Modelling and implementation of IoT based Flood Observatory System (FOS)

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Keywords: Flood observatory system, flood migration plan, monitoring system

ABSTRACT – Flash and seasonal flooding events have always been a concern in many countries around the world, particularly in the tropical region with heavy rain falls. Traditionally, flood monitoring and forecasting are restricted to events recorded in the flood-prone regions that are based on a dedicated non-centralized local-scale system. Such a system is detailed to local data (one-off) only and lack of knowledge to manage flooding events in a large-scale application by the relevant authorities. Thus, there is always a demanding urge to set an effective flood observatory system in line with the increasingly changing environment and growing population located in these flood-prone regions. The key focus area of implementation is to prompt the detection to alert relevant authorities and public in the flood-prone region as events are recorded in the system through IoT platform. An efficient and detailed characterization of flooding model linked to a centralized system would be an asset for relevant authorities to execute rescue and resources planning affords. The collected data is then further used in the analysis and evaluation of flood prediction system for flood mitigation plans by relevant authorities and research community

1. INTRODUCTION

In this modern era, few technologies can be used to make a system that can manage the flooding events. [5-10] The key focus area of implementation is to prompt the detection to alerts the relevant authorities and the public in the flood-prone region as events are recorded in a system through IoT platform. An efficient and detailed characterization of flooding model linked to a centralized system would be an asset for relevant authorities to execute rescue and resources planning affords. The collected data is then further used in the analysis and evaluation of flood prediction system for flood migration plans by relevant authorities and research community.

2. OPERATION OF FLOOD OBSERVATORY SYSTEM

The system operates with sensors that are located in the flood-prone region such as river bank or any location where the water level measurement is essential. As the water level changes, the sensors will detect the water level and the data or information will be sent to the controller connected to each sensor. Each controller is given a unique code obtained from the Blynk application, the identity of each controller can be traced and tracked. The information obtained will be sent to the cloud and a graph will be plotted where the decision making takes place by the authorities. At the same time, the controller for each sensor will do a simple comparison to the value inserted to indicate the water level condition. The controller will then trigger the controller connected to the display and warning unit to send the warning.

2.1 System operation

Once the microcontroller receives the information from the sensors, it will compute some simple comparison to obtain the properties of the water level as shown in Table 1.

Table 1 Properties of Water Level

Water Level	Description
Safe level	The water level is not higher than normal level
Warning level	The water level is higher than normal level
Danger Level	The water level is approaching flooding level

Apart from the comparison, the results displayed will be also in the form of warning. The warning will be displayed by another controller connected to the warning system as shown in Table 2. The input of this controller will be triggered by the controller connected to the sensors via the internet. The proposed unit is to be placed in a public access area where the flood forecast can be visualized by the public for safety measures.

Table 2 Display and Warning Unit

Water Level	Warning
Safe level	Dim green LED
Warning level	Bright yellow LED
Danger Level	Bright red LED with alarm

2.1 System result

Figure 1 Graph in Blynk application

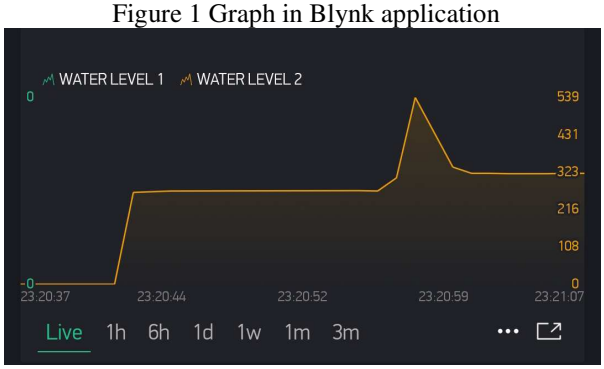
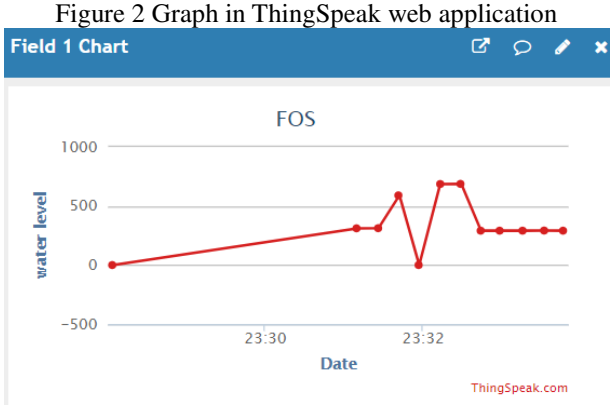


Figure 2 Graph in ThingSpeak web application



The results shown in both Figure 1 and 2 are obtained from the sensor unit. The changes in the graph indicate the changes in the water level and it is plotted in real-time. Both data can be exported and used for offline research. When the water level increases, the distance between water and sensor will decrease, this will indicate that the water level is increasing. When this happens, the water level in the graph will increase.

3. CONCLUSION

The Flood Observatory System is designed to be an intelligent system to send real-time water level information from flood-prone region to the cloud platform. The Flood Observatory System is a standalone unit that requires no human intervention. Once connected to the internet, the system will run on its own to collect data and send them to the cloud platform. The system designed is capable of plotting a real-time graph and display it on the phone and web-based platform for easy access. The data received will be stored in the cloud and can be used for future research or flood mitigation plans by the authorities. The Flood Observatory System will be linked to a display and warning system that will display the water level and send out a warning as required. The system helps to minimize the damage of flood in flood-prone region.

ACKNOWLEDGMENT

Authors would like to thank Universiti Teknikal Malaysia Melaka and all other organization for their sincere encouragement, support, and assistance in the development of this study. The authors would like to thank all parties that are involved directly or indirectly in improving and completing this research

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