UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DEVELOPMENT OF REAL-TIME FLASH FLOOD ALERT SYSTEM IN SHOPPING MALL PARKING LOT

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical and Electronic Engineering Technology (Telecommunication) with Honours.

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF REAL-TIME FLASH FLOOD ALERT SYSTEM IN SHOPPING MALL PARKING LOT

Sesi Pengajian: 2019

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I hereby, declared this report entitled DEVELOPMENT OF REAL-TIME FLASH FLOOD ALERT SYSTEM IN SHOPPING MALL PARKING LOT is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Electric and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical and Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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Co-supervisor: Puan Rosziana Binti Hashim

ABSTRAK

This project entitles Real-Time Flash Flood Alert System in Shopping Mall Parking Lots with IoT. Flash flood is a regular natural disaster which happens during the monsoon season. Flood disasters have a bad effect on all living things. The effect from flood disasters is damage to property, destruction of plants, and the condition of the flood victims. Since this is a hazardous disaster, it requires an efficient warning system to communicate to the public on an early stage so that preparatory measures will face flooding as well as security can be taken to prevent any accidents happened. The frequent area occurrence flash flood such as in Kuala Lumpur is a target for this project. The design goal of this project is to provide an improvement of the safety for users at shopping mall when occurs of flash flooding at parking lots. Next, the real-time system is used in this project are capable of monitoring sudden floods in parking lots, then it also to avoiding water damage inside the vehicle; personal alert to the user through their mobile phone. This project is controlled by Arduino Uno R3 ATmega and PushBullet applcation to send data measured via Short Message Service (SMS) to the users have registered the phone numbers into the system. Besides, this system is capable to envision the timing before flash flood and detect a maximum water level at 1.5 centimeters height. The Real-Time Flash Flood Alert System in Shopping Mall Parking Lots with IoT is based on Arduino Uno as microcontroller and the measurement of the water level is processed by water level sensor.

ABSTRACT

Projek ini bertajuk Sistem Peringatan Banjir Kilat Masa Nyata di Tempat Letak Kereta di Pusat Beli-belah dengan aplikasi IoT. Banjir adalah bencana alam semula jadi yang berlaku semasa musim tengkujuh dan mempunyai banyak kesan buruk terhadap pelbagai keadaan. Kesan daripada bencana banjir ialah kerosakan harta benda, kemusnahan tumbuh-tumbuhan, dan mangsa banjir. Bencana ini ialah benca yang berbahaya, ia memerlukan sistem amaran yang cekap untuk berkomunikasi dengan orang awam pada peringkat awal supaya langkah-langkah persediaan menghadapi banjir serta keselamatan boleh diambil untuk mengelakkan sebarang kemalangan atau kemusnahan yang berlaku. Kejadian banjir kilat sering berlaku di Pusat Bandaraya Kuala Lumpur oleh kerana itu sasaran projek ini tertumpu kepada kawasan sekitar dan berhampiran dengan Pusat Bandaraya Kuala Lumpur. Matlamat projek ini adalah untuk meningkatan keselamatan pengguna di pusat membeli-belah ketika terjadinya banjir kilat di tempat parkir kereta. Seterusnya, sistem masa nyata yang digunakan di dalam projek ini mampu mengawasi banjir dan mampu untuk mengelakkan kerosakan kederaan dengan menghantar amaran peribadi kepada pengguna melalui telefon bimbit. Projek ini dikawal oleh Arduino Uno dan aplikasi PushBullet yang di gunakan untuk menghantar data yang diambil melalui Sistem Pesanan Ringkas kepada pengguna. Selain itu, sistem ini memberi peringatan kepada pengguna apabila mengesan paras air pada ketinggian maksima 1.5 sentimeter. Sistem Amaran Banjir Kilat Masa Nyata di Tempat Letak Kereta Pusat Beli-belah dengan aplikasi IoT ialah sebuah projek yang berdasarkan Arduino Uno sebagai mikrokontroler dan pengukuran paras air diproses oleh pengukur automatik paras air.

DEDICATION

I dedicated this project to my beloved parents who have always been my nearest and educated me to reach this level. I am also wanted to say a thank you to my Supervisor who always surrounded me with positive, Co-supervisor, and all my housemates who have encouraged, guided, motivates me to complete this research.

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V	-	Voltage
cm	-	Centimeter
s	-	Second

LIST OF ABBREVIATIONS

Apps	Application
IoT	Internet of Think
Wi-Fi	Wireless Fidelity
SMS	Short Message Service
MCU	Micro Controller Unit
ROM	Read-Only Memory
RAM	Random Access Memory
EPROM	Erasable Programmable Read-Only Memory
EEPROM	Electrically Erasable Programmable Read-Only Memory
GSM	Global System for Mobile
ADC	Analog Digital Converter
USSD	Unstructured Supplementary Service Data
FAX	Facsimile
CSD	Circuit Switched Data
MIC	Minimum Inhibitory Concentration
TX	Transmitter Channel
RX	Receiver Channel
LED	Light Emitting Diode

CHAPTER 1

INTRODUCTION

1.1 Background

There are some researches about the previous project before starting with this project. Star Publication report that in Malaysia, the flood is a regular natural disaster that happens during the monsoon season. Flood disasters have a bad effect on all living things. The effect of flood disasters is damage to property, destruction of plants, and the condition of the flood victims. Since this is a hazardous disaster, it requires an efficient warning system to communicate to the public on an early stage so that preparatory measures will face flooding, as well as security, that can be taken to prevent any accidents happened.

A Development of Real-Time Flash Flood Alert System in Shopping Mall Parking Lot is a system that will prevent shopping mall user's car traps in flash floods at parking lots. This project offers an efficient solution at a lower cost of a system and easier for future technologies. This project is offered a system that easier to apply, inexpensive maintenance, and long-lasting duration for one system.

This project has several element components which consist of Water Level Sensor, Wi-Fi Module, IoT platform, and User Mobile Phone. The water level sensor used to monitor and regulate water levels within a contained space. Then, it also to obtain the water height. Many methods have been used to get data for water level, the conventional method by flood board. This project is not suitable to use the conventional method, because the conventional method is giving late information to the users. The

method is used in this system is more efficient because is based automatic sensor to measuring the level of water at the affected area. Besides, the wireless system function as a communication medium with the Pushbullet application and the IoT platform. While Arduino UNO board works as a microcontroller which all the collected data from the sensor sent to the IoT platform for monitoring. Next, the hardware component that has been using in this project is the Wi-Fi module. Wi-Fi module will communicate with IoT to generate the data that has been monitored, and triggered the alert notification through short message service (SMS) with the information of the parking area and inform authorities (user) about the flood level when the threshold has been reached the limit.

This paper research about flood warning systems and related issues and proposes an effective flood alert system to overcome the previous project studied systems disadvantages.

1.2 Problem Statement

The geographical location of Malaysia becomes a source for natural disasters of monsoonal floods and flash floods. Malaysia's terrestrial also is simply affected by the Asian Monsoon. During the late half of May or early June to September, prevails the Southwest Monsoon and it causes the intense rainfall. However, the Northeast Monsoon is blowing from November to March, the heavy rain over most of the main cities and towns in Malaysia, such as Kuala Lumpur.

This project aims to improve the flood detector system. In Malaysia, the current flood detector system is late to given the flood information to the road user and due to the late information given, the majority of the road user cannot avoid trapping in the flash

flood. However, by implementing this project, the system will be improved and can give an alert faster and accurate when the flash flood occurs in a place.

Other than that, using the manual flood detector system where it only read the flood level through the flood board at the river. Hence, this project is used Water Level Sensor which this programmable sensor to monitored and obtain the data of the water height from the distance of the water surface.

To get the information regarding flash flood, the previous version of the flood detector system only used the radio or information board location at the side of the road. This project will be more efficient to the user where users will receive the information about the flash flood through the short message service (SMS). In this case, Pushbullet application will be used to send information.

Besides, the aim of the internet and connected devices is to allow people to communicate with each other and to access the online data and for all the processes. While the purpose of IoT is to analyze and create the desired outcomes in real-time data. In this project, using the Wi-Fi module system into a flood alert system make it easier for monitoring the water level in real-time and the input Arduino Uno will communicate with the Wi-Fi module and IoT platform until the data at the sensor reach at the maximum water level measurement four centimeters. The communication process with the mobile phone network is when the data from the IoT platform is reaching the maximum value and triggered then sent to the Pushbullet application.

Lastly, the development of this project is to allow the user (authorities) to monitor the water level easily by using a mobile phone. In other word, to create a user-friendly interface that can be used to monitor the water level.

1.3 Objective

The main objective of this project is:

i. To develop an alert system that will immediately warn and notify the user about the flash flood that occurs in a shopping mall parking lot.

ii. To interface the water level sensor and warning alert system via Arduino Uno by using Wi-Fi Module and Pushbullet application.

iii. To create a user-friendly interface on the mobile phone to monitor the water level at the parking lot in the shopping mall.

1.4 Project Scope

This project is limited to the following that could be focused to achieve the stated objective. To achieve that stated objective, the work scope is listed as below;

i. Water Level Sensor

Responsible for measuring flood water levels and communicate with Wi-Fi Module and Pushbullet application. It collects and converts the analog data from the Water Level Sensor. This sensor is to observe the water height and measure the distance between the water surfaces.

ii. Arduino Uno

The main component as a microcontroller. Collected all data from the sensor and sent for processing through the Wi-Fi module.

iii. Wi-Fi Module

Medium with the IoT platform, ThingSpeak and Mobile Phone.

iv. Pushbullet Application

The application sends a notification through short system service (SMS) with the information of the parking area and informs authorities (user) when the flood level threshold has been reached.