

Earthquake Detector Using Arduino

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Abstract: Earthquake is an inevitable phenomenon that happens quickly and cannot be prevented, but can be warned. An accelerometer ADXL335 sensor is used to detect pre-earthquake vibrations. When a vibration occurs, the accelerometer detects and converts the equivalent ADC value. These digital values are then read by the microcontroller Arduino. Arduino then compares these values with the current values. If the Arduino detects that the standard value is greater than the threshold, it will beep and display a message on the 16x2 LCD indicating the alarm status and the LED will light up at the same time. SMS notification messages are sent to the relevant mobile phone number using the GSM module. Both sensors are used for fire detection and gas leaks in the building can be detected using a combination of flame and smoke. If an SMS notification is detected, it will be sent to the corresponding mobile number.

Keywords: Accelerometer, Arduino.

1.INTRODUCTION

Earthquakes are phenomena caused by the movement of tectonic plates, resulting in the thermal motion of the Earth's core colliding with another Earth plate and breaking it [2]. Earthquakes cause loss of life and property. Earthquakes are unexpected events that cannot be prevented, but can be prevented. Pre-earthquake detection using the highly sensitive ADXL335 accelerometer. It is very sensitive to shock and vibration on all three axes. Whenever it detects any shakes or vibrations, it will start the buzzer that vibrations and convert the m into equivalent ADC value.. These values are then read by the Arduino and displayed on the 16x2 LCD. The accelerometer is first calibrated by taking environmental vibration samples when the Arduino is turned on. This sample must be subtracted from the actual reading to get the actual reading, so it doesn't show a warning about the vibrations around it. After finding the correct reading, the Arduino compares these values with the predefined maximum and minimum values. If the Arduino detects a change in the preset value of an axis in both directions (negative and positive), the Arduino will emit a sound and display an alarm on the 16x2 LCD and the LED will light up at the same time [4]. You can adjust the sensitivity of the earthquake detector by changing the values given in the Arduino code. SMS notifications are sent to the corresponding mobile number [12] using the GSM module. and two more Using sensors to detect fire, any smoke in the building can be detected using a combination of flame and smoke. If detected, an SMS notification will be sent to the corresponding mobile number [5].

2.OBJECTIVES

Its main purpose is to detect the initial low-frequency oscillations of an earthquake and to evaluate ground shaking. If vibrations are detected early, an alarm sounds to facilitate evacuation. Compared to previous models, it is more portable and can be placed anywhere. Its relatively small size makes it very portable and lightweight. The hardware components used in the device are far more efficient and less complex. Light, easy to use, optimal size and low complexity for easy handling.

3.PROPOSED SYSTEM

Use an accelerometer to determine the significant vibrations of an earthquake along one of the three axes. Therefore, any vibration that occurs is detected by the accelerometer and converted to an equivalent ADC value [1]. These values are read by the Arduino and displayed on the 16x2 LCD. Accelerometer calibration is done by taking environmental vibration samples when the Arduino is turned on. This formula then needs to be subtracted from the actual reading to get the actual reading. Therefore, continuous vibration does not leave any warning around it [7]. After finding the correct reading, the Arduino compares these values with the predefined minimum and maximum values. If the Arduino detects a change for an axis in both directions (negative and positive) greater or less than the specified value, the Arduino will activate the buzzer and show the alarm status on the 16x2 LCD and the LED will also turn on. The sensitivity of the earthquake detector can be adjusted by changing the predefined value in the Arduino code [11]. Flame sensors are used to detect and respond to fire or flame formation. A gas sensor is a device that interacts with gas to measure its concentration and detect it in an area. When an earthquake is detected, alerts are sent to mobile phones via GSM [8].

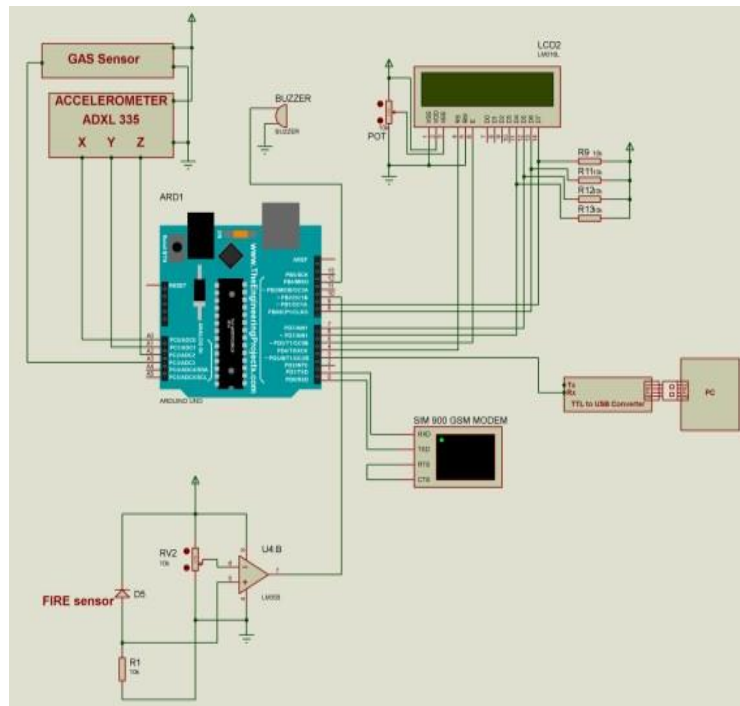


Fig. 1. Circuit Diagram

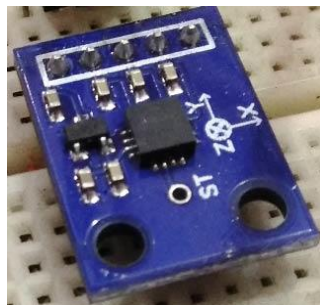


Fig. 3. Accelerometer

C.Buzzer

A buzzer or bell is an audible signaling device that can be electromechanical or piezoelectric (called a piezoelectric). Beeps and their uses include calls, timers, trains, and user input such as mouse clicks or keystroke

The microcontroller's 14 digital input/output pins can be used as inputs or outputs when programming the Arduino using the pinMode(), digitalRead(), and digitalWrite() function. Arduino code is provided and below is the IDE code for both. IDE code helps draw state diagrams. A buzzer or LED is used as an alarm when the vibration starts to increase.



A. Accelerometer ADXL335

Accelerometer sensors are sensitive to pre-earthquake vibration and motion. The ADXL335 provides full 3-axis acceleration measurement. It measures acceleration in the x, y, and z axes within ± 3 g. The accelerometer sensor has a micro-machined sensor with polysilicon surface and signal conditioning circuitry.

4.CONCLUSION

So to summarize, the purpose of this product is to reduce the damage caused by earthquakes by warning people. It is very economical and can accommodate every people. This device is designed as a modern technology to solve the problem of automatic detection and classification of earthquakes in one step by using Arduino as an earthquake detector. In this process, most of them do well in protecting lives and resources during earthquakes. The device is small and light, which makes it easy to carry and place anywhere. The hardware used in this device is very good and uncomplicated. In addition, the system's sensors are very sensitive, allowing for more accurate measurements. The equipment is more efficient and therefore uses less energy. Fire sensor and gas sensor are also connected to it to detect gas and fire environment, so this system has many uses. As a result, the system is very efficient.

5.FUTURE SCOPE

Early detection can make escape easier. Raising awareness can lead to preventive measures that can prevent serious harm. The best dimensions make the system easy to unwind. Future work includes improving the accuracy of our system and measurement system, as well as improving the mobility of our device so that the system can be connected to a more convenient location in a home.

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