



Cooperative Flood Detection Using SMS Through IoT

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ABSTRACT: Flood disaster usually happens due to improper irrigation method in a housing area or the sudden increase of water volume in a river. Flood disaster often causes lost of property, damages and life. Since this disaster is considered dangerous to human life, an efficient countermeasure or alert system must be implemented in order to notify people in the early stage so that safety precautions can be taken to avoid any mishaps. This paper proposes architecture for an early warning floods system to alert public against flood disasters. An effective early warning system must be developed with linkages between four elements, which are accurate data collection to undertake risk assessments, development of hazard monitoring services, communication on risk related information and existence of community response capabilities. This project focuses on monitoring water level remotely using wireless sensor network. The project also utilizes Global System for Mobile communication (GSM), Internet of Things(IoT) and short message service (SMS) to relay data from sensors to computers or directly alert the respective victim's through their mobile phone. It is hope that the proposed architecture can be further develop into a functioning system, which would be beneficial to the community and act as a precautionary action to save lives in the case of flood disaster.

KEYWORDS: Flood detection, warning system, GSM Module, IoT, SMS.

I. INTRODUCTION

Mobile phones are vital in modern day communication these days. For communication community, mobile phones act as a medium to communicate, interact or as a device to gain knowledge. Mobile phone is defined as a communication device used to interact between geographical areas. There are many features available in modern mobile phones now a day that would satisfy users. Among the most popular applications in a mobile phone is short messaging system(SMS). SMS text messaging is the most widely used data application in the world. Based on this fact, SMS application can also be applied to other phone of information in order to help mankind. One of the ideas is to connect a sensing system and send an alert or warning SMS indicating any mishaps to the users. Alert SMS can be exploited to be used using a proper system with a proper sensing system. Often cases of flood disaster happened due to residents unaware of the sudden increase of water level at the neighborhood. Due to that a proper warning system must be implemented to notify people in the early stage so that safety precautions can be taken to avoid any mishaps. Alert system implemented currently is via television and radio broadcasting to indicate which area is affected. However, warnings might fail to those affected due to ineffective and late information in the area. With the rapid development of technology, a sustainable and reliable monitoring system is required to protect the community in any case of emergency. By implying level sensors and GSM technology, this paper aimed to build a reliable and real time response of water level alarm system that would detect the escalation level of water in the riverbanks and send SMS alarm to the user's mobile phone. SMS has been proven to be a reliable source of information recently. It also utilizes IoT, for monitoring water level increase and controlling it remotely using wireless sensor networks. Most of the information was gathered using SMS as the lines are congested at that moment. This shows the reliability of SMS through IoT as it works on different band and can be used even though the lines are congested.

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II.SYSTEM MODEL AND ASSUMPTIONS

System structure is illustrated in Fig. 1. System composed of three sensors, one MCU-based ARMLPC2148, a GSM module, a Wi-Fi module and a mobile phone. Sensors used are retro reflective, NPN type. It uses system of blocking interruption where the system will give 5V signal to the amplifier. Water level sensors been used for this project due to its unique ability of detecting water level in dams and river banks. In the water level sensor, the property of 555timer IC is used. the temperature sensor is used for detecting the temperature level. The LM35 series is used because it generates a higher output voltage than thermocouples and may not require the output voltage be amplified. The humidity sensor been used for detecting moisture level in the water. If the sensor voltage exceeds the reference voltage than the comparator gives digital logical output. MCU used is ARMLPC2148. ARMLPC2148 was chosen because it is embedded C compiler optimized architecture. Since this project runs on embedded C compiler program, it is the best option to use this MCU. Other special features include 512K byte flash memory that could be used to write high capacity of programming language. GSM Module is a device used to transmit SMS signal to the intended user. By using GSM module, GSM network can be used since it is much more accountable and by using IoT, continuous monitoring and controlling of the water level is done.

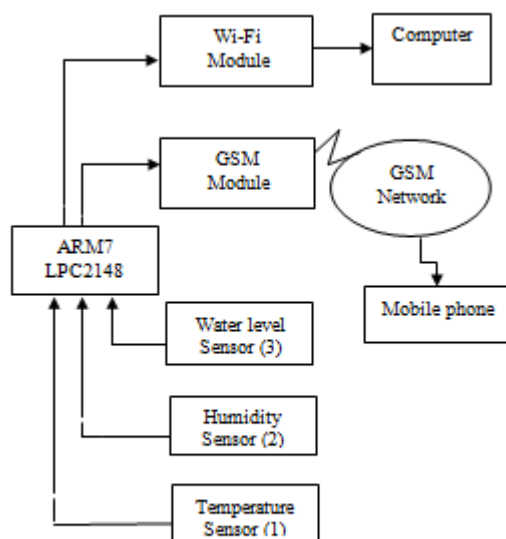


Figure.1 System Structure

TABLE 1 SMS CONTENTS AND CONDITIONS

CONDITIONS	SMS CONTENTS
LEVEL 1	Temperature exceeded
LEVEL 2	Humidity exceeded
LEVEL 3	Water level exceeded

The working principle of the system is based on sensor's detection shown in Table I. Level One sensor would be the lowest part of all sensors. When Level One sensor receives a signal which means the temperature has increased more than the threshold, the sensor would send „1“ signal to the MCU. Upon reaching the MCU, program would identify it as Alert trigger. Hence, MCU would send AT command of “Temperature exceeded” to GSM module. Level Two sensor would be positioned higher than first sensor; hence the SMS display would be “Humidity exceeded”. The highest positioned sensor which is Level Three would send SMS of “water level exceeded”. The system is also monitored and controlled periodically by the Wi-Fi module. The information is stored in computer.

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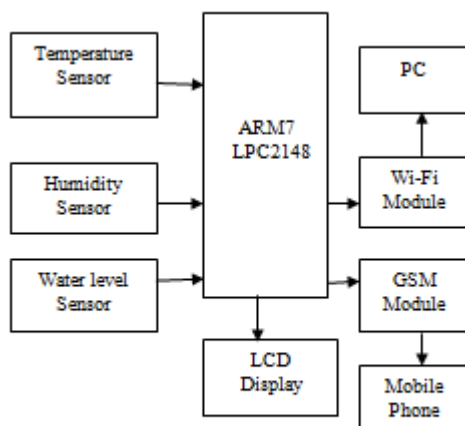


Figure.2 BLOCK DIAGRAM

The block diagram shows the system consists of temperature sensor, humidity sensor, water level sensor, an MCU, GSM module, Wi-Fi module, mobile phone. The three sensors would be used for detecting the level of temperature, humidity and water in the dams and river banks. The data send by sensors will be handled by the MCUARM7LPC2148.

The MCU has been preprogrammed for different inputs in the three sensors and would send different output through transmission pin. These outputs are in analog form and it is converted into digital form using ADC. Commands are send using embedded C compiler program with relevant AT Commands. Data from the input also has been interconnected with 2x16 character LCD to display the values of the three sensors when it is exceeded in dam or river banks. The transmitted output from the MCU will be conveyed to GSM module and Wi-Fi module. By doing this, SMS along would be send to respective user and by using Wi-Fi module monitoring and controlling is carried out. User will receive different SMS depending on the level of sensors detection. GSM network is being exploited to convey data to user via short message alarm SMS via GSM network proven to be reliable due to it works on different band and can be sent or received although the phone lines are congested. It also as the advantage of sending data to multiple users.

The project of the flowchart in fig 4.initial feasibility study was done to check whether the project able to fulfill the objective to give early warning whether a flood as occurred or not. After that, embedded C program need to be prepared for this project. Embedded C program is chosen due to the ability of the system to use AT Commands. Once the embedded C program completed, hardware modeling is prepared for prototype purpose. Integrating embedded C program with hardware is done to check viability of the project. During this period, any problems encountered need to be adhered amendments must be rectified. The last step is to do analysis for the system ensure it worked properly.

III. DESIGN OF SYSTEM HARDWARE

Prototype system had been created for this system. As mentioned above, MCU ARMLPC2148 was chosen as it is the most common widely used MCU available the market. Besides that, it can be used with embedded C compiler program. Embedded C compiler program was downloaded using appropriate downloader to the MCU. Three sensors have been selected as the inputs for the system and GSM module as the output. Wi-Fi and LCD display installed to provide indication at the control box.5v power supply used to supply voltage to the system.

IV.RESULT AND DISCUSSION

Several tests have been conducted to verify the condition of Flood detection using SMS through IoT. The tests were conducted to accomplish the objective of the project that the system able to give SMS alert whenever the sensors



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detected changes of temperature, humidity and water level. The test that have been done are SMS alert receive by the user according the user according to condition. For this test, system is tested to check whether SMS sent to user. Sensor signal has been set using 1.5v for each signal. The system has been connected to detect signal from the lowest sensor(Temperature sensor) and gradually to the highest sensor(water level sensor) system also has been tested to show condition of SMS after the sensors don't sense any changes at the sensors.

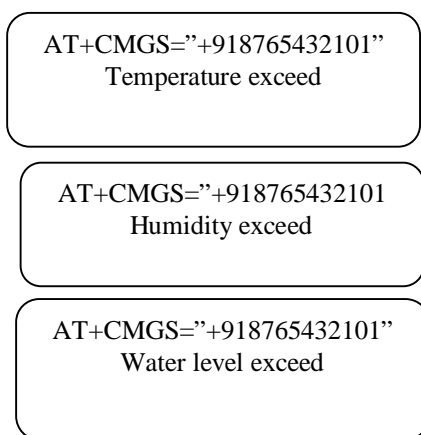


Figure.5.SMS TO USER

V.CONCLUSION

The project cooperative detection using SMS through IoT is deemed as a success. The project found able to be integrated between software development and hardware design. The system able to detect increase of water level and would send SMS alert to the respective user. System also had been tested under several conditions to check the viability and ease of usage. The system could be placed at riverbanks, dams and drainage system. It can also be placed in water tanks and even controlling and monitoring is carried out using IoT. The SMS alert received by the user is an real time basis and this feature allowed user to take early preventive measures.

It is hoped that the proposed architecture can be further develop into a functioning system which could be beneficial to the community.

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