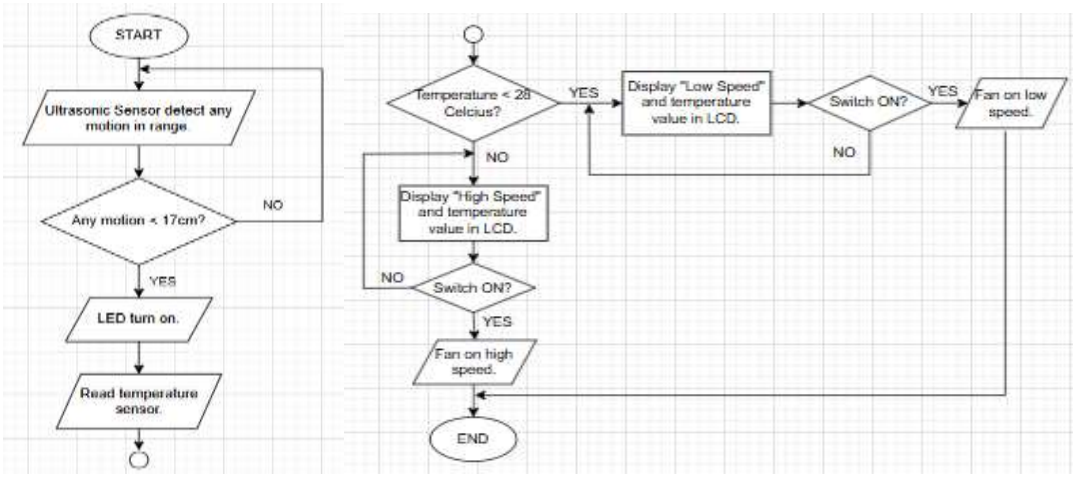


Figure 2: Flowchart

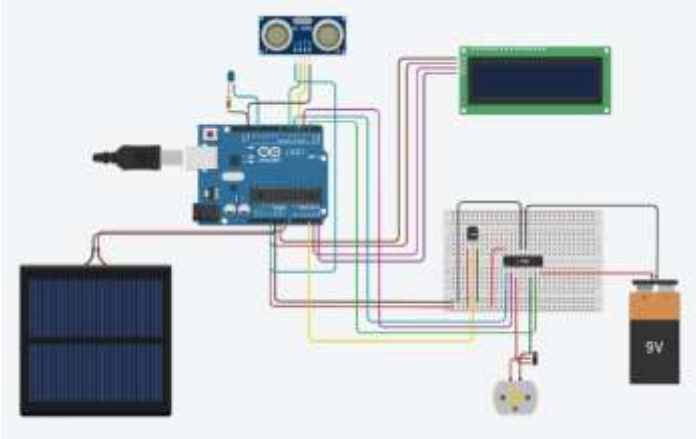


Figure 3: Schematic Diagram

NOVELTY AND UNIQUENESS

The Solar-Powered Temperature-Based Fan Speed Controller stands out due to its innovative combination of renewable energy utilization, automation, and user-centric design. Its novelty lies in the integration of a solar charging system with intelligent fan control, providing a sustainable and self-sufficient cooling solution. The project uniquely combines a motion-detecting ultrasonic sensor with temperature-based fan speed regulation, ensuring efficient operation only when needed. Additionally, the inclusion of a battery fuel gauge for real-time solar charging insights and customizable 3D-printed housing enhances its practicality and aesthetic appeal.

BENEFIT TO MANKIND

The Solar-Powered Temperature-Based Fan Speed Controller promotes energy efficiency and environmental sustainability by applying renewable solar energy to power a smart fan system. It provides an affordable and portable cooling solution, particularly beneficial in areas with limited access to electricity. By adjusting fan speed based on temperature and motion, it minimizes energy waste, contributing to reduced carbon footprints and promoting green living. The system's compact design and automation enhance convenience, making it a practical solution for households, workplaces, and outdoor applications. It provides an affordable and portable cooling solution, particularly beneficial in areas with limited access to electricity. By adjusting fan speed based on temperature and motion, it minimizes energy waste, contributing to reduced carbon footprints and promoting green living. The system's compact design and automation enhance convenience, making it a practical solution for households, workplaces, and outdoor applications.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Temperature-Based Fan Speed Controller has a great chance of becoming a commercial product in markets that prioritise energy-efficient and environmentally friendly technology. Customers who care about the environment, especially in areas with lots of warm temperatures, are drawn to it because of its cost and adaptability, which make it ideal for outdoor applications, household cooling, and instructional packages for automation and renewable energy. It can be customised to meet a variety of practical and aesthetic needs according to its adaptable 3D-printed housings, giving it a competitive edge in consumer goods customisation. Mass manufacturing and collaborations with producers of smart home appliances or renewable energy projects might help achieve stability.

CONCLUSION

The Solar-Powered Temperature-Based Fan Speed Controller is a sustainable, intelligent cooling solution that effectively combines renewable energy and automation. By adjusting fan usage according to temperature and motion, it meets the increasing need for energy-efficient gadgets while maintaining convenience with its small size and informative displays. This initiative offers great promise for future development and wide adoption, and it is a first step towards sustainable technological innovation with the ability to benefit both people and the environment.

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Sensor-Driven Fan: Optimizing Comfort and Efficiency with Motion, Infrared, and Power Management Technology

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ABSTRACT

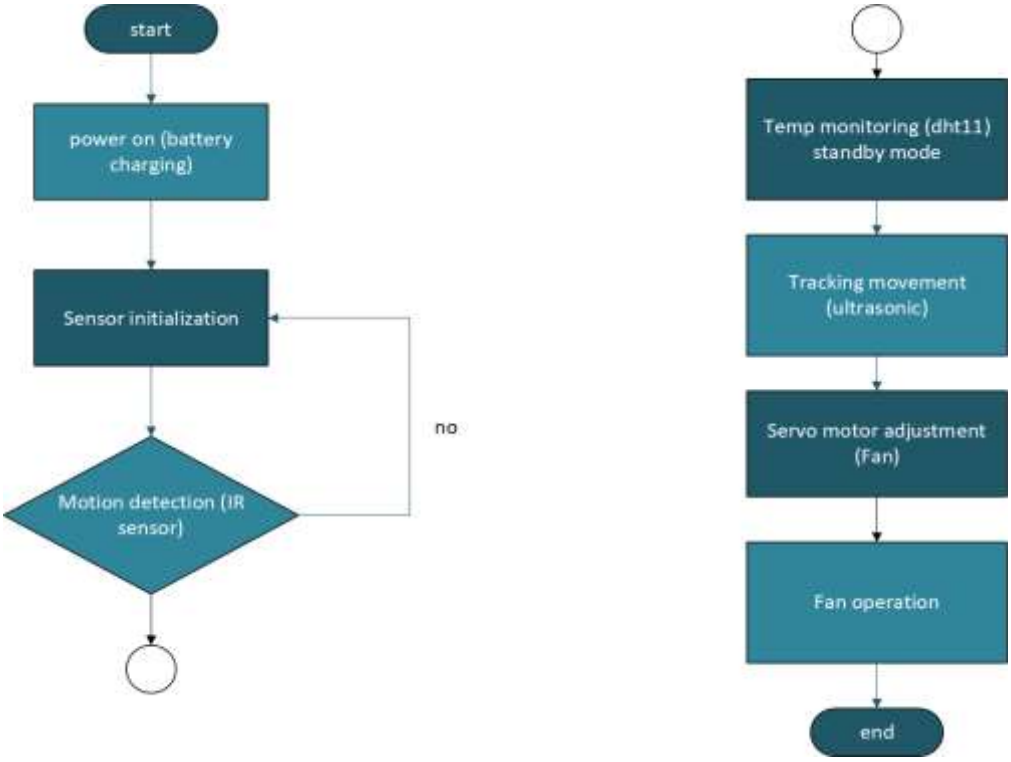
This project introduces an innovative, enhanced fan system designed to provide intelligent cooling functionality using advanced sensor integration and lithium battery power. The fan incorporates multiple sensors, including an infrared (IR) sensor for motion detection, ultrasonic sensors for precise movement tracking, and a DHT11 sensor to monitor ambient temperature. These components enable the fan to dynamically respond to environmental conditions and user presence. Servo motors are employed to adjust the fan's direction, allowing it to follow the movement of individuals in its range, ensuring targeted airflow. The fan is powered by rechargeable lithium-ion batteries, providing portability and convenience. A battery management system, including a battery indicator and multi-cell LiPo charger, ensures safe and efficient operation. This system exemplifies the synergy between comfort, energy efficiency, and modern technology, presenting a versatile cooling solution for various applications.

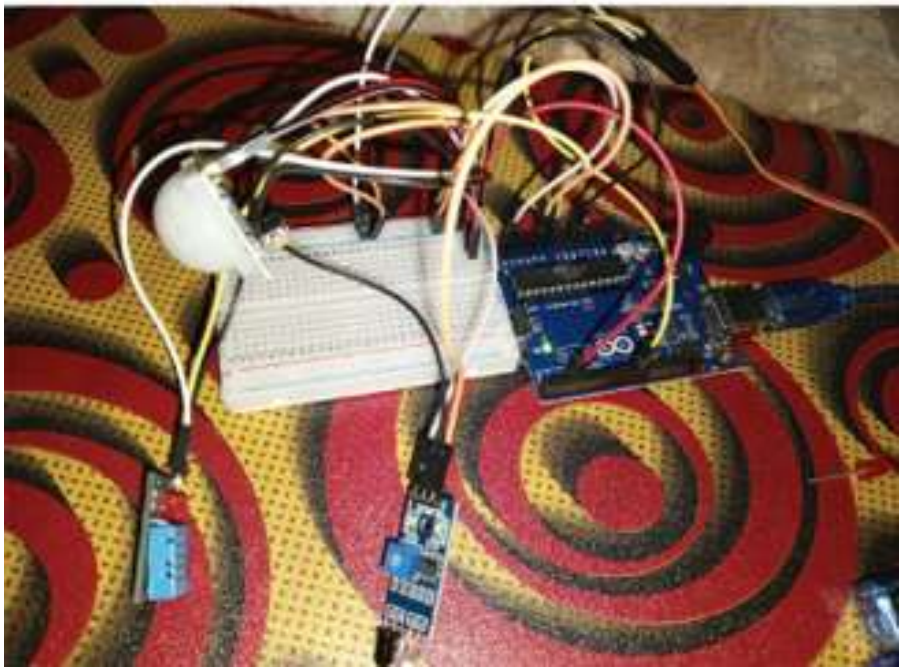
KEYWORDS: advanced, movement tracking, rechargeable

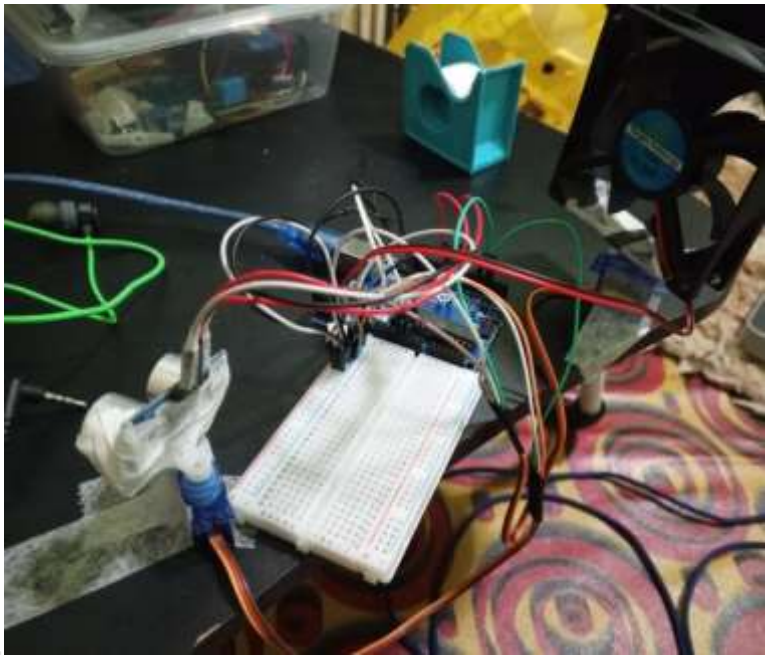
PRODUCT DESCRIPTION

Introducing the **SmartTrack Portable Fan**, an innovative cooling solution designed to enhance comfort and efficiency in any environment. This intelligent fan combines advanced sensor technology and portability to create a user-focused experience. The SmartTrack Portable Fan features built-in motion detection via an IR sensor and movement tracking using ultrasonic sensors. These capabilities allow the fan to follow user movement seamlessly, ensuring consistent, targeted airflow. An integrated DHT11 temperature sensor enables automatic fan speed adjustment based on the surrounding temperature, providing optimal cooling with energy efficiency. Powered by rechargeable lithium-ion batteries, the fan offers portability without sacrificing performance. The batteries are supported by a robust multi-cell LiPo charging system and a battery level indicator, ensuring safe and hassle-free operation. Dual servo motors allow the fan to tilt and rotate smoothly, adapting to changing user positions. Compact, versatile, and smart, the SmartTrack Portable Fan is perfect for home, office, or outdoor use. It delivers a customized cooling experience with the added convenience of eco-friendly, rechargeable power

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS







NOVELTY AND UNIQUENESS

This project is novel because it combines several cutting-edge sensors, such as an infrared sensor for motion detection, ultrasonic sensors for precise tracking, and a DHT11 sensor for temperature regulation, all of which combine to produce an intelligent and responsive fan system. In contrast to conventional fans, this system can automatically modify its cooling power and direction in response to changes in the surrounding environment and user movement in real time. It is portable and energy-efficient thanks to its rechargeable lithium-ion battery power, and its battery management system guarantees secure and efficient operation. The fan system is exceptionally adaptable and creative due to its clever functionality and energy efficiency.

BENEFIT TO MANKIND

Through the provision of a more individualized and effective cooling solution, this project offers humanity substantial benefits. Utilizing motion and temperature sensors, the fan optimizes comfort while preserving energy by modifying its direction and speed in response to the user's presence and ambient temperature. It is environmentally friendly and portable thanks to the rechargeable lithium-ion battery, which also lessens the need for continuous power consumption from outlets. This clever, energy-efficient fan enhances comfort and encourages sustainability in a variety of settings, including homes and workplaces.

COMMERCIALIZATION POTENTIAL

This improved fan system has a great deal of commercialization potential because it provides a special blend of energy efficiency and clever features. It can be marketed to a variety of markets, including homes, workplaces, and outdoor activities, thanks to its motion detection, temperature control, and portable design. Rechargeable lithium-ion battery use adds value by being both economical and environmentally beneficial over time. Additionally, this fan is positioned as a promising product in the market, appealing to both tech-savvy and environmentally conscious buyers due to the growing demand for smart home devices and energy-efficient appliances.

CONCLUSION

To sum up, this improved fan system shows how cutting-edge sensors and lithium-ion battery technology can be successfully combined to produce a clever, effective, and portable cooling solution. The system adjusts to changes in the environment and user movement through the use of motion detection, temperature control, and precise airflow management. Sustainability and secure operation are guaranteed by the use of rechargeable batteries and a battery management system. This project not only provides a more customized and efficient cooling experience, but it also serves as an example of how contemporary technology can be combined to enhance commonplace devices for increased efficiency and comfort.

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Home Automation and Energy Efficiency System

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ABSTRACT

The "Home Automation and Energy Efficiency System" project is a prototype that aims to enhance household management by integrating renewable energy sources with Internet of Things (IoT) technology. The system automates and optimizes household utility control such as lighting, HVAC, and appliances using a microcontroller and a variety of sensors, including motion sensors, temperature and humidity sensors, and light sensors. The project shows considerable convenience and energy efficiency improvements, contributing to environmental sustainability. The IoT platform provides remote monitoring and control, allowing users to operate their home systems from anywhere via a smartphone application. This capability, together with real-time data processing and monitoring, ensures energy savings and user comfort by automatically controlling equipment based on occupancy and surroundings. The results of this project demonstrate its ability to reduce energy usage and promote sustainable living practices.

KEYWORDS: Home Automation, IoT, Smart Home, sensors, microcontroller.

PRODUCT DESCRIPTION

The process of developing a Home Automation and Energy Efficiency System requires some steps, including system design, component implementation, and programming. The system runs on solar power which is renewable energy. The Arduino microcontroller is used as the primary control unit in this project, connected with inputs including the BH1750 light sensor, DHT22 temperature and humidity sensors, and VL53LOX motion sensors. The objective of the system is to increase efficiency by automating the control of appliances, ventilation, and lighting in the house and by using sustainable energy that is solar energy. Input from the sensors is processed by the microcontroller and connected to the Blynk IoT platform to enable remote monitoring and control via a smartphone application.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

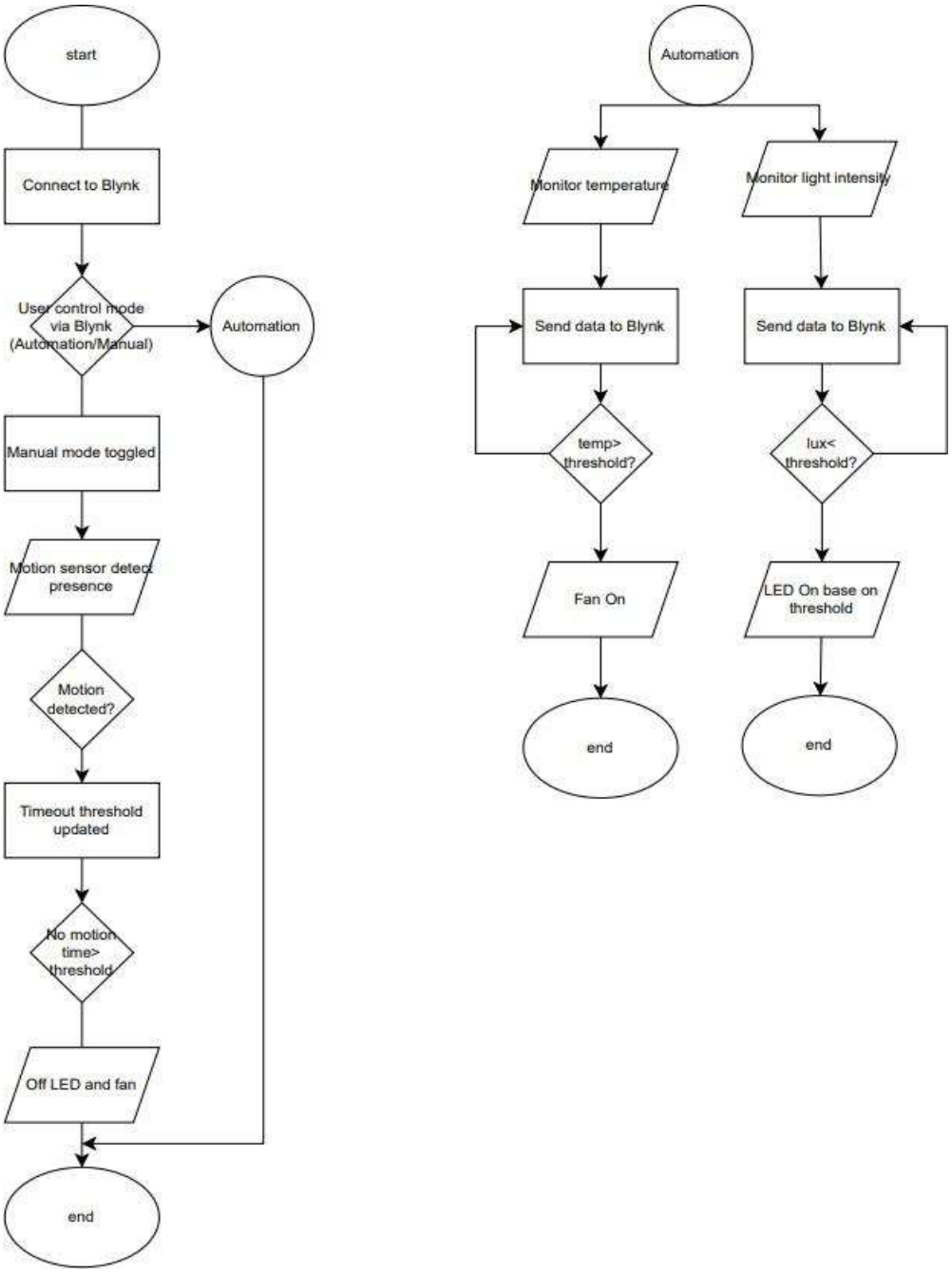


Figure 1: Flowchart of the system

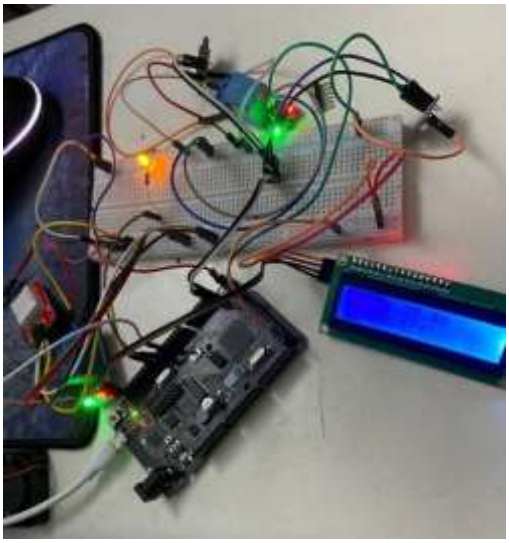


Figure 2: Project development and testing

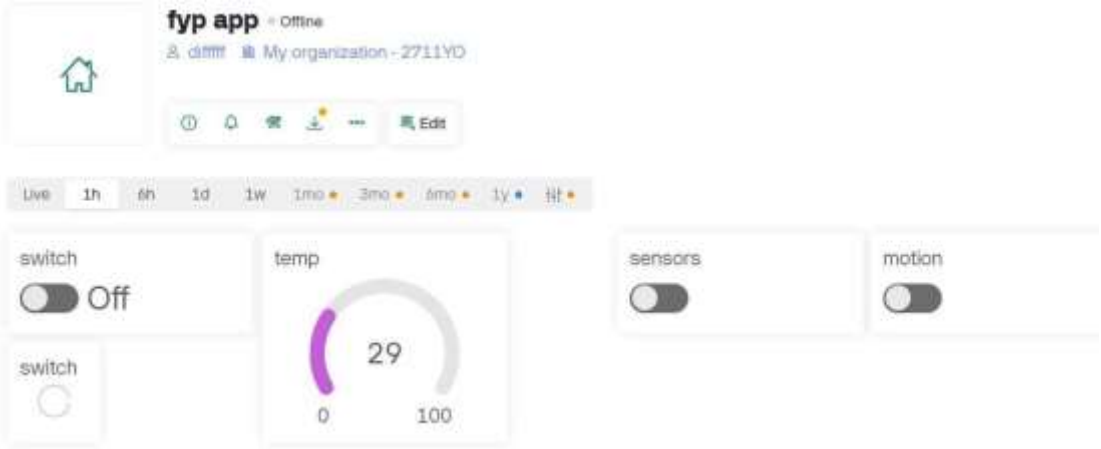


Figure 3: Blynk dashboard

NOVELTY AND UNIQUENESS

This project stands out because it combines IoT technology with sensor-based automation, giving users a customizable smart home solution. Unlike conventional systems, this system allows users to switch between automated control (using temperature and light sensors) and manual motion detection via the Blynk IoT platform. The system provides real-time data such as light intensity and temperature for monitoring from the sensors. These readings are simultaneously transmitted to the Blynk app on users' smartphones. The ability to remotely control these systems using the Blynk app offers flexibility. Users can switch between automation and manual operation, making this system practical and adaptable.

BENEFIT TO MANKIND

This project has significant benefits for humanity by promoting sustainability, energy efficiency, convenience, and smart control for everyday appliances. By integrating a solar-powered system, it reduces reliance on non-renewable energy sources, contributing to a cleaner environment while lowering electricity costs. Automating devices such as fans and lights based on environmental conditions, reduces unnecessary energy consumption, resulting in lower electricity bills and a more sustainable environment. The ability to control automation remotely via Blynk ensures that users have control even when they are away from home, improving convenience and safety. For example, users can turn on automated lighting control at work or disable motion-based systems while traveling.

COMMERCIALIZATION POTENTIAL

The project has enormous commercialization potential in the fast-growing smart home and IoT markets around the world. Its ability to integrate sensor-based automation with manual IoT control interests both residential and commercial users looking for energy- efficient, customizable solutions. By providing remote access via IoT, the system appeals to tech-savvy customers who value convenience and energy efficiency. With minor changes, this project could be expanded to include voice control, for example, Google Assistant and Alexa, power consumption tracking, and integration with larger home automation ecosystems.

CONCLUSION

Home automation and energy efficiency system is a prototype that demonstrates the combination of renewable energy and automation systems, resulting in a sustainable and intelligent solution for modern living. By utilizing real-time data monitoring and user- defined controls, the system ensures energy efficiency while providing convenience and adaptability. Its adaptability and potential for expansion make it a promising step towards addressing global issues like energy conservation and resource management. With its innovative design and practical applications, the project displays the role of technology in creating a smarter, more environmentally friendly future.

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Automatic Water Controller with Solar System

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ABSTRACT

Automatic Water Controller with Solar System" is the project to automate the process of monitoring and managing water levels in tanks or reservoirs, thus preventing overflow and ensuring efficient water usage. The system employs a water level sensor to continuously measure the water level and send the data to the Arduino Uno as a microcontroller. When the water reaches a predetermined threshold, the Arduino can control a pump or valve to maintain the desired water level. After that, if the water level sensor has an error or don't have the water supply the pump or valve will automatically turn off and the buzzer will turn on to make the user alert and troubleshoot the problem on the system. This solution is cost-effective, easy to implement, and offers a reliable method for water management in various applications, including residential, agricultural, and industrial settings.

KEYWORDS: Automatic water controller, microcontroller, water monitoring

PRODUCT DESCRIPTION

The process of Automatic Water Controller with Solar System requires some steps, including system design, component implementation and programming. The system runs on solar power which is renewable energy. The Arduino microcontroller is used as the primary control unit in this project, connected with input such as water level sensor. To design an automatic water pump controller system for managing the inlet and outlet of fixed container.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

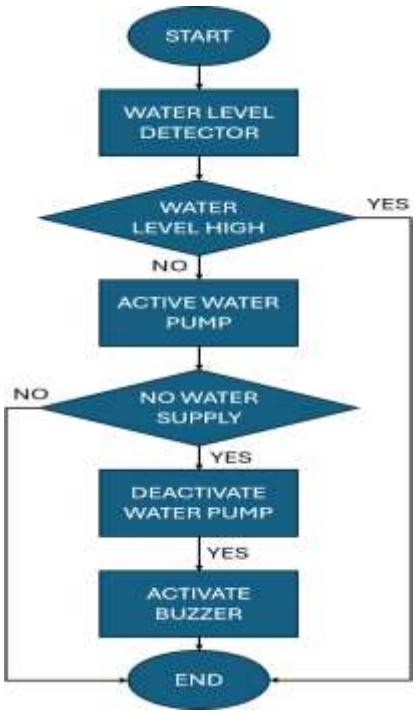


Figure 1: Flowchart of the system

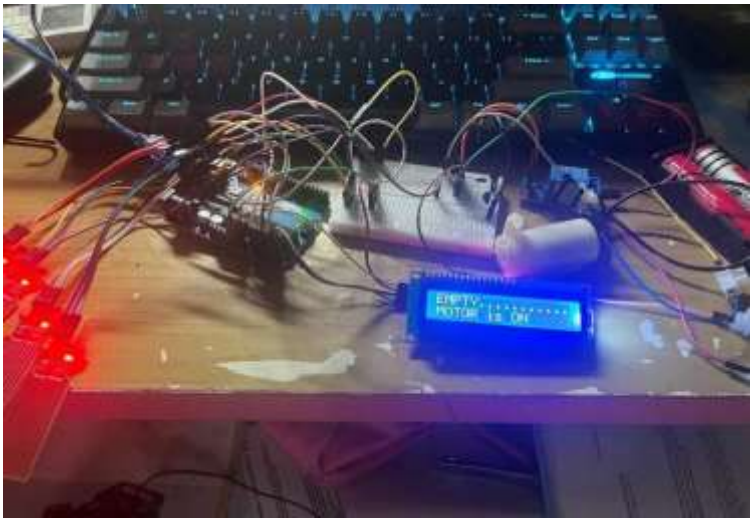


Figure 2: Project development and testing

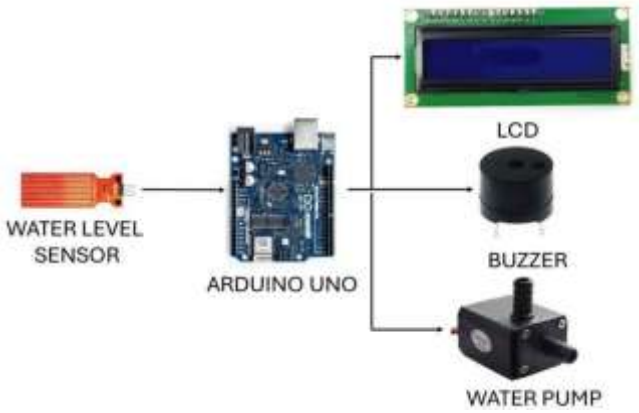


Figure 3: Project Block Diagram

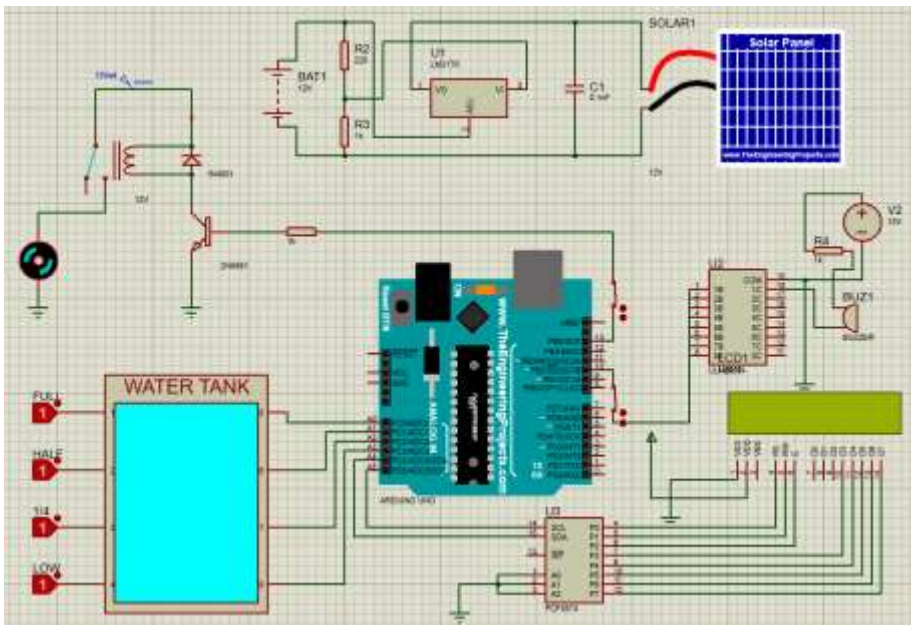


Figure 4: Project Schematic Diagram

NOVELTY AND UNIQUENESS

This project stands out because it uses a solar system as a renewable energy with water level sensor to monitor water level, Unlike conventional systems, this systems allows users to monitor turn on and off automatically using water level sensor

BENEFIT TO MANKIND

Automatic water controllers use a water level sensor to monitor which offers transformative benefits to humanity by energy efficiency, and convenience. By integrating a solar-powered system, it reduces reliance on non-renewable energy sources, contributing to a cleaner environment while lowering electricity cost. Automating devices such as motor for water pumps can reduces unnecessary energy consumption, resulting in lower electricity bills and a more sustainable environment.

COMMERCIALIZATION POTENTIAL

The project has enormous commercialization potential in renewable energy and water management and automation market. The key markets include industrial applications, Industries that require consistent water supply for cooling, processing, or other operations can use solar-powered automatic controllers to automate water management and reduce operational costs, and residential and rural areas, Solar-powered water controllers help manage water levels in tanks, ensuring uninterrupted supply without high electricity costs. Opportunities also exist in occupational safety, contributing to the system that will automatically turn off the motor if don't have water supply, the motor will not be damaged.

CONCLUSION

The Automatic Water Controller with Solar System provides a creative and environmentally friendly way to effectively control tank or reservoir water levels. For household, agricultural, and industrial applications particularly in places with unstable electricity, the system offers an affordable, environmentally responsible substitute by automating water control and using solar power. In addition to meeting the increasing demand for effective water management, this project promotes environmental sustainability and energy conservation. It is a useful tool for enhancing water conservation and encouraging the use of renewable energy sources in both urban and rural areas due to its adaptability and simplicity of usage.

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Home Electricity Energy Meter Monitoring System

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The Home Electricity Energy Meter Monitoring System is an innovative solution designed to provide real-time monitoring of energy consumption in residential settings. This system employs advanced sensing technologies, including voltage and current sensors, integrated with an ESP32 microcontroller to process data and display metrics such as voltage, current, power consumption, and temperature. A local OLED screen provides immediate visualization, while a mobile application powered by the Blynk platform enables remote monitoring. Additional features include LED indicators for alerts and a servo motor for temperature control. The system promotes energy efficiency by providing users with actionable insights into their consumption patterns, helping reduce wastage and costs. Designed with user convenience in mind, it supports remote access and real-time alerts, ensuring a seamless experience. This system is a step forward in residential energy management, empowering users to adopt more sustainable energy practices and contribute to environmental conservation.

KEYWORDS: Energy Monitoring, Smart Meter, ESP32, IoT, Energy Efficiency.

PRODUCT DESCRIPTION

The Home Electricity Energy Meter Monitoring System is a comprehensive device engineered to track and analyze energy consumption in real-time. Leveraging state-of- the-art sensors like ACS712 for current and ZMPT101B for voltage, the system measures electrical parameters with high precision. An ESP32 microcontroller processes the data, displaying it locally on an OLED screen and remotely via the Blynk app. The system's unique feature set includes automatic temperature control using a servo motor and LED indicators for threshold alerts. Designed for residential users, the device empowers homeowners to manage their energy usage effectively, reduce wastage, and minimize costs. Its IoT capabilities enable remote accessibility, ensuring convenience and efficiency in energy management.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

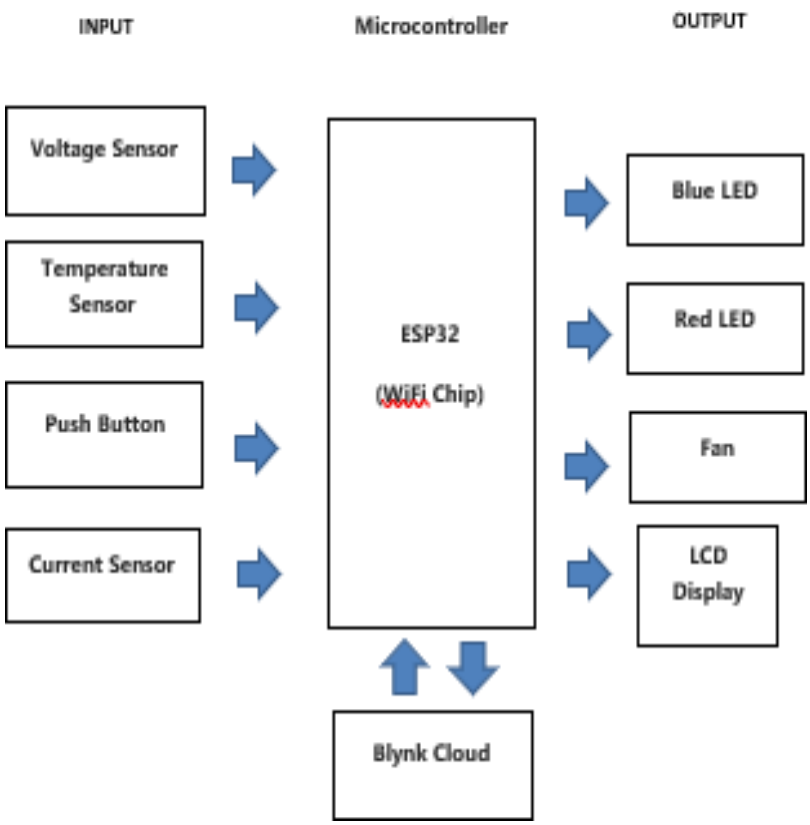
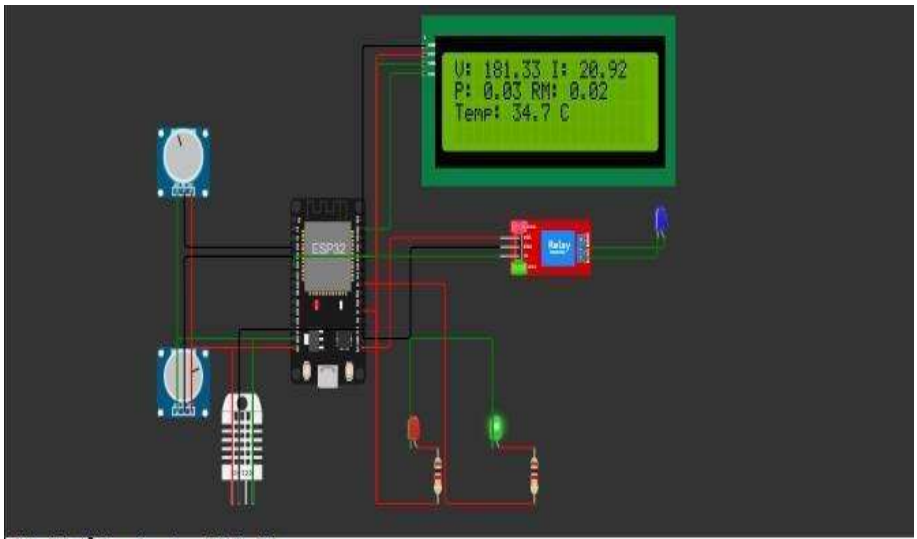


Figure 1: Block Diagram of the Home Electricity Energy Meter Monitoring System




```
34.70 °C, Cost: RM0.02
Voltage: 181.33 V, Current: 20.92 A, Power/H: 0.03 kWh, Temperature:
34.70 °C, Cost: RM0.02
Voltage: 181.33 V, Current: 20.92 A, Power/H: 0.03 kWh, Temperature:
34.70 °C, Cost: RM0.02
Voltage: 181.33 V, Current: 20.92 A, Power/H: 0.03 kWh, Temperature:
34.70 °C, Cost: RM0.03
```

Figure 2: Simulation Result of the Home Electricity Energy Meter Monitoring System

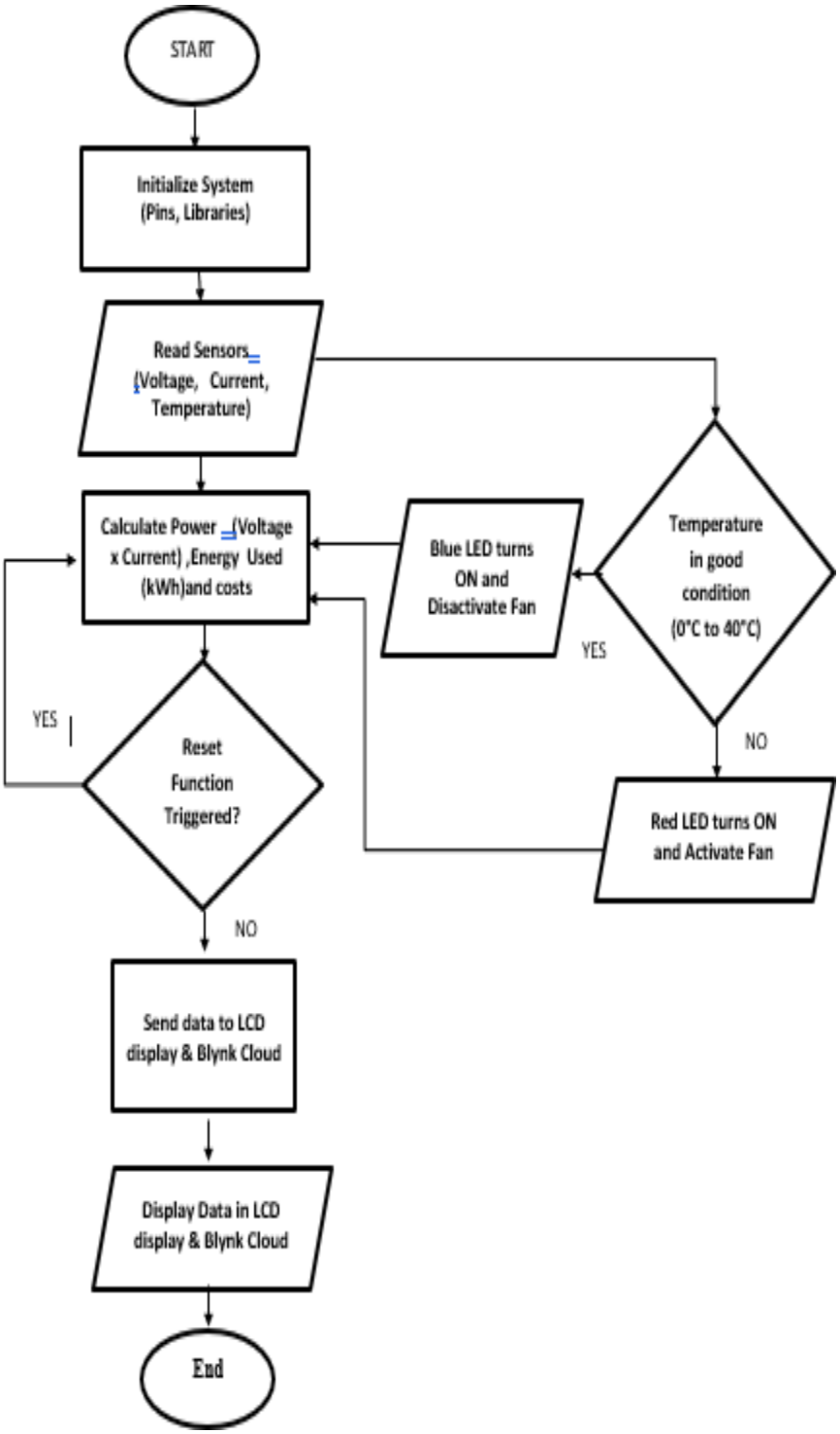


Figure 3: Flowchart of the Home Electricity Energy Meter Monitoring System

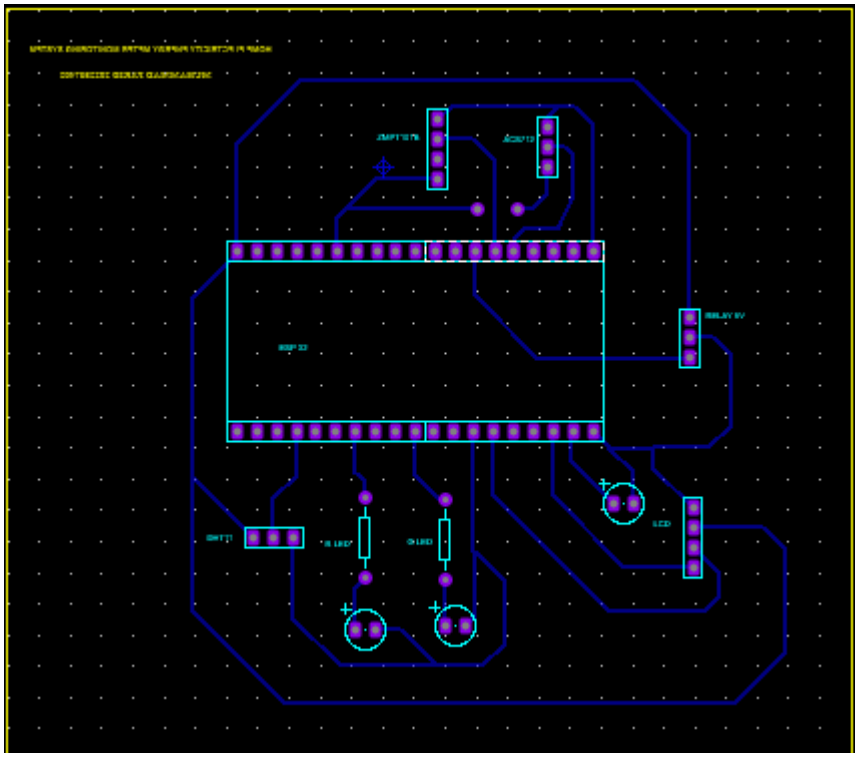


Figure 4: PCB Layout of the Home Electricity Energy Meter Monitoring System

NOVELTY AND UNIQUENESS

The Home Electricity Energy Meter Monitoring System stands out due to its integration of real-time data analytics and IoT functionalities in a compact and user-friendly design. Unlike conventional energy meters, this system not only tracks consumption but also provides actionable insights to users. Its advanced features, such as temperature-based control and remote accessibility, make it a versatile tool for energy management. The device's innovative use of IoT technology for mobile app integration enables users to monitor and control their energy usage from anywhere, setting it apart from traditional solutions.

BENEFIT TO MANKIND

This system contributes significantly to sustainable living by promoting energy conservation and efficiency. It empowers users to understand and optimize their energy consumption, leading to reduced electricity bills and a lower carbon footprint. By providing insights into energy usage patterns, the system supports informed decision- making and encourages responsible energy practices. Its role in temperature management also enhances comfort and safety, making it a valuable addition to modern homes.

COMMERCIALIZATION POTENTIAL

The Home Electricity Energy Meter Monitoring System is well-positioned for commercialization, targeting residential markets with a growing demand for smart home technologies. Key applications include real-time energy monitoring, cost reduction, and smart temperature control. Its compatibility with IoT ecosystems further expands its market potential, appealing to tech-savvy homeowners and sustainability-conscious consumers. With its user-centric design and advanced features, the system aligns with the increasing emphasis on energy-efficient solutions, paving the way for widespread adoption.

CONCLUSION

In conclusion, the Home Electricity Energy Meter Monitoring System represents a significant advancement in residential energy management. By integrating precision sensing, IoT connectivity, and user-friendly interfaces, it addresses key challenges in energy efficiency and sustainability. The system empowers users to make informed decisions about their energy consumption, resulting in cost savings and reduced environmental impact. Future enhancements could include the integration of renewable energy sources, AI-based analytics for predictive insights, and scalability for diverse applications. This project highlights the importance of innovation in promoting sustainable energy practices, paving the way for a smarter and more environmentally conscious future.

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Automatic Sun Tracking and Monitoring System Solar Panel

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ABSTRACT

The Automatic Sun Tracking and Monitoring System is an advanced solution designed to enhance solar energy collection and battery management. Utilizing LDR sensors to detect sunlight intensity, the system adjusts solar panels' horizontal and vertical angles via servo motors, maximizing energy absorption. An Arduino Uno R3 serves as the microcontroller, processing data from sensors with precision. Battery performance is monitored using voltage and current sensors, with LED indicators signalling charging status making red for active charging and green when fully charged. Real-time data visualization, including solar panel angles and battery metrics, are displayed on an LCD screen and accessible remotely via ESP32 IoT integration. Designed for residential and small-scale solar installations, this system empowers users to optimize energy efficiency and manage power consumption effectively. Its IoT capabilities allow for remote monitoring and control, ensuring a safe and user-friendly experience.

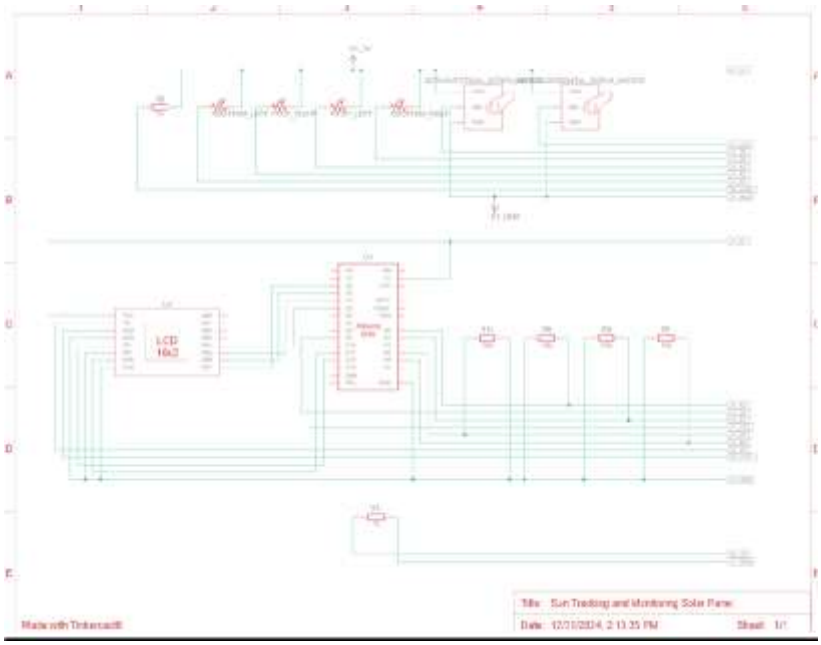
KEYWORDS: *Solar Panel, Automatic Sun Tracking, Battery Monitoring, Servo Motor Angle Tracking, Arduino Uno R3, Real-time Data Visualization, Wi-Fi Module, ESP32, Internet of Things (IoT).*

PRODUCT DESCRIPTION

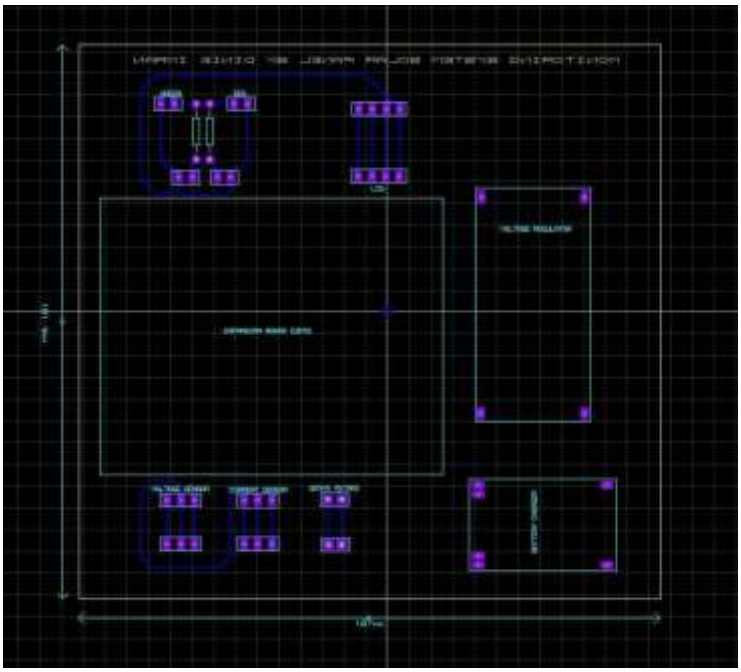
The solar energy collection is improved by automatic sun tracking and monitoring system which incorporates sunlight detection with four LDRs, and two-axis servo motors controlled by an Arduino Uno R3 for the most suitable position alignment of solar panels. It also has a way of tracking battery parameters, using voltage and current sensors(ACS712), LEDs displaying red when charging and green if fully charged. Real- time information of panel angles and battery measurements can be displayed on an LCD(I2C) and sent out for remote access via an ESP32 Wi-Fi module to IoT platforms in keeping with previous works fully highlighting the advantages of IoT in solar tracking systems. This is a scalable and efficient solution for home solar energy management, taking advantage of the most modern technologies maximally in terms of output and usability.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

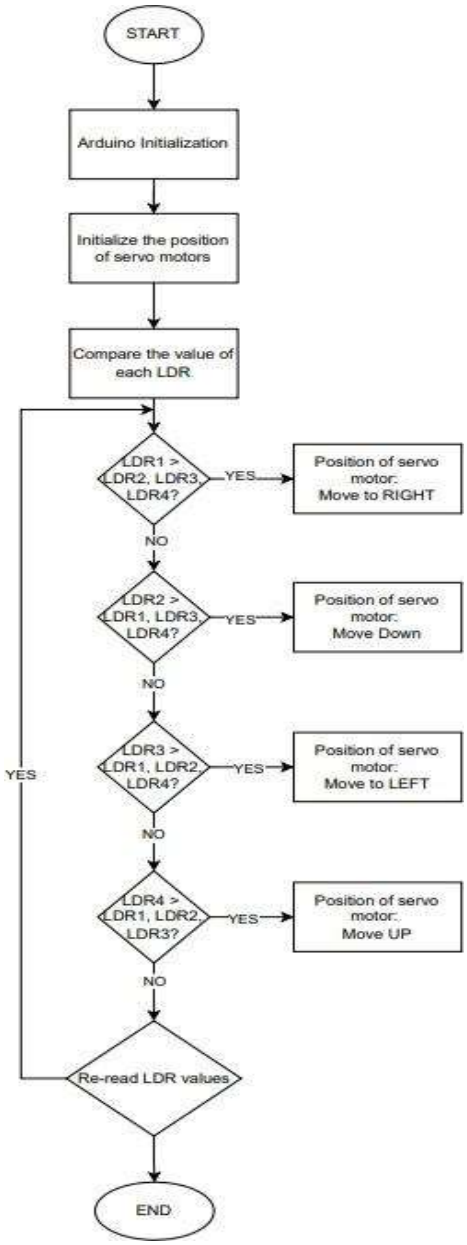
Schematic Diagram

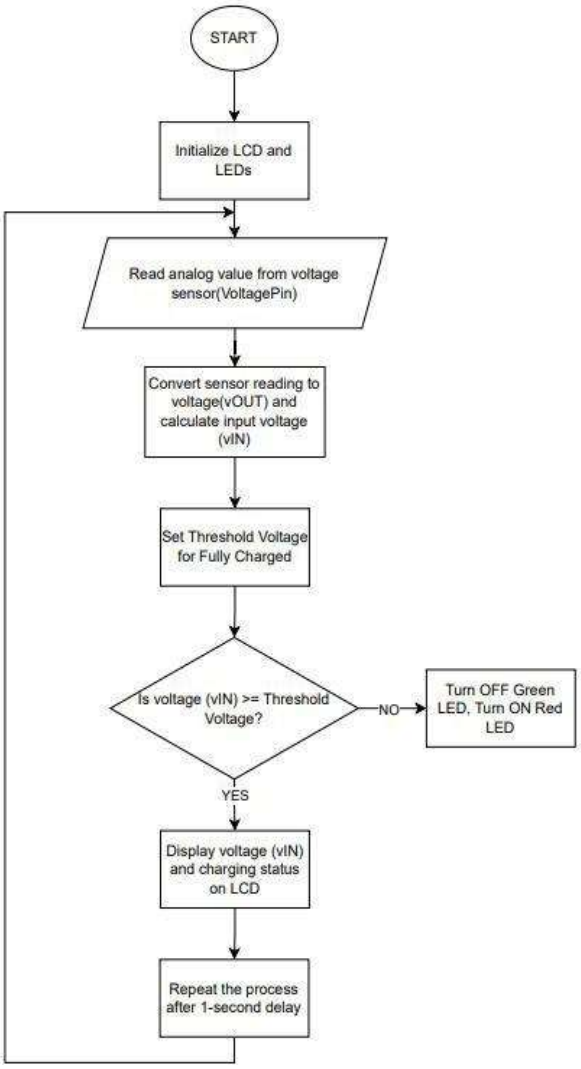


PCB Layout of the Monitoring System Solar Panel



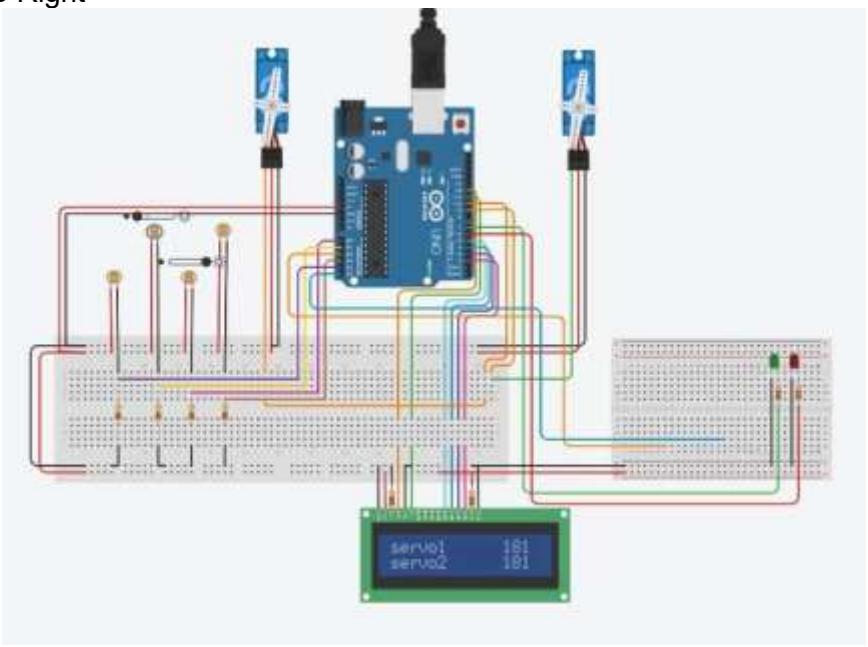
Flowchart


START
Arduino Initialization
Initialize the position of servo motors
Compare the value of each LDR
LDR1 > LDR2, LDR3, LDR4?
YES
Position of servo motor: Move to RIGHT
NO
LDR2 > LDR1, LDR3, LDR4?
YES
Position of servo motor: Move Down
NO
LDR3 > LDR1, LDR2, LDR4?
YES
Position of servo motor: Move to LEFT
NO
LDR4 > LDR1, LDR2, LDR3?
YES
Position of servo motor: Move UP
NO
Re-read LDR values
YES
END

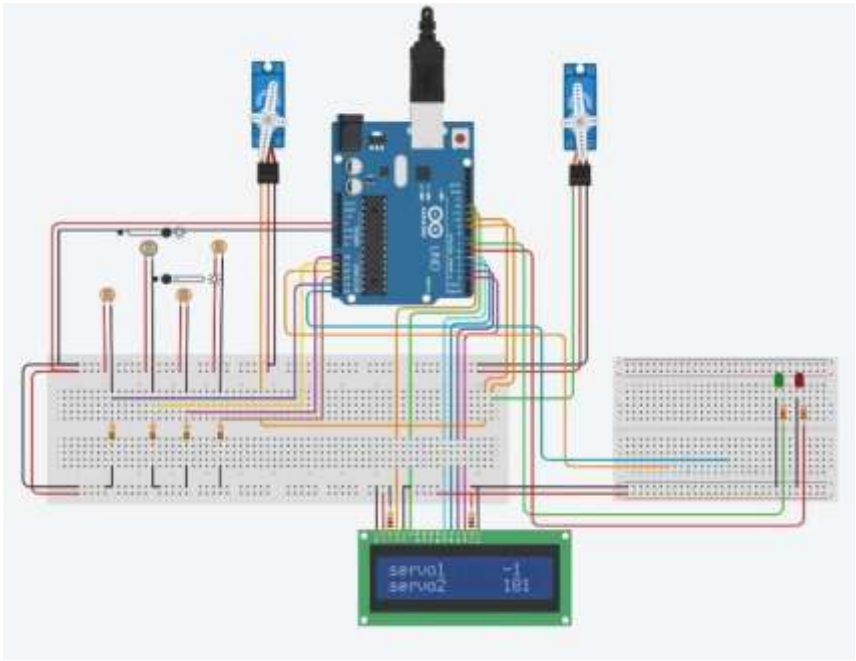

START
Initialize LCD and LEDs
Read analog value from voltage sensor(VoltagePin)
Convert sensor reading to voltage(vOUT) and calculate input voltage (vIN)
Set Threshold Voltage for Fully Charged
Is voltage (vIN) >= Threshold Voltage?
NO
Turn OFF Green LED, Turn ON Red LED
YES
Display voltage (vIN) and charging status on LCD
Repeat the process after 1-second delay

Sun Tracking System

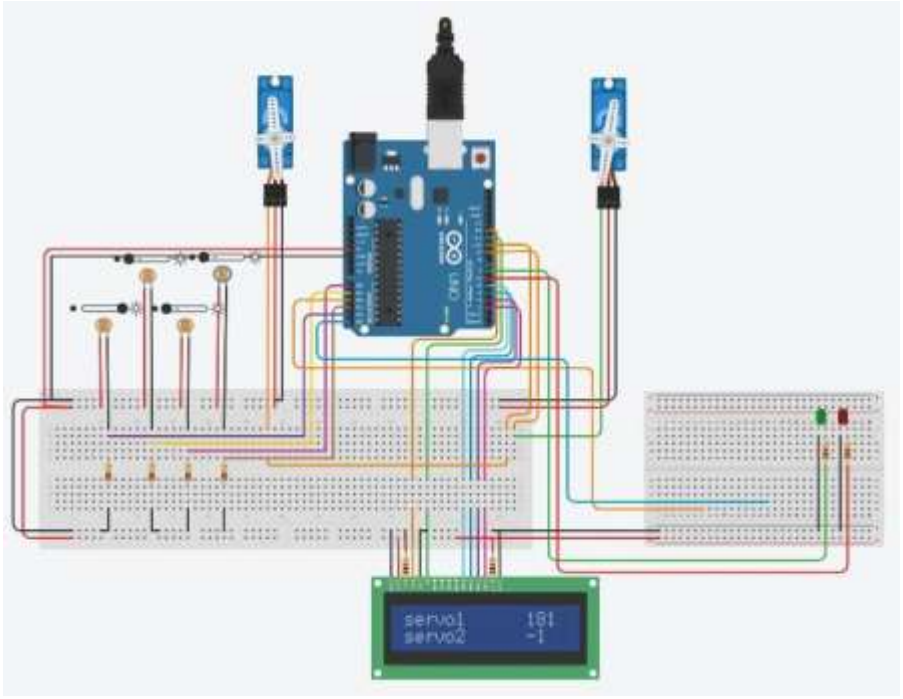
i. Condition 1 of Servo motors angle monitoring where it is adjusted for LDR is that is located on Top Right



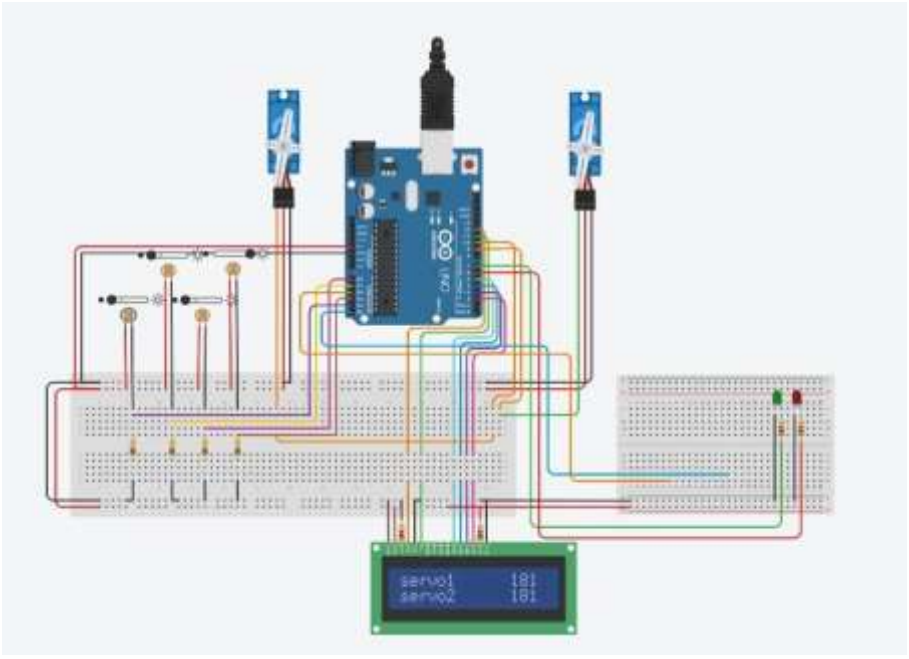
ii. Condition 2 of Servo motors angle monitoring where it is adjusted for LDR is that is located on Top Left



Condition 3 of Servo motors angle monitoring where it is adjusted for LDR is that is located on Bottom Left

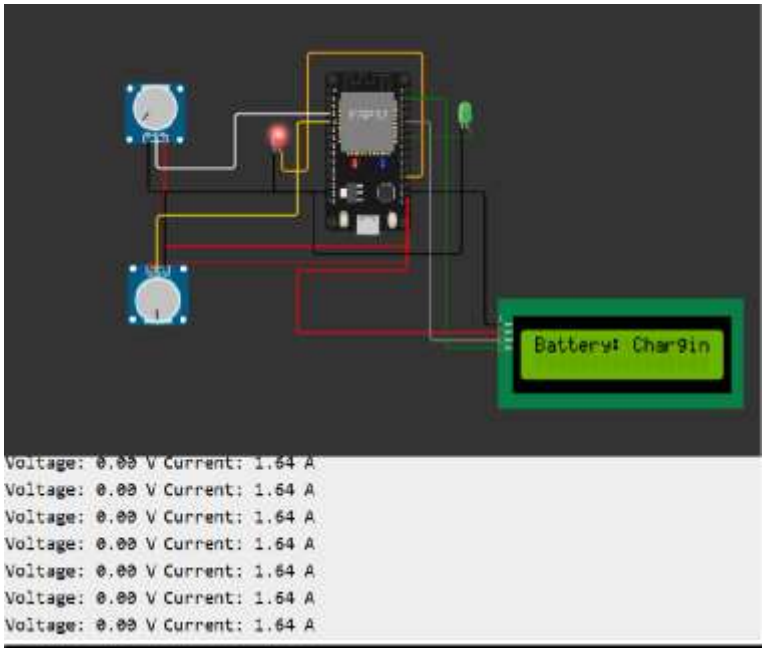


Condition 4 of Servo motors angle monitoring where it is adjusted for LDR is that is located on Bottom Right

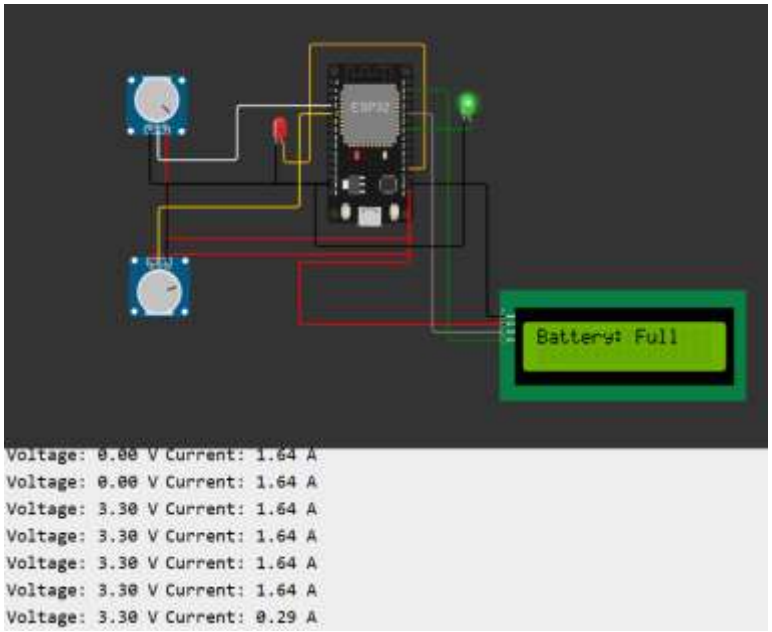


Monitoring System

i. Condition 1 of LED where the voltage sensor doesn't reach the threshold set indicate the battery haven't finished charging



ii. Condition 2 of LED where the voltage sensor reached the threshold set indicate the battery have finished charging



NOVELTY AND UNIQUENESS

The Automatic Sun Tracking and Monitoring System is distinguished by its seamless integration of dual-axis tracking, real-time battery monitoring, and IoT-enabled remote control. Unlike conventional solar tracking systems, this project uses voltage and current sensors to monitor battery performance, ensuring efficient energy management. The inclusion of an ESP32 Wi-Fi module enables users to monitor solar panel angles and charging status remotely via IoT platforms, inspired by the advancements in IoT- integrated solar systems. This innovative combination of precision tracking ensures optimized energy capture and sets it apart from traditional static or single axis tracking designs.

BENEFIT TO MANKIND

This system contributes to sustainable energy use by maximizing solar panel efficiency through continuous tracking of the sun. By ensuring optimal alignment and battery performance, it reduces reliance on fossil fuels and promotes renewable energy adoption. Remote monitoring capabilities via IoT platforms ensures users to track and control energy production conveniently, enhancing system usability. Furthermore, by optimizing battery usage and providing real-time updates, it encourages responsible energy management practices that align with global sustainability goals.

COMMERCIALIZATION POTENTIAL

The Automatic Sun Tracking and Monitoring System holds significant potential for commercialization, especially in residential and small-scale solar energy markets. Its ability to enhance energy output through dual-axis tracking and provide remote IoT- enabled monitoring appeals to tech-savvy and eco-conscious consumers. Applications include solar farms, residential rooftop systems, and remote off-grid setups. With growing emphasis on renewable energy and smart IoT solutions, this system aligns with market trends and is poised for widespread adoption as a cost-effective and user-friendly energy management tool.

CONCLUSION

The Automatic Sun Tracking and Monitoring System has successfully demonstrated its potential as an efficient and scalable solution for optimizing solar energy collection. By integrating dual-axis servo motor control, real-time battery monitoring, and IoT-based remote access via the ESP32 module, the system addresses the limitations of conventional static and single-axis tracking solutions. The usage of LDR sensors for sunlight detection and precise alignment, combined with voltage and current sensors for battery management, ensures optimal performance and sustainability. The IoT- enabled monitoring further allow users with physical insights, aligning with global sustainability goals and paving the way for responsible energy habit. This system's innovative design and capabilities make it an ideal choice for residential and small- scale solar installations, contributing to the advancement of renewable energy solutions and the transition towards a more sustainable future

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Solar Street Light Monitoring System

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ABSTRACT

This proposed system for monitoring solar streetlights is aimed at eliminating inefficiencies in running conventional streetlights through the built-in smart technologies. It focuses on light-dependent resistor (LDR) sensors that automate LED switching on according to the ambient light level, infrared (IR) sensors for motion detection, and solar photovoltaic (PV) systems for renewable energy utilization. The Wi-Fi-based remote monitoring and control guarantee efficient maintenance. This system allows energy saving with the amount of energy consumption reaching about 63.5% and makes it sustainable for lower operational costs. Embedded upon a combination of smart sensors, IoT, and renewable energy, this solution is mountable on heightened urban infrastructure efficiency.

KEYWORDS: Intelligent Street Lighting System, Solar Power, Remote Monitoring, IoT, Energy Efficiency.

PRODUCT DESCRIPTION

The Solar Street Light Monitoring System seeks to make controlled urban streetlights more efficient by installing smart technologies. The system comprises LDRs light detection sensors, IR sensors for movement detection, and a solar PV system. The ESP32 microcontroller controls the system and allows users to collect data in real-time via Blynk application. Maintaining its intelligent design, the application optimally adjusts the level of light depending on the need prevailing at that time, thereby enhancing safety and energy efficiency. Furthermore, the use of IoT technologies enables remote access to the system for monitoring and error diagnosis, thereby increasing the reliability and ease of maintenance of the device.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

I) Day/Night Cycle

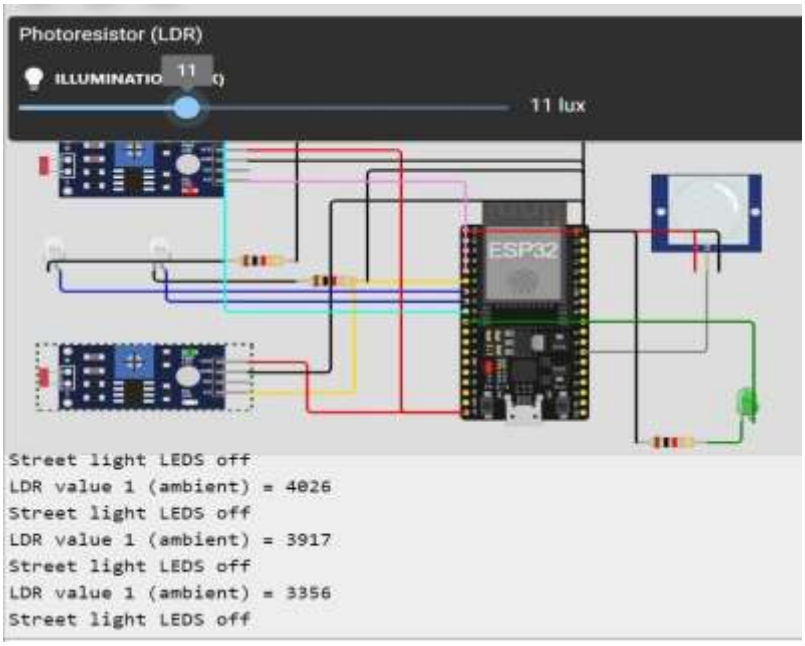


Figure 4.1: Simulation Result for Condition 1 of Day Time.

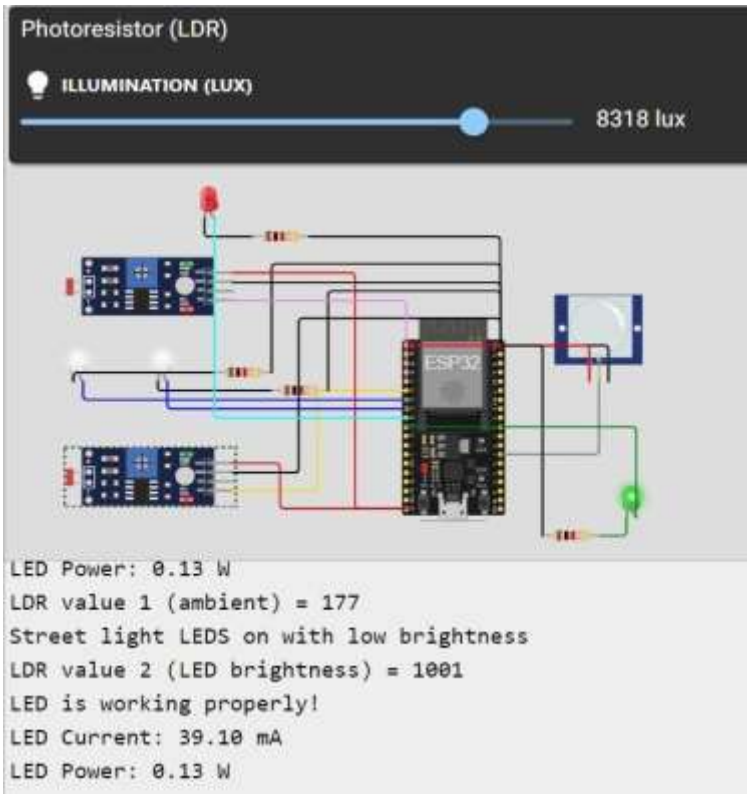


Figure 4.2: Simulation Result for Condition 2 of Nighttime.

II) Motion Detection

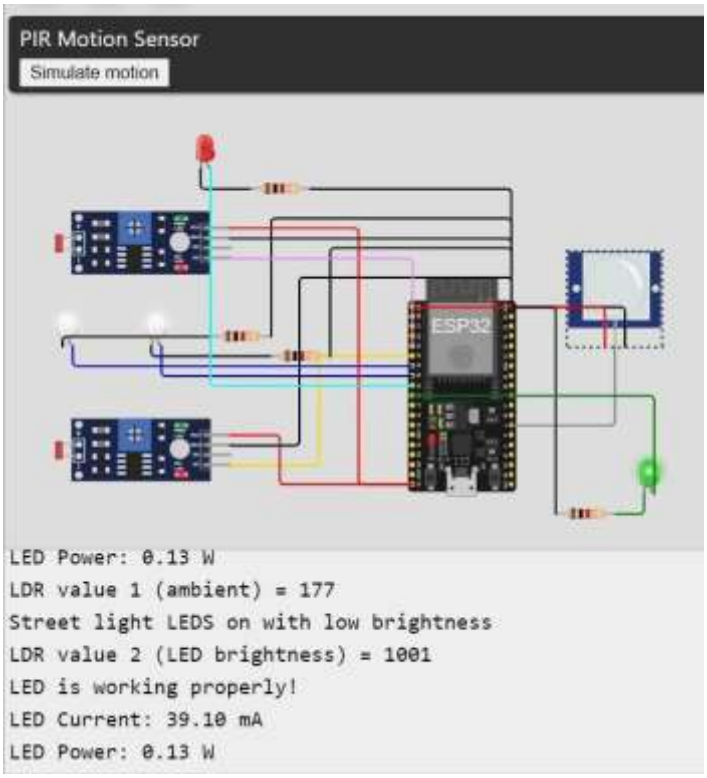


Figure 4.3: Simulation Result for Condition 1 of Motion Detection.

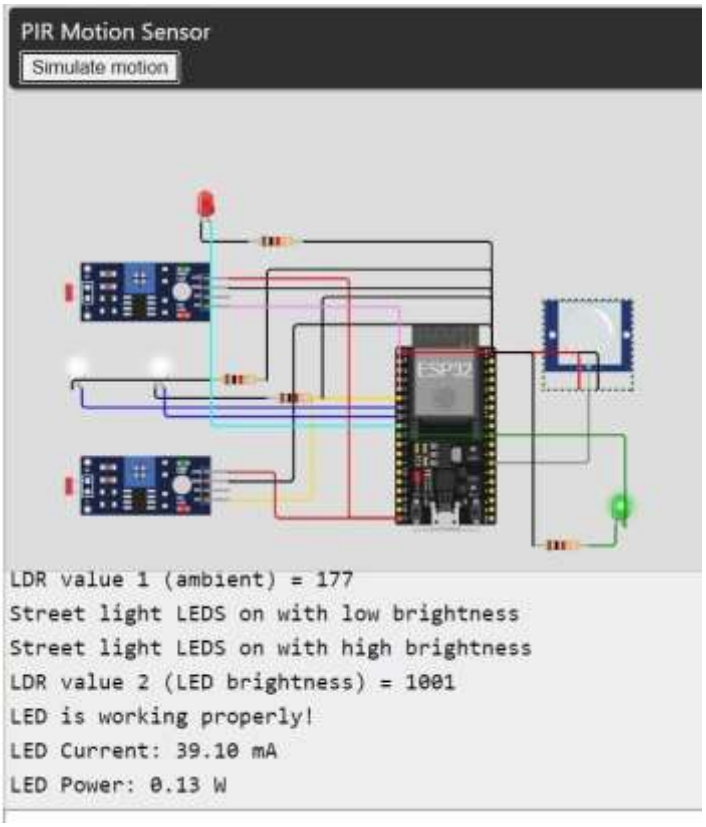


Figure 4.4: Simulation Result for Condition 2 of Motion Detection.

III) System Monitoring and Alerts

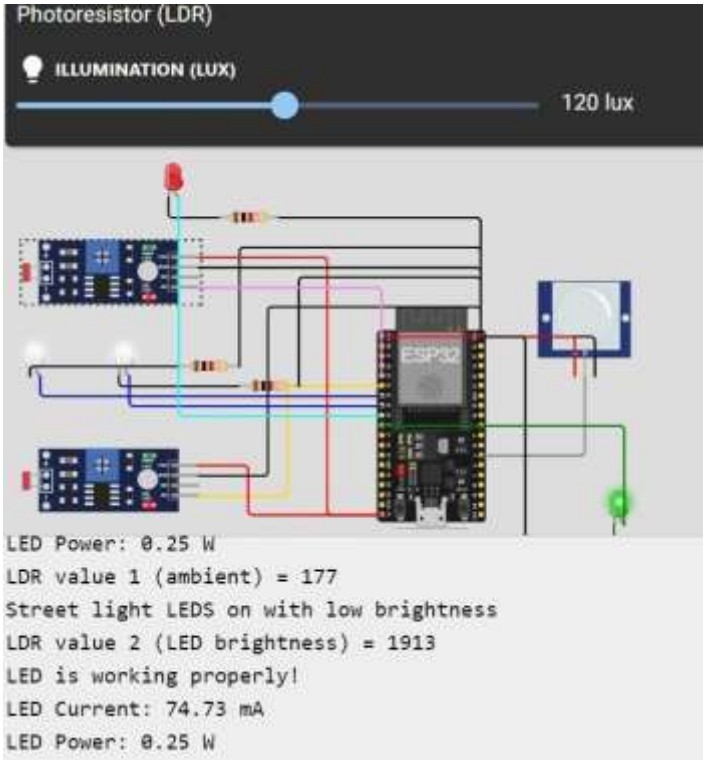


Figure 4.5: Simulation Result for Condition 1 of System Monitoring and Alerts

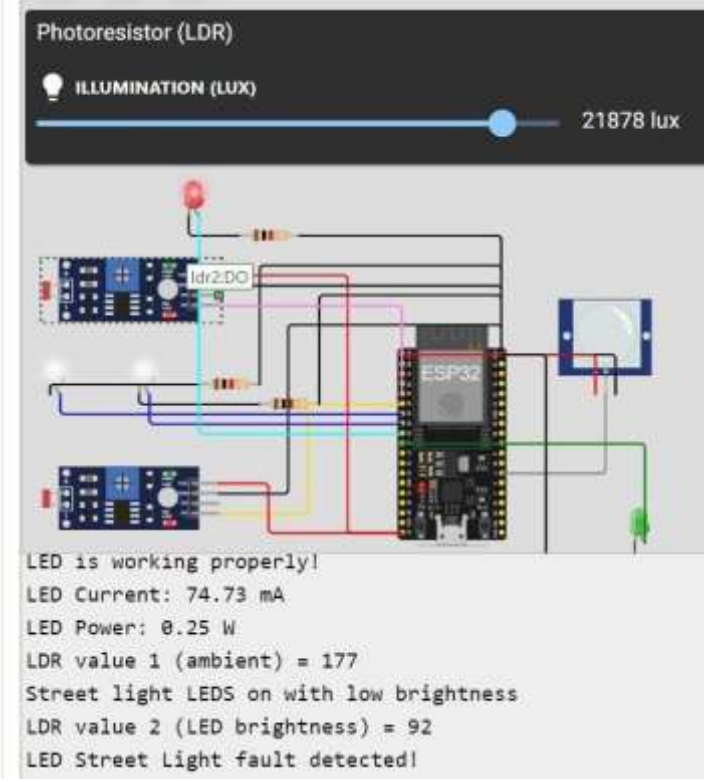


Figure 4.6: Simulation Result for Condition 2 of System Monitoring and Alerts

NOVELTY AND UNIQUENESS

The core innovation of the system is integration of IoT, renewable energy, and advanced sensors. This system is quite different from traditional systems, as it includes features for automated fault detection and the ability to monitor from a distance, therefore people do not need to interfere too much. The two layer LDR technique provides the capability to monitor both ambient and self-testing light in a way that enhances the overall reliability of the system.

BENEFIT TO HUMANKIND

The Solar Street Light Monitoring System boosts energy preservation, environmental protection and urban security. The effective use of IoT and clean power resources lowers carbon emissions as well as the costs of operation. It improves security through intelligent lighting, fosters smart city concepts, and decreases the maintenance requirements through remote monitoring. Its scalability guarantees usability in various settings and is thus advantageous to communities and municipalities around the world.

COMMERCIALIZATION POTENTIAL

The Solar Street Light Monitoring System has wide commercial prospects, especially concerning urban infrastructure and smart city development. It slashes the operational costs of municipalities by using solar power and IoT in energy-efficient lighting and their remote maintenance. The system is of modular design; that is, it can be scaled and customized for homes, commercial buildings, and industrial applications. Thus, it also caters to the increasing environmental goals and commitment to industries in renewable energy and green technologies. Herein lies this innovative solution with a marketable product within fast-growing markets for urban solutions that are sustainable and energy efficient.

CONCLUSION

The Solar Street Light Monitoring System demonstrates substantial advancements in urban lighting technology. By integrating IoT, renewable energy, and adaptive sensors, it delivers improved energy efficiency and operational reliability. Future developments will focus on machine learning for predictive analytics, expanded sensor arrays for advanced functionality, and scalability for broader adoption. This project aligns with global trends towards sustainable and intelligent infrastructure.

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Solar-Powered Visitor Counting System with Infrared Technology

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ABSTRACT

Solar-powered visitor counting-system with infrared technology is an improved visitor counting system that uses a lithium battery powered by a solar panel and an infrared sensor integration to communicate information in real time. For motion detection, the system uses sensors such an infrared (IR) sensor. In addition, it includes a Real-Time Clock (RTC). The system may react dynamically to the presence of a vehicle or person via these components. While LCD is used to send information to the person in charge of the system, LEDs and buzzers are utilized to act as a signal for information detection, enabling it to notify them and ensure everything functions properly. The system is easy to install anywhere due to its solar-powered source. Then, an ESP8266 is used to relay information to telegram in real time. Lastly, an Arduino UNO is used as the microcontroller for the whole system.

KEYWORDS: solar-powered, infrared sensor, RTC, ESP8266, telegram, Arduino UNO,

PRODUCT DESCRIPTION

The Solar-Powered Visitor Counting System with Infrared Technology is an innovative solution designed to efficiently monitor vehicle or pedestrian traffic at entry and exit points. Whether for residential gates, building entrances, or other access points, this system combines sustainability with advanced technology for reliable performance.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

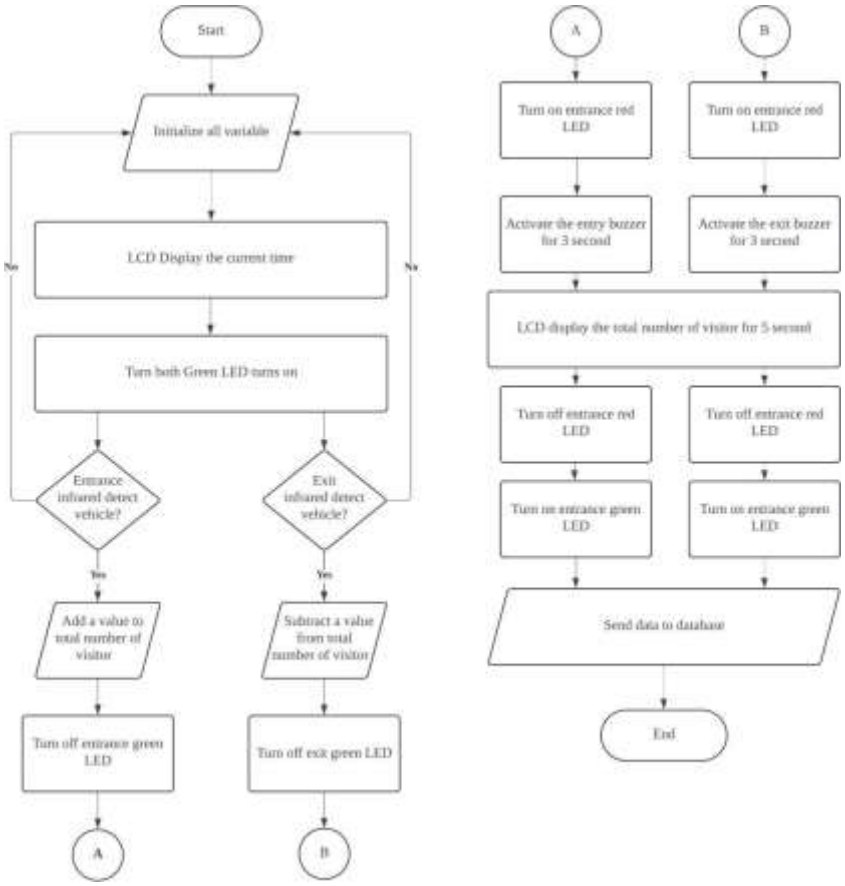


Figure 1 : Flowchart of the Solar-Powered Visitor Counting System

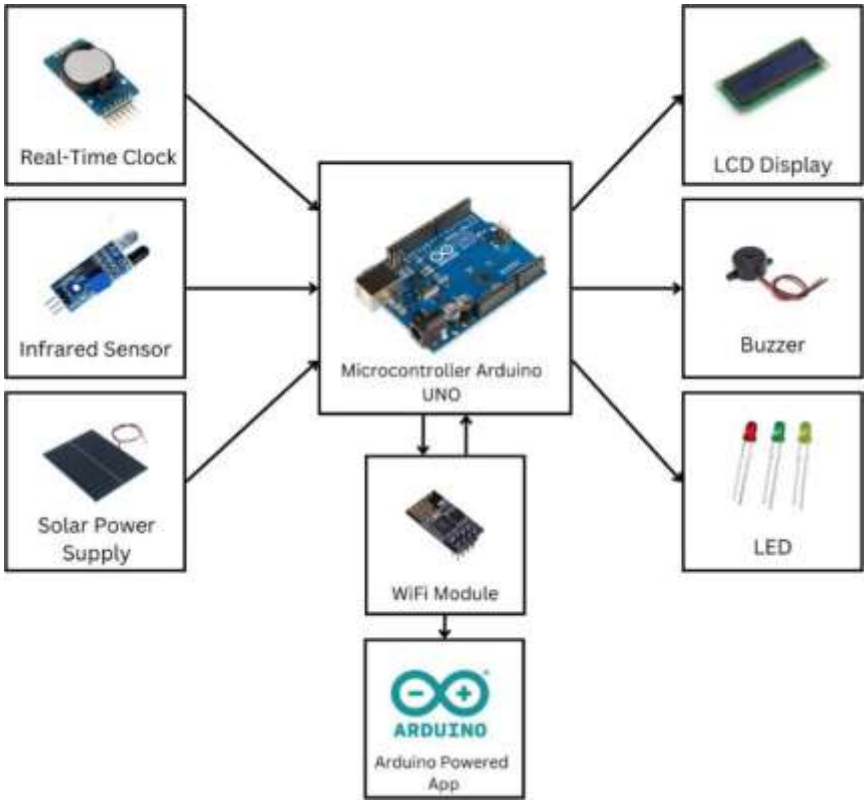


Figure 2: Block Diagram of Solar-Powered Visitor Counting System

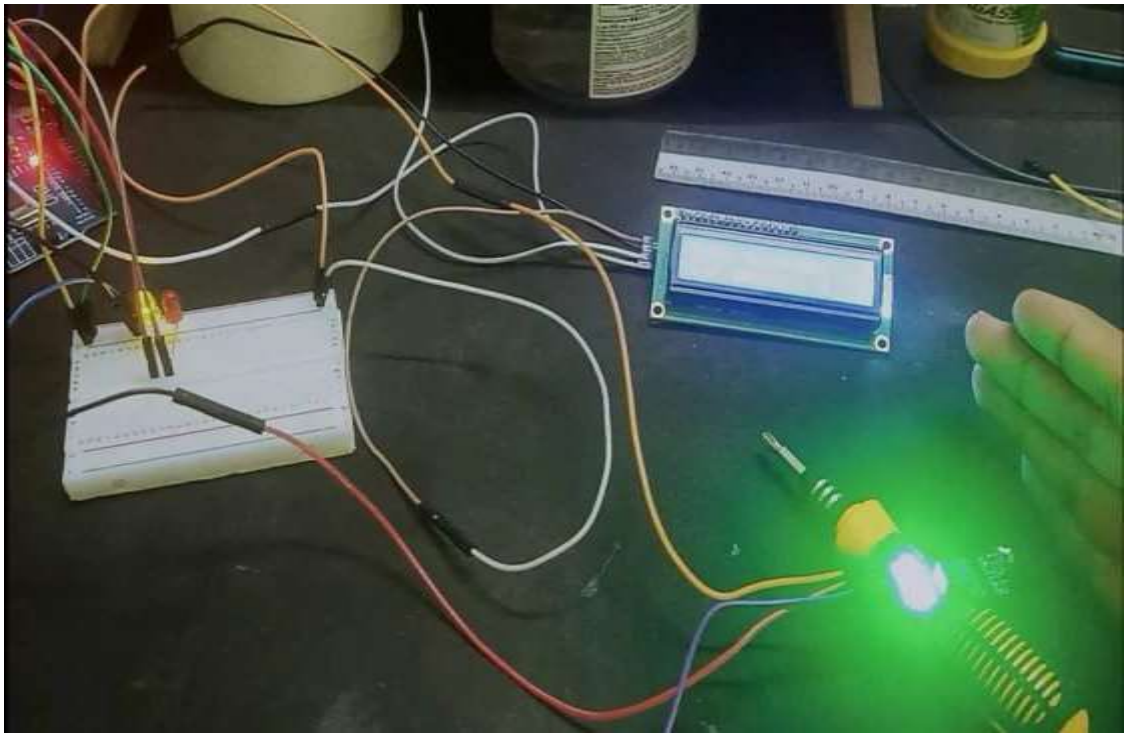


Figure 3: The prototype of the system on Protoboard

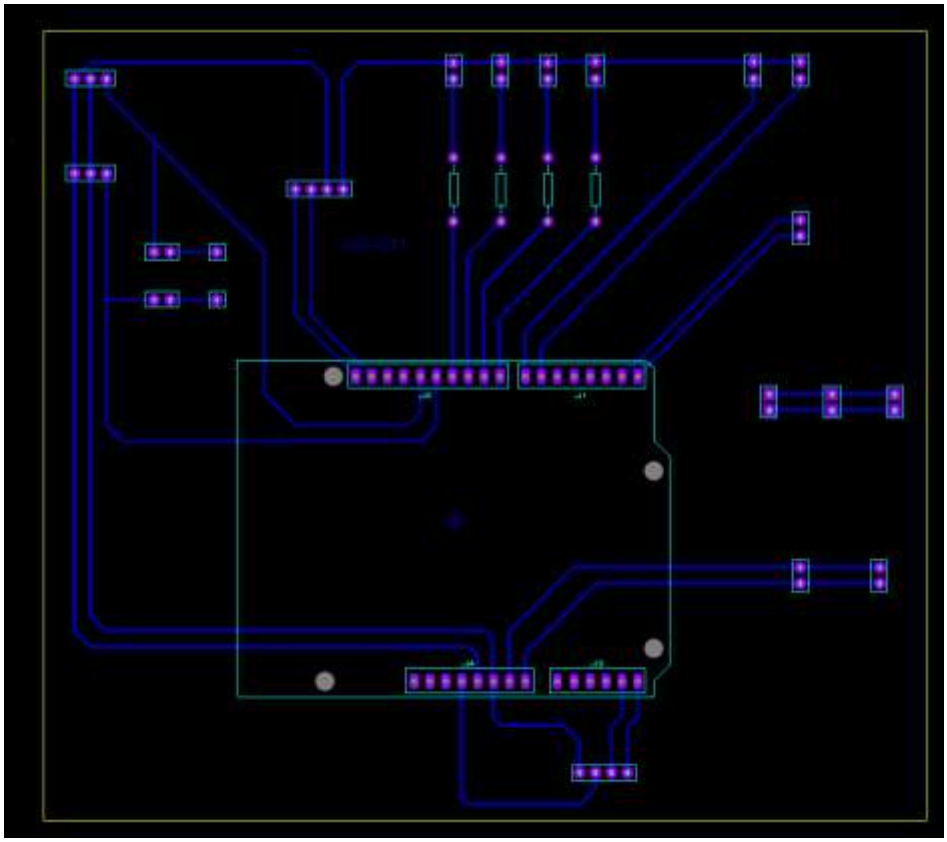


Figure 4: PCB Layout of the system

NOVELTY AND UNIQUENESS

The Solar-Powered Visitor Counting System is unique in that it sends data straight to users' phones by integrating renewable energy and the Internet of Things. It differs from conventional visitor counting systems due to its special integration of solar power, sensors, and Internet of Things connectivity. With the Arduino UNO microcontroller and ESP8266 serving as its Wi-Fi module, precise control and real-time monitoring become possible. This creative method ensures both long-term energy sustainability and real- time information.

BENEFIT TO MANKIND

The Solar-Powered Visitor Counting System offers a workable answer for a residential area's or an individual's home's safety. Buzzers and LEDs can be used to help improve security wherever it is required. The user may concentrate on other duties while still maintaining the necessary level of security thanks to the automated functions, which save time and effort. The system's usage of pure solar energy also lowers operating costs and helps to conserve the environment.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Visitor Counting System has a large market potential in the home security, especially in luxury residential areas or areas with apparent high crime rates. Its eco-friendly design, scalability, and affordability make it ideal for both major home- building companies and mid-to-high-end individuals. The system is ideally positioned for installation in local as well as global markets, given the growing interest in sustainable solutions and smart security technology. Because of its flexibility, it can be installed anywhere, increasing its commercial potential.

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CONCLUSION

The Solar-Powered Visitor Counting System solution integrates renewable energy, automation, and technology to improve security techniques. It is necessary for people since it addresses important problems like information accessibility, energy efficiency, and the highest possible level of security. The Solar-Powered Visitor Counting System is a progressive approach to home security that ensures both environmental protection and economy for the future through increasing safety while promoting sustainability.

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Solar Charge Controller Using Arduino Microcontroller

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ABSTRACT

This project focuses on the design and implementation of a solar charge controller aimed at efficiently managing power from a 5V solar panel to charge lithium-ion batteries. The system integrates an Arduino microcontroller to monitor and control charging operations, ensuring battery health and safety. Important features for this project including LED indicators for real-time battery status updates (charging, fully charged, low battery) and an automatic power cut off which disconnects the charging process once the battery reaches full capacity using simple MOSFET, guaranteeing efficient energy management while protecting the batteries from damage caused by overcharging or deep discharging. The project is designed to be both cost-effective and user-friendly, serving applications for renewable energy on a small scale. This solar charge controller encourages effective energy use and encourages the adoption of green technology by utilizing the concepts of sustainable energy. This work contributes to the broader effort of integrating renewable energy sources into everyday applications, offering an innovative and practical solution for energy storage and management.

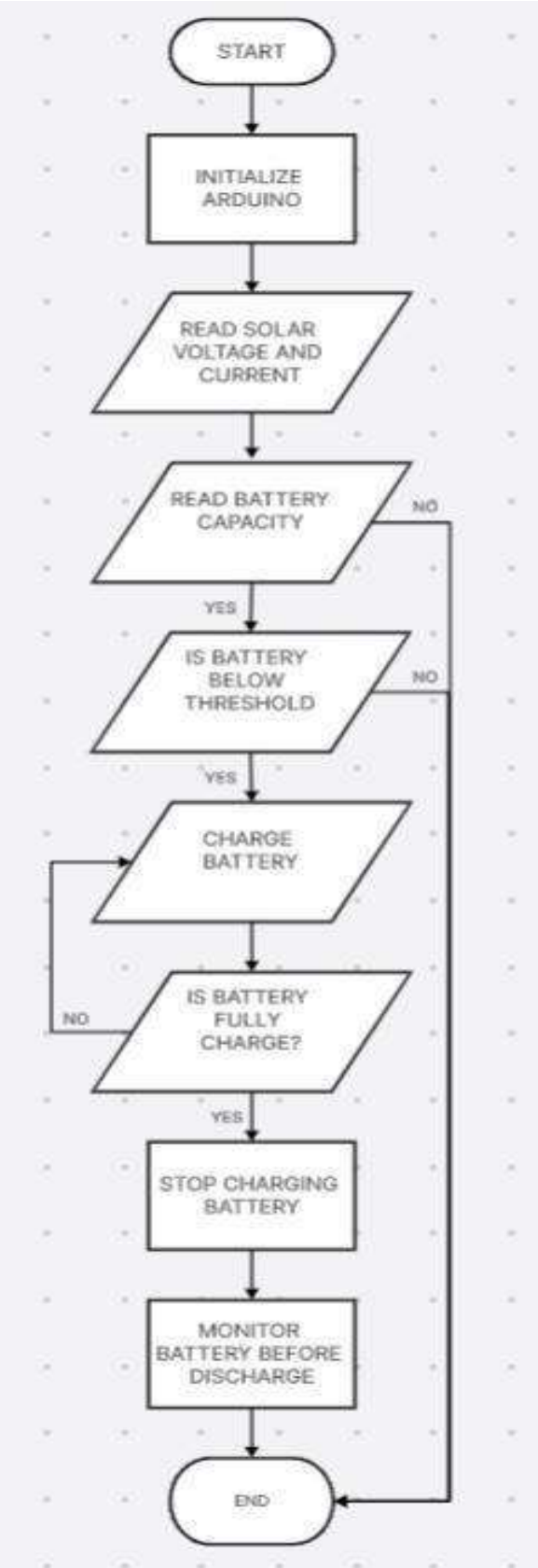
KEYWORDS: Solar charge controller, 5v solar panel, Lithium ion batteries, Arduino microcontroller, Battery health, LED indicators, Real time battery status, Automatic cut off, MOSFET.

PRODUCT DESCRIPTION

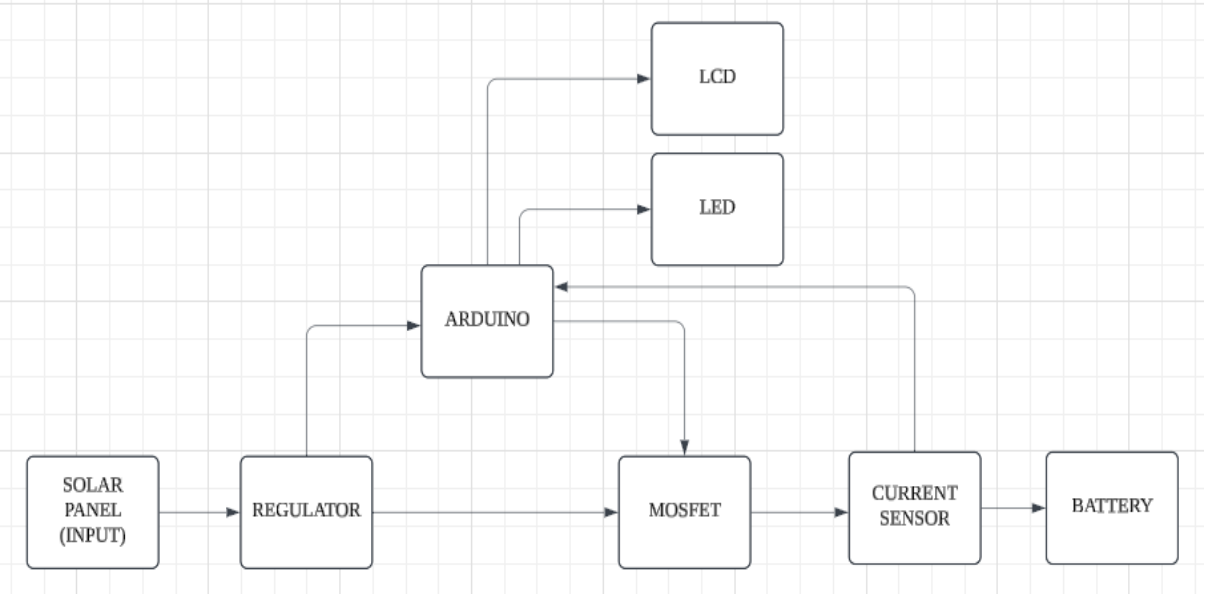
A charge controller or alternatively a charge regulator is basically a voltage and current regulator, to keep batteries from overcharging. A charge controller's main purpose is to keep the battery charged to its maximum capacity. The charge controller disconnects the load to avoid deep discharge and protects from overcharging the battery. This help to prolong the battery life. [Osaretin and Edeko, 2015] Key components of the product include an Arduino microcontroller, which oversees the charging process and safeguards battery health. The controller is equipped with LED indicators to display real-time battery status, such as charging, fully charged, and low battery levels, providing clear and accessible feedback to users. A standout feature is the automatic power cutoff mechanism, implemented using a simple MOSFET, which halts the charging process once the battery reaches full capacity.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Flowchart:



Block diagram:



NOVELTY AND UNIQUENESS

The solar charge controller project is perfect for small-scale renewable energy applications because of its unique design, which prioritizes sustainability, affordability, and simple use. It incorporates an Arduino microcontroller and a simple MOSFET-based automatic power cutoff mechanism, while maintaining effective energy management, it also preventing deep dischraging and overcharging of batteries. Intuitive LED indicators provide real-time battery status updates. By leveraging affordable and readily available components, the system promotes the adoption of green technology in a practical and accessible manner. Its modular design allows for easy scalability and customization, making it adaptable to future needs. Furthermore, the project combines fundamental ideas in electronics, renewable energy, and microcontroller programming, adding substantial instructional value. This makes it both inventive and useful for both academic and real-world applications.

BENEFIT TO MANKIND

The solar charge controller offers significant benefits to mankind by encouraging the use of renewable energy, contributing to environmental sustainability, and reducing dependency on non-renewable resources. Its cost-effective design makes solar energy solutions more accessible to individuals and communities, particularly in remote or underdeveloped areas where electricity is scarce. The project reduces waste and maintenance expenses by guaranteeing effective energy management and prolonging battery life with features like automatic power cutoff and overcharge protection. Furthermore, it encourages the use of renewable energy technologies, supporting international efforts to fight climate change. A greener and more sustainable future for everybody is fostered by the design's simplicity and adaptability, which make it a great educational tool that equips people with the knowledge and skills to incorporate renewable energy into their daily lives.

COMERCIALIZATION POTENTIAL

This designed solar charge controller has large commercialization potential; the design will be comparatively cheap and not complicated but quite workable to implement. With all LED indicators of battery status, real-time display voltage/current LCD display, and a number of embedded safety mechanisms like automatic power cutoff, this is able to serve a wide end range of people: from simple off-grid users to avid campers and hikers, to renewable energy electronics hobbyists. The controller, being compatible with 5V solar panels and lithium-ion batteries, is suitable for small-scale solar applications. The compact design and low Production cost will give an edge in markets that look for low-cost renewable energy solutions.

CONCLUSION

This solar charge controller project, in summary, offers a creative and workable way to effectively manage renewable energy supplies. The system makes use of a 5V solar panel, an Arduino microcontroller, and straightforward yet efficient parts like a MOSFET- based automatic power cutoff to guarantee the best possible battery health, safety, and energy efficiency. Its affordable and easy-to-use design makes it suitable for small-scale applications, and its emphasis on sustainability supports international initiatives to lessen environmental impact and encourage the use of renewable energy. This initiative bridges the gap between theoretical understanding and real-world application while also demonstrating the potential of solar energy to address energy concerns. It advances the more general objective of building a sustainable future by using scalable and inventive renewable energy solutions

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Auto Motion Solar Powered Road Lighting System

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In Malaysia, efficient road lighting systems are crucial for energy conservation and safety, yet traditional systems often suffer from inefficiency and energy wastage. The "Auto Motion Solar Powered Road Lighting System" addresses this challenge by introducing an Arduino-based automated lighting solution that optimizes energy usage and enhances road safety. This system utilizes an LDR sensor to activate the lights based on ambient light levels and a PIR motion sensor to detect motion, dynamically adjusting LED brightness from 50% to 100% to conserve energy. Integrated with an I2C LCD, the system displays real-time data, including ambient light levels, system status, and motion detection counts. An active buzzer adds auditory feedback when motion is detected, further enhancing its functionality. Simulations using Wokwi and TinkerCAD validate the system's performance, ensuring reliability and accuracy. This project presents a scalable, energy-efficient lighting solution that promotes sustainability and supports safer road infrastructure in communities.

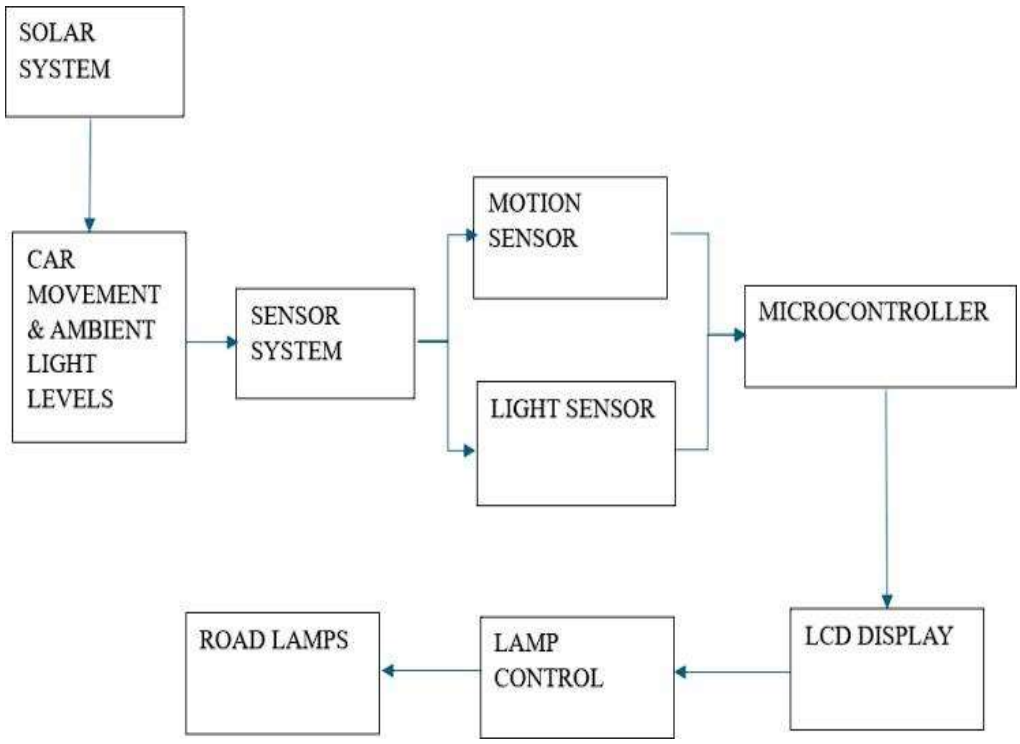
KEYWORDS: Arduino-based system, LDR sensor, PIR motion sensor, LED brightness control, Motion detection, Energy-efficiency, Real-time data display

PRODUCT DESCRIPTION

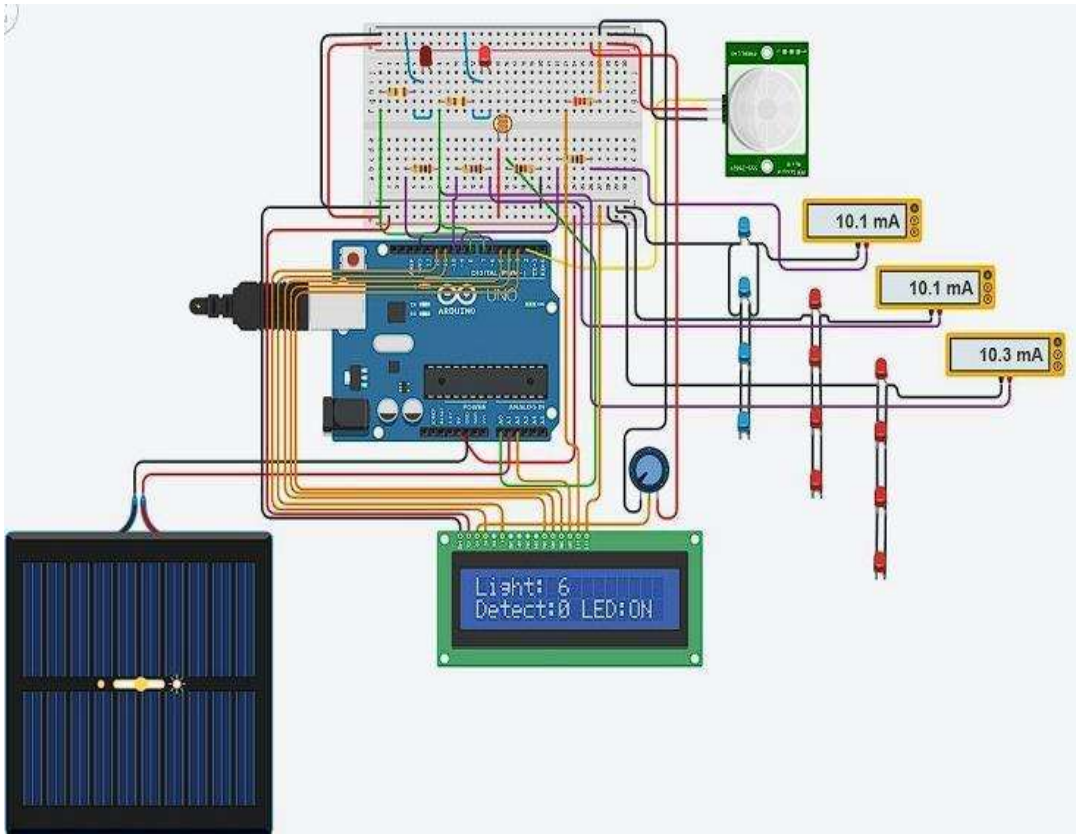
The Auto Motion Road Lighting System is an intelligent and energy-efficient road lighting solution designed to adapt to changing environmental and traffic conditions. The system utilizes an Arduino Uno microcontroller, integrated with an LDR sensor to monitor ambient light levels and a PIR motion sensor to detect movement. LEDs dynamically adjust their brightness, operating at a default low brightness of 10% during low-light conditions and increasing to 60% when motion is detected to enhance road visibility. An I2C LCD displays real-time information such as ambient light levels, motion detection count, and LED status, while a passive buzzer provides audible feedback during motion events. Powered by a CN3065 solar charging module and a rechargeable battery, the system ensures sustainable operation. Simulations on Wokwi validate its functionality and reliability, making this product an innovative and scalable solution for modern road lighting infrastructure.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

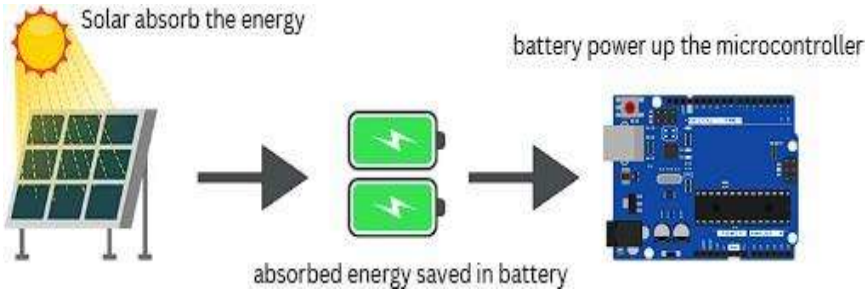
Methods used in preparing the samples are summarised as follow: Block Diagram



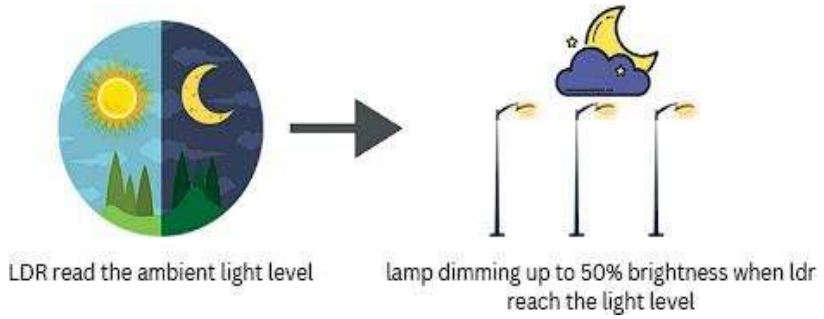
Simulation Circuit



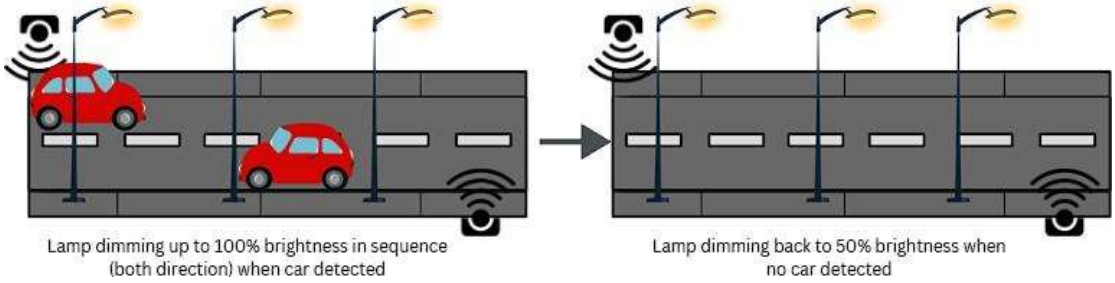
1. **Solar system for power supply**



2. **Reading ambient light level**



3. **Detect a motion**



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the flexible strain sensor utilizing MWCNT Composite for motion monitoring lies in its advanced material design and application-specific innovations. The incorporation of MWCNTs into a flexible substrate like ecoflex creates a unique composite that exhibits superior sensitivity and durability compared to conventional materials used in strain sensors. The sensor maintains a low profile, conducive to integration into clothing or direct application on the skin, offering users a non-invasive and comfortable monitoring experience. This flexible strain sensor presents a unique combination of stretchability and sensitivity, offering significant improvements over existing technologies for motion monitoring.

BENEFIT TO MANKIND

The Auto Motion Road Lighting System provides significant benefits to mankind by addressing critical challenges in energy conservation, road safety, and environmental sustainability. By dynamically adjusting LED brightness based on ambient light and motion detection, the system minimizes energy consumption and reduces operational costs. The solar-powered design promotes the use of renewable energy, decreasing dependence on fossil fuels and lowering carbon emissions, thereby contributing to a healthier environment. Enhanced road safety is achieved through adaptive lighting, which ensures optimal visibility during low-light conditions and motion detection events, reducing the risk of accidents and crime. Additionally, the system's modular and scalable nature makes it a cost-effective solution for urban and rural communities, supporting sustainable development and improving the quality of life for society as a whole.

COMMERCIALIZATION POTENTIAL

The Auto Motion Road Lighting System holds strong commercialization potential due to its innovative features, energy efficiency, and adaptability to various road infrastructures. Its ability to dynamically adjust LED brightness based on motion and ambient light conditions significantly reduces energy consumption, making it an attractive option for municipal and private road lighting projects. The integration of solar power ensures operational independence from traditional power grids, appealing to regions with limited electricity access and a focus on sustainable development. Additionally, its modular design allows for easy scalability, catering to diverse applications such as highways, residential streets, and industrial zones. With increasing global emphasis on smart cities and sustainable solutions, this system aligns with market demands for cost-effective, eco-friendly, and reliable lighting technologies. The use of simulations to validate performance further enhances its feasibility, making it a viable product for wide-scale adoption in both urban and rural settings.

CONCLUSION

The Auto Motion Road Lighting System presents an innovative and sustainable solution to address the challenges of energy inefficiency and road safety in conventional lighting systems. By incorporating an Arduino-based control system with LDR and PIR sensors, the system intelligently adjusts LED brightness according to real-time environmental and traffic conditions, significantly reducing energy consumption. Powered by a solar panel and rechargeable battery, it ensures reliable operation while promoting renewable energy use. The inclusion of an I2C LCD for real-time data display and a passive buzzer for motion alerts enhances functionality and user interaction. Validated through simulations on platforms like Wokwi, the system demonstrates its feasibility and scalability for diverse applications. This project contributes to the advancement of energy-efficient technologies, promoting sustainability, safety, and cost-effectiveness in modern road infrastructure.

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Hybrid House System Using Solar Panel

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ABSTRACT

This project investigates the implementation of a hybrid energy system for residential areas in Malaysia, which is aimed at addressing electricity wastage and promoting renewable energy use. Utilizing solar panels controlled by an Arduino microcontroller, the system optimizes energy distribution for household applications. Given Malaysia's favorable equatorial climate, solar energy is a viable solution, potentially saving households up to RM6000 annually despite an initial setup cost of around RM30000. The system components include Tinkercad, PIR sensors, LDRs, rechargeable batteries, LEDs, LCDs, and motors, forming an integrated setup to manage power consumption efficiently. The project's objectives are to introduce hybrid energy solutions, enhance solar panel functionality, and advocate for renewable energy benefits, particularly among students at UiTM Pasir Gudang. The study highlights the importance of renewable energy education in Malaysia, where traditional fossil fuels dominate energy consumption, contribute to pollution. Through systematic design and testing, the project demonstrates significant potential for sustainable energy management and offers a practical approach to reducing carbon footprints in residential areas.

KEYWORDS: Hybrid Energy System, Solar Panels, Renewable Energy, Energy Efficiency, Arduino, Malaysia, Sustainable Development, Residential Electricity

PRODUCT DESCRIPTION

The Hybrid House System Using Solar Panel represents a sustainable approach to Malaysia's residential energy use optimization through the reduction of wastage and promotion of renewable energy. Powered by solar energy and an Arduino-controlled setup, it efficiently distributes energy and is able to save households with up to RM6000 annually, despite an initial setup cost of RM30000. The system is integrated with components such as PIR sensors, LDRs, and rechargeable batteries for continuous energy management. It also provides renewable energy education for the students, especially those in UiTM Pasir Gudang, to move away from dependency on fossil fuel. This innovative system reduces carbon footprints and supports a cleaner, more sustainable future for residential areas.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

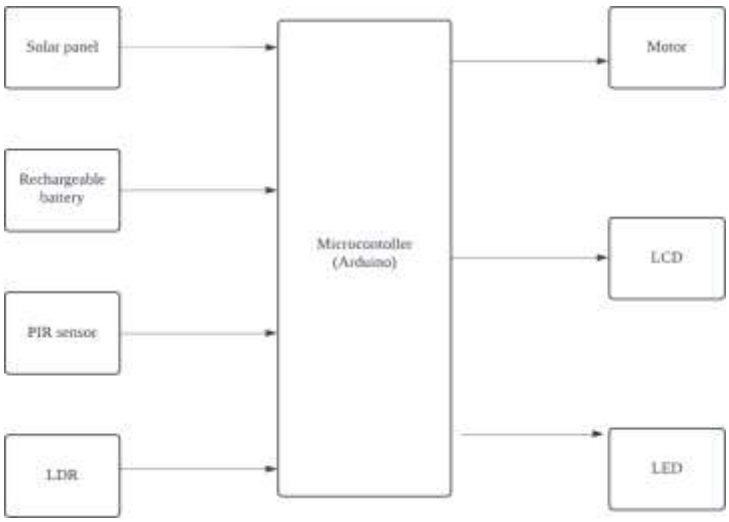


Figure 1.1: Block Diagram of Hybrid House System Using Solar Panel

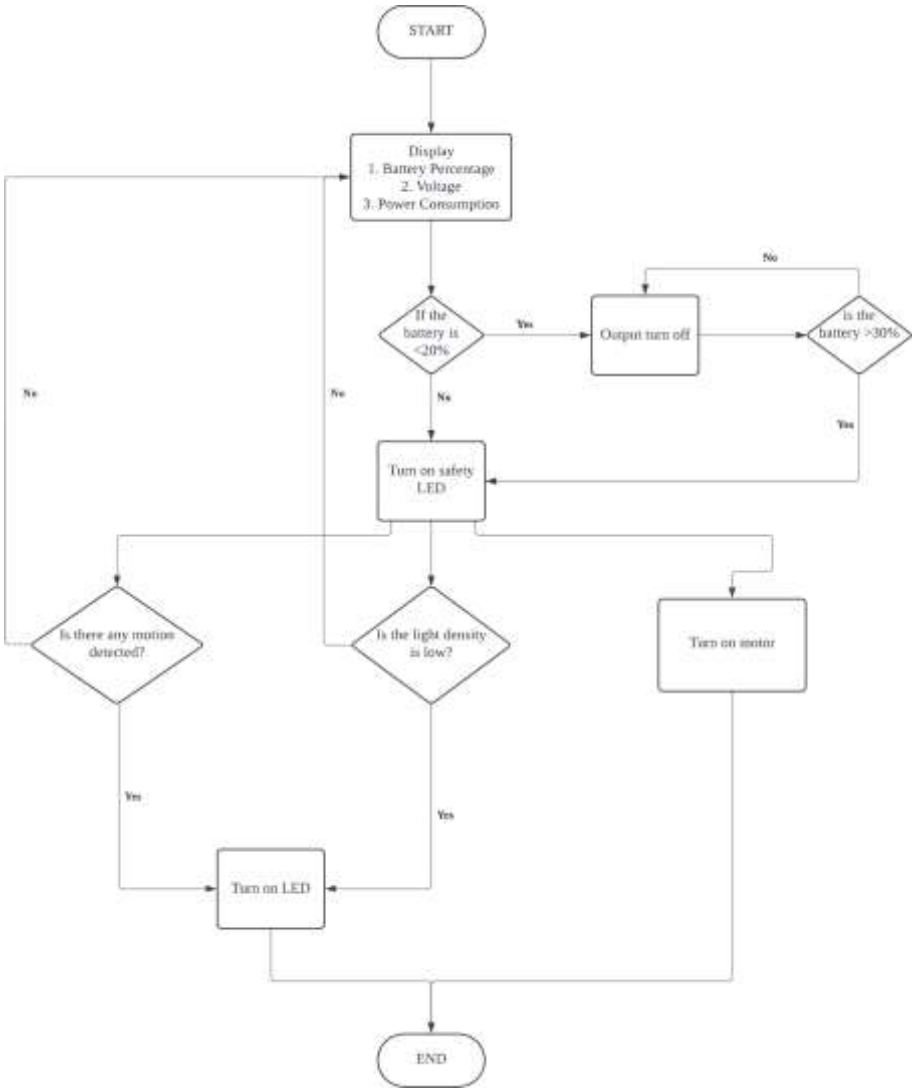


Figure 1.2: Flowchart of how Hybrid House System Using Solar Panel operates.

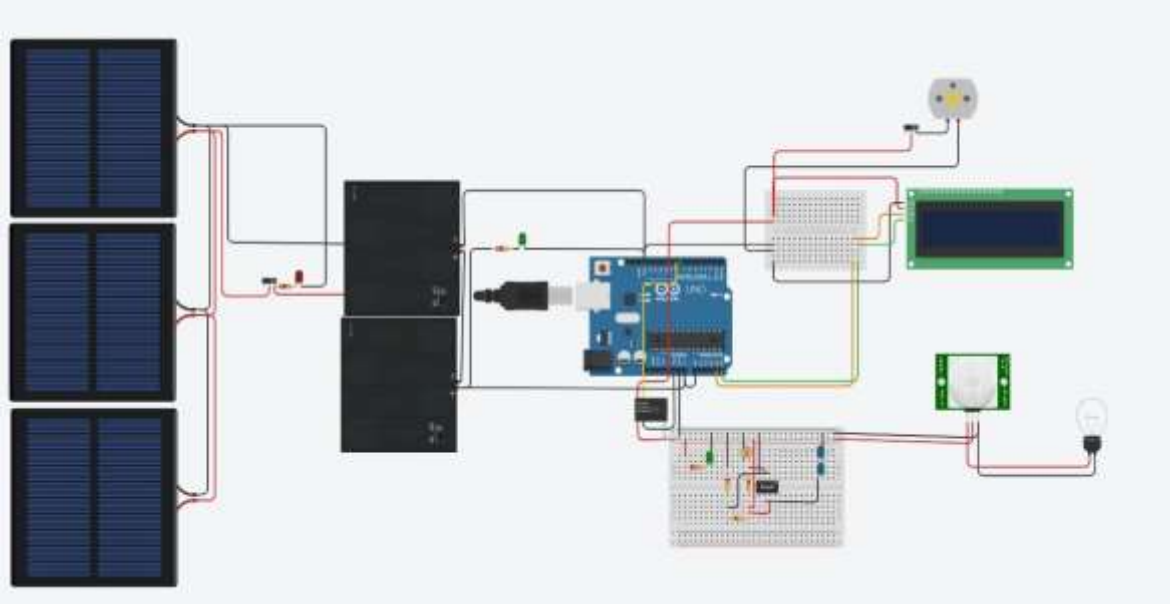


Figure 1.3: Final look of the simulation circuit of Hybrid House System Using Solar Panel

NOVELTY AND UNIQUENESS

What makes this different is that the practical, innovative solution to energy challenges in Malaysian households through the use of solar power with smart technologies integrates an Arduino microcontroller that optimizes energy distribution in a manner that ensures that there is minimum wastage and complete efficiency, unlike conventional systems. Equipped with various features like motion sensors, light detectors, and rechargeable batteries, the system intelligently responds to household needs, helping to reduce costs and making life more convenient while encouraging a sustainable lifestyle. What sets it apart is the combination of technology and education, striving for the inspiration of students at UiTM Pasir Gudang and beyond toward taking up renewable energy and changing their traditional ways of energy utilization for a cleaner, sustainable future.

BENEFIT TO MANKIND

The Hybrid House System Using Solar Panel has a huge potential to provide enormous benefits to mankind in terms of two critical challenges facing humanity: energy efficiency and environmental sustainability. Reducing energy wastage and encouraging the use of renewable solar power contribute to lowering the cost of electricity in households, easing the financial burden of families and helping people move away from dependence on fossil fuels. This contributes to reducing carbon emissions and fostering cleaner air and a healthier environment for future generations. It is also focusing widely on renewable energy education to empower people, especially students, to adopt sustainable practices in creating innovation for a green future. In addition, this system makes renewable energy not only accessible but also functional in improving lives, especially in the development of sustainable eco-conscious society.

COMMERCIALIZATION POTENTIAL

With increasing energy costs and concerns for sustainability in Malaysia, the Hybrid House System Using Solar Panel has great potential for households to become practical and marketable. It provides substantial savings of up to RM 6000 per year, while smart and adaptable technology provides financial and environmental benefits. Besides being affordable to individual households, the modular approach also integrates cost-effective components, like Arduino microcontrollers and sensors. This makes the system scalable, and in addition to homes, it will also be marketed to educational facilities for renewable energy awareness and hands-on learning. This would enable it to be well-placed in the growing demand for smarter, cleaner energy solutions, to really make a difference in people's lives, with Malaysia's push toward green energy and government incentives supporting sustainable technologies.

CONCLUSION

The Hybrid House System Using Solar Panel is a breakthrough to solving Malaysia's energy challenges. Integrating renewable energy solutions with smart technologies such as Arduino microcontrollers, PIR sensors, and LDRs, it successfully depicts the potential to reduce energy wastage, lower household electricity costs, and minimize environmental impact. Because it adds to the benefit of increasing renewable energy education for students, this project is aligned with the government's goals on sustainable development. It looks promising due to practical design and scalability for wide applications within residential areas and educational institutions toward a greener energy-efficient future. More innovation and development regarding this would surely enhance the impact of the system in support of global transition towards sustainable energy practices.

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Efficient Power Generator : Sustainable Solution for Highway Applications

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ABSTRACT

The increasing demand for renewable energy technologies has driven advancements in solar panel manufacturing, making these systems more accessible and cost-effective. Solar panels have emerged as a viable solution for sustainable power generation with minimal environmental impact. This project focuses on developing an efficient power generation system tailored for highway applications through the strategic deployment of solar panels. By harnessing sunlight along highways, the system aims to maximize energy capture while addressing the unique environmental and structural challenges of highway infrastructure. Key objectives include selecting durable and efficient solar panel technologies for long-term outdoor use, overcoming challenges related to installation, maintenance, and grid connectivity, and ensuring seamless integration into transportation networks. This initiative seeks to reduce the carbon footprint of highway systems, promote sustainable infrastructure development, and provide a reliable supply of clean energy for roadside facilities and electric vehicle charging stations.

KEYWORDS: solar panels, renewable energy, sustainable infrastructure, highway applications, clean energy, carbon footprint reduction.

PRODUCT DESCRIPTION

Introducing our Highway Solar Power System, a cutting-edge solution designed to transform sunlight into renewable energy for highway applications. This innovative system utilizes strategically placed solar panels along highways to maximize energy capture while seamlessly integrating with existing infrastructure. Built with durable, high-efficiency solar panel technologies, the system is engineered to withstand long- term outdoor conditions and deliver consistent performance. It addresses challenges such as installation, maintenance, and grid connectivity, offering a robust and low- maintenance solution for sustainable energy needs. The Highway Solar Power System not only reduces the carbon footprint of transportation networks but also supports sustainable infrastructure development. It provides a reliable source of clean energy for powering roadside amenities and electric vehicle charging stations, promoting eco-friendly transportation and energy independence. Embrace the future of sustainable energy with a system designed to make highways greener, more efficient, and environmentally responsible –

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

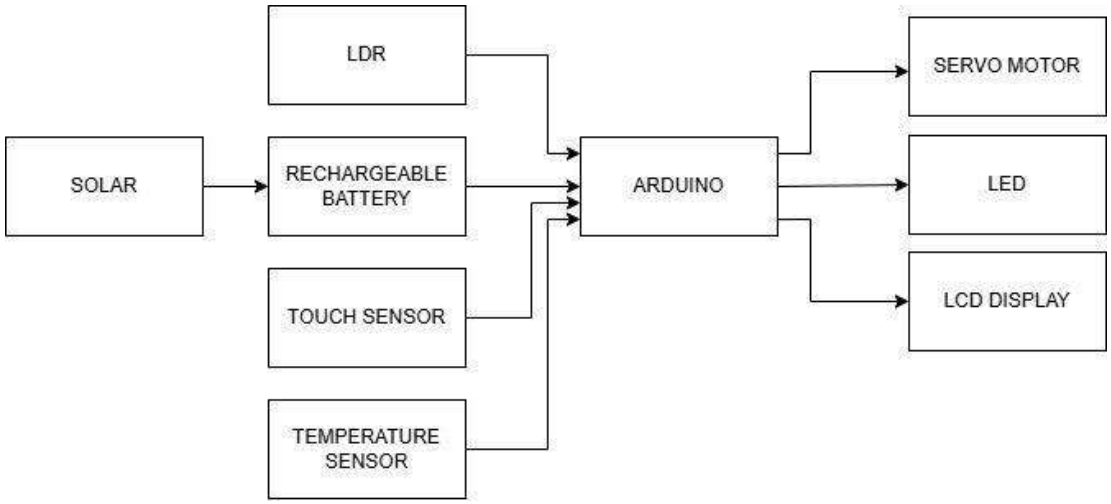


Figure 1: Block Diagram of Efficient Power Generator : Sustainable Solutions for Highway Applications

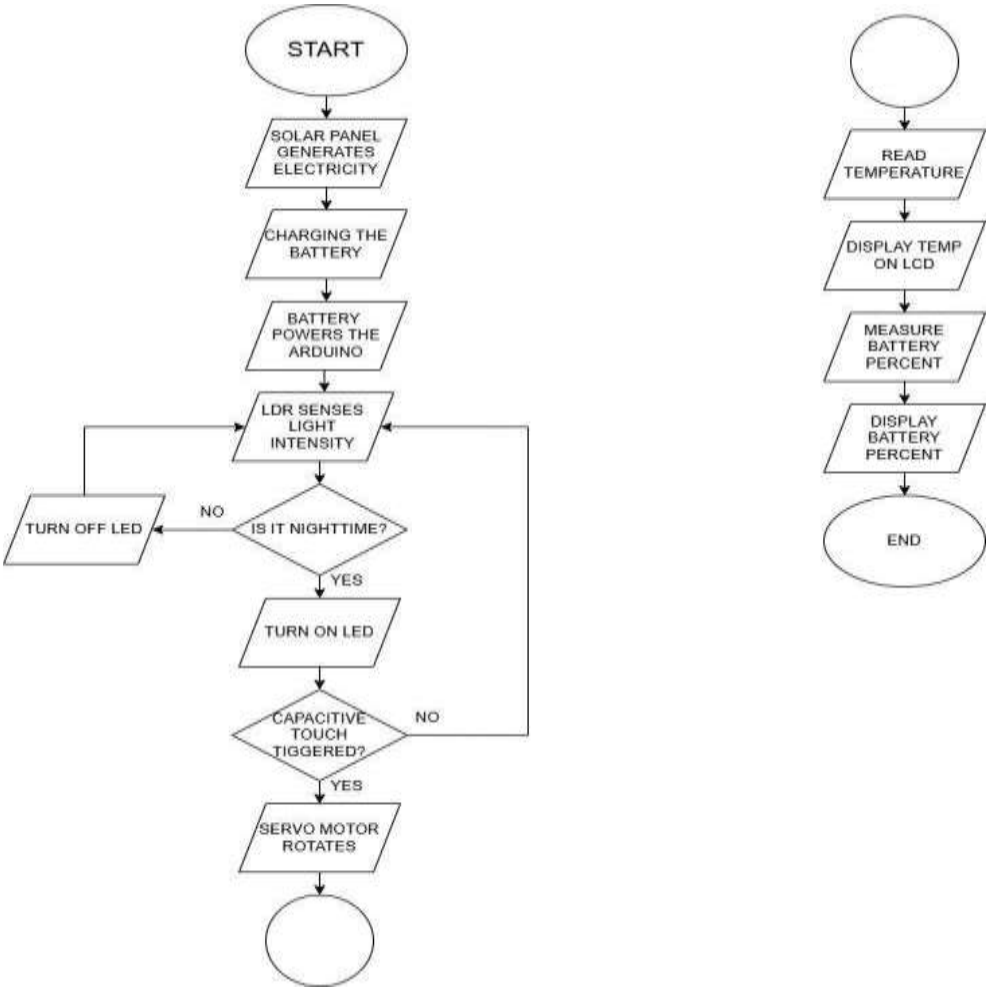


Figure 2 : Flow Chart of Efficient Power Generator Sustainable Solutions For Highway Applications

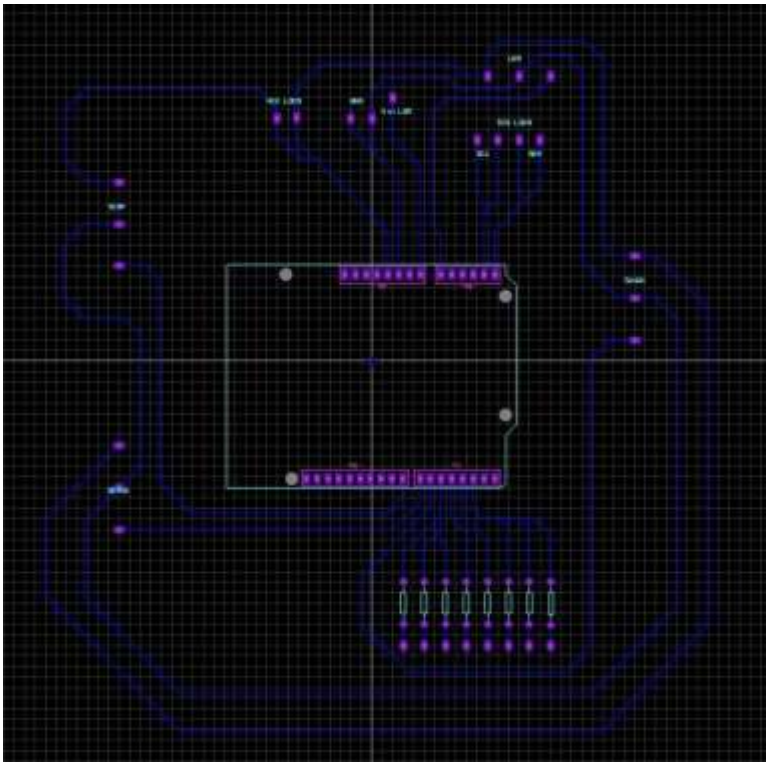
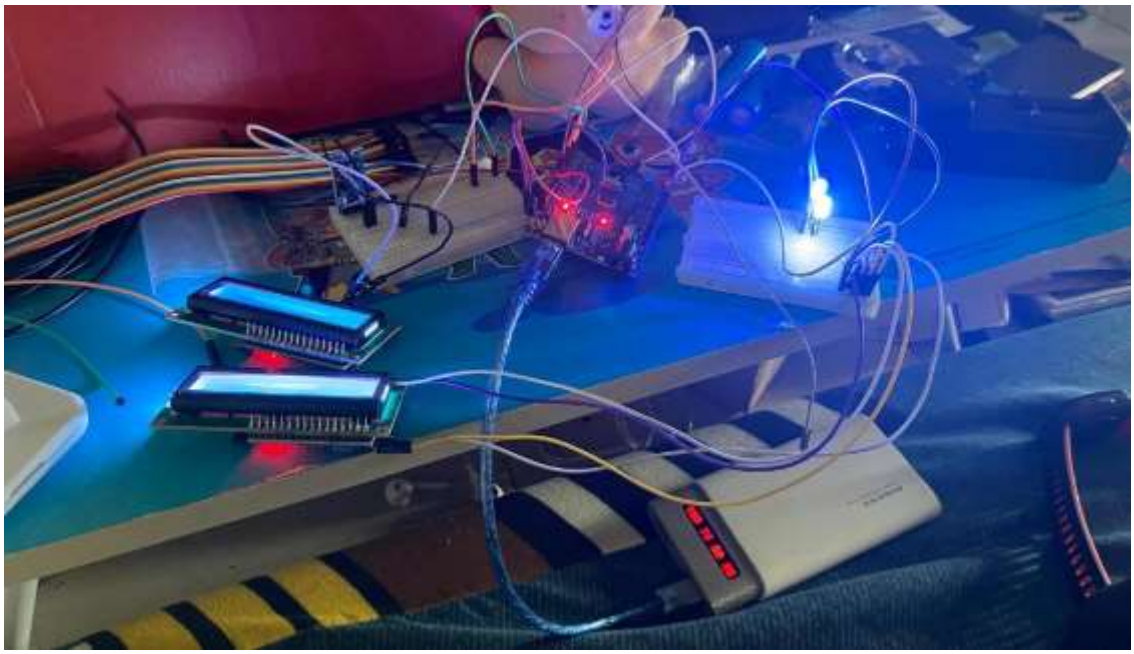


Figure 3: PCB Design of Efficient Power Generator : Sustainable Solutions For Highway Applications



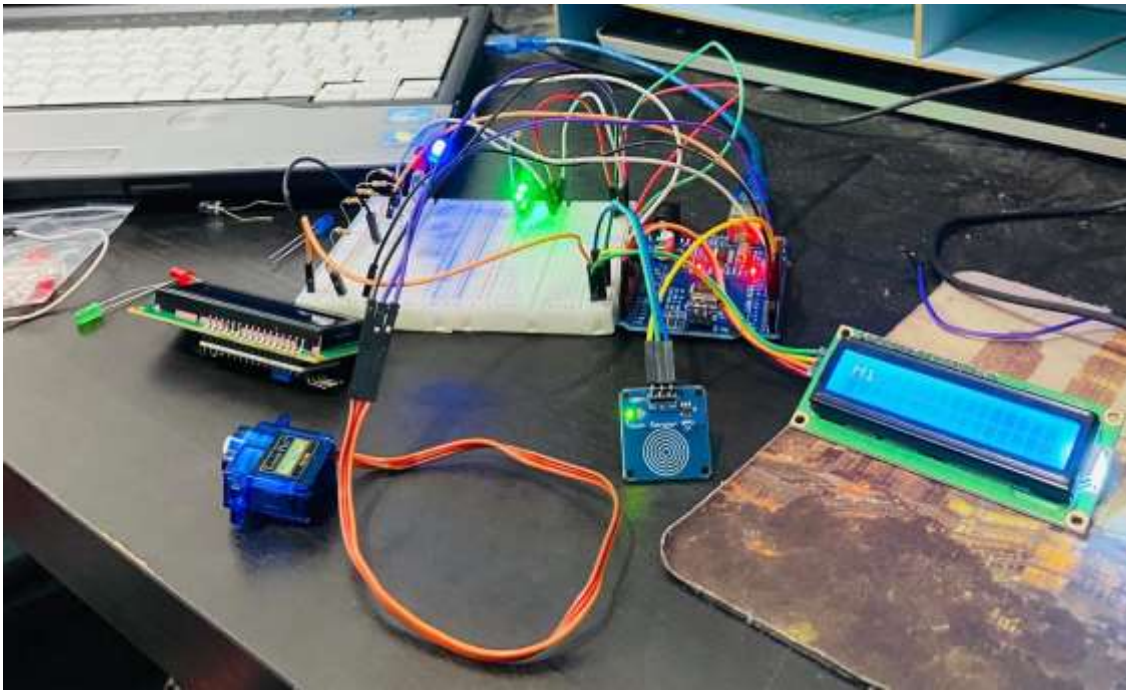


Figure 4&5 : Hardware Connections of Efficient Power Generator : Sustainable Solutions For Highway Applications

NOVELTY AND UNIQUENESS

This project presents a novel approach to sustainable highway systems by integrating advanced renewable energy and automation technologies. It utilizes a dual-purpose solar panel system to generate renewable energy while storing it in batteries for uninterrupted operation, even at night. The inclusion of a Light Dependent Resistor (LDR) enables dynamic LED control, reducing energy waste by activating lights only during nighttime. A capacitive touch sensor adds interactivity, controlling a servo motor for potential applications like automated signage or barriers. Additionally, the system features an LCD display for real-time monitoring of temperature and battery percentage, enhancing user awareness and operational transparency. Designed with scalability and modularity, the system can adapt to diverse highway setups and accommodate future technological advancements. This environmentally conscious design reduces the carbon footprint of highway operations, offering an innovative and efficient solution for sustainable infrastructure.

BENEFIT TO MANKIND

This project offers significant benefits to humankind by addressing the growing need for sustainable and eco-friendly energy solutions in infrastructure. By harnessing renewable solar energy, it reduces dependence on fossil fuels, thereby lowering greenhouse gas emissions and contributing to environmental conservation. The efficient power generation system ensures reliable lighting and operational functionality for highways, enhancing safety for drivers and reducing maintenance costs. The real- time monitoring features promote energy awareness and efficient resource utilization, while the system's adaptability supports its use in diverse applications, such as roadside amenities and electric vehicle charging. Overall, this project contributes to building smarter, greener highways, fostering sustainable development and improving quality of life for present and future generations.

COMMERCIALIZATION POTENTIAL

The commercialization potential for this project is substantial, as it addresses the increasing global demand for sustainable energy solutions in infrastructure development. The integration of solar panels with advanced features such as LED lighting, real-time monitoring via LCD displays, and automated components like touch- activated servos makes it an attractive solution for highway authorities, urban planners, and smart city initiatives. Its cost-effectiveness, low environmental impact, and scalability position it as a viable product for widespread adoption. The system can also cater to various applications, including roadside lighting, advertisement displays, and electric vehicle charging stations, creating diverse revenue streams. By aligning with global sustainability goals, this project holds significant promise for both public and private sector investments.

CONCLUSION

In summary, this project effectively illustrates how to design and implement a solar- powered power generation system that is optimized for highway applications. The system tackles important issues in sustainable infrastructure development by combining renewable energy with contemporary technologies like sensors for real-time monitoring and automation, LEDs for illumination, and an Arduino-based control system. While features like an LCD display and a touch-activated servo motor improve functionality and user engagement, the use of a rechargeable battery guarantees continuous operation. In addition to lowering carbon emissions, this creative method offers an economical and sustainable way to satisfy the expanding energy needs of transportation systems. The project has potential uses in roadside advertising, highway lighting, and electric vehicle charging.

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Real Time Power Monitoring and Control System for Electrical Appliances

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ABSTRACT

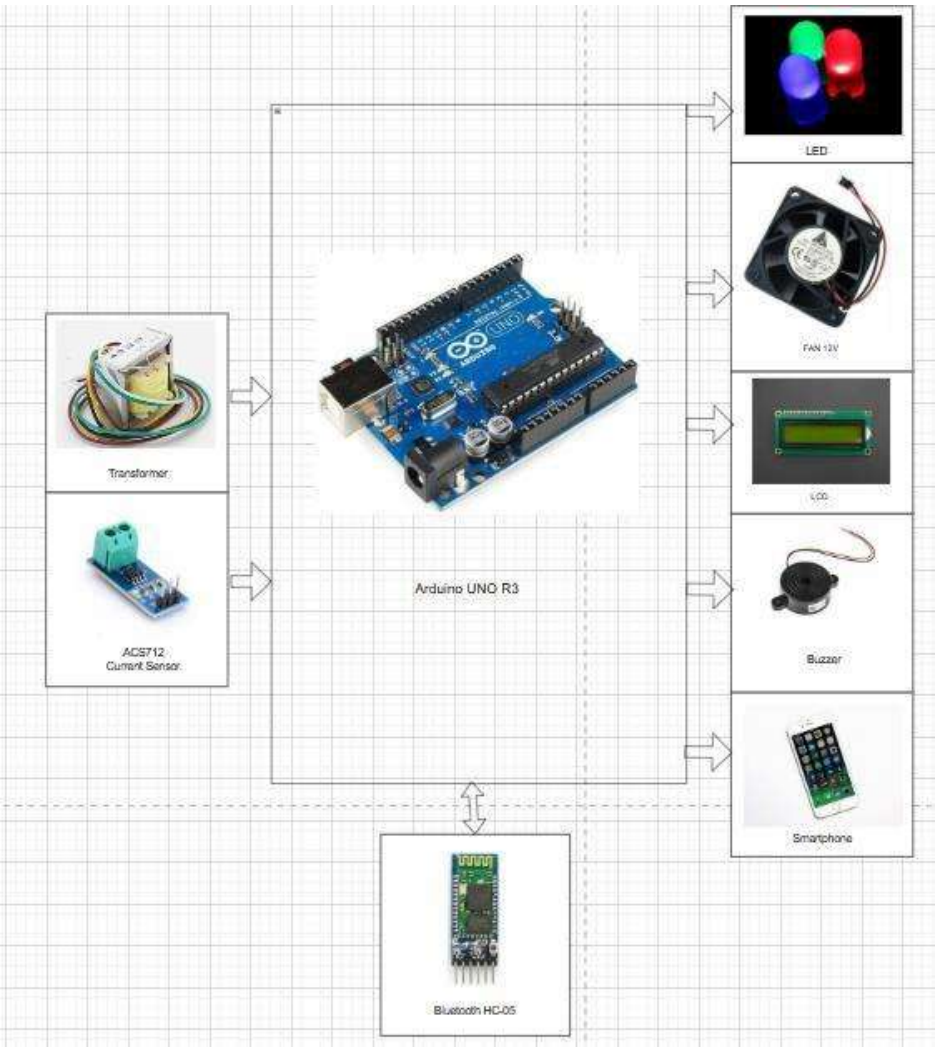
Electric energy demand is increasing day by day to reduce this increasing demand, it is necessary to use energy economically and efficiently. Nowadays, studies on energy efficiency and saving are ongoing. Various systems have been developed to deliver the energy produced in the electricity generation facilities to the end consumer in an efficient and quality manner. The increase in energy concern in the university campus due to Increase in energy demand and consumption, poor use of energy by users, and neglect in the switch off of appliances and lighting, has caused outages, high operations costs, and energy wastage frequently encountered in the university. This project presents the development of a Real-Time Power Monitoring and Control System For Electrical Appliances, leveraging Internet of Things (IoT) technology. The system uses a Arduino Uno microcontroller for data connectivity and processing, an ACS712 sensor for accurate current and voltage measurements, and a Transformer for transfers electrical power from one to another, while changing the voltage level .Bluetooth HC-05 is used for wireless communication, allowing remote monitoring and control. This integration provides users with real-time information about their energy consumption, facilitating efficient management and optimization of electrical devices. By implementing this system, significant progress in energy efficiency and cost savings can be achieved, contributing to sustainable energy practices.

KEYWORDS: Real Time Power Monitoring and Control,Internet of Things(IoT) ,Arduino Uno ,ACS712,Transformers.

PRODUCT DESCRIPTION

The “Real-Time Power Monitoring and Control System for Electrical Appliances” concept includes all those measures that can contribute to increased energy effectiveness and better usage of electrical power. This smart system is developed around the sturdy Arduino Uno microcontroller that has the capability to supervise and operate the electrical appliances in real-time mode to offer users, the right data and information about usage of energy. A transformer is used to regulate voltages that supply power, converting high voltage AC to a safer tangible level for the system. For the measurement of current and power, the system employs ACS712 sensor so as to accurately capture real-time data at high levels. Further, relays help to manage the power supply of connected appliances, and the LEDs, the 20 × 4 LCD module make the signals visible and help to show essential indicators of the system. Taken together, these components are ready to provide solid and intuitive environment for power usage tracking and consumption analysis, as well as saving decisions support. This project educates users on how to better control their appliances hence achieving efficient use of energy, at the same time advancing the technology in power management and control systems. Thus, it may be useful for people and companies that would like to cut energy bills

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS



NOVELTY AND UNIQUENESS

The idea behind the “Real-Time Power Monitoring and Control System for Electrical Appliances” invention is the combined use of accurate power measurement and comfortable ways of controlling in one affordable device. Different from classical energy management systems, this project utilizes the widely available Arduino Uno microcontroller to ease the development process but without affecting the performance and reliability. The incorporation of the ACS712 sensor for accurate monitoring of the current consumption guarantees energy conservation by monitoring power consumption accurately. In addition, the system also has a transformer which ensures good power supply thus allow the system to perform in various electrical environments. Appliance control by relays together with 20×4 LCD for instant results improves functionality enabling users to respond to information displayed in real time. This integration of components not only reduces complexity but also helps to keep the cost low which makes is a viable solution for the households and small business, who want to manage waste energy, and ensure sustainability. It is laudable that this project is functional, accessible and tries to have minimal to no negative impression on the environment, these are the features that make a modern look at energy management.

BENEFIT TO MANKIND

The special relevance of the project is in solving energy problems in living-rooms and study-rooms for appliances, using the system “Real-Time Power Monitoring and Control System for Electrical Appliances.” Through the constant control of electrical appliances in these areas, the consumption patterns by users can be detected, energy utilization can be optimally done, and wastage reduced. This has the effect of; reducing costs of electricity and reducing pressure on these resources thus playing part in environmental conservation. The capacity of the system to recognize changes and not to overload helps to protect appliances in these zones frequently and thus, to avoid their repair or replacement. By use of such operational affairs as an LCD display and light indicators, users are not only made aware but are also put in charge of responsible use of energy. Finally, this solution fits into the contemporary solutions, which take into consideration the aspect of efficient use of energy in the residential area towards sustainability and enhanced living standards in different generations.

COMMERCIALIZATION POTENTIAL

Among all the ‘Real-Time Power Monitoring and Control System for Electrical Appliances’ targets the most suitable niche is residential sectors specifically living room and study room. As energy consumption and costs skyrocket in many areas of the world today, this system is an excellent solution to monitor and regulate power usage in these often-lighted areas in real-time accurately. With the help of Arduino Uno, the ACS712 sensor, and acquainted interface, namely 20x4 LCD display, the system is cost-effective and convenient for homeowners. Due to the above factors, it is very suitable for home automation to meet the specific energy needs of living and study room. This makes energy awareness useful in helping users cut down the overall consumption of power, managing to incurs less charges in their electricity bills, and promoting use of environmentally friendly energy. As trends for sustainability and smart energy solutions rise, this system is set to become an attractive asset for prospective residential IoT platforms. In its enhanced version it could be a standalone smart energy appliance or integrated into existing smart home platforms thus guaranteeing tremendous sales and profitability in the rapidly growing smart home segment.

CONCLUSION

The “Real-Time Power Monitoring and Control System for Electrical Appliances” solve basic necessities of energy and power issues for the home areas such as living room and study room effectively with efficiency. This newly developed system uses Arduino Uno microcontroller, ACS712 sensor and a stable circuit configuration to perform accurate real time monitoring and controlling of electrical loads. Since it is easy to operate, has a consistent voltage supply through a transformer, and can adapt to various uses, it is an appropriate toolkit for reducing energy consumption and enhancing power in such often used areas. This means that in addition to driving the sustainable use of energy, this project raises a compelling opportunity for proper management of energy in homes through smart and efficient products that may be produced in large scale. This way, the system encourages users make the right decision when it comes to energy usage and promotes a clean environment while at the same time contributing to development of residential energy control and efficiency.

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Solar-Powered Wireless Charging System for Hybrid Vehicle

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ABSTRACT

As more people start using electric vehicles (EVs), charging them in a greener and more easy way becomes a challenge. A completely new approach is using solar energy while raising contactless technology to wireless charging. And so this idea tries to cover two major issues of current charging systems, i.e reliance on fossil fuel for EV charging and the ineffectiveness and degradation tendencies of wired systems. In order to address these concerns, solar powered wireless charging technology was developed and made ready for usage. The system consists of wireless power transfer (WPT), used to charge the cars via resonant inductive coupling, solar panels for collection of solar energy, and a battery that stores the energy for effective use. The design went through a detailed sequence of tests aimed at verification of its reliability, alignment accuracy, and energy transfer efficiency. Testing was successful that is in optimal conditions, energy transfer efficiency of the system was above 85%. This solution reduces dependence on coal or gas energy, simplifies the charging process of EVs, and contributes to the development of a better and more ecological transportation system.

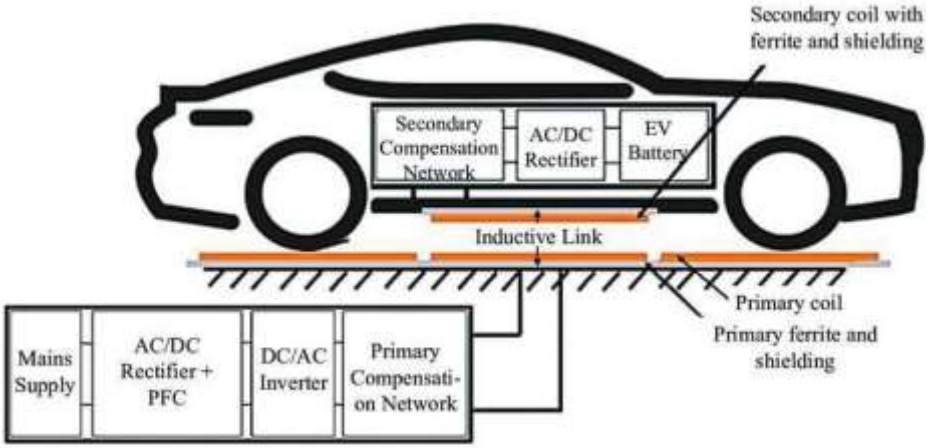
KEYWORDS: Electric Vehicles (EVs), Solar-Powered Charging, Wireless Charging, Renewable Energy, Photovoltaic (PV) Panels, Wireless Power Transfer (WPT), Resonant Inductive Coupling

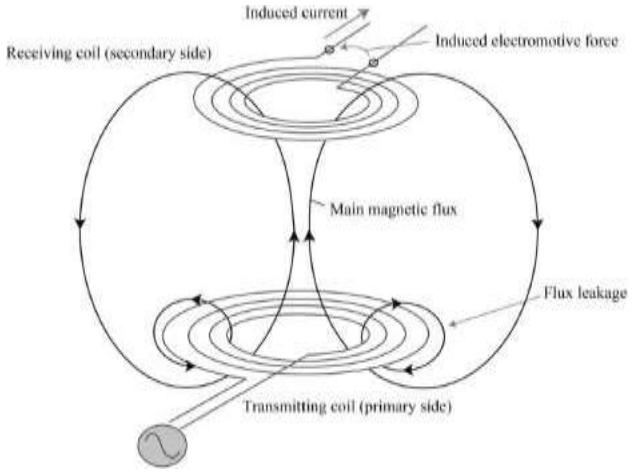
PRODUCT DESCRIPTION

Saving green energy more efficiently than ever through EVs was developed through a multistep process which is solar powered wireless charging system. The primary focus is the objective which in this case is to connect solar energy and EVs with the help of a wireless charging technology. After this EV solar charging systems attempt to combine existing wireless power transfer and photovoltaic technology with solar-powered systems. Improving the WPT modules initialized in EVs that use resonant inductive coupling, along with solar gathered from PV panels. Using software such as proteus allows for these simulations of electric vehicles to start ranging W radius until building the prototype. Alongside this software, there is the setup for hardware that contains for example PV panels and batteries which are afterwards constructed with energy management systems connected to platforms like Arduino. Additionally, traditional systems are the benchmarks of various validation testing to re-optimize the electric vehicles for an even superior internal infrastructure. After everything is completed in a satisfying manner the final step documents everything alongside visual presentations. Furthermore, it could make sense to focus on the adaptation of EVs for smart cities and incorporating modular designs that could improve scale or connect the IoT for remote controlling and tracking smart cars in smart cities. If this innovation will ever occur, then it's fair to say that all the aforementioned requirements satisfy the future EV market and push forward its green economy standards.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Visuals of wireless power transfer:





NOVELTY AND UNIQUENESS

The integration of wireless charging technology backed by renewable energy sources is what makes this project different from traditional methods of charging EVs, which is also the most fascinating and exciting aspect of this project. The wireless option does away with physical connections and therefore facilitates easier use while also minimizing damage to various charging ports. Furthermore, the system utilizes solar energy which in turn lowers the dependence on grid electricity considerably. This system is economically viable and environmentally friendly compared to traditional electric charging methods that incur high energy costs due to frequent charging. In this project, contactless charging powered by renewable energy sources increases comfort and also provides real energy savings which makes it a suitable technology for the EV sector.

BENEFIT TO MANKIND

The recommended system or project would enhance society by promoting the use of EVs and advancing wireless solar charging technology. It helps in decreasing dependence on fossil-based sources of energy and cuts down on the emission of greenhouse gases which in turn supports worldwide campaign to mitigate climate change. Software as a service based solar charging systems helps in higher savings in the long term in comparison to conventional electrical grid-x`xbased charging. Wireless technology makes it more convenient as it removes trying physical connections that add to the wear and tear of the equipment. Moreover, it helps in the proliferation of renewable technologies integrated with advanced technologies for self-contained electricity generation for future generation of EV facilities. To summarize, it enhances the health of the population, the air in the environment, and makes the whole transport system more user oriented and ecological.

COMMERCIALIZATION POTENTIAL

The project has great business and commercialization opportunities because it combines solar charging and the WPT technology. This invention set frees users from having to deal with physical, wired connections, thus improving convenience to users and reducing the wear and tear of equipment, unlike the previous solar EV charging systems which were tied to the grid. Also, while earlier WPT systems were able to be more efficient during the energy transfer process, they did so at the cost of being grid dependent which was not sustainable. This project solves these problems through the use of solar energy harvesting and storage with wireless charging with a remarkable energy transfer rate of 80 percent and reduced fossil fuel dependency. The end result is a cost effective and environmentally friendly approach that meets the needs of the exploding EV marketplace seeking off grid charging technology, making it ideal for residential, commercial and smart city applications.

CONCLUSION

The wireless charging system for electric vehicle (EV) solar battery charger is a milestone in the progression of sustainable transport technologies. It's addressing issues such as dependence on grid electricity, impact on the environment and end-user convenience with the use of a wireless power transfer system and renewable energy sources that come from PV panels. Emitting up to 85% of energy transfer efficiency rated under optimal conditions, it shows certain degree of practicality and effectiveness. Together with the use of contact-based technology, this innovation assists in reducing the emission of greenhouse gases, increases the convenience of charging as well as meets the global trends for clean energy sources and green mobility. In its current form, this system has potential to be deployed in multiple settings and is envisioned to be further developed and refined to address other pain points and in essence it provides a viable, scalable solution towards the wider goals of creating a sustainable and efficient transport ecosystem.

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Solar Powered Standing Fan

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ABSTRACT

Solar powered fan implements of a smart fan that integrates with renewable energy, energy efficiency and automated control for enhance user experience. Utilization of ESP32 as the microcontroller make it easy to collect data through sensors such as current flow, temperature and presence of object through ACS712, DHT22 and ultrasonic sensor while L298N motor driver control the fan's speed. Integration of Internet Things (IoT) make user easy to control based on their need. The system operation active based on user controls via Blynk IoT apps and auto control through the sensors. When the motor run, LED will light up to notice user. This innovation is designed to address the demand for energy efficient appliance that operate with minimal impact of electricity usage. The project demonstrate scalability for various applications such as residential and industrial settings. The integration of solar and rechargeable battery using TP4056 charging module helps to contribute es to environment sustainability and aligns with trends toward smart technology adoption.

KEYWORDS: Smart fan, Internet of Thigs (IoT), sensors, energy efficient, environment sustainability**.**

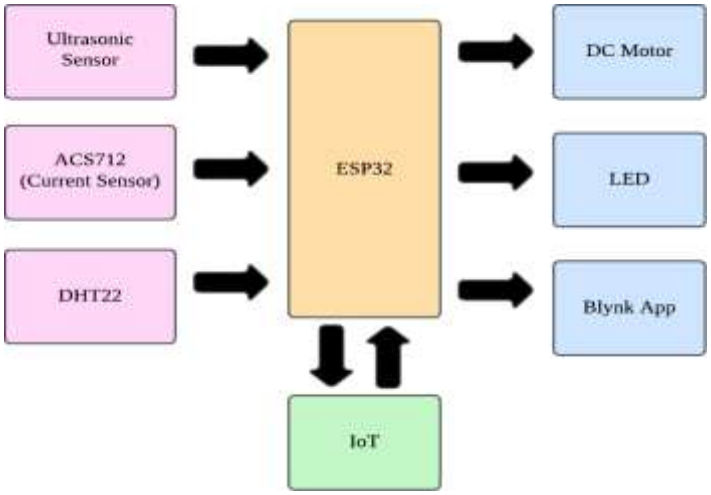
PRODUCT DESCRIPTION

This product is designed to deliver an efficient cooling solution that prioritizes energy conservation and intelligent operation. The ESP32 serve as the microcontroller to enable IoT integration and control the system. An ultrasonic sensor uses to detect proximity as the automation of the system to on and off. DHT22 read the environment temperature to decide either the fan run in a high speed or medium. ACS712 was put to read current flow through this system, meanwhile L298N motor driver and DC motor provide the mechanical operation of the fan. The data collected by the sensors displayed on Blynk application, enabling users to monitor and control it remotely as their need. The combination of solar panel and this smart fan minimizes reliance on traditional power source, making the system ecofriendly.

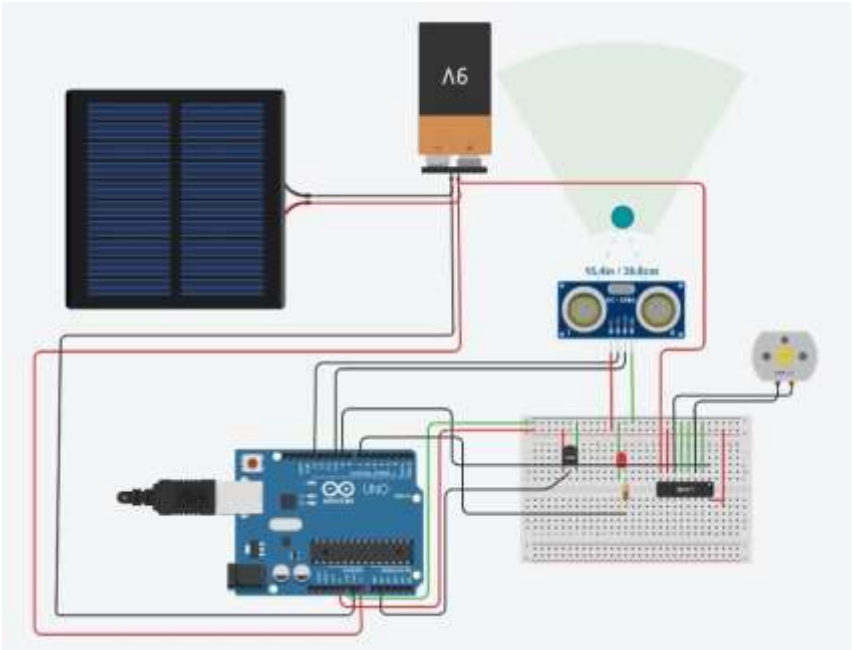
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarised as follow:

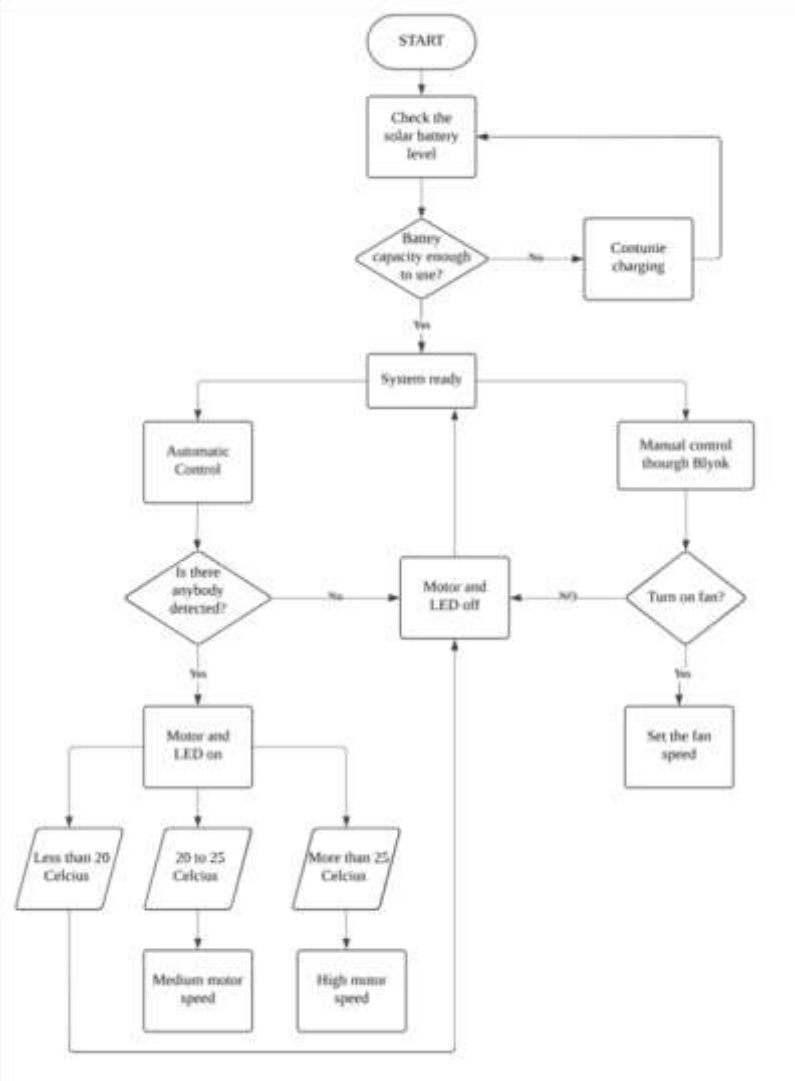
1. Block Diagram



2. Schematic Diagram



3. Flow chart



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the smart fan due to its integration of IoT technology, intelligent automation and renewable energy. Contrary to the former traditional cooling systems, this project combines environmental monitoring with automated control to give new experience for users. Moreover, the usage of IoT allow users to monitor and control the fan remotely, providing convenience. Use of a solar panel and LI-ion batteries reduces the system's dependence on conventional power sources, aligning with global sustainability goals. It also can be easily adapted for different settings from residential to commercial environments. The automated fan activation based on environmental conditions ensure optimal operation.

BENEFIT TO MANKIND

The solar powered fan system offers a lot of benefits to society by addressing the increasing need for energy efficient and sustainability cooling solutions. By utilizing renewable energy through solar integration, the system automatically reduces energy consumption, contribution to environmental protection. The smart design ensure that the energy is only used when necessary, prevent it from wastage. From users perspective, the system provides convenience through its IoT based remote monitoring and control. Users can adjust the fan's speed and monitor environmental data in real time, enhancing their overall experience. Furthermore, its eco-friendly design aligns with global efforts to combat climate change and transition towards sustainable living practices.

COMMERCIALIZATION POTENTIAL

The solar powered standing fan system has significant market potential in residential and commercial sectors. The potential due to its innovative features and adaptability to ensure users comfortability. Its simple design allows it to be adapted to specific needs of different markets. The integration of renewable energy and IoT makes it an attractive option for eco conscious consumer and business seeking sustainable solutions. The system's ability to reduce energy costs and enhance user convenience positions it as a valuable product in the market. As global demand for smart and sustainable technologies continues to grow, the system is well suited to enter these trends. Its scalability ensures it can be deployed in various settings, making it a versatile and marketable solution for modern cooling needs.

CONCLUSION

The Solar Powered Standing Fan represents a significant advancement in the field of energy efficient cooling technology. By integrating IoT, renewable energy, and intelligent automation, it provides a sustainable and user-friendly solution that meets the demands of modern living. The system's innovative design not only reduces energy consumption but also enhances convenience and adaptability, making it a practical choice for a wide range of applications. By aligning with global trends toward sustainability and smart technology, the Solar Powered Standing Fan demonstrates its potential to become a cornerstone in the development of intelligent and eco-friendly infrastructure.

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Solar Powered Gate Identification System

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ABSTRACT

The Solar-Powered Gate Identification System is an innovative project designed to automate gate control while promoting sustainable energy use. The system integrates an Ultrasonic Sensor, an RFID Reader, a Servo Motor, and a Buzzer, all controlled by an Arduino Uno microcontroller. Powered by a solar panel, the system ensures efficient energy usage, making it suitable for off-grid or remote locations. The ultrasonic sensor detects vehicles approaching the gate, and the buzzer alerts when an object is within a specified range. Authorized access is granted through the RFID reader, triggering the servo motor to open and close the gate automatically. Real-time status updates, such as "Gate Opening" or "Gate Closing," are displayed on a Liquid Crystal Display (LCD). This system reduces reliance on manual gate operations, increases security, and minimizes energy consumption, making it an ideal solution for residential and commercial applications. (141 words)

KEYWORDS: Solar-Powered System, Ultrasonic Sensor, RFID Reader, Servo Motor, Liquid Crystal Display (LCD).

PRODUCT DESCRIPTION

The Solar-Powered Gate Identification System automates gate control using sustainable energy and smart technology. It uses an Ultrasonic Sensor to detect approaching vehicles, triggering a Buzzer for audible alerts. Authorized access is managed via an RFID Reader, ensuring secure and controlled gate operation. A Micro Servo Motor physically opens and closes the gate, while an LCD I2C Display shows real-time system status messages such as "Gate Opening" and "System Ready". The entire system operates on power supplied by a solar panel, ensuring energy efficiency and reliable performance even in remote or off-grid areas. This project demonstrates an eco-friendly and user-friendly approach to gate control and security.

SCHEMATIC DIAGRAMS AND FLOW CHARTS

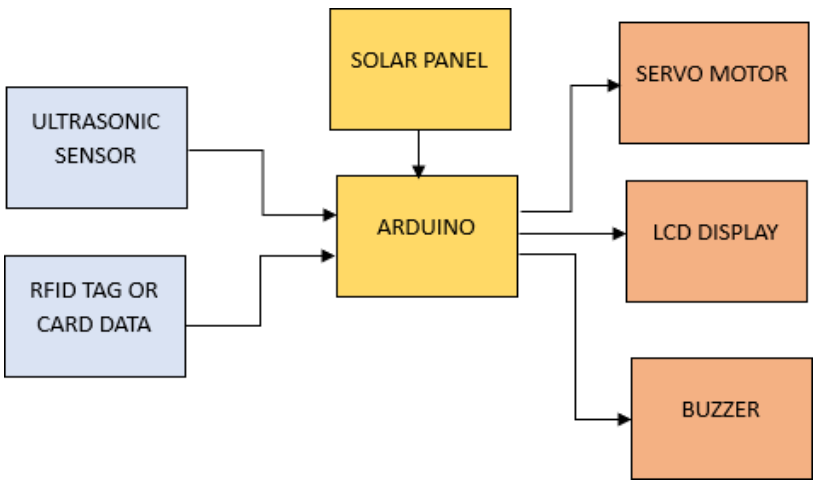


Figure 1: Block Diagram

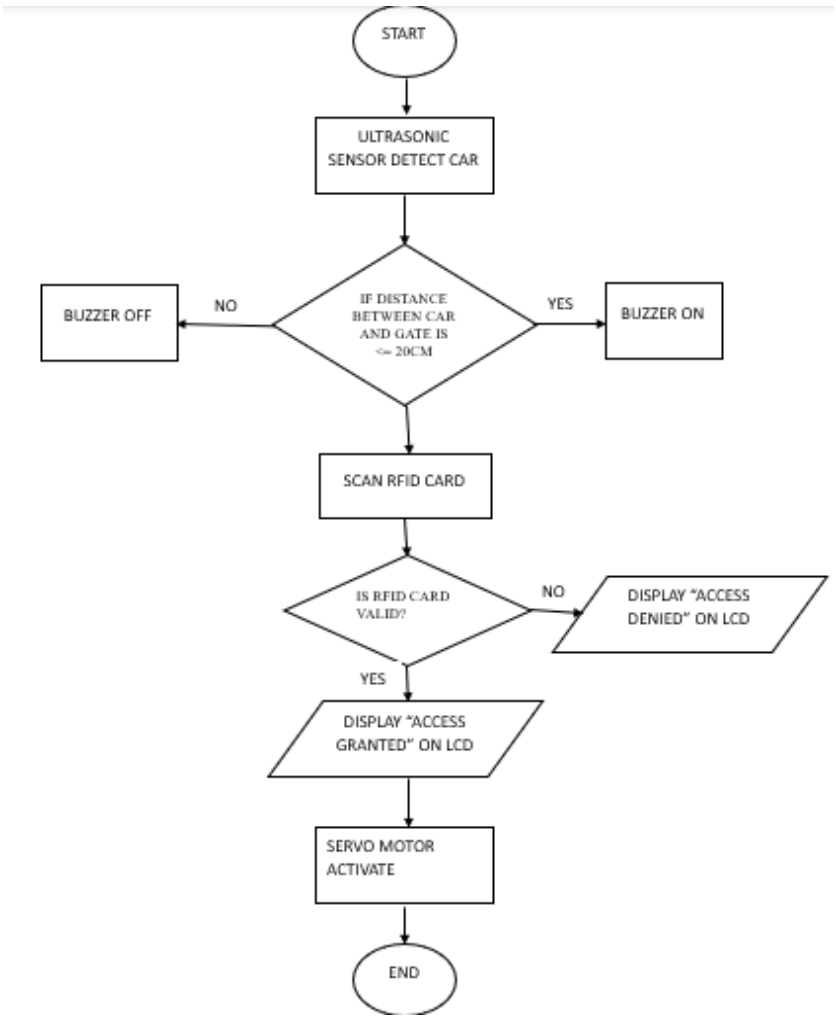


Figure 2: Flow Chart

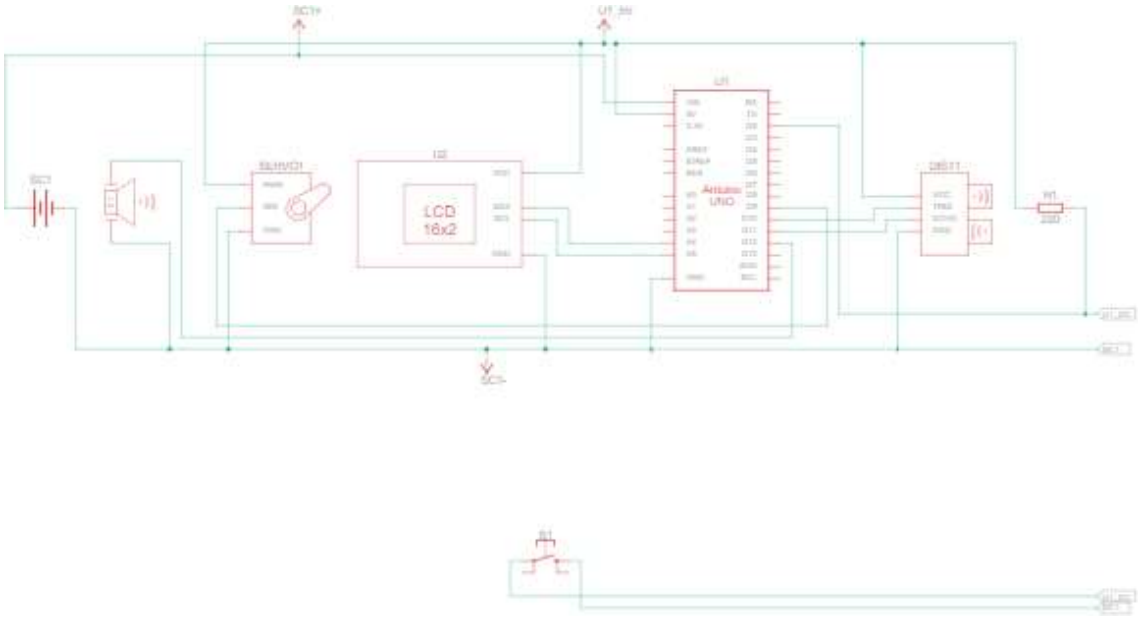


Figure 3: Schematic Diagram

NOVELTY AND UNIQUENESS

The uniqueness of the Solar-Powered Gate Identification System lies in its integration of renewable solar energy with smart automation technology. Unlike traditional gate control systems that rely heavily on grid power, this project offers an independent, energy-efficient solution. The use of Arduino Uno, combined with an Ultrasonic Sensor and RFID technology, allows for precise vehicle detection and secure access. Its adaptability for both residential and commercial use highlights its versatility. Furthermore, real-time system feedback through an LCD display improves user experience, while the buzzer ensures immediate alerts for safety purposes.

BENEFIT TO MANKIND

This project addresses common challenges in gate control systems, such as manual operation, high energy consumption, and unreliable power supply. By using solar energy, the system reduces dependency on non-renewable energy sources, contributing to a cleaner environment. It improves security through RFID-based access control and provides an efficient and convenient user experience. Additionally, the system's adaptability allows it to be deployed in residential areas, commercial facilities, and remote locations, ensuring reliable operation and easy maintenance.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Gate Identification System has strong commercialization potential in both residential and industrial markets. It is ideal for gated communities, private homes, parking lots, and secure industrial facilities. Its low maintenance requirements, renewable energy source, and advanced automation technology make it an attractive option for customers looking to improve security and energy efficiency. The increasing demand for sustainable and automated solutions positions this system well for successful market adoption.

CONCLUSION

The Solar-Powered Gate Identification System combines renewable energy and smart automation to deliver an efficient, secure, and eco-friendly solution for gate control. By integrating an Ultrasonic Sensor, RFID Reader, Micro Servo Motor, and LCD Display, the system ensures seamless gate operation while minimizing manual intervention. Its solar-powered design promotes environmental sustainability, and its user-friendly interface enhances overall functionality. Future improvements could include smartphone app integration for remote monitoring and further optimization for mass production. This project demonstrates a scalable and practical approach to modern gate automation technology.

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Solar Chaser: An Optimal Solar Tracking

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ABSTRACT

This report is a document about the design and simulation regarding the project called Solar Chaser: An Optimal Solar Tracker. This system combines multiple input and output such as temperature sensor (LM35), photoresistor, LDR Module, Servo Motor, LED, Liquid Crystal Display (LCD), Solar Cell and most importantly is the microcontroller Arduino MEGA. The system is centered at solar cells to find the most intense light source throughout the day based on photoresistor data and oriented by the servo motor. Other sensors such as LM35 and LDR module are used to determine the variables that are related to solar cell absorption. This project is designed to maximize solar energy capture using cost-effective and widely available components. The uniqueness of this lies in its use of a simple yet effective control system and its ability to integrate multiple functionalities into a compact modular design. By increasing the efficiency of solar energy systems, it supports sustainable energy adoption and reduces dependency on fossil fuels.

KEYWORDS: Solar Tracker, Photoresistor, Arduino MEGA, Solar Energy Optimization, Sustainable Energy

PRODUCT DESCRIPTION

The Solar Chaser is a smart, efficient, and cost-effective solar tracking system designed to maximize solar energy capture throughout the day. By utilizing advanced sensing technology and dynamic orientation, this product ensures optimal alignment with the most intense light source, significantly improving the efficiency of solar panels. The key features are Dynamic dual axis tracking, intelligent sensor and user-friendly interface. The Solar Chaser not only enhances energy efficiency but also promotes sustainable energy solutions, reducing reliance on non-renewable resources and supporting global efforts toward a greener future.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

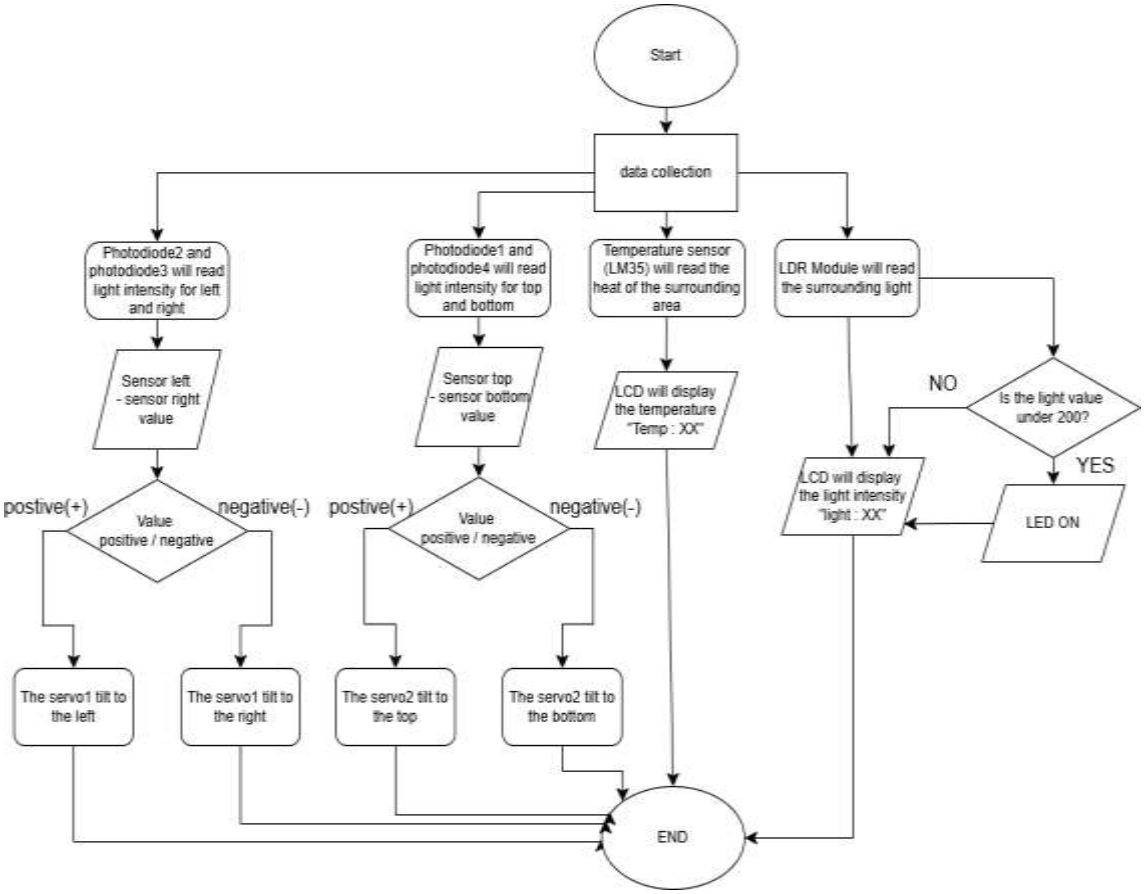


Figure 1 Flow Chart of how the system work.

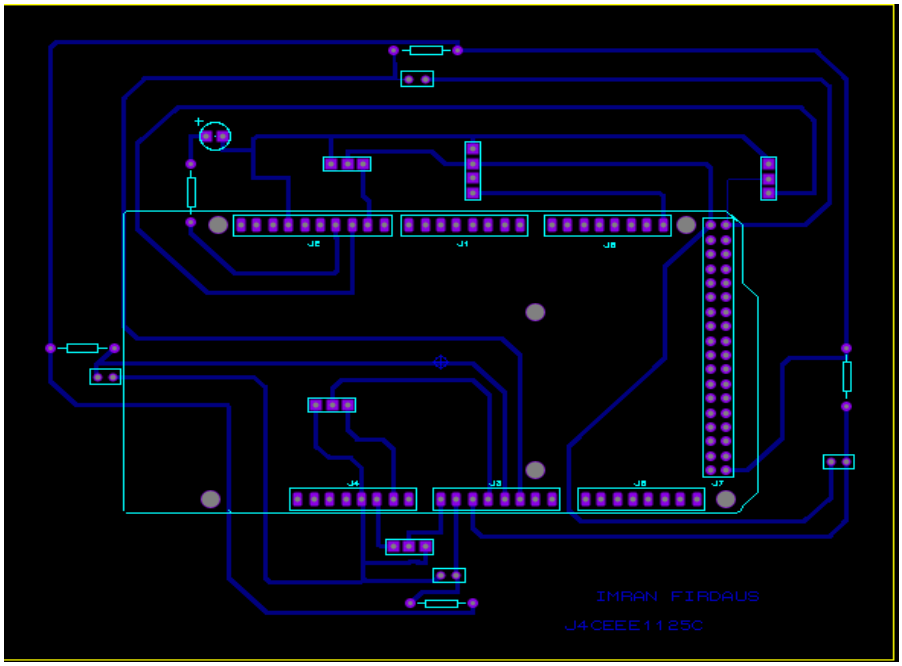


Figure 2 PCB layout of the system (simplified)

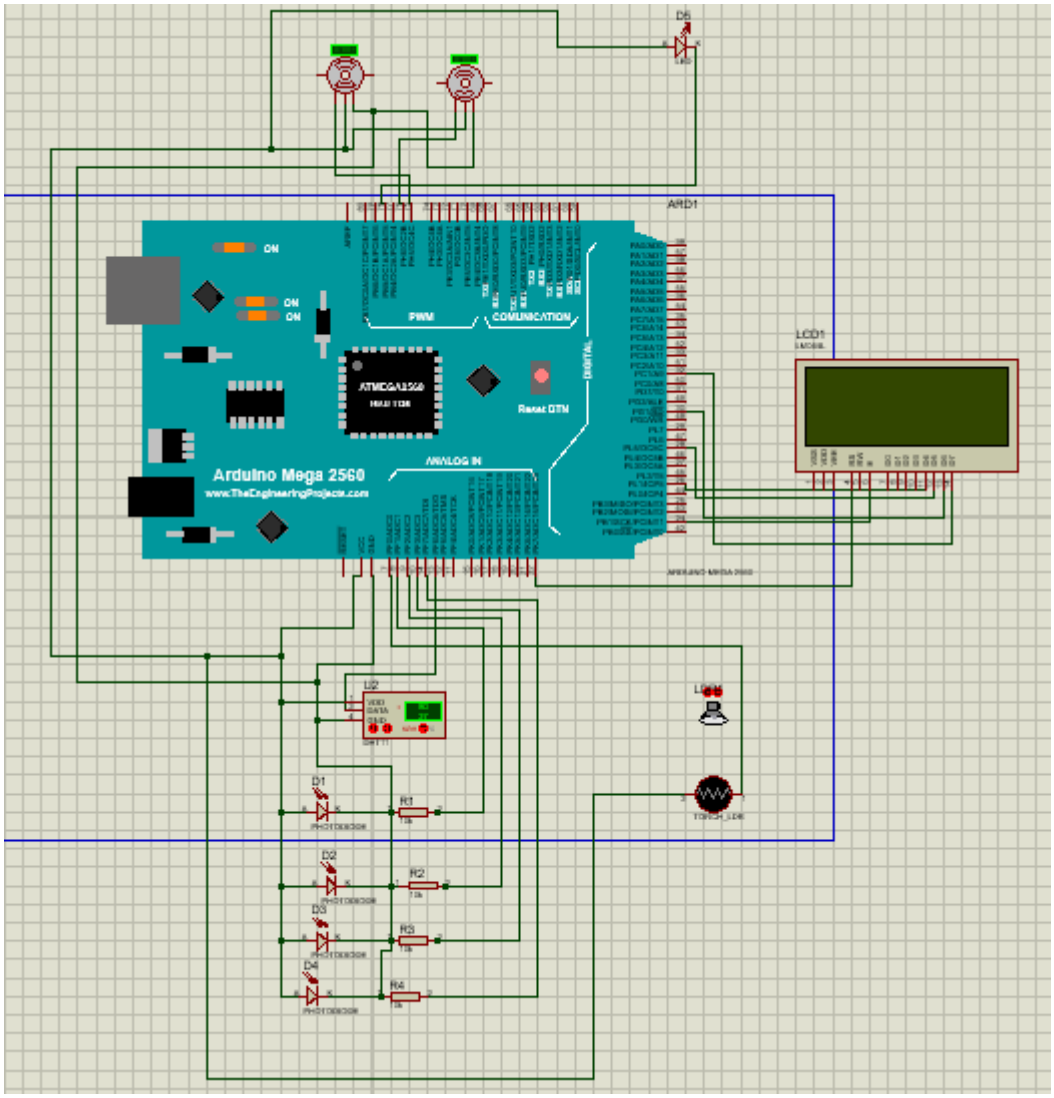


Diagram 3 layout of simulation of the project.

NOVELTY AND UNIQUENESS

The core innovation of this solar tracking system lies in its integration of renewable energy principles, advanced sensors, and automation features, setting it apart from traditional systems. Utilizing a two-layer LDR technique, the system can monitor both ambient light and perform self-testing, enhancing overall reliability. The inclusion of automated fault detection allows for real-time identification of issues such as shading or component malfunctions, while the LCD display and LED indicators provide immediate feedback. Additionally, the system supports precise sunlight tracking using four photoresistors and ensures optimal performance with temperature monitoring via an

LM35 sensor. This design emphasizes efficiency, minimal manual intervention, and adaptability, making it a cutting-edge solution for sustainable energy optimization.

BENEFIT TO MANKIND

This solar tracking system offers significant benefits for mankind by promoting the efficient utilization of renewable energy, contributing to a cleaner and more sustainable future. By maximizing the energy capture of solar panels, it reduces dependency on fossil fuels, helping to mitigate environmental pollution and combat climate change. The system's automation and remote monitoring capabilities make it accessible and easy to maintain, even for users with minimal technical expertise, which can encourage widespread adoption in residential and industrial settings. Its cost-effectiveness and reliability also make it an ideal solution for off-grid communities, empowering them with access to affordable and sustainable energy. This

innovation supports global efforts to transition to renewable energy, fostering economic and environmental sustainability for future generations.

COMMERCIALIZATION POTENTIAL

The solar tracking system, equipped with sensors and automated control mechanisms, holds considerable commercialization potential due to its applicability in various renewable energy sectors. Key markets include residential solar installations, where its efficient energy capture can reduce electricity costs, and industrial solar farms seeking to maximize energy output with minimal maintenance. Opportunities also exist in rural electrification projects, empowering off-grid communities with sustainable energy solutions. Its robust features, including automated fault detection and remote monitoring, make it an attractive option for government-sponsored green energy initiatives and urban smart grid projects. Furthermore, the growing emphasis on renewable energy adoption, combined with the system's cost-effectiveness and reliability, positions it as a scalable solution in the global renewable energy market.

CONCLUSION

The solar tracking system developed in this project has demonstrated in optimizing solar energy capture through precise tracking, environmental monitoring, and automated fault detection. Its integration of advanced sensors and automation highlights its potential to revolutionize renewable energy applications by enhancing efficiency and reducing manual intervention. The system's adaptability and cost-effectiveness make it a promising solution for residential, industrial, and off-grid solar installations. Future recommendations include refining the design for scalability, integrating IoT for enhanced remote management, exploring additional renewable energy sources for hybrid systems and more precise equipment for detecting. Continued research and development will be crucial for improving reliability and expanding its applications, solidifying its role in the future of sustainable energy technologies.

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FINAL YEAR PROJECT

DIPLOMA IN ELECTRICAL ENGINEERING (ELECTRONICS)

CEEE111/EE111

Asthma Health Monitoring System

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ABSTRACT

Manual observation and routine check-ups are common components of traditional asthma health monitoring systems, which might cause delays in recognizing serious symptoms and delivering prompt therapies. This study offers an Internet of Things (IoT)-based asthma health monitoring system that incorporates cutting-edge sensors and actuators for automated, continuous surveillance of important environmental and health metrics in order to get around these restrictions. An ESP32 module serves as the system's central controller. Other sensors include an MG2 gas sensor to identify hazardous substances in the surrounding air, a DHT22 sensor to track temperature and humidity, and a pulse sensor to monitor heart rate. The information is shown on an LCD screen, giving patients and caregivers a quick and easy way to see health measures. When measurements are abnormal, the system turns on LED lights and a buzzer to deliver instant alerts, ensuring prompt responses to potential emergencies. Furthermore, the system leverages IoT connectivity to enable seamless data transmission and remote monitoring, allowing healthcare providers and caregivers to access real-time updates. This comprehensive approach enhances the reliability, efficiency, and effectiveness of asthma management, reducing risks and improving patient outcomes.

KEYWORDS:

Heart rate monitoring, Temperature and humidity tracking, Harmful gas detection.

PRODUCT DESCRIPTION

The IoT-based Asthma Health Monitoring System is a state-of-the-art tool that will transform asthma treatment by continuously and automatically tracking vital environmental and health indicators. An ESP32 module powers the system's core, ensuring smooth IoT connectivity and effective processing. It has an MG2 gas sensor to identify the presence of dangerous chemicals that may aggravate asthma symptoms, a DHT22 sensor to measure temperature and humidity, and a pulse sensor to track heart rate. Together, these sensors offer thorough information on environmental factors and patient health. Vital metrics may be easily tracked at a glance by patients and caregivers thanks to the system's LCD display, which provides clear and real-time depiction of collected data. A buzzer and embedded LED lights are activated in the event of abnormal readings to provide instant visible and auditory alerts, allowing for quick reactions to possible crises. Additionally, the device makes use of IoT connectivity to send data in real-time to caregivers and healthcare practitioners, enabling remote monitoring and guaranteeing that vital information is always available.The IoT-based Asthma Health Monitoring System is small, easy to use, and incredibly effective. It not only improves the dependability of asthma treatment but also speeds up emergency reaction times. This creative method greatly enhances asthma patients' safety and quality of life by providing real-time insights to patients and caregivers and facilitating proactive health management.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

To design, develop, and implement a cutting-edge solution for ongoing asthma care, the IoTBased Asthma Health Monitoring System project took a methodical and creative approach. To provide a solid basis based on the most recent research and technology, the project started with a thorough analysis of the healthcare monitoring systems that were already in place. A thorough system architecture was developed as a result of the precise requirements and functions that were established throughout the design phase. A DHT22 sensor for temperature and humidity tracking, an MG2 gas sensor for identifying hazardous ambient gases, and a pulse sensor for heart rate monitoring were all integrated into the final implementation. Health parameters were visualized in real time via an LCD display, and abnormal readings were immediately alerted by a buzzer and LED lights. Powered by an ESP32 module, the system enabled IoT connectivity for seamless datatransmission and remote monitoring, ensuring caregivers and healthcare providers have access to critical information at all times. This innovative and use-rcentric design offers a reliable, efficient, and proactive solution for managing asthma and improving patient outcomes.

Figure 1 shows the architecture of the IoT -Based Asthma Health Monitoring System, which integrates multiple sensors and components to provide realtime tracking of health and environmental parameters. At the core of the system, the ESP32 module processes data from key sensors, including a gas sensor for detecting harmful substances, a DHT22 sensor for monitoring temperature and humidity, and a pulse sensor for measuring heart rate. These inputs are displayed on an LCD screen for real -time visualization, while LED lights and a buzzer provide immediate visual and auditory alerts for abnormal readings. The ESP32 module also enables Wi-Fi connectivity for seamless data transmission and remote monitoring, ensuring that caregivers and healthcare providers have access to real -time updates. This design demonstrates the project's innovative approach to enhancing asthma management by combining accurate monitoring, user - friendly feedback mechanisms, and IoT connectivity.

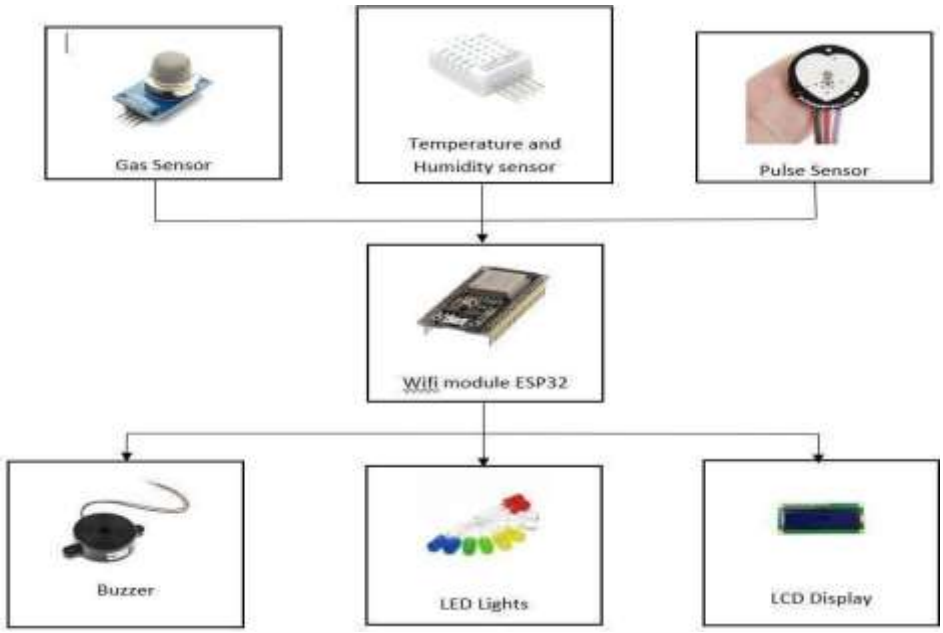


Figure 1. Block Diagram of Asthma Health Monitoring System

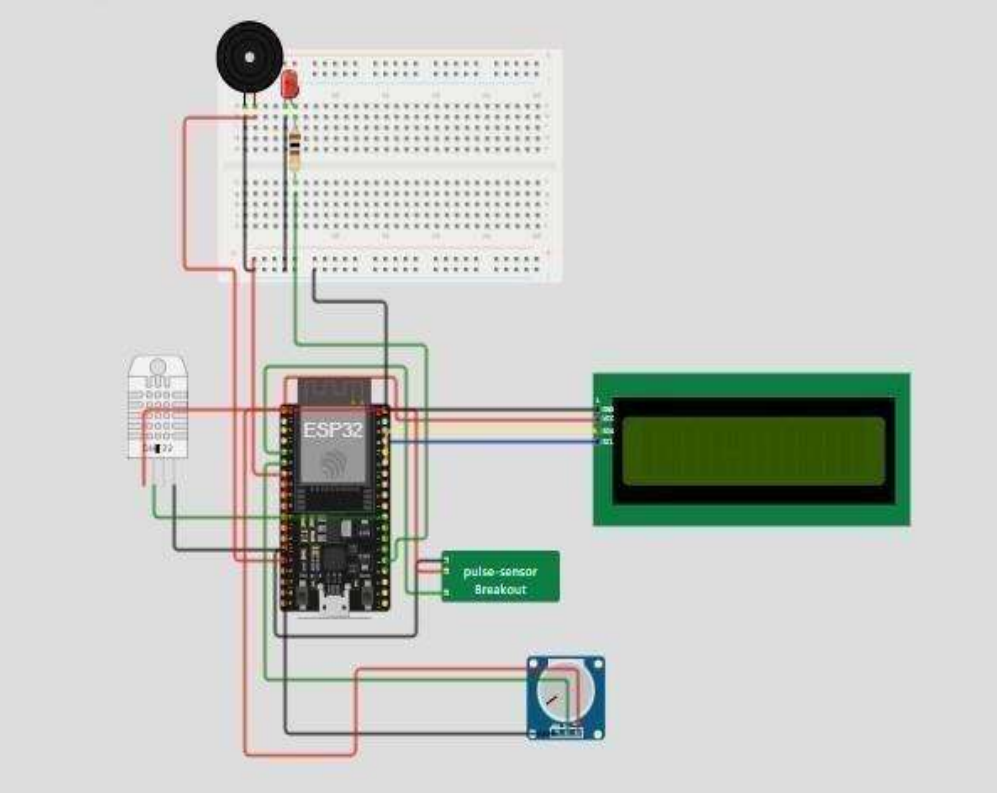


Figure 2. Schematic Diagram of Asthma Health Monitoring System

Figure 2 shows the schematic diagram for the Asthma Health Monitoring System, which illustrates the strategic connections of each component to the ESP32 DevKitC-v4 microcontroller. The Pulse Sensor is connected to GPIO 34 for analog pulse rate readings, while the MQ-2 Gas Sensor is linked to GPIO 32 for monitoring gas levels. The DHT22 temperature and humidity sensor is connected to GPIO 15 to measure the surrounding conditions. The LCD Display, used for presenting data, is connected via I2C with SDA on GPIO 21 and SCL on GPIO 22. The Buzzer, connected to GPIO 26, is activated for alerts when thresholds are exceeded, and the Red LED, connected to GPIO 25, is used to indicate alarm statuses. This schematic ensures a precise and organized system with all components interfacing seamlessly with the ESP32, providing rea-ltime monitoring and alerts for the asthma health monitoring system.

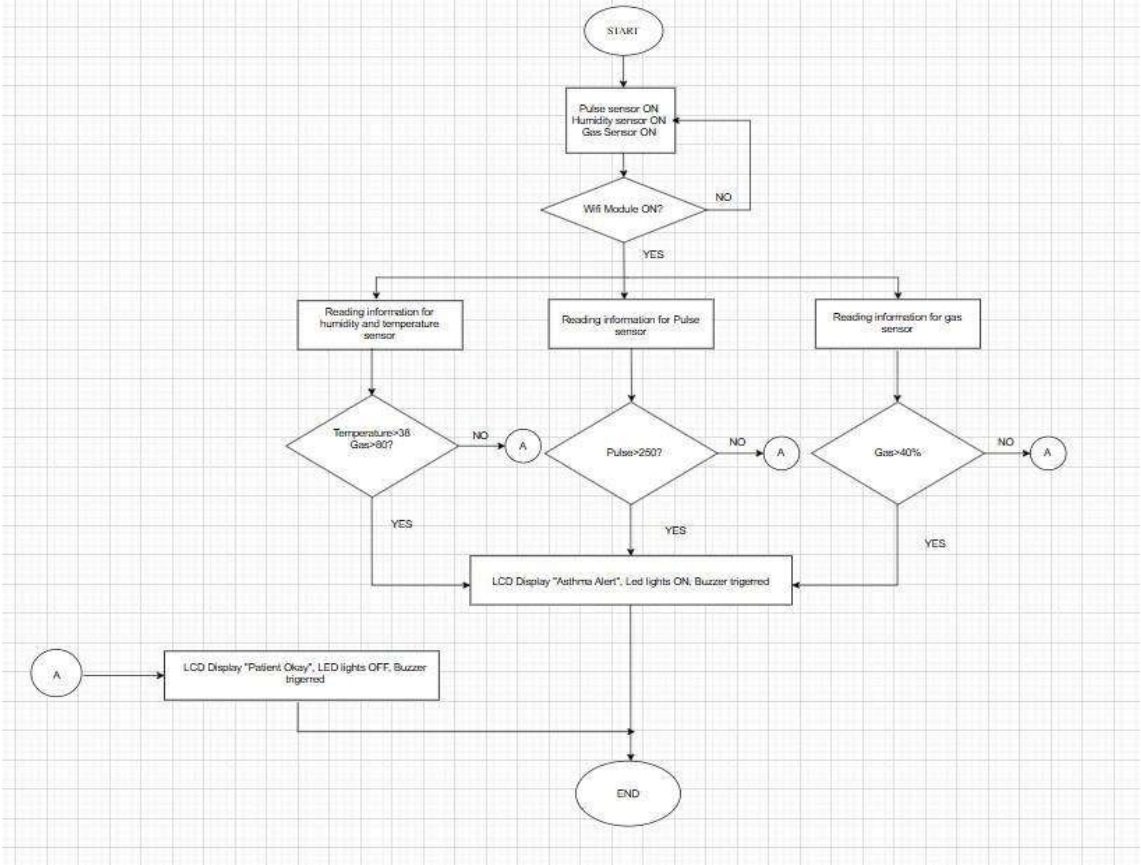


Figure 3. Flowchart of Asthma Health Monitoring System

Figure 3 presents the Flow Chart of the Asthma Health Monitoring System, outlining a comprehensive scheme for monitoring and managing health parameters. It commences with input data from a Pulse Rate Sensor, DHT22 Humidity and Temperature Sensor, and MQ2 Gas Sensor, directed to the Ar duino Microcontroller as the central processing unit. Sensor readings encompass pulse rate, humidity, temperature, and gas levels, subsequently controlling output indicators like a buzzer, LED lights, and an LCD display. The system dynamically responds to health parameter fluctuations, offering immediate feedback and alerts regarding potential health issues. This flowchart effectively illustrates the system's capability to monitor and regulate asthma health in real-time, showcasing the interaction between sensors, actuators, and output indicators.

NOVELTY AND UNIQUENESS

It is clear that the creation of the Asthma Health Monitoring System has great potential to address the urgent issues related to respiratory health. The technology exhibits the potential to enhance health monitoring and offer asthma sufferers real-time alerts by combining cutting-edge hardware components, including the ESP32 microcontroller, with complex software solutions. Important parts including the pulse sensor, MQ-2 gas sensor, DHT22 temperature and humidity sensor, and LCD display are included to allow for continuous data collection, which is necessary for making well-informed decisions on respiratory conditions. Monitoring temperature, humidity, pulse rate, and air quality replicates the complexities of real health monitoring systems, making it a useful tool for both patients and medical professionals. Additionally, the addition of a buzzer and red LED for alerts enhances patient safety by offering immediate responses to critical health conditions, ensuring timely intervention. This system offers a comprehensive approach to asthma management, making it a valuable tool for health monitoring and potentially improving the quality of life for asthma patients.

BENEFIT TO MANKIND

The Asthma Health Monitoring System provides a thorough method of regulating respiratory health by fusing innovative hardware, software, and Internet of Things connectivity. It offers realtime tracking of asthma-related variables with capabilities like ambient sensing, gas detection, and pulse rate monitoring. Additionally, the system has alert features like a red LED and buzzer for timely notifications, guaranteeing prompt action when needed. By enhancing asthma control, this prototype benefits both patients and medical staff.

COMMERCIALIZATION POTENTIAL

There is a lot of room for the proposed Asthma Health Monitoring System to be commercialized in the medical field. This solution, either as a stand-alone product or as a component of a larger health monitoring service, might be promoted as a useful tool for managing asthma by collaborating with healthcare doctors or wellness organizations. Real-time monitoring of vital health indicators, better asthma symptom management, and prompt warnings of possible health hazards would all help patients and caregivers, ultimately improving general wellbeing and bringing comfort.

CONCLUSION

One promising option for enhancing respiratory health care is the Asthma Health Monitoring System. It provides real-time monitoring of critical health parameters like pulse rate, gas levels, and ambient variables using an ESP32 microcontroller and Internet of Things technologies. For asthma sufferers, features like temperature sensing and gas detection offer early warnings, guaranteeing prompt action. This prototype offers a clever, practical, and user-friendly way to manage asthma and enhance patient well-being by fusing contemporary technology with conventional health monitoring.

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Adaptive Watering Control System for Soil Moisture Detection Accuracy

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ABSTRACT

The adaptive watering control system for soil moisture detection accuracy is an innovative project that combines IoT technology with smart irrigation systems. This system utilizes three sensors—a DHT22 sensor for temperature and humidity, an LDR sensor for light intensity, and a water level sensor—to collect data on environmental conditions. The system's six outputs include an LCD screen for displaying sensor readings, LED lights for indicating WiFi connection status, a LED strip light for plant lighting, a buzzer for indicating water pump, a water pump for irrigation, and data transfer to ThingSpeak for online monitoring. Upon startup, all sensors are activated along with a red LED light to indicate the device is on but not connected to WiFi. Once connected, a green LED light indicates successful WiFi connection. The system then reads sensor data and controls the water pump and buzzer based on temperature and humidity conditions. It also ensures that the water pump and buzzer are inactive if the water level is high. The LED strip light is controlled based on light intensity, providing supplemental lighting for plants.

KEYWORDS: Adaptive, Detection Accuracy, Online monitoring

PRODUCT DESCRIPTION

The adaptive Watering Control System is an innovative and portable solution designed for effortless plant care by integrating multiple sensors, including the DHT22 for temperature and humidity, the LDR for light intensity, and a water level sensor for monitoring moisture. Compact and lightweight, this device is easy to bring anywhere, making it perfect for homes, apartments with limited space, and individuals with busy lifestyles who have little time for plant maintenance. It is also ideal for researchers or those growing simple crops like tomatoes or herbs, even in temporary or mobile setups. The system includes six essential components: an LCD screen that displays real-time sensor readings, a red LED to indicate power and WiFi disconnection, and a green LED to show successful WiFi connectivity. A LED strip provides supplemental lighting for plants in low-light conditions, while a water pump ensures efficient irrigation, and a buzzer alerts users during pump activity. ThingSpeak integration, the system uploads data for remote monitoring and analysis, making it suitable for both casual and professional use. The Adaptive Watering Control System intelligently adjusts lighting and irrigation based on environmental conditions, ensuring plants receive optimal care while conserving water and energy. Whether you're a city dweller needing a low-maintenance plant solution, a researcher conducting agricultural experiments, or someone constantly on the move, this portable system is a reliable and efficient choice.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. PCB LAYOUT

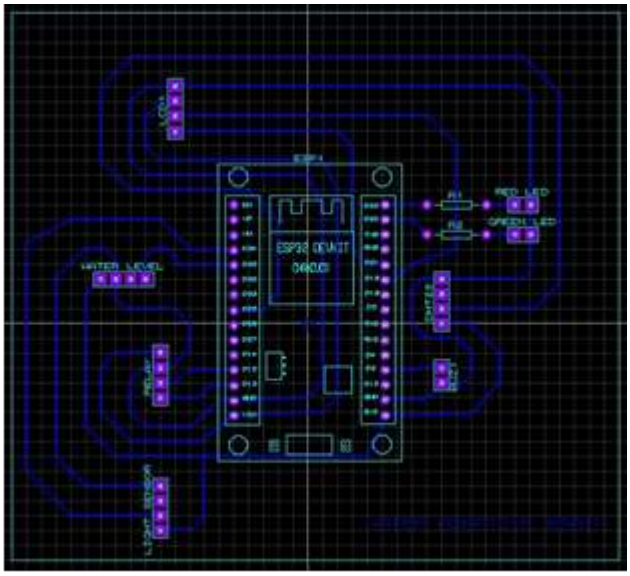


Figure 1. PCB layout of the adaptive watering control system

2. FLOWCHART

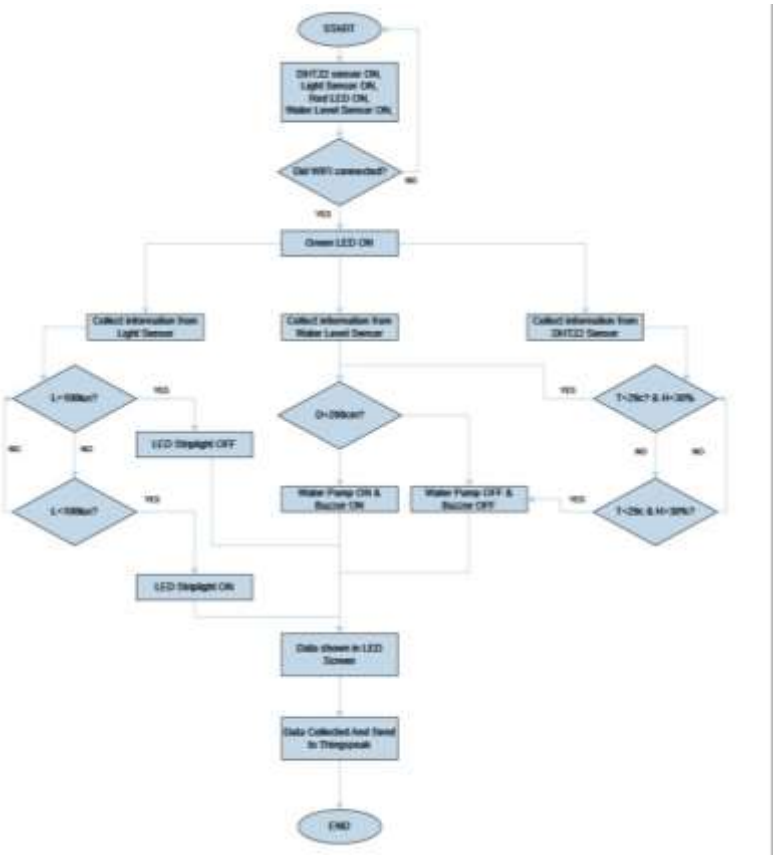


Figure 2. Flowchart for the operational process of the adaptive watering control system

3. BLOCK DIAGRAM

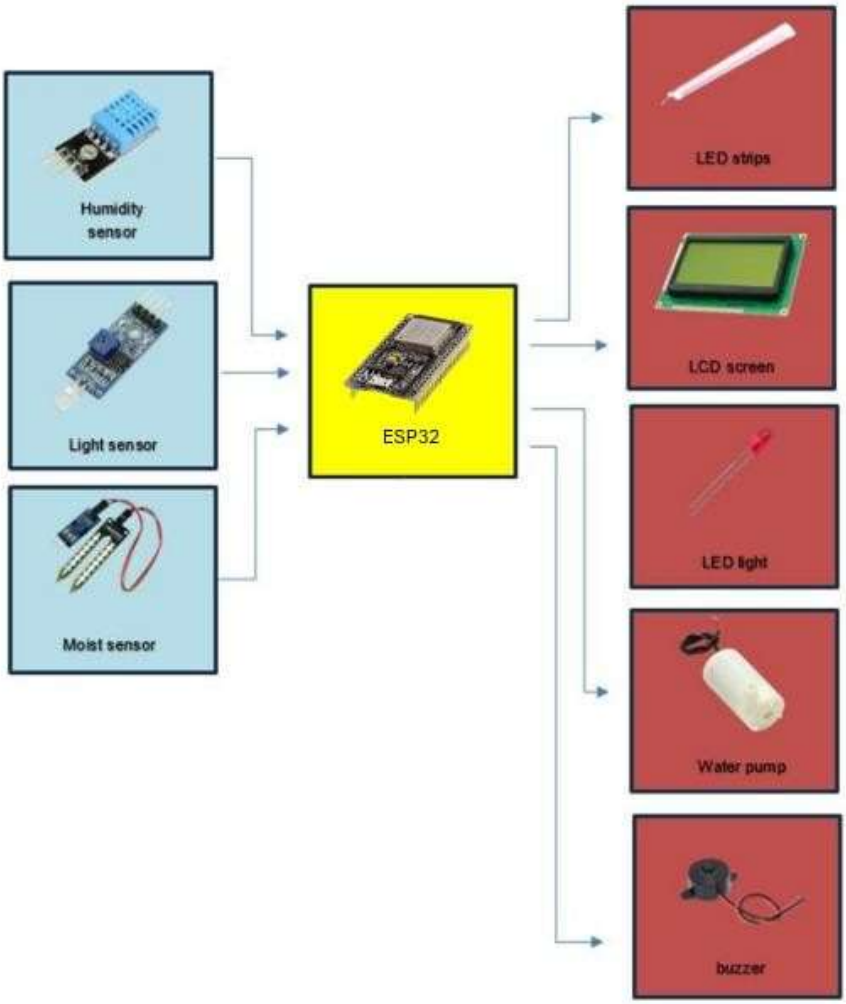


Figure 3. Block diagram of the adaptive watering control system

4. GRAPHS



Figure 4. Graph of the sensor data and system performance of the adaptive watering control system

NOVELTY AND UNIQUENESS

The adaptive watering control system combining portability, advanced IoT integration, and smart plant care technology into a single, compact solution. Unlike traditional irrigation systems, this device uses real-time data from multiple sensors temperature and humidity (DHT22), light intensity (LDR), and water level to make precise, automated decisions tailored to the plant's needs.Its portability makes it adaptable for urban living, research environments, or on-the-go setups, catering to users with limited space or time. The integration of features like WiFi connectivity for remote monitoring via ThingSpeak, supplemental lighting through LED strips, and intelligent irrigation control ensures sustainability and convenience. This innovative system is versatile enough to nurture everything from ornamental plants in apartments to research crops like tomatoes or simple foods. It eliminates the need for constant attention, making it a solution for plant care enthusiasts, busy professionals, and researchers seeking efficiency and ease of use.

BENEFIT TO MANKIND

The Adaptive Watering Control System provides significant benefits to mankind by promoting efficient and sustainable plant care. Its automated features help conserve water, reduce energy consumption, and minimize the time and effort required for maintaining plants, making it ideal for individuals with busy lifestyles or limited resources. By enabling urban dwellers to grow food in compact spaces like apartments, the system supports urban agriculture and contributes to food security. It also empowers researchers and small-scale farmers to optimize crop growth with precise monitoring and control, fostering innovation in sustainable agriculture. The portability and ease of use make it accessible to a broad audience, encouraging more people to engage in gardening or plant-based research. Overall, this system enhances quality of life by supporting healthier environments, promoting self-sufficiency, and enabling smarter use of natural resources.

COMMERCIALIZATION POTENTIAL

The adaptive watering control system has strong commercialization potential due to its versatility, portability, and appeal across various markets. It caters to urban gardeners by offering a low-maintenance solution for plant care in homes and apartments with limited space, while also serving as a valuable tool for researchers and small-scale farmers who require precise monitoring and control. The system is ideal for retail and DIY markets, appealing to hobbyists and gardening enthusiasts, and can be marketed as a ready-to- use kit for consumers or a specialized tool for educational and research institutions. Its modular design and cost-effective production make it highly scalable, with the potential for customization to suit specific crops or environments. With IoT integration and data- sharing capabilities, it aligns with the growing adoption of smart home and agricultural technologies, addressing global challenges such as water conservation, space optimization, and sustainable food production, ensuring a promising trajectory in the market.

CONCLUSION

In conclusion, the Adaptive Watering Control System is a groundbreaking innovation that combines IoT technology, portability, and intelligent automation to revolutionize plant care. Its ability to monitor and respond to environmental conditions with precision makes it ideal for urban dwellers, researchers, and agricultural enthusiasts alike. By promoting sustainability, conserving resources, and simplifying plant maintenance, the system addresses the challenges of modern lifestyles and limited spaces. With its strong commercialization potential and versatility, this device is poised to make a significant impact on sustainable living and agricultural practices, offering a reliable and efficient solution for both personal and professional use.

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Automatic Pet Feeder with Scheduled Feeding and Food Level Monitoring

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ABSTRACT

This project focuses on the design and implementation of an automatic pet feeder system utilizing an ESP32 microcontroller. The system integrates multiple sensors, including an ultrasonic sensor for distance measurement, a DHT22 sensor for temperature monitoring, and a photoresistor (LDR) sensor module for ambient light detection. Additionally, it incorporates various output components such as LEDs, a buzzer, and a 20x4 LCD display to provide real-time feedback and alert mechanisms. The ultrasonic sensor manages the distance measurement, controlling a green LED for close proximity and a red LED for greater distances. The buzzer activates when the food level in the maximum value, as measured by the ultrasonic sensor, ensuring timely alerts for potentially harmful conditions. The photoresistor sensor module triggers an LED when ambient light falls below a specified threshold. The LCD display presents real-time data on distance, temperature, and light levels, facilitating continuous monitoring. The system's implementation and testing demonstrated its ability to reliably monitor environmental conditions and respond appropriately, ensuring the well-being of pets in the owner's absence. This project highlights the ESP32's capabilities in developing comprehensive and efficient automated systems for pet care, combining accurate sensor data collection with effective real-time feedback mechanisms.

KEYWORDS Pet Feeding Management, Food Level Monitoring, Ultrasonic Sensor, DHT 22 Humidity sensor, ESP32 microcontroller, LCD display, LED indicators, Buzzer.

PRODUCT DESCRIPTION

The automatic pet feeder with scheduled feeding and food level monitoring is a project designed that allows pet owners to remotely feed their pets through an app or a programmable mechanism. Utilizing ESP32 as the microcontroller, the system integrates three input sensors which is light dependent resistor, ultrasonic sensor, and temperature sensor to monitor the pet's environment effectively. These sensors enable the system to schedule feedings, ensuring timely nourishment, and to monitor food levels within the feeder. On the output side, the project incorporates three components which is an LED, LCD display, and buzzer to provide real-time feedback to the user. LED indicators convey system status, the LCD display offers a user-friendly interface for setting schedules and monitoring data, while the buzzer delivers audible alerts for important events or conditions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

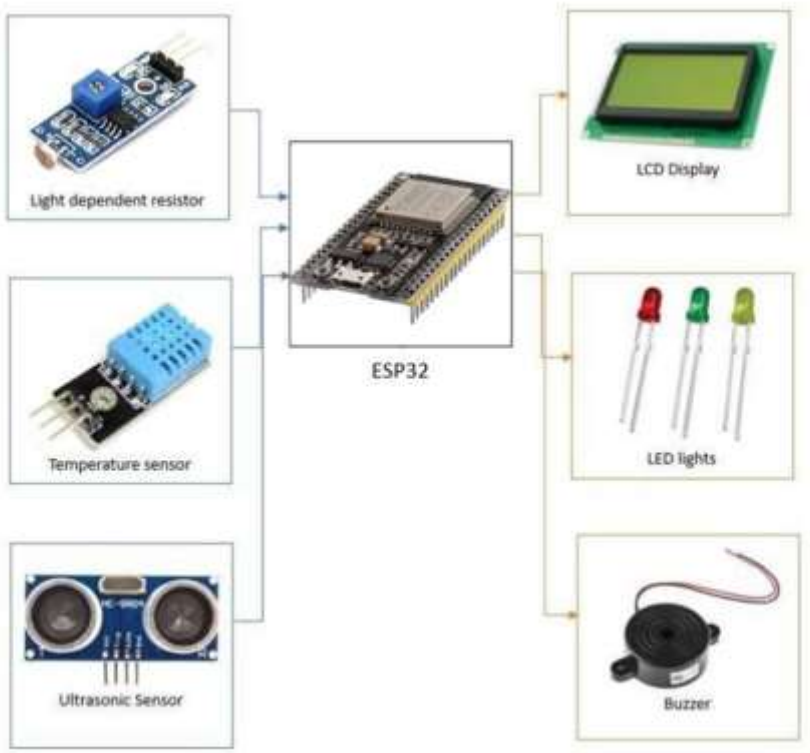


Figure 1. Block Diagram for automatic pet feeder with scheduled feeding and food level monitoring

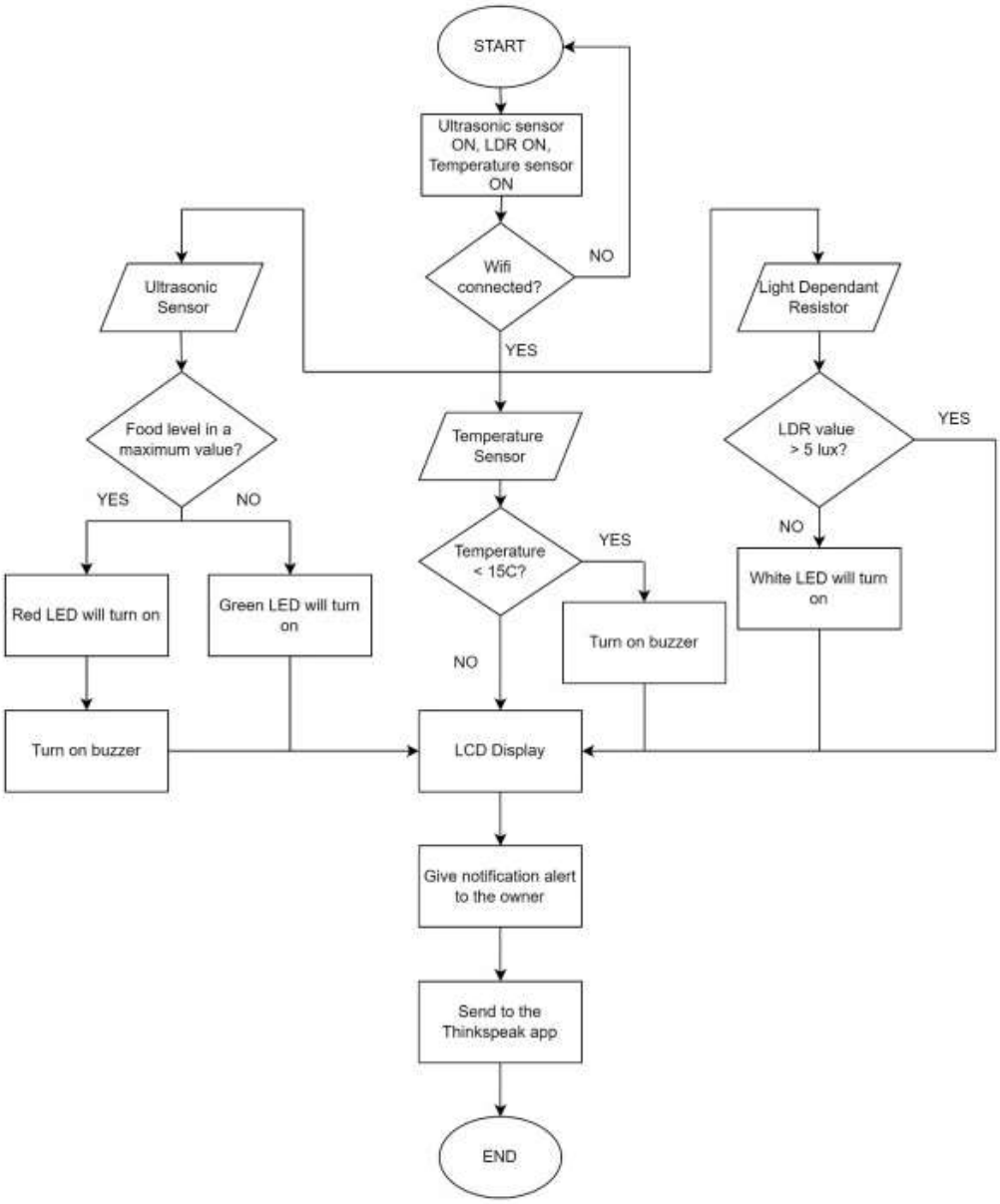


Figure 2. Flow chart for automatic pet feeder with scheduled feeding and food level monitoring

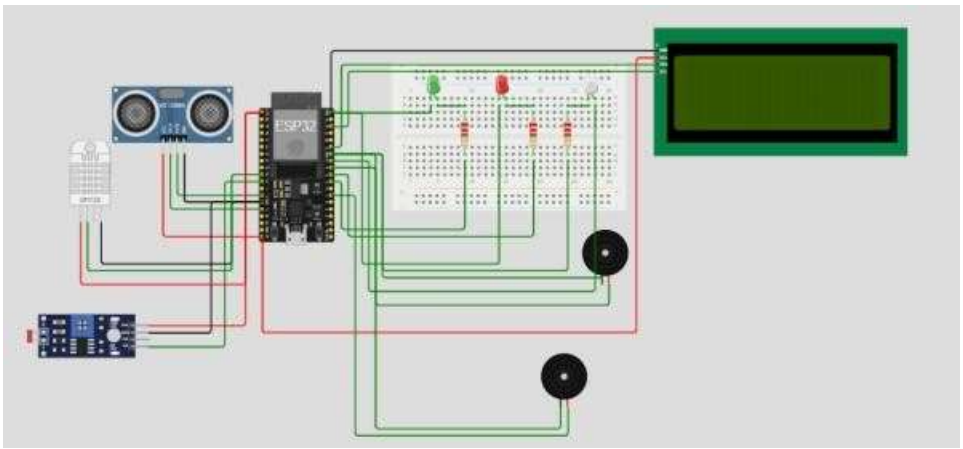


Figure 3. Schematic Diagram of Automatic Pet Feeder with Scheduled Feeding and Food Level Monitoring

NOVELTY AND UNIQUENESS

The automatic pet feeder with scheduled feeding and food level monitoring stands out due to its innovative combination of features that address convenience, reliability, and pet health. Its unique aspects include real-time food level monitoring using advanced sensors, ensuring owners are promptly notified when refills are needed, and highly customizable feeding schedules that cater to individual pet needs. The integration of IoT technology allows for remote control and monitoring through mobile apps or smart home assistants, offering unparalleled convenience. Additionally, the feeder can be designed to support multiple pets with varying dietary requirements, enhancing its versatility. By incorporating health monitoring features, such as tracking eating habits, the system promotes pet wellness. Its eco-friendly, energy-efficient design and the inclusion of a fail- safe mechanism with backup power ensure sustainable and reliable operation, making it a comprehensive and unique solution for modern pet care.

BENEFIT TO MANKIND

The automatic pet feeder with scheduled feeding and food level monitoring benefits mankind by providing convenience for pet owners through automated feeding schedules, improving pet health with precise portion control, reducing stress by ensuring pets are cared for even during busy times or travel, and preventing food wastage with real-time monitoring. It also supports multi-pet households with customizable feeding options, enhances pet health monitoring by tracking eating habits, integrates seamlessly with modern lifestyles through IoT features, and offers reliable operation with backup power, ultimately simplifying and enriching the lives of both pets and their owners.

COMMERCIALIZATION POTENTIAL

The automatic pet feeder with scheduled feeding and food level monitoring has significant commercialization potential, driven by the growing pet care market and increasing demand for automated and IoT-enabled devices. It targets busy professionals, travelers, and tech-savvy pet owners, offering convenience, reliability, and advanced pet care solutions. With opportunities for recurring revenue through subscription-based consumables, wide accessibility via retail and online distribution, and customization for different pet needs, the product can appeal to diverse consumer segments. Its integration with smart home ecosystems, eco-friendly design, and scalability for global markets further enhance its marketability and potential for profitability.

CONCLUSION

In conclusion, the automatic pet feeder with scheduled feeding and food level monitoring is an innovative solution that combines technology and practicality to address the modern challenges of pet care. By offering features such as automated feeding schedules, real-time food level monitoring, IoT connectivity, and health tracking, the project enhances convenience, reliability, and pet wellness. Its eco-friendly design and fail-safe mechanisms ensure sustainability and dependable operation, while its scalability and customization options make it versatile for various consumer needs. This project not only simplifies the lives of pet owners but also contributes to the growing smart home and pet care industries, showcasing significant potential for real-world application and commercial success.

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Real-Time Monitoring and Reporting of Food Waste Accumulation for Efficient Removal Operations Schedules

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ABSTRACT

This project, "Real-Time Monitoring and Reporting of Food Waste Accumulation for Efficient Removal Operations Schedules," aims to revolutionize waste management in restaurant settings by utilizing a combination of weight sensors, ultrasonic sensors, and humidity sensors to provide accurate real-time monitoring of food waste levels. Controlled by an ESP32 microcontroller and activated through an intuitive push-button system, the collected data is displayed locally on an LCD screen and remotely via IoT- enabled platforms for enhanced accessibility. LED indicators visually signal waste levels with green for low, yellow for medium, and red for high, streamlining waste disposal processes and ensuring timely action to prevent overflow. By integrating advanced sensor technologies with IoT capabilities, this project optimizes waste collection schedules, minimizes manual intervention, and promotes sustainability through proactive waste management practices. Furthermore, this innovative system not only addresses the operational inefficiencies in managing food waste but also contributes to environmental preservation by reducing carbon footprints and enhancing waste disposal efficiency. Its user-friendly features, coupled with its ability to provide actionable insights, make it a comprehensive solution for tackling food waste issues in commercial restaurant environments, paving the way for more sustainable and eco-conscious waste management practices.

KEYWORDS: Real-time monitoring, food waste management, IoT-enabled platforms

PRODUCT DESCRIPTION

The proposed system combines multiple sensors such as weight, ultrasonic, and humidity sensor to track food waste accumulation accurately. The push-button mechanism allows users to activate or deactivate the system. When turned on, the sensors monitor waste data, displaying the results in real-time on both an LCD screen and a remote IoT interface. The LED indicators provide visual cues, signaling when the waste bin reaches different levels of fullness (low, medium, or high). This comprehensive monitoring system ensures efficient waste disposal operations and reduces manual intervention. The project is specifically designed for restaurant environments, addressing the challenge of managing large volumes of waste effectively.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

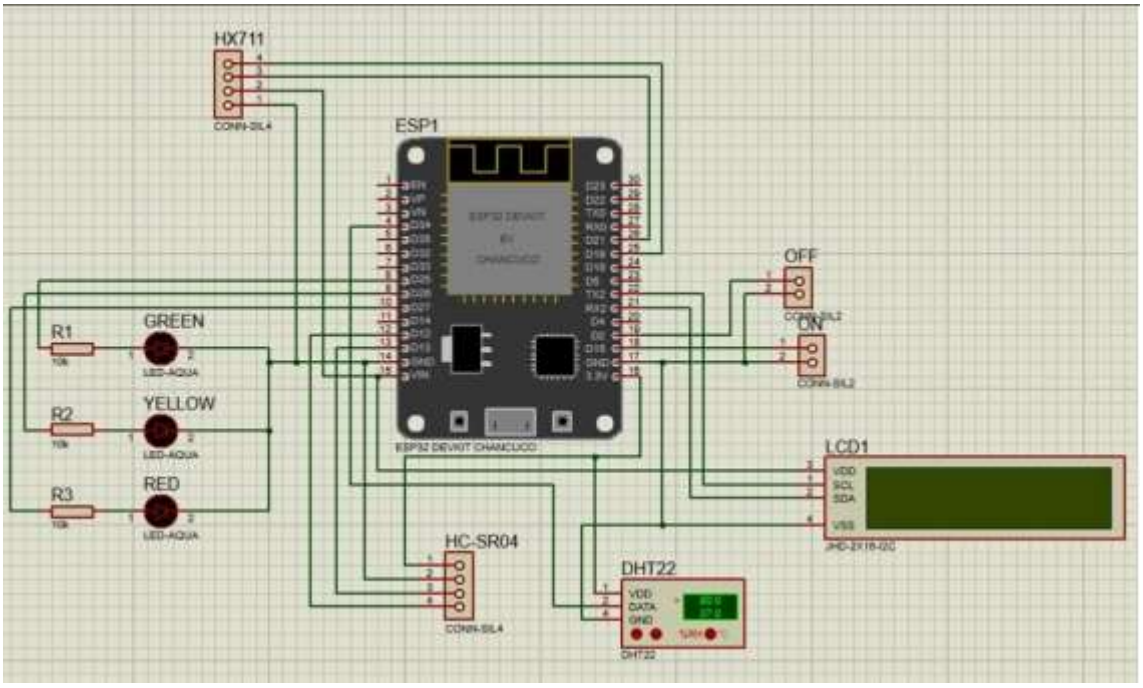


Figure 1. Schematic Diagram of the Waste Management Project

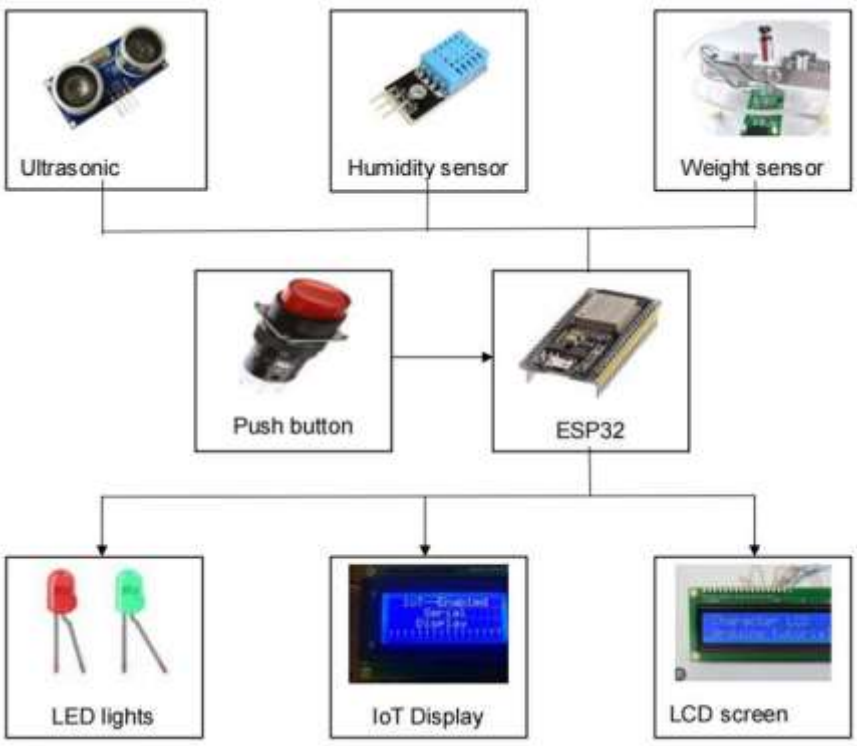


Figure 2. Block Diagram of the Waste Management Project

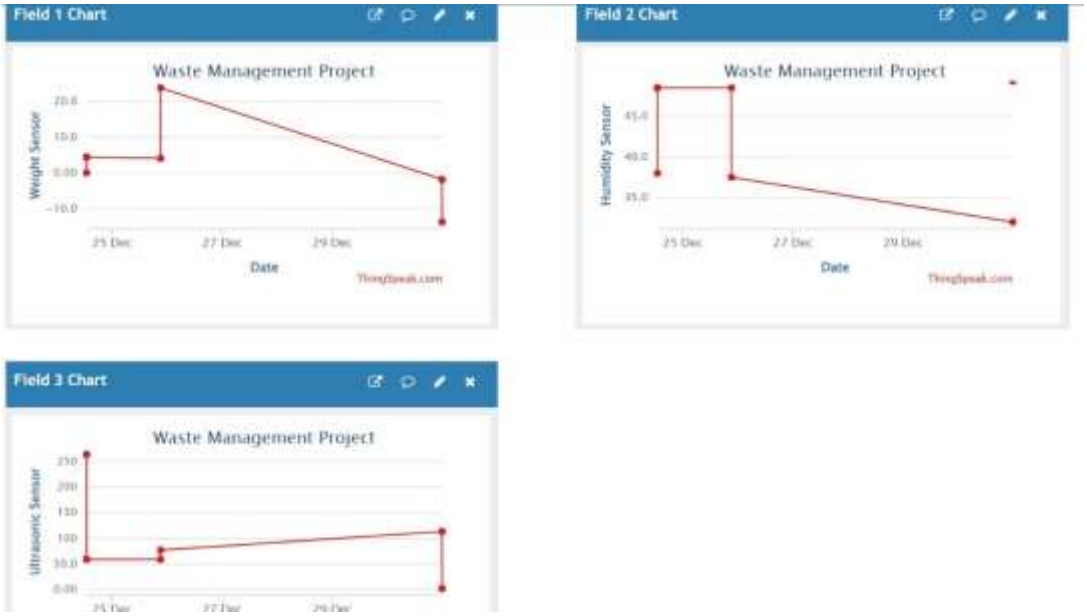


Figure 3. IoT Data ThinkSpeak of the Waste Management Project

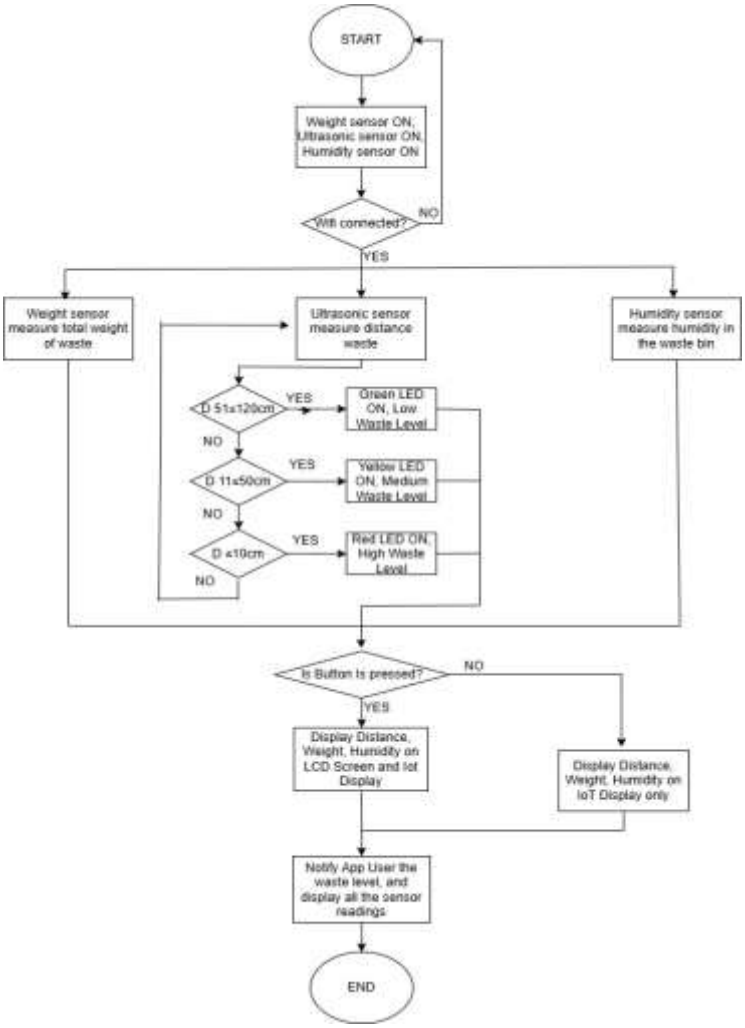


Figure 4 . Flow Chart of the Waste Management Project

NOVELTY AND UNIQUENESS

The novelty and uniqueness of this project lie in its innovative combination of features that address key challenges in waste management. By integrating IoT technology, users can remotely access real-time waste data, revolutionizing traditional practices. The inclusion of weight, ultrasonic, and humidity sensors offers a comprehensive and multi- dimensional analysis of waste accumulation. The dual push-button control system ensures simplicity in toggling the system on or off, while color-coded LED indicators provide immediate visual alerts for varying waste levels. This cohesive integration of advanced technologies ensures a streamlined, user-friendly, and efficient approach to waste management, setting it apart from conventional systems.

BENEFIT TO MANKIND

This project promotes sustainability by addressing inefficiencies in current waste management practices. By providing real-time data on waste levels, the system helps reduce the frequency of waste collection trips, thereby lowering fuel consumption and carbon emissions. Additionally, accurate tracking of food waste enables restaurants to better understand consumption patterns, leading to improved inventory management and reduced overall waste generation. The system's proactive monitoring minimizes the risk of overflow, ensuring cleaner and healthier environments. Furthermore, by streamlining waste disposal operations, the project enhances operational efficiency and supports long-term environmental goals. This combination of benefits highlights the project's potential to significantly impact waste management practices and sustainability efforts in the food service industry.

COMMERCIALIZATION POTENTIAL

The commercialization potential of this project is substantial, targeting a wide range of applications within the food service industry. Restaurants, hotels, and other food-based businesses stand to benefit significantly from this system's innovative features. Its modular design ensures scalability, allowing businesses to adapt the system for various waste bin sizes. The use of readily available components keeps production costs low, making it an attractive and affordable option for commercial adoption. Additionally, customization options enable businesses to tailor the system according to their specific operational needs, such as integrating additional sensors or modifying alert mechanisms. This versatility, combined with the system's emphasis on efficiency and sustainability, positions it as a valuable tool for modern waste management solutions in a competitive market.

CONCLUSION

In conclusion, this project demonstrates the potential to revolutionize waste management practices in restaurant environments. By integrating IoT technologies, advanced sensors, and user-friendly features like push-button controls and LED indicators, the system enhances the efficiency of waste collection operations. It not only ensures timely waste disposal but also contributes to environmental sustainability by reducing carbon footprints and promoting responsible waste management practices. Moving forward, this project could be further refined by incorporating predictive analytics and machine learning algorithms to anticipate waste patterns and optimize collection schedules.

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Forest Fire Forest Detection, Temperature and System Alert Monitoring with Phone

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ABSTRACT

Forest fires are a significant concern, espcially in equatorial regions like Malaysia and Indonesia, where annual droughts exacerbate their occurrence. This project focuses on the development of a smart forest fire detection and alert system using an ESP32 microcontroller integrated with multiple sensors and a phone-based alert system. The system utilizes a DHT11 sensor for temperature and humidity monitoring, an MQ135 air quality sensor for detecting harmful gases, a flame sensor for fire detection, and a GPS module for location tracking. The collected data is transmitted to cloud-based platform for real-time monitoring, while emergency alerts are sent to a mobile application to facilitate immediate action. Additionally, the system is equipped with a button that serves as an emergency aid for users who are lost or injured. Upon activation, the button triggers the LED and buzzer for local signaling and transmits critical information, including the user's current GPS coordinate, to emergency contacts or a designated mobile application. This feature provides an additional safety layer for individuals venturing into forests or remote areas, ensuring they can signal for help effectively. The combination of real-time monitoring, accurate location tracking, and emergency assistance capabilities makes this system a comprehensive solution for forest fire detection and personal safety in wilderness areas.

KEYWORDS: Forest fire detection, ESP32, IoT, DHT11, GPS.

PRODUCT DESCRIPTION

The Forest Fire Detection, Temperature, and System Alert Monitoring System with Phone is a comprehensive device designed to enhance safety and environmental monitoring in forested and remote areas. At its core, the system leverages the ESP32 microcontroller to integrate multiple sensors and provide real-time data tracking. Key sensors include the DHT11, which measures temperature and humidity; the MQ135, which monitors air quality by detecting harmful gases; and a flame sensor, which identifies the presence of fire. Additionally, a GPS module is incorporated to provide precise location data, ensuring accurate tracking and reporting during emergencies.One of the standout features of the system is its dual alert mechanism. When a flame is detected, the system immediately activates an LED and a buzzer to provide local visual and auditory alerts. Simultaneously, the device transmits critical information, including the GPS coordinates and sensor readings, to a cloud platform such as Adafruit IO or Arduino Cloud. This data is then visualized on line charts for temperature, humidity, and air quality, while GPS coordinates are displayed on an interactive map. Alerts are also sent to a linked smartphone application, enabling remote monitoring and rapid response. To further enhance its functionality, the system includes an emergency button. This feature is specifically designed to assist individuals who may become lost or injured in remote areas. When the button is pressed, it triggers the LED and buzzer to signal distress locally and sends an emergency message containing the user's location to the smartphone application. This feature ensures that help can be summoned quickly, even in situations unrelated to forest fires, such as personal safety concerns or medical emergencies. The device's design emphasizes portability, ease of use, and integration with wearable technology, making it suitable for forest rangers, hikers, and environmentalists. Its capability to combine environmental monitoring with personal safety alerts positions it as a versatile solution for addressing the challenges posed by

forest fires and other emergencies in remote areas.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

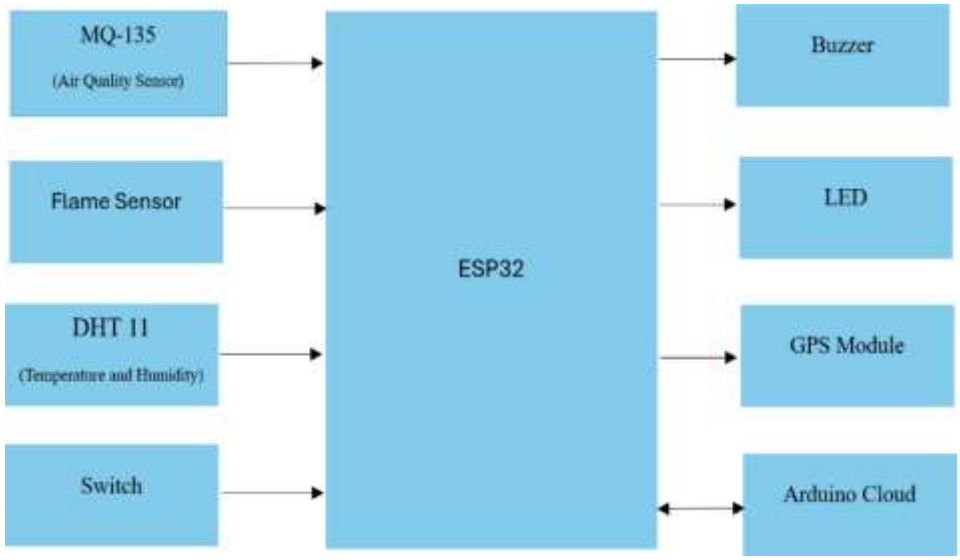


Figure 1 : Block Diagram of Forest Fire Detection, Temperature and System Alert Monitoring with Phone

Local alerts are provided through an LED and a buzzer, which are activated when potential fire conditions are detected. Additionally, an emergency switch is integrated into the system. When activated, the emergency switch triggers an immediate alert, notifying nearby personnel or users of a critical situation. The ESP32 also connects to a GPS module to provide precise location data and transmits information to the Arduino Cloud via Wi-Fi for remote monitoring and alert notifications. This integration allows users to receive real-time updates and alerts on their mobile phones, ensuring timely responses to potential fire threats.

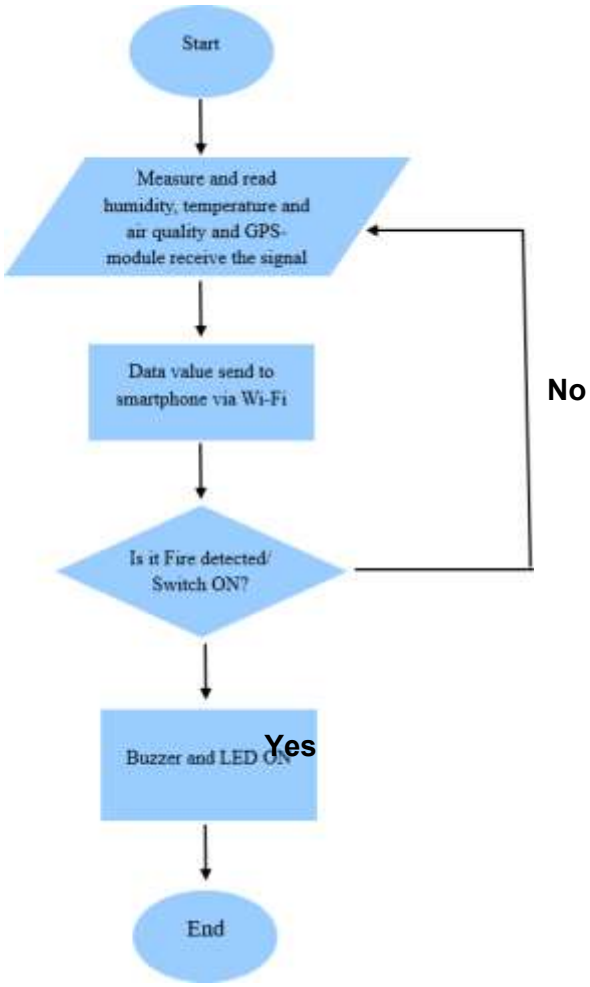


Figure 2 : Flowchart of Forest Fire Detection, Temperature and System Alert Monitoring with Phone

A flowchart for an IoT Integrated Forest Fire Detection and Monitoring System outlines the process from initiation to warning notification. The system starts by initializing the ESP32 microcontroller and sensors (DHT11, MQ135). It then collects data from these sensors, checks predefined thresholds and sends information to the user. Then, the Flame sensor starts processing. If the flame sensor detects danger, the system will trigger a buzzer and LED for local alerts. At the same time, the GPS module captures location data. Finally, using the ESP32's WiFi capability, the system sends alerts to the user's phone via the Blynk app, including sensor readings and location information, ensuring immediate notification and response to potential fire hazard.

NOVELTY AND UNIQUENESS

The system is unique in combining multiple sensors with cloud-based monitoring and a GPS module for precise location tracking. The use of IoT technology ensures real-time data availability and remote accessibility. Unlike conventional systems, this project integrates local (buzzer, LED) and remote (phone alerts) notification methods, enhancing its reliability and usability in remote forested areas.

BENEFIT TO MANKIND

This project contributes significantly to disaster management by enabling early forest fire detection and rapid response. The system can save lives, reduce property loss, and protect natural resources by improving the efficiency of fire detection and alert systems. Its applications extend to forest management, wildlife conservation, and disaster response teams.

COMMERCIALIZATION POTENTIAL

The Forest Fire Detection, Temperature, and System Alert Monitoring System with Phone offers substantial commercialization potential across multiple industries due to its versatile design and functionality. In the forestry sector, it provides an efficient tool for early fire detection and environmental monitoring, reducing risks and enhancing resource management. The system's emergency button and GPS tracking capabilities make it highly appealing for outdoor enthusiasts, such as hikers and campers, as well as for use in search-and-rescue operations. Its adaptability for wearable technology and IoT integration also positions it well in the growing market for smart devices. Additionally, the system can be marketed to government agencies, environmental organizations, and safety- focused industries seeking innovative solutions to address forest fire threats and improve workplace safety in remote areas. With its combination of affordability, scalability, and ease of use, this device is primed to meet the demands of an increasingly safety-conscious market.

CONCLUSION

The Forest Fire Detection, Temperature, and System Alert Monitoring System leverages IoT to provide a robust solution for monitoring environmental parameters and detecting forest fires. By combining real-time data visualization, local alerting mechanisms, and phone-based notifications, this project addresses critical needs in forest management and disaster response. Future work could include enhancing sensor accuracy, integrating
advanced analytics, and testing the system in real-world conditions.

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Automated Notification System for Baby Car Seat Safety with in-Car Speaker Guidance

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ABSTRACT

The Automated Notification System for Baby Car Seat Safety with In-Car Speaker Guidance uses wireless communication, real-time monitoring, and Internet of Things- based notifications to increase infant safety in automobiles. Using NRF24L01 modules, the system consists two microcontrollers known as Arduinos that can communicate with each other. The Arduino Mega integrated into the infant car seat and an Arduino Nano placed at the parent's seatbelt clip. By employing a Hall magnetic sensor, the Arduino Nano is capable of detecting whether a parent is entering or exiting the vehicle. Using sensors including the MQ-135 for gas detection, the HX711 for weight, and a PIR motion sensor for movement, the Arduino Mega monitor the safety of the infant. Additionally, the system has a DFPlayer Mini MP3 module with an inbuilt speaker to warn parents of possible risks and offer voice instruction. The device initiates safety protocols when hazardous conditions, such as elevated level of harmful gases are detected in the presence of the baby. By integrating with the Blynk app and sending automatic calls, a GSM SIM900A module enables parents, turn on a DC fan for air flow, and surveillance environments. This innovative, easy-to-use system integrates wireless communication, embedded technology, and the IoT to provide reliable means to improve child safety when driving.

Keywords: Baby Car Seat Safety, In-Car Speaker Guidance, real-time monitoring, NRF24L01 modules, Arduinos, GSM SIM900A

PRODUCT DESCRIPTION

The purpose of the Automated Notification System for Baby Car Seat Safety with In-Car Speaker Guidance is to address Forgotten-Baby Syndrome (FBS), a serious problem that causes many deaths globally. According to research, over 25 percent of parents who have babies under three have inadvertently left their kids in cars, exposing them to dangerous chemicals and extremely high temperatures. An 8-month-old daughter was unintentionally left in a car for ten hours in Kuala Lumpur, a terrible occurrence that highlighted the urgent need for a dependable safety solution. Two microcontrollers are used in this system: an Arduino Nano at the seatbelt clip and an Arduino Mega integrated into the infant car seat. Using a variety of sensors, the Arduino Mega keeps an eye on the well-being of the baby, and the Arduino Nano uses a seatbelt sensor to determine when the parent begins or stops their trip. Instructions on how to use the baby seat correctly and reminders to look for the infant before getting out of the car are provided by the DFPlayer Mini MP3 module. The GSM module immediately notifies the parent of the child's presence in the car if the reminder is missed. For real-time monitoring and notifications, the system also connects with the Blynk app. This enables parents to remotely turn on a fan to control the car's temperature, preventing heatstroke and protecting the infant. This IoT-enabled solution lowers the risk of Forgotten-Baby Syndrome and gives parents piece of mind with its all-encompassing safety mechanism.

PROJECT'S BLOCK DIAGRAM, FLOW CHART AND SCHEMATIC DIAGRAM

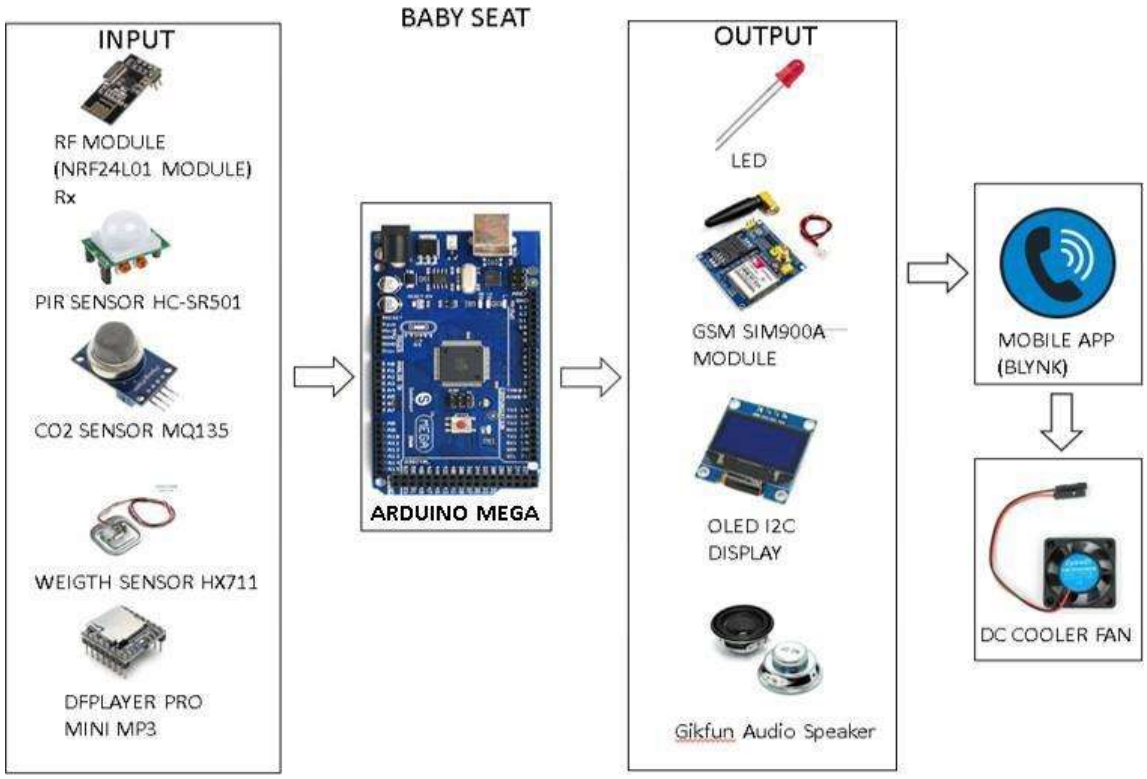


Figure 1.1: Block diagram for baby car seat system

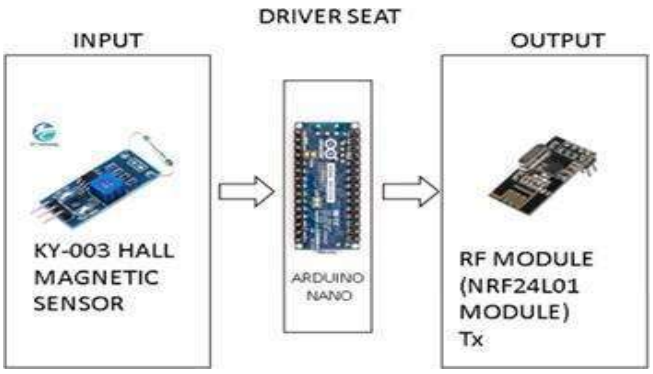


Figure 1.2: Block diagram for parent seatbelt system

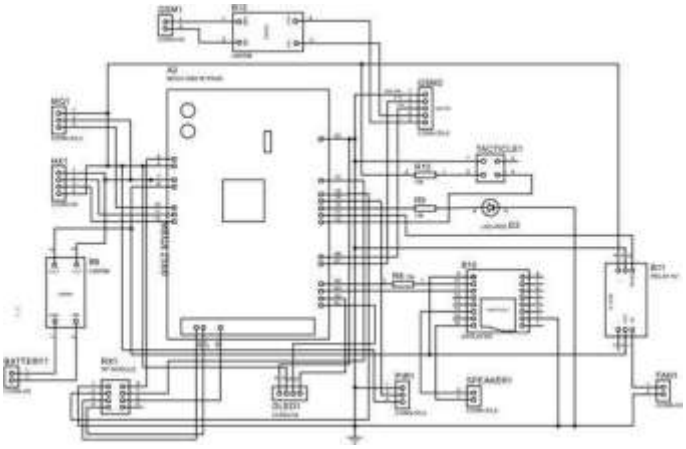


Figure 1.3: Schematic diagram for baby car seat system

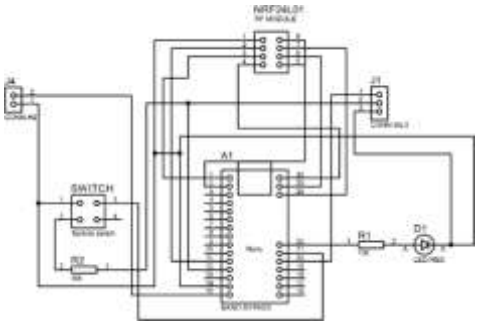


Figure 1.4: Schematic diagram for parent seatbelt system

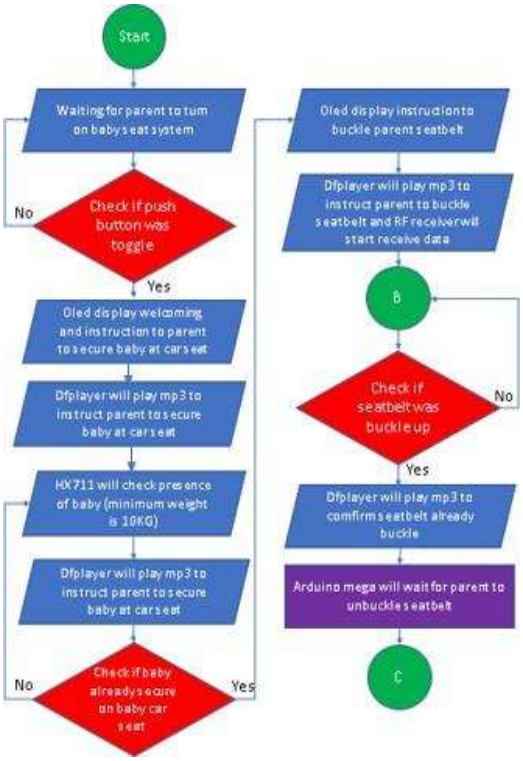


Figure 1.5: Flowchart for Baby car seat system-Pre journey (A)

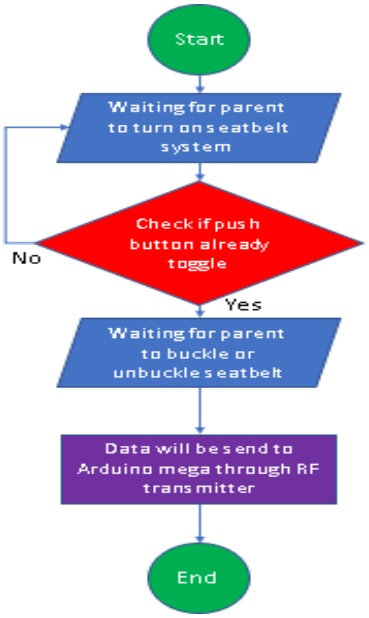


Figure 1.6: Flowchart for parent seatbelt system (B)

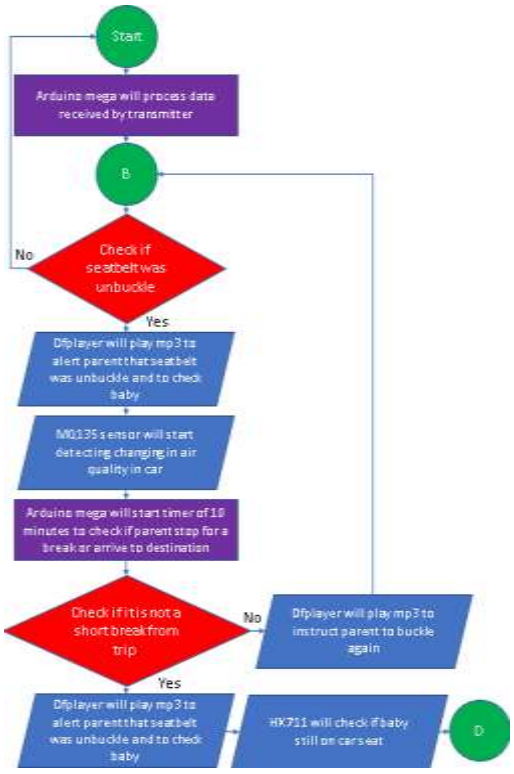


Figure 1.7: Flowchart for baby car seat system-break session (C)



Figure 1.8: Flowchart for baby car seat system-post journey (D)

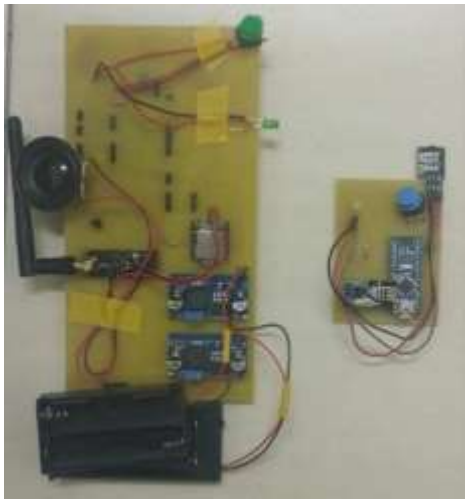


Figure 1.9: Fully soldered circuit boards for the baby car seat system and parent seatbelt system



Figure 1.10: Designed baby car seat equipped with an integrated electronic system

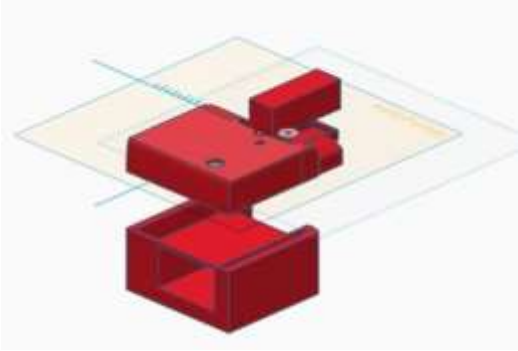


Figure 1.11: 3D model of seatbelt protective case with an integrated parent seatbelt detection system

NOVELTY AND UNIQUENESS

By integrating an entire safety system straight into a specially made infant car seat, the Automated Notification System for infant Car Seat Safety with In-Car Speaker Guidance presents a novel solution. With the integration of sensors and electronics, this designed seat allows for real-time baby safety monitoring without the need for additional devices. The most distinctive and crucial component of the system is the GSM module, which enables real-time communication by calling the parent or guardian and sending alerts in the event that the infant is left in the car. This function greatly improves child safety by guaranteeing that parents, wherever they may be, are informed as soon as possible. Another significant invention is the seatbelt clip detector, which is simple to install in any car without changing

the original buckle. This sensor keeps track of the parent's movements to make sure the system is turned on when it's time. Both timely reminders to check for the baby before getting out of the car and instructions on how to use the seat properly are provided by the DFPlayer Mini MP3 module. Real-time notifications are ensured by the integration of GSM calling functionality, which makes this system an exceptionally unique and practical safety solution for protecting child safety in cars.

BENEFIT TO MANKIND

By tackling important problems like Forgotten-Baby Syndrome, the Automated Notification System for Baby Car Seat Safety with In-Car Speaker Guidance greatly improves child safety. The device helps to avert potentially fatal conditions like heatstroke and carbon monoxide poisoning by using GSM calling to deliver real-time alerts to parents in the event that their youngster is left alone in a car. In addition to increasing child safety, this system educates parents about the dangers of leaving children unattended in a vehicle. Its practical answer to a common issue is made available to a wide range of families due to its simple installation, particularly the seatbelt clip sensor that can be installed to any car. But in the end, this technology could save lives, giving parents piece of mind and making society safer and more accountable.

COMMERCIALIZATION POTENTIAL

Because of its innovative approach to kid safety in cars, the Automated Notification System for Baby Car Seat Safety with In-Car Speaker Guidance has a lot of marketing potential. This technology is well-positioned to address a broad market need as awareness of the risks posed by Forgotten-Baby Syndrome and the increased emphasis on child protection develop. The product's marketability extends beyond specially made baby seats due to its simplicity of installation and compatibility with any vehicle's seatbelt clip sensor. Because of its adaptability, a wider range of customers can use it, including parents who can install the system in their current car seats. By offering real-time notifications and remote calling capabilities, even in places without Wi-Fi, the incorporation of GSM technology ensures the system's dependability and usefulness while also adding a unique selling proposition. Furthermore, this method may gain traction through legislative support and endorsements as governments and organizations place a greater emphasis on improving child safety in automobiles. The possibility of forming alliances with automakers, producers of infant supplies, and even insurance firms may spur broad adoption and deliver a significant return on investment. All things considered, the system's cost, ease, and safety make it a viable product for widespread distribution and has the potential to establish itself as a standard in kid safety equipment for automobiles.

CONCLUSION

By using GSM notifications to deliver real-time alerts, the Automated Notification System for Baby Car Seat Safety with In-Car Speaker Guidance presents an innovative way to combat Forgotten-Baby Syndrome. The technology guarantees simple installation and adaptable safety with its integrated embedded system in a designed infant car seat and a seatbelt clip sensor that suits any car. While the DFPlayer Mini MP3 module offers instructions and reminders, the GSM module ensures dependable connection. The fan activation feature also lowers the risk of carbon monoxide and heatstroke. This technology offers parents peace of mind and contributes to a safer society by providing a workable and scalable solution for an infant protection, with great commercialization potential.

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Floodwall: A River- Flood Monitoring And Mitigation System

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ABSTRACT

The "Floodwall: The proposed solution known as a ‘’A River-Flood Monitoring and Mitigation System’’ is the development aimed at satisfying the necessity of coping with the rising threats of river flooding. The system integrates multiple sensors, including an ultrasonic sensor for water level detection and a DHT11 sensor for monitoring temperature and humidity. A slide switch enables manual system control. Utilizing an ESP32 microcontroller, the system integrates water level, temperature, and humidity sensors to continuously monitor environmental parameters. The collected data is transmitted to a Telegram application for remote notification, ensuring timely alerts to the users.When water levels exceed a threshold value, the system triggers an automatic response which are a buzzer and LED are activated to alert nearby residents, and a gate or barrier mechanism is engaged to mitigate potential flood impact. Collected data is displayed on an LCD and transmitted to a Telegram mobile application via the ESP32 microcontroller Wi-Fi module, enabling real-time monitoring and remote alerts. When critical thresholds are exceeded, the system activates multiple response components: an LED and buzzer for local alerts, and a servo motor to control barriers or gates to mitigate flooding. The project demonstrates the integration of hardware and software for proactive flood management. By combining real-time monitoring with automated responses, the system provides an effective and scalable solution for riverine communities vulnerable to flooding. Floodwall can show how advances in current day technology are able to tackle present day real environmental challenges as well as give helpful strategies for efficient and effective flood response strategies

KEYWORDS: IoT, ESP32, Flood monitoring, sensors, alarm

PRODUCT DESCRIPTION

Floodwall is an IoT product to help control river flooding and reduce the effects of flooding with timely monitoring and response. The system has ESP32 control module which controls the data collected from Ultrasonic sensors to measure water level and from the DHT11 sensors to measure the climate conditions including the temperatures and the humidity. In the case of floods, if the water level exceeds a predefined threshold, a servo motor is used to pull a barrier to stop the flow of the flood. LED and buzzer alarms inform the residents nearby, while a water level and temperature for the local usage will be displayed on the LCD. One of the selling points of Floodwall is the incorporation of the Telegram application as it creates a new convenient way of getting updates to the residents’ smartphones for real- time monitoring of the situation and making necessary decisions remotely from the house. Slide switch will act as an emergency switch to allow for control even in special situations when the machine needs to be started manually. Floodwall has also been designed to be a prototype that can easily scale, with using cost parts and components that are available in the market. Its applicable to the congested areas. Therefore, this will be an advantage since it provides a preventive system of dealing with disasters. Floodwall shows how the modern technology intervention can prove useful in promoting the community’s ability to ward off climate challenges.

PROJECT'S BLOCK DIAGRAM, SCHEMATIC DIAGRAM, FLOWCHART, PCB CIRCUIT, RESULT

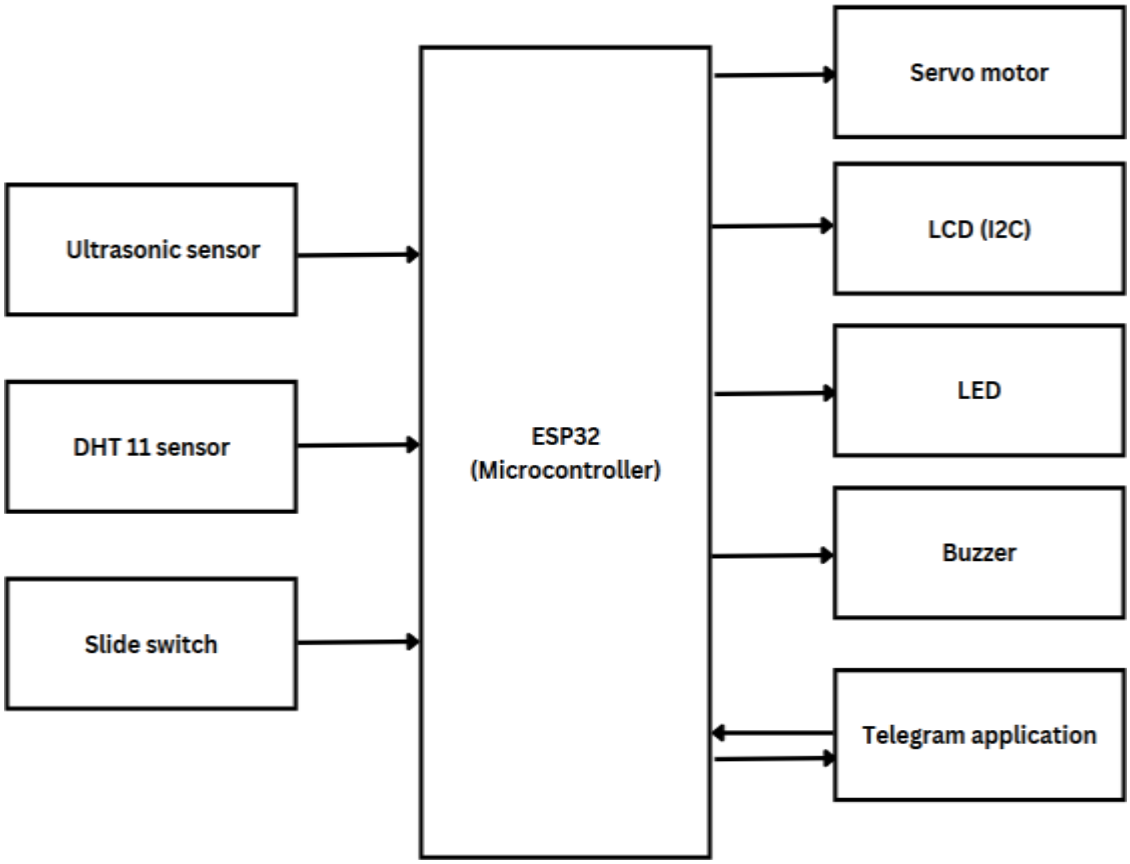


Figure 1: Block Diagram of the project

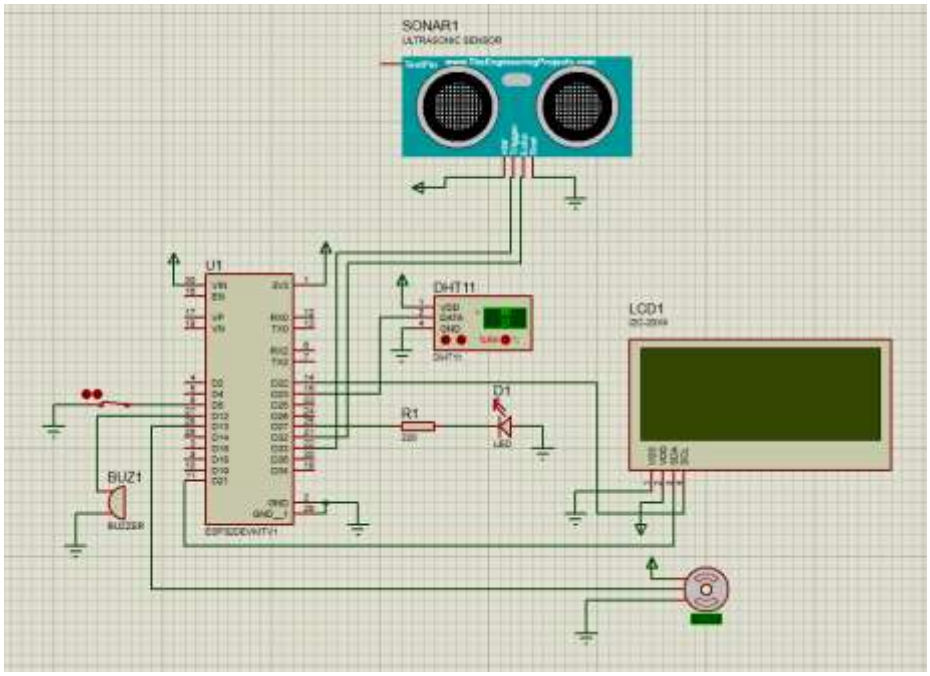


Figure 2: Schematic Diagram of the project

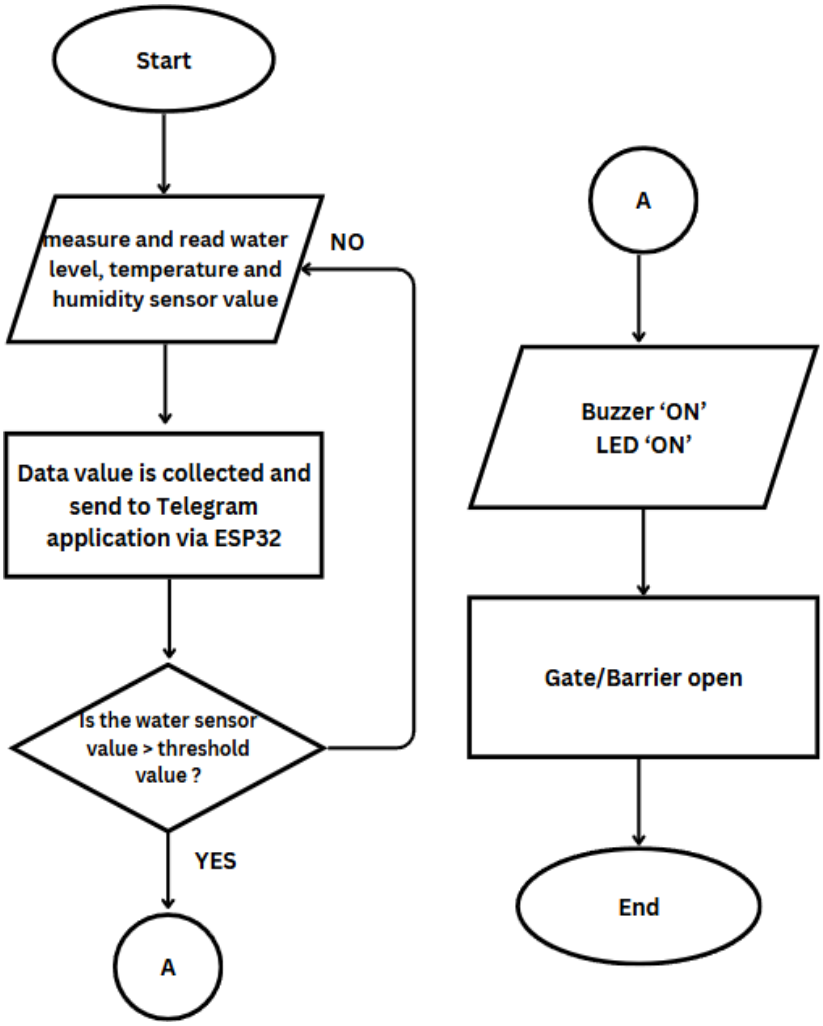


Figure 3: Flowchart system of the project

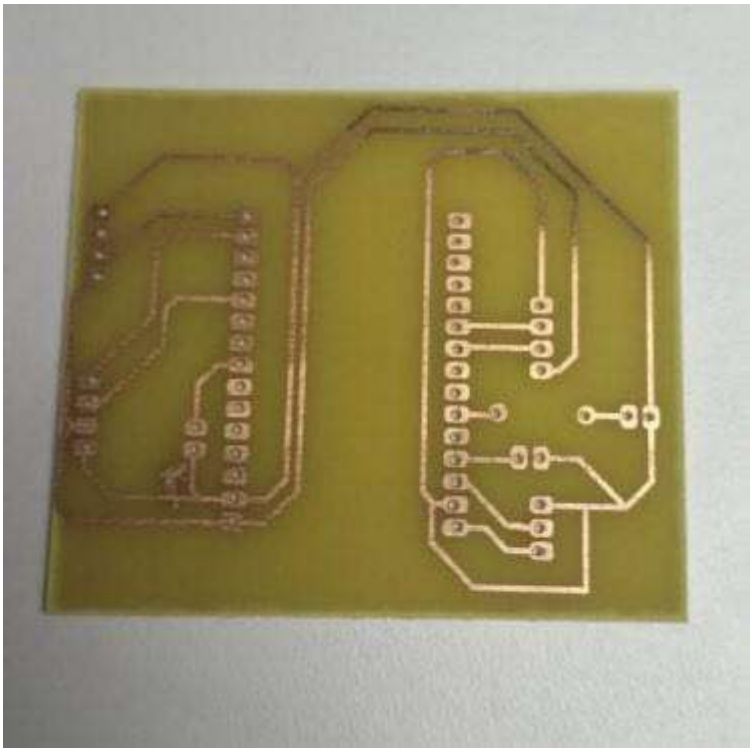


Figure 4: PCB layout of the project

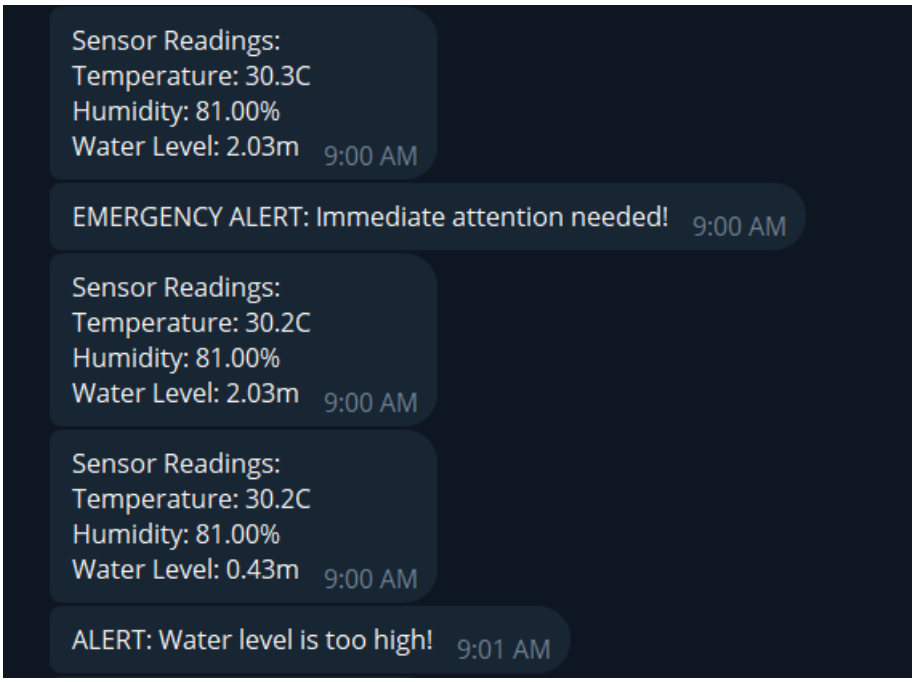


Figure 5: Result by data transfer to Telegram

NOVELTY AND UNIQUENESS

Most of the components of Floodwall are distinctive based on the use of IoT, real-time monitoring as well as the automated flood handling. With several parameters such as water level, environmental status, barrier control, user alerting through Telegram, and it is a scalable cost-effective approach for systematic flood management.

BENEFIT TO MANKIND

Floodwall saves community from possible damage caused by floods through giving timely flood notification and how to avoid the danger. It also decreases loses in terms of economy and infrastructure, it also eradicates human interference while in the process of monitoring and most important it gives real power to the people by providing real-time data that can be crucial during flooding conditions.

COMMERCIALIZATION POTENTIAL

Floodwall is quite ready for commercialization because this invention is rather cheap, clinically scaled and caringly oriented to the global flood issues. Flooding has become more frequent and severe, and this has created a lot of pressure in coming up with modern technologies and affordable methods of disaster management. Thus, by using the ESP32 microcontroller and sensors that are relatively easy to find, the mass production of the system remains possible. It is versatile and can be customized to fit the geographical area, whether urban areas or rural areas, and infrastructure hence being a product of interest to many markets. It also supports smart city measures as the system interfaces with other associated larger environmental monitoring networks. There are many potential users of Floodwall today such as governments, private developers, disaster management organizations and agencies, and civil and infrastructure engineers and planners. Moreover, the real-time data features, which are integrated into its design due to the IoT concept, make it a rather effective product in the continually developing market for connected safety devices. The ability to expand the system, to incorporate it into other systems. For example, the use of machine learning to improve the predictions of floods. Also, it sets the system up for future relevancy and provides long-term value in light of future technological growth.

CONCLUSION

The Floodwall system is truly a marked improvement in the management of flood disasters as it integrates monitoring, risk assessment, and response while being completely reliant on this system. Through the successful adoption of latest IoT technologies, the system ensures accurate early alerts, effective flood mitigation measures, as well as easily retrievable data that will support the community. The actual system architecture is modifiable and thus is capable of spanning different environments, ranging from small based communities up to metropolitan ones. Floodwall does not focus solely on the relief and rebuilding effort in current flooded communities but also contributes to sustainable water management and climate adaptation solutions. Its low cost and flexibility in implementation mean that the possibilities to save lives, structures and assets from devastating effects of floods are within the system. It is with this ongoing series of disastrous climate events that Floodwall provides hope for both efficient and promising techniques in flood management and preparation.

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Robotic Firefighter

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ABSTRACT

This project focuses on the development of a firefighter robot equipped with advanced sensors and automated systems to efficiently detect and respond to fire hazards. Utilizing flame sensors and a TMP36 temperature sensor, the robot can autonomously identify fire sources and evaluate the severity of the hazard. Once a fire is detected, the robot activates a water pump to extinguish the flames and uses a buzzer to emit a firefighter-like siren, alerting individuals nearby. An LCD display provides real-time updates, including temperature readings and status messages like "Fire Detected" or "Stay Safe." For enhanced operational flexibility, the robot integrates an HC-05 Bluetooth module, enabling remote control via smartphone. Powered by motors and managed through an Arduino controller, this robot offers a reliable, efficient, and safe approach to fire hazard mitigation, particularly in areas too dangerous for human intervention.

KEYWORDS: Firefighter robot, Flame Sensor, Temperature Sensor (TMP36), Bluetooth connectivity, Water Pump

PRODUCT DESCRIPTION

The Firefighter Robot is an advanced autonomous system designed to detect and respond to fire hazards effectively and safely. Equipped with flame sensors and a TMP36 temperature sensor, it identifies fire sources and monitors environmental conditions in real-time. When a fire is detected, the robot activates its water pump to extinguish the flames and emits a loud, firefighter-like siren using a buzzer to alert nearby individuals. An integrated LCD display provides real-time temperature readings and status updates such as "Fire Detected" or "Stay Safe," ensuring clear communication. Additionally, the HC-05 Bluetooth module allows remote control via a smartphone, enabling operators to deploy the robot into hazardous areas without putting themselves at risk. Powered by an Arduino and efficient motors, the robot can navigate various terrains autonomously, making it an invaluable tool for fire hazard mitigation in residential, commercial, and industrial settings. Its combination of fire detection, suppression, and remote operation ensures a modern, practical approach to enhancing fire safety.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

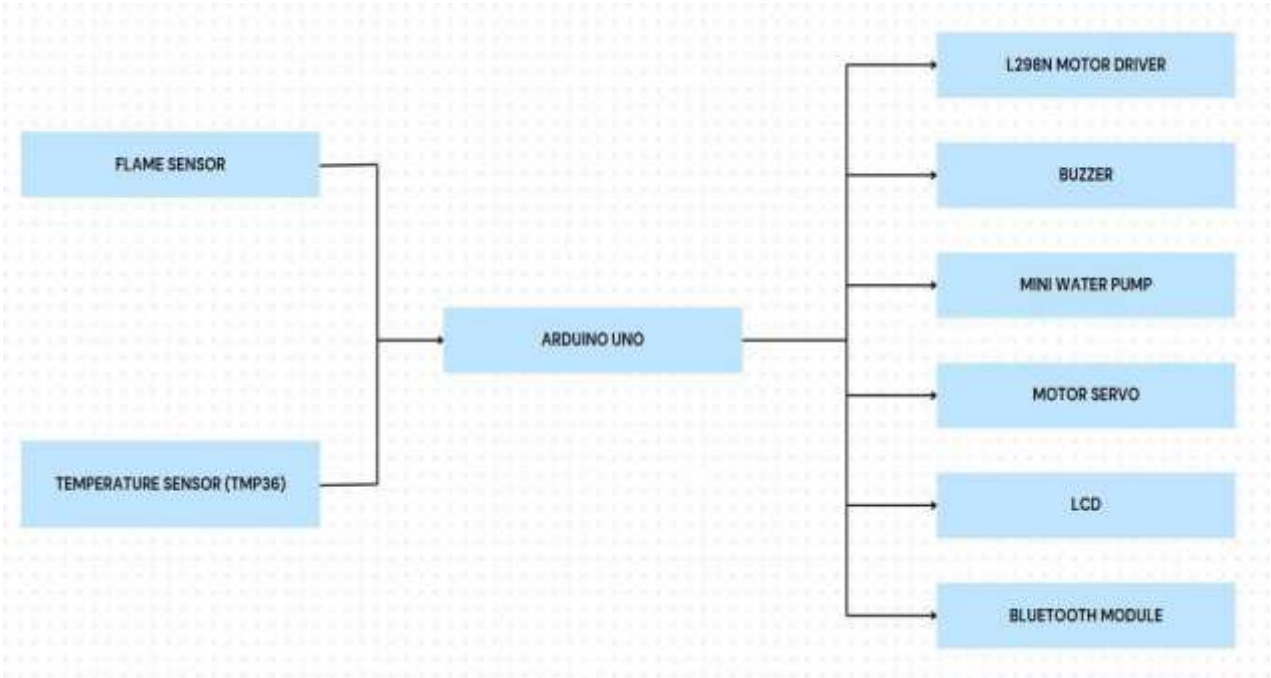


Figure 1: Block Diagram of the Robotic Firefighter

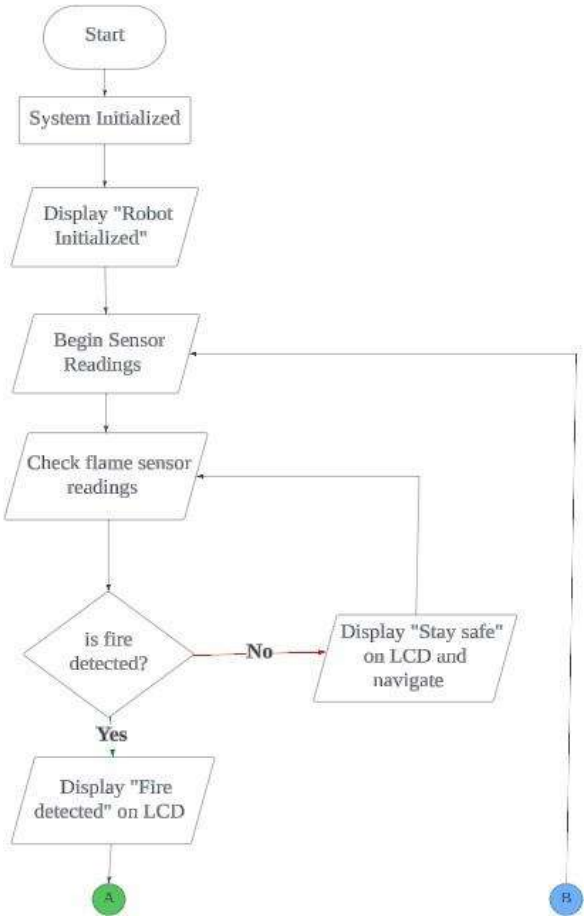


Figure 2: Flowchart of the Robotic Firefighter

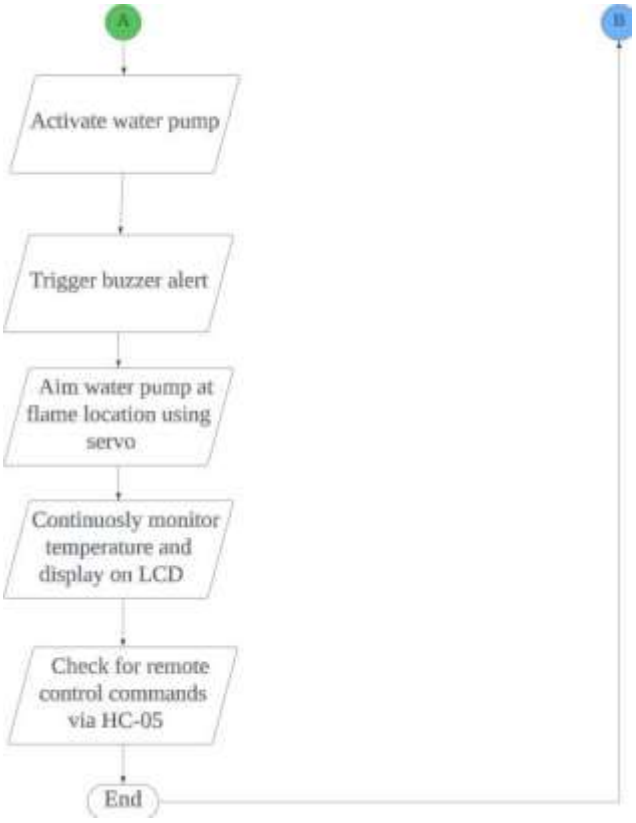


Figure 3: Flowchart of the Robotic Firefighter

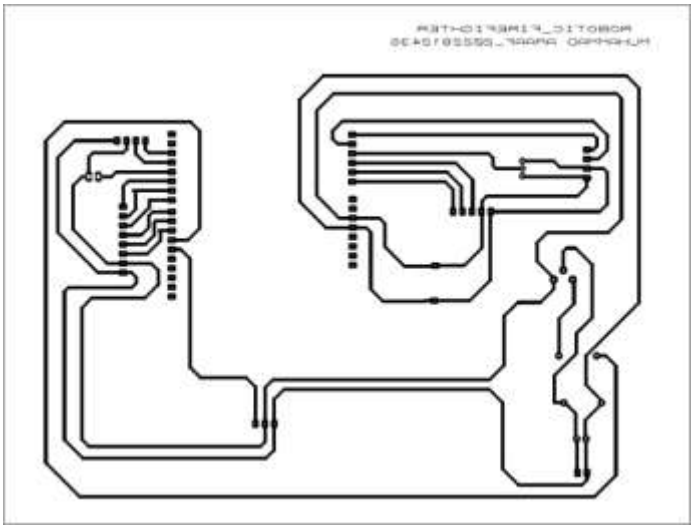


Figure 4: PCB layout of the Robotic Firefighter

NOVELTY AND UNIQUENESS

The novelty and uniqueness of this firefighter robot project lies in its integration of multiple features to enhance fire detection and response efficiency. Unlike conventional fire safety systems, this robot combines autonomous flame detection, temperature monitoring, real-time status display, and remote-control capabilities. Its use of flame sensors allows precise detection of fire sources, while the TMP36 temperature sensor provides continuous environmental monitoring to assess potential risks. The addition of a servo-controlled water pump ensures accurate targeting of flames, and the buzzer offers an auditory alert, mimicking a firefighter siren for enhanced awareness. Furthermore, the integration of an HC-05 Bluetooth module enables remote operation via a smartphone, allowing users to control the robot from a safe distance. This comprehensive system not only ensures swift action during fire hazards but also promotes safety and convenience, making it a unique and practical solution for fire hazard mitigation in both residential and industrial settings.

BENEFIT TO MANKIND

This firefighter robot offers significant benefits to mankind by enhancing safety and efficiency in fire hazard situations. Its autonomous fire detection and suppression capabilities reduce the need for humans to risk their lives in dangerous environments, such as during house fires or industrial accidents. Equipped with flame sensors, temperature monitoring, and a water pump, the robot can promptly detect and extinguish small fires before they escalate into major disasters. The inclusion of Bluetooth connectivity allows remote control, ensuring users can operate the robot from a safe distance. Additionally, its real-time temperature readings and status updates on an LCD provide valuable information for situational awareness. By minimizing human exposure to hazardous conditions and offering a cost-effective solution for fire mitigation, this robot has the potential to protect lives, reduce property damage, and assist firefighters in their critical work.

COMMERCIALIZATION POTENTIAL

The firefighter robot has strong commercialization potential due to its practical applications in both residential and industrial settings. With increasing concerns over fire safety, this autonomous and remotely controlled robot provides an innovative, cost- effective solution for fire detection and suppression. It can be marketed to households, small businesses, warehouses, and factories as a proactive fire management tool. Its compact design, ease of use, and integration of IoT technology, such as Bluetooth control, make it appealing for modern smart home systems. Additionally, the robot can serve as a supplementary tool for firefighting departments, helping them tackle smaller fires or providing support in hazardous environments where human intervention is risky. With further advancements, such as the addition of Wi-Fi connectivity or mobile app integration, the robot could appeal to a wider consumer base, including smart city projects. Its affordability, versatility, and ability to minimize fire-related risks make it a promising product for commercialization in safety technology markets.

CONCLUSION

In conclusion, this firefighter robot project successfully integrates multiple technologies to achieve its primary objectives of fire detection, suppression, and real-time monitoring. Equipped with flame sensors, the robot can autonomously detect fire and take immediate action by activating the water pump to extinguish it. The TMP36 temperature sensor enables continuous environmental monitoring, with real-time data displayed on an LCD screen. Additionally, the inclusion of a buzzer provides an audible alert to mimic a firefighter siren, ensuring timely warnings. The HC-05 Bluetooth module allows for remote control and operational flexibility, enabling users to control the robot from a smartphone safely. By combining these features with an autonomous navigation system and real-time feedback, the project demonstrates its ability to mitigate fire hazards effectively while ensuring user safety. This innovative approach not only reduces the risks associated with firefighting but also offers a practical solution for fire prevention and control in residential, industrial, and hazardous environments.

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Wireless Rover with Gas-Leaked Sensor

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ABSTRACT

Wireless Rover with a gas-leaked sensor is significantly efficient in producing a chemical field because of the sensor's flexibility. The sensor has been used to detect dangerous gas to avoid injury to the internal respiration body and affect the lifetime of the living being. The sensor will help track gas that can create an explosion that could harm the living being in its surrounding area. The Wireless Rover helps with controlling the rover using a Wi-Fi Connection so the people in charge can use it to move the sensor into certain areas without harming themselves to go and check if there is an unknown gas that might be dangerous to the living being Iot that has been used in this project also help to control and receive the information that been capture from the sensor so the people that in charge can write the data to record.

KEYWORDS: Gas Sensor, Iot, Wireless Rover

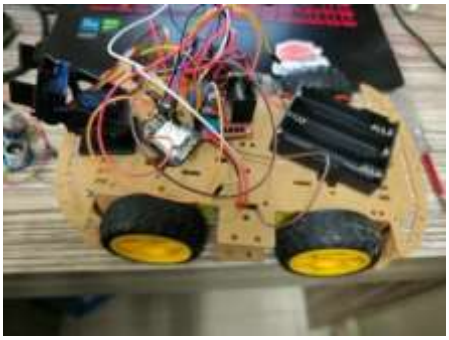
PRODUCT DESCRIPTION

The Wireless Rover With a Gas Leaked sensor contains the gas sensor MQ-2 that can detect the gas in its surroundings depending on the density of the gas itself the gas sensor system will also be paired with a distance sensor that would help the Wireless Rover to detect the distance so the rover can be avoid to crash or have a contact to something that can damage the other sensor or the wiring that might affect the 100% of the project efficiency. Both the distance sensor and gas sensor will connect to the NodeMCU as a brain for a program the NodeMCU will send the input that has been received by the gas sensor and distance sensor and sent it to the main control through the Wi-Fi connection so the data can be transfer so the people in charge can see the data and detect and being alert for the output display of the program. Wireless Rover also contains four DC motors for the movement of Rover. The Wireless Rover also gets a power supply from lithium-ion batteries that contain 3.7V which can power up the whole system of Wireless Rover. The Wireless rover also holds the pan tilt motor that can be controlled to move the camera that sticks to the ESP 32 Wi-Fi module. The code of Wireless Rover has been uploaded to ESP 32 to control the whole system including the pan tilt motor while having a camera that can be used to monitor the wireless rover surroundings. ESP 32 will have a connection with the device through the Wi-Fi connection to control the wireless rover movement.

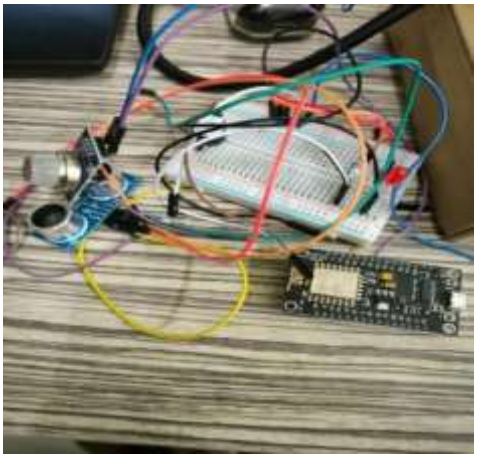
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarized as follows: Prepare the component that need to be used in project





Combine the component into one unit with fully connection (Wireless Rover)



Combine the components into one unit with full connection (gas sensor)

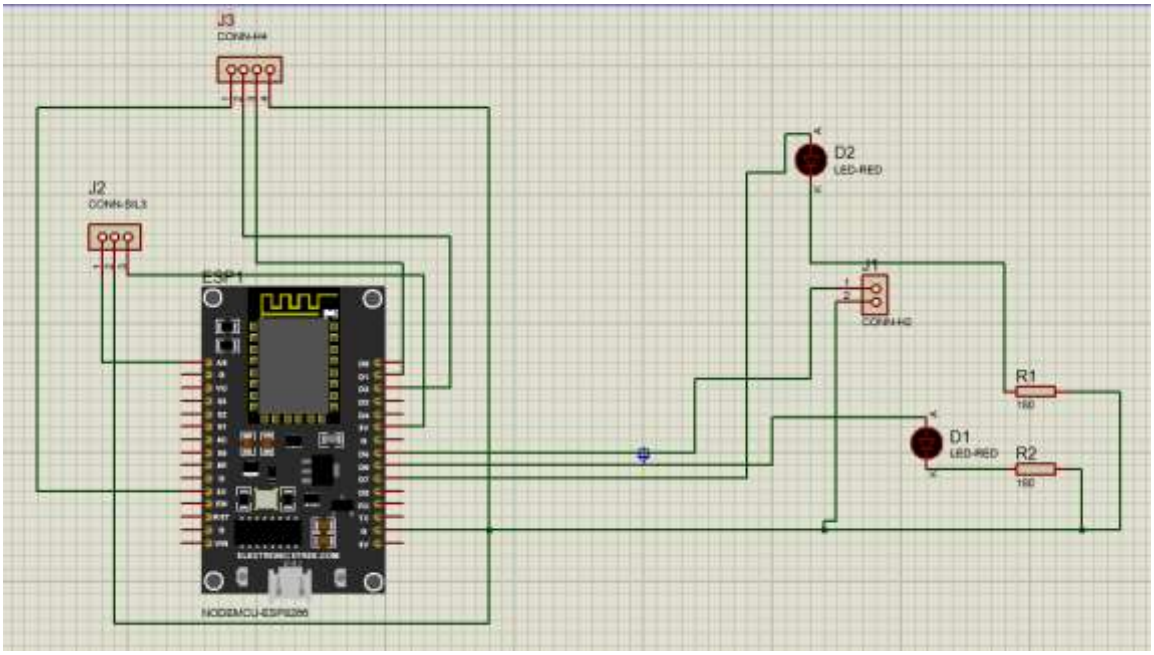
Combine both units into one to create a complete project and can be fully functional to complete the objective of project



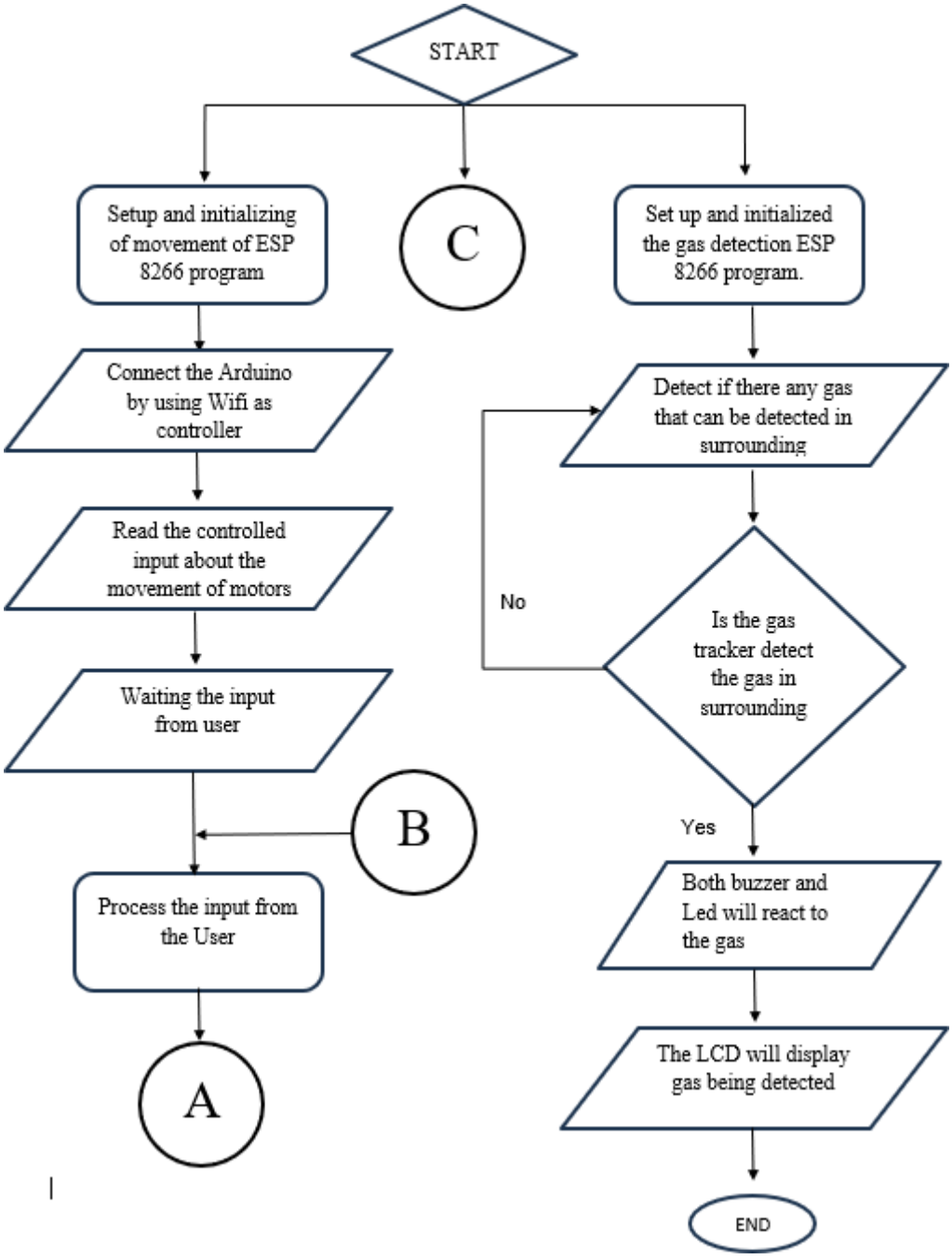
Build a system to control gas and distance system while monitoring the output value

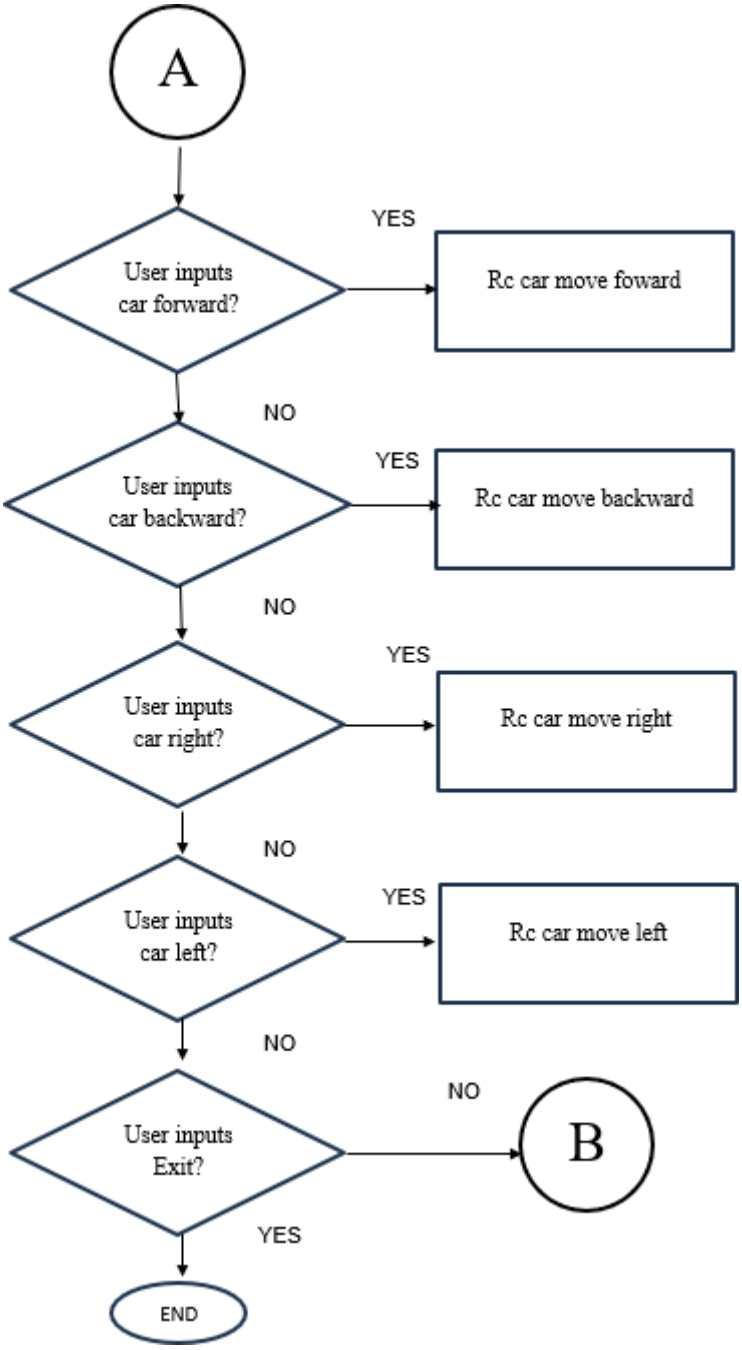


Schematic of gas and distance sensor system



Block diagram for wireless rover with gas leaked sensor




A
User inputs car forward?
YES
Rc car move foward
NO
User inputs car backward?
YES
Rc car move backward
NO
User inputs car right?
YES
Rc car move right
NO
User inputs car left?
YES
Rc car move left
NO
User inputs Exit?
NO
B
YES
END

NOVELTY AND UNIQUENESS

The uniqueness of the flexibility of the ESP device helps to make the whole system function. It can be used perfectly while controlling the Project from far away to make the user's job more effective and efficient. The size of each component helps to combine it into one functioning project that can use many sensors to show the input and the output while doing the test. The function of each component shows how the simple circuit still can create a great project that can be used in a certain situation. Each component has its uniqueness that can be shown how they were built from scratch to a component that can be used to complete a project and show the output of the program.

BENEFIT TO MANKIND

The main objective of this project is to fulfill sustainability and help humans kind to ease their work and help them to achieve solutions that can avoid or harm any living being from any unnecessary purpose to create a technology to bring small benefits. This Project allows the user to control the system for distance while monitoring the surroundings and collecting the input and output data from the sensor that is being transferred using the form of a Wi-Fi connection it will help to ease the movement to check the surroundings without tiering the user. It helps the user to monitor the surrounding area to check a gas leak that can harm and bring destruction to a surrounding area and any living being. With this project, the user can fulfill the job without putting themselves in unknown danger while avoiding any probability of getting harm.

COMMERCIALIZATION POTENTIAL

The wireless Rover with a gas leaked sensor has the flexibility to contain more than one sensor that can be used in the factory as a safety measure moreover the chemical factory field uses a lot of chemical reactions while creating some deadly gas that can affect the entire body system and make it permanent for a lifetime. The design of the circuit system in this project is simple and easy to understand, making it more flexible and reliable. With the Wi-Fi connection, the system of the Wireless rover can be controlled from a distance putting the user in a safe area while controlling and monitoring the surrounding area and collecting the output data from the sensor that is connected to the ESP or the brain of the whole system and send the information output to the Io system so the used can be used to collect and check data from time to time.

CONCLUSION

The conclusion for this project is there are different projects and yet using the same component it only depends on the circuit connection and the code that has been uploaded to the ESP or the control system to make the sensor act and react to the program even a simple circuit connection can make a huge different of the function of each component. Every sensor that has been applied has its specialty and its use for a certain function. This project shows that each element needs the right connection and the right pin to make the component fully function it also depends on the supply power to power up each component and needs to be controlled so all the components and sensors do not burn and affect the component or the sensor. The only problem with this project is the limitation for each element dan affects their output result making it less accurate and less effective. The gas sensor system can only detect a certain type of gas because of the component's limitation and the element's circuit design. Even with its limitations it also can help by using it to build the prototype for a real project with advanced components.

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Car Parking Platform System with Flood Monitoring and Platform Leveling

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ABSTRACT

This project proposes the development of a smart parking platform equipped with flood monitoring and platform-leveling mechanisms to enhance vehicle safety in flood-prone areas. At its core, the system integrates an ESP32s microcontroller with a water level sensor for flood detection and an infrared sensor for vehicle presence monitoring. A stepper motor coupled with a dual-axis TT gear mechanism enables the platform to automatically elevate during flooding and lower when conditions are safe. To improve user awareness, LED indicators and an LCD display provide real-time feedback on both vehicle status and flood conditions. The system is powered by a rechargeable battery, with protective resistors incorporated to ensure safe operation of electronic components. Designed for residential and commercial applications, this solution offers a practical and cost-effective approach to mitigating flood risks while safeguarding parked vehicles. The proposed system emphasizes simplicity, reliability, and actionable insights, providing a balance between affordability and advanced safety automation.

KEYWORDS: Smart parking platform, flood detection, car existence monitoring, ESP32s, Automated safety system.

PRODUCT DESCRIPTION

This project introduces an automated parking platform capable of monitoring vehicle presence and responding to flood conditions. The system is powered by an ESP32s microcontroller and employs sensors such as a water level sensor for flood detection and an infrared sensor to detect vehicle presence. A dual-axis TT gear motor, controlled by a stepper motor driver, enables the platform to automatically elevate when flooding is detected and lower when conditions are safe, effectively protecting vehicles from water damage. Real-time updates on flood status and vehicle presence are displayed on an LCD panel, while green and red LEDs provide visual feedback on car detection. By adjusting the platform's position autonomously based on sensor data, this system ensures vehicle safety in flood-prone areas. Designed to minimize human intervention, this smart parking solution offers a reliable and efficient way to safeguard vehicles in areas susceptible to flooding.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Block Diagram

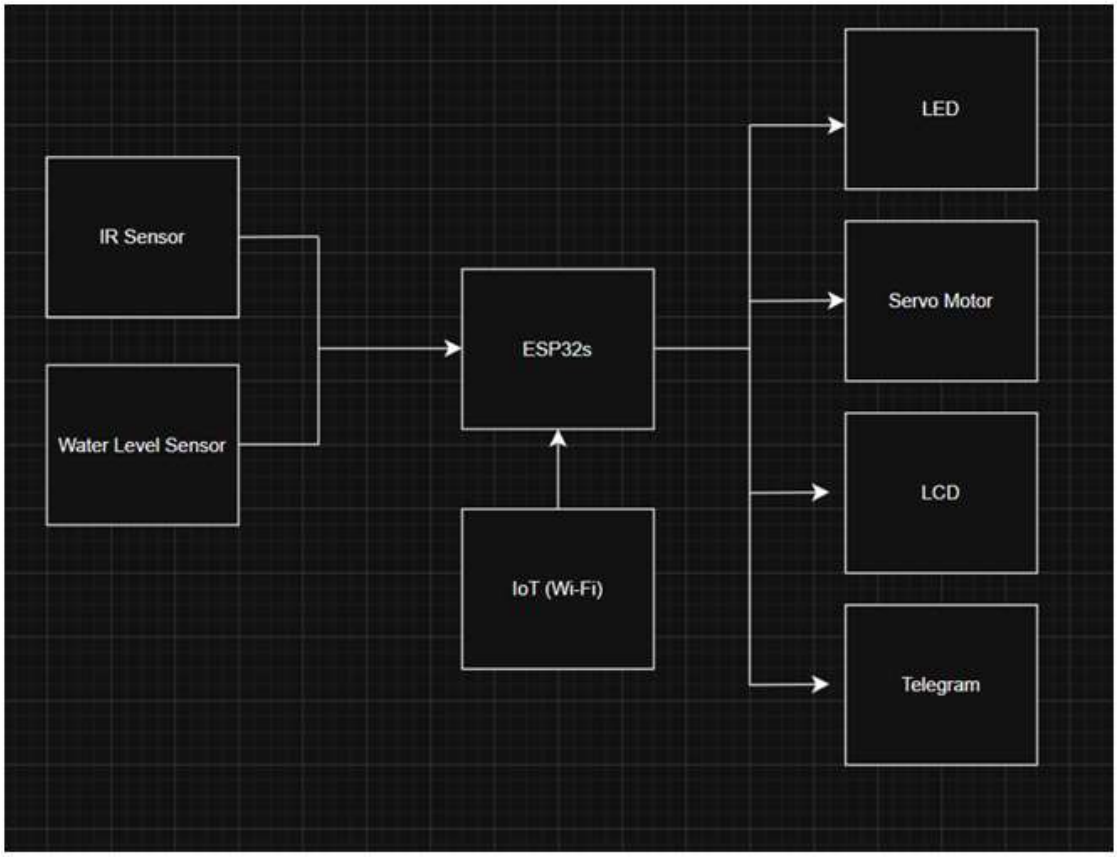


Figure 1: Block diagram

Schematic diagram

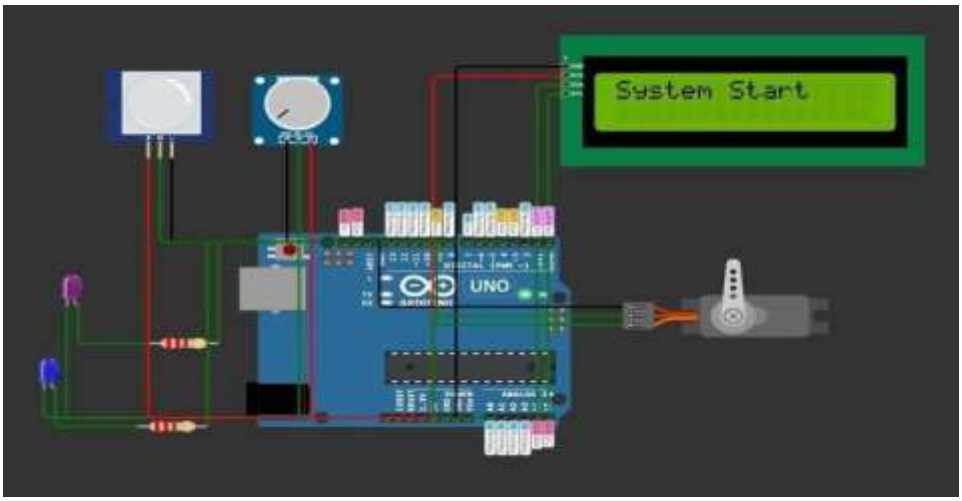


Figure 2: System start.

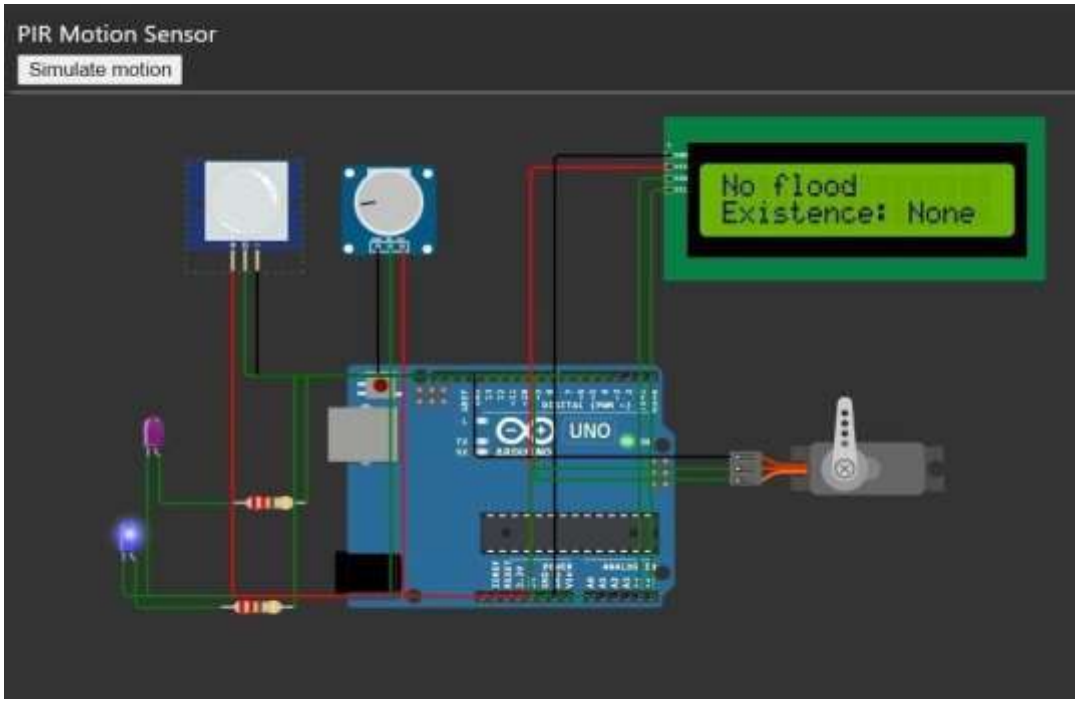


Figure 3: Sensor no flood detected.

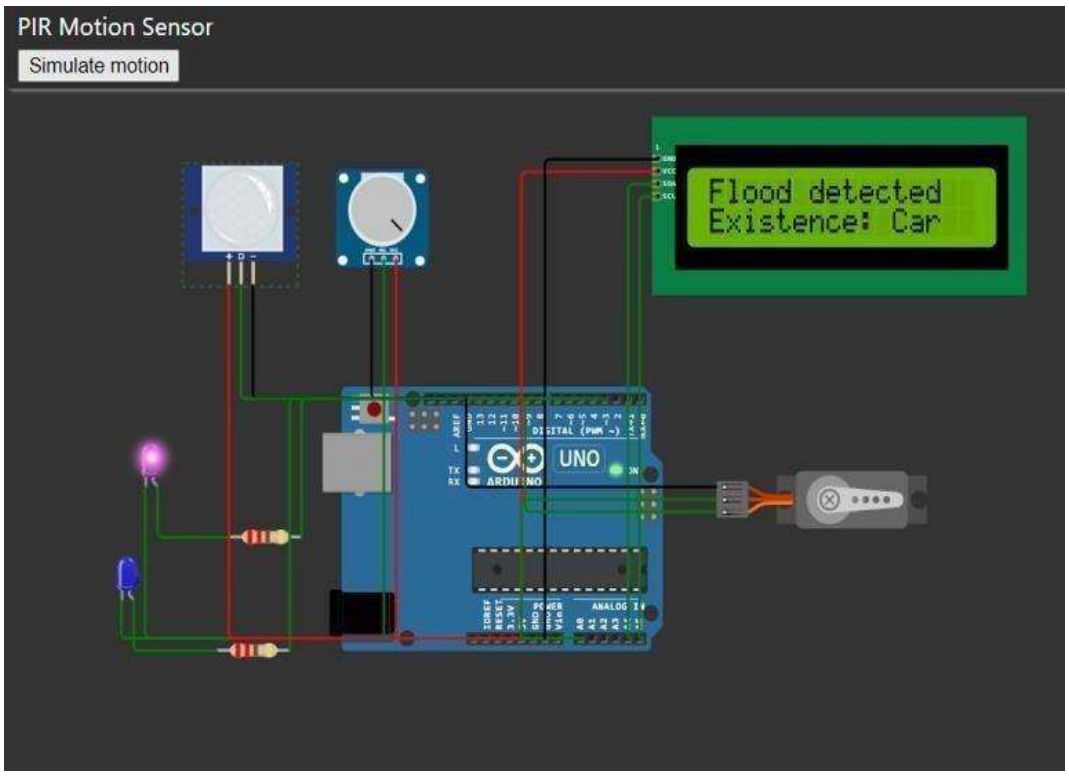


Figure 4: Sensor detected flood.

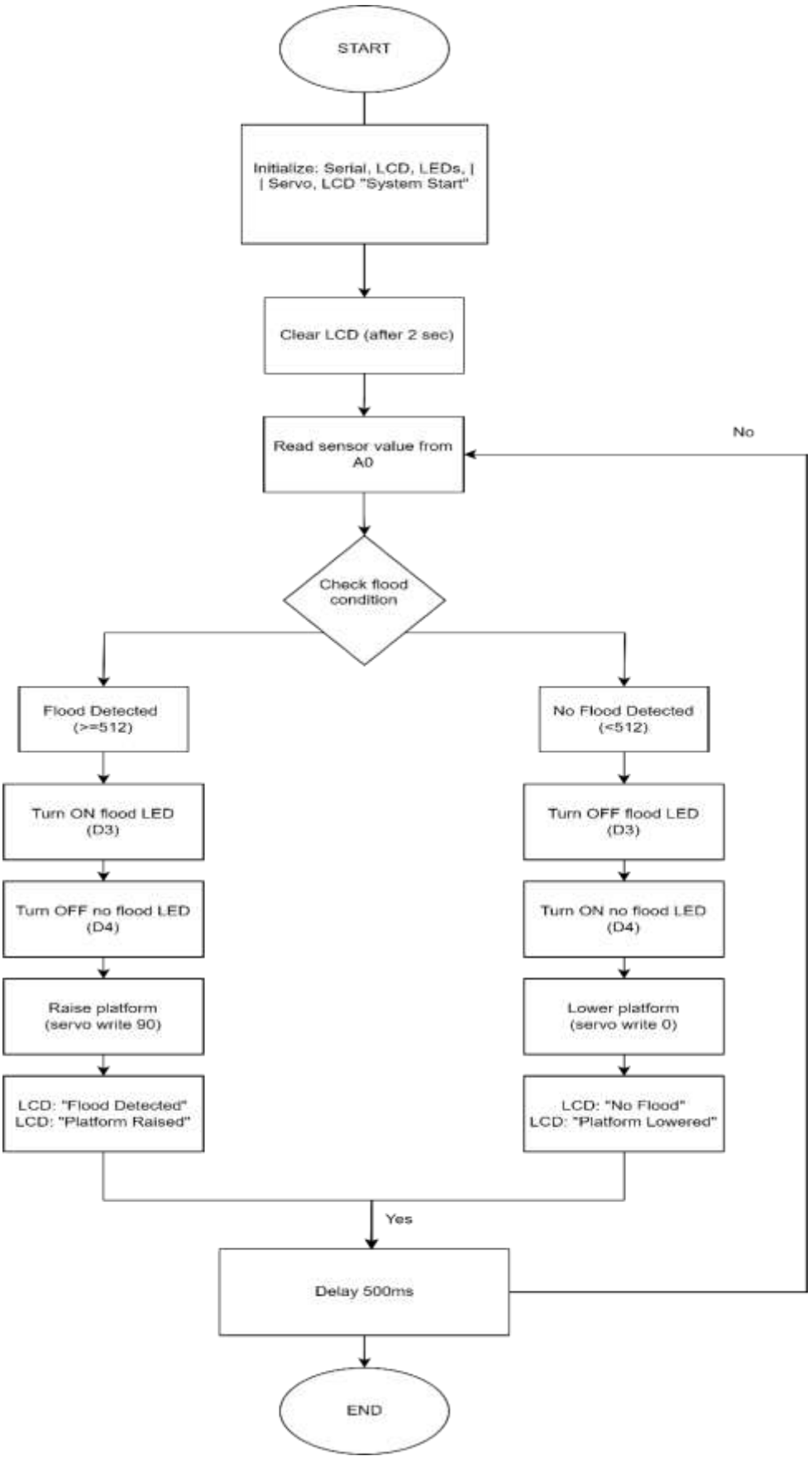


Figure 5: Flow chart of the system.

NOVELTY AND UNIQUENESS

This design concept stands out for its innovative integration of automated flood detection and parking management within a compact system. Unlike traditional parking solutions, it employs a water level sensor for real-time flood monitoring, triggering an automatic response to protect vehicles by adjusting the platform's position. The addition of an infrared sensor enhances functionality by providing dual-layer features for both flood protection and parking assistance. The system's affordability, enabled by the use of an ESP32s microcontroller, makes it highly accessible for widespread application. User interaction is further enhanced through visual feedback via an LCD panel and LED indicators, ensuring clear communication of vehicle and flood status. This project's uniqueness lies in its practical and efficient approach to mitigating vehicle damage in flood-prone areas, offering a cost-effective, automated solution with a user- friendly design.

BENEFIT TO MANKIND

This initiative has several advantages for humanity, including convenience and safety. This technology automatically detects rising water levels and modifies the platform to prevent cars from water damage in flood-prone areas. This lessens the monetary costs and psychological anguish brought on by flood-related car damage. Furthermore, the concept improves parking management by employing an infrared sensor to identify the presence of cars, guaranteeing effective parking spot utilization, and giving consumers straightforward visual feedback via LED indicators and an LCD display. Users' overall safety and convenience are increased by the automation and integration of parking management and flood detection. This initiative encourages sustainable and scalable solutions for residential and urban areas by utilizing affordable, easily accessible technology, which helps to improve infrastructure resilience to extreme weather and climate change. In the long run, this innovation improves living quality, lowers hazards, and encourages efficiency and safety in day-to-day transportation management.

COMMERCIALIZATION POTENTIAL

With its affordable solution to parking issues in residential, commercial, and public sectors as well as flood-prone areas, this project has a high potential for commercialization. It is accessible and scalable for a range of applications, from little places to huge parking lots, thanks to reasonably priced components like ESP and sensors. In order to draw in customers, companies, and governments, the technology can be sold as a retrofit kit or incorporated into smart city platforms It offers a workable solution with wide market appeal by improving parking effectiveness and vehicle safety.

CONCLUSION

In conclusion, this project leverages Arduino-based automation to deliver an innovative and cost-effective solution for parking challenges in flood-prone areas. By integrating dual-axis motors, water level sensors, and infrared sensors, the system ensures vehicle safety through real-time detection and automated platform adjustments. The use of an LCD display and LED indicators provides clear, user-friendly status updates, enhancing convenience and accessibility. Designed with affordability and scalability in mind, this solution is not only practical for individual users but also holds significant potential for large-scale commercial and municipal applications. Its contributions to improved parking efficiency, robust flood protection, and sustainable urban infrastructure underscore its relevance and value in addressing the needs of modern urban living.

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Automatic Segregation Waste Bin and Monitoring System

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ABSTRACT

Effective waste management is essential for maintaining a clean, safe, and sustainable laboratory environment. Conventional waste bins rely on manual sorting, which is time- consuming, error-prone, and exposes users to potential hazards, such as contamination and improper segregation of hazardous materials. This project introduces an Automatic Waste Segregation and Monitoring System specifically designed to address these challenges in laboratory settings. The system focuses on accurately segregating metal, wet, and dry waste, prioritizing metallic waste detection using a PR124DP proximity sensor to ensure hazardous materials are safely handled. Waste is sorted automatically using a stepper motor to direct it to the appropriate compartment and a servo motor to control the lid operation. The Blynk IoT platform enables real-time monitoring, notifications, and remote control, offering live updates on waste type and bin status. This innovation significantly reduces manual intervention, improves waste segregation accuracy, and enhances safety and organization in laboratory environments. Unlike existing waste bins, which lack automated segregation and IoT integration, this system uniquely combines advanced sensors, automation, and user-friendly features, setting a new standard in laboratory waste management solutions.

KEYWORDS:
Waste segregation, laboratory waste management, IoT monitoring, ESP32, ultrasonic sensor, moisture sensor, sustainability.

PRODUCT DESCRIPTION

This project introduces an Automatic Waste Segregation and Monitoring System, designed to enhance waste management specifically in laboratory environments. The system is built around an ESP32 microcontroller and focuses on categorizing waste into metal, wet, and dry types, with three dedicated compartments in the bin for each category. Prioritizing metal waste detection, the system utilizes a inductive proximity sensor (PR124DP) to identify metallic materials, ensuring proper disposal of hazardous waste. If the waste is not metal, it is sorted into either the wet or dry waste compartments based on moisture levels, which are monitored using a moisture sensor. An ultrasonic sensor tracks the bin's capacity and triggers alerts when it is full, ensuring timely disposal. The system also uses a stepper motor to direct waste to the appropriate compartment and a servo motor for lid operation. LED indicators provide visual feedback, changing colors based on the detected waste type, while a red LED and buzzer signal when the bin reaches full capacity. For enhanced user interaction, the system integrates ESP32 Wi-Fi functionality, allowing real-time waste monitoring and notifications via a mobile app. This enables users to receive updates about the type of waste detected and be notified when the bin is full. Additionally, the system can be turned on or off remotely via the app when not in use.By automating waste segregation, the system reduces manual intervention, increases efficiency, and promotes safety and sustainability in laboratory settings. This scalable and automated solution simplifies waste sorting and collection, making laboratory waste management more organized and environmentally friendly.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1.BLOCK DIAGRAM

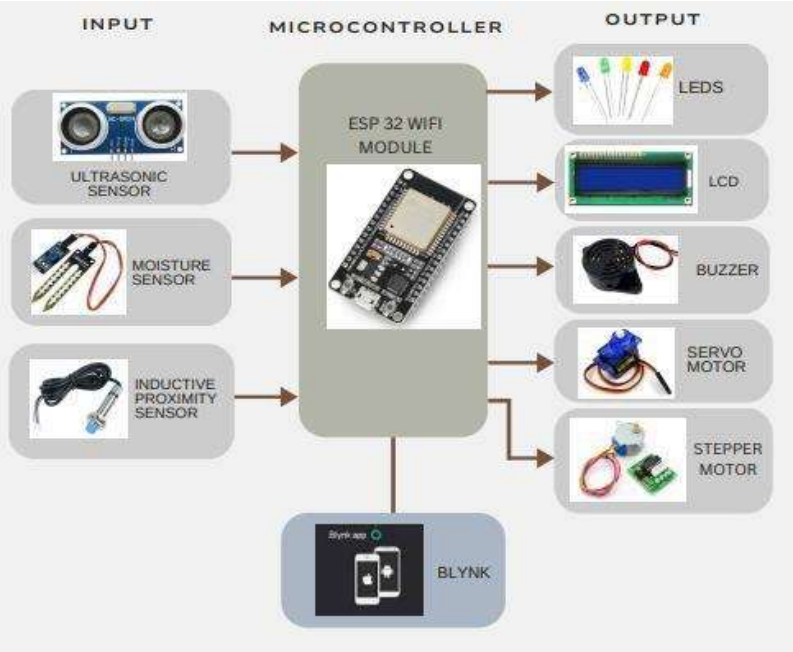


Figure 1: Block Diagram of Automatic Waste Segregation and Monitoring System

2. FLOWCHART

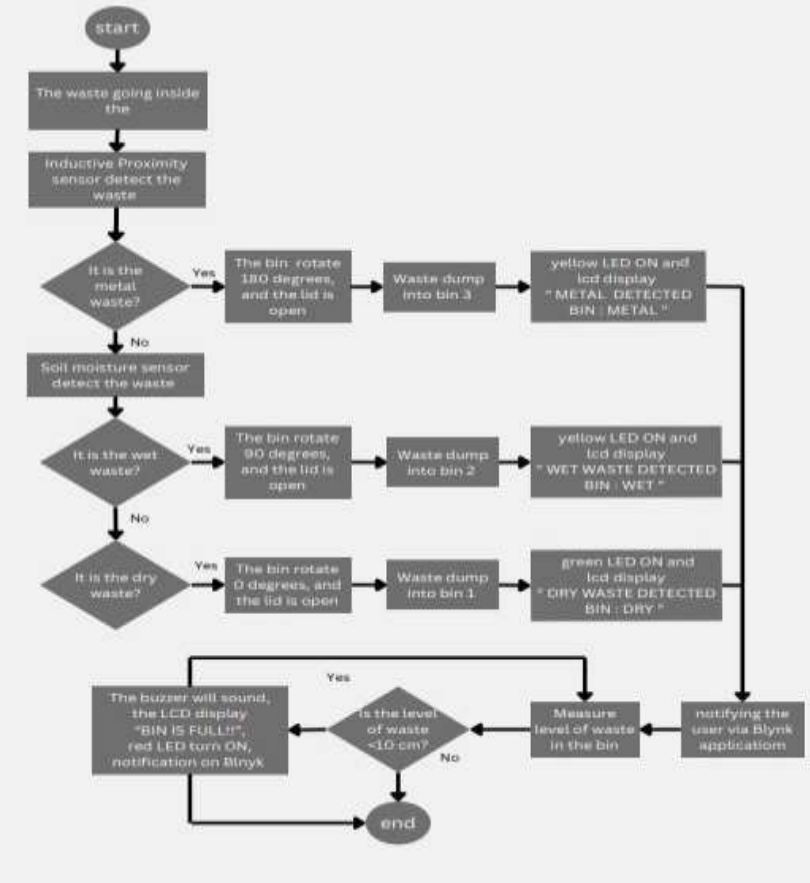


Figure 2: Flowchart of Automatic Waste Segregation and Monitoring System

3.0 PCB LAYOUT

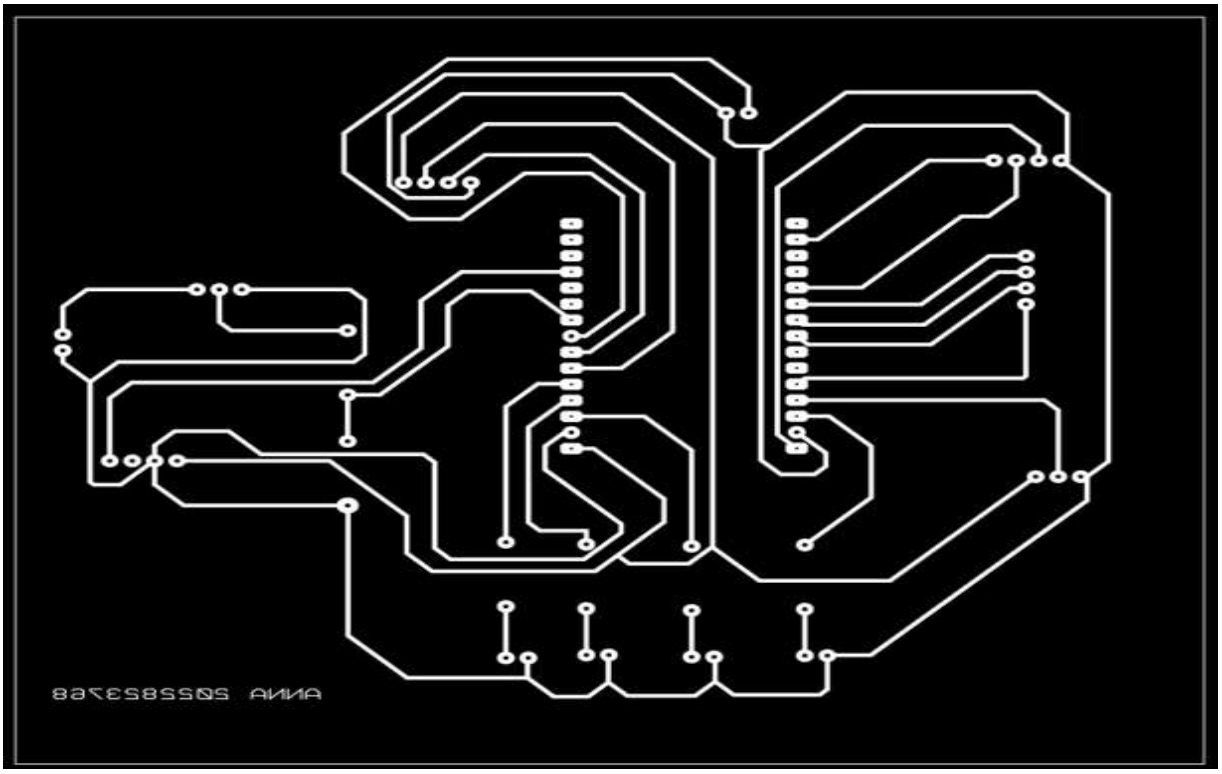


Figure 2: PCB Layout of Automatic Waste Segregation and Monitoring System

NOVELTY AND UNIQUENESS

This project's strength is in its use of IoT technology and advanced sensor integration to revolutionize waste management in laboratory settings, addressing the limitations of manual waste sorting system. Unlike this older system, this project prioritizes metal waste detection using a PR124DP inductive proximity sensor, ensuring that hazardous materials are accurately identified and separated, which is crucial in laboratory environments where safety is paramount. The automated sorting mechanism, driven by a stepper motor and servo motor, directs waste into specific compartments for metal, wet, and dry waste, reducing the reliance on manual sorting and minimizing errors. Another key feature is the real-time monitoring and control enabled by the ESP32 Wi-Fi module, which integrates with the Blynk IoT platform. This allows users to receive mobile notifications about the waste type, bin status, and when the bin reaches full capacity. The inclusion of LED indicators and a buzzer further enhances user interaction and provides immediate feedback. By combining automation, safety, and remote monitoring, this system stands apart from traditional waste bins, offering a modern, scalable, and eco- friendly solution for laboratory waste management

BENEFIT TO MANKIND

This project is improving safety, efficiency, and sustainability in laboratory environments. By automating the waste segregation process, it reduces human error in sorting hazardous materials, ensuring safer disposal of metal, wet, and dry waste. The real-time monitoring and notifications provide users with timely updates, preventing bin overflow and ensuring proper waste handling. This automation minimizes manual intervention, saving time and effort. Additionally, by promoting accurate waste categorization, it encourages recycling and waste reduction, contributing to environmental sustainability. Overall, the system enhances workplace safety, supports eco-friendly practices, and streamlines waste management, ultimately benefiting both public health and the

environment.

COMMERCIALIZATION POTENTIAL

The Automatic Waste Segregation and Monitoring System is significant especially in laboratories, educational institutions, research facilities, and industries that dealing with specialized waste. By automating waste segregation and integrating real-time monitoring through IoT technology, the system improves safety, efficiency, and sustainability, making it a valuable solution for organizations that require precise waste management. Its ability to accurately sort metal, wet, and dry waste ensures proper disposal, reducing contamination risks in sensitive environments. This system can be marketed to sectors such as healthcare, pharmaceuticals, manufacturing, and food processing, where waste segregation is critical. Its scalability makes it adaptable to various facility sizes, from small labs to large industrial sites. As environmental regulations tighten and the demand for eco-friendly solutions grows, this project aligns with sustainability goals, offering an automated, cost-effective, and environmentally responsible waste management solution. The system's efficiency and reliability position it as a highly marketable product across multiple industries

CONCLUSION

The Automatic Waste Segregation and Monitoring System presents an innovative solution to waste management in laboratory environments by automating the segregation of metal, wet, and dry waste. By integrating advanced sensors, IoT technology, and real- time monitoring, it enhances safety, efficiency, and sustainability. The system reduces manual intervention, minimizes contamination risks, and ensures proper waste categorization, contributing to a cleaner and safer workspace. With its scalability and adaptability, this project holds strong commercial potential, offering a modern, cost- effective solution for laboratories, research institutions, and industries. As the demand for eco-friendly and efficient waste management systems grows, this automated approach stands as a valuable tool for improving environmental sustainability and operational efficiency across various sectors.

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Greenhouse Monitoring System

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ABSTRACT

Greenhouses play a vital role in modern agriculture, providing a controlled environment for optimal plant growth and crop production. However, maintaining ideal conditions within a greenhouse requires continuous monitoring and precise control of various environmental parameters. This project aims to develop an advanced greenhouse monitoring and control system using the ESP32 microcontroller and IoT technology. By integrating sensors for temperature, humidity, soil moisture, and light intensity, the system continuously collects critical data. The ESP32 processes this data in real-time and automates the control of actuators, including fans, water pumps, lights, and a humidifier, to maintain optimal growing conditions. Additionally, the ESP32's built-in Wi- Fi functionality transmits data to a cloud platform, enabling real-time remote monitoring and control via a user-friendly mobile application. The proposed system offers significant advantages over traditional methods, including reduced manual intervention, enhanced resource management, and improved crop yield and quality. By leveraging real-time data analysis and automated adjustments, this project aims to enhance the efficiency and sustainability of greenhouse farming practices.

KEYWORDS: greenhouse monitoring system, ESP32 microcontroller, Wi-Fi module, controlled environment, IoT technology.

PRODUCT DESCRIPTION

The Greenhouse Monitoring System is a state-of-the-art solution designed to modernize and optimize agricultural practices in controlled environments. Powered by the ESP32 microcontroller, this system integrates a suite of sensors to monitor essential environmental parameters, including temperature, humidity, soil moisture, and light intensity. The ESP32 processes the sensor data in real-time and enables automated responses to maintain optimal conditions. Output devices such as fans for cooling, lights for illumination, water pumps for provide water to the plant, and a humidifier for stabilizing humidity levels work together seamlessly to ensure the ideal growing environment The system features an LCD display for on-site monitoring, allowing farmers to view essential data at a glance. Additionally, the ESP32's built-in Wi-Fi capabilities enable IoT connectivity, allowing users to remotely access real-time data through a mobile app or web platform. This functionality ensures that users can monitor greenhouse conditions, receive alerts, and control environmental parameters from anywhere. By integrating advanced automation, real-time monitoring, and remote accessibility, the system reduces manual labor, optimizes resource use, and supports sustainable farming practices. The addition of a humidifier further enhances the system's ability to maintain consistent humidity, improving crop health and yield reliability in varying environmental conditions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. Block diagram

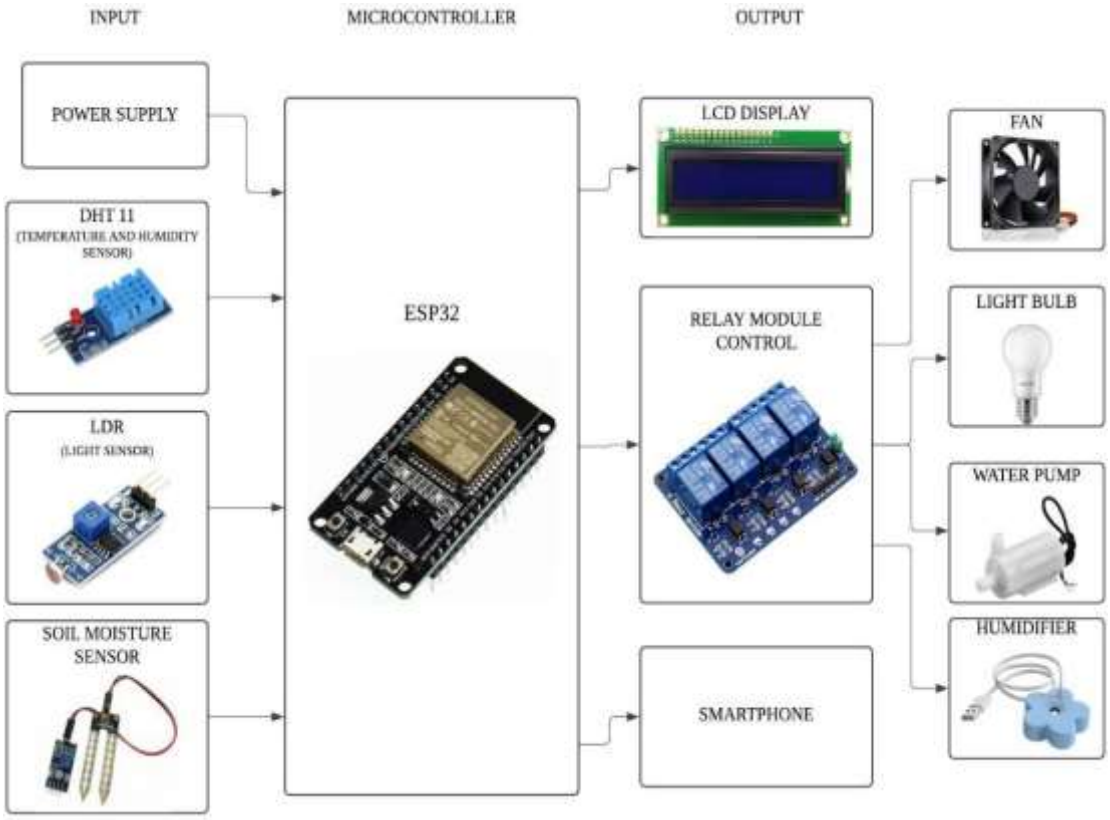


Figure 1 : Block diagram of Greenhouse Monitoring System

Flowchart

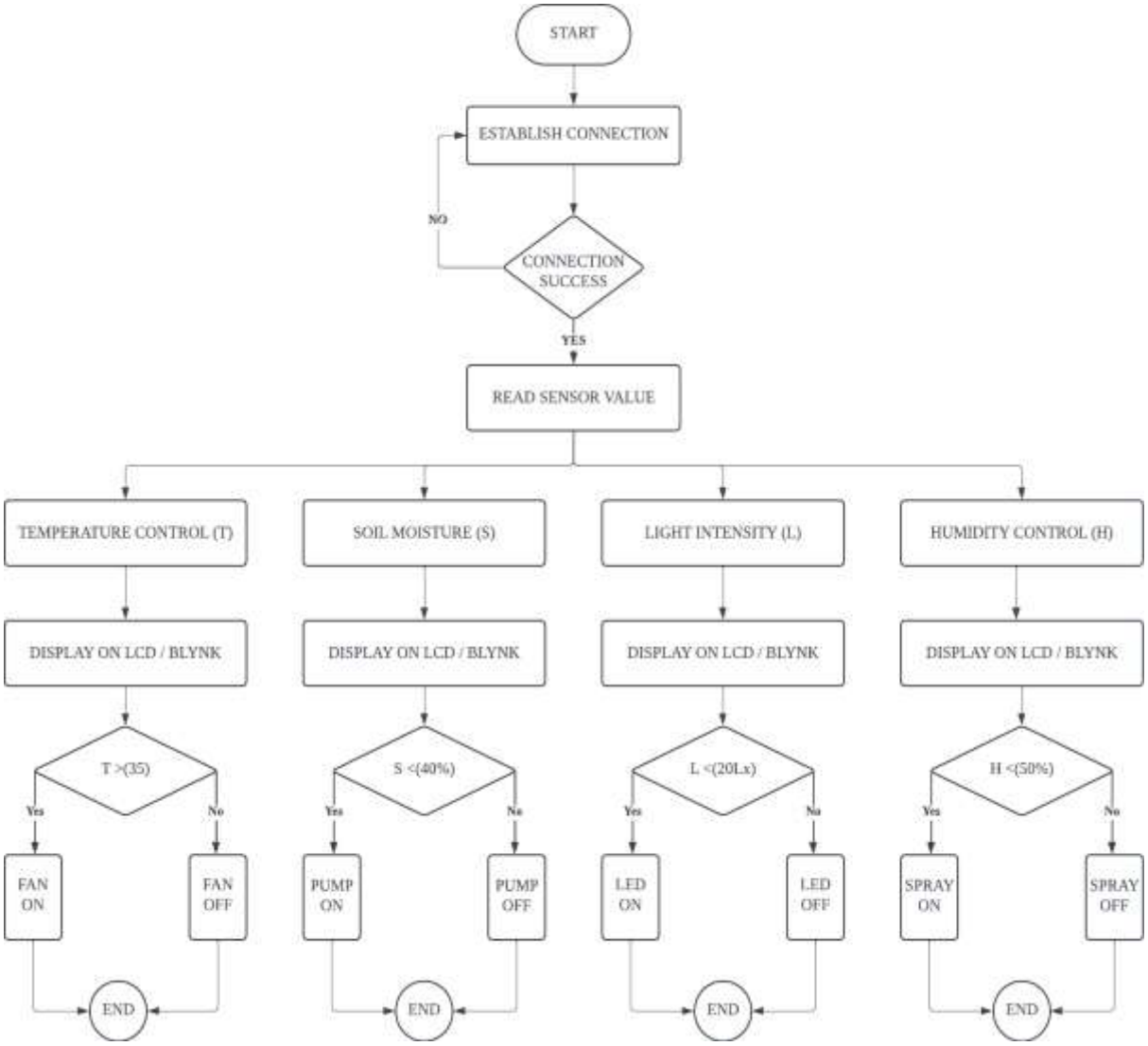


Figure 2 : Flowchart of the Greenhouse Monitoring System

Schematic Diagram

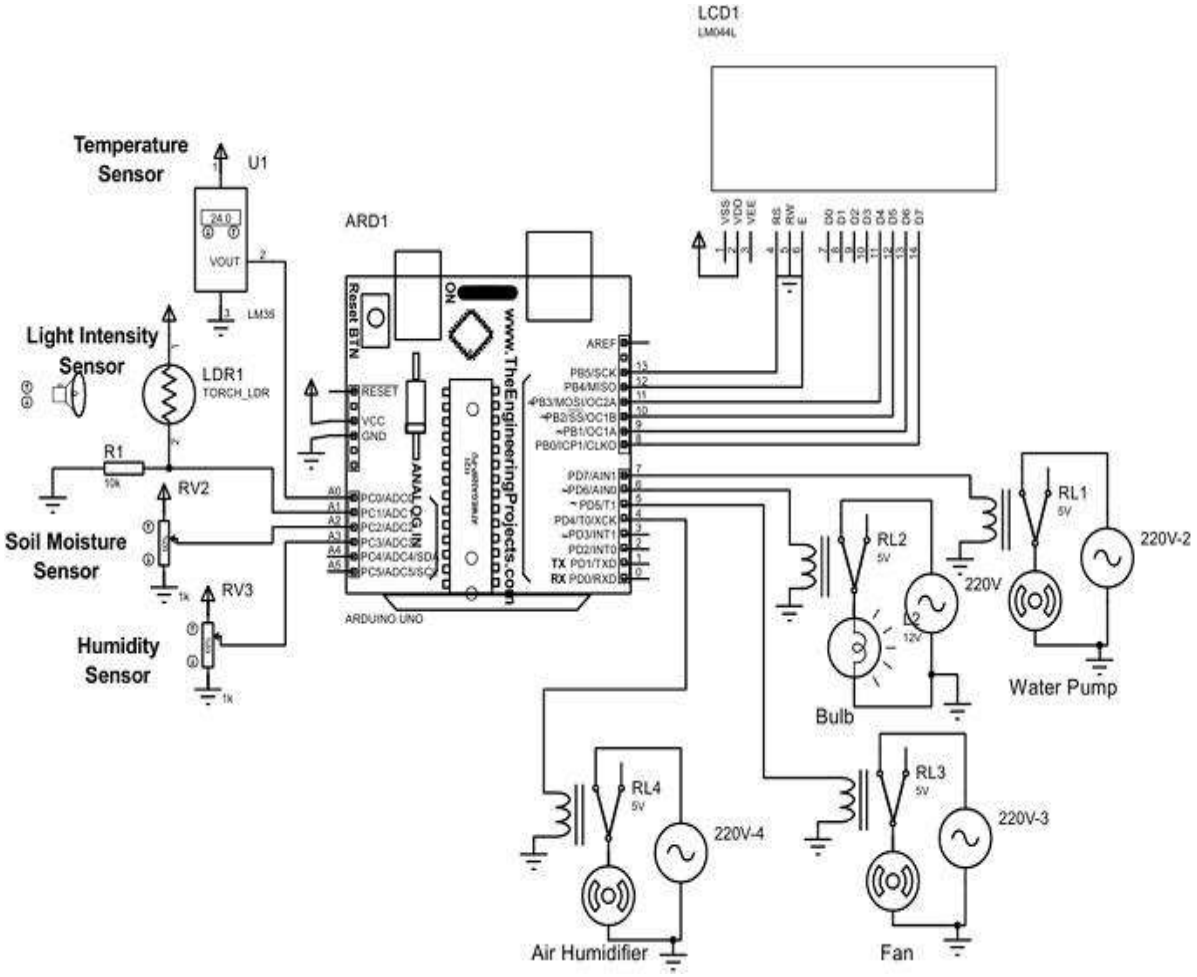


Figure 3 : Schematic diagram of Greenhouse Monitoring System

NOVELTY AND UNIQUENESS

The Greenhouse Monitoring System is distinguished by its innovative use of the ESP32 microcontroller, which enables real-time monitoring, IoT connectivity, and automation in a single, scalable solution. Unlike traditional greenhouse setups that require extensive manual intervention, this system integrates multi-sensor data to automate the control of key environmental parameters such as temperature, humidity, and soil moisture. One of the unique features of the system is its ability to monitor multiple greenhouses simultaneously through its IoT-enabled remote access. Users can not only receive real- time updates but also adjust settings for specific crops, creating tailored conditions to optimize growth and yields. Another standout innovation is the system's dual-functionality in providing both local monitoring via an LCD display and remote accessibility through mobile applications or web platforms. Its compact and user-friendly design ensures compatibility with existing farming setups, making it easy to adopt. Overall, the system offers a smarter, more efficient, and highly customizable approach to greenhouse management.

BENEFIT TO MANKIND

The Greenhouse Monitoring System offers significant benefits to society by addressing global agricultural challenges such as food security, resource efficiency, and sustainability. By automating critical tasks like irrigation, temperature regulation, and lighting control, the system reduces the reliance on manual labor, saving farmers valuable time and effort. Its real-time monitoring capabilities help prevent crop losses by allowing users to quickly respond to environmental changes or anomalies, ensuring optimal conditions for plant growth. This can lead to higher crop yields and improved food production, directly contributing to global food security. Additionally, the system

promotes sustainability by minimizing resource wastage; for example, it ensures precise water usage, preventing over-irrigation or drought stress. Its remote access functionality empowers farmers to monitor and manage their greenhouses from anywhere, improving efficiency and convenience. By enhancing productivity and reducing environmental impact, the Greenhouse Monitoring System supports the development of a more resilient and sustainable agricultural sector for future generations.

COMMERCIALIZATION POTENTIAL

The Greenhouse Monitoring System has immense potential for commercialization due to its practical features, affordability, and wide range of applications. The integration of IoT technology makes it an attractive solution for farmers, agribusinesses, and agricultural technology companies. Its real-time monitoring and automation capabilities address the growing demand for smart farming solutions, providing a modern alternative to traditional greenhouse systems. The system's scalability and adaptability enable it to cater to diverse farming needs, from small-scale greenhouse operations to large commercial setups. Its ease of installation and compatibility with existing infrastructure further enhance its marketability. Additionally, with the rising awareness of sustainable farming practices, this system appeals to environmentally conscious buyers by promoting efficient resource utilization. Target markets include individual farmers, agritech firms, and industrial-scale agricultural operations. Entrepreneurs can capitalize on the increasing demand for IoT-enabled farming tools, positioning this system as a cost- effective, efficient, and innovative product in the growing smart agriculture market.

CONCLUSION

In conclusion, the Greenhouse Monitoring System represents a revolutionary step forward in agricultural technology. By leveraging the capabilities of the ESP32 microcontroller, the system integrates real-time monitoring, IoT connectivity, and automation to optimize greenhouse management. It ensures precise control over critical environmental parameters, enhancing crop growth and productivity while minimizing resource usage and labor requirements. Its scalability and user-friendly design make it suitable for a wide range of applications, from small-scale greenhouses to large commercial farms. The ability to monitor conditions remotely and respond to changes in real-time empowers farmers with unprecedented control over their operations. By addressing key challenges in agriculture, such as food security and sustainability, this system paves the way for smarter and more efficient farming practices. Its combination of advanced features, affordability, and practicality makes it an ideal solution for modernizing agriculture and creating a more sustainable future for the global farming community.

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Water Clarity Monitoring and Warning System

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ABSTRACT

Water is one of the most crucial elements of any ecosystem and necessary for all living things. The quality of water can be defined based on water clarity, where the clear water indicates low pollution and good quality while murky water indicates the presence of pollutants. In this project, an ESP32 microcontroller is used to design the Water Clarity Monitoring and Warning System, which offers a practical and affordable way to measure the quality of water in real time. Three sensor which is turbidity, pH, and water level are integrated into the system. By classifying water levels as "HIGH" or "LOW," pH levels as "ACID," "NEUTRAL," or "ALKALINE," and turbidity as "VERY DIRTY," "DIRTY," or "VERY CLEAN," it activates the proper LEDs and buzzers for situations that are considered significant. Besides, the status of the level of the sensors are also presented on the 20x4 I2C LCD guaranteeing feedback that is easy to utilise. Aims of the project is to monitor and alert the users on the water quality status. The possibilities for scalability and practical applications in domestic, commercial, and environmental settings are highlighted in this study, which tackles important issues such sensor integration, data calibration, and system synchronisation. Its impact and functionality could be further enhanced by future developments like real-time data logging and IoT connectivity.

KEYWORDS: Water Quality ,Water Clarity, Water monitoring system, Turbidity Sensor,ESP32,

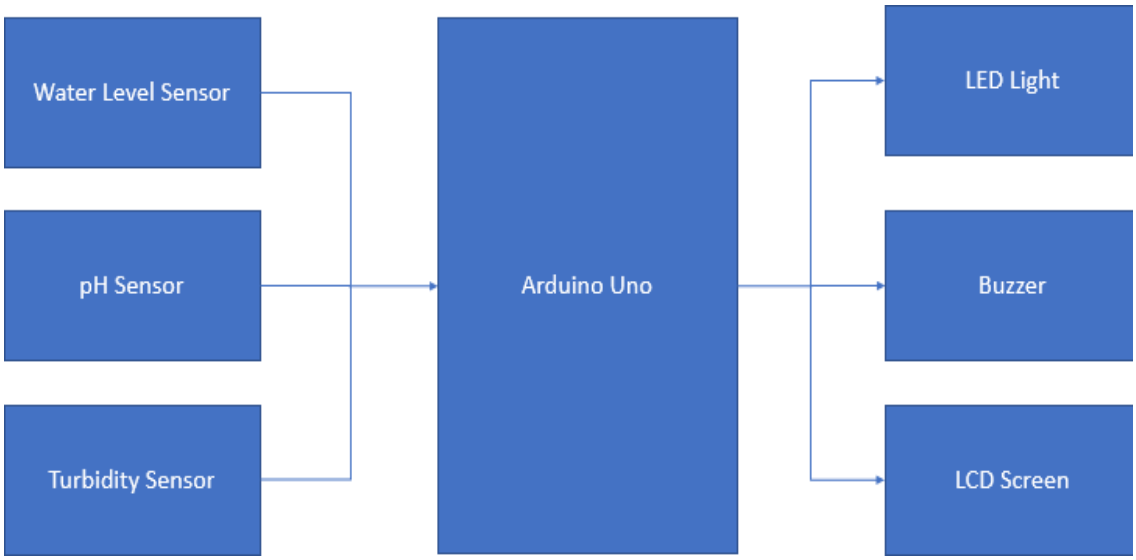
PRODUCT DESCRIPTION

An ESP32 microcontroller is used in the student-designed Water Clarity Monitoring and Warning System to measure water quality in real time. It uses three sensors, which are represented by potentiometers in this prototype: turbidity, pH, and water level. The system classifies turbidity as "VERY DIRTY," "DIRTY," or "VERY CLEAN," classifies water levels as "HIGH" or "LOW," and classifies pH levels as "ACID," "NEUTRAL," or "ALKALINE." LEDs and buzzers are among the outputs that turn on in emergency situations to provide prompt notifications. For ease of monitoring, all data is shown on a 20x4 I2C LCD. This affordable and easy-to-use system shows how sensors, output devices, and a microcontroller may be combined to provide a workable water quality monitoring solution.

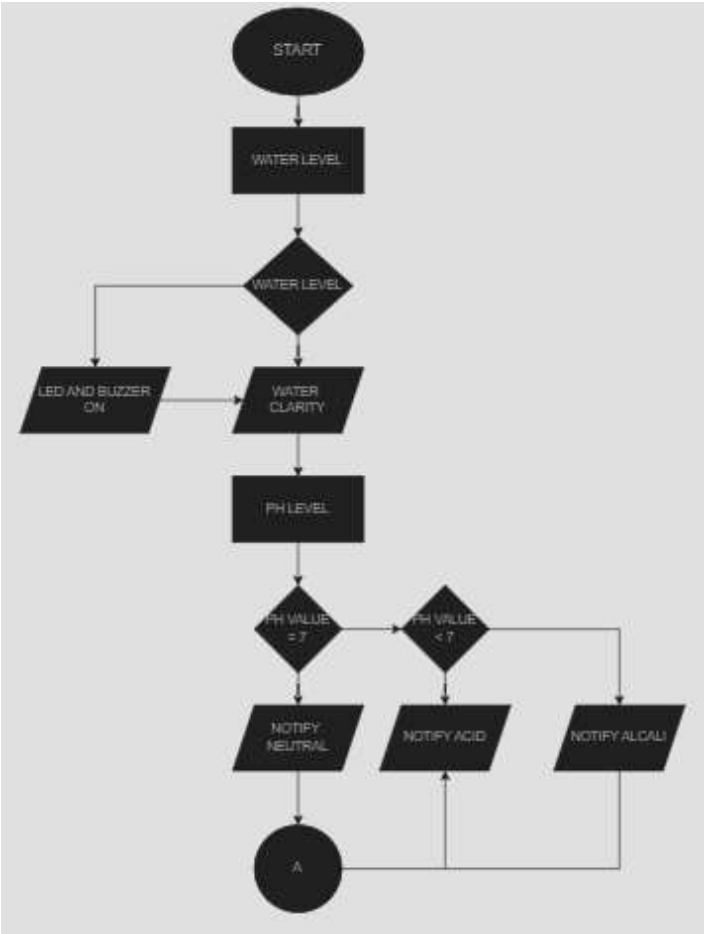
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

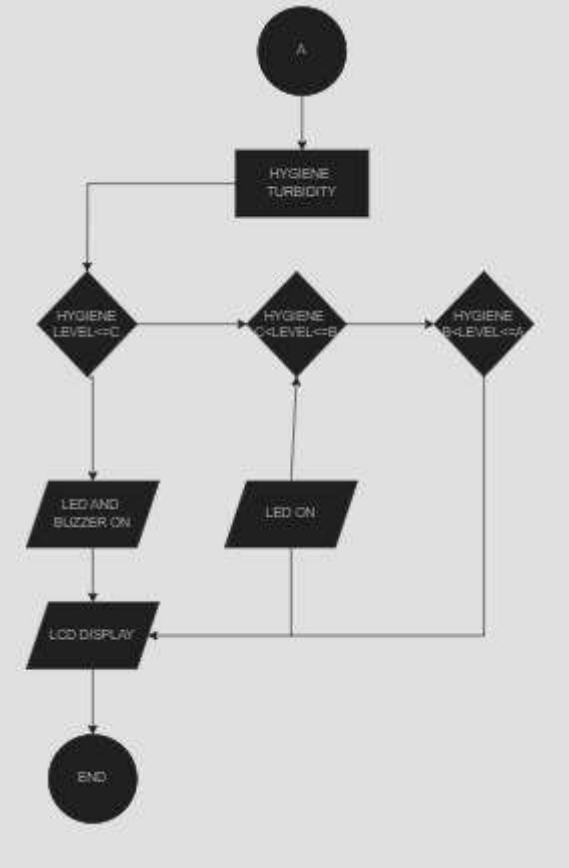
Operational flow of the project and simulation are summarized as follow:

1. Block diagram



2. Flow chart of the project





3. Turbidity sensor

I) Definition

Condition	Output
0V – 1.5V	Very dirty
1.6V – 3.0V	Dirty
3.1V – 5.0V	Clean

II) Result

Condition	Result
0.91	Very dirty
1.92	Dirty
3.30	Clean

4. Water level

I) Definition

Condition	Output
0% - 50%	Low
51% - 100%	High

II) Result

Condition	Result
21.18%	Low
61.12%	High

5. pH sensor

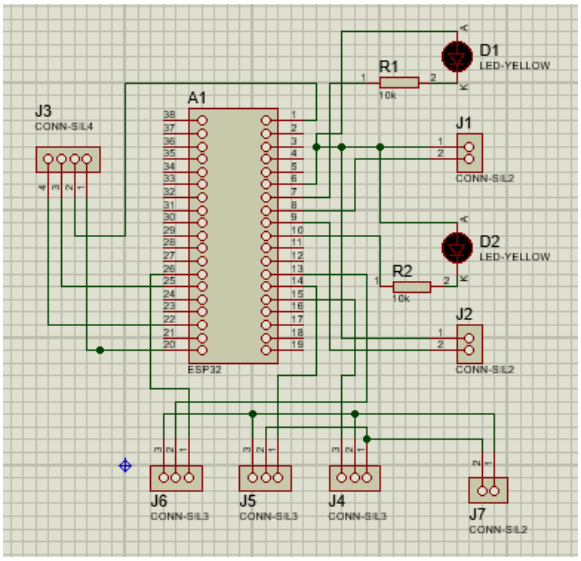
I) Definition

Condition (pH)	Output
0 – 6.8	Acid
6.9 – 7.1	Neutral
7.2 - 14	Alkaline

II) Result

Condition (pH)	Result
5.8	Acid
7.1	Neutral
10.4	Alkaline

6. Schematic diagram of the Water Clarity Monitoring and Warning system



NOVELTY AND UNIQUENESS

This project's innovation and distinctiveness come from its capacity to integrate real-time water quality monitoring with useful applications for environmental and residential purposes, like river water assessment. This idea combines turbidity, pH, and water level measurements into a single, small device, in contrast to conventional systems that concentrate on individual parameters. It ensures clarity and use by displaying all readings simultaneously on a 20x4 I2C LCD and providing instant alerts using LEDs and buzzers for urgent conditions. It is appropriate for remote monitoring as the ESP32 microcontroller increases adaptability and permits future enhancements like IoT connectivity. Its low cost and straightforward design, which includes the prototype's use of potentiometers as sensor substitutes, also make it suitable for educational settings while maintaining the possibility of practical uses in homes, businesses, and environmental monitoring, including the monitoring of rivers and other water sources.

BENEFIT TO MANKIND

By meeting the urgent demand for safe and clean water, which is vital for human health and wellbeing, the Water Clarity Monitoring and Warning System helps humanity. By offering a straightforward yet efficient method of real-time water quality monitoring, this system helps to avoid using tainted water for industrial, culinary, or drinking uses. It is especially helpful for applications like river water quality monitoring, where it can identify dangerous circumstances like excessive turbidity or pollution-induced pH imbalances. It enables people, communities, and environmental organizations to act quickly to guarantee water safety by classifying water clarity and sending out instant notifications for dangerous circumstances. Because of its adaptability and cost, it can be used for environmental monitoring, small businesses, families, and rural areas, improving living conditions and managing water quality.

COMMERCIALIZATION POTENTIAL

Because it addresses the growing global concern for water quality, especially in locations with limited access to modern monitoring technologies, the Water Clarity Monitoring and Warning System has enormous commercialisation potential. Households, small businesses, agriculture, and environmental organisations are just a few of the many industries to which this technology can be sold. It can be used, for instance, to monitor the quality of the water in lakes, reservoirs, and rivers

in order to prevent contamination and guarantee that populations have access to safe water. Furthermore, the system is a desirable option for areas with limited resources because to its low cost, simplicity of use, and potential for IoT integration. There will probably be a greater need for reasonably priced, dependable monitoring systems like this one as people become more conscious of problems with water quality, which will create chances for mass manufacture and broad use.

CONCLUSION

To sum up, the Water Clarity Monitoring and Warning System effectively illustrates a workable, affordable option for monitoring water quality in real time. The system gives vital information on water safety by incorporating sensors for turbidity, pH, and water level. LEDs and buzzers are used to immediately warn of dangerous circumstances. An ESP32 microcontroller guarantees effective processing, and the system is easy to operate thanks to the results being shown on a 20x4 I2C LCD. This experiment demonstrates the possibility for low-cost water monitoring devices that can be used in a variety of settings, such as homes, businesses, and environmental monitoring in places like rivers. This method presents a viable strategy for enhancing water quality management and encouraging safer, healthier environments because of its scalability and room for future improvements.

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Touch-Free Toilet Sanitizing System with Adaptive Smart Lighting

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ABSTRACT

This project presents a Touch-Free Toilet Sanitizing System with Adaptive Smart Lighting to improve restroom hygiene and energy efficiency. The system addresses issues of poor sanitation and high energy consumption in public restrooms by using Arduino-based sensors like PIR for motion detection, ultrasonic for proximity tracking, and water level sensors to monitor sanitizer levels. It features output devices such as LEDs, adaptive lamps, and automated dispensers to provide a contactless and efficient solution. The system's smart lighting adjusts based on occupancy and ambient conditions to reduce energy waste, and all components are controlled through an Arduino Uno. The system was tested on the Wokwi platform, showing effective results in enhancing hygiene and energy efficiency. This project highlights the potential of IoT in creating cleaner, more sustainable restrooms, with future plans to scale it up and integrate advanced analytics for further improvements.

KEYWORDS: Touch-free sanitization, Adaptive smart lighting, Arduino-based sensor, Restroom hygiene, Energy efficiency, Public health

PRODUCT DESCRIPTION

The Touch-Free Toilet Sanitizing System with Adaptive Smart Lighting is an innovative device engineered to improve restroom hygiene and reduce energy consumption. The system features advanced sensors such as a PIR sensor for detecting motion, an ultrasonic sensor for user proximity tracking, and a water level sensor to ensure sufficient sanitizer availability.It automates the sanitization process, ensuring consistent disinfection of lavatory fixtures without physical contact. Adaptive smart lighting uses ambient and user presence data to adjust brightness, thereby minimizing unnecessary energy usage.The Arduino-based framework processes sensor inputs and coordinates outputs like sanitizer spray mechanisms, LED indicators, and lighting adjustments. Its compact design is optimized for integration into public and private restroom facilities.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

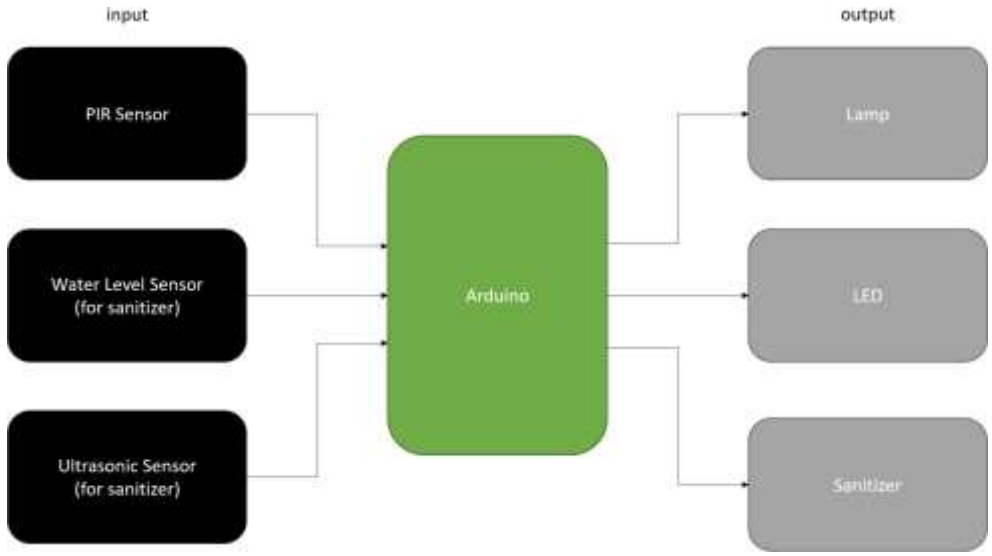


Figure 1: Block Diagram of the Touch-Free Toilet Sanitizing System with Adaptive Smart Lighting

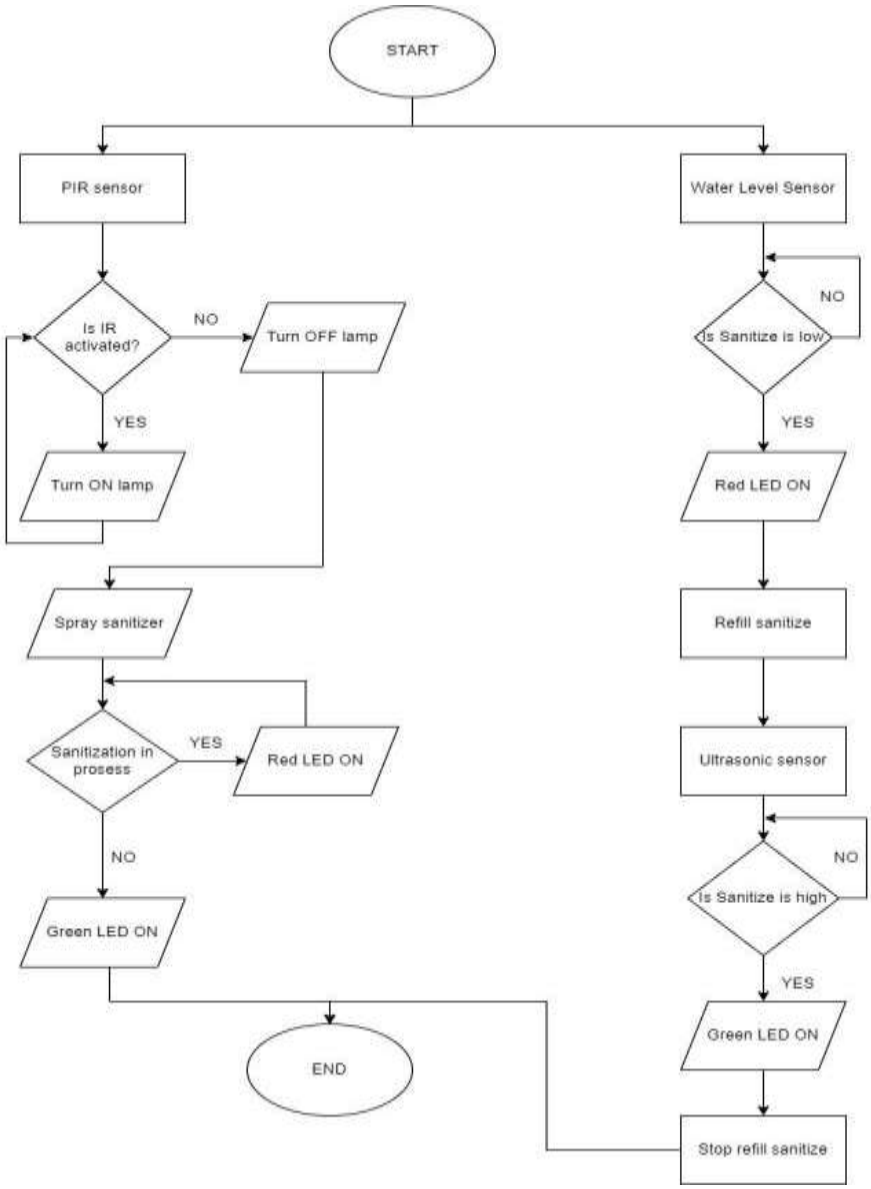


Figure 2: Flow Chart

NOVELTY AND UNIQUENESS

The novelty of the Touch-Free Toilet Sanitizing System lies in its dual focus on hygiene and energy efficiency. By combining contactless sanitization with adaptive lighting, it surpasses traditional restroom maintenance technologies. Its non-invasive, automated operation significantly reduces the spread of harmful bacteria while conserving electricity through smart lighting algorithms. The system is designed for easy scalability and integration, making it suitable for diverse restroom environments.

BENEFIT TO MANKIND

The Touch-Free Toilet Sanitizing System offers transformative benefits to public health and energy conservation. By automating the sanitization process, it reduces bacterial transmission, promoting cleaner restroom environments. Its adaptive lighting feature minimizes energy waste, aligning with global sustainability goals. This system enhances the user experience in public and private restrooms, ensuring safety, convenience, and environmental responsibility.

COMMERCIALIZATION POTENTIAL

This system has substantial commercialization potential across multiple sectors. Key markets include public infrastructure (e.g., airports, malls, schools), healthcare facilities requiring stringent hygiene standards, and private businesses aiming to improve restroom conditions. Its adaptability for diverse restroom designs and emphasis on sustainability make it attractive to stakeholders seeking innovative solutions in sanitation and energy efficiency.

CONCLUSION

The Touch-Free Toilet Sanitizing System with Adaptive Smart Lighting showcases a pioneering approach to restroom hygiene and energy management. By integrating advanced sensor technology with microcontroller programming, it addresses critical public health and environmental challenges. Future developments could focus on enhancing system scalability, and refining adaptive algorithms. This system is poised to redefine standards in restroom maintenance and sustainability.

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Purfeeder: Automatic Cat Feeder

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ABSTRACT

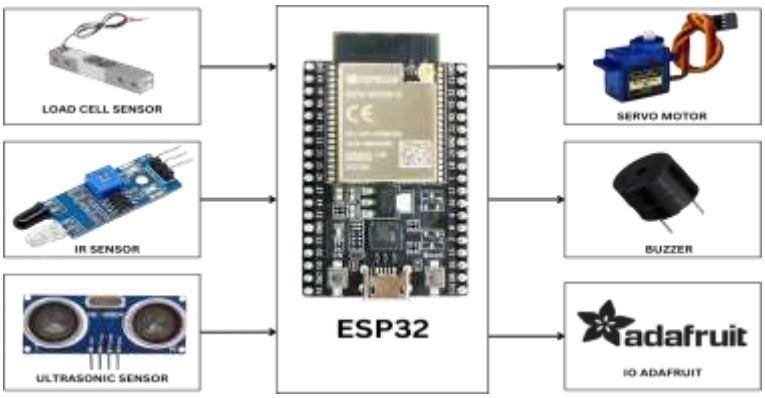
In today's fast-paced technological landscape, IoT (Internet of Things) technology emerges as a transformative solution, utilizing connected devices to automate and streamline everyday tasks. However, the persistent challenges faced by pet owners in ensuring timely feeding, particularly for cats, underscore the urgent need for innovative solutions. Traditional feeding methods often lack flexibility and monitoring, creating barriers to maintaining pet health and convenience. This proposal advocates for the integration of IoT technology into pet care, establishing an automatic cat feeder equipped with sensors, motors, and real-time monitoring. These components would enable efficient food dispensing and level monitoring through platforms like Adafruit IO, streamlining the feeding experience for pet owners. Beyond enhancing convenience, the implementation of an IoT-based feeder holds the potential to optimize pet care management and foster smarter living solutions. Through collaborative efforts between technology developers and pet care providers, this initiative aims to empower pet owners, ensuring their pets well-being while promoting modern and innovative lifestyles.

KEYWORDS: Internet of Things (IoT), Adafruit IO, Automatic Cat Feeder, Smart Pet Care, Remote Monitoring and Control

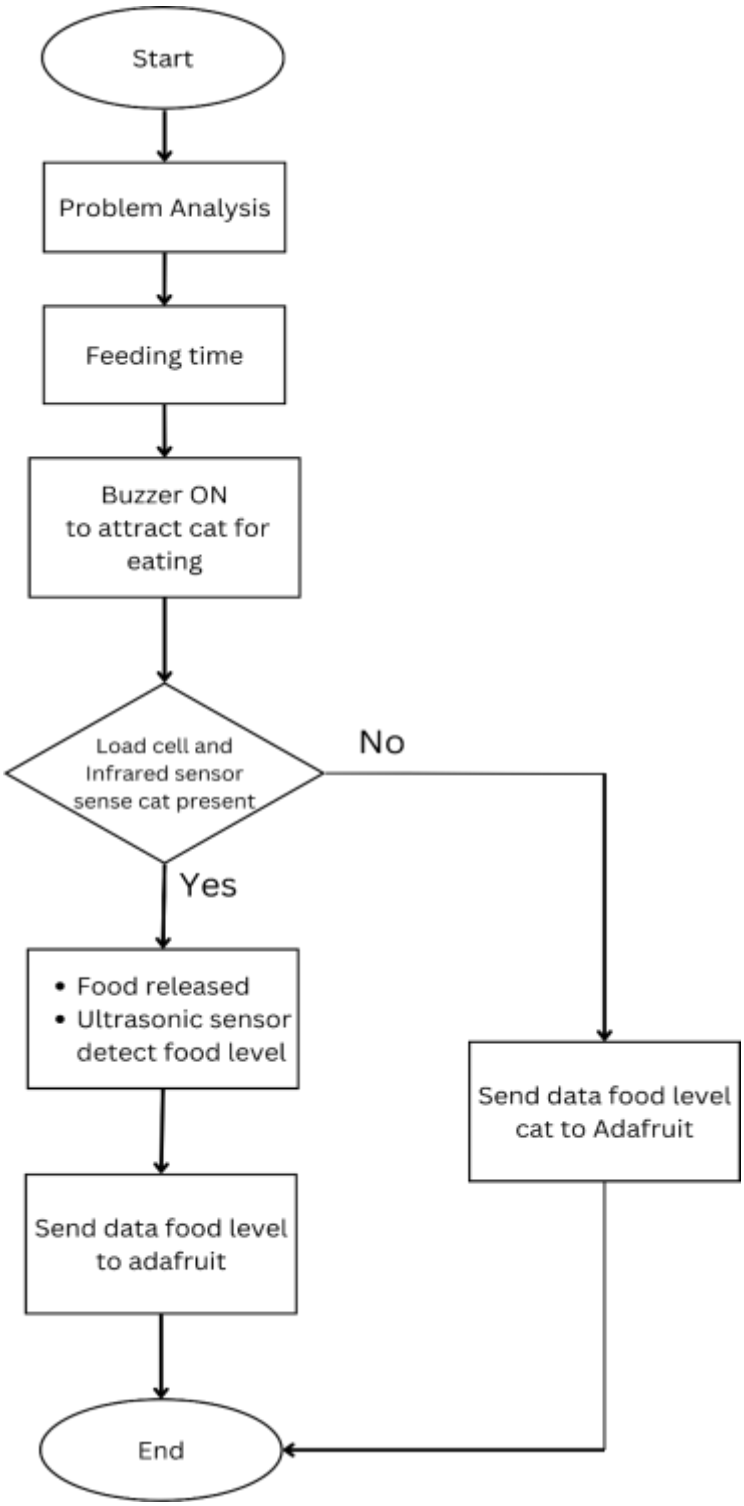
PRODUCT DESCRIPTION

Purfeeder: Automatic Cat Feeder is designed to make feeding cats easier and more convenient. Internet of Things (IoT) technology is used to ensure that food is dispensed at scheduled times, even when the owner is not present. Ultrasonic sensors are employed to check the food level, and servo motors are used to dispense the appropriate amount of food. The system is connected to Adafruit IO, allowing the food level to be monitored and the feeder to be controlled remotely. With this feeder, the worry of forgetting to feed the cat is eliminated. The meals are managed, and the right amount of food is dispensed every time. The system is easily set up, and feeding schedules can be adjusted to meet the cat's needs. The automatic cat feeder ensures that pets are fed, even when the owner is away or busy.

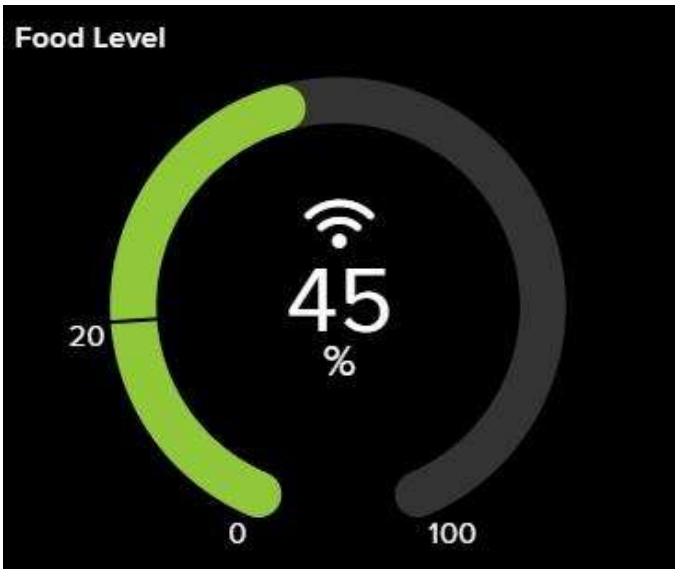
BLOCK DIAGRAM



FLOWCHART


Start
Problem Analysis
Feeding time
Buzzer ON
to attract cat for
eating
Load cell and
Infrared sensor
sense cat present
No
Yes
• Food released
• Ultrasonic sensor
detect food level
Send data food level
to adafruit
Send data food level
cat to Adafruit
End

FOOD LEVEL INTERFACE



NOVELTY AND UNIQUENESS

The development of Purfeeder: Automatic Cat Feeder represents a significant advancement in the way pets are fed, offering a smarter and more convenient solution for pet owners. By utilizing Internet of Things (IoT) technology, the feeder automates the feeding process, ensuring that your cat is fed at the right time and in the right amount, even when you're not home. The integration of ultrasonic sensors and servo motors allows for precise food dispensing based on real-time food levels, making feeding more efficient and eliminating the worry of overfeeding or underfeeding. What makes this feeder unique is its ability to connect to Adafruit IO, enabling pet owners to monitor and control the feeder remotely from anywhere in the world. This remote monitoring and control functionality adds a level of convenience that traditional feeders cannot provide. With real-time updates on food levels and customizable feeding schedules, the IoT-based Automatic Cat Feeder offers a personalized feeding experience tailored to your cat's needs. This combination of smart technology and automation makes the feeder not only innovative but also an essential tool for modern pet care.

BENEFIT TO MANKIND

Purfeeder: Automatic Cat Feeder revolutionizes pet care by automating feeding through Internet of Things (IoT) technology. Using ultrasonic sensors and servo motors, it ensures precise food dispensing and real-time food level monitoring. What makes this feeder unique is its ability to connect to Adafruit IO, allowing pet owners to remotely control and monitor the feeder from anywhere. This integration of smart technology and automation offers convenience, efficiency, and a personalized feeding experience, making it an essential tool for modern pet owners.

COMMERCIALIZATION POTENTIAL

Purfeeder: Automatic Cat Feeder has great potential for commercialization in the pet care market. It can be sold through pet stores, online shops, or even vet clinics, offering a convenient solution for busy pet owners. The feeder's smart features, like remote control and food level monitoring, make it a unique product that can attract pet owners who want more control over their pet's feeding. This product could also be marketed as a subscription-based service, where customers get regular updates or accessories, creating a chance for businesses to keep customers engaged and generate steady income.

CONCLUSION

Purfeeder: Automatic Cat Feeder provides a smart and efficient solution for pet care, utilizing IoT technology to automate feeding and ensure precise food dispensing. This innovation enhances convenience for pet owners by allowing remote control and real-time monitoring. Future improvements could include AI-based feeding suggestions, voice integration, and enhanced app features for a more personalized experience. User feedback and continuous testing will help optimize the feeder for a better user experience. Ultimately, this product represents a significant step toward smarter pet care, offering both convenience and reliability for modern pet owners.

Indoor Hydroponic Monitoring System

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ABSTRACT

Indoor hydroponic systems are increasingly popular for resource-efficient, optimized plant growth. This project introduces an Indoor Hydroponic Monitoring System integrating sensors for real-time environmental monitoring and automated controls. An NTC 10k thermistor measures temperature, while an ultrasonic sensor monitors water levels for automated irrigation. A light sensor and RGB LED strip ensure consistent, customizable lighting for optimal growth. Sensor data, including temperature, water levels, and lighting, is displayed on an LCD screen, enabling proactive system management. Additionally, the system integrates with the Blynk application, allowing users to monitor and control the system remotely via a smartphone or other connected devices. This integration enhances efficiency, supports sustainable agriculture, and demonstrates the potential of automation and IoT technologies in modern indoor farming.

KEYWORDS: Indoor Hydroponic Monitoring System, automated control, lighting optimization, sustainable agriculture, plant growth optimization, Blynk application

PRODUCT DESCRIPTION

The Indoor Hydroponic Monitoring System excels through its innovative combination of real-time data tracking, IoT-enabled management, and automated functionalities tailored for hydroponic cultivation. Among its standout features are dynamic lighting adjustments using an RGB LED strip, which supports plant growth by adapting light spectrums to different developmental phases, and clear data visualization on an LCD screen for prompt decision-making. An ultrasonic sensor facilitates precise water level regulation, minimizing manual effort and conserving resources. The integration of the Blynk application allows remote oversight and control via mobile devices, enhancing convenience and reliability. Designed with affordability in mind, the system employs efficient components like the NTC 10k thermistor to deliver advanced capabilities without excessive costs. Its compact structure and adaptability suit both personal setups and industrial operations, while the emphasis on conserving water and energy underscores its contribution to sustainable farming practices.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

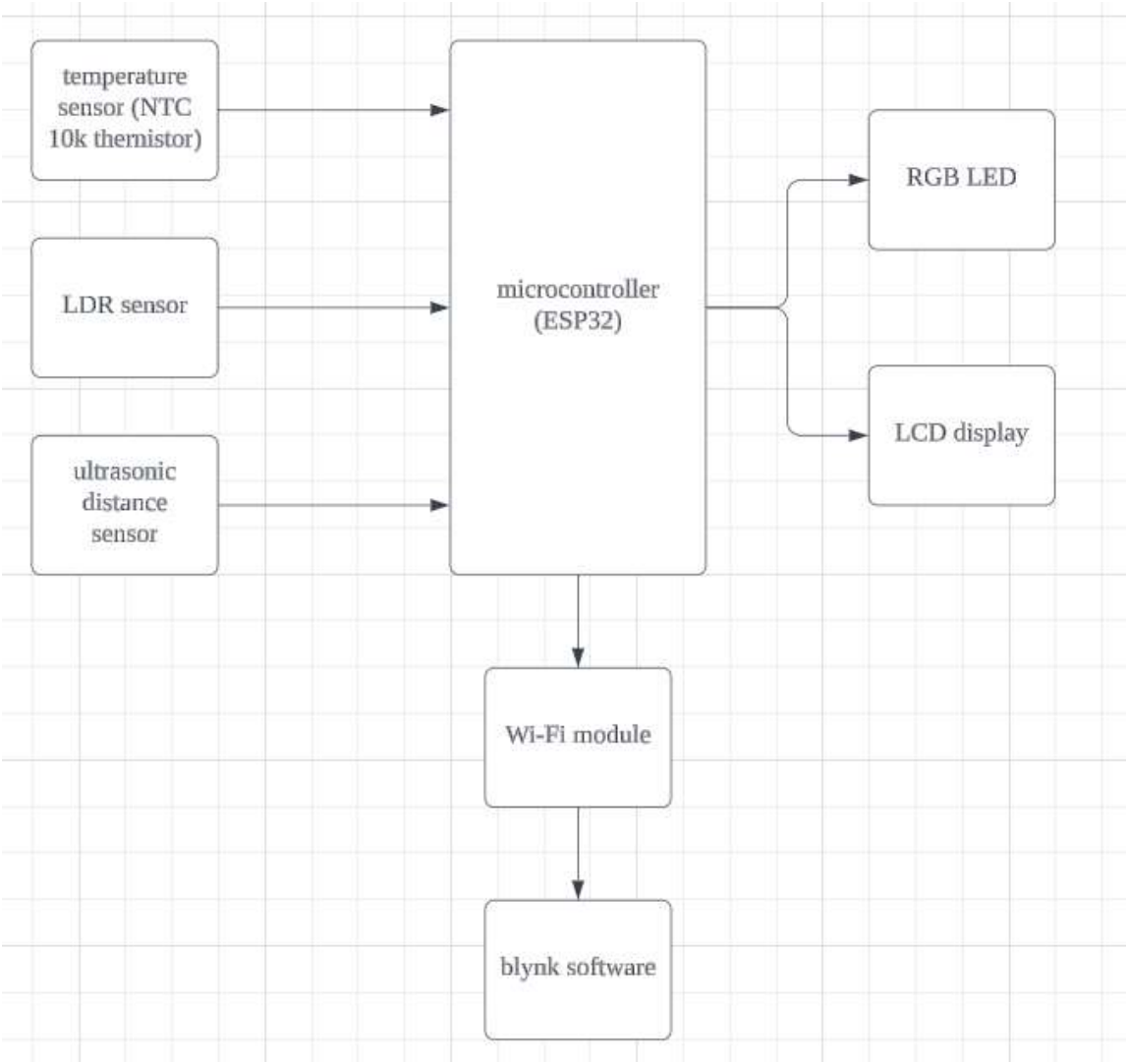


Figure 1: Block diagram

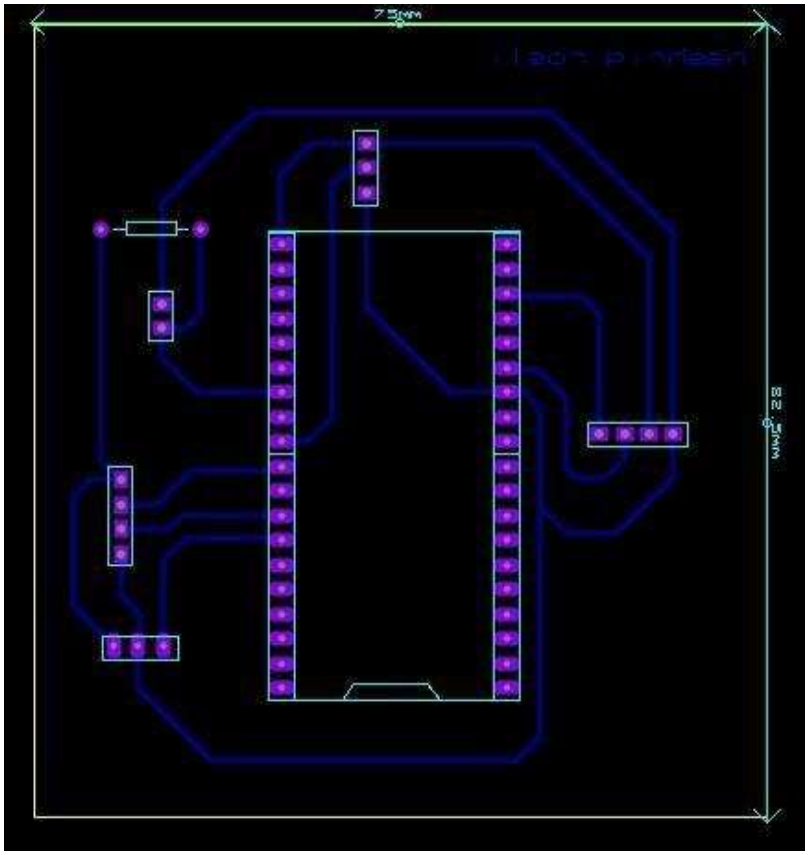


Figure 2: PCB layout

NOVELTY AND UNIQUENESS

The Indoor Hydroponic Monitoring System excels through its innovative combination of real-time data tracking, IoT-enabled management, and automated functionalities tailored for hydroponic cultivation. Among its standout features are dynamic lighting adjustments using an RGB LED strip, which supports plant growth by adapting light spectrums to different developmental phases, and clear data visualization on an LCD screen for prompt decision-making. An ultrasonic sensor facilitates precise water level regulation, minimizing manual effort and conserving resources. The integration of the Blynk application allows remote oversight and control via mobile devices, enhancing convenience and reliability. Designed with affordability in mind, the system employs efficient components like the NTC 10k thermistor to deliver advanced capabilities without excessive costs. Its compact structure and adaptability suit both personal setups and industrial operations, while the emphasis on conserving water and energy underscores its contribution to sustainable farming practices.

BENEFIT TO MANKIND

The Indoor Hydroponic Monitoring System offers significant benefits to mankind by promoting sustainable and efficient agricultural practices. By optimizing resource use, such as water, energy, and nutrients, it supports environmentally friendly farming, reducing the strain on natural resources. The system's automation and real-time monitoring reduce labor requirements, making farming more accessible to individuals with limited time or expertise. Its compact and scalable design enables urban and small- space farming, providing fresh, locally grown produce and reducing the environmental impact of transportation. Furthermore, this system contributes to global food security by enabling year-round cultivation, even in areas with harsh climates or limited arable land, making healthy food more accessible to diverse populations.

COMMERCIALIZATION POTENTIAL

The Indoor Hydroponic Monitoring System has significant commercialization potential, particularly in the growing markets of urban agriculture, sustainability, and smart farming. Its affordable, scalable design makes it ideal for both small-scale urban farming in homes, apartments, and community gardens, as well as larger commercial hydroponic farms seeking to optimize efficiency and reduce operational costs. The increasing demand for locally grown, fresh produce and eco-friendly solutions presents a strong market opportunity for the system. It can also be marketed to educational institutions, such as schools and universities, for use in teaching agricultural technology and environmental science. Additionally, the system's adaptability makes it suitable for global markets, including regions with limited arable land or harsh climates, expanding its potential reach. With revenue streams from retail sales, subscription-based cloud services, custom solutions for larger farms, and support services like installation and maintenance, this product has the potential to thrive in diverse commercial sectors, driving both sustainability and innovation in modern agriculture.

CONCLUSION

In conclusion, the development of the Indoor Hydroponic Monitoring System marks a significant improvement in managing hydroponic systems. By using sensors like an ultrasonic distance sensor, temperature sensor, and LDR sensor, the system effectively monitors key parameters for plant health and productivity. The addition of a Wi-Fi module allows for remote monitoring and control, with outputs like an LCD display and Blynk software enhancing functionality. To further improve the system, additional sensors such as pH, EC, and CO2 could provide a more complete view of the environment. Power efficiency could be increased with ESP32's low-power modes and solar power. A larger OLED display and a mobile app could enhance data visualization, while cloud integration would enable remote monitoring and notifications. Automating watering and nutrient dispensing, improving code efficiency, and adding features like voice assistant integration and environmental controls would make the system more responsive and user-friendly. Data logging with an SD card and using machine learning for data analysis could provide deeper insights and help optimize plant care.

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Solar Powered Fan with Integrated Lamp

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ABSTRACT

The Solar-Powered Fan with Integrated Lamp is an innovative solution designed to address the challenges of unstable power supply by utilizing solar energy to ensure uninterrupted operation. This multipurpose device features a fan and LED lamp powered by a rechargeable battery charged via a solar panel. Its smart features include an LDR that turns the LED lamp on in the dark and off in bright environments, ultrasonic sensors to activate the fan when humans are detected, and a DHT22 temperature sensor that adjusts the fan speed based on the surrounding temperature. Additionally, the ESP32 module with Wi-Fi connectivity enables users to control lamp brightness and monitor real-time temperature and humidity data through the Blynk IoT app. By combining renewable energy, sensor automation, and IoT technology, this device promotes eco-friendly practices and provides a sustainable solution for both indoor and outdoor use.

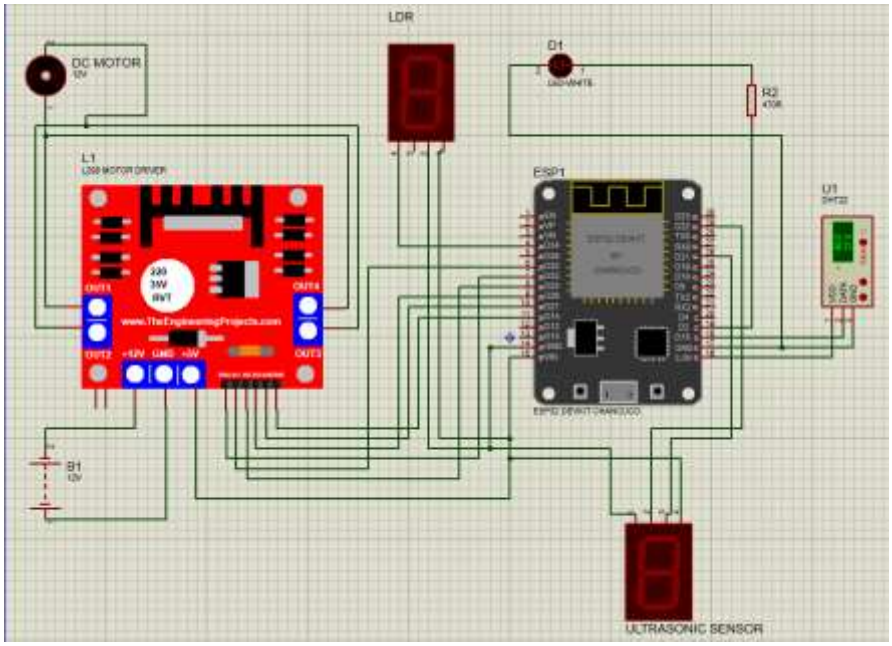
KEYWORDS: ESP32 Microcontroller, Light Dependent Resistor (LDR), Ultrasonic sensor, Renewable Energy, Blynk IoT, Sustainability, LED lamp

PRODUCT DESCRIPTION

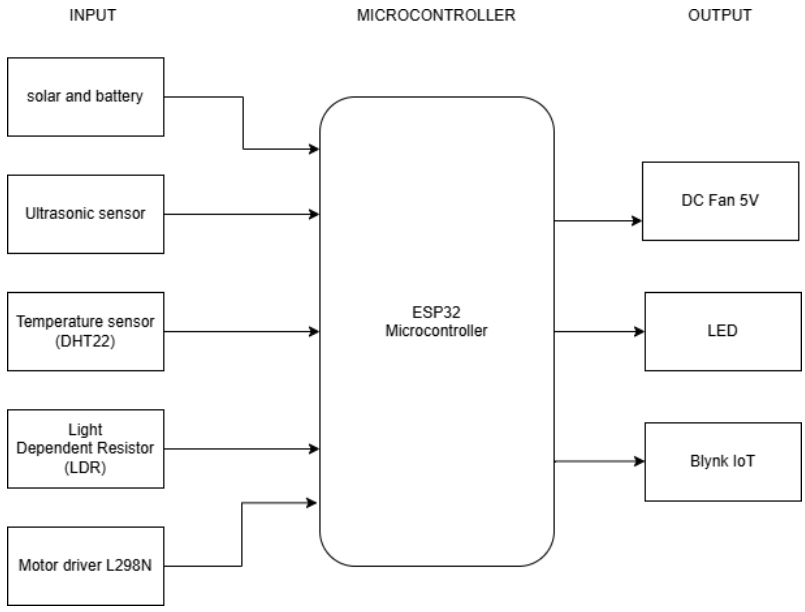
The Solar-Powered Fan with Integrated Lamp is an eco-friendly and versatile device designed to perform reliably in areas with unstable power supplies, operating entirely on solar energy. It features a solar panel that charges a rechargeable battery, ensuring uninterrupted use of the fan and LED lamp even at night. Smart functionalities include a Light Dependent Resistor (LDR) that adjusts the lamp by turning it on in the dark and off in bright environments, ultrasonic sensors to activate the fan upon detecting human presence, and a DHT22 temperature sensor that regulates fan speed based on the ambient temperature. Additionally, the ESP32 module with Wi-Fi connectivity enables real-time monitoring of temperature and humidity levels and offers flexible lamp brightness control via the Blynk app. This innovative device integrates renewable energy, smart sensors, and IoT technologies, promoting sustainable and energy- efficient living for both indoor and outdoor applications.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

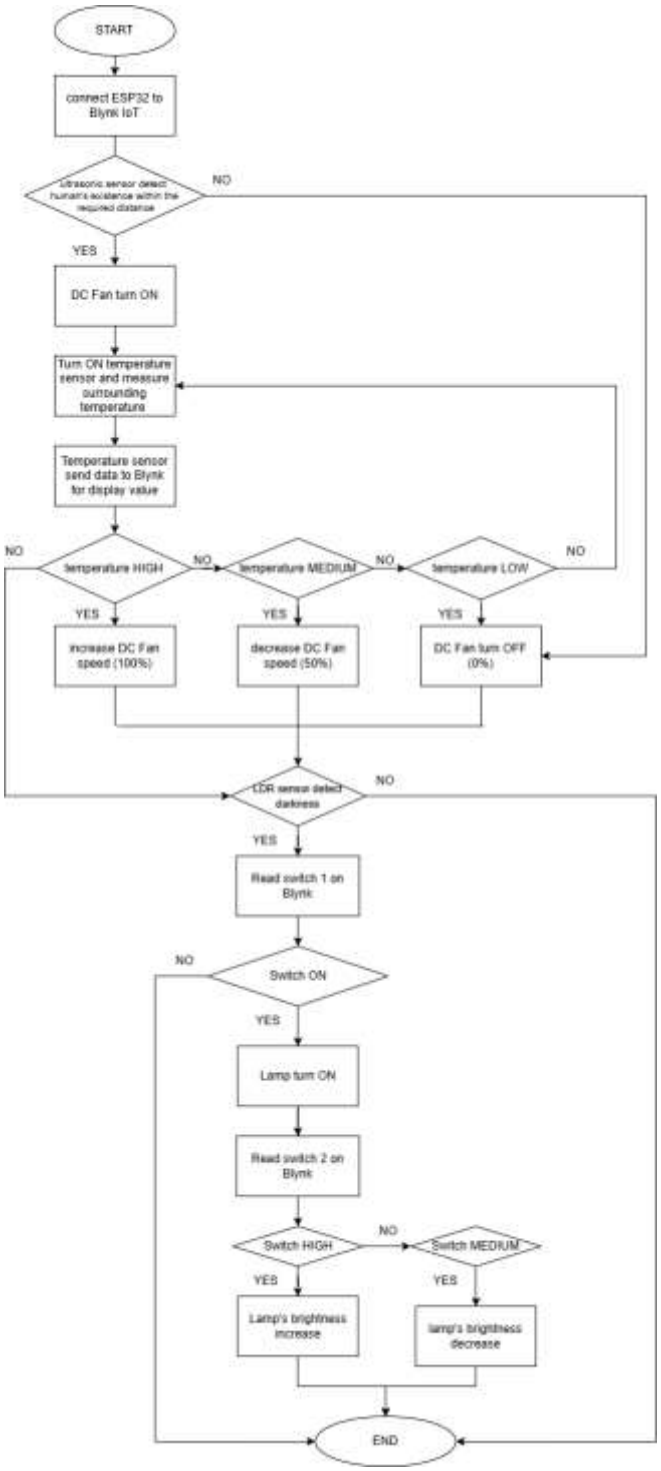
SCHEMATIC DIAGRAM



BLOCK DIAGRAM

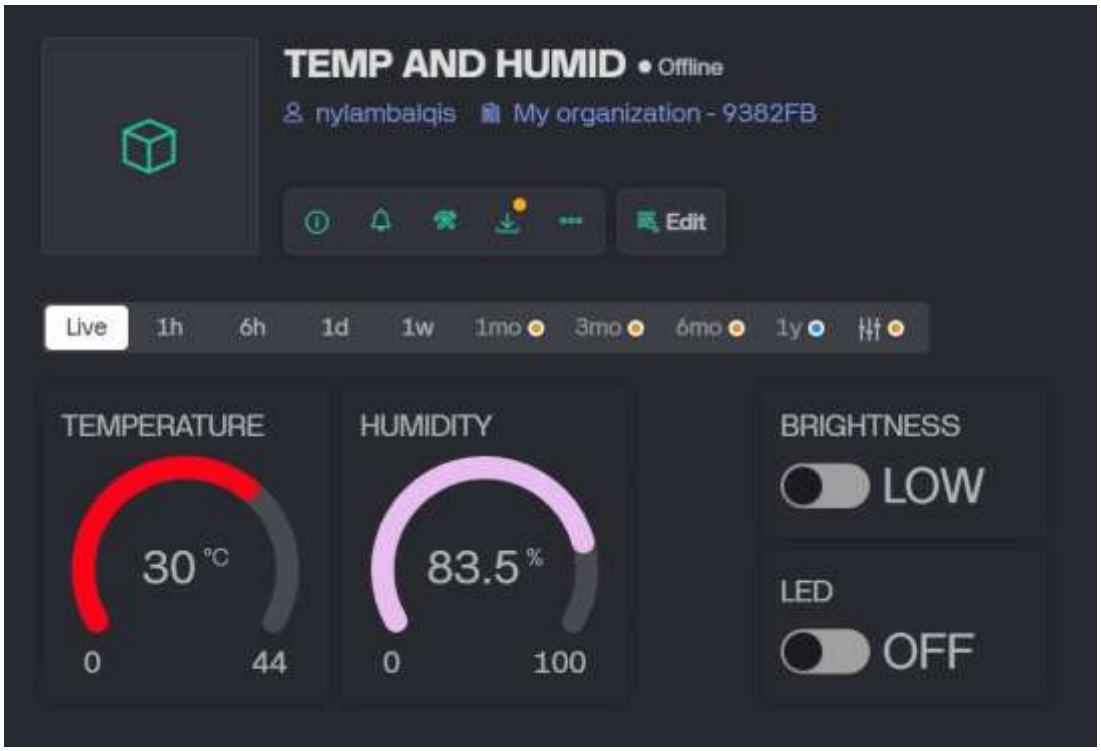


3. FLOWCHART


START
connect ESP32 to Blynk IoT
Ultrasonic sensor detect human's existance within the required distance
NO
YES
DC Fan turn ON
Turn ON temperature sensor and measure surrounding temperature
Temperature sensor send data to Blynk for display value
NO
temperature HIGH
NO
temperature MEDIUM
NO
temperature LOW
NO
YES
YES
YES
increase DC Fan speed (100%)
decrease DC Fan speed (50%)
DC Fan turn OFF (0%)
LDR sensor detect darkness
NO
YES
Read switch 1 on Blynk
NO
Switch ON
YES
Lamp turn ON
Read switch 2 on Blynk
Switch HIGH
NO
Switch MEDIUM
YES
YES
Lamp's brightness increase
lamp's brightness decrease
END

4. BLYNK


TEMP AND HUMID • Offline
nylambalqis
My organization - 9382FB
Edit
Live
1h
6h
1d
1w
1mo
3mo
6mo
1y
TEMPERATURE
30 °C
0
44
HUMIDITY
83.5 %
0
100
BRIGHTNESS
HIGH
LED
ON


TEMP AND HUMID • Offline
nylambalqis
My organization - 9382FB
Edit
Live
1h
6h
1d
1w
1mo
3mo
6mo
1y
TEMPERATURE
30 °C
0
44
HUMIDITY
83.5 %
0
100
BRIGHTNESS
LOW
LED
OFF

NOVELTY AND UNIQUENESS

The Solar-Powered Fan with Integrated Lamp stands out for its seamless integration of solar energy, smart sensors, and IoT technology in one compact device. Unlike conventional solar-powered products, it combines automation and real-time monitoring for enhanced functionality. The inclusion of ultrasonic sensors to detect human presence and activate the fan, paired with a temperature sensor that dynamically adjusts fan speed, ensures personalized comfort and energy efficiency. The device's LDR system goes beyond basic lighting control by automatically adapting to ambient light conditions, preserving battery life without manual intervention. Additionally, its ESP32-powered IoT connectivity not only allows users to monitor environmental data but also customize settings remotely, setting a new standard for convenience and sustainability. These features make it a pioneering solution for eco-friendly living, tailored to modern needs.

BENEFIT TO MANKIND

The Solar-Powered Fan with Integrated Lamp provides significant benefits to mankind by addressing energy challenges in areas with unreliable power supplies. Its reliance on solar energy reduces dependence on non-renewable resources, promoting sustainable living. The device enhances convenience and comfort with features like automatic lighting, fan activation based on human presence, and temperature- responsive fan speed, improving the quality of life for users. By integrating IoT technology, it allows real-time monitoring and remote control, enabling smarter energy management. This eco-friendly solution not only reduces energy waste but also supports environmental conservation, making it a valuable innovation for a sustainable future.

COMMERCIALIZATION POTENTIAL

The Solar-Powered Fan with Integrated Lamp holds strong commercial appeal in today's market, where sustainable energy solutions and cost-effective products are in high demand. By relying on solar power, the device reduces reliance on conventional electricity, making it attractive to consumers in areas with unstable power or those seeking greener living options. Its advanced features—such as automatic fan activation, temperature-responsive speed control, and IoT connectivity—add further value and convenience, positioning it as a premium offering. With the global push for eco-friendly technologies, this integrated solution for ventilation and lighting is well-poised to capture a broad audience, from individual homeowners to businesses and institutions looking to reduce energy costs and environmental impact.

CONCLUSION

The Solar-Powered Fan with Integrated Lamp is a groundbreaking innovation that combines renewable energy, smart automation, and IoT technology to address energy challenges and enhance convenience. It utilizes key components such as a solar panel for energy generation, a rechargeable battery for continuous operation, an LDR (Light Dependent Resistor) for automatic brightness control, ultrasonic sensors for human presence detection, a DHT22 temperature sensor for adjusting fan speed, and an ESP32 module for IoT connectivity. These components work seamlessly to ensure efficient and reliable functionality. By providing sustainable energy solutions and promoting eco-friendly practices, this device is a versatile and user-friendly tool for modern living, making it an essential step toward a greener and more sustainable future.

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Enhancing Marketing Insight : Real Time Visitor Tracker

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ABSTRACT

The abstract highlights the development of an accurate automated visitor counting system to address the inefficiencies and risks of manual counting methods in retail settings. By utilizing advanced components like sensors, high-resolution cameras, and microcontrollers, the system tracks visitor movements in real time, reducing reliance on error-prone manual methods. The primary goals are to enhance safety protocols, improve operational efficiency, and ensure reliable visitor tracking. In addition to daily operations, the system is invaluable during emergencies. In events like fires, terrorist attacks, or missing persons, real-time occupancy data helps identify critical areas, guide evacuations, and assist first responders by pinpointing where help is most needed. This ability enables quick and effective responses while aiding in locating individuals within the premises. Retail managers can use this system to improve emergency preparedness, optimize resource allocation, and refine marketing strategies. The article explains the system's design, including how sensors detect movement, how the Arduino microcontroller processes data, and how the results are displayed on a user-friendly LCD screen. This scalable solution addresses operational and security challenges, supports smarter, data- driven store management, and enhances the overall customer experience in retail environments.

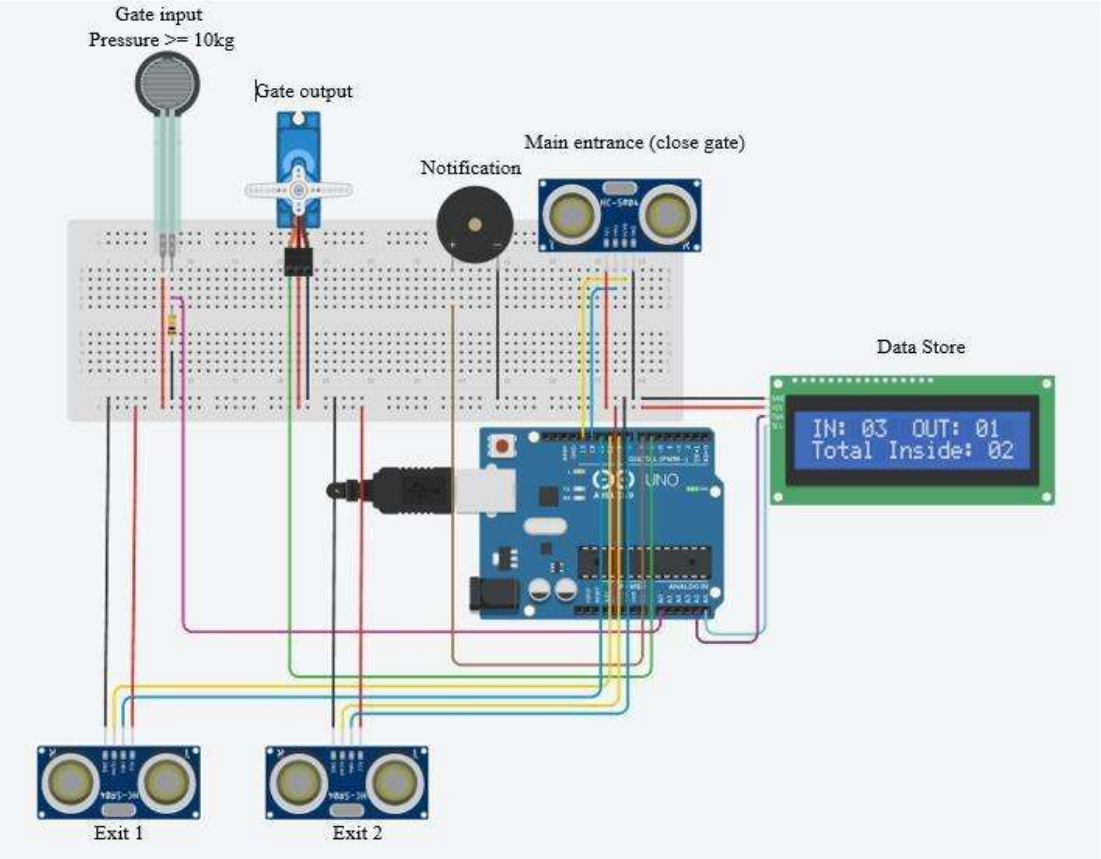
KEYWORDS: Automated visitor counting system, Data-driven store management, Emergency preparedness, Marketing strategies

PRODUCT DESCRIPTION

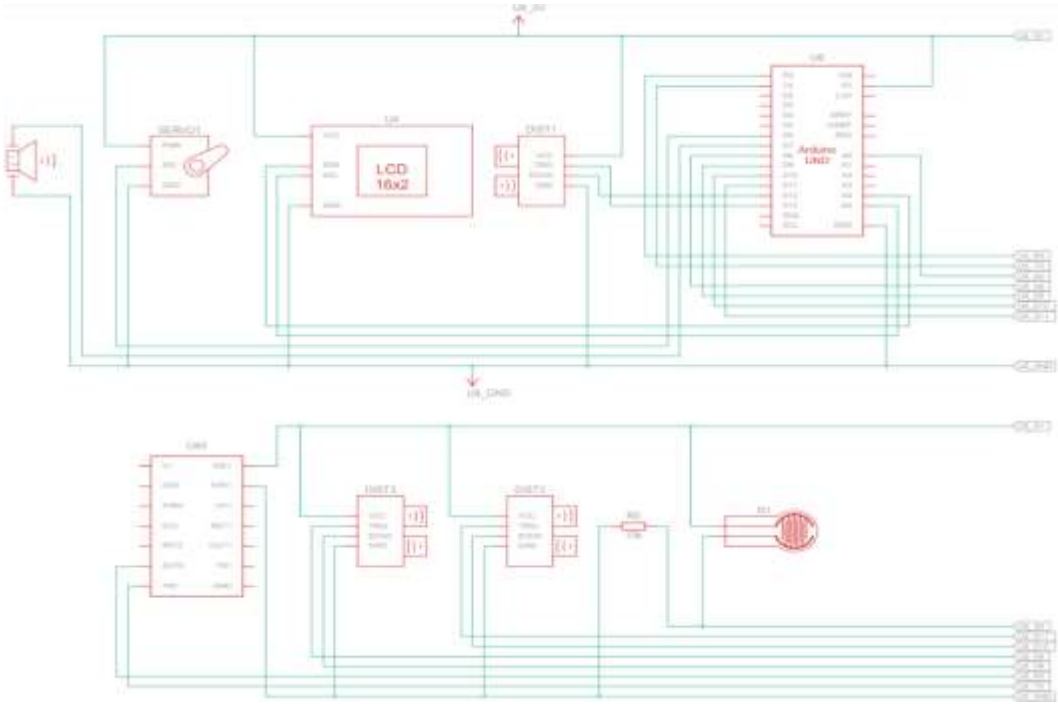
"Enhancing Marketing Insights: Real-Time Visitor Tracker" is a advanced automated system that helps fix the problems and safety issues that come with counting visitors manually in stores. The system uses advanced components like ESP32 cameras, ultrasonic sensors, force sensors, and an Arduino UNO microcontroller to accurately track visitor movements in real-time. This system helps businesses keep track of foot traffic, look at how customers behave, and quickly address safety issues during emergencies like fires or security threats. This design is based on research about automatic visitor counting systems and includes different methods like video analytics, sensor networks, and occupancy estimation. For example, research such as Ashkanani et al. (2015) points out the advantages of using video-based visitor counting to improve operational efficiency, whereas Connell et al. (2013) focus on the possibilities of incorporating video analytics for gaining deeper insights into consumer behavior. In a similar way, Hui et al. (2009) look into how path data can be used to improve marketing strategies, which highlights how crucial it is to track visitors accurately for making strategic decisions. This new system provides a dependable and effective solution for today's retail settings, bringing together real-time data collection, improved safety, and valuable business insights.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

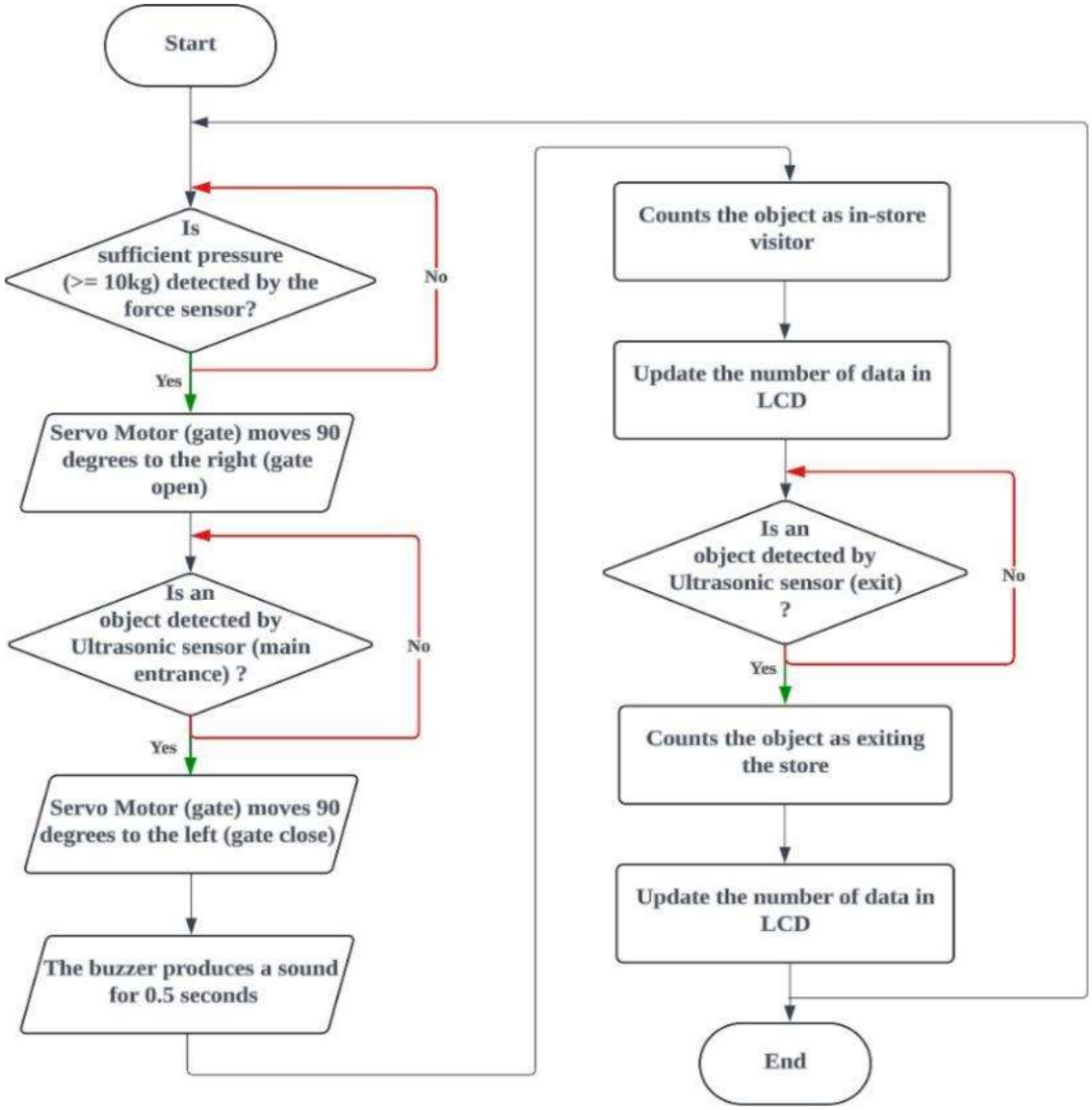
All components and function:



Schematic Diagram :



Flowchart :



NOVELTY AND UNIQUENESS

The "Enhancing Marketing Insights: Real-Time Visitor Tracker" is a new system that combines ultrasonic sensors, force sensors, ESP32 cameras, and an Arduino microcontroller to change how visitor tracking works in retail settings. By bringing together real-time data collection with automated gate functions, buzzer notifications, and LCD screens, it makes sure that visitor movements are monitored accurately while also improving safety measures during emergencies like fires or security issues. The system uniquely supports dynamic resource allocation, marketing strategy optimization, and seamless security surveillance through remote monitoring capabilities. Its innovative design addresses inefficiencies in manual counting methods, delivering accuracy, adaptability, and operational efficiency in modern retail settings.

BENEFIT TO MANKIND

The "Enhancing Marketing Insights: Real-Time Visitor Tracker" provides significant benefits to mankind by addressing inefficiencies in manual visitor counting, enhancing operational efficiency, and ensuring safety in public spaces. By integrating technologies like ESP32 cameras, ultrasonic sensors, and Arduino microcontrollers, the system offers precise, real-time tracking, which supports better decision-making in resource allocation and marketing strategies.

Its ability to monitor visitor flow and enhance emergency preparedness, as highlighted by research on visitor counting systems (Ashkanani et al., 2015), promotes public safety during crises like fires or security threats. Additionally, the integration of real-time surveillance and data analytics aids in improving customer experiences and optimizing staffing, contributing to a more sustainable and efficient retail environment.

COMMERCIALIZATION POTENTIAL

The commercialization potential of the automated visitor counting system is significant due to its capacity to address multiple market needs in retail and public spaces. By offering accurate, real-time visitor data through integrated technologies such as sensors, cameras, and microcontrollers, the system enhances operational efficiency and safety. Its ability to reduce dependency on manual counting methods presents cost-saving opportunities for businesses, while the data-driven insights can improve marketing strategies and resource allocation. Moreover, its application in emergency preparedness and visitor safety strengthens its appeal in high-footfall environments like shopping centers, museums, and event venues. The system's innovative use of affordable components ensures scalability and broad adoption, making it a valuable solution for businesses aiming to optimize operations and improve customer experiences.

CONCLUSION

In conclusion, the report's automated visitor counting system offers a comprehensive solution to the safety risks and inefficiencies of human counting techniques. The system provides real-time, accurate insights into visitor dynamics by integrating state-of-the-art technology such as an Arduino UNO microcontroller, force sensors, ultrasonic sensors, and ESP32 cameras. This reduces the need for time-consuming manual tallies while strengthening safety protocols and streamlining operational procedures. The system's capacity to quickly monitor and display visitor data on an LCD screen makes it easier to allocate resources more effectively, adjust marketing strategies, and be prepared for emergencies. The suggested system efficiently addresses operational and security issues by providing continuous and accurate monitoring of in-store traffic using rigorous techniques that include sensor detection mechanisms, data interpretation, and output display.

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Advanced Blindspot Detection and Emergency Location Tracking System for Enhanced Driver Safety

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ABSTRACT

With reference to reversing movements, the "Advanced Blindspot Detection and Emergency Location Tracking System for Enhanced Driver Safety" handles important safety issues. This device combines an ultrasonic distance sensor to measure the closeness of moving objects with a Passive Infrared (PIR) motion sensor to identify them. Controlled by an encoder, the complete system only activates while the car is in reverse, providing accurate readings while preventing false alarms when driving properly. Other than that ,an LCD display that provides real-time distance readings and visual and aural alerts to improve driver awareness are among the system's primary outputs. When an object is detected within 4 meters, a red LED and buzzer sound to indicate possible danger; when the distance is greater than this, a green LED indicates safe reversing. Together, these features give drivers real-time feedback about their environment. The device has a GPS module that enables emergency position monitoring in addition to blindspot identification. The system can send an SMS to a specified number or send the vehicle's latitude and longitude to websites like Blynk or SMS by pressing a pushbutton. Overall driver safety is greatly increased by this dual capability, which not only improves situational awareness but also guarantees that vital location data is accessible in an emergency.

KEYWORDS: blindspot detection, driver safety, proximity alerts, GPS tracking, real-time monitoring, accident prevention, and object detection.

PRODUCT DESCRIPTION

Presenting the latest advances "Advanced Blindspot Detection and Emergency Location Tracking System," which is intended to improve vehicle safety when reversing. This cutting-edge technology has an ultrasonic distance sensor for accurate proximity readings and a Passive Infrared (PIR) motion sensor to identify nearby moving objects. The device, which is only activated when the car is in reverse, reduces false alerts and guarantees precise environmental monitoring. Equipped with a clear LCD display, the device gives real-time distance readings to keep drivers informed. Visual and audio signals boost awareness, with a red LED and buzzer signaling possible hazard when an object is within 4 meters, while a green LED indicates appropriate reversing parameters. Along with blindspot identification, the device has a GPS module for tracking location in an emergency. The vehicle's latitude and longitude coordinates can be sent via SMS or to websites like Blynk with a single button press, guaranteeing that vital position data is always accessible in an emergency. This all-inclusive driver aid system provides increased safety and peace of mind.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

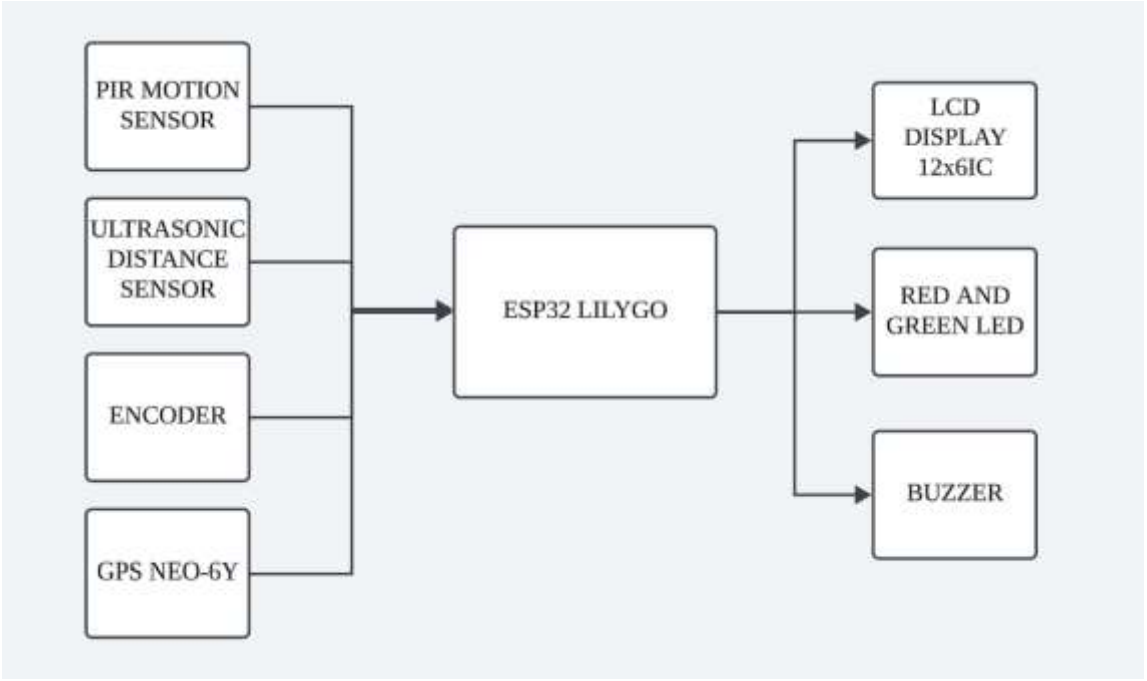


Figure 1: Block diagram of Advanced Blindspot Detection and Emergency Location Tracking System for Enhanced Driver Safety

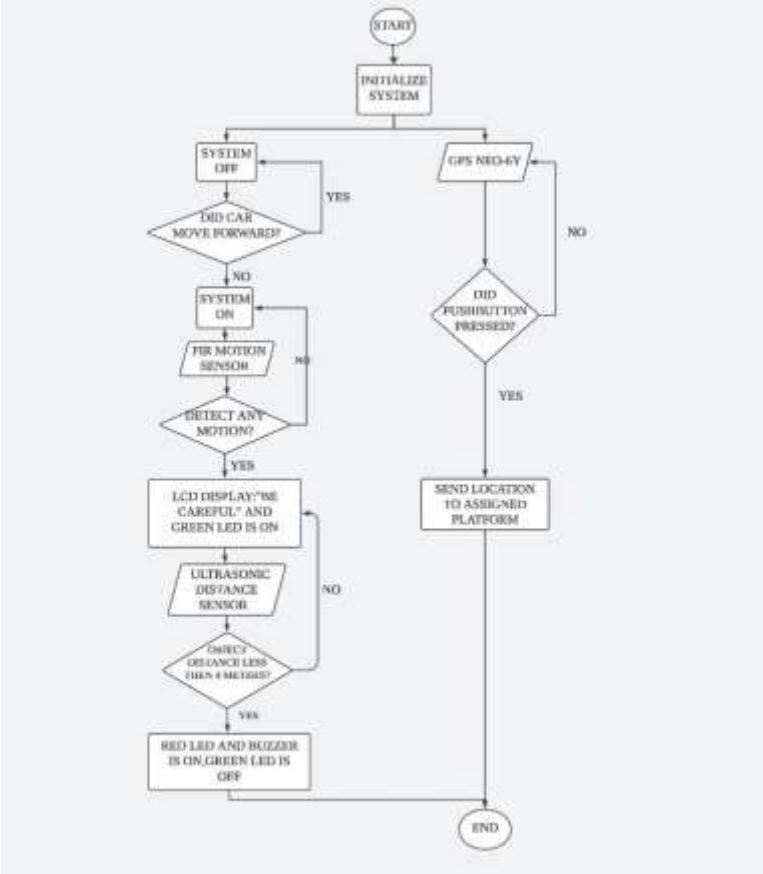


Figure 2: Flowchart of Advanced Blindspot Detection and Emergency Location Tracking System for Enhanced Driver Safety

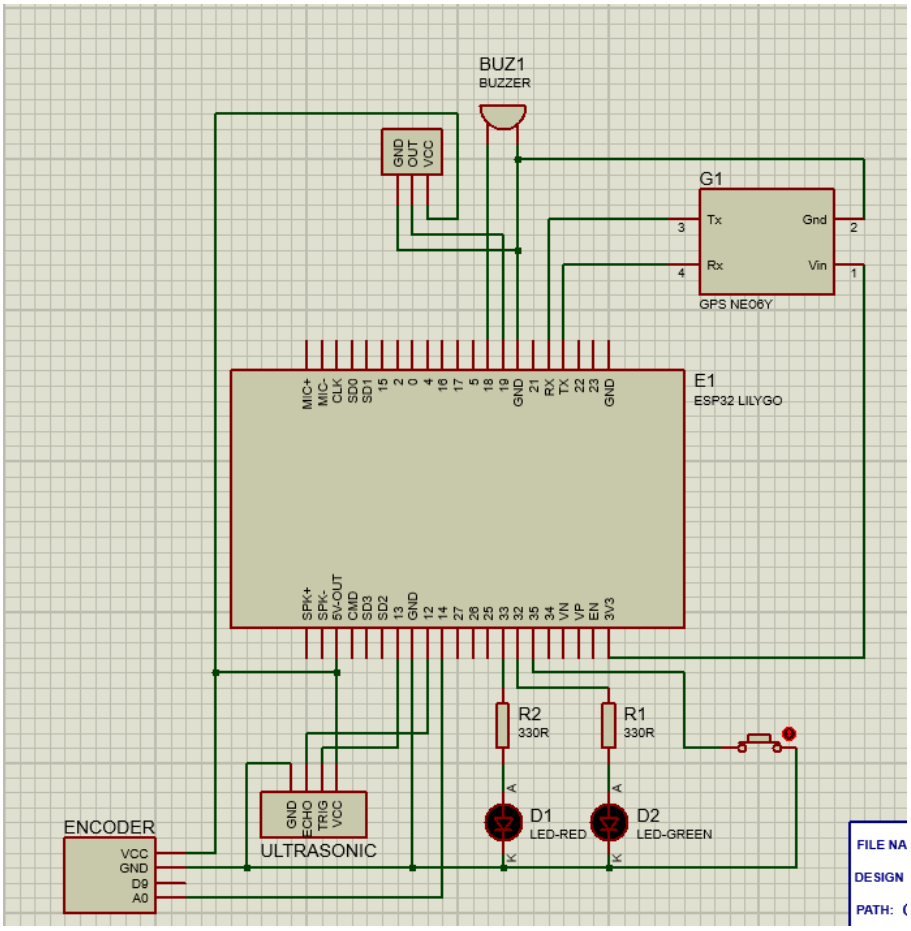


Figure 3: schematic of Advanced Blindspot Detection and Emergency Location Tracking System for Enhanced Driver Safety

NOVELTY AND UNIQUENESS

In an attempt to define itself apart, the "Advanced Blindspot Detection and Emergency Location Tracking System" combines several sensor technologies into one complete system. This product improves situational awareness during reversing movements by combining a PIR motion sensor and an ultrasonic distance sensor for full object recognition, in contrast to conventional systems that only use visual or audible alerts. One of its main features is its dual functionality, which allows it to provide emergency location monitoring in addition to blindspot identification by sending GPS coordinates via SMS or to websites like Blynk. This feature adds a crucial degree of security that is uncommon in comparable goods. The device is essential for improving driver safety and confidence because it is made only operate in reverse, minimizing false alarms while giving real-time alerts.

BENEFIT TO MANKIND

By reducing blindspots while providing accurate proximity alerts, the "Advanced Blindspot Detection and Emergency Location Tracking System" greatly improves road safety by averting collisions during reversing and protecting pedestrians and other drivers. Drivers may immediately share their precise location in emergency scenarios thanks to its emergency location tracking feature, which could save lives by allowing emergency services to respond promptly. The system's integration of cutting-edge sensor technologies encourages safer driving habits and cultivates a culture of accountability, which helps to reduce accident rates and improve community and driver security.

COMMERCIALIZATION POTENTIAL

A variety of significant features make the "Advanced Blindspot Detection and Emergency Location Tracking System" highly viable for commercialisation. This technology is extremely significant because of the increased need for vehicle safety solutions brought on by laws requiring sophisticated safety systems in cars and growing awareness of road safety. Its versatility for a variety of vehicles, such as private automobiles, business fleets, and electric vehicles, increases its market reach and meets a range of customer demands. Additionally, integration into new and existing vehicles can be facilitated via cooperation opportunities with automakers and aftermarket accessory providers, boosting acceptance and awareness.

Both users on low incomes and those looking for high-end safety features will find the system's modular design intriguing because it makes upgrades and customisation simple. Effective marketing techniques can draw attention to the special advantages of this system, raising demand as buyers place a higher priority on safety when making car purchases. Furthermore, since everyone is concerned about road safety, there is a lot of room for worldwide growth, especially in areas where car ownership is rising and traffic is getting worse. All things considered, this system is well-positioned for successful commercialisation because to a combination of cutting-edge technology, consumer demand, and strategic alliances.

CONCLUSION

To sum up, the "Advanced Blindspot Detection and Emergency Location Tracking System" solves important issues with blindspots and emergency response, marking a substantial breakthrough in vehicle safety technology. Because of its versatility across different vehicle types, growing customer demand for safety features, and prospects for strategic alliances within the automotive sector, it has a strong chance of becoming a commercial product. This system's modular design and successful marketing techniques allow it to appeal to a broad spectrum of customers, including those on a tight budget and those looking for high-end safety features. This system is in a good position to have a significant impact, making roads safer and eventually saving lives, since road safety is still a top issue worldwide.

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Automatic Inventory System in Hypermarket

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ABSTRACT

This code implements a smart rack system using RFID for tracking items across three zones: Entrance, Internal, and Exit. It utilizes an ESP32, multiple MFRC522 RFID readers, a buzzer, an LED, and an LCD to manage and monitor the entry, internal movement, and exit of items. Items are added to the system when scanned at the entrance, and the payment status is checked at the exit. If an unauthorized tag or an unpaid item is detected, an alarm is triggered, and a message is displayed on the LCD. The system is connected to Wi-Fi for remote monitoring through Blynk. The code is designed to store up to 10 items in memory, with each item's RFID tag and payment status recorded. While functional, improvements can be made for database scalability, Wi-Fi reconnection, enhanced security, and better Blynk integration for real-time monitoring and status updates

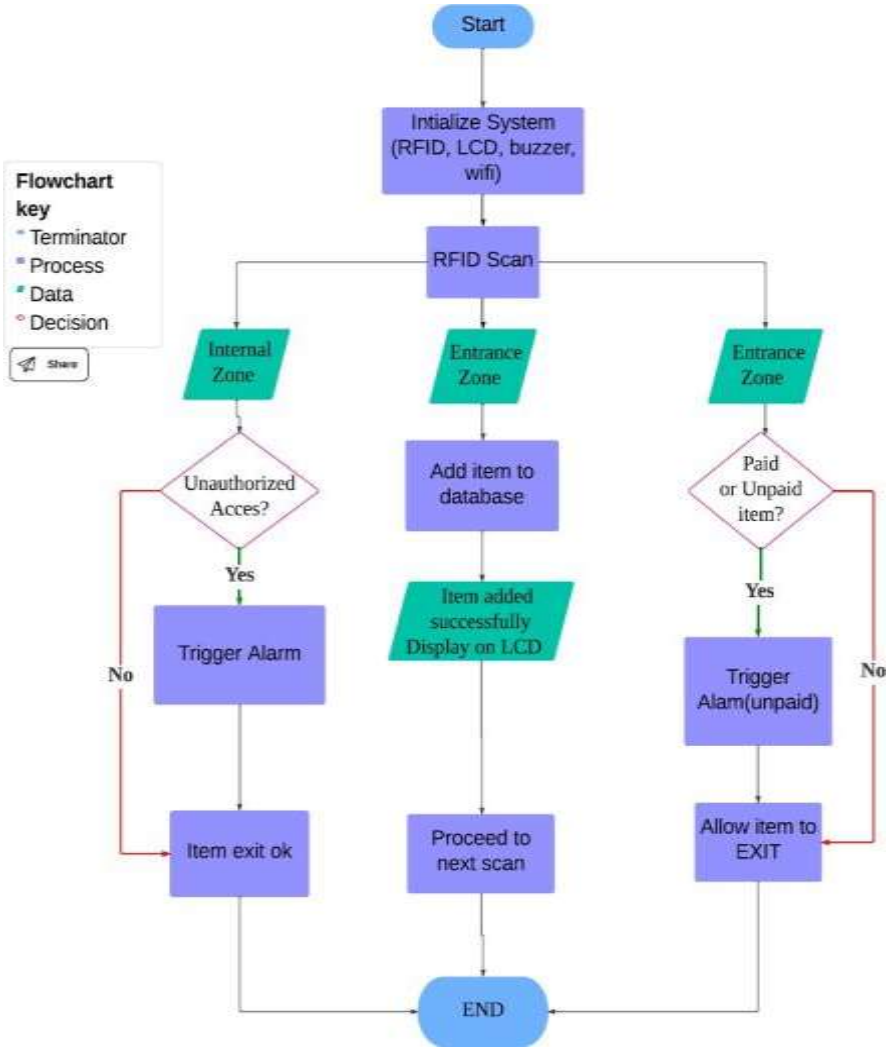
KEYWORDS: RFID, ESP32, MFRC522, smart rack system, entrance zone, internal zone, exit zone, LCD, buzzer, LED, Wi-Fi, Blynk, item tracking, payment status, alarm, database, remote monitoring, security.

PRODUCT DESCRIPTION

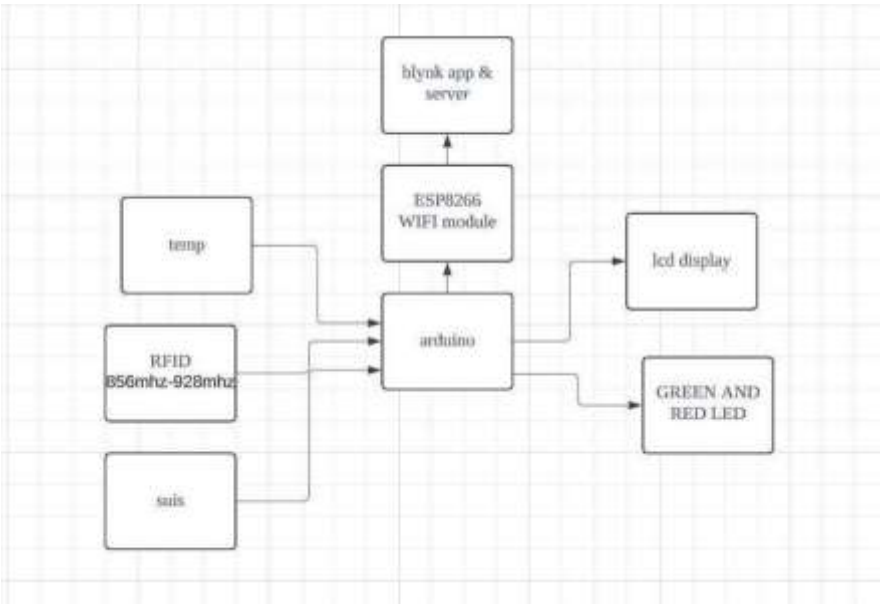
The Smart Rack System is an RFID-based solution designed to track and manage items across three zones: Entrance, Internal, and Exit. Using an ESP32 microcontroller and multiple MFRC522 RFID readers, the system scans RFID tags to monitor the movement and status of items. The system includes an LCD display for real-time status updates, a buzzer, and an LED to alert users to unauthorized access or unpaid items. Wi-Fi connectivity allows for remote monitoring via the Blynk app, enabling users to view and manage the system from anywhere. The system features a simple database to store up to 10 items, each with an associated payment status. If an item is detected in the internal zone without proper authorization or payment, an alarm is triggered. This solution is ideal for applications such as inventory management, item tracking, or security in a retail or warehouse environment.

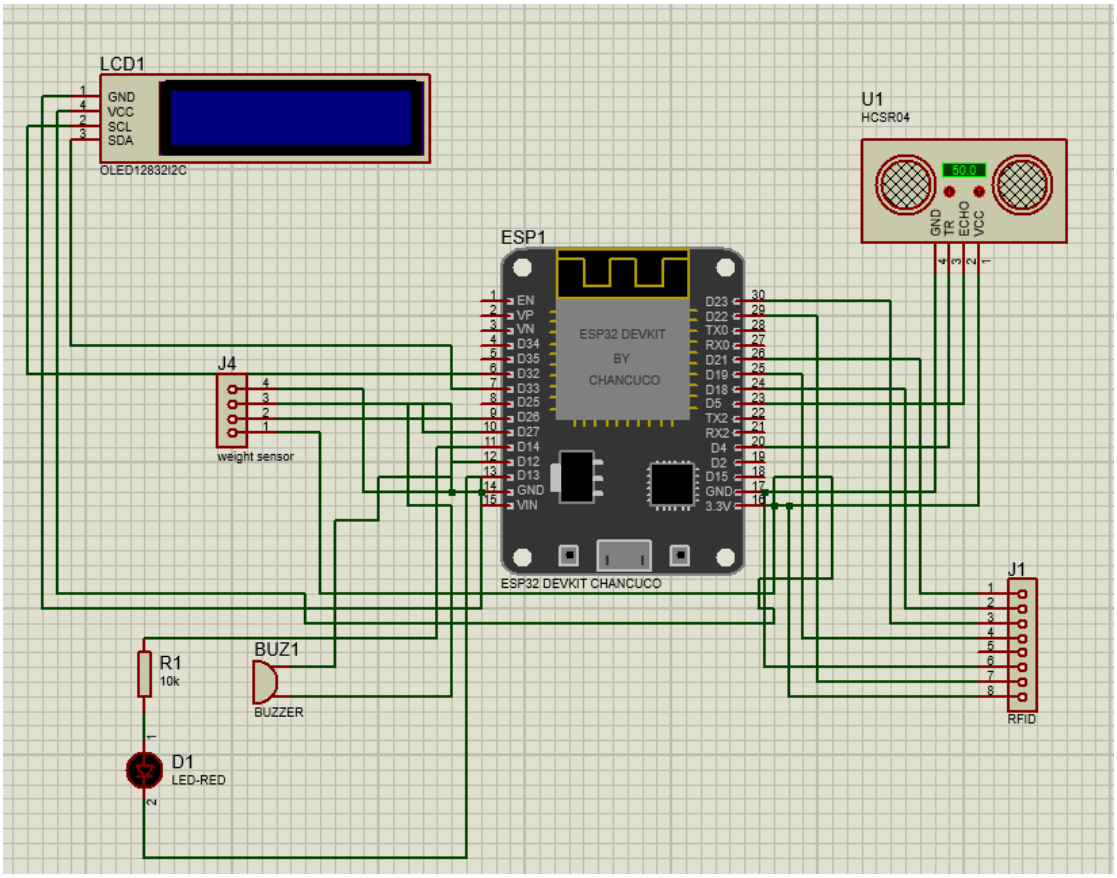
SCHEMATIC DIAGRAMS and FLOW CHARTS

1. Block Diagram



2. FlowChart





NOVELTY AND UNIQUENESS

The Smart Rack System stands out for its novel integration of RFID technology with a robust tracking and monitoring framework across three distinct zones (Entrance, Internal, Exit), ensuring precise item management and security. Its real-time alerts using a buzzer, LED, and LCD display provide instant feedback for unauthorized access or unpaid items, enhancing operational security. With built-in Wi-Fi connectivity, it enables remote monitoring via the Blynk platform, offering seamless oversight for businesses across locations. The system's modular and scalable design caters to businesses of all sizes, while its simplified database efficiently tracks items and payment statuses, reducing errors and streamlining operations. Cost-effective and built with readily available components, it makes advanced item management accessible, even for smaller enterprises. Additionally, by minimizing losses and improving inventory accuracy, the system promotes sustainable resource management, making it a unique and impactful solution for modern business needs

BENEFIT TO MANKIND

The Smart Rack System offers several key benefits to mankind by improving security, efficiency, and accountability in various industries. First, it significantly reduces theft and fraud in retail environments by ensuring that only authorized, paid items are allowed to exit, thus creating safer shopping experiences for consumers. In logistics and warehouses, it enhances operational efficiency by automating inventory tracking and reducing human errors, leading to faster processing and distribution of goods. This results in a more reliable supply chain, which ultimately benefits consumers through better availability and timely delivery of products. Additionally, the system promotes better asset management, allowing businesses and institutions to track valuable equipment and materials, minimizing losses and misuse. In high-security sectors like healthcare and research, it ensures the safe handling of sensitive items, contributing to the safety and protection of public health and research integrity. By facilitating better resource management, the Smart Rack System helps reduce waste, optimize operations, and contribute to sustainability goals.

Overall, it fosters a safer, more efficient, and accountable environment for businesses, employees, and consumers alike, benefiting society as a whole

COMMERCIALIZATION POTENTIAL

The Smart Rack System presents a versatile and scalable solution with immense commercial potential in various industries such as retail, logistics, inventory management, and security. In retail stores and warehouses, the system provides an efficient way to track stock, prevent theft, and automate inventory management by ensuring that only paid items exit the premises. In logistics and supply chains, it can significantly improve operational efficiency by automating the movement of goods and providing real-time inventory updates, reducing manual errors and delays. The system is also ideal for asset management, enabling businesses to track valuable equipment

CONCLUSION

The Smart Rack System offers a comprehensive and efficient solution for item tracking, management, and security across various industries, including retail, logistics, and asset management. By integrating RFID technology with real-time monitoring through an LCD, buzzer, LED, and Wi-Fi connectivity, the system enhances operational efficiency, reduces theft, and ensures proper payment status before allowing items to exit. Its scalability allows for adaptation in different environments, while its ability to provide alerts for unauthorized access and unpaid items ensures security. This system not only optimizes inventory management but also fosters accountability, security, and sustainability, benefiting businesses, employees, and consumers alike. With its potential to streamline processes and improve security, the Smart Rack System represents a valuable tool for modern businesses looking to enhance operational performance and reduce losses.

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Improving Public Toilet Experience Through Illumination and Telemetry

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ABSTRACT

The public toilet experience is a critical aspect of urban infrastructure, significantly influencing hygiene and user comfort. To address these challenges, this project introduces a comprehensive system that enhances public toilet facilities through advanced illumination and telemetry, utilizing an ESP32 microcontroller for seamless integration of sensors and actuators. A slide switch allows toggling between normal and cleaning modes, signaling availability to users and maintenance staff. An ultrasonic sensor detects occupancy and uses Green LED and Red LED to indicate restroom availability, while automatically controlling illumination. Additionally, a Passive Infrared (PIR) sensor automates the air freshener's DC motor activation through a motor driver, ensuring a pleasant environment with minimal manual intervention. Data such as occupancy frequency, air freshener usage, and cleaning mode activation is logged and displayed on an LCD, providing actionable insights for optimized maintenance scheduling and resource management. By integrating these elements, the proposed system enhances user experience with smart illumination and availability indicators, while supporting better facility management and hygiene.

KEYWORDS: ESP32, Passive Infrared (PIR) Sensor, Green LED, Red LED, Motor Driver, LCD, DC Motor, and Ultrasonic Sensor.

PRODUCT DESCRIPTION

Improving Public Toilet Experience Through Illumination and Telemetry, is an advanced solution designed to enhance hygiene, comfort, and efficiency in public restroom facilities. Powered by an ESP32 microcontroller, the system integrates key features such as a slide switch for toggling between normal and cleaning modes, providing clear availability signals for users and maintenance staff. An ultrasonic sensor detects occupancy, controlling illumination automatically and using Green and Red LEDs to indicate availability, while a PIR sensor automates air freshener activation through a DC motor for a consistently pleasant environment. Real-time data on occupancy, air freshener usage, and cleaning mode activation is displayed on an LCD offering actionable insights for better maintenance scheduling and resource management. With its cost-effective, scalable design, this system supports smart city initiatives and ensures an improved public toilet experience.,

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

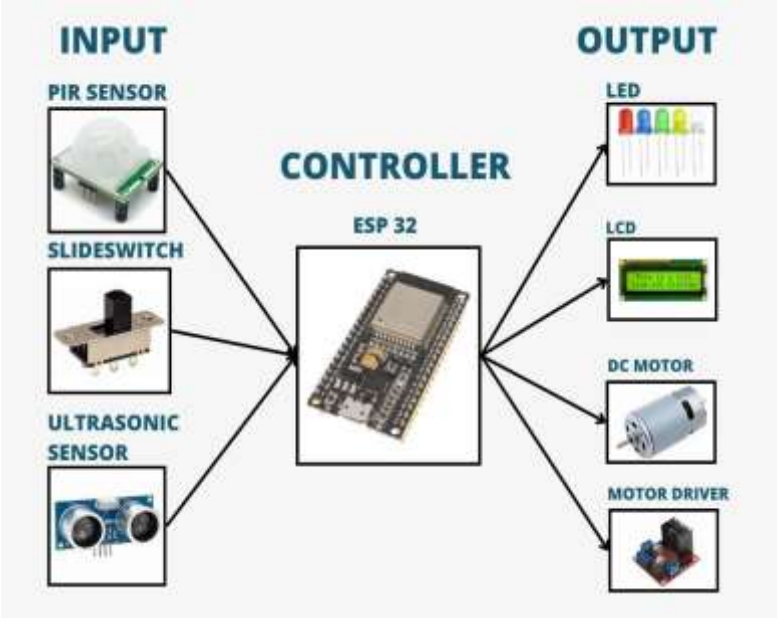


Figure 1: The Block Diagram

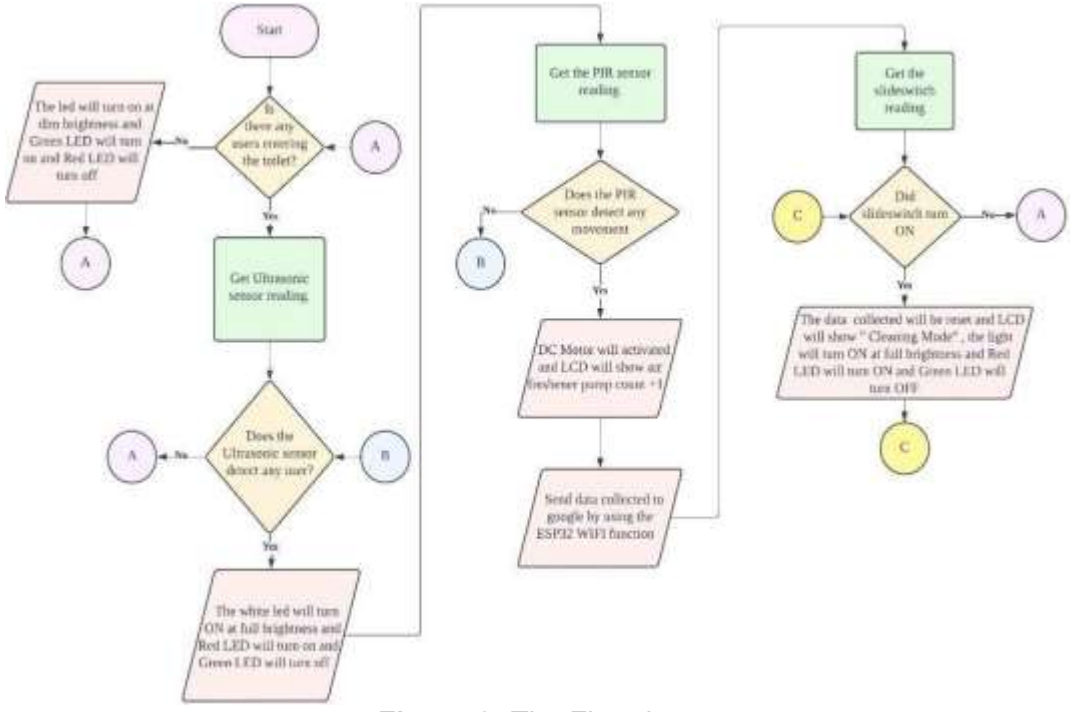


Figure 2: The Flowchart

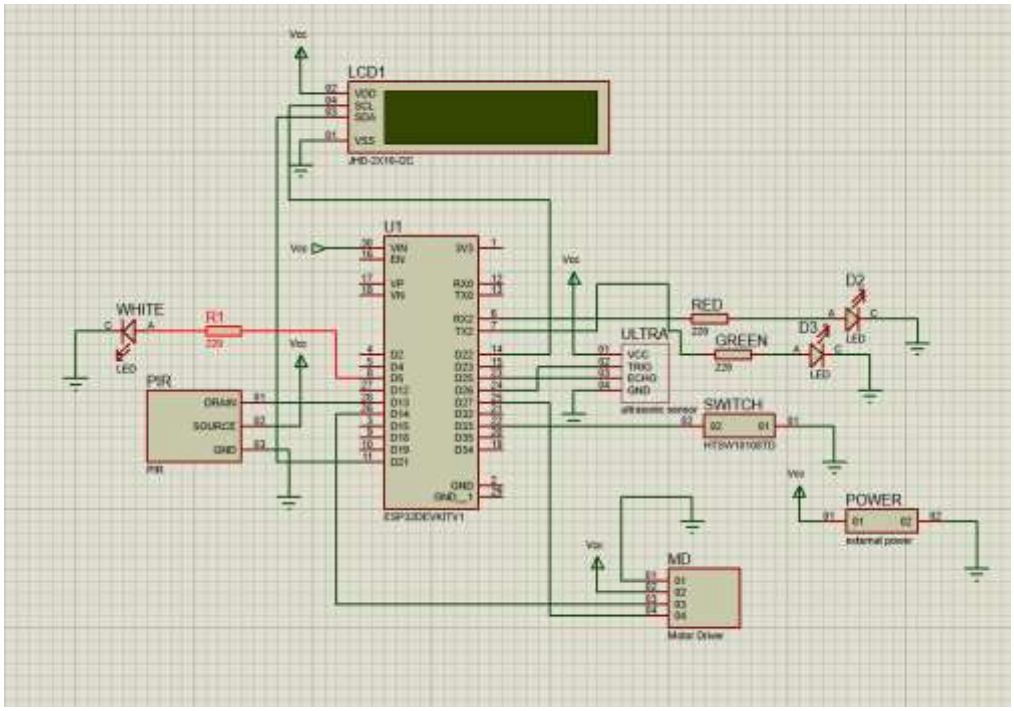


Figure 3: The Schematic Diagram

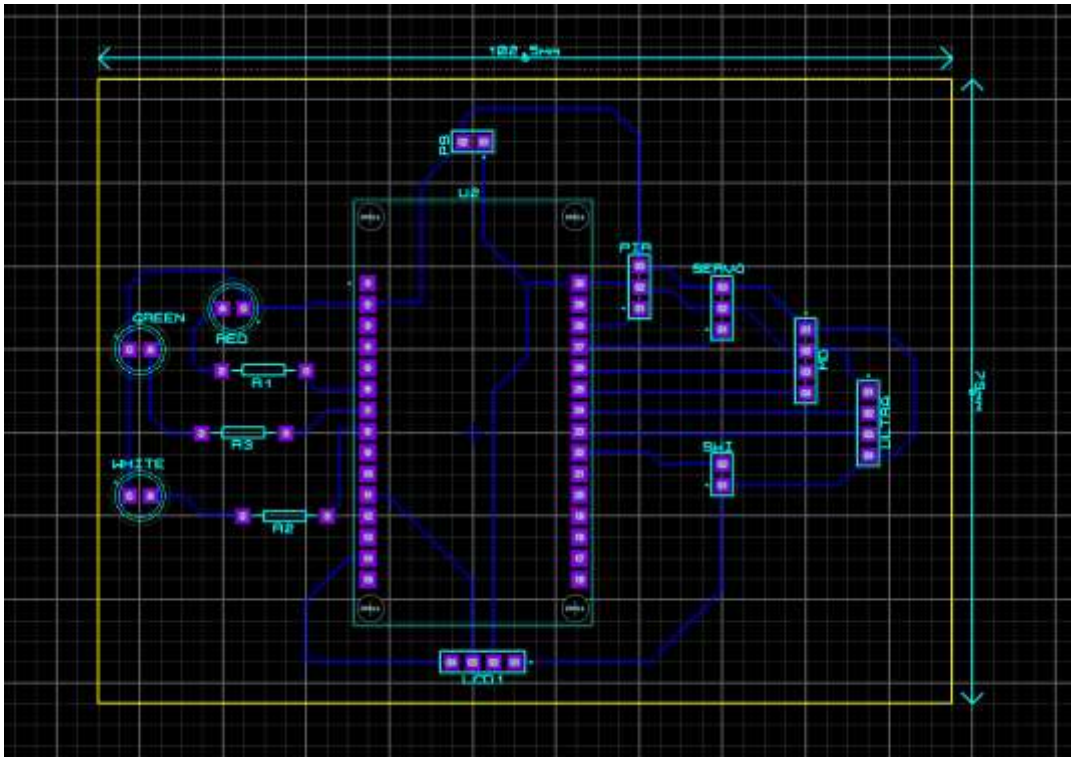


Figure 4: The PCB Layout

NOVELTY AND UNIQUENESS

The novelty and uniqueness of this project lies in its smart integration of sensors and controls to improve public toilet facilities. It uses an ESP32 to combine features like occupancy detection with Green and Red LED indicators, automatic lighting, and air freshener activation through a PIR sensor and motor driver. A slide switch allows easy toggling to cleaning mode, helping users and staff know the toilet's status. Real-time data is displayed on an LCD, offering valuable insights for better maintenance and resource management. This simple yet effective system enhances hygiene, user comfort, and operational efficiency, making it ideal for modern public spaces.

BENEFIT TO MANKIND

Improving Public Toilet Experience Through Illumination and Telemetry, offers significant benefits to mankind by enhancing hygiene, convenience, and resource efficiency in urban environments. By automating essential functions such as illumination, air freshening, and occupancy indication, the system ensures a more comfortable and pleasant experience for users while reducing manual intervention. The integration of data logging and actionable insights enables optimized maintenance schedules, leading to cleaner and more functional facilities. This innovation not only promotes public health by maintaining high hygiene standards but also supports sustainable urban development by utilizing energy-efficient technologies and smart resource management, ultimately improving the quality of life in communities.

COMMERCIALIZATION POTENTIAL

Improving Public Toilet Experience Through Illumination and Telemetry, possesses substantial commercialization potential due to its relevance to urban infrastructure, tourism, and public health management. Governments, municipalities, and private facility operators can adopt this technology to enhance user satisfaction, reduce maintenance costs, and promote sustainability. The modular design, powered by the ESP32 microcontroller, allows easy customization and scalability, catering to different market segments such as malls, parks, transportation hubs, and corporate facilities. Furthermore, integrating IoT capabilities opens avenues for remote monitoring and analytics, creating opportunities for subscription-based services or maintenance contracts. With growing emphasis on smart cities and sustainable living, this system aligns perfectly with current global trends, making it a highly marketable solution for modern urban challenges.

CONCLUSION

Improving Public Toilet Experience Through Illumination and Telemetry, revolutionizes the traditional restroom experience by integrating advanced automation, telemetry, and data-driven management. By addressing critical aspects such as hygiene, user comfort, and maintenance efficiency, the system ensures a more pleasant and sustainable environment for users. The use of modern technologies, such as the ESP32 microcontroller and smart sensors, provides seamless functionality and the potential for IoT integration, making it a versatile and future-ready solution. This innovation not only enhances public health and convenience but also supports urban infrastructure development, demonstrating its value as a vital component of smart city initiatives and sustainable living practices.

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Enhanced Anti-Theft Safe Lock for Home Security

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ABSTRACT

Conventional or traditional safe lock systems frequently have inadequate security and access control mechanisms. The lack of advanced components makes it more difficult to safeguard against modern burglary techniques and unauthorized access attempts. This could result in breaches and compromised security for valuable assets. The proposed solutions for the currently existing issues in safe lock systems include the use of IoT-based sensor systems to automate security and provide real-time monitoring, ensuring robust protection against unauthorized access. Hence, this technical report presents the design and implementation of an advanced electronic safe lock system utilizing a range of sensors and actuators for enhanced security. By integrating optical fingerprint sensors and numerical keypads, the system enhances authentication reliability and reduces false rejections and acceptances. Real-time monitoring with an ESP32 camera module and GPS tracking ensures continuous surveillance and immediate alerts in case of breaches. Visual and audible alerts through RGB LEDs and buzzers provide immediate feedback, while the incorporation of a Wi-Fi module enables remote monitoring and control. These advanced techniques ensure consistent and accurate security measures, increasing efficiency and reducing the possibility of human error.

KEYWORDS:
Electronic Safe Lock System, Optical fingerprint sensor, Numerical keypad authentication

PRODUCT DESCRIPTION

The report provides a detailed exploration of the design, implementation, and functionality of the system, emphasizing its adaptability and scalability to different security needs. The project's multifaceted approach extends beyond basic access control, incorporating intelligent features such as RGB LEDs for visual alerts, a buzzer for audible notifications, and a GPS module for precise location tracking. These components collectively contribute to the system's goal of achieving an intelligently managed and secure access control ecosystem. As the project seeks to address key challenges in security through technological innovation, it promises to make a valuable contribution to the evolving landscape of smart security solutions, bridging the gap between technology and real-world security practices.

The system integrates Optical fingerprint sensor (R507), a numerical keypad, an ESP32 camera module, an RGB LED, an LCD display, a buzzer, a GPS module, and a solenoid lock. These components work together to create a multi-layered security mechanism. Users can authenticate using either the fingerprint sensor or the numerical keypad, with a maximum of three attempts allowed. Upon successful authentication, the system displays a "granted access" message on the LCD, turns the RGB LED green, emits a single three second beep from the buzzer, and unlocks the solenoid lock. If authentication fails after three attempts, the system enacts several security measures: displaying an error message and the remaining attempts on the LCD, turning the RGB LED yellow, sounding the buzzer continuously for one-minute, streaming video from the ESP32 camera module, and sending an alert notification with the safe's location via the GPS module. This integrated approach ensures both proactive and reactive security responses, making the electronic safe lock system highly reliable and secure.

The continuous evolution of security technologies has spurred advancements in the realm of personal and property protection, fostering innovative solutions for secure and intelligent access control. This technical report introduces a comprehensive project entitled "Enhanced Anti-theft Safe Lock for Home Security System," designed to harness the power of integrated sensors and actuators. The project addresses the critical need for robust and intelligent management of safe access, where precision control is paramount for ensuring security and user convenience. In real-life security systems, maintaining the delicate balance between accessibility and protection is a complex task that greatly influences the effectiveness of the security measures.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

The Advanced Electronic Safe Lock System project involved a comprehensive and systematic approach to design, develop, and implement a sophisticated system for enhancing home security. Beginning with a thorough literature review, the project aimed to draw insights from existing research on modern security systems, ensuring a foundation grounded in established knowledge. The system design phase defined specific requirements and functionalities, culminating in a well-thought-out circuit design that integrated a optical fingerprint sensor (R502), a numerical keypad, an ESP32 camera module, an RGB LED, an LCD display, a buzzer, a GPS module, and a solenoid lock. Additionally, a Wi-Fi module was incorporated to enable IoT connectivity for remote monitoring and control.

Figure 1 shows a comprehensive array of components depicted, illustrating the intricate architecture proposed for the Enhanced Anti-Theft Safe Lock for Home Security project. Serving as primary inputs, a fingerprint sensor and numeric keypad stand as pivotal mechanisms for user authentication and access control, fortifying the system against unauthorized entry. Complementing these inputs, output functionalities are realized through a solenoid lock, LCD display, buzzer, and LED indicator, collectively ensuring intuitive operation and user engagement. Seamlessly integrated wireless connectivity with an ESP32 camera module augments the system's defensive capabilities through visual surveillance as well as enables communication with external devices. This combination of carefully chosen parts represents a synthesis of security, usability, and usefulness and is representative of the project's goal of redefining home security via technical innovation and complexity.

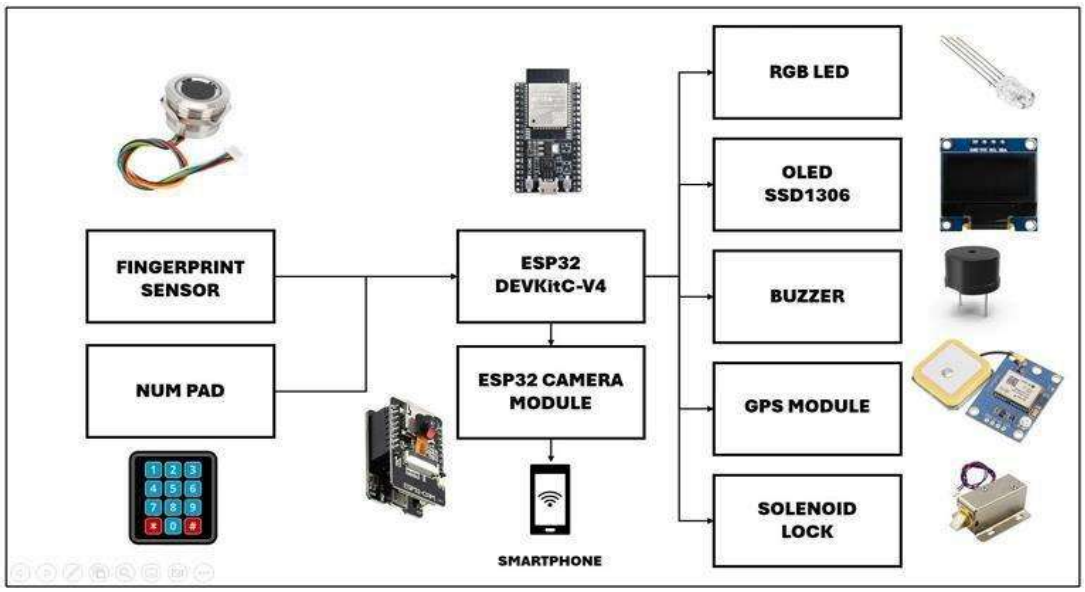


Figure 1. Block Diagram of Enhanced Anti-Theft Safe Lock for Home Security.

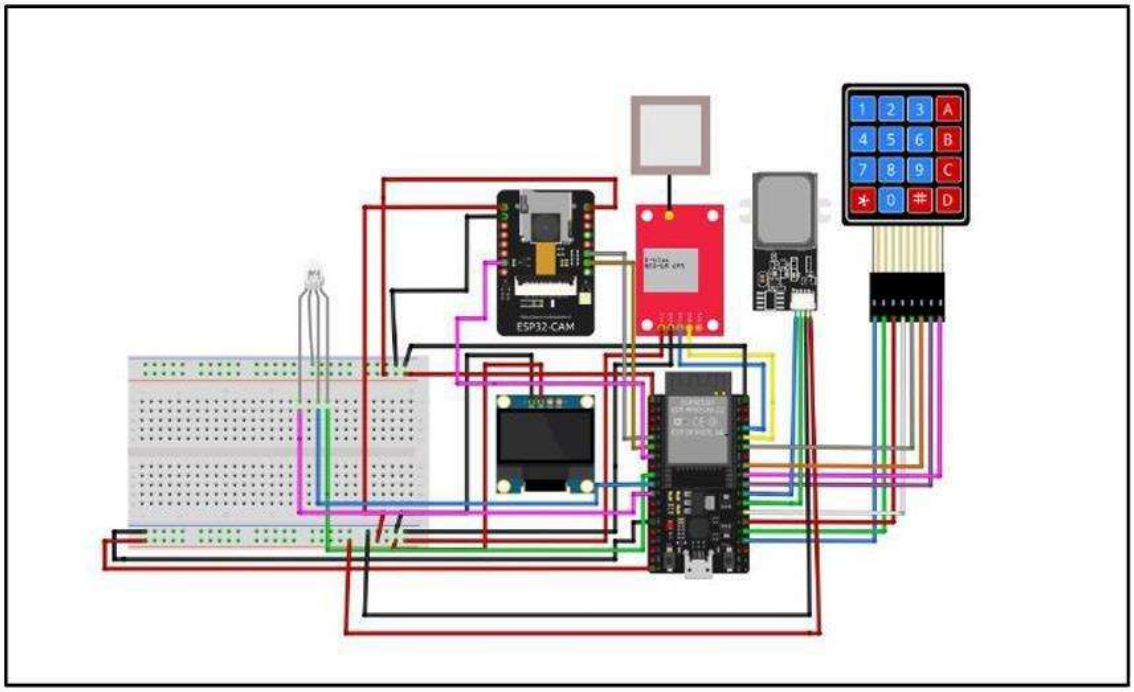


Figure 2. Schematic Diagram of Enhanced Anti-theft Safe Lock for Home Security.

Based on Figure 2, the schematic diagram for the Enhanced Anti-theft Safe Lock for Home Security vividly illustrates the strategic connections of each component to the ESP32 DevKitC-v4 microcontroller. Each sensor and actuator are meticulously interfaced with the corresponding pins on the ESP32 DevKitC-v4, ensuring a well-defined and organized system. The Optical Fingerprint Sensor R502 is intricately linked to the RX and TX pins, facilitating precise fingerprint authentication. The Keypad is connected to digital pins D2 through D9, allowing for accurate input readings. The ESP32 Camera Module is appropriately connected to the corresponding pins for camera functionality, including VSYNC, HREF, PCLK, XCLK, D0-D7, and SDA/SCL for I2C communication. The RGB LED, indicating various statuses, is tied to digital pin 5 (rgbLedPin). Furthermore, the Buzzer, responding to different alerts, is linked to digital pin 6 (buzzerPin). The GPS Module, providing location data, is connected via UART pins RX and TX (gpsRxPin and gpsTxPin). The Solenoid Lock, a crucial security component, is connected to digital pin 7 (lockControlPin). The SSD1306 OLED display, a crucial output display, is connected via the I2C interface, ensuring efficient data presentation. This meticulous arrangement not only highlights the precise connections of each component to the ESP32 but also underscores the systematic integration that forms the foundation of the Enhanced Anti-theft Safe Lock for Home Security.

NOVELTY AND UNIQUENESS

It's evident that the development of the Enhanced Anti-theft Safe Lock system holds significant promise in addressing the pressing concerns surrounding home security. By integrating advanced hardware components such as the ESP32 microcontrollers, along with sophisticated software solutions, the prototype demonstrates the potential to enhance residential protection against burglary and theft. By incorporating a suite of components, including a optical fingerprint sensor (R502), a numerical keypad, and an ESP32 camera module, the system enables real-time data collection essential for informed decision-making. The ability to monitor and control access closely mirrors the intricacies of actual security setups, providing a valuable tool for both security enthusiasts and professionals. Moreover, the integration of a Wi-Fi module transforms the safe lock system into a connected Internet of Things (IoT) device, enabling remote monitoring and control. This connectivity not only enhances accessibility but also facilitates prompt responses to security breaches or unauthorized access attempts.

BENEFIT TO MANKIND

By incorporating elements of both hardware and software innovation, along with IoT connectivity, our prototype represents a holistic approach towards enhancing residential security. Additionally, the integration of advanced features such as fingerprint recognition and impact sensing add a layer of sophistication that aligns with the evolving landscape of security technologies.

COMMERCIALIZATION POTENTIAL

The proposed Enhanced Anti-theft Safe Lock for Home Security System holds significant potential for commercialization within the security sector. By partnering with home security manufacturers or companies, this solution can be marketed as an add-on feature or integrated service for home security systems. Residents would benefit from reduced theft

CONCLUSION

The Enhanced Anti-theft Safe Lock system is a promising solution for improving home security. Using an ESP32 microcontroller and IoT technology, it offers real-time monitoring and alerts for security breaches. Features like fingerprint recognition and impact sensors add extra protection, preventing unauthorized access and ensuring homeowners' safety. This prototype combines modern technology with traditional safe lock systems, providing a smart, effective, and easy-to-use security solution.

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Autonomous Robot for Visually Impaired Person

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ABSTRACT

Autonomous Robot Visually Impaired Person is Bluetooth and GPS-based Navigation Robot to assist visually impaired individuals in safe and autonomous movement. This robot is equipped with obstacle detection, edge detection, and directional control to navigate environments effectively while avoiding obstacle. Th is system is powered by an ESP32 microcontroller, which processes data from various sensors. An ultrasonic sensor detects obstacles, infrared sensors identify edges, and a GY-271 compass maintains direction. A GPS module provides location tracking, enabling navigation to destinations. The robot is controlled using a custom mobile application developed with MIT App Inventor. This app allows users or caregivers to set destinations using latitude and longitude coordinates and send commands via Bluetooth. This robot also features a buzzer for audio alerts, notifying users about obstacles or critical updates during navigation. This project demonstrates an affordable and practical assistive technology designed to enhance mobility and independence for visually impaired individuals. It offers flexibility through manual and automatic modes and can be further improved with voice commands and real- time monitoring for enhanced functionality.

KEYWORDS: Assistive Technology, Navigation Robot, MIT App Inventor, Visually Impaired Support, GPS Navigation, Bluetooth Control, Obstacle Avoidance.

PRODUCT DESCRIPTION

The Autonomous Robot for Visually Impaired Persons is an advanced assistive device designed to enhance mobility, safety, and independence for individuals with visual impairments. It uses GPS navigation, Bluetooth communication, and sensor - based obstacle detection to provide safe and reliable navigation assistance.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

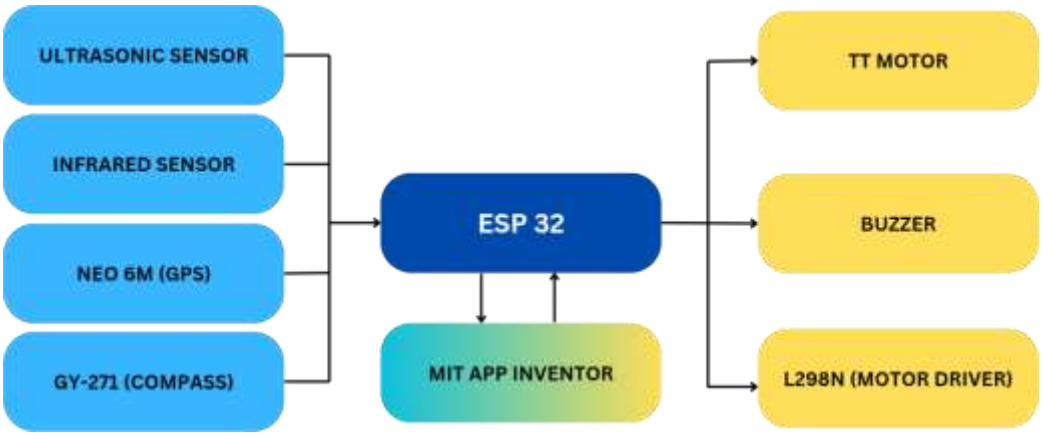


Figure 1: Block Diagram of the Autonomous Robor for Visually Impaired Person

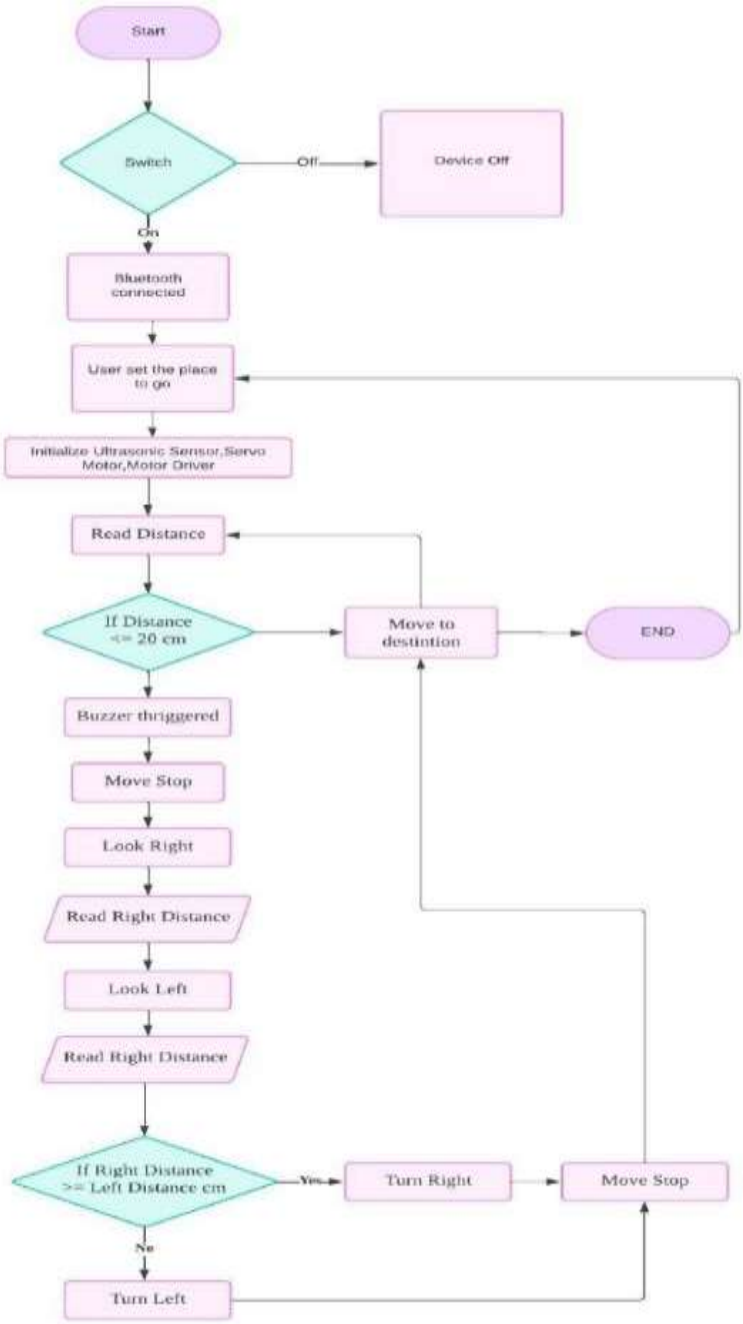


Figure 2: Flowchart of the Autonomous Robot for Visually Impaired Person

NOVELTY AND UNIQUENESS

The Autonomous Robot for Visually Impaired Person integrates multiple sensors, including ultrasonic sensors for obstacle detection, infrared sensors for edge detection, and a GY-271 compass for directional accuracy, to provide a comprehensive navigation solution. Powered by an inexpensive ESP32 microprocessor, the system is cost-effective while also offering autonomous navigation using real-time GPS, allowing the robot to reach predetermined destinations. The unique smartphone software, created using MIT software Inventor, allows caregivers and users to specify destinations and control the robot via Bluetooth, making it more user-friendly. The usage of audible notifications via a buzzer improves accessibility for visually challenged users, while the manual and automatic modes allow for customization. Future innovations, such as voice commands and real-time monitoring, have the potential to significantly improve user experience and safety. This system is designed exclusively for the needs of visually impaired people, providing a practical, flexible, and adaptive solution for increasing mobility and independence.

BENEFIT TO MANKIND

This project provides great benefits to humanity, especially in terms of enhancing the quality of life for visually impaired people. By delivering a secure and dependable navigation solution, the robot increases users' mobility and freedom, allowing them to travel comfortably in a variety of surroundings without relying on others. This autonomy contributes to less social isolation and increased inclusion in public spaces, workplaces, and social activities. The system's low cost and ease of use make it accessible to a wide spectrum of people, offering assistive technology that does not require specialist training or expensive equipment. Furthermore, future enhancements, such as voice command integration and real- time monitoring, have the potential to significantly expand its capabilities, making it a dynamic tool for continuing support. Finally, this project helps to build a more inclusive society by enabling visually impaired people to live more independent and fulfilling lives.

COMMERCIALIZATION POTENTIAL

The Autonomous Robot for Visually Impaired Person has high commercialization potential due to its novel features, low cost, and practical application in the assistive technology market. As the global number of visually impaired people grows, the demand for mobility aids that provide autonomy and independence is likely to increase. This robot, which combines obstacle recognition, edge sensing, GPS navigation, and Bluetooth control, fills a market need by offering a low-cost and configurable solution for visually impaired people. The system's user-friendly mobile app and the ability to integrate with advanced features such as voice control add to its attractiveness. Healthcare providers, rehabilitation clinics, non- profit organizations, and consumers, both individual and group, are all potential markets. Partnerships with government agencies, NGOs, and social entrepreneurs that prioritize accessibility can foster wider adoption, ensuring that this technology reaches those who need it the most. Furthermore, the system's scalability and possibility for future upgrades allow for continual improvement and product extension, making it an attractive commercial enterprise.

CONCLUSION

In conclusion, this project represents a huge step forward in assistive technology, combining various sensors, GPS navigation, and Bluetooth control to provide an affordable, user-friendly solution for visually impaired people. Its capacity to recognize barriers, avoid edges, and automatically follow predefined routes improves users' mobility and independence, giving them more confidence and freedom. The system's flexibility, with manual and automatic modes and the option for future improvements, ensures that it can evolve to suit the community's changing demands. By tackling both the practical obstacles of navigation and the emotional dimensions of freedom, this initiative has the potential to significantly improve the lives of visually impaired people and contribute to a more inclusive society.

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Soil Monitoring and Watering System for Home Farming

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ABSTRACT

This project introduces an innovative soil monitoring and watering system for home gardening, leveraging IoT technology and programmable logic controllers (PLC) to ensure optimal plant care. The system accurately detects the demands of the plant by using sensors, such as the DHT22, to measure the temperature and humidity of the soil. To keep the soil in optimal condition, the device uses a motor-controlled route to automatically water the plant when needed. By enabling real-time plant status monitoring via cellphones, the ESP32 module enhances accessibility and facilitates prompt reactions to environmental changes. A buzzer to alert users when the water level is low, an ultrasonic sensor to check the container's water levels, and LEDs for visual alerts are further features. This automated system provides a clever, effective, and dependable way to maintain healthy plants by addressing common gardening problems like neglect and inadequate watering. By integrating advanced technology, it enhances home gardening, ensuring plants thrive even in challenging conditions and providing gardeners peace of mind.

KEYWORDS: advanced, movement tracking, rechargeable

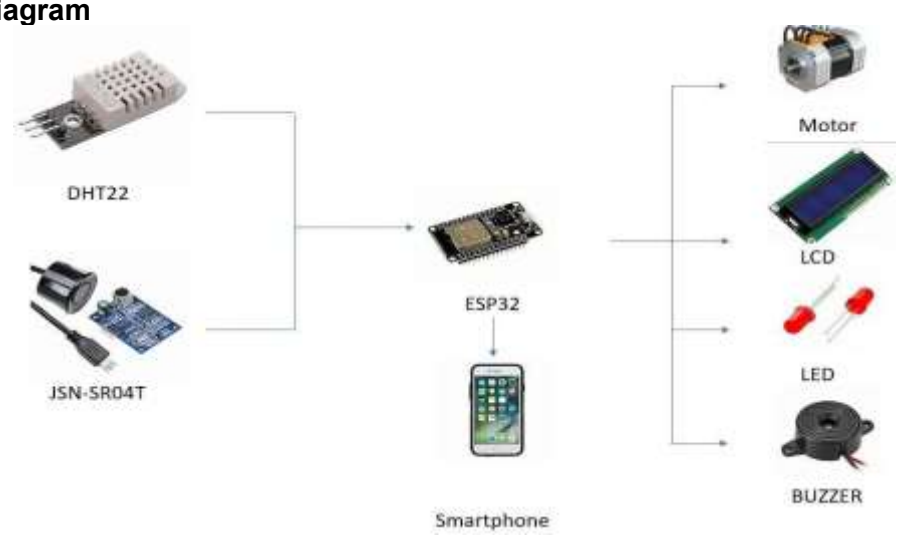
PRODUCT DESCRIPTION

The "Soil Monitoring and Watering System for Home Farming" is a smart gardening solution that uses IoT technology to automate plant care. The ESP32 microcontroller connects all components and enables remote monitoring through a smartphone, ensuring plants are cared for even when users are away. A DHT22 sensor monitors soil temperature and humidity, and the system activates a DC motor water pump to water plants when needed. A 16x2 LCD displays real-time data, while an LED indicates when watering is happening or when the water in the water tank in insufficient. An ultrasonic sensor checks the water level in the container, and a buzzer alerts users if the level is too low, ensuring the pump works smoothly. This system simplifies gardening, saves water, and ensures plants stay healthy with minimal effort.

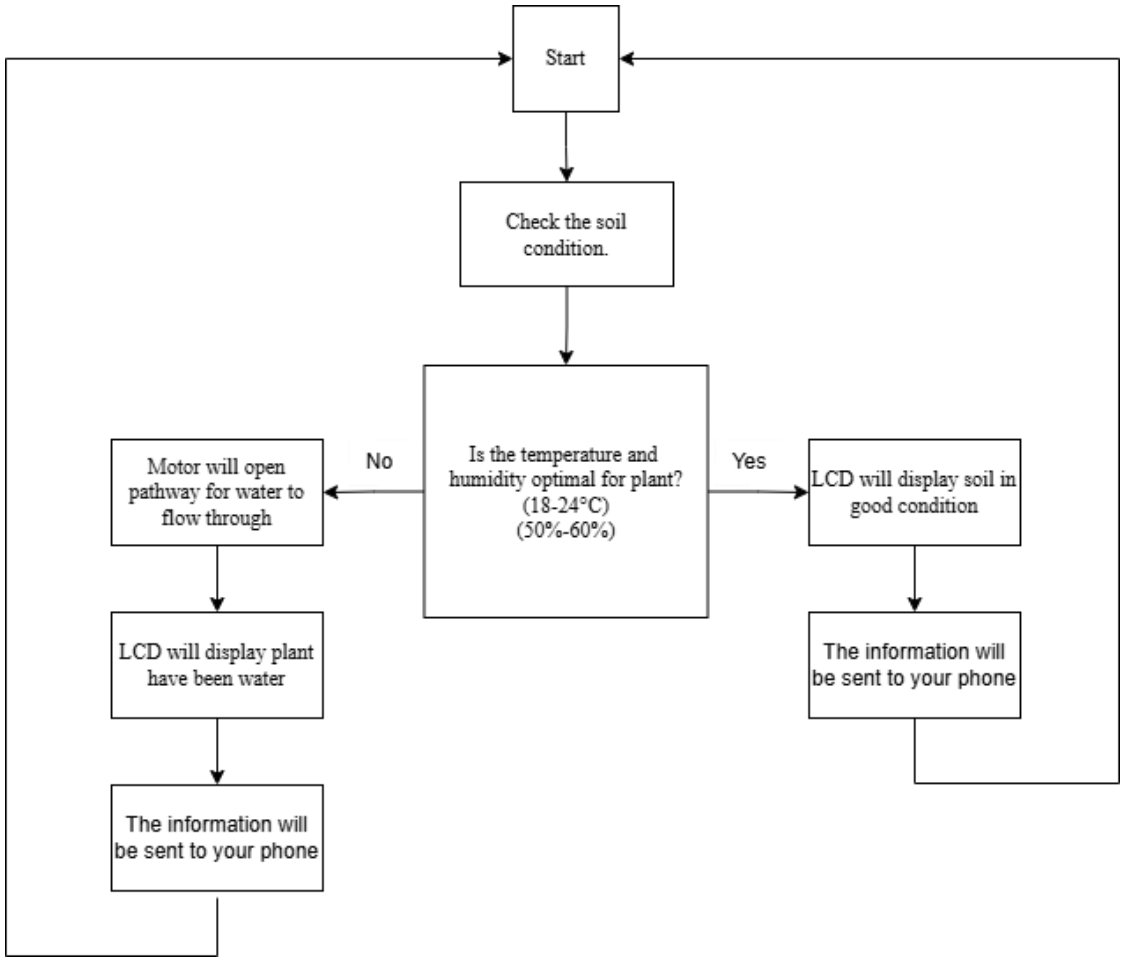
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarized as follow:

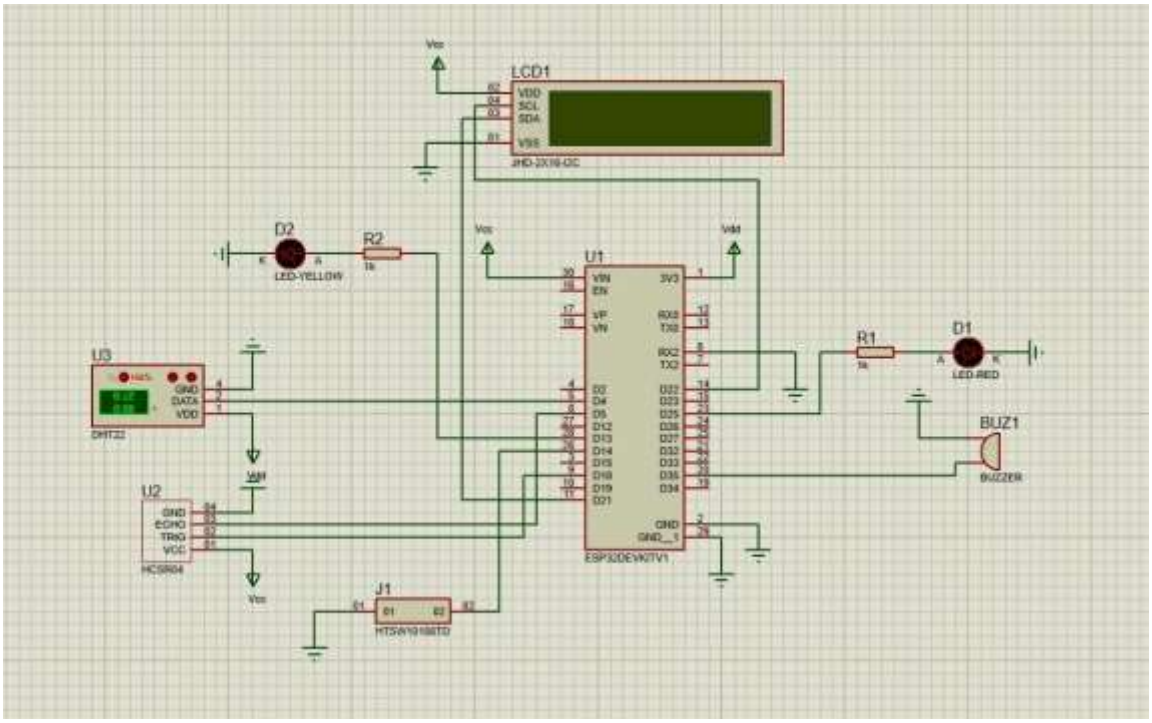
1. Block Diagram



2. Flowchart



3. Schematic Diagram



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the "Soil Monitoring and Watering System for Home Farming" lie in its smart integration of IoT technology and automation for plant care. Unlike traditional methods, this system combines sensors, such as the DHT22 for monitoring soil temperature and humidity, and an ultrasonic sensor for water level detection, to create a fully automated solution. Its use of the ESP32 microcontroller for real-time monitoring and remote access through smartphones adds a modern, user- friendly aspect. Features like LEDs, a buzzer for alerts, and a motorized watering system make it highly efficient and convenient. This unique combination of technology ensures precise, low-maintenance plant care, setting it apart from existing gardening tools.

BENEFIT TO MANKIND

The "Soil Monitoring and Watering System for Home Farming" offers significant benefits to humanity by simplifying and improving plant care. It ensures optimal watering and monitoring, helping gardeners maintain healthy plants with minimal effort. This technique prevents overwatering and conserves water, which promotes sustainable practices. With automation and real-time plant condition updates via smartphones, it offers busy people peace of mind. Additionally, it encourages urban gardening, which teach us to farm for our own greens when there is crisis. This technology improves users' well-being and helps create a more sustainable, healthy environment by making gardening more efficient and accessible.

COMMERCIALIZATION POTENTIAL

The "Soil Monitoring and Watering System for Home Farming" holds strong commercialization potential due to its practicality and alignment with modern smart home trends. It is ideal for home gardeners, and hobbyists looking for efficient and automated plant care solutions. The device appeals to people looking for sustainability and ease because it can automate watering, remotely monitor plant temperature and humidity, and maximize resource utilization. Its features, such as IoT connectivity and real-time warnings, meet the rising need for smart devices. It might also be modified for educational or small-scale commercial farming, making it adaptable to a variety of markets. The system is well-positioned for success in the home and urban gardening industry thanks to its user-friendly design and emphasis on sustainability.

CONCLUSION

By combining smart technologies and the Internet of Things, the "Soil Monitoring and Watering System for Home Farming" has demonstrated significant promise in automating plant care. The technology offers a useful answer for contemporary gardening by providing automated watering, real-time monitoring, and effective resource management. Its features, which promote ecological practices and lessen manual labor, make it perfect for both urban and residential gardeners. Future developments might concentrate on expanding the system's scalability, improving connectivity for easy remote access, and investigating new commercial agricultural uses. The technology will continue to be dependable and easy to use with continued improvement, opening the door for more intelligent and environmentally friendly gardening solutions.

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RFID-Based Parking System for Disabled Driver Convenience

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ABSTRACT

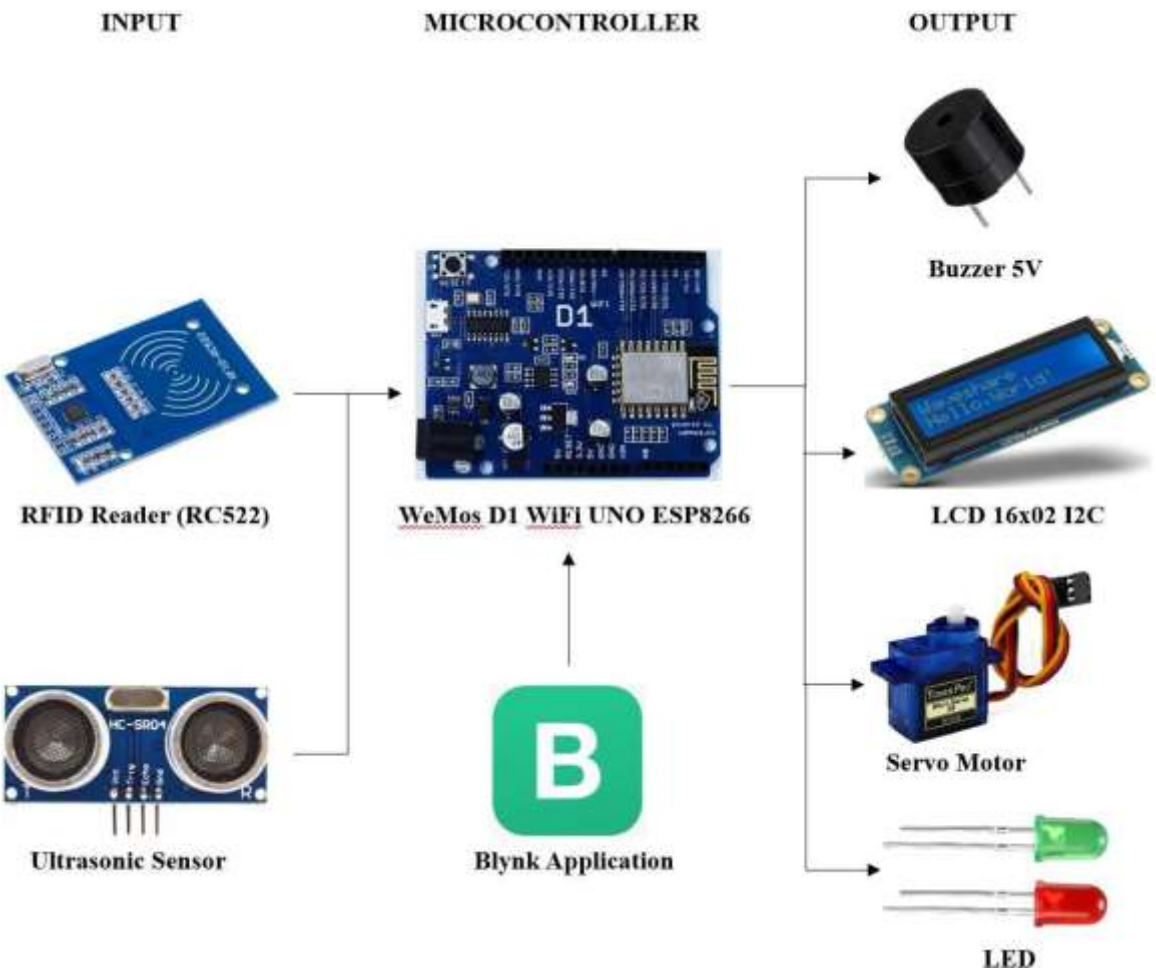
In today's fast-paced technological landscape, Radio Frequency Identification (RFID) technology emerges as a transformative solution, utilizing wireless signals to uniquely identify objects, animals, or individuals. However, the persistent challenges faced by disabled individuals in accessing essential services, particularly within parking facilities, underscore the urgent need for innovative solutions. Traditional parking setups often lack accommodations for disabled drivers, creating barriers to their mobility and independence. This proposal advocates for the integration of RFID technology into parking infrastructure, establishing dedicated parking spots equipped with RFID sensors. These sensors would enable real-time identification and reservation of accessible spaces, streamlining the parking experience for disabled drivers. Beyond enhancing accessibility, the implementation of an RFID-based parking system holds the potential to optimize parking management efficiency and foster inclusivity in urban environments. Through collaborative efforts between technology developers, policymakers, and disability advocacy groups, this initiative aims to empower disabled individuals, ensuring their equal participation in community life while promoting independence and inclusivity.

KEYWORDS: Radio Frequency Identification (RFID), Internet of Things (IoT), Smart Parking System, Accessible Parking, Independence for Disabled Individuals

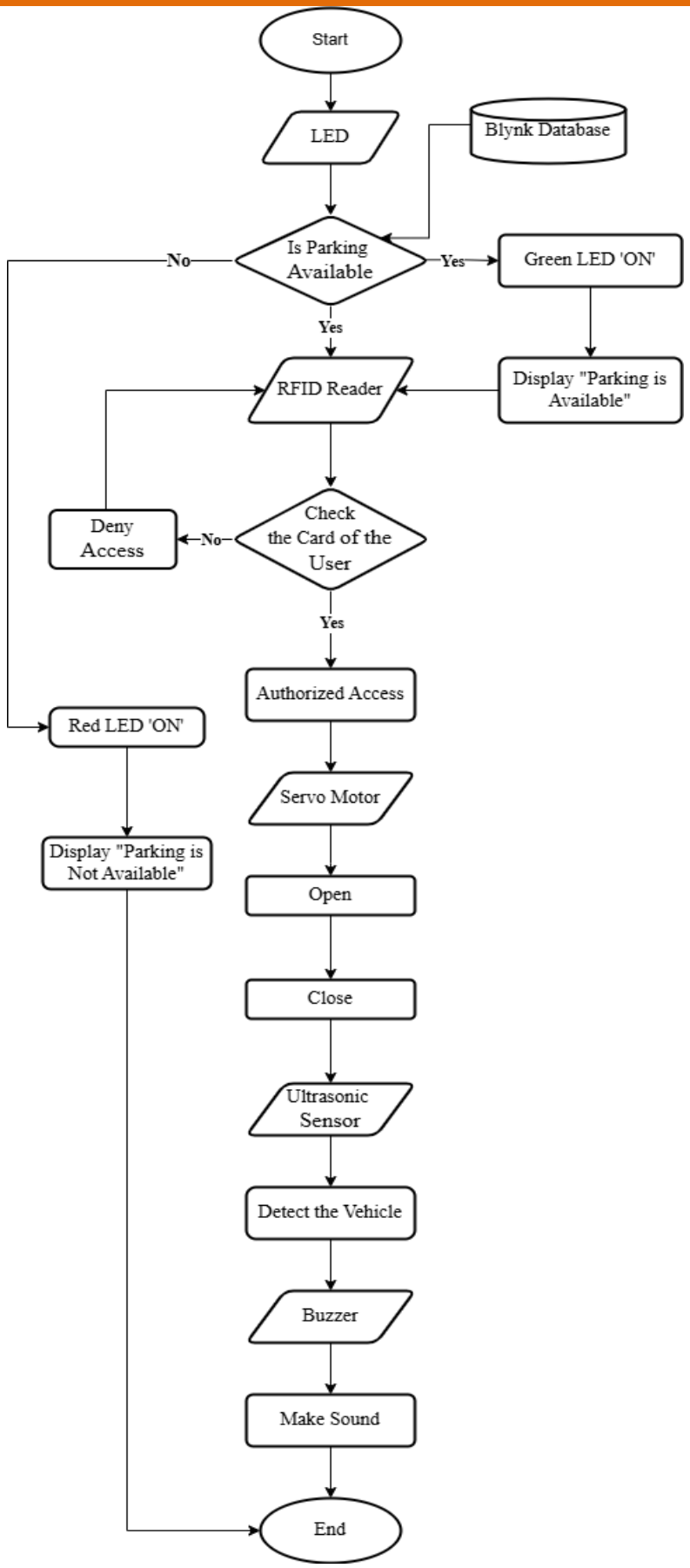
PRODUCT DESCRIPTION

The misuse of designated parking facilities for disabled drivers by non-disabled drivers has become a significant issue in recent years. Despite clear signage indicating that these parking spots are reserved for individuals with disabilities, many normal drivers occupy these spaces, disregarding the needs and rights of disabled drivers. This misuse results in numerous challenges for disabled drivers, who are often left with no choice but to find alternative parking spots located farther from their intended destinations. This increased distance can cause considerable inconvenience and additional physical strain for disabled individuals, particularly those with mobility impairments. To address this pervasive issue, an RFID-based parking system for disabled drivers presents a viable solution. The implementation of an RFID-based parking system for disabled drivers represents a significant step towards improving accessibility and inclusivity in urban environments. By addressing the specific challenges faced by disabled individuals in parking facilities, this solution aims to enhance their independence and mobility, thereby promoting greater participation in social, economic, and recreational activities. Moreover, the adoption of such a system aligns with broader societal goals of creating smart, connected cities that utilize technology to improve the quality of life for all residents. As cities continue to grow and evolve, the integration of RFID technology into parking infrastructure can serve as a model for other accessibility initiatives, demonstrating how innovative solutions can make a tangible difference in the lives of people with disabilities.

BLOCK DIAGRAM



FLOWCHART


Start
LED
Blynk Database
Is Parking Available
No
Yes
Green LED 'ON'
Yes
RFID Reader
Display "Parking is Available"
Deny Access
No
Check the Card of the User
Yes
Authorized Access
Red LED 'ON'
Servo Motor
Display "Parking is Not Available"
Open
Close
Ultrasonic Sensor
Detect the Vehicle
Buzzer
Make Sound
End

NOVELTY AND UNIQUENESS

The development of the RFID-Based System for Disabled Driver Convenience represents a significant advancement in optimizing parking accessibility for disabled drivers. Through the utilization of RFID readers and cards, the system effectively controls access to designated parking spaces, ensuring that these spaces are used appropriately by those who need them. The integration of automated gate control mechanisms further enhances the system's functionality, allowing for seamless entry and exit based on real-time user identification. This feature not only enhances user convenience but also improves the overall efficiency of parking space utilization.

BENEFIT TO MANKIND

The successful implementation of this system highlights its potential to address common challenges faced by disabled drivers in finding and accessing suitable parking spaces. By automating the access control process, the system reduces the likelihood of unauthorized use of designated parking spots, thereby ensuring that these spaces remain available for those who genuinely need them. This contributes to a more equitable and user-friendly car park environment.

COMMERCIALIZATION POTENTIAL

The proposed RFID-Based System for Disabled Driver Convenience holds significant potential for commercialization within the commercial sector. By partnering with mall or business parking management companies, this solution can be marketed as an add-on feature or integrated service for smart parking systems. Commercial area would benefit from reduced revenue losses and enhanced parking management, making them ideal clients for the solution.

CONCLUSION

The RFID-Based Parking System for Disabled Driver Convenience enhances accessibility by using RFID technology and automated gate controls to ensure appropriate use of designated parking spaces, improving convenience and efficiency. Future enhancements could include real-time parking availability tracking, mobile app integration, and predictive analytics to optimize space utilization and user experience. Field trials and user feedback would refine the system further. Overall, this solution represents a significant step towards becoming more accessible, equitable, and efficient parking for disabled drivers.

Flood Secure: Building House Resilience with Intelligent Flood Management

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ABSTRACT

The design and construction of an Internet of Things (IoT)- integrated flood monitoring and alert systems using Arduino-based sensors are described in this technical study. Furthermore, of Ultrasonic, Water, and Float sensors, the system has a Short Message Service (SMS) application that allows for real-time alert alerts. The system becomes an Internet of Things (IoT) device with real-time monitoring and automated reaction capabilities when wireless communication technology is included. To further reduce damage, the system has featured that automatically close house gates. The system monitors and controls flood conditions by processing data from various sensors using the Arduino microcontroller. Automated gate actuators are examples of responsive components that improve system functionality. Intelligent decision-making is built into the Arduino code, which also constantly controls the sensors and send alarms in response to predetermined water levels. With real-time IoT connectivity to enhance disaster preparation and safety, this IoT-Integrated Flood Monitoring and Response System gives an adaptable and scalable automated flood control solution.

KEYWORDS: Flood Monitoring, Ultrasonic, Water Sensor, Float Sensor, Internet of Things (IoT)

PRODUCT DESCRIPTION

"Flood Secure" is an innovative IoT-based solution aimed at improving flood resilience. This system incorporates advanced sensors, such as Ultrasonic, Water, and Float sensors, to accurately monitor water levels. Powered by an Arduino microcontroller, it processes real-time data to perform automated actions, including activating a gate mechanism to block water entry. The system also features an SMS notification function, enabling immediate alerts to inform users during potential flood situations. Designed with scalability and modularity in mind, the system can be tailored for use in different settings, from residential properties to industrial facilities. Its wireless connectivity ensures continuous monitoring and remote accessibility, giving users timely and detailed updates on flood conditions. By combining automation, reliability, and ease of use, "Flood Secure" provides a comprehensive solution for proactive flood prevention and management.

FLOW CHARTS / BLOCK DIAGRAM / SCHEMATIC DIAGRAMS / PCB LAYOUT



Figure 1: Model Flow Chart

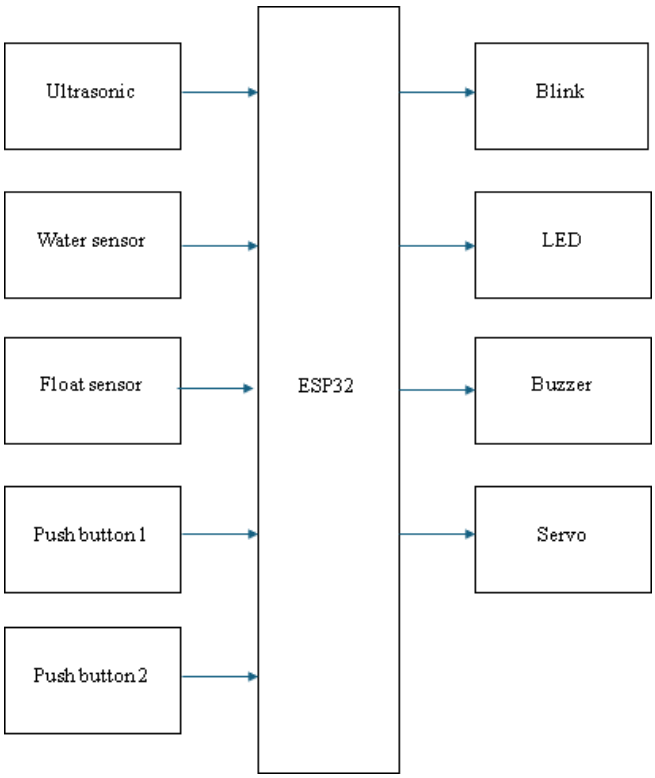


Figure 2: Model Block Diagram

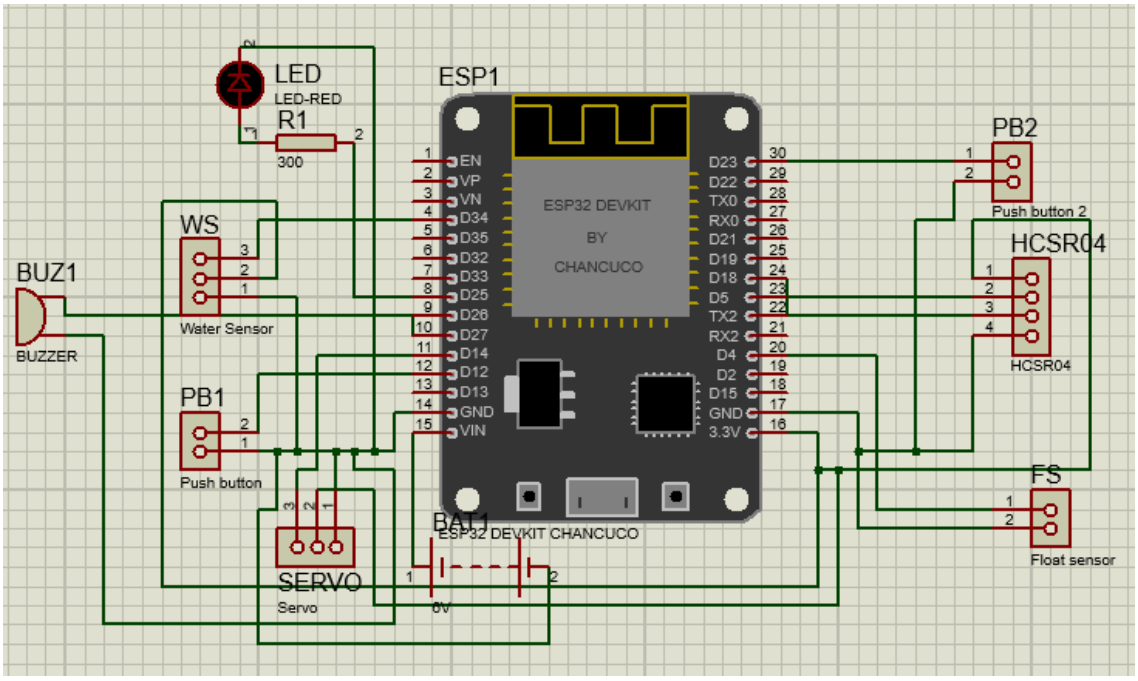


Figure 3: Model Schematic Diagram

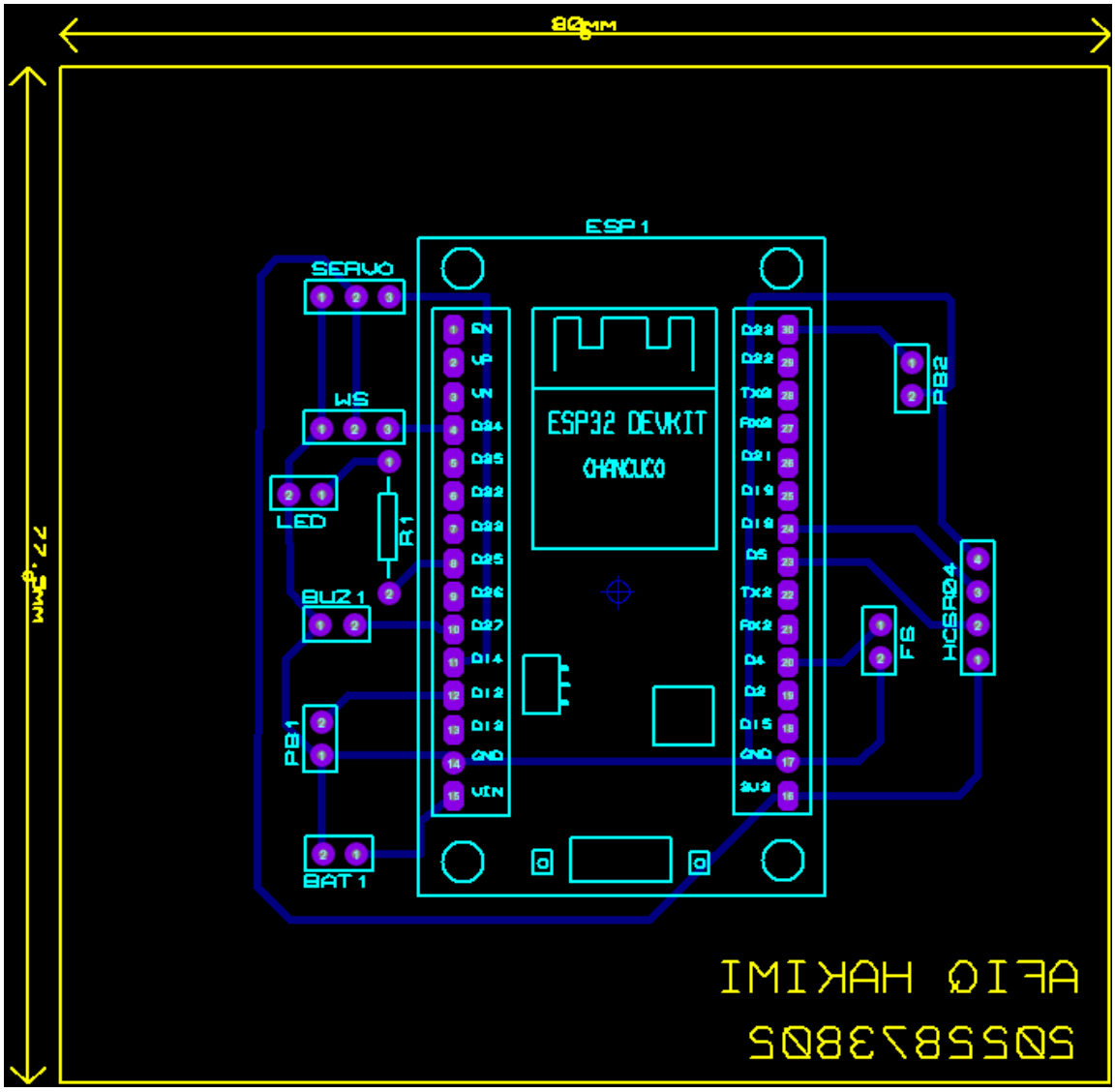


Figure 4: Model PCB Layout

NOVELTY AND UNIQUENESS

This flood management system offers a groundbreaking approach by combining IoT technology with real-time monitoring and automated responses. Unlike traditional methods, it employs a network of sensors such as Ultrasonic, Water, and Float to enhance detection precision and support smarter decision-making. The integration of SMS-based notifications ensures users receive immediate alerts during emergencies. A unique feature is its ability to automatically close house gates, providing an extra layer of protection. The blend of automation and user-centric design makes this solution an innovative and practical tool for flood mitigation.

BENEFIT TO MANKIND

The project addresses a pressing need by providing a practical solution to mitigate the effects of flooding. By delivering real-time alerts and enabling automatic responses, it helps safeguard lives and property. Its versatile design allows it to be applied in various settings, from homes to larger infrastructures. Furthermore, the system's affordability and user-friendly nature empower communities to adopt effective flood monitoring measures, ultimately boosting preparedness and reducing disaster-related losses.

COMMERCIALIZATION POTENTIAL

The "Flood Secure" system holds significant promise for commercialization, thanks to its innovative use of IoT technology in flood detection and prevention. Its cost-effectiveness, customizable design, and user-friendly operation make it ideal for a wide range of applications, including residential, industrial, and commercial settings. Features like real- time SMS alerts and automatic safety mechanisms, such as gate closures, increase its value proposition in the market. As concerns over climate change and disaster preparedness grow globally, this system addresses a critical need by providing a
proactive solution. Additionally, its adaptable design allows it to be tailored for various environments, enhancing its appeal and utility in disaster management markets.

CONCLUSION

The "Flood Secure" IoT-enabled flood management system is a cutting-edge innovation that improves disaster readiness. By integrating advanced sensor technology with automated responses and real-time communication, it offers an effective way to minimize the impacts of flooding. Key features such as SMS notifications and automated gate control highlight its practicality and focus on user needs. Designed with scalability and affordability in mind, the system is suitable for a variety of applications, ranging from individual households to larger facilities. Ultimately, "Flood Secure" plays a vital role in strengthening community preparedness, enhancing safety, and reducing flood-related risks. Overall, the project “Flood Secure: Building House Resilience with Intelligent Flood Management” has been successfully developed using ESP32 and other components.

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Advanced Fire and Gas Alarm System

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ABSTRACT

This report presents the design and simulation of an Advanced Fire and Gas Alarm System for enhanced emergency response. Using the ESP32 microcontroller, the system integrates a Fire Sensor, DHT11 Temperature Sensor, MQ2 Gas Sensor, and an LCD for real-time data visualization. Responsive outputs, including LEDs and a buzzer, provide visual and audible alerts, while a Wi-Fi module enables mobile phone connectivity for remote monitoring. Sensor data is processed using predefined thresholds, dynamically activating alarms and sending notifications via IoT connectivity. The LCD displays hazard-specific messages to guide occupants during emergencies. A Tinkercad simulation validates the ESP32's capability to manage sensor inputs and outputs efficiently, demonstrating reliable decision-making algorithms implemented in the Arduino code.This scalable and versatile system enhances safety by automating hazard detection and enabling real-time alerts, reducing response times during fire or gas- related emergencies. It is a practical solution for modernizing home safety systems with IoT integration.

KEYWORDS: Fire Sensor, Gas Sensor, and Temperature Sensor, Wi-Fi module, Internet of Things (IoT), Arduino-based Sensor, and LCD Display

PRODUCT DESCRIPTION

The Advanced Fire and Gas Alarm is an advanced safety system designed to detect fire and gas hazards quickly and accurately. It uses sensors to monitor temperature, gas levels, and flames, ensuring constant protection of the surroundings. The system is powered by an ESP32 microcontroller, which processes the data and displays important information on an LCD screen. Additionally, it includes an automatic fan that activates when high gas levels are detected, helping to ventilate the area and reduce potential dangers. A Telegram bot sends instant alerts to users' smartphones, enabling them to stay informed and take timely action, even remotely. This system is designed to identify unusual patterns that indicate danger, helping reduce false alarms and improving reliability. Its flexible design makes it easy to set up in homes, offices, or factories and allows it to integrate with existing safety setups. With real-time monitoring, automatic responses, and simple operation, this IoT-based alarm system supports users in protecting lives and property, offering a smarter way to ensure safety. Figure 1 illustrates the operational flow of the Advanced Fire and Gas Alarm system, where sensors monitor for gas, fire, or high temperature (above 70°C) to activate alerts via buzzer, LED, LCD, and a mobile app for real-time notifications. Figure 2 show the Comparison of Actual and Predicted Gas Sensor Value Patterns Using Regression Model

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

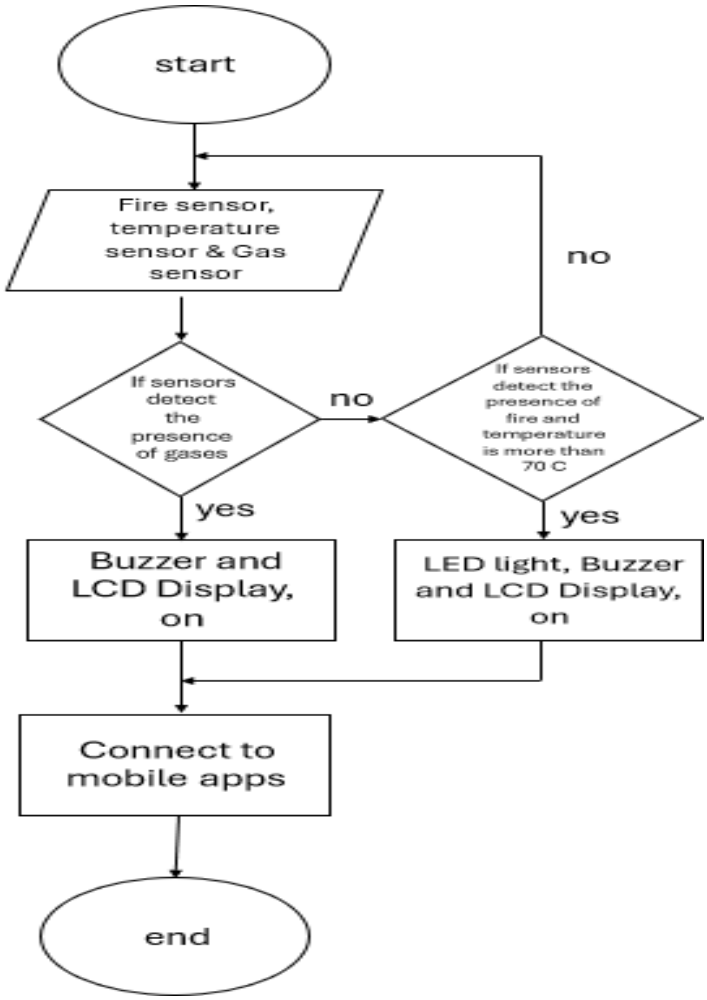


Figure 1. Model Flowchart

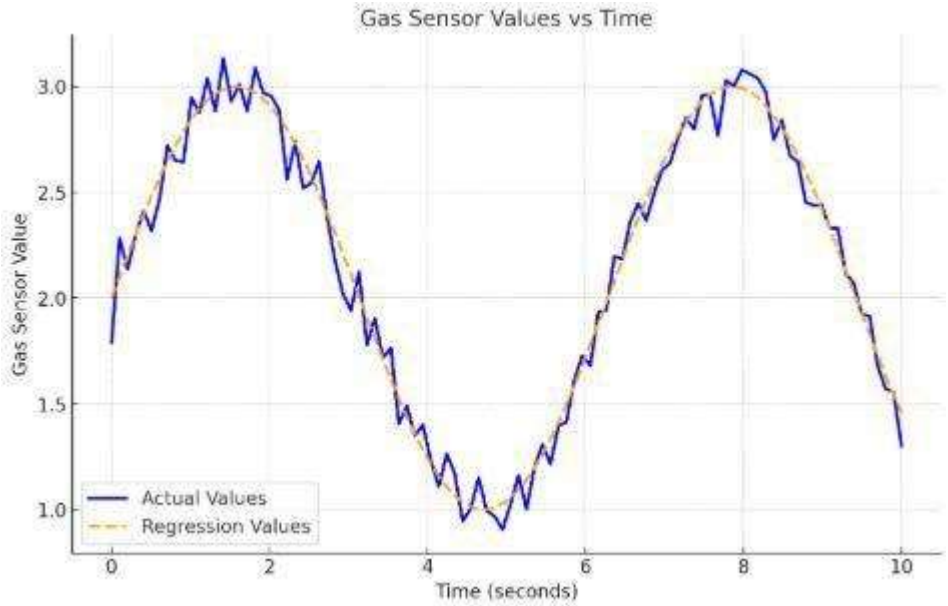


Figure 2. Comparison of Actual and Predicted Gas Sensor Value Patterns Using Regression Model

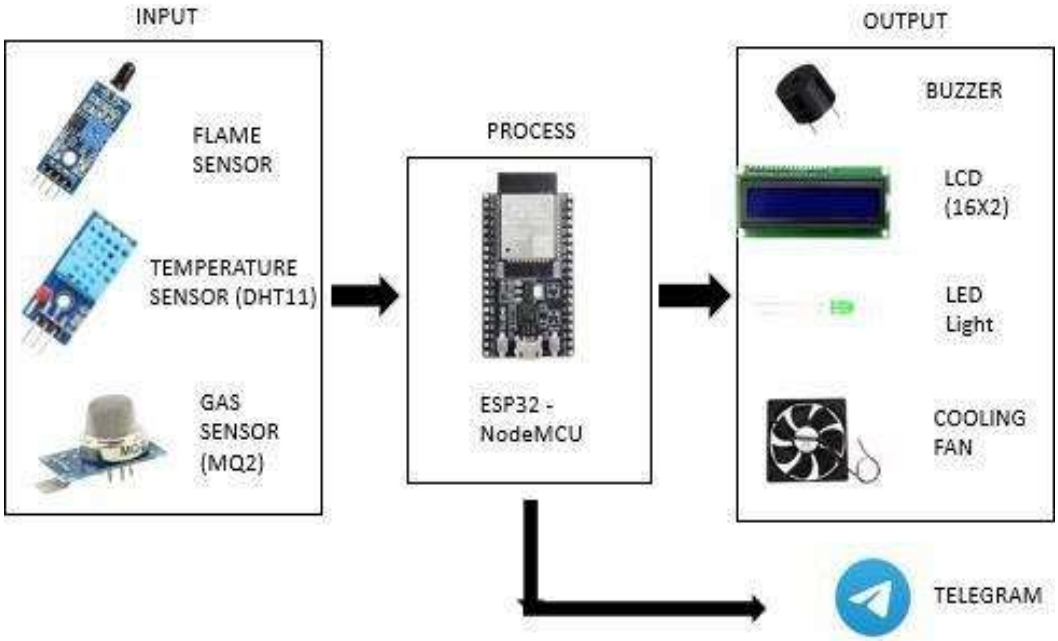


Figure 3: Block Diagram of the Advanced Fire and Gas Alarm System

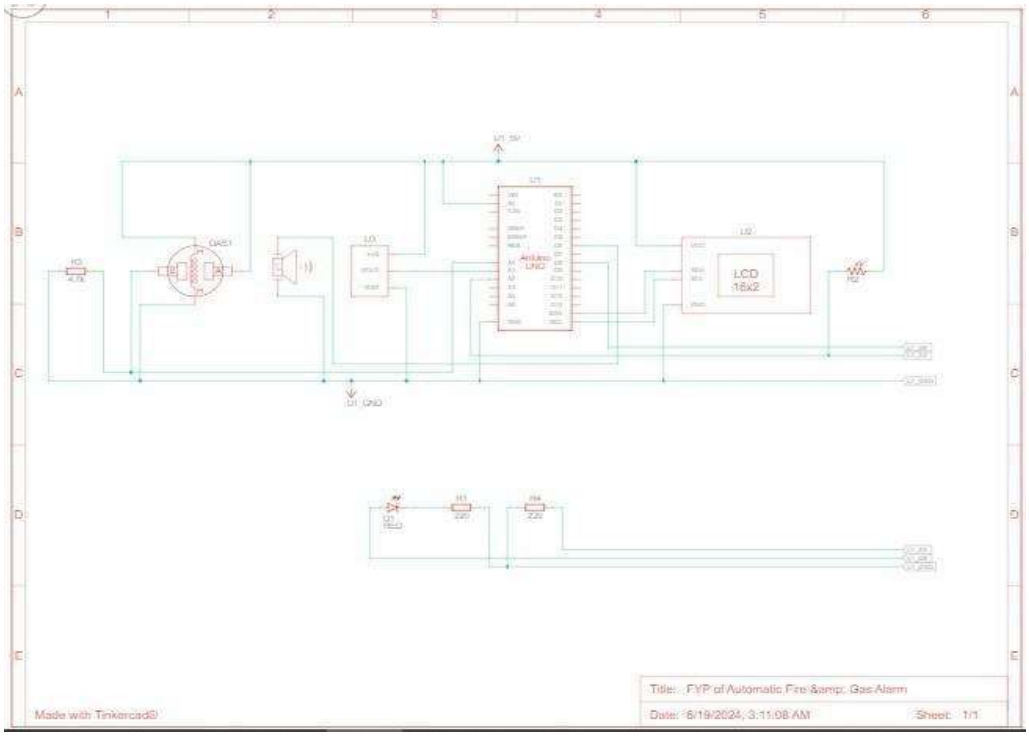


Figure 4: Schematic Diagram of the Advanced Fire and Gas Alarm System

NOVELTY AND UNIQUENESS

The novelty of this project lies in its application of The Advanced Fire and Gas Alarm system stands out for its integration of real-time monitoring, multi-sensor fusion, and IoT technology. By combining gas, temperature, and flame sensors, the system provides comprehensive hazard detection with reduced false alarms. A unique feature is the automatic ventilation mechanism, where a fan activates upon detecting high gas levels, minimizing the risk of dangerous gas buildup. The system also ensures users are alerted locally through an LCD, buzzer, and LED indicators, as well as remotely via a mobile application, enabling timely responses to potential hazards. Another key innovation is the system's anomaly detection capability, which identifies irregular patterns in sensor data to predict and mitigate risks before they escalate. This

intelligent feature, paired with its scalable IoT-based design, allows seamless integration into existing safety setups for homes, offices, or industrial facilities. Overall, the system offers a smarter and more proactive approach to safeguarding lives and property, setting it apart from traditional fire and gas alarm systems.

BENEFIT TO MANKIND

The Advanced Fire and Gas Alarm system provides important benefits by improving safety and preventing dangerous situations. It can quickly detect gas leaks, fires, and high temperatures, helping to avoid injuries, loss of life, and damage to property. The system sends alerts through mobile apps, allowing users to act quickly, even if they are not at the location, which can save lives during emergencies. The system's automatic fan helps reduce gas buildup, lowering the risk of explosions or harm. Its simple design makes it easy to set up in homes, offices, and factories, ensuring more people can use it to stay safe. By offering better protection and faster responses to hazards, this system helps create safer living and working environments for everyone.

COMMERCIALIZATION POTENTIAL

This project has strong potential for commercialization due to its practical features and wide range of applications. Its ability to provide real-time monitoring, instant alerts, and automatic responses makes it an appealing safety solution for homes, offices, factories, and other environments. The system's affordability, ease of installation, and compatibility with existing infrastructures further increase its appeal to a broad audience. With the growing demand for smart and connected safety devices, this system can be marketed to individuals, businesses, and industries seeking reliable and innovative solutions for fire and gas hazard detection. Its unique combination of features, such as multi-sensor monitoring and IoT integration, positions it as a standout product in the market. Entrepreneurs and companies can commercialize this system by targeting smart home, industrial safety, and IoT device markets, tapping into the increasing need for smarter and safer living and working spaces.

CONCLUSION

In conclusion, The Advanced Fire and Gas Alarm system has been successfully developed to provides an efficient and reliable solution for safety and emergency response. Integrating fire, temperature, and gas sensors with the ESP32 microcontroller, it ensures real-time monitoring and automated alerts via LEDs, a buzzer, an LCD, and mobile notifications through Wi-Fi. The system's ability to process sensor data dynamically and respond to hazards was validated through Tinkercad simulations, demonstrating its effectiveness. By modernizing traditional alarm systems with IoT connectivity, this scalable design enhances safety, reduces response times, and offers actionable insights during emergencies, making it ideal for residential and commercial applications.

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Revolutionizing Attendance Tracking: RFID Integration with IOT for Seamless Management

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ABSTRACT

This technical paper details the planning and execution of an RFID attendance system that makes use of Arduino-based hardware. An RFID tag and reader, a touch sensor, an ESP32 microcontroller, an LCD for real-time data visualization, and a loud feedback buzzer are all included in the system. The addition of a Wi-Fi module expands the system's functionality and makes it an Internet of Things (IoT) gadget with remote monitoring and control capabilities. The system efficiently manages attendance records by processing data from the touch sensor and RFID reader using the ESP32 microcontroller. The buzzer and LCD are dynamically controlled by the Arduino code, which integrates intelligent decision-making based on specific circumstances. The LCD shows a number of information screens with important data and the attendance status shown. With remote IoT connectivity for improved control and accessibility, this RFID attendance system with connected IoT devices offers an adaptable and scalable automated attendance management solution.

KEYWORDS: ESP32, Touch Sensor, LCD**,** Buzzer, RFID tag and reader.

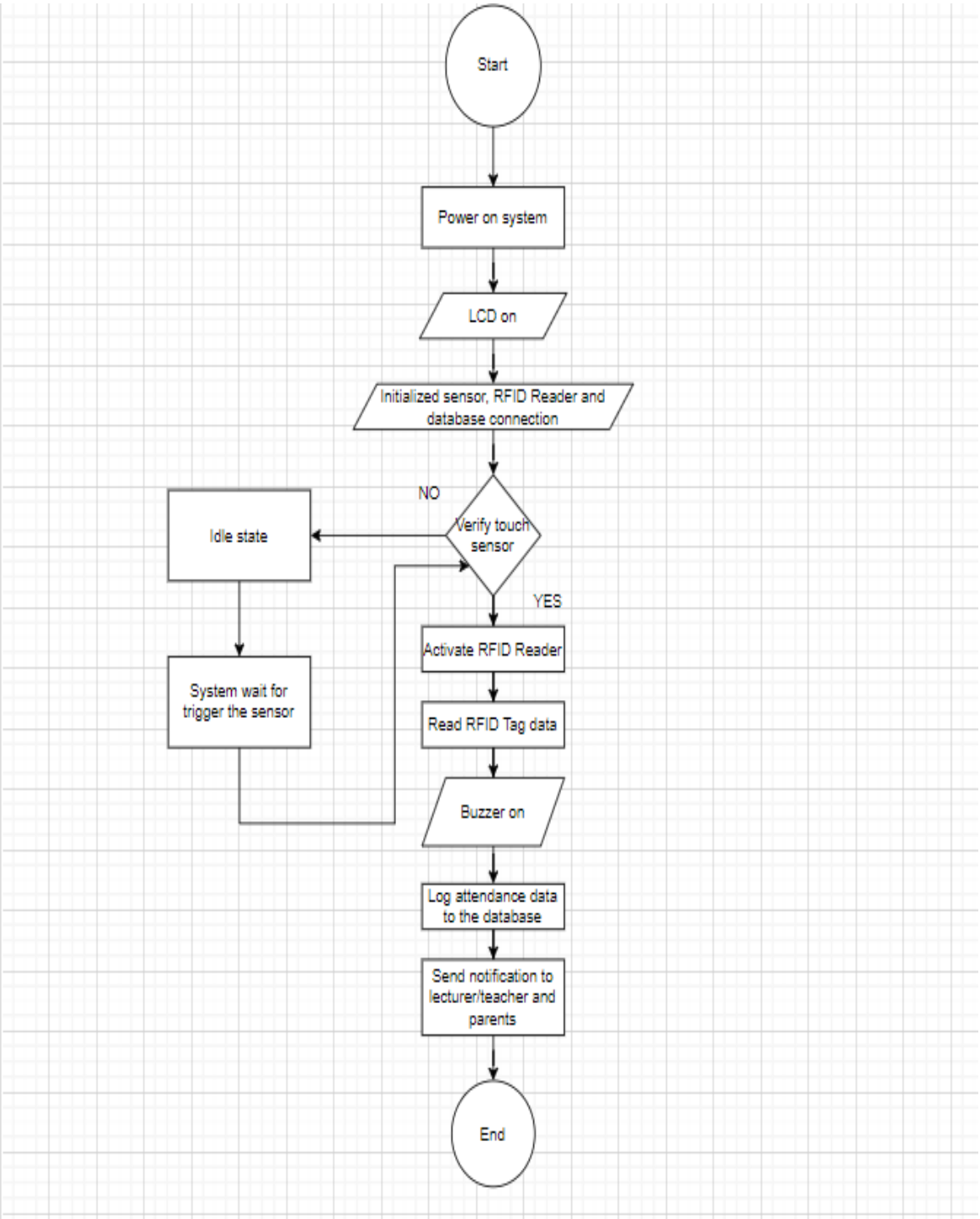
PRODUCT DESCRIPTION

The IoT-Integrated Attendance Management System is a state-of-the-art tool for automating and streamlining attendance monitoring in business and educational environments. The system's key components include an ESP32 microcontroller for effective data processing, a touch sensor for activation, and RFID technology for accurate identification. Users are immediately notified of successful registrations because of the real-time feedback provided by an LCD display that shows attendance status and a piezo buzzer that provides auditory signals. The system is now an IoT-enabled device with improved Wi-Fi connectivity, enabling administrators to remotely monitor and manage attendance data from any place with an internet connection. This feature guarantees safe and organized data storage in addition to reducing administrative duties. Future enhancements like biometric or facial recognition sensors for improved verification and data analytics for creating attendance trends and insights are made possible by the system's scalability and adaptability. The IoT-Integrated Attendance Management System, which is small and easy to use, is designed to satisfy the changing needs of attendance tracking and provides a dependable, effective, and futuristic substitute for conventional techniques.

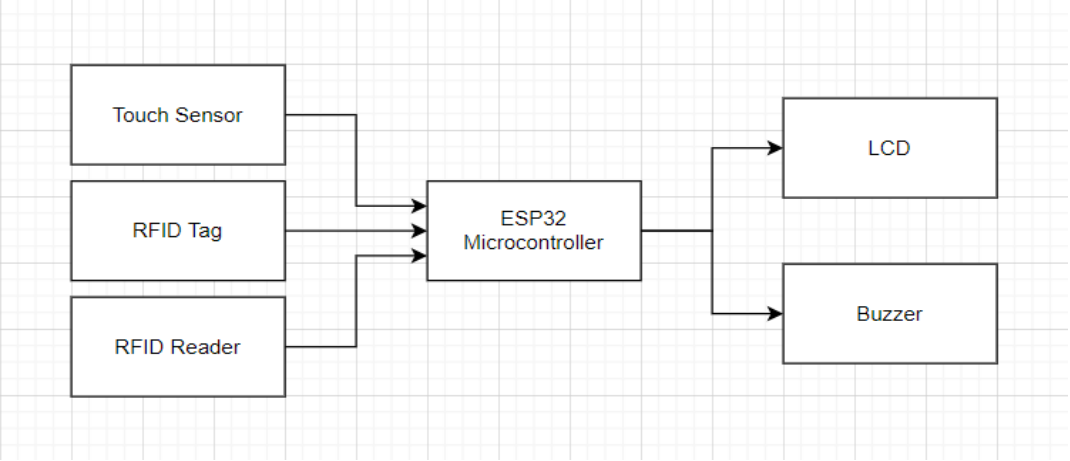
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarized as follow:

1. Flow Chart



2. Block Diagram



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the IoT-Integrated Attendance Management System lie in its innovative integration of RFID technology, touch sensors, and IoT capabilities. By leveraging an ESP32 microcontroller and Wi-Fi connectivity, the system provides seamless automation, real-time feedback, and remote monitoring of attendance records. Unlike conventional methods, this system ensures enhanced accuracy, security, and efficiency, eliminating errors associated with manual tracking. Its compact design allows easy implementation in educational and corporate environments, offering a user-friendly and reliable solution. This system combines advanced features with scalability, paving the way for future upgrades such as biometric verification and data analytics, making it a groundbreaking advancement in attendance management technology.

BENEFIT TO MANKIND

The IoT-Integrated Attendance Management System improves and automates attendance monitoring procedures in business and educational environments, which has major positive social effects. Teachers and management can concentrate on their primary responsibilities since it guarantees accurate record-keeping, lowers administrative tasks, and improves accountability. Its IoT connectivity and real-time tracking improve transparency and dependability by removing errors frequently found in manual processes. The system provides proficient security, detects attendance trends, and facilitates well-informed decision-making by supporting future improvements like biometric verification and data analytics. In the end, this creative approach fosters effectiveness, scalability, and equality, advancing workforce management, corporate operations, and education.

COMMERCIALIZATION POTENTIAL

There is a lot of room for commercialization of the RFID IoT Attendance System, which includes RFID tags and readers, an ESP32 microcontroller, a touch sensor, an LCD, and a buzzer. It simplifies procedures like time and attendance management, employment, and access control by providing effective, contactless attendance tracking for companies, events, and educational institutions. Its versatility is used in event management for security and attendance tracking, as well as in healthcare for patient or staff monitoring. This technology is positioned for broad adoption in sectors looking to improve data management and operational efficiency due to the growing need for IoT and automation solutions.

CONCLUSION

In conclusion, the development of the IoT-Integrated Attendance Management System is an interesting progress in presenting the monitoring and reporting of student attendance. By employing elements like the RFID tag and reader, touch sensor, and ESP32 microcontroller, the system efficiently captures and presents attendance data. The addition of an LCD screen for instant feedback and a buzzer for auditory notifications enhances the system's performance, offering clear and quick verification of each student's attendance status.There are a number of suggestions that can be made going ahead to improve the functionality and efficiency of the system. Firstly, adding biometric or facial recognition sensors to the system could add further layers of verification, increasing security and accuracy. Adding data analytics algorithms could also make it possible for the system to provide accurate statistics and spot attendance trends, which would help educators make wise judgements. Additionally, investigating the use of machine learning methods may make it easier to create more advanced attendance tracking plans that are customized to the unique requirements of various educational settings. Finally, field testing and teacher and student input would be crucial to improving the system and guaranteeing its usefulness in practical applications. All things considered, the IoT-Integrated Attendance Management System is a promising first step towards obtaining effective and automated attendance monitoring.

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Automated Food Temperature and Humidity Food Monitoring and Maintaining System

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ABSTRACT

This project demonstrates the developing of an Internet of Things (IoT)-based Automated Food Storage System intended to reduce waste and maintain food quality. The ESP32 microcontroller, at the heart of the system, incorporates an LCD for real-time data display, LEDs for status indication, and a DHT22 sensor for temperature and humidity monitoring. Connectivity to the Telegram for monitoring is made possible by a Wi-Fi module. By showing precise data and alerting users through the Internet of Things platform, the system responds dynamically to changes in the environment. The system's ability to sustain ideal storage conditions is verified by a detailed simulation. Using IoT technology, this scalable solution improves food storage management, lowers spoilage, and reduce losses due to any accident in home, bakery, refer truck or any commercial setting .

KEYWORDS: Temperature sensor, Internet Of Thing(IOT), Wifi-Module, Food Storage, LCD Screen.

PRODUCT DESCRIPTION

The IoT-based Automated Food Storage System is a clever and innovative solution for maintaining food quality and reducing waste in both residential and industrial settings. This system is powered by the ESP32 microcontroller, which serves as the central hub for monitoring, automation, and communication. It has a DHT22 sensor that continuously monitors temperature and humidity levels, ensuring appropriate storage conditions for diverse food varieties. The system has a 16x2 LCD display with real-time data visualization, allowing users to monitor environmental conditions at a glance. LED indications provide clear feedback on system status, and the built-in Wi-Fi module connects the system to the Blynk app. This offers remote monitoring and control, allowing users to change settings or receive notifications via their cellphones. The system is designed to be scalable and efficient, and it adjusts dynamically to changes in Storage conditions. It uses IoT technology to automate the process of maintaining optimal temperatures, decreasing spoilage, and extending the shelf life of volatile goods. This system, which is simple to set up and extremely flexible, is ideal for those looking to modernize food storage management. Whether you want to expand your personal pantry or improve industrial food storage systems, our Automated Food Storage System offers a dependable, sustainable, and cutting-edge solution.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

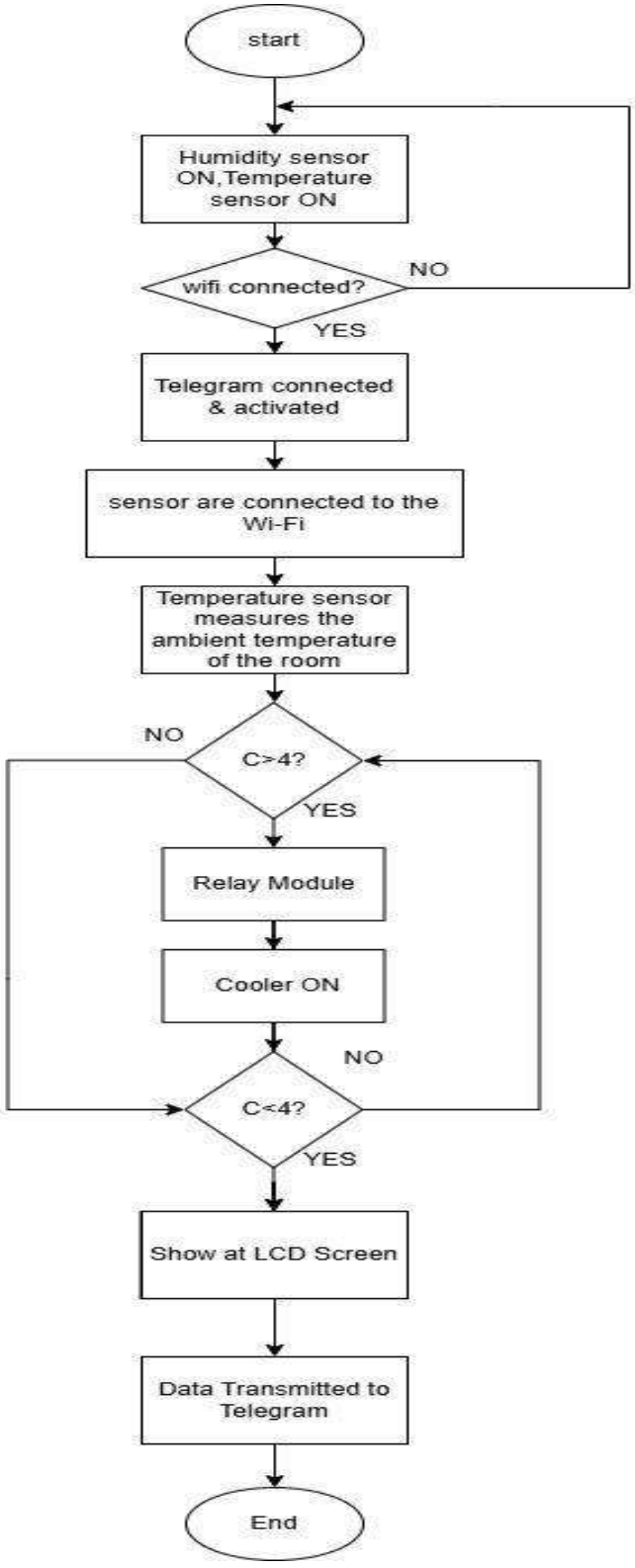


Figure 1: Flowchart of the automated food monitoring system

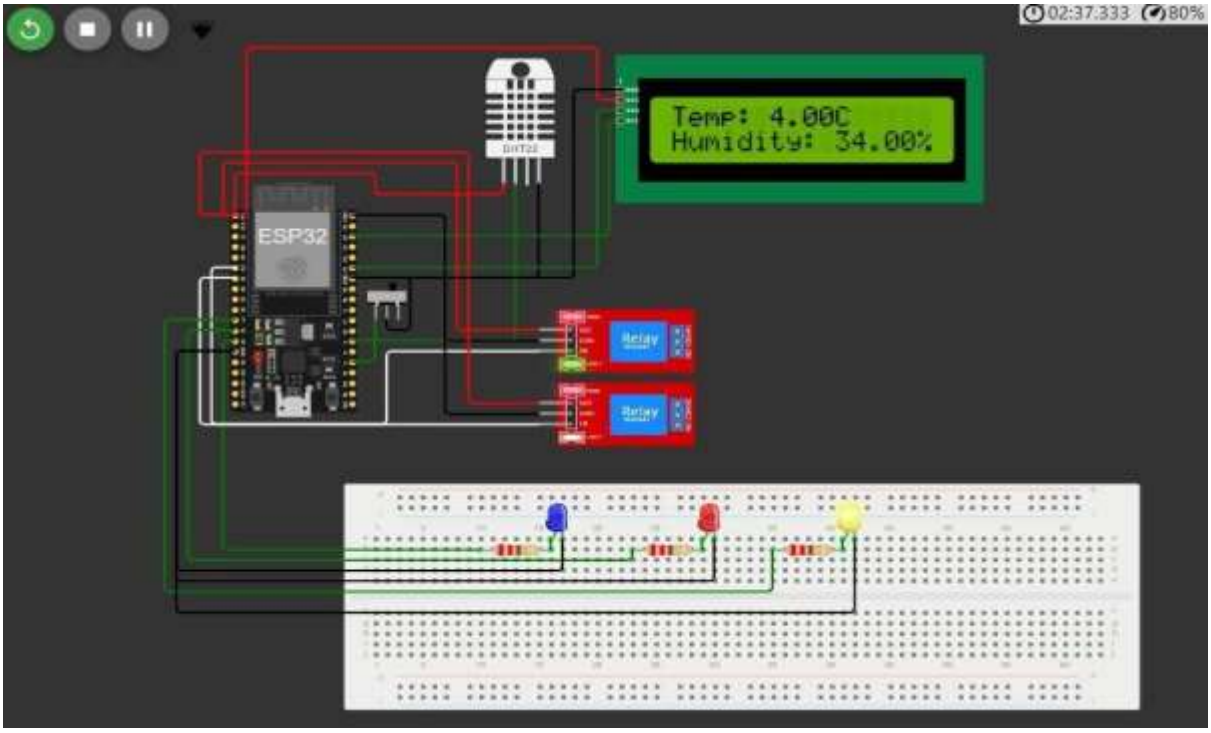


Figure 2: Simulation of project

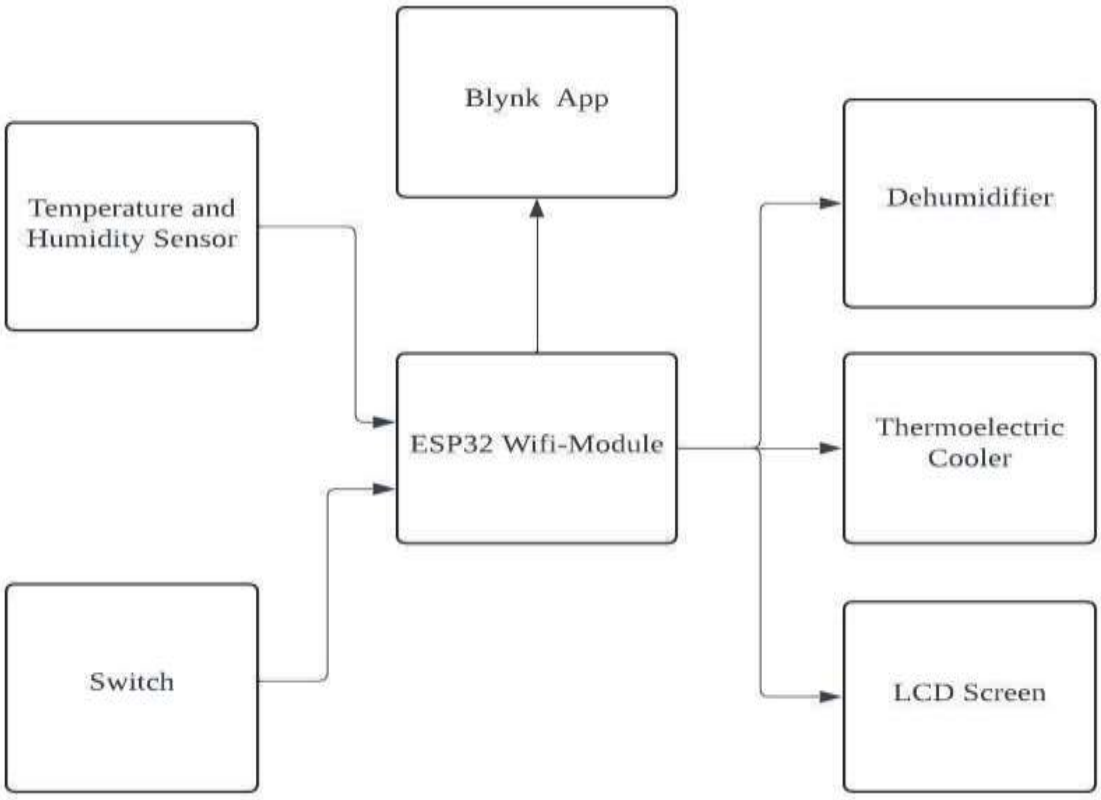


Figure 3:Block diagram of the project

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the IoT-based Automated Food Storage System lie in its integration of IoT technology with real-time environmental monitoring to optimize food preservation. Utilizing the ESP32 microcontroller and sensors like the DHT22, this system uniquely combines temperature and humidity monitoring with automated alerts and Real time info from telegram. Its ability to adapt dynamically to changing storage temperature and conditions while providing seamless connectivity for remote monitoring sets it apart from traditional food storage solutions. This innovation not only enhances the preservation of food quality but also reduces waste and accident through precision management, making it a valuable advancement for both household and commercial applications. The system's scalable design and integration of intuitive displays and indicators further ensure accessibility and practicality for diverse users. Its is also super customizable so it can be applied to any system like food heater at food stall or even cake display at a bakery.

BENEFIT TO MANKIND

The IoT-based Automated Food Storage System provides several benefits to society by addressing food preservation issues and minimizing waste. It continuously monitors temperature and humidity, ensuring optimal storage conditions to preserve food quality, prevent rotting and reduce accident. The system's automated alarms and remote monitoring features allow users to take timely measures while away, lowering the chance of food loss. Its integration with IoT technology supports energy-efficient operation, which helps to improve sustainability and reduce electric costs. The system is simple to set up and use, and it can be used in homes, restaurants, and food enterprises to improve food security while also lowering environmental effect. By increasing the shelf life of perishable commodities and encouraging better resource management, this approach promotes healthier lifestyles and more sustainable practices for individuals and communities.

COMMERCIALIZATION POTENTIAL

This IoT-based Automated Food Storage System has a high commercial potential due to its novel features and capacity to handle major food preservation issues. Its ability to monitor and modify environmental conditions in real time provides optimal food storage, making it an attractive option for households, restaurants, and the food supply chain business. The system's price, ease of use, and seamless IoT connectivity make it appealing to a diverse consumer base, including proficient in technology individuals and business enterprises. With a global emphasis on minimizing food waste and boosting sustainability, this solution perfectly meets market demands. Its capacity to lengthen food shelf life while reducing energy consumption makes it a standout choice for consumers who value cost-efficiency and environmental responsibility. Furthermore, the system's compatibility with modern smart home technologies broadens its market appeal by catering to the fast growing IoT-enabled device business. Entrepreneurs and enterprises can capitalize on this product by focusing on the residential and industrial sectors, promoting it as a critical tool for food security and sustainable living, and pushing acceptance in both local and worldwide markets.

CONCLUSION

In keeping with its main goals, this project was successfully completed. The ESP32 microcontroller, DHT22 sensor, LCD, and LED indicators are all successfully integrated into the IoT-Based Automated Food Storage System to monitor and preserve the best possible storage conditions for food preservation. Through Wi-Fi connectivity, the system accomplishes its objectives of remote management and real-time environmental monitoring, guaranteeing ood quality and minimizing spoiling. The project's ability to precisely react to changing conditions and handle sensor data dynamically has been shown through testing and certification. In addition to meeting the project's goals, this achievement offers a workable and scalable option for sustainable food storage that can be used in both residential and commercial settings.

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Daytech Anti-Theft Burglar Wireless Security

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ABSTRACT

The Daytech Anti-Theft Burglar Wireless Security System is an IoT-enabled solution designed to enhance home security by integrating reliable sensors, a microcontroller, and a smartphone application. The system employs an ultrasonic sensor to monitor specific areas, such as corridors, and alerts users to motion or any presence in real-time. Upon detection, it activates recording and notifies the homeowner through telegram. The homeowner can also control the system remotely, including turning it on or off. Magnetic reed switches monitor unauthorized access points, such as doors and windows. This cost-effective and scalable solution bridges gaps in traditional security systems by offering local real-time monitoring and user-friendly features. By ensuring enhanced safety and control, it empowers homeowners to live with greater peace of mind. A secure home fosters a sustainable lifestyle, promoting trust and confidence in technology to protect what matters the most.

KEYWORDS: IoT, Anti-Theft System, Video Recording, Real-Time Monitoring, Ultrasonic Sensor, Magnetic Reed Sensor

PRODUCT DESCRIPTION

The ultrasonic sensor monitors specific areas, such as corridors or doorways, detecting motion and automatically activating a recording function. Real-time notifications are sent directly to the user, keeping them informed and in control. An integrated high-definition external camera provides live video feeds, allowing users to visually verify and respond to potential security breaches through the mobile app. To secure the perimeter, magnetic reed switches safeguard doors and windows, triggering alarms upon unauthorized access. At the heart of the system, a powerful microcontroller processes sensor inputs and manages outputs, including alarms, sensors, and camera. Users can also reset alarms easily using an online method given. With robust internet or online integration, including remote control capabilities, the Daytech Security System offers a seamless, proactive approach to home protection. By combining real-time alerts, reliable technology, and intuitive features, it redefines modern home security.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

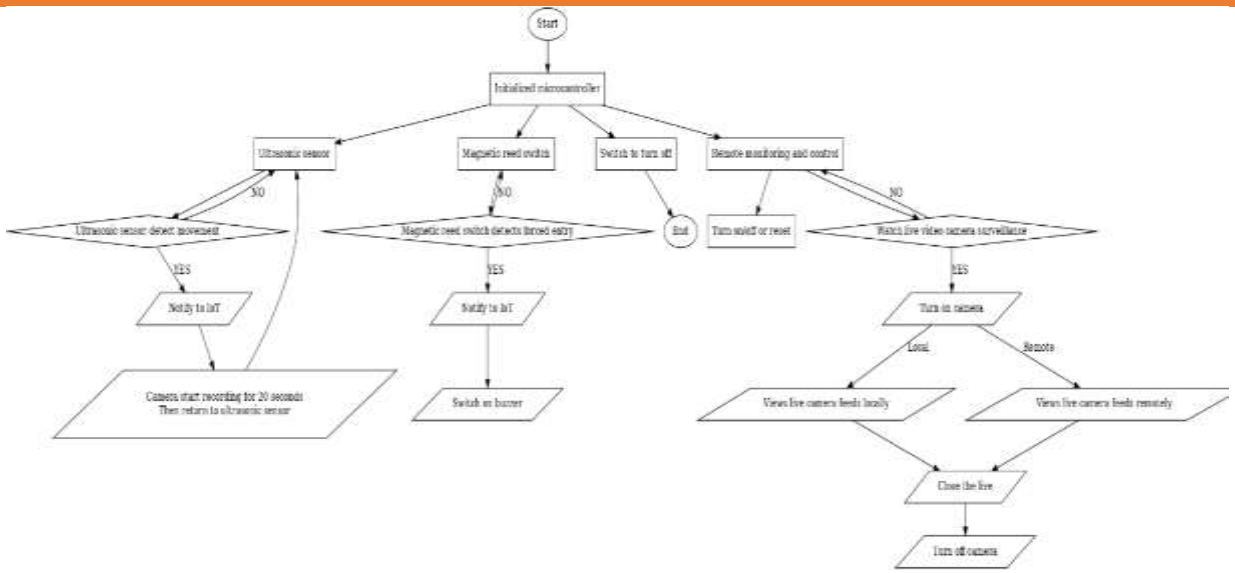


Figure 1: Flowchart

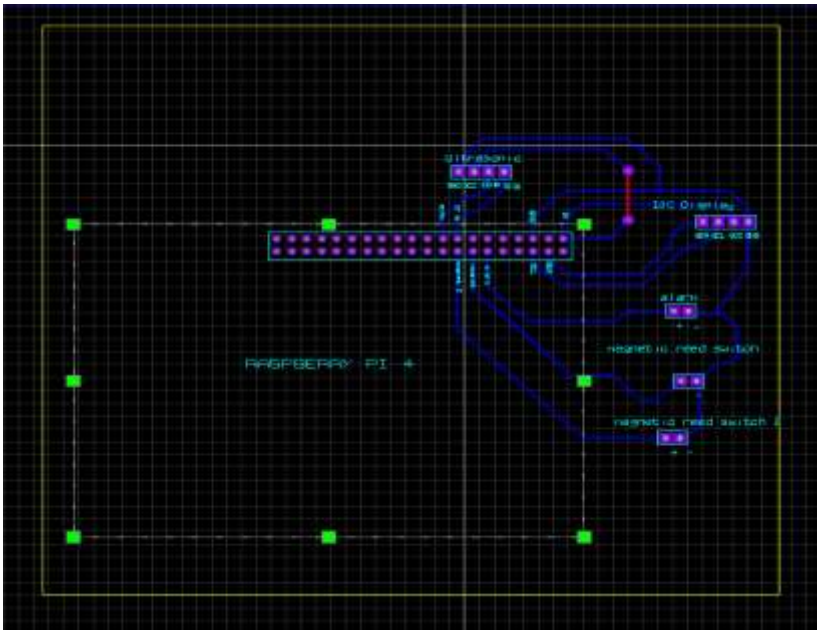


Figure 2: PCB Design



Figure 3: Block Diagram

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Daytech Anti-Theft Burglar Wireless Security System introduces a novel approach to home security by integrating ultrasonic sensors and an external camera for precise monitoring and enhanced surveillance. Unlike traditional systems, the ultrasonic sensor focuses on detecting motion at designated locations, such as doorways, activating recording and alerts, thereby minimizing false alarm. The integration of an external high-definition camera allows users to visually verify potential threats, adding a critical layer of real-time situational awareness. The system's IoT-enabled online based solution offers seamless remote control, enabling users to receive alerts, view recorded footage, and manage system condition whether on or off from anywhere, enhancing user convenience. With its minimalist architecture and modular design, the system is both scalable and energy-efficient, making it suitable for residential and commercial use.

BENEFIT TO MANKIND

The Daytech Anti-Theft Burglar Wireless Security enhances safety and peace of mind for homeowners by providing real-time alerts and detailed surveillance for key areas. Its ultrasonic sensor ensures targeted monitoring, while the external camera offers live feeds and recorded footage for better decision-making during security incidents. By making advanced security technology accessible and affordable, the system reduces vulnerabilities to theft and intrusions, thereby improving the quality of life for a wider audience and empowering individuals and communities to protect their assets effectively.

COMMERCIALIZATION POTENTIAL

The Daytech Anti-Theft Burglar Wireless Security System holds strong commercialization potential due to its combination of affordability, scalability, and user-centric design. By addressing key gaps in traditional security systems, such as limited remote access and false alarms, it offers a cost-effective and reliable solution tailored for both residential and commercial markets. Its IoT integration, featuring real-time monitoring, remote control, and live video feeds, aligns with the growing consumer demand for smart home technologies. The modular and energy-efficient design enhances its appeal, allowing easy customization and adaptation for diverse applications. As security remains a top priority for homeowners and businesses, the system's innovative features and accessible price point position it as a competitive product in the rapidly expanding home security market, fostering widespread adoption and long-term market sustainability.

CONCLUSION

The Daytech Anti-Theft Burglar Wireless Security System demonstrates significant advancements in modern security technology by integrating IoT-enabled sensors, a microcontroller, and a smartphone application. Its combination of ultrasonic sensors for motion detection, magnetic reed switches for perimeter security, and an adjustable high- definition camera provides precise, real-time monitoring and situational awareness. By offering seamless remote access, proactive alerts, and robust surveillance capabilities, the system effectively addresses the limitations of traditional security measures. The scalable and energy-efficient design makes it a versatile solution for residential and commercial applications, promoting accessibility and affordability without compromising functionality.

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Student E-Attendance Management System with Phone App

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ABSTRACT

An IoT-based Attendance System report using an Esp-32 microcontroller reveals an ultrasonic sensor, RFID reader, and fingerprint sensor integration. The ultrasonic sensor on the other hand picks out a person's presence to start the system so that energy conservation is honored by activating only one component at a time when the load demands it. The user verifies / authenticates the ID cards using the RFID reader, and the fingerprint sensor provides biometric verification. An LED screen displays user IDs, authentication status, and other relevant information in real-time. A Wi-Fi module is used to transfer live data to a central server for remote monitoring and control, and the attendance register is saved in an external module storage. The Proteus simulation platform, through which the system is developed, flexibly collects and processes sensor data as a means to control attendance. Beside ultrasonic activation as well, card authentication and biometric verification, are all combined to provide more advanced level security measures, reliability, and give the infrastructure efficient power consumption in the attendance management area.

KEYWORDS: RFID Reader, Fingerprint Sensor, Microcontroller

PRODUCT DESCRIPTION

Iot-Based Student E-Attendance Management System is an IoT based biometric attendance tool, which takes attendance management to the next level. Using RFID, fingerprint scanning, and ultrasonic sensors, this system records the presence of students without having to do manual roll call saving time and reducing clerical work. With excel, you receive immediate attendance updates, full reports, and mobile application support for remote access and monitoring. Excel helps educational institutions streamline and transform their attendance tracking processes, thereby improving accuracy, driving efficiency, and supporting accountability.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

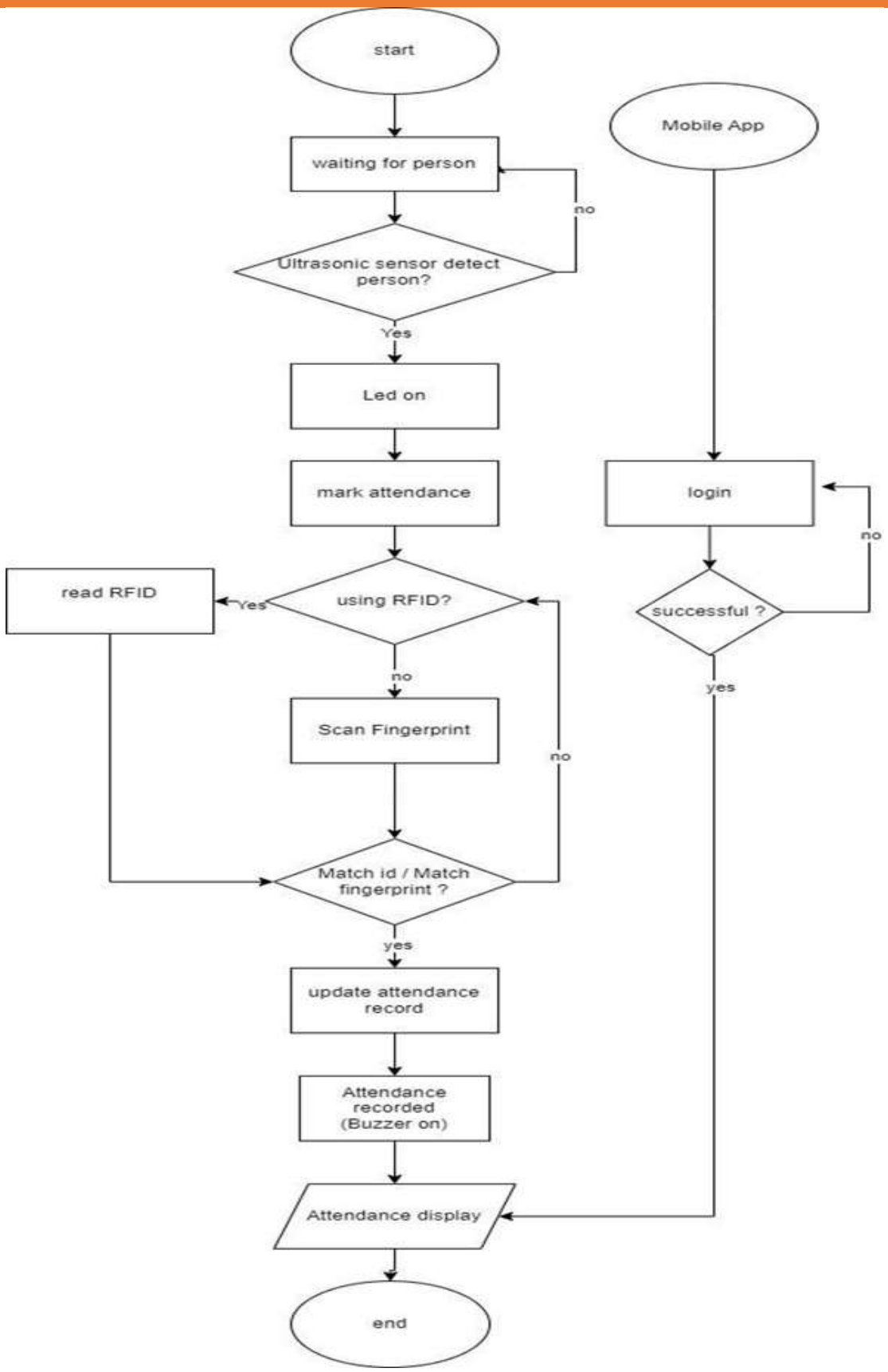
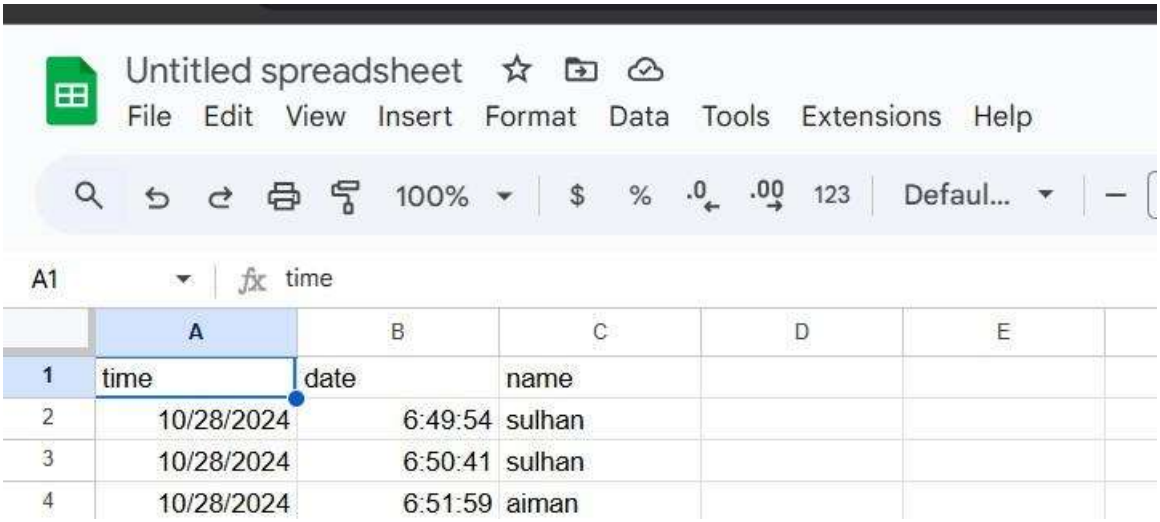


Figure1: Model Flowchart

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	A	B	C	D	E
1	time	date	name		
2	10/28/2024	6:49:54	sulhan		
3	10/28/2024	6:50:41	sulhan		
4	10/28/2024	6:51:59	aiman		

Figure2: App system

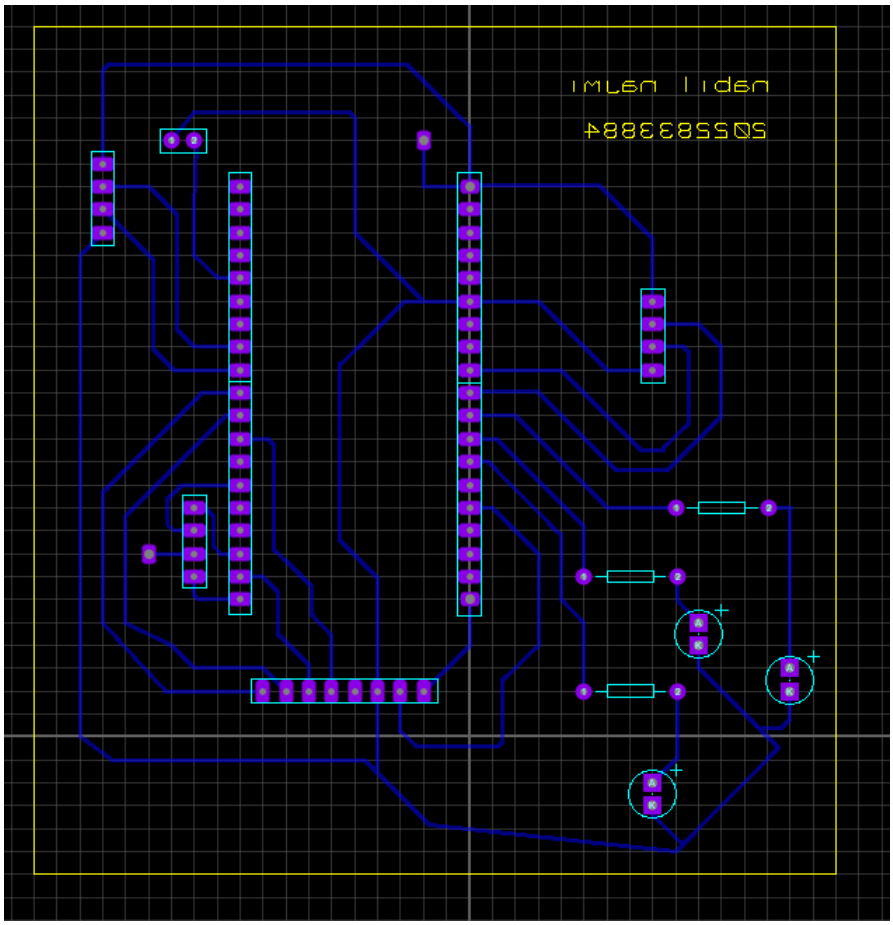


Figure 3: PCB Layout

NOVELTY AND UNIQUENESS

An innovative aspect of this project is the multi-sensory approach to student attendance. Traditional systems are either manual or depend on a single source or sensor of technology inputting data, but the proposed system combines various technologies like Ultrasonic Distance Sensors, RFID readers, and Fingerprint Scanner to provide a better analysis of student attendance. In addition, integrating the system with a mobile application that enables real-time data access and remote monitoring sets it apart from traditional attendance systems. Having access to this data in real-time allows educators and administrators to understand when students are attending at the same time easier to know how many students that is presence that day. This novel blend of cutting-edge sensors, live data processing, and mobile accessibility is a substantial

leap forward in student attendance tracking, delivering a far more effective, precise, and convenient alternative for educational establishments.

BENEFIT TO MANKIND

This system provides accurate and timely attendance tracking, this system greatly improves educational outcomes. This accelerates student ownership and enables a deeper focus on student learning and support by educators. Real-time data on students' attendance patterns allows educators and administrators to spot potential issues, such as absenteeism or disengagement, early. Such data can then be utilized to execute interventions that are targeted at student academic success, for example, academic counseling or additional support programs. Additionally, by offering accurate attendance records that can be used to track student progress, monitor school performance, and ensure equitable access to education for all students, the system facilitates transparency and accountability in the educational sector.

COMMERCIALIZATION POTENTIAL

The system can provide a cloud-based SaaS solution and help educational institutions to have a flexible and cost-effective way to access the platform. Thanks to this feature, the system can adjust with demands and needs of different educational institutions like schools, colleges, and universities. The app can be scaled up to new classes for items such as auto report generation, integration with school management systems, advanced analytics for data insights. If built to the education sector's evolving needs, this system could emerge as an effective and commercially successful product.

CONCLUSION

In conclusion, the development of the Student E-Attendance Management System with Phone App represents a significant advancement in the efficient and accurate management of attendance in educational institutions. By integrating multiple sensors, such as the Ultrasonic Distance Sensor, RFID Reader, and Fingerprint Sensor, the system ensures precise identification and verification of students. The use of these technologies not only automates the attendance recording process but also enhances security and reduces the potential for errors associated with traditional methods.The system's ability to handle different operational scenarios through the simulation platform Tinkercad demonstrates its robustness and adaptability. Successful verification scenarios, as well as error-handling mechanisms, showcase the system's reliability in providing real-time feedback and maintaining data integrity. Additionally, the incorporation of a Wi-Fi module allows for remote monitoring and control, adding a layer of convenience and accessibility for educators and administrators. Moving forward, this system has the potential to significantly streamline attendance management, promote student accountability, and support a more efficient and responsive educational environment.

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Automatic Street Light Using Solar Tracker

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ABSTRACT

Streetlights integrated with solar trackers and monitoring systems have a crucial role in electricity especially in Malaysia. The system includes Light light-dependent resistor for monitoring ambient light for each LED to increase the efficiency of Street lights and reduce the waste of electricity. With the integration of the solar system into the streetlight system, it can reduce the reliability of grid power. The application of the Internet of Things (IoT) increases the effectiveness of the monitoring system and fast maintenance and repair for the streetlights. It could reduce the number of accidents related to malfunctioning streetlights due to the limitation of light, especially during holidays or any celebration day. Since solar energy is renewable energy, it can be used continuously and can supply enough power for streetlights to operate during the night. The major purpose of this system is to provide continuous energy by using solar trackers for streetlight systems and to maintain all streetlights immediately based on data from the monitoring system. Therefore, the integration of solar systems and monitoring systems using Light- dependent resistors and IoT can benefit our environment, people, and energy.

KEYWORDS: Solar tracker**,** Light-dependent resistor (LDR), Internet of Things (IoT)

PRODUCT DESCRIPTION

Automatic Streetlight using solar tracker Integrate a solar tracking mechanism and automatic streetlight control system by using a relay module to turn it on/off. The solar tracker moves depending on the light direction from to sun to move the servo motor, maximizing energy capture. The streetlight system consists of an LDR for measuring the light level and triggering the relay module to turn on/off based on light conditions. Each streetlight attaches with LDR for monitoring each LED condition during the night. The system is controlled by an ESP32 microcontroller, the system includes LCD I2C for real- time status display for each streetlight based on data from LDR. Each time the LED malfunctions, there is a notification to alert the technician via telegram to maintain the streetlight and avoid electricity waste.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Circuit Diagram

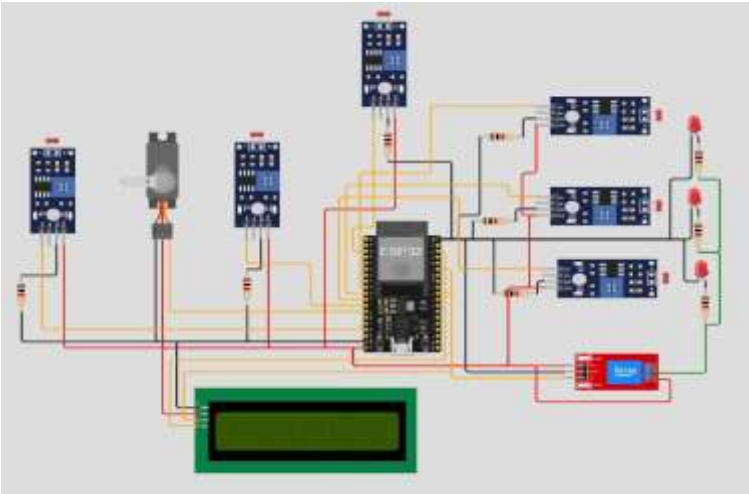


Figure 1.1: Circuit Diagram

2) Block Diagram

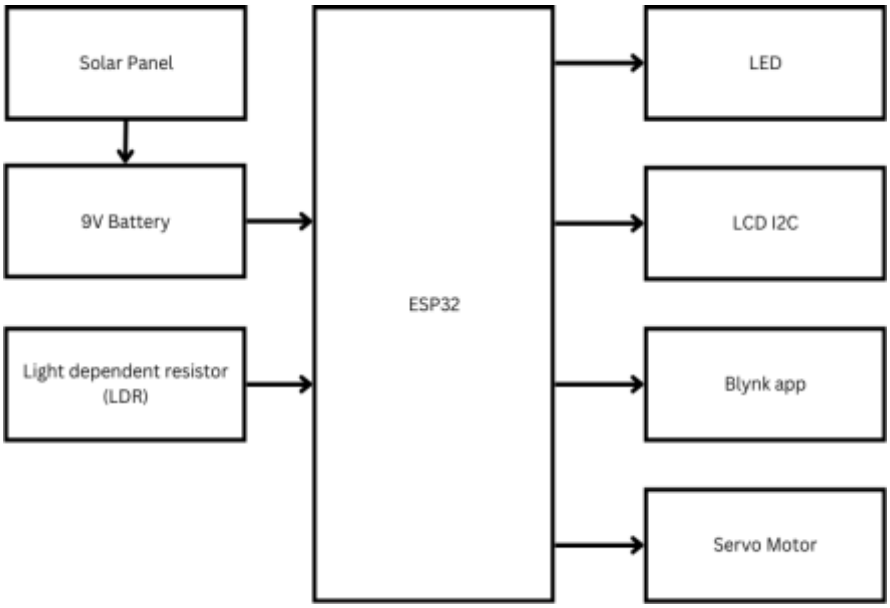


Figure 2.1: Block Diagram

3) Flowchart

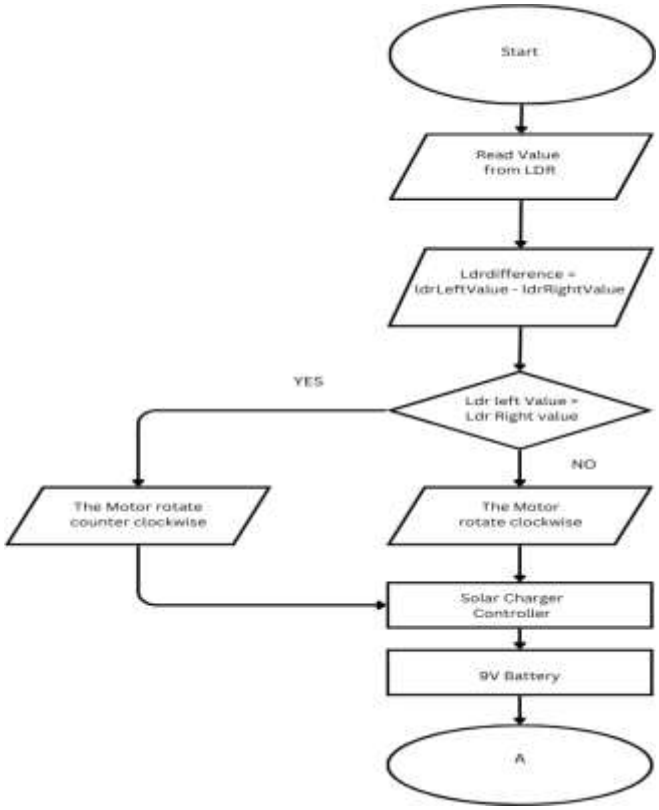


Figure 3.1: Solar Tracker Flowchart

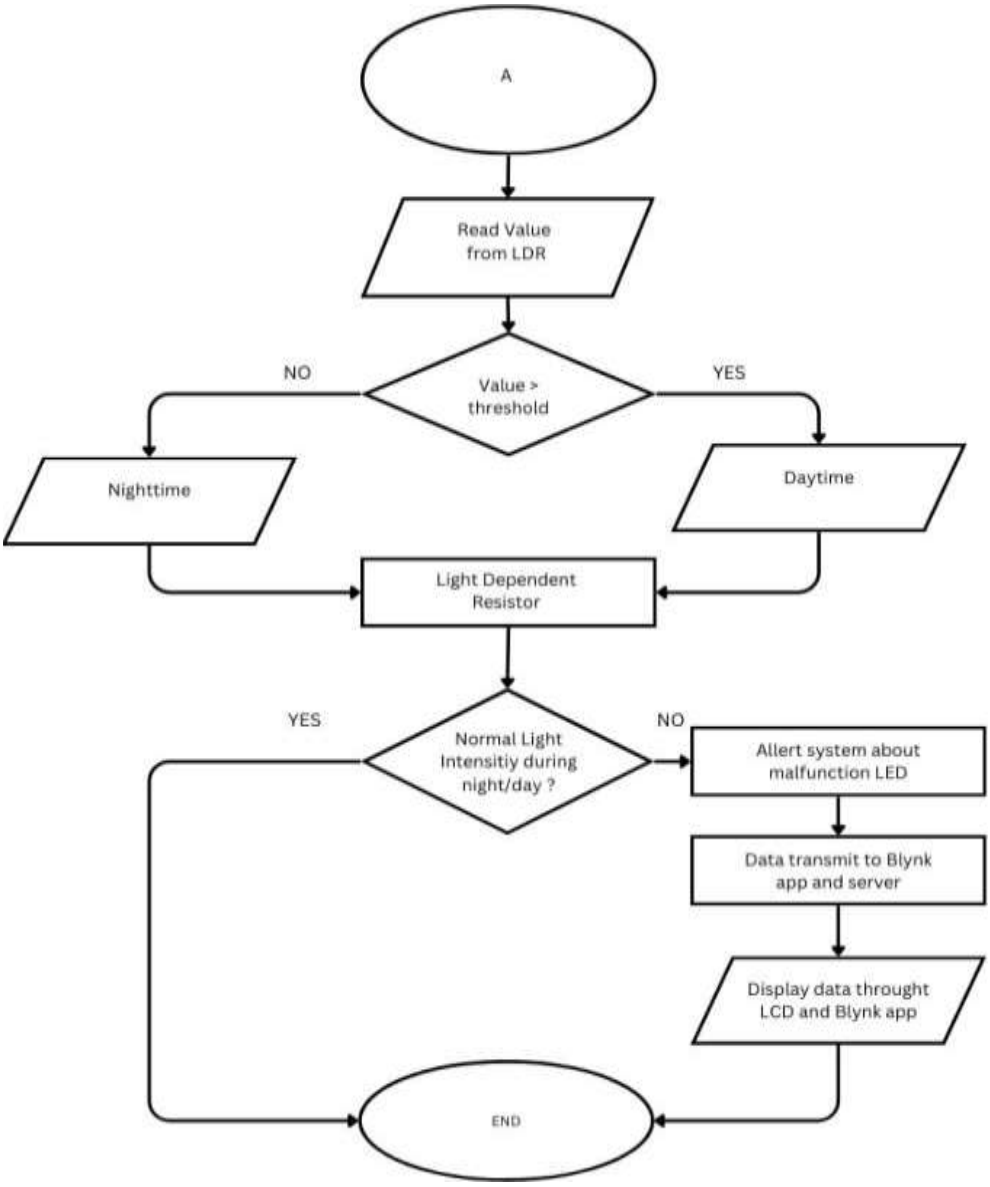


Figure 3.2: Automatic Streetlight Flowchart

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the automatic streetlight using a solar tracker is it combines a solar tracker with an automatic streetlight system into a single system. This project employs precise LDR-based light sensing and servo motors to control the solar tracker mechanism to maximize solar energy efficiency [1], while simultaneously operating the streetlight system. The integration of LCD I2C for real-time feedback and the use of an ESP32 microcontroller to access Telegram by using the internet for real- time notification. This innovative approach not only improves energy efficiency but also provides a scalable solution for sustainable energy management.

BENEFIT TO MANKIND

The Automatic Street light using Solar tracker could benefit mankind by promoting sustainable energy practices and enhancing energy efficiency through solar tracking and automatic streetlight system. Maximizing solar energy utilization during the day and efficiently managing streetlight operation at night, reduces energy waste and dependence on non-renewable energy sources [2]. With the integration of real-time monitoring through LCD I2C and Telegram for detecting streetlight failure, the amount of electricity waste can be reduced by alerting the technician to fix the streetlight based on monitoring system data. The major benefits of this system are to reduce the excess of electricity by using renewable energy and a real-time monitoring system for faulty streetlights [3].

COMMERCIALIZATION POTENTIAL

The project has significant commercialization potential due to its practicality, cost-effectiveness, and alignment with the growing demand for sustainable energy solutions. The integration of solar tracking and automated streetlight control makes it ideal for deployment in urban infrastructure, rural electrification, and smart city initiatives. Its scalability and adaptability allow it to cater to a wide range of applications, from residential and commercial buildings to public lighting systems. By reducing energy costs and reliance on non-renewable sources, the system appeals to governments, businesses, and individuals looking to invest in green technology, offering a compelling value proposition for the market.

CONCLUSION

In conclusion, this project combines solar tracking and automatic streetlights to create an innovative, energy-efficient, and sustainable lighting system by optimizing solar energy utilization and ensuring reliable nighttime illumination. With monitoring systems, they can minimize the excess of electricity energy from a faulty streetlight. The system's practical design and cost-effectiveness make it suitable for a wide range of applications, from urban infrastructure to rural areas. This project stands as a testament to the possibilities of smart, eco-friendly technology, paving the way for a greener and more sustainable future while addressing the critical need for efficient energy solutions.

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Automated Fingerprint Identification System for Final Examination

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ABSTRACT

The Automated Fingerprint Identification System is an attendance system with IoT, such as Google Sheets to assist monitor the attendance system and registration mode. The system is designed to ensure secure and accurate attendance tracking by leveraging fingerprint recognition and an RFID sensor for user identification. The user interface consists of an LCD display for interaction and feedback. The user interface consists of an LCD display for interaction and feedback. This system is powered by an ESP32 microcontroller, which processes data from various sensors. A fingerprint will detect finger from user after user tap their card/keychain on RFID sensor. It employs push buttons for user registration and memory reset and integrates both visual and auditory feedback mechanisms using LEDs and a buzzer. The system's core functionalities include handling user inputs, verifying credentials and confirming attendance through fingerprint recognition. This innovative approach aims to enhance the reliability and security of attendance systems in various applications, providing an effective solution for educational institutions for accurate attendance monitoring.

KEYWORDS: Attendance System, Internet of Things (IoT), Fingerprint Sensor, RFID Sensor, LCD Display, User Interface, ESP32.

PRODUCT DESCRIPTION

The Fingerprint Attendance System is an innovative project designed to simplify and enhance attendance management using biometric technology. This system leverages an ESP32 microcontroller, integrated with a fingerprint sensor, to provide an accurate, reliable, and secure method of tracking attendance. By eliminating the need for traditional methods such as paper-based records or manual logins, the system reduces the risk of errors, time theft and administrative inefficiencies. Due to the increasing requirement for an integrated identification system across all low enforcement and security protocols, the majority of fingerprint identification techniques are used now automated and digital [1]. This application will be extremely essential for the security and protection for any of peculiar data [2]. The system operates by enrolling users fingerprints into a database, enabling seamless identification during attendance marking. Its real-time capabilities ensure instant verification and data recording, which can be accessed and analyzed for better resource management. This project is designed to be user-friendly, cost-effective, and scalable, making it suitable for diverse environments, including schools, offices, and industrial settings. By incorporating biometric technology, the project offers a secure and tamper- proof solution, ensuring that attendance records are accurate and trustworthy. Furthermore, the system's compact design, affordability, and adaptability to various settings position it as a promising candidate for commercialization in the global market for smart solutions. This project demonstrates a significant step toward embracing digital transformation in attendance management systems. Display LCD to show the modes and student ID. A fingerprint sensor is used to detect and identify a person. This can prevent them from changing their identity with another person. Meanwhile, push button can be used for choosing options provided. Besides, RFID sensors represent student cards. So, an RFID sensor is an alternative for students to register their fingerprint. If fingerprint and RFID cannot detect that person, LED and buzzer will turn on. The data will send information to Google Sheets. In [3], have suggested that a wireless attendance management system based on iris recognition was proposed using Daugman’s algorithm. The system uses an off-line iris

recognition management system that can finish all the process including capturing the image of iris recognition, extracting minutiae, storing and matching but it is difficult to lay the transmission lines where topography is bad.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

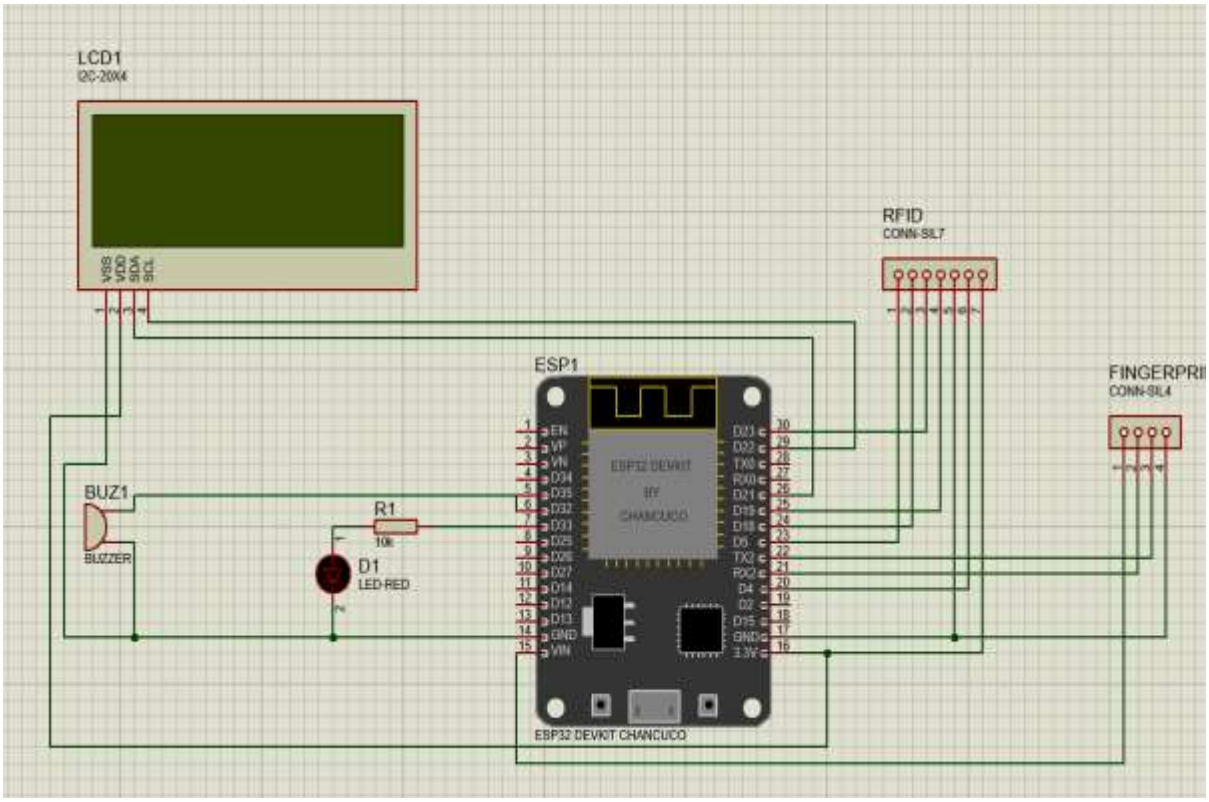


Figure 1: Schematic Diagram

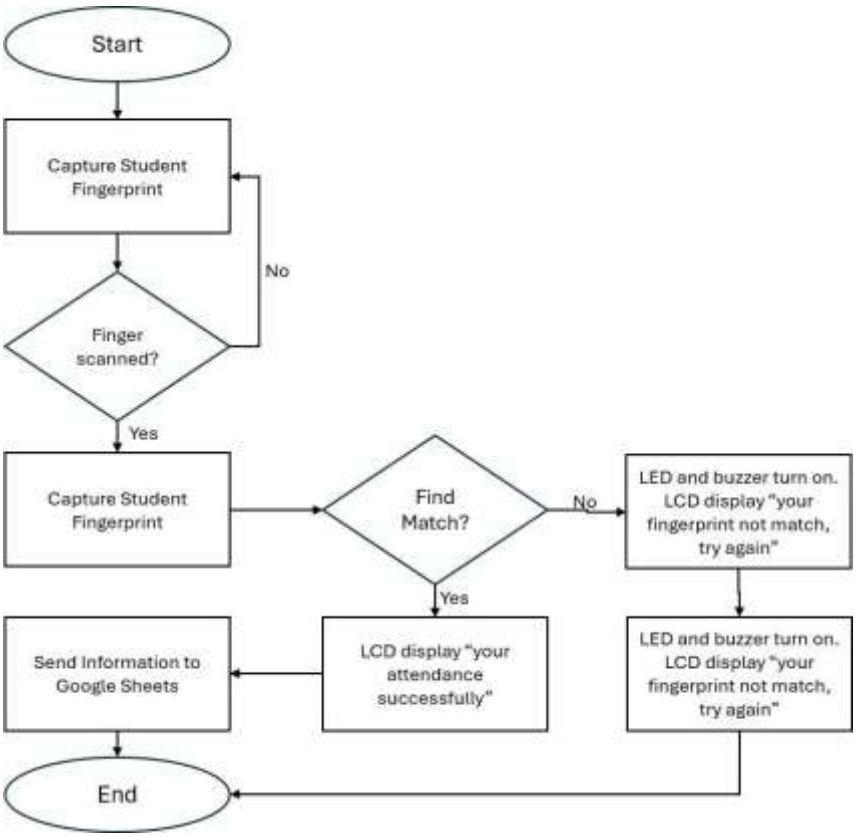


Figure 2: Flow charts of processes in the Automated Fingerprint Identification System

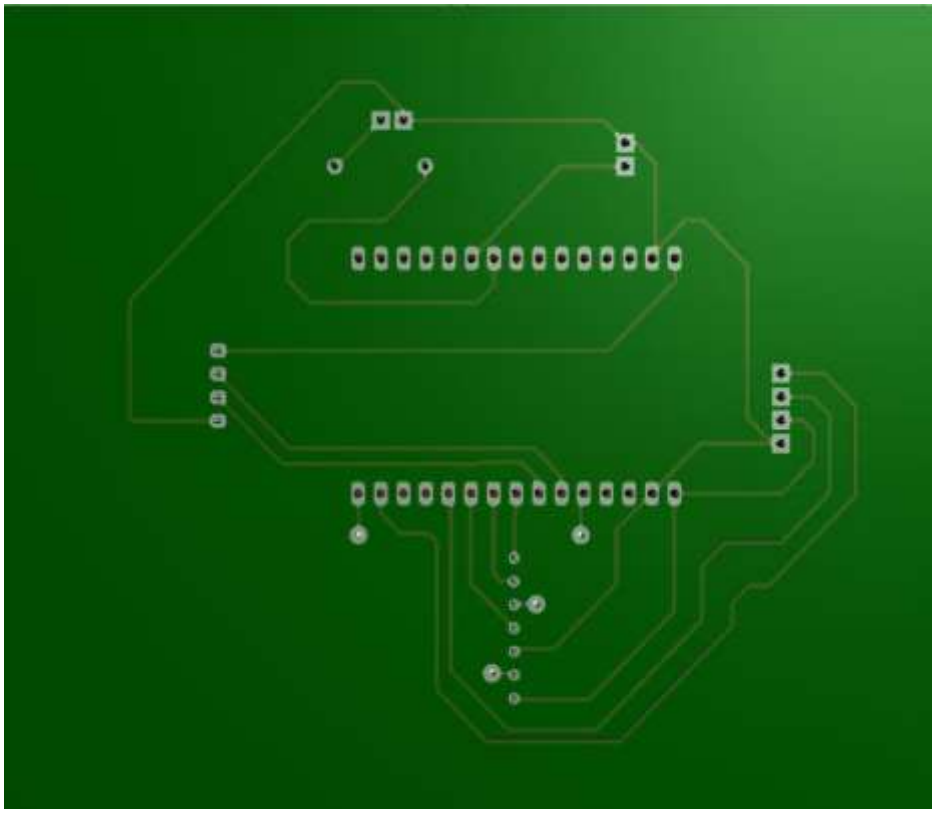


Figure 3: PCB Design

NOVELTY AND UNIQUENESS

The Automated Fingerprint Identificaiton System is a novel and unique solution that addresses the challenges of traditional attendance management methods. By integrating biometric fingerprint recognition technology, it ensures accurate and tamper-proof tracking of attendance, eliminating the risks associated with manual records or RFID- based systems. The system leverages the capabilities of the ESP32 microcontroller, known for its low power consumption, robust processing and Wi-Fi connectivity to enable real-time data processing and seamless communication with cloud servers or local databases. This innovative approach allows for instant attendance logging, enhancing efficiency and reliability. What sets this system apart is its cost-effective design, making it an affordable alternative to commercial biometric attendance solutions, especially for schools, small offices, and organizations with budget constraints. Additionally, its modular and scalable structure allows for easy customization and integration into existing infrastructures. The system is user-friendly, requiring minimal technical knowledge for operation, and is designed for energy efficiency, making it suitable for long-term use in areas with limited power resources. By combining affordability, security and advanced technology, the Fingerprint Attendance System stands out as a highly distinctive and impactful solution in the field of attendance management.

BENEFIT TO MANKIND

The Automated Fingerprint Identification System offers significant benefits to mankind by revolutionizing the way attendance is managed in various sectors. By leveraging biometric fingerprint recognition, it provides a secure and accurate method of tracking attendance, reducing fraud and errors commonly associated with traditional manual or card-based systems. This enhances accountability and productivity in workplaces, educational institutions, and organizations. Its affordability and scalability make it accessible to smaller organizations and underprivileged communities, helping bridge the technological gap in attendance management systems. Furthermore, the system promotes environmental sustainability by minimizing the need for paper-based records, contributing to a greener and more eco-friendly solution. With its user-friendly interface and real-time data processing, it saves time and reduces administrative burdens, enabling users to focus on more critical tasks. The integration of advanced technology, such as the ESP32 microcontroller, ensures a reliable and energy- efficient operation, making it suitable for areas with limited resources. Ultimately, the Fingerprint Attendance System empowers communities by providing a modern, efficient, and secure solution that improves

operational efficiency and fosters transparency and fairness.

COMMERCIALIZATION POTENTIAL

The Automated Fingerprint Identification System demonstrates strong commercialization potential due to its affordability, reliability and applicability across various industries, including education, offices, healthcare and manufacturing. Designed with the cost- effective ESP32 microcontroller and biometric fingerprint technology, it offers an accessible and secure alternative to traditional attendance methods, meeting the growing demand for efficient and modernized solutions. Its user-friendly design, real-time data processing, and scalability make it ideal for organizations of all sizes, while its plug-and- play functionality simplifies deployment and reduces setup costs. The system's potential for customization, software upgrades and maintenance services further enhance its market appeal, positioning it as a versatile and innovative solution in the global biometric attendance market.

CONCLUSION

In conclusion, the Automated Fingerprint Identification System is a groundbreaking innovation that combines affordability, reliability, and advanced biometric technology to address the limitations of traditional attendance methods. Its novelty lies in its use of the cost-effective ESP32 microcontroller, providing a scalable and real-time solution suitable for various industries. The system's uniqueness stems from its ability to deliver precise, secure, and efficient attendance tracking, reducing errors and enhancing productivity. With significant benefits to mankind, including fostering accountability, promoting digital transformation, and optimizing resource management, this system contributes to societal advancement. Furthermore, its strong commercialization potential, driven by its adaptability, ease of use, and cost-effectiveness, positions it as a viable product in the growing global market for biometric solutions. This project embodies innovation and practicality, offering a solution that is not only beneficial but also scalable for widespread adoption.

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Automated Parking Management and Monitoring System

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ABSTRACT

The Automated Parking Management and Monitoring System is an IoT-based solution designed to optimize and improve parking management in modern facilities. By integrating IoT into the system, users can quickly see which parking spaces are available and help them save time. The system combines sensors, microchips, and software tools to provide an efficient, secure, and user-friendly experience. The user interface consists of an LED, LCD display and servo motor for interaction and feedback. This innovation addresses the challenges commonly faced in parking management, including inefficiencies, security concerns, and lack of real-time monitoring. By leveraging advanced IoT technologies, it ensures a smooth, secure, and user-friendly parking experience while enhancing operational efficiency and providing real-time updates to users and administrators. This system uses advanced sensors and real-time monitoring to track available parking spaces, ensuring optimal space utilization. The flood monitoring feature makes the system even more reliable and valuable, especially in areas prone to heavy rainfall or water accumulation. It not only helps to manage parking effectively but also adds a layer of protection.

KEYWORDS: advanced, facilitate, monitoring, LED, LCD, IoT, Servo motor, sensors

PRODUCT DESCRIPTION

The Automated Parking Management and Monitoring System is a smart and easy-to-use solution for managing parking. Using advanced IoT technology, this system combines infrared sensors to detect the presence of a vehicle, RFID and servo motor for gate system and Water sensor for flood sensors in Car Park. [4] The system also includes access control features, allowing seamless entry and exit. With its user-friendly interface and reliable performance, this system is ideal for shopping malls, office buildings, airports, and other busy parking areas, offering an improved parking experience for both drivers and parking lot operators. The system uses real-time sensors to monitor parking space availability, allowing drivers to easily find open spots through IoT, either via mobile apps or digital displays. [1] This eliminates the frustration of searching for parking and saves valuable time. The system uses real-time sensors to monitor parking space availability, allowing drivers to easily find open spots through an IoT technology, either via mobile apps or digital displays. [2]

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Flow charts of processes in the Automated Parking Management and Monitoring Systems

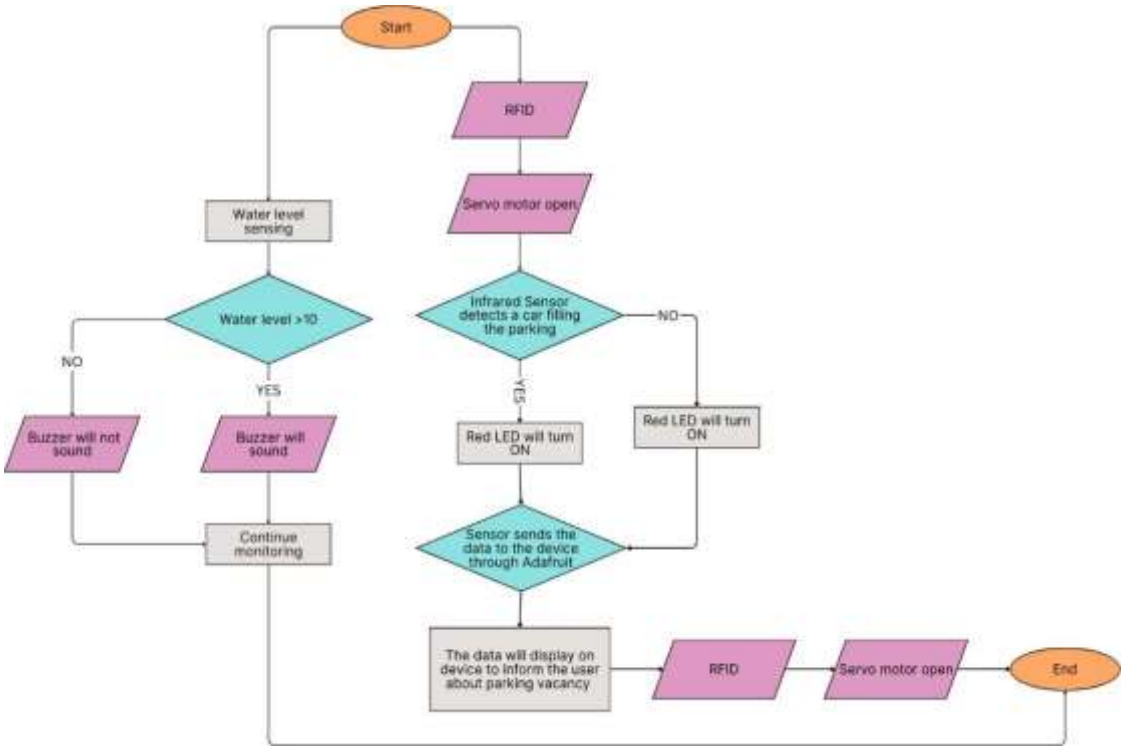


Figure 1: Flow chart of processes in Automated Parking Management and Monitoring Systems

Block diagram

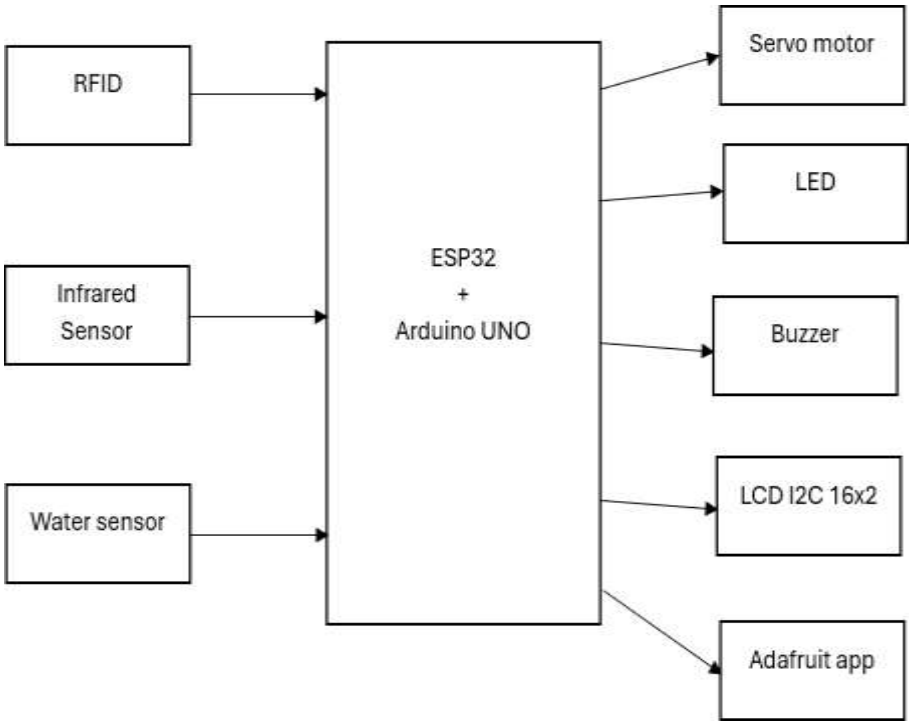


Figure 2: Block Diagram

3. PCB design

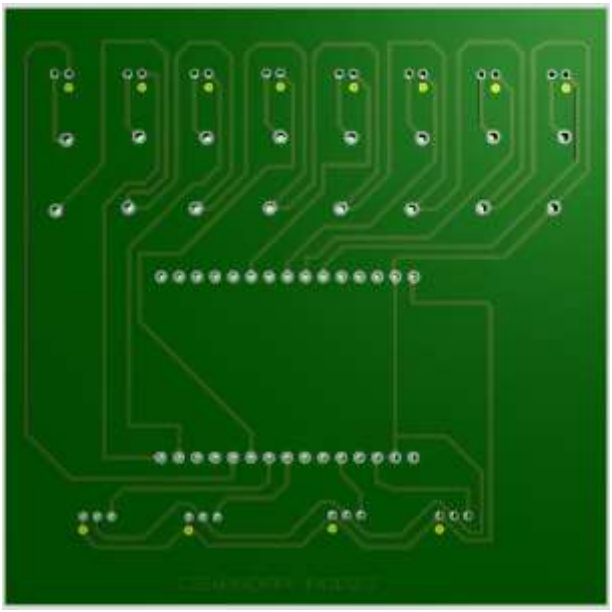


Figure 3: PCB design

NOVELTY AND UNIQUENESS

The system's novelty lies in its integration of advanced sensors and real-time parking space monitoring, along with automated parking management using IoT technology and access control. The system's ability to track parking space availability using IoT technology significantly enhances user convenience, allowing drivers to quickly locate open spaces via mobile apps or digital displays. This time-saving feature addresses a common issue in crowded parking areas, offering smoother and more efficient parking experience. Unlike traditional parking management systems, this system can detect rising water levels in parking lots and automatically activate a buzzer to alert users and operators to potential flooding. This added safety feature ensures the protection of vehicles and prevents damage caused by floods. The combination of IoT, flood monitoring, and automated parking management makes this system a unique solution for modern parking challenges and improved safety in one complete system.

BENEFIT TO MANKIND

The Automated Parking Management and Monitoring System offers several key benefits to mankind, particularly in terms of convenience, efficiency, and sustainability. The system maximizes the use of available parking spaces, reducing the time spent searching for a spot. This not only saves time for drivers but also decreases traffic congestion in parking areas, leading to smoother urban mobility. Data collected by the system provides insights into parking trends, peak hours, and usage patterns, helping city planners and parking operators make informed decisions about infrastructure development and optimize parking management in urban areas. [3]

COMMERCIALIZATION POTENTIAL

The Automated Parking Management and Monitoring System has strong commercialization potential, driven by current trends in urbanization, smart cities, and sustainability. The system also generates valuable data on parking trends, peak hours, and user behavior, which can be monetized through partnerships with parking lot owners, urban planners, real estate developers, or municipal governments. The ability to provide actionable insights through data analytics adds further commercial value.

CONCLUSION

In conclusion, the Automated Parking Management and Monitoring System combines modern technology with the everyday needs of parking management, offering a simple and effective solution for both drivers and parking lot operators. It helps to use parking spaces more efficiently and makes the process easier for everyone. The system's features and "ease of use" make it a valuable tool for improving parking in cities. With its potential for wide use and clear benefits, it provides a practical solution for today's parking challenges.

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Automatic Cat Kibble and Water Dispenser

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ABSTRACT

The Automatic Cat Kibble and Water Dispenser presents a fully automated pet feeding system that integrates time-based auto dispensing, level monitoring, and manual override functionalities that are designed for convenience. By employing various components with different functions such as Real-Time Clock (RTC) modules for precise scheduling, various sensors including water-level sensor and ultrasonic sensor to monitor kibble and water level, and servo motors for dispensing. The system also incorporates an LCD display to ease user interaction, and a camera module to monitor the surroundings, ensuring a better security.This innovation addresses the challenges pet owner may face, including those that are busy or travelling, ensuring pets receive a timely and sufficient nourishment [1]. By integrating IoT in the system, pet owners have the option to wirelessly control the system for more flexibility [2].

KEYWORDS: pet feeding system, RTC, sensors, servo motors, camera module

PRODUCT DESCRIPTION

The Automatic Cat Kibble and Water Dispenser is an automated pet-feeding device combining advanced sensors, actuators, and microcontroller technology. The dispenser contains two compartments for kibble and water, each monitored by an ultrasonic sensor and water-level sensor to ensure adequate levels [3]. A Real-Time Clock (RTC) module allows pre-programmed meal times [6], while a manual way of controlling the dispensing option is available to provide flexibility. The system is powered by a microcontroller [5], and features an LCD display for its interface [4].The system is also equipped with a camera module, allowing user to monitor the surrounding. An alert mechanism is also included that will notifies users when refilling is needed. IoT in the system will ease the control of the system whenever needed without needing to physically interact with the device.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. Flow charts of processes in the Automatic Cat Kibble and Water Dispenser

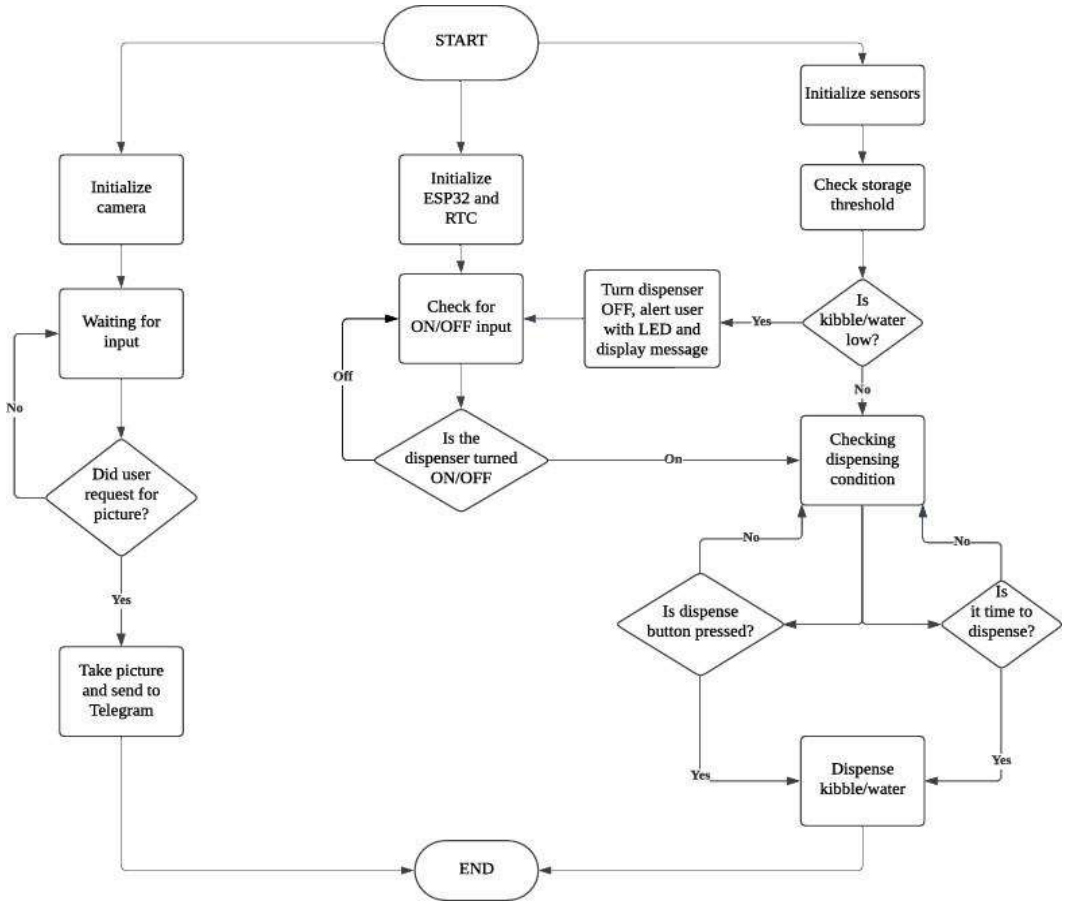


Figure 1: Flow chart of processes in Automatic Cat Kibble and Water Dispenser

2. PCB Design

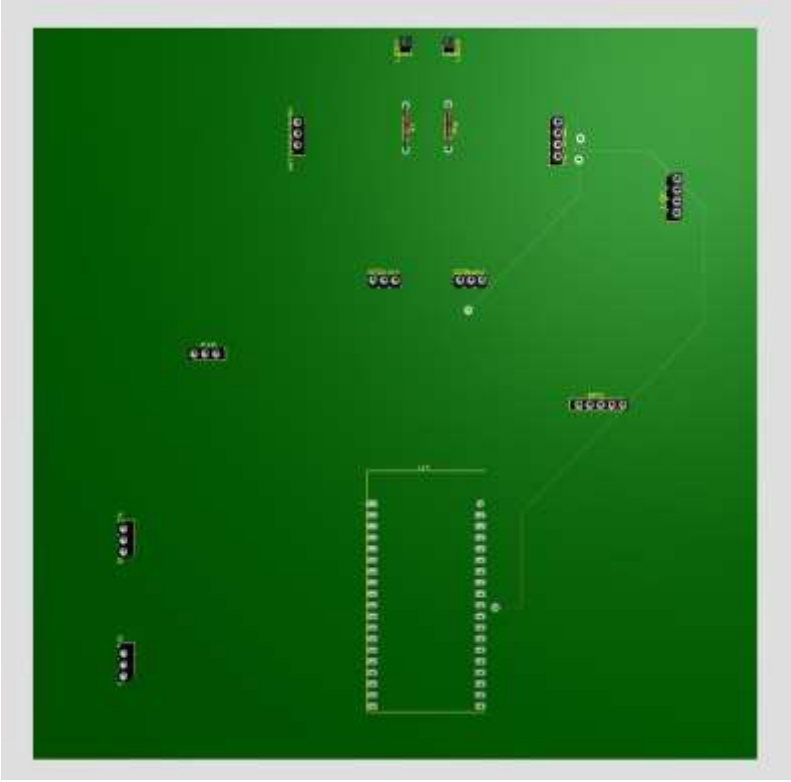


Figure 2: PCB design used in the Automatic Cat Kibble and Water Dispenser

NOVELTY AND UNIQUENESS

The system's novelty lies in its integration of camera module and time-based feeding mechanism with real-time kibble and water level monitoring while allowing manual control on the dispenser, enhancing both functionality and reliability. Unlike traditional feeders, the system provide an easy way of monitoring on both kibble and water, minimizing the risk of pet neglect. The inclusion of an RTC module for scheduled feeding time makes it a preferred solution in the pet-care world.

BENEFIT TO MANKIND

This invention and innovation offers significant benefits to pet owners by ensuring their pets' health, even in their absence. The device can reduce the needs and stress associated with maintaining consistent feeding schedules, particularly for individuals with a very busy and demanding lifestyles. Additionally, the dispenser also promotes pet care while allowing owner to monitor the surroundings with the camera embedded in the system.

COMMERCIALIZATION POTENTIAL

The Cat Kibble and Water Dispenser holds significant commercialization potential due to the growing pet care market. The device's features address a clear need for pet owners, making it more appealing to a wide audiences. The cost-effective ensures the product affordability, while its functionalities makes it stand better among competitors. The product can be marketed through various ways, including online retail platforms, pet care stores, and veterinary clinics.

CONCLUSION

The project combines advanced technology with practical pet care needs, resulting in an innovative product that simplifies pet ownership. The Cat Kibble and Water Dispenser ensures consistent pet nourishment and hydration, addresses the challenges of modern lifestyles of pet owners, and contribute to overall well-being of pets. Its features, benefits, and marketability place it as a valuable product to the pet-care industry.

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Keyswitch Alarm Systems for Real-Time Security Monitoring

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ABSTRACT

This project focuses on designing and implementing an advanced home security system using an ESP32 microcontroller integrated with passive infrared (PIR) motion sensors, key switches, a pushbutton, and a keypad. Traditional CCTV systems often suffer from continuous bandwidth consumption and lack of real-time notifications for suspicious activities. To address these limitations, the proposed system employs PIR sensors for motion detection, enabling efficient monitoring of residential properties. The key switch provides a manual arming and disarming mechanism, enhancing user control and minimizing false alarms triggered by homeowner movements [1]. The keypad introduces an additional layer of security by allowing users to disarm the alarm system through a password, ensuring that unauthorized access triggers an audible alert. Additionally, the pushbutton detects door/window status changes, ensuring comprehensive security coverage [3]. Outputs include an LCD for system status display, a buzzer for audible alerts, and LEDs for visual indication of security states. This solution aims to optimize energy consumption, provide timely alerts for potential threats, and offer a user-friendly interface for enhanced residential security.

KEYWORDS: *ESP32, home security system, passive infrared sensor, PIR motion sensor, key switch, pushbutton, keypad, LCD display, buzzer, LED indicators, real-time notifications, energy efficiency*

PRODUCT DESCRIPTION

The Keyswitch Alarm Systems for Real-Time Security Monitoring is a reliable and energy-efficient solution designed to enhance residential security. Equipped with PIR motion sensors, it provides accurate motion detection while minimizing false alarms. A key switch allows manual arming and disarming, and a keypad adds an extra layer of security by enabling password-based alarm disarming, with incorrect entries triggering an audible alert. The pushbutton monitors door and window statuses, ensuring comprehensive coverage. The system features a buzzer for alerts, LED indicators for system states, and an LCD for real-time updates, all designed to provide an intuitive and user-friendly experience. This advanced system optimizes energy consumption while delivering real-time protection and convenience for your home [2].

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

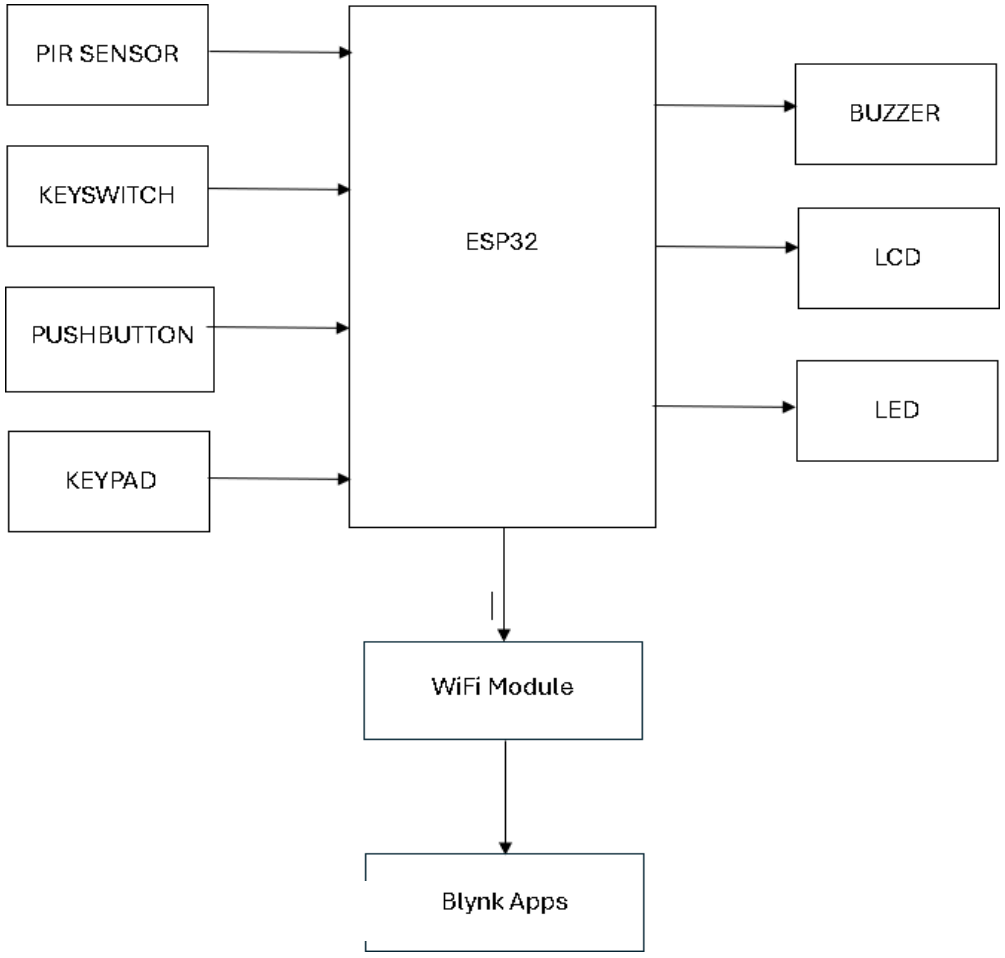


Figure 1 : Block Diagram of the Key switch Alarm Systems for Real-Time Security Monitoring

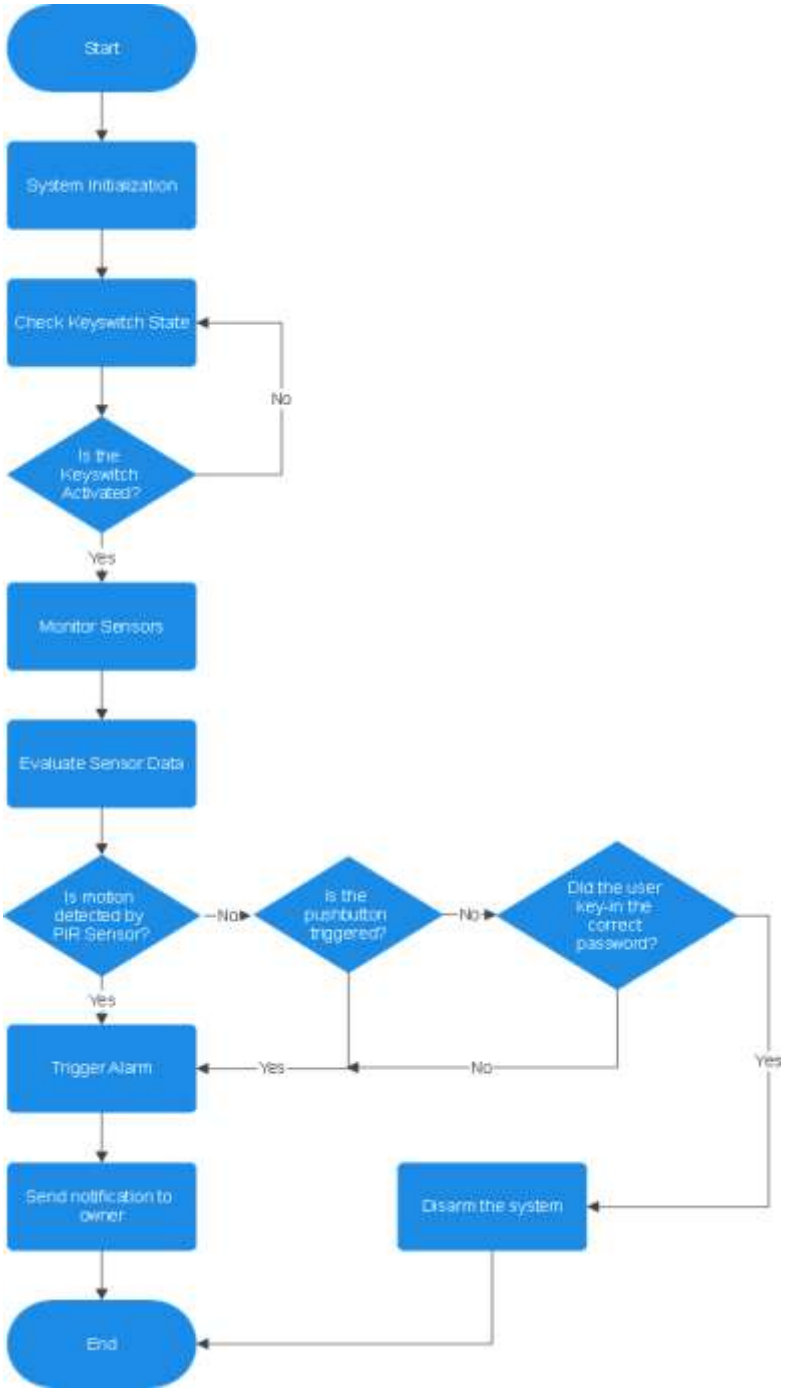


Figure 2 : Flowchart of the Keyswitch Alarm Systems For Real-Time Security Monitoring

NOVELTY AND UNIQUENESS

The novelty of this project lies in its energy-efficient, integrated design that addresses limitations of traditional CCTV systems, such as continuous bandwidth consumption and lack of real-time alerts. By combining PIR motion sensors, a key switch for manual control, and a keypad for password-based disarming, it provides dual-layer protection against unauthorized access while minimizing false alarms. The use of pushbutton for door and window monitoring ensures comprehensive security, while outputs like a buzzer, LED, and an LCD offer immediate feedback on system status. Built on the cost- effective ESP32 microcontroller, this standalone system delivers reliable, scalable, and user-friendly residential security without relying on constant internet connectivity.

BENEFIT TO MANKIND

The Keyswitch Alarm Systems For Real-Time Security Monitoring benefits mankind by providing a cost-effective, reliable, and energy-efficient solution for enhancing residential security. By utilizing advanced motion detection, door/window monitoring, and dual-layer protection with a keypad and key switch, it helps prevent unauthorized access and reduces false alarms, ensuring peace of mind for homeowners. Its user-friendly design, featuring real-time notifications through audible, visual, and display outputs, enables quick responses to potential threats [4]. Additionally, the system's standalone functionality eliminates the need for continuous internet connectivity, making it accessible and practical for a wide range of users, including those in areas with limited bandwidth [5]. This innovative approach contributes to safer living environments and fosters a greater sense of security in communities.

COMMERCIALIZATION POTENTIAL

The commercialization potential of this project is significant, as it addresses the growing demand for affordable, reliable, and energy-efficient home security systems. Its standalone design, powered by the versatile ESP32 microcontroller, makes it cost- effective and accessible to a wide range of consumers, including those in regions with limited internet connectivity. The integration of advanced features such as motion detection, password-based disarming, and door/window monitoring ensures comprehensive security, making it highly competitive in the smart home market. Additionally, its user-friendly interface, low energy consumption, and adaptability for residential or small office applications further enhance its appeal to both individual homeowners and small businesses. With increasing concerns over home security, this solution offers a scalable and practical product that can capture a significant share of the smart security system market.

CONCLUSION

In conclusion, this project demonstrates a practical and innovative approach to enhancing home security by leveraging the capabilities of the ESP32 microcontroller. By integrating motion detection, door/window monitoring, dual-layer protection mechanisms, and real-time notifications through a buzzer, LEDs, and an LCD, it offers a comprehensive, energy-efficient, and user-friendly security solution. The system addresses key limitations of traditional security systems, such as continuous bandwidth consumption and false alarms, while remaining cost-effective and accessible. With its adaptability and standalone functionality, this advanced home security system provides a scalable and reliable solution that promotes safer living environments and meets the growing demand for modern residential security.

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Air Quality Monitoring System (Energy Monitoring)

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ABSTRACT

The "Air Quality Monitoring System" project addresses the pressing issue of air quality degradation in Malaysia, a consequence of rapid urbanization and industrialization. This system utilizes MQ135 and DHT22 sensors to continuously monitor various air quality parameters, including harmful gas concentrations, temperature, and humidity. Leveraging the capabilities of the ESP32 microcontroller, equipped with Wi-Fi and Bluetooth, the system processes the collected data and transmits it in real-time to cloud servers for storage and analysis. The integration of an RTC module ensures accurate timestamping for historical data tracking. The project features a comprehensive output mechanism: an LCD display for real-time data visualization, a buzzer for audible alerts, and LED indicators for quick visual assessment of air quality and lastly a fan to reduce those bad gases If poor air quality is detected, the system not only alerts users through these mechanisms but also activates fans to improve the air condition and sends notifications via connected apps, allowing users to take necessary precautions. By employing the Internet of Things (IoT), the system offers enhanced data accuracy, reliability, and real-time responsiveness. It aims to raise public awareness, promote sustainable practices, and support data-driven decision-making for policymakers and urban planners. Ultimately, this project seeks to mitigate health risks, foster a healthier urban environment, and contribute to Malaysia's sustainable urbanization efforts.

KEYWORDS: MQ135(gas sensor), DHT22(Humidity sensor), Esp32, Comprehensive output mechanism, Wi-fi

PRODUCT DESCRIPTION

Air Quality Monitoring System is an IoT project based on safety systems that provides an advanced management system. By applying MQ135(Gas sensor) and DHT22(Humidity sensor) in the system, it will monitor the status of gas in its surroundings. This system is powered by ESP32 which controls the input and output data by displaying it on an LCD screen. It also shows its results on the output mechanism which are the LEDs, buzzer and the fan. Each component has their own different output display but serves the same main purpose. Whenever the input gives a signal of poor air quality At same time, RTC also has its own purpose on this system. It will give an accurate up to date status of the air surrounding to the user. This system was designed to make it convenient for users to know the air state of its surroundings. Its design is also portable and easy to install whatever place that the users want to, such as in the kitchen, office or even in a factory.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

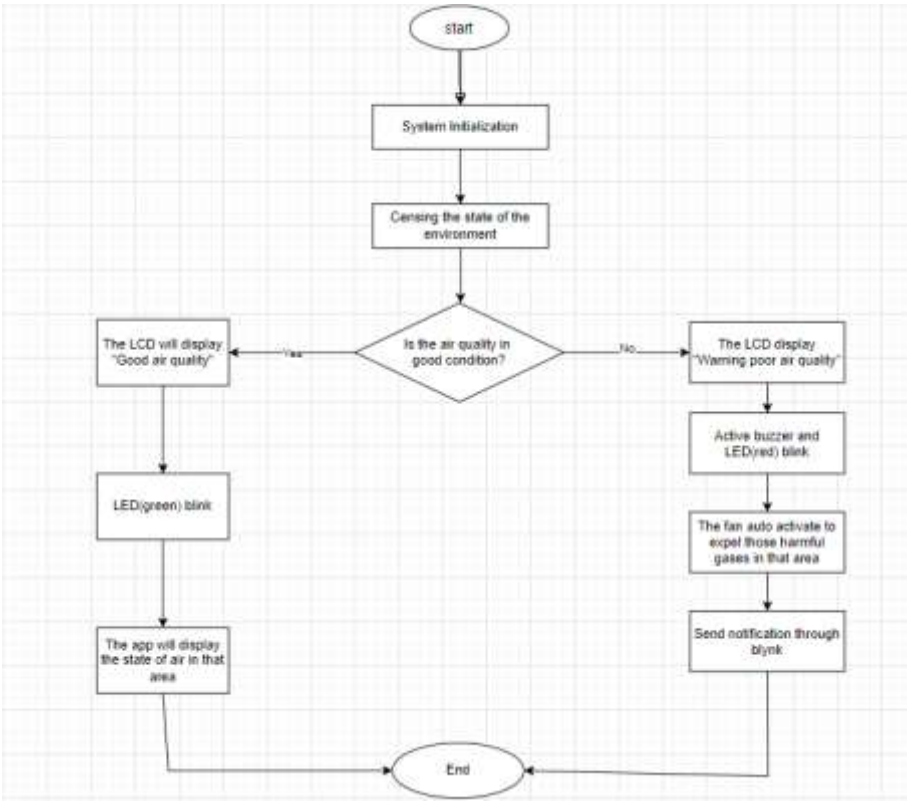


Figure 1 : Flow Chart of Air Quality Monitoring system

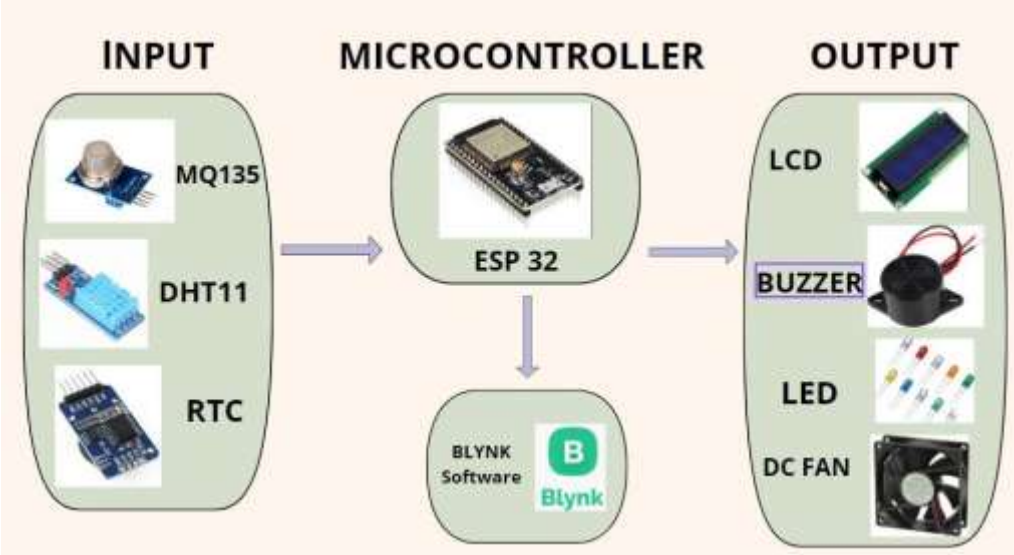


Figure 2 : Block diagram of Air Quality Monitoring System

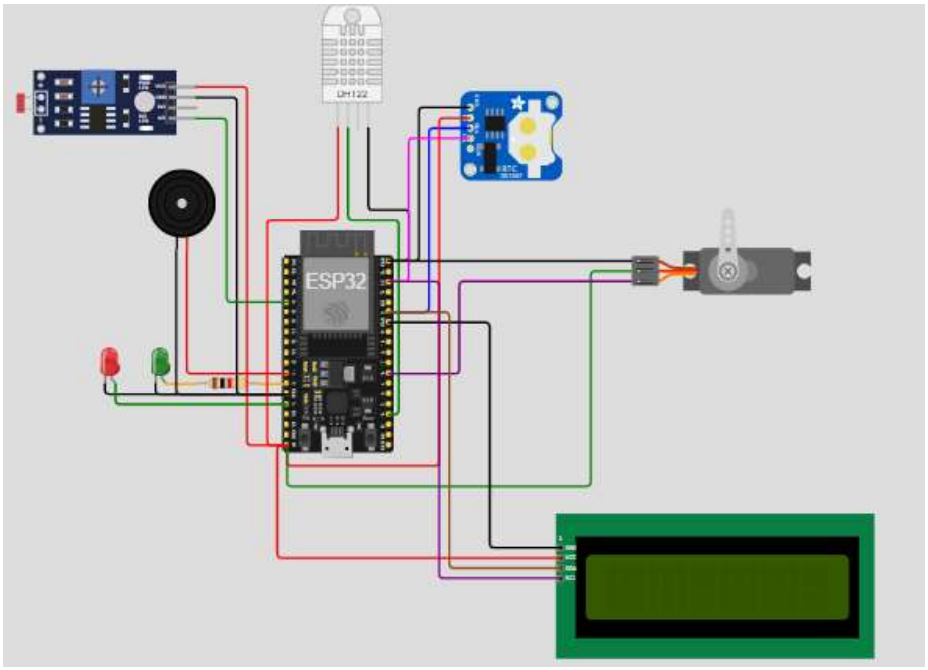


Figure 3 : Schematic Diagram of Air Quality Monitoring system

NOVELTY AND UNIQUENESS

The novelty of this project lies in its proactive approach to air quality management by integrating a fan to expel harmful gases such as carbon dioxide, smoke etc. This feature is not commonly found in standard air quality monitors. Unlike typical systems that only measure air conditions, this project automates responses to poor air quality, making it more interactive and functional for example by installing a fan that automatically activates when the air surrounding is in poor state. The inclusion of energy monitoring alongside air quality tracking further enhances its uniqueness, offering users a dual-purpose solution to manage both environmental and energy concerns. Additionally, the potential for IoT integration provides modern connectivity for remote monitoring and control, increasing its practicality. The IoT that has been used in this system is the Blynk app where the software that connects with this project.It also will give users an up to date status of the quality air in their surroundings by informing the user through the software. This system's modular design allows for easy customization, making it Suitable for both indoor and outdoor applications. By focusing on affordability and user-friendliness, this project stands out as an accessible yet innovative tool for improving air quality in various settings, from homes to industrial environments.

BENEFIT TO MANKIND

The air quality monitoring system offers significant benefits to mankind by improving public health. By detecting harmful gases the system helps prevent exposure to substances like carbon monoxide, smoke and particulate matter which can lead to heart disease, respiratory issues and other serious health conditions. By reducing these poor air quality contributes to lower healthcare and improves the overall quality of life. At same time, this system raises environmental awareness by making individuals and organizations more conscious of the air they breathe. With this, it can increase awareness that lead to collective action and a healthier environment. Furthermore, the system can also be one of the education tools for schools, offices and public spaces. It can help to teach anyone, especially students who are pursuing in their education programs such as environmental health or importance of sustainability, fostering a more environmentally conscious society. Lastly, by improving air quality and reducing pollution, the system supports efforts to mitigate environmental degradation and climate change. By making cleaner air more accessible, it plays a crucial role in preserving both human health and the planet for future generations.

COMMERCIALIZATION POTENTIAL

The commercialization potential of this air quality monitoring system is strong, driven by increasing global demand for solutions that address health, sustainability, and energy efficiency. With growing awareness of the impact of air pollution, this project is marketable to residential consumers, especially homeowners and renters who want to monitor and improve indoor air quality, particularly through smart home integration. In the commercial sector, offices, schools, and universities are investing in healthier environments, while businesses in retail and hospitality can enhance customer experience by ensuring clean air. The industrial market offers further opportunities, with manufacturing facilities and healthcare institutions benefiting from air quality monitoring for safety and health. Partnerships with environmental and health organizations, along with government contracts, can expand its reach, while a subscription model for advanced features and the sale of anonymized data provide additional revenue streams. Finally, with air pollution being a global issue, this system has significant potential for international expansion, especially in high-pollution regions. Overall, the system's versatility, growing demand, and various monetization avenues position it for successful commercialization.

CONCLUSION

The "Air Quality Monitoring System" project successfully addresses the critical issue of air quality degradation resulting from Malaysia's rapid urbanization and industrialization. By integrating advanced sensors such as the MQ135 and DHT22 with the versatile ESP32 microcontroller, the system provides accurate and real-time monitoring of various air quality parameters, including harmful gases, temperature, and humidity. The system's ability to process and transmit data in real-time to cloud servers ensures that comprehensive and timely information is available for analysis and action. The incorporation of an RTC module allows for precise timestamping, facilitating the tracking of historical air quality trends. The output mechanisms, including the LCD display, buzzer, and LED indicators, offer clear and immediate communication of air quality conditions. Additionally, the system's proactive measures, such as activating fans to improve air quality and sending notifications through apps, demonstrate its commitment to not only monitoring but also mitigating poor air conditions. Leveraging the Internet of Things (IoT), the project enhances data accuracy, reliability, and responsiveness, promoting public awareness and sustainable practices. It also provides valuable insights for policymakers and urban planners to develop informed regulations and initiatives. In conclusion, the "Air Quality Monitoring System" is a comprehensive solution that significantly contributes to improving air quality, reducing health risks, and supporting sustainable urban development in Malaysia.

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Wireless Health Monitoring System for Elderly Care

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ABSTRACT

The "Wireless Health Monitoring System for Elderly Care" project addresses the urgent healthcare needs of Malaysia's rapidly aging population, with 71% of individuals over 60 years old. This demographic shift necessitates innovative solutions to enhance elderly care while minimizing direct contact with healthcare professionals. The system employs various sensors to continuously monitor vital signs, including heart rate, blood pressure, and body temperature. Utilizing the ESP32 microcontroller equipped with Wi-Fi and Bluetooth capabilities, it transmits real-time health data to cloud servers for analysis and storage. An RTC module ensures accurate timestamping of health metrics, facilitating the tracking of health trends over time. This wireless system enables caregivers and medical personnel to access health data remotely, allowing for early diagnosis and timely interventions. Additionally, visual alerts via OLED displays and audio notifications through a buzzer enhance responsiveness to abnormal readings. By leveraging IoT technology, this project aims to improve healthcare quality for the elderly, promote proactive health management, and alleviate pressure on the healthcare system while fostering data-driven decision-making among providers.

KEYWORDS: Wireless health monitoring, elderly care, vital signs, real-time data, cloud analysis, remote access, early diagnosis, IoT technology

PRODUCT DESCRIPTION

The Wireless Health Monitoring System for Elderly Care is an innovative solution designed to support the healthcare needs of the aging population in Malaysia. With a significant portion of the population over 60 years old, this system continuously tracks vital signs such as heart rate, blood pressure, and body temperature using advanced sensors.Powered by the ESP32 microcontroller, the system transmits real-time health data to cloud servers for analysis. It features an RTC module for accurate timestamping, allowing caregivers to monitor health trends effectively. Remote access enables timely alerts and notifications about any health abnormalities, promoting early diagnosis and intervention. The system also includes visual alerts on an OLED display and audio notifications via a buzzer. By utilizing Internet of Things (IoT) technology, this product enhances elderly care quality, encourages proactive health management, and reduces the strain on healthcare services, ultimately leading to better health outcomes for seniors.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

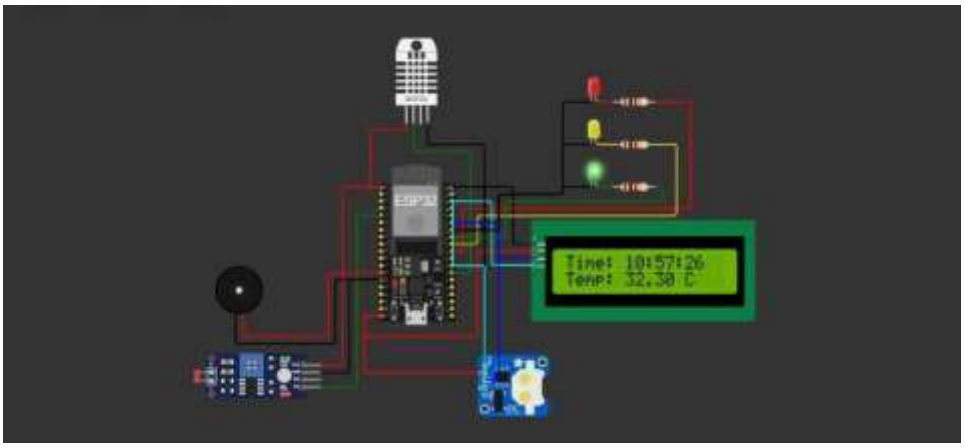


Figure: Schematic Diagram of the Wireless Health Monitoring System

NOVELTY AND UNIQUENESS

The Wireless Health Monitoring System for Elderly Care introduces a groundbreaking approach to elderly healthcare by integrating advanced sensor technology with real-time data transmission capabilities. Unlike traditional monitoring systems, this project utilizes the ESP32 microcontroller, which supports both Wi-Fi and Bluetooth, allowing for seamless connectivity and data transfer to cloud servers. The inclusion of an RTC module for accurate timestamping sets this system apart, enabling healthcare providers to track health trends over time effectively. Additionally, the use of visual alerts via OLED displays and audio notifications through a buzzer enhances user interaction and responsiveness to critical health changes, making it a unique solution tailored specifically for the elderly.

BENEFIT TO MANKIND

This system significantly benefits society by addressing the healthcare challenges faced by an increasingly aging population. By enabling continuous monitoring of vital signs such as heart rate, blood pressure, and body temperature, it facilitates early diagnosis and timely interventions, ultimately improving the quality of life for seniors. The ability for caregivers and healthcare professionals to access health data remotely reduces the need for direct contact, which is especially valuable in situations where minimizing exposure is crucial. This proactive approach not only enhances individual health outcomes but also alleviates pressure on healthcare systems, promoting healthier communities.

COMMERCIALIZATION POTENTIAL

The commercialization potential of the Wireless Health Monitoring System for Elderly Care is substantial. With the global market for remote patient monitoring systems projected to grow significantly due to rising healthcare costs and an aging population, this product aligns perfectly with current market demands. Its unique features—such as real-time data access, IoT integration, and user-friendly alerts—make it appealing to both consumers and healthcare providers. Partnerships with healthcare institutions and technology companies could facilitate widespread adoption, while potential applications in home care services further enhance its marketability. The system's scalability allows for customization based on specific user needs, increasing its attractiveness in various segments of the healthcare industry.

CONCLUSION

In conclusion, the Wireless Health Monitoring System for Elderly Care represents a significant advancement in elderly healthcare technology. By leveraging innovative sensor technology and IoT capabilities, it provides a comprehensive solution that enhances health monitoring while promoting independence among seniors. The system's ability to deliver real-time health data to caregivers not only facilitates early intervention but also contributes to improved health outcomes. With its strong commercialization potential and clear benefits to society, this project stands poised to make a meaningful impact in the field of elderly care, ultimately fostering healthier lives for the aging population.

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Face Recognition Based Attendance System

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ABSTRACT

This project is to present the development and implementation of a Face Recognition- Based Attendance System utilizing the ESP32 microcontroller. The system aims to automate the process of attendance monitoring in educational institutions, workplaces, and other organizations, ensuring accuracy and efficiency. Traditional attendance methods, which rely on manual entry or RFID cards, are prone to inaccuracies and can be easily manipulated. Our system leverages the ESP32's processing capabilities and integrates it with a infrared sensor (IR sensor), a OLED display, LEDs, a buzzer, and a servo. The methodology involves capturing images, detecting faces, recognizing individuals, and recording their attendance in a database. The OLED display provides real-time feedback on attendance status. The use of face recognition technology enhances security and reduces the chances of proxy attendance. This innovative approach demonstrates a reliable, user-friendly, and scalable solution for modern attendance management, addressing the limitations of conventional systems and paving the way for future advancements in automated attendance tracking.

KEYWORDS: Face Recognition-Based Attendance System, Attendance monitoring, Real-time feedback, ESP32 Microcontroller, IR sensor, OLED display, User-friendly, Automated attendance tracking.

PRODUCT DESCRIPTION

This project focuses on developing a robust face recognition-based attendance system that utilizes the capabilities of the ESP32 microcontroller, ESP32 CAM, infrared sensor, and real-time clock (RTC). The ESP32 microcontroller is chosen for its versatility and powerful processing capabilities, while the ESP32 CAM facilitates high-resolution image capture for face detection and recognition. The infrared sensor enhances the system's accuracy by ensuring consistent and reliable face detection under varying lighting conditions, and the RTC ensures accurate time stamping of attendance records. By integrating these hardware components with advanced face recognition algorithms and output devices such as OLED displays, LEDs, and buzzers or speakers, the system aims to streamline attendance management. This integration not only improves data accuracy and enhances security but also provides a seamless user experience. The result is a sophisticated attendance tracking system that addresses the shortcomings of traditional methods, paving the way for future advancements in automated attendance solutions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

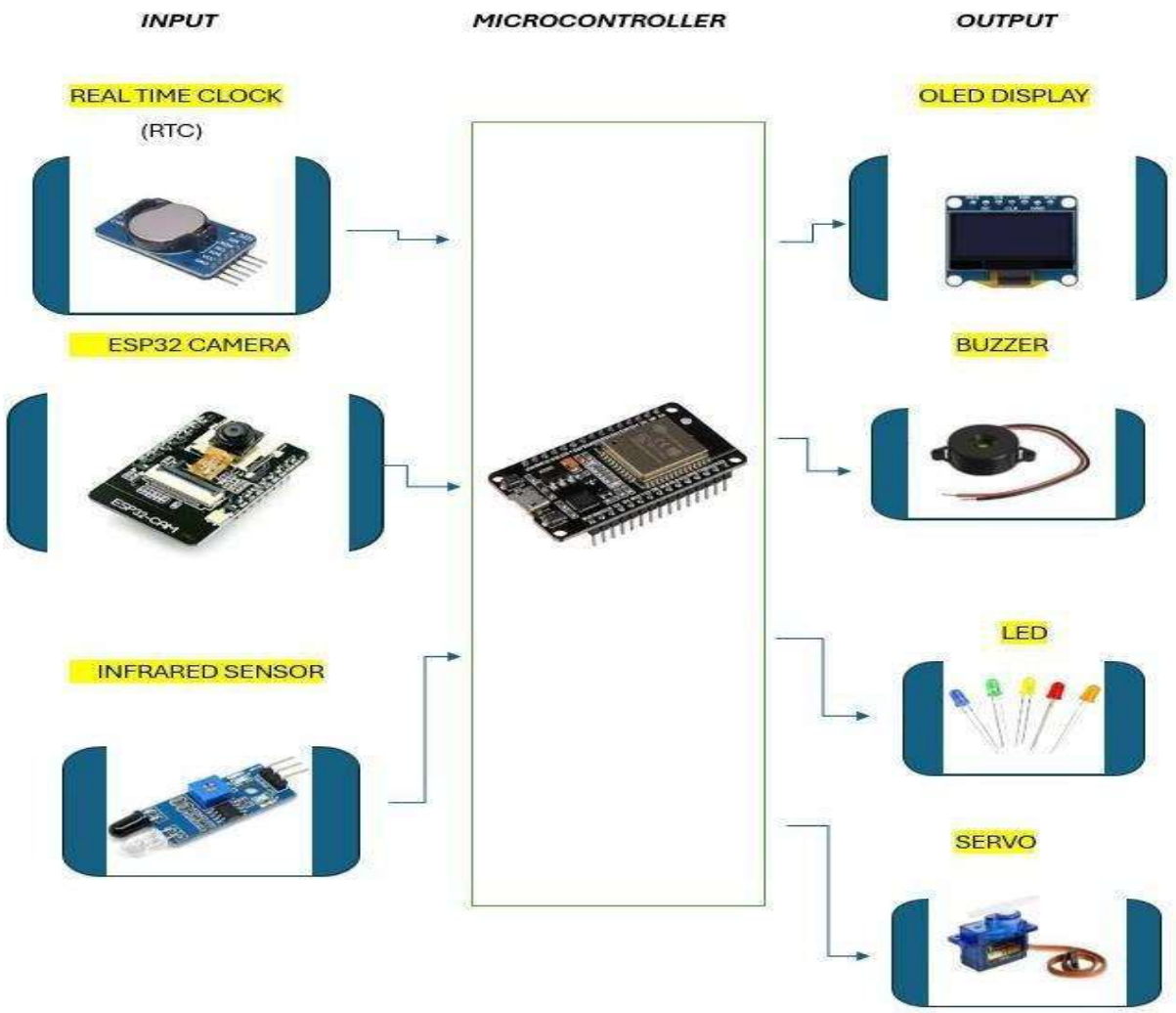


Figure 1: Block Diagram of the Face Recognition Based Attendance System

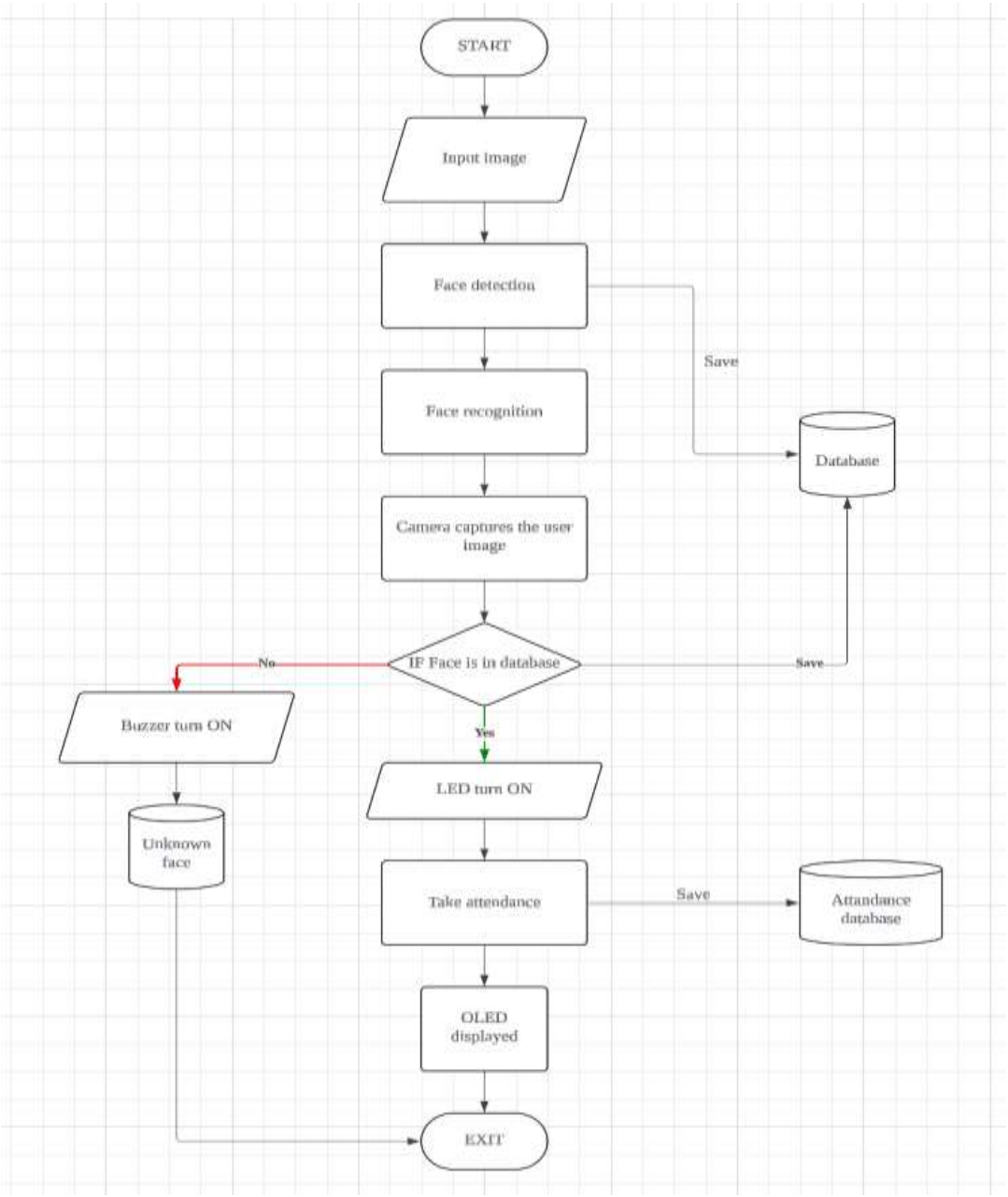
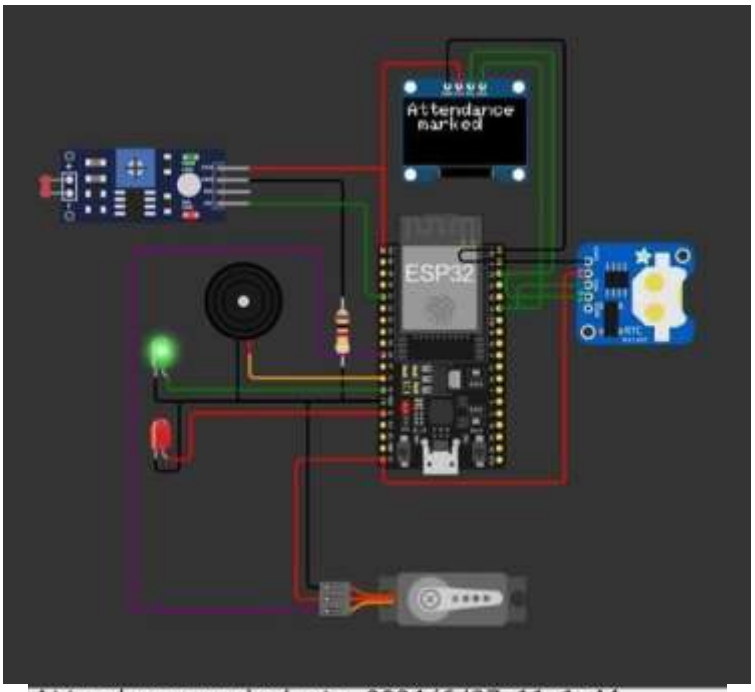


Figure 2: Flowchart of the Face Recognition Based Attendance System




```
Attendance marked at: 2024/6/27 11:1:44
LDR Value: 1001
Lux: 2599.17
Attendance marked at: 2024/6/27 11:1:49
LDR Value: 1001
Lux: 2599.17
Attendance marked at: 2024/6/27 11:1:55
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Figure 3: Simulation Result for Condition 1 of Face recognition

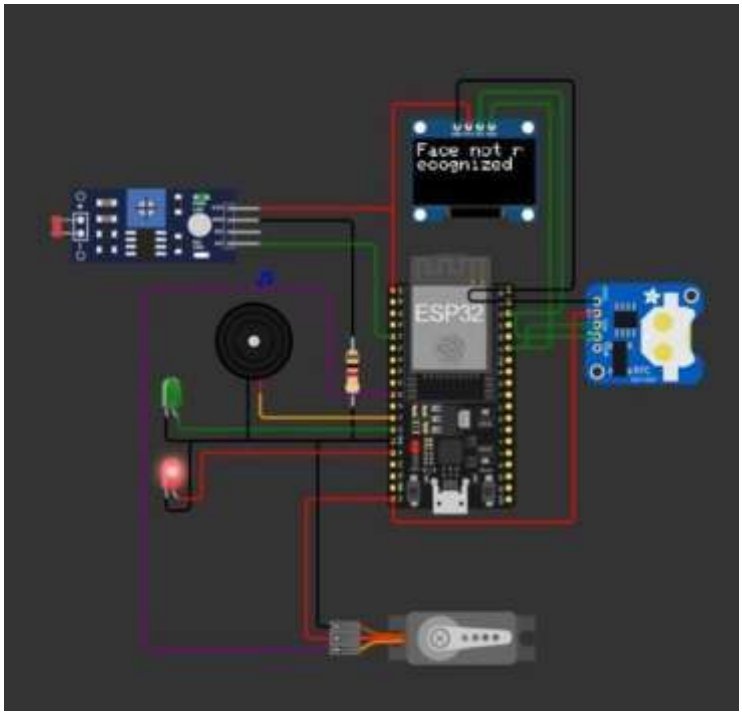


Figure 4: Simulation Result for Condition 2 of Face recognition

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the face recognition-based attendance system using ESP32 stem from its innovative approach to addressing traditional attendance tracking challenges. By leveraging face recognition technology, the system provides a contactless, efficient, and highly accurate solution that eliminates the need for manual methods or physical identification cards. Its design is both compact and cost-effective, utilizing the ESP32 microcontroller and ESP CAM to deliver powerful capabilities at an accessible price point, making it suitable for a wide range of users and applications. What sets this system apart is its integration of advanced features with practical hardware components. Real-time feedback mechanisms, such as buzzer alerts, LED indicators, and an OLED display, enhance user interaction by providing immediate attendance confirmation. The inclusion of a servo motor for automated door control adds a layer of security and automation, making the system not only functional but also user-friendly and reliable. Furthermore, the system's adaptability to varying environmental conditions, enabled by sensor integration, underscores its robustness. It is a versatile solution with potential applications beyond attendance tracking, such as visitor monitoring or access control, and offers opportunities for future expansion through cloud integration and AI-driven analytics. By combining affordability, advanced technology, and user-centric design, this project stands out as a groundbreaking contribution to the field of IoT and smart automation.

BENEFIT TO MANKIND

The face recognition-based attendance system using ESP32 benefits mankind by making attendance tracking faster, more accurate, and easier. By automating the process, it reduces human errors and saves time in schools, offices, and other workplaces. Its contactless design helps maintain hygiene, especially in situations where avoiding physical contact is important. The system also improves security by allowing only authorized people to enter. Its affordability and accessibility make advanced technology like face recognition available to more people, helping even small businesses and institutions use smarter, more efficient methods. This project not only solves everyday problems but also lays the foundation for future innovations that make life easier and more organized.

COMMERCIALIZATION POTENTIAL

The commercialization potential of the face recognition-based attendance system using ESP32 is significant due to its combination of advanced features, affordability, and versatility. Businesses, educational institutions, and other organizations are always looking for efficient and reliable ways to manage attendance, and this system addresses that need with a modern, automated solution. Its contactless nature makes it especially appealing in a post-pandemic world, where hygiene and minimizing physical contact have become critical. The system's cost-effectiveness makes it suitable for a wide range of markets, including small businesses and schools with limited budgets. Additionally, its adaptability for different environments, such as offices, factories, and event venues, broadens its potential customer base. Features like real-time feedback, secure access control, and the ability to integrate with databases for record-keeping add value, making it a compelling option for buyers. With the growing demand for smart IoT solutions, this project has the potential to be scaled up for mass production and marketed as a ready-to-use attendance management product. Further enhancements, such as cloud integration or analytics features, could increase its appeal and create opportunities for subscription-based services, adding to its commercial viability. This system has the potential to become a practical, widely adopted solution in the global market for attendance and access control systems.

CONCLUSION

The development of the face recognition-based attendance system using ESP32 has been a significant step in automating attendance tracking. By utilizing advanced technologies like face recognition algorithms and microcontroller capabilities, the system achieves greater accuracy and efficiency. The integration of hardware components, including sensors and feedback devices, has created a reliable and effective solution for modern attendance needs. This project highlights the potential of face recognition technology and sets the stage for future advancements in smart attendance systems. With further refinements, such as cloud integration for data management and analytics, the system can become even more versatile and efficient. Its success demonstrates the value of innovation and automation in solving traditional attendance challenges and advancing IoT solutions.

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Online Parking System: Parking Management and Monitoring Data

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ABSTRACT

Technology has greatly improved our lives, but parking remains a common problem. Many parking areas are poorly managed, causing congestion and frustration as drivers waste time searching for open spaces, especially in crowded areas. This project presents the design and simulation of an Online Parking System: Parking Management and Monitoring Data aims to create a mobile app that helps users find available parking spots easily. The application provides real-time updates on parking availability and locations, saving time and reducing stress. The system uses sensors and devices, including a Proximity Sensor, and Relay Module. It's equipped with a Wi-Fi module to enable remote monitoring and control, making it an IoT solution. The Proximity Sensor detects whether a parking spot is occupied or empty, and this information is sent to the app via the ESP32 Wi-Fi module. The mobile app allows users to track and locate parking spots in real time, offering a simple and effective way to manage parking.

KEYWORDS:
Online Parking System, Proximity Sensor, Relay Module , ESP32 Wi-Fi module, IoT, Parking management.

PRODUCT DESCRIPTION

This project presents an online parking system featuring IoT technology with sensors to enhance parking management. In order to make things easier for drivers and parking facility managers, the system focuses on tracking and managing parking availability in real time. A proximity sensor, a relay module, and an ESP32 Wi-Fi module are essential parts. The Wi-Fi module sends the information to a mobile application when the proximity sensor determines if a parking space is filled or unoccupied. This helps consumers find open spots faster and spend less time searching by enabling them to get real-time information about available parking spaces straight from their mobile phones. The system also has LED indicators for every parking space, which lights up to indicate whether a spot is occupied or available. When there are no parking spots available, a servo motor at the entrance automatically blocks access to the lot. This guarantees that only vehicles with slots available can enter and prevents needless traffic. By facilitating remote monitoring and control, the IoT feature improves the system and makes it much more effective and user-friendly. The solution greatly enhances parking lot management and lessens user annoyance by fusing real-time data updates with clear visual signs and automatic entry control. In addition to making parking easier for vehicles, this project maximises available space and guarantees improved traffic flow inside parking lots.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. Block Diagram

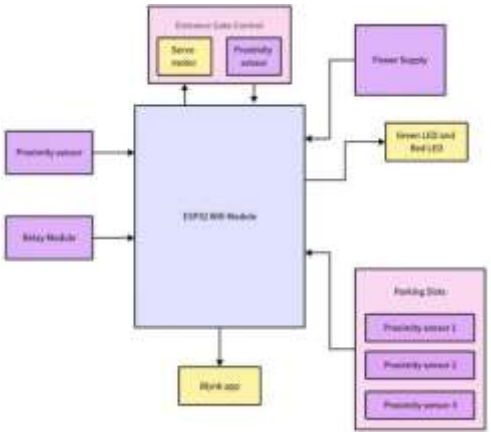


Figure 1: Block Diagram of Online Parking System: Parking Management and Monitoring Data

2. Flow Charts

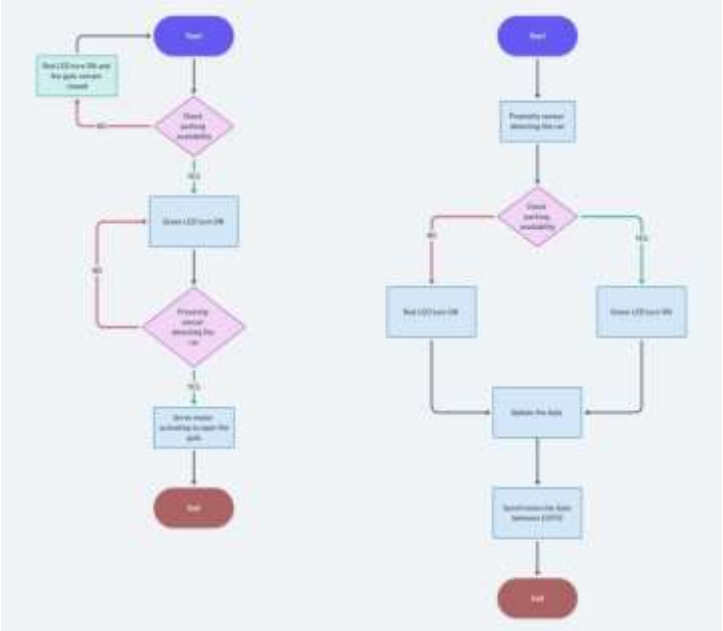


Figure 2. Flowchart of Online Parking System: Parking Management and Monitoring Data

NOVELTY AND UNIQUENESS

This concept is unique and distinctive because it combines sensor with Internet of Things technology to improve parking management. The system is a major improvement over conventional parking systems since it uses real-time monitoring to offer precise data on parking spot availability, which is visibly shown by LED indications. Its automated access control system, which restricts vehicle entry when there are no available parking spaces using a servo motor, is one of its most significant features. This proactive strategy ensures smoother parking operations by preventing needless congestion. Additionally, The Blynk app operates as an easy-to-use interface for customers to track parking space availability in real-time, and the entire system is built to function as an Internet of Things (IoT) solution, enabling remote monitoring and control. This project stands out among conventional parking management systems because of to its fully automated and user-friendly solution.

BENEFIT TO MANKIND

This Online Parking System reduces drivers' time and stress, which is one of its significant benefits for mankind. It reduces the frustration of searching for available spots, especially in congested areas, by directing users straight to parking spots that are available. The user experience is enhanced by this efficient technology, which also lessens traffic in parking lots and around the area. Congestion is further reduced by the system's ability to block needless car entry when there are no spaces available, facilitating easier flow of traffic both inside and outside the parking lots. Because vehicles spend less time looking for parking, the technology helps lower vehicle emissions and fuel usage from an environmental perspective. By reducing carbon footprints, this helps create a more environmentally friendly world.

COMMERCIALIZATION POTENTIAL

This parking system's implementation of IoT technology influences another industry that still uses outdated, manual parking management techniques. This solution opens up novel opportunities for parking and transportation innovation by automating the process and providing real-time information. From small parking spaces to big cities buildings like shopping centres, airports, and stadiums, this able to adapt solution can be used in a variety of locations. Because of its flexibility, the system is extremely adaptable and may be used in a variety of settings. Furthermore, by providing a technical solution to city-wide issues like traffic congestion and inefficient parking, the idea supports the objectives of proactive society programs.

CONCLUSION

In conclusion, my project is an innovative IoT-based parking management system that seeks to address the growing challenges of parking in urban spaces. By combining Arduino-based sensors, Wi-Fi communication, and a user-friendly mobile app, this system offers a smarter, more efficient solution to finding parking spaces in real time. My aim is to reduce the time drivers spend searching for parking, reduce stress, and minimize congestion, thereby contributing to better traffic management and a cleaner environment. The objectives include improving parking facility management through automated monitoring, ensuring better space utilization, and preventing unnecessary vehicle entry when parking spots are full. The system's scalability allows it to be adapted for various settings, from small parking lots to large urban parking facilities, aligning with the goals of smart city initiatives. By integrating technology and real-time data, the project not only enhances user convenience but also creates entrepreneurial opportunities in the growing smart transportation and urban infrastructure sectors. Overall, this project offers a practical solution to a global urban problem, with the potential to make cities more efficient, sustainable, and user-friendly for drivers and facility operators alike.

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Automated Stray Cat Feeding Solution

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ABSTRACT

The growing population of stray cats presents significant challenges, including malnutrition, health issues, and public health concerns due to inconsistent feeding and limited resources. Traditional feeding methods often rely on manual intervention, which is inefficient, inconsistent, and unable to address the border needs of stray populations [1]. The “Automated Stray Cat Feeding Solution” tackles these issues with an IoT-based system integrating sensors and devices, including a Pushbutton, LDR, Load Cell with HX711 Amplifier paired with ESP32 for remote monitoring and control. The system ensures precise and efficient feeding through features such as a Servo motor for dispensing food, LEDs for alerts, and a 16x2 LCD for real-time feedback. Intelligent algorithms optimize operations, while the Blynk app provides mobile notifications for enhanced accessibility. This scalable and innovative solution exemplifies the integration of technology and compassion, offering a promising approach to improving stray cat welfare.

KEYWORDS:
Automated Stray Cat Feeding Solution, servo motor, LDR, Load Cell , ESP32, IoT, Blynk app, Mobile notifications, Remote monitoring.

PRODUCT DESCRIPTION

This project introduces an IoT-based stray cat feeding system designed to automate food dispensation, monitor food availability, and ensure proper hygiene, addressing common challenges in manual feeding [3]. The system uses a Pushbutton sensor, an LDR (Light Dependent Resistor), a Load Cell with HX711 Amplifier, and an ESP32 Wi-Fi module. The Pushbutton detects a cat's presence, activating the Servo motor to dispense food while logging the feeding data. The ESP32 module sends real-time updates to a mobile app, allowing users to track daily feedings. The LDR monitors the food storage lid, using LED indicators, an LCD display, and app notifications to inform users if the lid is open or properly sealed. The Load Cell measures the food weight, sending a "Food low!" notification when supplies drop below 1 kg and displaying the weight on the LCD. The system ensures consistent feeding schedules, reduces food wastage, and provides real-time updates, all managed remotely through the ESP32 module. This scalable solution enhances stray cat welfare by automating feeding practices, improving efficiency, and offering an intuitive, user-friendly approach to animal care. It exemplifies the integration of IoT technology to streamline operations while ensuring consistent and effective care for stray cats.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

1. Block diagrams

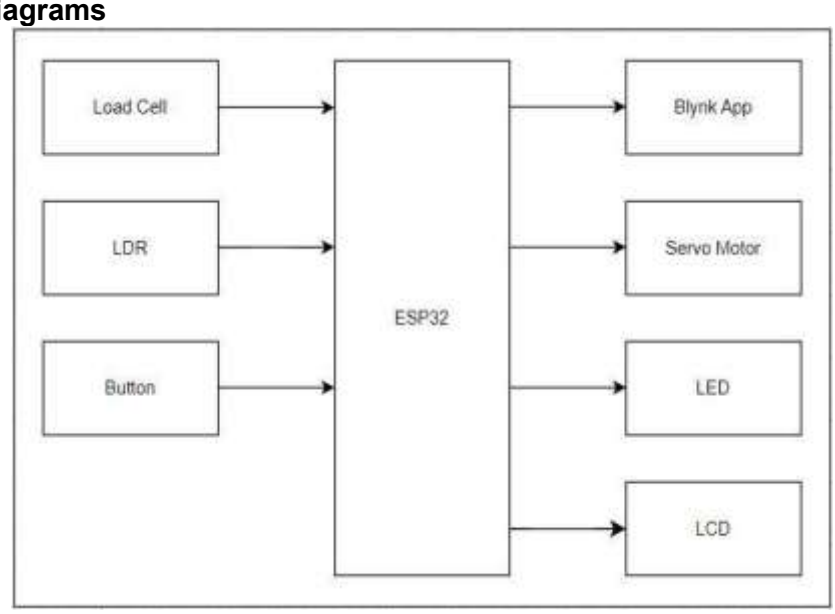


Figure 1: Block Diagram of Automated Stray Cat Feeding System

2. Flow Charts

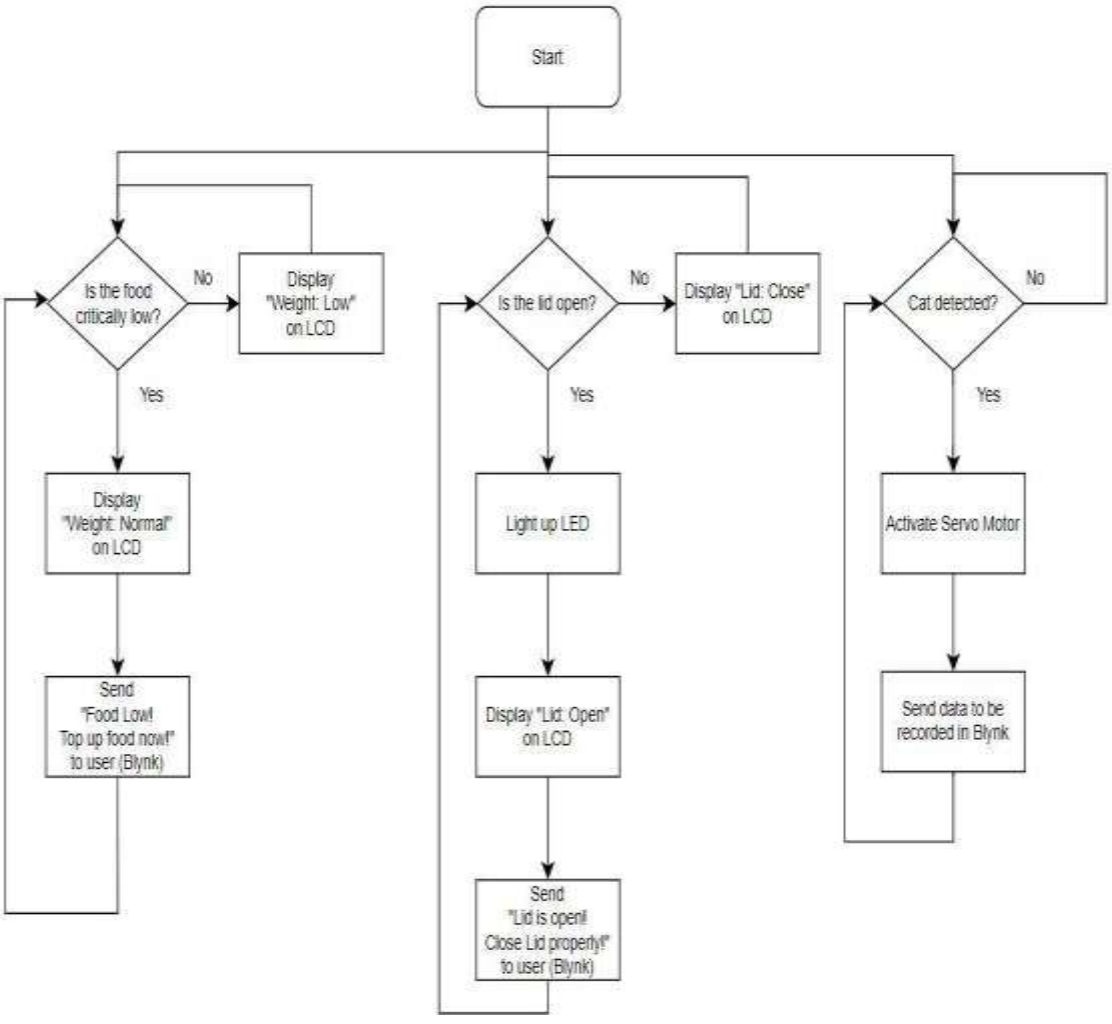


Figure 2. Flowchart of Automated Stray Cat Feeding Solution

NOVELTY AND UNIQUENESS

This concept is unique and distinctive because it combines Arduino-based sensors with Internet of Things technology to improve stray cat feeding management. The system is a significant advancement over traditional feeding methods, as it uses real-time monitoring to provide precise data on food availability, which is clearly displayed on an LCD screen and communicated through app notifications. One of its most important features is the automated food dispensing system, which ensures that the correct amount of food is dispensed when needed, based on sensor inputs, eliminating manual intervention and ensuring consistent feeding for stray cats. Additionally, the Blynk app functions as a user-friendly interface for users to track food levels and system status in real-time, making remote monitoring and control easy. This project stands out among traditional feeding solutions because of its fully automated, efficient, and user-friendly design, ensuring better care for stray cats and improving overall feeding management.

BENEFIT TO MANKIND

This Automated Stray Cat Feeding Solution offers significant benefits for both stray cats and their communities. It reduces the time and effort required for feeding, eliminating the need for constant manual intervention. By ensuring that food is dispensed automatically and consistently, the system minimizes the risk of overfeeding or underfeeding, helping to maintain the health and well-being of stray cats. The system's real-time monitoring and notifications provide users with easy access to food levels and feeding schedules, ensuring that the cats are fed regularly without human presence [4]. Additionally, the automation reduces the environmental impact by conserving resources and minimizing waste, promoting a more sustainable approach to animal care. This solution not only improves the lives of stray cats but also contributes to a more efficient, environmentally conscious method of managing their feeding needs.

COMMERCIALIZATION POTENTIAL

The integration of IoT technology in this Automated Stray Cat Feeding Solution has the potential to transform the management of stray cat care, replacing outdated, labor- intensive methods with an efficient, automated system. By leveraging real-time monitoring and intelligent decision-making, the solution opens up new opportunities to improve the welfare of stray cats. This innovative approach can be implemented in a wide range of settings, from urban areas with large stray populations to smaller, rural communities, as well as shelters and community-based feeding programs. Its adaptability ensures that it can be scaled and customized to meet the unique needs of different environments. Beyond simply providing a feeding solution, the system addresses key challenges such as food wastage, inconsistent feeding schedules, and ensuring food availability [2], all while reducing the need for human intervention. This makes it an invaluable tool for both local communities and animal welfare organizations. Furthermore, by automating the feeding process, this project supports broader goals of promoting sustainability and compassionate animal care, creating a more efficient and humane way of managing stray cat welfare in both urban and rural areas.

CONCLUSION

In conclusion, this project presents an innovative IoT-based automated stray cat feeding system designed to address the increasing challenges of managing stray cat welfare. By combining Arduino-based sensors, Wi-Fi communication, and an intuitive mobile app, the system offers a smarter and more efficient solution for ensuring that stray cats receive consistent and timely feedings. The goal is to minimize the effort and time spent on feeding while maintaining proper feeding schedules, ultimately improving the health and well-being of stray cats. The objectives of this project include automating the feeding process, tracking food levels, and providing real-time updates to users, ensuring a reliable and effective feeding routine. Its scalability allows it to be implemented in various environments, from urban areas with large stray populations to smaller rural communities, supporting broader goals of animal welfare. Through the use of technology and real-time data, the project enhances the care provided to stray cats while opening opportunities for innovation in the fields of smart animal care and welfare. Overall, this project offers a practical solution to the challenges of stray cat management, with the potential to make communities more compassionate, efficient, and sustainable, benefiting both animals and their caretakers.

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Advanced Solar Tracking System with Temperature Control and Real Time Monitoring

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ABSTRACT

This work presents the development of a Smart Solar Tracker system featuring wireless monitoring, temperature optimization, and real-time visualization utilizing the ESP32 microcontroller. The system integrates key components such as a humidity sensor, light- dependent resistor (LDR) sensor, servo motor, relay module, and LCD display, working in unison to optimize solar panel performance. The incorporation of a Wi-Fi module transforms the setup into an Internet of Things (IoT) device, enabling remote monitoring and control capabilities. The LDR sensor detects variations in light intensity, allowing precise adjustments of the solar panel's position via the servo motor to maximize solar energy capture. Meanwhile, the temperature and humidity sensors provide critical environmental data to ensure efficient system operation. Leveraging the Wokwi simulation platform, the Arduino microcontroller processes sensor inputs and executes intelligent decision-making algorithms. These algorithms dynamically control the servo motor, relay module, and LCD display, adapting the system based on environmental conditions. The use of IoT technology enables enhanced accessibility through remote connectivity, offering real-time data visualization and system management. This scalable and versatile solution advances solar tracking by combining automation, wireless monitoring, and IoT integration, paving the way for improved energy efficiency and user accessibility.

KEYWORDS: Smart Solar Tracker, Wireless Monitoring, Temperature Optimization, ESP32, IoT, Wokwi Simulation Platform.

PRODUCT DESCRIPTION

The Smart Solar Tracker is an innovative system designed to optimize solar energy capture through automated panel alignment and real-time monitoring. This system integrates a servo motor for precise solar panel positioning, an LDR sensor to detect light intensity, and temperature and humidity sensors to ensure optimal operating conditions. Equipped with an ESP32 microcontroller and a Wi-Fi module, the tracker transforms into a versatile IoT-enabled device, offering remote monitoring and control capabilities. Data from the sensors is processed via intelligent Arduino code, which dynamically adjusts the panel's position and displays real-time information on an LCD screen. The inclusion of Wokwi's simulation platform enhances development and testing, ensuring robust performance. The system features wireless connectivity for convenient remote access, enabling users to monitor and manage solar panel conditions from anywhere. Its efficient design maximizes energy output while ensuring reliability and scalability for various applications. This IoT integrated solar tracker provides an advanced, user-friendly solution for sustainable energy management

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

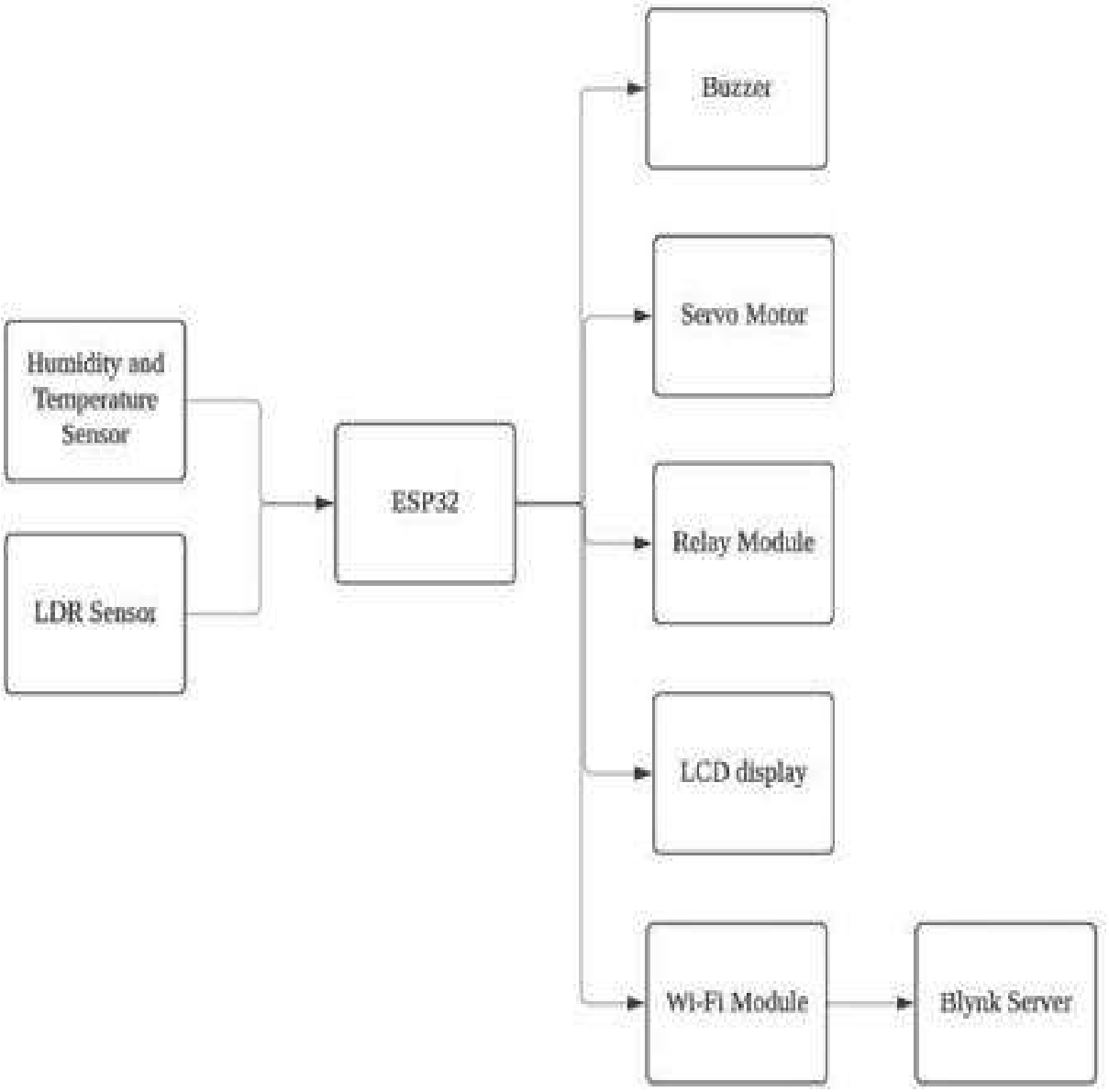


Figure 1: Block Diagram of Advanced Solar Tracking System with Temperature Control and Real-Time Monitoring

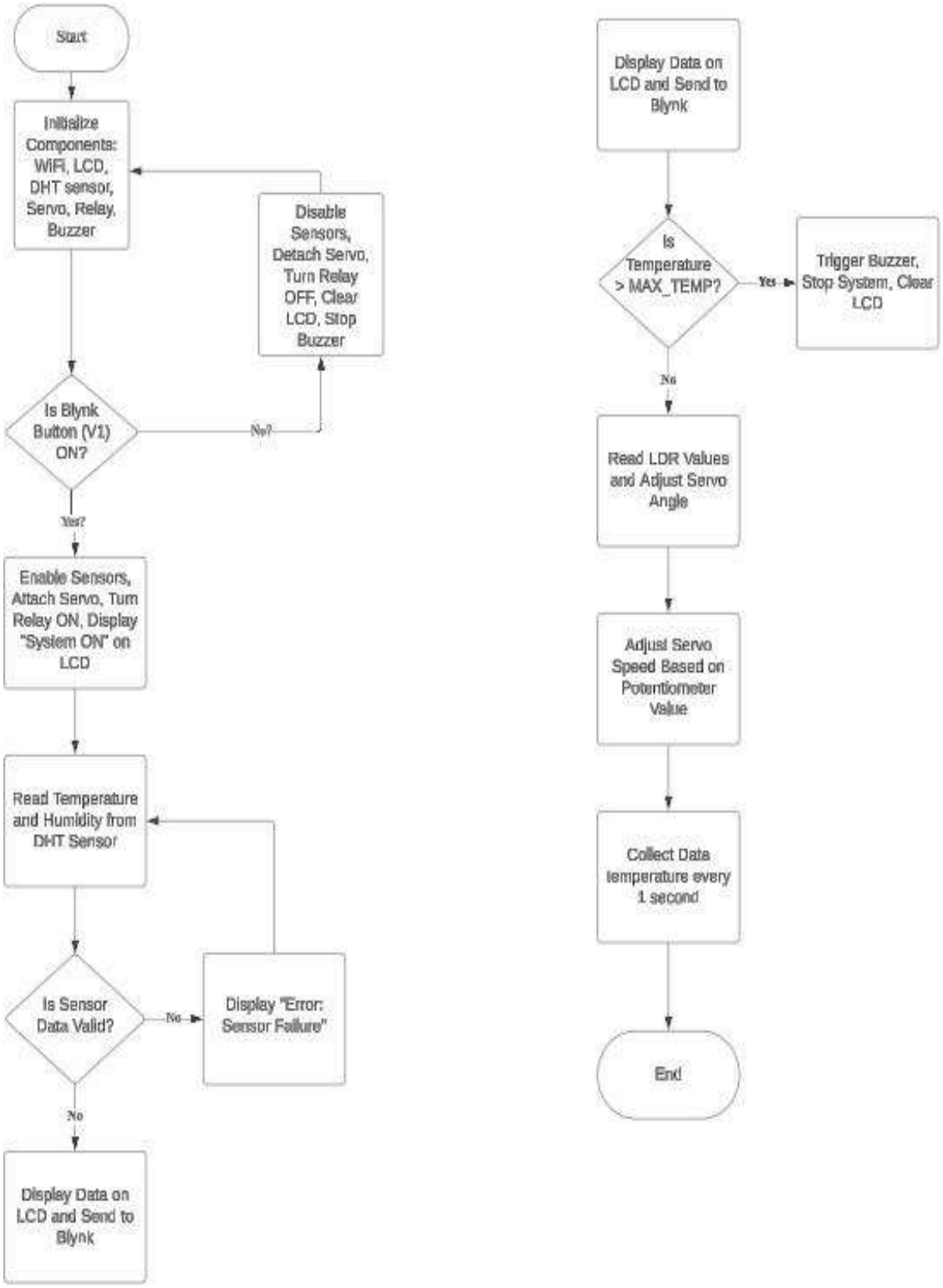


Figure 2: Flowchart of Advanced Solar Tracking System with Temperature Control and Real-Time Monitoring.

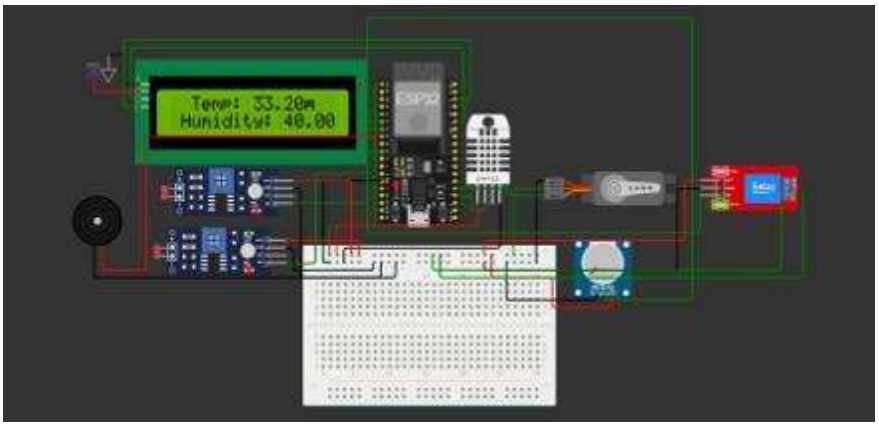


Figure 3: Simulation Result of Advanced Solar Tracking System with Temperature Control and Real-Time Monitoring.

No	Date and Time	Temperature, C	Humidity, %	Colour
1	7:43:00 AM	15	60	
2	9:50:00 AM	12	54.5	
3	11:50:00 AM	22	40	
4	2:00:00 PM	26	43	
5	3:00:00 PM	41	30	
6	7:00:00 AM	16	50	

Table 1: Results of Advanced Solar Tracking System with Temperature Control and Real-Time Monitoring.

NOVELTY AND UNIQUENESS

A unique feature of this project is the incorporation of temperature monitoring and automatic system shutdown when high temperatures are detected, enhancing safety and preventing potential damage to the hardware. Furthermore, the use of a potentiometer to control the servo motor speed adds adaptability, allowing the system to perform efficiently under varying environmental conditions. The system is also integrated with the Blynk IoT platform, providing real-time monitoring and remote control capabilities. This distinguishes it from traditional solar trackers by offering live performance data, including temperature, humidity, and system status, directly to the user's mobile device. From a performance perspective, the combination of servo motors, LDR sensors, and real time feedback ensures precise tracking of the sun's position, resulting in improved energy output compared to static solar systems. Additionally, the project's modular design and scalability allow for further enhancements, such as dual-axis tracking or predictive algorithms, making it adaptable to future advancements in solar technology.

BENEFIT TO MANKIND

The Smart Solar Tracker enhances energy efficiency by dynamically adjusting solar panel positioning to maximize sunlight capture. This leads to increased renewable energy production, reducing reliance on non-renewable sources and lowering electricity costs for consumers. By improving energy self-sufficiency, especially in areas with unreliable grids, it supports both economic growth and quality of life. On a global scale, the project contributes to environmental sustainability by reducing greenhouse gas emissions and promoting the use of clean, renewable energy. The inclusion of safety features, like temperature monitoring, ensures long-term reliability and durability of solar systems. By optimizing solar energy harvesting, this system fosters energy conservation, supports efforts to combat climate change, and promotes a sustainable future. Ultimately, the Smart Solar Tracker helps create a more resilient and ecofriendly energy infrastructure, benefiting individuals, communities, and society at large.

COMMERCIALIZATION POTENTIAL

The Smart Solar Tracker system has strong commercialization potential in the renewable energy market. By partnering with solar panel manufacturers or energy providers, it can be marketed as an advanced add-on to enhance solar energy capture and efficiency. With IoT integration, the system enables remote monitoring and real- time data visualization, making it ideal for both residential and commercial applications. Offered as a Software-as-a-Service (SaaS), the system can be easily customized with regular updates for optimal performance across various environmental conditions. Its scalability allows it to be adapted to different market segments, from small residential setups to large-scale commercial solar installations. This cost-effective solution maximizes solar energy output, making it an attractive offering in the growing global renewable energy sector.

CONCLUSION

This project successfully demonstrates the development of a Smart Solar Tracker system integrating advanced features such as wireless monitoring, temperature optimization, and real-time visualization. By leveraging the ESP32 microcontroller and the Wokwi simulation platform, the system effectively optimizes solar energy capture through automated panel alignment and intelligent control algorithms. The integration of IoT technology, including the Blynk platform, enhances user experience by providing remote monitoring and control capabilities. This innovative solution not only improves energy efficiency and reduces reliance on fossil fuels but also contributes to environmental sustainability and promotes a cleaner energy future. With its strong commercialization potential and adaptability to various applications, the Smart Solar Tracker has the potential to significantly impact the renewable energy sector and drive the transition towards a more sustainable and energy-efficient future.

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Green Restroom Solutions: Harnessing Technology for Enviromental Savings

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ABSTRACT

This project is designed to conserve electricity and simplify human tasks by addressing common issues such as forgetting to turn off lights in the restroom and not properly closing taps, which leads to unnecessary waste of electricity and water. The system initiates its operation when a person opens the restroom door, at which point it detects action and triggers the lighting system to turn on. Inside the restroom, a motion sensor continuously monitors for any presence or movement, ensuring that the restroom remains lit and ventilated only when occupied. This motion sensor sends signals to a microcontroller, a central processing unit that manages all inputs and outputs in the system. This relay is crucial as it manages the power supply to the restroom's lighting and exhaust fan, acting as an electronically controlled switch that can be precisely regulated by the microcontroller. If the motion sensor detects occupancy, the lights will remain on, and the exhaust fan, powered by a DC fan, will operate to ensure proper ventilation and drying of the restroom. When no motion is detected, the microcontroller will signal the solid-state relay to turn off the lights and the fan, thereby conserving electricity. Additionally, the project incorporates an automatic tap water system to further enhance efficiency and convenience. An infrared (IR) sensor installed near the tap detects the presence of hands or any obstacle, prompting the microcontroller to activate a DC motor that controls the water flow. This allows water to be dispensed only when hands are detected near the tap, preventing water waste. Once the hands are removed, the IR sensor no longer detects presence, and the microcontroller shuts off the motor, stopping the water flow immediately. To provide users with a clear indication of restroom occupancy, an LED indicator is included in the system. This indicator is also controlled by the microcontroller and illuminates when the restroom is occupied, based on signals from the motion sensor.

KEYWORDS: Electricity Conservation, Water Conservation, Restroom Automation, Motion sensor, Microcontroller, IR sensor.

PRODUCT DESCRIPTION

This project is designed to conserve electricity and simplify human tasks by addressing common issues such as forgetting to turn off lights in the restroom and not properly closing taps, which leads to unnecessary waste of electricity and water. The system activates when a person opens the restroom door, triggering a motion sensor that turns on the lights. Inside the restroom, a motion sensor detects presence, and the microcontroller (Arduino Uno) processes this information which in turn manages the power supply to the lights. If the restroom is occupied, the lights and an exhaust fan powered by a DC motor will remain on. Additionally, an automatic tap water system equipped with an infrared (IR) sensor detects hand presence [3], prompting the microcontroller to activate a DC motor that allows water to flow for hand washing. Furthermore, an LED indicator signals restroom occupancy. This project aims to reduce energy and water wastage while enhancing user convenience through automation. Refer to figure 1 for the schematic diagram, figure 2 for the prototype, figure 3 for the flowchart and figure 4 for the block diagram of the system

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

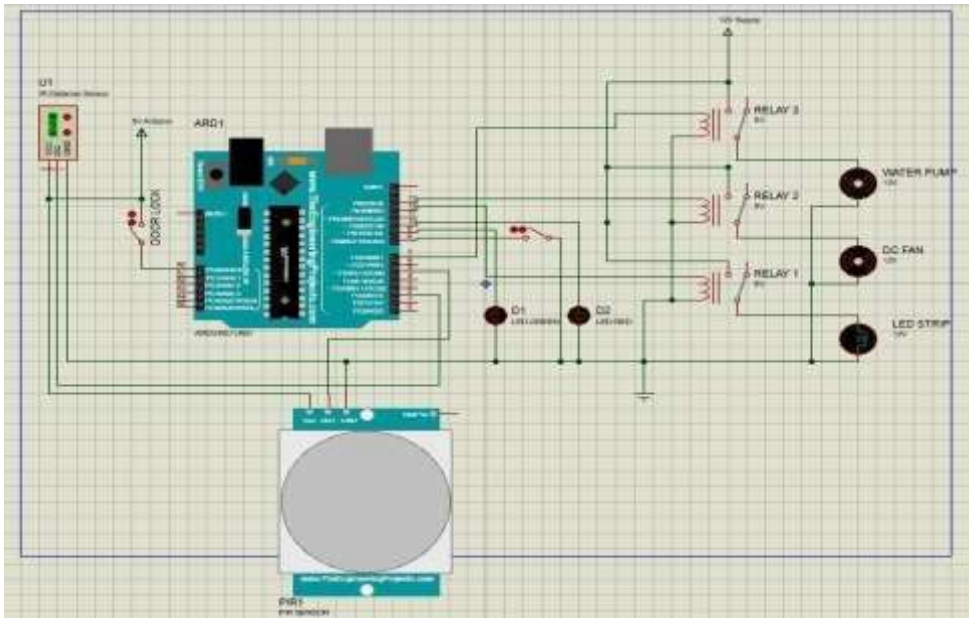


Figure 1 : Schematic diagram



Figure 2 : Prototype

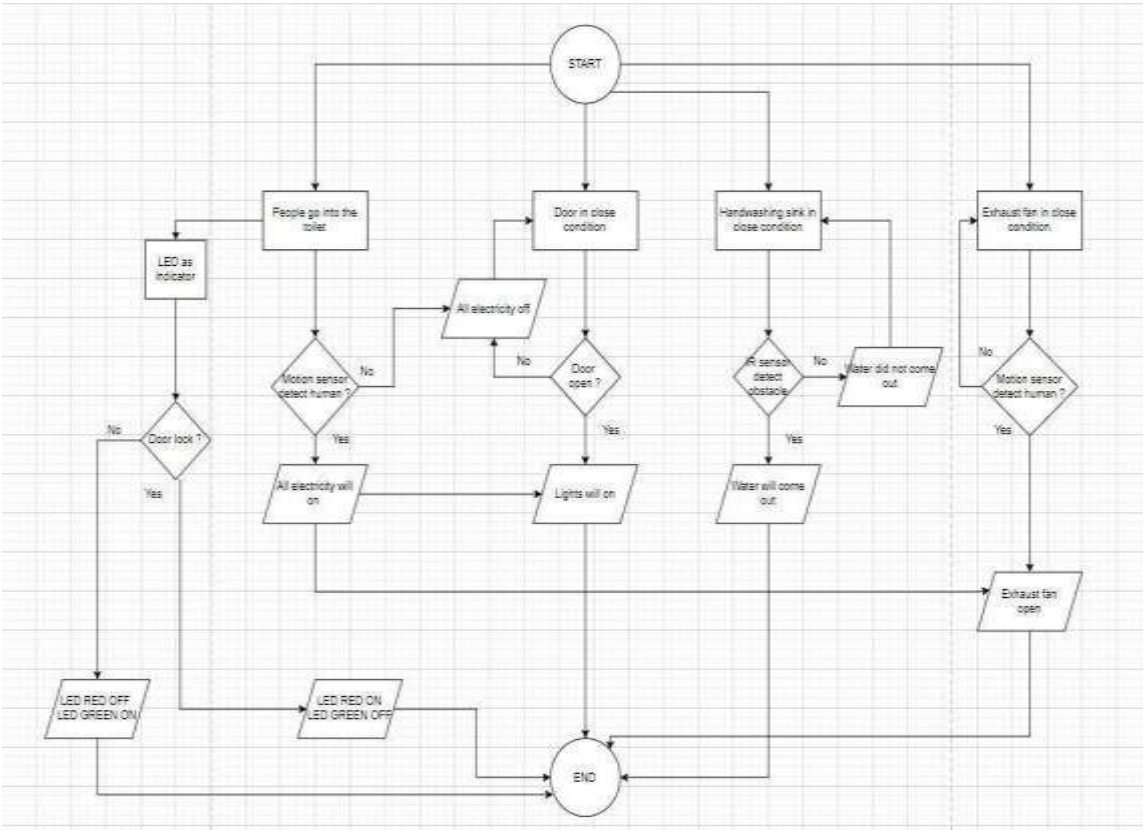


Figure 3 : Flowchart

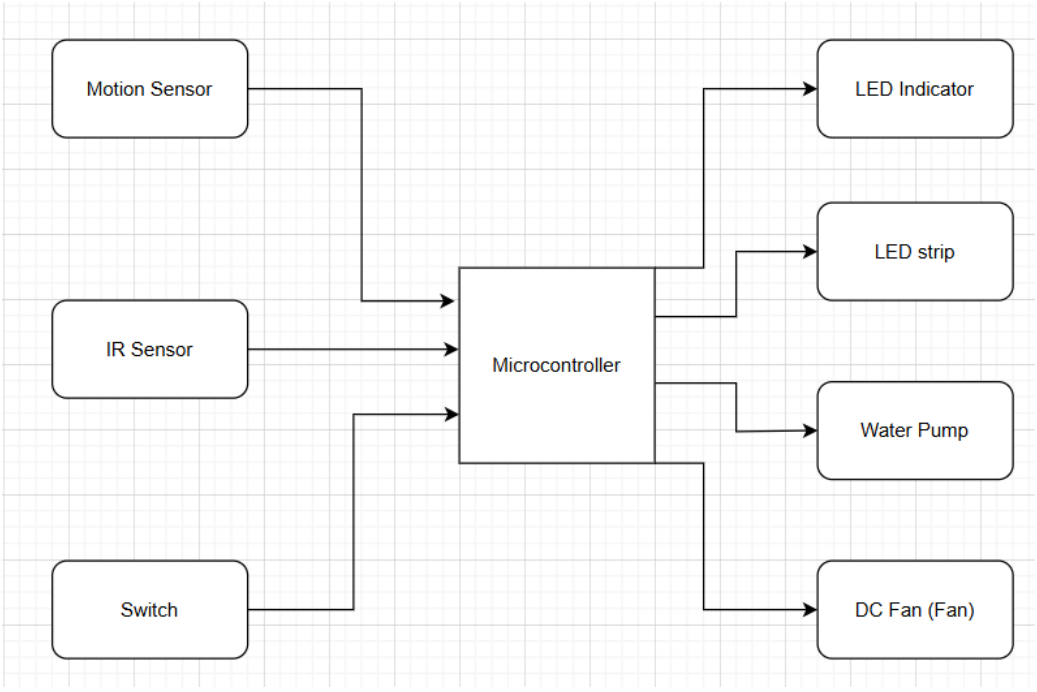


Figure 4 : Block diagram

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the system activates when a person opens the restroom door, triggering a motion sensor that turns on the lights. Inside the restroom, a motion sensor detects presence, and the microcontroller (Arduino Uno) processes this information to control a relay, which in turn manages the power supply to the lights. If the restroom is occupied, the lights and an exhaust fan powered by a DC motor will remain on. Additionally, an automatic tap water system equipped with an infrared (IR) sensor detects hand presence [3], prompting the microcontroller to activate a DC motor that allows water to flow for hand washing. Furthermore, an LED indicator signals restroom occupancy. This project aims to reduce energy and water wastage while enhancing user convenience through automation.

BENEFIT TO MANKIND

The benefits of this project are to reduce waste of water and electricity. According to reports from the public, some people failed to close the faucet properly and turn off the light in the restroom, wasting both water and electricity. Therefore, the goal of this initiative is to reduce the number of those incidents. When somebody opens the door, the light will turn on when the motion sensor detects it. The presence sensor will identify us when we enter the restroom. The light will remain on when people are using the restroom. The infrared (IR) sensor will identify the existence of an obstacle. Subsequently, it enables the sensor to be activated, releasing the water so that individuals can cleanse their hands.

COMMERCIALIZATION POTENTIAL

To provide a welcoming environment for all users, design components like lighting, ventilation, and accessibility are also prioritized. Modern restrooms place a high priority on sanitation due to growing awareness of hygiene, whether in public areas or at home. In addition, water and electrical bills depends on how people use it. Its adaptability positions it well for market success.

CONCLUSION

In conclusion, this smart restroom automation solution effectively incorporates contemporary technologies to improve user convenience and resource efficiency. The system efficiently automates the control of lighting, ventilation, and water flow by utilizing sensors and a microcontroller. This effectively addresses typical problems like forgetting to switch off lights and wrongly closing taps. Because the lights and fans are controlled automatically, they only turn on when someone uses the restroom, which drastically cuts down on the amount of electricity that is used needlessly [2]. Similarly, by regulating water flow in response to hand presence, the infrared sensor-based automatic tap system reduces water waste. These systems' automation makes human labor easier, resulting in a smooth and effective toilet experience. To further improve customer convenience, an LED indication provides a clear visual signal of restroom occupancy.

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Life Saving : Vehicle Alert System for Infants and Children

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ABSTRACT

The Vehicle Alert System for Infants and Children addresses the critical issue of child s vehicles, preventing fatalities caused by extreme temperatures or carbon monoxide (CO) poi The system utilizes an ESP32 microcontroller integrated with a DHT22 sensor for temp monitoring, a PIR motion sensor for detecting occupant presence, and an MQ7 sensor to m CO levels. By employing Telegram as an IoT platform, it provides real-time alerts to car smartphones, allowing swift responses to hazardous condition. This approach integrates monitoring parameters, ensuring comprehensive safety while maintaining cost-effectivene reliability. Furthermore, features like automatic notifications and escalation to emergency s enhance the system's practicality and effectiveness in preventing vehicle-related tragedies.

KEYWORDS: Child safety, unattended children, ESP32, DHT22, PIR sensor, MQ7, carbon monoxide, temperature monitoring, IoT, real-time alerts, Telegram, emergency services, veh safety.

PRODUCT DESCRIPTION

This smart car monitoring system is an IoT-based safety solution designed to safeguard unatt children and infants in vehicles. The ESP32 microcontroller functions as the central unit, mar critical sensors such as the DHT22 for temperature measurement, the PIR motion sens detecting movement, and the MQ7 for identifying dangerous CO levels. Alerts are trans through Telegram, notifying caregivers of hazardous conditions such as elevated temperatu increased CO levels in real time. Its compact and easy-to- integrate design allows sea adoption in new or existing vehicles, making it an efficient and reliable safeguard for v occupant safety.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

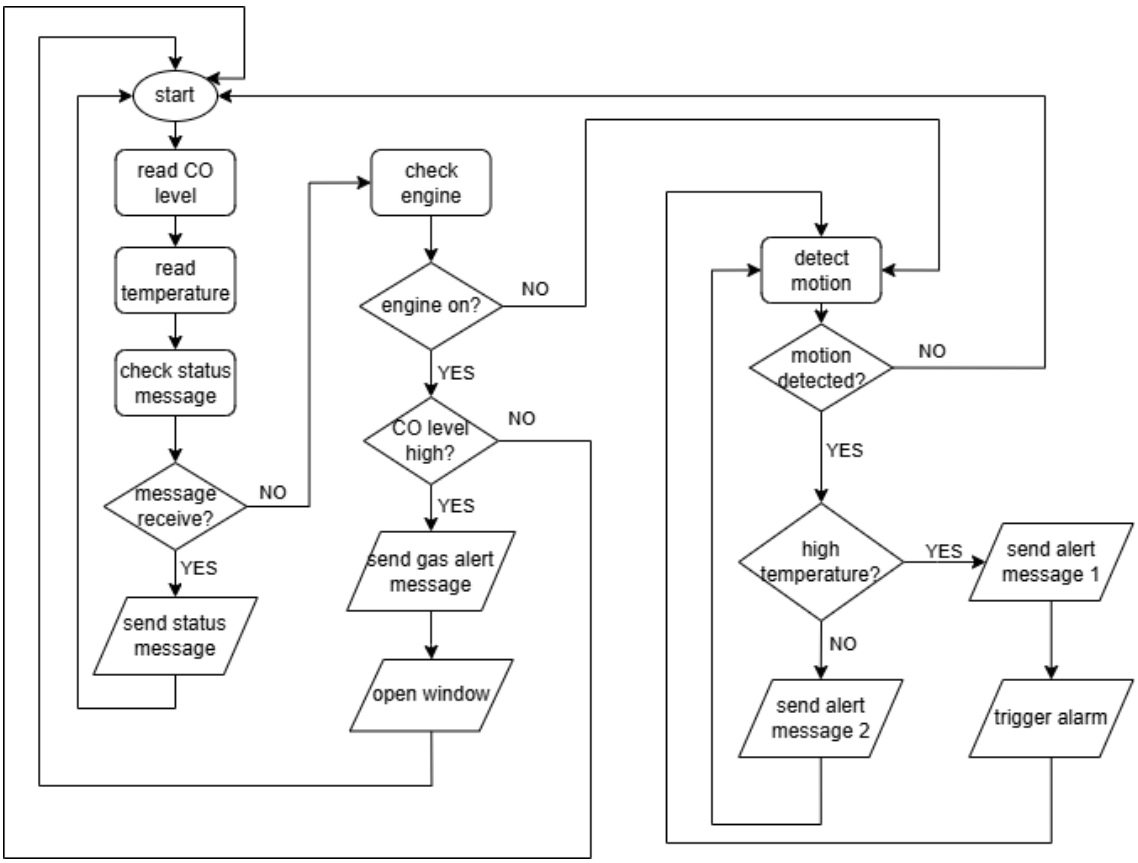


Figure 2: Flowchart

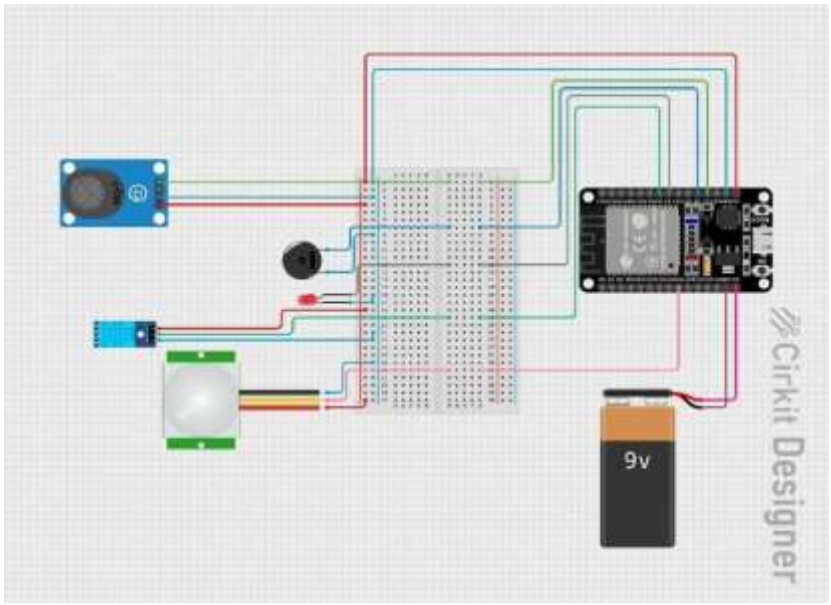


Figure 3: Circuit Diagram

NOVELTY AND UNIQUENESS

The system stands out for its innovative integration of multiple sensors on the ESP32 microcontroller, delivering a comprehensive approach to vehicle safety. Unlike traditional alarm systems, it leverages Telegram as an IoT platform to provide instant notifications, ensuring caregivers can respond promptly to emergencies. Its ability to simultaneously monitor temperature, motion, and CO levels sets it apart, offering a holistic safety solution with minimal impact on vehicle power systems. Furthermore, the compact and energy-efficient design enhances its usability and long-term applicability in vehicles.

BENEFIT TO MANKIND

This system significantly enhances child and passenger safety in vehicles by preventing incidents of heatstroke, suffocation, and CO poisoning. Real-time notifications sent to caregivers enable timely interventions, reducing the risk of fatalities caused by negligence or oversight. The inclusion of automated emergency escalation features further increases the likelihood of successful rescues during critical situations. Its user-friendly design ensures accessibility for a wide audience, offering peace of mind to parents, caregivers, and fleet managers while addressing a pressing public safety issue.

COMMERCIALIZATION POTENTIAL

The system presents substantial commercialization potential across diverse markets. Automotive manufacturers can integrate it into new vehicle models as a standard safety feature, while parents and caregivers can adopt it as an aftermarket accessory. Its applicability extends to public transport and shared vehicle fleets, enhancing passenger safety in commercial operations. Insurance companies may promote its usage to minimize liability risks, and regulatory agencies could incorporate it into safety standards, further driving market adoption. With increasing awareness of vehicle safety, this system aligns with contemporary demands for innovative IoT-based solutions.

CONCLUSION

This smart car monitoring system offers a practical and scalable solution to address child and occupant safety in vehicles. Its advanced features—such as temperature, motion, and CO monitoring, along with real-time notifications through Telegram—make it a reliable and user-friendly innovation. By leveraging the ESP32 microcontroller and efficient sensors, the system demonstrates significant potential for reducing vehicle-related tragedies. Future developments may focus on enhancing AI-driven detection capabilities, expanding sensor integration, and improving analytics for a more versatile and impactful safety tool.

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Automatic Garage with Security and Carbon Monoxide Detector System

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ABSTRACT

In Malaysia nowadays, the numbers of vehicles are more than the number of citizens. It is optimal for each car to have its own garage to keep the vehicle safe. However, cars in garages are also prone to be stolen, or be involved in fire, or carbon monoxide pollution from exhaust gases. To avoid these accident from happening, this study proposes an automatic garage with security and carbon monoxide detector system. Esp32 has been selected as the project's brain and is Wi-Fi associable. A servo motor opens and closes the garage door using the mfrc522 RFID module and infrared sensor. The visual interface on the Blynk platform also provided signal that opens or closes the garage door. An MQ135 gas sensor is used for measuring the air quality in the garage to detect any dangerous trapped gas. An exhaust fan is included to neutralize the air quality. This system is connected to the Telegram application for notification. The motion sensor allows the light to turn on when the owner is in the garage. This project is aimed to have a positive impact on the vehicle and the owners itself.

Keywords: 'Automatic door, Air quality, Motion, Blynk, Telegram'

PRODUCT DESCRIPTION

The ESP-32 for this project act as a brain that control all components and establishing a Wi-Fi connection. By connecting to Wi-Fi, Blynk can be used to operate the servo motor that opens and closes the garage door and the Telegram will send the notification alerts. To activates the servo motor, an RFID module will read the card to open the door. A buzzer will be active if the card is rejected by RFID. Air quality system consists of a gas sensor and a DC fan. The Telegram app will give a notification if air quality is bad. The motion sensor used to detect if someone is in the garage and the light will turn on.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

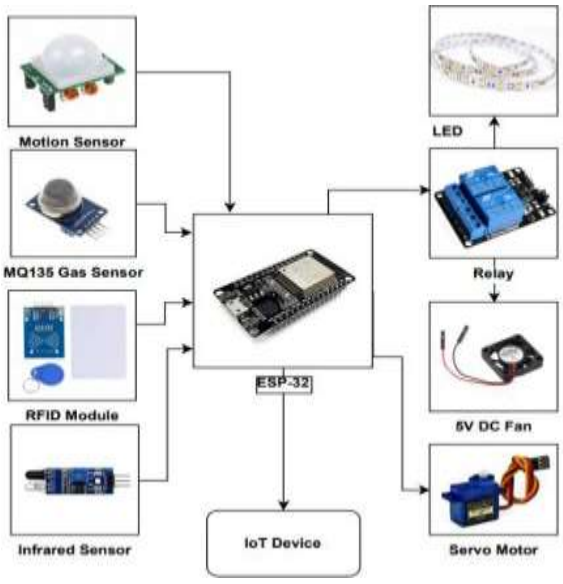


Figure 1: Block Diagram of Automatic Garage with Security and Carbon Monoxide Detector System

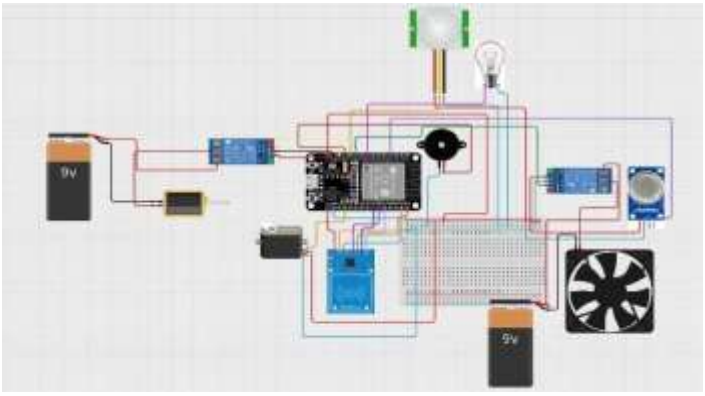


Figure 2: Circuit Diagram of Automatic Garage with Security and Carbon Monoxide Detector System

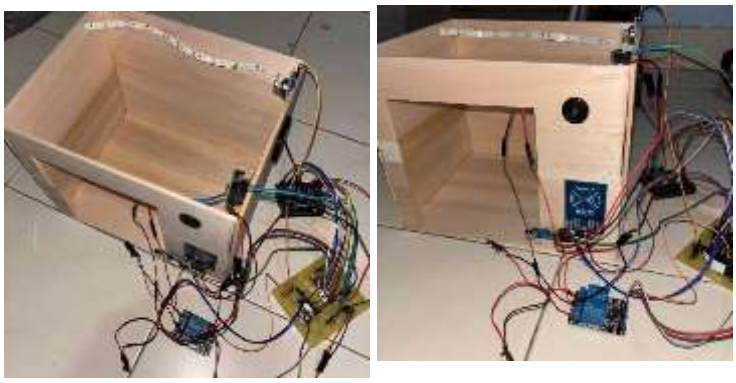


Figure 3: Prototype of Automatic Garage with Security and Carbon Monoxide Detector System

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the automatic garage with security and carbon monoxide detector system is a system that integrate of multiple essential features. Unlike traditional garage, this system also combines advanced automation, safety, and security to create a cutting-edge solution for modern garage.

BENEFIT TO MANKIND

By tackling important concerns like convenience, safety, security, and environmental health, the Automatic Garage with Security and Carbon Monoxide Detector System greatly helps humanity. Its provides gas value monitoring, saving electricity consumption, and automatic door system. Beside that, this system also suitable for parking system that have many similartiy.

COMMERCIALIZATION POTENTIAL

The Automatic Garage with Security and Carbon Monoxide Detector System possesses significant commercialization potential due to its versatility across various industries. The demand for intelligent and automated systems is growing as a result of the IoT quick adoption. This project is a useful addition to the smart home ecosystem since it meets the growing demand for integrated, user-friendly, and multipurpose solutions.

CONCLUSION

The Automatic Garage with Security and Carbon Monoxide Detector System is a groundbreaking innovation that addresses critical aspects of modern living, including safety, security, convenience, and environmental health. By integrating advanced automation, innovative security features, and proactive health monitoring, the system offers a complete solution that is suited to the requirements of modern homes.

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Automatic Battery Charging System With Real Time Monitoring For Household Application

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ABSTRACT

In order to improve the security, dependability, and effectiveness of battery charging procedures, this project focuses on creating an Arduino-based battery voltage monitoring and automatic cutoff system. The device uses a voltage divider circuit to reduce the battery voltage so that the Arduino microcontroller can measure it precisely. It is specifically designed for a 9V battery. An LCD panel, which offers constant updates on the battery's voltage and condition, makes real-time monitoring easier. A buzzer and an LED indicator are extra features that act as visual and auditory cues when the battery is fully charged. When the maximum safe voltage is reached, a relay module built into the design instantly cuts off the AC power supply to the battery charger, preventing overcharging [1]. A frequent problem, overcharging can shorten battery life, cause overheating, and pose safety risks. By combining automation and safety features to guarantee that charging is stopped at the proper voltage level, this solution allays these worries. To ensure constant monitoring and control, the relay only restarts the charging process if the battery voltage falls below the predetermined threshold. The project places a strong emphasis on elements that are straightforward for users to grasp, like the LCD's clear and succinct display of voltage readings and status information. Users are instantly alerted when the battery is fully charged thanks to the LED light and buzzer, which provide instant feedback. These characteristics work together to make the system both useful and simple to use. This Arduino-based battery management solution is economical and effective, showcasing the potential of microcontroller-based systems to tackle practical energy issues. It is appropriate for a variety of uses, such as emergency backup power solutions, portable devices, and renewable energy storage systems, because to its modular architecture and scalability. The idea is a creative move toward safer and more intelligent battery charging methods and emphasizes the value of automation in contemporary energy systems [5].

KEYWORDS: Arduino-based system, Battery voltage monitoring, Automatic cutoff system, Voltage divider circuit, Battery, LCD display, Relay module, Overcharging prevention

PRODUCT DESCRIPTION

This product is focused on one creative way to guarantee the security, dependability, and effectiveness of battery charging procedures is the Automatic Battery Charging System with Real Time Monitoring For Household Application. Specifically designed for 9V batteries, this smart device uses cutting-edge microcontroller-based technology to automatically monitor and manage the charging process. For a variety of uses, such as emergency backup power supply, portable electronics, and renewable energy storage systems, this technology provides an adaptable and affordable option. It may be easily customized and scaled to meet different energy management needs because to its modular architecture. With its clever approach to battery management that improves performance and user experience, the Automatic Battery Charging System with Real Time Monitoring For Household Application is a prime example of how automation and safety can coexist in contemporary energy systems. In figure 1, there were the example of the circuit simulation for the project that been created using tinkercad. Next, figure 2 show the block diagram and figure 3 show the flowchart of the Automatic Battery Charging System with Real Time Monitoring For Household Application.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

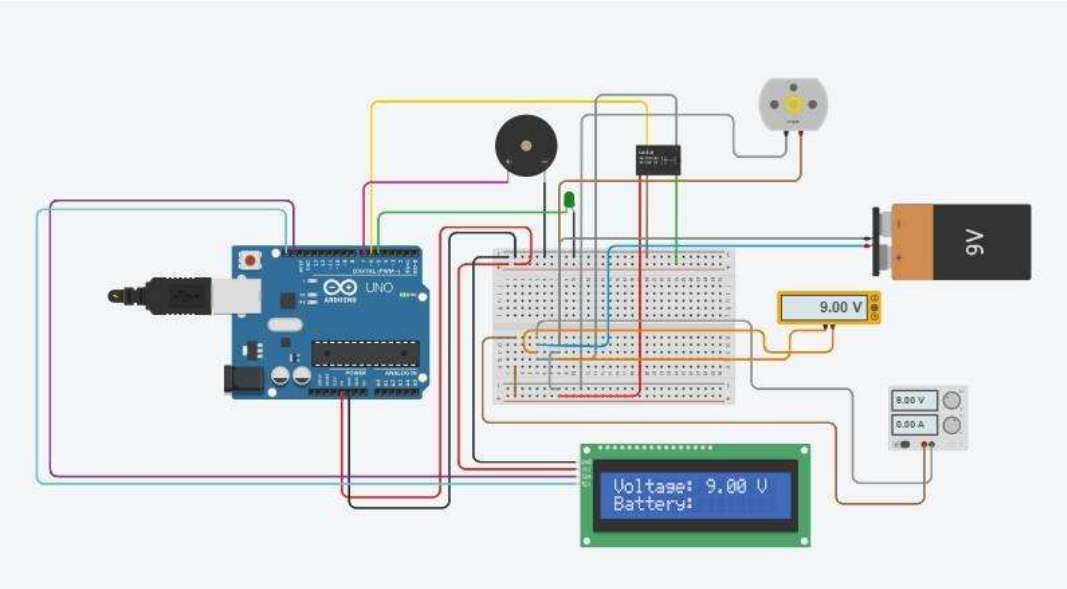


Figure 1: Circuit simulation at tinkercad

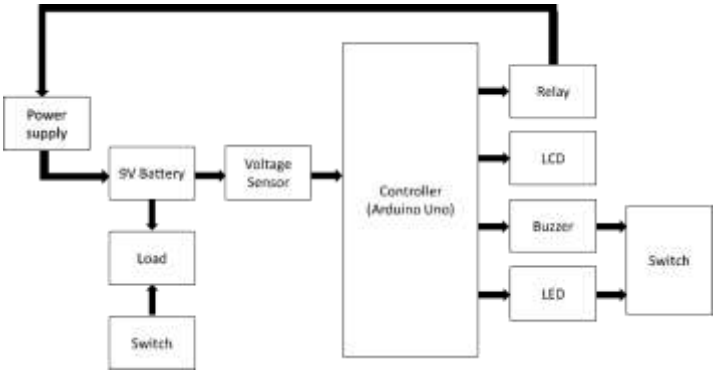


Figure 2: Block Diagram

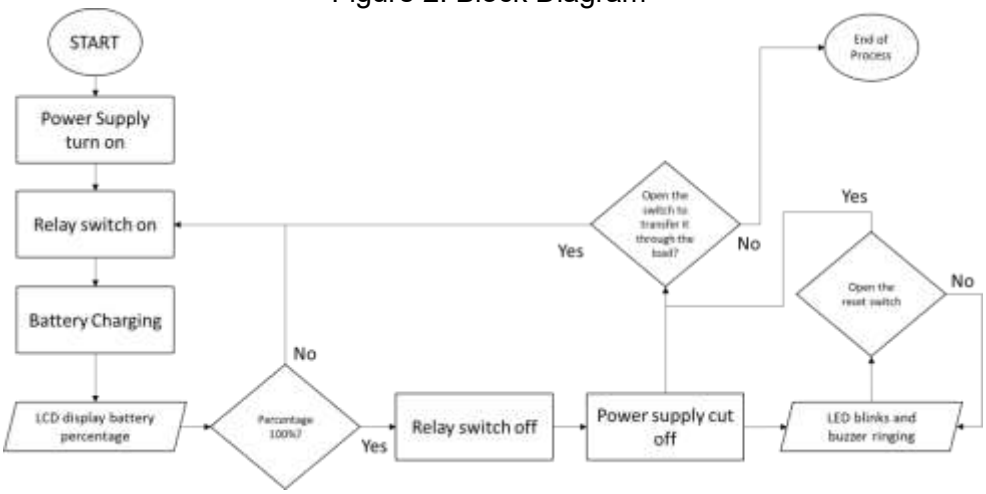


Figure 3: Flowchart

NOVELTY AND UNIQUENESS

By combining real-time voltage monitoring, an automated charging cutoff mechanism, and two feedback systems (LED and buzzer) into a single, small design, the Automatic Battery Charging System with Real Time Monitoring For Household Application presents a revolutionary approach to battery management. A relay module automatically cuts off the AC power source at the highest safe voltage, preventing overcharging and extending battery life. This system, in contrast to conventional chargers, uses an LCD display to provide easy-to-use, constant updates on battery voltage and status. It is adaptable for use in backup power systems, portable electronics, and renewable energy storage because of its scalable and modular construction, which enables adaptation for different battery types and capacities. This inexpensive approach minimizes power waste by only restarting charging when required, exhibiting energy efficiency. The combination of cost- effectiveness, security and adaptability makes this system stand out in the field of energy management, offering a smarter alternative to conventional charging solutions.

BENEFIT TO MANKIND

By encouraging safer and more effective battery charging procedures and immediately addressing the hazards of overcharging, overheating, and shortened battery lifespan, the Automatic Battery Charging System with Real Time Monitoring For Household Application benefits humanity. The technology reduces human mistake and interference by automating the cutoff process and offering real-time feedback through visual and audible alerts, which makes it very helpful in both home and business settings. Its adaptability to renewable energy applications, such solar power storage, is made possible by its modular design, which helps create sustainable energy solutions. Furthermore, a larger audience may now access improved battery management due to the system's cost and user-friendliness, which promotes the global adoption of safer energy practices. This invention demonstrates the potential of microcontroller-based technologies and satisfies the growing demand for sustainability and energy efficiency in contemporary culture [2].

COMMERCIALIZATION POTENTIAL

As for the commercialization potential is low risk because of its cost, modularity, and adaptability to a wide range of applications, the project has a great deal of commercialization potential. It is appealing to both household and industrial markets because it provides an affordable way to meet the demand for safe and effective battery charging solutions worldwide. Because of its scalability, it can be adjusted to work with batteries of varying voltages, which makes it appropriate for backup power systems, renewable energy storage, and portable electronics. By lowering safety hazards and extending battery life, the system's automated cutoff and real-time monitoring capabilities provide it a competitive edge over conventional chargers and satisfy consumer demands for dependable and environmentally friendly energy solutions. Furthermore, the open- source nature of the project makes modification simple, making it appealing to small enterprises, hobbyists, and major corporations looking for creative yet cost-effective energy management systems [3].

CONCLUSION

An inventive and workable solution to the problems of battery overcharging and ineffective energy management is the Automatic Battery Charging System with Real Time Monitoring For Household Application. The system optimizes energy use, extends battery life, and assures safety by combining automation, real-time monitoring, and user- friendly feedback systems. It supports sustainable energy practices because of its modular design and versatility, which make it appropriate for a variety of uses, from home use to renewable energy systems. Because of its simplicity, scalability, and affordability, this project represents a major breakthrough in battery management technologies [4]. Its potential for broad acceptance and influence on global energy practices is further highlighted by its compatibility with contemporary aspirations for safer and smarter energy solutions.

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Sustained Food Supply For Stray Animals

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ABSTRACT

This project presents the development and implementation of a "Sustained Food Supply for Stray Animals" system using ESP32 microcontrollers. The primary objective is to create an automated and reliable system that ensures a continuous food supply for stray animals, minimizing human intervention and maximizing efficiency. The system integrates several components: a servo motor for food dispensing, an LDR (Light Dependent Resistor) module sensor for ambient light detection, an ultrasonic sensor to monitor if the food container is empty, an IR (Passive Infrared) sensor to detect the presence of animals, an IR sensor 2 to detect if food is present in the bowl, and a bulb for illumination during low-light conditions. The ESP32 module is utilized for wireless communication, enabling remote monitoring and control via the Blynk application. The LDR module sensor and IR sensor work in tandem to detect stray animals' presence and the surrounding light conditions, ensuring the food dispensing mechanism is activated only when necessary. The ultrasonic sensor continuously monitors the food container's status, providing real-time data to prevent overfilling or depletion. The IR sensor 2 ensures that food is successfully dispensed into the bowl. The servo motor is controlled to dispense the appropriate amount of food based on the sensor inputs. Remote monitoring and control are facilitated by the ESP32 module, which connects to the Blynk platform. This allows users to track the system's status and receive notifications about low food levels, enabling timely refilling. Additionally, the system can be manually overridden through the Blynk app if required. This project aims to provide a sustainable and efficient solution for feeding stray animals, reducing food waste, and ensuring a consistent food supply. The integration of multiple sensors and wireless communication enhances the system's reliability and ease of use, making it a viable option for animal welfare organizations and individuals committed to supporting stray animals. In conclusion, the "Sustained Food Supply for Stray Animals" demonstrates the potential of IoT (Internet of Things) technologies in addressing real-world challenges, promoting animal welfare, and fostering a more compassionate community.

KEYWORDS: ESP32, Servo motor, LDR module sensor, IR sensor, Ultrasonic sensor, Bulb.

PRODUCT DESCRIPTION

The issue of stray animals, particularly dogs and cats, is a global concern that poses significant challenges to both animal welfare and public health. Stray animals often suffer from malnutrition, disease, and harsh environmental conditions due to the lack of consistent and adequate food sources. Overpopulation of stray animals in urban and rural areas can lead to conflicts with humans and other animals, the spread of zoonotic diseases, and ecological imbalances. Addressing these issues requires a sustainable and reliable food supply for stray animals, which is a critical aspect of animal welfare and community health.

Traditional methods of feeding stray animals, such as manual feeding by volunteers or community members, are labor-intensive, inconsistent, and often unsustainable. These methods rely heavily on human presence and availability, which can be erratic and subject to various limitations such as time constraints, financial resources, and adverse weather conditions. Consequently, there is a pressing need for innovative solutions that can provide continuous and reliable feeding mechanisms with minimal human intervention, ensuring that stray animals receive consistent care and nourishment.

Recent advancements in technology have opened up new possibilities for addressing such challenges. The advent of the Internet of Things (IoT) has revolutionized various sectors by enabling smart, connected devices to communicate and function autonomously. IoT technology can be leveraged to create automated systems that monitor and manage feeding processes efficiently. Microcontrollers like the ESP32 offer powerful yet affordable platforms for building such systems. These devices can interface with various sensors and actuators to perform specific tasks, making them ideal for creating an automated food dispensing system for stray animals.

The proposed project aims to develop an automated food supply system for stray animals using ESP32 microcontrollers. The system integrates several components, including a servo motor for dispensing food, an LDR module sensor for detecting ambient light, an IR sensor to detect animal presence near the feeder, and a second IR sensor (IR sensor 2) to check whether food is already in the bowl before dispensing. If the bowl is empty, the system proceeds to dispense food. Additionally, an ultrasonic sensor is used to measure the distance from the top of the food container to the surface of the food. By calculating this distance in centimeters the system can determine the food level inside the container. If the sensor detects that the distance is equal to or close to the height of the empty container, it indicates that the container is empty or nearly empty. A bulb provides illumination during low-light conditions, ensuring proper operation at all times. The ESP32 module facilitates wireless communication, enabling remote monitoring and control through the Blynk application. This allows users to monitor the system’s status, receive notifications about food levels, and manually control operations if necessary.

By implementing this project, we aim to provide a sustainable solution to the challenge of feeding stray animals, thereby improving their welfare and contributing to a healthier, more balanced ecosystem. The system's autonomous operation ensures that food is dispensed only when stray animals are present and under suitable conditions, while the integration of multiple sensors enhances its reliability. This project aspires to make a meaningful impact on the lives of stray animals and the communities in which they live, promoting animal welfare through technological innovation.

The project aims to address the challenge of insufficient food supply for current urban stray animal populations, caused by the lack of effective monitoring systems. According to World’s Veterinary Journal, many stray cats are roaming along the street, sometimes seen in restaurants, institutions, places of worship, and refuse dump looking for food. The same problem has also been observed in other developing countries their limited food sources, these animals frequently suffer from nutritional deficiencies and hunger. The project's goal is to create a sustainable and dependable solution for ensuring consistent and timely access to food by developing an stray animal feeding system. The feeder system will monitor food levels, precisely measure portions at scheduled times and adapt to shifting external circumstances. Ultimately, the project aims to lessen the detrimental effects of hunger and malnutrition while also enhancing the general well- being of stray animals by addressing the underlying cause of irregular feeding practices. Therefore, to solve the problem, system that can automatically feed the pet without the presence of the owner is needed to make sure that the pet stays healthy.

The objectives of this project are to design a Sustained Food Supply for Stray Animals system to address the need for reliable and efficient feeding solutions for stray animal populations in the environment. Next, to design a circuit using IR sensor, LDR, and ultrasonic sensor as inputs, coupled with a servo motor and an alert system utilizing ESP32.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

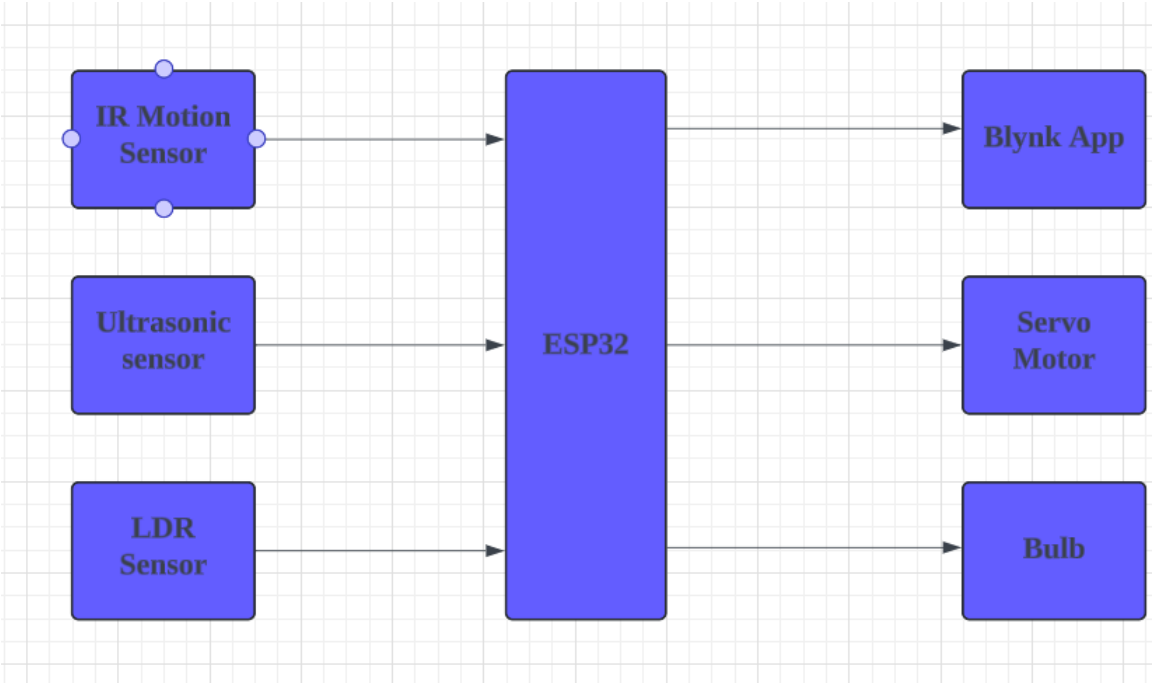
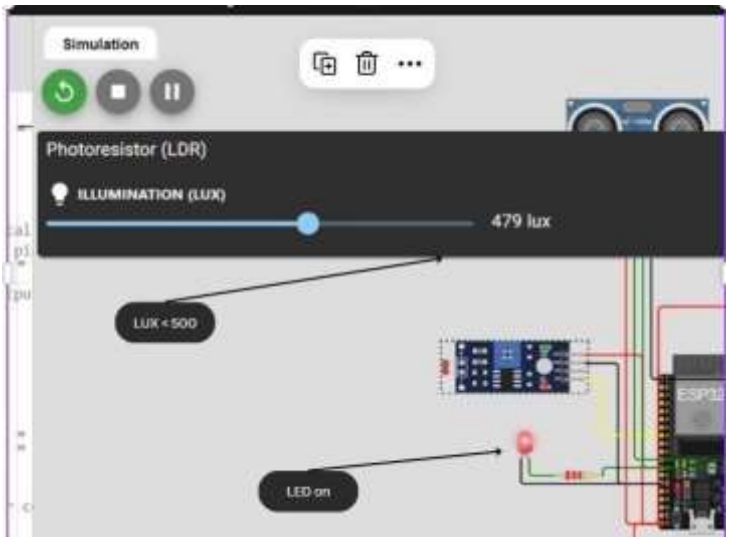


Figure 1. Block Diagram of the Sustained Food Supply for Stray animals

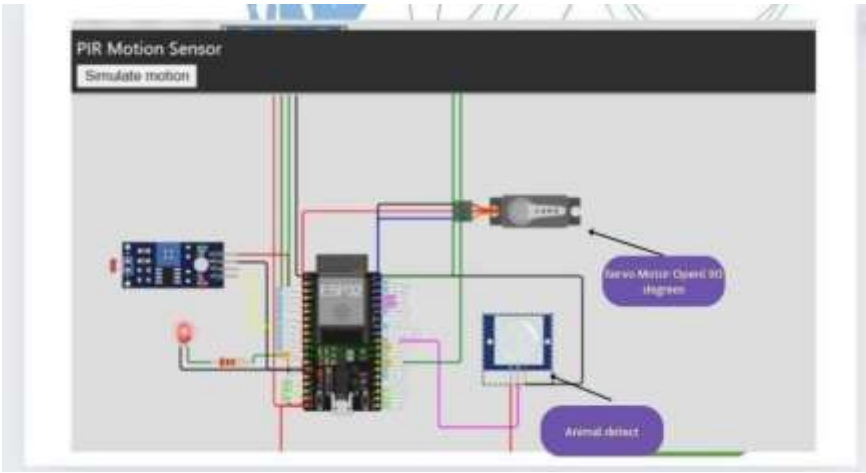
The block diagram highlights the use of various components, each of which plays a distinct role depending on the functions of the sensors used. The block diagram is divided into two sections, which represent input and output functionalities. On the input side, the integration includes an IR sensor and an ultrasonic sensor that communicate with the microcontroller. The IR sensor detects the presence of animals, and the ultrasonic sensor measures the food level. Additionally, IR sensor 2 checks whether food is already present in the bowl before the system dispenses food. Incorporating these input components ensures a consistent and efficient feeding process, which improves the overall well-being of the pets. The output section includes a servo motor and a bulb. ESP32 allows for communication with external devices such as smartphones to monitor the pet feeder. LDR sensor detects ambient light levels, allowing the system to adjust its operation accordingly, conserving energy during daylight hours while triggering necessary functions in low-light conditions or at night. The mobile alert system in the Stray Animal Feeder project sends real-time notifications to users' mobile devices via the Blynk application, providing updates on feeding activities.

I) LED Monitoring



When the ambient light level drops below 500 lux, the LDR sensor detects the low light condition and sends a signal to the ESP32. The ESP32 processes this input and turns on the LED connected to pin 14, providing necessary illumination around the feeder. This ensures that stray animals have visibility around the feeder during low light conditions, enhancing the effectiveness and reliability of the automated food supply system.

II) IR sensor and Servo motor Monitoring



When the IR sensor detects the presence of an animal, it sends a signal to the ESP32 indicating motion. The ESP32 processes this input and activates the servo motor, rotating it 90 degrees to release food from the dispenser. This immediate response ensures that stray animals receive timely nourishment, enhancing the efficiency and effectiveness of the feeding system.

III) Ultrasonic sensor Monitoring and Blynk



Ultrasonic sensor plays a crucial role in monitoring the food level within the dispenser. The sensor measures the distance from its position at the top of the food container to the surface of the food. If the measured distance is far, indicating that the food level is low, the sensor signals the ESP32 microcontroller. The ESP32 then processes this information and sends a notification to the user through the Blynk application, alerting them that the food supply is depleted and needs to be replenished. This automated monitoring system ensures that the food dispenser is consistently refilled, providing a reliable food source for stray animals.

NOVELTY AND UNIQUENESS

This project introduces an innovative IoT-based automated feeding system using ESP32 microcontrollers. Unlike traditional manual feeding methods, this system leverages sensors such as IR (for animal detection), LDR (ambient light detection), and ultrasonic sensors (food level monitoring) to ensure efficient and autonomous food distribution. The integration of the Blynk app enables real-time monitoring, remote control, and notifications, reducing human intervention. The project's unique approach combines IoT technology, energy-saving mechanisms, and precise food dispensing through servo motors, ensuring a reliable food supply while preventing waste. By incorporating ambient light sensors and motion detection, the system operates intelligently, optimizing resources and conditions for feeding. This novelty lies in its multi-sensor integration and real-time communication, providing a practical, scalable, and efficient solution to a prevalent societal problem.

BENEFIT TO MANKIND

The project offers significant societal and humanitarian benefits by addressing the welfare of stray animals. Providing a consistent and reliable food source minimizes malnutrition, starvation, and related diseases among stray populations. This, in turn, promotes healthier and safer communities by reducing conflicts between humans and animals. Animal welfare organizations and volunteers benefit from reduced manual efforts through automation, enabling them to focus on other essential tasks. By preventing food waste and ensuring timely nourishment, the system fosters compassion and a sense of responsibility towards animal welfare. Ultimately, the project promotes a harmonious coexistence between humans and animals, contributing positively to public health and the environment.

COMMERCIALIZATION POTENTIAL

This project has strong commercialization potential, particularly for animal welfare organizations, municipal councils, and pet care markets. The automated feeding system's scalability, affordability, and ease of deployment make it an attractive solution for managing stray animal populations. Customizable features, such as real-time monitoring via mobile apps and notifications for food replenishment, add significant value for end-users. The system could be further commercialized as a modular product for animal shelters or marketed as a smart pet feeder for domestic use. Integration with solar power or advanced analytics for feeding patterns can enhance its market appeal, creating opportunities for widespread adoption and profitability.

CONCLUSION

In conclusion, addressing the challenges faced by stray animals is crucial, given their tough lives compared to domestic pets . Strays rely on external help for food , highlighting the importance of projects like "Sustained Food Supply for Stray Animals." This initiative uses ESP32 technology and a variety of sensors to efficiently manage urban strays' feeding needs, minimizing food waste and ensuring timely nourishment. By detecting animal presence, dispensing food accurately, and alerting volunteers about feeding activities and food levels, the system guarantees a steady food supply. It tackles inconsistent feeding schedules caused by resource limitations and unpredictable patterns, aiming to enhance the well-being of strays vulnerable to nutritional deficiencies and hunger. Key components such as PIR sensors for animal detection, servo motors for automated food dispensing, and an ultrasonic sensor for monitoring food levels underscore the project's sophistication. Integration with Blynk facilitates remote monitoring and alleviates caregiver responsibilities when the microcontroller is online. This project not only improves feeding efficiency in shelters through automation and real-time oversight but also supports animal welfare organizations in managing stray populations with reliable feeding schedules. With equipment including IR motion sensors, ultrasonic sensors, LDR modules, ESP32 microcontrollers, servo motors, and Blynk, the initiative exemplifies technological innovation in addressing practical challenges in animal care.

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QR Code Assisted Locker Rental System

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ABSTRACT

Traditional locker systems relying on physical keys face numerous security issues, including the risk of loss, theft, and unauthorized access. This project introduces a QR Code-Assisted Locker Rental System that enhances security and user convenience by replacing traditional keys with QR code technology. Each locker is assigned a unique QR code that directs users to a Google Form, where they can select their locker, set a password, and receive login credentials for the Blynk platform to remotely lock and unlock their assigned locker. The system integrates real-time monitoring of locker availability, a vibration sensor, and a buzzer to detect unauthorized tampering, ensuring robust security. By leveraging QR codes, password protection, and real-time digital control, this system addresses the shortcomings of traditional lockers, offering a modern, efficient, and secure solution for managing locker rentals while safeguarding users' belongings.

KEYWORDS: Password protected locker, Esp32, IoT, Blynk**.**

PRODUCT DESCRIPTION

Locker systems have been widely used for temporary storage in various environments, such as schools, gyms, and workplaces. Traditional lockers typically rely on physical keys for access, which pose significant security and practical challenges. Keys are often small and easy to lose or steal, and their association with locker numbers makes it simple for unauthorized individuals to access specific lockers. Additionally, traditional locker systems lack robust security measures, leaving them vulnerable to tampering and unauthorized entry. As technology advances, there is a growing demand for modernized locker systems that enhance security and offer a more convenient user experience. QR code technology, combined with password protection, presents a promising solution to these challenges by eliminating the risks associated with physical keys and improving ease of use. Traditional key-based locker systems face critical issues, such as the risk of key loss, theft, and security breaches. The engraved locker numbers on keys further expose users to potential theft, while the lack of adequate security mechanisms leaves lockers susceptible to tampering. These limitations not only compromise the safety of users' belongings but also make the rental process inconvenient. Therefore, there is an urgent need for a modern locker system that leverages advanced technologies to improve security, reduce the risk of unauthorized access, and simplify the user experience. The proposed solution uses QR code technology linked to a Google Form for locker rental, where users can select a locker, set a password, and receive credentials for the Blynk platform to manage their locker. The primary objective of this project is to develop a QR Code-Assisted Locker Rental System that uses QR codes and password protection to enhance security and eliminate the issues associated with physical keys. Users will scan a QR code linked to a Google Form to select a locker, set a password, and receive credentials for the Blynk platform to open and lock the locker. The system also aims to simplify the rental process by providing real-time locker availability updates and integrating an alert system using LEDs to indicate occupancy. The project involves using an ESP32 microcontroller, ultrasonic sensor, vibration sensor, servo motor, LEDs, buzzer, and an LCD display. Key methods include designing and constructing the locker system, programming the ESP32 to handle locker operations, and integrating an alert system to notify users of locker status.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

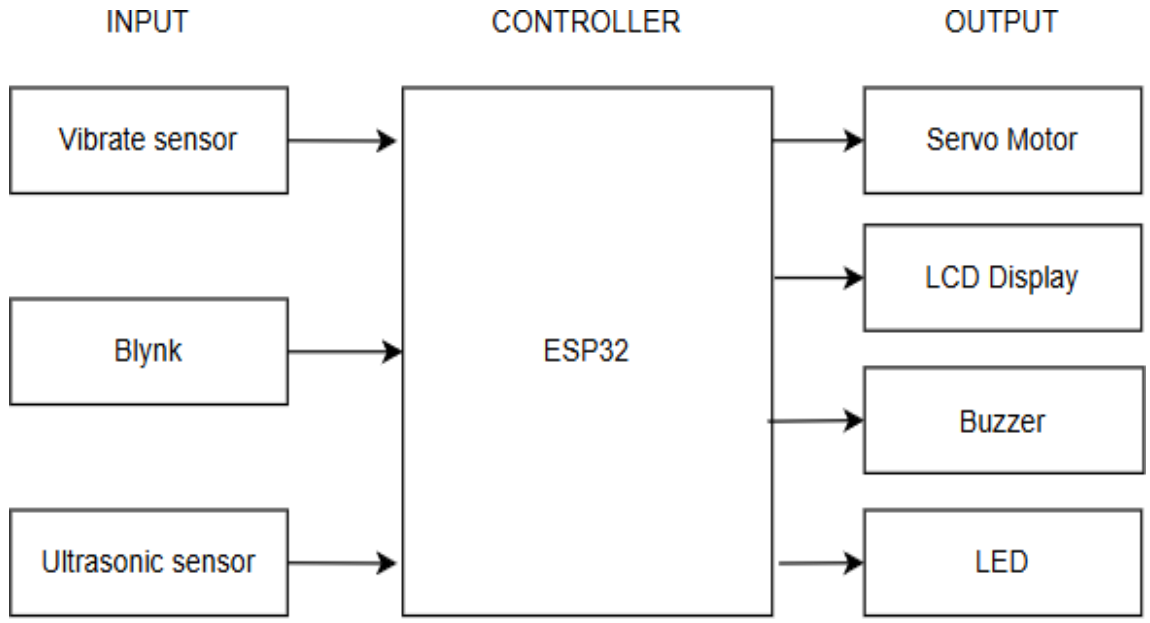


Figure 1. Block Diagram

The proposed QR Code-Assisted Locker Rental System utilizes a streamlined operation flow that integrates inputs, processing, and outputs for enhanced security and user convenience. The input section includes a vibration sensor to detect tampering, an ultrasonic sensor to monitor locker occupancy, and the Blynk platform, which serves as the user interface for managing locker operations after scanning a QR code. At the core of the system, the ESP32 microcontroller processes data from the sensors and Blynk commands to activate outputs. These outputs include a servo motor for locking and unlocking the locker, an LCD display for real-time status updates, a buzzer for auditory alerts, and LEDs for visual status indicators. By combining QR code technology, password protection, and real-time monitoring, this system provides a secure, efficient, and user-friendly solution to the limitations of traditional locker systems.

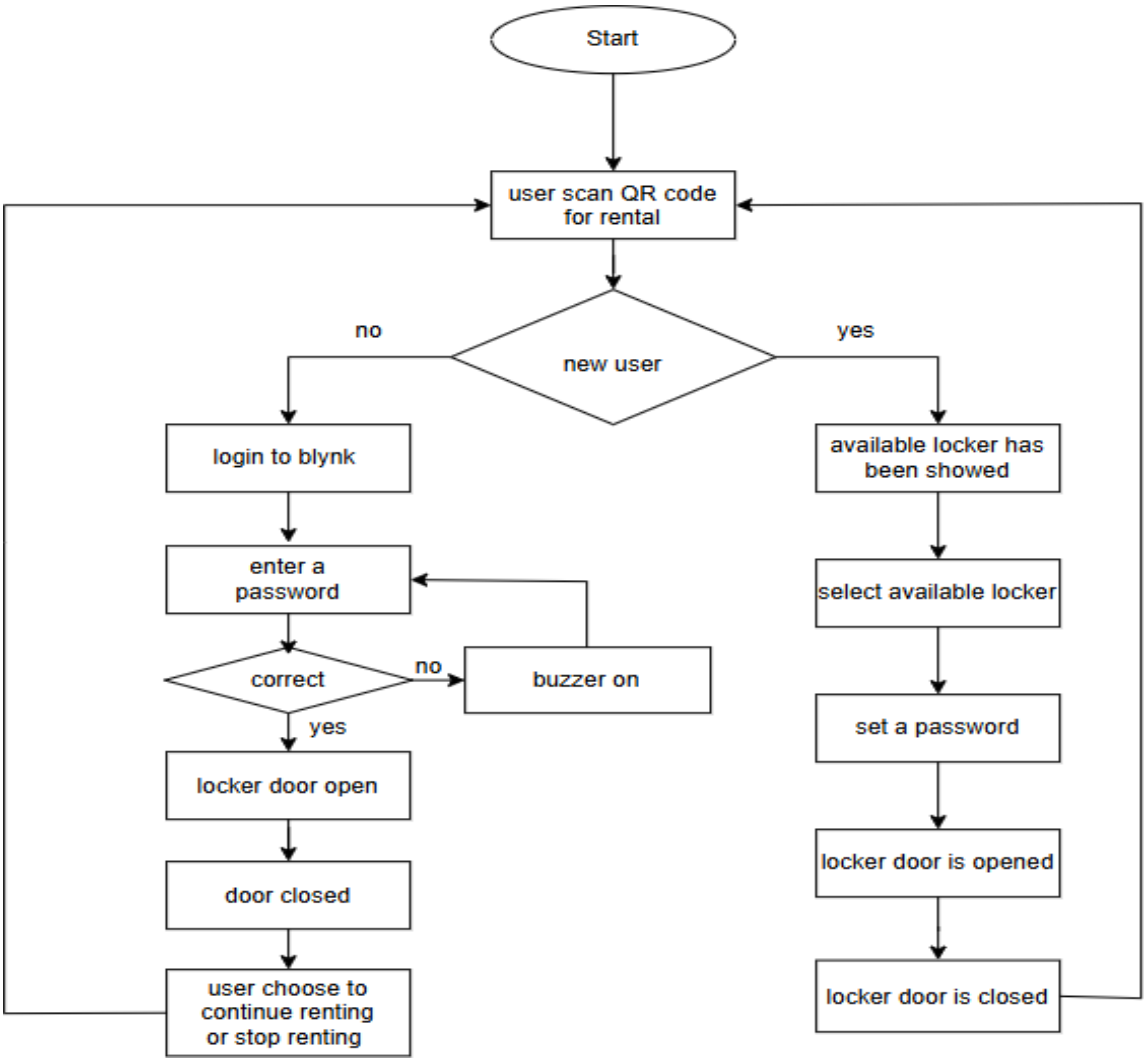


Figure 2. Flow-chart

The QR code-assisted locker rental system begins by generating a unique QR code for each locker, which grants access to the rental process. Upon scanning the QR code, the system determines whether the user is new or an existing renter. For existing users, the system prompts a login to Blynk, where the user must enter their password. If the password is correct, the locker door opens automatically; otherwise, a buzzer alerts the user to retry entering the code. After use, the door closes automatically, and the user can choose to continue or stop renting. For new users, scanning the QR code displays available lockers, allowing the user to select one and set a password. Once the password is set, the locker opens automatically for the user to store their belongings. After closing the locker, it remains secured until accessed again via the rental system.

NOVELTY AND UNIQUENESS

The QR Code-Assisted Locker Rental System introduces a unique and innovative approach to modern locker management by integrating QR code technology, password authentication, and IoT functionalities. Unlike traditional systems reliant on physical keys, this project uses QR codes linked to Google Forms for users to set personalized passwords and access lockers through the Blynk platform, ensuring enhanced security and convenience. The incorporation of ultrasonic and vibration sensors provides real-time monitoring of locker occupancy and detects unauthorized tampering, further improving safety. Powered by the ESP32 microcontroller, the system seamlessly manages multiple lockers, automates door

operations using a servo motor, and provides user feedback through an LCD and buzzer, offering a comprehensive and advanced solution tailored to contemporary storage needs.

BENEFIT TO MANKIND

The QR Code-Assisted Locker Rental System provides significant benefits to mankind by addressing key security and efficiency challenges associated with traditional locker systems. By eliminating the need for physical keys, it reduces the risk of theft and loss, offering a safer and more reliable storage solution. The integration of QR code technology and password authentication ensures secure and personalized locker access, protecting users' belongings. Additionally, the system enhances user convenience by streamlining the rental process through real-time monitoring and automated operations via IoT and Blynk platform integration. This innovative solution not only improves security but also optimizes locker management in public spaces such as schools, gyms, and workplaces, promoting a safer and more efficient environment for individuals and organizations alike.

COMMERCIALIZATION POTENTIAL

The QR Code-Assisted Locker Rental System has strong commercialization potential, particularly in environments where secure and efficient storage solutions are in high demand, such as schools, gyms, shopping malls, airports, and coworking spaces. Its integration of QR code technology, IoT connectivity via the Blynk platform, and password authentication offers a modern and user-friendly alternative to traditional key-based lockers, making it appealing to businesses aiming to enhance customer experiences. The system's real-time monitoring of locker availability and seamless management features can reduce operational costs and improve service efficiency for operators. Furthermore, its scalable design allows customization for various industries, offering an innovative and marketable product with significant potential for widespread adoption in the growing smart infrastructure sector.

CONCLUSION

The QR Code-Assisted Locker Rental System represents a modern and efficient solution that addresses the shortcomings of traditional key-based systems. By utilizing QR codes linked to Google Forms for locker selection and password setup, and integrating the Blynk platform for real-time access and management, the system ensures enhanced security and convenience. The ESP32 controller serves as the central hub, effectively processing inputs from the ultrasonic sensor, vibration sensor, and Blynk platform, while controlling outputs such as the servo motor, LCD display, buzzer, and LEDs. This innovative design streamlines the rental process, provides real-time locker availability, and eliminates the risks associated with physical keys, creating a user-friendly and secure locker management experience. The successful implementation of this system highlights its potential to redefine temporary storage solutions with modern technology.

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Aquaponic Monitoring System: Ensure Water Quantity for Plant and Fish

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ABSTRACT

This technical report documents the design and simulation of an Aquaponic Monitoring System to Ensure Water Quality for Plant and Fish using Arduino-based sensors and actuators. The *system* incorporates an ultrasonic sensor as water *level,* a DS18B20 temperature sensor, and a simulated pH sensor, complemented by a Liquid Crystal Display (LCD) for real-time data visualization. The inclusion ol a ESP8266 Wi-Fl module enhances the system's capabilities, transfonning it into an Internet of Things {loT) device capable of remote monitoring and control. Leveraging Proteus's simulation platform, the Arduino microcontroller processes data from these sensors to monitor and manage critical parameters in an aquaponic environment. With the capabilities to connect with internet, this system usedalert system at Blynk, servo motor for fish feeder and relay module to control water pump, enhance the system's functionality. The Arduino code incorporates intelligent decision-making, dynamically controlling the relay module, servo motor, activating the alert system at Blynk based on predefined temperature conditions, pH conditions, and water level, and intertacing with the Wi-Fi module. The LCD displays variousinformation screens, presenting temperature, and pH values on one. In Blynk application also display temperature, pH and water level for user easy to monitor in phone. The Aquaponic Monitoring System serves as a versatile and scalable solution for automated monitoring and management of aquaponic conditions, with the added capability ol loT connectivity for enhanced control and accessibility.

KEYWORDS: Aquaponic, Arduino, ESP8266, loT, Btynk.

PRODUCT DESCRIPTION

The ongoing growth of Internet of Things {loT) technology has accelerated agricultural **innovations,** producing **creative** ideas for ellicient and intelligent ecosystem management. This technical paper describes a detailed project entitled "Aquaponic Monitoring System: Ensure Water Quality Jor Plant and Fish," using Arduino-based sensors and actuators. The project covers the vital demand Jor Iona-term and Intelli Qent management of aquaponic systems, where precise control is essential for optimal plant and fish growth. Maintaining the delicate balance of water quality, temperature, and nutrient levels in real-world aquaponic systems is a d ficult task that has a significant impact on both plant and fish health and efficiency.The system offers real-time data collecting, which is required for informed decision• making, by induding a suite of sensors, including the Ultrasonic Sensor as water level, DS18b20 Temperature Sensor, and a simulated pH sensor. The capacity to monitor these parameters closely resembles the complexities **ol** true aquaponic setups, making it a useful tool for both aquaponics enthusiasts and professionals. Furthermore, the addition of a Wi-Fi module turns the aquaponic system into a linked loT device, allowing for remote monitoring and control. This link not only improves accessibility, but also allows for faster reactions to changing environmental circumstances. The research delves deeply into the system's design, simulation, and functionality, highlighting its adaptability and scalability to various aquaponic configurations.The project's multidimensional approach goes beyond data collecting to include intelligent elements like a Blynk for alert *system,* a relay module for active water flow adjustments, and a servo motor for the fish feeder. These components and application work together to help the system achieve its goal of creating an intelligently regulated and sustained aquaponic ecosystem. As the project aims to solve critical aquaponics difficulties through technical innovation, it promises to make an important

contribution to the expanding landscape of smart agriculture by bridging the gap between technology and real-world aquaponic practices.Traditional farming and fish farming methods are often inefficient and unsustainable due to excessive resource utilization and negative environmental impacts. The growth of fish and plants can be impacted by unmonitored water quality, which is why it is crucial to monitor water quality. Therefore, the goal of this project is to minimize waste and adVerse environmental effects while increasing productivity and efficiency. By using sensors to monitor water quality, temperature, pH value, and water pumps, we can optimize the system for plant and fish growth while enhancing productivity and sustainability. Using the Blynk app, users can remotely check the temperature, pH level, and water level of the aquaponic system when they are *away* from home. The sensors' data will be updated continuously, and they can only be viewed with a phone.

This project aims to design an aquaponic monitoring system that ensures the quality of the water for plants and fish and to design a circuit that consists of an input such as a pH sensor, temperature sensor, water level sensor, module wi-li, and water pump, while an output such asa Blynk application, alert system, water pump and fish feeder.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

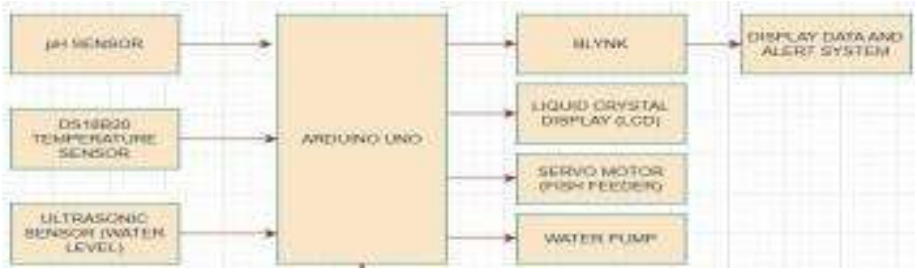


Figure 1. Block Diagram

Figure 1 shows the block diagram of the Aquaponic Monitoring System: Ensure Water Quality for Plants and Fish project. The Arduino Uno will be the main component and work as the brain of this project for the entire time, controlling the other components by inserting the coding of this project The system begins with crucial input data from environmental parameters such as Ultrasonic Sensor for water level, DS18B20 for temperature readings and pH sensor. This diverse range of data is then directed to the central processing unit, the Arduino Microcontroller which seNes as the *neNe* center of the entire system. The Arduino meticulously manages and interprets the incoming data, orchestrating control signals for an array of output devices. These include the LCD display for real time feedback and a Wi-Fi Module facilitating remote connectivity. The seamless integration of these components forms an aquaponic monitoring system, empowering users with the capability for real-time monitoring and remote interaction with the system, ultimately enhancing the efficiency and management of aquaponic... ecosystem

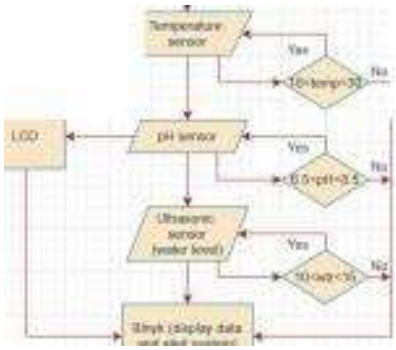
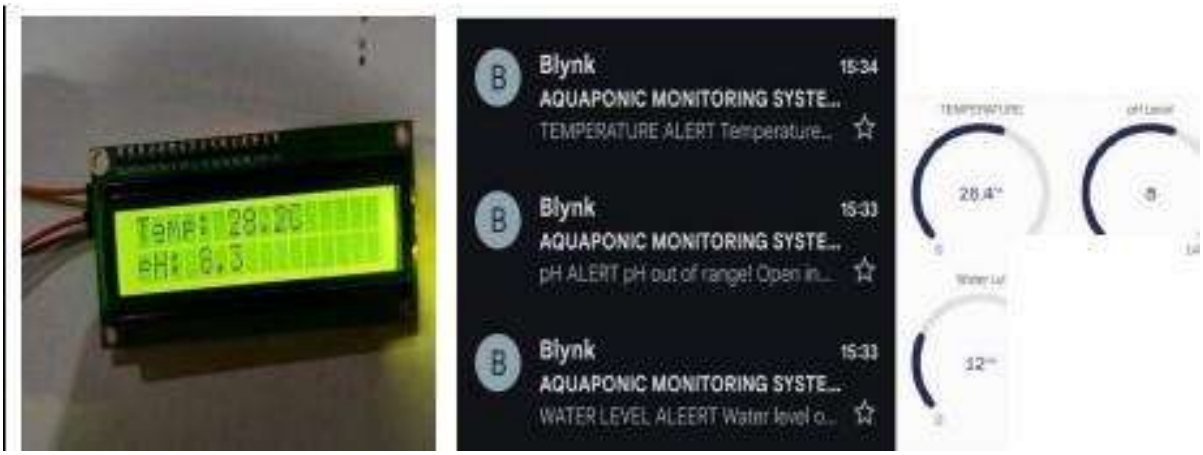


Figure 2 shows the Flow Chart of the Aquaponic Monitoring System

Figure 2 shows the Flow Chart of the Aquaponic Monitoring System: Ensure Water Quality for Plants and Fish project. The outlined flow chart 12 depicts a comprehensive scheme for an Aquaponic Monitoring System: Ensure Water Quality for Plants and Fish. Initiated by input data from a Water Level Sensor, DS18B20 Temperature Sensor, and a pH Sensor, the flow progresses to the Arduino Microcontroller. This microcontroller acts as the central processing unit, receiving and interpreting the sensor data. The flow begins with the temperature sensor read a temperature of the water. Then, pH sensor read a pH value of the water. This two sensor's value will be display on LCD. After that ultrasonic sensor will detect the water level in the tank. All the sensor has a condition such as temperature range is 18 until 30 celcius, pH range is 6.5 until 8.5 and water level range is 1Ountil 15 cm depend on size of the tank. If the sensors out of range, Blynk will be an alert system to notify user. Blynk also can display a value for user easy to monitor when user is not at home. Other component like servo motor for fish feeder and water pump is operate using timer that can be modify by the user.



From the images above, its show a result from this project. The temperature and pH value will be display on Liquid Crystal Display {LCD). In the Blynk application, the value from three sensor will be display for user easy to monitor and notice if one of the sensors out of ran e. The notification will be sent to user in e-mail or SMS.

NOVELTY AND UNIQUENESS

This work introduces an innovative approach to aquaponic system management through loT integration. By incorporating multiple sensors-water level, DS18B20 temperature, and pH sensors-the system monitors critical water parameters in real-time. The inclusion of the Arduino Uno and Wi-Fi module allows for remote monitoring and control via the Blynk app, ensuring proactive adjustments based on data feedback. Unlike traditional manual aquaponics, this system automates monitoring, detects irregularities {e.g., pH imbalance, temperature fluctuations, and water level drops), and alerts users through mobile alerts. Thereal-time LCD display ensures immediate local visibility, while the integration of loT enables remote accessibility, which is novel in the aquaponic domain. This unique system promote balance between aquaculture and hydroponics,

improving productivity, minimizing errors, and offering a scalable and sustainable solution for modem agriculture.

BENEFIT TO MANKIND

The project provides immense benefits for agriculture and sustainable food production. By ensuring optimal water quality Jor plant and fish growth, the system enhances the productivity and health ol aquaponic ecosystems, reducing water waste and resource consumption. It addresses global challenges such as food security and sustainable farming practices, making ii ideal Jor urban and rural settings alike. For aquaponic farmers, the system reduces manual effort through automation while enabling real-time remote monitoring, saving time and improving operational efficiency. By promoting an eco-lriendly method of combining plant and fish farming, the project contributes to healthier food production, reduced chemical usage, and improved environmental sustainability.

COMMERCIALIZATION POTENTIAL

The Aquaponic Monitoring System has strong commercialization prospects in both agricultural and educational markets. Small and medium-scale farmers can implement this low-cost, automated system to optimize aquaponic productivity with minimal intervention. Its real-time remote monitoring capabilities, through the Blynk app, make ii an attractive solution for urban and commercial farming operations. Customization options, such as additional nutrient sensors or Al-driven predictive analytics, could further enhance its value. The system also holds potential as an educational tool for teaching loT, automation, and sustainable farming practices in institutions. With increasing global interest in smart agriculture, this system can be marketed as a cost-effective, scalable solution for efficient and sustainable food production

CONCLUSION

The Aquaponic Monitoring System has proven to be an effective solution for maintaining optimal water quality, ensuring a balanced ecosystem Jor both plants and fish. By integrating loT-enabled sensors with precise real-time monitoring and notification capabilities, the system enhances sustainability and efficiency in aquaponics. Its success highlights the potential for improved **resource** management in agriculture and aquaculture. The integration of advanced automation, such as scheduled feeding and water pumping, further demonstrates its practicality for both small-scale and large-scale applications. Future recommendations include refining the system's design for scalability, enhancing the user interface for better accessibility, and exploring advanced analytics to provide predictive maintenance insights. Continued R&D will be vital to improve the system's reliability, energy efficiency, and adaptability, solidifying its role in the future of smart farming technologies.

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Fingerprint Security System with Solar Power

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ABSTRACT

The Fingerprint Security System with Solar Power is an innovative solution that merges renewable energy with biometric access control technologies, providing a sustainable and secure method for safeguarding assets. By integrating motion detection with fingerprint recognition, the system enhances protection against unauthorized access through two-factor authentication. The use of solar energy ensures consistent operation, even during power outages, making the system highly suitable for remote or off-grid areas. The ESP8266 microcontroller serves as the core of the system, managing fingerprint data, regulating access, and facilitating real-time monitoring via the Blynk IoT platform. Users receive instant notifications and can monitor access logs remotely, reinforcing overall security. This eco-friendly solution is designed for residential, commercial, and industrial applications, combining technological innovation with sustainability to provide robust and user-friendly security measures.

KEYWORDS: Biometric Authentication, Solar Energy System, Fingerprint Security, IoT, ESP8266

PRODUCT DESCRIPTION

The Fingerprint Security System with Solar Power addresses modern security challenges by integrating biometric authentication with renewable energy. The system is designed to provide enhanced access control by employing motion sensors that activate the fingerprint scanner only when movement is detected near the entry point. This design minimizes energy consumption by limiting unnecessary activations. A solar panel supplies power to the system, ensuring continuous operation, even in areas with limited or unstable grid electricity. This feature enhances the reliability and sustainability of the system, aligning with environmental conservation goals. The ESP8266 microcontroller processes fingerprint data, verifies user identity, and manages access control responses. Upon successful authentication, the system triggers a green LED and unlocks the door. In the event of an unauthorized attempt, a red LED lights up, and an audible buzzer alerts nearby individuals of a potential security breach. The Blynk IoT platform further enhances system usability by allowing users to receive notifications and monitor access activity through their smartphones. This ensures users remain informed about entry attempts, even when they are away from the secured location.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

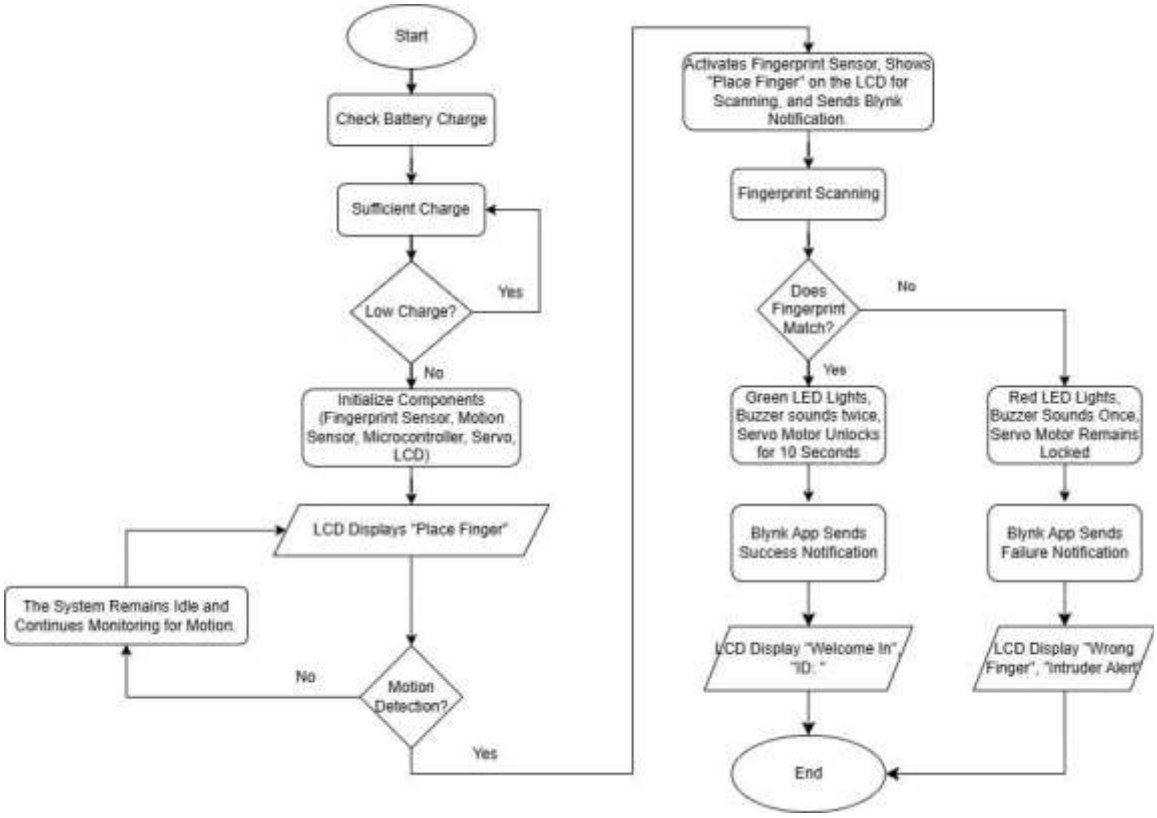


Figure 2: Flowchart of Fingerprint Security System with Solar Power

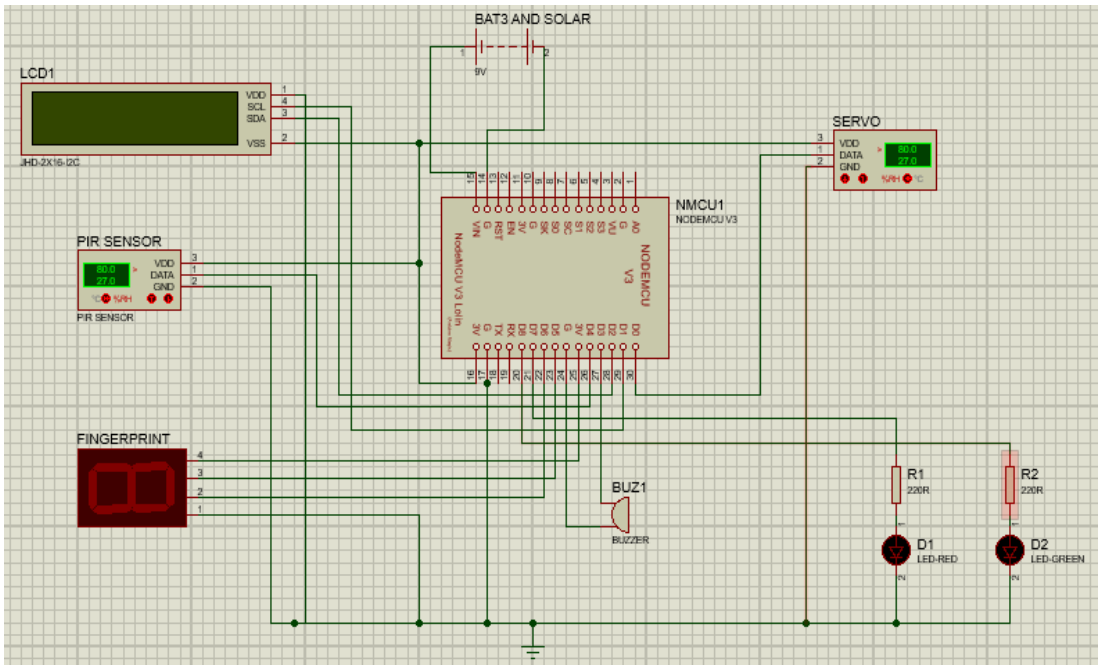


Figure 3: Schematic Design of Fingerprint Security System with Solar Power

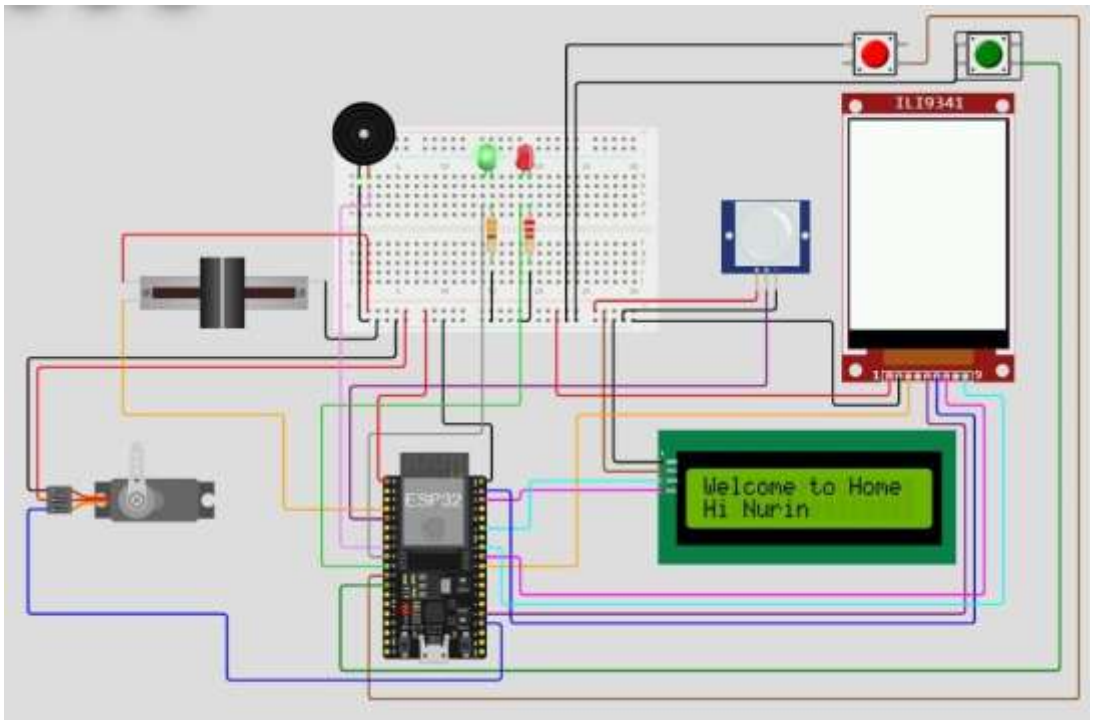


Figure 4: Simulation Result of Fingerprint Security System with Solar Power

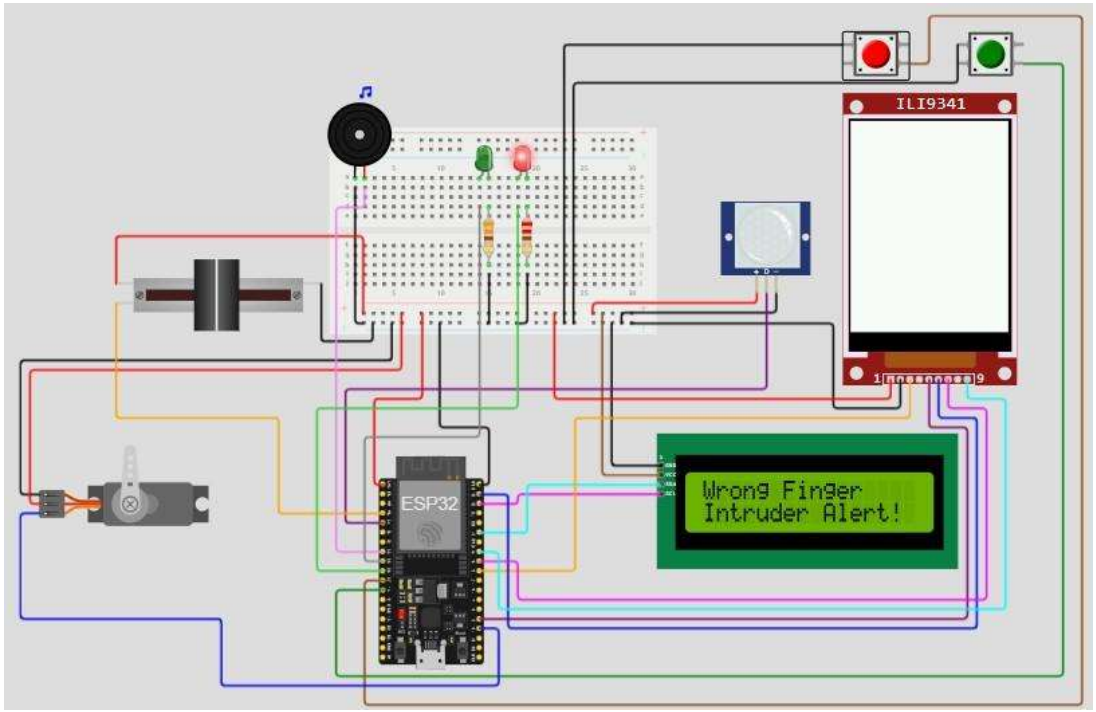


Figure 5: Simulation Result of Fingerprint Security System with Solar Power

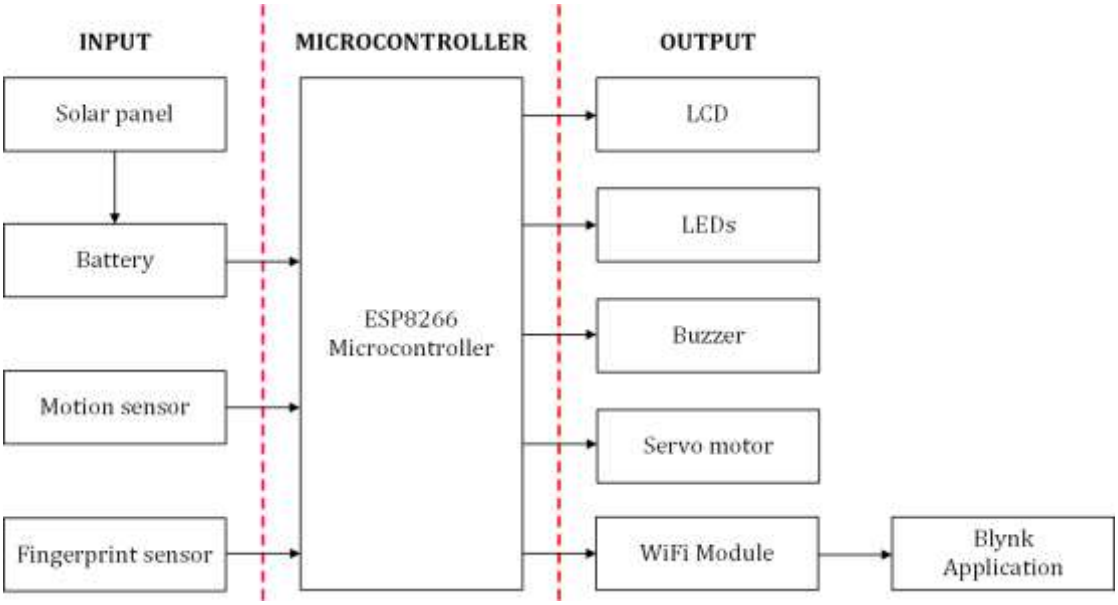


Figure 1: Block Diagram of Fingerprint Security System with Solar Power

NOVELTY AND UNIQUENESS

This project introduces a dual-layer security system that integrates solar power and two-factor authentication, setting it apart from conventional access control systems. Traditional security systems often rely on single-factor authentication or grid electricity, making them vulnerable to power failures and unauthorized access attempts. By combining motion detection with fingerprint recognition, the system ensures enhanced security by requiring dual verification before granting access. The solar- powered design ensures continuous functionality, contributing to environmental sustainability and reducing operational costs. The incorporation of IoT technology via the Blynk app adds another layer of innovation by enabling remote monitoring and notifications. This multi-functional approach redefines security by providing a cost-effective, sustainable, and technologically advanced solution for residential, commercial, and industrial applications.

BENEFIT TO MANKIND

The Fingerprint Security System with Solar Power addresses two critical global issues – security and sustainability. By harnessing renewable energy sources, the system reduces dependency on non-renewable resources, thereby lowering carbon emissions and promoting environmental conservation. The dual authentication mechanism enhances security by minimizing the risk of unauthorized access, ensuring safer living and working environments. This system is particularly valuable in off-grid areas, providing a reliable access control solution for homes, offices, and industrial facilities in remote locations. In addition, the user-friendly interface and eco-conscious design make the system accessible to a broader demographic, promoting inclusivity and fostering a culture of sustainable innovation. This project contributes to building a safer, greener, and more connected world.

COMMERCIALIZATION POTENTIAL

The Fingerprint Security System with Solar Power holds significant commercial appeal due to its affordability, scalability, and adaptability across various sectors. Its potential extends to residential properties, commercial buildings, and remote industrial sites where access control and energy efficiency are paramount. The integration of IoT technology enhances the product's marketability by providing real-time monitoring and remote control capabilities, aligning with the growing demand for smart home and office security solutions. The system's modular design allows for customization and scalability, ensuring it can cater to diverse security needs, from small residences to large-scale

industrial complexes. Collaboration with renewable energy providers and security firms could expand the market reach of the system, offering advanced solutions for global security challenges. This product's innovative blend of sustainability, advanced security measures, and smart technology positions it as a pioneering solution within the rapidly evolving smart security market.

CONCLUSION

The development of the Fingerprint Security System with Solar Power represents a significant advancement in biometric access control and renewable energy integration. By combining motion detection and fingerprint recognition, the system addresses vulnerabilities commonly found in conventional security solutions. The solar-powered feature ensures continuous operation, making the system a practical solution for diverse environments, including areas with limited grid access. The system's reliance on ESP8266 technology and the Blynk IoT platform enables real- time access monitoring and remote notifications, enhancing security and user convenience. This innovation underscores the potential of biometric technology and renewable energy in shaping future access control systems, promoting sustainability, safety, and inclusivity.

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Doorbell for Deaf People

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ABSTRACT

The Doorbell for Deaf People is an assistive technology project designed to address the communication barriers faced by individuals with hearing impairments. The system integrates IoT components such as the ESP32-CAM, HC-SR04 ultrasonic sensor, LEDs, and a vibration motor, with the Blynk application serving as the notification hub. When a visitor is detected within a 100 cm range, the system activates visual alerts through LEDs, tactile feedback via a vibration motor, and smartphone notifications through the Blynk IoT app. Additionally, the ESP32-CAM provides real-time surveillance, enhancing home security. This cost-effective and user-friendly innovation aims to empower deaf individuals, fostering greater autonomy while promoting inclusivity in daily life.

KEYWORDS: Assistive Technology, IoT, Hearing impairments, ESP32-CAM, User- friendly, Blynk application

PRODUCT DESCRIPTION

The Doorbell for Deaf People offers a comprehensive and practical solution to overcome the limitations of traditional auditory-based doorbells. This system combines multiple sensory notification methods to ensure individuals with hearing impairments receive timely and accurate alerts. The primary component, the ESP32-CAM, functions as a real-time surveillance device, providing visual monitoring of visitors at the doorstep. This camera streams live footage directly to the user's smartphone, enhancing situational awareness and security. The HC- SR04 ultrasonic sensor is responsible for detecting motion within a 100 cm radius. Once triggered, the system activates three bright LEDs to generate a visual alert while simultaneously engaging a mini coin vibration motor to provide tactile feedback. This ensures users are alerted regardless of their proximity to the door. The system's integration with the Blynk IoT platform further enhances accessibility by sending notifications directly to the user's smartphone. This allows users to monitor their home remotely and interact with visitors, even when they are not at home. Through this combination of visual, tactile, and digital alerts, the system not only meets the functional needs of users but also significantly improves their overall quality of life.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

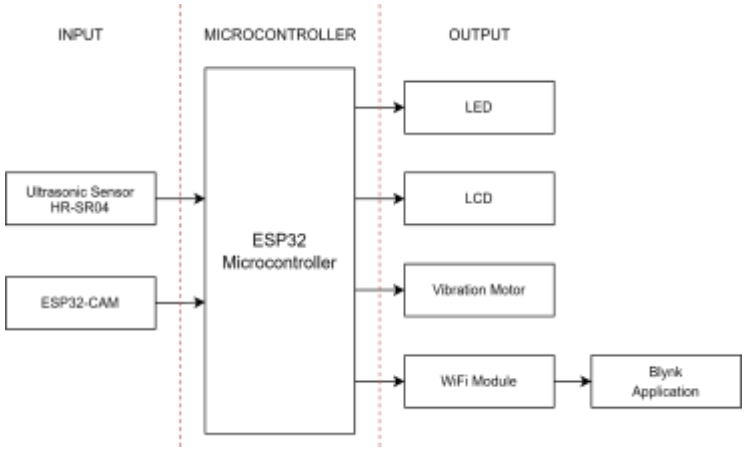


Figure 1: Block Diagram of Doorbell for Deaf People

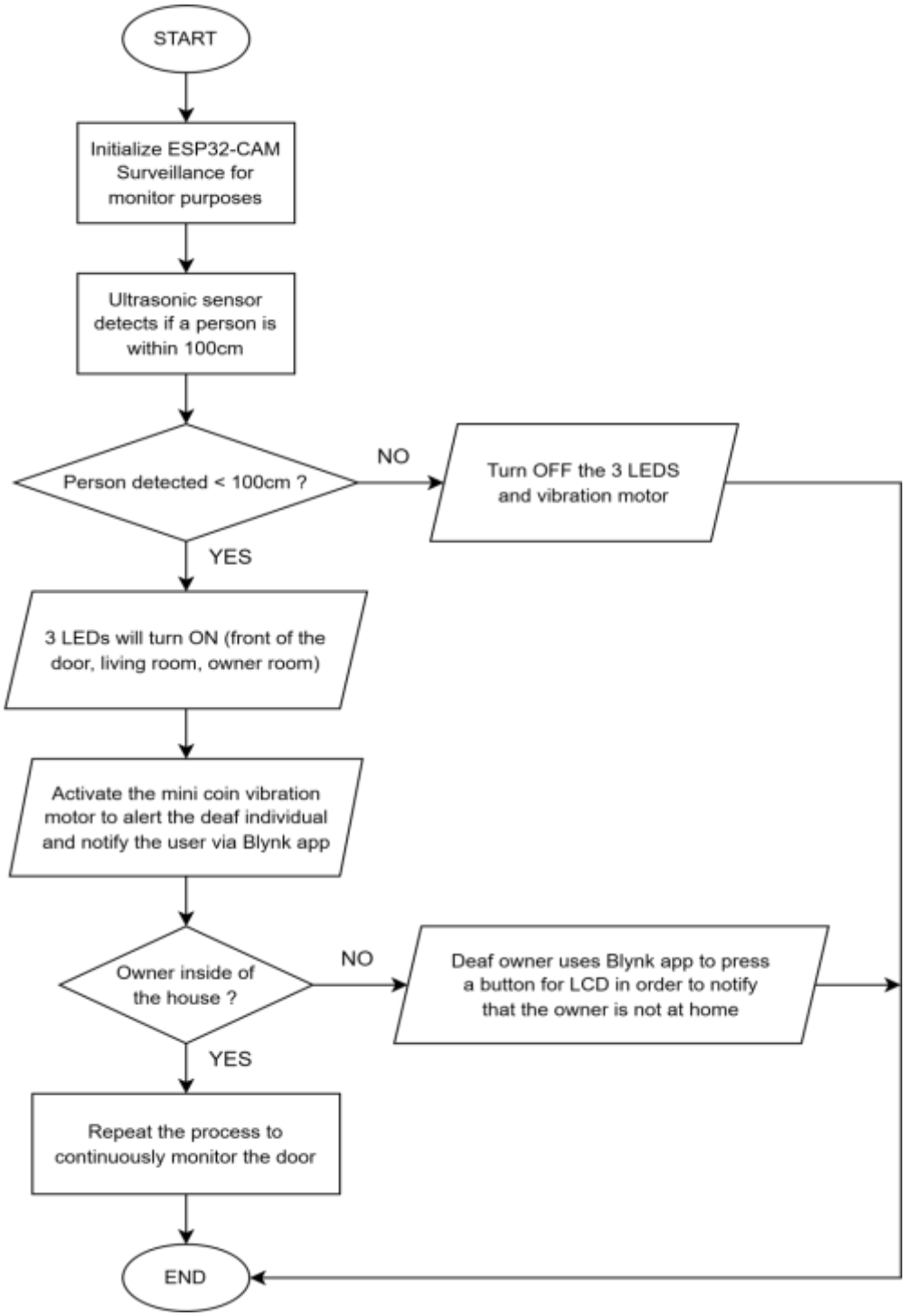


Figure 2: Flowchart of Doorbell for Deaf People

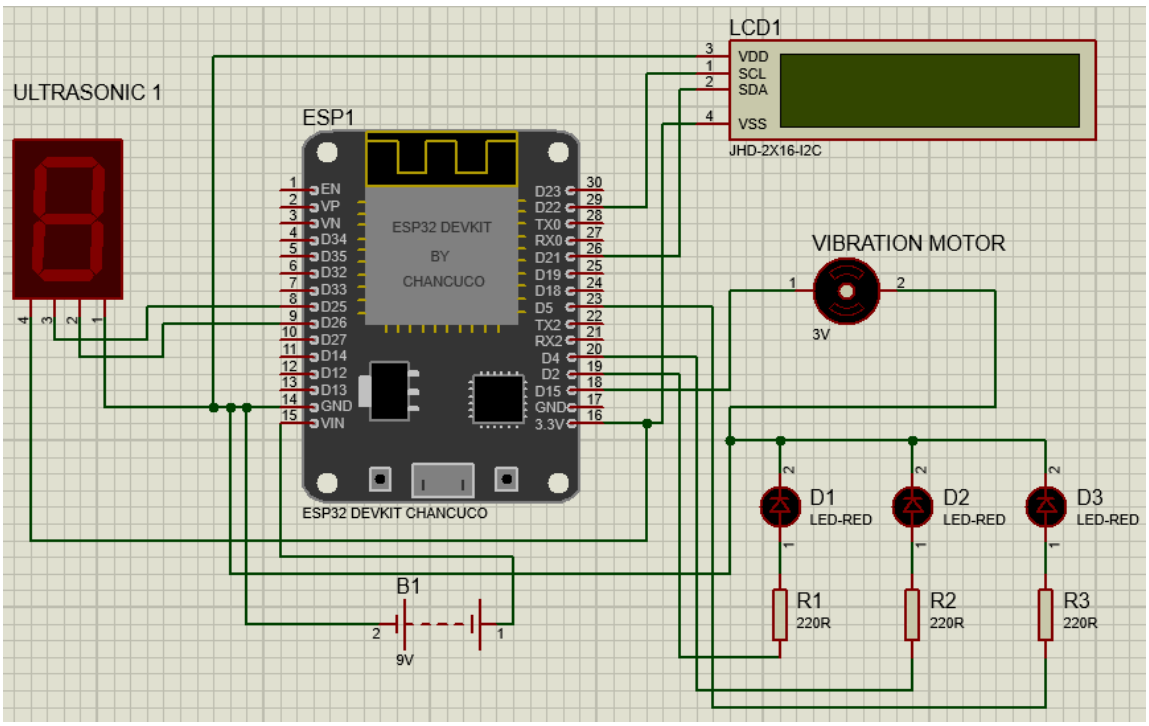


Figure 3: Schematic Design of Doorbell for Deaf People

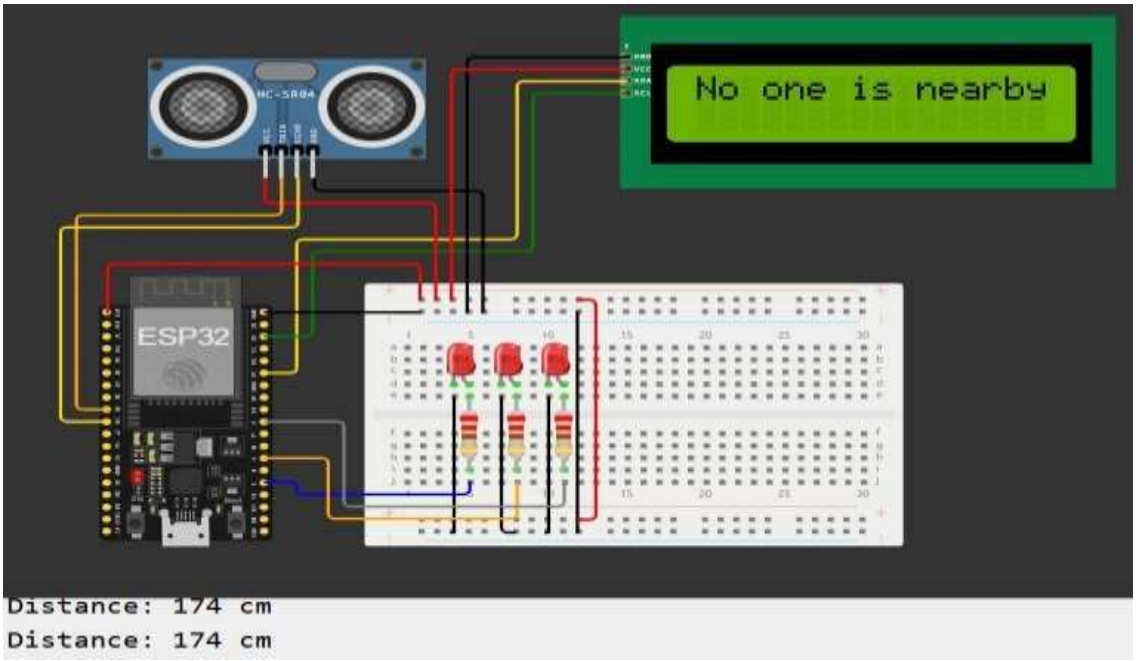


Figure 4: Simulation Result of Doorbell for Deaf People

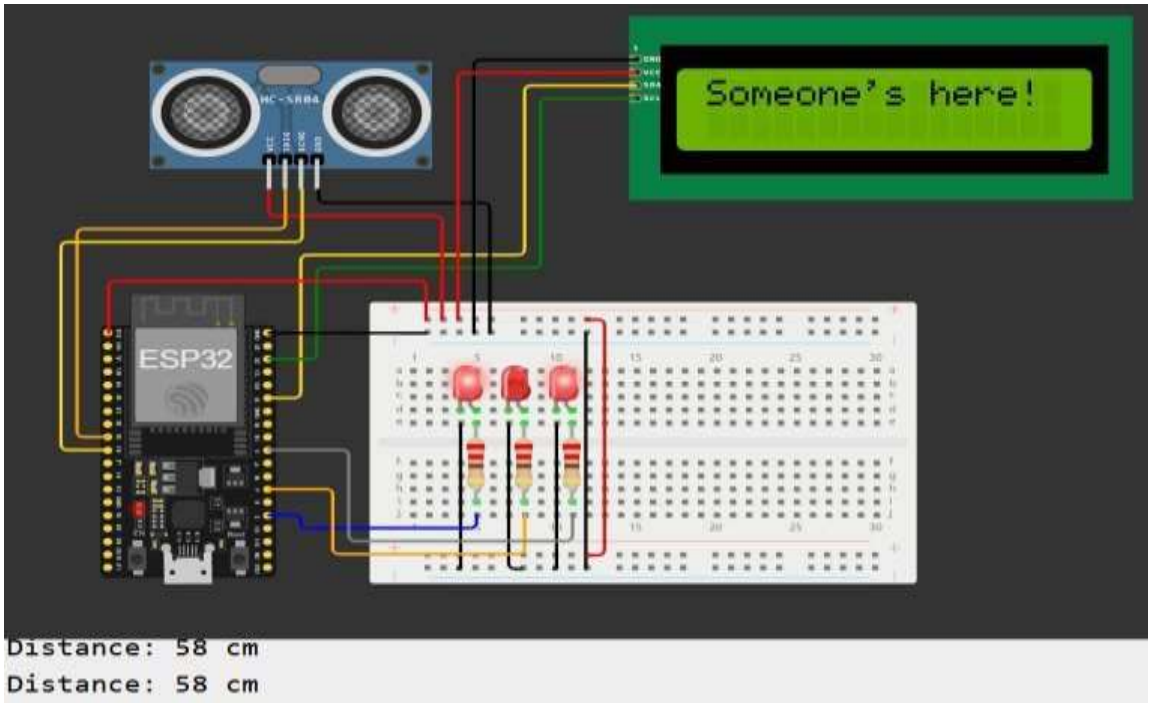


Figure 5: Simulation Result of Doorbell for Deaf People

NOVELTY AND UNIQUENESS

The Doorbell for Deaf People stands out due to its multi-layered notification system that surpasses the capabilities of conventional doorbells, which primarily rely on auditory signals. This project merges visual, tactile, and IoT-based alerts into a unified solution, ensuring comprehensive communication for individuals with hearing impairments. A unique feature of this system is the ESP32-CAM's dual functionality – providing both motion detection and live video streaming. This integration not only enhances security but also addresses a major accessibility gap by offering real-time surveillance in addition to doorbell notifications. Unlike typical assistive technologies that operate in isolation, this doorbell system connects to users' devices via the Blynk IoT application, allowing them to receive alerts, monitor their home, and respond to visitors remotely. Another key differentiator is the project's focus on affordability and ease of use. By leveraging low-cost hardware components and open-source IoT platforms, the project remains highly accessible, broadening its reach to diverse communities, including low- income households. This innovation bridges the gap between advanced technology and everyday accessibility, reinforcing the value of inclusive design.

BENEFIT TO MANKIND

The Doorbell for Deaf People addresses a crucial accessibility issue by providing an inclusive, practical solution that enhances safety, independence, and communication for individuals with hearing impairments. By incorporating multi-modal alerts, the system ensures users are notified through various means, reducing their reliance on third-party assistance and enabling greater self-sufficiency. Beyond direct benefits to the deaf community, this project also contributes to broader social inclusion. By demonstrating the potential for assistive technologies to integrate seamlessly into everyday environments, it highlights the importance of designing products that cater to diverse user needs. This innovation encourages the development of more inclusive, smart home solutions that promote equity and accessibility for marginalized communities. The project also serves as a catalyst for awareness in the field of engineering, fostering a deeper understanding of how technology can drive social change. Through this initiative, future engineers are encouraged to prioritize accessibility in their designs, contributing to a more inclusive technological landscape.

COMMERCIALIZATION POTENTIAL

The commercial potential of the Doorbell for Deaf People is substantial, owing to its versatility, affordability, and scalability. The system can be marketed as an affordable standalone product targeting individuals with hearing impairments, or as an add-on feature for smart home security systems. Its flexible design allows for easy customization, making it adaptable to various market segments, including elderly individuals, individuals with mobility limitations, and those in need of enhanced home security solutions. The IoT-based architecture facilitates remote updates and customization, ensuring long- term relevance and adaptability to emerging technologies. By partnering with assistive technology firms, healthcare providers, and smart home manufacturers, this project has the potential to reach global markets, significantly improving accessibility and quality of life. Additionally, the low production cost and reliance on readily available components contribute to the system's cost-effectiveness, making it attractive for large-scale deployment. This product not only meets a niche demand but also addresses broader home security and accessibility needs, increasing its market penetration potential.

CONCLUSION

The Doorbell for Deaf People exemplifies how innovative engineering solutions can break down communication barriers and enhance accessibility for individuals with hearing impairments. By integrating visual, tactile, and IoT-based alerts, the project addresses critical gaps in assistive technology, fostering greater independence and security for users. This project serves as a reminder of the profound impact that inclusive design can have on marginalized communities, demonstrating the potential for technology to enhance quality of life and promote social equity. As smart home innovations continue to evolve, the Doorbell for Deaf People represents a significant step toward a more inclusive and connected future.

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Advance Cooling System with Monitoring System Using Esp8266 and Blynk

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ABSTRACT

The Advanced Cooling System with Monitoring leverages Internet of Things (IoT) technology to enhance the efficiency and performance of conventional cooling systems. This project integrates the ESP8266 microcontroller and Blynk platform to enable remote control and real-time monitoring, offering an innovative solution for residential and greenhouse applications. The system incorporates key components such as ultrasonic sensors for automated activation, DHT22 sensors for accurate temperature and humidity readings, and an LCD display for real-time data visualization. The ESP8266 facilitates seamless Wi-Fi connectivity, allowing users to monitor and adjust cooling operations through smartphones or computers, ensuring optimal energy use. By dynamically responding to environmental changes, the system minimizes energy waste, promoting sustainability while enhancing user convenience. This eco-friendly approach highlights the potential of IoT in driving intelligent and energy-efficient cooling solutions, contributing to cost savings and environmental conservation.

KEYWORDS: IoT-based Cooling, Energy Efficiency, Remote Monitoring.

PRODUCT DESCRIPTION

The Advanced Cooling System with Monitoring represents a significant step forward in cooling technology by incorporating IoT capabilities to optimize performance and user experience. Designed around the ESP8266 microcontroller, the system integrates sensors, actuators, and the Blynk IoT platform to enable remote monitoring and control via smartphones or computers. The inclusion of DHT22 sensors ensures precise measurement of temperature and humidity, while ultrasonic sensors automatically trigger the cooling mechanism when motion is detected, preventing unnecessary energy consumption. The system's LCD display provides real-time updates on cooling performance and environmental conditions, enhancing the overall user experience. By allowing remote access and adjustments, the system offers unprecedented flexibility, making it ideal for residential properties and agricultural greenhouses. This seamless integration of technology not only reduces operational costs but also contributes to sustainable living by promoting efficient energy use.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

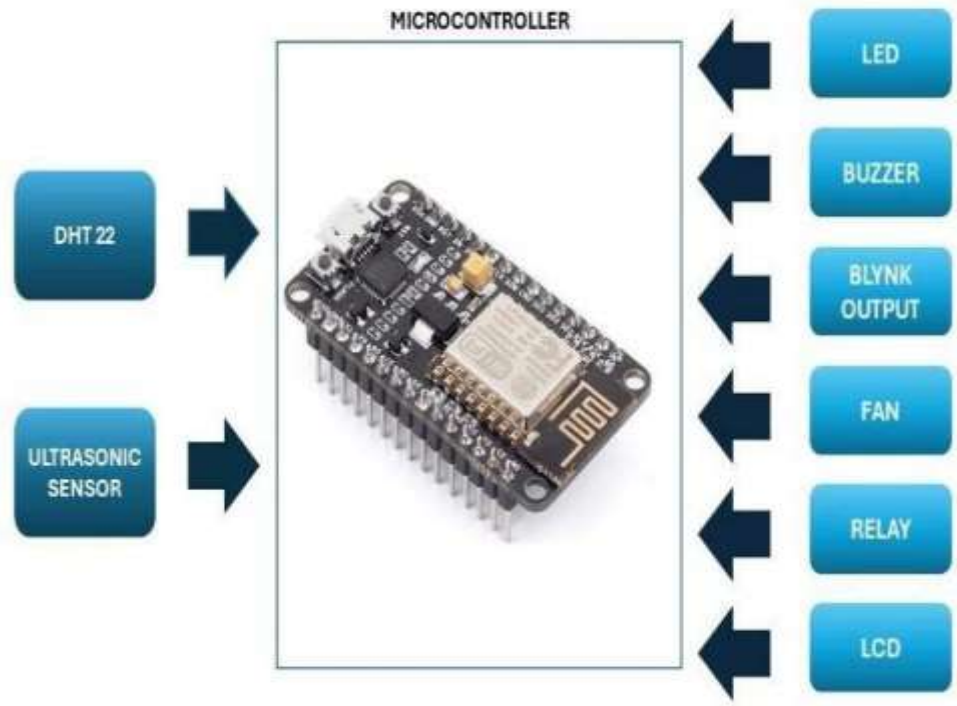


Figure 1 : Block Diagram

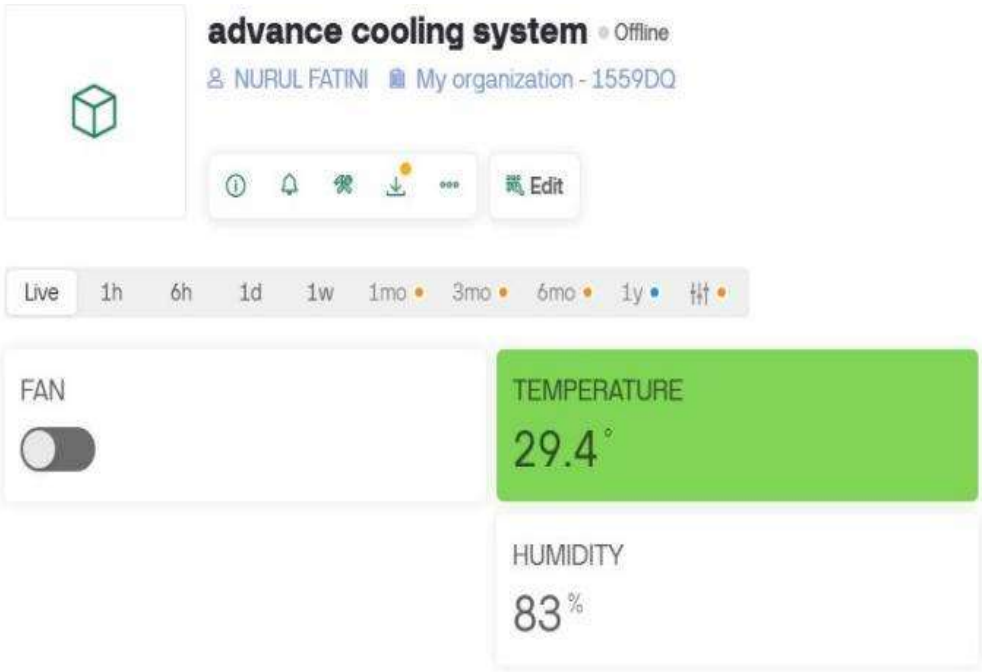


Figure 2 : Blynk Dashboard

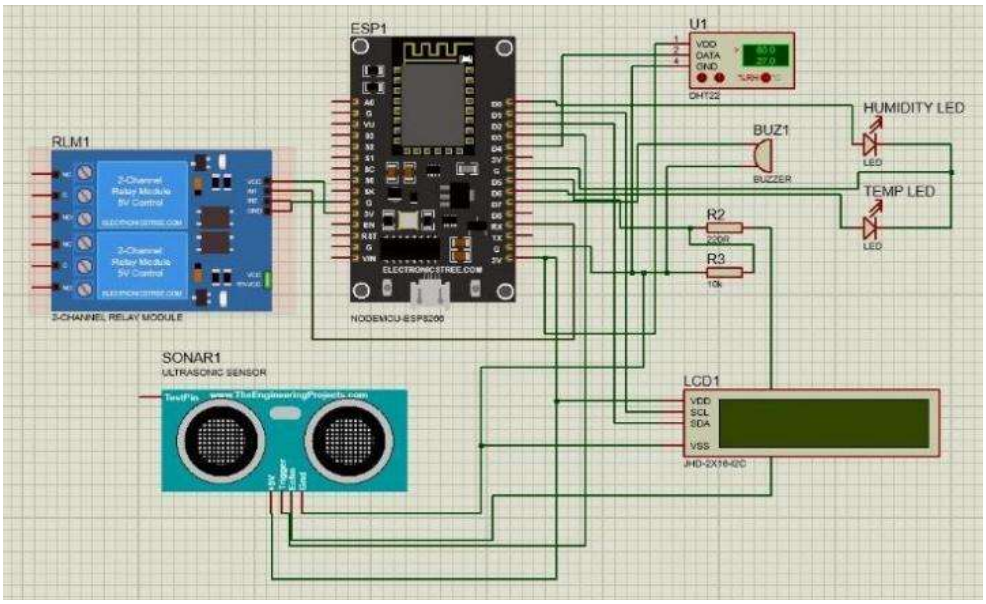
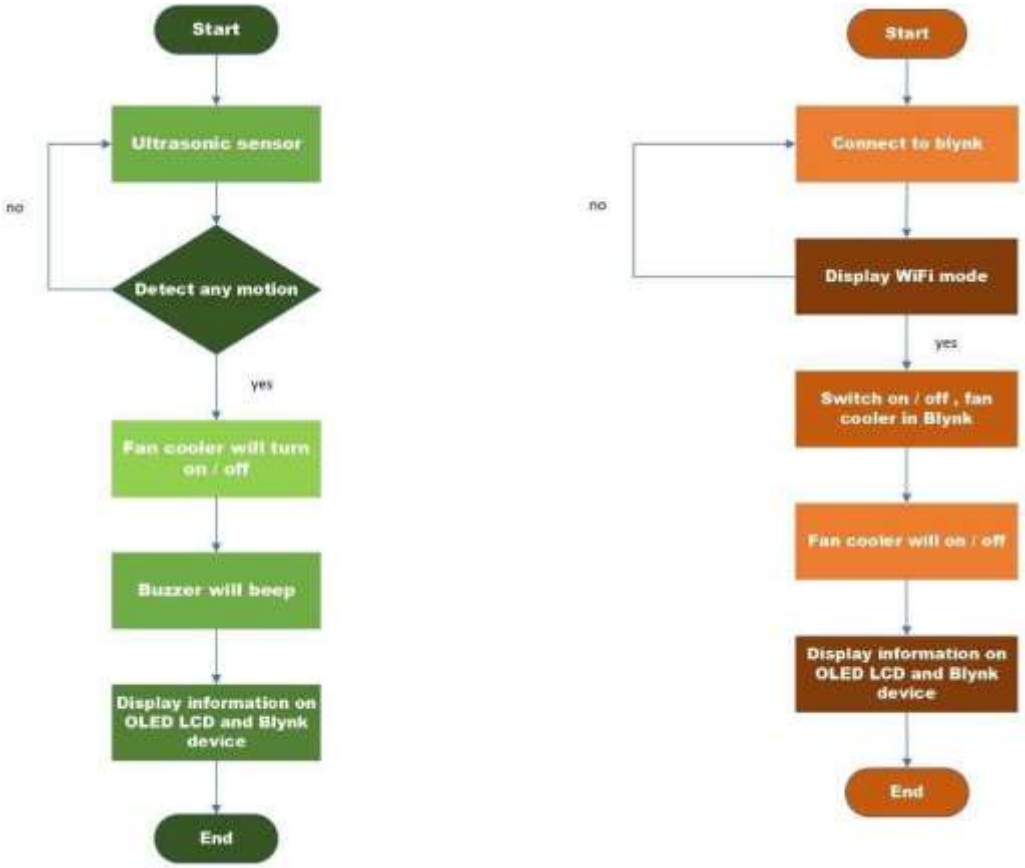


Figure 3 : Schematic Diagram



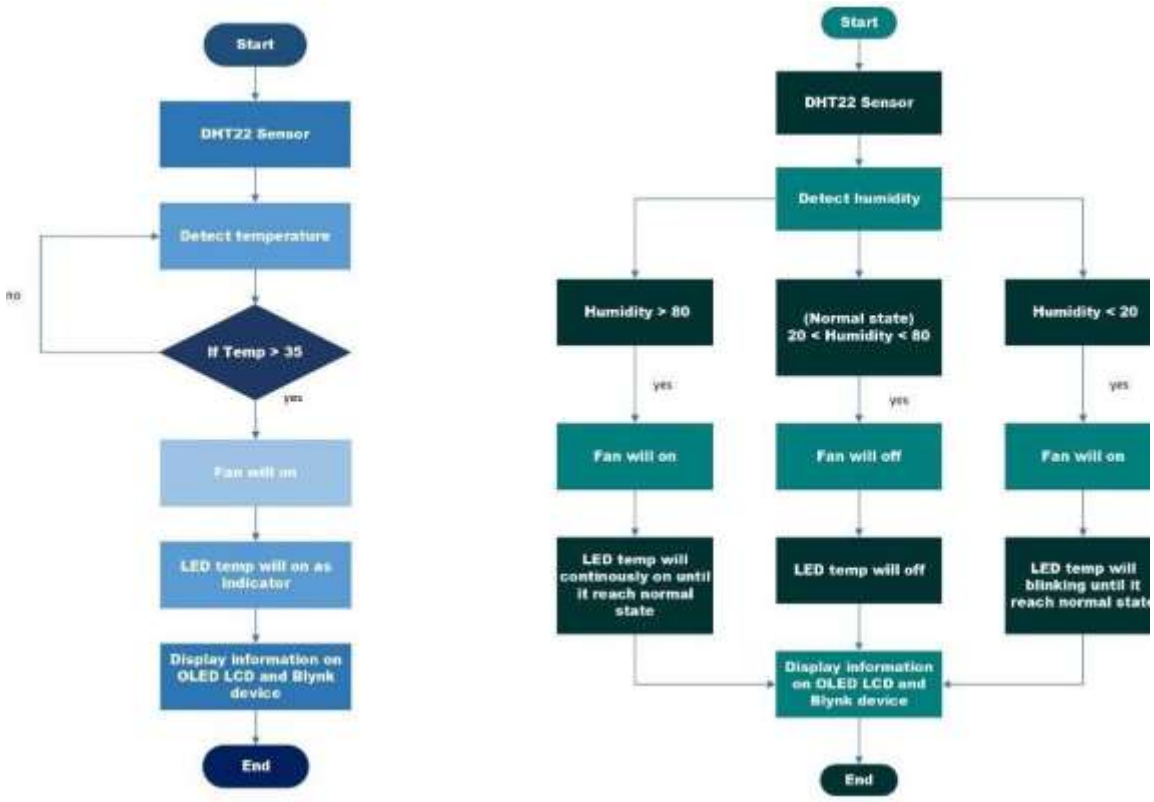


Figure 4 : Flow Chart

NOVELTY AND UNIQUENESS

The uniqueness of this system lies in its innovative fusion of IoT technology with automated cooling mechanisms, offering a smarter and more energy-efficient alternative to traditional cooling solutions. Unlike conventional systems that rely on continuous operation, the Advanced Cooling System activates only when necessary through its ultrasonic and DHT22 sensors, significantly minimizing energy wastage. This combination of dual-sensor automation and remote control capabilities enhances user convenience and ensures precise environmental regulation.

A distinctive feature of the system is its scalability and adaptability to different environments, such as homes, greenhouses, and small-scale industries. Additionally, the Blynk platform provides users with real-time notifications and control, making it easier to monitor and manage cooling operations from any location. Future upgrades, including solar energy integration and machine learning-based predictive cooling, are envisioned to further enhance the system's efficiency and sustainability, positioning it as a forward-looking solution for modern cooling needs.

BENEFIT TO MANKIND

The Advanced Cooling System with Monitoring addresses pressing global challenges related to energy efficiency, sustainability, and cost reduction. By integrating IoT technology, the system reduces energy consumption through automated cooling processes, which directly lowers electricity bills and decreases carbon footprints. This innovation benefits not only individual users but also contributes to broader environmental goals by promoting eco-friendly practices. The system's remote control and monitoring features provide significant convenience, allowing users to maintain optimal cooling conditions effortlessly. It is particularly beneficial for agricultural greenhouses, where maintaining the correct temperature and humidity is crucial for plant health and productivity. Furthermore, the system's affordability and scalability ensure that advanced cooling technologies are accessible to a wider audience, fostering greater adoption of sustainable solutions in everyday life.

COMMERCIALIZATION POTENTIAL

The commercialization potential of the Advanced Cooling System with Monitoring is significant, driven by increasing demand for energy-efficient and IoT-enabled products. The system's adaptability across various sectors, including residential, agricultural, and commercial environments, makes it highly marketable. Its ability to reduce operational costs while enhancing user comfort positions it as a competitive offering in the expanding smart technology market. By emphasizing the dual benefits of economic savings and environmental impact reduction, the system appeals to environmentally conscious consumers and businesses seeking sustainable solutions. Additionally, partnerships with renewable energy providers or smart home developers could further expand the product's reach, paving the way for successful commercialization. The integration of IoT technologies enhances the product's scalability, allowing customization to meet diverse customer needs and market demands.

CONCLUSION

The Advanced Cooling System with Monitoring showcases the transformative potential of IoT technology in addressing contemporary cooling challenges. By integrating ESP8266 microcontrollers, ultrasonic sensors, and the Blynk platform, the system delivers enhanced energy efficiency, remote operability, and user- friendly controls. This innovation not only optimizes cooling performance but also contributes to sustainability efforts by reducing unnecessary energy consumption. With applications in residential, commercial, and agricultural settings, the system demonstrates versatility and adaptability, highlighting the growing role of IoT in modernizing traditional technologies. Future enhancements, such as solar energy integration and predictive analytics, could further elevate its impact, reinforcing the potential of IoT to drive smarter, greener, and more cost-effective solutions across industries.

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The Mediremind: Microcontroller-Based Medication Reminder System

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ABSTRACT

The MEDIREMIND is stand for Microcontroller-Based Medication Reminder System prototype, designed to address the challenges of medication adherence among patients. Utilizing the ESP32 microcontroller as its core, the system integrates a Real-Time Clock (RTC) module, a PIR motion sensor, a buzzer, and a 20x4 LCD for efficient operation. The device offers features such as multi-compartment reminders, snooze functionality, and emergency alerts, ensuring adaptability for various user needs. By employing a motion detection mechanism, MEDIREMIND can detect patient activity near the device, triggering reminders at appropriate times. The system's user interface is developed through the Blynk application, allowing seamless interaction for scheduling and monitoring medication regimens. This propose innovative solution enhances user compliance by addressing common issues such as forgetfulness or complex schedules, making it particularly beneficial for elderly or chronically ill patients. The MEDIREMIND prototype adopts a modular hardware design, enabling straightforward assembly and scalability for future improvements. Comprehensive testing in simulated environments validates the system's effectiveness and reliability for actual implementation. This technical paper highlights the system's technical specifications, design methodology, and potential impact on healthcare. MEDIREMIND presents a cost-effective and user-friendly approach to improving health outcomes through timely medication adherence.

KEYWORDS: Medication reminder system, ESP32 microcontroller, healthcare technology, motion detection, Blynk application, RTC module, medication adherence, modular hardware design.

PRODUCT DESCRIPTION

The Microcontroller-Based Medication Reminder System prototype is an advanced solution designed to improve medication adherence through precise scheduling and user-friendly features. Powered by the ESP32 microcontroller, it integrates a Real-Time Clock (RTC) module, PIR motion sensor, buzzer, and a 20x4 LCD screen to deliver timely reminders tailored to user presence and needs. The system supports multi-compartment reminders for managing multiple medications, with added functionalities like snooze and emergency alerts for enhanced adaptability. Seamlessly connected to the Blynk application, it provides an intuitive platform for remote configuration and monitoring. Its modular hardware design ensures ease of assembly, maintenance, and future scalability, making it ideal for home or clinical use. Compact, reliable, and cost-effective, MEDIREMIND offers a practical and efficient solution to support patient health and medication compliance.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

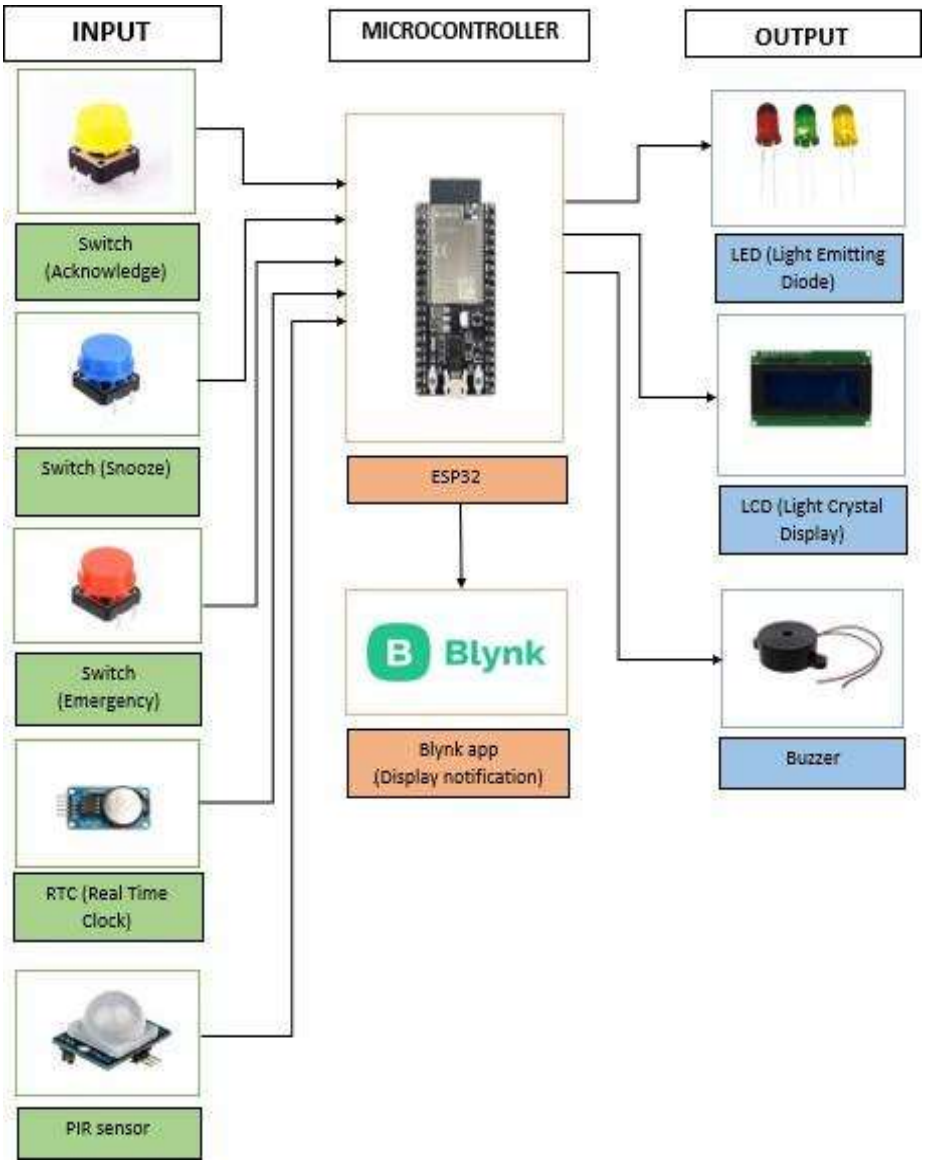


Figure 1: Block Diagram of the MEDIREMIND: A microcontroller-based medication reminder system.

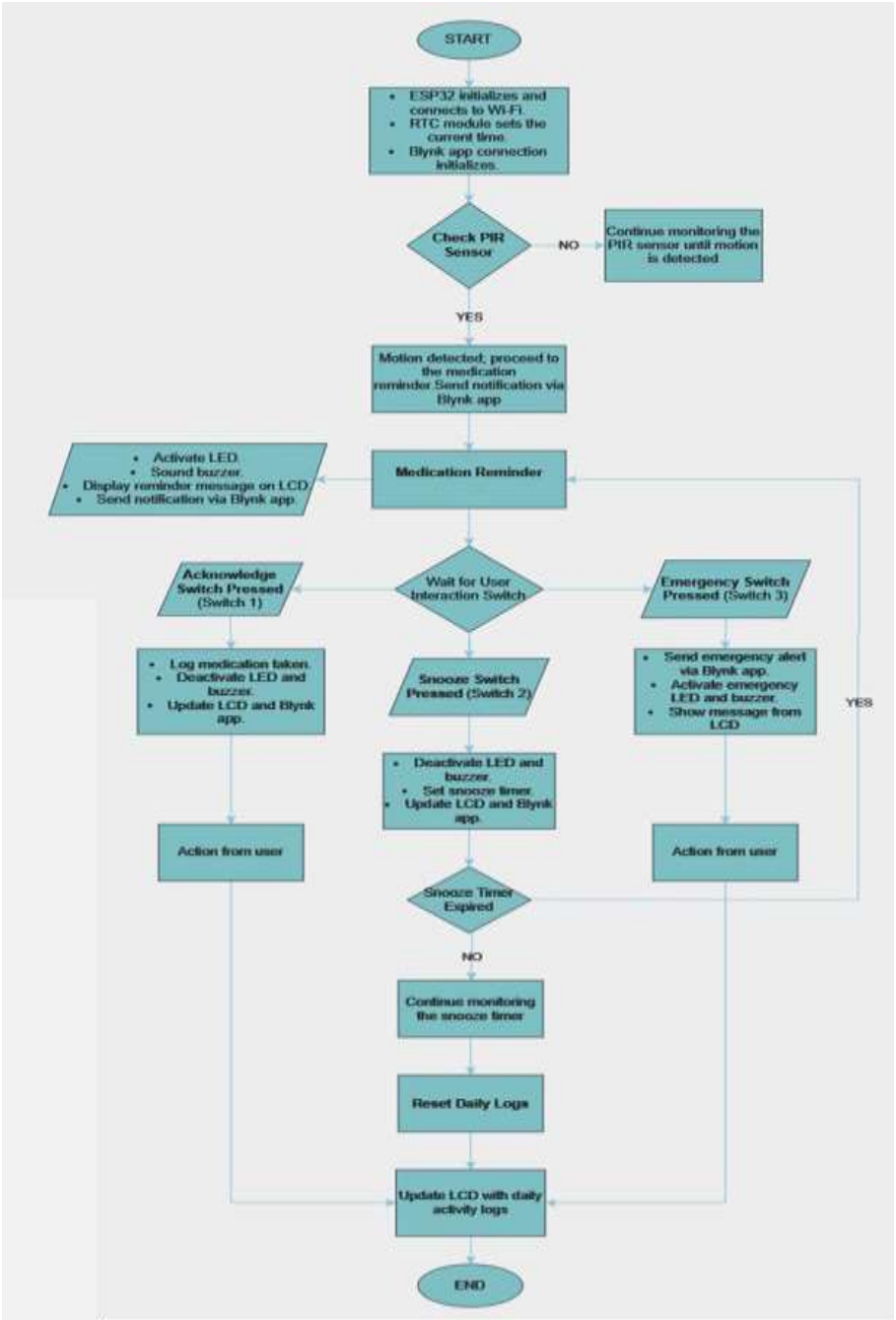


Figure 2: Flowchart of the MEDIREMIND: A microcontroller-based medication reminder system.

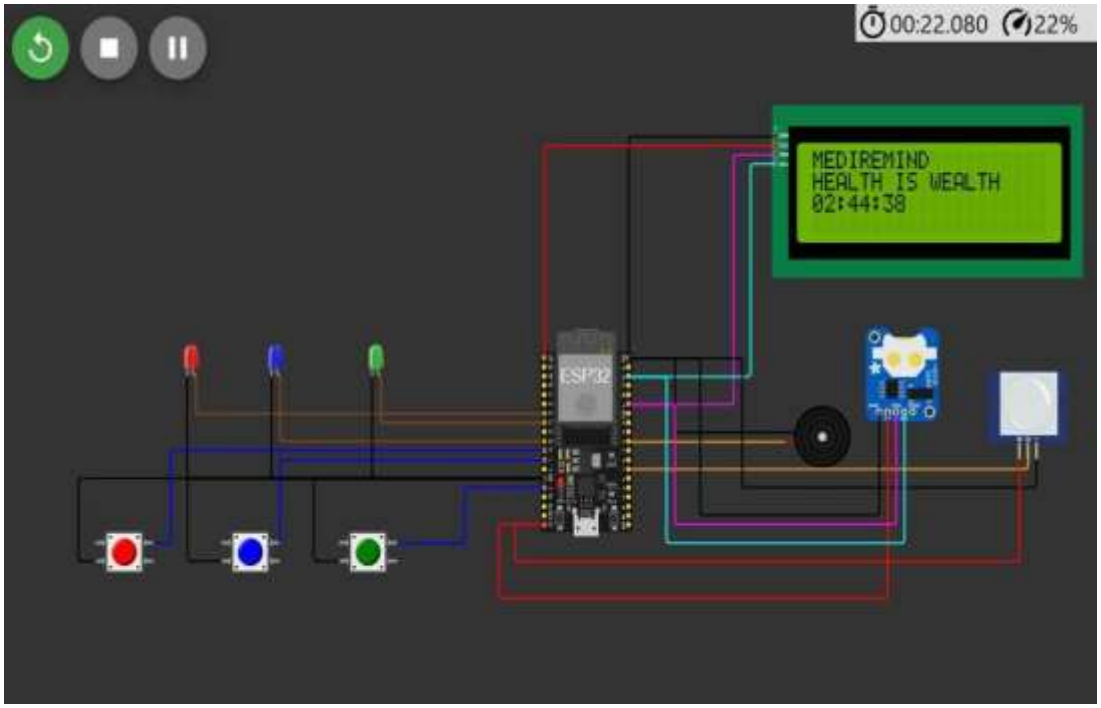


Figure 3: Simulation Result of the MEDIREMIND: A microcontroller-based medication reminder system.

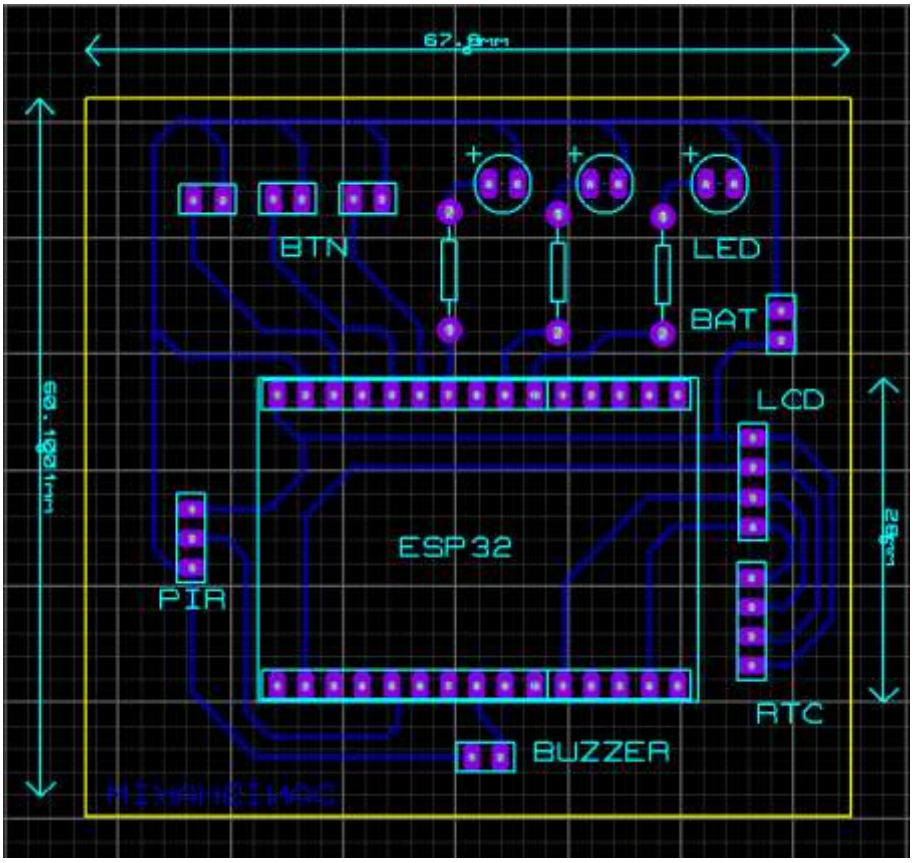


Figure 4: PCB diagram of the MEDIREMIND: A microcontroller-based medication reminder system.

NOVELTY AND UNIQUENESS

The MEDIREMIND system is a groundbreaking innovation that combines advanced motion detection, real-time reminders, and an intuitive user interface to redefine medication adherence. Unlike conventional solutions, it leverages a PIR motion sensor to activate reminders only when the patient is nearby, minimizing unnecessary alerts and enhancing user experience. Operated by the ESP32 microcontroller, it's integrates with the Blynk application, providing remote scheduling and monitoring capabilities that empower users and caregivers to manage medication schedules efficiently. Its multi-compartment reminder feature simplifies complex schedules, making it ideal for users managing multiple medications, while additional functionalities such as snooze and emergency alerts cater to diverse requirements, particularly for elderly individuals and patients with chronic conditions. The modular hardware design of MEDIREMIND ensures straightforward assembly, maintenance, and scalability, allowing for cost-effective production and future enhancements. This adaptability positions MEDIREMIND as a versatile solution suitable for both home and clinical environments. Its unique combination of motion detection, user-centric features, and digital connectivity differentiates it from traditional medication reminder systems, offering a more personalized and effective approach to medication management. Furthermore, its innovative design aligns with the growing trend of smart healthcare devices, providing a cutting-edge tool that not only improves medication schedule eficiency but also reduces caregiver burden and enhances patient independence. MEDIREMIND's practical and scalable architecture makes it a pioneering advancement in healthcare technology, addressing issue in healthcare management system.

BENEFIT TO MANKIND

This prototype offers significant benefits to mankind by addressing the widespread issue of medication non-adherence, a leading cause of poor health outcomes and increased healthcare costs. By providing timely, personalized reminders and leveraging motion detection to reduce unnecessary alerts, it promotes consistent medication compliance and improves treatment efficacy. The main benefit from this prototype is to provide better scheduling and tracking of medication especially for elderly people. Its features, such as multi-compartment reminders, snooze functionality, and emergency alerts, provide tailored support for elderly individuals and patients with chronic conditions, promoting independence while easing caregiver responsibilities. Integration with the Blynk application enables remote monitoring, adding an extra layer of safety and reassurance. On a broader scale, the system helps reduce hospital admissions, improve quality of life, and lower healthcare costs, contributing to a healthier and more self-reliant society. where it provide efficient scheduling and tracking of medication especially for elderly people.

COMMERCIALIZATION POTENTIAL

The MEDIREMIND prototype demonstrates significant commercialization potential within the thriving healthcare and wellness market. Addressing the critical issue of medication non-adherence, which leads to poor health outcomes and increased healthcare costs, this innovative system offers a practical and user-friendly solution for patients, caregivers, and healthcare providers. Its advanced features, such as motion-triggered reminders, multi-compartment scheduling, snooze functionality, and emergency alerts, combined with its integration with the Blynk application, make it a versatile tool adaptable to diverse user needs. Designed for cost-effective manufacturing with a modular and scalable approach, MEDIREMIND ensures affordability, enhancing its appeal to a broad consumer base. The growing prevalence of chronic diseases and the increasing aging population worldwide amplify the demand for solutions like MEDIREMIND, particularly in home and clinical settings. Furthermore, its compatibility with the rising trend of digital health technologies and smart home systems positions it as a cutting-edge addition to modern healthcare ecosystems. Commercial opportunities include direct-to-consumer sales, partnerships with healthcare facilities, and collaborations with pharmacies for medication

management services. Customization options for specific demographics, such as pediatric or geriatric users, provide avenues for premium offerings and market segmentation. By improving medication adherence, reducing hospital readmissions, and enhancing patient quality of life, MEDIREMIND aligns with the goals of healthcare providers and patients alike. Its unique combination of affordability, functionality, and adaptability ensures strong market demand, making it a highly promising product for widespread commercial success in the healthcare technology industry.

CONCLUSION

In conclusion, the MEDIREMIND: Microcontroller-Based Medication Reminder System is an innovative solution designed to address the critical challenge of medication non-adherence, which impacts patient health and increases healthcare costs globally. By integrating advanced features such as motion detection, multi-compartment scheduling, snooze functionality, and emergency alerts, the system ensures precise and user-friendly medication management tailored to individual needs. Powered by the ESP32 microcontroller and seamlessly connected to the Blynk application, MEDIREMIND offers remote monitoring and configuration capabilities, empowering users and caregivers alike. Its modular and scalable hardware design ensures ease of assembly, maintenance, and future upgrades, making it adaptable for both home and clinical settings. MEDIREMIND is designed with compact size, reliable, and cost-effective which not only enhances medication adherence and treatment outcomes but also reduces caregiver burden. This prototype is versatile and impactful tool where the system aligns with the rising demand for smart healthcare devices, offering a practical and efficient solution to improve the quality of life for individuals and contribute to a healthier society.

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Filtermate: Efficient Air Conditioning Filter Maintenance Reminder System

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ABSTRACT

This paper introduces a prototype of an Efficient Air Conditioning Filter Maintenance Reminder System (FilterMate). The system uses ESP32 microcontroller, sensors and actuators as the main components. The sensors system includes a dust sensor, a DHT22 temperature sensor, and a vibration sensor, as well as a Liquid Crystal Display (LCD) for real-time data display. In addition, this system is integrated with Wi-Fi module to the ESP32 increases the system's capabilities, transforming it into an Internet of Things (IoT) device capable of remote monitoring. In addition, a buzzer and an LED have been added as system outputs to detect the dust level in the air conditioner filter. The system's functionality is enhanced with additional active components such as LEDs for visual alerts, a buzzer for user notifications, and it's also connected to the Telegram apps. The Arduino code developed in this work includes sophisticated decision-making to ensure LEDs and other indicators activated at desired dust levels. The level of the dusk indicator also sends to the Telegram for users alert system. The LCD displays onsite display variety of information screens, including temperature, vibration stability, and filter cleanliness. This IoT-Integrated FilterMate is expected to enhance air-conditioning air quality, energy efficiency, and system longevity by sending timely maintenance reminders and warnings, thus increasing customer pleasure and confidence in the operation of their air conditioning systems.

KEYWORDS: Air Conditioning Filter, Internet of Things (IoT), ESP32, Dust Sensor, Telegram, LED and buzzer.

PRODUCT DESCRIPTION

The Air Conditioning Maintenance Reminder is an innovative device designed to enhance HVAC system efficiency and longevity. It integrates dust, vibration, and temperature sensors to monitor system performance and notify users when maintenance is required. The dust sensor detects accumulated particles, indicating when filters need cleaning, while the vibration sensor monitors mechanical operations, identifying potential issues before system failures. The temperature sensor ensures optimal climate control by detecting deviations from set parameters. Alerts are communicated through audible buzzers, visual LED indicators, and real-time notifications via Telegram, facilitated by IoT connectivity. This real-time monitoring and alert system aligns with industry trends towards smarter, energy-efficient HVAC solutions. By ensuring timely maintenance, the device helps prevent major outages and enhances overall system performance.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

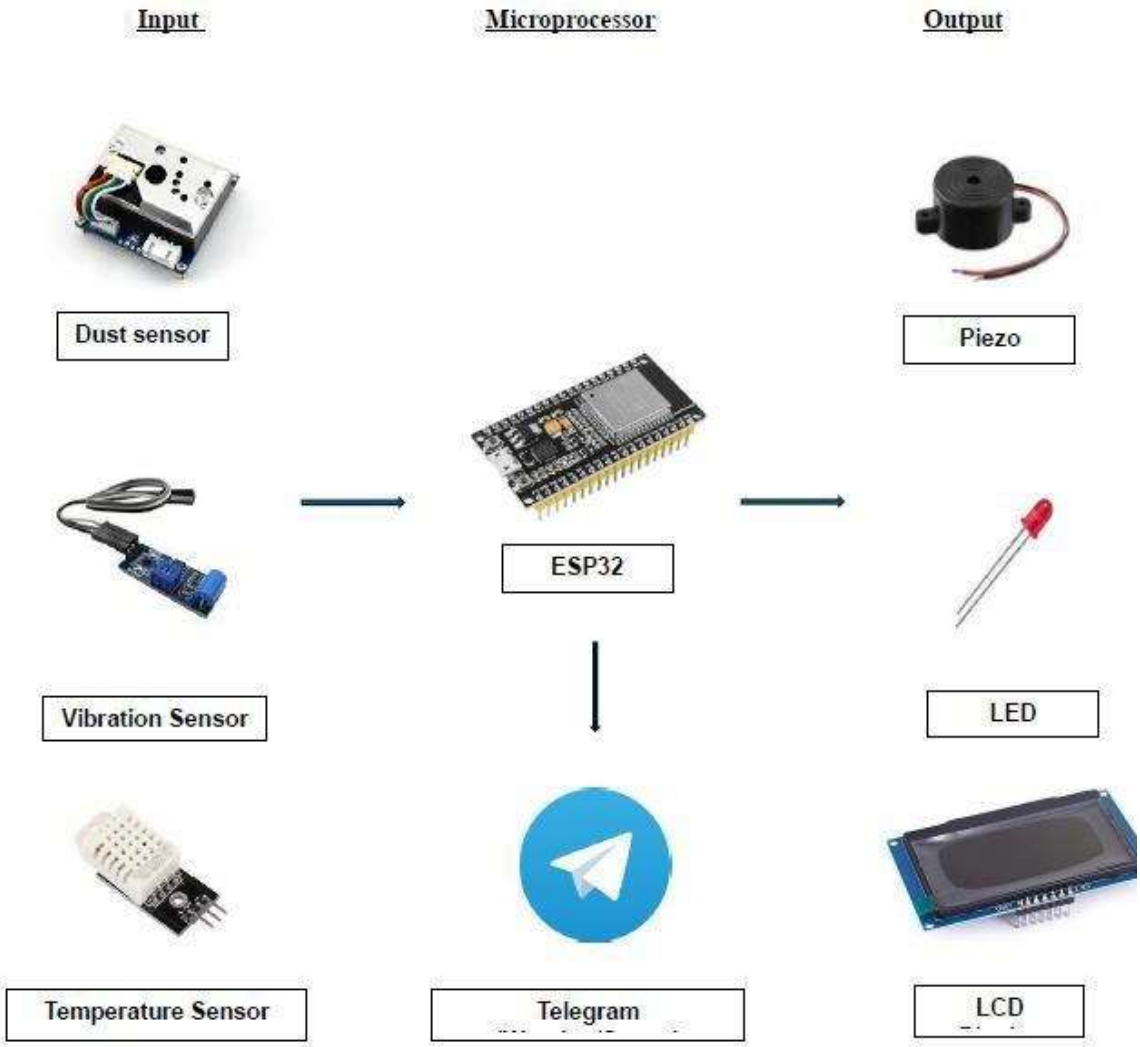


Figure: 1: Block diagram of the FilterMate: Efficient Air Conditioning Filter Maintenance Reminder System

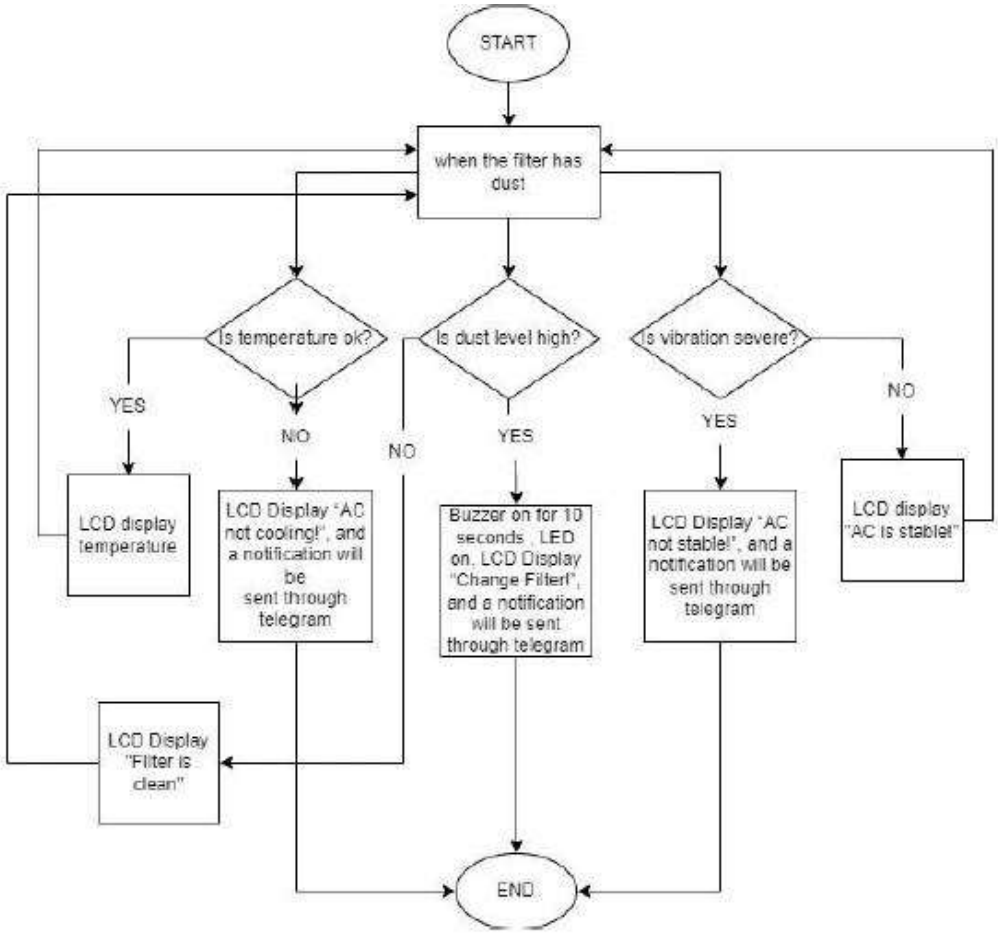


Figure: 2: Flowchart of the project

NOVELTY AND UNIQUENESS

The novelty and uniqueness of FilterMate lie in its integration of multiple sensors including dust, vibration, and temperature to provide a comprehensive monitoring solution for air conditioning maintenance. Unlike conventional approaches that rely on scheduled service or single-parameter monitoring, this system offers a dynamic and real- time assessment of air conditioner health. The use of IoT technology to send maintenance reminders via Telegram adds a modern, user-friendly element, ensuring users are promptly notified no matter where they are. Additionally, the combination of audible, visual, and remote alerts enhances accessibility and adaptability for different user preferences. This project stands out by addressing the challenge of timely maintenance with precision, while also being compact and easy to install, making it a practical and innovative solution for improving air conditioning efficiency and lifespan.

BENEFIT TO MANKIND

FilterMate will assist humanity by promoting ease, energy efficiency, and healthier living conditions. This prototype lowers the risk of respiratory problems brought on by dust and allergens by helping to maintain healthier air quality by sending out periodic reminders for air conditioner maintenance. Furthermore, it enhances energy efficiency by preserving peak performance, cutting down on electricity use, and minimizing carbon emissions. By identifying problems early, the prototype device can reduce the possibility of expensive repairs or replacements, saving time and money. Its incorporation of IoT technology simplifies maintenance, improving customer satisfaction and enabling people to properly maintain their appliances. All things considered, this

initiative enhances quality of life and promotes sustainable living.

COMMERCIALIZATION POTENTIAL

Due to the increased demand for energy-efficient solutions and smart home gadgets, this project has a high potential for commercialization. Many people use air conditioners and maintaining them on a regular basis is essential to both function and air quality. By enhancing energy efficiency and sending out timely maintenance notifications, this product meets that need. With majority of the population using smartphones in their daily life, IoT features for remote monitoring using Telegram is very useful and convenience. With possible collaborations with HVAC manufacturers or service providers, FilterMate can be promoted to building managers, businesses, and homeowners. All things considered, it has a lot of potential in the growing IoT and smart home industries.

CONCLUSION

In conclusion, FilterMate offers an innovative solution for air conditioner maintenance by combining dust, vibration, and temperature sensors with IoT connectivity. It provides real-time alerts for timely maintenance, improving air quality, energy efficiency, and system lifespan. The product's unique combination of features and remote notifications via Telegram makes it a valuable tool for homeowners, businesses, and building managers. With strong commercialization potential, FilterMate taps into the growing smart home and IoT market, offering a practical and sustainable solution for efficient air conditioner upkeep.

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Electronic Postbox Notifying System

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ABSTRACT

This work focuses on the design and implementation of an enhanced electronic postbox notification system. This system is a suite of sensors, actuator and microcontrollers aimed to monitoring and notifying users of new mail arrivals efficiently. The primary sensor used is a proximity sensor responsible for detecting mail insertion in the postbox. Upon detecting new mail, the sensor sends a signal to an ESP 32 microcontroller. The ESP 32 is programmed to activates a servo motor, which controls the opening and closing of the postbox lid to ensure secure mail storage. The system also includes an LCD display connected to the ESP 32, which shows notifications when mail is detected and logs each mail insertion event. Additionally, an infrared sensor detects mail, triggering a buzzer to alert the user. Furthermore, a servo motor acts as an automatic mechanism to open the postbox when the ultrasonic sensor detects motion within its range. This ensures the postbox can be accessed automatically when a user approaches without contact with the postbox. The current state of the postbox, including new mail detection, is displayed on the LCD screen. In addition, an LED and buzzer alert nearby residents of the new mail. To extend the system's reach, an ESP 32 Wi-Fi module is integrated to send data to the Blynk application, enabling users to receive instant notifications on their mobile devices.

KEYWORDS: *Postbox notifying, Internet of Things (IoT), Wi-Fi module, ESP 32, infrared module, servo motor*

PRODUCT DESCRIPTION

The Enhanced Electronic Postbox Notification System is a smart solution designed to revolutionize mail management by integrating advanced sensors, microcontrollers, and connectivity features. It detects mail using proximity sensors which are ultrasonic sensor and PIR sensor. This sensor notifies and alerts the user immediately when any mail is being delivered. It also has a secured storage with automated lid control powered by a servo motor. It can make it easier for users to retrieve the mail. Furthermore this electronic postbox also provides comprehensive notifications through an LCD display, LED indicators, and a buzzer for nearby alerts. Enhancing user convenience, the system incorporates hands-free access via an ultrasonic sensor that triggers the lid to open automatically when motion is detected. There is also a reset button that functions to reset the system once the user has retrieved the mail, indicating that no mail remains unread. Additionally, with its Wi-Fi-enabled ESP 32 module, users could receive real-time mail arrival updates on their mobile devices through the Blynk app, ensuring they stay informed no matter their location.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

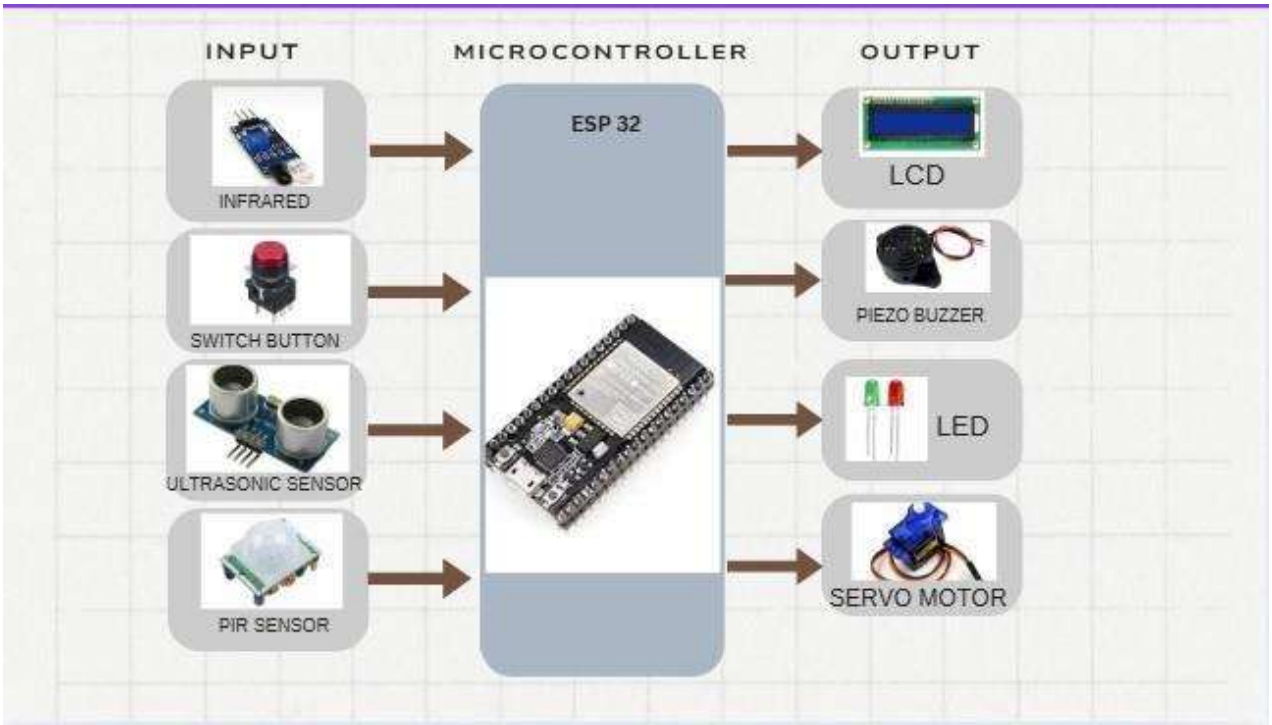
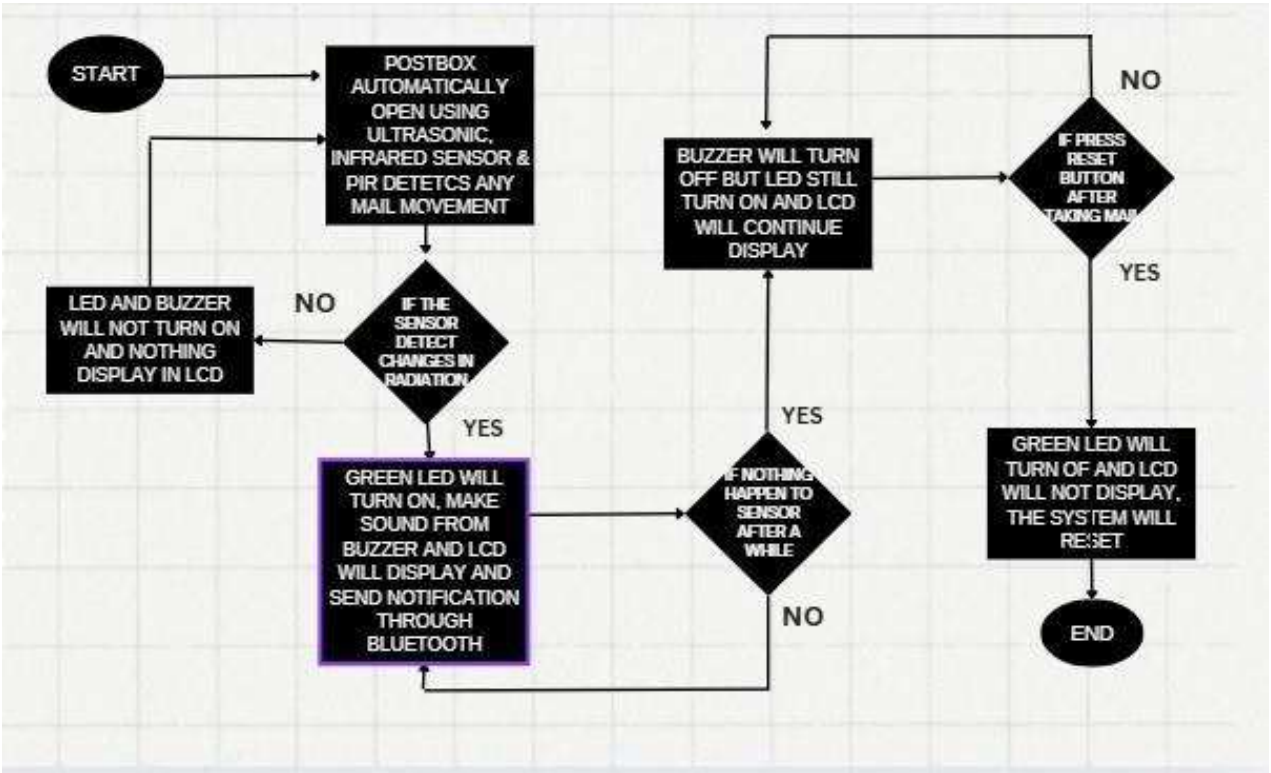


FIGURE 1 BLOCK DIAGRAM



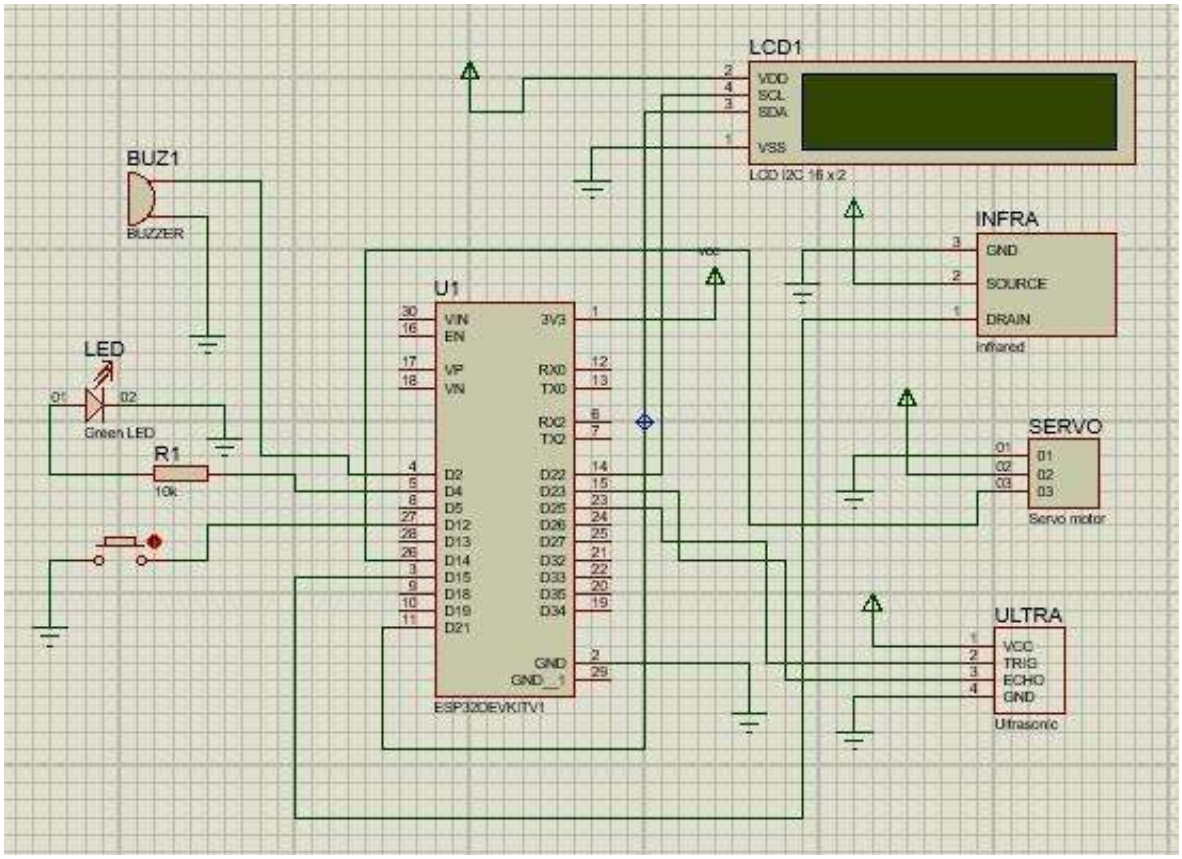


Figure 3 Schematic Diagram

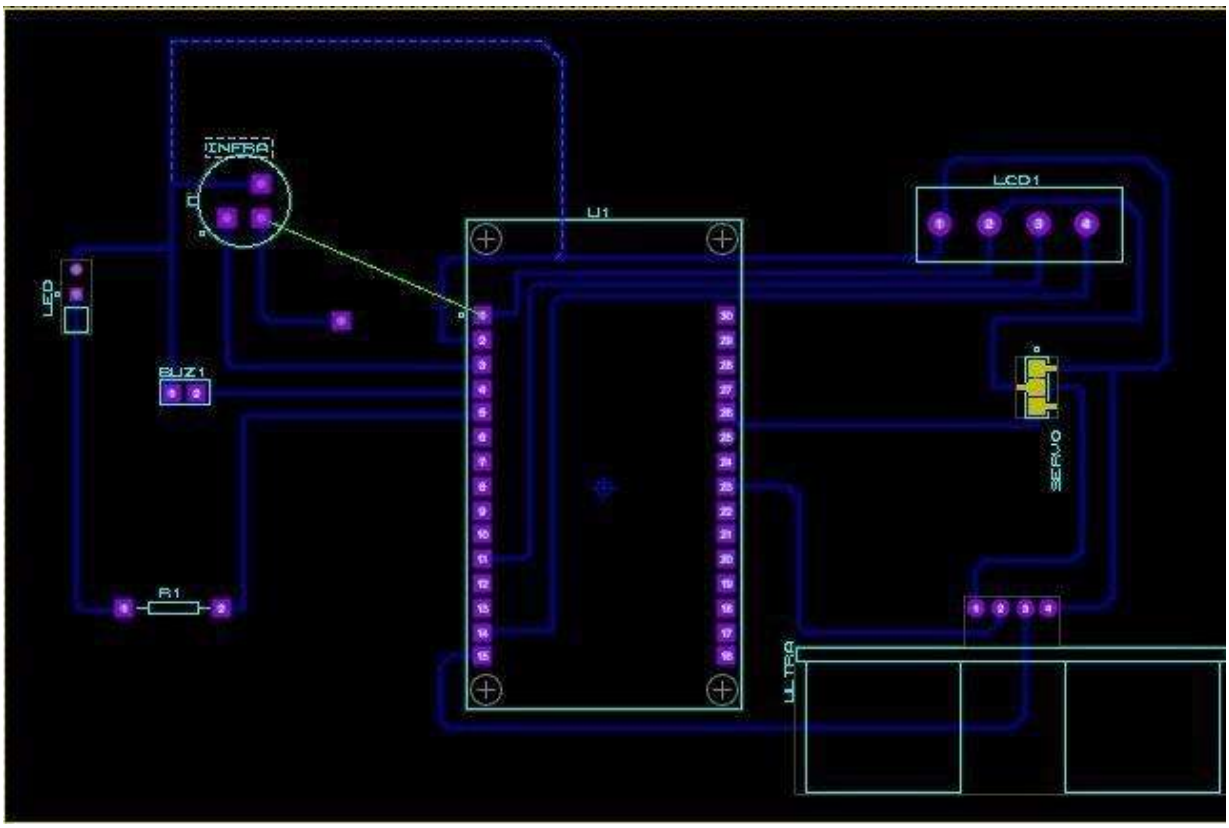


Figure 4 PCB Layout

NOVELTY AND UNIQUENESS

The novelty and uniqueness of this project stem from its integration of multiple advanced technologies, including ultrasonic and PIR sensors, to accurately detect the arrival of mail. The system enhances user convenience with an automated servo motor-controlled lid that opens hands-free when motion is detected, ensuring secure storage and easy access to the mail. Furthermore, the system incorporates a reset button to indicate when all mail has been retrieved, preventing any mail from being left unread. The integration of an ESP 32 microcontroller with Wi-Fi connectivity allows real-time notifications to be sent to users via the Blynk app, providing a seamless and efficient mail management solution. This combination of automation, real-time updates, and enhanced accessibility sets the project apart from traditional mailboxes, offering a more modern and user- friendly alternative.

BENEFIT TO MANKIND

The Electronic Postbox Notifying System is significant, particularly in terms of convenience, security, and efficiency. By automating the mail detection and retrieval process, it reduces the need for manual checks, saving time and effort for users. The secure storage with automated lid control ensures that mail is protected from the elements and unauthorized access. The real-time notifications via the Blynk app provide users with instant updates, ensuring they never miss important mail, regardless of their location. Furthermore, the hands-free access feature improves accessibility, particularly for individuals with mobility challenges. Overall, this project contributes to a smarter, more efficient way of managing mail, which can enhance daily life and promote greater convenience and security for users in both residential and commercial settings.

COMMERCIALIZATION POTENTIAL

This project lies in its robust functionality, which integrates advanced technologies such as ultrasonic and PIR sensors for accurate mail detection, automated servo motor- controlled lid operation for secure storage, and hands-free access for added convenience. With real-time notifications sent to users' mobile devices via the Blynk app, it ensures users are always informed about new mail, regardless of their location. This makes the system ideal for a wide range of commercial applications, such as smart homes, apartment complexes, office buildings, and even postal services, where efficient, secure, and convenient mail management can improve daily operations. The system's scalability, user-friendly interface, and enhanced security make it a marketable solution for both residential and business environments, offering a competitive advantage in the growing smart technology sector.

CONCLUSION

The Electronic postbox Notifying System highlights the significant impact of integrating smart technology into everyday life, particularly in the realm of mail management. By automating the process of detecting, storing, and notifying users about new mail, this system improves efficiency, security, and accessibility, offering a modern solution to a traditional task. Its ability to provide real-time updates, hands-free access, and secure mail storage enhances user convenience, while its scalability makes it applicable for both residential and commercial use. Ultimately, this project demonstrates how technological innovation can simplify daily routines, increase productivity, and contribute to the advancement of smart living solutions, making it a valuable addition to modern life.

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The Home-Based Automatic Self-Sanitized Waste Management System

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ABSTRACT

The Home-Based Automatic Self-Sanitized Waste Management System uses effective segregation, automation, and sanitation to completely rethink trash management. The system guarantees a smooth and sanitary waste disposal procedure with its cutting-edge parts, which include the ESP32, ultrasonic sensors, servo motors, DHT22 humidity sensor, IR motion sensor, MQ-135 gas sensor, and an LCD with I2C. The DHT22 sensor determines humidity to categorize garbage as dry or moist, while the IR sensor detects motion to engage servo motors for hands-free lid operation. The bin's fill level is monitored by ultrasonic sensors; real-time data is shown on the LCD and transmitted to the Blynk app for remote monitoring. A built-in self-sanitization system promotes better home hygiene by keeping things clean and reducing odors. This IoT-enabled solution, powered by ESP32 and Blynk, promotes smarter waste management by offering remote monitoring and control. Its cost-effective design and intuitive operation make it suitable for widespread adoption in both urban and rural settings. By reducing manual waste handling and encouraging cleaner surroundings, the system delivers significant socio-environmental advantages. It enhances living conditions and offers a scalable, innovative approach to modern waste management.

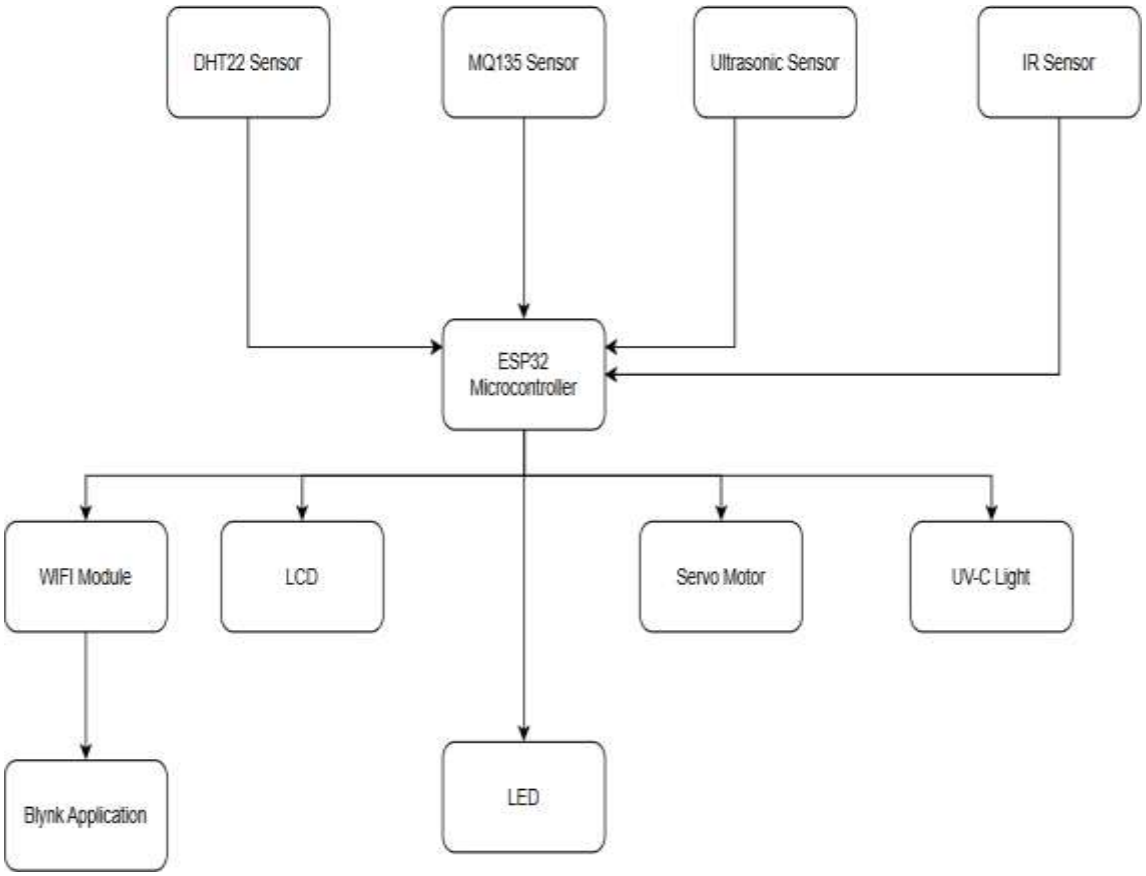
KEYWORDS: Automation, self-sanitization, monitoring.

PRODUCT DESCRIPTION

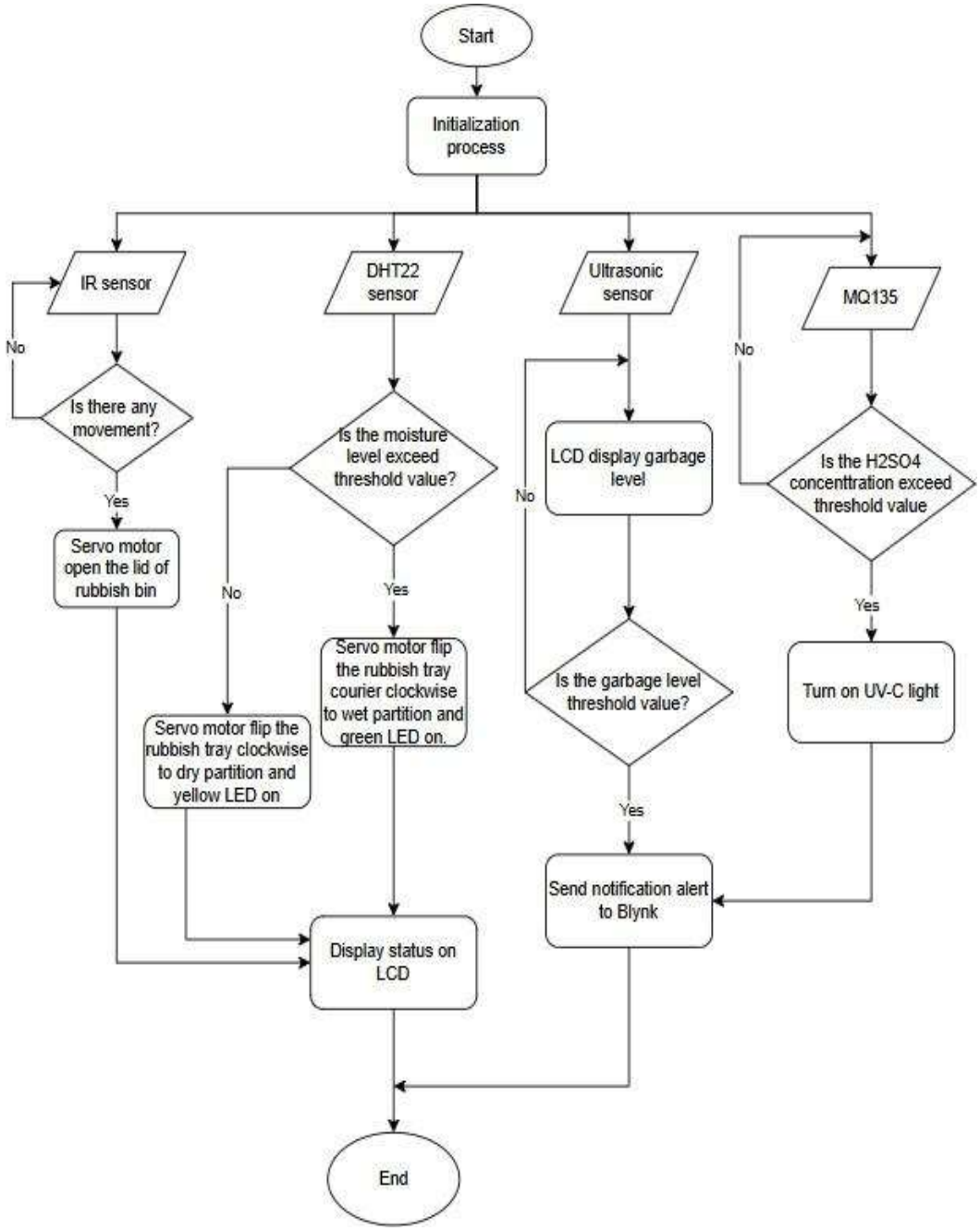
The Home-Based Automatic Self-Sanitized Waste Management System is an intelligent trash disposal system that combines automation and cutting-edge sensors to guarantee sustainability, efficiency, and hygienic conditions. This system, which was created for contemporary homes, integrates essential elements to provide a better waste management experience. To provide a hands-free, contactless operation, an infrared sensor that detects motion close to the bin triggers the servo motor to open the lid automatically. In order to facilitate appropriate trash segregation, the DHT22 humidity sensor divides waste into dry and wet groups according to its moisture content. An ultrasonic sensor checks the fill level to keep an eye on the bin's capacity and guarantees prompt disposal. The system uses a MQ-135 gas sensor to identify dangerous gases and activate the self-sanitization feature, which keeps the interior odour-free and clean. An LCD display gives customers a clear and well-organized picture of how the system is operating by providing real-time updates on the condition of the MQ-135, DHT22, ultrasonic, and infrared sensors. This smart bin makes garbage management easier and encourages cleaner, healthier living spaces with its automated functions and IoT integration via ESP32 and Blynk.[3]

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

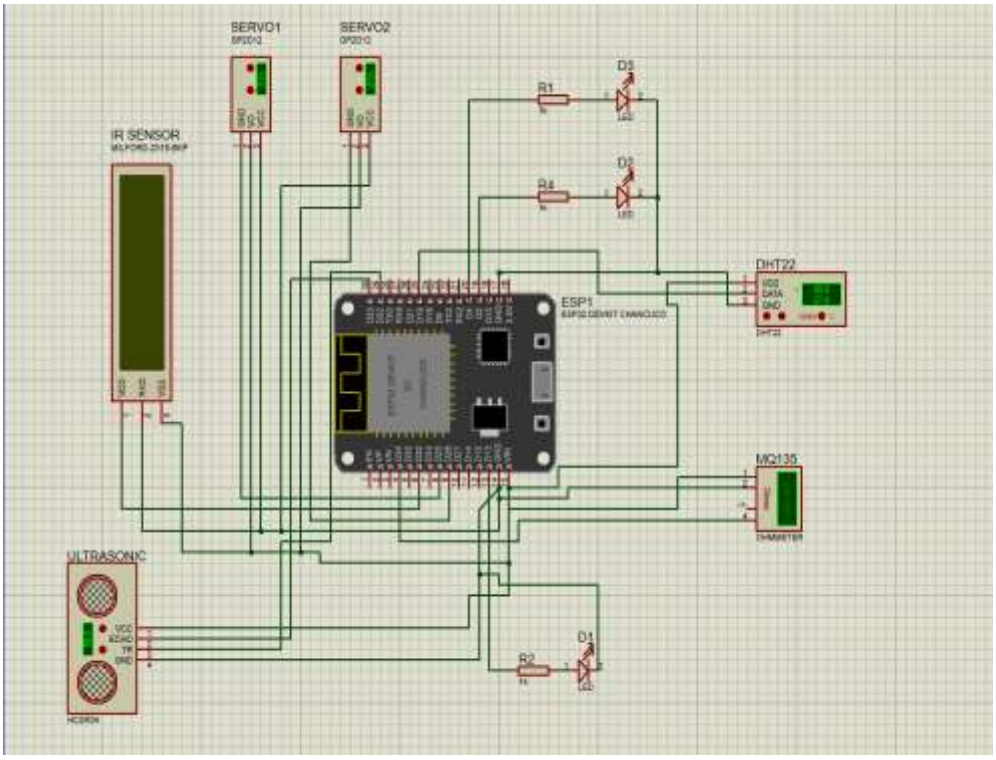
1. Block diagram



2. Flowchart


Start
Initialization process
IR sensor
DHT22 sensor
Ultrasonic sensor
MQ135
No
Is there any movement?
Yes
Servo motor open the lid of rubbish bin
Is the moisture level exceed threshold value?
No
Yes
Servo motor flip the rubbish tray clockwise to dry partition and yellow LED on
Servo motor flip the rubbish tray courier clockwise to wet partition and green LED on.
No
LCD display garbage level
Is the garbage level threshold value?
Yes
No
Is the H2SO4 concenttration exceed threshold value
Yes
Turn on UV-C light
Send notification alert to Blynk
Display status on LCD
End

3. Schematic Diagram



NOVELTY AND UNIQUENESS

The Home-Based Automatic Self-Sanitized Waste Management System excels in addressing traditional waste management issues by integrating sensor technology, automation, and IoT connectivity. Unlike standard waste bins, this system ensures improved hygiene with a hands-free lid mechanism operated by an IR sensor and servo motor that activates upon detecting motion.[3] A standout feature is the DHT22 humidity sensor, which categorizes waste as dry or wet based on moisture levels, facilitating effective waste segregation at the household level and promoting sustainable disposal practices. The MQ-135 gas sensor further enhances functionality by detecting harmful gases and odors, triggering an automatic self - sanitization process to maintain cleanliness and reduce unpleasant smells. The system's ultrasonic sensor monitors the bin's capacity, alerting users when it needs emptying, ensuring efficient management. Real-time data from all sensors is displayed on an LCD screen for user convenience, while IoT integration via ESP32 and Blynk allows remote monitoring and control through a smartphone. By combining these advanced features, the system offers a modern solution for waste management, emphasizing automation, hygiene, and waste classification. Its innovative design makes it a practical and efficient choice for addressing contemporary waste disposal challenges.

BENEFIT TO MANKIND

The Home-Based Automatic Self-Sanitized Waste Management System offers a smart, hygienic, and sustainable solution for modern household waste disposal. Designed with advanced sensors and automation, this innovative system streamlines the waste management process. An IR sensor detects motion near the bin, activating a servo motor to open the lid for hands-free operation. The DHT22 humidity sensor categorizes waste as dry or wet based on moisture levels, promoting effective segregation. An ultrasonic sensor tracks the bin's fill level, ensuring timely emptying. To enhance hygiene, the MQ- 135 gas sensor identifies harmful gases and triggers a self-sanitization process, keeping the bin's interior clean and odor-free. Real-time updates are displayed on an LCD

screen, providing users with a clear status of the system. With IoT integration via ESP32 and Blynk, users can remotely monitor and manage the smart bin, fostering a cleaner and healthier living environment.[2]

COMMERCIALIZATION POTENTIAL

The potential commercialization of the Home-Based Automatic Self-Sanitized Waste Management System aligns perfectly with the rapidly growing smart waste management market, projected to reach $9.01 billion by 2033, with a CAGR of 11%. This system leverages advanced technologies such as IoT and automation, positioning it as an innovative solution in a sector increasingly focused on sustainability and efficiency. As urbanization and environmental awareness rise, there is a growing demand for smart waste solutions that improve waste collection and segregation processes. By addressing these needs, your project can tap into diverse markets, including residential, commercial, and municipal sectors. Furthermore, its implementation could inspire local entrepreneurship by encouraging startups to develop complementary services or products, fostering a culture of innovation within the community. Overall, this project not only offers a viable business opportunity but also contributes to sustainable waste management practices.[1]

CONCLUSION

The Home-Based Automatic Self-Sanitized Waste Management System represents a cutting-edge solution for modern waste disposal, combining sensor technology, automation, and IoT integration to address hygiene, efficiency, and sustainability. By utilizing components such as an IR motion sensor for hands-free operation, a DHT22 humidity sensor for waste classification, an ultrasonic sensor for fill-level monitoring, and an MQ-135 gas sensor for self-sanitization, the system ensures a streamlined and sanitary experience. With IoT connectivity powered by ESP32 and Blynk, users can remotely monitor and manage waste disposal, enhancing convenience and promoting smarter waste management practices. The system's real-time updates via an LCD interface further simplify user interaction. Its innovative approach not only reduces manual handling of waste but also encourages effective segregation, cleaner spaces, and healthier living environments. Scalable, cost-effective, and user-friendly, this system is well-suited for widespread adoption in both urban and rural settings, offering significant socio-environmental benefits. By addressing key challenges in traditional waste management, this solution sets a new standard for sustainable and hygienic practices, contributing to a smarter, cleaner, and healthier future.

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Personal Locker Security System

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ABSTRACT

The Personal Locker Security System leverages the ESP8266 microcontroller to create a WiFi-enabled, app-controlled locker that offers both security and environmental protection for stored items. Using the Blynk app, users can unlock the locker through a secure connection to the ESP8266, with a buzzer sounding when the locker is accessed. Visual indicators enhance usability: a red LED lights up when the locker is locked, while a green LED illuminates when it is unlocked. Additionally, an I2C LCD display provides a clear status message indicating whether the locker is locked or unlocked, ensuring intuitive user interaction. Inside the locker, a DHT11 temperature sensor monitors the environment, automatically activating a fan if the temperature exceeds 30°C to protect sensitive items such as laptops and smartphones from overheating. Once the temperature normalizes, the fan turns off to conserve energy. By integrating IoT capabilities, temperature management, and user-friendly indicators, this system provides a secure and intelligent solution for safeguarding valuable possessions.

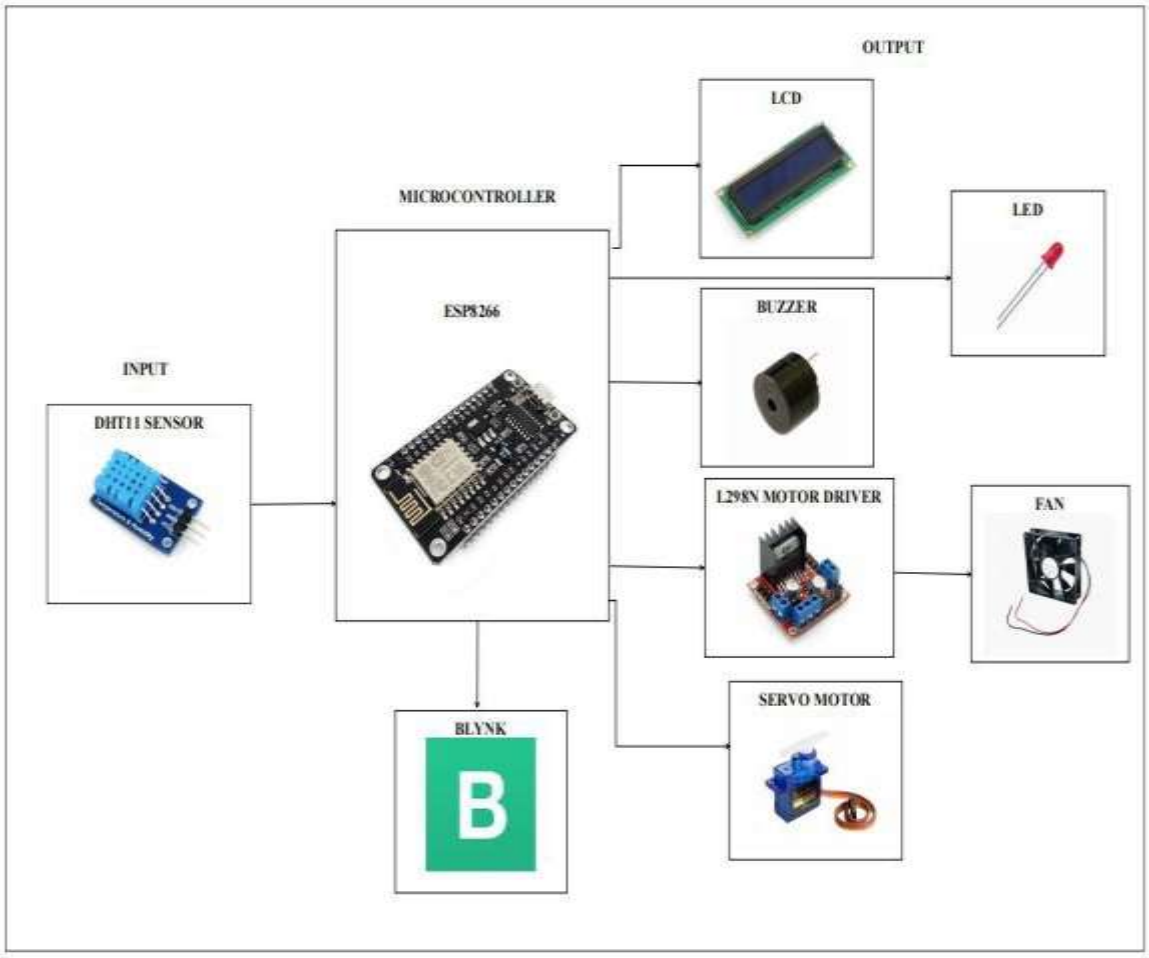
KEYWORDS: ESP8266 microcontroller, WiFi-enabled locker, Blynk app, Internet of Things (IoT), I2C LCD, DHT11 sensor, automatic fan, red LED, green LED, buzzer, smart locker system.

PRODUCT DESCRIPTION

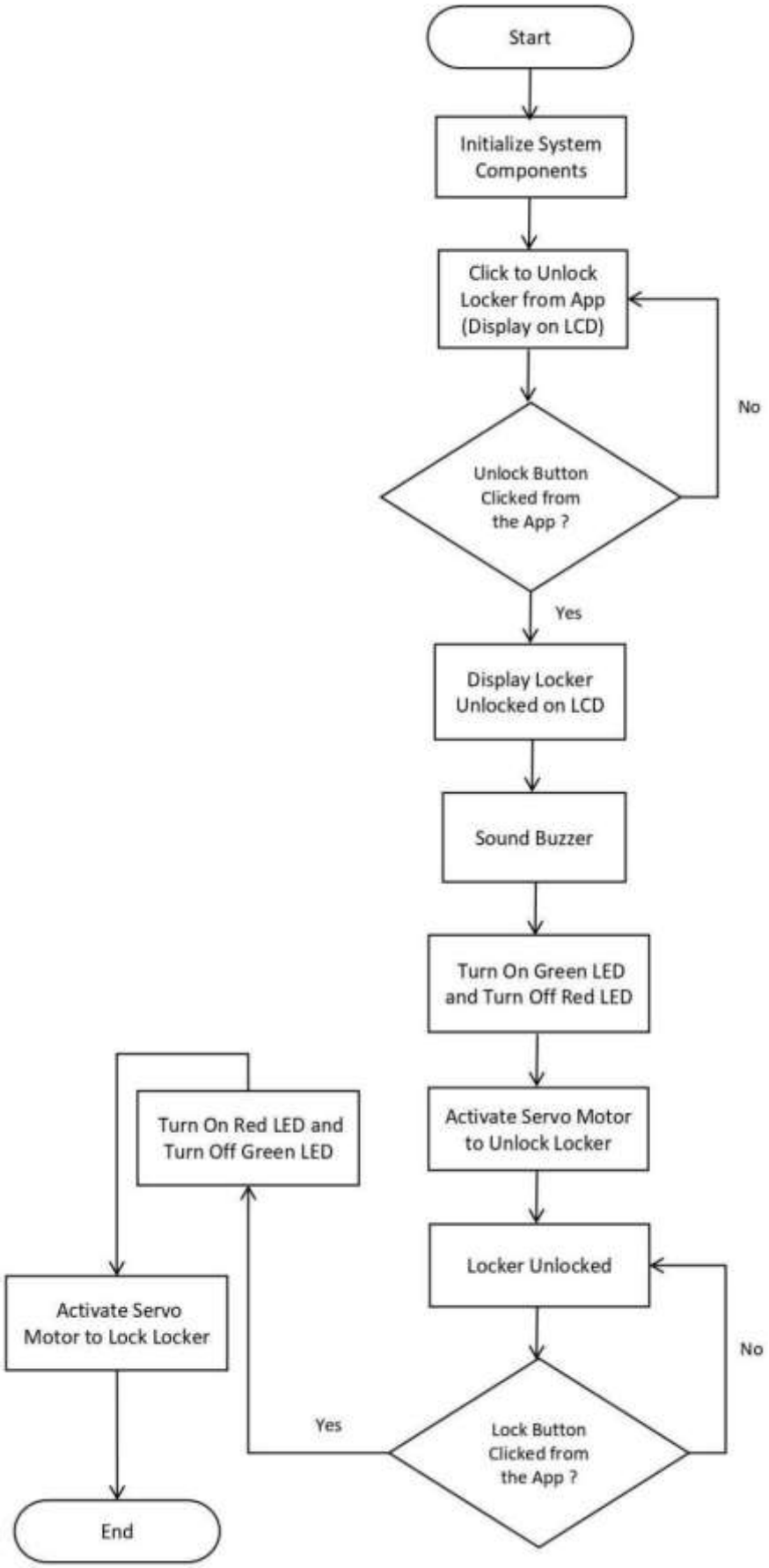
The Personal Locker Security System is a smart, app-controlled storage solution designed for enhanced security and environmental protection of valuable items. Powered by the ESP8266 microcontroller, it integrates seamlessly with the Blynk app, enabling users to unlock the locker effortlessly via WiFi. The system features intuitive visual indicators, with a red LED illuminating when locked and a green LED when unlocked, while an I2C LCD display provides clear status messages. A buzzer activates upon opening the locker for added security. Inside, a DHT11 temperature sensor monitors the internal environment, automatically triggering a fan if the temperature exceeds 30°C to prevent overheating of sensitive electronics like laptops and smartphones. The fan switches off once the temperature returns to normal, ensuring energy efficiency. Combining IoT technology, temperature regulation, and user-friendly functionality, this locker offers a secure and intelligent way to protect your valuable possessions.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

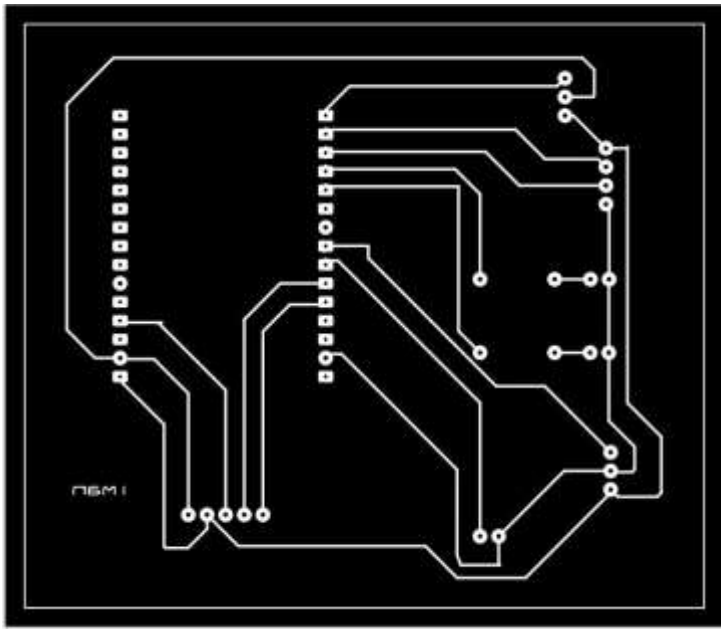
1. Block Diagram



2. Flowchart


Start
Initialize System Components
Click to Unlock Locker from App (Display on LCD)
Unlock Button Clicked from the App ?
No
Yes
Display Locker Unlocked on LCD
Sound Buzzer
Turn On Green LED and Turn Off Red LED
Activate Servo Motor to Unlock Locker
Locker Unlocked
Lock Button Clicked from the App ?
No
Yes
Turn On Red LED and Turn Off Green LED
Activate Servo Motor to Lock Locker
End

3. PCB Layout



4. Blynk Website



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Personal Locker Security System lie in its seamless integration of IoT technology, environmental monitoring, and user-friendly features to provide a comprehensive storage solution. Unlike conventional lockers, this system leverages the ESP8266 microcontroller for WiFi connectivity and app-based control via the Blynk app, allowing remote access and management. Its combination of visual indicators (red and green LEDs, I2C LCD display), audible alerts through a buzzer, and environmental protection via a DHT11 temperature sensor and automated fan sets it apart. The automated temperature regulation ensures the safety of sensitive electronics like laptops and smartphones, while the efficient energy management and real-time feedback make it highly innovative and practical for modern security needs. This fusion of advanced technology and intelligent design creates a standout solution for secure and climate-controlled storage.

BENEFIT TO MANKIND

The Personal Locker Security System offers significant benefits to mankind by addressing the dual needs of security and environmental protection for valuable possessions. By leveraging IoT technology, it provides users with convenient app- based control and real-time monitoring, ensuring accessibility and peace of mind. Its innovative temperature regulation system safeguards sensitive electronics, such as laptops and smartphones, from potential damage due to overheating, thereby prolonging their lifespan and reducing electronic waste. The visual and audible indicators enhance usability, making the system suitable for diverse users, including those with varying levels of technical proficiency. This smart locker promotes a safer, more organized, and energy-efficient way of storing valuable items, catering to the evolving demands of modern life while protecting personal and professional assets.

COMMERCIALIZATION POTENTIAL

The Personal Locker Security System has strong commercialization potential due to its versatile application and alignment with current market demands for smart, secure, and environmentally conscious solutions. Its integration of IoT technology and app-based control appeals to tech-savvy consumers seeking convenience and advanced security features. The system's ability to safeguard sensitive electronics through automated temperature regulation adds value for households, offices, and institutions storing valuable devices, making it attractive for both personal and professional use. Additionally, its user-friendly interface, visual and audible alerts, and energy-efficient operation position it as a desirable product in the smart home and office security market. With scalable manufacturing potential and adaptability to various use cases, the system can tap into a growing market for innovative, tech-driven storage solutions.

CONCLUSION

In conclusion, the Personal Locker Security System represents a sophisticated and practical solution for secure and environmentally conscious storage. By integrating IoT technology, app-based control via the ESP8266 microcontroller, and intelligent features such as visual indicators, temperature monitoring, and automated fan operation, the system addresses modern security and storage challenges effectively. Its ability to safeguard valuable electronics from overheating, combined with user-friendly design and energy efficiency, ensures broad applicability for both personal and professional use. This innovative system not only enhances convenience and safety but also aligns with the growing demand for smart, reliable, and sustainable solutions, making it a valuable addition to the evolving landscape of security technologies.

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Weather Monitoring System for Agriculture

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ABSTRACT

The weather monitoring system designed for agriculture integrates multiple sensors, including the DHT11 for temperature and humidity, BMP180 for atmospheric pressure, LDRs for light intensity, and MQ-7 for carbon dioxide levels, all powered by the ESP32 microcontroller. When the DHT11 sensor detects a temperature above the set limit, the system triggers an alert through the buzzer and illuminates an LED, providing immediate visual and auditory notifications to farmers. This IoT-based system provides real-time data collection on critical parameters essential for optimizing crop management. The system enables farmers to access comprehensive environmental data that informs their decision-making processes. Continuous monitoring allows for immediate responses to changing conditions, helping to adjust irrigation schedules and fertilization practices effectively. The user-friendly interface ensures that data is easily accessible via mobile devices, enhancing operational efficiency. This innovative approach not only increases crop yields by enabling precise agricultural practices but also promotes resource efficiency and sustainable farming methods. The market potential for this technology is substantial, as the demand for real-time weather monitoring solutions continues to grow in the agriculture sector. By integrating these advanced sensors, the system empowers farmers with the tools necessary to enhance productivity while contributing to environmentally friendly practices, making it a versatile and economically viable option for small-scale agricultural enterprises.

KEYWORDS: Dht11, Mq-7, esp32, led.

PRODUCT DESCRIPTION

The weather monitoring system for agriculture is an innovative IoT solution designed to enhance crop management through real-time environmental data collection. This system features an array of sensors, including the DHT11 for temperature and humidity, BMP180 for atmospheric pressure, LDRs for light intensity, and MQ-7 for carbon dioxide levels, all powered by the ESP32 microcontroller. A standout feature is the integrated LCD display, which provides immediate access to critical data such as temperature, humidity, pressure, light intensity, and CO2 levels. The system includes a buzzer and LED alert mechanism that activates when temperatures exceed a predefined threshold, ensuring farmers receive timely notifications to protect their crops from heat stress. Continuous data collection allows for prompt adjustments in irrigation and fertilization practices based on current environmental conditions. Moreover, users can access all this information through the Blynk app on their smartphones, enabling them to monitor their agricultural environment remotely. The user-friendly interface of the Blynk app ensures that data is easily accessible, enhancing operational efficiency.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

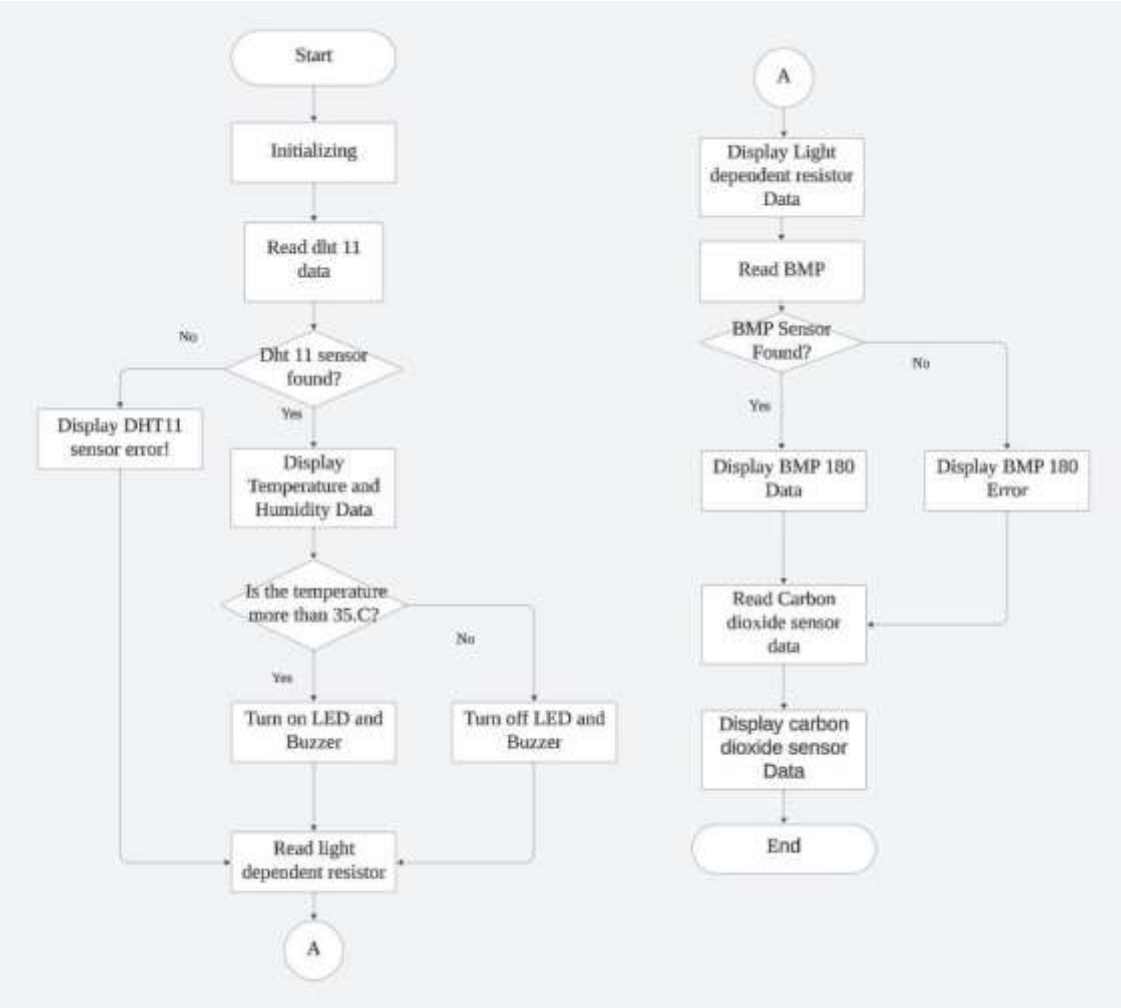


Figure 1. Flow Chart

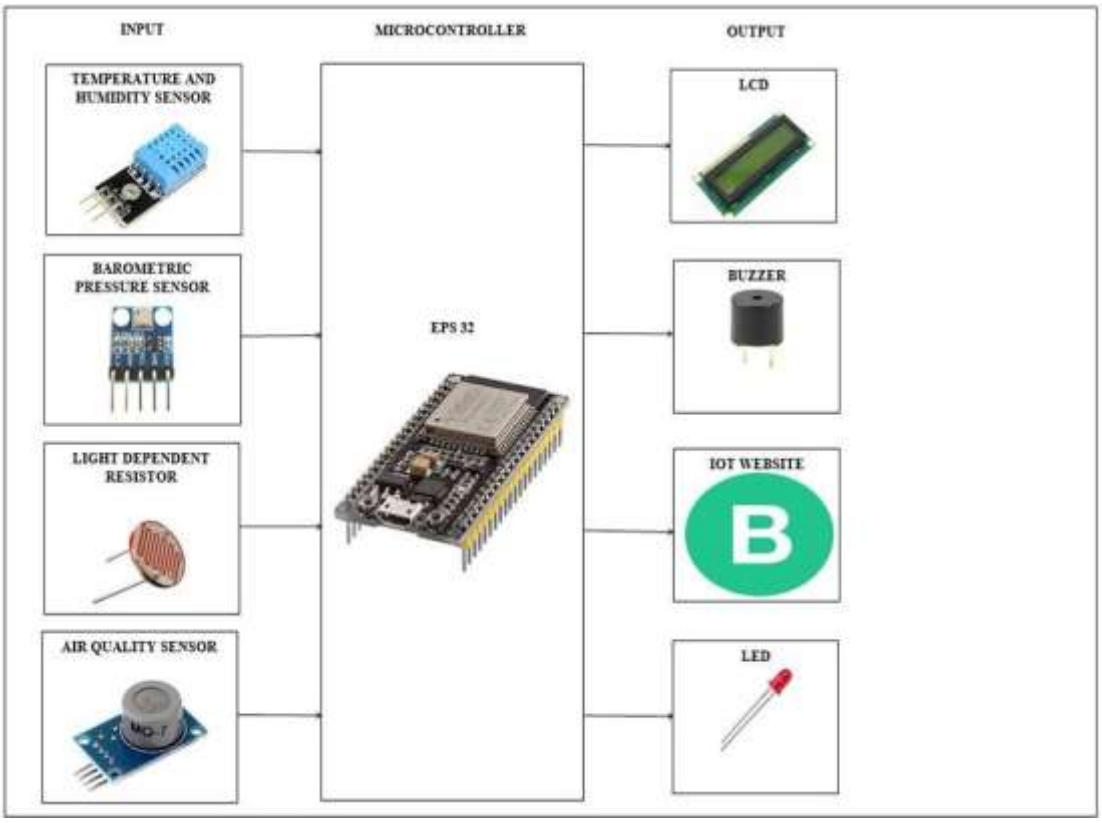


Figure 2. Block Diagram

Table 1. List of component

No	Component	Function
1.	Esp 32	Control all the sensors by processing all the information and connect to the internet for remote monitoring.
2.	Barometric pressure sensor	Measures the atmospheric pressure.
3.	Temperature and humidity sensors	Measure ambient temperature and humidity levels.
4.	Light dependent resistor	Changes based on the amount of light it is exposed to.
5.	Carbon Dioxide sensor	Detects the presence carbon dioxide.
6.	Lcd display	Display the intended text and information.
7.	Piezo buzzer	Produces sound or alarm.
8.	Led	Emit light

NOVELTY AND UNIQUENESS

The novelty of the weather monitoring system for agriculture lies in its seamless integration of multiple sensors, making it user-friendly and highly effective for farmers. This system combines an array of sensors into a single platform powered by the ESP32 microcontroller. This comprehensive approach allows farmers to monitor various environmental factors simultaneously, enhancing their ability to make informed decisions about crop management. The product stands out when compared to other agricultural weather stations available on the market. Many existing solutions are either prohibitively expensive or lack the same array of sensors that this system offers. While some systems may include basic temperature and humidity sensors, they often do not provide the complete suite of environmental data needed for precision agriculture, such as carbon dioxide levels or light intensity. Additionally, this advanced monitoring system simplifies the user experience with features like real-time alerts and remote access via the Blynk app, allowing farmers to stay connected with their operations from anywhere. The affordability of this product, combined with its extensive sensor capabilities, empowers farmers to optimize their operations while promoting sustainable agricultural practices. By providing critical insights at a competitive price point, this system not only enhances productivity but also supports environmentally responsible farming methods.

BENEFIT TO MANKIND

The weather monitoring system for agriculture provides significant benefits that enhance food security and sustainability for mankind. By integrating multiple sensors—including temperature, humidity, atmospheric pressure, light intensity, and carbon dioxide levels— this system delivers accurate and timely weather data that empowers farmers to make informed decisions regarding their agricultural practices.One of the primary benefits of this system is its ability to minimize crop losses due to adverse weather conditions. With real-time alerts for temperature extremes and comprehensive environmental monitoring, farmers can proactively adjust irrigation schedules and protect their crops from heat stress of frost. This proactive approach is crucial in an era of increasing climate variability. Additionally, the system promotes efficient resource use by enabling precision agriculture. Farmers can optimize water usage based on real-time soil moisture data and atmospheric conditions, reducing waste and conserving vital water resources. The integration of sensors also helps in managing fertilizer and pesticide applications more effectively, minimizing chemical runoff and promoting environmentally sustainable practices. Furthermore, by providing insights into pest and disease conditions through environmental monitoring, the system helps farmers anticipate outbreaks and take preventive measures, leading to healthier crops and livestock. Overall, this advanced weather monitoring system not only increases agricultural productivity but also supports rural economies by enhancing farmers' resilience against climate challenges, ultimately contributing to global food security and environmental sustainability.

COMMERCIALIZATION POTENTIAL

The commercialization potential of the advanced weather monitoring system for agriculture is substantial, driven by the increasing global demand for food and the need for sustainable agricultural practices. As farmers seek innovative solutions to enhance crop yields and manage resources efficiently, this system provides a timely response to those needs with its unique combination of affordability, comprehensive sensor integration, and user-friendly features. This distinctiveness allows it to stand out in a crowded market, appealing to a diverse range of farmers from smallholders to larger agricultural enterprises. Furthermore, partnerships with agricultural cooperatives, universities, and research institutions can facilitate pilot programs and demonstrations that showcase the system's capabilities, accelerating adoption among users. The system also has potential applications in related sectors such as horticulture and urban gardening initiatives, broadening its market reach even further. With a growing emphasis on sustainability in

agriculture, this product aligns perfectly with global initiatives aimed at reducing resource waste and promoting eco-friendly practices. This alignment not only enhances its appeal but can also attract both public and private investment, positioning it as a key tool in achieving sustainable farming goals and significantly boosting its commercialization prospects.

CONCLUSION

The weather monitoring system for agriculture offers an effective, innovative solution to address the challenges of modern farming. By integrating multiple advanced sensors and IoT technology, the system provides real-time data on critical environmental parameters, empowering farmers to optimize crop management. Its features, such as immediate alerts for temperature extremes, remote access via the Blynk app, and a user-friendly interface, ensure operational efficiency and timely decision-making. The system's affordability and comprehensive capabilities make it accessible to small- scale and large-scale farmers alike, promoting precision agriculture and sustainable practices. By enhancing resource efficiency, reducing crop losses, and supporting proactive responses to climate variability, this technology significantly contributes to global food security and environmental sustainability. The strong commercialization potential further positions the product as a vital tool in advancing the agricultural sector, benefiting both farmers and society at large.

Voice Recognition Application: Voice Controlled Home Automated (Vocha)

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ABSTRACT

The Internet of Things (IoT) is changing how we interact with our surroundings by allowing devices to talk to each other and work on their own. Our project, called "Voice Recognition Application: Voice Controlled Home automated (VO.C.H.A.)", uses IoT to create an easy-to-use home automation system controlled by voice commands. With VO.C.H.A, users can control various parts of their home just by speaking. This includes turning lights on and off, adjusting the thermostat, managing security systems, and operating appliances. The system uses advanced voice recognition technology to understand commands accurately, making it reliable and quick to respond. VO.C.H.A connects different smart devices through a central platform, allowing them to communicate and be controlled in real-time. This project aims to show how voice-controlled automation can make life easier, especially for people with mobility issues or disabilities. We discuss the hardware and software components, how the network is set up, and the security measures in place to give a complete picture of how the system works and its benefits. In summary, VO.C.H.A is a big step forward in home automation technology, demonstrating how IoT and voice recognition can make homes smarter, more efficient, and more user-friendly.

KEYWORDS: ESP32, DC MOTOR, SERVO MOTOR, DHT11, LCD, MICROPHONE MODULE

PRODUCT DESCRIPTION

VO.C.H.A. is a cutting-edge voice-controlled home automation system designed to enhance convenience and accessibility in everyday life. Utilizing advanced voice recognition technology, it accurately interprets user commands, ensuring efficient and reliable performance. The inclusive design makes it especially beneficial for individuals with disabilities, allowing them to control various home devices using simple voice commands. Real-time IoT integration enables seamless communication between smart devices, providing a cohesive and efficient home automation experience. VO.C.H.A. offers versatile functionality, allowing users to manage lighting, temperature, security, and household appliances. Additionally, the system continuously learns and adapts to users' preferences, delivering a personalized and optimized home environment.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

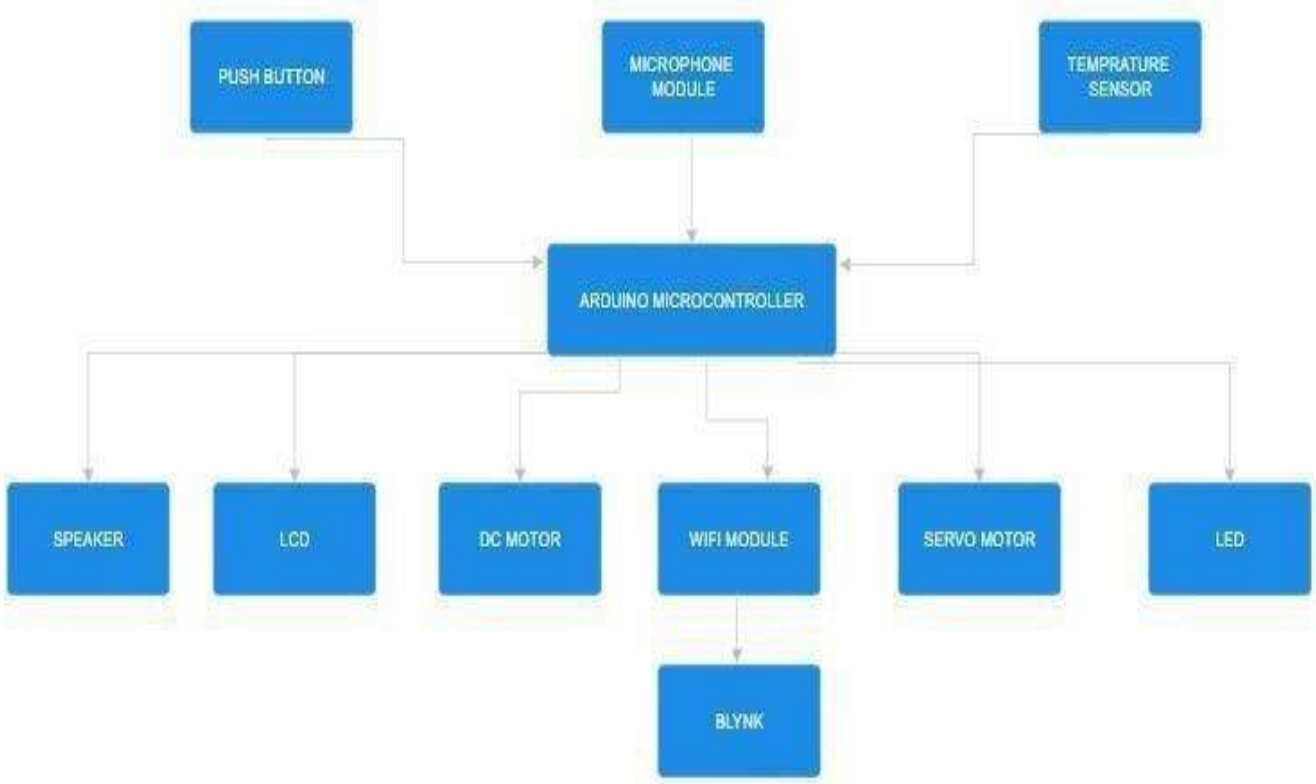


Figure 1: Block Diagram of Voice Controlled Home Automated (VOCHA)

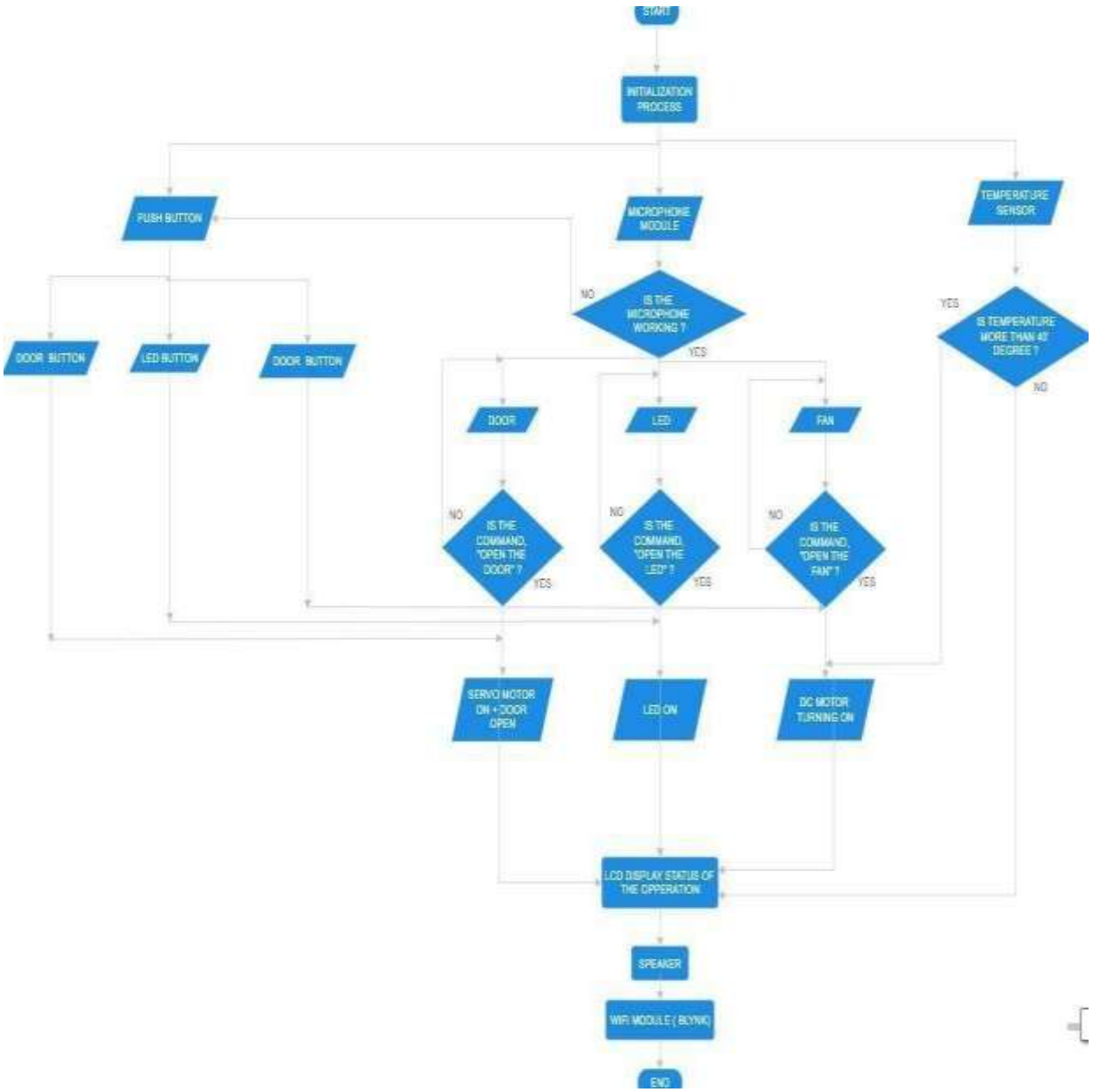


Figure 2: Flowchart of Voice Controlled Home Automated

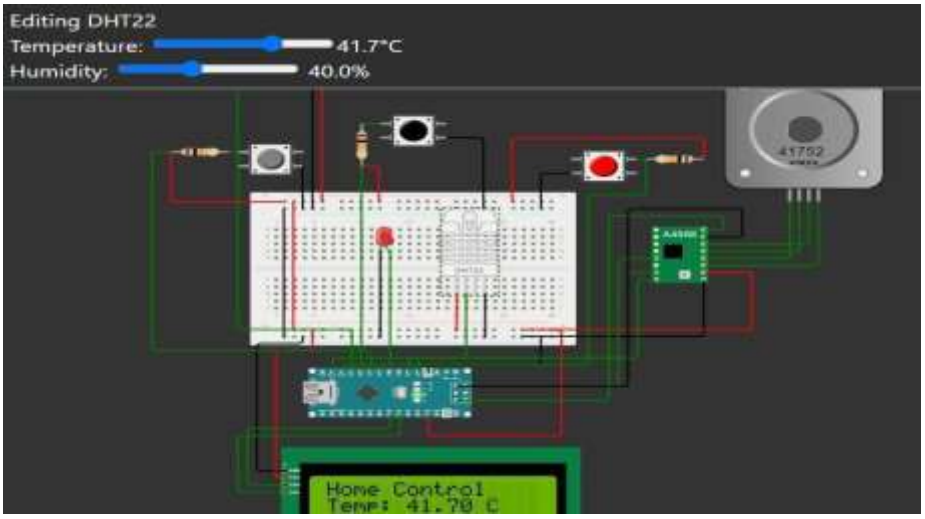


Figure 3: Simulation Result of Voice Controlled Home Automated with temprature.

NOVELTY AND UNIQUENESS

The Voice Controlled Home Automated (VO.C.H.A.) system stands out in the market due to its novel and unique features. It utilizes advanced voice recognition technology to accurately interpret user commands, ensuring reliable and efficient operation. The inclusive design makes it exceptionally beneficial for individuals with disabilities, enhancing their independence and quality of life. Real-time IoT integration allows seamless communication between devices, providing a streamlined home automation experience. VO.C.H.A. offers versatile functionality, enabling control over lighting, temperature, security, and household appliances. Additionally, the system continuously learns and adapts to users' preferences, delivering a personalized and optimized home environment.

BENEFIT TO MANKIND

Voice-controlled home automation offers numerous benefits to mankind by making everyday tasks more convenient and accessible. This technology, powered by the Internet of Things (IoT), connects various devices in a home and allows users to control them using voice commands. One of the most significant advantages is its ability to assist individuals with disabilities or mobility challenges. By using simple voice commands, they can perform tasks that might otherwise be difficult or impossible, enhancing their independence and improving their quality of life. For instance, turning lights on and off, adjusting the thermostat, and managing security systems can be effortlessly done by just speaking. Additionally, voice-controlled home automation can increase overall convenience for all users, making home management more efficient and user-friendly. With projects like the Voice Controlled Home Automated (VO.C.H.A.), integrating voice recognition technology with smart home devices, real-time communication between devices and a centralized control platform is achieved. This leads to a seamless and intuitive home automation experience, allowing for easy and highly responsive control of lighting, temperature, security, and appliances. In summary, the benefits of voice-controlled home automation extend to improving accessibility, enhancing convenience, and providing a more efficient way to manage home environments, ultimately contributing to a better quality of life for many people.

COMMERCIALIZATION POTENTIAL

Voice-controlled home automation, with its rising popularity, holds significant commercial potential across various markets. The technology’s broad appeal spans from individuals seeking convenience to those with specific needs like mobility issues. This creates a diverse customer base that companies can target, enhancing market viability. One key advantage is the growing smart home market, which is projected to expand rapidly in the coming years. By integrating voice recognition technology with IoT, products like the Voice Controlled Home Automated (VO.C.H.A.) system offer unique selling points that differentiate them from traditional home automation solutions. These systems can be marketed not only to tech-savvy consumers but also to elderly and disabled individuals, emphasizing the ease of use and enhanced quality of life they provide. Moreover, partnerships with real estate developers, builders, and healthcare providers can open new avenues for integrating these technologies into new constructions and assisted living facilities. This approach broadens the reach and application of voice-controlled home automation, making it a standard feature in modern living spaces. The commercial potential also extends to the development of complementary products and services, such as subscription-based support, software updates, and additional smart devices, creating continuous revenue streams and fostering long-term customer loyalty.

CONCLUSION

Voice-Controlled Home Automation (VO.C.H.A) systems represent a cuttingedge technology that allows users to control various household devices using voice commands. These systems are designed to enhance convenience, efficiency, and accessibility in everyday life. VO.C.H.A systems offer significant advantages in modern living. They simplify tasks by enabling users to control lights, thermostats, entertainment systems, and other devices hands-free. This feature is particularly beneficial for people

with disabilities or those who prefer a more effortless way to interact with technology. Key components of VO.C.H.A systems include a voice recognition module, a central processing unit (CPU) like Arduino and wireless connectivity technologies such as Bluetooth or Wi-Fi. These components work together to interpret voice commands, process them into actionable tasks, and communicate with connected devices throughout the home.

Recent advancements integrate VO.C.H.A systems with artificial intelligence (AI). AI algorithms enhance these systems by learning user preferences and behaviour patterns, thereby optimizing device control and improving overall user experience. This integration enables predictive automation based on user habits, further enhancing efficiency.

Looking forward, VO.C.H.A systems are poised for further innovation. Advances in AI and machine learning promise to improve voice recognition accuracy and expand system capabilities. Integration with smart home ecosystems and Internet of Things (IoT) devices will create more interconnected and automated living environments.

In summary, VO.C.H.A systems revolutionize home automation by enabling intuitive voice control of everyday devices. With their ability to streamline tasks and enhance accessibility, these systems pave the way for smarter and more responsive homes. As technology continues to evolve, VO.C.H.A systems areset to play a pivotal role in shaping the future of modern living.

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People Counting System With Real-Time Currency Management For Amusement Park

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ABSTRACT

The creation of a cutting-edge currency management and people counting system specifically for amusement parks is described in this proposal. The system accurately monitors visitors and calculates revenue by using an Arduino UNO microcontroller in combination with a variety of sensors and parts. An ultrasonic sensor, a PIR sensor, an LCD 16x2 display, IR Sensor, two push buttons, two LEDs (red and green), and a piezo buzzer are some of the essential parts. The device turns on the red LED to indicate detection when a visitor walks past the PIR sensor [5]. The visitor's height is then measured by the ultrasonic sensor to establish if they are considered an adult or a child. Subsequently, the system updates the figures on the LCD and increases the associated count. This system of counting and classifying visitors in real time guarantees accurate visitor tracking [1] – [2]. The park management can determine the total revenue at the conclusion of the operating day by multiplying the number of children and adults by the cost of their individual tickets (20 units for children and 30 units for adults) [3] – [4]. This can be done by pressing a specified push button. The revenue calculation is shown on the LCD, giving quick access to financial information and will be stored in the Datasheet. To get the device ready for use the following day, another push button makes it easier to reset the counts. By giving precise visitor counts and instant revenue estimates, this automated solution not only improves operational efficiency but also streamlines the ticketing process. Amusement parks may drastically enhance their management procedures, save down on manual labor, and guarantee a flawless experience for both employees and guests by putting this system into place.

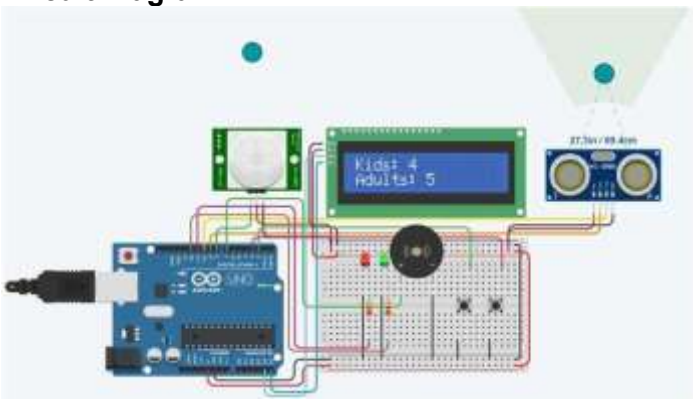
KEYWORDS: Currency management, people counting system, real-time classification, ultrasonic sensor, visitor tracking, IR sensor

PRODUCT DESCRIPTION

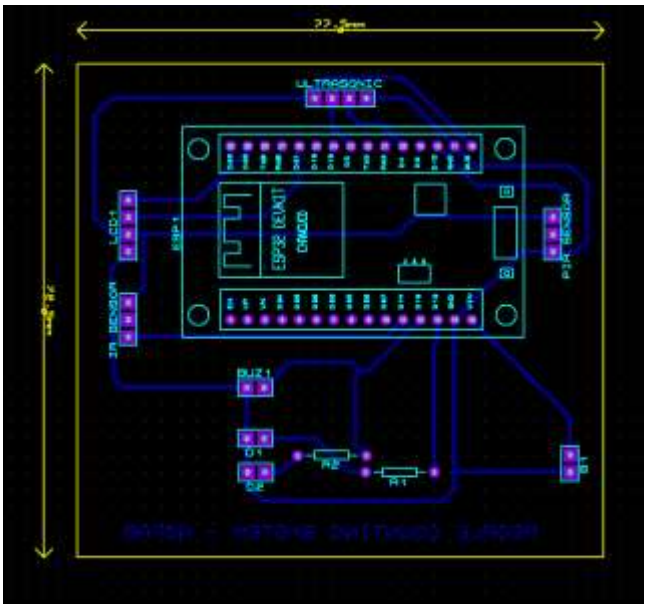
The People Counting System with Real-Time Currency Management for Amusement Park is perfect for managing finances at places like amusement parks or funfairs. Once customers purchase their tickets, they pass through a security gate equipped with a ticket-scanning mechanism. Inside, an infrared sensor tracks the number of individuals entering the park. This data is then collected and multiplied by the entrance fee, which is displayedon an LCD screen. The entrance gates use an ultrasonic sensor that measures a person's height to determine if they are an adult or a youngster. The cost of admission varies depending on the category. The manager only needs to hit a button at the end of the day to get a report that includes the total number of guests and the income for the day. The information will be carefully kept after being delivered to Datasheet. With this data, pressing a second button resets the data and gets the system ready for the following day's activities. The solution simplifies the financial management of these attractions, which guarantees precise visitor counts and revenue tracking without the need for calculating manually. This automation allows managers to focus on providing a great experience for guests, knowing they have precise financial data at their fingertips.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

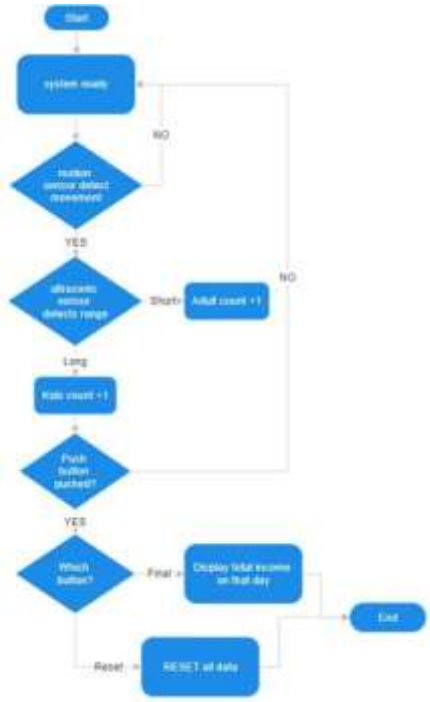
1. **Circuit Diagram**



2. **PCB Design**



3. Flowchart



NOVELTY AND UNIQUENESS

The system's novelty lies in its innovative use of IR, PIR and ultrasonic sensors to accurately classify visitors by height, a feature not commonly found in traditional people-counting solutions. Its integration of real-time revenue tracking and automated financial reporting further sets it apart, streamlining processes that typically require significant manual effort. The seamless incorporation of these features with existing ticketing systems and the ability to reset visitor counts and generate reports with a single button push demonstrate a unique blend of practicality and technological advancement. This combination of precision, automation, and ease of use makes the system a distinctive solution in the realm of visitor management.

BENEFIT TO MANKIND

The system benefits mankind by revolutionizing the management of high-traffic environments like amusement parks, making operations more efficient, accurate, and transparent. By automating visitor counting and revenue tracking, it reduces human error, minimizes manual labor, and saves time, allowing staff to focus on enhancing guest experiences. Its ability to provide real-time data and insights aids better decision-making, improving operational planning and resource allocation. Additionally, its scalability and potential for integration with advanced analytics empower businesses to understand visitor behavior, optimize services, and enhance overall satisfaction, setting a foundation for smarter, more efficient public spaces and events.

COMMERCIALIZATION POTENTIAL

The system has significant commercialization potential, particularly for amusement parks and other high-traffic venues that require efficient visitor tracking and revenue management. Its scalable design and compatibility with existing ticketing infrastructure make it easy to adopt without substantial upfront costs. The ability to provide real-time operational insights and reduce labor costs offers a strong value proposition for businesses, while its customization potential allows adaptation to various industries beyond amusement parks, such as museums, zoos, or large-scale events. By addressing key operational challenges with accuracy and efficiency, the system positions itself as a highly marketable and versatile product in the growing field of smart venue management solutions.

CONCLUSION

The People Counting and Real-Time Currency Management System for amusement parks represents a major advancement in visitor tracking and financial management. Utilizing IR, PIR and ultrasonic sensors, it accurately classifies visitors as kids or adults based on height, ensuring precise counting and categorization. The system integrates an LCD for real-time data display and automates revenue calculations, simplifying financial reporting and offering instant insights into park operations. Features like daily revenue report generation and visitor count reset at the push of a button enhance efficiency, reduce manual labor, and minimize errors. Its seamless compatibility with existing ticketing systems ensures smooth adoption with minimal disruption. This scalable and customizable system offers potential for enhancements such as improved sensor accuracy, advanced analytics, and integration with broader park management tools, providing deeper insights into visitor behavior and operational performance. By addressing the limitations of traditional methods, it sets a new standard for accuracy, efficiency, and financial transparency in amusement park operations.

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Keyswitch Alarm Systems For Real-Time Security Monitoring

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ABSTRACT

This project focuses on designing and implementing an advanced home security system using an ESP32 microcontroller integrated with passive infrared (PIR) motion sensors, key switches, a pushbutton, and a keypad. Traditional CCTV systems often suffer from continuous bandwidth consumption and lack of real-time notifications for suspicious activities. To address these limitations, the proposed system employs PIR sensors for motion detection, enabling efficient monitoring of residential properties. The key switch provides a manual arming and disarming mechanism, enhancing user control and minimizing false alarms triggered by homeowner movements [1]. The keypad introduces an additional layer of security by allowing users to disarm the alarm system through a password, ensuring that unauthorized access triggers an audible alert. Additionally, the pushbutton detects door/window status changes, ensuring comprehensive security coverage [3]. Outputs include an LCD for system status display, a buzzer for audible alerts, and LEDs for visual indication of security states. This solution aims to optimize energy consumption, provide timely alerts for potential threats, and offer a user-friendly interface for enhanced residential security.

KEYWORDS: *ESP32, home security system, passive infrared sensor, PIR motion sensor, key switch, pushbutton, keypad, LCD display, buzzer, LED indicators, real-time notifications, energy efficiency*

PRODUCT DESCRIPTION

The Keyswitch Alarm Systems For Real-Time Security Monitoring is a reliable and energy-efficient solution designed to enhance residential security. Equipped with PIR motion sensors, it provides accurate motion detection while minimizing false alarms. A key switch allows manual arming and disarming, and a keypad adds an extra layer of security by enabling password-based alarm disarming, with incorrect entries triggering an audible alert. The pushbutton monitors door and window statuses, ensuring comprehensive coverage. The system features a buzzer for alerts, LED indicators for system states, and an LCD for real-time updates, all designed to provide an intuitive and user-friendly experience. This advanced system optimizes energy consumption while delivering real-time protection and convenience for your home [2].

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

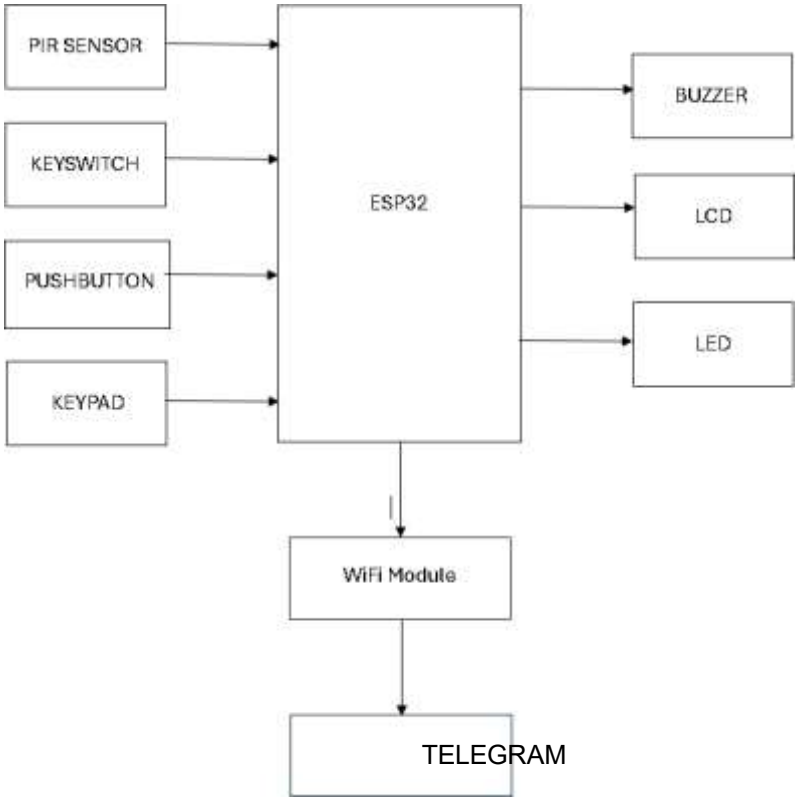


Figure 1 : Block Diagram of the Keyswitch Alarm Systems For Real-Time Security Monitoring

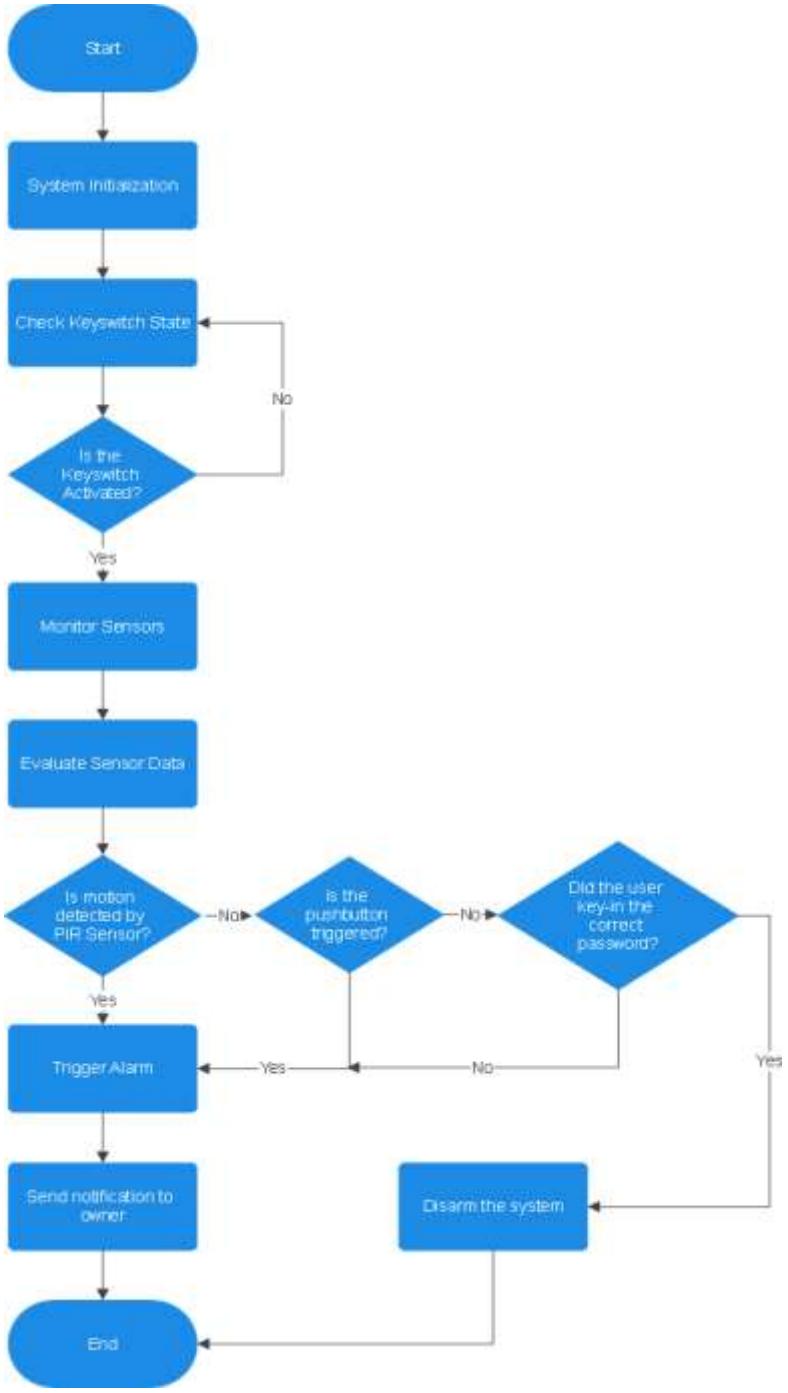


Figure 2 : Flowchart of the Keyswitch Alarm Systems For Real-Time Security Monitoring

NOVELTY AND UNIQUENESS

The novelty of this project lies in its energy-efficient, integrated design that addresses limitations of traditional CCTV systems, such as continuous bandwidth consumption and lack of real-time alerts. By combining PIR motion sensors, a key switch for manual control, and a keypad for password-based disarming, it provides dual-layer protection against unauthorized access while minimizing false alarms. The use of pushbutton for door and window monitoring ensures comprehensive security, while outputs like a buzzer, LED, and an LCD offer immediate feedback on system status. Built on the cost-effective ESP32 microcontroller, this standalone system delivers reliable, scalable, and user-friendly residential security without relying on constant internet connectivity.

BENEFIT TO MANKIND

The Keyswitch Alarm Systems For Real-Time Security Monitoring benefits mankind by providing a cost-effective, reliable, and energy-efficient solution for enhancing residential security. By utilizing advanced motion detection, door/window monitoring, and dual-layer protection with a keypad and key switch, it helps prevent unauthorized access and reduces false alarms, ensuring peace of mind for homeowners. Its user-friendly design, featuring real-time notifications through audible, visual, and display outputs, enables quick responses to potential threats [4]. Additionally, the system's standalone functionality eliminates the need for continuous internet connectivity, making it accessible and practical for a wide range of users, including those in areas with limited bandwidth [5]. This innovative approach contributes to safer living environments and fosters a greater sense of security in communities.

COMMERCIALIZATION POTENTIAL

The commercialization potential of this project is significant, as it addresses the growing demand for affordable, reliable, and energy-efficient home security systems. Its standalone design, powered by the versatile ESP32 microcontroller, makes it cost-effective and accessible to a wide range of consumers, including those in regions with limited internet connectivity. The integration of advanced features such as motion detection, password-based disarming, and door/window monitoring ensures comprehensive security, making it highly competitive in the smart home market. Additionally, its user-friendly interface, low energy consumption, and adaptability for residential or small office applications further enhance its appeal to both individual homeowners and small businesses. With increasing concerns over home security, this solution offers a scalable and practical product that can capture a significant share of the
smart security system market.

CONCLUSION

In conclusion, this project demonstrates a practical and innovative approach to enhancing home security by leveraging the capabilities of the ESP32 microcontroller. By integrating motion detection, door/window monitoring, dual-layer protection mechanisms, and real-time notifications through a buzzer, LEDs, and an LCD, it offers a comprehensive, energy-efficient, and user-friendly security solution. The system addresses key limitations of traditional security systems, such as continuous bandwidth consumption and false alarms, while remaining cost-effective and accessible. With its adaptability and standalone functionality, this advanced home security system provides a scalable and reliable solution that promotes safer living environments and meets the growing demand for modern residential security.

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Real -Time Microsleep Detection System

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ABSTRACT

The Real-Time Microsleep Detection System is a cutting-edge device developed to improve driver safety by detecting signs of fatigue through physiological and behavioural monitoring. It features a MAX30100 pulse oximeter sensor and an OLED display to track the driver's heart rate and oxygen saturation (SpO2) levels, ensuring they are suitable for safe driving conditions. An infrared (IR) sensor is also incorporated to monitor eye motion, identifying extended eye closures that may indicate a microsleep episode. If the driver's eyes remain closed for five seconds, the system triggers both a buzzer and a vibration motor to promptly alert them, reducing the risk of accidents. Powered by the ESP8266 microcontroller, the system efficiently manages sensor data, alert functions, and real-time processing. Furthermore, it connects to the Blynk app, allowing notifications to be sent directly to the driver's family or emergency contacts. This system provides a proactive and reliable approach to enhancing road safety and addressing the risks associated with driver fatigue.

KEYWORDS:
Fatigue monitoring, Reducing the risk of accidents, Enhancing road safety

PRODUCT DESCRIPTION

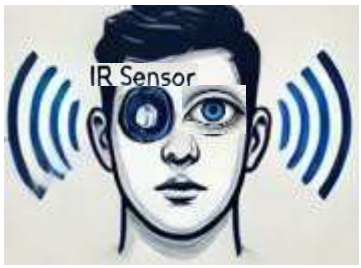
The Real-Time Microsleep Detection System is an innovative wearable device designed to enhance driver safety by monitoring key physiological and behavioral indicators of fatigue. The system incorporates a MAX30100 pulse oximeter sensor to continuously track the driver's heart rate and oxygen saturation (SpO2) levels, displaying real-time data on a compact OLED screen designed like a digital watch. Additionally, an infrared (IR) sensor is embedded in the spectacles to monitor the driver's eye motion, detecting when their eyes remain closed for an extended period. If signs of microsleep are detected, the system triggers both a buzzer and a vibration motor to alert the driver, reducing the risk of accidents. The device is powered by an ESP8266 microcontroller, enabling real-time processing and efficient management of data. Through integration with the Blynk app, the system also sends alerts to the driver's family or emergency contacts, ensuring timely intervention when necessary.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods on how the project works :



1. **The driver is required to wear the watch to monitor their oxygen levels and heart rate using oximeter sensor max30100, which will be displayed on the OLED screen. If the driver's heart rate and oxygen levels are within normal ranges, they can begin driving.**



2. **Next, the driver must wear the spectacles, which have an IR sensor mounted on the right side to monitor drowsiness. If the driver's eyes remain closed for 5-7 seconds, the buzzer and vibrator will activate to alert the driver, helping to prevent microsleep.**



3. **The system is also connected to the Blynk app on the relatives' phones, allowing them to monitor the driver's oxygen levels and heart rate. If there are any abnormalities in these readings, the relatives can immediately contact the driver and suggest taking a rest.**

NOVELTY AND UNIQUENESS

This microsleep detection system stands out due to its comprehensive approach to combating driver fatigue. Unlike traditional driver alert systems, which may only monitor external factors, this device uniquely combines physiological data (heart rate and oxygen levels) with behavioral data (eye motion) to detect signs of fatigue. The use of both a wearable watch and spectacles equipped with sensors makes this system highly user-centric, providing an unobtrusive yet effective solution for fatigue monitoring. The integration of a Blynk app adds an innovative layer by enabling remote monitoring, ensuring that the driver's family or emergency contacts are notified in real-time. This dual-layered alert system ensures that both the driver and their loved ones can take immediate action, significantly enhancing safety on the road.

BENEFIT TO MANKIND

The Real-Time Microsleep Detection System has the potential to save lives by addressing one of the leading causes of road accident driver fatigue. By proactively detecting microsleep episodes and alerting the driver before a potential accident occurs, the system enhances road safety, not only for the driver but also for other road users. The integration of remote notifications provides an added layer of safety, keeping family members or emergency contacts informed in case the driver fails to react to the alerts. This innovative device supports the broader goal of reducing traffic accidents caused by fatigue, ultimately contributing to safer driving practices and a decrease in road-related fatalities, benefiting society as a whole.

COMMERCIALIZATION POTENTIAL

The Real-Time Microsleep Detection System holds significant commercialization potential in a variety of industries, particularly in transportation, automotive safety, and wearable technology. As fatigue-related accidents continue to be a major concern worldwide, there is a growing demand for innovative solutions that can reduce these risks. This system can be marketed to commercial vehicle operators, fleet management companies, and even individual drivers who prioritize safety. With its wearable and non-invasive design, it can appeal to a broad consumer base, from long-distance truckers to everyday commuters. Moreover, the integration of IoT technology through the Blynk app enables seamless connectivity, providing opportunities for future updates and remote monitoring services, opening doors for subscription-based business models and partnerships with insurance companies. The adaptability of this technology also allows for potential integration into existing vehicles or wearable products, positioning it as a valuable addition to the global market of safety devices.

CONCLUSION

The Real-Time Microsleep Detection System represents a forward-thinking approach to addressing the critical issue of driver fatigue. By combining real-time physiological and behavioral monitoring, this innovative device offers a practical and proactive solution to improve road safety. Its dual-layer alert system ensures that drivers are alerted when fatigue sets in, while the remote notification feature guarantees that emergency contacts are kept informed. With its commercialization potential and positive impact on driver safety, this system can revolutionize the way we think about fatigue monitoring and could play a key role in reducing traffic accidents and saving lives. Through its unique combination of wearable technology and real-time alerts, it brings us one step closer to making our roads safer for everyone.

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Home Assistant Control for Energy-Saving Automation

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ABSTRACT

This project focuses on designing and implementing a LED and fan controller using an ESP32 microcontroller, integrating Light Dependent Resistor (LDR), pushbuttons, and the Blynk IoT platform. The primary objective is to automate and optimize energy usage by automatically turning off the LED when sufficient sunlight is detected, while still allowing manual control through pushbuttons or the Blynk app. A secondary aim is to provide control of a fan, enabling users to operate it either manually or remotely via the app. The LDR ensures the system adapts to environmental lighting, turning off the LED in the morning and resetting functionality at night. The integration with Blynk enhances the system's usability, providing real-time monitoring and remote operation through a smartphone. This solution addresses common challenges such as forgetting to turn off lights and managing home appliances efficiently, promoting energy conservation. The system is tested under various conditions, demonstrating its reliability and flexibility. The project serves as a practical, cost-effective, and scalable solution for smart home automation, blending automation, manual control, and IoT technology.

KEYWORDS: Energy Efficiency, Blynk, Automation**.**

PRODUCT DESCRIPTION

The Home Assistant Control for Energy-Saving Automation, powered by the ESP32 microcontroller and Blynk IoT platform, is an advanced solution designed to enhance energy efficiency and convenience in residential spaces. This system integrates key components such as Light Dependent Resistors (LDRs), LED lighting, and fans, all of which can be controlled manually via pushbuttons or remotely through the Blynk app. The system is equipped with an LDR-based automation feature that dynamically responds to environmental lighting conditions, ensuring that lights are automatically turned off during the day to conserve energy. Simultaneously, it allows for manual override through pushbuttons or app controls, granting users complete flexibility to adjust settings as needed. Built with scalability in mind, the Smart Home Automation System can be expanded to include additional appliances, offering a holistic approach to smart living. The integration of the ESP32 microcontroller ensures seamless wireless connectivity, while the Blynk platform enables real-time monitoring and control from anywhere. This innovative product delivers a blend of automation and user-centric design, making it an ideal choice for eco-conscious households seeking to modernize their living spaces with intelligent technology. Applications of similar IoT-based automation systems have demonstrated improved energy efficiency and user satisfaction.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

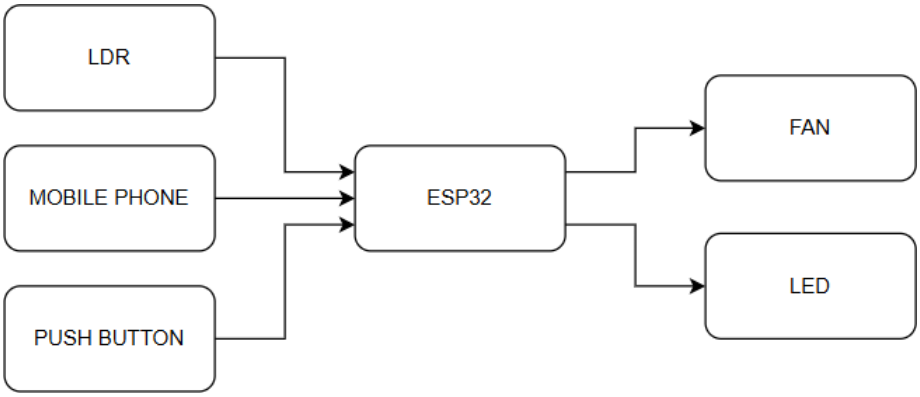


Figure 1: Block diagram of Home Assistant Control for Energy-Saving Automation

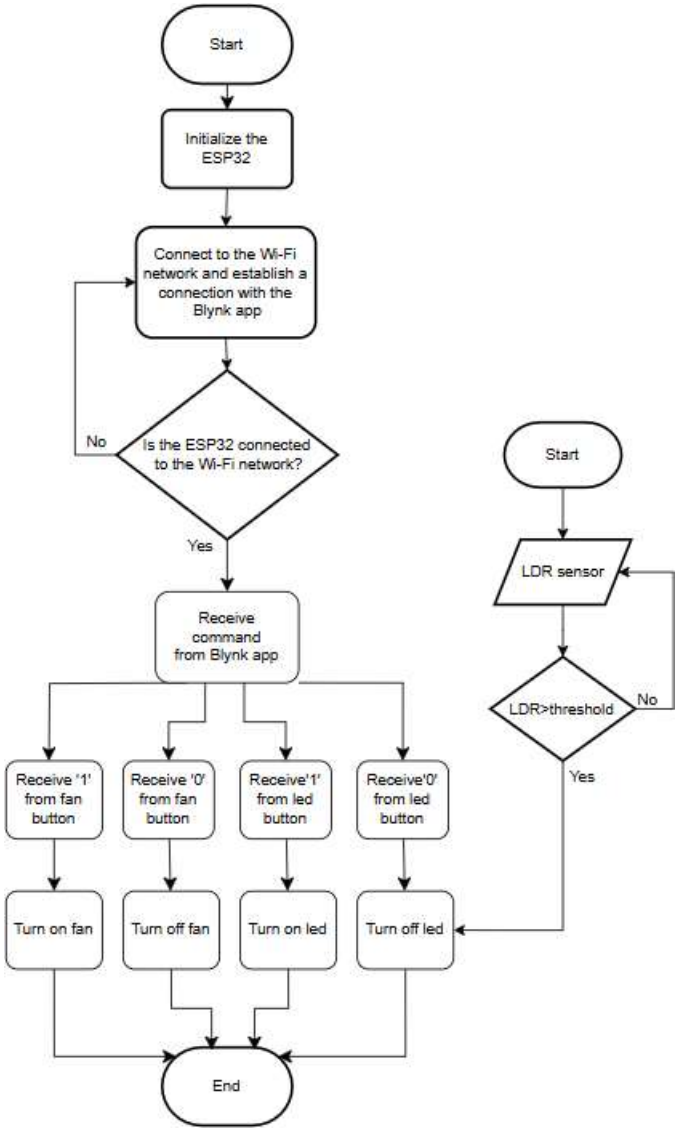


Figure 2: Flowchart of Home Assistant Control for Energy-Saving Automation

NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Home Assistant Control for Energy-Saving Automation with ESP32 and Blynk lie in its combination of automatic and manual control features. Unlike typical systems, it uses an LDR for automatic daylight detection to optimize energy usage while allowing users to override settings with pushbuttons or the Blynk app. What sets it apart is its ability to reset and adapt the LDR's functionality dynamically, ensuring flexibility for both automation and manual control. The system is scalable, making it easy to add more devices or sensors in the future. Using the ESP32 ensures affordability and reliable connectivity, while Blynk integration provides real-time remote monitoring and control. This unique blend of features makes the system a practical and innovative smart home solution.

BENEFIT TO MANKIND

The Home Assistant Control for Energy-Saving Automation with ESP32 and Blynk offers significant benefits to humanity by enhancing energy efficiency, convenience, and security. By using automatic daylight detection through the LDR, it reduces unnecessary energy consumption, contributing to environmental sustainability and lowering electricity costs. For users, it provides the flexibility of remote control via the Blynk app, enabling convenient management of home appliances from anywhere, fostering a more connected and efficient lifestyle. The system supports manual override, ensuring accessibility for all, including elderly or less tech-savvy individuals. Its scalable design allows integration with additional devices, paving the way for future smart home innovations. This system contributes to sustainable living while making technology accessible and practical for a wide range of users.

COMMERCIALIZATION POTENTIAL

The Home Assistant Control for Energy-Saving Automation with ESP32 and Blynk holds significant commercialization potential across various industries. Its ability to automate lighting and ventilation, coupled with remote control via a user-friendly app, makes it highly desirable for residential and commercial smart home markets. Key applications include energy-efficient solutions for homeowners, offering reduced electricity costs and environmental benefits. The system also appeals to property developers and builders integrating smart features into new constructions to meet growing consumer demand for smart homes. In the hospitality industry, the system can optimize guest comfort and energy use in hotels and resorts. The scalability of the system allows for customization, making it suitable for offices, educational institutions, and retail spaces requiring tailored automation solutions. With the rising adoption of IoT and the push toward sustainability, this system is well-positioned for success in the expanding smart home and energy efficiency market. Its affordability and compatibility with existing infrastructure further enhance its market appeal.

CONCLUSION

The Home Assistant Control for Energy-Saving Automation with ESP32 and Blynk demonstrates significant advancements in home automation by seamlessly integrating lighting and ventilation control with remote access capabilities. This system offers an efficient and user-friendly solution for energy conservation and convenience in modern living spaces. Its versatility highlights the potential for widespread application across residential, commercial, and hospitality sectors, addressing diverse needs with customizable features. The system's integration into the IoT ecosystem positions it as a pivotal component in the advancement of smart technologies, promoting sustainability and enhanced quality of life. Future recommendations include optimizing the system for larger-scale installations, incorporating AI-driven analytics for predictive automation, and expanding compatibility with emerging IoT devices. Continued research and development will further enhance functionality, reliability, and affordability, solidifying the system's role in the evolution of smart home technologies.

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Automatic Calibration System on Measuring Tape

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ABSTRACT

Project Automatic Calibration System on Measuring Tape incorporates the function of Ultrasonic Sensor and Temperature Sensor. The components used in this project are Ultrasonic Sensor, DHT11 Temperature Sensor, ESP8266 Microcontroller, LED, Buzzer, Potentiometer, and LCD (Liquid Crystal Display). This project also incorporates the functionality and stability of a Wifi Module in the ESP8266 Microcontroller, to utilize the usage of Internet of Things (IoT) by implementing the connectivity to the cloud function. The Ultrasonic sensor functions as a distance measurement device to measure distance using time-based conversion method. The DHT11 Temperature sensor functions as a surrounding temperature sensor that will be a factor in determining the final measured value of a certain distance by including the speed of sound formula in the calculation process done by the ESP8266 Microcontroller. The ESP8266 Microcontroller functions as the central data processor to merge together the programming aspects of the project with the hardware connectivity of each component. The LED and Buzzer functions as outputs to indicate that there is an object detected by the Ultrasonic Sensor. The LCD (Liquid Crystal Display) functions as the display of the final measurement value. This project aims to solve problems that arise from the traditional measuring tape while also adding new technology to the existing past projects that relates in some ways.

KEYWORDS: Ultrasonic Sensor, ESP8266, Microcontroller, Automatic Calibration, Temperature Sensor, IoT

PRODUCT DESCRIPTION

The project Automatic Calibration System on Measuring Tape focuses on improving the functionality and practicality of a measuring tape to measure distance. By using electronics components, the process of taking distance measurements can be done in a way that could help to achieve accurate measurement and solve time-consuming problems. The integration of an IoT system is also an added improvement to this project by implementing a method to save or keep the data value of the distance measurements in the cloud function so that it can be accessed for further references or usage. The main component in this project is the ESP8266 Microcontroller that functions as the central data processing component that can interpret the programming needed for the system. The inputs are Ultrasonic sensor and DHT11 Temperature sensor. Ultrasonic sensor functions as the distance measurement device of this project.The DHT11 Temperature sensor functions as the surrounding temperature sensor to accommodate the final measurement value by including the speed of sound factor into the measurements. The outputs are LCD, LED, Buzzer and IoT cloud function. The LED and Buzzer functions in the same way, in which they both turned on when an object is detected. Then, the LCD will display the distance measurement value. The IoT functions as a cloud data storage.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

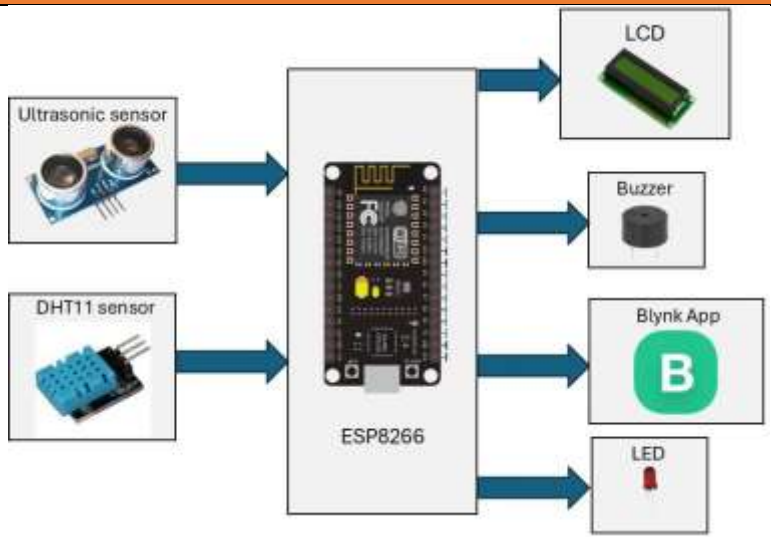


Figure 1: Block Diagram of Automatic Calibration System on Measuring Tape

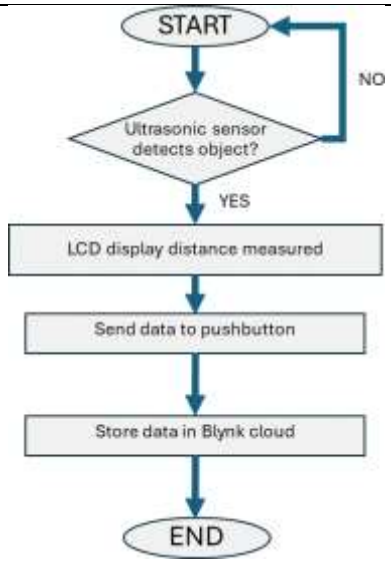


Figure 2: Flow Chart of Automatic Calibration System on Measuring Tape

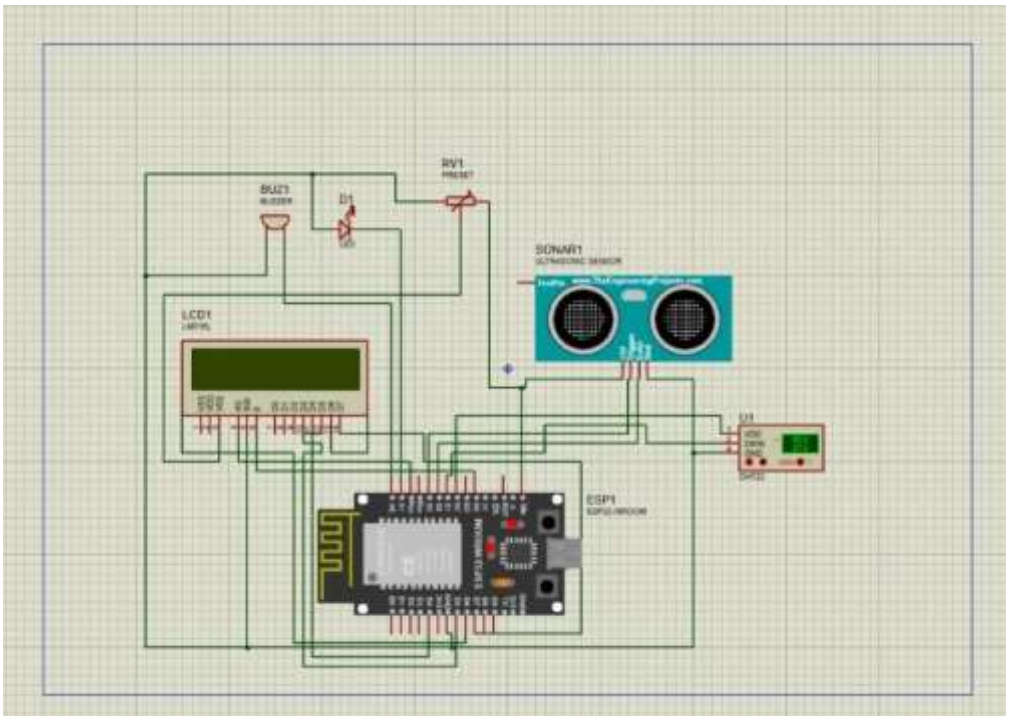


Figure 3: Schematic Diagram of Automatic Calibration System on Measuring Tape

NOVELTY AND UNIQUENESS

The project "Automatic Calibration to Improve Measuring Tape Methods" introduces a modernized solution to distance measurements methods by using an ultrasonic sensor with the integration of temperature sensor to dynamically consider for variations in the speed of sound, ensuring accurate measurements.Unlike traditional methods that are keen on human errors, this system automates calibration for precise results. Additionally, the integration of cloud storage allows a simplified system to save and access measurements remotely, enhancing efficiency and usability. This combination of calibration, automation, and IoT functionality makes the project unique over conventional measuring tools.

BENEFIT TO MANKIND

This research will greatly benefit humanity by improving the accuracy and efficiency of measuring distance, which is a basic duty in many different fields. Its automated calibration lowers human error and guarantees accurate measurements in engineering, manufacturing, and construction, resulting in safer structures and more precise designs. Including cloud storage makes data administration easier, saves time, and allows for remote collaboration which is especially helpful for large-scale projects. The initiative promotes productivity, and helps different businesses establish more intelligent,sustainable practices by updating a simple tool with stabilized and improved system.

COMMERCIALIZATION POTENTIAL

By improving conventional measurement instruments with more quality in accuracy, automation, and Internet of Things connection, this project offers significant commercialization potential. Its use of temperature and ultrasonic sensors guarantees accurate measurements in any setting, making it attractive to sectors like interior designs, manufacturing and construction. Data tracking and remote access are made possible by cloud-based storage. The project provides a creative solution for contemporary measurement demands, with applications for both professionals and other people in general.

CONCLUSION

In conclusion, this project has been developed successfully until the end, although there are some drawbacks along the way of building its structure to function as intended. The incorporation process of each component has been thoroughly constructed, beginning with the Ultrasonic sensor until the end output which is the LCD. The understanding process of the Ultrasonic sensor took some time because of the time-based conversion method it uses. The temperature sensor also had some difficulties to be incorporated in the circuit, but it does not affect the building process.The LED and Buzzer worked as intended as an indicator.

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Modern Home Automation

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ABSTRACT

Modern home automation systems are designed to enhance convenience, energy efficiency, and the quality of life in residential spaces. This project presents an IoT-based smart home automation system developed using an ESP32 microcontroller and the Blynk IoT application. The system enables users to control multiple household appliances, including three LED strip lights designated for general lighting in the kitchen, room, and living room, and a specialized RGB LED strip for creating customizable gaming ambiance. A DHT11 sensor is integrated to monitor temperature and humidity levels, providing real-time environmental data. Users can leverage this information to activate the fan during hot weather conditions. To ensure seamless operation, the system also incorporates physical switches for manual control, offering an alternative when Wi-Fi connectivity is unavailable. This innovative solution combines flexibility, functionality, and user convenience, catering to modern lifestyles while addressing practical challenges in IoT-based smart home automation.

KEYWORDS: Home automation, ESP32, Blynk IoT, DHT11 sensor, RGB LED strip, home appliances

PRODUCT DESCRIPTION

The Modern Home Automation System is an innovative solution designed to bring convenience, efficiency, and comfort to your home. It uses an ESP32 microcontroller and the Blynk IoT application, allowing users to control house appliances remotely. The system includes three LED strip lights for lighting the kitchen, living room, and bedroom, and an RGB LED strip for creating a vibrant and customizable gaming ambiance.A DHT11 sensor is integrated to monitor temperature and humidity, giving users real-time environmental data. This helps users whether to decide when to turn on the fan, especially during hot weather. To ensure reliability, the system also includes manual switches, enabling users to control appliances incase if the Wi-Fi connectivity is unavailable.Combining smart technology with practical features, this home automation system is easy to use and designed to enhance living experience, making it perfect for modern households.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Methods used in preparing the samples are summarised as follow:

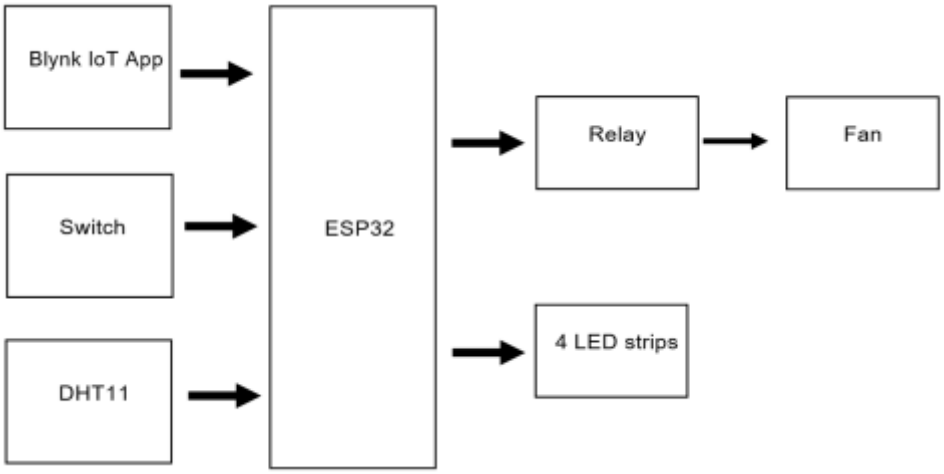


Figure 1: Block Diagram of The Modern Home Automation System



Figure 2: Flowchart of The Modern Home Automation System

NOVELTY AND UNIQUENESS

The Modern Home Automation system introduces a unique combination of smart technology and practical features that set it apart from traditional home automation solutions. Unlike many systems that focus solely on basic appliance control, this project integrates a customizable RGB LED strip designed specifically to enhance the gaming experience, allowing users to create a personalized ambiance. The inclusion of temperature and humidity monitoring by using the DHT11 sensor adds a layer of intelligence by helping users make informed decisions about appliance usage based on environmental conditions, such as activating the fan when the weather is hot. Furthermore, the system ensures continuous operation even without an internet connection by incorporating manual switches for direct control. This feature addresses a common limitation in IoT-based systems, providing a reliable backup when Wi-Fi is unavailable. By combining remote control, real-time monitoring, and manual overrides, this system offers an innovative, flexible, and user-centered solution for modern smart homes.

BENEFIT TO MANKIND

The Modern Home Automation system offers numerous benefits to individuals and society, contributing to improved quality of life, energy efficiency, and environmental sustainability. By automating routine tasks, such as controlling lighting and temperature, the system enhances convenience, allowing users to manage their homes more effectively and efficiently, even from a distance. The ability to adjust lighting, particularly with the customizable RGB LED strip, creates personalized environments, improving the well-being and comfort of users in various settings, including homes, offices, and gaming spaces. The integration of temperature and humidity monitoring promotes a healthier living environment, enabling users to make data-driven decisions, such as turning on the fan during hot weather, which can help prevent heat-related illnesses and improve air quality. Additionally, the system's energy-efficient features can lead to reduced electricity consumption, benefiting both household budgets and the environment. By combining convenience, energy efficiency, and smart technology, this home automation system supports a sustainable, comfortable, and connected lifestyle for the modern world.

COMMERCIALIZATION POTENTIAL

The Modern Home Automation system represents a significant innovation in the field of IoT-based home automation. By integrating remote control capabilities, environmental sensors, and customizable features such as the RGB LED strip for gaming ambiance, this system redefines the possibilities of smart homes. The combination of temperature and humidity monitoring with automated appliance control creates a more intuitive, responsive home environment, offering users enhanced comfort and energy efficiency. From an entrepreneurial perspective, this project demonstrates the potential for creating scalable, cost-effective solutions that cater to the growing demand for smart home products. The system's ability to operate without Wi-Fi through manual switches addresses a key limitation in many IoT- based solutions, making it a more reliable and user-friendly product. This innovation opens opportunities for entrepreneurship in the rapidly expanding smart home market. It also provides a foundation for future developments, such as integrating additional IoT devices or incorporating machine learning to optimize energy usage. With its practical applications and scalability, the system has the potential to influence both consumer markets and industries involved in smart technology, positioning it as a key player in the next generation of home automation solutions.

CONCLUSION

This project demonstrates significant potential by addressing modern security challenges through an innovative and accessible solution. By combining innovative technology with affordability, it offers a smart, keyless entry system suitable for homes, businesses, and hospitality spaces. The design is not only user-friendly but also energy-efficient, promoting sustainable practices. Its flexibility to adapt to new features and evolving needs ensures it remains relevant in the rapidly growing smart home market. Overall, the wireless fingerprint door lock system is a forward-thinking solution that meets modern security demands and offers societal benefits. The scalability and adaptability ensure it can evolve with technological advancements and enhancing its market appeal and long-term viability.

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Biometric Door Lock System

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ABSTRACT

This project is on the design and implementation of a Fingerprint Door Lock System using Arduino and smartphone with a view of improving security and ease of operation in door lock systems. Conventional mechanical using keys of locks are steadily being substituted by the digital types in the modern world IoT. Our system uses the fingerprint scanner through Bluetooth Module to connect to an Arduino microcontroller, which only grants access to the door to the authorized persons. Moreover, access control system is accompanied by a smartphone application that gives users an opportunity to control the system and receive information about its current state. It also shows how the hardware and software parts can be combined to form an effective smart lock system that can be easily used and depended on. It is suitable for residential, commercial and institutional use and the solution provides security and flexibility. The outcomes reveal that IoT technologies can effectively contribute to the creation of access control systems, thus opening a range of opportunities for future IoT advancements in smart home and security solutions.

KEYWORDS: Fingerprint, Bluetooth module, Internet of Things (IoT), Arduino, Microcontroller and Smartphone.

PRODUCT DESCRIPTION

This project is about creating a wireless fingerprint door lock system that brings security and convenience together. At its heart is an Arduino Nano, which acts as the brain of the system. A Bluetooth module (HC-05) connects the system to a smartphone, allowing users to unlock or lock the door with a simple fingerprint scan on their phone. When a valid fingerprint is detected, the Arduino triggers a relay module to activate a 12V solenoid lock, unlocking the door. At the same time, an LED lights up, and a buzzer sounds to let the user know the system is working. This setup eliminates the need for traditional keys and provides a modern, secure way to manage access to the home. This project is designed to be easy to use and aligns with today's trend of smart homes and IoT technologies. It's a step toward making everyday life more secure and connected.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

Figure 1 and 2 shows the flowchart illustrates the working of a fingerprint door lock system and connection with a smartphone and Arduino. It starts by the user powering on his or her phone, and the phone in return tries to connect to the door lock system via Bluetooth. In this case, the phone can recognize the fingerprint of the user in case the connection is successful. If the fingerprint matches the stored data, then the phone sends the data to Bluetooth module connected with Arduino. This part of the process is marked by a loop around the phone detecting the fingerprint and passing the data to the Bluetooth module. At the same time, the system can be entered not only through the voice command but also through the PIN number. The user enters the PIN, and then the system checks it. If the PIN is incorrect, the user is locked and has to enter the correct number again on the keypad. If the person enters the correct PIN, the system then goes to the next level. The Bluetooth module collects the data which activates the relay module present in the door lock system. This is done by the activation of the relay module which leads to the unlatching of the solenoid lock and therefore opening of the door. The flowchart indicates the steps and decision-making processes are well understood and have created a secure and efficient form of identification that also incorporates the use of both biometric and manual use of a PIN.

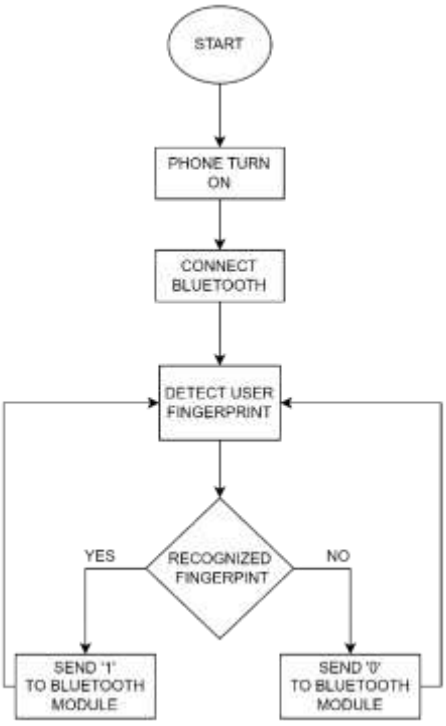


Figure 1: Flow chart of the Biometric Fingerprint Door Lock System of Application

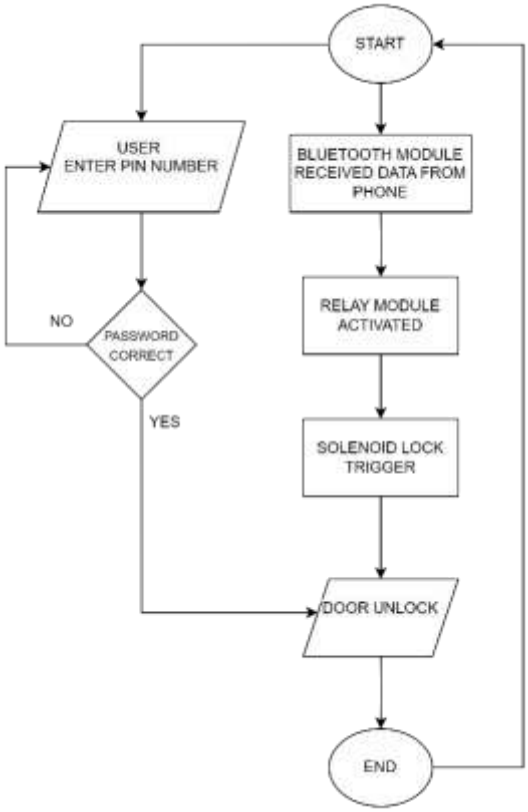


Figure 2: Flow chart of the Biometric Fingerprint Door Lock System of Arduino Nano.

NOVELTY AND UNIQUENESS

This project is about creating a wireless fingerprint door lock system that brings security and convenience together. At its heart is an Arduino Nano, which acts as the brain of the system. A Bluetooth module (HC-05) connects the system to a smartphone, allowing users to unlock or lock the door with a simple fingerprint scan on their phone. When a valid fingerprint is detected, the Arduino triggers a relay module to activate a 12V solenoid lock, unlocking the door. At the same time, an LED lights up, and a buzzer sounds to let the user know the system is working. This setup eliminates the need for traditional keys and provides a modern, secure way to manage access to the home. This project is designed to be easy to use and aligns with today's trend of smart homes and IoT technologies. It's a step toward making everyday life more secure and connected.

BENEFIT TO MANKIND

The biometric door lock system offers several benefits to mankind by enhancing security and convenience in daily life. This system eliminates the vulnerabilities of traditional keys such as being lost or duplicated. The fingerprint authentication ensures that only authorized individuals can get access. This can reduce the rick of unauthorized entry through the door. By replacing physical keys with smartphone's fingerprint authentication, the system simplifies access control to the door. Users no longer need to carry keys or worry about forgetting them, making it particularly beneficial for individuals with disabilities or those who frequently misplace keys.

COMMERCIALIZATION POTENTIAL

The biometric door lock system has strong commercialization potential due to its relevance to modern security and convenience demands. The global smart home market is growing rapidly, largely fueled by increasing adoption of Internet of Things (IoT) devices. This system is not just a trend, it is transforming how we interact with our homes, making them intuitive and connected. In the residential sector includes homeowners seeking secure and keyless entry systems that are both convenient and easy to use. Similarly, small businesses, such as offices and small commercial spaces, require reliable access control solutions. Additionally, the hospitality industry includes hotels and rental properties that benefits from modern and guest friendly locking systems that improve user experience.

CONCLUSION

This project demonstrates significant potential by addressing modern security challenges through an innovative and accessible solution. By combining innovative technology with affordability, it offers a smart, keyless entry system suitable for homes, businesses, and hospitality spaces. The design is not only user-friendly but also energy-efficient, promoting sustainable practices. Its flexibility to adapt to new features and evolving needs ensures it remains relevant in the rapidly growing smart home market. Overall, the wireless fingerprint door lock system is a forward-thinking solution that meets modern security demands and offers societal benefits. The scalability and adaptability ensure it can evolve with technological advancements and enhancing its market appeal and long-term viability.

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