Alert System for Earthquakes: Project Report

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Problem Statement-:

Earthquakes are natural disasters that cause significant loss of life, property damage, and economic disruption. The inability to predict earthquakes accurately leads to unpreparedness, resulting in severe consequences. Current earthquake detection systems are either expensive, lack coverage in rural and remote areas, or fail to provide real-time alerts. There is a pressing need for a cost-effective, reliable, and efficient earthquake alert system that can detect seismic activity and alert people promptly to mitigate losses.

Scope of the Solution-:

The proposed alert system for earthquakes will serve as an early warning system, designed to:

Detect seismic activity using sensors.

Process the data in real time to determine earthquake magnitude and location.

Send instant alerts through visual and auditory means, as well as SMS or mobile app notifications.

Be scalable and deployable in both urban and rural areas.

Offer an affordable alternative to existing high-cost systems.

This solution can be used in residential buildings, schools, offices, factories, and other critical infrastructure.

Hardware Requirements-::

1.SEN TILT SENSOR HW072

2.Microcontroller: Arduino UNO

4.Display Unit: LED

5.Buzzer

6.Power Supply

7.Resistor

8. Jumper wire

Software Requirements-::

1.IDE for Microcontroller Programming: Arduino IDE for coding and uploading firmware.

2. Tinkercad

3.Fritzing

Working Principle-:

1. Detection: The tilt sensor captures vibrations and measures ground acceleration.

2. Processing: The arduino processes the data in real time, using pre-set thresholds to distinguish earthquakes from minor vibrations.

3. Decision: If the vibration exceeds the threshold, the system categorizes the earthquake's intensity and generates an alert.

4. Alert Mechanism:
Local Alerts: Visual (flashing LED) and auditory (buzzer) alerts activate immediately.

Setup-:

Connect the tilt sensor to the microcontroller for vibration detection.

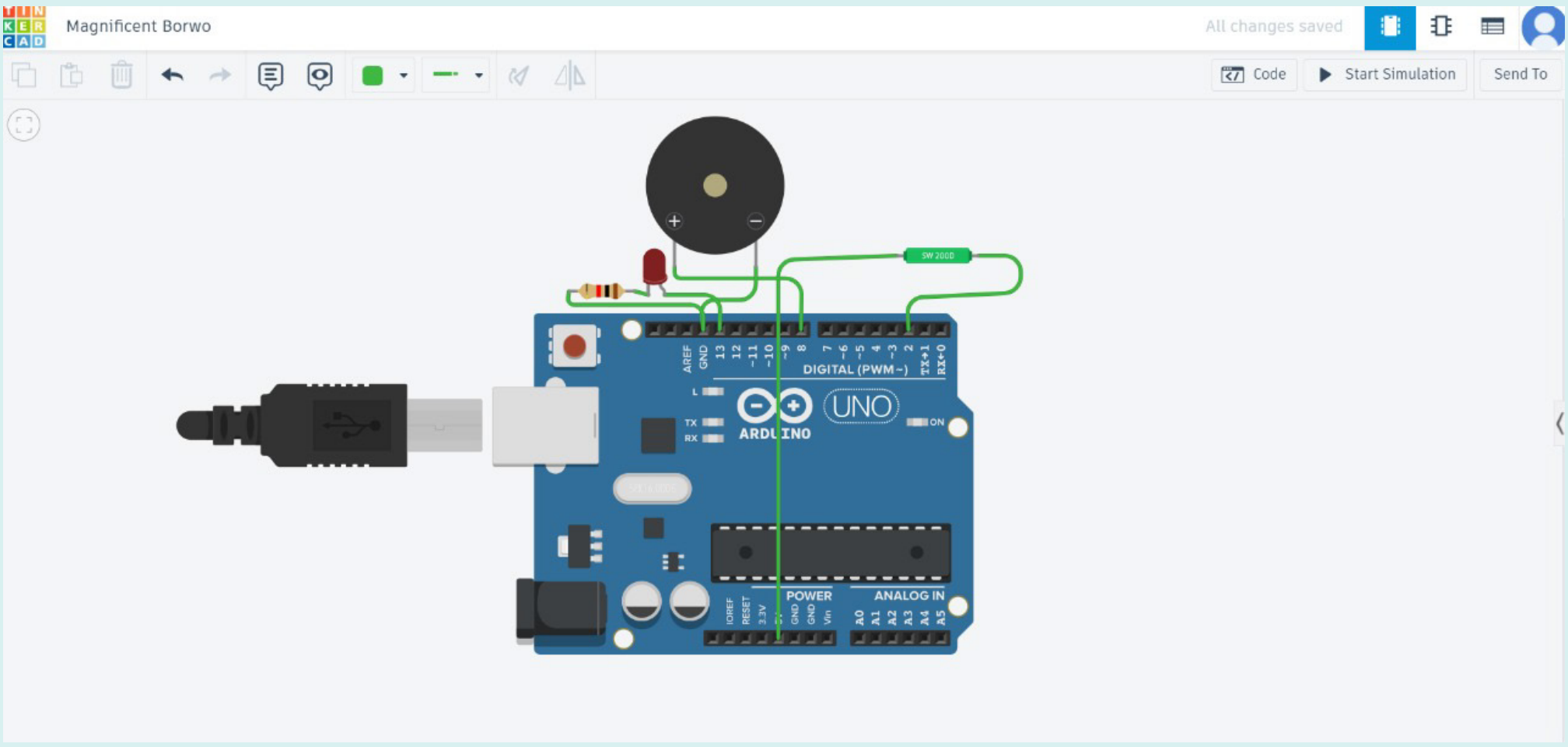
Integrate the communication module for remote notifications.

Attach the buzzer, and power supply.

Write and upload the sensor data processing code using Arduino IDE.

Develop the alert notification system using Android Studio or equivalent tools.

Simulated Circuit:-



Media-:

Media Link

Github Link-:

GitHub Link

Gerber file :-

.gerberfile link

Code for the solution:-_

```
#define TILT 2
#define LED 4
#define BUZZER 3


void setup() {
  Serial.begin(9600);
  pinMode(TILT, INPUT);
  pinMode(LED, OUTPUT);
  pinMode(BUZZER, OUTPUT);

}

void loop() {
  int TILT_VALUE = digitalRead(TILT);
  if (TILT_VALUE == HIGH){
    digitalWrite(LED,HIGH);
    digitalWrite(BUZZER, HIGH);
    delay(1000);
  }
  else {
    digitalWrite(LED,LOW);
    digitalWrite(BUZZER, LOW);
  }

}
```

Conclusion-:

This is a practical and scalable solution aimed at minimizing the impact of earthquakes. By leveraging low-cost sensors, microcontrollers, and modern communication technologies, this system can provide reliable early warnings, saving lives and reducing property damage. Further enhancements can include integrating AI for advanced data analysis and machine learning for predictive capabilities.

Future Scope-:

Integration with IoT networks for large-scale monitoring.

Use of machine learning models to predict earthquake patterns.

Expansion of alert mechanisms to include wearable devices.

This project demonstrates how engineering and technology can be utilized to create sustainable and impactful solutions for disaster management.

Thank You