VEHICLE ACCIDENT DETECTION AND ALERT SYSTEM USING ARDUINO

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***Abstract*–In this project we have built an accident detection and alert system that detects an accident and records its GPS coordinates. Further, it sends an SMS on the stored number with the location coordinates of the accident site. This project involved the use of arduino, GPS, GSM and accelerometer**.

Keywords–Accident Detection, acceleration, latitude, longitude.

I. AIM

The aim of this project is to create a detection and alert system for accidents that notifies saved contacts and sends the location along with google map link through SMS thereby improving response time of help.

II. THEORY

A. GPS Module:

The GPS Module (SIM 28ML) contains a specialised antenna to capture signals effectively. It determines its own position through triangulation. By calculating the time the signals take to travel from the satellites to the receiver, along with the known positions of the satellites, the module can determine its own latitude and longitude.

B. Accelerometer:

This measures acceleration in three dimensions. This contains tiny microstructures called capacitive MEMS (Micro-Electro-Mechanical Systems). On experiencing acceleration in any direction, the capacitance between certain components of the sensor changes. The sensor then generates analog voltage signals proportional to the acceleration along each axis.

C. GSM Module:

This contains a GSM modem that communicates with cellular networks by sending and receiving signals. The SIM card authenticates the module after which it can send data.

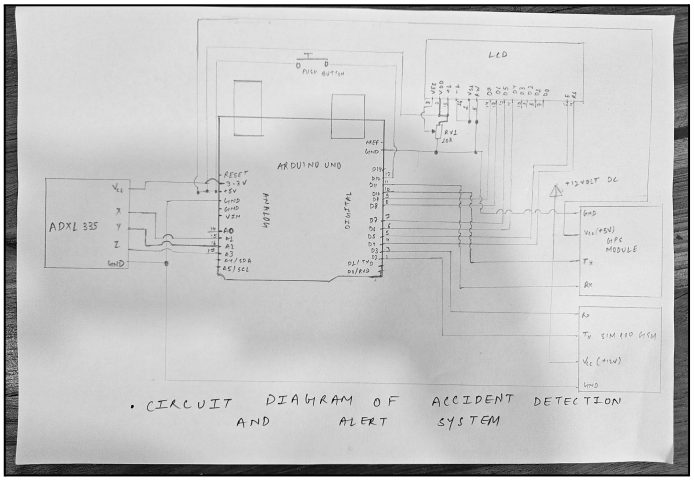

Fig 1. Circuit diagram of the system.

III. COMPONENTS

1. Arduino Uno
2. GSM Module (SIM 900A)
3. GPS Module (SIM 28ML)
4. Accelerometer (ADXL 335)
5. 16x2 LCD
6. Power Supply (11.1V Lithium-ion battery)
7. Connecting Wires
8. 10 K-POT
9. Breadboard
10. Push Button

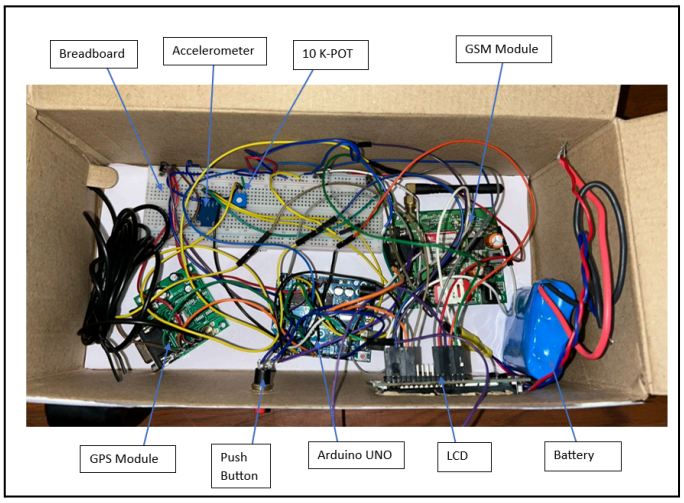

Fig 2. Circuit connections and components.

IV. WORKING

When the vehicle undergoes a collision, there is a sudden change in the acceleration of the vehicle which is detected by the accelerometer. When the acceleration increases above a threshold value, the arduino initiates the entire process. After this, the system waits for 10 seconds to manually stop false alarms. If no action is taken, it proceeds with the subsequent steps. Then, the GPS receiver records the location coordinates of the accident site in the form of NMEA (National Marine Electronics Association) sentences. The arduino extracts the latitude, longitude and speed from these sentences and displays this on the LCD. Further, the GSM module sends an SMS alert with the latitude, longitude and google map link on the stored contact number. This system provides a comprehensive solution for swiftly responding to accidents.

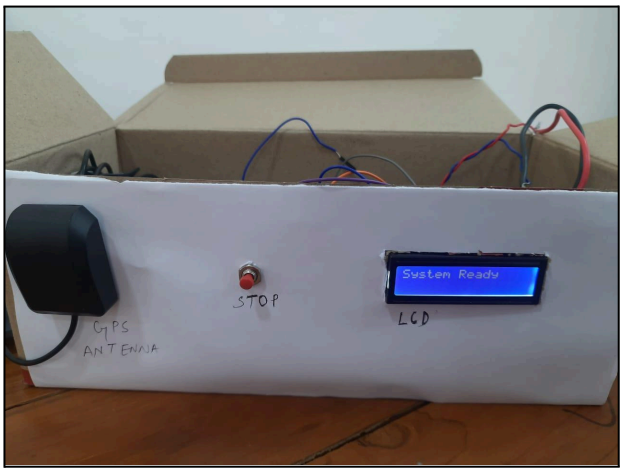

Fig 3. Picture showing outer box with LCD, push button and GPS antenna.

V. RESULTS

The primary objective of the project, to detect an accident and send an alert was met. On testing it, we realised the need to stop false alarms. For this, a push button was added in the circuit which can stop the trigger of alarms by manually pressing it within 10 seconds of the accident being detected. The prototype was able to successfully send an SMS alert on the mobile phone along with the exact latitude, longitude and a google maps link of the location.

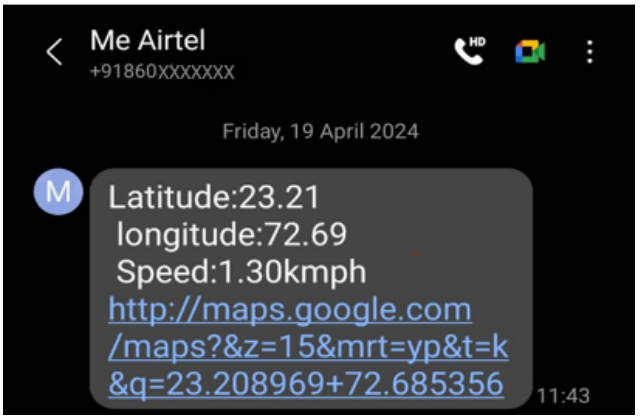

Fig 4. Screenshot of the SMS received on the mobile with google map link of the location.

VI. DISCUSSION

The accident detection and alert system has potential applications in various fields. This can help improve response time to accidents by automatically detecting collisions and alerting emergency services. This will ensure that assistance reaches promptly. Moreover, this can provide accurate data along with location coordinates thereby helping authorities identify trends and implement preventive measures. We encountered challenges with faulty components. Despite trying two GPS modules, neither worked. Additionally, the GSM module functioned only when the antenna was aligned in a specific direction, which was difficult to ascertain. Calibrating the accelerometer was time-consuming, requiring multiple attempts to achieve accurate results. Further, the GSM module required a 12 V battery. However, due to limited availability we used a 11.1 V battery because of which some components did not function properly every time. Looking ahead, potential improvements involve integrating it with emergency services and adopting advanced sensors to enhance collision, rollover, and sudden stop detection.

VII. ACKNOWLEDGEMENT

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