Flood Monitoring System Using Microcontroller (pic18f45k22) With effective Implementation of Embedded C

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Abstract: The main objective of this paper is to provide a cost effective flood monitoring system for cautioning the people during flood crisis by using simple sensor and a microcontroller. Floods have become one of the major issues taking place in various parts of the globe. Due to improper management during the flood crisis, there is a huge number of causalities taking place. The aim of this paper is to provide simple and cost effective solution in which the level of water is constantly monitored using pressure sensors and microcontrollers and the information in transmitted with the help of GSM (Global system for mobile communication) module. This paper provides design approach on both software and hardware.

Keywords: Gsm (Global System For Mobile Communication) (Sim900), Pressure Sensor (MPX5050), Microcontroller (Pic18f45k22), Linear Voltage Regulator (Lm317), Voltage Regulator IC (Lm7805).

I.INTRODUCTION

Floods have become one of the most dangerous hazards. This is either man-made or naturally occurring disaster. Main drawbacks of the flood are [i] pollution of clean drinking water [ii] a large number of causalities [iii] Landslides [iv] Leads to epidemics and diseases [v] Leads to spreading of water Bourne diseases [vi] Shortage of crops due to loss of entire harvest [vii] Economic hardships. Floods cannot be prevented but proper precautionary measures can be incorporated to reduce the loss of lives. In the majority of countries, there is no proper system for monitoring floods and due to this reason proper steps aren't taken to prevent causalities. The main reason to have proper

Flood monitoring system is to notify people beforehand so that loss lives can be reduced. Till now

various sensors are being used to detect the variations in water level in flood-prone zones. However, usage of microcontrollers, GSM, Pressure of sensors, Internet of things (IOT) in a cost effective way is not being implemented in flood monitoring system. Due to the ineffective usage of flood monitoring system, there is a huge loss in lives.

II. METHODOLOGY

A proper and effective flood alert and forecasting system can be of great use to the society as it acts as a protective measure in terms of preventing causalities and damage to infrastructures. SMS is one the most effective method for alerting the people regarding the information of flood within a particular area. Figure 1 represents the block diagram of flood monitoring system. A pressure monitoring sensor has been used to monitor the rise in water level (actually, the pressure sensor monitors the pressure of the water and pressure of the water is directly proportional to the level of the water). The data collected from the pressure sensor is transmitted to the microcontroller and this converts the received analog signal to digital signal. A threshold value has been fixed programmatically. The microcontroller constantly compares the water level with the threshold value which has been set programmatically. The results computed by the microcontroller and transmitted via GSM module.
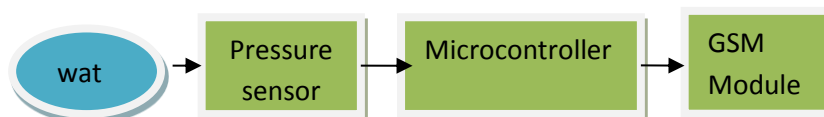

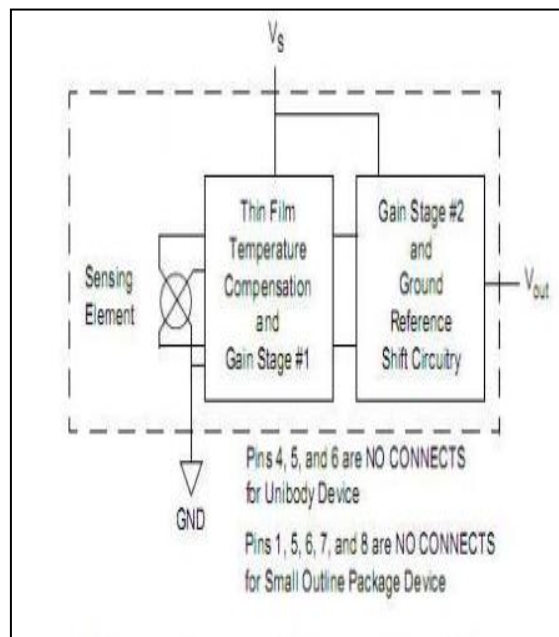**Figure [1] Block Diagram of Flood Monitoring System**

Hardware development

The sensor will be installed in the water reservoir or dams were the water level needs to be constantly monitored. The sensor used here is pressure sensor (MPX5050) and this sensor monitors the water level and constantly keeps comparing the monitored water level with the threshold value fixed programmatically. All the analog data collected by the sensor is converted into digital data with the help of microcontroller and then it will be transmitted to the monitoring side via GSM module whenever there is an increase in water level.

Features of MPX5050

[1]2.5% maximum error over 0 to 85 degree Celsius.[2] Ideally suited for microprocessor and microcontroller based system.[3] Temperature compensated over -40 to + 125 degree Celsius.[4] Patented silicon shear stress strain gauge.[5] Durable epoxy unibody element.[6] Easy to use chip carrier option.

Drawbacks of ultrasonic sensor

[1]Density, consistency, and material can distort ultrasonic sensors readings.[2]The the cost of the pressure sensor is less when compared to that of ultrasonic sensors.[3]Less accurate readings are obtained when compared to that of pressure sensors.

**Figure[2] Schematic diagram of MPX5050.**
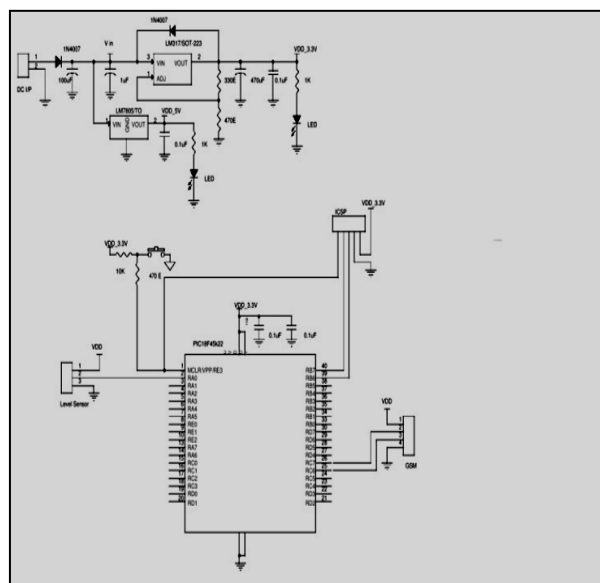
Figure[3] Pin diagram of flood monitoring system.

The above-drawn diagram represents the pin diagram of the flood monitoring system. The readings from the pressure sensor are given to the A/D pins of the microcontroller and there the analog data's are converted to digital data .These converted digital data's are compared with the threshold value which has been fixed programmatically in the microcontroller and now if the measured value is greater than the threshold value then the measured data are transmitted to the GSM module via the USART pins of the PIC microcontroller. The measured value is now sent as an SMS to the programmed numbers in the GSM module to alert the increase in water level.

III. TESTING

The prototype was tested in a 2 feet pond and was successful. The pressure sensor was placed in a tube and the tube was immersed inside the pond. Various threshold values were fixed programmatically in the microcontroller and the results for various levels of water was obtained.
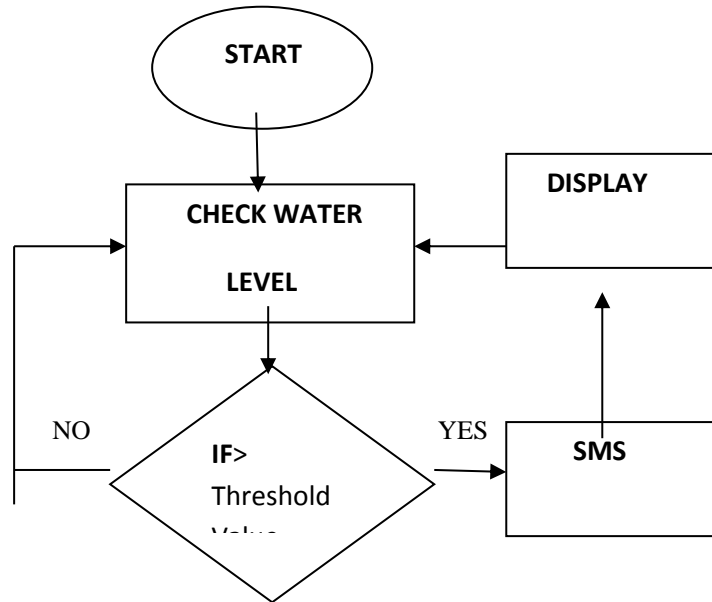
Figure[4] Flow chart of flood monitoring system.

The working of the Flood monitoring system has been depicted in the above-drawn Flowchart. First, the system is started by turning it on. The water level is checked with the help of pressure sensor. The measured value is compared with the reference value which has been programmed into the PIC Microcontroller. If the value is greater than the reference value then an SMS is sent via the GSM Module to the numbers which have been programmed. The SMS sent contains the information's pertaining to the water level is displayed on the mobile phone. Again the microcontroller compares the measured value with the reference value. This is a continuous cyclic process and it goes on as long as the system is turned on.

IV. RESULT AND ANALYSIS

The complete setup of Flood monitoring system has been shown below. The system comprises of PIC Microcontroller, Pressure sensor, GSM Module and a Mobile phone as a display unit.

Figure [5]Image of Flood Monitoring System

If the water level exceeds the threshold value an alert message is sent to the programmed numbers via GSM Module. The template of the warning message is shown below. Thus with this features the person on duty can also monitor the water level even from remote places.
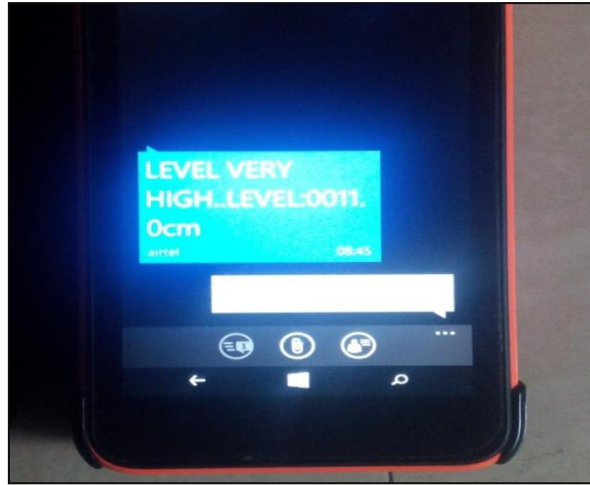
Figure [6] Sample Output

The advantages of using this flood monitoring system are that it is very compact and flexible can send an alert message to any programmed numbers at the instant in which the water level exceeds the reference value. The system is virus free and cannot be easily hacked. It is a low-cost system when compared to others flood monitoring system available in the market. However, this system is dependent on SIM card to transmit messages via GSM Module and the alert message cannot be sent if a signal for the functioning of SIM card is not available.

CONCLUSION

The flood monitoring system was successfully designed and is suitable to apply as an immediate alerting system by sending alert messages to the local authority. This system is user-friendly and self-guiding and no real training are required. The system has also achieved its objective by providing accurate values of water level in the alert messages and also achieved its objective in terms of performance, cost and flexibility.

There are certain recommendations on how to improve the performance of the system like introducing GPS module in order to track the location of the device and introducing solar panels to reduce the consumption of the electricity.

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