ACCIDENT DETECTION AND PREVENTION SYSTEM

A Project Report

Submitted by

GUGANESH RAJ S	**510920106006**
ADITHYA N	**510920106001**
JAYALAKSHMI S	**510920106007**
SRIDHAR S	**510920106305**

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY

MELVISHARAM, RANIPET-632509

ANNA UNIVERSITY:: CHENNAI 600 025

MAY 2024

ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "**ACCIDENT DETECTION AND PREVENTION SYSTEM**" is the bonafide work of "**S.GUGANESH RAJ** (510920106006), **N.ADITHYA (510920106001)**, **I.JAYALAKSHMI (510920106007)**, **S.SRIDHAR (510920106305)**" Who carried out the projectwork under my supervision.

SIGNATURE

Dr. S. CHANDRU, M.E., Ph. D

HEAD OF THE DEPARTMENT

ASSISTANT PROFESSOR

Department of Electronics and Communication Engineering

Global Institute of Engineering and Technology,

Melvisharam, Ranipet – 632509

SIGNATURE

Dr. S. CHANDRU, M.E., Ph. D

HEAD OF THE DEPARTMENT

ASSISTANT PROFESSOR

Department of Electronics and Communication Engineering

Global Institute of Engineering and Technology,

Melvisharam, Ranipet – 632509

Submitted for project viva voce examination held on ……

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLEDGEMENT

We are very much ineffably indebted to our beloved Chairperson **Mrs. HEMA PRASAD**, Chairman **Mr. RAMA PRASAD VEDULA** and Managing Director **Dr. SUHAS VEDULA.**

We express our sincere thanks to our Principal **Dr. V. NATARAJAN, M.E., Ph.D., FIE.,** for the opportunity given to us.

We would like to express our deep sense of gratitude to **Dr. S.CHANDRU M.E.,PhD.,** Head of the Department who has been always a mentor and motivator to complete this project.

We would like to extend our gratitude to our Guide **Dr. S.CHANDRU M.E.,PhD.,** for giving valuable guidance to complete the project

We feel to acknowledge our indebtedness to our Project Co-ordinator **Dr. S.CHANDRU M.E.,PhD.,** for giving valuable guidance and kind supervision given to us throughout the project.

We also thank the **Teaching and Non -Teaching staff** members of the Department of Electronics and Communication Engineering for their constant Support.

We also acknowledge with a deep sense of reverence, our gratitude towards our Parents and member of our family, who has always supported us morally as well as economically.

ABSTRACT

People lose their lives every day in countries with dense populations as a result of accidents and inadequate emergency services. If medical facilities had been available when they were needed, these lives might have been saved. Systems that automatically identify accidents are known as smart accident detection systems. The Internet of Things (IoT) allows for the connection of various devices, particularly sensors, and the use of information from sensors to carry out procedures that enable the identification of accidents. The most recent techniques for accident detection utilizing IoT technology are examined in this study, and then barriers, difficulties, and potential future trends are examined and contrasted. This project suggests a method that addresses this issue. Immediately when a car collides with an accident, a sensor will detect the signal and send it to the Arduino microcontroller. The Microcontroller will send a alert message through GSM modem which is in build IOT device with the recipient's location, and authorization . So, after obtaining the information, the authorised person instantly uses the IOT modem to determine the location. The proposed systems have been practically designed and simulated using hardware components, and the outcomes meet expectations. The purpose of the system is to offer information regarding the accident's cause and location. The IOT module in this system is used to locate the car. To disseminate accident information, GSM is employed.

Keywords : Accident detection, Alert system, GPS, GSM, IoT, MEMS, Android App

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	**iv**
	LIST OF FIGURES	**v**
	LIST OF ABBREVIATIONS	**vii**
1.	**INTRODUCTION**	**01**
	1.1. OVERVIEW	**02**
	1.2. INTERNET OF THINGS	
2.	**LITERATURE SURVEY**	
	2.1. ANALYSIS OF LITERATURE SURVEY	**04**
	2.1.1. UBIQUITOUS GPS VEHICLE TRACKING & MANAGEMENT SYSTEM	**04**
	2.1.2 IMPROVING ESTIMATION OF VEHICLE'S TRAJECTORY USING THE LATEST GPS WITH KALMAN FILTERING	**05**
	2.1.3 ACCIDENT DETECTION USING CONVOLUTIONAL NEURAL NETWORKS	**06**
	2.1.4 PROTOTYPE PROPOSAL FOR QUICK ACCIDENT DETECTION AND RESPONSE SYSTEM	**07**
	2.1.5 CAR ACCIDENT PREVENTION AND HEALTH MONITORING SYSTEM FOR DRIVERS	**08**

3.	**EXISTING SYSTEM**	
	3.1 BLOCK DIAGRAM	**09**
	3.2 DRAWBACKS	**10**
4.	**PROPOSED SYSTEM**	**11**
	4.1 PROPOSED MODEL	**12**
	4.2 SCHEMATIC DIAGRAM	**13**
	4.3 FLOW DIAGRAM	
5.	**HARDWARE SYSTEM**	
	5.1 HARDWARE REQUIREMENTS	**14**
	5.2 HARDWARE DESCRIPTION	**15**
	5.2.1 POWER SUPPLY	**18**
	5.2.2 MICRO CONTROLLER	**20**
	5.2.3 EYE BLINK SENSOR	**21**
	5.2.4 ALCOHOL SENSOR	**25**
	5.2.5 MEMS SENSOR	**27**
	5.2.6 CRASH SENSOR	**28**
	5.2.7 GPS MODULE	**33**
	5.2.8 GSM MODULE	**48**
	5.2.9 DC MOTOR	**42**
	5.2.10 LCD DISPLAY	
6.	**SOFTWARE IMPLEMENTS**	**44**
	6.1 SOFTWARE REQUIREMENTS	**44**
	6.2 SOFTWARE DESCRIPTION	**44**
	6.2.1 EMBEDDED C	**48**
	6.2.2 ARDUNIO IDE	

7.	**RESULTS AND CONCLUSION**	**50**
	7.1 WORKING OF PROPOSED SYSTEM	
	7.2 REAL TIME SETUP OF PROPOSED SYSTEM	**51**
	7.3 REAL TIME ALERT MESSAGE AND COMMUNICATION	**52**
8.	**CONCLUSION AND FUTURE SCOPE**	**55**
	8.1 CONCLUSION	
	8.2 FUTURE SCOPE	**56**
	REFERENCES	**57**
	APPENDIX	**60**

LIST OF FIGURES

Fig.No	Figure Description	Pg.No
3.1	Block Diagram of Existing System	13
4.1	Block Diagram of Proposed System	15
4 .2	Schematic Diagram of Proposed System	16
4.3	Flow Diagram of Proposed System	17
5.2.1	Working sequence behind power supply	19
5.2.1.1	Schematic Diagram of Transformer	19
5.2.1.2	Schematic Diagram of Rectifier	20
5.2.1.3	Schematic diagram of filter	21
5.2.1.4	Schematic diagram of regulator	22
5.2.2	Schematic diagram of arduino uno	23
5.2.2.1	PIN MAPPING OF ATmega168	24

Fig.No	Figure Description	Pg.No
5.2.3	Eye blink sensor goggles	25
5.2.4	MQ-X Gas Sensor	26
5.2.5	MEMS Sensor	29
5.2.6	Crash Sensor	31
5.2.7	GPS MODULE	32
5.2.7.1	Latitude and Longitude	35
5.2.8	GSM Module	37
5.2.8.1	GSM Architecture	38
5.2.8.2	AT Commands	40
5.2.9	Working of DC Motor	42
5.2.10	LCD Display	46
7.2	Real Time Setup of Proposed System	55

7.3.1 Alert Messages 56

7.3.2 IoT Web View Application 57

7.3.3 Homepage of IoT Web Application 58

7.3.4 Real Time Sensor Values 58

LIST OF ABBREVATON

ABBREVATION	EXPANSION
RFID	Radio Frequency Identifier
IR	Infrared
MCU	Microcontroller Unit
MEMS	Micro-electromechanical Systems
GSM	Global System for Mobile Communication
GPS	Global Positioning System
LCD	Liquid-Crystal Display
IOT	Internet of Things
TXD	Transmit Data
RXD	Receive Data
ALE/PROG	Address Latch Enable
PSEN	Program Store Enable
EA/VPP	External Access Enable
DC	Direct Current
UART	Universal Asynchronous Receiver-Transmitter
RF	Radio Frequency

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW :

In densely populated countries, countless lives are lost daily due to accidents exacerbated by insufficient emergency services [11]. The absence of timely medical assistance often proves fatal in these scenarios, underscoring the critical need for swift accident identification and response mechanisms [7]. Enter smart accident detection systems, leveraging the power of the Internet of Things (IoT) to revolutionize emergency response protocols. The convergence of IoT technology with sensor devices has unlocked a realm of possibilities in accident detection and prevention. By seamlessly connecting sensors and processing data in real-time, IoT-enabled systems can swiftly identify and respond to accidents with unparalleled efficiency [13]. This study delves into the latest advancements in accident detection techniques, exploring the potential of IoT to mitigate the human toll of accidents [25].

This project proposes an innovative approach to address this pressing issue head-on. Upon detecting a collision, a sensor integrated into the vehicle triggers an alert mechanism linked to an Arduino microcontroller [9]. This microcontroller, acting as the nerve center of the system, promptly dispatches an alert message via a GSM modem embedded within the IoT device [5]. The message, containing crucial details such as the accident location and authorization, is swiftly transmitted to designated recipients, enabling immediate response. Practical implementation and rigorous simulation of the proposed system have yielded promising results, aligning closely with initial expectations [3]. The primary objective of this system is to furnish precise information regarding the cause and location of the accident, facilitating rapid intervention and potentially rescuing.

Central to this system's functionality is the IoT module, instrumental in pinpointing the vehicle's location with accuracy [1]. Leveraging GSM technology, the system ensures seamless dissemination of critical accident information to relevant authorities, enabling swift and coordinated emergency responses [8]. In the subsequent sections, we delve deeper into the design, implementation, and evaluation of this IoT-based Accident Prevention and Detection System [15].

1.2 INTERNET OF THINGS :

The Internet of Things (IoT) is a transformative technology that revolutionizes the way we interact with the world around us. It encompasses a vast network of interconnected devices, from everyday objects to sophisticated industrial machinery, all communicating and exchanging data seamlessly over the internet. These devices, equipped with sensors, actuators, and communication modules, gather valuable information from their surroundings and transmit it to centralized servers or cloud platforms for analysis and action.

By harnessing IoT technology, businesses and individuals can automate processes, monitor environments in real-time, and remotely control devices with unprecedented efficiency and convenience. Whether it's optimizing energy consumption in smart homes, enhancing productivity in manufacturing plants, or improving safety in healthcare facilities, IoT offers limitless possibilities for innovation and optimization across various industries. Key to IoT's success is its ability to ensure reliable connectivity using a range of communication protocols, enabling seamless data transmission over long distances and in remote locations. Moreover, IoT promotes interoperability among diverse devices and systems, fostering integration and scalability for complex applications. Through advanced data analytics techniques, the wealth of information generated by IoT devices can be transformed into actionable insights, driving informed decision-making and proactive interventions.

In essence, IoT is not just about connecting devices—it's about unlocking new levels of efficiency, productivity, and sustainability across all aspects of our lives. As this technology continues to evolve, its impact on how we live, work, and interact with our environment will only continue to grow, shaping the future of innovation and progress. IoT systems are highly scalable, allowing for the integration of additional devices and sensors as needed, without significant infrastructure changes. This scalability ensures that IoT solutions can adapt to evolving requirements and accommodate growth in data volume and device deployments. the Internet of Things (IoT) stands as a cornerstone of modern technological advancement, reshaping industries and societies in profound ways. Its ability to connect and empower an array of devices, coupled with advanced analytics and automation, heralds a new era of efficiency, productivity, and innovation.

However, as IoT continues to proliferate, addressing challenges such as data security, privacy, and regulatory compliance remains imperative. By prioritizing robust cybersecurity measures and adherence to regulatory standards, stakeholders can foster trust and confidence in IoT deployments, safeguarding both data integrity and user privacy. Ultimately, the transformative potential of IoT extends far beyond mere connectivity—it represents a paradigm shift in how we interact with the world around us.

CHAPTER 2

LITERATURE SURVEY

2.1 ANALYSIS OF LITERATURE SURVEY:

TITLE : UBIQUITOUS GPS VEHICLE TRACKING AND MANAGEMENT SYSTEM

AUTHOR : Iman M. Almomani, Nour Y. Alkhalil, Enas M. Ahmad , Rania M. Jodeh

YEAR : 2011

Global Positioning System (GPS) is becoming widely used for tracking and monitoring vehicles. Many systems have been created to provide such services which make them popular and needed more than ever before. In this paper a "GPS vehicle tracking system" is proposed. This system is useful for fleet operators in monitoring driving behavior of employees or parents monitoring their teen drivers. Moreover, this system can be used in theft prevention as a retrieval device in addition of working as a security system combined with car alarms. The main contribution of this paper is providing two types of end user applications, a web application and a mobile application. This way the proposed system provides a ubiquitous vehicle tracking system with maximum accessibility for the user anytime and anywhere.It also monitors the vehicle by setting speed and geographical limits and therefore receiving SMS alerts when the vehicle exceeds these pre-defined limits.

DRAWBACKS :

Constant connectivity is essential for accurate tracking, which could be compromised in areas with poor network coverage. Additionally, ensuring data security and privacy, especially with sensitive location information, remains a critical concern.

TITLE : Improving Estimation of Vehicle's Trajectory Using the Latest Global Positioning System With Kalman Filtering

AUTHOR : Cesar Barrios ,Yuichi Motai

YEAR : 2011

This paper presents an innovative approach to predicting the future location of automobiles with heightened accuracy, targeting a 3-second prediction horizon. By amalgamating Global Positioning System (GPS) data with Geographic Information System (GIS) data, the proposed method aims to substantially diminish prediction errors.The methodology commences by leveraging existing techniques to extrapolate the current GPS location. It then employs sophisticated Kalman filters (KFs) to address inaccuracies across various states an automobile may traverse, encompassing constant locations, velocity, acceleration, and jerks. These KFs are seamlessly integrated into an interacting-multiple-model (IMM) framework, furnishing predictions of the automobile's future location.To further refine prediction precision, the paper introduces an iterated geometrical error-detection mechanism grounded in GIS data. This mechanism operates on the assumption that the automobile will adhere to the road, thereby rectifying predictions that deviate from this premise.

DRAWBACKS :

Implementing comprehensive Kalman filters and interacting-multiple-model systems introduce complexity and increase computational overhead, potentially requiring significant processing power and resources.

TITLE : Accident Detection Using Convolutional Neural Networks

AUTHOR : Sreyan Ghosh, Sherwin Joseph Sunny, Rohan Roney

YEAR : 2019

Accidents have been a major cause of deaths in India. More than 80% of accident-related deaths occur not due to the accident itself but the lack of timely help reaching the accident victims. In highways where the traffic is really light and fast-paced an accident victim could be left unattended for a long time. The intent is to create a system which would detect an accident based on the live feed of video from a CCTV camera installed on a highway. The idea is to take each frame of a video and run it through a deep learning convolution neural network model which has been trained to classify frames of a video into accident or non-accident. Convolutional Neural Networks has proven to be a fast and accurate approach to classify images. CNN based image classifiers have given accuracy's of more than 95% for comparatively smaller datasets and require less preprocessing as compared to other image classifying algorithms.

DRAWBACKS :

While CNN models can achieve high accuracy rates, there is still a risk of false positives or false negatives, particularly in challenging environmental conditions such as poor lighting, adverse weather, or obscured views. Ensuring the reliability of accident detection in real-world scenarios may require extensive training data and ongoing model refinement.

TITLE : Prototype Proposal for Quick Accident Detection and Response System

AUTHOR : Sonjoy Rana, Shounak Sengupta, Sourav Jana, Rahul Dan, Mahamuda Sultana, Diganta Sengupta

YEAR : 2020

Traffic accidents contribute to an annual death toll of 1.25 million marking one of the primary causes of fatality. The Post Accident Response for such an alarming Figure calls for an immediate and effective Emergency Care which takes into account a series of time critical procedures beginning with the activation of the Quick Accident Response System (QARS) proposed in this communication. The implementation of Internet of Things (IoT) in QARS helps to detect an accident using multi-functional accelerometer and ultrasonic/proximity sensors. The video recording of the accident along with the exact location of the accident site fetched using a GPS-GSM module, along with the driver details will be immediately notified via internet to the nearest Emergency Response Units (ERU) through the Emergency Services portal of a dedicated mobile application. Pedestrians can also use the Pedestrian portal in the application to send live image and video feed to the Emergency services.

DRAWBACKS :

The proposed accident detection system offers benefits but faces challenges. Accuracy in adverse conditions, data quality, and computational demands are key concerns. Deployment and maintenance costs, privacy issues, integration complexities, and scalability challenges also need addressing for successful implementation.

TITLE : Car Accident Prevention And Health Monitoring System For Drivers

AUTHOR : Md. Hasibul Islam, Azmi Aziz Khandoker ,T. M. Safi Sami, Touhidul Islam Talukder, Md. Isfaqur Rahman

YEAR : 2021

At present, road accident has become a regular headache for all people around the world. To overcome the situation, people are thinking of updating the way of driving and road law. Different brands of automobile companies are trying to invent different types of facilities in vehicles. The main focus of this paper is to ensure the life security of the drivers. There will be sensors for health monitoring system that will track the driver's health, such as heart rate, temperature, and whether or not the driver is drunk, as well as drowsiness. This prototype uses an ultrasonic sensor, which will detect very close vehicles and reduce its own speed. However, the engine will start based on driver health, where sensors will always observe the driver's lively movement. Car accident prevention with the health monitoring system of the driver can be a blueprint to reduce car accidents, and it will be cost-effective. This project is expected to have a significant effect on society and obtain better results.

DRAWBACKS :

These include challenges related to the accuracy and reliability of sensor data, potential privacy concerns regarding health monitoring, and the feasibility of implementing such a system across various vehicle models and driving conditions. Additionally, the effectiveness of the system in preventing accidents may be limited by factors such as driver behavior and external road conditions.

CHAPTER 3

EXISTING SYSTEM

The existing accident detection and prevention system represents a pivotal advancement in modern safety technology, aiming to enhance road safety and minimize the impact of traffic accidents. Leveraging a combination of sensors, and real-time data analysis, these systems detect potential hazards on roadways, alerting authorities and drivers to take preventive actions promptly. Despite their progress, existing systems encounter challenges such as accuracy limitations, coverage gaps, and privacy concerns. Addressing these drawbacks remains crucial for further enhancing the effectiveness and widespread adoption of these life-saving technologies.

3.1 BLOCK DIAGRAM :

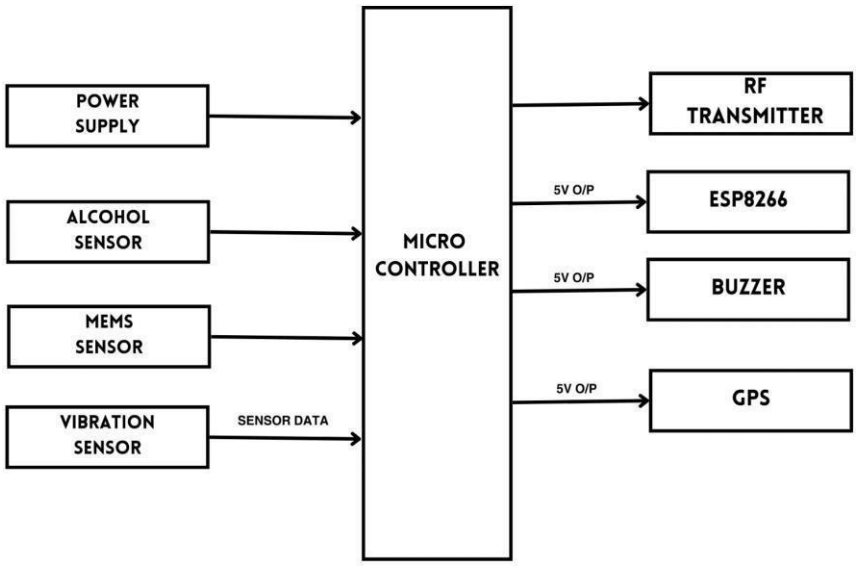

FIG 3.1 : BLOCK DIAGRAM OF EXISTING SYSTEM

3.2 DRAWBACKS :

- Accuracy issues, leading to false alarms or missed accidents.
- Limited coverage, especially in rural or less-traveled areas.
- Dependency on infrastructure like roadside sensors or cameras, which may not be uniformly deployed.
- Variable response times influenced by factors such as emergency service availability and traffic conditions.
- Data privacy concerns due to the collection and processing of real-time information.
- High implementation and maintenance costs, posing challenges for widespread deployment.
- Integration difficulties when merging different technologies and systems into a cohesive platform.
- User acceptance issues stemming from concerns about over-reliance on technology and loss of control.

CHAPTER 4

PROPOSED SYSTEM

Introducing our visionary approach to road safety, a next generation accident detection and prevention system. By seamlessly integrating advanced sensor technologies with powerful data analysis algorithms, our system provides unparalleled accuracy in identifying potential hazards on the road. With a focus on comprehensive coverage and rapid response times, our solution aims to mitigate accidents before they occur, revolutionizing how we safeguard lives on our roadways. Join us in shaping a safer, more secure future for drivers and pedestrians alike with our innovative accident detection and prevention system.

4.1 PROPOSED MODEL :

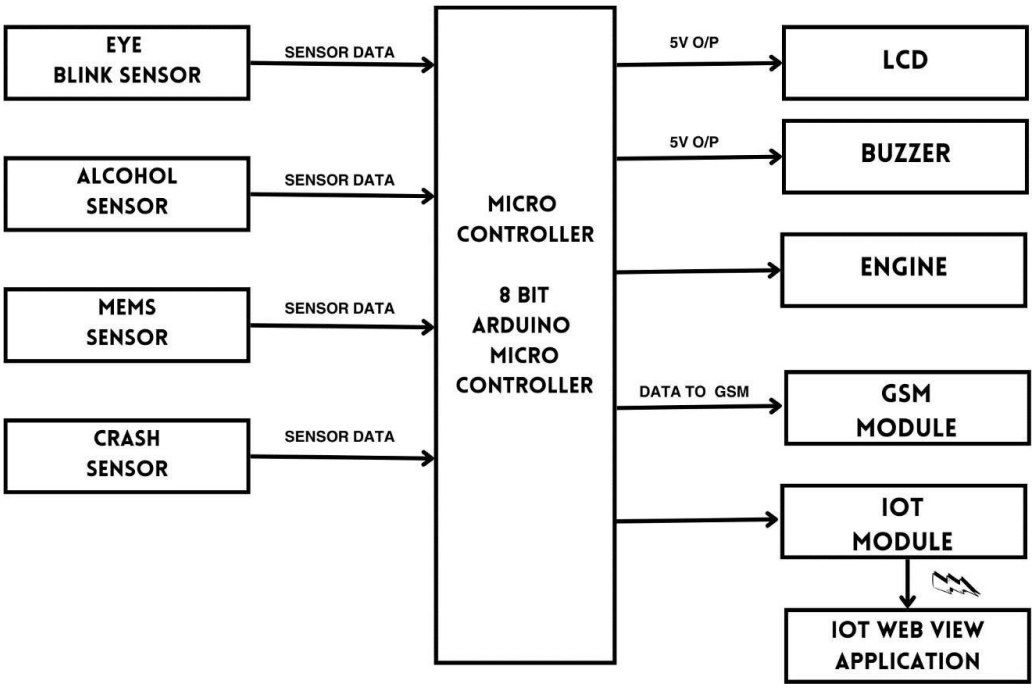

FIG 4.1 : BLOCK DIAGRAM OF PROPOSED SYSTEM

4.2 SCHEMATIC DIAGRAM :

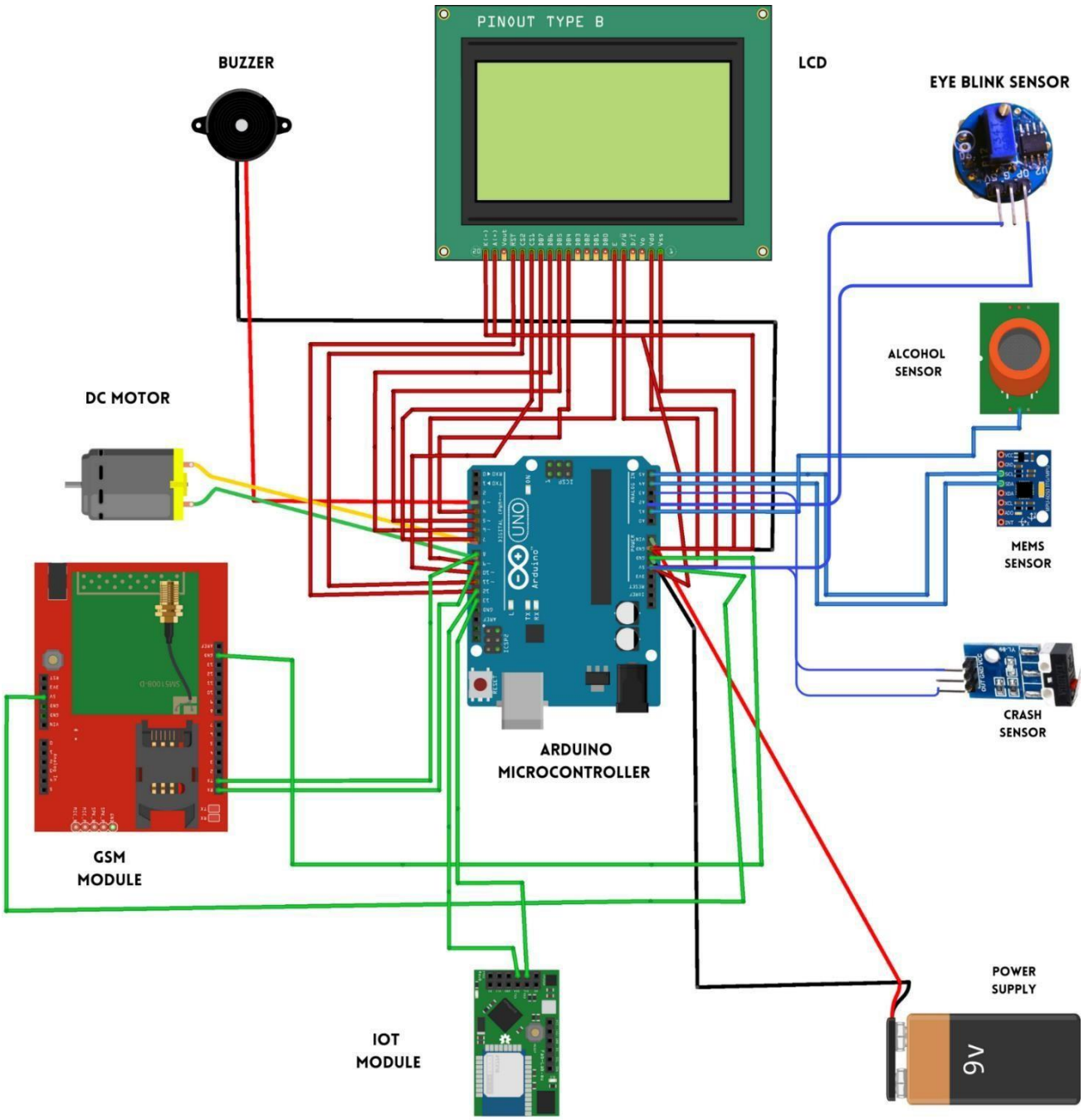

FIG 4.2 : SCHEMATIC DIAGRAM OF PROPOSED SYSTEM

4.3 FLOW DIAGRAM

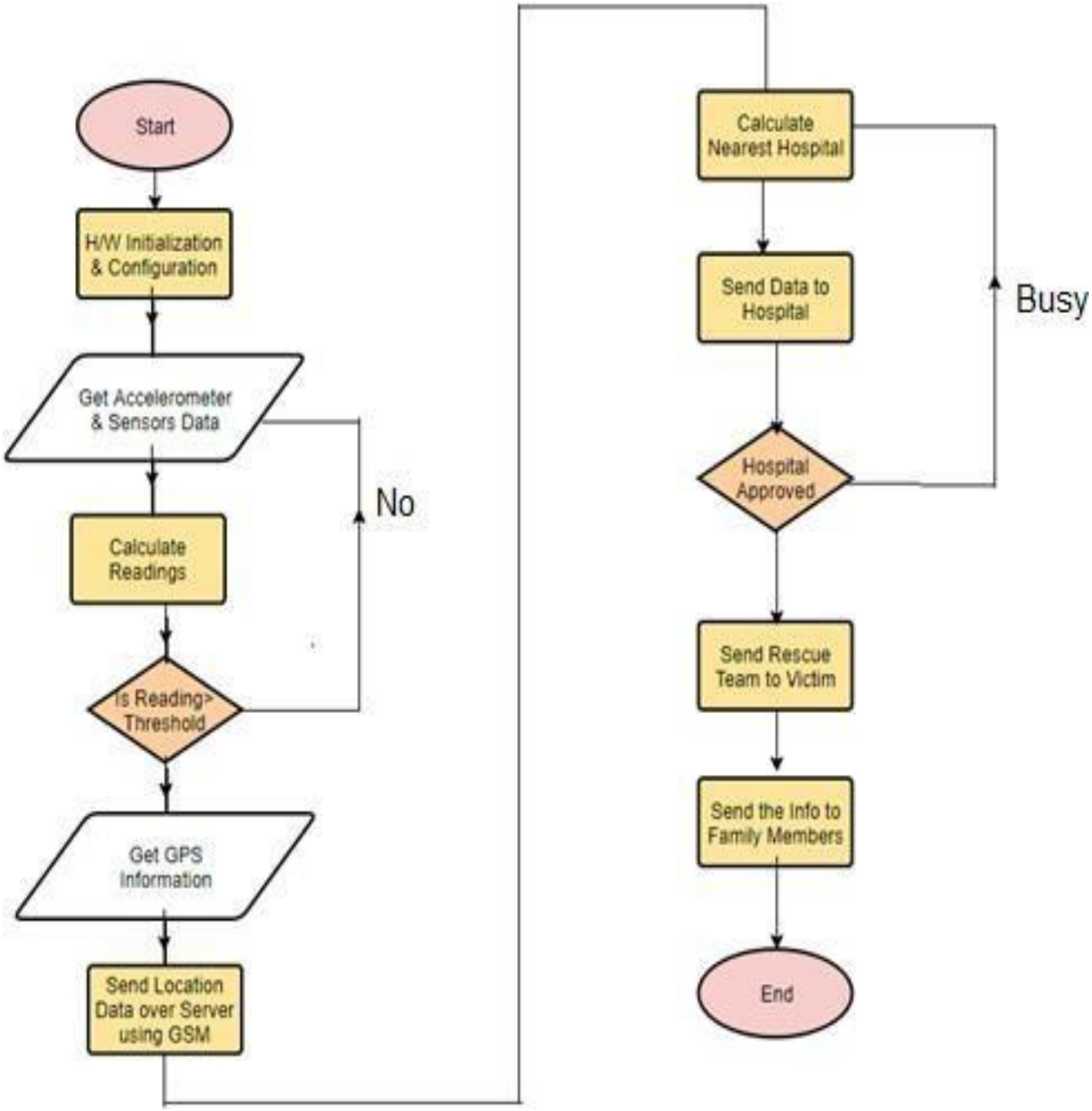

FIG 4.3 : FLOW DIAGRAM OF PROPOSED SYSTEM

CHAPTER-5

HARDWARE SYSTEM

Introducing the hardware requirements for our innovative accident detection and prevention system. Designed to deliver robust performance and reliability, our solution relies on cutting-edge sensors, cameras, and processing units. These components work in harmony to capture real-time data, analyze road conditions, and swiftly identify potential hazards. With a focus on durability, efficiency, and seamless integration, our hardware ensures optimal functionality in diverse environments and conditions. Join us as we pave the way for enhanced road safety through advanced technology and meticulous hardware design.

5.1 HARDWARE REQUIREMENTS :

- POWER SUPPLY
- MICRO CONTROLLER
- EYE BLINK SENSOR
- ALCOHOL SENSOR
- CRASH SENSOR
- MEMS SENSOR
- GPS MODULE
- GSM MODULE
- DC MOTOR
- LCD DISPLAY

5.2 HARDWARE DESCRIPTION :

5.2.1 POWER SUPPLY:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

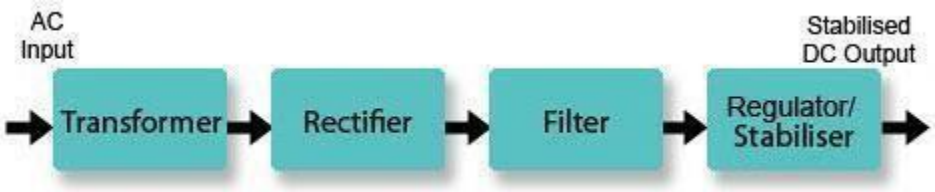

FIG 5.2.1 : WORKING SEQUENCE BEHIND POWER SUPPLY

1. TRANSFORMER :

Basic power supply the input power transformer has its primary winding connected to the mains (line) supply. A secondary winding, electro-magnetically coupled but electrically isolated from the primary is used to obtain an AC voltage of suitable amplitude, and after further processing by the PSU, to drive the electronics circuit it is to supply.

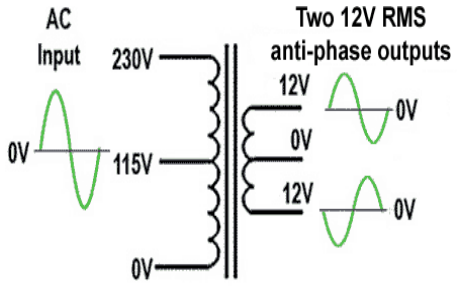

FIG 5.2.1.1 : SCHEMATIC DIAGRAM OF TRANSFORMER

The transformer stage must be able to supply the current needed. If too small a transformer is used, it is likely that the power supply's ability to maintain full output voltage at full output current will be impaired. With too small a transformer, the losses will increase dramatically as full load is placed on the transformer. As the transformer is likely to be the most costly item in the power supply unit, careful consideration must be given to balancing cost with likely current requirement. There may also be a need for safety devices such as thermal fuses to disconnect the transformer if overheating occurs, and electrical isolation between primary and secondary windings, for electrical safety.

2. RECTIFIER STAGE :

Rectifier circuit is used to convert the AC input is converted to DC. The full wave bridge rectifier uses four diodes arranged in a bridge circuit to give full wave rectification without the need for a center-tapped transformer.

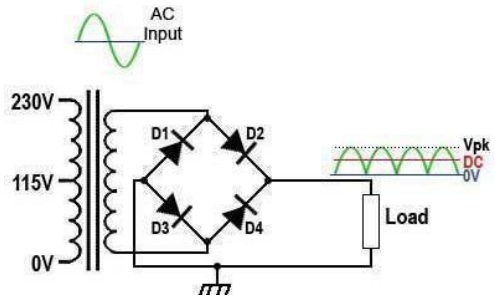

FIG 5.2.1.2 : SCHEMATIC DIAGRAM OF RECTIFIER

An additional advantage is that, as two diodes are conducting at any one time, the diodes need only half the reverse breakdown voltage capability of diodes used for half and conventional full wave rectification. The bridge rectifier can be built from separate diodes or a combined bridge rectifier can be used.

3. FILTER :

Typical power supply filter circuit can be best understood by dividing the circuit into two parts, the reservoir capacitor and the low pass filter. Each of these parts contributes to removing the remaining AC pulses, but in different ways.

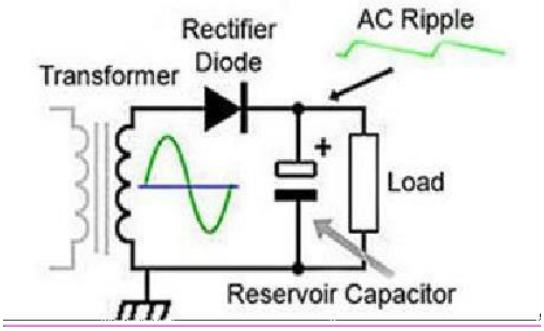

FIG 5.2.1.3 : SCHEMATIC DIAGRAM OF FILTER

Electrolytic capacitor used as a reservoir capacitor, so called because it acts as a temporary storage for the power supply output current. The rectifier diode supplies current to charge a reservoir capacitor on each cycle of the input wave. The reservoir capacitor is large electrolytic, usually Of several hundred or even a thousand or more microfarads, especially in mains frequency PSUs. This very large value of capacitance is required because the reservoir capacitor, when charged, must provide enough DC to maintain a steady PSU output in the absence of an input current; i.e. during the gaps between the positive half cycles when the rectifier is not conducting. The action of the reservoir capacitor on a half wave rectified sine wave. During each cycle, the rectifier anode AC voltage increases towards Vpk. At some point close to Vpk the anode voltage exceeds the cathode voltage, the rectifier conducts and a pulse of current flows, charging the reservoir capacitor to the value of Vpk.

4. REGULATOR :

Voltage regulator ICs are available with fixed or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current and overheating.

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and current.

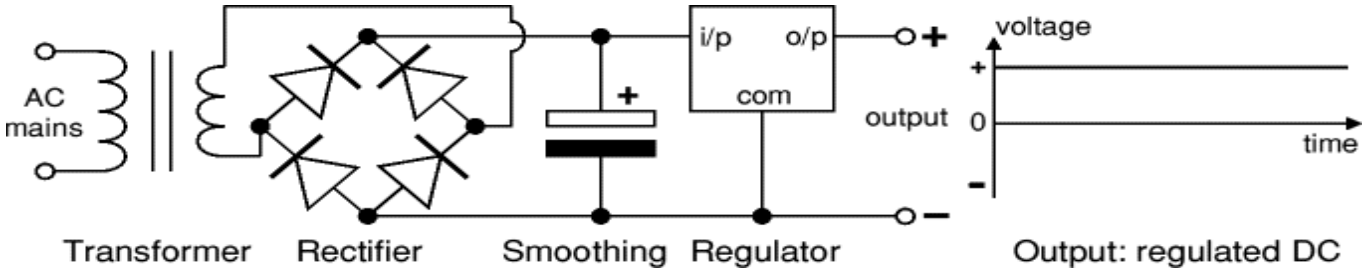

FIG 5.2.1.4 : SCHEMATIC DIAGRAM OF REGULATOR

5.2.2 MICROCONTROLLER (ARDUINO UNO ATMEGA328 P) :

The Arduino Uno, powered by the ATmega328P microcontroller, stands as a cornerstone in the world of embedded systems and DIY electronics. At its heart lies the ATmega328P, a high-performance, low-power 8-bit AVR microcontroller clocked at up to 16 MHz. Equipped with 32KB of flash memory, 2KB of SRAM, and 1KB of EEPROM, it offers ample resources for executing complex tasks while retaining data persistence across power cycles.

The Arduino Uno board itself serves as a user-friendly interface to this powerful microcontroller, featuring a straightforward layout with 14 digital input/output pins, 6 analog inputs, and a variety of communication interfaces including UART, SPI, and I2C. Its simplicity and accessibility make it an ideal platform for beginners learning the fundamentals of embedded programming, as well as seasoned developers prototyping sophisticated projects.

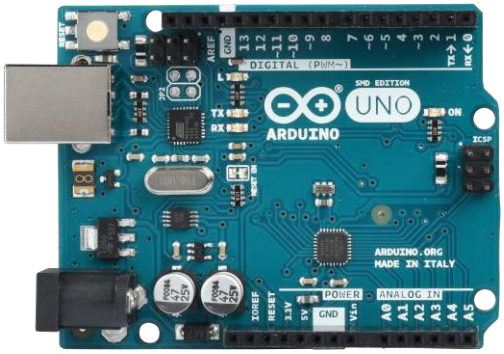

FIG 5.2.2 : SCHEMATIC DIAGRAM OF ARDUINO UNO

With its integrated USB interface, programming the Arduino Uno is seamless, allowing users to upload code directly from their computer and debug their applications in real-time. The open-source nature of Arduino further enhances its versatility, with a vast ecosystem of libraries and community-contributed resources readily available to streamline development and accelerate project implementation.

PIN DIAGRAM:

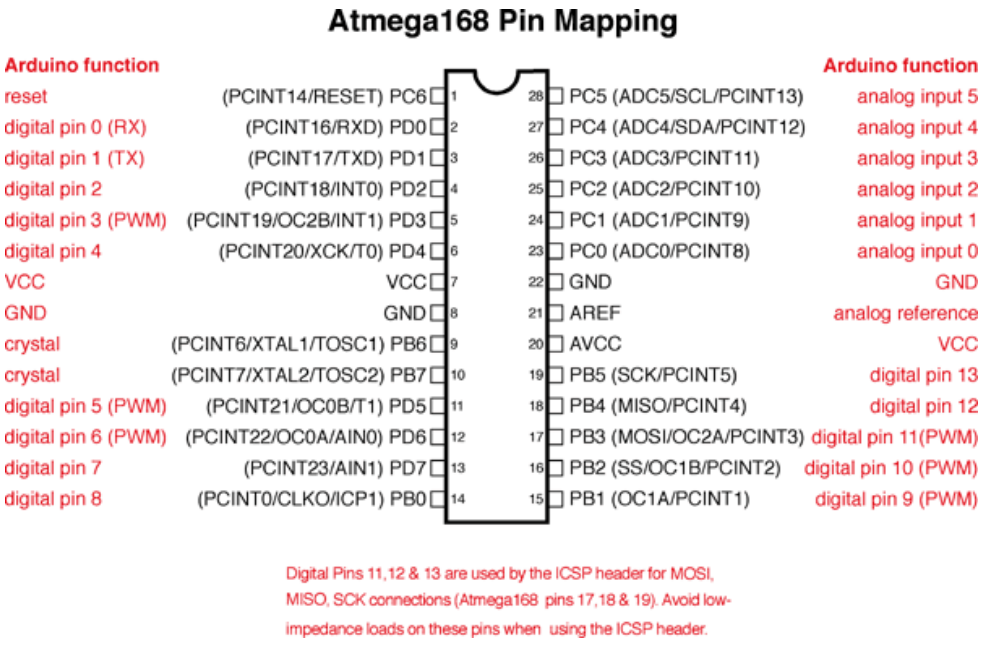

FIG 5.2.2.1 : PIN MAPPING OF ATmega168

5.2.3 EYE BLINK SENSOR :

Eye Blink Sensor (EBS) that will sense and alert the driver in drowsiness. A sensor for monitoring eye movements would be useful in warning drivers when they fall asleep. The driver's eye is continuously monitored using an IR sensor. The normal eye blink rate will have no effect on the output of the system. If Driver fell asleep, then IR sensor receives abnormal blinking rate & an alarm will ring, to wake him/her up. The sensor part of the EBM system is implemented as a goggle. This goggle is to be worn by the driver while driving the vehicle.

FIG 5.2.3 : EYE BLINK SENSOR GOGGLES

One common technique of monitoring eye blink rate is by measuring infrared (IR) light reflected from the surface of the eye.The eye is illuminated by an IR LED, which is powered by the +5V power supply and the reflected light is recorded by an IR photo diode. The IR photo diode converts this reflected light into electrical signal and given to Op-Amp. The output of Op-Amp depends on the intensity of light received by the IR photo diode. The micro-controller drives the buzzer according to output of Op-Amp. The digital display provides various messages to the user. When the eye is open, maximum amount of light will be reflected from the eye because our eyeball is transparent, while minimum of light will be reflected from the eye, when it is closed as skin part of eye is opaque.

5.2.4 ALCOHOL SENSOR :

A breathalyzer or breathalyser (a portmanteau of breath and analyzer/analyser) is a device for estimating blood alcohol content (BAC) from a breath sample. Breathalyzer is the brand name (a generalized trademark) for the instrument that tests the alcohol level developed by inventor Robert Frank Borkenstein. It was registered as a trademark on May 13, 1954, but many people use the term to refer to any generic device for estimating blood alcohol content.

Ethanol is a volatile, flammable, colourless liquid with a slight chemical odour. It is used as an antiseptic, a solvent, a fuel, and due to its low freezing point, the active fluid in many alcohol thermometers. The molecule is a simple one, being an ethyl group linked to a hydroxyl group. Alcohol Sensor for use in Breathalyzer’s or in an alarm unit, to detect the presence of alcohol vapours. The unit will work with a simple drive circuit and offers excellent stability with long life. When all the acetic acid is cleared

out of the FUEL CELL, the instrument is ready to analyse another sample. Grove - Alcohol Sensor is a complete alcohol sensor module for Arduino. It is built with MQ303A semiconductor alcohol sensor. It has good sensitivity and fast response to alcohol. It is suitable for making Breathalyzer. This Grove implements all the necessary circuitry for MQ303A like power conditioning and heater power supply. This sensor outputs a voltage inversely proportional to the alcohol concentration in air.

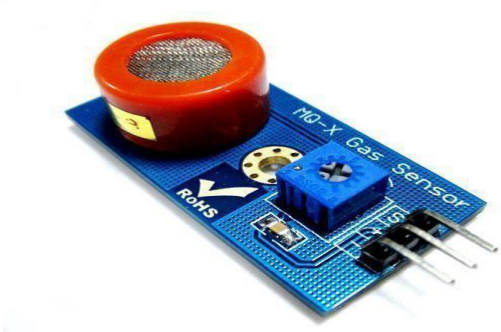

FIG 5.2.4 : MQ-X GAS SENSOR

1. ALCOHOL BREATH TESTING

- Drivers are initially tested for alcohol impairment at the roadside with a screening device. If this produces a positive test, evidential breath testing is performed at the police station. Motorists can be stopped and required to take a breath test by police at the scene of a road traffic accident, if a police officer suspects a motorist may be driving under the influence of alcohol, or if a motorist commits a moving traffic offence.

- Screening devices are about the size of old fashioned mobile phones. The driver blows into a disposable mouthpiece for each test. The whole process takes about a minute for the device to record the result.

- A sample of the ambient air is tested as a blank check. This is followed by a check sample of an air/ethanol standard. This checks the calibration of the device. The concentration of alcohol in the standard sample is 35 μg/100 ml air, which is the UK drink-driving limit.

- The driver is then asked to provide a sample of blood or urine for laboratory analysis. If the lower of the two results lies between 40 μg and 50 μg/100 ml breath, the driver has the right to ask for a blood sample. If the lower result is greater than 50 μg/100 ml breath, the driver is prosecuted.

- Devices used for evidential breath testing use either a fuel cell (as with the screening devices) or an infrared cell. An infrared cell directs infrared energy through the sample and any unabsorbed energy at the other side is detected. The higher the concentration of ethanol, the more infrared absorption occurs (in much the same way that a sunglass lens absorbs visible light, alcohol absorbs infrared light).
- Accuracy depends on the sample of breath being deep lung air (alveolar air). As the driver breathes out, the device continuously monitors the expired air using an infrared cell. The concentration of ethanol climbs as expiration continues, and when the level of ethanol stabilizes, the sample of breath is analyzed. This ensures accurate alcohol readings and means that the volume of air each person has to blow will depend on how large his or her lungs are.

- Alcohol in the mouth gives a rapid peak in ethanol concentration on the evidential test. If the infrared cell that monitors the breath alcohol profile detects such a peak the test is aborted and a blood sample is required instead.

These devices sometimes register “interfering substances.” If this happens the test is aborted and a blood sample is required. The maximum level of alcohol that may be accurately detected by evidential breath testers is 220 μg/100 ml air. The whole process takes 10 to 15 minutes with the fuel cell based instrument, and up to 5 minutes with the purely infrared based ones.

2. CHARACTERISTICS

- High sensitivity
- Fast response and resume
- Long life and low cost
- Mini Size

3. APPLICATION

- It has good sensitivity and fast response to alcohol, suitable for portable alcohol detector.
- Alcohol Detector project can be used in the various vehicles for detecting whether the driver has consumed alcohol or not.

- Breathing analyzer project can also be used in various companies or organization to detect alcohol consumption of employees. Alcohol detection system in an automobile is a must feature which every cab or bus should have.

4. ADVANTAGES

- Alcohol Detection System in Cars provides an automatic safety system for cars and other vehicles as well.

5.2.5 MEMS SENSOR :

MEMS is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements that are made using the techniques of micro fabrication. The critical physical dimensions of MEMS devices can vary from well below one micron on the lower end of the dimensional spectrum, all the way to several millimeters. Likewise, the types of MEMS devices can vary from relatively simple structures having no moving elements, to extremely complex electromechanical systems with multiple moving elements under the control of integrated microelectronics. The one main criterion of MEMS is that there are at least some elements having some sort of mechanical functionality whether or not these elements can move.

While the functional elements of MEMS are miniaturized structures, sensors, actuators, and microelectronics, the most notable elements are the micro sensors and micro actuators. Micro sensors and micro actuators are appropriately categorized as "transducers", which are defined as devices that convert energy from one form to another. In the case of micro sensors, the device typically converts a measured mechanical signal into an electrical signal.

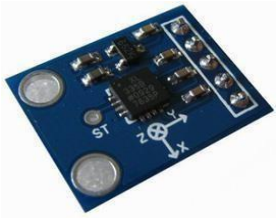

FIG 5.2.5 : MEMS SENSOR

More recently, the MEMS research and development community has demonstrated a number of micro actuators including: micro valves for control of gas and liquid flows; optical switches and mirrors to redirect or modulate light beams; independently controlled micro mirror arrays for displays.

1. ADVANTAGES:

- MEMS device are very small and can be applicable for many mechanical purposes where large measurements are needed.
- The small size of the device has also helped in reducing its cost.
- If two or three different devices are needed to deploy a particular process, all of them can be easily integrated in an MEMS chip with the help of microelectronics. Thus, data reception, filtering, storing, transfer, interfacing, and all other processes can be carried out with a single chip.

2. APPLICATIONS:

- The device is highly applicable as an **accelerometer** and thus can be deployed as airbag sensors or in digital cameras in order to stabilize the image.
- Can be used as a pressure sensor so as to calculate the pressure difference in blood, manifold pressure and also tire pressure.
- It is commonly used in a gyroscope, DNA chips and also inkjet printer nozzle.
- Optical MEMS is used for making projectors, optical fibre switch.
- RFMEMS is used for making antennas, filters, switches, relays, RAM's microphones, microphones.

5.2.6 CRASH SENSOR :

A crash sensor, also known as an impact sensor or collision sensor, is a vital component in vehicle safety systems designed to detect and respond to collisions or accidents. These sensors are crucial for deploying safety features such as airbags and activating emergency response systems in the event of a crash. By rapidly detecting sudden changes in acceleration or deceleration, crash sensors play a critical role in mitigating the impact of accidents and protecting vehicle occupants from injury.

FIG 5.2.6 : CRASH SENSOR

Crash sensors operate on the principle of measuring abrupt changes in motion or acceleration. They typically utilize accelerometers or gyroscopes to detect sudden accelerations or decelerations indicative of a collision. When the sensor detects a significant impact, it generates an electrical signal or triggers a switch, signaling the vehicle's safety systems to activate protective measures. This may include deploying airbags, tightening seatbelt pretensioners, or initiating automatic emergency calls to notify emergency services. Crash sensors are typically installed at strategic locations throughout the vehicle, such as the front, sides, or rear, to ensure comprehensive coverage and rapid response in the event of a crash.

The system interfaces with a communication module, such as a GSM (Global System for Mobile Communications) module, to send the alert messages or calls. It may also incorporate GPS (Global Positioning System) functionality to include location information in the alerts.

5.2.7 GPS MODULE :

GPS stands for Global Positioning System and was developed by the US Department of Defence as a worldwide navigation and positioning facility for both military and civilian use. It is a space-based radio-navigation system consisting of 24 satellites and ground support. GPS provides users with accurate information about their position and velocity, as well as the time, anywhere in the world and in all weather conditions. Navigation in three dimensions is the primary function of GPS. Navigation receivers are made for aircraft, ships, ground vehicles, and for hand carrying by individuals. GPS provides specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity and time.

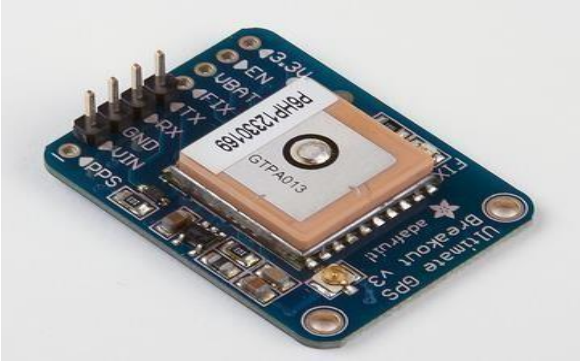

FIG 5.2.7 : GPS MODULE

Good GPS receivers can calculate their position, anywhere on earth, to within one hundred metres and can continuously update their position more than once a second. Of course, various factors, such as terrain and atmospherics can affect the GPS signals. In spite of this however, accuracy of one hundred metres for GPS will commonly be exceeded.

1. WORKING PRINCIPLE OF GPS

The Global Positioning System consists of a network of 24 broadcasting satellites orbiting the earth at a height of 20,200km. GPS also consists of receivers on the ground, which listen to and interpret the transmissions of the satellites.

The concept of ranging is best illustrated by example. Consider one satellite that is a distance of 25,000 kilometres from a person holding a GPS receiver. Then the person's position is known to be somewhere on a sphere 25,000 km in radius, cantered on the satellite. However, the exact location of the person on that sphere is yet unknown. If, at the same time, the distance from the person to a second satellite can be discovered to be 20,000 km, then a second sphere of radius 20,000 km on which the person is positioned can be determined.

Three satellites provide enough information to find the x, y, and z coordinates (measured from the centre of mass of the earth). However, in practice, four satellites are required to pinpoint a position, for reasons that will soon become clear.

- 21 GPS satellites and three spare satellites are in orbit at 10,600 miles above the Earth. The satellites are spaced so that from any point on Earth, four satellites will be above the horizon.

- Each satellite contains a computer, an atomic clock, and a radio. With an understanding of its own orbit and the clock, it continually broadcasts its changing position and time. (Once a day, each satellite checks its own sense of time and position with a ground station and makes any minor correction.)

- On the ground, any GPS receiver contains a computer that "triangulates" its own position by getting bearings from three of the four satellites. The result is provided in the form of a geographic position - longitude and latitude - to, for most receivers, within 100 meters.
- If the receiver is also equipped with a display screen that shows a map, the position can be shown on the map.
- If a fourth satellite can be received, the receiver/computer can figure out the altitude as well as the geographic position.
- If you are moving, your receiver may also be able to calculate your speed and direction of travel and give you estimated times of arrival to specified destinations.

The GPS is being used in science to provide data that has never been available before in the quantity and degree of accuracy that the GPS makes possible. Scientists are using the GPS to measure the movement of the arctic ice sheets, the Earth's tectonic plates, and volcanic activity.

2. LATITUDE AND LONGITUDE

Latitude and longitude are angles that uniquely define points on a sphere. Together, the angles comprise a coordinate scheme that can locate or identify geographic positions on the surfaces of planets such as the earth.

Latitude is defined with respect to an equatorial reference plane. This plane passes through the centre *C* of the sphere, and also contains the great circle representing the equator. The latitude of a point *P* on the surface is defined as the angle that a straight line, passing through both *P* and *C*, subtends with respect to the equatorial plane.

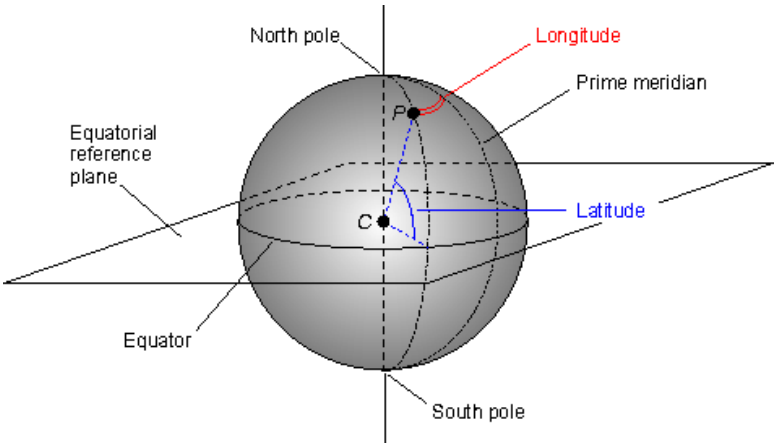

FIG 5.2.7.1 : LATITUDE AND LONGITUDE

Longitude is defined in terms of meridians, which are half-circles running from pole to pole. A reference meridian, called the prime meridian, is selected, and this forms the reference by which longitudes are defined. On the earth, the prime meridian passes through Greenwich, England; for this reason it is also called the Greenwich meridian. The longitude of a point *P* on the surface is defined as the angle that the plane containing the meridian passing through *P* subtends with respect to the plane containing the prime meridian.

3. FEATURES:

1. **Telling you where you are:** When you press the button Where Am I, the system will look at your gps position and will query the server to obtain information about your location. This feature is subject to the remote service limitations and may not work if the servers are too busy, if too many queries have been sent in a day or in a limited amount of time, etc.

2. **Letting you explore what's around you:** This feature is related to the visualization of a map of what's around you. This map is accessible with voice over. When you touch a point, after a short delay, you will be told the street information. Pointing your device toward a certain direction, you will have what's in front of you on the top half of the screen and what's behind you on the bottom half of the screen.

3. **Letting you explore a specific zone:** Everything like the previous point except that you can choose a zone by inserting street and city data.

4. **Periodically checking your position and telling where you are** (by only telling you the details changed since last check).This feature, called monitor, will periodically give you the information about your position.

5. **Letting you add and list your favorites points:** You can give a description of the point and the system will add the rest (Street, number, coordinates, etc.);

6. **Alerting you when you are close to one of your favorite points**: The app will inform you, on screen and via voice over, that you are close to a certain point you previously stored in your favorites list.

4. GPS APPLICATION

- Military
- Navigation
- Target Tracking
- Land, sea, air
- Mapping and surveying
- Missile and projectile guidance
- Search and rescue

5.2.8 GSM MODULE :

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates. There are various cell sizes in a GSM system such as macro, micro, Pico and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, Pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

FIG 5.2.8 : GSM MODULE

1. GSM ARCHITECTURE

A GSM network consists of the following components:

- **A Mobile Station:** It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.
- **Base Station Subsystem:** It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Controller which controls the Base Transceiver station and acts as an interface between the mobile station and mobile switching centre.
- **Network Subsystem:** It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the call routing and roaming capabilities of GSM.

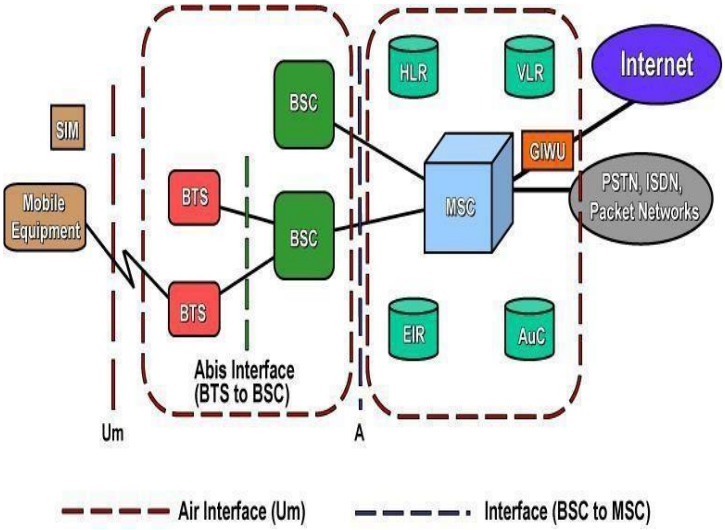

FIG 5.2.8.1 : GSM ARCHITECTURE

2. GSM MODEM WORKING PRINCIPLE

A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator.

A GSM modem can also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. GSM modem is usually preferable to a GSM mobile phone. The GSM modem has wide range of applications in transaction terminals, supply chain management, security applications, weather stations and GPRS mode remote data logging. Some GSM Modems also has GPRS feature that allows transmission of data over TCP/IP (internet).To transmit data using GSM Modem, there are various methods that can be used, such as:

- SMS
- CSD or HSCSD
- GPRS / UMTS

AT commands with a GSM/GPRS MODEM or mobile phone can be used to access following information and services:

- Information and configuration pertaining to mobile device or MODEM and SIM card.
- SMS services.
- MMS services.
- Fax services.
- Data and Voice link over mobile network.

3. TYPES OF AT COMMANDS

There are two types of AT commands:

- **Basic commands** are AT commands that do not start with "+". For example, D (Dial), A (Answer), H (Hook control), and O (Return to online data state) are basic commands.
- **Extended commands** are AT commands that start with "+". All GSM AT commands are extended commands. For example, +CMGS (Send SMS message), +CMGL (List SMS messages), and +CMGR (Read SMS messages) are extended commands.

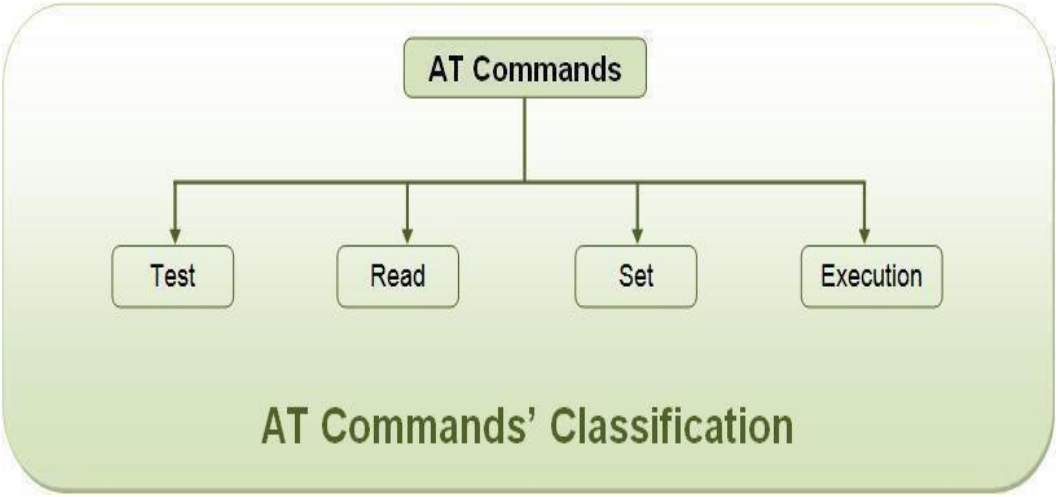

FIG 5.2.8.2 : AT COMMANDS

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

4. FEATURES:

- GSM supports multiple frequency levels like 900 MHz, 1800 MHz, 1900 MHz 1900MHz frequency is used.
- GSM technology facilitates with high speed integrated data, voice data, fax, mail, voice mail and mostly used SMS feature.
- GSM also make sure that all the communication made between networks are secured and protected from intruders and frauds.

5. APPLICATIONS

- SMS Gateway i.e. to send and receive SMS
- Telemetric to collect data from remote terminals
- SMS application, SMS solution, or SMS programme
- automatic reloading of pre-paid account with STK API
- machine to machine communication
- sending SMS from PC
- automating business process vehicle tracking with cell broadcast feature
- or with integrated GPS terminal

5.2.9 DC MOTOR :

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic field.DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

1.PRINCIPLE OF DC MOTOR

An Electric DC motor is a machine which converts electric energy into mechanical energy. The working of DC motor is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a mechanical force. The direction of mechanical force is given by Fleming’s Left-hand Rule and its magnitude is given by

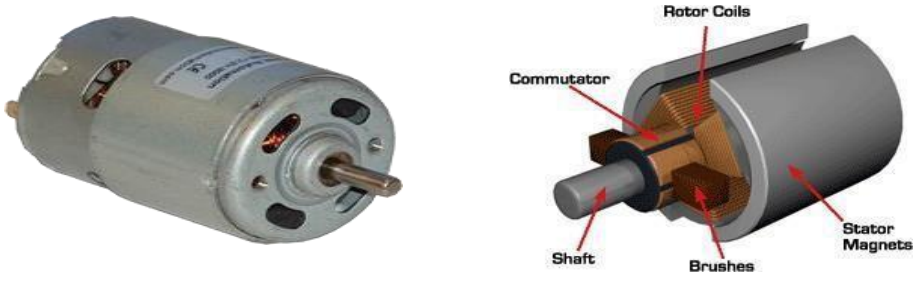

FIG 5.2.9 : WORKING OF DC MOTOR

There is no basic difference in the construction of a DC generator and a DC motor. In fact, the same D.C. machine can be used interchangeably as a generator or as a motor. Like generators DC motors are also classified in to shunt-wound, series- wound and compound-wound. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it.

A machine which transforms the DC power into mechanical power is called as a DC motor. Its operation relies on the principle that once a current carrying conductor is placed in a very magnetic field, the conductor experiences a mechanical force. The direction of this force is given by Fleming's left hand rule and magnitude is given by;

F=BIl Newton's

Force, $\mathbf{F = B\,I\,l}$ newton

Where , B is the magnetic field in weber/m^2.

I is the current in amperes and

l is the length of the coil in meter.

2. WORKING OF DC MOTOR

The armature conductors carry currents. All conductors under N-pole carry currents in one direction while all the conductors under S-pole carry currents in the opposite direction.

Suppose the conductors under N-pole carry currents into the plane of the paper and those under S-pole carry currents out of the plane of the paper as shown in Figure. Since each armature conductor is carrying current and is placed in the magnetic field, mechanical force acts on it. On applying Fleming's left hand rule, it is clear that force on each conductor is tending to rotate the armature in anticlockwise direction.

The armature conductors carry currents. All conductors below N-pole carry currents in one direction whereas all the conductors below S-pole carry currents within the opposite direction. Assume the conductors below N-pole carry currents into the plane of the paper and those below S-pole carry currents out of the plane of the paper which is shown in Fig. Since each armature conductor is carrying current and is placed within the magnetic field, mechanical force acts on that. Stating to the Fig and applying Fleming's left hand rule, it's clear that force on every conductor is tending to rotate the armature in anticlockwise direction. All these forces add along to provide a driving torsion that sets the armature rotating.

3. APPLICATIONS OF DC MOTORS

3.1 D.C SHUNT MOTORS

It is a constant speed motor. Where the speed is required to remain almost constant from no-load to full load. Where the load has to be driven at a number of speeds and any one of which is nearly constant.

3.2 INDUSTRIAL USE:

- Lathes
- Drills
- Boring mills
- Shapers

3.3 D.C SERIES MOTOR

It is a variable speed motor. The speed is low at high torque. At light or no load, the motor speed attains dangerously high speed. The motor has a high starting torque (elevators, electric traction).

3.4 D.C COMPOUND MOTOR:

Differential compound motors are rarely used because of its poor torque characteristics.

Industrial uses:

- Presses Shears
- Reciprocating machine.

3.1.1 LCD DISPLAY :

Liquid crystal cell displays (LCDs) used to display of display of numeric and alphanumeric characters in dot matrix and segmental displays.They are all around us in laptop computers, digital clocks and watches, microwave, CD players and many other electronic devices. LCDs are common because they offer some real advantages over other display technologies. LCDs consume much less power than LED and gas- display displays because they work on the principle of blocking light rather than emitting it.

An LCD is made with either a passive matrix or an active matrix display grid. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active matrix display can be switched on and off more frequently, improving the screen refresh time.

FIG 5.2.10 : LCD DISPLAY

1. WORKING

- When sufficient voltage is applied to the electrodes the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizer, which would result in activating/highlighting the desired characters. The power supply should be of +5v, with maximum allowable t ransients of 10mv. To achieve a better/suitable contrast for the display the voltage at pin 3 should be adjusted properly.
- The ground terminal of the power supply must be isolated properly so that voltage is induced in it. The module should be isolated properly so that stray voltages are not induced, which could cause a flicking display.
- LCD is lightweight with only a few, millimeters thickness since the LCD consumes less power, they are compatible with low power electronic circuits, and can be powered for long durations. LCD does not generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. LCDs have long life and a wide operating temperature range.
- Before LCD is used for displaying proper initialization should be done. LCDs with a small number of segments, such as those used in digital watches and pocket calculators, have individual electrical contacts for each segment. An external dedicated circuit supplies an electric charge to control each segment.

- Very slow response times and poor contrast are typical of passive matrix addressed LCDs. High-resolution color displays such as modern LCD computer monitors and televisions use an active matrix structure. A matrix of thin-film transistors (TFTs) is added to the polarizing and color filters. Each pixel has its own dedicated transistor, allowing each column line to access one pixel. When a row line is activated, all of the column lines are connected to a row of pixels and the correct voltage is driven onto all of the column lines. The row line is then deactivated and the next row line is activated. All of the row lines are activated in sequence during a refresh operation.
- Active-matrix addressed displays look "brighter" and "sharper" than passive-matrix addressed displays of the same size, and generally have quicker response times, producing much better images. A general purpose alphanumeric LCD, with two lines of 16 characters. So the type of LCD used in this project is16 characters * 2 lines with 5*7 dots with cursor, built in controller, +5v power supply, 1/16 duty cycle.

2. ADVANTAGES

- Consume much lesser energy when compared to LEDs.
- Utilizes the light available outside and no generation of light. Since very thin layer of liquid crystal is used, more suitable to act as display elements.
- Since reflectivity is highly sensitive to temperature, used as temperature measuring sensor.

3. DISADVANTAGES

- Angle of viewing is very limited.
- External light is a must for display.
- Since not generating its own light and makes use of external light for display.

CHAPTER 6

SOFTWARE IMPLEMENTATION

6.1 SOFTWARE REQUIREMENTS

- EMBEDDED C
- ARDUINO IDE

6.2 SOFTWARE DESCRIPTION

6.2.1 EMBEDDED C:

Embedded C is the most popular embedded software language in the world. Most embedded software is written in Embedded C. It is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. The C programming language is perhaps the most popular programming language for programming embedded systems.

Few embedded systems have capability for dynamic linking, so if standard library functions are to be available at all, they often need to be directly linked into the executable. Oftentimes, because of space concerns, it is not possible to link in an entire library file, and programmers are often forced to "brew their own" standard c library implementations if they want to use them at all.

C remains a very popular language for micro-controller developers due to the code efficiency and reduced overhead and development time. C offers low-level control and is considered more readable than assembly. Many free C compilers are available for a wide variety of development platforms. The compilers are part of an IDEs with ICD support, breakpoints, single- stepping and an assembly window. The performance of C compilers has improved considerably in recent years, and they are claimed to be more or less as good as assembly, depending on who you ask. Most tools now offer options for customizing the compiler optimization. Additionally, using C increases portability, since C code can be compiled for different types of processors.

- **BASIC CONCEPTS OF EMBEDDED C & EMBEDDED PROGRAMMING**

Embedded C, even if it's similar to C, and embedded languages in general requires a different kind of thought process to use. Embedded systems, like cameras or TV boxes, are simple computers that are designed to perform a single specific task. They are also designed to be efficient and cheap when performing their task.

It can run on a wide variety of processors, regardless of their architecture. Unlike high level languages, Embedded C requires less resources to run and isn't as complex. Some experts estimate that C is 20% more efficient than a modern language like C++. Another advantage of Embedded C is that it is comparatively easy to debug.

- **EMBEDDED C COMPILERS**

There are a variety of different compilers on the market, manufactured by different companies that use Embedded C. One of the more popular ones is the Keil compiler. Because of this, Embedded C is also sometimes known as Keil C. Embedded C has several keywords that are not present in C (learn more about the concept of keywords in this course).

- **EMBEDDED SYSTEMS PROGRAMMING**

Embedded systems programming is different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCs, are as follows:

Embedded devices have resource constraints(limited ROM, limited RAM, limited stack space, less processing power) Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components. Embedded systems are more tied to the hardware.

- **EMBEDDED SYSTEMS USING DIFFERENT TYPE OF LANGUAGES:**

1. Machine Code
2. Low level language, i.e., assembly
3. High level language like C, C++, Java, Ada, etc.
4. Application level language like Visual Basic, scripts, Access, etc.

- **DIFFERENCE BETWEEN C AND EMBEDDED C**

1. Though **C and embedded C** appear different and are used in different contexts, they have more similarities than the differences. Most of the constructs are same; the difference lies in their applications.
2. C is used for desktop computers, while **embedded C** is for microcontroller based applications. Accordingly, C has the luxury to use resources of a desktop PC like memory, OS, etc. While programming on desktop systems, we need not bother about memory. However, embedded C has to use with the limited resources (RAM, ROM, I/Os) on an embedded processor. Thus, program code must fit into the available program memory. If code exceeds the limit, the system is likely to crash.

3. Compilers for C (ANSI C) typically generate OS dependant executables. **Embedded C** requires compilers to create files to be downloaded to the microcontrollers/microprocessors where it needs to run. Embedded compilers give access to all resources which is not provided in compilers for desktop computer applications.
4. Embedded systems often have the real-time constraints, which is usually not there with desktop computer applications.

- **ADVANTAGES**

1. It is small and simple to learn, understand, program and debug and fairly efficient.
2. C Compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
3. Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems.

Many of these advantages are offered by other languages also, but what sets C apart from others like Pascal, FORTRAN, etc. is the fact that it is a middle level language; it provides direct hardware control without sacrificing benefits of high level languages.

6.2.2 ARDUINO SOFTWARE (IDE)

The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

- **WRITING SKETCHES**:

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension **.**ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information.

The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

NB: Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension .pde. It is possible to open these files with version 1.0, you will be prompted to save the sketch with the .ino extension on save.

- **SKETCHBOOK**

The Arduino Software (IDE) uses the concept of a sketchbook: a standard place to store your programs (or sketches). The sketches in your sketchbook can be opened from the File > Sketchbook menu or from the Open button on the toolbar.

The first time you run the Arduino software, it will automatically create a directory for your sketchbook. You can view or change the location of the sketchbook location from with the Preferences dialog.

- **TABS, MULTIPLE FILES, AND COMPILATION**

Allows you to manage sketches with more than one file (each of which appears in its own tab). These can be normal Arduino code files (no visible extension), C files (.c extension), C++ files (.cpp), or header files (.h).

CHAPTER 7

RESULTS AND DISCUSSION

7.1 WORKING OF PROPOSED SYSTEM :

The proposed system operates on a straightforward yet effective principle. When a collision occurs, sensors embedded within the vehicle promptly detect the impact and relay this information to the central processing unit, the Arduino microcontroller. Upon confirmation of the accident, the microcontroller springs into action, generating an alert message that encapsulates critical details such as the accident location and authorization information. This message is swiftly dispatched through the GSM modem, leveraging cellular network connectivity to reach designated recipients, including emergency services and authorized individuals. Concurrently, the IoT module integrated into the system facilitates precise location identification using GPS technology or triangulation methods, ensuring that emergency responders can swiftly navigate to the accident scene. Throughout this process, relevant data such as the time of the accident and environmental conditions are logged for subsequent analysis. By seamlessly integrating these components and processes, the proposed system enables real-time accident detection, prompt alert generation, and rapid emergency response, ultimately contributing to enhanced road safety and accident prevention efforts. Beyond accident detection and alerting, the system can support remote monitoring and diagnostics capabilities, allowing authorized personnel to remotely access and analyze real-time data streams from deployed vehicles. This proactive approach enables early identification of potential issues or anomalies, facilitating preventive maintenance and optimizing system performance.

7.2 REAL TIME SETUP OF PROPOSED SYSTEM :

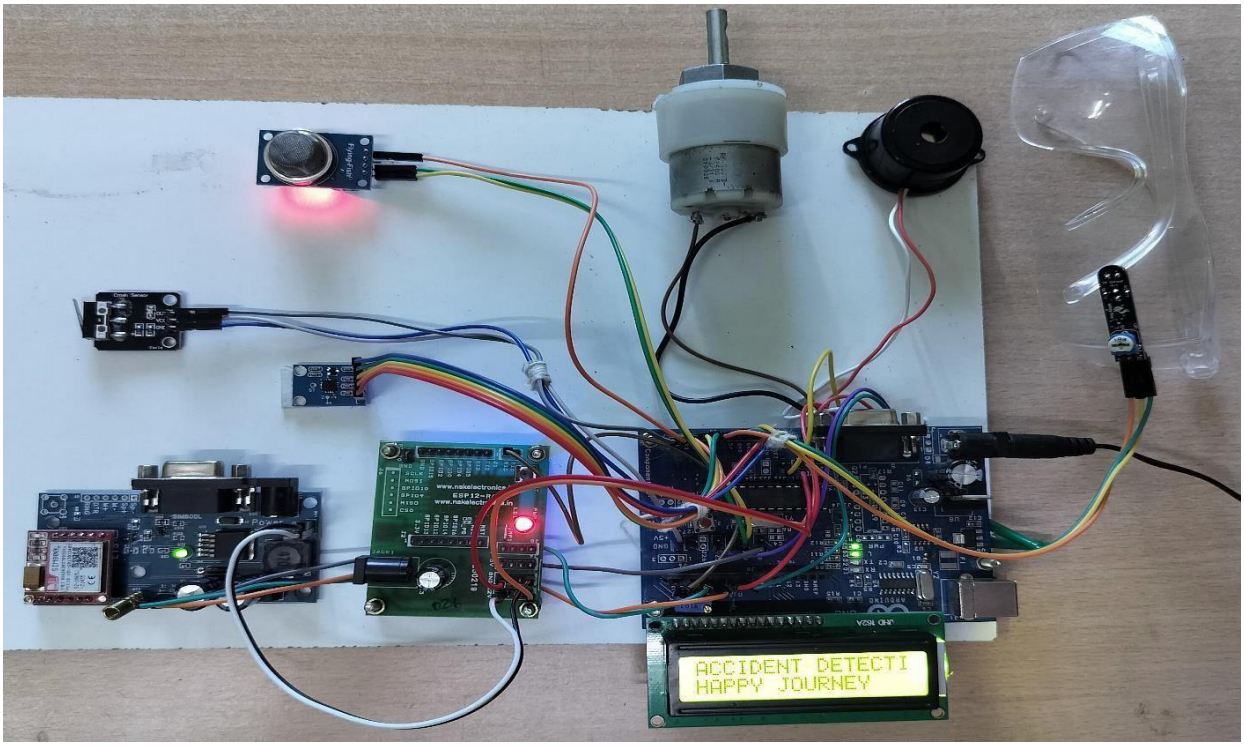

FIG 7.2 : REAL TIME SETUP OF PROPOSED SYSTEM

In the real-time setup of the proposed system, a compact yet sophisticated arrangement is evident. Within the vehicle, discreetly integrated sensors stand vigilant, ready to spring into action at the first sign of a collision. The Arduino microcontroller, the nerve center of the system, orchestrates the swift processing of incoming signals, confirming accidents and triggering alert mechanisms with precision. A sleek IoT device, seamlessly embedded within the vehicle's infrastructure, ensures seamless connectivity to cellular networks, enabling rapid transmission of accident alerts to designated recipients. Meanwhile, the GSM modem, a vital component of the system, stands ready to relay critical information, including the accident location and authorization details, to emergency services and authorized personnel. With these elements seamlessly integrated and meticulously calibrated, the real-time setup of the proposed system embodies efficiency, reliability, and unwavering readiness to tackle the challenges of road safety head-on.

7.3 REAL TIME ALERT MESSAGE AND COMMUNICATION :

In the domain of real-time alert messaging and communication, the proposed system emerges as a paradigm of efficiency and efficacy, augmented by its IoT module. Following the detection of a collision, the system swiftly orchestrates the generation of an alert message, encompassing crucial details like the accident location and authorization credentials. This message is expediently relayed through the system's GSM modem, leveraging cellular networks for rapid dissemination to predefined recipients, including emergency services and authorized personnel. Concurrently, the IoT module seamlessly interfaces with the system, facilitating precise location tracking and further enriching the alert message with real-time data insights.

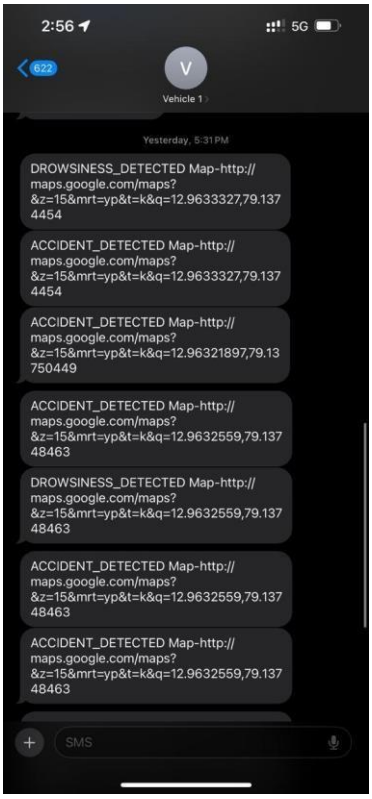

FIG 7.3.1 : ALERT MESSAGES

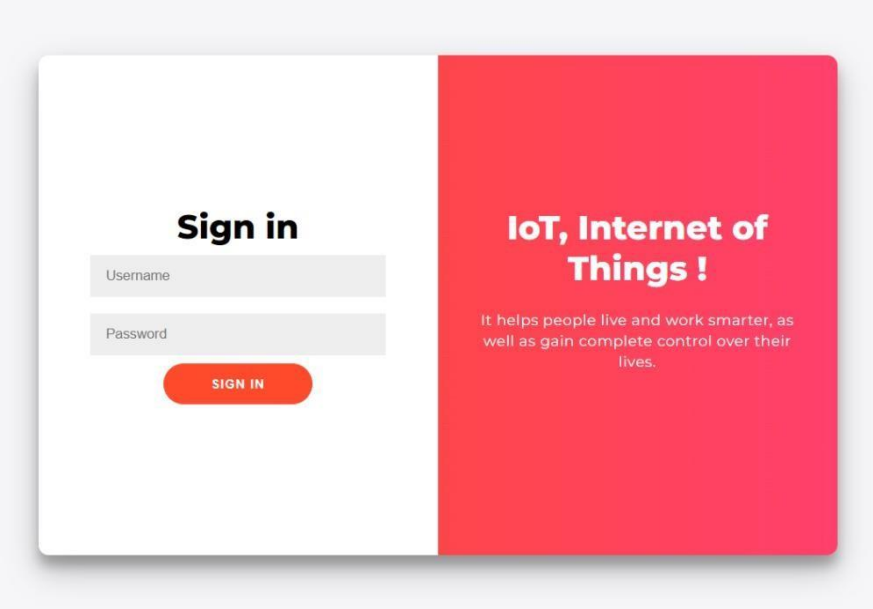

FIG 7.3.2 : IoT WEB VIEW APPLICATION

To access the live report, history of accidents, and real-time sensor data via the IoT web view application, users must log in using the provided credentials :

User ID: iot2k24026

Password: iot2k24026

Once logged in, users can navigate through the application's intuitive interface to access various features and functionalities. The live report section provides real-time updates on recent accidents, including their locations, timestamps, and severity levels. Users can also delve into the accident history to review past incidents and analyze trends over time.Furthermore, the application offers access to real-time sensor data, allowing users to monitor key metrics such as location, Sensor Values and environmental conditions. By leveraging the power of IoT technology, this data can provide valuable insights into road conditions and driving behavior, facilitating proactive measures to enhance road safety and prevent accidents.

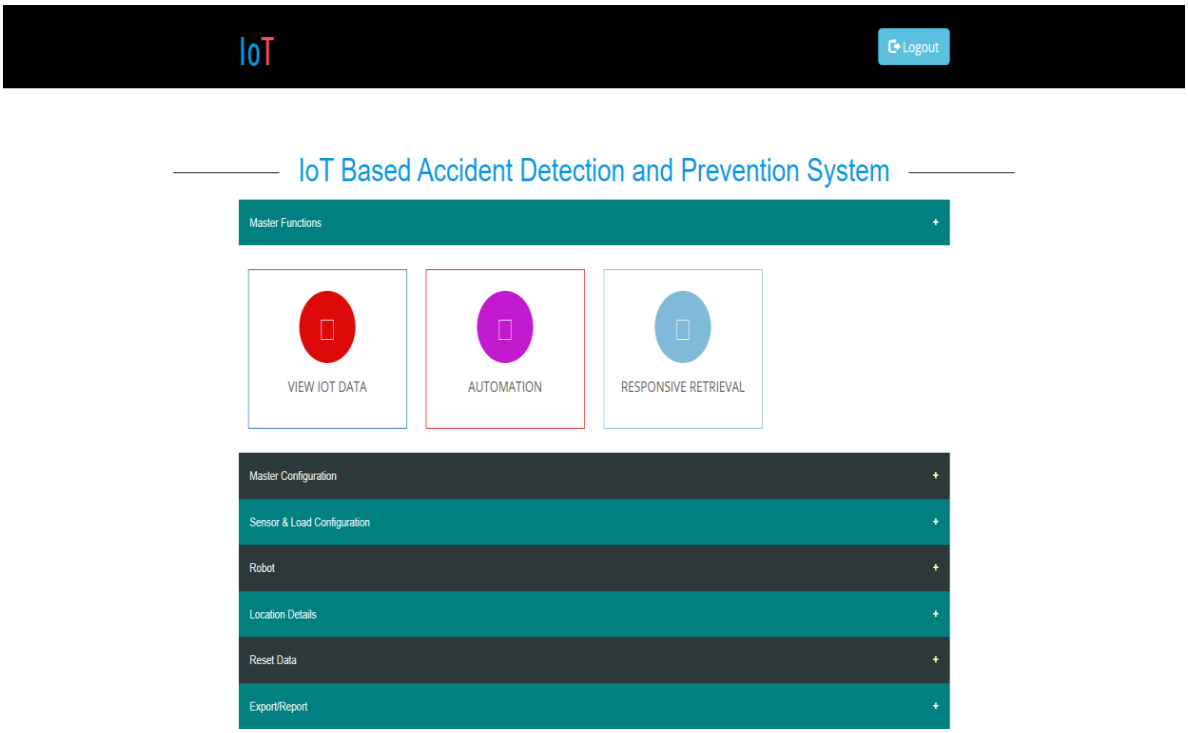

FIG 7.3.3 : HOME PAGE OF IoT WEB APPLICATION

FIG 7.3.4 : REAL TIME SENSOR VALUES

CHAPTER 8

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION :

In conclusion, the development of a robust accident detection system marks a significant stride towards enhancing road safety and emergency response mechanisms. The proposed system adeptly tackles the challenges of accident alerting and detection by harnessing advanced technologies and seamless integration of components. Leveraging Arduino's versatility, the system efficiently processes and relays critical information, including precise latitude and longitude coordinates, to the nearest emergency service providers in real-time. The integration of accelerometers and gyroscopes further enhances the system's capability to monitor accident dynamics, capturing crucial data on impact direction and vehicle rollover events. Through the seamless transmission of information via GSM modules and GPS tracking systems, the system ensures swift and accurate dissemination of accident details to registered recipients, enabling prompt intervention and potentially saving lives. In addition to its core functionalities, the developed system exemplifies versatility and adaptability in addressing various accident scenarios. By leveraging Arduino's flexible architecture, the system can seamlessly integrate with a multitude of sensors and devices, accommodating diverse vehicle types and environments. The utilization of gyroscope sensors enables the system to discern not only the occurrence of accidents but also their specific dynamics, providing invaluable insights for post-incident analysis and preventive measures. As we look towards the future, further advancements in IoT and sensor technologies hold the potential to enhance the system's capabilities, paving the way for more proactive and comprehensive accident prevention strategies. With its innovative approach and commitment to safety, the developed system stands poised to make a tangible impact in safeguarding lives on our roads.

8.2 FUTURE SCOPE :

Looking ahead, the future scope of this system holds immense potential for further innovation and enhancement. Integrating a wireless webcam into the system opens up new possibilities for providing comprehensive driver assistance and improving overall road safety. By capturing real-time images of the road environment and driver behavior, the system can offer valuable insights into potential hazards and assist drivers in making informed decisions. Furthermore, the addition of automatic brake locking functionality represents a significant advancement in accident prevention technology. By swiftly immobilizing the vehicle in the event of an accident, this feature has the potential to mitigate the severity of collisions and reduce the likelihood of secondary accidents caused by loss of control.

Expanding beyond accident detection and prevention, the system's versatility lends itself to a wide range of applications across various industries. From fleet management and food services to traffic violation monitoring and rental vehicle operations, the system's capabilities can be leveraged to enhance efficiency, safety, and compliance in diverse operational contexts. As we continue to explore opportunities for improvement and expansion, the future of this system is characterized by innovation, adaptability, and a steadfast commitment to promoting safer roadways and enhancing overall transportation systems. With ongoing advancements in technology and a proactive approach to addressing emerging challenges, this system remains poised to make a lasting impact on road safety and accident prevention efforts worldwide.

REFERENCES

[1] Ahmed, V., & Jawarkar, N. P. (2013). Design of Low Cost Versatile Microcontroller Based System Using Cell Phone for Accident Detection and Prevention. In 2013 6th International Conference on Emerging Trends in Engineering and Technology (pp. 73–77). https://doi.org/10.1109/ICETET.2013.17

[2] Alvi, U., Khattak, M., Shabir, B., Malik, A., & Ramzan, M. S. (2020). A Comprehensive Study on IoT Based Accident Detection Systems for Smart Vehicles. IEEE Access, PP, 1–1.https://doi.org/10.1109/ACCESS.2020.3006887

[3] Altameem, A., Kumar, A., Poonia, R. C., Kumar, S., & Saudagar, A. K. J. (2021). Early Identification and Detection of Driver Drowsiness by Hybrid Machine Learning. IEEE Access, 9, 162805–162819. https://doi.org/10.1109/ACCESS.2021.3131601

[4] Dogru, N., & Subasi, A. (2018). Traffic accident detection using random forest classifier. In 2018 15th Learning and Technology Conference (L&T) (pp. 40–45). https://doi.org/10.1109/LT.2018.8368509

[5] Ezzouhri, A., Charouh, Z., Ghogho, M., & Guennoun, Z. (2021). Robust Deep Learning-Based Driver Distraction Detection and Classification. IEEE Access, 9, 168080–168092. https://doi.org/10.1109/ACCESS.2021.3133797

[6] Fernandez, S., Ito, T., Cruz-Piris, L., & Marsa-Maestre, I. (2022). Fuzzy Ontology-Based System for Driver Behavior Classification. Sensors, 22(20), Art. no. 20. https://doi.org/10.3390/s22207954

[7] Karthikeyan, S., Kiruthik, J., Madumitha, S., Manikandan, R., & Prakash Raj, V. (2023). Design and Implementation of IoT Based Accident Detection and Prevention System. IEEE. https://doi.org/10.1109/ICOEI56765.2023.10125826

[8] Kim, K. G. (2016). Book Review: Deep Learning. Healthc Inform Res, 22(4), 351. https://doi.org/10.4258/hir.2016.22.4.351

[9] Kinage, V., & Patil, P. (2019). IoT Based Intelligent System For Vehicle Accident Prevention And Detection At Real Time. In 2019 Third International conference on ISMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC) (pp. 409–413). https://doi.org/10.1109/I-SMAC47947.2019.9032662

[10] Mohanta, B. K., Jena, D., Mohapatra, N., Ramasubbareddy, S., & Rawal, B. S. (2022). Machine learning based accident prediction in secure IoT enable transportation system. IFS, 42(2), 713–725. https://doi.org/10.3233/JIFS-189743

[11] Moosavi, S., Samavatian, M. H., Parthasarathy, S., & Ramnath, R. (2019). A Countrywide Traffic Accident Dataset. https://doi.org/10.48550/arXiv.1906.05409

[12] Muthukumaran, N., Prasath, N. R. G., & Kabilan, R. (2019). Driver Sleepiness Detection Using Deep Learning Convolution Neural Network Classifier. In 2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (ISMAC) (pp. 386–390). https://doi.org/10.1109/I-SMAC47947.2019.9032698

[13] Muthuramalingam, S., Bharathi, A., Rakesh kumar, S., Gayathri, N., Sathiyaraj, R., & Balamurugan, B. (2018). IoT Based Intelligent Transportation System (IoT-ITS) for Global Perspective: A Case Study. In Internet of Things and Big Data Analytics for Smart Generation (pp. 279–300). https://doi.org/10.1007/978-3-030-04203-5_13

[14] Nanda, S., Joshi, H., & Khairnar, S. (2018). An IOT Based Smart System for Accident Prevention and Detection. In 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA) (pp. 1–6). https://doi.org/10.1109/ICCUBEA.2018.8697663

[15] Onesimu, J. A., Kadam, A., Sagayam, K. M., & Elngar, A. A. (2021). Internet of things based intelligent accident avoidance system for adverse weather and road conditions. J Reliable Intell Environ, 7(4), 299–313. https://doi.org/10.1007/s40860-021-00132-7

APPENDIX - 1

ARDUINO CODE

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(13,12,11,10,9,8);
#include<SoftwareSerial.h>
SoftwareSerial sim(3,4);
 #include <math.h>
const int x_out = A1; /* connect x_out of module to A1 of UNO board */
const int y_out = A2; /* connect y_out of module to A2 of UNO board */
const int z_out = A3; /* connect z_out of module to A3 of UNO board */
const int eye= A0;
const int al=A4;
const int vib=A5;
const int buz=7;
const int mot=6;
void setup() {
  Serial.begin(9600);
  lcd.begin(16,2);
  pinMode(eye,INPUT);
  pinMode(al,INPUT);
  pinMode(vib,INPUT);
    pinMode(mot,OUTPUT);
      pinMode(buz ,OUTPUT);
  UCSR0B = (1<<RXEN0)|(1<<TXEN0);
/* Set frame format: 8data, 2stop bit */
UCSR0C = (1<<USBS0)|(3<<UCSZ00);
}

void loop() {
  lcd.setCursor(0,0);
  lcd.print("ACCIDENT DETECTION AND ALERT SYSTEM");
  lcd.setCursor(0,1);
  lcd.print("HAPPY JOURNEY");
    acc:
  int x_adc_value, y_adc_value, z_adc_value;
  double x_g_value, y_g_value, z_g_value;
  double roll, pitch, yaw;
  x_adc_value = analogRead(x_out); /* Digital value of voltage on x_out pin */
  y_adc_value = analogRead(y_out); /* Digital value of voltage on y_out pin */
  z_adc_value = analogRead(z_out); /* Digital value of voltage on z_out pin */
//  Serial.print("x = ");
//  Serial.print(x_adc_value);
//  Serial.print("\t\t");
//  Serial.print("y = ");
//  Serial.print(y_adc_value);
//  Serial.print("\t\t");
```

```
//  Serial.print("z = ");
//  Serial.print(z_adc_value);
//  Serial.print("\t\t");
//  delay(100);

  x_g_value = ( ( ( (double)(x_adc_value * 5)/1024) - 1.65 ) / 0.330 );
  y_g_value = ( ( ( (double)(y_adc_value * 5)/1024) - 1.65 ) / 0.330 );
  z_g_value = ( ( ( (double)(z_adc_value * 5)/1024) - 1.80 ) / 0.330 );

  roll = ( ( (atan2(y_g_value,z_g_value) * 180) / 3.14 ) + 180 ); /* Formula for roll */
  pitch = ( ( (atan2(z_g_value,x_g_value) * 180) / 3.14 ) + 180 ); /* Formula for pitch */
  //yaw = ( ( (atan2(x_g_value,y_g_value) * 180) / 3.14 ) + 180 ); /* Formula for yaw */
  /* Not possible to measure yaw using accelerometer. Gyroscope must be used if yaw is also
required */

//  Serial.print("Roll = ");
//  Serial.print(roll);
//  Serial.print("\t");
//  Serial.print("Pitch = ");
//  Serial.print(pitch);
//  Serial.print("\n\n");
//  delay(1000);

 if(z_adc_value <=400 )
  {
    digitalWrite(mot,LOW);
//    Serial.println("acciedent detected");
    lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("ACCIEDENT DETECTIED");
  lcd.setCursor(0,1);
  lcd.print("VEHICLE TILTED");
  delay(200);
  sim.print("AT");
  delay(50);
  sim.write(0x0d);
  delay(500);
  sim.print("AT+CMGF=1");
  delay(50);
  sim.write(0x0d);
  delay(500);
  sim.print("AT+CNMI=2,2,0,0,0"); // AT Command to recieve a live SMS
  delay(50);
  sim.write(0x0d);
  delay(500);
  sim.print("AT+CMGS=\"+919384949866\"");
  delay(50);
  sim.write(0x0d);
  delay(50);
  sim.println("ALERT ACCEDENT DETECTED");
```

```
    delay(1000);
  sim.write(0x1a);
  delay(5000);
  sim.println("AT");
     delay(1000);
     sim.println("AT+CMGF=1");
     delay(1000);
    sim.println("9384949866;"); //TO MAKE VOICE CALL
     delay(1000);
  delay(1000);
    // digitalWrite(buzzer, LOW);   // turn the LED on (HIGH is the voltage level)
    delay(10);
    Serial.print("sensornewgsm.php?client=iot2k24026&s1=");
Serial.print("ACCIDENT");
Serial.print("&s2=NA&s3=NA&s4=NA&s5=NA&sms=YES&msg=ALERT_ACCIDENT_DETECTED_IN_GIVEN_LOCATION
#");

  }
  else
  {
     digitalWrite(buz,LOW);
     digitalWrite(mot,HIGH);
  }
  int alc=analogRead(A4);
//  Serial.println("alc");
// Serial.println(alc);
  delay(1000);digitalWrite(mot,HIGH);
  if(alc>=300)
  {
    digitalWrite(mot,LOW);
    digitalWrite(buz,HIGH);
    lcd.clear();
  lcd.setCursor(4,0);
  lcd.print("DRUKEN");
  lcd.setCursor(4,1);
  lcd.print("DRIVING"); delay(1000);
      Serial.print("sensornewgsm.php?client=iot2k24026&s2=");
Serial.print("ALCOHOL");
Serial.print("&s1=NA&s3=NA&s4=NA&s5=NA&sms=YES&msg=ALCOHOL_DETECTED#");
delay(1000);
  }
  else
  {
    digitalWrite(mot,HIGH);
     digitalWrite(buz,LOW);
  }
  int eye=analogRead(A0);
//  Serial.println("eye");
// Serial.println(eye);
  if(eye>0)
```

```
  {
    digitalWrite(buz,HIGH);
     lcd.clear();
  lcd.setCursor(4,0);
  lcd.print("DROWSINESS ");
  lcd.setCursor(4,1);
  lcd.print("DETECTED"); delay(1000);
      Serial.print("sensornewgsm.php?client=iot2k24026&s3=");
Serial.print("DROWSINESS");
Serial.print("&s1=NA&s2=NA&s4=NA&s5=NA&sms=YES&msg=DROWSINESS_DETECTED#");
delay(1000);
  }
  else
  {
     digitalWrite(buz,LOW);
  }
  delay(1000);
    int vib=analogRead(A5);
//  Serial.println("vib");
// Serial.println(vib);
    delay(1000);
    if(vib<=100)
  {
    digitalWrite(mot,LOW);
    digitalWrite(buz,HIGH);
         lcd.clear();
  lcd.setCursor(4,0);
  lcd.print("VEHICLE ");
  lcd.setCursor(4,1);
  lcd.print("CRASHED");
       Serial.print("sensornewgsm.php?client=iot2k24026&s4=");
Serial.print("ACCIDENT");
Serial.print("&s1=NA&s2=NA&s3=NA&s5=NA&sms=YES&msg=ACCIDENT_DETECTED#");
delay(1000);
  }
  else
  {
     digitalWrite(mot,HIGH);
     digitalWrite(buz,LOW);
  }
  }
  void USART_Transmit( unsigned char data )
{
/* Wait for empty transmit buffer */
while ( !( UCSR0A & (1<<UDRE0)) );
/* Put data into buffer, sends the data */
UDR0 = data;
}

unsigned char USART_Receive( void )
```

```
{
/* Wait for data to be received */
while ( !(UCSR0A & (1<<RXC0)) );
/* Get and return received data from buffer */
return UDR0;
}
```