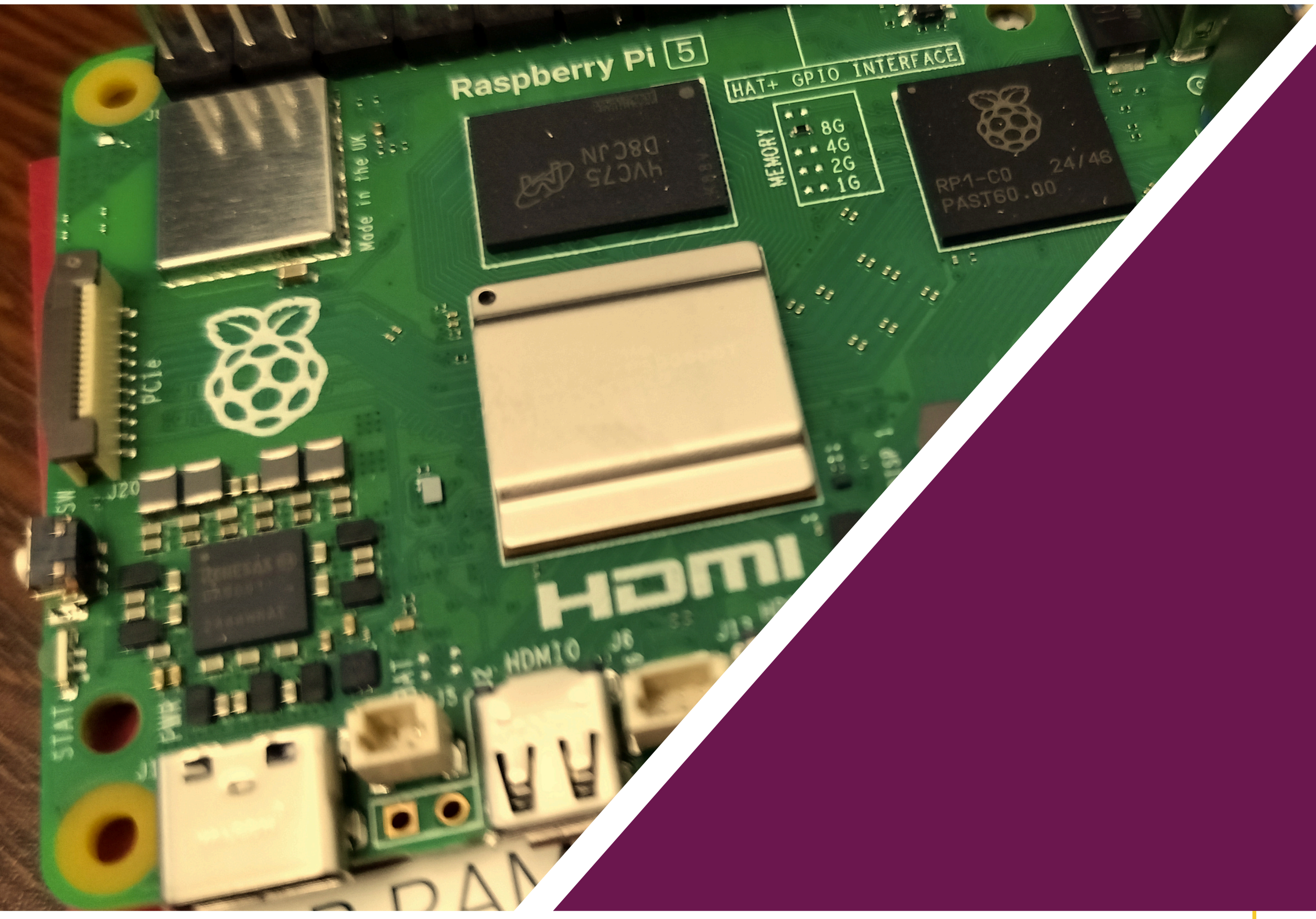
UNIVERSITI TEKNOLOGI MARA

EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

VOLUME 1



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UNIVERSITI TEKNOLOGI MARA
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e ISBN 978-967-0033-28-0

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

Published in Malaysia by Universiti Teknologi MARA Cawangan Johor
Kampus Pasir Gudang 81750 Masai

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)

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

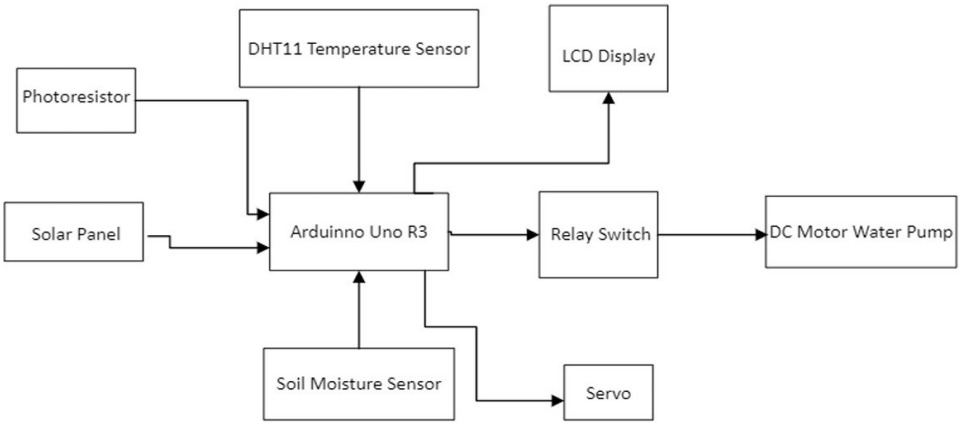

Figure 1: Block Diagram of Automatic Irrigation with Solar Tracking System

FLOWCHART

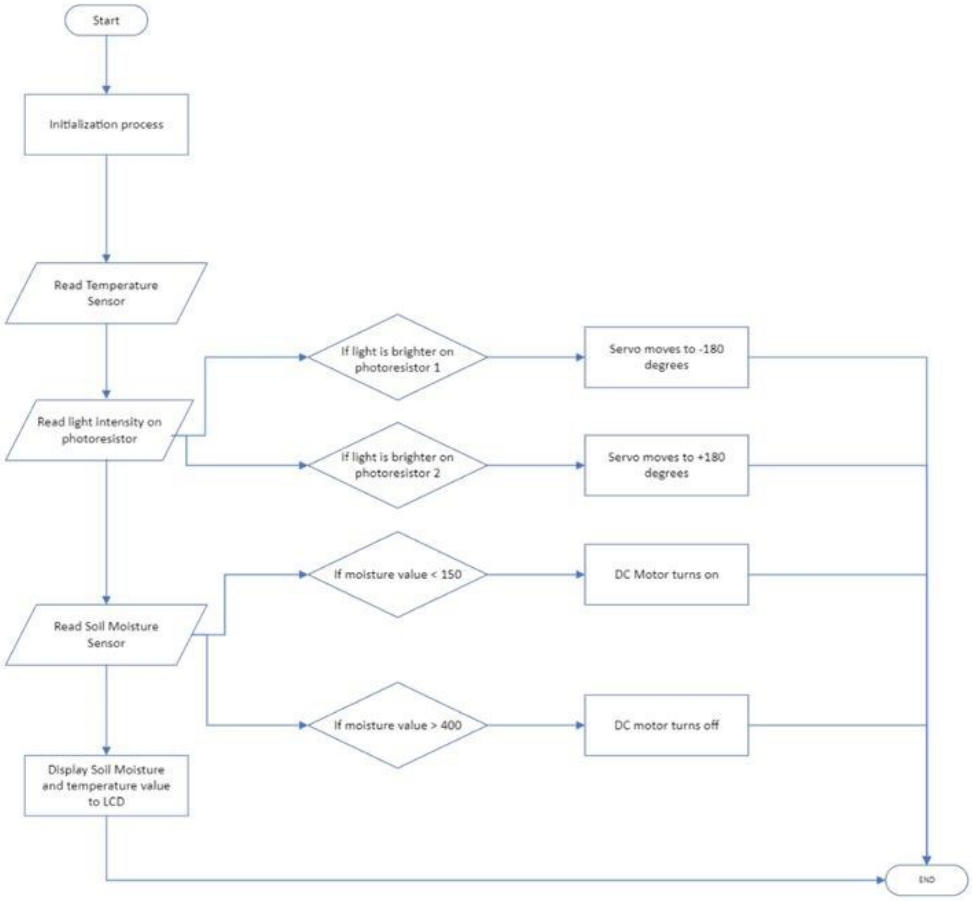

Figure 2: Flowchart of Automatic Irrigation with Solar Tracking System

PCB LAYOUT

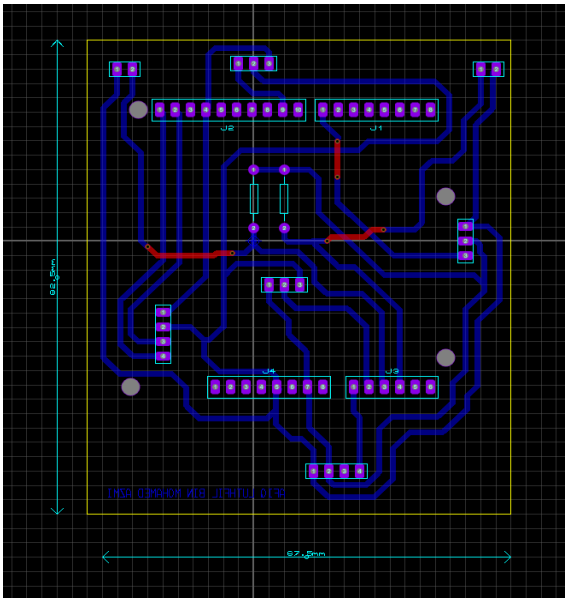

Figure 3 : PCB layout of Automatic Irrigation with Solar Tracking System

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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