EARTHQUAKE ALERT SYSTEM BY USING IOT TECHNOLOGY

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Abstract—Some countries have implemented earthquike warning system to save human lives. The earthquake warning and continuous response system in Istanbul represents one of the few examples of operational earthquake warning system[1]. It is very difficult to know where and when a seismic event can happen, thus to overcome damages in infrastructure and human lives, is the early detection where a real-time architecture and an efficient communication becomes a requirement. An Earthquake alert system can be implemented by means of an IoT in wireless sensor network. Values of sensor are connected to database and it is stored in ThingSpeak account. ThingSpeak account allows to cluster, aggregate and visualize the live data streams in the cloud. With the help of acceleration sensor realistic value of earthquake can be recorded and warning signal could be sent to stations which are registered with the help of wi-fi module on web server.

KEYWORDS :
Earthquake warning system, wireless sensor network, IoT, MEMS sensor 1.

INTRODUCTION:
There are two types of seismic energy radiate from eart are body wave and surface wave. Body wave are of high frequency than surface wave. The first kind of body wave is called as primary-wave and which is faster than surface-wave, hence it can easily be detected by the sensors. This kind of Seismic event have been responsible for the human dramatic event. For achieving more precise results of advanced earthquake alert system depends on precised detection of primary-waves and rejection of false-positive ground vibration [3]. Silent earthquake is recorded along the coast of Mexico from a network of permanent GPS station along the Guerrero seismic gap[4]. Major damage was reported in Los Angeles and long beach harbors. An estimated 300 small craft were set adrift and about 30 sink including a 24 meter which smashed into bridge piers by partially disabling the bridge. The northern part of India and southern part of Asia is very much seismically active. Earthquake of May 2015 in Nepal region is happened in one of the faults between this.

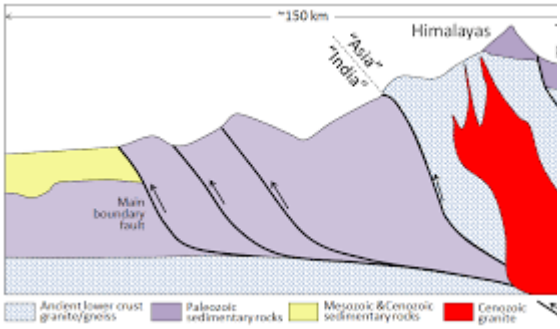


Fig 1. Schematic diagram of India -Asia convergent boundary

This earthquake alert system created to probe and characterize medium and extent earthquakes before their damaging effects reach at some location[5].

In this paper, proposed method is based on Arduino uno board with Microcontroller Atmega328p which process the the signal obtained from the senors[6]. All the sensors are connected to the internet and smartphones. Network of sensors and actuators are use by smart cities to notice physical reality, derive information and hence influence citizens[7].

TABLE 1. GLOBAL FREQUENCY OF EARTHQUAKES BY MAGNITUDE

Descriptor	Magnitude	Average annually
Great	8 and higher	1*
Major	7–7.9	17*
Strong	6–6.9	134†
Moderate	5–5.9	1319†
Light	4–4.9	13,000 (est.)
Minor	3–3.9	130,000 (est.)
Very minor	2–2.9	1,300,000 (est.)

Note: From U.S. Geological Survey (http://neic.usgs.gov/neis/eqlists/eqstats.html).
*Based on observations since 1900.
†Based on observations since 1990.

Table 1. Global frequency of earthquake by U.S Geological survey

IoT is encircle everything connected to the internet and other network connections to different sensors which is able to collect and transfer data over a wireless network without human intervention[8]. Here, smartphone-based sensor network is implemented with the help of accelerometric which detect quake wave and report the event to IoT platform [9]. This research paper helps in learning the behaviour of earthquake early warning system in large area. Earthquake monitoring system is of great significant. The earthquake warning system equipped in the country, use data from sensors to automatically alert citizens via phone and television. The total natural calamity can't be completely pull up by the roots by the human, it can anterior the situation and take major steps to minimize the losses[10].

LITERAATURE SURVEY

In this author Venita Babu[11] The vibration sensor like accelerometer, gyroscope helps to provide attentive signal to registered authority with the help of GSM module . IOT approach is done to fasten the information about the system and helps to analyze the results in a more effective way. ESP wi-fi module act as a gateway to transmit the data to ThingSpeak cloud server.

By using G4-61,an analog sensor and aid in detecting pre-earthquake quivering using ESP8260 and Cayenne app software. Cayenne yields an SMS to alert people[12]. This paper proposed a model which brought a minute of forward moving warning signal that depends upon the location of epiccentre[13].

In this author T.Nagaosa, Daichi[14] proposed a system where server in earthquake early warning system was constructed and mobile with android OS act as a seismometer about transmission of acceleration data. With this system, decision of acceptable values of

threshold is analyzed which aids in the detection of given earthquakes.

This paper shows the ability of some animal species to react against the approaching earth tremling signal with the help of the data analysis and processing at main core part[15].

Monitoring system include multiple sensors and three major disaster analysis earthquake, landslide and fire. Proposed system includes the web-based portal to monitor the threshold value. All sensor data shows in android mobile phone application and it totally worked on wireless sensor network. In message, map link is also shared with user to show the safe place in disaster [16]. This paper shows the use of WSN(wireless sensor network) with IOT to enabled all the connected elements and commute between them[17]. In this alarm detector system, Boolean sensing range is created and analyzation is done on how an inner and outer circle identify seismogenic zone[18].

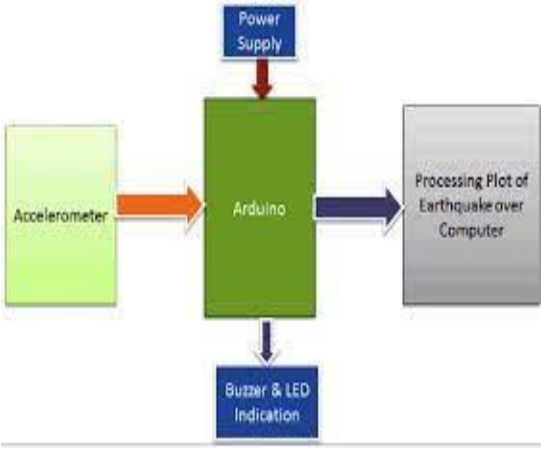
In this author Mr. sagar.D.Kharde [19] RF based network is proposed for alert system. Here, master request and slave response protocol is applied. Master sends the request to all the slave and slave in that region check for the slave ID. If the slave ID is matched then they accept the frame and send the parameter back to master. Slaves are equipped with sensors and sends the warning frame with the sensor data to the master which have VB software to show all the data on its graphical user interface. The collection of large number of interconnected devices leads to applicable amount of data that helps to create brand new services and opportunity for society, economy, environment and individual citizens[20].

PROPOSED METHOD

The most significant objective of this paper is to warned people about ncataclysm in particular area and alert them by means of innovative technology IOT. Then comprised system consists of MEMS Sensor, vibration sensor, Arduino uno and NodeMCU as a gateway.

Arduino Uno equipped with 8-bit RISC processor ,16 MHz CLK speed and 32-Kb for storing code, SRAM2Kb, EEPROM-1 kB, is wield the whole software with the help of NodeMCU. MEMS sensor helps in measuring linear motion, movement, shock,or vibration but without a fixed refrence. ThingSpeak is IOT cloud platform use for sending sensor data to the cloud. The earthquake early warning system, includes ADXL335 accelerometer. This accelerometer have 3-axis capacitive accelerometer and is also consist of magnetometer, gyroscope which helps to find any kind of vibration due to earthquake.

STRUCTURE OF THE SYSTEM



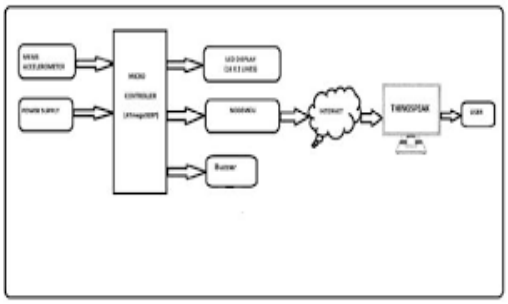


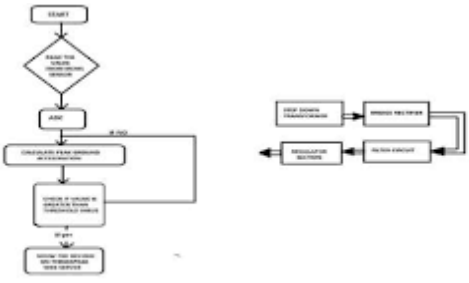
Fig.2 Block diagram of require earthquake alert system

WORKING

Microcontroller (ATmega328p) act as a heart piece of the system, and collect the data from ADXL335. It process the data after that according to the code written. If the generated value is greater than threshold value then its generate the signal correspondingly. That generated signal by microcontroller is send to NodeMCU, Thingspeak platform and LCD display. All of this process will happen on transmitter side.

In receiver side user is updated via ThingSpeak platform and Buzzer act as an alarm. ThingSpeak is a place where a real- time sensor data is uploaded. Here, the cloud channel can be made as private or public depending upon the requirement. This platform succor to record vibration value in all three axis by interfacing NodeMCU with Arduino.

WORKFLOW OF EEW SYSTEM AND POWER SUPPLY



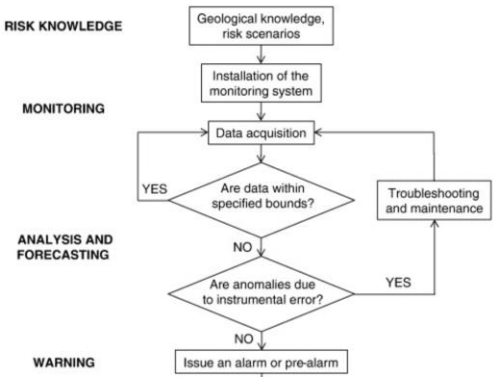


Fig 3. Flow chart of working of an earthquake alert system

RESULT AND CONCLUSION

Result This earthquake early warning system consist of vibration sensor ADXL335, to detect the vibration. The designed system shows the alert message on Thingspeak platform as the result. Here, wifi module that is NodeMCU is used to connect the Arduino uno and vibration sensor to Thingspeak web server which is automatically connected with user smartphone. Further, we are getting the output through LCD display and buzzer which can act as an alarm system for the people also living in particular diameter of area.

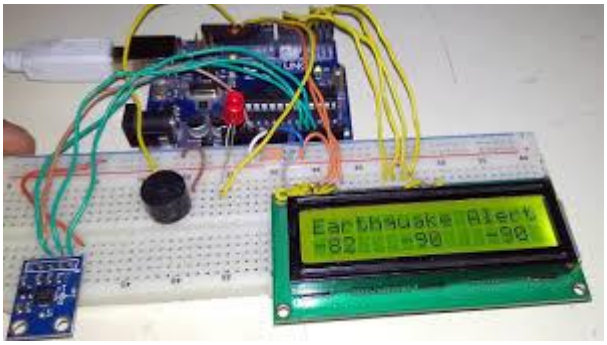


Fig.4 Hardware setting of the sytsem and its output

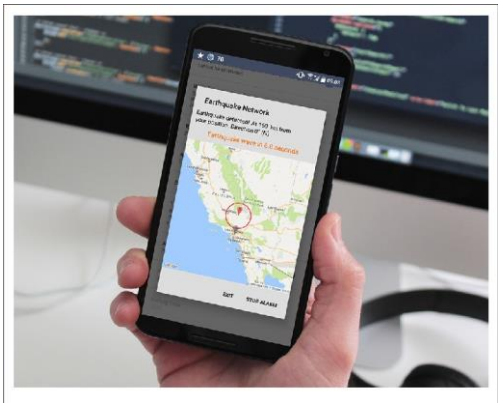


Fig.5 Result displayed on smartphone with the help of web server

Conclusion

This whole system is based on internet oof things which make this system more reliable, cost effective and can easily be used by user. This system can be divided into two parts. Firstly the detection of vibration and processed the data accordingly. Secondly, making it available for users using IOT platform that is Thingspeak. The main components required in this whole system is Arduino uno which is the heart core of this, vibration sensor and NodeMCU. The process of detection is briefly described in the working and flow chart Accuracy of the system can be increased with increasing seismic monitoring stations.

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