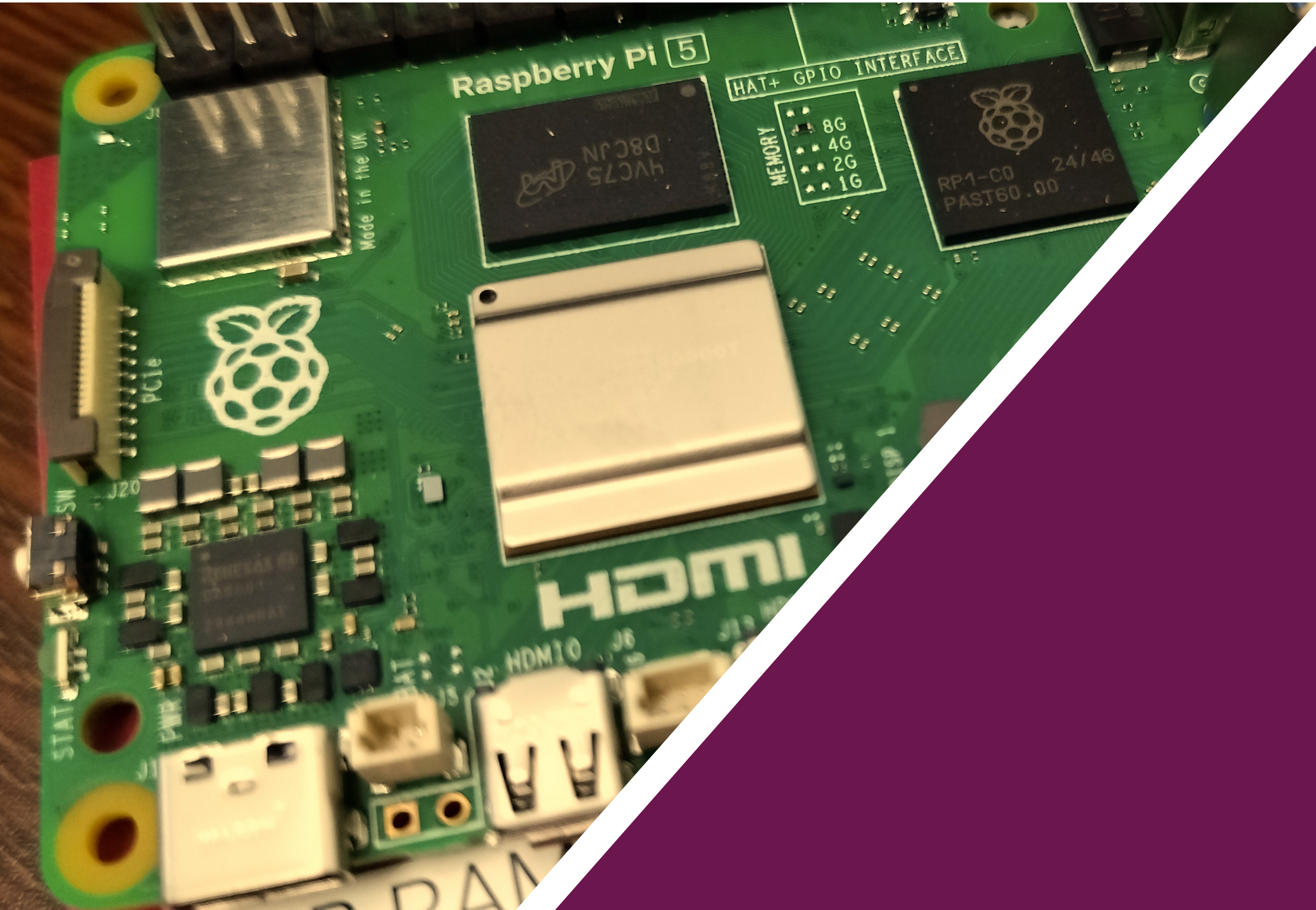




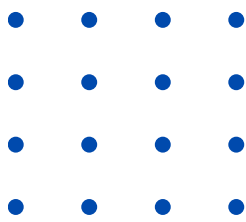
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EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS
ENGINEERING EXHIBITION 2025
VOLUME 1



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



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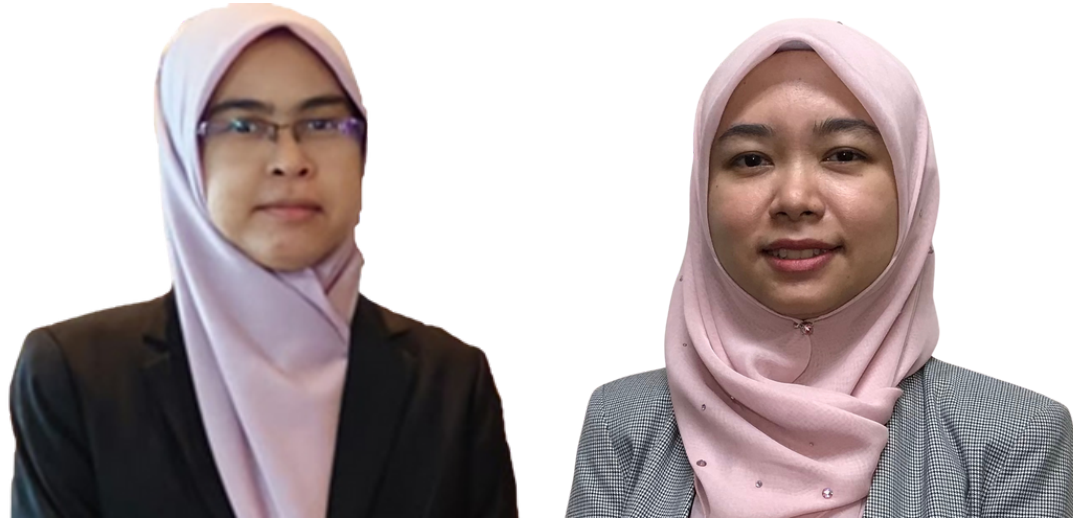
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FOREWORD BY THE PROGRAM CHAIR



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)



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

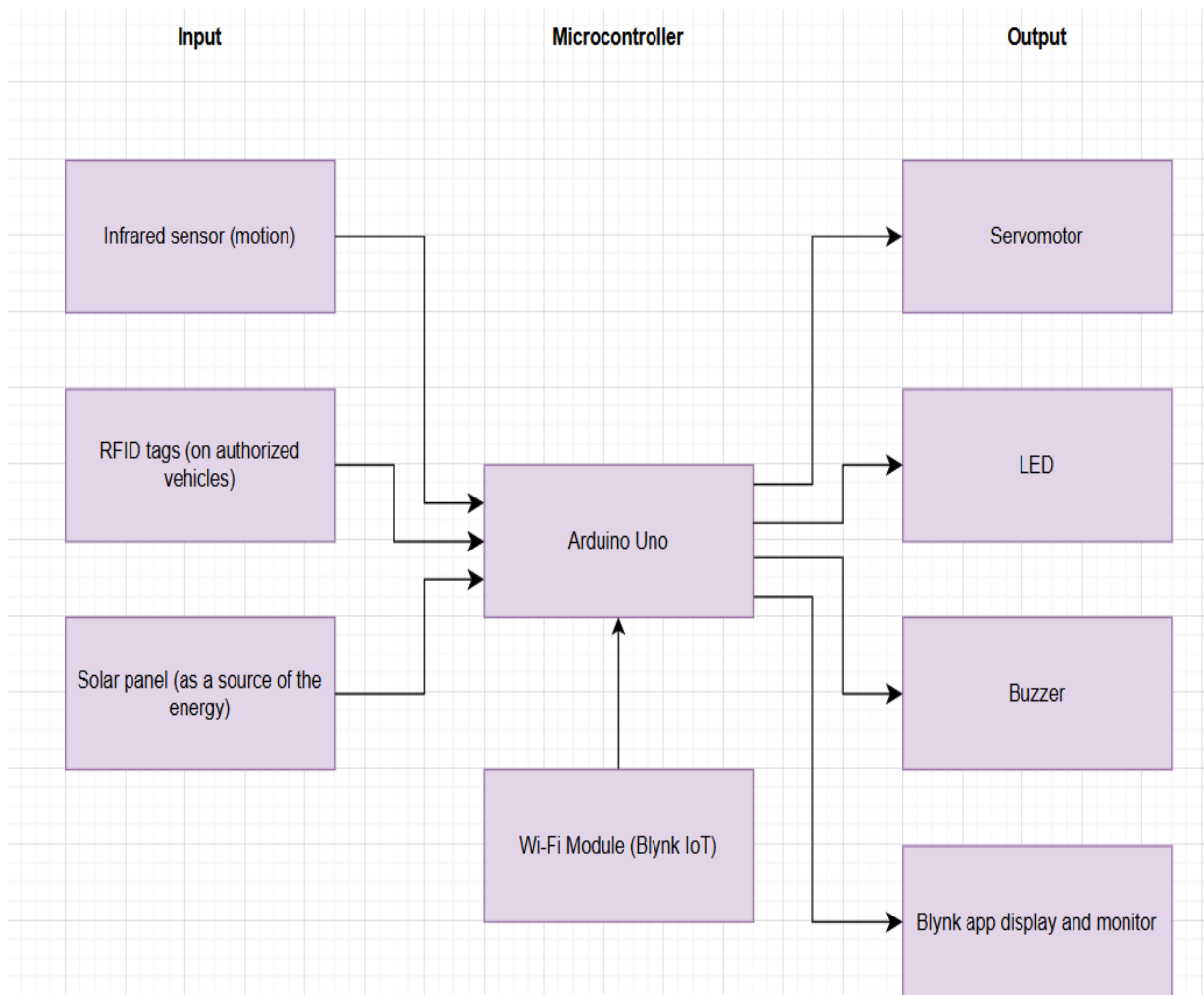


Figure 1: Block Diagram of Solar-Powered Garage System By Using Radio-Frequency Identification (RFID) Technology

FLOWCHART AND PCB LAYOUT

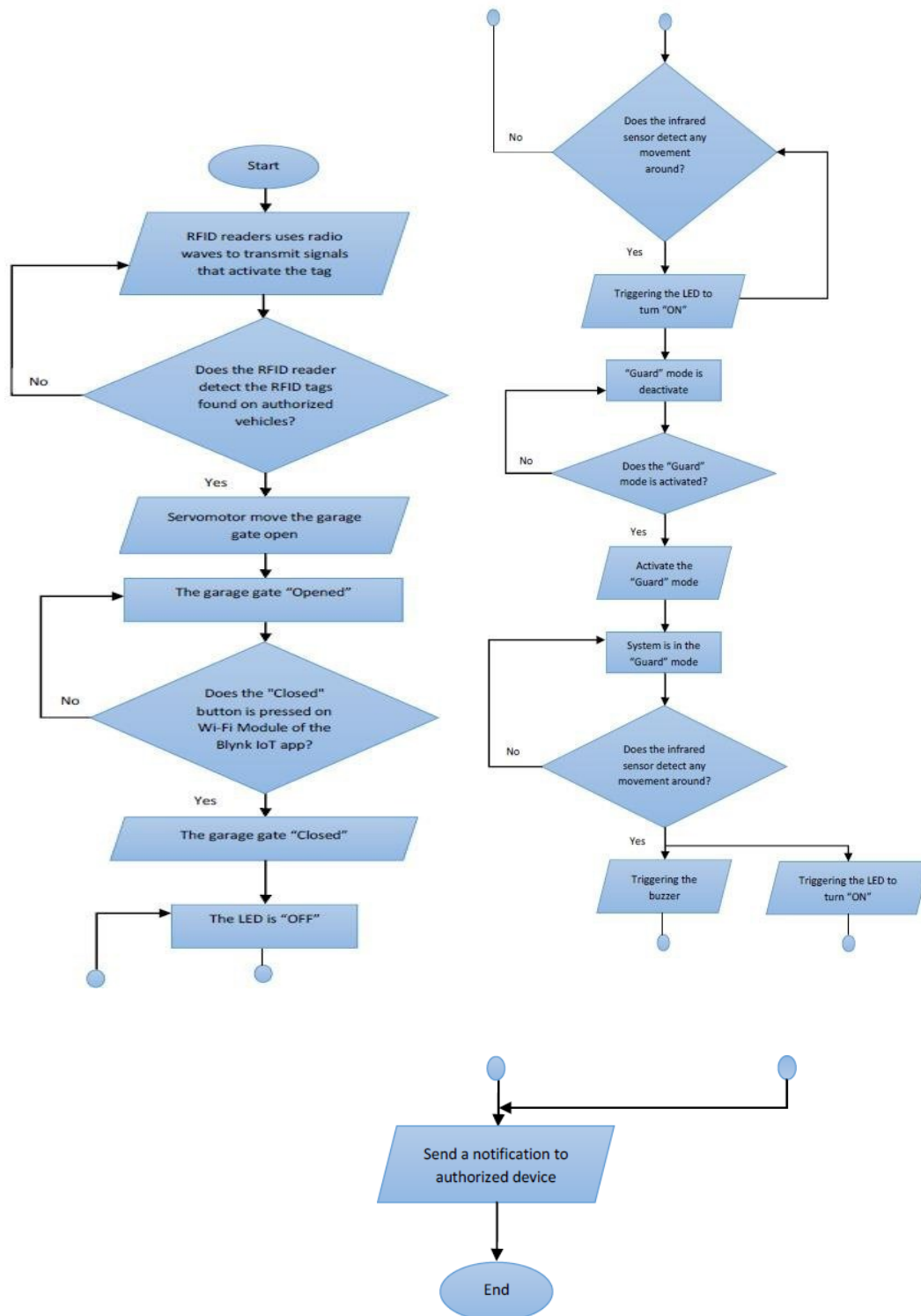


Figure 2 : Flowchart of Solar-Powered Garage System by Using Radio-Frequency Ident (RFID) Technology

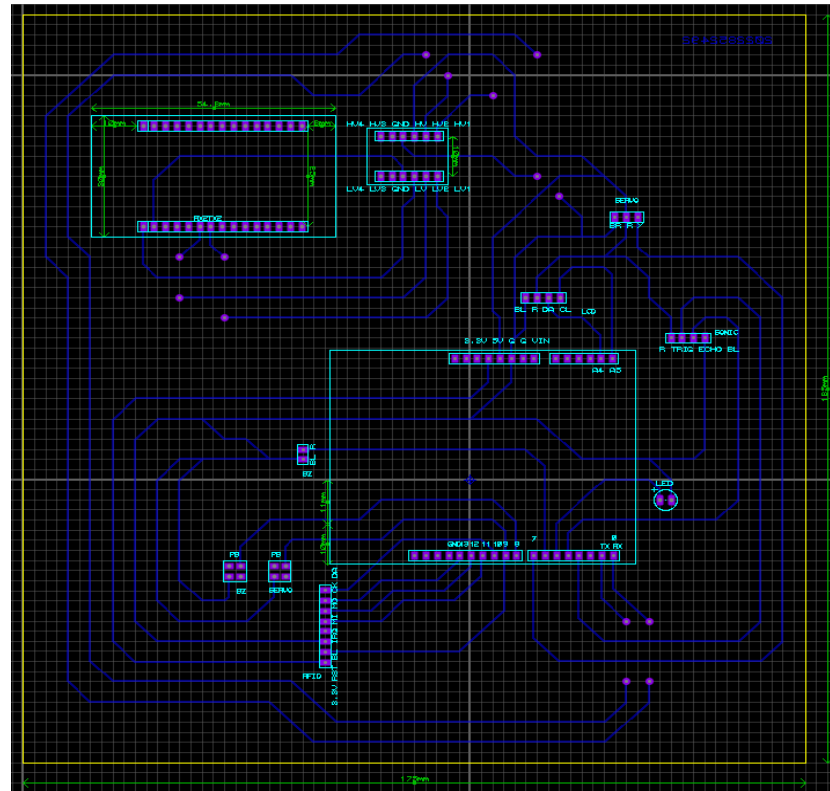


Figure 3 : PCB Layout of Solar-Powered Garage System By Using Radio-Frequency Identification (RFID) Technology



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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