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"Fostering a Culture of Innovation and Entrepreneurial Excellence"



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23 January 2025
PTDI, UiTM Cawangan Johor
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Electrical Engineering Studies, College of Engineering
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang

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A-ST058: INNOVATIVE IRRIGATION SYSTEM FOR AGRICULTURE

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ABSTRACT

One of the main challenges that many farmers and gardeners face is the need to carry heavy watering cans or repeatedly fetch water from sources to irrigate their plants. This task is physically demanding and can leave them feeling exhausted, requiring significant energy. For example, elderly individuals may experience joint pain and body aches due to the repetitive strain, while younger adults may be too busy with their jobs to consistently water their houseplants. As a result, plants may suffer from insufficient watering and eventually begin to wither and die. Therefore, the irrigation system offers a practical solution by streamlining the watering process and reducing the physical effort required. To address these issues an innovative irrigation system for agriculture was developed. The water pump system is designed to distribute water efficiently across the entire plantation equipped with many sensors like pH sensors, moisture sensor and water level sensor that make the system become more efficient. Additionally, the system incorporates effective water storage and distribution mechanisms, ensuring a consistent and reliable water supply for the plants. This solution not only saves energy and time but also promotes healthier and more sustainable plant growth that significant advancement in optimizing agricultural practices.

Keywords: irrigation system, IoT, agriculture, blynk, water pump

1. Product Description

This project introduces an advanced irrigation system designed to support agricultural practices. The system addresses a common challenge: the time-consuming and physically demanding task of manually watering plants, often requiring the transportation of heavy water containers across large plantation areas. The irrigation system offers a practical solution by streamlining the watering process and reducing the physical effort required. It features a water pump that efficiently distributes water across the plantation. Users can also schedule watering times, enhancing convenience and ensuring timely irrigation. This promotes healthier plant growth while saving time and energy, making it an ideal solution for managing large-scale plantations. A standout feature of the project is its ability to pump water both day and night, powered by a battery that stores energy. Equipped with a wireless transceiver module, data from soil moisture sensors and DHT11 sensors to the Blynk application. These sensors monitor the soil's moisture levels and provide updates on water levels, enabling users to remotely control the pump through their smartphones as in **Figure 1**. With this innovation, users can switch the motor on or off from remote locations. Environmentally friendly and cost-effective, the system uses solar panels to harness sunlight for powering the DC motor pump. This eliminates fuel costs and minimizes maintenance

requirements, making it a sustainable and affordable solution for farmers and gardeners alike.

2. Block Diagram

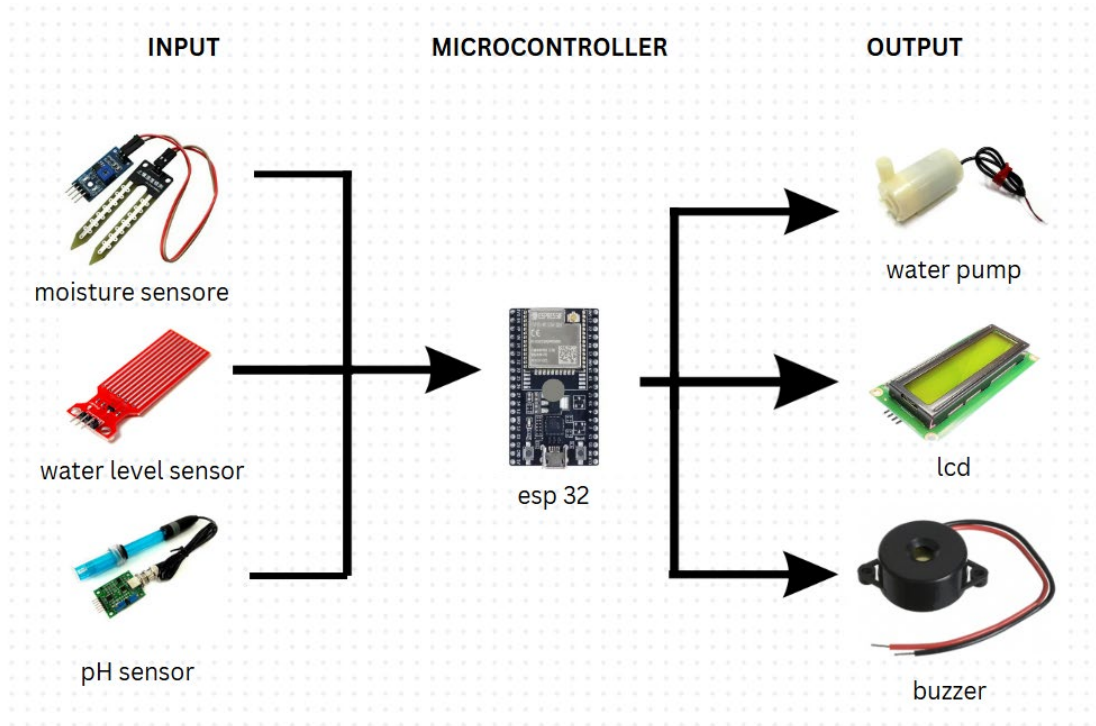


Figure 1. Block diagram for overall project.

Figure 1. depicts the overall design for water pump system using solar and IoT. The Blynk application will serve as the user interface for the system. It will display real time data from sensors and allow the user to control the water pump remotely. The soil sensor will measure the moisture level on the plantation. The water level sensor will monitor the water level in the area where the water is stored to ensure there is enough water to pump. Then, the pH sensor will measure the acidity or alkalinity of the soil to helps in ensuring the optimal pH level for plant growth. For the output devices, the LCD (16x2) displays important information from the sensors reading to alert and notify the user. Then, the buzzer will provide an alarm in case of any critical conditions such as low water level or abnormal pH levels. Lastly the main output devices will pump water from the water source to the soil based on the sensor reading and user commands. In summary, users can monitor the system's status and sensor reading remotely via Blynk application. **Figure 2. and Figure 3.** depict the result of the water pump when detecting the acidic and neutral of the soil. The water pump will automatically ON when the acidic soil detects so that eventually it will become neutral and the water pump automatically OFF. **Figure 4** depicts the overall hardware for this project. Essentially, the project functions successfully as described.

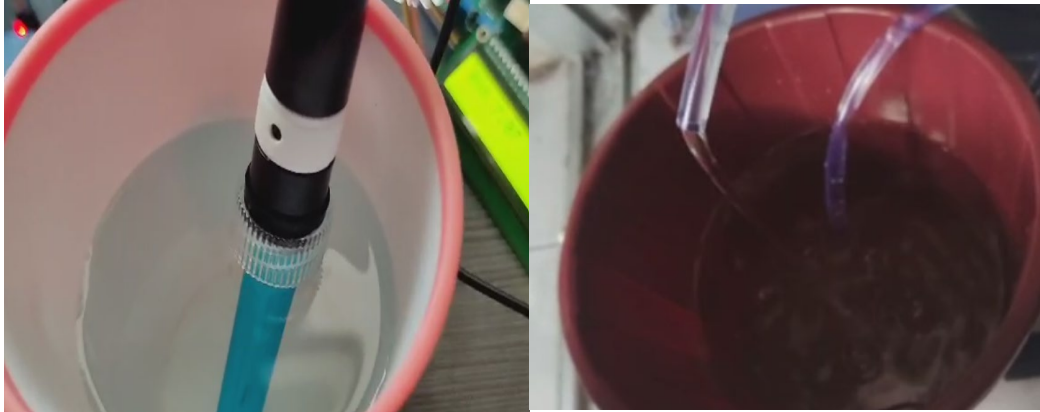


Figure 2. The water pump is ON when the moisture detects acidic of the soil.



Figure 3. The water pump is OFF when the moisture detects neutral of the soil.

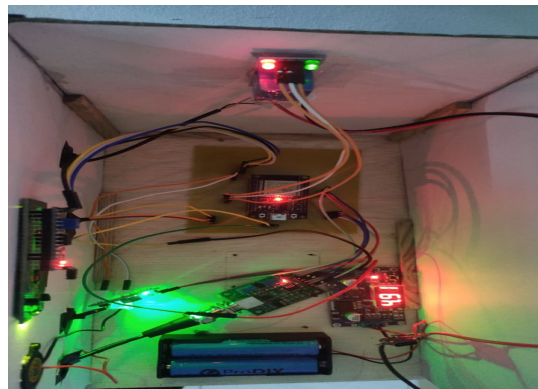


Figure 4. The overall circuit hardware

3. Novelty and uniqueness

The development of the innovative irrigation system for agriculture represents a significant advancement in optimizing agricultural practices. Through the utilization of pump water with equipped other sensors like moisture sensor, water level sensor and pH sensor, the system effectively and efficiently distributes water across the plantation and the feature of the project is its ability to pump water both day and night, powered by a battery that stores energy. Furthermore, this project integrates users to remotely control the pump through

their smartphones which be more convenient and easier for the user to access and control their plantation and overall improves the sufficiency in plantation.

4. Benefit to mankind

The successful implementation of this system highlights its potential to address common challenges faced by farmers in plantation sector which particularly benefiting gardeners and farmers cultivating crops like fruits and vegetables. By automating the access control process, the system reduces the physical burden and time spent on the labor-intensive task of watering large plantations. The system allows users to schedule watering at specific times, making the process much more convenient.

5. Innovation and Entrepreneurial Impact

By integrating smart technology and renewable energy, this innovative irrigation system not only alleviates the burden of manual watering but also contributes to more sustainable agricultural practices. It ensures optimal water usage, promotes healthier crops, and supports eco-friendly farming solutions which particularly benefit gardeners and farmers cultivating crops.

6. Potential commercialization

By integrating smart technology and renewable energy, this innovative irrigation system not only alleviates the burden of manual watering but also contributes to more sustainable agricultural practices. It ensures optimal water usage, promotes healthier crops, and supports eco-friendly farming solutions.

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