

# **Earthquake detector**

## **A PROJECT REPORT SUBMITTED TO**

**SCHOOL OF COMPUTER SCIENCE & ENGINEERING,  
LOVELY PROFESSIONAL UNIVERSITY,  
PHAGWARA (INDIA)**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE END TERM PROJECT**

**IN  
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY**

### **SUBMITTED BY:**

<b>NAME OF THE STUDENT</b>	<b>REG. NUMBER</b>	<b>ROLL NUMBER</b>	<b>Domain Knowledge / Methodology (20)</b>	<b>Ergonomics/ Innovations (10)</b>	<b>Individual and team contribution (10)</b>	<b>Presentation skills [20]</b>	<b>Viva Voce [20]</b>	<b>Project Report [20]</b>
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LOVELY PROFESSIONAL UNIVERSITY  
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# Earthquake detector

## 1. INTRODUCTION

Earthquakes are one of the most devastating natural disasters that cause significant damage to infrastructure and result in the loss of lives. Timely detection and alerts can help reduce the damage and improve emergency response. This paper introduces a low-cost earthquake detector using sensors, microcontrollers, and real-time notification mechanisms to aid in preparedness and safety

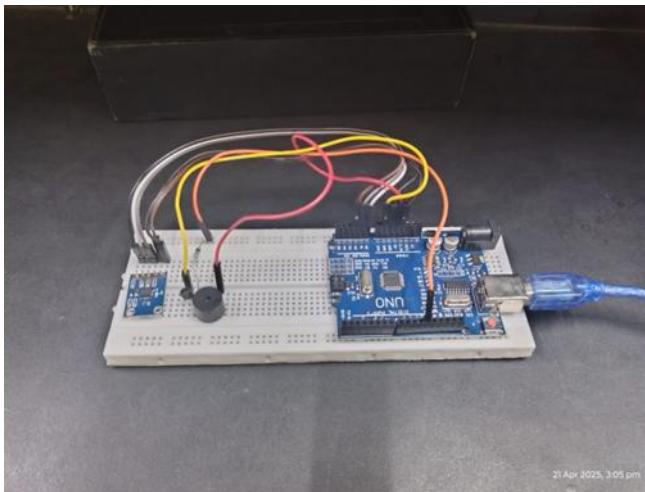


Fig 1 Earthquake detector using arduino

## 2. EARTHQUAKE DETECTOR STRUCTURE

- a. ↑ SENSORS
- b. Accelerometer (e.g.,
- c. ADXL335 or MPU6050) to detect vibrations or motion in X, Y, Z directions.
- d. ↑ ADC (ANALOG TO DIGITAL CONVERTER) AND SENSOR CIRCUIT
- e. If using analog accelerometer: Signal converted to digital via Arduino's in-built ADC.

- f. Proper connections with voltage dividers or filters if needed.
- g. ↑ Processor - Arduino Uno/Nano used to process input from the accelerometer. - Compares vibration data against threshold values.
- h. ↑ DRIVER
- i. Transistor (e.g., BC547 or 2N2222) used to drive the output device (buzzer, LED, GSM module, etc.).
- j. ↑ CHASSIS AND BODY STRUCTURE
- k. Compact platform to hold Arduino, accelerometer, power module, and output system. - Should be vibration-isolated or mounted firmly.
- l. ↑ POWER SUPPLY (5V / 12V DC)
- m. - 5V for Arduino and sensors. - 12V for relays, GSM modules, or larger actuators (if used). - Can use adapter, battery + regulator (7805), or USB power.

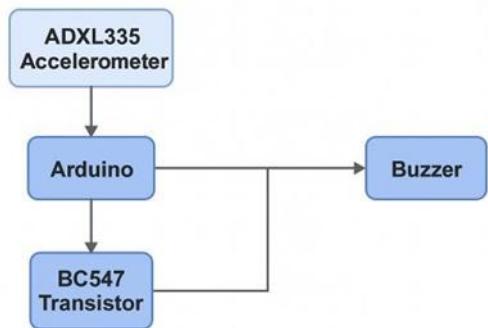


Fig 2 Block diagram

### 3 components and price

#### 1. Arduino with USB cable

RoboCraze UNO R3 SMD Board compatible with Arduino Development Board with USB cable

Visit the Robocraze Store

3.8 ★★★★☆ 1,305 ratings | Search this page

1K+ bought in past month

-78% ₹349 (Incl. GST)

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#### 4. BC547 transistor

Abhith India BC547 NPN Transistor - 5 Pieces

Brand: Abhith India

4.1 ★★★★☆ 72 ratings

-92% ₹3 (Incl. GST)

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Free Delivery, 10 days Returns, Secure Payment

#### 2. Adxl335 module 3 axis analog output accelerometer

IndieWAP > Sensors & Transducers > Position Sensors > Accelerometer Sensor

Adxl335 Module 3-Axis Analog Output Accelerometer

₹ 230/Unit

Enter Quantity piece ▾

Submit Requirement

complete a minimum full-scale range on board voltage regulator dynamic acceleration resulting break-out board comes measure the static acceleration	3-axis accelerometer with signal conditioned voltage outputs +3g works at both 3.3V & 5V motion shock or vibration an on-board gravity in tilt-sensing applications
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The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of 3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. This breakout board comes with an on-board voltage regulator and works at both 3.3V & 5V (3.6V)

#### 5. 1 k ohm resistor

1K ohm 1/4 Watt Resistor 1% Tolerance - 10 Pieces Pack

Von the Generic Store

3.9 ★★★★☆ 21 ratings | Search this page

-65% ₹13 (Incl. GST)

Inclusive of all taxes

Offers

Cashback	Bank Offer	Partner Offers
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#### 3. Buzzer

Audio Indicators

YMD12095(G)5V-CLDZ-Electromagnetic active split buzzer-5V(12x9.5mm)

Availability: Out of stock

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SKU: R179587

1. Brand: CLDZ  
2. MPN: YMD12095(G)5V  
3. Voltage Rating (V): 5  
4. Diameter (mm): 12  
5. Height (mm): 9.5  
6. Operating Temperature (°C): -20 to 70

₹ 18.00 (Incl. GST)

#### 6. Breadboard

Classic Time

Breadboard and Zero PCBs

Solderless 400 pin breadboard – Normal Quality – Without Packing

★★★★★ (3 customer reviews)

Availability: In stock

Add to Wishlist

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SKU: 1270232

1. 400 tie points  
2. 2 Power lanes, Total 300 tie points in power lanes  
3. 1 Double edge, Total 300 tie points  
4. Perfect for Arduino shield prototyping and testing  
5. Plastic housing, metal contact clips

₹ 41.00 (Incl. GST)

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## *4 use and functionality of each component*

### 1. Arduinio

The **Arduino** acts as the **brain of the system**. It continuously reads the analog signals from the **ADXL335 accelerometer**, which detects vibrations or movements on the X, Y, and Z axes. The Arduino processes this data in real-time and checks if the vibration level crosses a pre-set **threshold** that indicates an earthquake-like motion. If it does, the Arduino sends a signal to the **BC457 transistor** to activate the **buzzer**, giving an instant warning alert.

### 2. ADXL355 accelerometer

The **ADXL335 accelerometer** is used to **detect vibrations or movements** in three directions—X, Y, and Z axes. It converts these physical movements into **analog voltage signals**, which are then sent to the Arduino. When the accelerometer senses sudden changes in acceleration (like during an earthquake), these signals help the Arduino determine whether the motion is strong enough to trigger the buzzer alarm.

### 3. Transistor

The **BC457 transistor** is used as an **electronic switch** in the circuit. It is connected between the Arduino and the buzzer. When the Arduino detects an earthquake-like vibration, it sends a small current to the base of the transistor. This allows a **larger current** to flow from the collector to the emitter, **activating the buzzer**. Without the transistor, the Arduino might not be able to provide enough current to power the buzzer directly.

### 4. Buzzer

The **buzzer** serves as the **alert system** in the project. When the Arduino detects unusual vibrations through the accelerometer and activates the transistor, the buzzer turns on and produces a **loud sound**. This sound acts as an **immediate warning signal** to alert people nearby about possible earthquake activity.

### 5 1K ohm resistor

The **1 kΩ resistor** is used to **limit the current** flowing into the **base of the BC457 transistor** from the Arduino. This protects both the transistor and the Arduino pin from excess current. It ensures that the transistor switches properly without drawing too much current from the microcontroller.

## *5. circuit diagram*

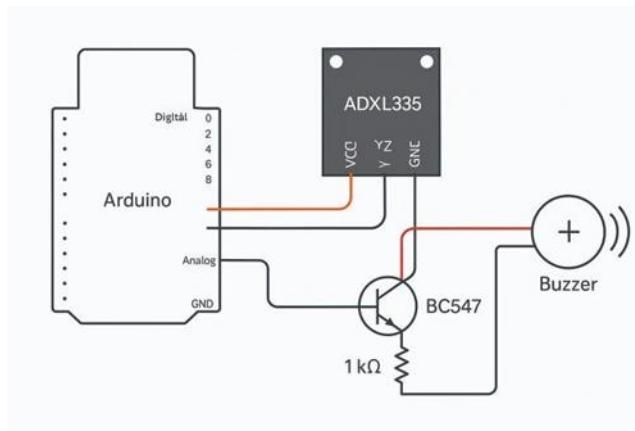


Fig 3 circuit diagram

- **Step 1: Powering the Circuit**

- Connect **VCC of the ADXL335** to the **5V pin of the Arduino**.
- Connect **GND of the ADXL335** to **GND on Arduino**.
- This powers the accelerometer.

- **Step 2: Reading Motion Data**

- Connect the X, Y, Z output pins of the ADXL335 to Arduino analog pins (e.g., A0, A1, A2).
- These analog pins will read the **acceleration data** from the sensor in real time
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- **Step 3: Motion Detection Logic**
- In the Arduino code, calculate the **change in acceleration** using the X, Y, Z values.
- If a sudden spike is detected (which indicates a tremor), the Arduino will output a **HIGH signal** to trigger the alert system.
- **Step 4: Controlling the Buzzer with Transistor**
- The **buzzer is connected to the collector of the BC457 transistor**.
- The **emitter of the transistor goes to GND**.
- The **base of the transistor is connected to a digital pin on the Arduino (e.g., D9) through a 1 kΩ resistor**.
- **Step 5: Role of the 1 kΩ Resistor**
- The **1 kΩ resistor** limits the current flowing from the Arduino to the base of the transistor.
- This **protects the Arduino and the transistor** from excessive current.
- **Step 6: Triggering the Alert**
- When the Arduino detects strong movement, it **sends a HIGH signal to the transistor's base**.
- This allows current to flow from collector to emitter, **activating the buzzer**.

## 7. RESULTS AND DISCUSSION

The proposed earthquake detector was tested under controlled vibrational stimuli. It successfully detected threshold-level tremors and activated alerts within seconds. The system is cost-effective and suitable for deployment in schools, homes, and workplaces. Further enhancements can include cloud connectivity and integration with emergency services.

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Identify applicable funding agency here. If none, delete this text box.