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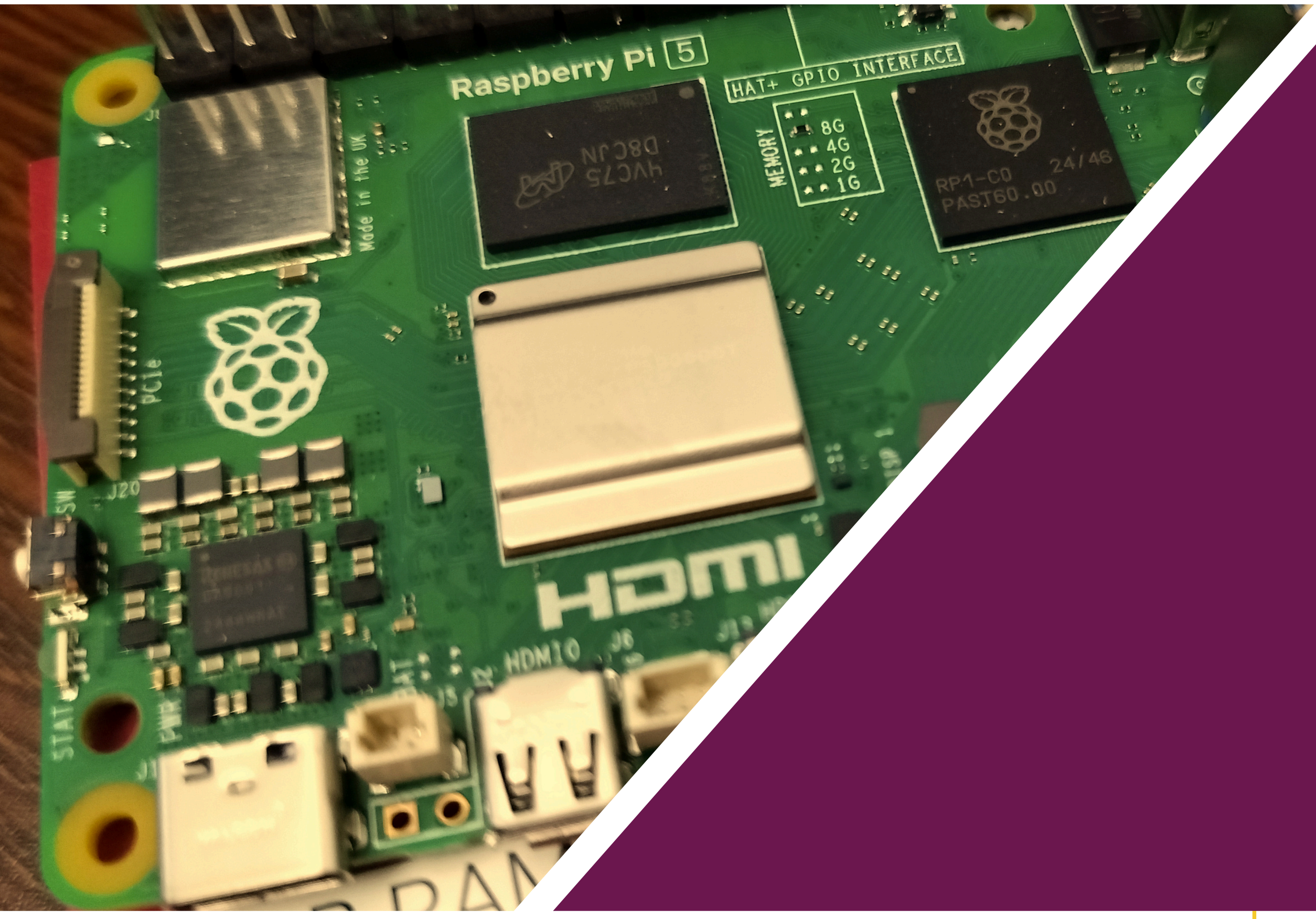
EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

VOLUME 1



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UNIVERSITI TEKNOLOGI MARA
JOHOR BRANCH
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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)

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 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

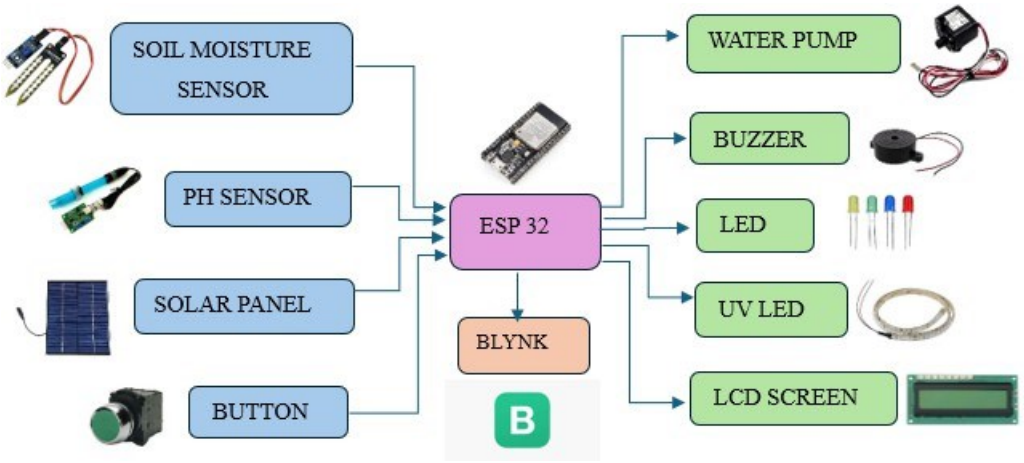


Figure 1: Block Diagram of Automatic Solar-Powered Aquaponic System

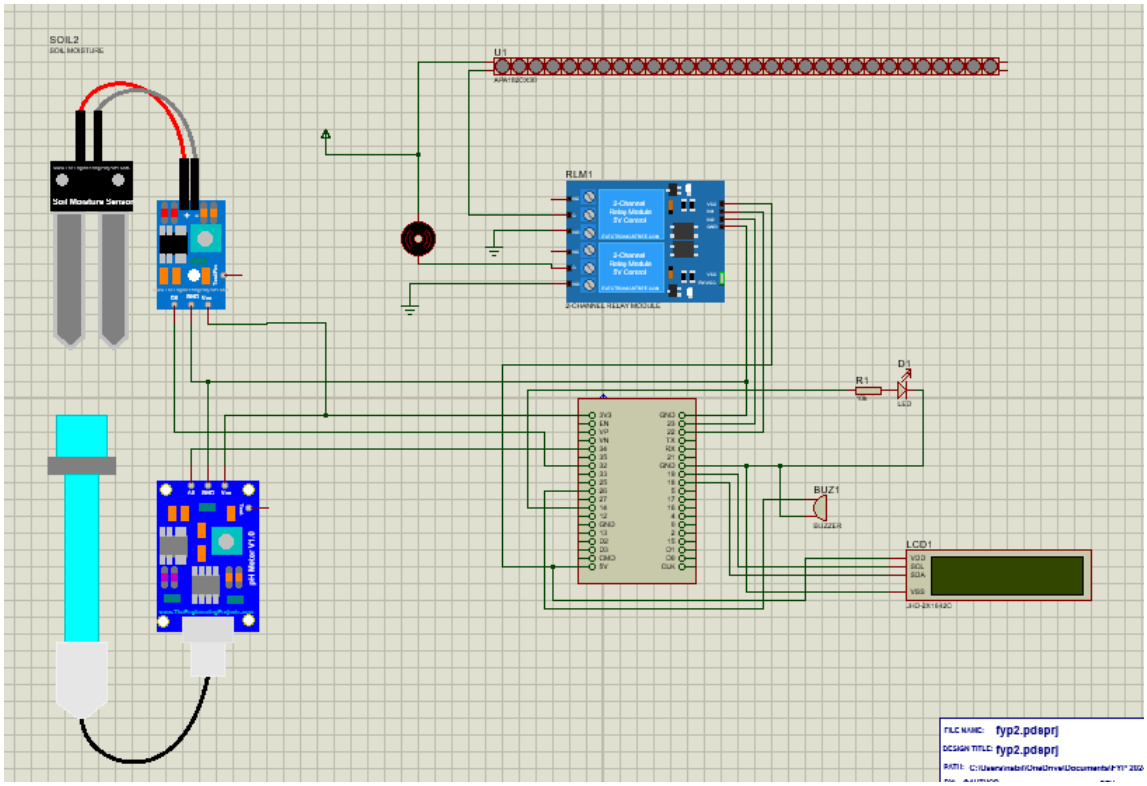


Figure 2: Schematic Diagram of Automatic Solar-Powered Aquaponic System

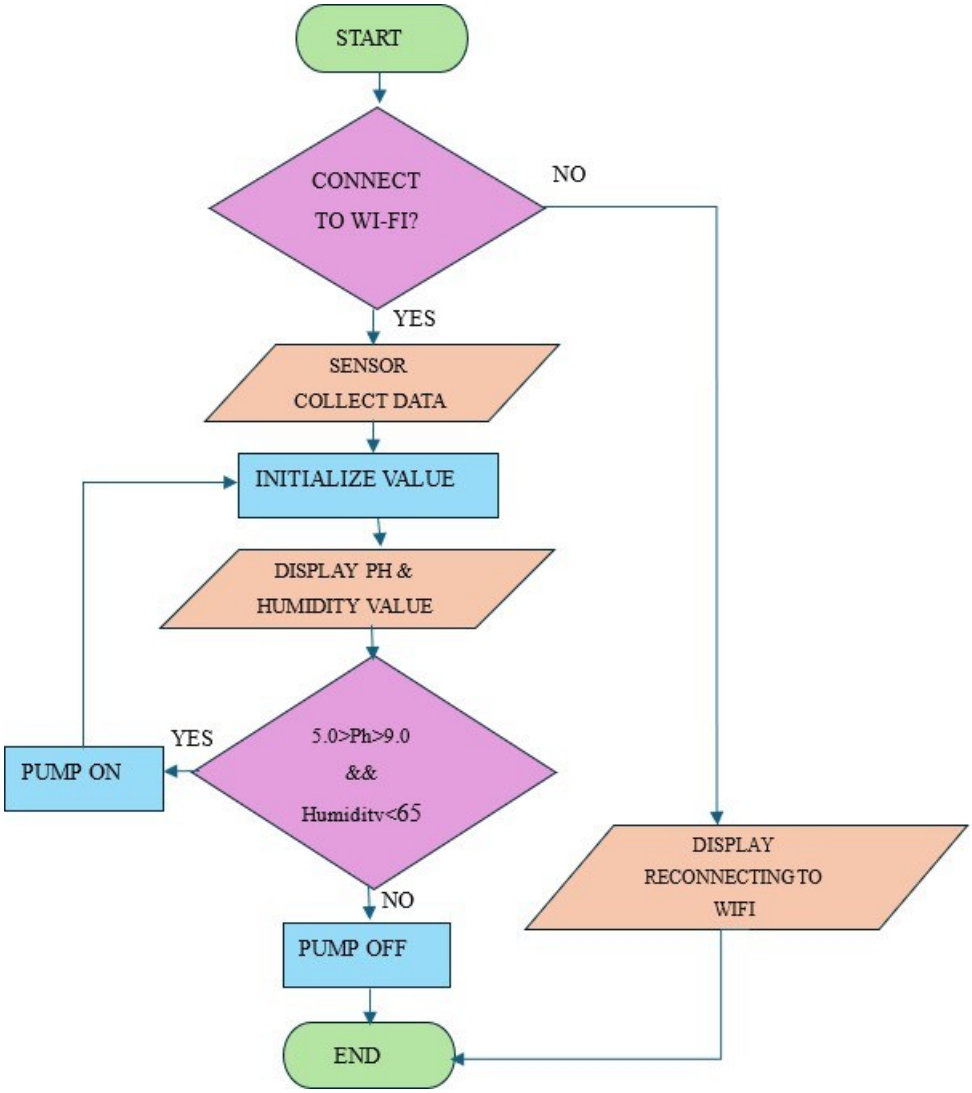
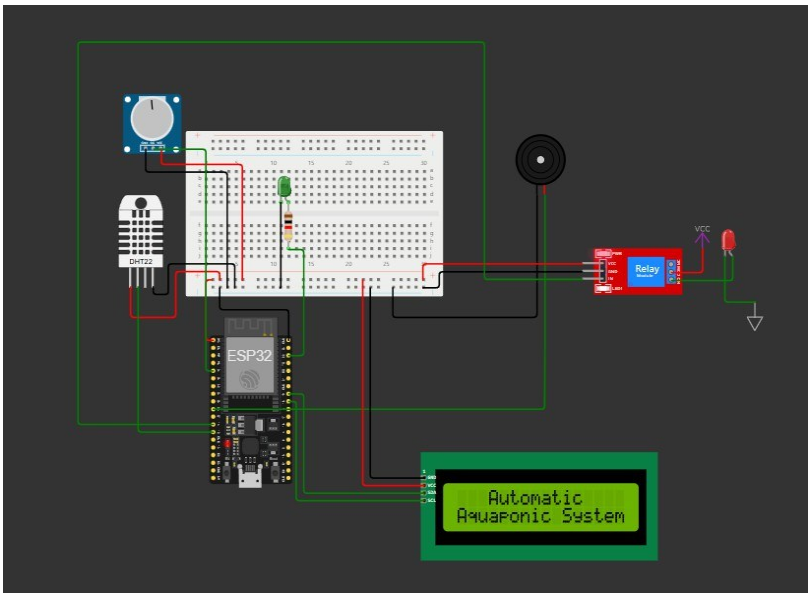


Figure 3: Flowchart of Automatic Solar-Powered Aquaponic System



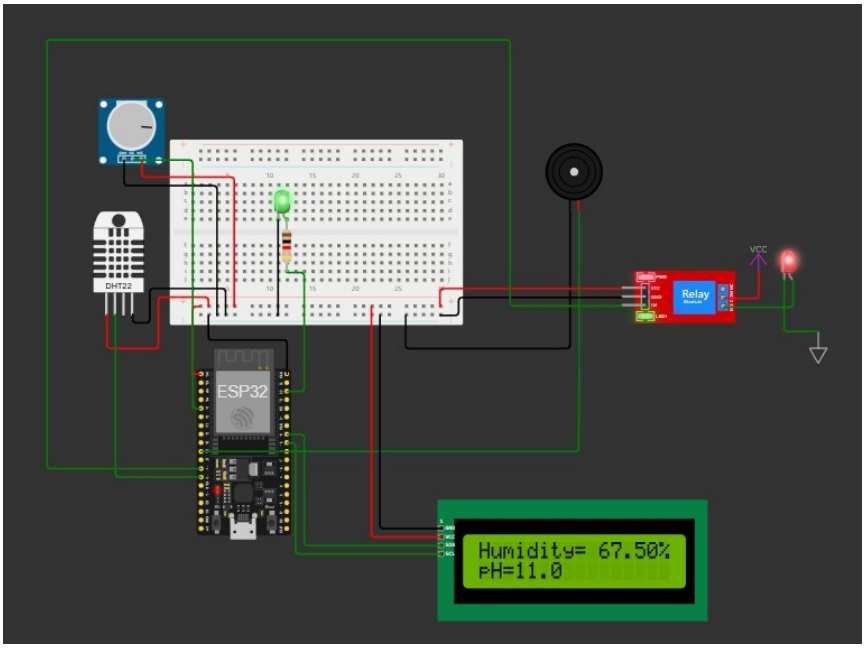


Figure 4: Simulation Result of Automatic Solar-Powered Aquaponic System in Wokwi Simulation.

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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