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EARLY WARNING SYSTEM FOR RAPID FLOOD AT RECREATIONAL AREA SITES USING LORA NETWORK

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ABSTRACT - Flood is one of the major disasters that affects many people each year in numerous places throughout the world. This flood disaster can occur anywhere, but the recreation area is the most dangerous. Therefore, an IoT early warning system for flood detection utilising the Arduino technology is suggested as a possible fix. The system is made up of a few sensors, including temperature, humidity, water flow sensor and ultrasonic ones. This research aims to develop a system that can contribute to collect data which will be used as an attribute to monitor and detect the water flow activity such as the water level and water velocity. Then to notify the potential occurrence of rapid flood. To implement this system, a System Development Life Cycle (SDLC) has been used as the methodology. Testing has been conducted by using method field testing at Puncak Janing Waterfall to evaluate the functionality of all sensors. All the data that has been taken is saved in the firebase database. The connection also used ESP32, where the coding was written and compiled using Arduino IDE software. This project has successfully achieved its objective where water level and water velocity can be monitored and stored in a firebase.

Keywords: IoT, Rapid flood, LoRa, water velocity, water level

1. INTRODUCTION

Flooding is one of the major causes of death in the world. Floods are a major threat to human life. One of the technologies that may be employed to reduce flood-related fatalities is the flood monitoring system, particularly in places along the rural areas and near the rivers. The purpose of this article is to demonstrate the usefulness of Internet of Things technology in the context of smart cities, with the end goal of enhancing disaster response and early warning systems. This article addresses the design, implementation, and test outcomes of a LoRa-based early flood related parameter monitoring and detection system and its avoidance utilizing the Arduino project are presented as solutions to the described problem. The proposed system will offer a straightforward monitoring interface, enough flood data, and short-term water level and water velocity forecasting in the future. The system's functionality and network performance utilizing an ultrasonic sensor, LoRa technology, and Arduino board are tested in a real-world setting. The positive results obtained from the on-site testing validate the effectiveness of the proposed sensor and network system. It indicates that the system is capable of accurately detecting and monitoring flood conditions, providing timely and reliable data for early warning purposes.

2. METHODOLOGY

The methodology may be characterized as a set of phases that were utilized to explain and discuss the project development process. More detail was included in the methodology section on the actions taken to carry out the project's objectives. Multiple phases of the project, including information collecting, project analysis requirements, project planning, system development, and project documentation, were employed as a System Development Life Cycle (SDLC).

3. RESULTS AND DISCUSSION

Field testing has been conducted. The water level indicates the height or depth of the water surface at a specific point in the system. The researcher analyses the chart that the water level gradually decreases from 400 cm 8:00 AM to 320 cm. The values show a consistent downward trend, indicating an increase in the water level over time. This means that the water level continuously rises to the ultrasonic sensor. This is because of the occurrence of rain.

4. NOVELTY OF RESEARCH / PRODUCT

Waterfalls, unlike river, do not have distinct banks or gauges against which water levels may be measured. Additionally, the dynamic nature of waterfalls means that their flow can fluctuate dramatically within short periods of time, further complicating the establishment of benchmarks. Waterfalls are equipped with gauges and water level stations strategically placed along their course. These measures of water level are commonly in centimetres or feet. To properly detect water levels, they use sensors, float-based equipment, or staff gauges. Gauges are frequently linked to data recording systems, allowing for real-time monitoring and analysis. Waterfalls have flood stage indicators that determine water level thresholds. These indicators are based on historical data as well as local knowledge of waterfall behaviour. When water levels exceed these levels, there is a substantial risk of flooding. Flood stage indicators provide critical alerts to communities and disaster management authorities, allowing them to take proper action.

5. CONCLUSION

In conclusion, the on-site findings validate the effectiveness of the proposed sensor and network system for flood monitoring. The system accurately detects and monitors flood conditions, providing valuable data for early warning purposes. This project contributes to the research field by offering a reliable solution for flood monitoring, with potential applications in public safety. Future work can focus on scalability, integrating additional sensors, and enhancing data analysis for better decision-making.

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