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B. Tech (Information Technology)
Project Report

VECHILE MONITORING AND ACCIDENT DETECTION SYSTEM

Submitted for the Course

ITE 1901: Technical Answers for Real World Problems (TARP) (TARP)

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PROJECTTITLE:VECHILE MONITORING AND ACCIDENT DETECTION SYSTEM

ABSTRACT:

With the advancement in technology and increasing traffic, road accidents and traffic hazard have increased, causing more chances of loss of life due to lack of timely help facilities. This project is an attempt towards solutions for timely accident notification, The projects record the parameters of vehicle at regular intervals of time, through a “smart device” installed in the vehicle and sends these values onto the cloud, vehicle owner or a third party. The Smart device consists of variable sensors which are well protected in a black box which is safe even after the car has been completely smashed. Based on the information, appropriate algorithms are implemented to send alerts and initiate action. The system will facilitate the users in a number of ways such as notification for immediate aid in case of accident, tracking the vehicle in cases of theft and disabling the vehicle remotely. The project records the parameters of vehicle at regular intervals of time, through a “smart device” installed in the vehicle and sends these values onto the cloud, vehicle owner or a third party. Based on the information, appropriate algorithms are implemented to send alerts and initiate action. The system will facilitate the users in a number of ways such as notification for immediate aid in case of accident, tracking the vehicle in cases of theft and disabling the vehicle remotely. In addition to that, we are parallelly sending the information to the Insurance companies immediately after the accident occurs, so that information is passed to the insurance company well in advance.

OBJECTIVE OF THE PROJECT:

The foremost objective of the project is to detect the occurrence of the accident and report the same to the concerned authorities for immediate rescue

INNOVATION COMPONENT IN THE PROJECT:

The usage of GPS module for tracking the accident location and the MPU6050 integrated with 801S Vibration sensor for detecting the occurrence of an accident is where our innovative component lies .This has not been observed previously in vehicles.

TECHNOLOGIES:

1. NodeMCU
2. Arduino
3. GSM Module
4. GPS Module
5. MPU6050
6. 801S Vibration Sensor

LITERATURE SURVEY:

1.Smart Vehicle Connectivity for Safety Applications using IOT

It is to address some of the most pressing problems in transportation related to environment, mobility, and safety. This article proposed a system for sending traffic information to neighboring intersections indicating the number of cars, ambulance clearance, stolen vehicle detection, accident detection, and traffic information. Through Internet of Things technology, the microcontroller continuously communicates traffic data with adjacent intersections. It enables passengers to make a wise choice on their journey. By assisting users in selecting the least congested route to their destination, this technology also increases traveler safety. Currently, it uses a system that takes into account two roads and two traffic intersections.

2.Vehicle Accident Detection System using Internet of Things (VADS -IoT).

The purpose of this document is to speed up the emergency response department's ability to respond to car accidents in Malaysia. The main result of this study was to shorten the time that accident victims had to wait before being rescued from a serious auto accident and receiving medical attention. In order to do this, sensors and a microprocessor were to be included in the car in order to calculate the displacement of the vehicle. The system was created utilizing a vibration sensor to assess the impact of an accident's collision and a gyro sensor to assess the vehicle's x-y displacement. The instantaneous coordinates of the car will be recorded using a GPS module and sent to the emergency response department via a GSM module when an accident happens. The emergency response department's registered mobile phone displays the coordinates, which are then mirrored by a desktop Push bullet programmed. With that, the required emergency response teams can be sent to the scene of the accident. The project's output makes use of a vibration sensor at an impact frequency of more than or equal to 90 Hz and a gyro sensor to monitor angles between 45° and 315°. The prototype could be a workable solution that Malaysian automakers could implement to enhance a car's safety features and guarantee more accurate vehicle accident detection.

3.Road Obstacles Detection using Convolution Neural Network and Report using IoT.

The majority of highway accidents happen as a result of poor road conditions. Highway potholes and cracks can be filled in to reduce traffic accidents. This project's goal is to find negative impediments like road cracks and potholes that are below the surface of the ground. Highway road sceneries are captured and tested using the USB camera arrangement. The automatic detection of road cracks features a novel evaluation and comparison mechanism. Convolution neural network classifier was used to process the road crack images that were gathered, and MATLAB was used to simulate the model. Utilizing IoT modules, the roads department is informed of the classified barriers and their locations. The values and the results will be communicated immediately to concern end point.

4.Accident Detection System for Bicycle Athletes Using GPS/IMU Integration and Kalman Filtered AHRS Method

Studies using bicycle sensors and computing on Internet of Things (IoT) platforms have been conducted in an effort to lessen unexpected accidents. However, the sensor's location determination precision is poor, and as a result, the system may rapidly send false warnings. The goal of this study is to use the Kalman Filter with the Madgwick AHRS algorithm to improve the performance of accident detection for cyclists. The GPS location results are stored on a web server that is set up to host a map that is provided via the Google Maps API. This web server can be used to find the race's route and the bicycle's location. According to the study's findings, the measurement of angle estimate is less noisy when Madgwick AHRS and Kalman Filter are used, with a MAPE value of 15.84 percent. As a result, the system's percentage of false alarms in identifying accidents can drop from 100% to 42.86%.

5.Driver Safety and Assistance System using Machine Learning & IoT.

This study intends to create a machine learning and internet of things (IoT) based robust alert system that could recognise the potential indications of a traffic accident while sleepiness as well as daydreaming and alert the driver and emergency services to prevent the cause of occuring. Convolutional neural networks have been used to identify traffic signs and detect tiredness in two different ways. The number of vehicles on the road and modes of mobility have increased exponentially in recent years. Just with the development of the nation, this has had a significant impact on our lives. Road accidents remain one of the major causes of death, though. Around 1.3 million people each year die in traffic accidents, and in many of these situations, driver drowsiness is to fault. It is frequently more difficult to protect lives since emergency services and systems frequently give delayed notice.

6.A Review on Smart Helmet for Accident Detection using IOT

From the literature survey we find that the method proposed using microcontroller RF transmitter and other sensors is cost effective but we find the system proposed using Raspberry pi module, Pi camera, Pressure Sensor, GPS system which uses image processing algorithms is most efficient since the image processing is included so that we can easily detect the use of helmet from the rider. Smart helmet system helps to provide safety and security to the two wheeler riders given that accidents are on the rise, it is not surprising that the government has enacted numerous laws and regulations to prevent them. Accidents are characterised as unanticipated events or mistakes that can happen and cause harm, sometimes even death. Two-wheelers experience more accidents than other types of vehicles. By using a

helmet and staying sober while driving, this can be prevented. This study is looking at smart helmets for accident prevention and other related methods. This research aids in our comprehension of the IOT technology that is now in use.

7.Fall Prevention from Scaffolding Using Computer Vision and IoT-Based Monitoring.

The paper deals with the study, a smart safety hook (SSH) monitoring method is proposed to eliminate the risk associated with FFH accidents by integrating computer vision [closed-circuit TV (CCTV)-imagery] and Internet-of-Things (IoT)-based [inertial measurement unit (IMU)IMU and altimeter] monitoring technologies. The proposed monitoring approach is validated through five real-time scenarios: (1) attached to the scaffolding and h>1.82 m (6 ft), (2) attached to the worker and h>1.82 m , (3) unattached and h>1.82 m , (4) h<1.82 m , and (5) outside of the risk zone. The proposed technique aims to relieve the site manager's or safety engineer's workload by smartly and instantaneously alerting of workers' unsafe behavior (via alarm, LED blinking, and bounding box on live camera feed). Moreover, the IoT-based hardware setup goes to low power to extend the battery life when there is no unsafe behavior. The experimental results demonstrate that the proposed solution exhibits more than 98% accuracy for real-time detection and classification. Furthermore, it can be extended to monitor several workers and their location data in the future.

8.IoT Based Accident Detection and Tracking System with Telegram and SMS Notifications

The time between the accident's occurrence and the arrival of emergency responders at the scene of the accident is the most significant factor influencing the proportion of deaths due to road accident injuries. The report on the incidence of non-residence students engaged in accidents outside of working hours was given to KolejKomunitiSelandar (KKSL). Only if their friends or family report them will it be brought to the attention of the KKSL. To solve the issue, a novel Accident Detection and Tracking System (AD-Tracksys) is suggested leveraging the Internet of Things. In the event of an accident, AD-Tracksys strives to locate the scene and alert a specified person. For location tracking and alerting purposes, existing products employ GSM.However, it is unable to determine the location and transmit SMS-based notifications in real-time. As a result, the node MCU, GSM, and IFTTT protocols are implemented in AD-Tracksys to enable the system to identify an accident and deliver notifications via SMS or Telegram in real-time. Three test cases were used to test the system, and as a consequence, we were able to demonstrate the study's success. This system can be improved in the future by including alert features for help services like hospitals, police stations, and fire stations.

9. An automatic Smart Phone with IoT based Accident detection and alerting System

Due to the rising demand for vehicles, production and sales have surged recently. Road accidents are at an alarmingly high rate due to the increased use of autos. The percentage of traffic accidents is rising every year. Accident-related fatality rates are also rising. The delay in dispatching emergency services is another factor contributing to the high fatality rate in traffic accidents, together with the care used while operating the vehicle. If the injured person receives treatment right away, many lives can be saved. The failure to treat injured people promptly has a variety of causes. The factors include a delay in getting the injured people's needs communicated to the surrounding hospitals, as well as possible delays in ambulance service due to high traffic. An IOT (Internet of Things) based smart phone[1] based system for automatic accident detection and notification is presented. This system can assist in not only detecting accidents but also enabling the sending of notifications to local hospitals. To detect

the external force acting on the vehicle body, an external pressure sensor is fitted here. In this study, measurements are made using accelerometer, GPS, and speed-related metrics.

10.An IoT-Based Vehicle Accident Detection and Classification System Using Sensor Fusion

Road accidents are a leading cause of death and disability among youth. Contemporary research on accident detection systems is focused on either decreasing the reporting time or improving the accuracy of accident detection. Internet-of-Things (IoT) platforms have been utilized considerably in recent times to reduce the time required for rescue after an accident. This work presents an IoT-based automotive accident detection and classification (ADC) system, which uses the fusion of smartphone's built-in and connected sensors not only to detect but also to report the type of accident. This novel technique improves the rescue efficacy of various emergency services, such as emergency medical services (EMSs), fire stations, towing services, etc., as knowledge about the type of accident is extremely valuable in planning and executing rescue and relief operations. The emergency assistance providers can better equip themselves according to the situation after making an inference about the injuries sustained by the victims and the damage to the vehicle. In this work, three machine learning models based on Naïve Bayes (NB), Gaussian mixture model (GMM), and decision tree (DT) techniques are compared to identify the best ADC model. Five physical parameters related to vehicle movement, i.e., speed, absolute linear acceleration (ALA), change-in-altitude, pitch, and roll, have been used to train and test each candidate ADC model to identify the correct class of accident among collision, rollover, falloff, and no accident. NB-based ADC model is found to be highly accurate with 0.95 mean F1-score.

11. Vehicle Accident Detection and Prevention using IoT and Deep Learning

Road accidents are become a big concern for the public. The system for accident prevention described in this work uses a MQ3 alcohol sensor to detect alcohol, followed by automatic engine lockout. An SW-420 vibration sensor is used by the detecting component to identify any unusual vibrations that might result from a collision. Supervised deep learning CNN methods go along with this. The front camera of the car is utilised to take a picture of the accident scene for the deep learning accident prediction model. After an accident is detected, communication is sent to the closest emergency facility utilising GPS and GSM modules.

12. Vehicle Accident Detection & Alert System using IoT and Artificial Intelligence

A system that can promptly notify the competent authorities with all the pertinent information on the occurrence of a road accident is required due to the advancement of technologies like IoT. This research examines and suggests an approach to using IoT in this context that might potentially save tens of thousands of lives. To correctly identify a road collision, we have combined IoT with machine learning techniques and visual processing. A microprocessor receives data from sensors such as an accelerometer, gyroscope, camera, etc. and compares it to a machine learning model to decide if an accident has occurred or not. If it has, the device communicates the relevant metrics to the server through the internet. Here, we've adopted Edge computing to replace the use of a centralised server topology, allowing us to handle requests more quickly close to home. Response time is further improved by this. When the data reaches an edge server, it uses the GPS data to identify the closest hospitals and police stations and notifies them as well as the user-registered phone number after such locations have been identified. It transforms into a life-saving technology in this way.

13. Vehicle Collision Detection and Avoidance with Pollution Monitoring System Using IoT

Population growth also causes a rise in pollution and accidents. The growth of technology makes tremendous efforts to track rising pollution levels and detect accidents. The improvement of the smart car system is the basis for this article. In this study, various units that improve the vehicular system are implemented. The primary goal is to quickly identify incidents and reduce the time it takes for medical assistance to arrive. Tire pressure is measured for accident prevention, while node MCUs are used for accident detection. MQ7 is employed to keep an eye on the pollution. The proposed method is helpful in lowering auto accidents, and pollution monitoring would help to understand the state of the environment.

14. Vehicle Fall Severity Modeling using IoT and K-Nearest Neighbor Algorithm

Each year, falling automobiles from great heights inflict a large amount of injuries, property damage, and fatalities. This research fills a research hole in the investigation of the incidence, classification, and reporting of vehicle falls. It introduces an Internet of Things (IoT) system that uses the built-in sensors of modern smartphones to detect and categorise the occurrence of a vehicle fall incident. The suggested system builds a k-Nearest Neighbor (k-NN) based fall occurrence and classification model to report the occurrence and severity of a vehicle fall-off using the vehicle speed, linear acceleration, and altitude readings of smartphone and linked sensors. Metrics like precision, recall, and F1 score are used to assess the performance of the newly presented model.

15. Accident detection and reporting system using IOT

In this article, they generally advocate using both common and unusual videos to record oddities and then developing a system that can alert nearby emergency service units to emergencies. To avoid these difficulties, we will generally adapt abnormality through the profoundly different example positioning system by supporting weakly labelled training recordings, region unit at video level rather than cut level. Deciphering the variation from the norm in instructing recordings is extremely time consuming.both traditional and unconventional recordings Zone units are taken into account as objects and video clips are taken into consideration as occurrences in Multiple Instance Learning (MIL), anticipating an abnormal score from which an edge will be produced, and from which the framework will determine whether or not an accident has occurred. Presently available is a vast informational collection with 100 hours of recordings. To begin with, general oddity location taking into account each and every odd piece are gathered as the whole gang common exercises as another. Second, for analysing all of the strange street exercises.

16. Accident detection and prevention using IoT & python opencv

According to recent statistics, more people die in accidents because they don't receive the necessary medical care.. This is the above-mentioned project that makes use of computer vision and the Internet of Things. The car is equipped with ultrasonic sensors to look for obstacles. The Arduino Uno is used to send a message using the GSM module with the aid of the vibration sensor, which is attached to the vehicle's axle and utilised to detect any odd movement. The message is sent using the GPRS module, and the location is obtained using the

GPS module (Longitude & Latitude). When an accident is detected, all safety precautions are taken, including loosening seat belts and turning on the hazard indicator, allowing for a quick evacuation from the vehicle. This technology was created to help in car accident detection and prevention. This continuously monitors sensor values and responds when the limitations are met. This project's software component has been created and is anticipated to function in accordance with the suggested system. The hardware components are gathered and the code for this module is created. One of its primary tenets is dependent on the predefined thresholds in the programme that is built into the Arduino coding environment. The idea is to incorporate a sensor that monitors eye movements to determine whether the driver is paying attention to the road or not, as well as to use an eye blinking sensor to determine whether the driver is tired.

17. Vehicle accident sub-classification modeling using stacked generalization: A multisensor fusion approach

The end-to-end Internet of Things (IoT) system described in this paper is based on an Android smartphone and can send accident data to emergency services and impacted families as soon as a car collision is detected. Along with detection, the classification of auto accidents can be very beneficial in locating the right equipment for rescue operations and life-saving medical care. The major goal of this research project is to create a machine learning (ML) model that can reliably recognise and categorise automobile accidents into eight groups. A multi-sensor fusion framework that integrates various sensor-fusion techniques at various levels of implementation along with a number of preprocessing techniques, such as a 10-ms moving maximum, complementary filters, and a 2-sec sliding window, has been proposed to improve the classification effectiveness of the system. The framework combines the conclusions of three ML classifiers that are based on Decision Tree (DT), Naive Bayes (NB), and Random Forest (RF) approaches using a stacked generalisation strategy based on Logistic Regression (LR). With an F1-score of 0.95, the LR-based stacking classifier is shown to be extremely accurate, outperforming every single base-classifier in terms of performance.

18. An intelligent accident detection information system using iot

IOT is being used in this project to identify and transmit information about traffic accidents. The likelihood of an accident gradually increases with the number of vehicles on the route. According to WHO ("World Health Organization's") statistics, a fatal car collision occurs once every four minutes. The major goal of this work is to save the lives of people who perish in accidents because no one was informed about the disaster in a timely manner. The arduino uno device in the car is used to detect accidents. The coordinates of the accident's location will be given to the emergency contact person, who will receive the information from the Arduino Uno via the Ethernet adapter in the device. This gadget sends messages to the predetermined numbers on the Arduino board using the appropriate number. The lives of billions of people are saved by sending the message at the appropriate time.

19.Development of smart accident identification and detection system

The Internet of Things concept is new and resulted from the confluence of wireless technology. Wireless communication is the transmission of data or a signal between two or more sites that are not linked to electrically conducting objects. With IoT devices that have Wi-Fi, machines may communicate with one another. Using integrated sensors, these industrial equipment are utilised to gather data and act on it through a network. cordless or wearable technology. These systems provide fleet managers with a wealth of information on

their cars and drivers in addition to merely reporting each vehicle's location. Our project's primary goal is to prevent traffic accidents by raising awareness right away. This idea will make it simple to locate traffic accidents using a cell phone and GPS. It will notify the neighbourhood hospital and police station by cell site when it detects traffic accidents.

20. Vehicle Mishap Prevention and Detection using IOT and mesh topology implied node to node Communication

This article describes a hybrid approach that uses cutting-edge technology to identify and avoid traffic and vehicle accidents. The driver and authorised personnel are identified and warned in case of fire by the flame sensor, which also serves the additional goal of preventing disaster. This is accomplished by an interface of a Hall effect magnetic sensor to detect speeding and a MQ2 gas sensor to keep track of the oxygen level at a comfortable frequency. To determine axis tilt, an accelerometer (MMA 7761) is inserted into the model. A piezoelectric sensor serves as a safety device; in the event of an accident, the tremendous strain suffered is converted to an electrical signal that accurately represents the incident. An ultrasonic sensor is installed to detect any violations of the safety distance between the vehicles, preventing the collisions that frequently occur without warning. All the sensors are combined into a prototype along with an Arduino and a Wi-Fi module microcontroller, and the data gathered is sent to the cloud, which is accessible to everyone via all channels.

21. A Review on Vehicle Accident Detection System using Accelerometer

If an accident occurs this system helps to retrieve the exact position of the vehicles. This system sends an automated message to all the pre-install numbers in the device such as the drivers family members, police station, ambulances and the nearest hospitals.

22.Vehicle Accident Detection and reporting system using GPS and GSM Module.

Project aims at finding the occurrence of any accident and reporting the location of accident to the previously coded numbers so that immediate help can be provided by ambulance or the relatives concerned.

23.A Study on Strategic Provisioning of Cloud Computing Services

Cloud computing is currently an emerging paradigm that envisions a new paradigm of “everything-as-a-service,” hence, virtualizes physical resources, infrastructure, and applications which are being provided through service provisioning in the cloud. The growing adoption of cloud services suggests clear and distinct promises within the cloud industry

24.IoT Based Vehicle Accident Detection Using GPS Modem

IoT based vehicle accident detection system using GPS and WIFI has gained attention.When accident occurs, this system sends short message to WhatsApp of a mobile number via Wi-Fi over internet.Message will give longitude and latitude values. From these values location of accident can be determined.

25.Accident Detection Using Raspberry Pi

The proposed system provides the emergency medical service as soon as possible and to

avoid the mortality. It is to provide the details of the accident occurred and area of the accident with other information. It helps to easily provide facility and help to the victim of the accident. GSM is used to provide information regarding the accident and GPS module is used to traces the location of the vehicle.

26.Design of accident detection and alert system for motor cycles

Vehicle accident detection is not a brand-new concept, and the automobile industry has made great strides toward perfecting that technology. The same has been dormant in motorbikes up until this point and is poised to surge. This essay is an attempt to make a contribution in that technological field. Through three criteria—vehicle acceleration/deceleration, vehicle tilt, and pressure change on the body of the vehicle—we are attempting to identify accidents in this instance. With a reasonable success rate, the accident can be detected using these minute data quantities and an appropriate algorithm. And the emergency services are contacted for assistance using the GPS coordinates of the car.

27.The conceptual approach of system for automatic vehicle accident detection and searching for life signs of casualties

The first design for an onboard eCall device that may be added to used cars at the owners' request is shown in this paper. The suggested system will be able to recognize a motor vehicle collision, identify the number of passengers, record their vital signs, and transmit this data to designated emergency services over a duplex communication channel.

28.Blockchain-Enabled Certificate-Based Authentication for Vehicle Accident Detection and Notification in Intelligent Transportation Systems

An adversary may take advantage of the fact that connections between the vehicles, the Road-Side Units (RSU), and the Edge Servers (ES) occur across wireless networks and the Internet to tamper with the data shared among the various organizations in an Internet of Vehicles (IoV) ecosystem. As a result, it necessitates secure communication between all parties involved in the implementation of an IoV-based ITS. In this work, we develop BCAS-VADN, a brand-new certificate-based authentication method for ITS vehicle accident detection and notification. When an accident is identified on the road by either a vehicle's own or a neighboring vehicle, BCAS-authentication VADN's procedure enables each vehicle to safely notify the nearest Cluster Head (CH) of accident-related transactions (s)

29.Driver Safety and Assistance System using Machine Learning & IoT

In recent years, the growth in the number of road vehicles and transportation has been exponential. This has made a major effect on our lives just like the advancement of the country. However, Road accidents are one of the serious causes of mortality. Every year around 1.3 million people lose their lives as a result of road accidents and driver drowsiness is to be blamed in major cases. The delayed notice of emergency services and systems often makes it more difficult to protect lives. This paper aims to design a Machine Learning & Internet of Things (IoT) based robust alert system that could detect the possible signs of a road accident during drowsiness as well as daydreaming and alert the driver.

30.Smart Helmet with Rear View and Accident Detection System for Increased Safety

This paper presents a smart helmet to show the rider his rear view using a raspberry pi camera. A speed limit indicator will help the rider stay within safe speed limits. Accident detection system is implemented by means of a heart rate sensor. In case of an accident an automated SMS will be sent to the relevant authorities using a GPS and GSM module. The heart rate sensor is also used to detect drowsiness and a vibrator alerts the rider to stay awake. A smart turn indicator warns the vehicles behind motorcycle of the rider's intention to turn. This proposed smart helmet aims to make motorcycle riding safer.

31. MQTT based vehicle accident detection and alert system

Nowadays, every time we open the newspaper, there is at least one news item about a traffic accident. The average number of vehicles on the road worldwide has increased as cars and other vehicles become more and more accessible. Accidents devastate victims, costing them valuable time and money. It has been determined through considerable research that the majority of accidents result in fatalities as a result of poor communication with relevant medical authorities and the ensuing dearth of prompt medical assistance. With the use of sensors mounted to the car, this application assists in detecting the potential occurrence of an accident on the road. The individuals who need to know about this incident will be informed right away so that prompt action can be taken.

32.An IoT-Based Vehicle Accident Detection and Classification System Using Sensor Fusion

The number one cause of death and disability among young people is traffic accidents. The goal of current research on accident detection systems is to either shorten reporting times or increase accident detection accuracy. Platforms from the Internet of Things (IoT) have been heavily used recently to speed up rescue efforts after accidents. This work provides an Internet of Things (IoT)-based automobile accident detection and categorization (ADC) system that combines on-board and connected sensors from smartphones to not only detect but also report the type of accident. The effectiveness of numerous emergency services, including emergency medical services (EMSs), fire stations, towing services, etc., is improved by this unique technique because knowing the type of disaster is crucial for planning and carrying out rescue operations.

33.GPS and Map matching based vehicle accident detection system

The GPS (Global Positioning System) has been integrated into automobile systems and offers speed, time, and direction in addition to navigational information. One of the key factors in auto accidents is speed. If emergency services had been given quick access to accident information, many lives might have been saved. Using GPS speed data and a map matching algorithm, this article suggests detecting accidents from a vehicle's map-matched position and sending the location of the accident to an alert service centre. Every 0.1 seconds, the GPS updates position and speed. The map matching algorithm will locate the vehicle on the road using the position data. A microcontroller unit will compare the current speed to the prior speed every 0.1 seconds.

34.An IoT approach to vehicle accident detection reporting, and navigation

Reducing the impact of automobile accidents, helping as many injured individuals as possible, and offering 24/7 on-the-spot rescue are some unique concerns that Public Safety Organizations (PSO) must take into consideration while engaging in many operations. One of the most well-known PSOs to be there on-site whenever an accident or a disaster occurs is the humanitarian group the Red Cross. However, some rescue personnel have trouble getting to the injured due to delayed alarms and inadequate knowledge of the precise accident site. A paradigm shift in public and private services was brought about by the emergence of the mobile phone and Internet of Things (IoT) businesses, which also reshaped how people communicate. This is a promising device that is anticipated to speed up the laborious rescue process by notifying the site of an accident, the injured passengers, and blood types in a matter of seconds, hence reducing the death rate. The geographic information gathered by this method may be used as admissible evidence or as a gauge of the state and condition of the roads

35.IoT based Smart Accident Detection & Insurance Claiming System

IoT-based smart transportation systems are gaining a lot of public interest. Accident rates are rising dramatically as a result of the steadily rising vehicle rate. People are able to check the current condition of the vehicle and its surroundings in vehicles that have a large number of sensors installed. Even when there is a collision, these sensors protect the people by activating the airbags. However, dealing with the occurrences that follow accidents has proven to be a difficult procedure. Informing the support centre about the accident and setting up an ambulance to transport the accident victims both require time. The risk of death may rise as a result of this.

36.Traffic accident detection and condition analysis based on social networking data

To successfully restore traffic flow and lower serious injuries and fatalities, accurate detection of traffic incidents and condition analysis are crucial. An advanced data categorization model with a wealth of traffic data can be used to achieve this objective. Recently, a number of systems utilising sensors and social media platforms have been introduced to track traffic conditions and identify traffic-related events. Sensor-based systems, however, offer little information and risk failure due to their slow detection rates and high false alarm rates. Social networking data is also unexpected, unstructured, and full of jargon, idioms, and trending themes. It's possible that the traffic event detection machine learning algorithms won't be able to extract useful information from social networking data.

37.Real time traffic accident detection system using wireless sensor network

Today's high-speed highways require a life-saving programmed called automatic vehicle accident detection. Motorway accident notifications must be made quickly and effectively to the appropriate authorities. The major goal of this study is to develop a Real Time Traffic Accident Detection System (RTTADS) using RFID and Wireless Sensor Network (WSN) technologies. This paper describes the hardware prototype configuration for RTTADS, the employed algorithms, and the benefits and drawbacks of the complete system. Additionally, the setup and application software settings are discussed. The location of the collision, the car's speed right before the accident, and the number of passengers in the vehicle are all

detected by sensors put in the vehicle. The monitoring station receives an alert signal from the sensors.

38.Car Accident Detection and Notification System Using Smartphone

A significant portion of fatalities from automobile accidents occur every day worldwide.Building automatic systems to identify traffic accidents and shortening the time between an accident happening and the deployment of first responders to the scene are two effective ways to lower the number of traffic fatalities. Recent strategies make use of the automatic accident detection and notification system built into the car. Although these methods are effective, they are costly, require complicated upkeep, and are not offered in all automobiles. On the other hand, it has only recently become viable to use cellphones to identify traffic accidents due to advancements in processing speed and sensor technology.

39.5G and IoT Based Reporting and Accident Detection (RAD) System to Deliver First Aid Box Using Unmanned Aerial Vehicle

Intelligent transportation systems are made possible by the Internet of Things (IoT) and 5G. (ITSs). In smart cities, ITSs promise to increase traffic safety. As a result, ITSs are receiving serious devotion from both the industry and academia. Road accidents are becoming more frequent as a result of the population's rapid growth and rise in the number of vehicles. Most frequently, casualties are not properly found and reported to hospitals and loved ones. Lack of first aid and prompt care could cause death in a matter of minutes. An intelligent system is required to handle all of these problems. Although there have been a number of ICT-based solutions for accident detection and rescue operations offered, these solutions are both expensive and not compatible with all vehicles.

40.Freeway accident detection and classification based on the multi-vehicle trajectory data and deep learning model

In recent years, academics have paid a lot of attention to the identification and classification of motorway accidents. A potential method of using the multi-vehicle trajectory data to detect and categorise an accident on motorways is the growing availability of real-time vehicle trajectory data due to the widespread usage of the Global Navigation Satellite System (GNSS) on mobile devices and onboard equipment. The data's benefits include low cost, great penetration, excellent real-time performance, and outside environment resistance. Therefore, using data from several vehicle trajectories, a novel method for accident identification and classification is proposed in this study. The study will assist in precisely and quickly detecting accidents, identifying the type of accidents, and ultimately determining who is responsible for the accidents.

41.Vehicle Accident Detection on Highway and Communication to the Closest Rescue Service

he danger data and the opportune salvage execution are considered as the primary components to lessen the gamble of street auto collisions since the pace of roadway mishaps fundamentally expanded. In this paper, it is expecting to recognize the expressway mishap casualties by utilizing the information got from Sensor Fusion-Based calculation while Ray Casting calculation will help the clients to get the help of salvage administrations in opportune way. With the motivation behind ease of use, these calculations are planned to apply in the cell phones worked in high innovation sensors, which are associated with the GIS, GPS and

Geofence advancements.

42.Night-time Vehicle Detection Based on Brake/Tail Light Color

In the factual examination, the vast majority of the street mishaps occur during the evening. The significant test for lessening night mishaps is to identify vehicles at evening and keeping distance between the vehicles going in front. While driving in dim circumstances, vehicles in front are by and large apparent by their tail and brake lights. The vehicle appearance is changed at evening time when contrasted with sunshine because of different variables like shade of the vehicles, impression of light from the vehicle body and regular light. In this paper, we are proposing a strategy for vehicle recognition in view of brake/tail light tone from the caught variety picture.

43.Vehicle Speed Measurement for Accident Scene Investigation

Overspeed is a main consideration causing street car crashes in China. Since the mid 1980s, scientists have created different calculations to extricate speed data from traffic picture groupings. In this paper, a calculation is proposed to assess the speed of the mishap vehicle by recordings. With human association, control focuses are refined by corner indicator and afterward utilized for two-aspect mathematical revision. The casing contrast strategy is utilized to catch the mishap vehicle in pictures. When the speed bend is gotten and smoothed, the movement direction and speed of a mishap vehicle at crash can be caught too. Trial results show that the proposed strategy is more precise in speed estimation. It will work with the traffic police to manage car accident cases in a genuine world.

44.**Cloud Based Intelligent Traffic System to Implement Traffic Rules Violation Detection and Accident Detection Units**

The urbanization cycle has denoted a consistently expanding development in the quantity of on-street vehicles which has prompted a decrease in the air quality while an expansion in the quantity of street mishaps. In this paper a smart framework called CBITS has been proposed. CBITS follows a comprehensive methodology as it is exceptional with an organization of sensors that give constant discharge levels as well as it cautions the specialists with area in the event of a mishap. The framework has three fundamental capabilities: outflow checking; mishap recognition; and extraordinary vehicle distinguishing proof (UVID). CBITS is an exceptionally compelling, ongoing, light weight, solid, low-power consuming and a savvy framework for the vehicle-proprietors as well as the observing specialists.

45.**Accident Detection Using Deep Learning**

Consistently around 1.35 million individuals are sliced off because of various accidents in the event of street auto collision. According to the insights 20 to 50 million individuals endure because of its wounds. As an outcome of such car crashes individuals takes care of their lives. These circumstances are caused because of the absence of co-appointment among the associations including in it. Likewise not appropriately rehearsing the standards and ways as it to be kept amplifies the chart upwards. The gamble factors incorporate speeding, drive under the influence, interruption in driving, awful foundation, in-appropriate vehicles, defying

guidelines and some more. As such a framework is required which is entirely ready to co-ordinate between the various moves that will be made for the fast reaction at the mishap area.

46.Mono-camera based side vehicle detection for blind spot detection systems

This paper proposes a dream based side vehicle identification for vulnerable side discovery frameworks. The proposed calculation utilizes a HoG overflow classifier to recognize vehicles, and tracks the identified vehicles with Kalman channel. The proposed calculation plays out a periodical vehicle discovery rather than each edge vehicle recognition. Furthermore, the proposed calculation lessens the identifying picture size by downscaling the first picture and setting the area of interest where vehicles can exist. Thus, we can decrease the handling time for vehicle identification. Likewise, the proposed calculation utilizes a misleading problem lessening techniques by control the unwavering quality focuses at vehicle following.

47.Vehicle Detection System based on Signal Strength to Prevent Road Traffic Accidents

Directional radio wires which has the recurrence scope of 5.8 GHz is utilized to recognize vehicle distance up to 1 km in light of the transmission solidarity to forestall street car crashes. Surpassing of a vehicle is obviously distinguished by estimating the ongoing place of over-taker inside the distance scope of 15 m to 30 m from the recipient. Graphical User Interface (GUI) is carried out to show the recognized vehicle for constant checking to show the specific place of overwhelming vehicle.

48.Accidents Detection and Prevention System to reduce Traffic Hazards using IR Sensors

Traffic Hazards is one of the serious issues looking across the world. One of the significant reasons for traffic risks is expansion in vehicles and thick populace. Diminishing traffic risks is one the significant difficulties as larger part of the passings across the world are because of street mishaps. Subsequently there is a need to give better transportation offices that can diminish the proportion of street mishaps and save life's of individuals. One of the arrangement that is proposed in this paper is utilizing IR sensors and Arduino Uno innovation. The framework has two stages Accident Detection and Accident Prevention. The recognition stage is completed utilizing IR sensors that could distinguish and alarm individuals by sending SMS utilizing GSM module that contains predefined numbers and mishap area utilizing GPS module.

49.Driving support system adaptive to the state of surrounding vehicle drivers

This paper proposes an idea of a driving emotionally supportive network that is versatile to the condition of encompassing vehicle drivers. This paper shows the viability of the idea by a reenactment study for a case that the driver emotionally supportive network is a backside pre-crash wellbeing framework and the condition of encompassing vehicle drivers is the normal response season of the accompanying vehicle driver. This paper likewise shows the likelihood that the likelihood circulation of the normal response season of the accompanying vehicle driver can be assessed from the vehicle conduct. From reproduction results, the adequacy of

the idea is shown.

50.Approaching vehicle detection using linear microphone array

Because of ongoing patterns in the public arena, improved vehicle security is firmly required. To forestall car crashes, it is important to identify the heading of moving toward vehicles in T-crossing point precisely and quickly. This paper depicts a plan that utilizes a direct receiver cluster with four mouthpieces to gauge the oncoming vehicles. We utilize a cross-relationship strategy to acknowledge sound source restriction and propose a course assessment conspire in view of the weighted amount of inserted cross-connection. Preliminaries show that the proposed plot offers great execution.

TABULAR COMPARISONS

Ref. No	***Description***	***Advantages***	***Disadvantages***
[2]	In this project, the accident is detected using Gyrosensor to detect x-y displacement. When a accident occurs, information is sent to GSM Module to send emergency message to concerned authorities. The location information is also captured using GPS Module, This is also sent. A setup for cooling the system was also established, so that this can be implemented in real time.	Accurate measurement of accident. Can be directly implemented in vehicles without further changes.	The information is sent using a sim card(via GSM module) directly, thus there might be delay is communication, depending on the mobile network. Information over cloud is absent (which can make it faster)
[9]	In this article, they have proposed a system of detecting accident based on Speed of vehicle, Pressure applied, change in angle. The system will connect to drivers mobile using Bluetooth. This will enable the use of GPS from mobile. A pressure sensor is placed to detect the pressure applied when a accident occurs. An accelerometer is used to detect the angle/tilt. After detecting accident a emergency message is sent to concerned authorities along with the location using the Bluetooth connected mobile phone.	This method resulted in very less probability of false alarm being sent. Has high accuracy when detecting accident as it takes into pressure applied also.	If there is a problem with the mobile phone of the driver, then emergency message is not sent.
[10]	In this article, a IOT based system which can detect and classify the type of accident is developed. For detecting the accident, five parameters are taken into account.	The type of accident is also detected and reported(roll,collision, falloff etc..)	Slow reporting time, depending on the type of algorithm used for classification.

	(speed, absolute linear acceleration, and the change in pitch, altitude and roll). The data obtained is used to classify the type of accident with the help of various machine learning algorithms.	Low cost system	Needs Internet connection Smartphone of user cannot be placed at a distance and can only be placed in a defined slot.
[11]	The paper states the factor of preventive methodologies itself. The aim here is to understand that it is better to prevent than cure. Here as soon as the driver starts the vehicle the Arduino UNO starts and measures the alcohol levels from the breath of driver and as an indication a LED is kept blinking in that case. An automatic engine locking system ensures that the engine does not start unless the alcohol content is within permissible limits. An L293D motor driver is used to demonstrate the locking system for the prototype. DC motor, alarm and indicating unit MQ3 alcohol sensors are used as a part of prevention methodology.	It aims to prevent than detect It doesn't allow the engine itself to start when there is a risky environment The LED all time indication makes a alert notification all time	The alcohol reader may read the reading of the person travelling in it than the driver and stop the engine. A lot of hardware and software complexion makes the system complicated. Emergency cases are not handled (considering the real time scenarios) The model just prevents a single factor of alcohol consumption but other factors like dizziness, falling asleep during driving aren't looked after
[12]	Implementation accurately determines an accident and communicates with the server using a combination of IoT devices and machine learning algorithms. There are three sections in this implementation. Specifically, a vehicle-mounted IoT device, a backend web server, and web user interfaces for monitoring and notifying of accidents. In essence, the first component consists of IoT-enabled automobiles that can identify traffic accidents and relay data, along with GPS coordinates, to a server over the internet. The second	Decrease the number of accident death by an early notification system so that the patients can be transferred and treated at a hospital better and faster Combine the powers of IOT and Deep Learning to better detect the accident. Paper proposes that	A lot of hardware components are used, which damaging of one may require again mainatiance cost Lot of data/ information flow has been observed during the process from software-arware interaction. X Accuracy has been measured putting

	component is a web server that gathers data, saves it in a database, uses GPS data to locate nearby emergency services, notifies them, and makes an automated call to the registered cellphone numbers. Last but not least, the service's users and administrators can see and control data and act accordingly through the user interface served by the server.	IOT sensors do not have an impact/ weight in classification model which lacks in other methology.	ideal cases in consideration and not all the scwnarios.
[16]	This article aims in the development of a system that helps in reducing accidents-related deaths. Various sensors are used in detecting an accident, and a additional drowsiness detection system is also implemented. Additionally, a navigation system has been put in place so that emergency responders may find the quickest and closest path to the accident scene.	Has good accuracy and response time. Eye Blinking sensor is additionally used to detect drowsiness	If there is a damage in sensor it can't be detected hence there's no possibly of auto facial recognition In places where there is no provision of GSM network it is difficult for communication
[17]	In this project, a IOT project which can detect accident is framed. Further classification on the type of accident using machine learning algorithm is also developed. For detection of accident, it uses sensors of smartphone and sensordrone. A 9-axis inertial sensor and the smartphone GPS is also used to detect the various parameters. These parameters are used in detecting 8 different types of accident scenarios.	Very High accuracy Can detect 8 types of accident scenarios Cost effective Easy to install	Requires continuous internet connectivity. Damage in smartphone can result in wrong results
[18]	The approach used in the current research uses sensors like crash sensors and roll back sensors to find accidents. The implanted device in the car will automatically send an alerting message with the accident's time and location to emergency and relief organizations if the accident is identified using the sensor. The MEMS sensor it triggers the Arduino uno board and it sends the message to the emergency contact. The Ethernet is connected with the Arduino where it shares the sensor values and location with the Thingspeak cloud.	Get the exact location of the accident. Detecting the accident using the sensors. Rescuing the life of people who are in danger.	Issues in detecting the occurrence of accident. Couldn’t report about the accident in the correct time.

[19]	This system is totally based on GSM, GPS, and Associated application. If two vehicles collide with each other, then the accident which is going to happen there will be due to the vibrational shock, which will be detected by the accelerometer. The proposed model utilizes a MEMS sensor to detect the signal via the GPS module to find the exact location. At the final result, the GPS will find the location of the accident and retrieve the most neighboring hospital	Minimize the day to day road accidental death resulting through vehicles Successful reliability testing revealing that the system is stable, available, and serviceable.	Minimize the day to day road accidental death resulting through vehicles Successful reliability testing revealing that the system is stable, available, and serviceable.
[25]	This article targets at detecting an accident and identify the location details, along with the date and time details. The information is stored in cloud which will be accessible to everyone. In addition to this heart beat sensor is also installed which updates, monitors and also notifies if there is an abnormal condition along with stopping the vehicle to prevent from accidents. This article implements Raspberry pi to connect all the sensors and to access the internet.	Can predict accident with high accuracy. Heart monitor sensor is also used to monitor patient condition. Dedicated RF frequencies are used to notify emergency contacts.	Raspberry Pi camera module doesn't operate well at night Costly implementation Since the system developed is based on the Pi camera module, it is found that the image capturing rate of Pi camera is quite slower than webcam. Hence, processing and detection of face is slower

HARDWARE REQUIREMENTS

Arduino Uno

Arduino Uno is a ATmega328P based microcontroller which is widely used in many IOT Projects. This component is very important in our system, as it is the central controller which controls and collect data from all other components. It collects and sends data to/from GPRS and GSM Module and most importantly the vibration sensor. This data is then sent to other components for storing in cloud and analyzing.

GSM Module

In our Project , we have used GSM SIM900. It works in the frequency of 900Mhz to 1900Mhz. The main functionality of this component is to send messages to the concerned authorities when an accident occurs

GPS Module

We have used SIM28ML for this. We are using GPS Module to find the location of the vehicle

by latitude and longitude. This information is sent to aurdino which will further send this to GSM module, so that the gsm module can send the location information also to the concerned authorities.

Node MCU

We used node MCU to communicate with cloud and various other automation process. The Node MCU is a chip which acts as a computer by itself. Hence it will be able to satisfy the required functionalities.

MPU6050

We use this component to detect the accident in a system. This component will detect the measure the inertia, acceleration and other parameters which are required for detecting an accident. These information is sent to aurdino for further processing by which we can analyze if a accident occurred or not.

SOFTWARE REQUIREMENTS

Arduino(Software)

We are using this software to write our codes. We will write the code in this software and upload the commands to arduino hardware. We can also print commands.

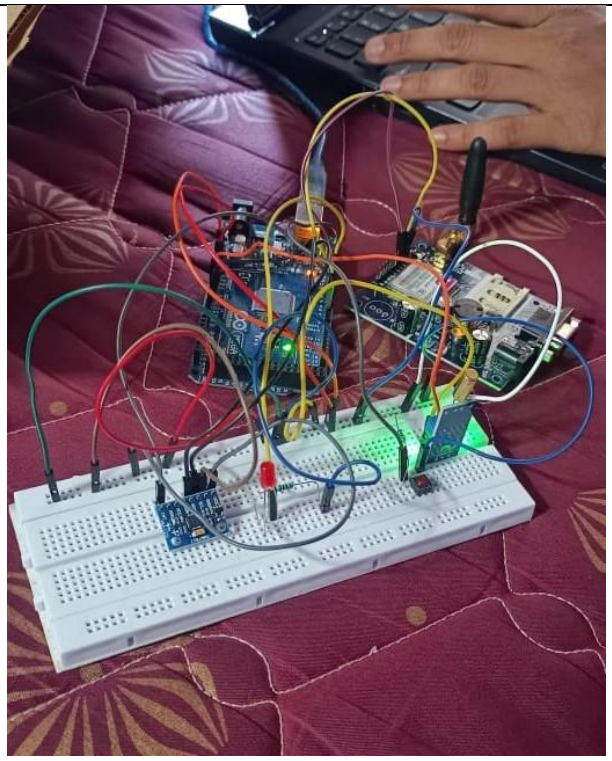
Processing.io

This is a similar app which will perform same functionality as arduino app. But with this help, we can visualize the change in axis of the car. We use this app in writing the code for MPU6050.

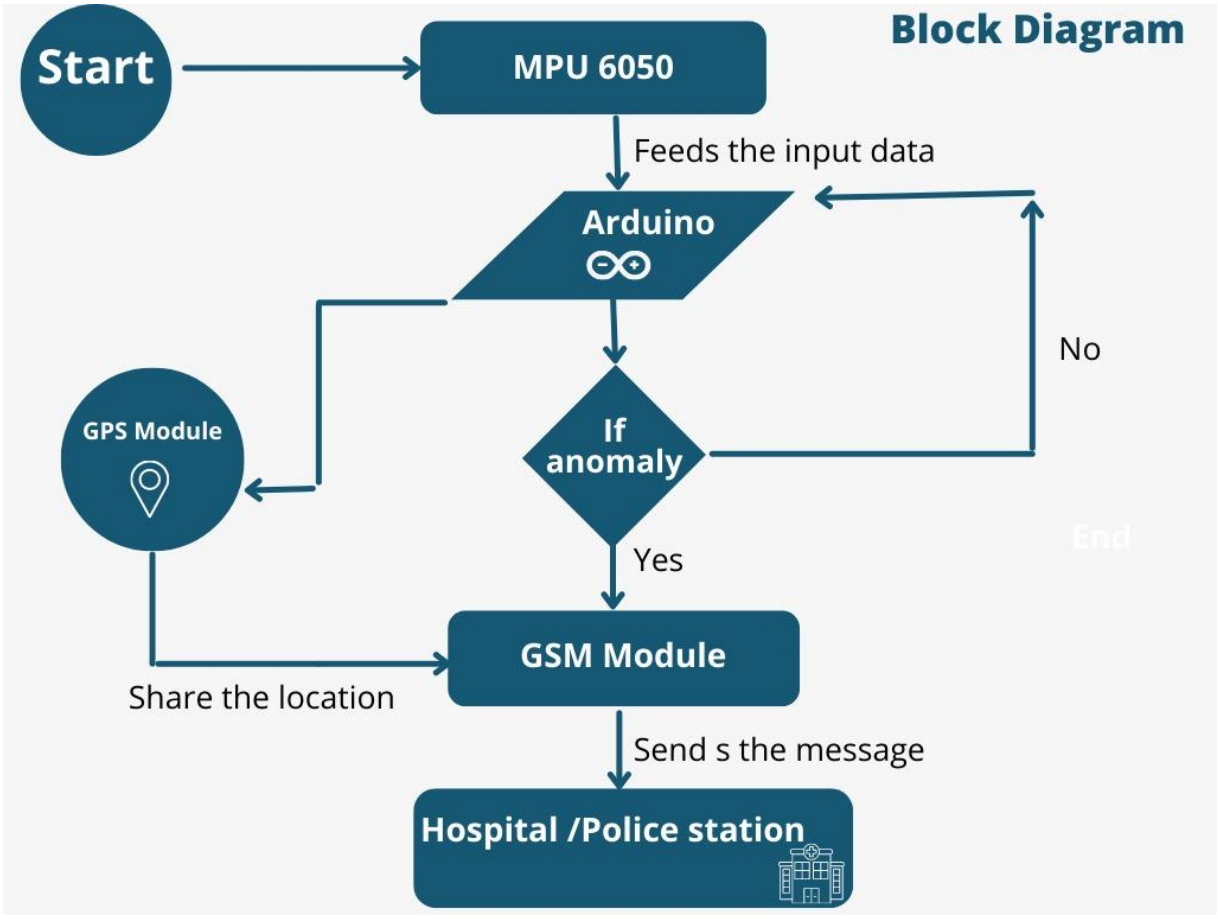
PROTOTYPE/FRAMEWORK/METHODOLOGY

The working of the project Cloud and the methodology of the enabled vehicle monitor and accident detection system can be summarized in following points stated below

- When accident is occurred, it is detected using mpu6050 and shock sensor module(801S Vibration Sensor) and the location details of vehicle/object is collected by the GPS module. Latitude and Longitude details are collected in this process.
- Thus, collected information is then fed to Arduino. Necessary processing is done, and the information is passed onto GSM modem. The GPS information is also transferred to the cloud using NODEMCU.
- The GSM modem collects the information from Arduino and then transfer it to the mobile phone through the SMS which is in text format.
- The sensors are used to detect the stimuli and microprocessor (arduino uno board) evaluates the response from sensors to perform action such as initiating message / data transfer.
- GPS technology is employed to gather the information of the speed and the location (latitude and longitude) of the vehicle.
- The GSM module is used to send messages to the vehicle owner/third party when required. The external interface to the Internet, SMS service is also provided by the device.



BLOCK DIAGRAM



SWOC ANALYSIS

- **STRENGTH**
  - The model accurately detects the accident and the change in orientation, motion and angle of the vehicle.
  - Detects the location of vehicles through satellite communications.
  - Quick and easy flow of data to various stakeholders of the project: the driver, driver's family, hospital and insurance office.
  - Relatively low cost of implementation.

- **WEAKNESS**
  - Integrating various components may cause a crash or error.
  - The model is so sensitive that it may detect a change in near threshold orientation as also an accident.
  - Detects only skidding and rolling.
  - High complexity.

- **OPPURTUNITY**
  - The major and top most opportunity of not being injured in fatal manner and prevent post accidents effects.
  - Gives basic and strong opportunities for further updates in the system.
  - Connecting various stakeholders and working of them together gives an opportunity to work as a team and creates good work environment.

- **CHALLENGES**
  - Accurate detection of location in unknown location and in various unpredictable conditions.
  - Getting ambulance service in remote areas.
  - Sending or receiving messages can be challenging during change in weather conditions due to loss in signals or lost networks.
  - Protection of the components from physical damage during the accidents.

Code/Algorithm

Arduino Code

```
#include <TinyGPSPlus.h>

#include <TinyGPS.h>

#include <SoftwareSerial.h>
TinyGPSPlus gps; // Create an Instance of the TinyGPSPlus object called gps
SoftwareSerial ss(9, 10); // rx,tx //gps tx, rx
SoftwareSerial mySerial(7, 8); // 7 to D3-TX and 8 to D2-RX to send sensor and lat and lon data to node mucu
SoftwareSerial mySerial1(4,5); // 4 to D6 on nodemcu , 5 to D5 on nodemcu to send message string to nodemcu
int x, y, z, bstate2;
int buzzer = 11;
```

```
int sw2 = 3;
String value, url1;
double latitude, longitude;
String condition ;
int acc = 0, i = 0, j = 1;
void setup() {
 // put your setup code here, to run once:
 Serial.begin(115200);
 mySerial.begin(115200 );
 mySerial1.begin(115200);
 ss.begin(9600);
 pinMode(sw2, INPUT);
 pinMode(buzzer, OUTPUT);
 digitalWrite(buzzer, HIGH);
}
void loop() {
 // put your main code here, to run repeatedly:
 x = analogRead(A0);
 y = analogRead(A1);
 z = analogRead(A2);
Serial.println( "x: "+String(x));
Serial.println( "y: "+String(y));
Serial.println( "z: "+String(z));
 bstate2 = digitalRead(sw2);
 Serial.println( "BUTTON STATE "+String(bstate2));

 latitude = gps.location.lat();
 longitude = gps.location.lng();
 delay(1000);
 smartDelay(1000);
 String url1 = "$";
 url1 += "&field3=";
 url1 += condition;
 url1 += "&field1=";
 url1 += String(latitude, 6);
 url1 += "&field2=";
 url1 += String(longitude, 6);
 url1 += "*";

 //Serial.println(url1);
 if (millis() > 5000 && gps.charsProcessed() < 10)
 Serial.println(F("No GPS data received: check wiring"));

if (x >=700 && y > 700 && z>700) {
 Serial.println("accident is detected");
 acc = 1;
 }
```

```
// else if (x >380 && y > 390) {
// Serial.println("accident is detected");
// acc = 1;
// }
 else {
 Serial.println(" no accident is detected");
 acc = 0;
 }
 if (acc == 1)
 {
 Serial.println("accident happened");
 digitalWrite(buzzer, HIGH);
 // tone(buzzer ,1000);
 delay(3000);
digitalWrite(buzzer, LOW);
 // noTone(buzzer);
 while (j == 1) {
 bstate2 = digitalRead(sw2);
 Serial.println( "BUTTON STATE "+String(bstate2));
 if ( bstate2 == 0) {
 j = 0;
 }
 else if (i == 5) {
 j = 0;
 }
 i++;
 delay(500);
 }
 if (bstate2 == 0)

 {
 Serial.println("vehicle is safe");
 condition = "0";
 mySerial.println(url1);
 Serial.println(url1);
 }
 else if (bstate2 == 1)
 {
 Serial.println("vehicle is not safe");
 condition = "1";
 value = "#accident occured at lat ="+String(latitude,6)+"and lon ="+String(longitude,6);
 value += "*";
 Serial.println(value);
 mySerial1.println(value);
 delay(1000);
 mySerial.println(url1);
 Serial.println(url1);
```

```
  }
  }

  j = 1;
 i=0;
 delay(1000);
 }
 static void smartDelay(unsigned long ms) // This custom version of delay() ensures that the
 gps object is being "fed".
 {
  unsigned long start = millis();
  do
  {
  while (ss.available())
  gps.encode(ss.read());
  } while (millis() - start < ms);
}
```

PROCCESSING APP CODE(ARDUINO) -> For Checking accident

```
 import
 processing.serial.*;
 import
 processing.opengl.*;
 import toxi.geom.*;
 import toxi.processing.*;
 ToxiclibsSupport gfx;
 Serial port; // The serial port
 char[] teapotPacket = new char[14]; // InvenSense Teapot packet
 int serialCount = 0; // current packet byte position
 int synced = 0;
 int interval = 0;
 float[] q = new float[4];
 Quaternion quat = new Quaternion(1, 0, 0, 0);
 float[] gravity = new
 float[3]; float[] euler =
 new float[3];
 float[] ypr = new float[3];
 void setup() {
  // 300px square viewport using OpenGL rendering
  size(300, 300, P3D);
 gfx = new ToxiclibsSupport(this);
  // setup lights and antialiasing
  lights();
  smooth();

  // display serial port list for debugging/clarity println(Serial.list());
  // get the last available port (use EITHER this OR the specific port code below) //String
```

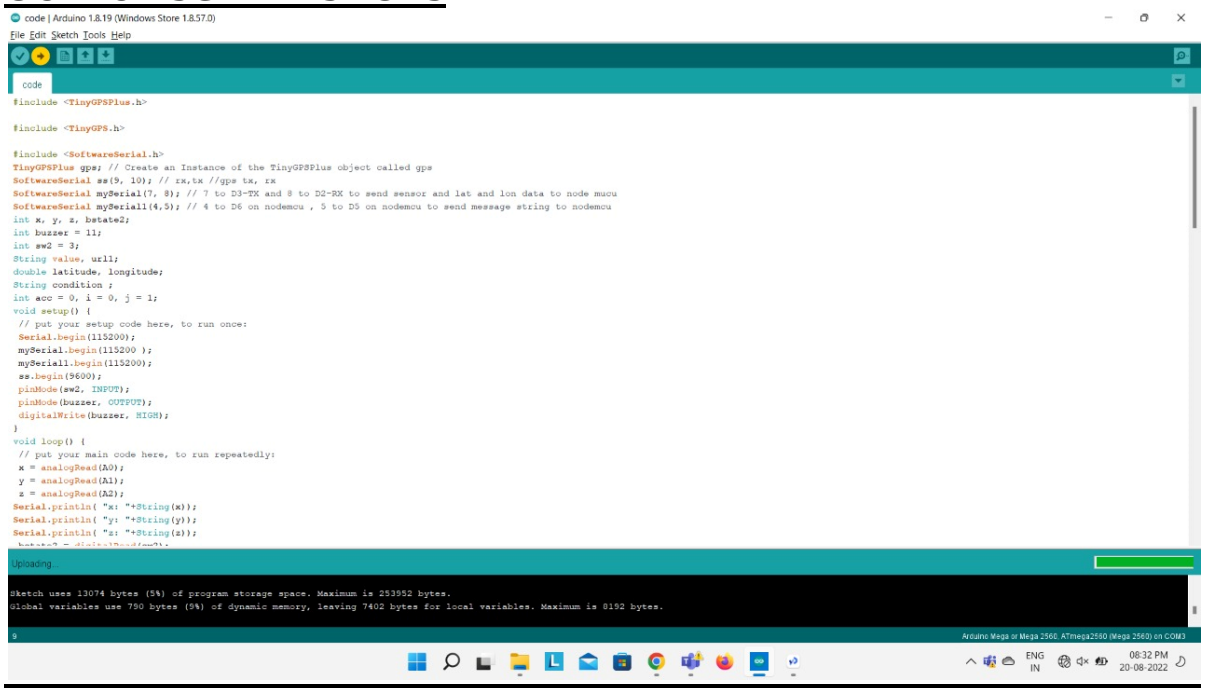
```
portName = Serial.list()[Serial.list().length-1];

 // get a specific serial port (use EITHER this OR the first-available code above)
 String portName = "COM3";

 // open the serial port
 port = new Serial(this, portName, 115200);

 // send single character to trigger DMP init/start
 // (expected by MPU6050_DMP6 example Arduino sketch)
port.write('r');
}
void draw() {
 if (millis() - interval > 1000) {
 // resend single character to trigger DMP init/start
 // in case the MPU is halted/reset while applet is running
 port.write('r'); interval = millis();
 }

 // black background
 background(0);

 // translate everything to the middle of the viewport
 pushMatrix(); translate(width / 2, height / 2);
 // 3-step rotation from yaw/pitch/roll angles (gimbal lock!)
 // ...and other weirdness, haven't figured out yet
 // DONT CHANGE NEVER THIS SEQUENCE, IN OTHER CASES THEY FAIL
 rotateY(-ypr[0]); // YAW
 rotateZ(-ypr[1]); // ROLL
 rotateX(-ypr[0]); // PITCH
 // toxiclibs direct angle/axis rotation from quaternion (NO gimbal lock!)
 // (axis order [1, 3, 2] and inversion [-1, +1, +1] is a consequence of
 // different coordinate system orientation assumptions between Processing
 // and InvenSense DMP)
 //float[] axis = quat.toAxisAngle();
 //rotate(axis[0], -axis[1], axis[3], axis[2]);
 // draw main body in red
 fill(255, 0, 0, 200);
 box(10, 10, 200);

 // draw front-facing tip in blue
 fill(0, 0, 255, 200);
pushMatrix(); translate(0, 0, -120);
rotateX(PI/2);
drawCylinder(0, 20, 20, 8);
popMatrix();
```

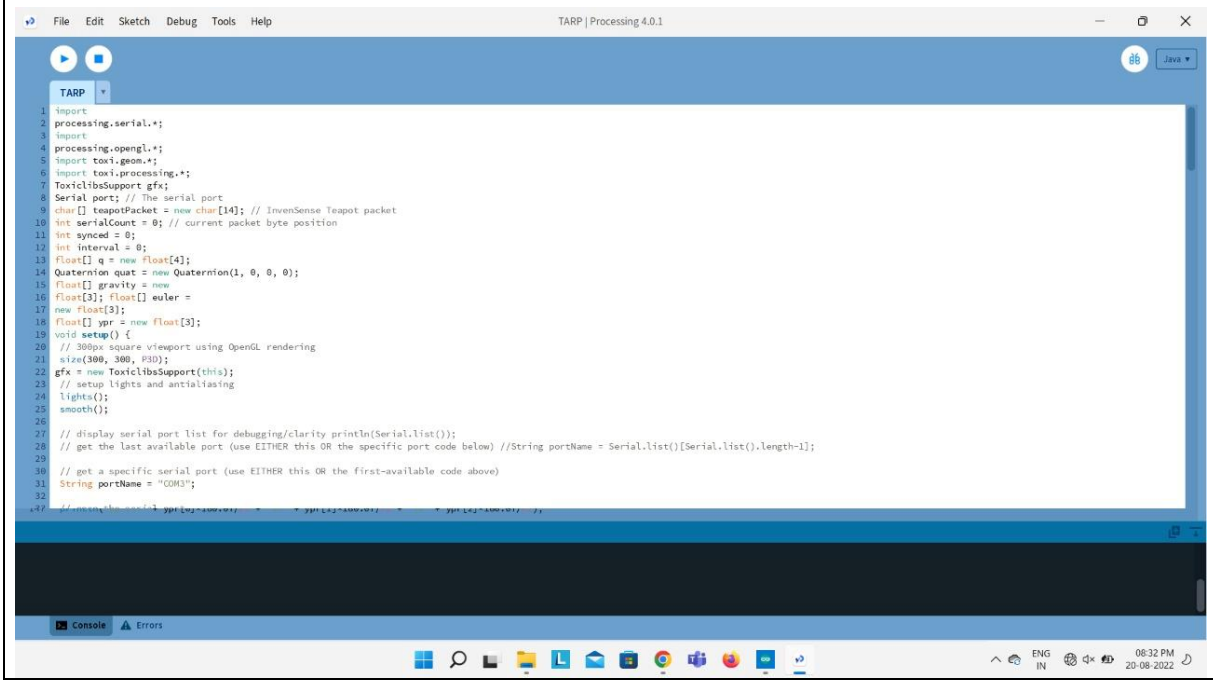
```
 // draw wings and tail fin in green
 fill(0, 255, 0, 200);
 beginShape(TRIANGLES);
 vertex(-100, 2, 30); vertex(0, 2, -80); vertex(100, 2, 30); // wing top layer
 vertex(-100, -2, 30); vertex(0, -2, -80); vertex(100, -2, 30); // wing bottom layer
vertex(-2, 0, 98); vertex(-2, -30, 98); vertex(-2, 0, 70); // tail left layer
vertex( 2, 0, 98); vertex( 2, -30, 98); vertex( 2, 0, 70); // tail right layer
endShape();
beginShape(QUADS);
vertex(-100, 2, 30); vertex(-100, -2, 30); vertex( 0, -2, -80); vertex( 0, 2, -80); vertex( 100, 2,
30); vertex( 100, -2, 30); vertex( 0, -2, -80);
vertex(0, 2, -80); vertex(-100, 2, 30); vertex(-100, -2, 30); vertex(100, -2, 30);
vertex(100, 2, 30); vertex(-2, 0, 98); vertex(2, 0, 98); vertex(2, -30, 98); vertex(-2, -30, 98);
vertex(-2, 0, 98); vertex(2, 0, 98); vertex(2, 0, 70);
vertex(-2, 0, 70); vertex(-2, -30, 98); vertex(2, -30, 98); vertex(2, 0, 70); vertex(-2, 0, 70);
endShape();

 popMatrix();
}
void
serialEvent(Serial port) { interval = millis(); while
(port.available() > 0)
{
 int ch = port.read();
 if (synced == 0 && ch != '$') return; // initial synchronization -also used to resync/realign if
needed
 synced = 1;
 print ((char)ch);
 if ((serialCount == 1 && ch != 2) || (serialCount == 12 && ch != '\r') || (serialCount == 13
&& ch != '\n')) {
serialCount = 0; synced = 0;
return;
 }
 if (serialCount > 0 || ch == '$') {
teapotPacket[serialCount++] = (char)ch;
 if (serialCount == 14) {
   serialCount = 0; // restart packet byte position

 // get quaternion from data packet
q[0] = ((teapotPacket[2] << 8) | teapotPacket[3]) / 16384.0f;
q[1] = ((teapotPacket[4] << 8) | teapotPacket[5]) / 16384.0f;
q[2] = ((teapotPacket[6] << 8) | teapotPacket[7]) / 16384.0f;
q[3] = ((teapotPacket[8] << 8) | teapotPacket[9]) / 16384.0f;
for (int i = 0; i < 4; i++) if (q[i] >= 2) q[i] = -4 + q[i];

 // set our toxilibs quaternion to new data
quat.set(q[0], q[1], q[2], q[3]);
```

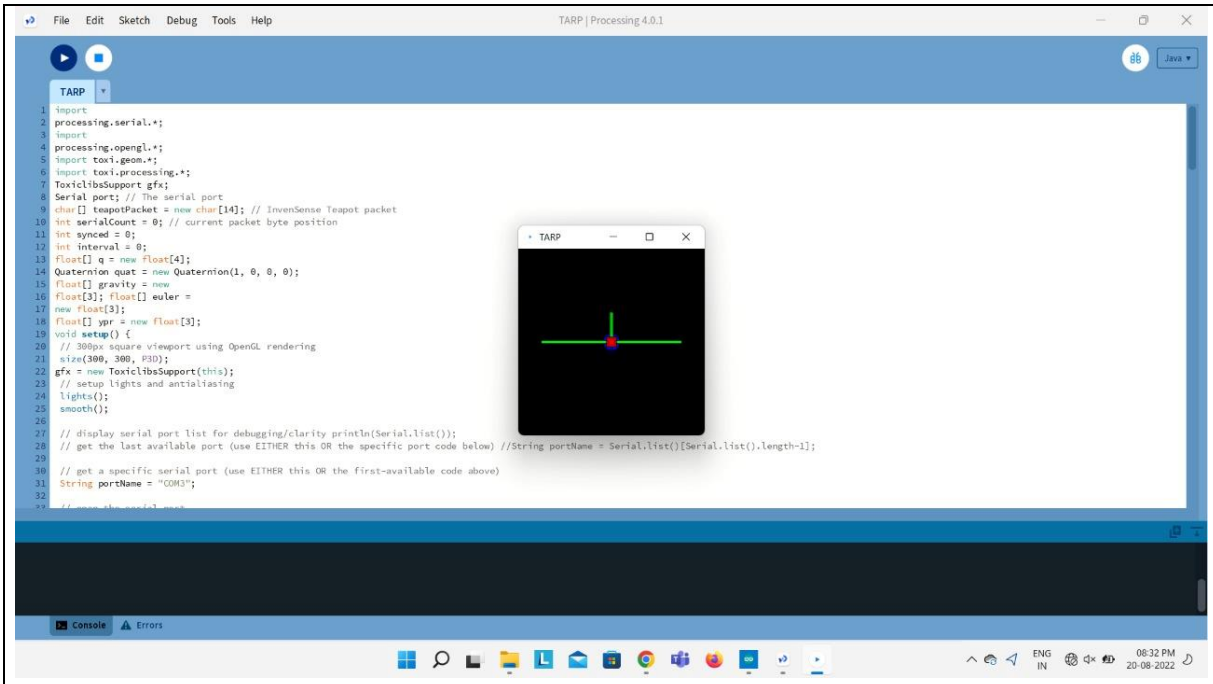
```
 /*
 // below calculations unnecessary for orientation only using toxilibs

 // calculate gravity vector gravity[0] =
2 * (q[1]*q[3] - q[0]*q[2]); gravity[1] = 2 *
(q[0]*q[1] + q[2]*q[3]); gravity[2] = q[0]*q[0] -
q[1]*q[1] - q[2]*q[2] + q[3]*q[3];

 // calculate Euler angles euler[0] = atan2(2*q[1]*q[2] -
2*q[0]*q[3], 2*q[0]*q[0] + 2*q[1]*q[1] - 1); euler[1] = -
asin(2*q[1]*q[3] + 2*q[0]*q[2]); euler[2] = atan2(2*q[2]*q[3] -
2*q[0]*q[1], 2*q[0]*q[0] + 2*q[3]*q[3] - 1);

 // calculate yaw/pitch/roll angles ypr[0] =
atan2(2*q[1]*q[2] - 2*q[0]*q[3], 2*q[0]*q[0] + 2*q[1]*q[1] - 1);
ypr[1] = atan(gravity[0] / sqrt(gravity[1]*gravity[1] +
gravity[2]*gravity[2])); ypr[2] = atan(gravity[1] /
sqrt(gravity[0]*gravity[0] + gravity[2]*gravity[2]));
 */

 // Fantastic solutions (yaw/pitch/roll and NO gimbal lock!) (similar to Euler angles)
 ypr[0] = -atan2(2*q[1]*q[2] + 2*q[0]*q[3], q[0]*q[0] + q[1]*q[1] - q[2]*q[2] - q[3]*q[3]); //
YAW
 ypr[1] = -asin(-2*q[1]*q[3] + 2*q[0]*q[2]);
// ROLL
 ypr[0] = atan2(2*q[2]*q[3] + 2*q[0]*q[1], q[0]*q[0] - q[1]*q[1] - q[2]*q[2] + q[3]*q[3]); //
PITCH

 // output various components for debugging
 println("q:\t" + round(q[0]*100.0f)/100.0f + "\t" + round(q[1]*100.0f)/100.0f + "\t" +
round(q[2]*100.0f)/100.0f + "\t" + round(q[3]*100.0f)/100.0f);
 println("euler:\t" + euler[0]*180.0f/PI + "\t" + euler[1]*180.0f/PI + "\t" +
euler[2]*180.0f/PI);
 println("ypr:\t" + ypr[0]*180.0f/PI + "\t" + ypr[1]*180.0f/PI + "\t" + ypr[2]*180.0f/PI);
 }
 }
 }
}
void drawCylinder(float topRadius, float bottomRadius, float tall,
int sides) { float angle = 0; float angleIncrement = TWO_PI /
sides; beginShape(QUAD_STRIP);
 for (int i = 0; i < sides + 1; ++i) {
 vertex(topRadius*cos(angle), 0, topRadius*sin(angle));
vertex(bottomRadius*cos(angle), tall, bottomRadius*sin(angle));
angle += angleIncrement;
 }
 endShape();
```

```
  // If it is not a cone, draw the circular top cap
  if (topRadius != 0) {
  angle = 0;
  beginShape(TRIANGLE_FAN);

  // Center point
 vertex(0, 0, 0);
  for (int i = 0; i < sides + 1; i++) {
 vertex(topRadius * cos(angle), 0, topRadius *
 sin(angle)); angle += angleIncrement;
  }
  endShape();
  }

  // If it is not a cone, draw the circular bottom cap
  if (bottomRadius != 0) {
  angle = 0;
  beginShape(TRIANGLE_FAN);

  // Center point
 vertex(0, tall, 0);
  for (int i = 0; i < sides + 1; i++) {
 vertex(bottomRadius * cos(angle), tall, bottomRadius *
 sin(angle)); angle += angleIncrement;
  }
  endShape();
  }
}
```

OUTPUT SCREENSHOTS







CONCLUSION

From out project, we can see that this implementation can detect the occurrence of an accident. This is done by MPU 6050 and vibration sensor. When detected, concerned emergency authorities are informed. This can help in prevention of accidents if implemented in real life. Our project also takes into account of storing data in cloud server.

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