FLOOD MONITORING SYSTEM

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PROJEK SARJANA MUDA II

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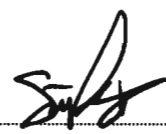
Signature : 

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Dedicated to my beloved family especially my father and mother, lecturer, and also to all my friends

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ABSTRACT

This mini project entitles Flood Monitoring System. The purpose of this project is to improve road user safety when occurrence of flash flood. Our target for this project is in those areas that frequently occurrence flash flood especially in Kuala Lumpur. Nowadays, the road user will be trapped in flash flood because of the information about flash flood always delay. Now, this project gives road user alternative to provide them from the flash flood. Firstly, the water level detector will be placed into the river to detect the level of river water. When the water level becomes rise, the reading of water level of river will be show at monitor. If the water level rises in maximum, the GSM Modem will send sms to authority to tell maximum level of river water. Warning lamp will on according to that river water level state. There is 3 states which are normal, precaution and danger. Green light represent normal state, yellow light represent precaution and red light represent danger. Before this, flood detector system works manually where it only detects the flood by using river water level detection circuit only. But for this project, the water level in the river can be monitored by using Data Acquisition (DAQ) interface to computer. This helps the authority to control or maintenance the situation. This system will give more advantage to protect our road users.

ABSTRAK

Flood Monitoring System merupakan sebuah projek yang dapat menambah baik keselamatan pengguna jalan raya apabila berlakunya banjir kilat. Fokus projek ini tertumpu kepada kawasn yang sering berlakunya banjir kilat terutamanya Kuala Lumpur. Sehingga kini, sering kali pengguna jalan raya terperangkap dalam banjir kilat disebkan oleh kelewatan pengguna jalan raya mendapatkan informasi mengenai banjir kilat. Namun begitu projek ini dapat memberi alternatif kepada pengguna daripada terperangkap dalam banjir kilat. Pada mulanya, alat pengesan paras air akan diletakkan di dalam kawasan sungai untuk mengesan paras air air sungai tersebut. Bacaan paras air akan dihantar sistem pemantauan. Jika berlaku sebarangpeningkatan air yang maksimum, *GSM modem* akan menghantar *short message service* (sms) kepada pihak berkuasa mengenai kenaikan paras air sungai. Lampu amaran akan bernyala bergantung kepada setiap keadaan paras air tertentu iaitu keadaan normal,berjaga-jaga dan juga bahaya. Warna hijau mewakili keadaan normal, warna kuning mewakili keadaan berjaga-jaga manakala merah mewakili keadaan bahaya. Sebelum ini, sistem pengesan banjir hanya berfungsi secara manual di mana hanya mengesan paras air tanpa di sambungkan kepada sistem pemantauan. Walaubagaimanapun, projek ini akan mengesan paras air yang akan di pantau melalui komputer dengan menggunakan *Data Acquisition* (DAQ)sebagai pengantara muka. Ini memudahkan pihak berkuasa mengawal keadaan sistem tersebut. Secara tidak langsung membri faedah kepada pengguna untuk melindungi pengguna jalan raya daripada terperangkap di dalam banjir kilat.

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LIST OF ABBREVIATION

PC	-	Personal Computer
VI	-	Virtual Instrument
LabVIEW	-	Laboratory Virtual Instrumentation Engineering Workbench
DAQ	-	Data Acquisition
NI	-	National Instrument
GSM	-	Global System for Mobile
SMS	-	Short Message Service
GIPB	-	General Purpose Interface Bus
DAC	-	Digital-to-Analog Converter
VFC	-	Voltage-to-Frequency Converter
MSPS	-	Million of samples per second
PCN	-	Personal Communication Network
PCS	-	Personal Communication System
RSS	-	Radio Subsystem
NSS	-	Network Switching Subsystem
OSS	-	Operation Subsystem
MS	-	Mobile Station
BSS	-	Base Station Subsystem
BTS	-	Base Transceiver Station
BSC	-	Base Station Controlled
SIM	-	Subscriber Identity Module
EI	-	Equipment Identity

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CHAPTER I

INTRODUCTION

This chapter explains about introduction about flash flood in Malaysia, project objectives for this project, problem statement and lastly scope of project.

1.1 **Introduction**

Flood plains are also regions where a significant proportion of the country's population and much of the economic activity are concentrated. As results, in recent decades, "flood risk", defined as the probability and other physical characteristic of floods has been increasing alarmingly in many parts of the country. Floods occur annually in Malaysia causing damage to properties and loss of life.

Floods occur annually in Malaysia causing damage to properties and loss of life. It is useful to distinguish between “normal” and “major” flood events. Normal floods are seasonal floods which occur annually the north-east monsoon between November to March. Major floods have their origins from seasonal monsoon rains but statically occur once every few years. Other classifications such as “flash flood”, “tidal flood”, “river flood” and “monsoon flood” may be grouped as normal or major floods depending on the severity. The latter two inter-monsoon seasons are prone to torrential rainstorms. During these two transitional periods when monsoon winds change directions, lights winds and predominantly calm atmospheric conditions coupled with hot and abundant sunshine give rise to intense convection currents which culminate in heavy thunderstorms in the late afternoons. These thunderstorms have been shown to be responsible for “flash flood” in Kuala Lumpur, Pulau Pinang, Melaka, Kedah and Perak.

Flood Monitoring System is a system that will avoid road users’ trap inside flash flood especially at the frequent area, Kuala Lumpur. Flood Monitoring System offers open and more intuitive traditional solutions at a lower total system cost and easier migration to future technologies. Easier to apply, inexpensive maintenance, long lasting duration and efficient solution.

In this project has several elements which consist of Water Level Detector, Warning Lamp, Data Acquisition (DAQ), LabVIEW software, GSM Modem and Mobile Phone. Water Level Detector will be interface to computer by using Data Acquisition (DAQ) and level of water can be measure by computer using LabVIEW software. There are many methods that have been used to get data for river water, the conventional method by getting from satellite. But this method is inefficient because the data does not update frequently. To solve this problem, monitoring technique had been introduced to ensure the authority will obtain information early. By using LabVIEW software, Virtual Instrument (VI) is divided to two main parts. The first part is to create block diagram and second part is to create the front panel. Virtual Instrument (VI) will perform will perform the following function such as displaying and measuring the level of water.

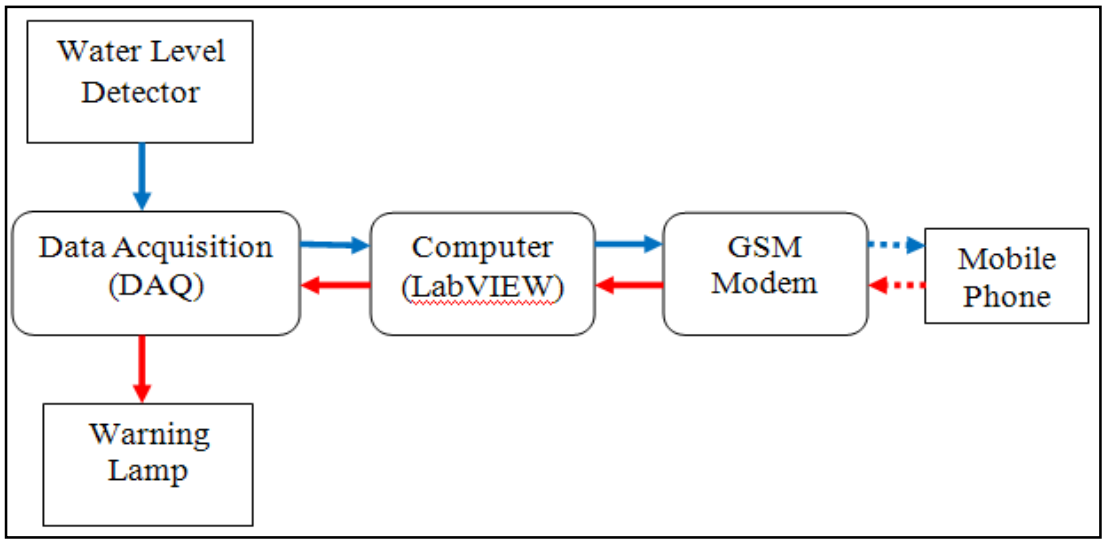

Figure 1.1 : Block Diagram of Project

1.2 Project Objectives

There are several objectives that need to be achieved at the end of PSM. The objectives are listed as below:

a. To develop the LabVIEW front panel by following block diagram Flood Monitoring System.

b. To interface between hardware prototype and front panel LabVIEW.

c. To develop the system that the information flash flood will be linked to user.

d. To interface water level detector and warning lamp with PC-based system by using DAQ device.

e. To develop the water level detector and warning lamp hardware.

f. To ease the user (authorities) in monitoring water level by using the PC instead of physical or conventional monitoring. In another word, to create a user friendly interface of Virtual Instrument this can be used to monitor the water level.

1.3 Problem Statement

There are a few problem statements that project try to solve it. Such as :

a. Getting Late Information.

Flood detector system nowadays still not helping drivers in the road from trapping in flash flood due to the slow information given to the road users. But using Flood Monitoring system, this system can inform about flash flood that occur in a place much faster and accurate.

b. Ease to Monitor Water Level

Before this, flood detector system works manually where it only detects the flood by using river water level detection circuit only. But for this project, the water level in the river can be monitored by using Data Acquisition (DAQ) interface to computer. This helps the authority to control or maintenance the situation.

c. Send Flood Information Using Short Message Service (SMS).

The earlier version of the flood detector system only shows the information regarding flash flood by radio or information board location at the side of the road. This project will be using more efficient procedure thus the road users will be receiving information about the flash flood, earlier using short message service (sms) that will be sent to the users. GSM modem will be used to send the information.

1.4 Scope of Project.

The scope of work in this project is stated as given:

a. Data Acquisition Device (DAQ)

   The process of measuring a real world signal for example water level and then bringing that information into the computer for processing analysis, storage or data manipulation.

b. LabVIEW Software

   Can command DAQ devices to read analog input signals (A\D conversion), generate analog output signal (D\A conversion).

c. Hardware Development (Water Level Detector & Warning Lamp)

   i) Water Level Detector is to measure to measure the level of water at the prototype.

   ii) Warning Lamp is function to give warning if the water level achieved at the maximum level.

d. GSM Modem

   GSM Modem will send the message to inform the authorities or road user after the water level achieves the maximum level.

CHAPTER II

LITERATURE REVIEW

This section describes the area proposed to put this system to be applied. In addition, this section will also describe the hardware, software, GSM modem and sensors to be used

2.1 Introduction

The lure and attractiveness of the flood plain as a place of occupancy is well documented in the flood literature. In Malaysia, it has been estimated that at least 3.5 million people live on flood plains and are vulnerable to flood of varying probability. Furthermore, this figure is still increasing as rural-urban migration, land pressures, poverty and other structural forces are anticipated to exacerbate flood plain encroachment. Flood plains are also regions where a significant proportion of the

country's population and much of the economic activity are concentrated. As a result, in recent decades, "flood risk", defined as the probability and other physical characteristics of floods, has been increasing alarmingly in many parts of the country. As flood risk is essentially a product of flood hazard and vulnerability there is no risk if there are hazards but vulnerability is nil, or if there is a vulnerable population but no hazard event. However, as more and more people occupy flood plains, and increasingly more properties and infrastructures are built, the potential for damage and loss is high.

The Klang Valley is the most developed area in Malaysia, especially at the city of Kuala Lumpur. Due to the rapid development and urbanization, flooding problems in the Kuala Lumpur city centre have become more frequent and severe. It has been recognized that from the flooding events happened on 26th April 2001 and 29th October 2001, the Sungai Klang stretch between Tun Perak bridge and Dang Wangi bridge is badly flooded where the channel capacity is insufficient to cater for the flood flows. The situation is compounded by constrictions at various bridge crossings especially at the Tun Perak bridge and blockages. However, it does not mean that the other tributaries are sufficient to cater for the flood flows. It so happened that during the 26th April 2001 and 29th October 2001 flood events, both rainstorms occurred at the north-east of the catchment where flood runoff is drained by the Sungai Ampang and the upper Sungai Klang. The other tributaries that flow through the Kuala Lumpur city are also in critical conditions and required immediate flood mitigation solutions. Among the more critical ones are the Sungai Gombak and Sungai Batu, which are located on the north-west portion of the catchment. The confluence of Sungai Klang and Sungai Gombak is at the Masjid Jamek. This project concentrate to create a system that help authorities to monitoring the level of river especially at two locations which are Tun Perak Bridge and Dang Wangi Bridge.

2.2 Hardware Development

2.2.1 Level Sensor

Level measurement is defined as the measurement of the position of an interface between two media. These media are typically gas and liquid, but they also could be two liquids. Level measurement is a key parameter that is used for reading process values, for accounting needs, and for control. Of the typical flow, level, temperature, pressure measurements, flow tends to be the most difficult but level follows closely behind.

2.2.1.1 Beam Breakers

The beam breaker is also known as a “photometric” or “light beam”. Its basic components are a light source and a receiver (photocell) that accepts the light beam and measures it. The light travels in a straight line until it is intercepted by an object. The beam breaker offers a low cost solution and can be used for pressurized or unpressurized. It is also easy to apply, is of simple construction, and is unaffected by gravity. However, sensitivity adjustment is available only in some units, and residue coating will affected by changes in reflectivity. When applying such devices, the designer should consider the effect of liquid drops or condensation since they will deflect the beam and affect performance. In addition, on clear liquids it may be difficult to interrupt the light beam. In some cases, it may be necessary to shield the light receiver from outside light sources to avoid the introduction of measurement errors