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Accidental Impact Driven Paramedic Alerting System

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Abstract. Nowadays the traffic has been increased on a large scale. The number of vehicles on the road is increasing rapidly while the rate of construction of new roads is slow. Due to this, the number of road accidents has increased. Research has shown that there is a lack of proper communication with the medical authorities and delayed medical support which results in loss of life. To address this situation, we have proposed a model in which an accelerometer sensor is used to detect the occurrence of an accident. GSM module is used to send alert messages with GPS coordinates to Hospitals, Police Control Rooms, and Rescue teams. The emergency services receive these alert messages and coordinate through Emergency helpline numbers via the GSM module. Mainly, this System will be useful in isolated Areas where there is no one to report on the spot of mishap. With the inclusion of this system, there will be increase in the effectiveness of medical emergency services. Surely, the medical emergency services will get evolved and faster responses can be generated towards the injured person with the help of this System.
Keywords: GPS, Emergency, Accelerometer, Vehicle, GSM module.

I. INTRODUCTION

Vehicles are an inevitable part of our lives. Availability of vehicles is increasing due to cheaper cost of vehicles. This has increased traffic and congestion. This has led to accidents and loss of life. According to the reports, after the year 2000, the rate of Construction of new Roads has been increased by 39 % but the rate of new vehicles has been increased by 159%. Moreover, One of the major reasons for Road Accidents is Overspeeding. Also, many vehicles are not equipped with emergency airbags or if available, Only for the Driver. The lives of the rest of the passengers come under threat. According to the reports, India faces a loss of around 2-3% of the GDP of the country through Accidents. Many times localites have to call an ambulance on their own which wastes a lot of time and may lead to loss of life. To overcome this issue, we have made an automated accident detection system. The System consists of GPS, a GSM module, Accelerometer Sensor interfaced with an Arduino Uno board[4]. Accidents are identified with the help of an Accelerometer Sensor. The Accelerometer Sensor is an electromechanical device, that uses three coordinate system. Abrupt changes in acceleration will trigger the accelerometer and it will send the signals to the Arduino Uno. In turn, the Arduino Uno will send signals and activate the System. The GPS module will identify the actual location of the vehicle and the GSM module will send the alert SMS with precise latitudes and longitudes to pre-coded numbers. The Message can be sent to Hospitals, Police Authorities, Towing Services, and Doctors. The National emergency numbers for Ambulance, police and other services are stored and used accordingly.
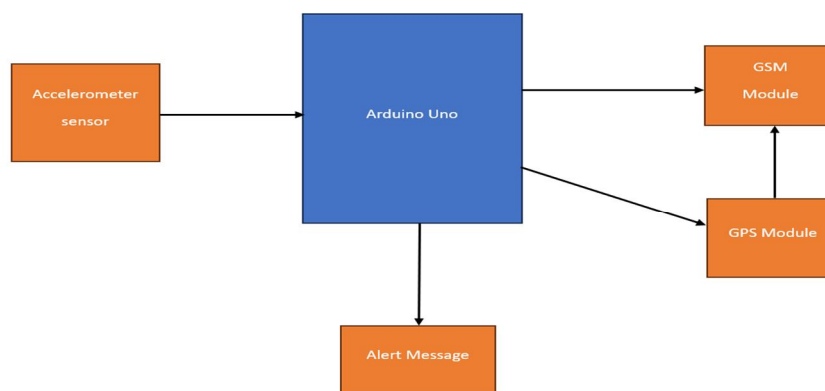
Block Diagram

Fig. 1. Block Diagram of the proposed system

II. LITERATURE REVIEW

C K Gomathy et al. [1], worked on system that will send messages to nearest hospital and friends when accident is detected using accelerometer and heartbeat sensor on body. Saranya Shanmugam et al. [2], created a system which will detect accident with help of GPS, GSM and accelerometer and send early message. Prabha C et al. [3], constructed accident warning and alert system. Kiran Sawant et al [4], ultrasonic sensor and accelerometer is used to detect accidents. Sri Krishna C Varma et al [5], built a accident detection and alerting system. Rashida Nazir et al. [6], created a model that will help to divert vehicle in case of emergency and also detect accident. Pratiksha R et al. [7], built a system to detect and inform about the accident and its location. Saddam et al [8], GPS and GSM module are used to track location and send alert regarding the accident. Manasi Patil et al [9], created a traffic light system that will help to reduce time of ambulance services. A. Bhakat et al [10], built a accident detection and alerting system using sensors and iot. F. A. Malik et al [11], study accident prone areas and provide suggestion to redesign them. A. Chaudhari et al [12], created a system to send alert message on accident. S. Gupta et al [13], studied causes of road accident. S. Gupta et al [14], used machine learning to manage accidents.

III. METHODOLOGY

A. Components Used

GSM RS-232 Module
- It is used to establish communication between mobile and computer systems.
- It is used to send SMS messages

GPS NEO-6M Module
- It is used to locate all locations on Earth.
- The readings are obtained using an antenna.

ADXL 335 Accelerometer
- It is an electromechanical device that is used to measure acceleration.
- It is also used for sensing tilt.

Arduino Uno
- It is a microcontroller board based on Atmega 328P
- It is equipped with a set of digital input and output pins.
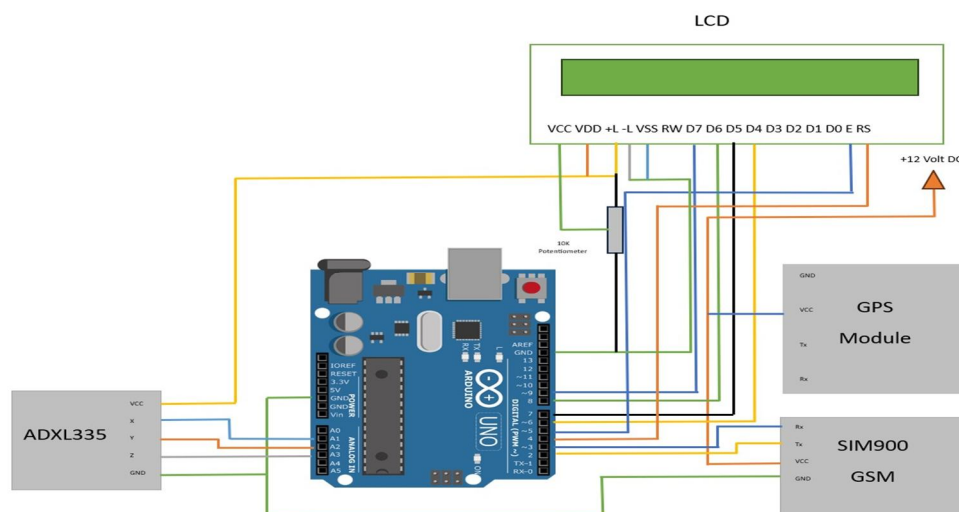
B. Circuit Diagram

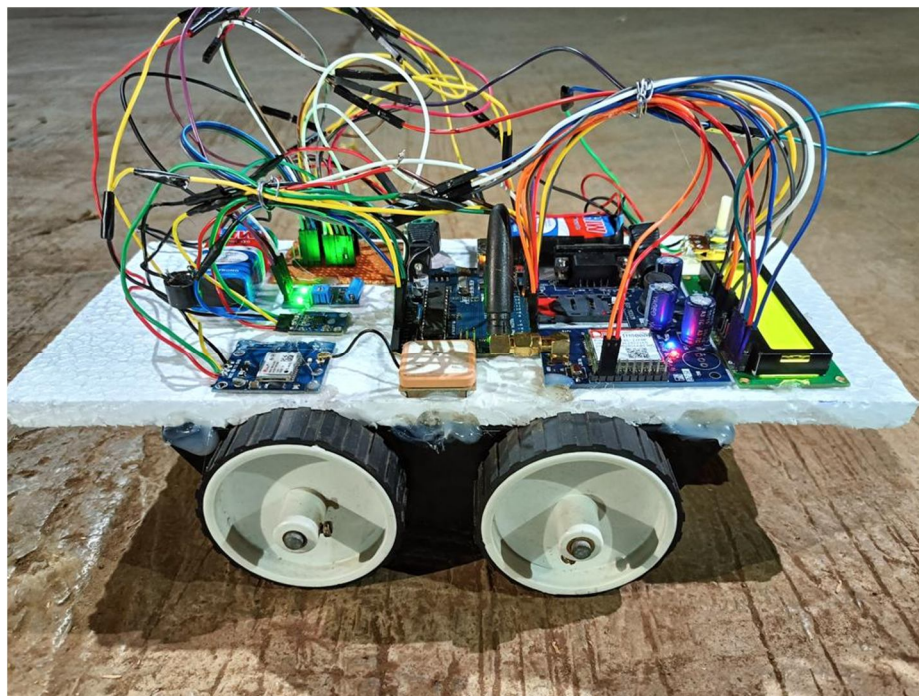Fig. 2. Circuit Diagram of the proposed system
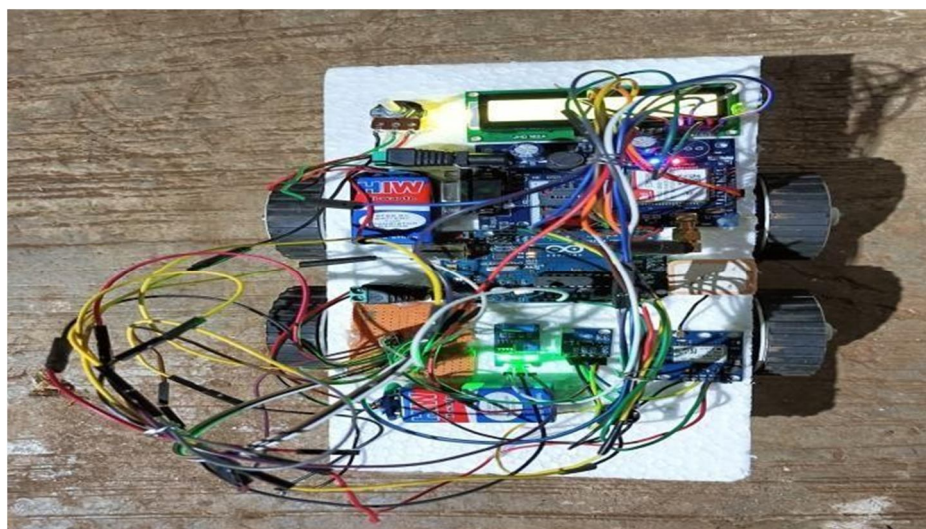
Fig. 3. Front View of the prototype

Fig. 4. Top View of the prototype

The Project helps to provide timely help at the accident spot. The system helps to reduce the response time of emergency services drastically. It also helps to avoid any confusion regarding the location of accident. When the Vehicle undergoes an Accident the impact is immediately sensed by the system. The accident causes a change in the orientation of the vehicle and it is detected by a change in the axis of the accelerometer sensor[4]. The change in speed and acceleration is also detected simultaneously. The GPS module on the system gets activated and collects the coordinates of the accident location. The coordinates are then sent to authorized mobile numbers stored in the GSM module in for of emergency SMS[1]. The Paramedics and other emergency services can access the location via the link in SMS.

Basically, this system fastens the process and helps to save time which can be very important for victims. Also, it guides the emergency services to the right location if the accident has happened in some remote place. It is a quick response and life-saving system. It thus makes road travel more safe and helps to reduce the number of deaths caused by road accidents.
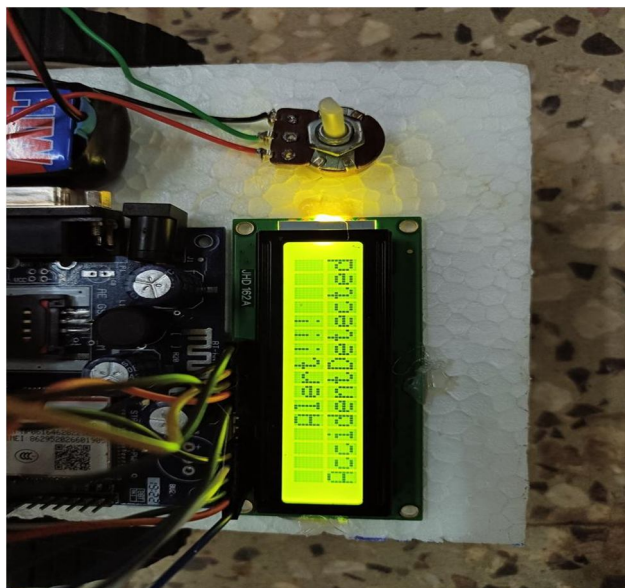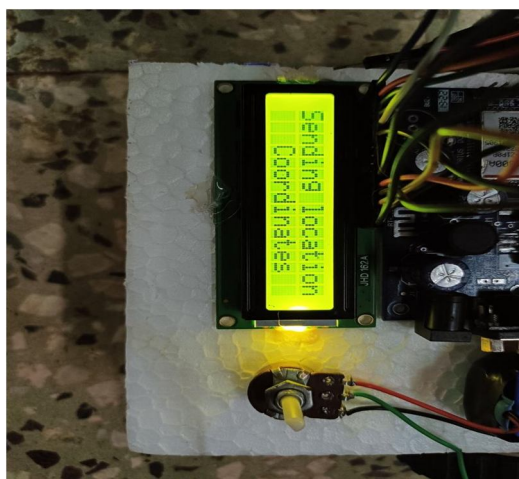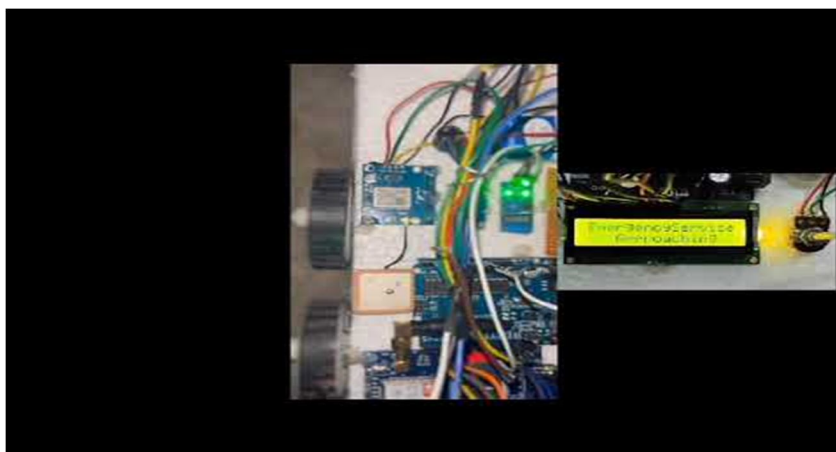
Fig. 5. Alert Message on the LCD Screen

Fig. 6. Message displaying Authorities on the LCD Screen of the location co-ordinates sending to the responsible Authorities

Fig. 6. Emergency Services arriving message displaying on the LCD Screen

C. Video Demonstration

IV. RESULTS AND DISCUSSION

This system is very cost effective and reliable. The system uses various sensors such as vibration sensor and accelerometer sensor. The system uses GSM module and GPS module. The sensors can be adjusted to give accurate readings and prevent any false signals. The GSM module can be made more enhanced preventing any third-party intervention. The GSM module can record real-time data which helps the system to send data to nearest services to facilitate quick response.

The system helps to fill the gap between emergency services and road safety. This system can be used to effectively detect and identify the accident. The system works on a simple mechanism. It can be an integral part of road safety and the automobile industry.
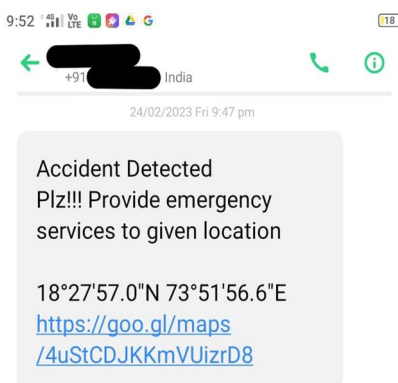

Fig. 5. Alert Notification sent to registered mobile number in GSM Module
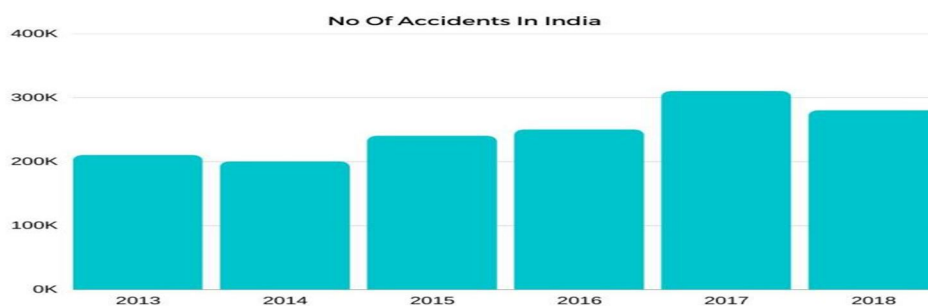

Fig. 6. Number of Accidents vs Year graph generated by the Arduino IDE software
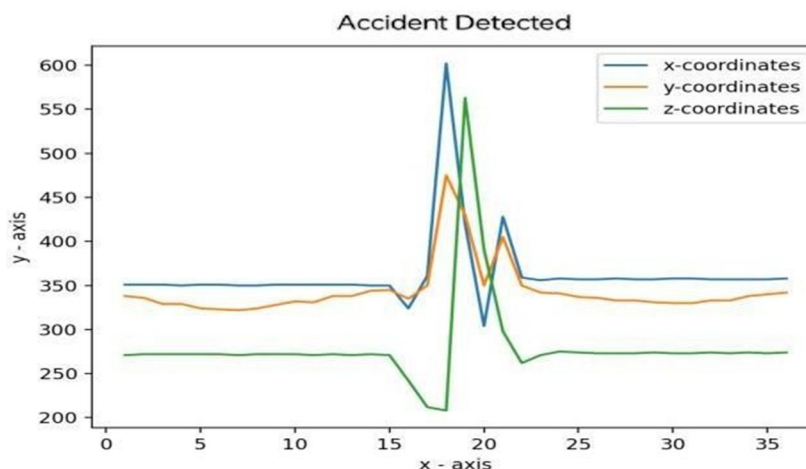
Fig. 7. Graph of the detection of accident on the basis of the accelerometer Sensor generated by Arduino IDE software

V. FUTURE SCOPE

In the future, there is a possibility to improve accident detection systems by integrating various sensors such as alcohol sensors, drowsiness detectors, and heart rate sensors [1][10]. By doing so, the system can prevent accidents before they happen and save lives. In the future, the system can be installed with a camera that will capture images of accidents. It will help both police and insurance services. The flame detection feature can also be added many more sensors can be integrated. A data recorder can be integrated with this system to give information about last-moment inputs by drivers and make accident investigation easy. A flame or smoke is detected in the car engine using the flame sensor and smoke sensor, the user is notified[5]. This technique can also be used in cars that use airbag do not always open and the accident victim is injured [4].

VI. CONCLUSION

The system will help to bring new changes to existing emergency system services. It will help in improving medical and automobile infrastructure. Users will get timely help and no accident will be neglected. This will increase the speed of rescue operation which will benefit passengers by saving their lives and also helping to clear the road avoiding traffic blockage and congestion. This system will improve the overall operational efficiency and reduce confusion and delays. This will reduce the number of deaths drastically.

VII. ACKNOWLEDGMENT

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