GSM-Based Collision Detection And Prevention System For Automobiles

Nandhini P, Kalaiyarasi M, Karthikeyan S, Manoj P, Nirmalkumar G, Praveen C,
Department of Electronics and Communication Engineering,
V.S.B. Engineering College, Karur, India
karthisubramaniyam3067@gmail.com

Abstract.

Technology's recent advancements have made our lives easier and faster. The advancement of technology has resulted in an increase in transportation risks. A GSM-based accident detection and prevention system is presented in this paper to reduce accidents and save lives. One of the most typical problems that individuals strive to tackle while acquiring a vehicle. As the number of cars grows, traffic management becomes a mess, resulting in accidents. Accidents can occur for a variety of reasons other than poor traffic control, such as inclement weather, irresponsible driving, defective automobiles, or poor road conditions. For safety reasons, the vehicle's performance has been regularly checked. If an accident occurs, this system transmits an emergency alert, including the location, to the nearest hospital through the GSM module. The outcome of this paper is that accident can be prevented by utilizing sensors and help can be sent immediately after accident has occurred.

Keywords. GSM, Accidents, emergency alert, nearest hospital

.

1. INTRODUCTION

Since the demand for automobiles is increasing every day, traffic is increasing. As a result, transportation has to be improved since, as demand grows, there will be more opportunities for automobile accidents. One of the most common causes of death is motor vehicle accidents. If individuals can't seek help when they need it, there will be serious consequences. Poor emergency response might be a key contributor to our country's high fatality rate. According to crash analysis research, road accidents may be avoided if this innovative life-saving technique was used. The design focuses on giving emergency contacts with basic information about the accident scene. A valuable life may be saved as a consequence of the prompt assistance. During this project, a three-axis accelerometer was used. The approach identifies accidents faster and reports them to the appropriate authorities. Transportation development has been the generating force for citizens to possess the greatest civilization over all organisms on the planet. The automobile is quite important into our way of life. It has the potential to cause us harm and even death through accidents. One of the most essential and fundamental risk factors in driving is speed. It has an impact not just on the severity of a collision, but also on the likelihood of being engaged in a severe collision. Despite the numerous efforts made by various governments and nongovernmental groups throughout the world via various initiatives to raise awareness about irresponsible driving, accidents continue to decrease on a regular basis. However, many lives may be spared if emergency personnel could receive the necessary information in a timely manner. This paper proposes GSM-based collision detection and prevention system for automobiles. The paper is organised as follows. Section II contains related works. Section III outlines the approach. Section IV presents the experimental data, and Section V wraps up.

2. RELATED WORKS

Several studies have been conducted previously that have led to the development of accident detection systems [1] - [3]. Accelerometers have been used in previous projects to detect changes in the car's axis, which then triggers a short message to the predetermined number with details of the accident. Various forms of technology have made our lives easier. Like every coin has two sides, technology is not without its downsides either. With technological advancements, road accidents are occurring at an increasingly rapid pace, which has resulted in a significant increase in fatalities. In our nation, there are insufficient emergency services, thereby causing the problem to worsen. Our initiative aims to provide a solution to this problem.

In addition to the increased use of automobiles, the risk of automobile accidents also increases. The most common causes of automobile accidents are high speeds, driving while intoxicated, distracted minds, overstress, and technological failures. An accident detection system in the study is developed to detect accidents occurring as a result of the driver's inattention. This system is designed to notify the owner of the vehicle. Once an accident has occurred, the system will send instructions to the registered cellphone number to assist with the recovery.

Whenever a person is unable to control the vehicle or when an internal failure occurs, an accident occurs. There are a number of sensors that can be used to aid in the safety of vehicles, whether they are private or public. There is a rapid increase in the number of road accidents. The paper describes several systems that are designed to detect accidents and notify hospitals and medical services. In order to dispatch medical assistance immediately, we can use this method to pinpoint the location of an accident. We are developing a vehicle accident monitoring system that incorporates GPS, and GSM technology for the purpose of delivering messages. The system uses a microcontroller, GPS, and GSM module to deliver messages. Ultrasonic sensors detect movement, falls and accidents with the ultrasonic sensor. GSM [Latitude, Longitude] will be included in the Short Message, which provides vehicle location information

3. PROPOSED METHOD

An accident may be detected using the vehicle's speed, and GPS data is processed by a microcontroller to tell the Alert Service Center of the accident's position and time over the GSM network. Figure 3.1 depicts the proposed system’s block diagram.

Temperature sensor, door lock sensor, brake failure indication, ultrasonic sensor, GSM module, LCD, Motor driver, and DC motor are all part of the proposed system. The thermal condition of the car is monitored using a temperature sensor. Whenever this system detects a brake failure, the vehicle is brought to a complete stop using the break failure sign. The pollution is detected by an ultrasonic sensor, which sends the information to a mobile phone through the GSM module. When an utilized individual tries to enter the car door, the door lock sensor transmits information to the owner's mobile phone. When a car accident happens, the gadget sends a message to the predetermined numbers with the GSM module's information so that assistance may be sent. This system is equipped with a GSM module, and when an accident is detected, the system sends emergency information to the server through the GSM module. On the LCD Display, all of the parameters are presented. It is hoped that this technique would reduce the number of deaths by making better use of the time it takes for an ambulance to get at the hospital. The primary purpose of this paper is to employ sensors to identify accidents. Using GPS and GSM modules, an ambulance and two members of the victim's family can pinpoint the car's exact position. GPS coordinates are used to find the vehicle using a mobile application for theft detection, and the position is then sent to the cloud. Embedded systems may be used to do this, which is a revolutionary technology that will exceed all others. This integrated technology allows us to automate everything around us, therefore decreasing the need for human contact while preserving product quality. When an accident is detected, the LCD may show the current condition.

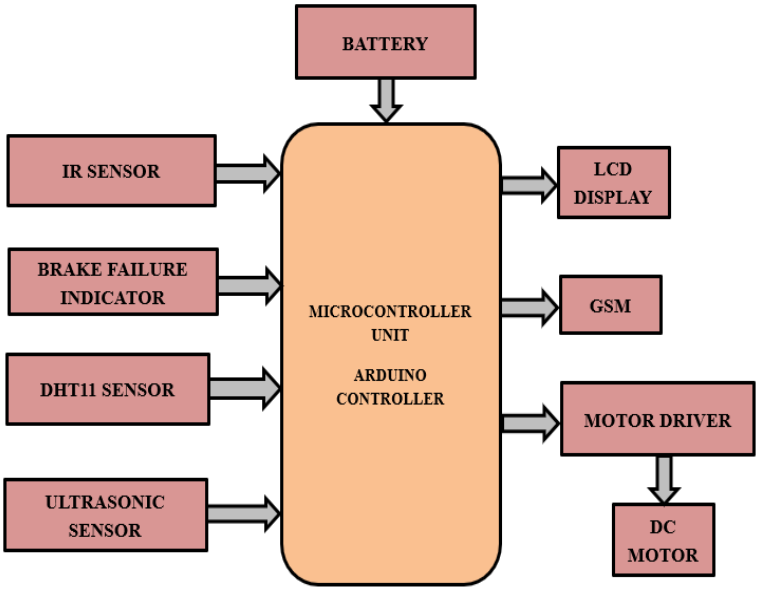

Figure 3. 1. Proposed System Block Diagram

3.1. GSM Network

GSM is a digital modulation-based second-generation cellular technology that uses digital modulation to deliver voice and data services.

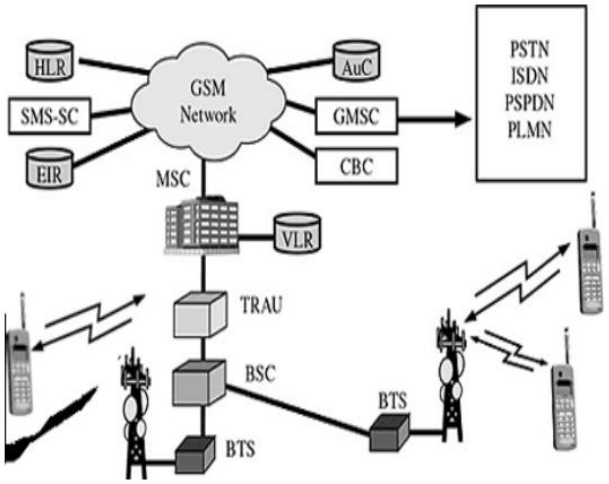

Figure 3.2. GSM Network

There are eight 25 kHz time slots for each 200 kHz channel in a circuit-switched GSM system. 900 MHz and 1800 MHz are used to transmit mobile data all around the world. It supports data speeds ranging from 64 kbps to 120 Mbps. Basic to sophisticated phone and data services are available with GSM, along with roaming services. Before sending data along a

channel, GSM encrypts and compresses it before distributing it, along with two other time-slotted streams. The GSM Network is depicted in Figure 3.2.

The purpose of it in this paper is to send a short message to the predefined number if an accident occurs along the coordinates of the accident's location. This way, help can be dispatched as soon as the accident occurs, saving people's lives. We do not need to wait for someone else to contact the ambulance, since the predefined number is automatically notified.

3.2. Arduino

The Arduino Uno microcontroller board is powered by an ATmega328P processor. The 14 digital input/output pins on this device include an ICSP header, USB, an importance jack, and a push button. The starter kit includes everything you'll need to get started with the microcontroller. To power it, you may either use an AC-to-DC converter or a battery connected to a computer through USB. It is used here in the project, so that it can connect all the different sensors and the battery with the LCD display and GSM module. By doing so, all these work in synchronization, to indicate a fault in the vehicle through LCD display and an accident by sending message to the predefined number. All these can happen only if the coding is done in Arduino, since all of these are embedded into the system.

3.3. DHT11 sensor

Digital temperature and humidity sensors, such as the DHT11, are easy to use. It uses a capacitive humidity sensor and a thermistor to monitor the air's temperature and generate a digital signal. It is used here in the project, so that it can monitor the heat of the vehicle's engine, and if the heat is more than the predetermined value, it can alert the driver through LCD display, indicating the vehicle needs to be stopped for the engine to cool down.

3.4. Ultasonic Sensor

Ultrasonic sensor can estimate the distance to an item. In a simple-to-use design, it provides good range accuracy and reliable readings. It is used in the project, so that it can cover the distance between any objects or vehicles surrounding the vehicle, and can transmit a beep sound through buzzer if the vehicle is so close to another vehicle or if it has collided with any other vehicles, it can transmit message through GSM to send message to predefined number.

It is a flat-panel display or other electronic visual display that takes use of the light-modulating properties of liquid crystals (LCDs).It is used in the project, so that it indicates what problem has occurred in the vehicle and we can act to rectify that problem. A buzzer is used here, so that when any of the sensors detect any faults/ failures, the buzzer indicates us by sending off high beep sound.

4. EXPERIMENTAL RESULTS

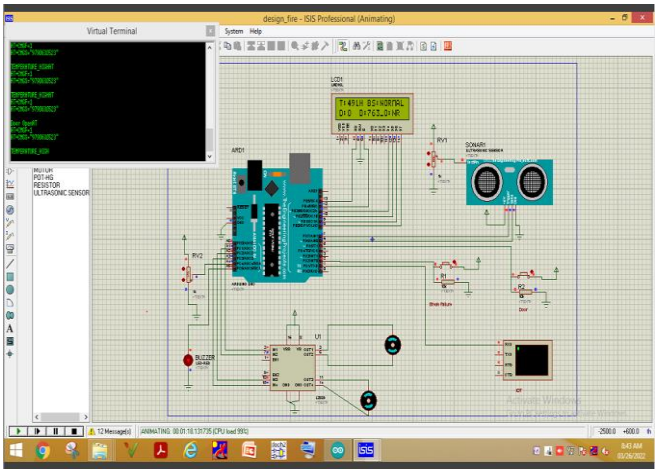

Figure 3.3. Circuit Diagram

By using the Arduino Ide, the necessary code for the above circuit diagram has been coded, which is shown in Figure 3.3. And after successful execution of the code, it has been inserted into the Arduino microcontroller. Then the microcontroller is connected with the required sensors and GSM module, to it all interactive with each other. By making all these components interactive, in case an accident or fault occurs in the vehicle it is indicated to the owner of the vehicle as well as emergency medical services. If the driver notices of the fault through the display, he/ she can avoid accident occurrence. The indication is done through GSM module with a Short Message Service (SMS) and for internal fault occurrence in the vehicle, it is displayed through the LCD display. By implementing this system, human lives can be saved, since the message is sent immediately after accident occurrence along the co-ordinates to the emergency number.

5. CONCLUSION

Several technologies have been analyzed that have reduced traffic risks while highlighting current concerns in the transportation sector. The main focus of the proposed system was on accident detection and prevention. With the suggested method, traffic officials could track incidents through GSM Modules and intervene before they become a tragedy. Several strategies are presented in the project that can be used to detect accidents. As part of the majority of the solutions outlined, the driver has the option of turning off the alarm if the accident is not significant or an erroneous accident detection has occurred. Typically, these solutions are either primarily connected to hardware, such as sensors, that is installed inside the vehicle, or they require a smartphone to be installed inside the vehicle. Using such hardware may seem more cost-effective, but it has the disadvantage

that it may be destroyed in an accident, resulting in erroneous or nonexistent measurements. The result is a technique independent of any sensor or physical device. If a camera is connected to the controller module, the project can be further enhanced, so that a snapshot of the accident site can be taken, making tracking even easier. This problem becomes more serious when drivers lose control and fail to react in an emergency situation. In the future, this system could be used for fleet management, restaurant service, traffic infraction cases, and vehicle rentals.

6. REFERENCES

[1] V. Singh Kushwaha, Deepa Yadav, Abuyeed Topinkatti, Amrita Kumari, 'Car Accident Detection System using GPS And GSM,'Vol. 2, pp.12-17, 2015.
[2] Nimisha Chaturvedi, PallikaSrivastava, 'Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem,' Vol. 5, Issue. 3, 2018.
[3] C. Prabha, R. Sunitha, R. Anitha, 'Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem,' Vol. 3, Issue 7, 2014.
[4] Hoang Dat Pham, Micheal Drieberg, Chi Cuong Nguyen, 'Development of vehicle tracking system using GPS and GSM modem,' IEEE Conference on Open Systems (ICOS), 2013.
[5] Lih-Jen Kau, Member, IEEE, Chih-Sheng Chen, 'A Smart Phone-Based Pockert Fall Accident Detection, Positioning and Rescue System,' 2013.
[6] R. Ganiga, Rohit Maurya, Archana Nanade, 'Accident detection system using Piezo Disk Sensor,' International Journal of science, Engineering and Technology Research (IJSETR), Vol. 6, Issue. 3,2017.
[7] S.Gomathi,"Performance comparison of different bidirectional DC-DC converters for solar PV system" published on Journal of Electrical Engineering, Vol. 19.1.20, 2019, pp. 158-164
[8] S.R Aishwarya, Ashish Rai, Charitha, Prasanth M.A, Savitha S.C, 'An IoT based vehicle accident prevention and tracking system for night drivers,' proc. IEEE, Vol. 3, Issue 4, 2019.
[9] Sadhana B Shabrin, Bhagyashree Jagadish Nikharge, Maithri M Poojary, T Pooja, 'Smart helmet-intelligent safety for motorcyclist using raspberry pi and open CV,' proc.IEEE, Vol. 03, Issue. 03, 2016.
[10] S.Kannadhasan, R.Nagarajan and R.Banupriya, Performance Improvement of an ultra wide band antenna using textile material with a PIN diode, Textile Research Journal, DOI: 10.1177/00405175221089690journals.sagepub.com/home/trj
[11] R.Bharathi, T.Abirami," Energy efficient compressive sensing with predictive model for IoT based medical data transmission", Journal of Ambient Intelligence and Humanized Computing, November 2020, https://doi.org/10.1007/s12652-020-02670-z
[12] T. Anitha, T. Uppalaigh 'Android based home automation using Raspberry pi,' Proc-IEEE, Vol. 4, Issue 1, pp-2351-2355, 2014.
[13] Nwankwo, Wilson, Charles Oluwaseun Adetunji, Akinola S. Olayinka, 'IoT-Driven Bayesian Learning: A Case Study of Reducing Road Accidents of Commercial Vehicles on Highways,' Artificial Intelligence-based Internet of Things Systems, pp. 391-418, 2022.
[14] S. Belhadad, M. Menai, 'Vehicle Tracking and Trajectory Estimation for Detection of Traffic Road Violation,' In Advanced Computational Paradigms and Hybrid Intelligent Computing, pp. 561-571, 2022.
[15] D. Tushara, P.A. Bindu, Harsha Vardhini, 'Wireless vehicle alert and collision prevention system design using Atmel microcontroller,' *In 2016 International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT)*, pp. 2784-2787. IEEE, 2016.

Biographies

Mrs.P.Nandhini, Assistant Professor, Dept. of Electronics and Communication Engineering, VSB Engineering College, Karur. She has completed her B.E in Electronics and Communication Engineering in 2013, M.E in Communication systems in 2015. She has around 6 years of teaching experience. Her area of research in Digital image processing and Networking.

Kalaiyarasi Murugesan, Born in Nagercoil, Kanyakumari District of Tamil Nadu in 1985. She graduated in Electronics and Communication Engineering from Cape Institute of Technology, Levengipuram and post graduated in Applied Electronics from Raja Rajeshwari Engineering College, Chennai, India in 2006. She pursued her doctoral programme in Kalasalingam Academy of Research and Education, Krishnankoil. Now, she is currently working as an Assistant Professor in the Department of Electronics and Communication Engineering, V.S.B. Engineering College, Karur. She has so far published around 20 papers in National and International journals and Conferences. Her research interests are SAR image processing and Remote Sensing.

Karthikeyan S, is an undergraduate electronics and communication engineering student pursuing his studies at VSB Engineering College, Karur. He is good at Java programming, and has knowledge on testing with selenium.

Manoj P, who is currently an undergraduate electronics and communication engineering studentpursuing his studies at VSB Engineering College, Karur. He is good at database management.

Nirmalkumar G, is a student who is currently pursuing Electronics and Communication Engineering at VSB Engineering College, Karur. He is good at different programming languages such as Java, Python and C and has attended internship on Artificial Intelligence.

Praveen C, is an undergraduate electronics and communication engineering student pursuing his studies at VSB Engineering College, Karur. He is good at networking and is a Java Programmer.