IJMTST is UGC Approved Journal with Journal Id: 43137

International Journal for Modern Trends in Science and Technology, 8(S05):11-15, 2022

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/ICETEE03
Available online at: https://www.ijmtst.com/vol8si05.html

Arduino-based vehicle trailing and crash warning system through SMS

B.Srinivas Raja | Kadavakollu Prabhakar | V.Harichandhana | K.Pavan Sai | M.Gowtham

Department of Electronics and Communication Engineering, Godavari Institute of Engineering and Technology(A), JNTUK, Kakinada.

To Cite this Article
B.Srinivas Raja, Kadavakollu Prabhakar, V.Harichandhana, K.Pavan Sai and M.Gowtham. Arduino-based vehicle trailing and crash warning system through SMS. International Journal for Modern Trends in Science and Technology 2022, 8(S05), pp. 11-15. https://doi.org/10.46501/IJMTST08S0503

Article Info
Received: 26 April 2022; Accepted: 24 May 2022; Published: 30 May 2022.

ABSTRACT

Our lives have been made simpler by the rapid advancement of technology and infrastructure. The digital revolution has also increased mobility risks, and road accidents are becoming more common, leading to substantial loss of life and property due to a lack emergency services.Our project will give the best possible answer to this problem. In a car alarm application, an accelerometer can be utilized to detect risky driving. During and after an accident, it can be utilized as a crash or rollover detector for the car. A major accident can be detected using accelerometer readings.According to this research, if a vehicle is involved in an accident, a vibration sensor will detect the signal instantly, and if a car rolls over, a Micro electro mechanical system (MEMS) sensor will detect the signal and send it to the ARM controller.Through the GSM MODEM, the microcontroller sends an alarm message to the police control centre or a rescue squad, providing the location. As a result, once the information is received, the police may quickly trace the location using the GPS MODEM. Following that, relevant actions will be made when the location has been confirmed.This article may be used to precisely identify an accident using a vibration sensor and a Micro electro Mechanical system (MEMS) or an accelerometer. As there is room for development, we can include a wireless webcam for taking photos in the future, which will aid in giving driver assistance.

KEYWORDS:Arduino IDE,GSM,GPS,Vibrator sensor,accelerometer,buzzer

1.INTRODUCTION

The growing demand for vehicles has resulted in a rise in traffic congestion and road accidents. The people's lives are in grave danger. This is due to the lack of high-qualityemergency services in our nation. This study introduces an automated car accident alert system.This design is a system that can identify accidents in a fraction of the time and delivers basic information to a first-aid centre in a matter of seconds, including geographic coordinates, time, and angle of the car collision. This alarm message is transmitted to the rescue crew in a timely manner, allowing vital lives to be saved.The alarm message is automatically sent to the rescue team and the police station when an accident happens. The message is delivered over GSM, and the GPS module is used to locate the accident. Both the Micro electro mechanical system (MEMS) sensor and the vibration sensor may be used to accurately identify the accident. The MEMS sensor may also be used to determine the angle at which the automobile flips over. This application offers the most cost-effective answer to inadequate emergency services for traffic accidents.

2. COMPONENTS USED FOR THE SYSTEM

ARDUINO UNO

The Arduino UNO is a microcontroller board that uses the ATmega328P microprocessor (datasheet). There are 14 digital input/output pins (six of which may be used as PWM outputs), six analogue inputs, a 16 MHz quartz crystal, a USB connection, a power connector, an ICSP header, and a reset button on the board. It comes with everything you'll need to support the microcontroller; it's as simple as that.

To get started, connect it to a computer with a USB cable or power it using an AC-to-DC converter or battery. You may experiment with your UNO without worrying too much about making a mistake; if something goes wrong, you can replace the chip for a few bucks and start over. In Italian, the word "uno" means "one," and it was selected to commemorate the release of Arduino Software (IDE) 1.0.

Arduino is made up of a hardware programmable circuit board (also known as a microcontroller) and software (called an IDE) that runs on your computer and is used to create and upload computer code to the physical board. The Arduino IDE employs a simplified version of C++ to make programming easier. Finally, Arduino provides a standard form factor that separates the microcontroller's operations into a more manageable packaging

Figure 1:Arduino UNO

GSM MODULE

GSM stands for "global system for mobile communication" and is a type of mobile phone modem (GSM). In 1970, Bell Laboratories came up with the concept for GSM. It is the world's most popular mobile communication system. The 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands are utilised by GSM to carry mobile voice and data services. For communication purposes, the GSM system was created as a digital system that used the time division multiple access (TDMA) method.

A GSM digitises and compresses data before sending it over a channel with two separate streams of client data, each with its own time slot. The digital system can transmit data speeds ranging from 64 kbps to 120 Mbps. In a GSM system, there are macro, micro, Pico, and umbrella cells. Each cell differs depending on the implementation domain. A GSM network has five distinct cell sizes: macro, micro, Pico, and umbrella cells. Each cell's coverage area changes depending on the implementation environment.

Figure 2: GSM MODULE

GPS MODULE

The NEO-6 module series is a line of stand-alone GPS receivers that use the u-box 6 positioning engine for outstanding performance. These versatile and cost-effective receivers come in a small 16 x 12.2 x 2.4 mm box with a variety of connecting choices. NEO-6 modules are suited for battery-operated mobile devices with severe cost and space limitations due to their small architecture and power and memory choices. The u-box 6positioning engine, which has 50 channels, has a TimeTo-First-Fix0(TTFF) of less than 1 second.With 2 million correlates, the specialised acquisition engine is capable of huge simultaneous time/frequency space searches, allowing it to discover satellites fast. NEO-6 GPS receivers have exceptional navigation performance even in the most demanding circumstances because to innovative design and technology that suppresses jamming sources and mitigates multipath effects. Check out the datasheet for further information.

Figure 3: GPS MODULE

ACCELEROMETER

The sensor features three measurement axes, X, Y, and Z, as well as connectors for I2C or SPI digital connection. You may choose from +-2g, +-4g, +-8g, or +-16g for the sensitivity level. The lower range provides more detail for sluggish motions, while the higher range is better for tracking at rapid speeds.These modules' Adafruit Breakout boards have on-board 3.3v voltage regulation and level shifting, making it easy to connect them to 5v microcontrollers like the Arduino.

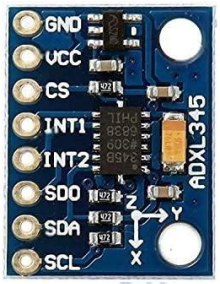

Figure 4: Accelerometer

VIBRATOR SENSOR

Various sensors can be used to monitor vibrations. Although no direct vibration sensors exist, vibrations can be monitored indirectly by assuming values from conventional analog or optical measurements. Some characteristics distinguish these sensors. They may be classified based on active and passive activity, and there are sensors that monitor relative and absolute values. Frequency range, signal dynamics, and measurement data quality are further important factors. The following sensors were organized into two groups: contacting and non-contacting, with sub-items for path, velocity, and acceleration measurement within each group.

Figure 5: Vibrator sensor

BUZZER

A piezo buzzer is a type of arduino buzzer. It's just a little speaker that can be directly connected to an Arduino. You may programme it to emit a tone at a specific frequency. The buzzer makes sound by using the piezoelectric effect in reverse.When the magnetic field is triggered, the flexible ferromagnetic disc is drawn to the coil, and when the magnetic field is turned off, it returns to rest. The buzzer creates a changing magnetic field that shakes the disc by pulsating the signal via the coil. The buzzer is activated by this movement.

LCD DISPLAY

The LCDs feature a parallel interface, which means that to operate the display, the microcontroller must manipulate numerous interface pins at once. The pins that make up the interface are as follows:

The register select (RS) pin determines where data is written in the LCD's memory. You may choose between a data register, which stores the information that appears on the screen, and an instruction register, which is where the LCD's controller searches for instructions on what to do next.

A Read/Write (R/W) pin that controls whether the deviceis in reading or writing mode.

An enabling pin that allows you to write to the registers' eight data pins (D0 -D7). When you write to a register, the states of these pins (high or low) represent the bits you're sending to the register, or the values

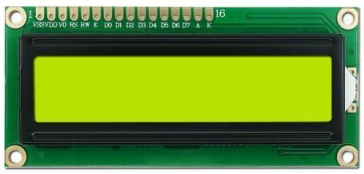

Figure 7:LCD

3. METHODOLOGY

The entire work has been broken down into seven sections.

- **Project Planning**:We look for difficulties in our daily lives. Then we discovered this issue and devised a strategy to address it.
- **Gather Information:**We studied a few research articles about the topic of accident detection. Welook for answers on the internet.
- **Requirement Analysis:**Arduino Uno, GPS, GSM

Accelerometer, LCD Display, Buzzer, Bread Board, Connecting Wires, and other components are used in this project.

- **Learn Required Skill:**We studied the Arduino Uno language and hardware connectivity in order to complete the project.
- **Design and Development:**We designed a technology that uses GPS communication via a GSM network to connect with the web server. It will provide the latitude and longitude data of the vehicle's position to the web server upon user request or once an accident is detected.
- **Testing and Debugging:**Final module testing is focused on demonstrating correctness, whereas debugging testing is focused on discovering faults.
- **Maintenance:**The whole extent and understanding of how to function should run and be controlled in an implementation area is presented in hardware project maintenance. Actions that must be taken to keep or restore a piece of equipment, machine, or system in the required operational state in order to extend its useful life. It entails both remedial and preventative maintenance.

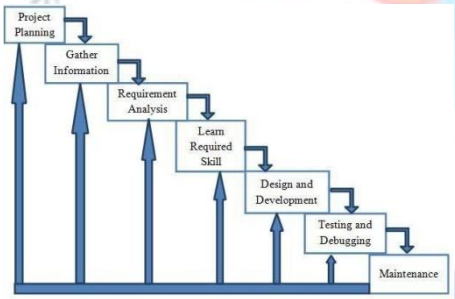

Figure 8: methodology

4. BLOCK DIAGRAM

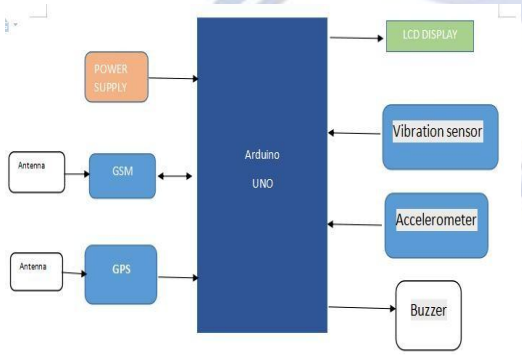

Figure 9: Block Diagram

In this project, Arduino is used for controlling whole the process with a GPS Receiver and GSM module. GPS Receiver is used for detecting the coordinates of the vehicle, GSM module is used for sending the alert SMS with the coordinates and the link to Google Map. Accelerometer namely ADXL345 is used for detecting accidents or sudden changes in any axis. And an optional 16x2 LCD is also used for displaying status messages or coordinates. We have used GPS Module NEO-6M and GSM Module SIM900A.

5. CIRCUIT DIAGRAM

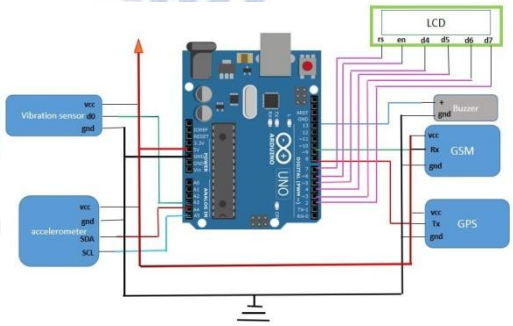

Figure 10:Circuit Diagram

Our Accident Alert System equipment has a simple circuit hookup. The GPS module's Tx pin is directly attached to Arduino Uno pin D8. Serial communication is enabled by default on pins 0 and 1 of the Arduino, utilizing the Software Serial library, we may enable serial communication on any of the Arduino's digital pins. The GPS Module is powered by a 5 volt source.

The Rx pin of the GSM module is linked directly to Arduino pin D9. We also utilised a software serial library for GSM connectivity. A 5v supply is also used to power the GSM module. The data ports D4, D5, D6, and D7 of an optional LCD are linked to Arduino pins 5, 4, 3, and 2. The LCD's command pins RS and EN are linked to Arduino pins 7 and 6, respectively, while the RW pin is connected straight to ground. For detecting an accident, an accelerometer and vibrator sensor are added to the system, and their D0, SDA, and SCL lines are directly linked to Arduino ADC pins A3, A4, and A5.

6. RESULTS

The effective functioning of an Arduino-based vehicle tracking and crash warning system through SMS is oneof the outcomes. This technology may identify an accident and notify the nearest police station and medical assistance center, which can subsequently give emergency medical assistance to accident victims.

All of the components were wired together according to the circuit schematic. The hardware connections and project prototype are shown in the diagram below..

Step1: Project prototype

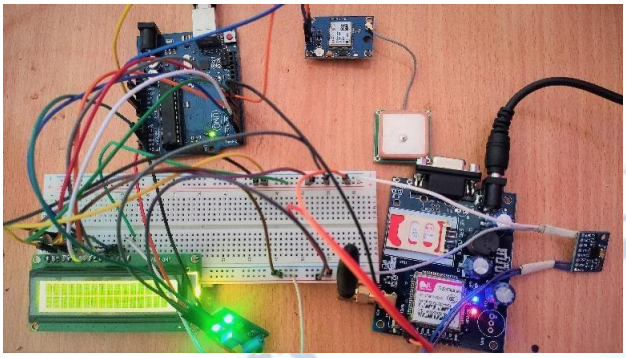

Figure 11:Prototype of the project

Step2: Power supply into the device and showing Arduino-based vehicle trailing and crash warning systemthrough SMS ready.

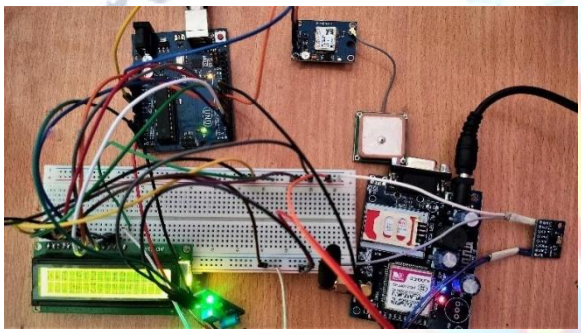

Figure 12: Power supply into the device

Step3: Location tracking and sending massage.

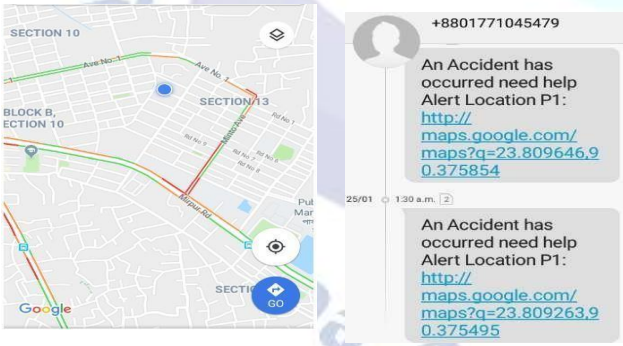

Figure 13: Location tracking and sending massage

7. APPLICATIONS OF THE SYSTEM

- It may be installed in a wide range of vehicles for automated accident detection and reporting to the nearest police station and medical help centre.
- It may be used to find the whereabouts of a stolen car.

8. CONCLUSION

This project demonstrates a vehicle accident detection and security system that sends SMS messages to user-defined mobile phone numbers. The algorithm for GPS tracking and GSM alerts has been created and implemented. The suggested vehicle accident detection system may automatically track geographical information and deliver an accident alarm SMS. The system has been installed and tested satisfactorily. This system is efficient and trustworthy, according to the results of the extensive trial

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] J. White, C. Thompson, H. Turner, B. Dougherty, and D. C. Schmidt, "Wreckwatch: Automatic traffic accident detection and notification with smartphones," Mobile Networks and Applications, vol. 16, no. 3, pp. 285-303, 2011.

[2] J. Zaldivar, C. T. Calafate, J. C. Cano, and P. Manzoni, "Providing accident detection in vehicular networks through OBD-II devices and Android-based smartphones," in 2011 IEEE 36th Conference on Local Computer Networks, 2011: IEEE, pp. 813-819.

[3] S. R. Sontakke and A. Gawande, "Crash Notification System for Portable Devices," INTERNATIONAL JOURNAL OF ADVANCE COMPUTER TECHNOLOGY, vol. 2, no. 3, pp. 33-38, 2013.

[4] J. A. Soni Kumari, M. Ghosh, and G. Ghosh, "Review of Automatic Speed Control of Vehicle using RFID Technology," International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume, vol. 5.

[5] R. K. Megalingam, R. N. Nair, and S. M. Prakhya, "Wireless vehicular accident detection and reporting system," in 2010 International Conference on Mechanical and Electrical Technology, 2010: IEEE, pp. 636-640.

[6] H. M. Ali and Z. S. Alwan, "Car accident detection and notification system using smartphone". LAP LAMBERT Academic Publishing Saarbrucken, 2017.

[7] N. Virtanen, A. Schirokoff, and J. Luom, "Impacts of an automatic emergency call system on accident consequences," in Proceedings of the 18th ICTCT, Workshop Transport telemetric and safety. Finland, 2005, pp. 1-6.