**Chapter 1**

**INTRODUCTION**

* 1. **Background of the Study**

Philippines, an archipelago country surrounded by South China, Celebes, Sulu and Philippine seas, and is situated at the west of Pacific Ocean, is a country that experiences an average of 19 typhoons per year, with 8 or 9 making landfall. With this natural fact and poor drainage systems, flooding is a common problem, almost anywhere in the country. Pepeng, Reming, Ondoy, Sendong and Pablo are just some of the typhoons in the recent years which have caused flash floods which resulted to major loss of properties, devastated crops and even caused high casualties. On the other hand, Philippines has also been tagged as “texting/SMS (short message service) capital of the world” and is home to a significant number of active social media and blog enthusiasts. For this reasons, the best approach to use the communication advantage in addressing this concern is to develop a flood detection and monitoring system that will help in determining water level and will help in disseminating information or warning to a community, barangay, town, city and even in the internet.

This special project aims to develop flood detection and monitoring system that will help warn the residents of a community for a possible flooding and the current water level status of the river. As an overview, this project is about a water level detection device which has a GSM-based output that will send warning signals through SMS on mobile phones, and a monitoring device which will automatically upload the warning signal to the internet via website and social media sites.

* 1. **Statement of the Problem**

To develop a flood detection system with a SMS and web-based monitoring system.

* 1. **Objectives of the Study**

This special project aims to build a prototype of a water level detection and monitoring system with the following specific Objectives:

* To interface a GSM Modem to a microcontroller that will serve as the platform for sending the warning message.
* To use sensors to determine the water level of a certain river or any body of water.
* To develop a program that will allow the communication between the microcontroller and the GSM modem
* To use short-messaging service (SMS) to disseminate alert messages to designated mobile phones.
* To develop a program that will allow the computer or mobile phone to automatically upload the received alert signal to a website or social media sites, once an alert message is received.
* To use the internet and social media sites to disseminate warning messages.
* To use a microcontroller that will supervise and decide when to instruct the GSM modem to send an SMS alert message.
* To develop a master microcontroller that will monitor the performance of the sensors and will control the over-all function of the system.
* To develop a web-based monitor to show flooded areas and flood levels.
  1. **Significance of the Study**

In this special project, a community and social media subscribers will be able to monitor the water level of a river or any body of water through an alert message sent via SMS or alert post on websites or social media sites. This project uses the feature of GSM-SMS technology wireless communication and social media sites like facebook, twitter and others in order to alert not just the inhabitants of an affected community, but also the subscribers to the social media accounts.

* 1. **Scope and Limitations**

This project is bounded with the following:

* A specific number of sensors will be used as different alert levels of detection system.
* The mobile numbers of the designated phones or recipients must be set in the code before HEX file of the code is being loaded to the microcontroller. If the recipient wishes to change his number, the updated code must be reloaded to the microcontroller.
* The SIM card attached to the GSM must have extra credits or load so that warning messages will be sent successfully to the recipient.
* The system will send an SMS alert message when any sensor is triggered, but cannot receive SMS command from the service.
* Only six to ten SMS messages is processed by the GSM every minute.
* The GSM Modem will send messages to two types of recipients: Mobile phones, monitoring computer.
* After the computer receives the alert message, a program will automatically upload the alert message to websites and social media sites.
* The hardware gets power supply from 220 AC and regulated 9V DC and can be battery-operated to function immediately when it is turned on.
* This project assumed a uniform water speed or water level rising.
* A manual switch will control the power supply of the whole system.
  1. **Definition of Terms**

**Microcontroller**

It is a type of microprocessor emphasizing high integration, low power consumption and self-sufficiency and cost-effectiveness, in contrast to general purpose microprocessor (the ind used in PC.) It is a computer-on-chip containing a processor, memory and input/output function. It is a single purpose processing units designed to execute small content programs sometimes in real time. This program is frequently stored in a microcontroller of non-volatile memory. [1]

**Sensor**

Any device that receives a signal or stimulus and responds to it in a distinctive manner. In other words, it is capable of detecting and responding to physical stimuli such as movement, light, heat or motion, etc. [2]

**GSM**

Global System for Mobile Communications is a digital cellular phone technology based on the TDMA that is predominant system in Europe, but also used worldwide. Developed in the 1980s, GSM was first deployed in seven European countries in 1992. It operates in 900 MHz. and 1.8 GHz bands in Europe and the 1.9 GHz. PCs band in the US.

GSM provides a short-messaging service (SMS) that enables text messages up to 169 characters in length and to be spent from a GSM Phone. [3]

**GSM Modem**

GSM Modem is a data oriented GSM transceiver system that uses a network provider to connect and transfer data. Using a network provider infrastructure has several advantages. Among them is a low initial cost (you don’t need to set up an expensive transceiver rig to cover a long distance), reliable, easy to use and has a wide coverage.

You can use both data and voice services for your control applications. Example of data application is a remote appliance control via SMS. [4]

**SMS**

Short Message Service (SMS) is a communication service standardized in the GSM mobile communication system, using standardized communications protocols allowing the interchange of short text messages between mobile telephone devices. It is a means of sending short messages of up to 160 characters to and from mobile phones. [5]

**Mobile Phones**

Is a long range, portable electronic device used for mobile communication. In addition to standard voice function of a telephone, current mobile phones can support many additional services such as SMS for text messaging, email, packet switching for access to the internet and MMS for sending and receiving multimedia. Most current mobile phones connect to a cellular network of base station (cell sites) which in turn interconnected to the public switched telephone network. [6]

**Web-based Monitoring**

Is the ability to monitor something from a web browser. Almost every monitoring system today has a web-based user interface. This means that you can monitor things and how it is performing at almost anywhere, as long as you can have access to the internet and at any time of the day. [7]

**Social Media**

Is a social software which mediate human communication. In the year 2012, social media became one of the most powerful sources for news updates like twitter and facebook. [8]

* 1. **Theoretical Background**

**1.7.1 Communication Theory**

Communications theory looks at how information is communicated from one place or person to another. This theory looks at the processes involved in transmitting information and how the methods of the transmission will affect the interpretation of the message.

One model of communication is the transmission model of communications. It really is about passing information from one place to another or from one person to another. In this view, communication is how you get information from one place to another. An example of this model is the 1947 Shannon-Weaver general model of communication. The emphasis is on the transmission and reception of information. It proposes that communication is comprised of the following six elements: Sources of a Message, Encoding of a Message, Transmission of a Message, Channels of Communication, Receiving of a Message and Decoding of a Message.[9]

**1.7.2 GSM**

GSM is a standard that was set by the European Telecommunications Standards Institute(ETSI) to describe protocols for the second generation digital cellular used by mobile phones. This was created for replacement of the first generation analog cellular networks. GSM is a cellular network. This means that cell phones would try to connect to it by searching for cells in the immediate vicinity. GSM networks operate in various frequencies. Mostly, 2G operates in 900 MHz or 1800 MHz bands while 3G operates at 2100 MHz frequency band. A GSM network consists of three components which are: Base Station Subsystem(BSS), Network and Switching Subsystem(NSS) and the GPRS Core Network. The BSS routes the traffic from cell phones to the NSS. Then the NSS takes data and calls that are routed from the BSS and sends it off to their respective destinations. The GPRS is optional but its task is to take any non-voice data and routes it to websites or any other places where the data should go. The network is designed with several encryption-based systems in order to prevent hackers from tampering with the cellular phone network. [10]

* + 1. **GSM Controller**

GSM Controller is the first compact PLC controller for wireless automation in mobile phone networks. It is an independent control unit with its own programmable. GSM-Controller sends and receives standard GSM text messages containing fixed or variable data and the controller may be remote programmed wirelessly using GSM data connection. GSM-Controller has the following functions: sends and receives SMS text messages containing fixed and variable data, sends messages to 6 different GSM numbers, can route different messages to different numbers and downloading, uploading and updating GSM-Controller’s application program with GSM data transfer. GSM-Control PC configures, transfers, secures, reports and interfaces the text messages of the GSM-Controllers and mobile phones. The PC is connected to GSM-network with a GSM-modem and the text messages may be handled by GSM-Control and then transferred bi-directionally to Excel, SQL and etc. The structure allows wide covering wireless automation systems and SMS package sending eliminates possible bottlenecks in communication. [11]

* + 1. **Web-Based Monitoring**

Advances in technology have made it possible to develop an Internet-based systems for water level detection. Because of this breakthrough, people can achieve control, monitoring and operation via the Internet where it adds convenience to people. Reporting and monitoring would be of greater comfort because it would be easier to disseminate information via this said medium which is the Internet. Also, advancement in electronic gadgets where internet access would be easy can be of great use and the user would be able to access and monitor a particular data 24 hours a day and 365 days a year. You would not need specific devices and softwares in order to monitor because anything that can access the Internet would be supported. Moreover, monitoring and controlling can be done anywhere. There is no need for the user to go to that particular location and history and real-time measurements and results are covered in this feature that would make data recording more accurate and comfortable. And in a world where time can be considered as a treasure, using the Internet would be very helpful because it is fast and easy. [7]

**1.7.5 Water Level Detection System**

Water level detection systems are designed in order to help facilitate people in collecting water level data that can be performed in real-time. Water level sensors are used in order to measure the level of water in a designated area. The system is composed of two modules which are the transmitter and receiver. The GSM would serve as a transmitter and there would be two receivers that will also be GSM-based receivers, one for SMS monitoring and another for wireless PC monitoring, for example is a tattoo stick or broadband. The transmitter, GSM module, would perform the water level detection and transmits the data to the receiver modules. The receiver then displays the data transmitted. A warning device would alarm if water level would exceed a designated limit of level. This system would be used to those systems that need water level detection such as flood control and warning systems. [12]