PERFORMANCE ANALYSIS OF VARIOUS WATER LEVEL DETECTOR SENSOR FOR FLOOD WARNING SYSTEM

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This report is submitted in partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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To my beloved mother and father, my dearest brothers and sisters, my beloved supervisor and all my lecturers and finally all my good friends for their encouragement and supports through my journey of doing project and education.

ABSTRACT

Flood is the most damaging natural disaster. It is crucial to develop a flood warning system to reduce the flood risk. Getting a quick feedback regarding the rise of the water level would help the surrounding area to take early precaution such as moving away quickly to a safer area or higher place. Thus, this project is about designing a system that can measure the level of water rising at the potential flooded area. Ultrasonic level model is used as the methodology in this project. The Ultrasonic sensor, Arduino Uno, ESP8266 WIFI module are used as hardware in the system. Arduino Uno is used to collect the data from the Ultrasonic sensor and transmit the data to ESP8266 WIFI module to show the water rising graph in ThingSpeak which is known as one of the IoT cloud. According to the water level, the tower light will signal it which is green for low water level, orange for moderate and red for dangerously high. QR codes specific to the areas are available for scanning which shows the water level of that area through the Flood Monitoring mobile application.

ABSTRAK

Banjir adalah salah satu bencana alam yang berbahaya dan membawa banyak kerosakan. Oleh itu, sistem amaran awal banjir penting untuk mengurangkan risiko banjir. Sistem ini akan memudahkan untuk mendapat amaran yang cepat mengenai kenaikan paras air yang boleh membantu kawasan sekitar untuk mengambil langkah berjaga-jaga awal seperti bergerak cepat ke kawasan yang lebih selamat atau tempat yang lebih tinggi. Oleh itu, projek ini adalah mengenai membina sistem yang dapat mengukur tahap peningkatan air banjir di kawasan yang berpotensi untuk banjir. Model tahap ultrasonik digunakan sebagai metodologi dalam projek ini. Sensor ultrasonik, Arduino Uno, ESP8266 WIFI modul digunakan sebagai perkakasan dalam sistem. Arduino Uno digunakan untuk mengumpul data dari sensor ultrasonik dan menghantar data ke modul ESP8266 WIFI untuk menunjukkan graf kenaikan air di Thingspeak yang dikenali sebagai salah satu 'IoT Cloud'. Mengikut paras air, lampu "towerlight" akan memberi isyarat iaitu hijau untuk tahap air rendah, oren untuk sederhana dan merah untuk berbahaya tinggi. Kod QR khusus untuk kawasan-kawasan tertentu disediakan untuk pengimbasan yang menunjukkan tahap air kawasan itu melalui aplikasi "Flood Monitoring".

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LIST OF SYMBOLS AND ABBREVIATIONS

For examples:

WIFI	:	Wireless Fidelity
JPS	:	Jabatan Pengaliran Sungai
JKR	:	Jabatan Kerja Raya
IoT	:	Internet of Thing
PVC	:	Polyvinyl Chloride
VSM	:	Virtual System Modelling
ESP8266	:	Wifi Module
IOX	:	Ionospheric Osculation Experiment
DC	:	Direct Current
AC	:	Alternating Current
WSN	:	Wireless Sensor Network
SCADA	:	Supervisory Control and Data Acquisition

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CHAPTER 1

INTRODUCTION

This chapter discusses about the introduction of the project and the project background. It outlines the problem statements, project questions, project objectives, project scopes, project contributions and the thesis organization of this project.

1.1 Introduction

Malaysia has an equatorial climate with constant high temperatures and a high relative humidity. The climate is influenced by the northeast and southwest monsoons. The former, prevailing between November and February, brings heavy rainfall as much as 600 mm in 24 hours in extreme cases [1] predominantly to the east coast of Peninsular Malaysia and to Sabah and Sarawak. Rain bearing winds also come with the southwest monsoon from April to September though rainfalls during these periods are generally less than during the northeast monsoon. There are, in addition, two transitional periods between the monsoons (inter monsoon) when convectional thunderstorms are common. The annual average rainfall is 2420 mm for Peninsular Malaysia, 2630 mm for Sabah and 3830 mm for Sarawak, with

heavier precipitation recorded in the east coast of Peninsular Malaysia and the coastal regions of Sabah and Sarawak.

There are two basic types of rainfall causing flooding viz, moderate intensity, long duration rainfall covering a wide area; and high intensity, short duration localized rainfall [2]. In addition, flood records indicate that there is a seasonal pattern of flood occurrences. The east coast and the southern part of Peninsular Malaysia, Sabah and Sarawak are mainly affected by floods during December to January when the northeast monsoon is prevailing. Flooding occurs due to widespread prolonged heavy rainfall resulting in a large concentration of runoff which is very much more than the capacities of streams and rivers. Extensive areas are often inundated. The west coast of Peninsular Malaysia on the other hand is mainly affected from September to November during the winter and monsoon period when convectional thunderstorms become prevalent. Such storms bring short but very intense rainfall which severely overloads the drainage systems, causing localized “flash” floods.

Following a news article from NST online on the 5th of November 2017 regarding the latest flood disaster in Penang, Kedah and Perak which has caused a national chaos, and it has been identified the flood was due to continuous heavy rain [3]. It was reported that in Penang, the increasing number of casualties due to flood were predominantly septuagenarian who were failed to get evacuated on time. The flood which has reached up to waist line has affected major roads in Penang causing heavy traffic and as well as Penang Government Hospital. Where else in Kedah, it was reported that schools were underwater, but the Education Department has yet to issue any order for the schools to close. However, the evacuation process was done efficiently as stated by the Civil Defence Force (APM) which reports that 336 people were evacuated in Kuala Muda district while 22 people were evacuated in Yan. This is understood that lesser number of victims as compared to Penang which has caused the evacuation process faster and smoother. The report also says that a group of hikers were stranded in a recreation area as they are unable to cross the river due to strong currents.

Figure 1.1: The area normally affected by flood

Figure 1.2: Flood 2017 in Rantau Panjang, Terengganu

Figure 1.3: Flood 2017 in Kota Bharu, Kelantan

Figure 1.4: Evacuation During Flood at Penang, 2017

There are three levels of disaster management authorities in Malaysia, the first is the National Disaster Management and Relief Committee, followed by the State Disaster Management and Relief Committee, and lastly the District Disaster Management and Relief Committee (DDMRC) [4]. However, there is often lack of coordination between these three levels of management committees. DDMRCs are represented by