Accident Alert System using GPS and GSM Module

V. Aravind Sai[1], V. Sampath Kumar[2], R. Prema[3]

[1, 2]Student, Dept of Computer Science and Engineering, SCSVMV University, Kanchipuram, Tamil Nadu.

[3]Assistant Professor, Dept of Computer Science and Engineering, SCSVMV University, Kanchipuram, Tamil Nadu.

Abstract: Nowadays, Over 37,000 people die in road accidents each year because medical aid cannot reach to the location in time. This system aims to alert the nearby medical center and register mobile numbers about the accident to provide immediate medical aid. The vibrator attached in the vehicle senses sudden vibrations in the vehicle, and Accelerometer detects the tilt of the vehicle. Once the accident occurs to the vehicle, with the help of the GPS module, it takes the exact location of the vehicle and sends the accident location to the registered mobile numbers and the ambulance with the support of the GSM module. The main aim of this project is to minimize the time to reach the accident location to provide iSmmediate medical help that saves human lives.

Keywords: Arduino Uno, GPS Module, GSM Module, Accelerometer.

I. INTRODUCTION

Motorization has enhanced the lives of many people around the world, but the benefits have come with a hefty price. Injury and deaths due to road traffic accidents (RTA) are a significant public health problem in developing countries where more than 85% of all deaths and 90% of disability-adjusted life years were lost from road traffic injuries. As a developing country, India is no exception. Not a day passes without RTA happening in the roads in India in which a countless number of people are killed or disabled. Often members of the whole family are wiped out. Those who are affected or killed are mostly people in their prime productive age. The primary purpose of this system is to minimize the time taken to reach the accident location. When the accident happened, the values of the Accelerometer or vibrator will be changed so that the system will checks whether there are any discrepancies in the values of Accelerometer and vibrator. If the values are changed, the GPS module records the exact location, and the message of the location will be sent to registered mobile numbers and the ambulance via SMS using GSM module. So by clicking the location link from the received message, it will be redirected to google maps, and the rescue team can rush to the accident spot immediately without any delay. The system will also send a message to the registered mobile numbers where friends and relatives will be informed about the accident.
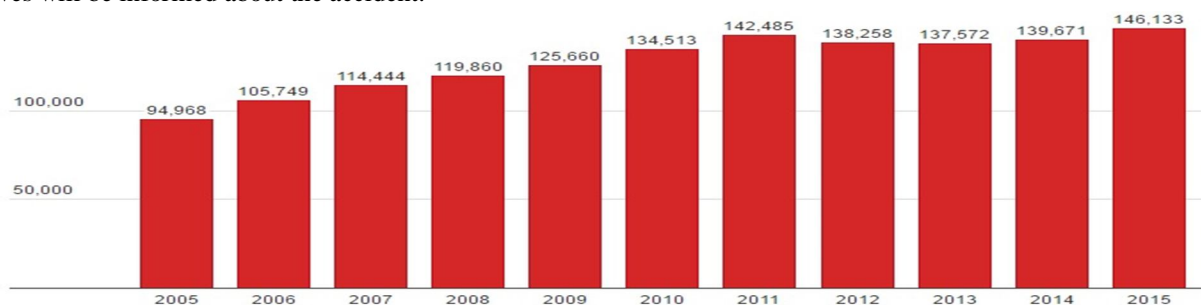

Figure 1: Road accidents in India from the year 2005 - 2015

II. LITERATURE SURVEY

In the present situation, when the accident happened, we cannot detect where the accident has occurred, and there will be no information regarding the accident, leading to the death of thousands of people in a day, especially in rural areas. The main drawback of the current system is the system is manually adopted, such that the injured person should call the ambulance, which may not be possible when the person is seriously injured. In this project, an automated system is used and placed inside the vehicle. So when the accident occurs, the exact location of the accident spot will be sent to an ambulance and registered mobile numbers automatically, which reduces the time to reach the accident spot. In this project, GPS is used for tracking the position of the vehicle, and GSM is used for sending the message when an accident has been detected. Hence with this project implementation, we can identify the location of the vehicle where the accident has occurred accurately so that we can provide the first aid as early as possible.

III. SYSTEM DESIGN

A 9V portable power supply will power the Arduino UNO board. The GPS, GSM, Accelerometer, Vibrator modules will get power from the Arduino board itself. The circuit is first initialized, and all the modules will be turned on. The system waits until the GSM module receives a signal and is registered with the respective network. The system then goes on standby until the accelerometer and vibrator sensors give positive values. Once the accident is detected, Arduino acquires the current location of the vehicle where the accident occurred using the GPS module, and the location will be sent via SMS to an ambulance and other registered contacts.
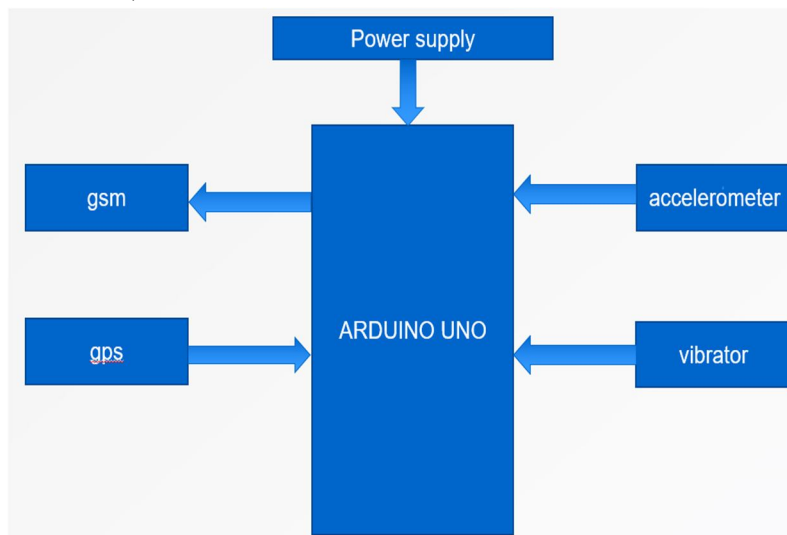

Figure 2: BLOCK DIAGRAM OF THE SYSTEM

A. Arduino UNO

The Arduino UNO is a microcontroller board. It is based on the ATmega328.It has 14 digital input/output pins, six analog inputs, a 16 MHz ceramic resonator, a USB connection, a reset button, an ICSP header, and a power jack. The Arduino is the primary control unit to detect or alert when an accident occurs. It collects the data from the Acceleration sensor, vibration sensor, GPS, and GSM modules and reflects the output either in the display system or through a message. Here vibration sensor plays a significant role. This vibration sensor will receive the vibrations of the vehicle, which in turn acts as an accident detection module. Arduino gathers the information from all other modules and sends the message to the receiver through the GSM module.

B. GSM Module

GSM, also known as Global System for Mobile Communication, is used for providing communication between the GPS and the registered mobile numbers. GSM SIM900A module is used in this project. The name SIM900A says that it is a tri-band work ranging from a frequency of 900MHz to 1900 MHz, such as EGSM900 MHz, PCS 1900 MHz, and DSC 100 MHz Receiving pin of GSM module and transmitting pin of GPS module is used for communication between the modules and the mobile phone.

C. GPS Module

GPS or Global Positioning System is a satellite navigation system that furnishes location to the user. This GPS module will find the vehicle's location, and the information fetched by the GPS receiver is received through the coordinates. The collected data is first sent to Arduino, and the information is transmitted to the saved contact through the GSM module. The frequency is operated in the range of 1575.42 MHz, and the output of the GPS module is in NMEA format, which includes data like location in real-time.

D. Accelerometer ADXL335

The 3-axis accelerometer ADXL335 is used in this project, which reads off the X, Y, and Z acceleration as analog voltages. It continuously monitors the posture of the bike. By measuring the amount of acceleration due to gravity, an accelerometer can find out the angle it is tilted. The angle below 10 degrees or greater than 170 degrees is considered as the fall of the bike. Once Arduino detects the fall, an interrupt is generated and sends a control signal to the GPS module. The Accelerometer is a straightforward interface to an Arduino Micro-controller using three analog input pins. It can be used with most other microcontrollers, such as the PIC or AVR.

E. Vibrator Sensor

This sensor module produces logic states that depend on vibration and external force applied to it. When there is no vibration, this module gives a logic LOW output. When it feels vibration, then the output of this module goes to logic HIGH. The working bias of this circuit is in between 3.3V to 5V DC.
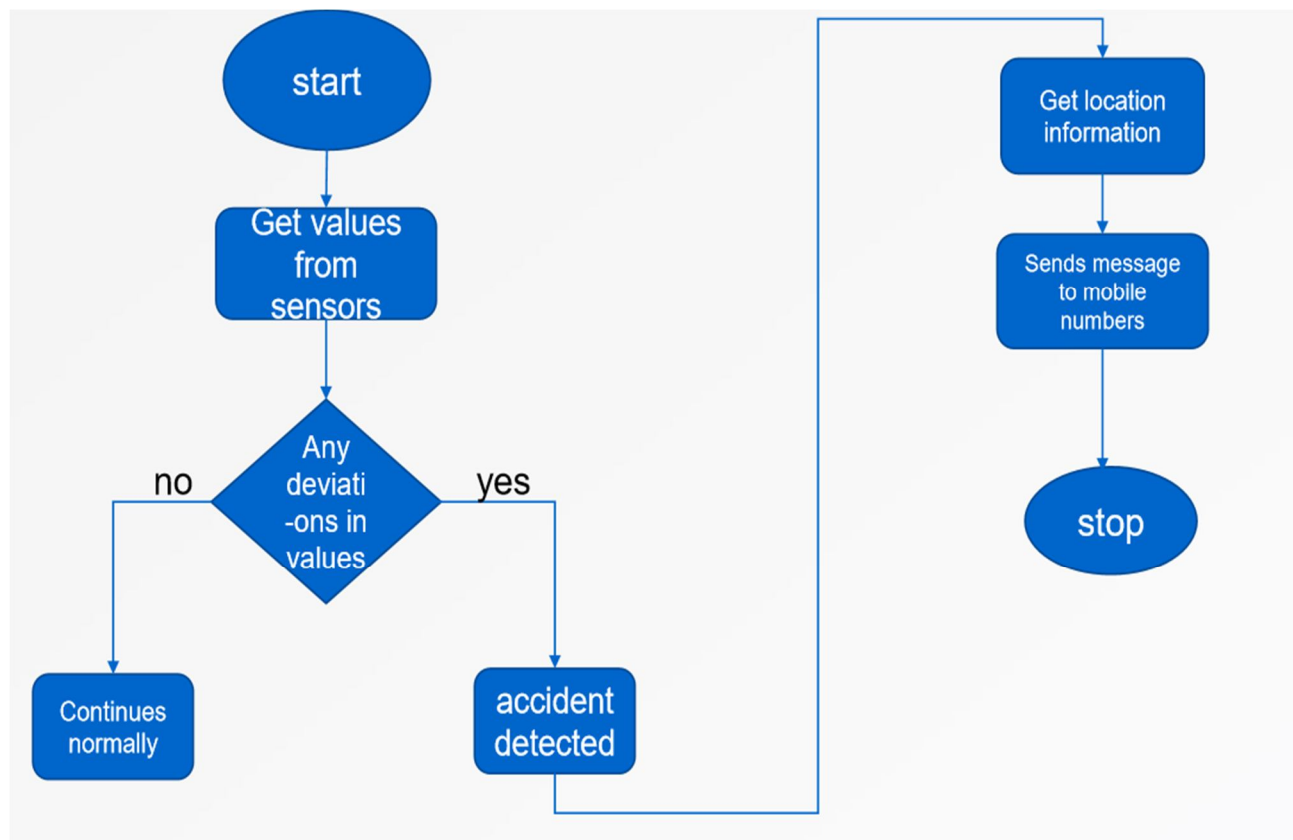
IV. WORKING METHODOLOGY

Figure 3: Flowchart For Accident Detection And Notification

Usually, Accelerometer and vibrator sensors take the values, but when accidents occur, the sensor detects abnormal values and alerts the Arduino if not sensors continue to receive values. If the sensor values are positive, then the collision is detected, and GPS will retrieve the location information. Then the message is sent automatically to the rescue team by GSM. The message will be sent to an ambulance and registered mobile numbers via SMS consisting google map link of the location.
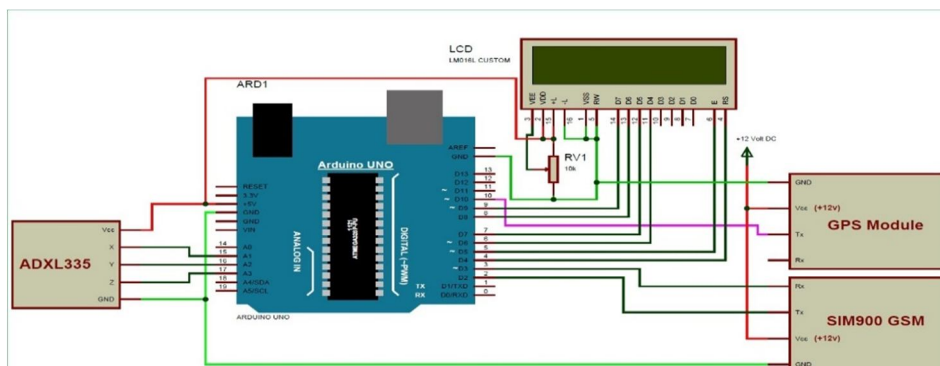
A. Circuit Diagram
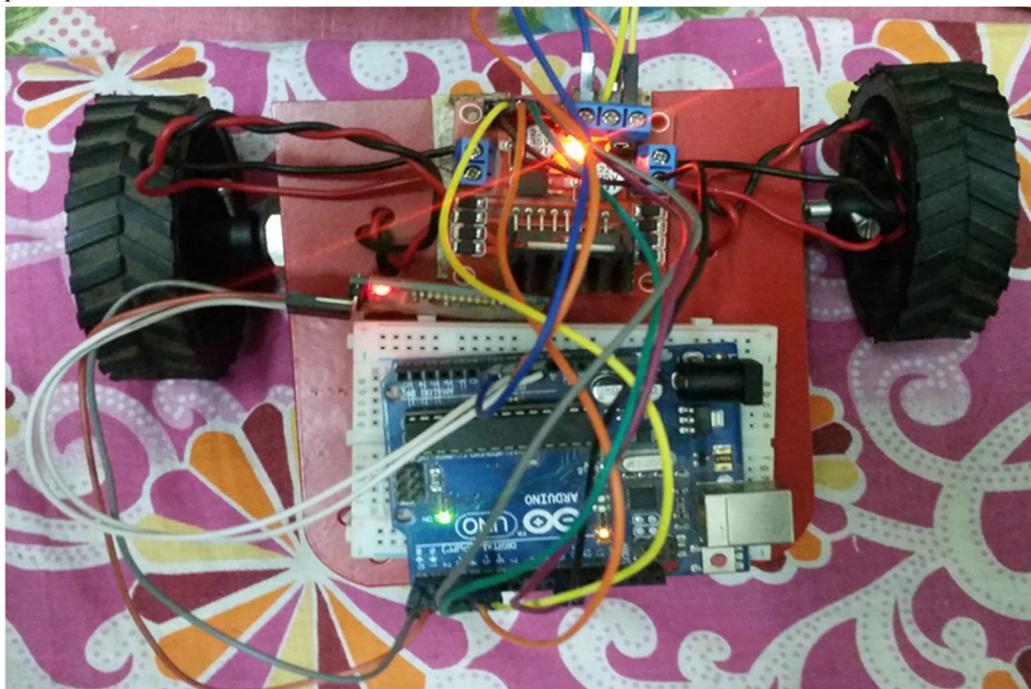

Figure 4: circuit diagram

B. Hardware Implementation

Figure 5: Implementation of the Hardware

V. APPLICATIONS

A. Driver Monitoring
B. Stolen vehicles recovery
C. Accident analysis
D. Route Monitoring

VI. ADVANTAGES

A. Low power consumption.
B. Operated automatically.
C. Small in Size and easily fitted in any vehicle.
D. Low Cost.
E. It saves time to reach the accident location that can save the victim.

VII. LIMITATIONS

A. It does not work without a network.
B. Sometimes GPS takes a much longer time than usual to connect to the signal.

VIII. CONCLUSION

The proposed system is developed to provide the accident location of the victim by sending the information via SMS to the ambulance and the registered mobile numbers. This system uses the GPS module to locate the vehicle and GSM module to send information about the accident. This system is implemented by using Accelerometer and vibrator to make it more accurate and efficient to detect an accident. In the coming year, it is going to play a significant role in our day-to-day living. The main motto of this project is to decrease the chances of losing life in an accident which we can't stop from occurring. Whenever an accident is detected, the paramedics are reached to the accident location to give the medical treatment. This device invention is much more useful for the accidents that occurred in deserted places, rural areas, and midnights. This vehicle tracking and accident alert feature plays a much more critical role in the day to day life in the future.

IX. FUTURE SCOPE

This system can be developed by connecting a camera module to the controller module that takes the photographs of the accident spot that makes the tracking and find of the cause easier. This system can also be interfaced with a vehicle airbag system, which will give accurate information. Alcohol sensors and temperature sensors can be included in this system to avoid accidents.

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