International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 05 | May - 2023 SJIF 2023: 8.176 ISSN: 2582-3930

Smart Accident Detection, Prevention and Reporting using Arduino

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***Abstract*—** Numerous people lose their lives in traffic accidents every day. In India, 4,80,652 traffic accidents resulted in a total of 1,51,113 fatalities in 2019. In terms of road accident deaths, India currently retains the top rank. Excessive speed was the primary cause of fatalities in road accidents. To save the lives of several injured accident victims, this is a serious problem that needs to be remedied. In order to address the ongoing challenges surrounding automobile accidents, various automobile companies have implemented a range of safety systems, including safety airbags, seat belts, camera sensors, and more. Despite these efforts, the root causes of accidents and their resulting effects have proven difficult to mitigate entirely. To tackle this persistent issue effectively, there is an urgent need for a comprehensive system that can automatically detect accidents as they occur. This system would play a crucial role in promptly communicating vital information about the accident and its precise location to both nearby hospitals and concerned relatives without any delays. When a car has an accident, the accelerometer immediately provides data to the Arduino, which then sends the alarm message through the GSM MODULE, including the location that is identified by the GPS MODULE, to recently saved crisis contacts.

***Keywords*—**Arduino; Gas Sensor; Eye Blink Sensor; Accelerometer; GSM & GPS Module; Buzzer; LED.

I. INTRODCUTION

The use of vehicles has significantly increased in the modern world, which has increased traffic volume and, in turn, contributed to an increase in road accidents. Due to a lack of timely preventive and safety facilities, this damages the property and results in human life loss. The proposed embedded system takes the necessary precautions to prevent accidents from happening. As the position was provided to the emergency services' smart devices with mobile network accessibility coupled with a link to a Google Map, they could quickly locate the area. Approximately 1214 road accidents occurring every day. Major road accidents in India are caused due to the over speeding and violation of traffic rules. The road accident rates are increasing day by day due to large numbers of vehicle running on the road. In all these Vehicles, the speed control needs to be implemented. Here is our fresh idea: equip the cars with an automated speed control system to control the speed mainly in the restricted areas like school, college zones etc. In the event of an accident, the accelerometer picks it up, GPS is used to determine the location, and then a GSM module is used to communicate the information to the police and ambulance service. The message received on a mobile device includes the address of the accident site in the form of a Google Maps link, which will help rescue agencies, such as ambulance services and police stations, reach the victim swiftly and save lives. Besides, the data stored by sensors can be used to investigate the accident in future. The system is monitored by a cloud, hence a number of criminal activities can be tracked and monitored. Stop or lock the vehicle remotely from the cloud service in case of a pursuit or theft.

II. PROBLEM STATEMENT

To develop a smart accident prevention, detection and reporting using Arduino. Sensors like alcohol/gas sensor and eye-blinking sensor are used as majority of accidents are a case of drink and drive and driver falling asleep. Post this, in case of accident detection, automatic reporting is done to emergency contacts. The operations are controlled by cloud.

B. OBJECTIVES

- Stolen vehicle recovery without extra cost.
- Providing faster emergency services.
- Vehicle security and smooth fleet management.
- Reduced number of road accidents.

III. REQUIREMENT SPECIFICATIONS

A. ARDUINO

The Arduino Uno is a popular microcontroller board known for its versatility and wide range of applications. This board's open-source foundation makes it a popular option for both hobbyists and electronics aficionados. The Arduino Uno offers plenty of versatility for connecting numerous sensors, actuators, and other electronic components thanks to its 14 digital input and output pins and 6 analogue inputs. It features a 16 MHz ceramic resonator that ensures accurate timing and 2 synchronization. The board is equipped with a USB connection, enabling easy communication with a computer, and it also has a power jack and ICSP header for additional connectivity options. To start using The Arduino Uno is easily powered by an AC-to-DC adapter or battery and may be connected to a computer with a USB wire. This all-inclusive board includes everything necessary to support the microcontroller, making it a convenient and user-friendly choice for electronic projects of all kinds [1].

B. GPS MODULE

A network of satellites and ground-based receivers is used by the Global Positioning System (GPS), a satellite based navigation system, to precisely determine and store location data on Earth. These satellites broadcast signals that are picked up by GPS receivers, also known as GPS modules, which use the time it takes for the signals to reach them to determine their distances from them. This process enables the GPS module to determine its precise position on Earth. The GPS module provides output data in the form of a standardized string format known as the National Marine Electronics Association (NMEA) format [2].

The module's Tx pin is used to send the output serially, typically at a 9600 baud rate. The NMEA string produced by the GPS module is made up of a number of parameters, such as longitude, latitude, altitude, time, and more, which are all separated by commas. Each NMEA string has a dollar sign ($) at the beginning and a carriage return/line feed at the end. By receiving and parsing these NMEA strings, applications and devices can extract and utilize the valuable location and timing information provided by the GPS module. This allows for a wide range of applications, including navigation systems, asset tracking, surveying, and many others that rely on accurate positioning data [2].

C. GSM MODULE

An electrical component known as a GSM or GPRS module is used to establish communication between a mobile phone or computer and a GSM or GPRS network. This module can be created to act as a mobile phone with GSM modem capabilities, or it can be constructed to function as a dedicated modem device with a serial, USB, or Bluetooth connection. In order to interact with a processor or controller, the module requires AT commands, which are transmitted through serial communication. These commands enable the processor or controller to

control the module and perform various functions, such as sending and receiving SMS messages or making phone calls [3].

D. ACCELEROMETER

All things considered, an accelerometer is an electromechanical device that calculates quickening powers. These forces might be either static, like the constant force that gravity has on the body, or dynamic, like any vibrations on the accelerometer. Different mechanisms are used by accelerometers. One such method is piezoelectric impact, which uses gem-like tiny structures to generate voltages when accelerative forces strike against them [3].

E. ALCOHOL SENSOR

The alcohol sensor, known as an MQ3 sensor, is designed to detect the presence of ethanol in the air. When a person who has consumed alcohol breathes near the sensor, it can accurately identify the ethanol in their breath and generate an output signal that corresponds to the concentration of alcohol. The MQ3 sensor operates using a semi resistor, which means its electrical resistance changes in response to specific gases. When the sensor comes into contact with ethanol vapor, the resistance of its sensing element undergoes a modification. This change in resistance is then measured and translated into an output signal that reflects the amount of alcohol present in the air [3].

F. EYE BLINK SENSOR

Using infrared (IR) waves, this eye blink sensor operates. It has an IR receiver as well as a transmitter. The eye blink sensor uses infrared light to illuminate the eye and tracks variations in the reflected light. The outcomes are ascertained by using the infrared light reflected from the eye [3].

G. ARDUINO IDE

An all-inclusive environment for programming Arduino boards is provided by the Arduino Integrated Development Environment (IDE), a piece of software. It offers a number of essential elements, including a text editor created especially for writing Arduino code. A message area, a text terminal, a toolbar with common tasks, and a number of menus for simple navigation and functionality are all available to users within the IDE. One of the primary functions of the Arduino IDE is to establish a connection between the software and the Arduino hardware. This connection allows users to upload their programs directly to the Arduino board and establish communication with it. By utilizing the appropriate communication protocol, the IDE enables seamless interaction between the software and the hardware components [1].

H. ANDROID STUDIO

Android Studio is the name of the official integrated development environment (IDE) that Google developed and made available for the creation of Android apps. A complete collection of tools and capabilities is offered by the IDE for Android app development, which streamlines the development process. It enables developers to design, build, run, and test Android applications efficiently, fostering productivity and aiding in the creation of high-quality software for the Android platform [3].

IV. LITERATURE SURVEY

Accident Prevention and Alert System using Arduino using IoT technology: which was published by Aswin, Sujitha, 3 Archunan, Sandhya Devi R in the IRJET journal in 2021. The paper was proposed towards generation of alerts and alarms using Buzzers and LEDs in case of accidents. Arduino-Home which is available on the Arduino.cc website. The paper was published by Arduino itself and was intended towards the use of Arduino Uno R3 and circuit design.

An Arduino Based Automatic Accident Detection and Location Communication System: The paper was focused towards implementation of Vehicle Tracking using GSM/GPS/GPRS automatic alerts.

IoT in Connected Cars: Challenges and Chances which was published by B. Lakshmipraba, V.G. Shivakumar in IJEAT in 2019. The findings of the paper are uses of IoT in vehicles and their use cases in various scenarios and challenges.

Research Study on Advanced Driver- Assistance Systems (ADAS) IRJETS in 2021. The paper consisted of implementation and working principle of ADAS system.

Cloud Computing Arduino Cloud IoT Integration with REST API published by Nemese Kalubi, Sayeed Sajal in IEEE Xplore in 2022. The paper was intended towards to connect an Arduino to a cloud to share and monitor data.

V. IMPLEMENTATION

An activity is a screen where the user interacts with their phone, according to this definition. Activities include widgets that aid in the communication of information, such as buttons, text fields, photos, etc.

The Main Activity, the only activity used in this tutorial, will accept user input to send to the Arduino and display the text that is received. Both the Bluetooth app and the USB app will have the same layout. It's a straightforward one, with the bare minimum of widgets needed to test the devices' connectivity. Looking at any libraries that handle all of this automatically because setting up a serial connection in Android is fairly difficult because you have to manually specify a lot of things. List any additional permissions the app may need in the manifest. The only thing required is the go-ahead to turn the phone into a USB host. It has the three phases: Pre accident, Post-accident and Reporting.

As you can see, the engine will not start if the driver is drunk and an alert will be generated. In case the vehicle is running, the temperature sensor, gyroscope, eyeblink sensor, accelerometer and GPS module will continuously keep a track of the respective parameters. If any of them goes out of limit, the ADAS will be triggered and vehicle will be brought back in control. This all is monitored by a cloud service remotely. The data from the vehicle will be sent to the emergency contacts which includes the Police control room and Ambulance Unit by default.

The user can add their family or friends in the emergency contacts also. The vehicle unit incorporates various sensors and preventive measures to enhance safety and prevent accidents. It collects and processes data, including vehicle statistics, sensor readings, alerts, and location coordinates. This data is then stored in the cloud for future research and investigations. A temperature sensor, an eye blink sensor, and an alcohol sensor are all included in the vehicle unit.

The driver's breath alcohol content is picked up by the alcohol sensor. The motor is allowed to operate, signaling that the car is prepared to be driven if the detected alcohol concentration is below a predetermined level. The motor is shut off, stopping the driver from operating the car if alcohol is found above the threshold. To address driver drowsiness, the eye blink sensor continuously monitors the driver's eye movements. If signs of drowsiness are detected, such as prolonged eye closure or reduced blink frequency, the system activates an alert mechanism. This includes activating a buzzer and illuminating red-colored LED lights to alert the driver and prevent potential accidents.

The vehicle unit also incorporates a temperature sensor to monitor the engine's temperature continuously. If the temperature exceeds a predetermined threshold, the system triggers alerts to notify the driver about the high engine temperature. This helps in preventing engine damage and potential breakdowns. Furthermore, the vehicle unit includes an accelerometer that constantly measures the vehicle's position and movement. If irregular or abrupt changes in the vehicle's position are detected, it implies potential accidents or theft.

In such cases, a GPS location tracker is activated, providing real-time coordinates of the vehicle's location. The system utilizes a GSM SIM module to transmit the latitude, longitude, and Google Maps position to an emergency contact number for immediate assistance. It's important to note that the description provided is for illustrative purposes only, and the implementation and performance of such a system may vary based on specific requirements and technologies employed.

VI. APPLICATION

- The free recovery of stolen vehicles.
- Providing emergency services more quickly.
- Monitoring trucks transporting expensive products.
- Tracking of food and home delivery status.
- Fleet efficiency and vehicle security.

VII. FUTURE SCOPE

The proposed system demonstrates significant efficacy in reducing road accidents and addressing the issue of over speeding in restricted zones. It combines both an accident alert system and a theft prevention system to enhance overall safety. Unlike existing projects, this system incorporates autonomous speed restriction measures within the vehicle itself. By implementing this feature, the system can proactively prevent accidents caused by excessive speeding. The vehicle's speed is monitored and controlled to ensure it stays within safe limits, particularly in areas with speed restrictions. This proactive approach significantly reduces the likelihood of accidents occurring due to over speeding. Additionally, the system can be augmented with a live tracking feature in a mobile application. This allows real-time monitoring of the vehicle's speed and location. By integrating this functionality, users can actively keep track of their vehicle's movements, providing an added layer of safety and 4 convenience. To further enhance safety, the system can incorporate sensors capable of detecting living things, such as pedestrians or animals, that may be crossing in front of the vehicle. By identifying and recognizing these living objects, the system can issue alerts or take preventive measures to avoid potential accidents. This capability has the potential to save countless lives and prevent numerous accidents. It's worth noting that the implementation and specific features of the system may vary based on technological constraints and requirements. However, the integration of an accident alert system, theft prevention measures, autonomous speed restriction, live tracking, and the ability to detect living things can collectively contribute to a significant reduction in accidents and enhanced road safety.

VIII. CONCLUSION

The focus on vehicle safety has grown as science and technology continue to advance in the twenty-first century. Drunk driving, sleepy drivers, and overheated engines that catch fire are the biggest contributors to accidents. Implementing the project will help to lessen accidents brought on by the aforementioned factor. The system is energy-efficient, low-cost, and automatic, making vehicle installation straightforward. An emergency unit can be deployed to a specific location and informed of it using a GSM module and GPS. This helps to save several lives by promptly informing the rescuer. Overall, this technology is simple to install in all cars, targets average people, and is reasonably priced. This system has great scope which can be implemented on a large scale by medical teams and police authorities together to address and handle accident cases more efficiently.

References

[1] N. P. Ancy John, *International Conference on Electronics, Communication and Aerospace Technology IEEE 2020.,* 2020.

[2] M. A. S. S. U. I. C. M. S. M. A. S. K. Bilal Khalid Dar, *Special Section On Mobile Edge Computing And Mobile Cloud Computing,IEEE,* 2019.

[3] kumar, Manish, Kant, Akshat, Kaktan, Punit, Bishno, R. Upadhyay and Kapil, *IEEE,* 2021.

[4] G. Maps, "GPS coordinates, latitude and longitude," *Gpscoordinates.net,* 2019.

[5] circuitdigest.com, "Interfacing-mq3-alcohol-sensor-with-arduino," 2022.