Earthquake Early Warning System by IOT Using Wireless Sensor Networks

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Abstract— The Wireless device network (WSN) is spatially distributed sensors in associate autonomous manner to observe physical environmental conditions. The Internet of things (IOT) is the network of computed physical objects which enables these things to connect, collect and exchange data. In this paper, we have a tendency to propose Associate in Nursing earthquake early warning system by means that of Associate in Nursing IOT in WSN. The sensors ar placed within the surface of the planet. When associate earthquake happens, each compression P wave and transversal S wave radiates outward the geographical point of the planet. The P wave, that travels quickest, journeys the sensors, placed in the landscape. It causes early alert signals to be transfer ahead, giving humans and automatic electronic system a warning to require precautional actions. So that before the harm begins with the arrival of the slower however stronger S waves, the general public ar warned earlier. Thus, early alert message is received by the individuals in terms of location, time and other parameters. Eventually, several of the human lives are often saved. The software used here is Arduino where the three-angle axis of the sensor can be sensed and detected when the sensors are interfaced with this software.

Indexed Terms— Earthquake, Wireless Sensor Network, IOT, Warning signal.

I. INTRODUCTION

Earthquake is commonly said to be a natural disaster which is also known as tremor or temblor. The sudden shake in the surface of the earth, which shutters down the buildings and kills thousands of human lives. Thereby by predicting the surfaces shake earlier by means of sensors that may warn public earlier. By the speculation that the S waves area unit the primary attack wave from the surface so the P waves attack the surface latter that brings the strongest shake then the S wave. Hence the public is warned earlier in few minutes or seconds before. The wireless sensor network is the network where the sensors are spatially distributed to monitor the physical and environment conditions normally.WSN is used in many fields due to its low cost, easy maintenance and robustness. The wireless sensor network is connection of several sensors that are connected to each other to perform the same functionality to monitor the environment scenario.

The term "IOT" is commonly abbreviated as "INTERNET OF THINGS" The IOT is a said to be of computing concept that describes a future where every day and everywhere physical objects will be connected to the internet and can be able to identify themselves to other devices. IOT is the technique or network used in this paper to send the accurate alert message to the public with more accuracy. The IOT is the network it connects the internet connected objects to form a network and hence the alert massage is send to the public is more accurate way by IOT.

II. METHODOLOGY

The main purpose of this paper is to detect the earthquake and to alert the public earlier. It can be done by sending warning message by means of IOT, the more accurate and smart way for transferring message to the public. Thereby the smart phones are hinted with the alert message by IOT and thus the human are aware. Fig. 1 shows the various blocks in transmitter.

The following are the components for designing,

- Vibration sensors
- Accelerometer
- Arduino
- Node MCU

- GSM Module
- LCD display

The public who are free from smart phones can also be warned by GSM module technique, where the alert message to send to the nearby base station and from there the authorized numbers can be alerted. The earthquake early warning systems monitors to alert the human and devices when the shaking waves that are generated by the earthquake are expected to arrive the respected location .Even a few seconds or minutes of early warning may allow the people to take actions to protect their lives and move to safer positions.

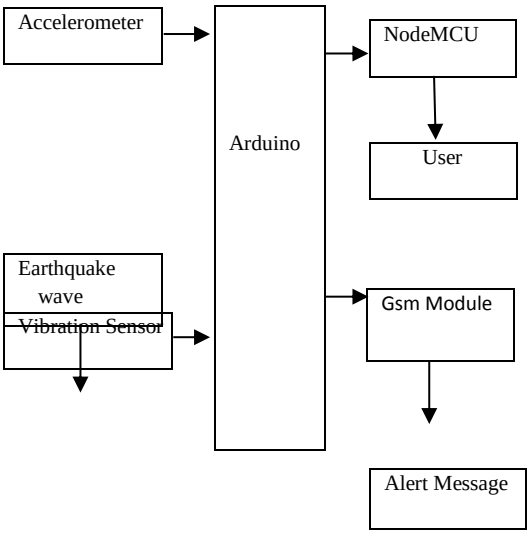

Figure 2.1 Block Diagram of the Proposed System

III. HARDWARE DESCRIPTION

The overall circuit of the proposed system is shown in figure 2.1 The vibration sensors are designed to measure the acceleration of the physical object. In this paper this sensor helps in detecting the earth ground shakes. Thus the sensors sense the P wave first which initially attacks the surface and then after few seconds or minutes, the S wave latter hits the surface. Hereby sensors sensing the P wave earlier send the alert message earlier to the public immediately. Thus the accelerometer does it works by sensing the ground shakes and sending the alert signal to the microcontroller where decision is taken according to the programmed feature Thus the major initial part in the transmitter side of the paper is determined. The next is about the Arduino UNO is designed or programmed in such a way that the alert signal is transferred to the public until the ground wave hits certain magnitude level. For example, the Arduino is programmed to be 2 magnitudes, thus the waves which is with 2 magnitudes and above then only the warning signal is delivered to the public. These are the process that is done in the transmitter side. Well, then the communication technique has to be followed to deliver the earlier warning signal from the microcontroller to the PC where it acts as an IOT.

The communication technique used is the Node MCU, where the sensors that are randomly distributed in the ground senses and microcontroller decides and sends the alert signal by the IOT. Normally, the Node MCU is preferred due to the low power consumption, smaller in size, easier to interface.

Eventually by means of an IOT, the warning or alert message is passed to the public in more effective way to the smart phone. Even another way to those who are not using smart phones then by using the GSM module the alert message can be sent to the nearby base station and from there the early alert signal of earthquake is to the authorized numbers and thus they are warned earlier. We will set the threshold value for the Accelerometer of the y axis and the vibration sensor in Hz. That value will always display in LED Display. When the Earthquake occurs, the value will cross the threshold value it indicates “Earthquake Occurred” and the buzzer also ON.

IV. RESULT AND DISCUSSION

For the detection of the earth waves it is done by the sensors where as the data that the sensor senses is sent to the user’s knowledge by using the database, where the sensor sensed values are connected to the database by the Node MCU and it is Stored in ThingSpeak account. More over the IOT environment where the alert signal is sent can be achieved by this software; thereby the IOT is instrumented by this software. Here in this result section, earth waves are sensed and transfer the data to the database where the users are aware of the wave’s condition. The remaining output is that the alert message is delivered to the public by SMTP where by mail the warning can be sent to the public by means of IOT. For the people those who are

out of smart phones can also get the warning message by the GSM module. The detailed explanation is that the sensors detect the earth shakes and then the alert signal is passed to the nearby base station. From the base station to the authorized numbers the warning signal can be passed to the public.

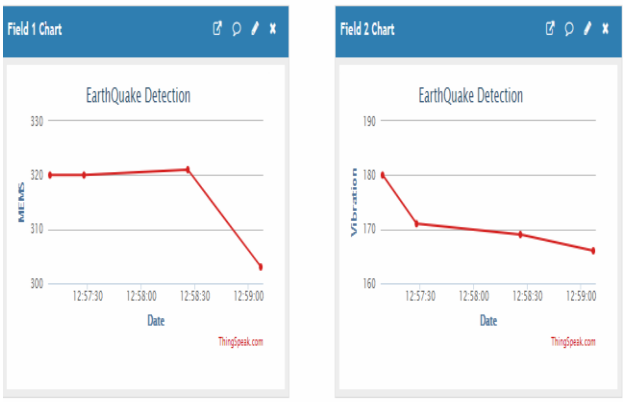

Figure 4.1 Graphical representation of output.

Figure 4.2 Alert Message to the Mobile.

V. CONCLUSION

The proposed early earthquake warning system by using the smart way for transferring the alert signal to smart phones is accomplished by the trending buzz term IOT. The hardware portion plays the role of detecting and reading the signal successfully. Thereby the software portion is to deliver the alert signal to the human which is done by the trending and most reliable term IOT. The Arduino program helps greatly to interface the hardware kit and to control and monitor the reading by this software. Thus each sensors connected to the others are ended up connected to the gateway where it is interfaced to the Arduino Program. The platform is created in such a way that the sensor reading is monitored in terms of numerical and graphical representation. And the earth vibrated reading values can be viewed in the database which the software does for the reference of the user. It creates a platform to provide a link between the IOT cloud and the warning signal. Thus the Arduino Program helps to achieve the early warning signal reaches the public. Eventually for the non-smart phones users by GSM module the alert messages can be reached.

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