



E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



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23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

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Electrical Engineering Studies, College of Engineering
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang
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PREFACE

It is with great pleasure that we present the e-proceedings of International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), which compiles the extended abstracts submitted to the International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), held on 23 January 2025 at **PTDI, Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang**. This publication serves as a valuable resource, showcasing the intellectual contributions on the invention and innovation among students, academics, researchers, and professionals.

The International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), organized under the theme "Fostering a Culture of Innovation and Entrepreneurial Excellence," is designed to inspire participants at various academic levels, from secondary students to higher education students and professionals. The competition emphasizes both innovation and entrepreneurship, encouraging the development of product prototypes that address real-world problems and have clear commercialization potential. By focusing on technological and social innovations, i-TIEC 2025 highlights the importance of turning creative ideas into viable, market-ready solutions that can benefit users and society. The extended abstracts in this e-proceedings book showcase the diverse perspectives and depth of research presented during the event, reflecting the strong entrepreneurial element at its core.

We extend our sincere gratitude to the contributors for their dedication in sharing their innovation and the organizing committee for their hard work in ensuring the success of the event and this publication. We also appreciate the support of our collaborators; Mass Rapid Transit Corporation Sdn. Bhd. (MRT Corp), Universitas Labuhanbatu, Indonesia (ULB), Universitas Riau Kepulauan, Indonesia (UNRIKA) and IEEE Young Professionals Malaysia, whose contributions have been instrumental in making this event and publication possible.

We hope that this e-proceedings book will serve as a valuable reference for researchers, educators, and practitioners, inspiring further studies and collaborations in both innovation and entrepreneurship. May the knowledge shared here continue to spark new ideas and market-ready solutions, advancing our collective expertise and fostering the growth of entrepreneurial ventures.

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B-ST083: HIDROPONIC CONTROL SYSTEM USING INTERNET OF THINGS (IOT)

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ABSTRACT

The Internet of Things (IoT) can be utilized in various forms of control equipment as a control system for Internet of Things (IoT) based hydroponic systems. The hydroponic control system using the Internet of Things (IoT) is an innovative solution designed to optimize and automate plant cultivation in hydroponic farming. This system integrates sensors, actuators, and IoT connectivity to monitor and control critical parameters such as water pH, nutrient levels, temperature, humidity, and light intensity in real time. By leveraging IoT technology, the system enables remote monitoring and management through a user-friendly mobile or web application. Data collected from sensors is processed and analyzed to ensure optimal growing conditions, while automated responses, such as adjusting nutrient delivery or activating lighting systems, enhance plant health and yield. This control tool can help hydroponic farmers to control and monitor their hydroponic plantations from remote areas because it is connected to the blynk application that has been installed on their smartphone.

Keywords: Internet of Things (IoT), Hydroponic system, Control system, Remote area.

1. Product Description

These are several components used in hydroponic system, such as the ultrasonic sensor, LCD, selenoid valve, DC water pump, DC motor, ESP8266 Wi-Fi tranceiver module and relay 4 channel. This equipment works is by using ultrasonic sensor will read the water level in tank. The microcontroller will read the data to calculate to maintain water level if condition is lower with setpoint. All data will send to cloud by Blynk application at android smartphone. And then, the ESP8266 Wi-Fi module will read data from database cloud and will control the relay so that it turn on selenoid valve to flow water to water storage container. The 1st pump to distribute fertlizer A to storage container, the 2nd pump to distribute fertlizer B and 3rd pump to distribute fertlizer C. Therefore, DC motor function as a stirrer in the storage container so that the water and fertlizer can be mixed. After ESP8266 Wi-Fi module control of four relays, it can then be controlled manually using and android smartphon through the application used by user.

2. Block Diagram, Schematic Diagram and Hydroponic System

The block diagram hydroponic system at figure 1 consist of ultrasonic sensor, NodeMCU ESP8266, power supply 12 VDC, water pump, motor DC, selenoid valve and Blynk application.

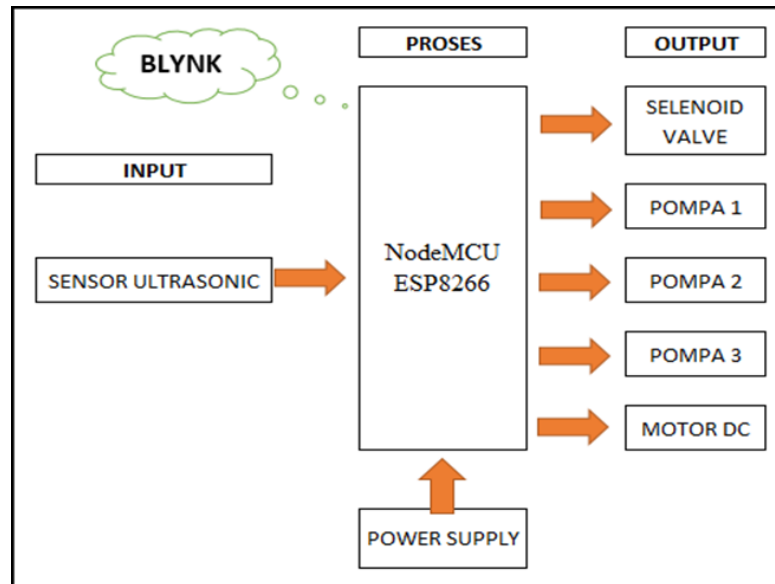


Figure 1. Block diagram

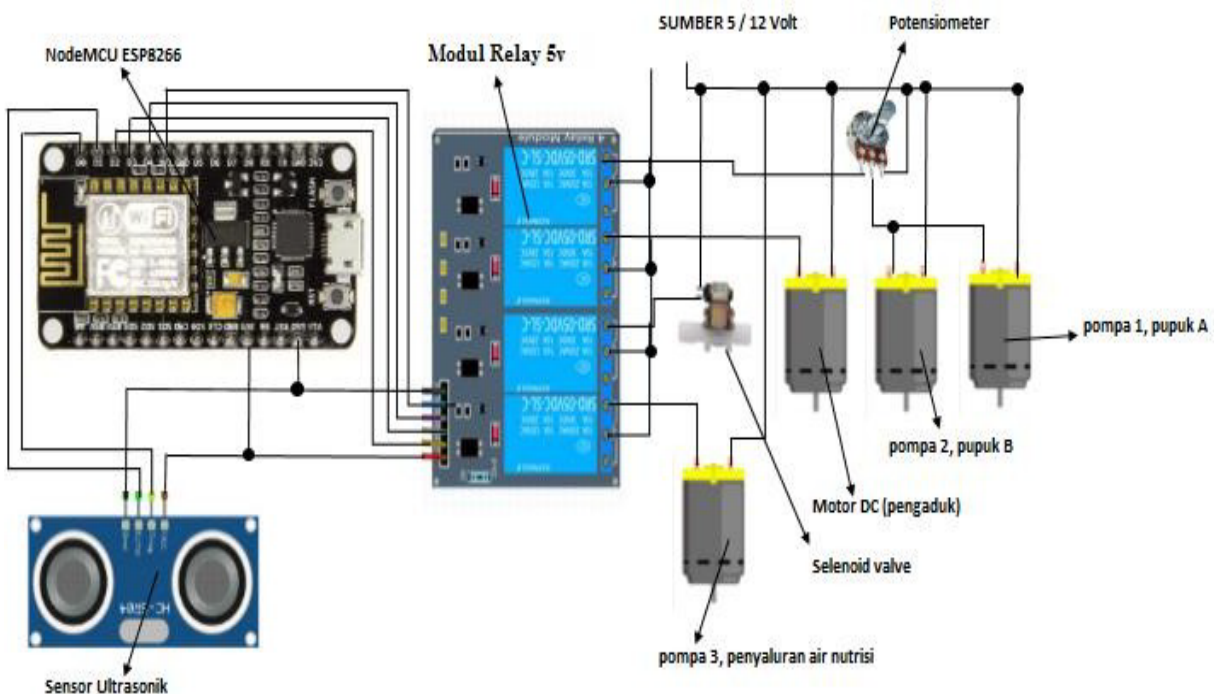


Figure 2. Schematic diagram

The schematic diagram at figure 2 above shows wiring diagram in hydroponic system.

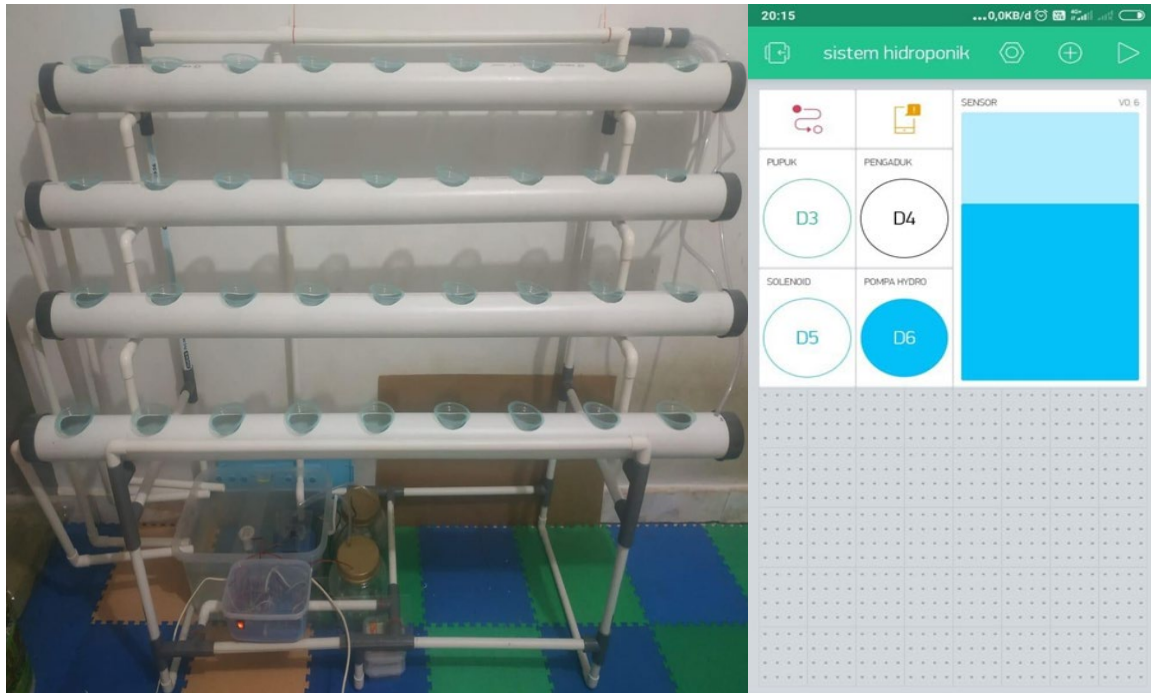


Figure 3. Hydroponic system

At the figure 3, hydroponic system with 4 water level piping to flow water by gravity for supply fertilizer.

3. Novelty and uniqueness

Combines advanced IoT technology with hydroponic farming, enabling real-time monitoring and management from anywhere via a smartphone or computer. The system automates essential tasks like nutrient delivery, pH adjustment, and water circulation based on real-time data, ensuring precise control over the growing environment. Customizable configurations allow users to tailor the system to specific crop requirements or environmental conditions. Optimizes water and nutrient usage by delivering precise amounts only when needed, minimizing waste. Can be integrated with other IoT-enabled smart agriculture tools, such as weather monitoring systems or automated irrigation solutions. Remote accessibility empowers users to monitor and control their hydroponic farms conveniently, improving operational efficiency.

4. Benefit to mankind

Real-time monitoring and automated controls prevent common issues like nutrient deficiencies, water imbalances, or environmental stress. Hydroponic systems use significantly less water compared to traditional farming methods, and IoT technology further minimizes waste by delivering water only when needed. Enables farming in areas with

limited arable land, such as urban environments or regions with poor soil quality. Can be deployed in urban areas, rural communities, and disaster-prone regions to increase local food production. To makes advanced farming techniques accessible to a wider audience, including small-scale farmers and urban gardeners. Automation of tasks such as watering, nutrient delivery, and environmental adjustments reduces manual labor. Support local economies by enabling small-scale farmers to produce and sell high-quality crops more efficiently. By enhancing agricultural productivity and making farming more accessible and sustainable, this technology contributes significantly to the well-being of humanity and the preservation of our planet.

5. Innovation and Entrepreneurial Impact

Incorporates IoT, data analytics, and automation, enabling precision control and efficient farming methods. Advanced sensors and cloud connectivity allow for continuous data collection and instant feedback loops to optimize plant growth. Expands access to advanced farming technologies for small-scale farmers, urban gardeners, and startups in agricultural innovation. Encourages the development of localized food production systems, reducing reliance on long supply chains and associated costs. Provides innovative solutions for tackling food security, especially in regions with limited arable land or scarce water resources. Reduces reliance on chemical fertilizers and pesticides, promoting safer and more sustainable food production. To drives innovation in agriculture while fostering entrepreneurial opportunities. It reshapes traditional farming practices, encourages sustainable business models, and creates a ripple effect of economic and environmental benefits. This technology not only redefines modern agriculture but also inspires a new generation of agripreneurs to embrace smart, efficient, and sustainable farming solutions.

6. Potential commercialization

A foundational product for startups aiming to innovate in sustainable farming technologies. Offering customizable solutions based on the size of the hydroponic setup and the specific crops being grown. Compatibility with other IoT devices and systems, such as weather monitoring tools or automated irrigation solutions, creating an ecosystem of smart agriculture products. Opportunities to collaborate with agribusinesses, NGOs, and government programs focused on sustainable food production. Offers a unique combination of IoT, automation, and data analytics, differentiating it from traditional hydroponic systems. To be holds immense commercialization potential, tapping into the growing demand for sustainable, efficient, and technologically advanced farming solutions. Its adaptability, scalability, and environmental benefits position it as a game-changer in both local and global agricultural markets.

7. Acknowledgment

We extend our heartfelt gratitude to all individuals and Faculty of Engineering that contributed to our project. We are deeply grateful to our academic mentors and advisors for their invaluable guidance, constructive feedback, and encouragement throughout the research and development process. Your insights significantly enhanced the quality and

functionality of this system. Special thanks to our partnering institutions and industry collaborators who provided the resources, technical support, and facilities necessary to bring this project to fruition. Your cooperation and shared vision for sustainable agriculture have been instrumental. Thank you all for being part of this endeavor.

8. Authors' Biography



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