CHAPTER 1

INTRODUCTION

The thought of developing this project comes from social responsibility towards the society. As we can see many accidents occurring around us, there is a lot of loss of life. According to a survey of India there are around 1200 accidents occurring due to bike crashes per day. The major factors responsible for these accidents is due to irresponsible driving, lack of fitness of the bike, rash driving, drinking and driving etc. In certain circumstances, the person who was injured in the accident may not have been directly at fault; instead, it might have been the fault of another rider, but at the end of the day, both of the drivers engaged in the accident will bear the brunt of the consequences.

As increase in the consumption of alcohol by the vehicle drivers, there has been hike in the number of accidents taking place. To avoid this, this project is designed in such a way that it detects whether the person is wearing the helmet or not. In addition to this, it checks the alcohol consumption of the rider and switches on the engine accordingly.

1.1 PROBLEM STATEMENT

Road accidents results in death of human life. It was noted, with deep concern that most of these deaths occur as a result of late response by emergency services especially for accident occurring in remote areas or at night where there is no witness or a means of alerting the responsible authorities such as police, emergency services responders and or relatives. Furthermore, each minute that an injured crash victim does not receive emergency medical care can make a significant difference in their survival rate, i.e., Analysis shows that reducing accident response time by one-minute correlates to a 6% difference in the number of lives saved. This project seeks to reduce the time taken between accident time and notifying the emergency responders of the accident occurrence

1.2 MOTIVATION

There is currently no technology available to detect accidents. In golden hours, there is a loss of life since it is done manually. The accident victim is reliant on the kindness of others to get him to the hospital. Often, an accident stays unreported for hours before assistance arrives. Because of all of these conditions, accident victims have a high fatality rate. Furthermore, due to traffic

congestion between the accident site and the hospital, the ambulance takes longer to arrive at the hospital, increasing the odds of the person dying.

Although automobiles save us a great deal of time on the road, they also increase the chance of accidents. For the prevention from such accidents, modern additional technologies are used. In the process of our project, there are sensors, electrical modules, and a microcontroller unit to aid in accident prevention, detection of accidents that occur despite preventative measures, and reporting to the ambulance service.

1.3 OBJECTIVES

- To create a system that can increase the vehicle safety while driving.
- To design system reduces number of accidents due to drinking and driving.
- To create a system that makes sure that the driver is wearing a helmet.
- To create a sense of responsibility among the people.
- The main objective of the system is to provide help and need for the vehicle user and detects the accident if occurred and informs the respective authority through wireless technologies such as GSM and GPS.
- The purpose of the project is to find the vehicle it is located be means of sending a message using a system which is placed inside a vehicle system.

CHAPTER 2

LITERATURE REVIEW

The literature survey for IMPLEMENTATION OF IOT BASED ACCIDENT PREVENTION SYSTEM is as follows:

[1] U. Alvi, M. A. K. Khattak, B. Shabir, A. W. Malik and S. R. Muhammad, "A Comprehensive Study on IoT Based Accident Detection Systems for Smart Vehicles," in IEEE Access, vol. 8, pp. 122480-122497, 2020, doi: 10.1109/ACCESS.2020.3006887. With population growth, the demand for vehicles has increased tremendously, which has created an alarming situation in terms of traffic hazards and road accidents. The road accidents percentage is growing exponentially and so are the fatalities caused due to accidents. However, the primary cause of the increased rate of fatalities is due to the delay in emergency services. Many lives could be saved with efficient rescue services. The delay happens due to traffic congestion or unstable communication to the medical units. The implementation of automatic road accident detection systems to provide timely aid is crucial. Many solutions have been proposed in the literature for automatic accident detection. The techniques include crash prediction using smartphones, vehicular ad-hoc networks, GPS/GSM based systems, and various machine learning techniques. With such high rates of deaths associated with road accidents, road safety is the most critical sector that demands significant exploration. In this paper, we present a critical analysis of various existing methodologies used for predicting and preventing road accidents, highlighting their strengths, limitations, and challenges that need to be addressed to ensure road safety and save valuable lives.

[2] Dr. T. Kalaichelvi, Dr. V. Subedha, Mrs. APorselvi, S. Krishna, S. Divakar “Smart Accident Prevention Technique by using Brain Wave Signal”, IJERT,2022 Brain Wave Sensor observes the human brain, and Neuro Sky provides Brainwave Headphones to feel it. Electroencephalography (EEG) is a well-established approach enabling for recording of human brain-electrical activity. EEG signals refer to absorb brain activity and they are frequently acquired to address clinical as well as research questions. Many studies in the search field of cognitive neuroscience rely on EEG [2] since EEG hardware is available at relatively low cost. EEG signals also enable us to observe the signal such as attention, speech, or memory operations with millisecond precision. BCI (Brain-computer interfaces) typically make use of EEG signals. The aim is to identify cognitive states from Electroencephalogram signatures in real-time to exert control without any muscular involvement.

advantage from a machine learning signal processing approach. The application of BCI (Brain-Computer Interface) is speller systems which provide a communication channel for fully paralyzed individuals e.g., motor imagery BCI systems promise to control prostheses by thought alone, and BCI error monitoring systems have been shown to reliably detect car driver emergency braking intentions even before the car driver can hit a brake automatically, thereby supporting future braking assistance systems. With the help of this EEG Accident prevention system, we can avoid accidents.

[3] S.Uma, Eswari Rajagopal, "Accident prevention and safety assistance using IOT and machine learning", JRIE,2022 Transportation is playing a vital role in our daily life and its development has made many of our chores much easier. But in recent years, driver drowsiness, distractions, and speed limit crossing cause ruinous road accidents which lead to fatalities. Slumbering, dozing, alcohol consumption cause intrusiveness which needs to alert the driver before a mishap happens. In this paper, a prototype is designed using Raspberry Pi, Pi Camera, sensors for monitoring driver's eye movements, detecting yawning, detecting toxic gases, and alcohol consumption to prevent accidents and provide safety assistance to drivers. Internet of Things and machine learning-enabled system is implemented in vehicles for transmitting the behaviour of the driver and his driving pattern to the cloud to take quick response under emergency situations. Several lives are saved by alerting the driver with help of a sound system that is deemed to prevent any distractions before happen. The cloud services and machine learning are employed in identifying fatigue drivers through the collected and stored dataset from cloud services. The device is experimentally tested, and the results show its efficiency and effectiveness.

[4] S Surya, Abdul Quadir, Arun Kumar Sivaraman, "IoT-Based Accident Prevention System Using Machine Intelligence", IJERT ,2021 Reckless driving is a major traffic violation, caused by exceeding the speed limit, changing lanes irregularly, the drowsiness of drivers, or influence of drugs or alcohol on them. This dangerous driving practice often results in road accidents and injury or death of many innocent people. Therefore, we have come up with a new idea for this sector. Our system intends to implement a disciplined online payment service in the buses using an android application so that we can lessen the competitive tendency of the drivers to take more and more passengers. Using the application, passengers can view the location of nearby available buses. It will save their time and reduce congestion on the buses too. We will calculate the fare in the app through the scanning of QR (Quick Response Code) in and out code by the passengers. Before getting down from the bus, passengers can press a buzzer kept in front of their seats. It will also cause the LED (Light Emitting Diode) to lighten up beside the driver so that he can stop the

bus at the right stoppage. Another two features of our system are drowsiness detection of the driver and lane detection of the bus. Whenever the driver will be either drowsy or will be in the wrong lane, the pi camera kept in front of him will trace the abnormality, and also the LED will be on. As a result, the driver will be alerted for safe driving. As we all know, prevention is better than cure, so our motto is to decrease the number of road accidents to a noticeable extent by preventing the vital cause of reckless driving. Therefore, just a little bit more caution from our positions can ensure a safer life for us.

[5] S. Shafiulla Basha, B. P. Santosh Kumar, Syed. Jahangir Badashah ,"Smart Helmet for Bike Riders Safety", IJRASET,2022 With the growing number of 2-wheel motor vehicles, the frequency of accidents is on the rise. A major portion of the fatalities occur because the person was either not wearing a helmet, or his accident was not reported in time, and he could not be saved because of the delayed admittance to a hospital, or because he was riding while drunk. For this purpose, we use onboard sensors – gas Sensor, mems sensor. The accelerometer measures the change in tilt, in X Y and Z axes respectively, and sends the data to a server via an online application programming interface (API). The breath analyser senses the amount of alcohol present in the breath of a person wearing the helmet and reports if it is beyond the legal limit. This can help optimize accident detection in the future when enough data is gathered to provide reliable accuracy. This will ensure the holistic safety of the rider at all times. This project presents an alert of the accident detection techniques by using smart helmet detection.

CHAPTER 3

HARDWARE AND SOFTWARE REQUIREMENTS

The accident prevention system detects whether the rider is wearing the helmet and checks the alcohol consumption level. To implement the design of the accident prevention system, there is a requirement of various hardware and software components. This is a short description of all the components used and their uses.

3.1 HARDWARE REQUIREMENTS

3.1.1 ARDUINO UNO R3

The Arduino Uno is an open-source microcontroller board designed by Arduino.cc that is based on the Microchip ATmega328P microprocessor. The board has a number of digital and analogue input/output (I/O) pins that may be used to connect to various expansion boards (shields) and other circuits. The board features 14 digital I/O pins (six of which are capable of PWM output), 6 analogue I/O pins, and is programmable through a type B USB cable using the Arduino IDE (Integrated Development Environment). It may be powered by a USB connection or an external 9-volt battery, and it handles voltages ranging from 7 to 20 volts.

Fig 3.1: Arduino Uno R3

3.1.2 IR-SENSOR

An Infrared Sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR Sensor can measure the heat of an object as well as detects the motion.

The Types of Infrared Sensors:

Infrared sensors can be active or passive and they can be split into two main types:

- **Thermal infrared sensors** – use infrared energy as heat. Their photo sensitivity is independent of the wavelength being detected. Thermal detectors do not require cooling but do have slow response times and low detection capabilities.
- **Quantum infrared sensors** – provide higher detection performance and faster response speed. Their photo sensitivity is dependent on wavelength. Quantum detectors have to be cooled in order to obtain accurate measurements.

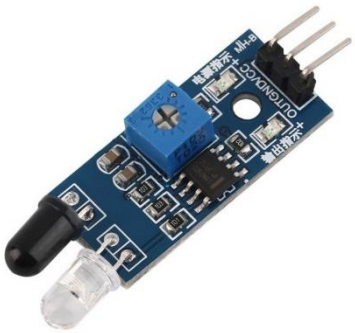

Fig 3.2: IR Sensor

3.1.3 ALCOHOL SENSOR

MQ3 is one of the most commonly used sensors in the MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type of sensor. Metal oxide sensors are also known as **Chemiresistors**, because sensing is based on the change of resistance of the sensing material when exposed to alcohol.

Fig 3.3: Alcohol Sensor

3.1.4 RELAYS

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Applications:

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays are used in a wide variety of applications throughout industry, such as in telephone exchanges, digital computers and automation systems.

Fig 3.4: Relay

3.1.5 POWER SOURCE

These batteries can provide hundreds of amps of electrical current for a short period of time. This is why these batteries are commonly used in automotive applications. Not all 12-volt, lead-acid batteries are interchangeable, however. It is important to consider the automobile's electrical requirements before attempting to install a 12-volt battery.

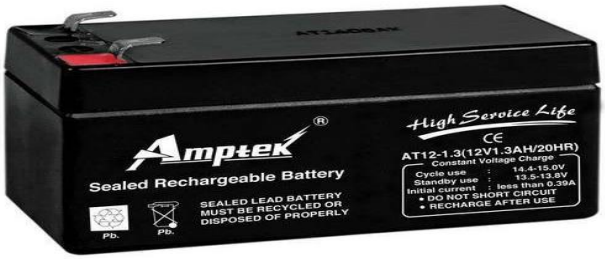

Fig 3.5: 12V Battery

3.1.6 GSM Module SIM 900A:

GSM sim 900a is a device with quad band technology. This is a communication interface. This is used to send the information about the rider to their respective family members This is connected to the vibration sensor this GSM module activates only when the vibration sensors send's this signal to it.

Fig 3.6 GSM module SIM 900A

3.1.7 GPS neo-6 Module:

The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. Thanks to the data backup battery, the module can save the data when the main power is shut down accidentally. Its 3mm mounting holes can ensure easy assembly on your aircraft, which thus can fly steadily at a fixed position, return to Home automatically, and automatic waypoint flying, etc.

Fig 3.7 GPS module neo-6

3.1.8 Accelerometer MPU 6050:

MPU6050 sensor module is complete 6-axis Motion Tracking Device. It combines 3-axis Gyroscope, 3-axis Accelerometer and Digital Motion Processor all in small package. Also, it has additional feature of on-chip Temperature sensor. It has I2C bus interface to communicate with the microcontrollers.

It has Auxiliary I2C bus to communicate with other sensor devices like 3-axis Magnetometer, Pressure sensor etc.

If 3-axis Magnetometer is connected to auxiliary I2C bus, then MPU6050 can provide complete 9-axis Motion Fusion output.

Fig 3.8 Accelerometer MPU 6050

3.2 SOFTWARE REQUIREMENTS

3.2.1 ARDUINO IDE

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '. ino.'

The Arduino IDE will appear as:

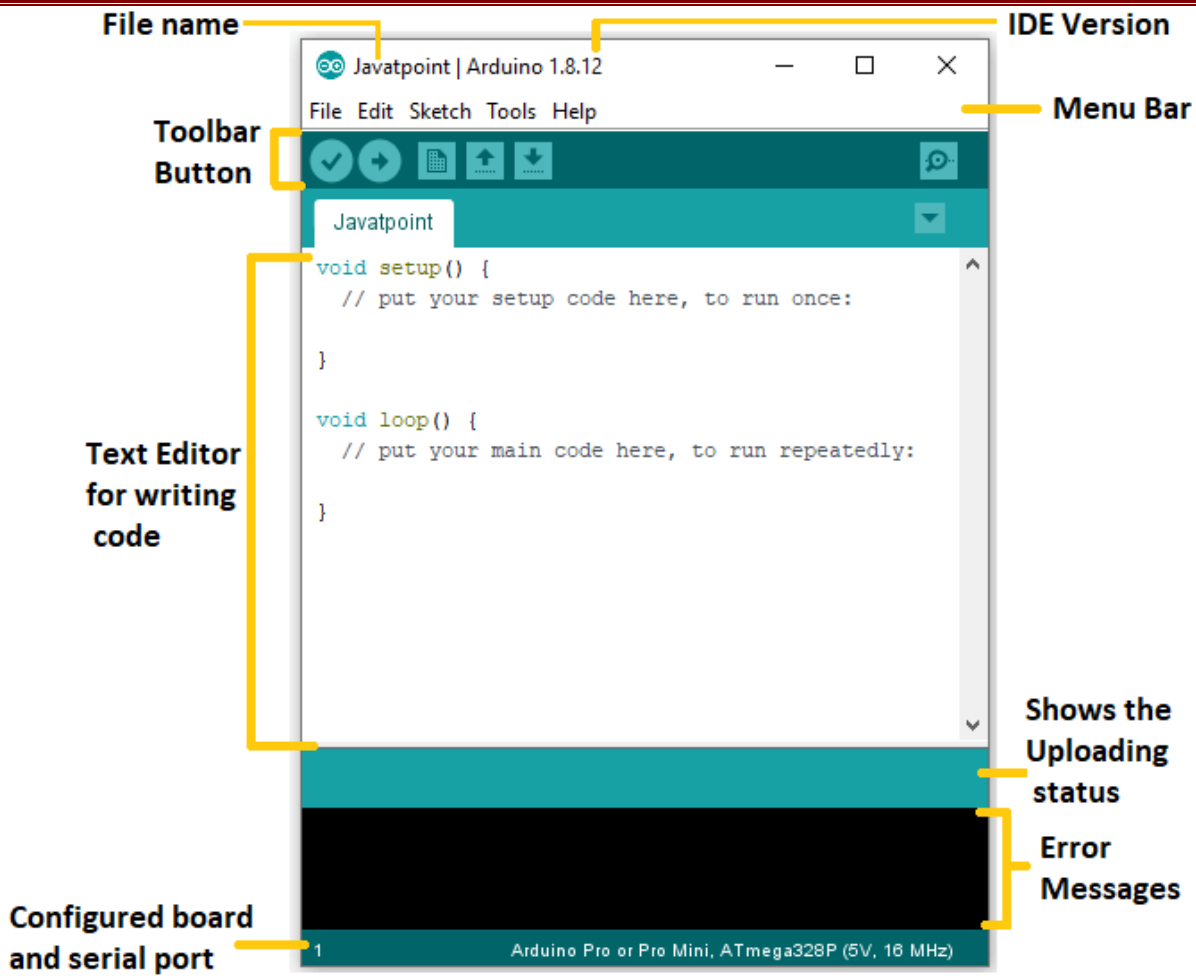

Fig 3.9 Arduino IDE

CHAPTER 4

BLOCK DIAGRAM AND METHODOLOGY

4.1 BLOCK DIAGRAM

The above block diagram consists of the Arduino Uno microcontroller, IR sensor, alcohol sensor, LED, relay and motor. All the components are interfaced with each other through the Arduino. The IR sensor measures the proximity of the rider when the helmet is worn, and sends information to the Arduino to switch off/on LED accordingly. The alcohol sensor will measure the amount of alcohol consumed and sends data to the Arduino for the required action to be performed. Motor is connected through the relay to the microcontroller and will switch on/off according to the program.

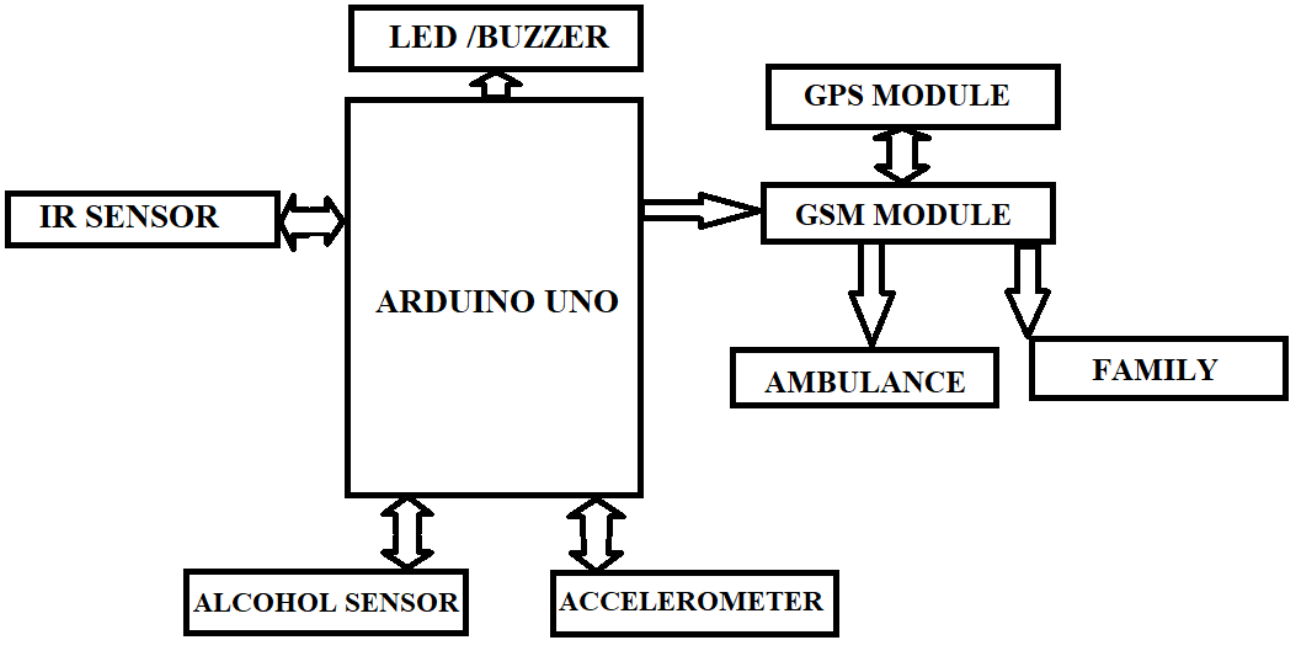

Fig 4.1: Block Diagram

4.2 METHODOLOGY (FOR THE PREVENTION SYSTEM):

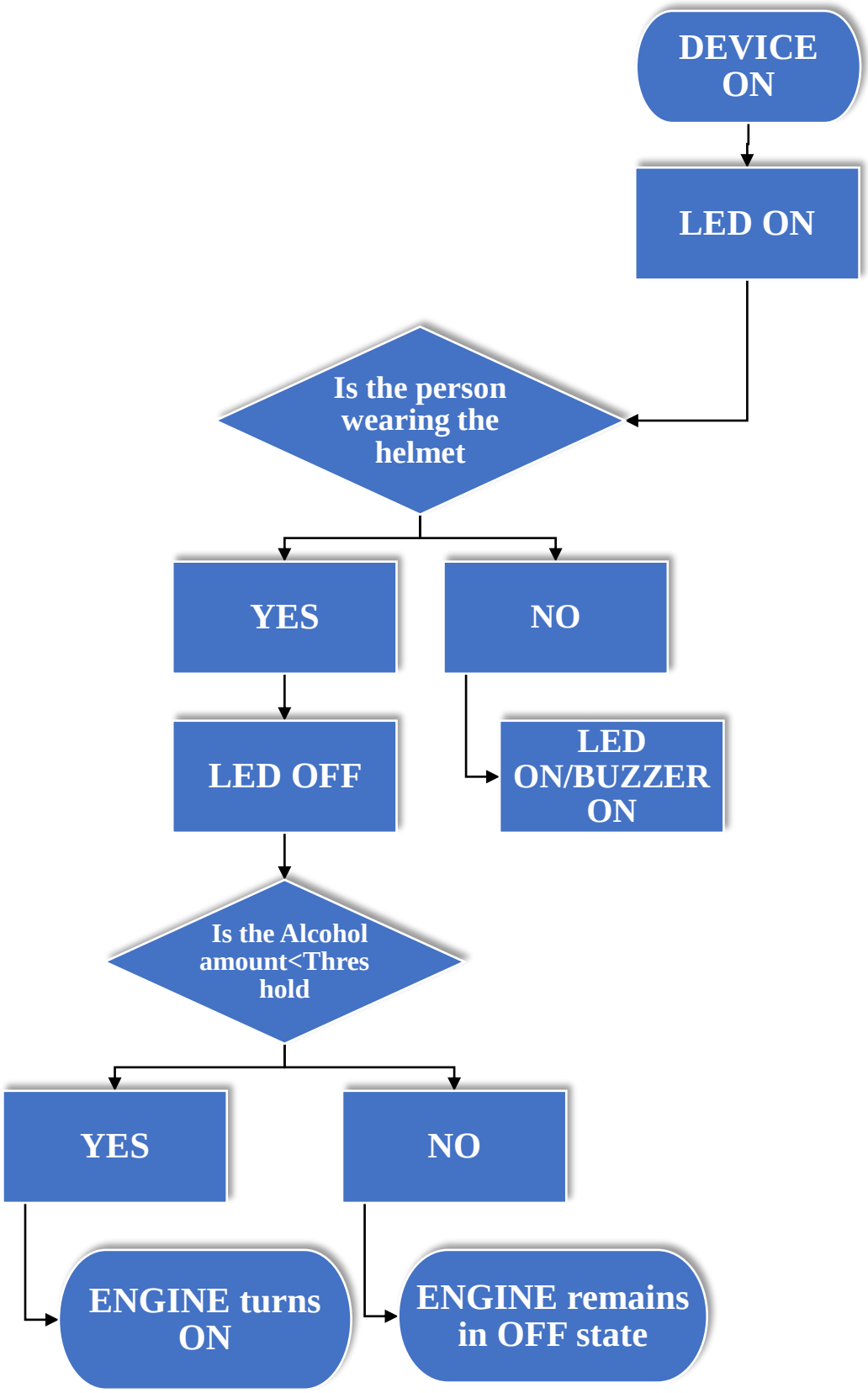

Fig 4.2: Flow Diagram for the detection system

As per the working of the above block diagram the Arduino Uno microcontroller, IR sensor, alcohol sensor, LED, relay and motor are interfaced with each other. The IR sensor measures the proximity of the rider when the helmet is worn and sends information to the Arduino to switch off/on LED accordingly. The alcohol sensor will measure the amount of alcohol consumed and sends data to the Arduino for the required action to be performed. Motor is connected through the relay to the microcontroller and will switch on/off according to the program.

The above flow diagram represents the sequence of how the system works. Initially, when the system is turned on, the LED is in ON state and engine is in OFF state. Next, a condition arises which checks if the person is wearing the helmet. If no, then the LED remains ON. If yes, the LED turns OFF. This is followed by another condition which checks if the amount of alcohol consumed is less than threshold. If no, the engine remains in OFF state. If yes, the engine turns ON.

4.3 METHODOLOGY FOR THE PREVENTION SYSTEM

In the detection system, the accelerometer will detect if the accident has taken place. If the accident has taken place, the GSM will connect with the GPS module to get the coordinates of the accident location. Further, a message will be sent to the family members/ambulance services through the GSM module.

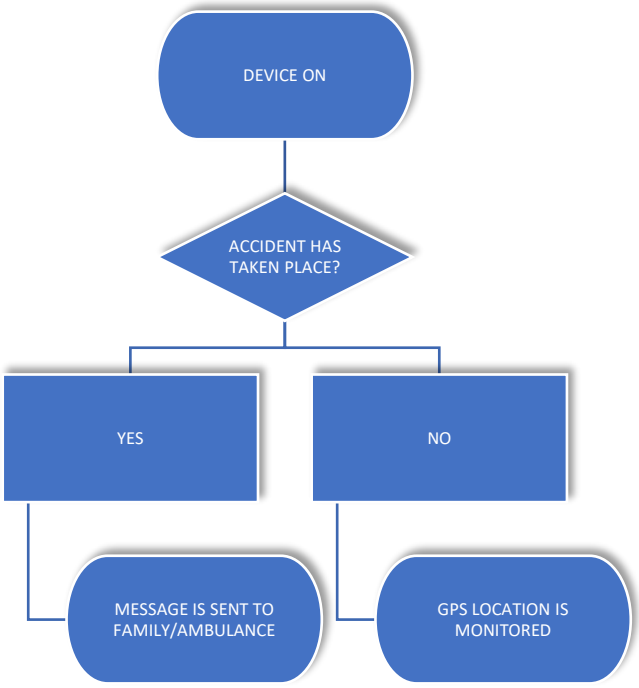

Fig 4.3: Flow Diagram for prevention system

CHAPTER 5

RESULTS AND DISCUSSION

5.1 RESULTS

Step 1: LED ON STATE

When the rider is ready to wear the helmet, the system becomes active. The IR sensor is ready to sense whether the person is wearing the helmet.

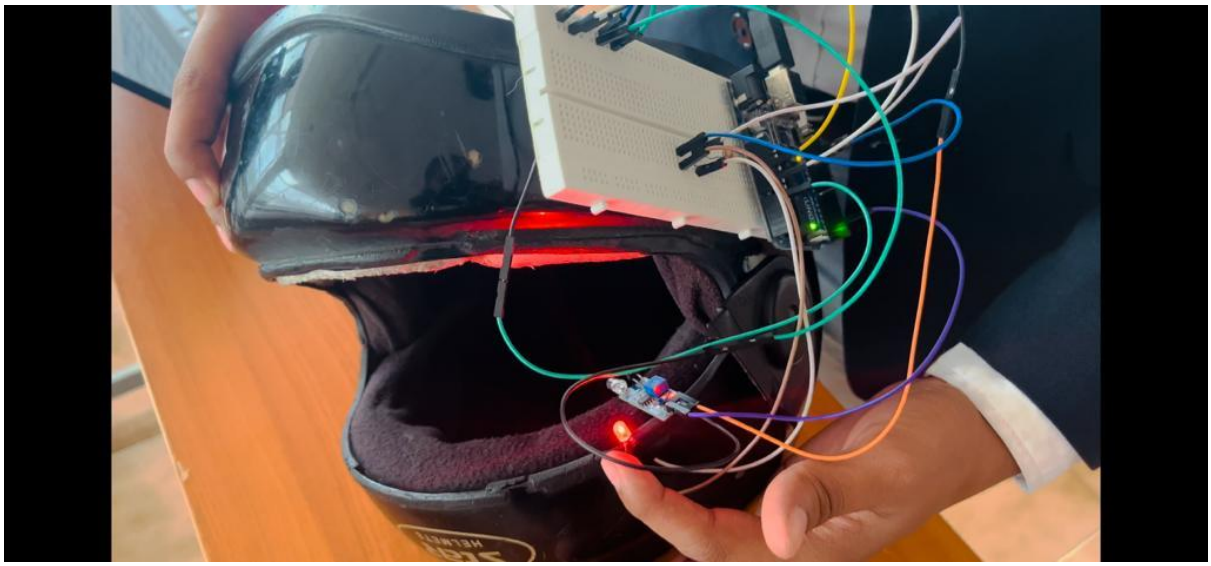

Fig 5.1: LED on state

Outcome: The LED is in ON state when the person is not wearing the helmet.

Step 2: LED OFF state:

The IR sensor senses the proximity of the rider and sends data to the Arduino. If the person is not wearing the helmet, the LED remains in OFF state.

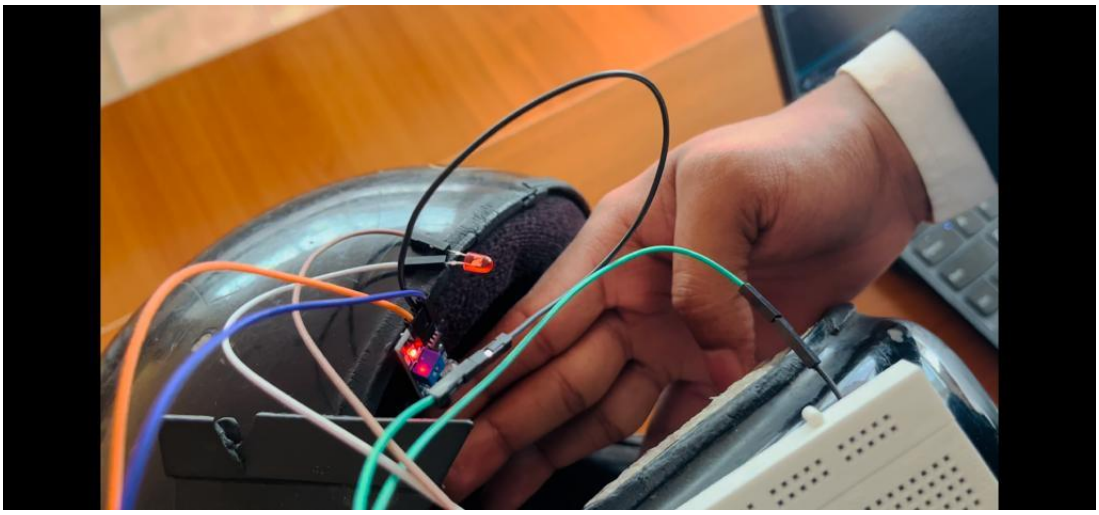

Fig 5.2: LED off state

Outcome: The IR detects the person wearing the helmet and the LED turns OFF.

Step 3: ALCOHOL DETECTION

Next, if the person is wearing the helmet, the alcohol sensor becomes active and starts sensing the amount of alcohol consumed.

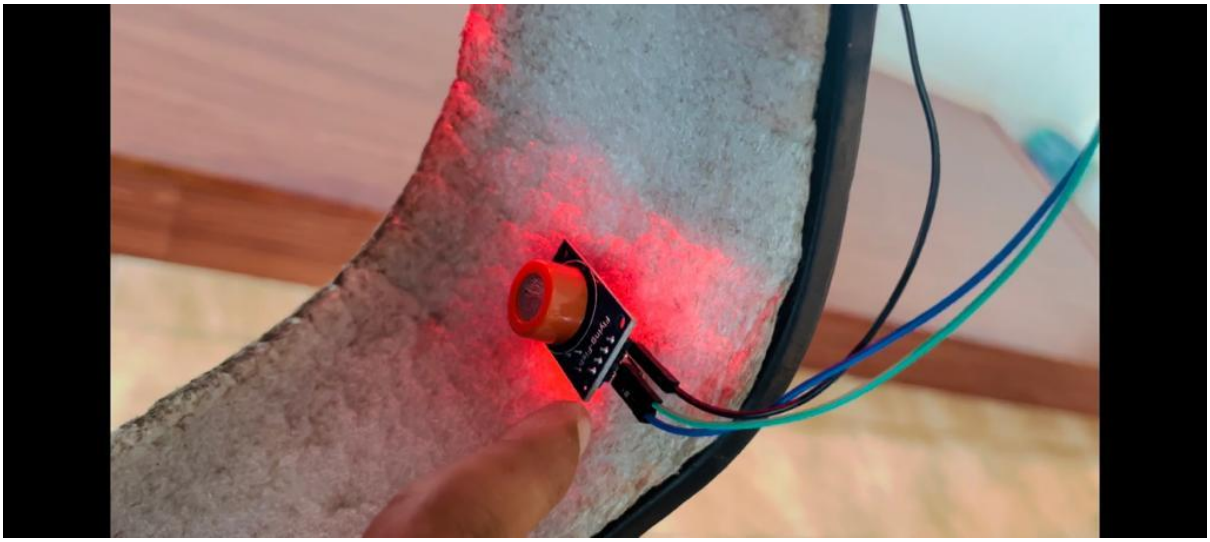

Fig 5.3: Alcohol detection

Outcome: Alcohol sensor sensing the amount of alcohol consumed.

Step 4: ALCOHOL SENSOR READING

In this step, if the amount of alcohol consumed is above the threshold limit set, the engine will not switch ON. If the amount of alcohol consumed is below the threshold limit, the engine will switch ON.

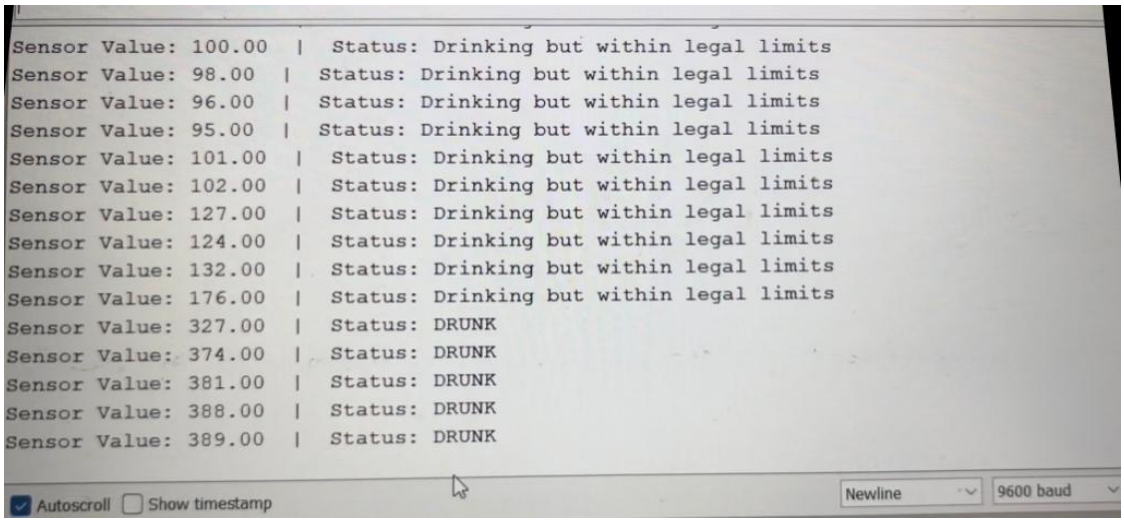

Fig 5.4: Alcohol sensor reading

Outcome: In the above serial monitor it can be observed that if the limit is below 200, it displays the status as Drinking but within legal limits.

When the value increases above 200, the status is displayed as Drunk**.**

5.2 APPLICATIONS

- Prevents road accidents to a great extent.
- Ensures the safety of the rider.
- Alcohol consumption during riding is reduced.
- Instils a sense of responsibility and awareness in the riders.
- Detects the accident and contacts the near and dear ones immediately.

5.3 SOCIETAL RELEVANCE

The proposed system directly contributes to saving hundreds of lives, as it is a prevention system which is implemented before an accident can take place. As many people tend to break traffic laws and regulations like wearing a helmet and drinking and driving, this system makes sure that both of these issues are taken care of. Indirectly, it creates a sense of discipline among the people making them responsible citizens. A lot of youth in the country are negligent towards these safety measures, and if a safety system like this is in place, it reduces the negligence among the youth.

A lot of lives are lost due to the lack of timely response when an accident occurs. The family members and the ambulance services are totally unaware that an accident has occurred. That is where this project would send a message to the near ones immediately after an accident occurs.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

The accident prevention and detection system is an efficient model that can be implemented to reduce the number of road accidents that take place due to negligence of the riders and to detect the accidents immediately. The two major issues that were tackled in the prevention part through this project is make sure the rider is wearing the helmet and the second issue tackled is drinking and driving where the alcohol consumption is checked. Wherein in the detection part, the accident is detected immediately and a message is sent to the family through the GSM and GPS module.

The project can further be developed to be compatible with other vehicles such a car, autos lorries etc. Along with preventive measures already implemented, detection of drowsiness using brainwave activity can be added additionally. Along with this, detection of accidents interfaced with an app also amounts to the future scope of this project.

REFERENCES

1) U. Alvi, M. A. K. Khattak, B. Shabir, A. W. Malik and S. R. Muhammad, "A Comprehensive Study on IoT Based Accident Detection Systems for Smart Vehicles," in IEEE Access, vol. 8, pp. 122480-122497, 2020, doi:10.1109/ACCESS.2020.3006887.

2) Dr. T. Kalaichelvi, Dr. V. Subedha, Mrs. APorselvi, S. Krishna, S. Divakar “Smart Accident Prevention Technique by using Brain Wave Signal”, IJERT,2022.

3) S.Uma, Eswari Rajagopal, “Accident prevention and safety assistance using IOT and machine learning”, JRIE,2022

4) S Surya, Abdul Quadir, Arun Kumar Sivaraman, “IoT-Based Accident Prevention System Using Machine Intelligence”, IJERT ,2021

5) S. Shafiulla Basha, B. P. Santosh Kumar, Syed. Jahangir Badashah ,“Smart Helmet for Bike Riders Safety”, IJRASET,2022

6) https://www.slideshare.net/anandbedre2/accident-prevention-and-detection-system.

7) https://electronicsworkshops.com/2021/07/05/accident-prevention-detection-and-reporting-system-using-arduino/

8) https://ieeexplore.ieee.org/document/8697663.