

# Car Accident Detection System using GPS Module

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**Abstract:** In this paper, we'll implement two features: GPS tracking and engine locking mechanism. And secondly the accident detection and alert system. Despite the majority of people having their own cars today, theft still occurs in parking lots and occasionally when driving in unsafe areas. For public transport vehicles, vehicle safety is of the utmost importance. The car has a tracking and locking system installed to lock the engine and track its location. Using the Global Positioning System (GPS) and the Global System for Mobile Communication (GSM), the location of the car is determined. These devices continuously monitor a moving vehicle and provide status reports as needed. When a theft is discovered, the person in charge sends an SMS to the microcontroller, which causes the microcontroller to send out control signals to turn off the engine. Authorised person needs to send the password to the controller to restart the vehicle. This is More secure, reliable and low cost. Numerous fatalities are caused by automobile accidents on highways every day all over the world. The primary causes of these fatal accidents are the lack of knowledge about impending roadblocks and the delay in the rescue team's arrival at the accident site owing to their unknown location. An efficient approach to reduce traffic deaths and injuries is to alert the driver about hindrances on the roadway that can be the reason for mishap, prior and if there is an occurrence of the mishap event, find the mishap spot and give therapeutic help to them as early as possible. The purpose of this study is to present a brief overview of numerous approaches that have been proposed for the prevention of traffic accidents, the detection of accidents based on different parameters, and the provision of medical assistance. The main intention of this paper is to find the accident spot at any place and intimidating it to alert the ambulance through the GPS and GSM networks. The MEMS, GSM, and GPS modem in the GPS-based car accident identification module are all coupled to the microcontroller. Cellular connections are established using Global System for Mobiles (GSM) technology. GPS is employed to track the location of the car.

**Keywords:** Embedded system, GPS Module, Accident Detection

## I. INTRODUCTION

Automobile accidents and traffic congestion have increased as a result of the rising demand for cars. The lives of the people are in grave danger. This is due to a lack of the greatest emergency facilities. The high demand of automobiles has also increased the traffic hazards and the roads in our country.

There are certain negative impacts of society's rapid progress, such as the rise in auto accidents. An injury occurs in one out of every three motor vehicle accidents, on average. To prevent the issue, numerous alternatives have been put up. We have avoided it as well to some extent but still we can't avoid it completely. Due to incorrect post-accident signalling and tracing out the exact spot, many lives are lost. Our paper offers a solution for the aforementioned issue using an Arduino-based accident detection system that uses GPS and GSM. A tilt sensor detects a rapid change in the vehicle's axes, and a GSM module notifies you of the accident's position via a message sent to your mobile phone.

The development of technology has simplified our daily life. Similar to how every coin has two sides, technology has advantages as well as disadvantages. The development of technology has increased the frequency of fatal traffic accidents. The inadequate emergency services we have in our nation only make matters worse. We'll offer a solution to this issue in our article.

## II. LITERATURE REVIEW

- 1] Bansal, B. and Garg, V. This paper includes a proposed system for Accident notification, which if used in automobiles can save millions of lives and that too by just timely informing the concerned ones of the people involved in the casualty. This proposed system aims to save those lives, which can be saved if information of casualty is timely conveyed. The proposed system implements a low-power vibration sensor, a cost-effective microcontroller and a powerful IoT platform to create an application that does not depend on humans to function.
- 2] Kalyani, T., et. al. This paper seeks to lower the accident rate by educating drivers about various potential alternatives. Once the accident occurred, the location was sent as a message through GPS & GSM. This makes it easier to locate the spot and to administer first aid right away. Here, microcontrollers play the major role. This system contains sensors to alert the drivers. Here, sensors like the eye blink sensor, the alcohol sensor, and the vibration sensor are used. The location is tracked using both GPS and GSM, and the appropriate numbers are texted.
- 3] Manuja M et. al., .The suggested structure is a framework that can locate accidents in comparatively less time and deliver the vital information to a medical help centre within a few seconds, including topographical directions and the time and location of a car accident. The quick transmission of this warning notice to the rescue team will help to save the lives of the potential victims. Switch is likewise given so as to end the sending of a message in an uncommon situation where there is no loss, this can spare the valuable time of the medicinal safeguard group.
- 4] Bergonda, S., et. al. DENT DETECTION AND TRACKING SYSTEM USING GPS TECHNOLOGY". We are using Raspberry pi in our paper. When the system is switched on, the LED will be ON indicating that power is supplied to the circuit. The obstruction is detected by the vibration sensors we are utilising in our paper, which then interrupts Raspberry Pi. The GPS returns the information after receiving the location of the accident-related car. This data will be delivered by WhatsApp to a cellphone number.
- 5] Kodali, R. and Sahu, S. e. In this review paper, we will examine a few of these designed and suggested systems for accident reporting, detection, and vehicle tracking. By notifying the relatives of those involved in road accidents, getting in touch with the closest hospital, and giving the precise coordinates of the scene of the accident, these technologies, if practically interfaced and implemented in automobiles, can help save lives. A range of sensors, including acceleration sensors, vibration sensors, and simple vibration switches, are used in these developed or proposed systems. A low-cost yet dependable microcontroller, such as an ESP8266 NodeMCU or an Arduino Uno R3 or Arduino Mega Board, is at the centre of many IoT enabled or embedded systems.
- 6] Kiran Sawant et al., developed an accident alert system using a Raspberry Pi and GSM and GPS technology. A microcontroller receives its output from an electricity detector after it detects the frequency of accidents. The vehicle's latitude and meridian position are sent as a message over the GSM. The central emergency dispatch server's static information science address is already preserved in the EEPROM. Every time an Associate in Nursing accident occurs, the location is identified, and a message is sent to the static information science address that has already been saved.
- 7] Manasi Patil et al., described a better traffic management system using Raspberry pi and RFID technology. The car has a raspberry pi controller attached to it that communicates with sensing components such a shock sensor, temperature sensor, and gas sensor. These sensor square measure fastened at a planned worth before the accident. When an associated accident happens the worth of 1 of the sensing element changes and a message to a predefined variety is distributed through GSM. The GPS module that additionally interfaces with the controller also sends the placement of the vehicle. When the message is received by the car, a clear route has to be provided to the ambulance. The car includes a controller ARM that is interfaced with the RFID tag that sends magnetism waves. When an associated car reaches the light the RFID reader that is placed on the joints notice the magnetism waves of the tag. If the light is red, then the reader goes through the database in a fraction of seconds and turns the red light green.
- 8] V.Sagar Reddy et al., developed an Associate in Nursing measurement device based System for driver safety. The system has the advantage of chasing or distinctive vehicles location simply by sending a SMS or email to the licensed person. The Raspberry Pi (ARM11) is intended to be used by the system to provide quick access to measuring devices for event detection. If there is any event, the message is sent to the licensed person so that they will take immediate action to avoid wasting their lives and cut back the damages.
- 9] Sri Krishna Chaitanya Varma et al., planned to associate Automatic Vehicle Accident Detection and electronic messaging System exploitation GPS and GSM Modems. When the IR sensors that square measure used sense any

obstacle, they send an interrupt to the microcontroller. The GPS receives the situation of the vehicle that met with an associated accident and offers the data back. This info is distributed to a mobile variety as a message.

10] Apurva Mane et al., represented the use of Arduino for remote alarm devices and car collision detection. Key options of this style embrace period vehicle observance by causation its data relating to position, time, angle to the observance station and to the user mobile that should facilitate them to induce medical facilitate if accident or the stealing happens Also user has Associate in nursing access to induce period position of a vehicle in real time. Every time an accident occurs, a MEMS and vibration detector picks it up and sends the signals to a microcontroller, which uses GPS to pinpoint the exact site of the event and then uses GSM to send a message to authorised parties.

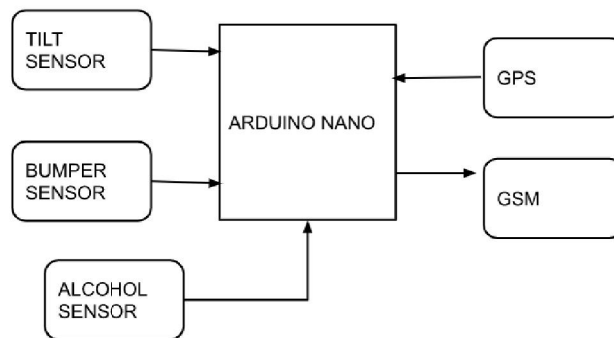
**II. METHODOLOGY**

The proposed system is a car accident detection system using a GPS module that aims to detect accidents and alert emergency services and car owners in real-time. The system comprises various sensors such as a GPS module, a bumper sensor, a tilt sensor, and an alcohol detection sensor. The GPS module is used to detect the location of the accident and send it to the car owner's mobile device via a GSM module. The GSM module is also used to send an alert message to the car owner, notifying them of the accident.

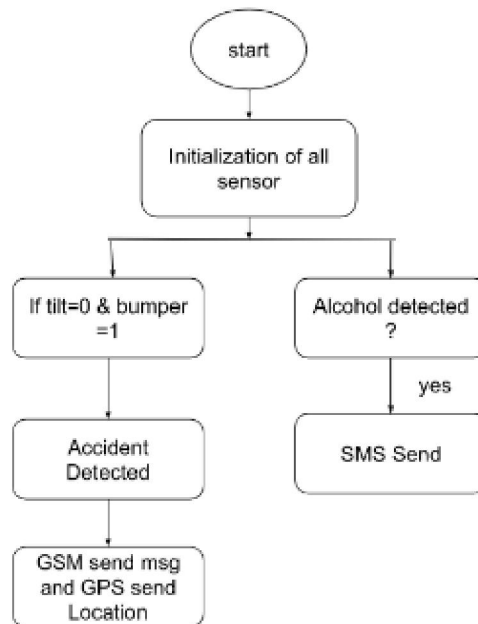
The bumper sensor is used to detect the impact of the accident and trigger the GPS module to send the location of the accident. The tilt sensor is used to detect whether the car is in a horizontal or vertical position, indicating the severity of the accident. If the car is in a vertical position, it indicates that the accident was severe, and emergency services need to be contacted immediately. Additionally, the alcohol detection sensor is used to detect if the driver was driving under the influence of alcohol. If the sensor detects alcohol, the system can alert the car owner or emergency services to take appropriate action.

The proposed system is an integrated car accident detection system that can help reduce the number of fatalities and injuries caused by road accidents. By detecting accidents in real-time and alerting emergency services and car owners, the system can improve response times, save lives, and minimise damage caused by accidents.

**III. BLOCK DIAGRAM**



**IV. FLOW CHART**



**V. WORKING**

The paper title is “Car accident detection system using GPS module, The Prototype of this Accident Detection and information passing technique uses Arduino Nano as a microcontroller. We are using here GSM, GPS, tilt sensor & bumper sensor. Here GSM is used for sending messages when an accident gets happens also GPS is used for tracking location. When the tilt sensor gives value of zero & bumper sensor gives a value of 1 then, GSM & GPS get activated. And then the message will send to the owner with the location. In the proposed system, we have reduced the cost of paper by utilising the previously existing infrastructure present in the victim's cell phone, increased the accuracy of accident detection using several sensors, and eliminated the false alarm situation created for particular conditions. A bumper sensor is applied to the front end of the car. When high pressure will be applied in the car. The registered number will receive the location. Also here, when the car is going on ebay, then the tilt sensor gets activated and then also a location with a message sent to the owner.

**VI. SYSTEM REQUIREMENT**

**HARDWARE REQUIREMENT**

**Arduino Nano**

A compact, adaptable microcontroller board called the Arduino Nano is built around the ATmega328P processor. It is made to be small and simple to use and is a member of the Arduino family of development boards. The popular Arduino Uno board's functionality is comparable to that of the smaller-sized Nano board. The Arduino Nano has 6 PWM (Pulse Width Modulation) output pins, 8 analogue input pins, and a total of 22 digital input/output pins. It may also readily connect to and communicate with other devices and sensors thanks to built-in support for the I2C and SPI communication protocols (Inter-Integrated Circuit and Serial Peripheral Interface, respectively).

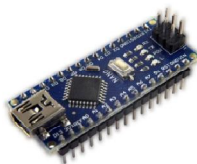


Fig 1. Arduino Nano

### Tilt sensor

A tilt sensor, commonly referred to as an inclinometer or a tilt switch, is a tool that measures how an item is tilted in relation to gravity. It is frequently used to keep track of an object or surface's inclination, angle, or movement. The mechanism used in tilt sensors typically responds to changes in orientation by producing an electrical output signal. Different technologies, such as mercury, ball and spring, electrolytic, or MEMS (Micro-Electro-Mechanical Systems) sensors, can be used to power the mechanism. A response or an output signal that can be utilised for a variety of tasks is triggered or provided when the tilt sensor detects a change in inclination. For instance, in automotive applications, when a vehicle suddenly changes angle during a collision, tilt sensors might cause airbag deployment.



Fig 2. Tilt Sensor

### Bumper sensor

A bumper sensor, often referred to as a proximity sensor or collision sensor, is a tool used in a number of applications to identify objects or barriers that are present close to moving vehicles or other objects. It is often positioned on a car's front or back bumper and communicates by sending and receiving electromagnetic, infrared, or ultrasonic signals. The sensor detects the existence of an object when it enters its detecting range by reflecting or interrupting the signal that is being emitted. This detection sets off a reaction or action, such as sounding an alarm, alerting the driver, or applying the brakes automatically to avoid an accident. In motor cars, bumper sensors are frequently employed to help with parking, collision avoidance, and object recognition.



Fig 3. Bumper Sensor

### GPS module

A GPS module, commonly referred to as a Global Positioning System module, is a device that receives signals from a network of satellites in orbit around the Earth to provide precise positioning and navigation. The module is made up of a GPS receiver, which picks up signals from numerous satellites, and circuitry to process and decipher the data it receives. A GPS module's main job is to precisely determine the user's geographic coordinates (latitude, longitude, and frequently altitude). It does this by calculating the user's position by examining the timing and strength of signals from several satellites. GPS modules can deliver important data in addition to positioning, such as speed, heading, and time synchronisation.



Fig 4. GPS Module

### GSM module

A hardware component known as a GSM (Global System for Mobile Communications) module facilitates communication over the GSM network. It functions as a modem and makes it easier for devices and the cellular network to send and receive voice, data, and SMS (Short Message Service). A SIM card slot, an antenna connector, and other interfaces like UART (Universal Asynchronous Receiver-Transmitter) or SPI (Serial Peripheral Interface) for connecting to external devices are commonly included in GSM modules. They require a working SIM card to connect and run on certain frequency bands designated for GSM networks. With the help of these modules, a variety of electronic equipment, including embedded systems, IoT (Internet of Things) devices, and remote monitoring systems, can easily add wireless communication capabilities.



Fig 5. GSM Module

### MQ Sensor

A form of gas sensor called the MQ (Metal Oxide) sensor can identify different gases in the environment. It functions according to the principles of metal oxide semiconductor technology, where the sensing component is a metal oxide layer whose electrical resistance changes as it comes into contact with particular gases. In businesses, residences, and laboratories, MQ sensors are frequently utilized for applications involving the detection and monitoring of gases. They come in a variety of models, each built to identify a particular gas, such as alcohol (C<sub>2</sub>H<sub>5</sub>OH), carbon monoxide (CO), methane (CH<sub>4</sub>), propane (C<sub>3</sub>H<sub>8</sub>), or carbon dioxide (CO<sub>2</sub>).



Fig 6. Alcohol Sensor

## SOFTWARE REQUIREMENT

### Arduino IDE

The software platform known as Arduino IDE (Integrated Development Environment) is used to programme and create applications for Arduino microcontroller boards. It offers a user-friendly interface and a collection of libraries that make it easier to write, compile, and upload code to Arduino boards. A variety of users can utilise the IDE because it is cross-platform and compatible with Windows, Mac OS X, and Linux. The Arduino IDE offers a variety of capabilities, including code highlighting, grammar checking, and a serial monitor for debugging and communication with the Arduino board. It also supports a subset of the C++ programming language. For developing and building interactive applications with Arduino, both novice and seasoned developers favour this method.

### Proteus

Proteus is a software programme used for electronic circuit design and simulation, not an Arduino board or microcontroller. Engineers and electronics enthusiasts frequently use it to develop and test circuits before actually manufacturing them. Without using any physical parts, you may create, simulate, and test Arduino-based circuits using the Proteus software environment. It enables you to design a schematic diagram of your circuit that features Arduino boards, sensors, actuators, and other electronic parts. Then, you may create your Arduino code and upload it to Proteus's virtual Arduino board.

## VII. IMPLEMENTATION

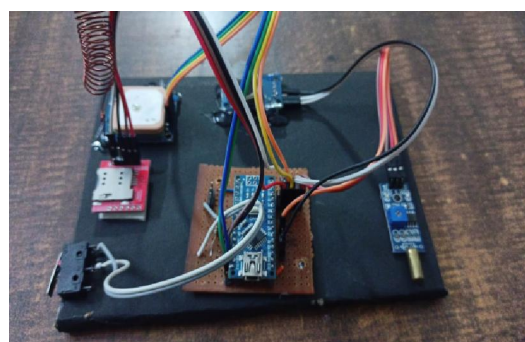
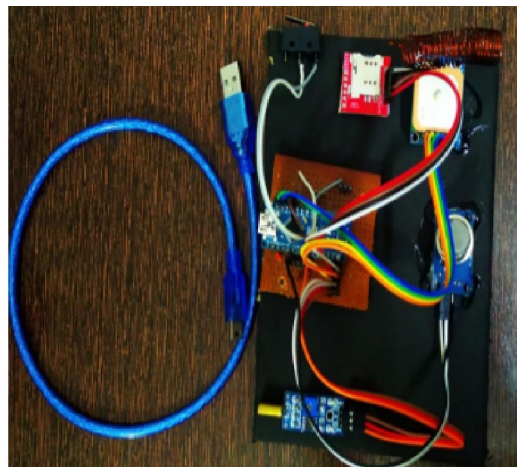


Fig 7. shows the experimental setup of the system

## VIII. RESULT

The system uses the GSM module to send messages after detecting accidents caused by moving vehicles. Implementing the suggested system results in the expected performance. The sensor and other necessary components are dispersed

throughout the vehicle to produce more ideal outcomes in the detection of accidents. To the greatest extent possible, the suggested approach can also be utilised to estimate traffic and system performance.

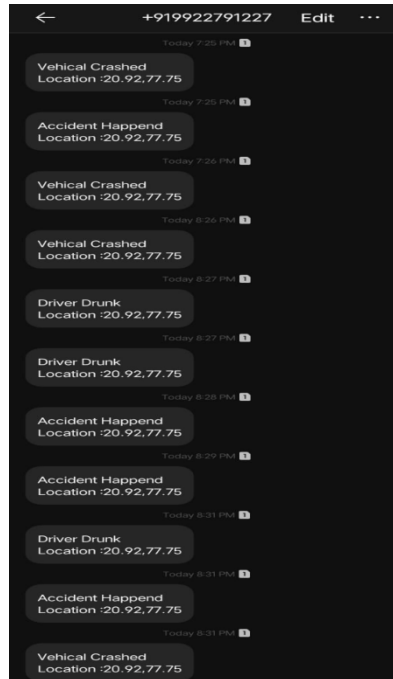


Fig 8. shows the message from the GSM and GPS about Accident Happened/Vehicle Crashed/Driver Drunk.

### IX. CONCLUSION

We apply our concept to detect accidents. As a result, the system is messaging the accident location to the specified number. Road accidents and traffic risks have also increased due to the rising demand for autos. The people's lives are in grave danger. This is due to the dearth of top-notch emergency facilities in our nation. With this design, an accident can be detected and the necessary information sent in a lot shorter time. This warning message is quickly transmitted to the rescue crew, aiding in the preservation of precious lives.

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