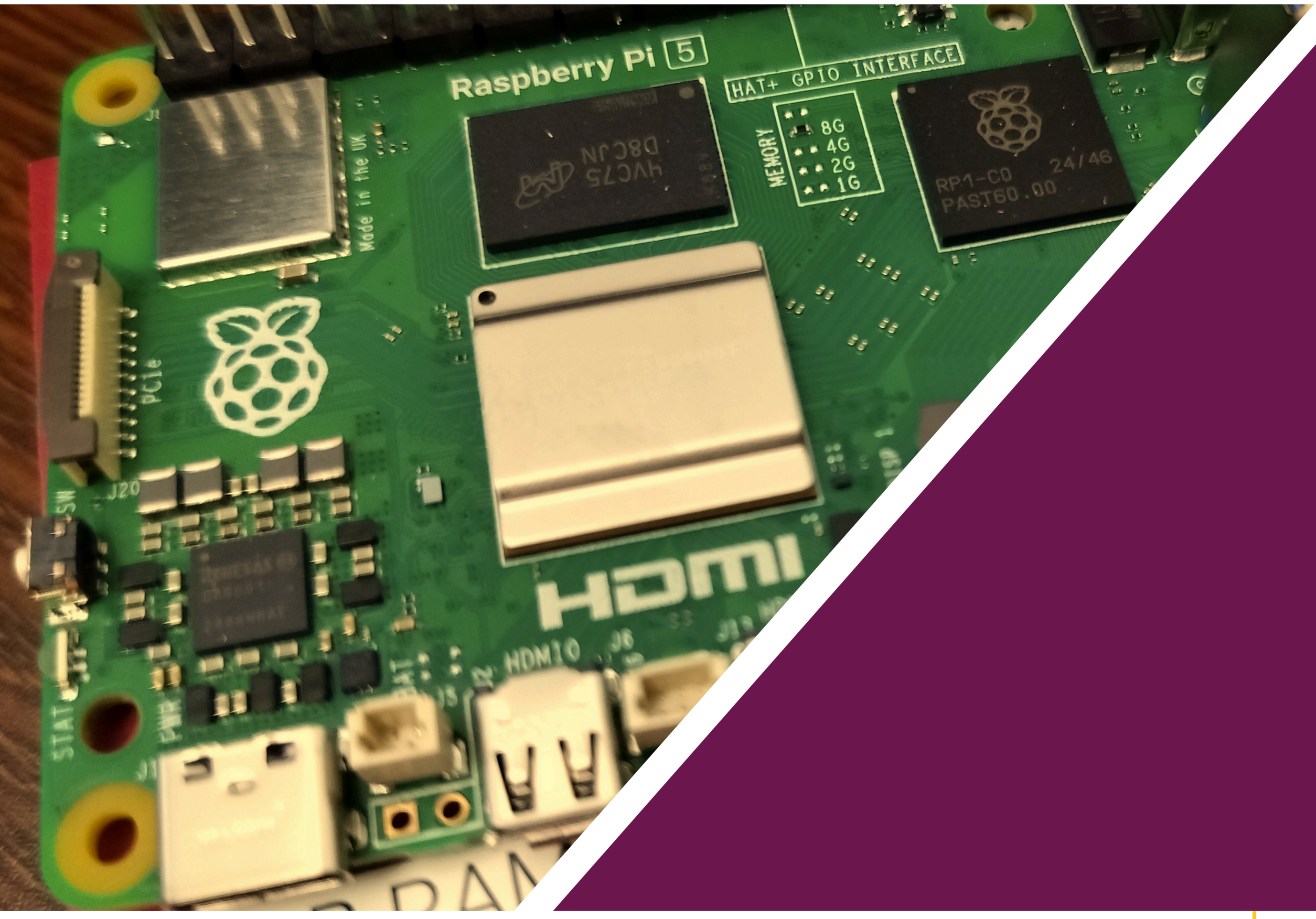
UNIVERSITI TEKNOLOGI MARA

EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

VOLUME 1



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

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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 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.

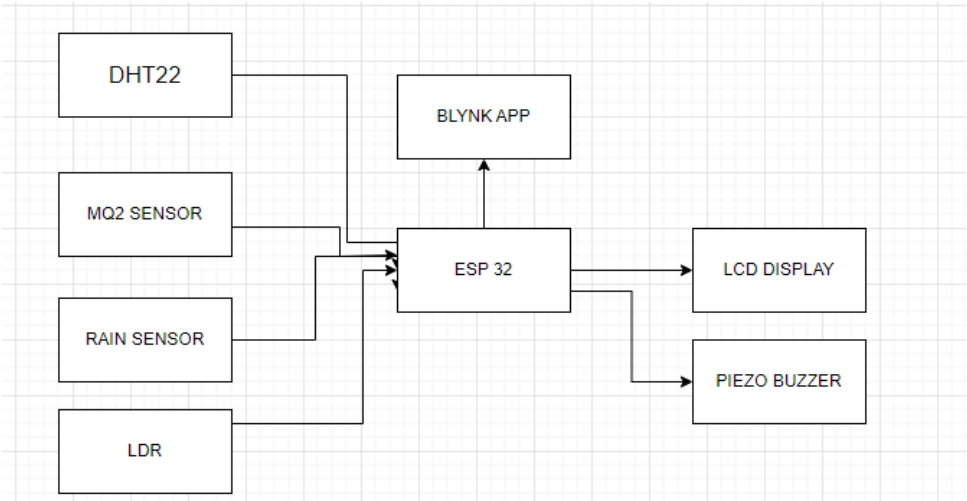
PRODUCT DESCRIPTION

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

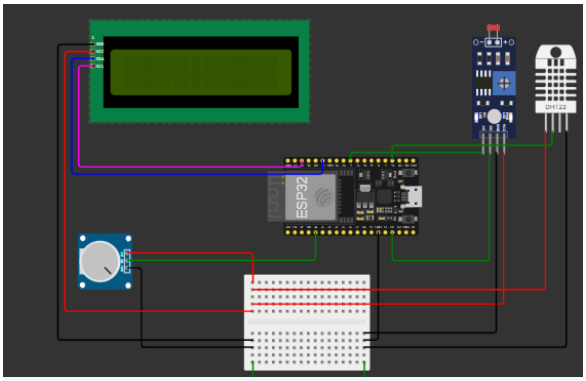
delivers comprehensive, accessible weather data and alerts, enhancing safety and decision-making capabilities for users.

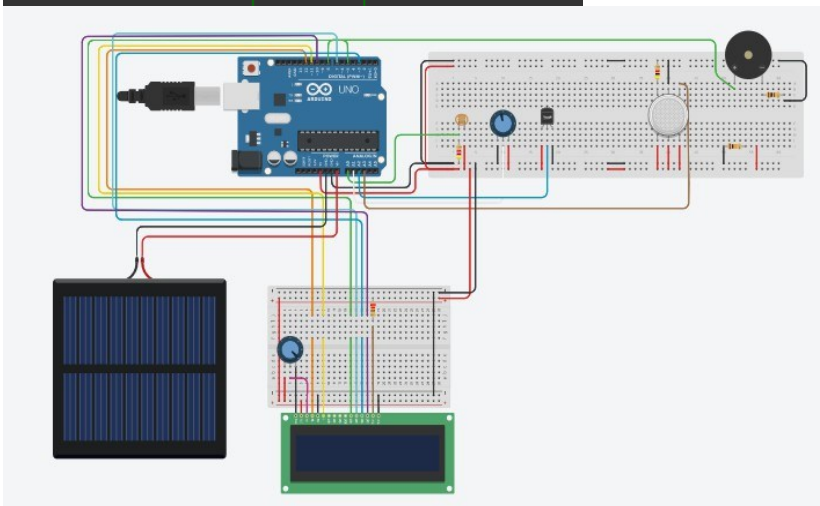
PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

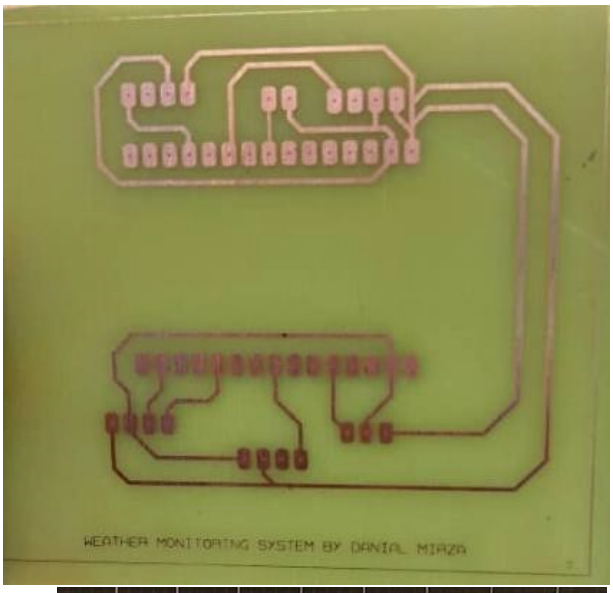
1. BLOCK DIAGRAM

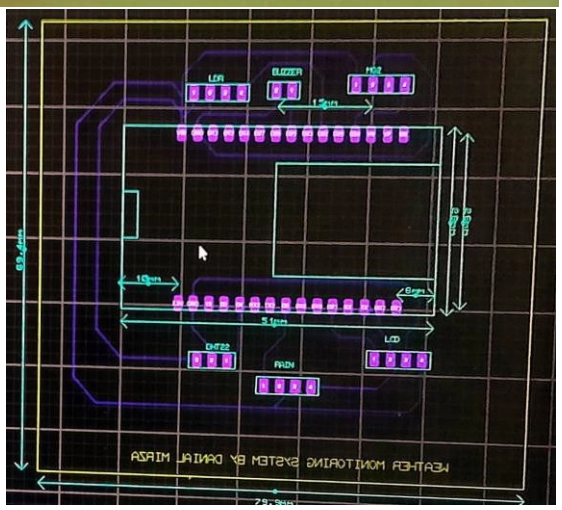


2. SIMULATION DIAGRAM









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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