

# A Global Earthquake and Flood Alerting System using MEMS and GSM

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**Abstract:** The system focuses on monitoring water level & earth vibrations via sensors, & generates alert signal when water level or level of earth vibrations crosses a threshold. Alert message is Voice Message Service to the concerned authorities through their mobile phones and to the local people, nearby the river side. The module can also send status of water elevation to anyone who knows the system's modem number. Large magnitude earthquakes may cause significant losses of life and property. Designing an earthquake alarm to detect the magnitude of the quake and give an alarm. A method is described in the present disclosure which includes detecting a longitudinal wave of a seismic movement by a MEMS accelerometer. and transmitting an alarm notification indicating seismic movement to at least one alarm device. If making many alarm devices, they can form a network and communicate each other. The purpose of this project is designing a water level & earth vibrations alarm to detect the magnitude of the Disaster and give an alarm.

**Keywords:** Micro controller, MEMS Accelerometer Sensors, GSM module, Buzzer and Water level sensor electrodes

## 1. Introduction

Flood & earthquake become one of the major problems in most of the countries around the world. Floods are common in some countries in Asia, especially in Indonesia. These disasters cannot be eliminated, *i.e.* it is not possible to control the flood, however this condition can be prevented if the authorities always know the current state of the water level or earth vibrations level. The Disaster Alert systems have been introduced to notify people in the early stage about the possible threat so that safety precautions can be taken to avoid any mishap. The GSM transmission detector can sense the presence of an activated mobile phone from a distance. So it can be used to prevent use of mobile phones in examination halls, confidential rooms, etc. It is also useful for detecting the use of mobile phone for spying and unauthorized video[1,2] transmission. In this project we are using the path follower robot series which helps in detecting the signals from far distance, any land mine, and any gas leakage in surroundings. This is a path follower robot series which is connected to the PsoC which follows the line which is drawn on the surface that may be black line on white surface or vice versa [3,4].

Natural Disaster Alert system using GSM Network will give prior intimation on the mobile of concerned persons, in the form of voice message who will be taking precautionary measures against the flood & thus life of people and animals can be saved by quick shifting them to safe places, before situation becomes critical. The warning messages can be delivered by media such as television and radio etc. But if the warning arrives late at night when people are asleep then it will be of no use. The biggest advantage of the proposed system is that it gives alert message on the concerned mobile by ringing the call bell of phone so that the voice message cannot be left without attending.

Any warning in the form of human voice which is previously recorded is sent over GSM network to alert the concerned authority. Also the system includes public address

PA system to alert the local people at the flood prone location.

## 2. System Design Model

The system focuses on monitoring water level & earth vibrations via sensors, & generates alert signal when water level or level of earth vibrations crosses a threshold. Alert message is Voice Message Service to the concerned authorities through their mobile phones and to the local people, nearby the river side. The module can also send status of water elevation to anyone who knows the system's modem number. Large magnitude earthquakes may cause significant losses of life and property. Designing an earthquake alarm to detect the magnitude of the quake and give an alarm. A method is described in the present disclosure which includes detecting a longitudinal wave of a seismic movement by a MEMS accelerometer. and transmitting an alarm notification indicating seismic movement to at least one alarm device. If making many alarm devices, they can form a network and communicate each other. The purpose of this project is designing an water level & earth vibrations alarm to detect the magnitude of the Disaster and give an alarm.

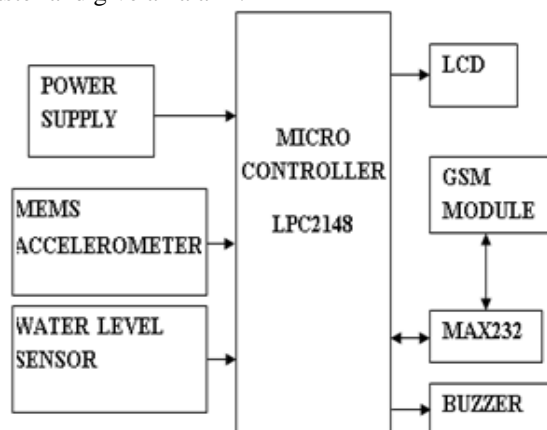


Figure 1: Block diagram of the system

System uses carbon wire as water level sensors. There are number of water level sensors, but for this system carbon rod type is used because of its noncorrosive property. It also uses MEMS piezo-buzzer as vibration sensor to detect earthquake vibrations. Piezoelectric sensor or piezo-buzzer is a versatile & reliable device that uses the piezoelectric effect to measure vibrations for machinery, pressure, acceleration, strain or force by converting them to an electrical charge.

One of the most useful devices, which is performing signal conditioning operation, is Schmitt trigger. The outputs of sensors are given to it, which converts an analogue output of sensors to digital signal as required by microcontroller for further processing. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. GSM modem receives and sends messages from mobile device by using radio waves. Microcontroller and GSM modem interface are using AT commands for sending and receiving message.

It is possible to create the source files in a text editor such as Notepad, run the Compiler on each C source file, specifying a list of controls, run the Assembler on each Assembler source file, specifying another list of controls, run either the Library Manager or Linker (again specifying a list of controls) and finally running the Object-HEX Converter to convert the Linker output file to an Intel Hex File. Once that has been completed the Hex File can be downloaded to the target hardware and debugged. Alternatively KEIL can be used to create source files; automatically compile, link and convert using options set with an easy to use user interface and finally simulate or perform debugging on the hardware with access to C variables and memory. Unless you have to use the tools on the command line, the choice is clear. KEIL Greatly simplifies the process of creating and testing an embedded application.

### 3. Experimental Results

In the experimental results, particularly, a sensor device, which may be positioned in a subterranean part of a structure, may detect a seismic movement. The sensor device may make a determination as to whether the received seismic movement is greater than a predetermined threshold. If the seismic movement is greater than a predetermined threshold, the sensor device may transmit an alarm notification through GSM to one or more alarm devices, which may be located within the structure, indicating the seismic movement. The alarm device(s) may provide an alarm, notifying people in the structure of the seismic movement. This may provide an opportunity for the people to leave the structure before the seismic movement reaches the structure. Here we used LCD to display the values (longitude & latitude) i.e. The Particular values in X & Y axis. Below figure shows the hardware components of the system. It includes the power supply, LCD display, MEMS water levels electrodes, buzzer and GSM.

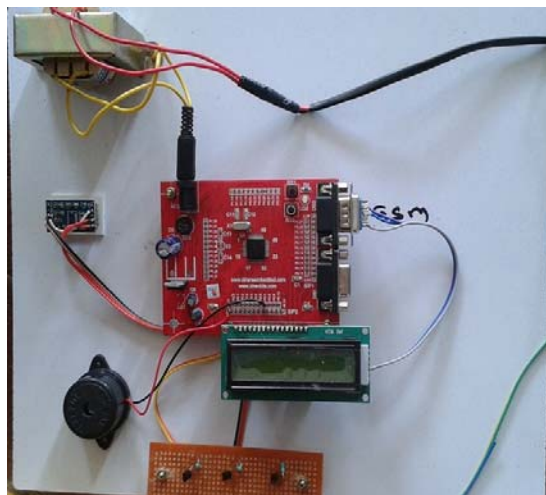
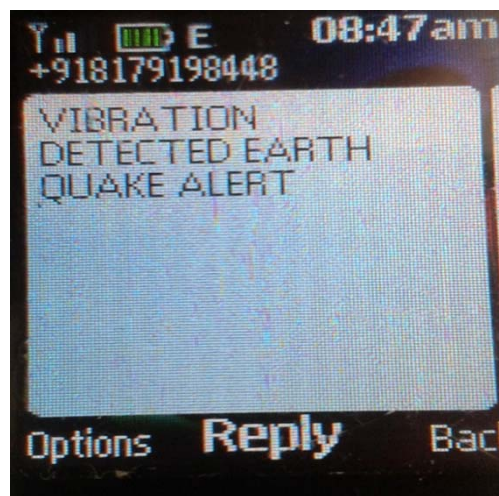
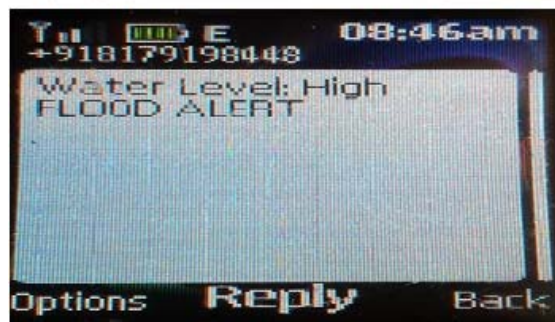
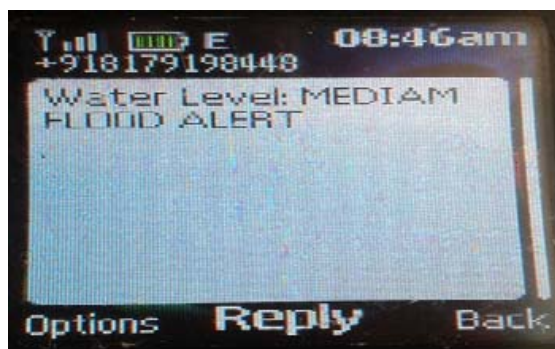


Figure 2: Experimental kit



The above fig shows the earthquake. Whenever the MEMS detect the vibration then the MEMS accelerometer sends the signal microcontroller. Then the microcontroller sends the digital signal to the GSM. GSM sends the message to the concerned authorities.



The above fig shows the flood level. The above fig shows the medium flood level. The system did not detect the low level. Because of at first the level of water always in low and shows the high flood alerts.



The above figures shows the different levels flood alerts which showed by LCD display.

#### 4. Conclusion

The paper concludes the recent technological advances in communication made new trends in the disaster monitoring system. The system focuses on monitoring water level & earth vibrations via sensors, & generates alert signal when water level or level of earth vibrations crosses a threshold. Alert message is Voice Message Service to the concerned authorities through their mobile phones. It also includes Public address system to broadcast the messages to the local people, nearby the river side. The module can also send status of water elevation to anyone who knows the system's modem number.

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