IOT BASED EARTHQUAKE PREDICTION

Problem Statement

Being able to predict the earthquake and using it to warn others with the help of equipments such as accelerometer, Arduino, basically using IOT.

The Accelerometer ADLX335 has been used in combination with Arduino Uno at the earthquake prone areas .

ADLX335 is capable of sensing vibrations from all the directions X, Y as well as Z.The ADXL335 is a low power, complete 3-axis accelerometer with signal conditioned voltage outputs and can measure static and dynamic accelerations.

Programming for the controller is carried out using the software Arduino by which we obtain the graphical data of seismic waves in X, Y, Z directions.[1]

Equipments Required

1.Accelerometer (ADLX355)"+-3g": Detects Acceleration

2.Arduino Uno: Used for programming the accelerometer

3.Arduino IDE: Software used for inputting program code

4.Led

5.Buzzer

6.PC/Laptop (for obtaining output)

7.Proteus

Additions to the problem statement

An earthquake is the shaking of the surface of the Earth, resulting from the sudden release of energy in the Earth's lithosphere that creates seismic waves. An earthquake is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter[2]

This energy is radiated outward s from the focus in all Directions in form of Seismic waves. These Seismic waves Produced tend to shake the earth surface as it moves through It. When we talk about Seismic wave , these are further of Two types , Body waves and Surface waves .We focus more On body waves rather than surface waves because the source Regions can be constrained in both azimuth and distance Using conventional array technique . Also, the velocity of Surface wave is even less than 2 mi. per sec as compared to Velocity of Body wave. Body waves are classified into Primary waves (P waves) and Secondary Waves (S waves) . P waves are the longitudinal waves and travel with a Velocity of 6.4 km per sec while S waves are the transverse Waves and travel at 3.2 km per sec . Therefore, P waves being the fastest among all the Seismic waves are the first to Be detected and help predicting it[3]

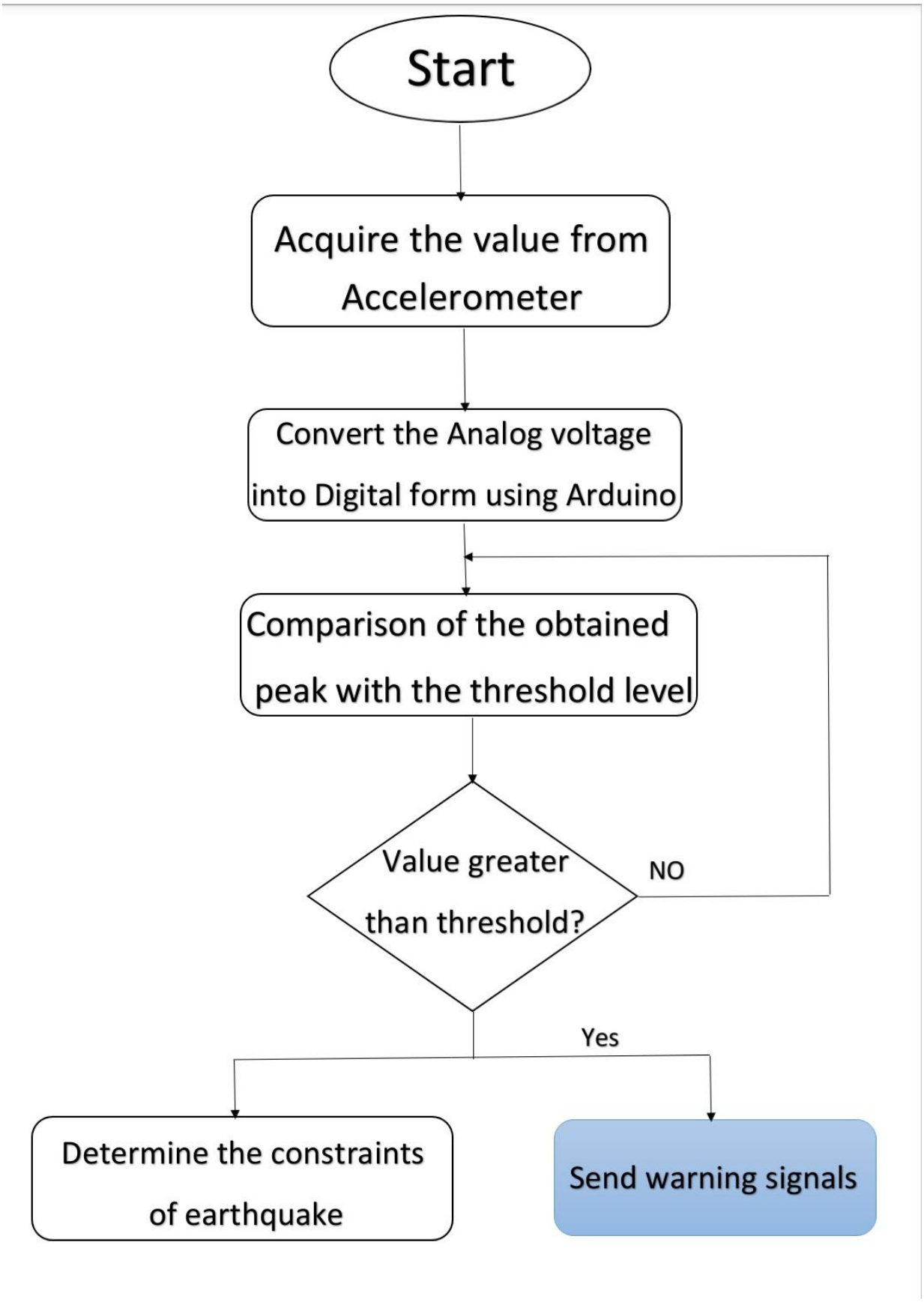

Figure 1: Flowchart of earthquake Prediction step[4]

Advantages Applications and challenges

As early as 1978 it was reported that earthquake rupture might be complicated by "heterogeneous distribution of mechanical properties along the fault",[5] and in 1986 that geometrical irregularities in the fault surface "appear to exert major controls on the starting and stopping of ruptures".[6] Another study attributed significant differences in fault behavior to the maturity of the fault.These kinds of complexities are not reflected in current prediction methods.[7]

Earthquake Prediction can be very useful and can be proved very effective in saving a lot of lives and prevent loss of goods, it provides an early warning and people to act accordingly.

Conclusion

Due to Primary body wave which is faster than the secondary body wave ,we can with the help of IOT (mainly with accelerometer and software) detect primary waves earlier and Predict an Earthquake through the nodes of accelerometer , if the difference is above the threshold than the probe will send signal through accelerometer to Arduino and trigger warning such as a buzzer or light , with this early warning we can save valueable lives of people

References

[1] Veenu Grover, Aman Sharma “Prediction of Earthquake using 3 axis accelerometer” (PDF).

[2] Lisa Wald “The Green Frog News “, “The Science of

Earthquakes”.

[3] “Seismology”,Science of everyday things, 10 July 2017”.

[4] Veenu Grover, Aman Sharma “Prediction of Earthquake using 3 axis accelerometer”.

[5] Kanamori, Hiroo; Stewart, Gordon S. (10 July 1978), "Seismological Aspects of the Guatemala Earthquake of February 4, 1976" (PDF).

[6] Sibson, R. H. (1986), “Earthquakes and Lineament Infrastructure”, Philosophical Transactions of the Royal Society A, 317 (1539): 63–79

[7] Schwartz, David P.; Coppersmith, Kevin J. (10 July 1984), “Fault Behavior and Characteristic Earthquakes: Examples From the Wasatch and San Andreas Fault Zones”, Journal of Geophysical Research, 89 (B7): 5681–5698