UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Flood Disaster Indicator of Water Level Monitoring System using Internet of Things (IoT)

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

by

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ABSTRAK

Banjir adalah bahaya alam yang paling merosakkan di Malaysia.dan memberikan impak yang tinggi. Ia menjadi isu kritikal dan penduduk hidup dengan kecemasan akibat masalah banjir yang dihadapi. Projek ini direka untuk menghasilkan penunjuk bencana banjir yang berkesan menggunakan teknologi Teknologi Internet (IoT), yang merupakan paras air kawasan tertentu dikesan dan diukur tanpa kehadiran fizikal ke kawasan itu untuk mengukurnya. Sensor ultrasonik mengesan paras air. Nilai atau data yang dikesan mengaktifkan Arduino Mega. Data masa nyata dihantar ke platform IoT melalui modul Wi-Fi ESP8266. Diod Pemancar Cahaya (LED) mempunyai perubahan dalam warna apabila pelbagai jarak yang dikesan.. Paparan Liquid Crystal (LCD) menunjukkan bacaan jarak yang dikesan berhampiran sensor ultrasonik. Aplikasi Blynk adalah platform bagi pengguna mendapatkan maklumat tahap air masa nyata dan menterjemahkan mesej amaran kepada pengguna. Pengguna dapat memantau dan mematuhi paras air secara langsung dari telefon bimbit. Buzzer menghasilkan bunyi apabila paras air berada dalam keadaan berisiko tinggi. Model ini menentukan paras air menggunakan sensor ultrasonik, maka ia menganalisis data yang dikumpul dan menentukan jenis bahaya yang ada. Sebagai kesimpulan, penunjuk bencana banjir bertindak sebagai sistem amaran untuk tindakan pencegahan bagi mangsa. Dengan menggunakan penunjuk bencana banjir sistem pemantauan air, penduduk mempunyai notis awal, supaya mereka dapat mencegah kehilangan nyawa, trauma dari bencana dan harta benda dari kerosakan.

ABSTRACT

Flood is the most destructive natural hazards experienced in Malaysia. Floods give a high impact to the population that can be the critical issues and residents live with anxiety due to the flooding problem faced. This project is designed to produce an effective flood disaster indicator using Internet of Things (IoT) technology, which is the water level of the certain area is detected and measured without the physical presence to the area to measure it. The ultrasonic sensor detects the water level, in which the distance from it. The detected value or data activates the Arduino Mega. At the same time, the real time data is sent to the IoT platform via the ESP8266 Wi-Fi module. The Light Emitting Diode (LED) has changes in color when different range of distance detected from the ultrasonic sensor. The Liquid Crystal Display (LCD) shows the reading of the detected distance near to the ultrasonic sensor. The Blynk application is the platform for the user to obtain the real time water level information and translates the alert message to users. The user is able to monitor and observe the water level directly from mobile phones. The buzzer produces sound when water level is in high-risk state. The model determines the water level using ultrasonic sensor, then it analyzes the collected data and determine the type of danger present. As a conclusion, flood disaster indicator acts as a alerting system of precautionary action for the victims. With the use of flood disaster indicator of water monitoring system, residents have the advance notice, so that they are able to prevent loss of lives, trauma from disaster and property from damage.

DEDICATION

To my beloved parents, Lim Kian Keong and Toh Poh Yean thank you for gicing the continuous moral support. Besides that, I would like to dedicate this project to my supervisor and co-supervisor, Puan Wan Haszerila binti Wan Hassan and Encik Mohd Faizal Bin Zulkifli who assist and guide me to develop this project. I also want to thank to all my lectures and friends that help me in developing and completing this project.

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LIST OF SYMBOLS

g - Grams

Gb/s - Giga bit per second

GHz - Gigahertz

kB - Kilobytes

kb/s - Kilo bit per second

kHz - Kilohertz

mA - Mili Ampere

mHz - Megahertz

mm - milimetre

V - Voltage

LIST OF ABBREVIATIONS

CCTV	Closed-Circuit Television
GSM	Global System for Mobile communication
GPS	Global Positioning System
IEEE	Institute of Electrical and Electronics Engineers
IoT	Internet of Things
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PAN	Personal Area Network
SMS	Short Message Service

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter is studied on the project background, problem statement, project objectives, project scope and project outline of the project. In this project, some introduction about flood disaster indicator and water level monitoring system using Internet of Things (IoT) is presented.

1.2 Project Background

Nowadays, the IoT paradigm is given rise as there is the advancement in electronics technologies and computing. The IoT is in the act of the coordinator that operates some sort of information exchange among the objects surrounding the environment by having the connections between them. The IoT has the function to serve the users' needs in the organized way. (Samaniego & Deters, 2016)It is also and binds the power of computation to transfer information about the environments. The actual time operating system, embedded system program and network system program are the mode that been carried out in these mechanisms.

The field of environmental monitoring is one of the fast influences of IoT. This is especially such as in disaster management, early warning system and environmental data analytics. (Kumar, Zaveri, & Choksi, 2017) Another notable topic in a monitoring of the environment is water level sustainability and monitoring. The water level monitoring is the foremost beneficial system that encountered frequently with many challenges from the point of view of consumer. For instance, water level monitoring system is important in the case of flood indicator. This is because it gives an initial warning to aware nearby citizens in order to carry out some actions. The IoT based water level monitoring system in actual time framework is studied in this project. The integrated sensory system is used as our proposed method, which is using low cost. It enables the inner controlling of water quantity. The solution that proposed is a low cost solution with integrated sensory system. It allows inner monitoring of water quantity. The appropriate data and information are transferred to a mobile application through the Internet and is received by users using user terminal. The web based remote dashboard is used to display the result of the water level measurement. (Saarikko, Westergren, & Blomquist, 2017)

1.3 Problem Statement

Flood is the most destructive natural hazards experienced in Malaysia. In Malaysia, flooding occurred in two states which are Kelantan and Terengganu due to the seasonal heavy continuous rains from 26 December 2016. The floods temporarily displaced about 25,000 victims. It is rendered some villages inaccessible due to blocked roads and damaged bridges. Besides, flooding occurred also in six states, which are Johor, Kelantan, Pahang, Perak, Selangor and Sabah after 23 January 2017. The waters rose 1.5 meters in certain areas of Johor and Pahang. The total number of influenced citizens was 14,903 as of 27 January 2017. Based on the study, the main cause of floods is improper drainage condition. However, this project is based on unexpected situation flood disaster is taken place. Floods give a high impact to the population that can be the critical issues and residents live with anxiety due to the flooding problem faced. This is because of no advance notice about the floods that can cause accidents.

1.4 Project Objectives

The objectives of this project are as below:

i. To produce an effective flood disaster indicator using IoT technology.
ii. To investigate the performance of developed system.
iii. To explore the IoT application with respect to monitoring system.

1.5 Project Scope

This project is about implementing the alert system, which is used to alert people in the early stage in case the safety precautions steps can be carried out to avoid any mishaps. The water level monitoring system is developed using the Internet of Things (IoT) technology to measure the water level in real time. The ultrasonic sensor work by transmitting the sound wave of 40 kHz and measure the water level. The measured water level is sent to microcontroller unit. Furthermore, this project scope covered the understanding about the Arduino Mega which is used as the main component in this project. Arduino Mega microcontroller is interfaced to the control circuit. It contains the software component through which the apparatuses are controlled and monitored. It works along with the other input and output components such as ultrasonic sensor, Light Crystal Display (LCD), Light Emitting Diode (LED) and IoT platform. (Barbon, Margolis, Palumbo, Raimondi, & Weldin, 2016)The C programming language is required for this water level monitoring system. The system is needed to order and execute. In this project, the power bank can be utilized as the primary supply to all components operates. The cloud server is configured as data repository. The dimension of the level of water are showed in the Blynk application by using the mobile phone or tablet.

1.6 Project Outline

There are five chapters highlighted in this project of title of flood disaster indicator of water level monitoring system using IoT.

Chapter 1 presents about how the possibility of this project created. This section contains purpose of the project, issue explanation and extent of the project.

Chapter 2 contains the writing survey on hypothetical ideas connected in this project and some reviews of the past projects that have been finished by others. The part closes the foundation investigation of Wi-Fi and Arduino Mega Microcontroller.

Chapter 3 contains the equipment plan of the project. It is mostly about the development of the project, which includes of block diagram planning and flowchart of the project to be carried out. This section examines on interfacing gadget on this project by utilizing C programming. The architectural design and expected results is fully discussed in this chapter.

Chapter 4 contains the result and discussion of the project. The software implementation and hardware implementation are carried out. Some relevant software is needed in completing the project. The results of designing and implementing are collected and tabulated. All these results are further explained and discussed.

Chapter 5 is the ending part of the project. It is needed to conclude and summarize the information completing this project. It is important to determine whether the objectives are achieved.