WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Arduino Based Accident Prevention, Detection and Reporting System

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DOI: https://doi.org/10.55248/gengpi.4.1223.123509

ABSTRACT:

This paper seeks to address the crucial issue of individuals being left without assistance in the event of a vehicle accident while riding. This Arduino-based accident prevention, detection, and reporting system incorporates a wide range of sensors increased security. The technology ensures a multi-faceted approach to accident prevention by combining GPS, GSM, accelerometer, eye-blink, piezo-pressure, fire, and alcohol sensors. The Arduino microcontroller analyzes data from numerous sensors to detect probable crashes, irregular driving behavior, driver tiredness, and various environmental risks like as the presence of fire or alcohol.

In the event of an impending threat, the system sends out notifications, warning the driver and transmits incident details, including location, to emergency authorities via GSM. This comprehensive and adaptable system targets a wide range of issues of road safety, encouraging a proactive and preventive approach to accident prevention.

INTRODUCTION

In today's fast-paced world, road safety remains a paramount concern. The increasing number of accidents demands innovative solutions to mitigate risks and enhance emergency response systems. This paper introduces an Arduino-based Accident Prevention, Detection, and Reporting System that integrates advanced sensors, such as GPS, Neo SIM800L GSM Module, Fire Sensor, Accelerometer ADXL335, Eye Blink Detection, Alcohol Sensor, and Piezo-pressure Sensor.

The core objective of this system is to proactively identify potential hazards on the road, monitor the driver's condition, and promptly report emergencies to designated authorities. The GPS module ensures accurate location tracking, allowing for precise incident mapping. The Neo SIM800L GSM module facilitates real-time communication by sending instant alerts to emergency services and relevant contacts.

The Fire Sensor acts as an early warning system, detecting potential fire outbreaks in the vehicle. The Accelerometer ADXL335 provides critical data on sudden accelerations or deceleration's, aiding in the identification of collisions or abrupt maneuvers. The Eye Blink Detection feature monitors the driver's fatigue levels, while the Alcohol Sensor detects any signs of impaired driving.

To enhance the system's responsiveness, the Piezo-pressure Sensor is incorporated to detect sudden impacts, ensuring the system can distinguish between normal driving conditions and potential accidents. The amalgamation of these sensors creates a comprehensive and intelligent safety net for both drivers and passengers.

This paper aims to explore the design, implementation, and testing of this integrated system, emphasizing its potential to significantly reduce accident rates and improve emergency response times. The research findings highlight the effectiveness of leveraging advanced technologies to create a robust and reliable Accident Prevention, Detection, and Reporting System, with applications in both personal and commercial vehicles.

LITERATURE REVIEW

Arduino based accident prevention, detection and reporting system has proposed to prevent accidents due to drowsiness, alcoholism, vibrations of vehicle, fire attacks while driving. The major causes of accidents are observed as mentioned above and various sensors are used for detecting those factors and sent to Arduino UNO micro-controller. The Arduino sends a alert message by detecting various parameters in the vehicle by using GSM and GPS modules with location of the accident. In previous project there is no usage of air bag sensors but in our project there is a piezo pressure sensor which works as air bag sensor. This system uses various sensors like ADXL335,alcohol Sensor, fire sensor, eye-blink sensor in one system to detect the accident, but in early projects only one or two sensors are used. It uses GPS directly there is no limitation since it depends on base station existing in area but previously the

system used Bluetooth so the connectivity is limited. These systems are useful as it improves their functionalities by adding a feature to the existing system which could increase functionality and reliability such that it prevent accidents.

Rajvardhan Rish, Sofiya Yede, Keshav Kunal, Nutan V Bansode [1] proposed a system which states that the leading cause of deaths in road accidents is due to delay in medical help. This can be prevented by messaging the authorities and emergency contacts too on time. The system consists of GPS, GSM, accelerometer and Arduino. It alerts nearest hospital, police headquarters, family and friends during the time of mishap mainly by detecting changes in accelerometer. The system sends a google map link using GPS module and Arduino. The vehicle sets the flag bit of the Arduino UNO as an accident is identified until it detects abrupt deviation from the threshold values with the help of the measuring system detector. Throughout the accident, the device sets the effective sensitive value for measuring instrument detectors, unless a crash is observed. Once the accident or set bit is detected by the measuring instrument detector, Arduino activates the GSM module, which has a manually saved signal of the accident victim's emergency contact, and sends a pre-stored SMS to that contact. Though this system works fine, it lacks the detection of rare minor accidents with no casualties. So, it will eventually result in waste of resources and time in the case of minor accidents. Furthermore, it uses Arduino UNO which is less powerful than the recent micro-controllers available in the market. Hence, we decided to only take the system architecture components which would be beneficial to our project in accuracy which are the following: GSM, GPS module, accelerometer.

Aarya D.S, Athulya C.K, Anas. P, Basil Kuriakose, Jerin Susan Joy, Leena Thomas [2] proposed a system that states the vehicle accidents are one of the most leading causes of fatality. The period between the occurrence of an accident and the dispatch of emergency medical services to the accident site is a critical factor in accident survival rates.

Prashant Kapri, Shubham Patane, Arul Shalom [3] proposed a system which states that an accident might occur at an isolated area where humans are absent to report any mishap. Inbuilt hardware modules in luxury vehicles have recently been developed to detect and report accidents. Unfortunately, such devices are both costly and immobile.

There are several efforts, application: approaches are projected to produce security and safety just in case accident. A completely unique approach to extend the protection of road travel victimization the ideas of wireless detector network and therefore the Bluetooth protocol has been protected. It mentioned however, vehicles will type mobile ad-hoc network and exchange information perceived by the onboard sensor [3]. Platform of the robot in operation system and software system development atmosphere well-tried optimum resolution for public safety just in case of accident. An honest survey of victimization personal itinerant, Microcontroller, Bluetooth and JAVA Technology has been well- tried.

Mr. S. Kailasam, Mr. Karthiga, Dr. Kartheeban, R.M. Priyadarshani, K Anithadevi [4] states that due to lack of attention, Drowsiness, and drunk driving are the major causes of road accidents, this paper proposes preparing a system to prevent these circumstances. This system monitors the driver's face when the car starts which mainly helps in observing continuously. It uses two functions: One to detect the eye blinking, second is for reading the blinking. Automatic driving and braking systems are-also combined with a controlling system using python programming.

PROPOSED SYSTEM

To overcome the limitations in the existing systems this project is designed in which various sensors are used to detect the accident. This project uses GSM and GPS modules to track the accident spot and send spontaneous message to the ambulance. The system uses piezo pressure sensor to detect the pressure when accident occurs and opens the air bags in the car. So, using of various sensors the system becomes more efficient and reliable. This system is more useful in detecting the accident and saves the lives of the people.

Figure 1 shows the block diagram of accident detection, prevention and reporting system using Arduino. The proposed system uses various sensors like accelerometer ADXL335, Alcohol sensor(MQ3), Eye-blink sensor, Fire sensor, Piezo-pressure sensor, GPS, GSM modules to detect the accident.

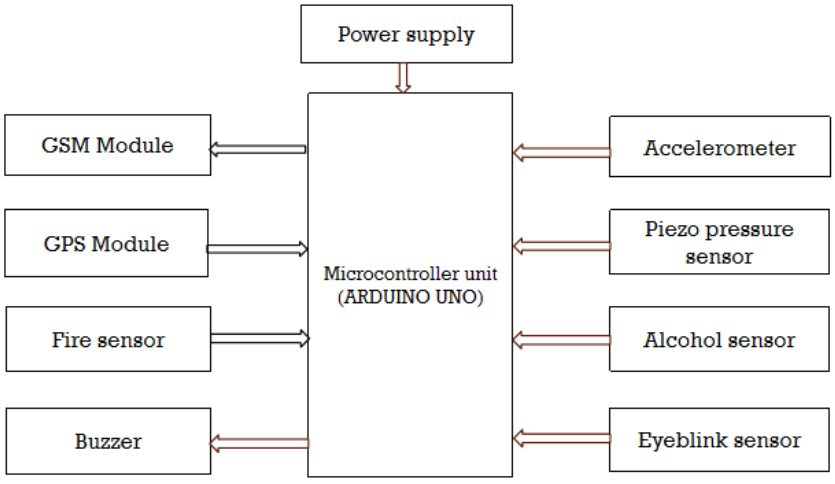

Figure 1: Bock Diagram

Circuit connections of the system are made as follows Accelerometer's X,Y,Z pins are connected to A0,A1,A2 pins of Arduino, Piezo-pressure is connected to A4 pin of Arduino, Alcohol sensor is connected to A3 pin of Arduino, Eye-blink sensor is connected to 4 pin of Arduino, Fire sensor is connected to 10 pin of Arduino, Buzzer is connected to 9 pin of Arduino, GSM receiver pin is connected to 1 pin of Arduino, GPS transmitter pin is connected to 2 pin of Arduino respectively.

Working

The core controller is Arduino to which various sensors are interfaced to detect the accident. The sensors senses the input change in the vehicle by means of any fire, alcohol presence, vibrations, pressure, drowsiness and sensors are activated and information is sent to Arduino .As the GPS is connected to Arduino the GPS tracks the accident location. The location is sent via google map to emergency services or any other number through GSM module. The location of accident can be known and we can save the victim. The alert message is sent through GPS and GSM to emergency services and the buzzer will blow.

Figure 2: Working

From the accident spot GPS tracks the location through satellite and alert message is sent to specified mobile number through GSM module through which we can rescue the victim in the accident

Accelerometer ADXL335: In accident prevention systems, accelerometers play a crucial role by detecting sudden changes in acceleration. These devices measure acceleration forces and can trigger alarms or reporting mechanisms when abrupt deceleration indicative of a collision is detected. Integrating accelerometers into vehicles or wearable devices allows for real-time monitoring and reporting of potential accidents, enhancing safety measures.

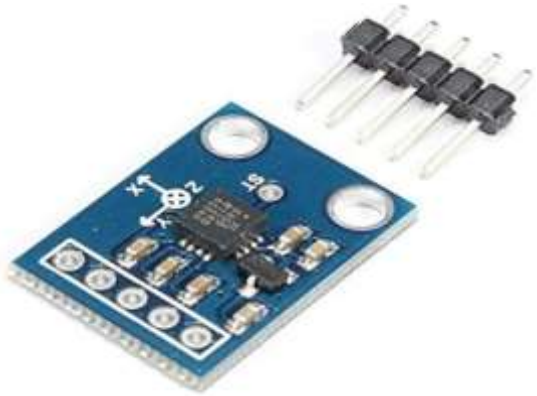

Figure 3: Accelerometer ADXL335 courtesy: Google

Alcohol sensor(MQ3): The MQ-3 is a gas sensor module specifically designed to detect alcohol vapor in the air. The MQ-3 sensor uses a tin dioxide (SnO2) semiconductor to detect the presence of alcohol in the air. The MQ-3 sensor is highly sensitive to various types of alcohol, such as ethanol, methanol, and isobutane. The MQ3 alcohol sensor is one of the series of MQ gas sensors, which can detect and monitor the alcohol gas present in the atmosphere. It is capable of detecting 25-500ppm alcohol gas concentration in the air.

Figure 4: Alcohol sensor courtesy: Google

Eye-blink sensor: This Eye Blink sensor senses the eye-blink using infrared. The Variation Across the eye will vary as per eye blink. If the eye is closed the output is high otherwise the output is low. The main component of the Eye Blink Sensor is the infrared sensor. The infrared sensor contains two parts. An IR transmitter and an IR receiver. The IR transmitter emits infrared waves onto the eye. While the receiver continuously searches for variations in the reflected waves which indicates that the eye has blinked or not. If the eye is closed then reflected waves will be received by the IR Receiver and the output of the sensor would be low. If the eye is open then all the IR rays will be absorbed by the eye and the output of the eye blink sensor would be high.

Figure 5: Eye-blink sensor courtesy: Google

GPS Neo-6 : The NEO-6MV2 is a [14]GPS (Global Positioning System) module and is used for navigation. The module simply checks its location on earth and provides output data which is longitude and latitude of its position. It is from a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature (16 x 12.2 x 2.4 mm) package. The compact architecture, power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. Its Innovative design gives NEO- 6MV2 excellent navigation performance even in the most challenging environments. It tracks the location of the accident and sends to emergency services. So, this technology is used to detect, prevent and report the accidents.

Figure 6: GPS Neo-6 courtesy: Google

RESULT

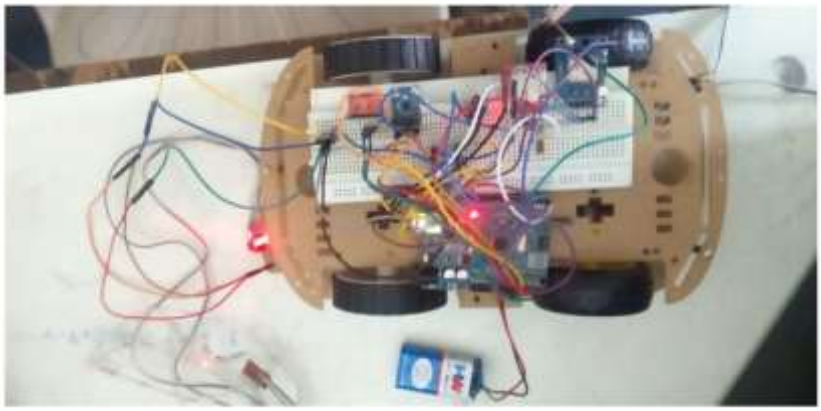

Figure 7: Hardware module

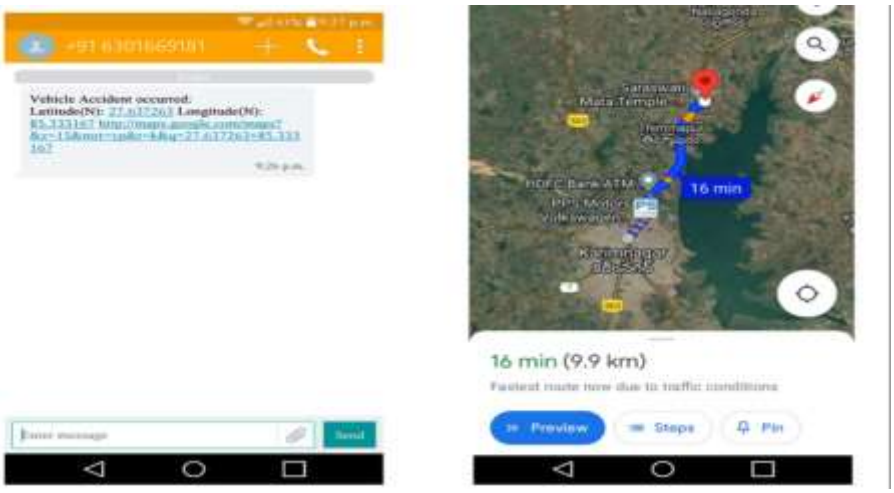

Figure 8: Message received with location of the accident to specified number via Google Map

CONCLUSION

The Arduino-based accident prevention, detection, and reporting system offers a robust solution for enhancing road safety. By integrating sensors such as accelerometers, fire detectors, and GPS technology, the system can swiftly identify potential accidents and hazards. Its real-time monitoring capabilities, coupled with the ability to communicate through a reporting mechanism, enable prompt response and intervention. This system stands as a practical and effective tool in mitigating road accidents, contributing significantly to overall traffic safety and security.Using GPS, the location can be sent through tracking system to cover the geographical coordinates over the area.By this system the death rate can be reduced by alerting the accidents.

REFERENCES

1. Rajvardhan Rish, Sofiya Yede, Keshav Kunal, Nutan V Bansode [1] proposed a system which states that the leading cause of deaths in road accidents is due to delay in medical help.

2. Aarya D.S, Athulya C.K, Anas.P, Basil Kuriakose, Jerin Susan Joy, Leena Thomas [2] proposed a system that states the vehicle accidents are one of the most leading causes of fatality.

3. Prashant Kapri, Shubham Patane, Arul Shalom [3] proposed a system which states that an accident might occur at an isolated area where humans are absent to report any mishap.

4. Mr. S. Kailasam, Mr. Karthiga, Dr. Kartheeban, R.M. Priyadarshani, K Anithadevi[4] states that due to lack of attention, Drowsiness, and drunk driving are the major causes of road accidents, this paper proposes preparing a system to prevent these circumstances.

5. Syedul Amin, M., Jalil, J., & Reaz, M. B. I. (2012). Accident detection and reporting system using GPS, GPRS and GSM technology. 2012 International Conference on Informatics, Electronics & Vision.

6. Vikram Singh Kushwaha, Deepa Yadav, Abuyeed Topinkatti, Amrita Kumari . “Car Accident Detection System using GPS And GSM”, Volume 2, Issue 1(Jan-Feb 2015), PP12- 17.

7. Nimisha Chaturvedi, Pallika Srivastava . “Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem “,Volume: 05 Issue: 03 | Mar-2018.

8. C.Prabha, R.Sunitha, R.Anitha. “Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem”, Vol. 3, Issue 7, July 2014.

9. Hoang Dat Pham, MichealDrieberg, Chi Cuong Nguyen, “Development of vehicle tracking system using GPS and GSM modem “,Conference: 2013 IEEE Conference on Open Systems (ICOS) .

10. Lih-Jen Kau, Member, IEEE, and Chih-Sheng Chen, “A Smart Phone-Based Pockert Fall Accident Detection, Positioning And Rescue System”, Dec 2013.

11. Wadhahi, N. T. S. A., Hussain, S. M.,Yosof, K. M., Hussain, S. A., & Singh, A. V. (2018). Accidents Detection and Prevention System to reduce Traffic Hazards using IR Sensors. 2018 7th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions).

12. Pura Javale al. have proposed the accident detection and surveillance of computer using technologies which explains how the accident detected by using the computer technologies.

13. S.K.C.Varma al. Have proposed automatic vehicle accident detection and messaging system using GPS and GSM module.

14. Nithin thakre al. have proposed automatic vehicle accident detection and localization of automobile using Bluetooth technology.