Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF FLOOD MONITORING SYSTEM WITH ALERTING SYSTEM BASED ON DATA COLLECTION VIA IOT APPLICATION

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Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours

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A project report submitted in partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours

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Supervisor Name : Ts. Dr Syed Najib Bin Syed Salim

Date : 12/1/2023

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Co-Supervisor Name (if any) : ....

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DEDICATION

Thank you, God Almighty, for being my firm foundation, my source of motivation, wisdom, knowledge, and insight, and for inspiring me to complete this work. All the way through this programme, He has been my rock, and it is only by His grace that I have been able to soar. This project is also a tribute to my mom and dad. Thanks for not charging me exorbitant interest on the money I owe you. My mom and dad will enjoy this.

ABSTRACT

Development Of Flood Monitoring System With Alerting System Based On Data Collection Via Iot Application was a project used a wireless sensor network to collected flood data in the vicinity of Melaka Sentral River. The project has been created a system that can monitor and predict the flood used a wireless sensor network comprised of a sensor, a transceiver to transmit data, and a computational device. Water level, temperature, and velocity data were all important in predicting flood disasters. On top of that, this project was focusing on water level, temperature, humidity, and water raindrops. The working principle of this mechanism was as follows: sensors collected flood parameters at a specific location, then these parameters were transmitted from nodes to the base station. The system would compare the measured parameter to the probability of a flood disaster that we had set. If the measured values exceed the threshold values, the IoT application sends an alert message and activates an alarm, alerting the targeted area. As a result, the data gathered had been saved in this database system and used in the future whenever the sensor reads the water level.

ABSTRAK

Pembangunan Sistem Pemantauan Banjir Dengan Sistem Makluman Berdasarkan Pengumpulan Data Melalui Aplikasi Iot merupakan projek menggunakan rangkaian penderia tanpa wayar untuk mengumpul data banjir di sekitar Sungai Melaka Sentral. Projek ini telah mencipta sistem yang boleh memantau dan meramalkan banjir menggunakan rangkaian sensor wayarles yang terdiri daripada sensor, transceiver untuk menghantar data, dan peranti pengiraan. Data paras air, suhu dan halaju semuanya penting dalam meramalkan bencana banjir. Selain itu, projek ini memberi tumpuan kepada paras air, suhu, kelembapan dan titisan air hujan. Prinsip kerja mekanisme ini adalah seperti berikut: sensor mengumpul parameter banjir di lokasi tertentu, kemudian parameter ini dihantar dari nod ke stesen pangkalan. Sistem akan membandingkan parameter yang diukur dengan kebarangkalian bencana banjir yang telah kami tetapkan. Jika nilai yang diukur melebihi nilai ambang, aplikasi IoT menghantar mesej amaran dan mengaktifkan penggera, memberi amaran kepada kawasan yang disasarkan. Akibatnya, data yang dikumpul telah disimpan dalam sistem pangkalan data ini dan digunakan pada masa hadapan apabila sensor membaca paras air.

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CHAPTER 1

INTRODUCTION

1.1 Background

Flooding is a well-known natural calamity. When the water level in dams, river beds, and other bodies of water suddenly rises, the surrounding areas suffer greatly. It has a serious harmful impact on both our environment and living organisms. In Malaysia,flooding most occur due to heavy rainfall especially during monsoon season yet it was regarded as a common disaster in Malaysia. [1] Communities in the low-lying area are at high risk of flooding-related losses. This natural disaster is unavoidable and it can be happened without any sign, but with preparation it might can be avoid. As a result, emergency notifications of the water level situation in the riverbed under varied conditions are crucial in these scenarios.[2][3]

Flood monitoring has been used in Malaysia since we have experienced 51 natural disasters between 1998 and 2018.[1] Malaysia already have the system that can be used to detect flood such as early warning system yet the recent tragedy happened in Kuala Lumpur and Selangor brought a huge impact for us to improve the system. Therefore, a lot of initiative that Government and Department of Irrigation and Drainage, Malaysia have done in order to improve the flood warning system in Malaysia.

Flood monitoring systems are one of the technologies that can be used to reduce the number of flood fatalities, particularly in east coast states such as Kelantan, Terengganu, and Pahang. The alarm system can be integrated into the system to notify the public. Flood authorities are working hard to prevent fatalities and flood monitoring system was one such system. GSM and wifi-module was the system that necessitates the use of communication services.[1] This system's function was to measured the river's water level, and when the water level exceeds a certain threshold, a notification had been sent to the user. This system was created specifically for rescuer team and also for victim during their evacuation.

Research on this system has increased every year when many organizations try to find the best ways preventing floods. Most of the research on this project was using wireless sensor network, ultrasonic sensor, Arduino and GSM model to performed the warning SMS whether for authorities or for the victims nearest the affecting area. Moreover, it also can be found that other researcher used wifi-module that functioning similarly as GSM module. Consequently, in a recent years, the performance of flood monitoring and warning system has been continuously improved.[4], [5] However, most systems prioritize sending messages to victims using SMS and the factor taken into account for each flood incident that occurs was only the height of the water level in the affected area. In fact, the data collected was limited to the time of the incident only. As a result, the data cannot be reused for study by the authorities if any flood events occur suddenly.

The existing technology used to monitor and alert floods was divided into two categories: remote sensing data and local sensing data. In remote sensing data, satellites are typically used to record cloud images and predict rain formation. By installing sensor nodes along the river, local sensing data will be used to measure flood parameters in the study area, which was near the river. Although most industries are now making significant improvements in flood monitoring and warning systems, educational institution improvements must be accelerated in order to produce more disaster control systems, particularly floods, among the younger generation.[4], [5] Following that, Malaysia can produce numerous systems to address any problem that arises.

The goal of this project was to create a flood monitoring system and alerting system for the area near river to be monitor using local sensing data via a microcontroller system and the data that can be used for future record. The system can also measure flood parameters like water level, raindrops, temnperature and humidity, but for the time being, the project is more focused on storing the data taken each time the sensor reads the data for future use. This parameter had been displayed to the user in the controlled station and also to the society used an application. The user could view the current flood status and water level in the surrounding area. When the parameter reading exceeds the threshold valued indicating dangerous flood conditions, the alarm would sounded and a warning had been sent to the user.

1.2 Problem Statement

In the recent few decades, there have been several major floods. The main causes of flooding in Malaysia are increased run off rates due to urbanisation, loss of flood storage due to development extending and taking over flood plains and drainage corridors, inadequate drainage systems or failure of localised drainage improvement works extended insufficiently downstream, construction at bridges and culverts that are either undersized or partially blocked by debris buildup or other causes, and siltation in waterway channels.[6] Therefore it was hard to control the incoming flood because of numerous barrier in the system construction. However, in order to make improvement for the system the cost of equipment uses should be considered and data of everyday reading must be collected for future used..

Another important issue that people encounter during floods is that they have no idea where the incoming flood happened or which road to take to get to a new area. Because nobody knows what was going on in such a setting. If there existed a mechanism that could warn people ahead of time of a major calamity, lives could be saved, because flooding ruins the telecommunications system as well. In some cases, victims have already been warned by authorities about the flood disaster, but due to a lack of detailed information on flood scenarios, when the flood begins, and when it was fully flooded, residents disregard the information. A previous project conducted a study for a flood monitoring and alerting system, but the system design did not include data collection and instead only measured various parameters.

Therefore, we need a significantly quicker and more sophisticated technique to alert the public before the destruction takes place. Incoming flood warnings need to be highlighted ahead of time for their high quality and accuracy. As a result, there is a hole that needs filling in order to realise this objective, especially when implemented in the business world. At this juncture, both the system's performance and the source of the disruption can be pinpointed. Flood characteristics such as water level had been measured in real time by this project's low-cost monitoring and alarm system. Additionally, the user had been informed of the flooding status and the historical data had been preserved and recorded for future used

1.3 Project Objective

The following are the objectives of this project:

a) To develop flood monitoring system complete with alerting system using Arduino

b) To integrate the system with IoT for data collection that can be saved for future use

c) Analyze the performance of the system based on consistency and the ability of the system to provide the information.

1.4 Scope of Project

The following are the scope of the project:

1. Identify the parameter : water level, raindrops, temperature and humidity to detect flood nearby the river that can send the data to Blynk. It can be monitor lively and used in public with email and message notification. The comparison between the simulation and hardware setup will be performed.
2. The proposed flood monitoring and alerting system had been validated and simulated used real-time sensor data. Experiments are conducted over distances of up to 800 mm. The performance of the system with the proposed techniques was analysed and compared to existing methods using Blynk. The system data is then saved in the cloud and further data collection can be export using excel. Furthermore, the collected data can be made available to the general public.

Areas close to the river in Melaka Sentral are the primary focus of this development project. Keeping tabs on the water level required constant data collection and updates. The project uses a wifi-module to send out Blynk alerts to users if there was a flood. The authorities will also offer the current state of the impacted area, with three conditions indicated as safe, warning, and flood alert.

System construction and coding are the most crucial steps. Simulation and real-time hardware enable model identification. The monitoring and alerting system would not measured flood prevention solutions. The flood status and water level would also been recorded. Install the system near the house on a lower soil surface where floodwater enters first. However, the system device needs a suitable position. Then the user receives the reading result.

1.5 Project Outline

The project is structured as follows:

Chapter 2 contains a review of the literature on flood monitoring and alerting system technologies. The investigation begins with an examination of how previous researchers have modelled the system. The techniques for modelling the monitoring and alerting system are also discussed. Following that, the control techniques used are described. The discussion was divided into several categories in order to investigate the accomplishments. This chapter concludes with a system summary.

Chapter 3 was about the modelling of a flood monitoring and alerting system. The parameter using sensor will elaborate the modelling, and the performance will be analysed using Blynk. This chapter also includes the experimental setup for data collection. The methods for determining flood parameters using an ultrasonic sensor's mathematical formula are thoroughly explained. Following that, for future works, a comparison of simulations and experiments will be performed for validation. Furthermore, the preliminary design procedure of the flood monitoring and alerting system that will be used in the design of the proposed monitoring technique was included.

In chapter 4, three proposed experiments are described. The determination of the parameters involved in the design of these systems is discussed in detail. Furthermore, after the hardware setup established via the Flood Live Monitoring analysis in the Blynk, the stability of the system was shown in this chapter in the future. The proposed design's flood monitoring and alerting system results are demonstrated and analysed through simulation, followed by experimental work in the future. The effectiveness of these techniques is evaluated under a variety of conditions. First, simulation and experiments are carried out based on various references such as circuit construction, equipment used, and how to interface data from Arduino to Blynk. Following that, the results with the threshold variation are also provided in this chapter for the purpose of analysing the system's robustness.

In chapter 5, the project findings and conclusions are summarised. Recommendations for future work are also provided.