# NANDHA ENGINEERING COLLEGE

**ERODE–638052 (Autonomous)**

**(Affiliated to Anna University, Chennai)**

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

**22AIC14 – INTERNET OF THINGS AND ITS APPLICATIONS**

**MINI PROJECT REPORT ON**

**TOPIC- IOT IMPLEMENTED SAFETY MODULE**

**Submitted by**


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**NANDHA ENGINEERING COLLEGE**

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**BONAFIDE CERTIFICATE**

**This is to certify that the project work entitled "IOT IMPLEMENTED SAFETY MODULE" is the Bonafide work of CHETHANAND V (22AI007), DINESH KUMAR B (22AI013), MANOJ J V (22AI026) who carried out the work under my supervision.**

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# IOT IMPLEMENTED SAFETY MODULE

## AIM:

To develop a safety module that detects danger through abnormal heart rate and sound, raises an alert via a buzzer, and sends GPS location and emergency messages using GSM.

## SCOPE:

This project provides an IoT-based safety solution for women, enabling automated emergency alerts and location tracking, ensuring timely assistance during critical situations.

## BRIEF HISTORY:

IoT technology has transformed personal safety by integrating advanced sensors, GPS, and GSM modules. This project leverages these technologies to enhance safety measures, providing real-time alerts and location sharing.

## PROPOSED METHODOLOGY:

1. Hardware Setup:

   Connect the Arduino with the LM393 sound sensor, pulse sensor, GPS module (NEO-6M), GSM module (SIM800L), and buzzer.

   Power the system using a 9V battery and a buck converter for the GSM module.

2. Software Configuration:

   Configure Arduino IDE with necessary libraries for GPS, GSM, and sensors.

   Write a program to read sensor data, analyze conditions, and send alerts via GSM.

3. Testing:

   Simulate various scenarios to validate the system’s functionality.

   Verify SMS delivery and GPS accuracy.

## COMPONENTS REQUIRED:

| S.NO | HARDWARE | QUANTITY |
|---|---|---|
| 1 | Neo 6m gps module | 1 |
| 2 | Arduino UNO | 1 |
| 3 | LM393 sound sensor | 1 |
| 4 | sim800l gsm module | 1 |
| 5 | pulse sensor | 1 |
| 6 | Buzzer | 1 |
| 7 | Jumper Wires | several |

## DESCRIPTION:

The **Women Safety IoT Module** is designed to provide an efficient, real-time safety solution for women. This module leverages the power of IoT (Internet of Things) to integrate multiple sensors and communication technologies, ensuring immediate action in dangerous situations. By combining a **sound detection sensor**, **heart rate sensor**, **GPS module**, and **GSM module**, the system can detect abnormal conditions and send real-time emergency alerts, including GPS location, to predefined contacts such as family members, friends, or emergency services.

### Core Components and Functionality:

1. **Sound Detection (LM393):**
   The sound sensor detects abnormal or loud noise levels that could indicate distress, such as shouting, screams, or unusual sounds. When a threshold of sound intensity is crossed, the system triggers an emergency alert.
2. **Heart Rate Monitoring (Pulse Sensor):**
   The pulse sensor continuously monitors the user's heart rate. A sudden spike or abnormal heart rate can be a sign of stress or danger, such as panic or fear. If the heart rate goes beyond the normal threshold, the system reacts by sending an emergency alert.
3. **GPS Location (NEO-6M GPS Module):**
   The GPS module constantly updates the user's geographic location. In case of an emergency, the system captures the latitude and longitude coordinates and generates a link to the location using Google Maps. This link is included in the alert to help responders locate the user quickly.

4. **SMS Alert System (SIM800L GSM Module):**
   The GSM module is responsible for sending SMS messages to predefined emergency contacts with the user's GPS location and a distress signal ("SOS"). The message includes a Google Maps link, allowing responders to easily track the user's whereabouts. The system is designed to send alerts without requiring any manual intervention, ensuring the safety of the user even in the most urgent situations.
5. **Buzzer Alert:**
   A buzzer is activated as an immediate physical alarm when abnormal conditions are detected, notifying nearby individuals of the distress situation.

## HOW THIS WORKS:

- The system continuously monitors the user's heart rate and surrounding sound levels. If the heart rate exceeds a predefined threshold or if loud noise is detected (such as a scream), the module triggers the buzzer and sends an **SOS SMS** containing the GPS location to predefined contacts.
- The **GPS** module provides real-time location data, which is sent with the message in the form of a clickable Google Maps link.
- The **SMS** is automatically sent through the **SIM800L GSM module**, ensuring that emergency services or guardians are informed without the need for the user to manually make a call or text.

## CONNECTIONS:

### 1. Arduino Uno:

- The Arduino Uno acts as the central microcontroller for processing data from all connected components.

### 2. Sound Detection Sensor (LM393):

- **VCC** pin → **5V** pin on Arduino
- **GND** pin → **GND** pin on Arduino
- **OUT** pin → **A0** (Analog pin) on Arduino

### 3. Pulse Sensor (Heart Rate Sensor):

- **VCC** pin → **5V** pin on Arduino
- **GND** pin → **GND** pin on Arduino
- **SIGNAL** pin → **A1** (Analog pin) on Arduino

**4. GPS Module (NEO-6M):**

- **VCC** pin → **5V** pin on Arduino
- **GND** pin → **GND** pin on Arduino
- **TX** pin → **Pin 3** on Arduino (SoftwareSerial RX)
- **RX** pin → **Pin 4** on Arduino (SoftwareSerial TX)

**5. GSM Module (SIM800L):**

- **VCC** pin → **5V output** of the **buck converter**
  (The buck converter steps down voltage to a stable 5V for the GSM module).
- **GND** pin → **GND** pin on Arduino
- **TX** pin → **Pin 10** on Arduino (SoftwareSerial RX)
- **RX** pin → **Pin 11** on Arduino (SoftwareSerial TX)

**6. Buzzer (5V Active Buzzer):**

- **Positive (+) pin → Pin 9** on Arduino
- **Negative (-) pin → GND** pin on Arduino

**7. Power Supply:**

- The **Arduino Uno** is powered directly through the **USB cable** or **Vin pin**.
- The **buck converter** steps down voltage from the power source (e.g., 9V or 12V) to supply a stable **5V** to the GSM module.

## PROTOCOLS:

**1. UART (Universal Asynchronous Receiver-Transmitter):**

Used for serial communication between the Arduino and:

- The SIM800A GSM module (to send SMS or make calls).
- The GPS module (NEO-6M) (to receive location data).

**2. AT Commands (Attention Commands):**

A set of instructions used to control the SIM800A GSM module for sending SMS, making calls, and other functions. Examples include AT+CMGF (SMS mode) and ATD (dial a call).

**3. NMEA Protocol (National Marine Electronics Association):**

Used by the GPS module to transmit location data as strings of standardized sentences. For example, $GPGGA provides latitude and longitude information.

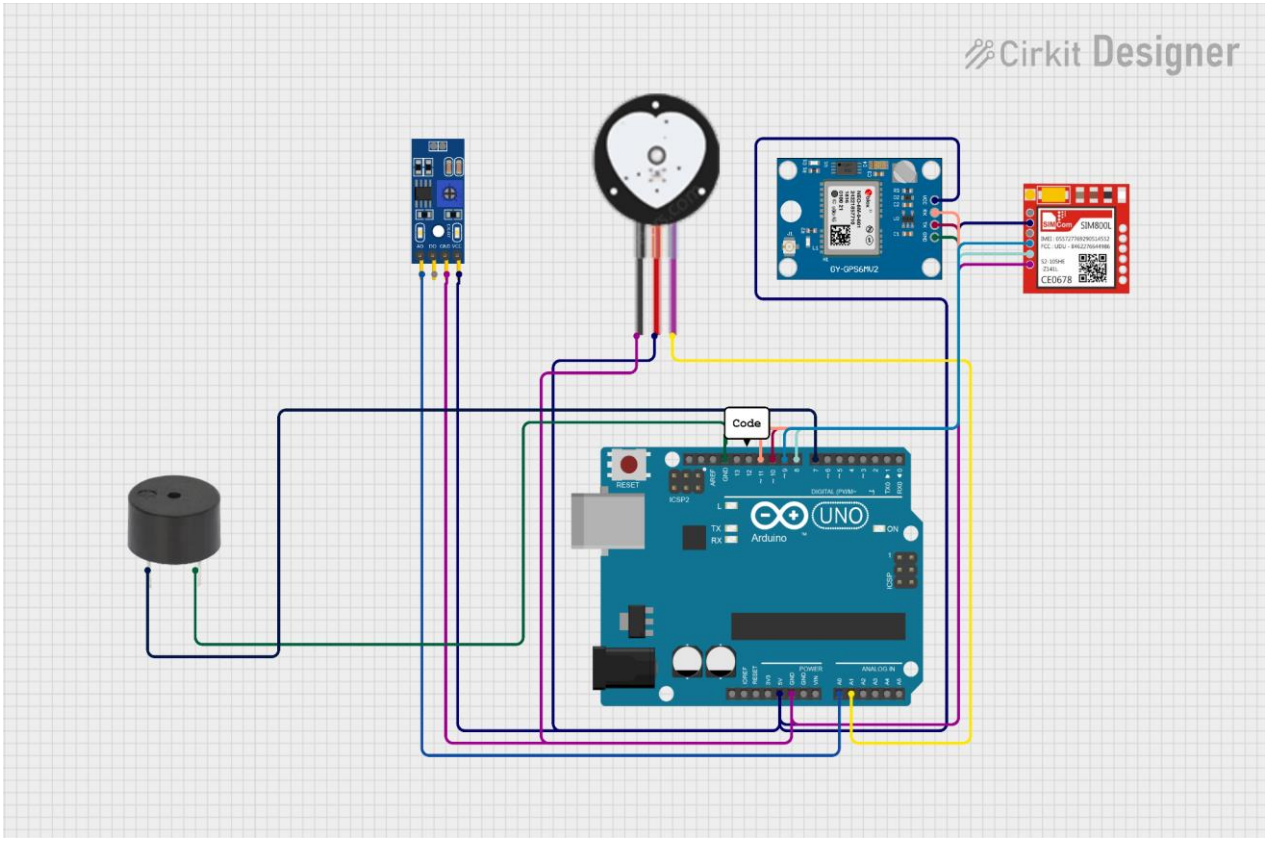
## CODING:

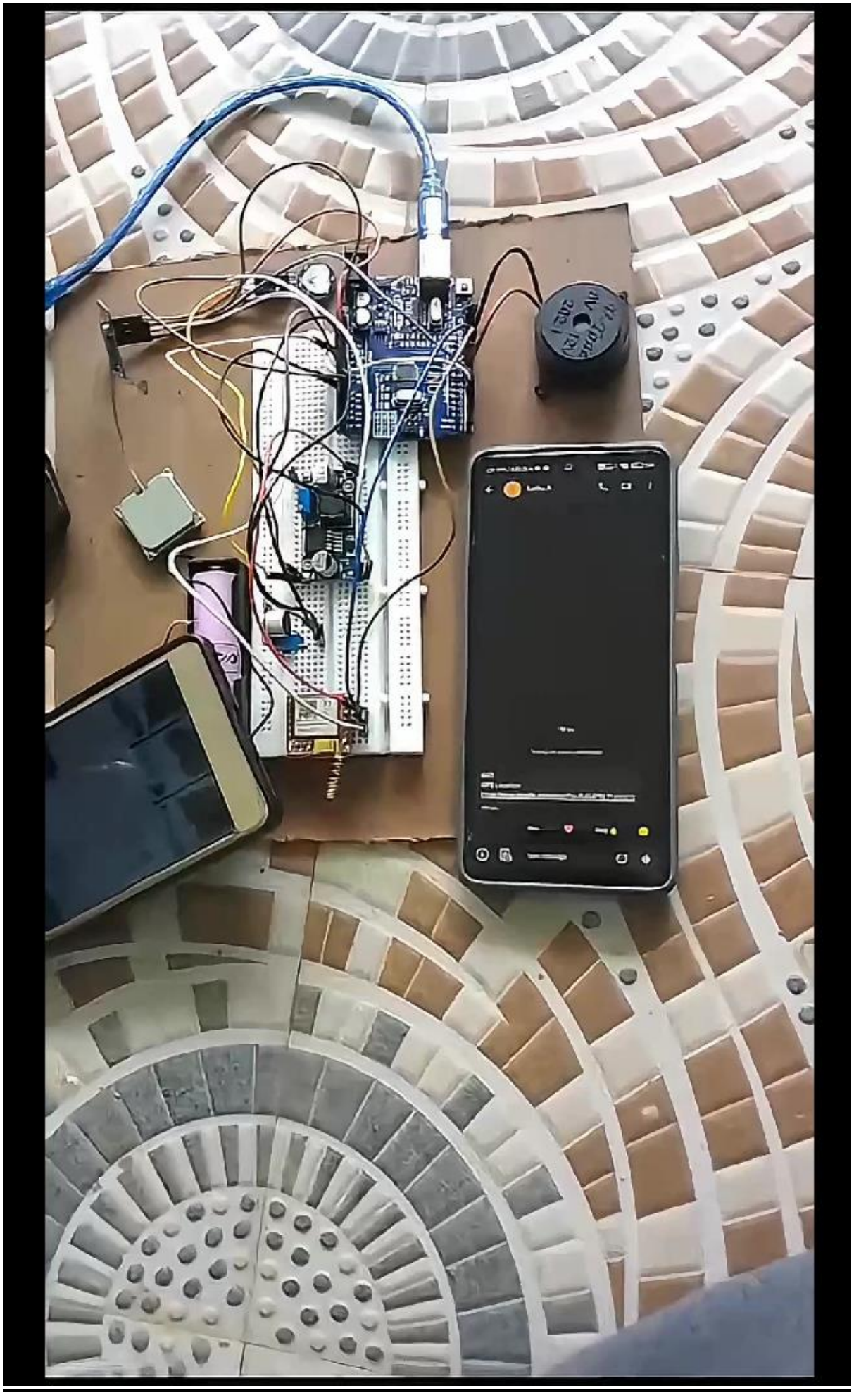
```
#include <SoftwareSerial.h>
#include <TinyGPS++.h>
// Define pins
#define SOUND_SENSOR A0
#define PULSE_SENSOR A1
#define BUZZER 9
// GPS and GSM
TinyGPSPlus gps;
SoftwareSerial gpsSerial(3, 4); // RX, TX for GPS module
SoftwareSerial gsmSerial(10, 11); // RX, TX for GSM module
// Thresholds
int soundThreshold = 500; // Adjust based on testing
int abnormalHeartRate = 100; // Adjust based on normal ranges
void setup() {
  Serial.begin(9600);
  gpsSerial.begin(9600);   // GPS module communication
  gsmSerial.begin(9600);   // GSM module communication
  pinMode(SOUND_SENSOR, INPUT);
  pinMode(PULSE_SENSOR, INPUT);
  pinMode(BUZZER, OUTPUT);
  Serial.println("System initializing...");
  initializeGSM();
}
void loop() {
  // Read sensor data
  int soundLevel = analogRead(SOUND_SENSOR);
  int heartRate = analogRead(PULSE_SENSOR);
  // Check for abnormal conditions
```

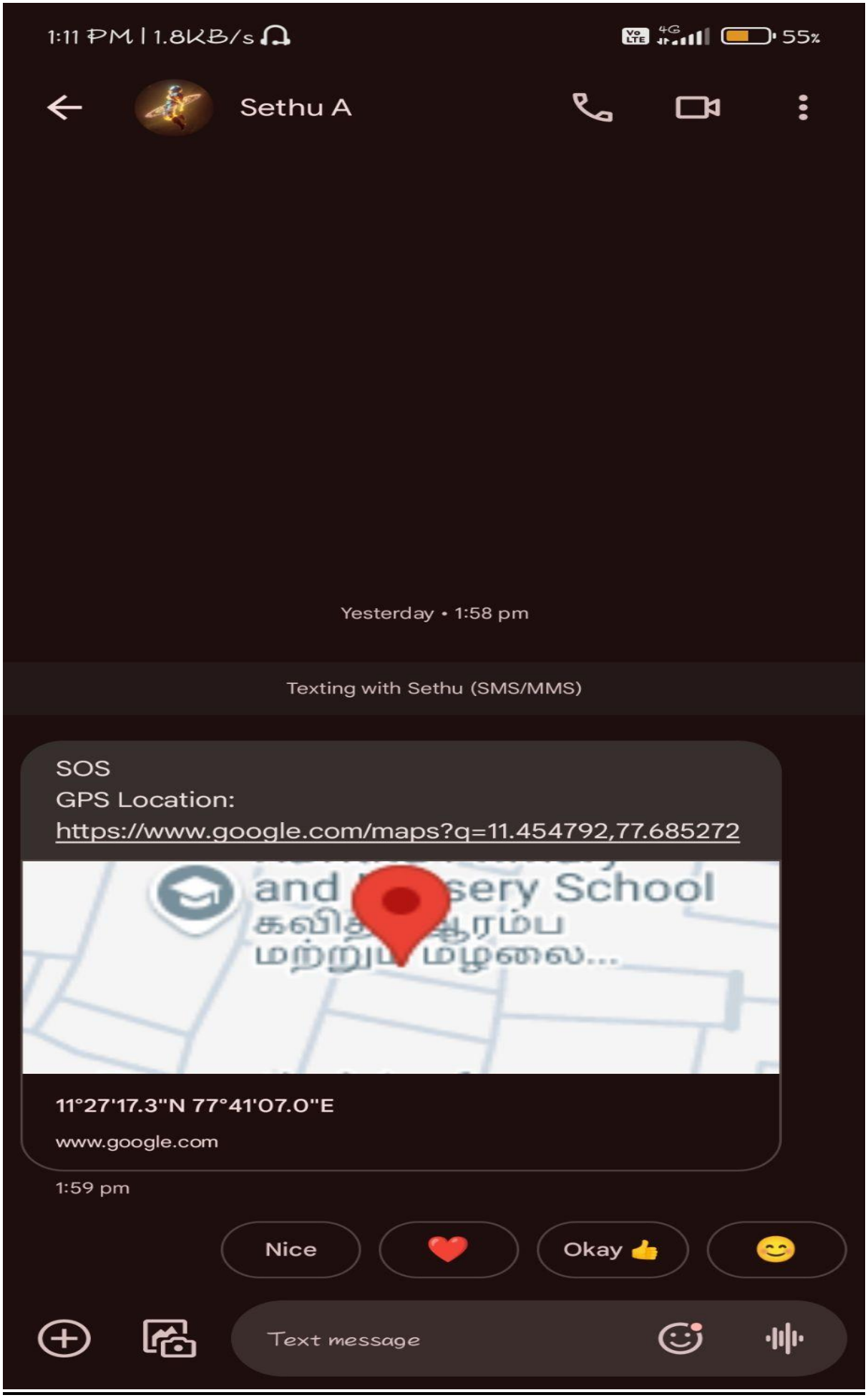
```
  if (soundLevel > soundThreshold || heartRate > abnormalHeartRate) {
    triggerAlert();
  }
  // Continuously parse GPS data
  while (gpsSerial.available() > 0) {
    if (gps.encode(gpsSerial.read())) {
      // GPS data is parsed and updated
    }
  }
}
void triggerAlert() {
  digitalWrite(BUZZER, HIGH);
  delay(5000); // Keep buzzer on for 5 seconds
  digitalWrite(BUZZER, LOW);
  String gpsLocation = getGPSLocation();
  Serial.println("SOS");
  Serial.println("GPS Location: " + gpsLocation);
  sendSMS(gpsLocation);
}
String getGPSLocation() {
  String gpsLink = "GPS location not available";
  if (gps.location.isValid()) {
    double latitude = gps.location.lat();
    double longitude = gps.location.lng();
    gpsLink = "https://www.google.com/maps?q=" + String(latitude, 6) + "," + String(longitude,
6);
  }
 return gpsLink;
}
```

```
void sendSMS(String message) {
  gsmSerial.println("AT+CMGF=1"); // Set SMS mode
  delay(100);
  gsmSerial.println("AT+CMGS=\"+919514370059\""); // Emergency contact number
  delay(100);
  gsmSerial.print("SOS\n");
  gsmSerial.println("GPS Location: " + message); // SMS body
  gsmSerial.write(26); // End SMS with Ctrl+Z
  delay(1000);
  Serial.println("SMS sent: SOS\nGPS Location: " + message);
}
void initializeGSM() {
  gsmSerial.println("AT");
  delay(1000);
  gsmSerial.println("AT+CREG?"); // Check network registration
  delay(1000);
  gsmSerial.println("AT+CSQ"); // Signal quality
  delay(1000);
  Serial.println("GSM module initialized.");
}
```

## OUTPUT SCREENSHOTS:






1:11 PM | 1.8KB/s
55%
Sethu A
Yesterday • 1:58 pm
Texting with Sethu (SMS/MMS)
SOS
GPS Location:
https://www.google.com/maps?q=11.454792,77.685272
11°27'17.3"N 77°41'07.0"E
www.google.com
1:59 pm
Nice
Okay
Text message

## LIMITATIONS:

- The system relies on GPS for location and GSM for communication, both of which are affected by poor signal conditions. Additionally, the SIM800A module requires a stable power supply due to its high current draw.
- The sound sensor and pulse sensor may produce false positives or negatives due to environmental noise or inaccurate readings, impacting the system's reliability.
- The Arduino Uno has limited processing power for handling multiple tasks simultaneously, and the current setup lacks a user-friendly interface for real-time monitoring or remote access.

## FUTURE ENHANCEMENTS:

Wearable Integration: The module will be implemented as a wearable device, such as a watch, to increase portability and ease of use. This will ensure that users can carry the safety device on their person at all times, offering more convenience and real-time protection.

## CONCLUSION:

The women safety IoT module successfully integrates sound detection, heart rate monitoring, GPS tracking, and GSM communication to enhance safety measures, ensuring timely and effective alerts in emergencies.