DROPS TO WATTS: RAINWATER HARVESTING SYSTEM FOR IOT BASED MONITORING USING ESP32

A Project
Presented to the Faculty of the
Computer Studies Department
College of Science
Technological University of the Philippines
Ayala Boulevard, Manila

by:

Angela A. Concepcion
Desiree A. Dumaguing
Glen B. Mataya
Eisen Lois E. Moises

In Partial Fulfillment
Of the Requirements for the Degree
Bachelor of Science in Information Technology

June 2024

INTRODUCTION

The paper addressed the technology?s concept, design, and prospective applications. The prototype was designed for small-scale applications, potentially limiting its suitability for larger populations or households. This developing technology has the potential to have an important impact in the field of renewable energy by decreasing the dependency on fossil fuels while also improving the quality of everyday life in communities with limited electrical power. By leveraging IoT technology, this research endeavors to push the boundaries of what is possible in the realms of sustainable energy production and responsible water management. Study focused on innovative turbine technology that worked with ESP32 microcontroller. Prototype also included converting mechanical energy into electricity via a 12V water turbine, harnessing the kinetic energy from the flowing water to generate electricity. The prototype aimed to provide sustainable electricity and non-potable water using specified hardware and a software IoT application. Study acknowledged several limitations, such as increased turbine capacity and power distribution infrastructure, was not addressed, limiting the understanding of how the system might perform in more extensive setups. integrated systems being widely adopted, aiming to enhance people's quality of life. By implementing the prototype, significant reductions in electricity and water consumption were achieved, resulting in cost savings for households. The Blynk IoT platform's capabilities are crucial for overcoming obstacles in effectively combiningurbine technology and rainwater collection. The prototype's combination of functionalities, including effective filtering, energy generation, and water storage, demonstrated a comprehensive approach to addressing these challenges. The Philippines has limited access to both water and power due to its vulnerability to disasters, aged infrastructure, and rising urban demand.

METHOD

Researchers developed an IoT-based rainwater harvesting system. The system used the Blynk IoT platform for real-time monitoring and control, Wi-Fi to connect the system to the internet, and ESP32 to track energy consumption. The prototype was installed a filter to filter the rainwater down to the extended protected part of the pipe. The water goes inside the filter then into the basin. After filtering, the rain water was collected and stored in a tank. The tank is then used to store water for various utility purposes. The focus of this project was to develop an innovative rainwater harvesting system. The system combined the development of renewable energy with water conservation. The information could be displayed through one?s mobile phone. The data was serialized to JSON format for easy handling and updating in real-time. The generated electricity water turbine was controlled by a charge controller to protect the battery from damage caused by excessive charging. The water was stored temporarily after the filtering process and then released when the battery had reached its full charge capacity. The prototype was demonstrated and tested with the respondents. It features an ESP32 microcontroller, a 12V water turbine, a charge controller, a JSL (Lead Acid 12V 100Ah) battery, and a 3000W inverter. It also features a monitoring system that tracks the battery's real-time battery percentage. The data are then sent to the Blynk IoT platform for visualization. The prototype was then built by combining these components to produce a prototype and an IoT application. The system collects rainwater and converts it into electrical energy. It can store water for utility use. The accuracy and functionality of the project were evaluated through the subsequent processes. The system successfully powers the Basic and Emergency Appliances, providing a steady electrical output. It also provides high-quality and safe water for various applications. It was tested and improved before being implemented in actual working environments. It has been shown that it can be used to power a range of household appliances. It could also be used for emergency water supply.

RESULTS

The project is a combination of a rainwater harvesting system and an IoT monitoring system. The system turns mechanical energy into electricity that can power essential household appliances. The monitoring system provides accurate and accurate and realtime data exchange between the prototype and the IoT Platform. The test results on the functionality and efficiency of the Monitoring and Rainwater Harvesting System are shown in Table 5 that follows. The project is elaborated in two parts: the Prototype Prototype and the Monitoring System Catch basin 1. The prototype collects the rainwater from the gutter and the monitoring system collects the energy from the turbine. The project was evaluated to determine its level of acceptability in terms of.Functionality, Aesthetics, Workability, Durability, Economy, and Safety. The system was designed to supply electricity from battery. The monitoring system has data latency. The power level of microcontrollers is limited compared to powerful computers. Blynk Application and Dashboard is capable to remotely monitor IoT devices, Customized dashboards and visualize data. The water collected cannot be used for drinking and washing the dishes.

DISCUSSION

The system was reviewed and evaluated by a total of 40 respondents. The developed project was rated as ?Highly Acceptable? in terms of Functionality, Workability, Workmanship, Durability, Economy, and Safety. The project was successfully developed using the following algorithms and tools. The system was tested on the Arduino Arduino IDE. The prototype and IoT Based Monitoring System is usable and reliable to its user. This result suggests that the Prototype and IoT based Monitoring system is useful and reliable. The Lithium Battery monitors the load input and charges the battery. The battery can be charged by using a charger. It can also be used to monitor the battery's charge status. It also monitors the battery voltage and charges and de-charges. It is designed to be used by researchers to test battery life. It has a range of sensors to monitor battery life and charge. For future researchers, use Lithium battery. It monitors the voltage and charging of the battery and charges it.