

ACCIDENT ALERT SYSTEM USING PRESSURE SENSING DEVICE

Tirth Patel*1, Saurabh Patel*2

*1,2Graduate Student, College Of Management, University Of Massachusetts Boston,
Boston, Massachusetts, United States.

ABSTRACT

Traffic accidents are a major public concern around the world. The large number of injuries and deaths caused by road traffic accidents reveals the story of a global road safety crisis. Road collisions are the second leading cause of death among those aged 5 to 29, and the third major cause of death among those aged 30 to 44. In today's fast forward world, every day almost 3700 people dies due to road accident. This system cannot prevent the accident, but it can reduce the damage after accident. After accident occurs, the accelerometer detects pressure and generate notification and Arduino fetch coordinates of the location from GPS module and GSM module automatically sends the alert notification to the emergency services and close people. This system helps the medical team to reach to the accident location within the minimum time frame as it provides the alert message as soon as the accident occurs. So, it also helps in minimizing the communication delay and the person met with the accident can be treated timely. It plays a very important role in identifying the accident locations that occurs in midnights. The proposed system deals with the detection of the accidents, hence the biggest expected milestone from this system is to save life of victims.

Keywords: Accident, Accelerometer, Arduino, Alert, GSM, GPS, Pressure.

I. INTRODUCTION

The current system is primarily concerned with passenger safety, rather than providing fast assistance in the case of a crash. Hence, the goal of this research is to provide an ideal method for reducing the global accident rate. The accident alert system's main aim is to reduce collision after accidents by sending an alert message to the registered mobile phone via wireless communications. When an accident occurs, the GSM module will send a message to the registered mobile phone in a short amount of time. When an accident occurs, the Pressure sensor is triggered, and the information is delivered through GSM module to the registered phone number. The use of GPS technology will facilitate in the locating of the accident spot. The proposed system will use GSM and GPS modules to identify whether an accident has occurred and will alert local medical centers and registered mobile phones of the accident's location. The location can be provided through a tracking system to cover the geographical coordinates over the area. An accident can be detected by an accelerometer, which is a key component of the system. This system's core component is Arduino, which aids in the transfer of messages to various components.

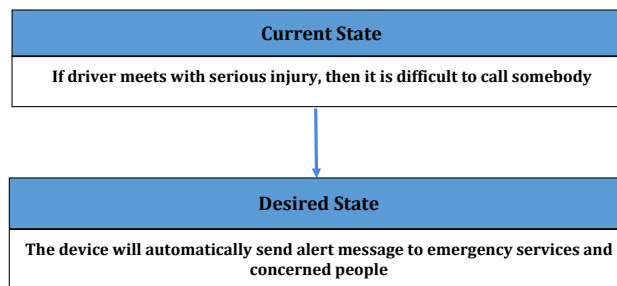


Figure 1: Opportunity Statement

II. DESIGN & ANALYSIS

Functional Requirements

- The system should detect the accident. The system must send alert messages to emergency services.
- The system must send alerts to family members & concerned people.
- Accidents should occur over a speed limit that is pre-set so an accelerometer can detect the accident.
- There should be an active GSM module to send messages.
- Users should add at least one family members' number in emergency contacts to send them alert messages.

Non-functional Requirements

- Message sending time must not take more than 3 seconds.
- The coding part must be done using the Arduino platform in the system.
- The data of users should be stored in a secure database.

Risk associated with this

- If sometime accident happens with slow speed or lower pressure, then at that time Accident Alert System may not detect the accident and does not send alert messages to emergency services and close people.
- Some time when the accident occurs in out of network coverage area, at that time there may be some delay or error in message sending
- Automobile company will be more benefited if their cars are equipped with high level security system.

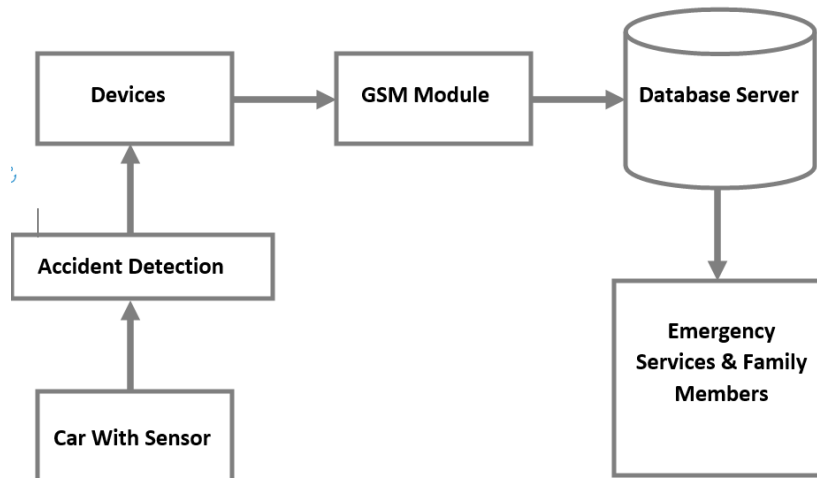


Figure 2: System Architecture

Context Diagram

In system, there is no interaction of driver with system. When accident occur, system will automatically detect the accident and will fetch current location from GPS and send the alert to emergency services and contact via GSM module. Also, car company will generate reports of the system like how much accident occur.

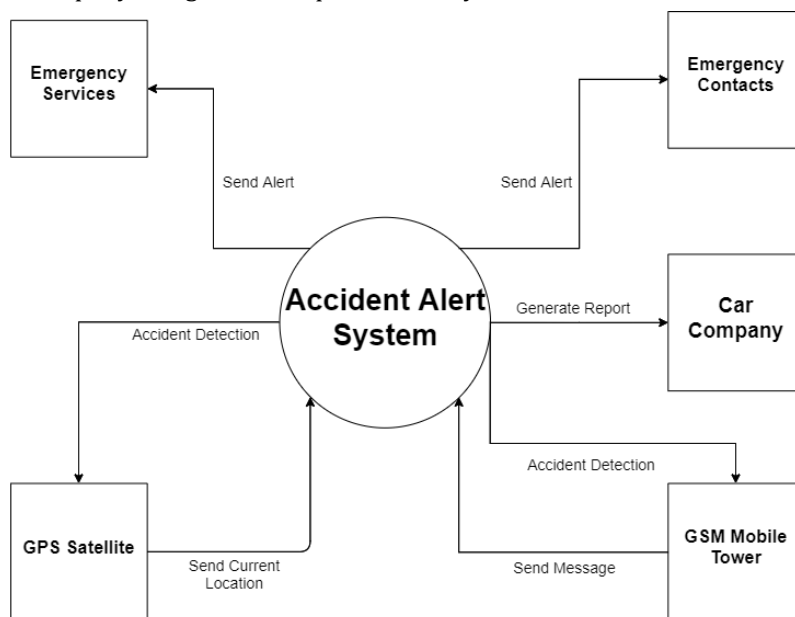


Figure 3: Context Diagram

Class Diagram

In this section, we established five major classes: device, satellite, emergency, alert, and car firm. In addition, there are two generalized classes: emergency services and emergency contacts.

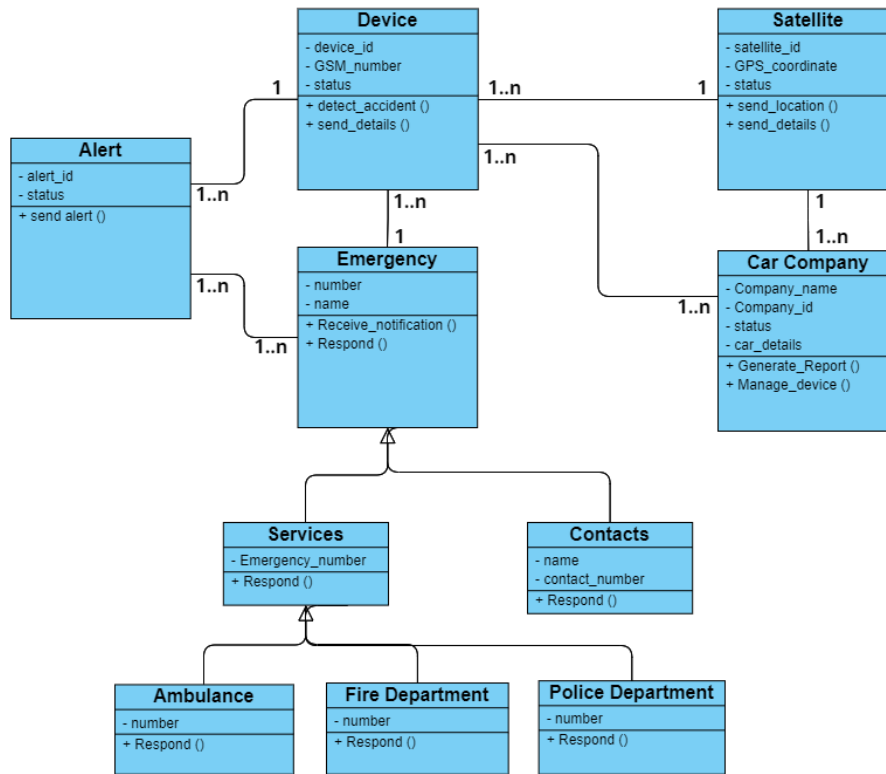


Figure 4: Class Diagram

III. COMPONENTS

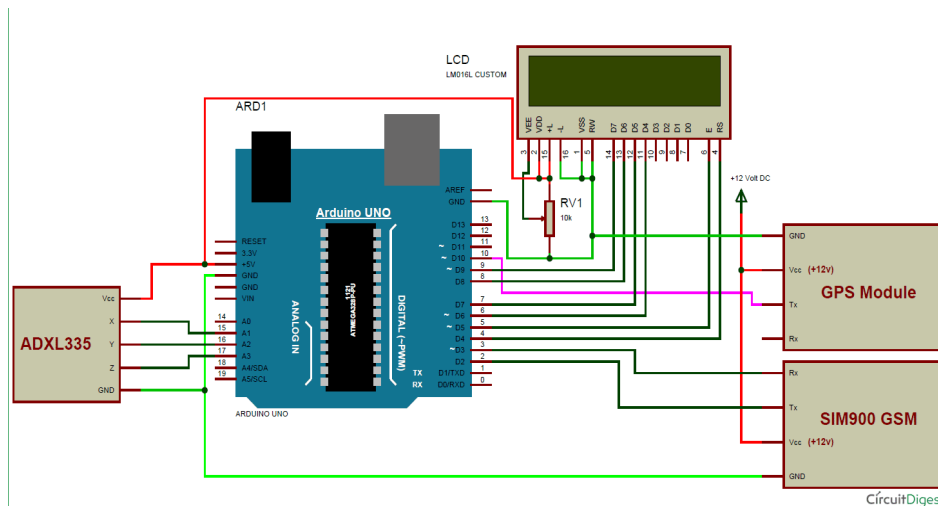


Figure 5: Circuit Diagram

- Arduino Uno
- GSM Module (SIM900A)
- GPS Module (SIM28ML)
- Accelerometer (ADXL335)
- 16x2 LCD
- Power Supply
- Connecting Wires
- 10 K-POT
- Breadboard or PCB
- Power supply 12v 1amp

There are 4 major components in this system:

Arduino Uno:

Arduino is a free and open-source platform that includes a programmable circuit board as well as the Arduino IDE software (Integrated Development Environment). This IDE is a computer tool that allows you to write, compile, and upload programs to a variety of physical boards. The Arduino IDE supports C and C++ languages that have unique code structuring rules.

GSM Module (SIM900A):

The SIM900 is a full-featured quad-band GSM/GPRS module that may be simply embedded and utilized by customers or hobbyists. An industry-standard interface is provided by the SIM900 GSM Module. SIM900 provides GSM/GPRS 850/900/1800/1900MHz voice, SMS, and data capabilities with minimal power consumption.

GPS Module (SIM28ML):

This module collects the satellite's coordinates every second, along with the time and date. The GPS module delivers data on the tracking position in real time, as well as a lot of data in NMEA format. The NMEA format is made up of numerous sentences, but we only need one of them. This statement begins with the letters \$GPGGA and includes the longitude and latitude, time, and other relevant information. Global Positioning System Fix Data is referred to as GPGGA.

Accelerometer (ADXL335):

Accelerometers calculate the velocity associated with translational motion to detect acceleration. Newton's 'F = ma' law is used to calculate this force. The accelerometer is a tiny gadget that can detect three-dimensional tilts. It has an acceleration sensitivity of up to 4g. If gravity is to be measured, it can detect static acceleration. It can also detect dynamic acceleration as a result of any movement.

IV. METHODOLOGY

Arduino is utilized in this research to control the entire process, as indicated in the circuit diagram. The Arduino then reads the accelerometer's output and compares it to the predefined settings to see if there have been any changes in pressure. If the pressure value changes, Arduino reads coordinates from the GPS module records via \$GPGGA and sends an SMS to emergency services such as police, ambulance, and fire, as well as family members, informing them of the accident location. This allows the victim to be rescued by the rescue team in the shortest amount of time possible while also receiving the necessary medical attention.

V. CONCLUSION

Vehicle popularity has also increased traffic risks and street accidents. Individuals' lives are in grave jeopardy. This is a direct outcome of the world's top crisis centers being unavailable. The use of an accident alarm system improves asset management, which leads to increased earnings. Accident alert systems improve safety and protection, communication channels, performance analysis, and efficiency in both individual and commercial situations. To minimize the number of accidents, we proposed this system, which uses a GSM module to send an alert message to the close relatives of the person who is involved in an accident, and a GPS module to consistently sense the location of the accident site and send the coordinates of the accident site. In the future, this accident alert system might play a significant role in daily life.

VI. REFERENCES

- [1] Chaudhari, P. P., & Naik, R. B. (2016). Vehicle monitoring system for accident detection. International Journal of Science and Research (IJSR), 5(5), 2008-2012.
- [2] Parveen, N., Ali, A., & Ali, A. (2020, October). IOT Based Automatic Vehicle Accident Alert System. In 2020 IEEE 5th International Conference on Computing Communication and Automation (ICCCA) (pp. 330-333). IEEE.
- [3] Patel, N., Tank, D., Patel, K., Adatkar, R., & Thosar, R. (2019, April). Vehicle accident alert system. In 2nd International Conference on Advances in Science & Technology (ICAST).
- [4] Routh, Jayati & das, Arshiya & Kundu, Piyashi & Thakur, Madhubarsha. (2019). Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Module. International Journal of Engineering Trends and Technology. 67. 69-72. 10.14445/22315381/IJETT-V67I8P211.

- [5] Saddam. (n.d.). Arduino Based Vehicle Accident Alert System using GPS, GSM and Accelerometer. Retrieved from CircuitDigest: <https://circuitdigest.com/microcontroller-projects/arduino-based-accident-alert-system-using-gps-gsm-accelerometer>
- [6] Yellamma, P., Chandra, N. S. N. S. P., Sukhesh, P., Shrunith, P., & Teja, S. S. (2021, April). Arduino Based Vehicle Accident Alert System Using GPS, GSM and MEMS Accelerometer. In 2021 5th International Conference on Computing Methodologies and Communication (ICCMC) (pp. 486-491). IEEE.