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IOT Based Vehicle Accident Detection System

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Abstract - Vehicle accidents are a major cause of death. People die due to delayed assistance and inadequate emergency services. Here is the best answer to this problem. This article introduces an automated car accident alert. The vehicular module detects car accidents. A buzzer may be used in a vehicle alarm to detect hazardous driving. It can detect a vehicle's collision or rollover during and after. Signals may detect a serious collision. The vehicle module can quickly locate the accident site and transmit basic information to the nearest hospital and police station. First responders and police can quickly find the scene and help the wounded. This article contributes to detecting automobile accidents using an ATMEGA 328 controller. This project detects accident and alcohol level, controls the vehicle accordingly, notifies using IOT if accident occurs and vehicle doesn't start. It has an emergency button also. It is a complete solution for vehicle safety.[2]

Keywords—Arduino, GPS, Accelerometer, L293D Motor Driver, Wi-fi.

I. INTRODUCTION

As technology and automobile manufacturing have progressed, the number of traffic accidents has increased. The survival rate after an accident is exceedingly low due to a lack of proper emergency facilities. Our approach would aid in the detection and location of an accident, which would subsequently be relayed to the rescue team and the rider's emergency contacts. In comparison to past decades, the arrival of contemporary technology has made our life considerably simpler and more pleasurable. Automobiles give convenience and time savings, but people are growing less willing to utilise them for transportation. As a result, the usage of automobiles increases, increasing traffic dangers at a correspondingly faster rate, resulting in a large increase in the number of people killed or injured in car accidents.[3]

Vehicles play an important role in practically everyone's daily activities in today's environment. Millions of people rely on their personal vehicles and public transportation to get to their destinations on time every day. One of the most essential types of transportation used by commuters is highway transportation. A collision involving any on-road cars, objects, or pedestrians, among other things, is known as a mad accident. [1]

This article suggested a system workon that monitors features of a moving vehicle such as speed of the vehicle, the number times brakes has been applied, and the wheeling of vehicle, which is used to define "quality of driving." This will increase the driver's responsibility by increasing his or her duty to prevent reckless driving. A warning sound will be played on the dashboard buzzer every time a vehicle's speed exceeds the system's projected safe threshold speed.[1]

II. LITERATUREREVIEW

Many researchers carried out their studies on accident detection system. Aishwarya S.R explained an IoT based vehicle accident prevention and tracking system is a promising solution for enhancing road safety and preventing accidents.

[1] . Sadhana B explained the Smart Helmet is an intelligent safety system for motorcyclists that utilizes the Raspberry Pi and OpenCV (Open Source Computer Vision Library) to prevent potential accidents on the road. The concept was born out of concern over the growing number of fatal road accidents each year, especially those involving motorcycles.[9]

[2] Sarika R. Gujar explained the system comprises of various sensors, communication modules and microprocessors that work together to detect an accident and take appropriate action. The sensors used in the system include GPS and gyroscope. If the microprocessor determines that it is an accident, it sends an alert to the emergency services by using the communication module.[9]

[3] Kajal Nandaniya and colleagues (2014) reported use of GPS module and a GSM modem to create an autonomous collision detection and warning system. The vehicle to be protected must be equipped with a mechanism that ensures a solid mechanical connection with chassis. When a collision occurs, the system detects it by observing how the car decelerates suddenly in such a situation.[9]

[4] Anil proposed a collision detection approach. The platform detects the accident using flex and accelerometer sensors, and the location of the accident is to notify emergency responders via a GSM modem.[9]

III. BLOCK DIAGRAM

The following block diagram consists of the following modules: Arduino UNO, Accelerometer or vibration sensor, GPS, L293D motor driver, Bluetooth Module, LCD 16x2, buzzer, Wi-fi Node MCU, Alcohol sensor, DC motor 12V.[9]

The components mentioned above are connected as per the block diagram given below in Fig 1:

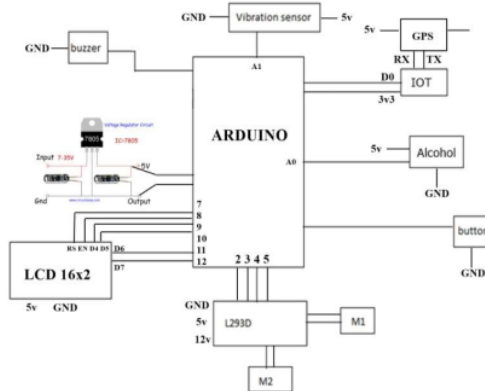


Fig 1: Block diagram of the system

A. Arduino UNO

The Arduino UNO is a versatile, efficient, and user-friendly open-source microcontroller board that is programmable that can be used in a variety of electrical projects. This board's output can control relays, LEDs, servos, and motors, and it can be connected to other Arduino boards, Arduino shields, and Raspberry Pi boards. [9]

B. Vibration Sensor

A piezoelectric sensor is also called vibration sensor. These sensors are multi-skilled devices that are used to observe different type of operations. This sensor is also used to determine smell in the air by measuring quality and capacitance in real time. The operating idea of a piezo electric sensor is that it is a sensor that detects vibrations of the system using different mechanical or optical methods. [9]

C. L293D Motor Driver

This device is a four-channel monolithic integrated high-voltage high-current driver that accepts normal DTL or TTL logic levels and drives inductive loads like as relays, solenoids, DC motors, and stepping motors, as well as on-and-off power transistors. To make using them as two bridges easier each pair of channels has an enable input, a distinguishable. Internal clamp diodes are present and the logic includes a supply input that allows it to function at a lower voltage. This device is excellent for switching applications at frequencies up to 5 kHz. A 16-lead plastic enclosure protects the L293D.[9]

D. Bluetooth Module

The Bluetooth module allows for wireless communication. It can be used as a slave or a master. Wireless headsets, mice, keyboards, game controllers, and other consumer electronics use the technology. Depending on the atmospheres of the transmitter and receiver, as well as regional and urban environments, it has a range of up to 100 metres. All serial-enabled devices can communicate wirelessly thanks to Bluetooth serial modules. It contains six pins, one of which is needed to enable the Bluetooth module's AT instructions mode. The module will operate in command mode if the Key/EN pin is set to high. Aside from that, it's defaulted to data mode. [9]

E. Alcohol Sensor

This output can then be converted into a digital signal using an analogue to digital converter (ADC) and processed by a microcontroller to determine the alcohol level. The sensor typically uses a metal oxide semiconductor (MOS) or a thin film resistor as the sensing element. When alcohol molecules come into contact with the sensing element, they alter the resistance, which is then measured by the sensor. This type of alcohol sensor is commonly used in breathalyzers, ignition interlock systems, and personal breathalyzers. It is essential for preventing drunk driving and promoting safe alcohol consumption. [9]

This output can be used in combination with a microcontroller or other digital device to trigger an alert or warning, such as flashing lights or sounding an alarm. The MQ3 sensor is typically made up of a small circuit board with a sensing element that reacts to the presence of ethanol molecules. [9]

IV. HARDWARE IMPLEMENTATION

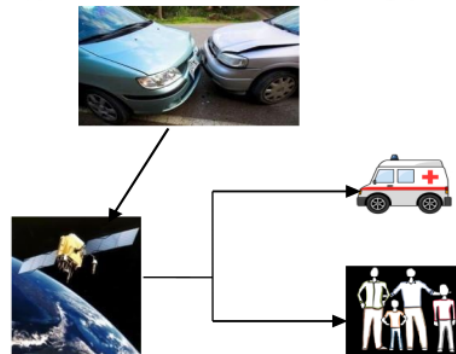


Fig 2: Hardware implementation

Working of the System

The Alcohol and accelerometer sensor send analog input to the arduino ranging from 0 to 1023 which the arduino transfers to the lcd for displaying using 4 bits. Whenever the alcohol sensor sends an input of more than 700 the arduino sends a signal to lcd for display to change and a signal to buzzer is also sent. [8]

Whenever the accelerometer sends a value of less than 300 to the board it executes two tasks one is to give input to led to display "are you ok" and set buzzer and reset button high, If the user doesn't set the reset button to low by pressing then it forwards a signal to the nodemcu. Then the nodemcu collects the data from the gps module which is directly connected to it and with the help of the internet it transfers it to the blynk app which gives the user a notification regarding the accident and gives the live location. [5]

This whole thing is installed on a basic car setup which we can control using the bluetooth module. The bluetooth is connected to any app supporting BLE which gives commands to the module which forwards it to the arduino and which in turn transfers it to the motor driver and the car moves.[9]

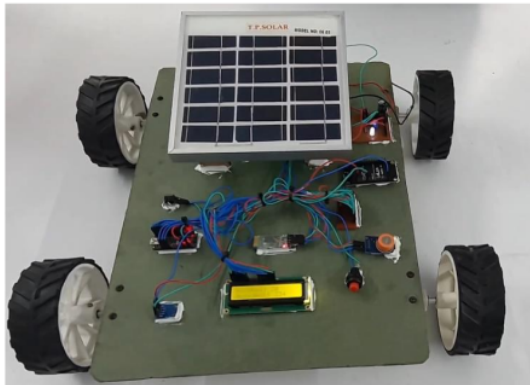


Fig 3: Assembled device

V. ADVANTAGES

- The IoT Vehicle Accident Monitoring system. project using Arduino UNO is fully computerized.
- It does not involve any human intervention.
- It provides real time location.
- Cost and efforts required are low.
- High accuracy.
- Vehicle speed is monitorable.
- Location of the vehicle is also monitorable.
- Mobile device interactable.

VI. LIMITATIONS

- This system does not work for places where network connection is poor.
- It can be difficult to communicate in some areas when there is no GSM network.
- The sensor is partial pressure sensitive, its sensitivity may fluctuate as altitude and elevation change.[6]

VII. APPLICATIONS

- Self-propelled and transport vehicles
- Remote monitoring, security, transportation, and logistics
- This system can also work with vehicle alert detecting system projects.[7]

VII. CONCLUSION

The main purpose of this method is to increase the chances of survival for people who have been in a car accident. When an accident occurs, this device transmits an alert to emergency personnel, allowing them to arrive at the accident location as quickly as feasible. As a result, it helps to reduce communication delays, allowing people who have been in accidents to receive fast treatment. It is critical in pinpointing the locations of incidents that occur during the night hours of the day. The problem we're trying to tackle is one that arises frequently in our daily lives but has yet to be fixed. Researchers in the future will be able to use machine learning, image processing, and artificial intelligence into their research in order to predict the occurrence of an accident before it happens. Adversities, such as public lawlessness, will make developing a consumer-oriented product more challenging. Our solution combines hardware and software that has been specifically created for this purpose in order to deal with the aftermath of a traffic incident. It is not only more comprehensive, but also more dependable and intelligent than anything else now on the market. It may be accessible by the victim, emergency response service, and emergency contact in order to give a faster and more automatic alarm and reply in the short period of time possible.[11]

VIII. FUTURE SCOPE

- Adding a few extra sensors allows for more information, such as fire breakout.
- An additional type of vibration sensor can be used to improve accuracy and eliminate false alarms.
- If the alcohol level surpasses a certain threshold, we can add functions such as notifying the police, preventing the car from starting for a period of time, and so on.
- We may also improve this using vehicle-to-vehicle communication, so that when a car approaches an accident location, it receives a notification., etc.
- We can also enhance this with vehicle to vehicle communication as if a car get in range of an accident area they also get an notification regarding the same.[10]

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