

Abstract

According to the research of the WHO (World Health Organization), more than 50% of individuals loss their lives yearly due to road traffic injuries. More than the half of deaths are of two-wheeler riders because of head injuries. Most of these deaths can be avertible by the compulsory use of helmets. Researches have shown that wearing the helmet can prevent the fatal injuries by 75%. In addition, WHO specifies that the drunk and drive scenario increased day by day in the world which leads towards a major road accident. Furthermore, there are some rural areas around the world where the traffic of people is less. In such a situation, rider loss their lives due to delay in providing emergency service. Many awareness drives have been launched, laws have been enforced in the public interests but still, people are violating the rules and driving very casually without wearing helmets and thereby risking their lives. Hence, a solution to overcome this problem is to develop an innovative as well as the novel project of "Smart Helmet for Auto Ignition". The system is designed in such a way that the bike will not start until rider wear helmet and pass through the alcohol test which solve the problem of drunk driving. The additional features of this project are it consists of GPS and GSM technology which sends the message to the hospital as well as a family member with the current location at the time of an accident. Ultimately, the project is focused on safety of bikers.

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Chapter 1

Introduction

There is an alarming increase in the morbidity and mortality due to two wheeler road traffic accidents. Based on the various survey in India, it is estimated that in every 2 minutes, one accident takes place. Data from the National Crime Records Bureau indicates that deaths and injuries related to road traffic accident has increased two and four fold respectively during the period of 1991–2015. Reportedly 98,254 persons were killed in 2015 on Indian roads. The riders of two wheeler vehicles are among the majority to be affected in road traffic accidents. Two wheeler accidents have been shown to have maximum case fatality in accidents[1].

Even though the safety rules made by the authority, many riders avoid following it. Furthermore, riders in India often avoid the prime rule of wearing the helmet while riding bike which leads to fatal injuries to the rider in case of accidents. There needs to be a system rather than manual checking that could enforce this rule upon the riders and hence prevent them from bypassing it. One of the prime reasons that leads to accidents is “drunk and drive” in which riders are drinking alcohol above government specified limit[6]. Almost 55% of the accidents in our country can be prevented if the riders stop consuming alcohol before riding.

1.1 Project summary

The World has seen the increases in the sales of two wheeler vehicles over the year specially in the countries like India where the rate of growth of motorcycle is increased by 60% which is 20 times the rate of population growth[3]. The scenario increased the number of accidents as well as deaths. The major reason behind this increment is drunk driving, violation of traffic rules, carelessness and many more. Studies have shown that wearing the helmet and avoids the driving after alcohol consumption can prevent the head injuries and deaths by 50%. Also, we have seen the situation where due to lake of proper on time treatment and late ambulance arrival at the place of accident leads to rider’s death that could have been saved if accident report was sent on time. These problem leads to think and come up with solution of helmet based auto ignition system of vehicles with alcohol detection, accident detection and reporting system.

1.2 Aim and Objective of project

To provide safety of humans' life and to stop the drunk and drive. Also, inform to emergency service and relative when accident occurs.

1.3 Purpose

There are three main purpose of the present Invention that are:

1. Safety of rider's life.
2. Information send when accident occur.
3. Stop drunk and drive.

1.4 Scope

The authority should allow more advanced development and research on this project and should provide some subsidy so that it is under every individual's reach. The two wheeler manufacturers should incorporate these helmets as an integral part of the vehicle. Moreover, to solve the basic complains of suffocation problem, helmet can be modified with ventilation holes.

Chapter 2

System analysis

2.1 Literature survey

2.1.1 Smart Helmet

Author	Anjana.B.S, Litto.Thomas, Rahul.K.V
Advisors	Saravana Kumar K
Publication [Year]	International Journal of Science, Engineering and Technology Research (IJSETR), Volume 5, Issue 3, March 2016
Pros	System is very simple and less costly. It provides the security of rider's life as well as rider's bike by voice command recognition system to identify the ownership.
Cons	System can not provide any information about consumption of alcohol during ride which increase number of road accidents that leads to increases number of death of rider.

Table 2.1: Smart Helmet

According to the survey specified in research paper, around "750" people die in road accidents occurring due to bike crashes per year in India. There are many reasons for accidents to be occur such as no proper driving knowledge, rash driving[2], "drunk and drive", etc. Among this the major reason behind it was absence of helmet on rider's head, which result in immediate death due to brain damage [5].

Hence the prime purpose behind to develop this invention is to reduce death of rider's by forcing them to wear helmet compulsory throughout the ride. So, provide moral responsibility towards the society, which laid the foundation of our project "Smart Helmet for Auto Ignition".

2.1.2 Helmet Based Vehicle's Auto Ignition with Alcohol Detection and Accident Indication and Reporting System

Author	Ms. Khyati Varma, Ms. Sneha Jainwar, Mr. B. Hari Kishor Rao, Ms. Juby Jogi
Publication [Year]	International Journal of Advanced Research in Computer and Communication Engineering, Volume 5, Issue 8, August 2016
Pros	System provides safety of riders by cheking primary condition like wear helmet and consumption of alcohol. Also, it reports the hospital with current location of riders when accident occur.
Cons	System will going to be costly due to use of encoder and decoder inside bike module to encrypt the information which is not important.

Table 2.2: Helmet Based Vehicle's Auto Ignition with Alcohol Detection and Accident Indication and Reporting System

According to World Health Organization(WHO), around 1 million people die annually due to road traffic accidents. Most of them are of two wheeler rider, rides vehicle in absence of helmet. In addition to this, there are another reason behind this happens is driving a bike with consumption of alcohol.

Furthermore, rider loss thier life during an accident due to late hospital treatment. Therefore, implementation of Helmet based vehicle's Auto ignition with Alcohol detection and Accident Indication help to reduce the number of deaths occuring due to road traffic by the functionality provided by the Helmet.

2.1.3 Intelligent Helmet

Author	Jennifer William, Kaustubh Padwal, Nexon Samuel, Akshay Bawkar, SmitaRukhande
Publication [Year]	International Journal of Scientific & Engineering Research, Volume 7, Issue 3, March-2016
Pros	It will provide the safety of riders by necessary wearing helmet and passing through the alcohol consumption test throughout the ride. Furthermore, it will provide the immediate SMS services when rider faced any road traffic accident.
Cons	The system only provide the SMS notification when accident occur but when it happened, it will not provide due to lack of GPS functionality.

Table 2.3: Intelligent Helmet

Two wheeler riders in the countries like India are increased more and more nowa-days, which leads to more traffic on road. Also, in our country, the individuals violate

the traffic rules like absence of helmet during ride, "drunk and drive" and they are more excited about racing which increased the numbers.

Furthermore, sometimes people loss their life due to not getting immediate treatment because of absence of people to inform the hospital regarding the incidence. Hence by providing reporting system using GSM & GPS module inside helmet, we can overcome this problem.

2.1.4 Bike Rider's Safety Measures Using Helmet as a Key

Author	Sanjeev Sahu, Lokesh Yadav, K Diwakar, Vibhor William
Publication [Year]	International Journal of Computer Engineering in Research Trends (IJCERT), Volume 4, Issue 1, January 2017, pp. 61-66
Pros	System will ignite if pressure is applied on helmet's interior which ensure safety of biker.
Cons	System can't able to inform for immediate treatment if accident happens and not able to stop drunk driving.

Table 2.4: Bike Rider's Safety Measures Using Helmet as a Key

People prefer motorcycles over the car as it is much cheaper to run. Due to high usage of two-wheeler, they are having high accident percentage than other vehicles. Fatal injuries to the brain are major reason behind deaths due to the road accidents. Therefore, biker must wear a helmet to protect his skull[4].

Solution for that is Helmet interior designed in such a way that without pressurized internal part, bike is not ignite. Then helmet becomes integrated part of bike so rider have to must wear it for riding.

2.2 Literature Summary

After studied research papers, functionalities like Alcohol detection, Helmet detection for ignition, accident detection with reporting system are available individually. They all are having good individual functionalities but by combining them, it may become more useful for safety of biker.

2.3 Problem specification

There are some problems in countries like India, in which most of the individual two wheeler riders violate the traffic rules. Also, they are drive the motorcycle after drinking alcohol. Also, people are more excited towards speed which leads to increasing in road accident.

2.4 Project development approach and justification

We are working on this project for safety of bike riders with positive approach. Our project can solve the problems like violating traffic rules, consumption of alcohol while driving, fatal injuries during accidents which causes death. We are detecting the head of riders by using of Infrared sensor which enforces rider to follow the traffic rules. We are including alcohol test compulsory for ignition by using alcohol sensor with that reduces drunk and drive problem. We are sending location of rider by GPS/GSM in case of accident detects by ultrasonic sensor. So, we are justifying our solutions for problems identified by us.

2.5 SWOT Analysis

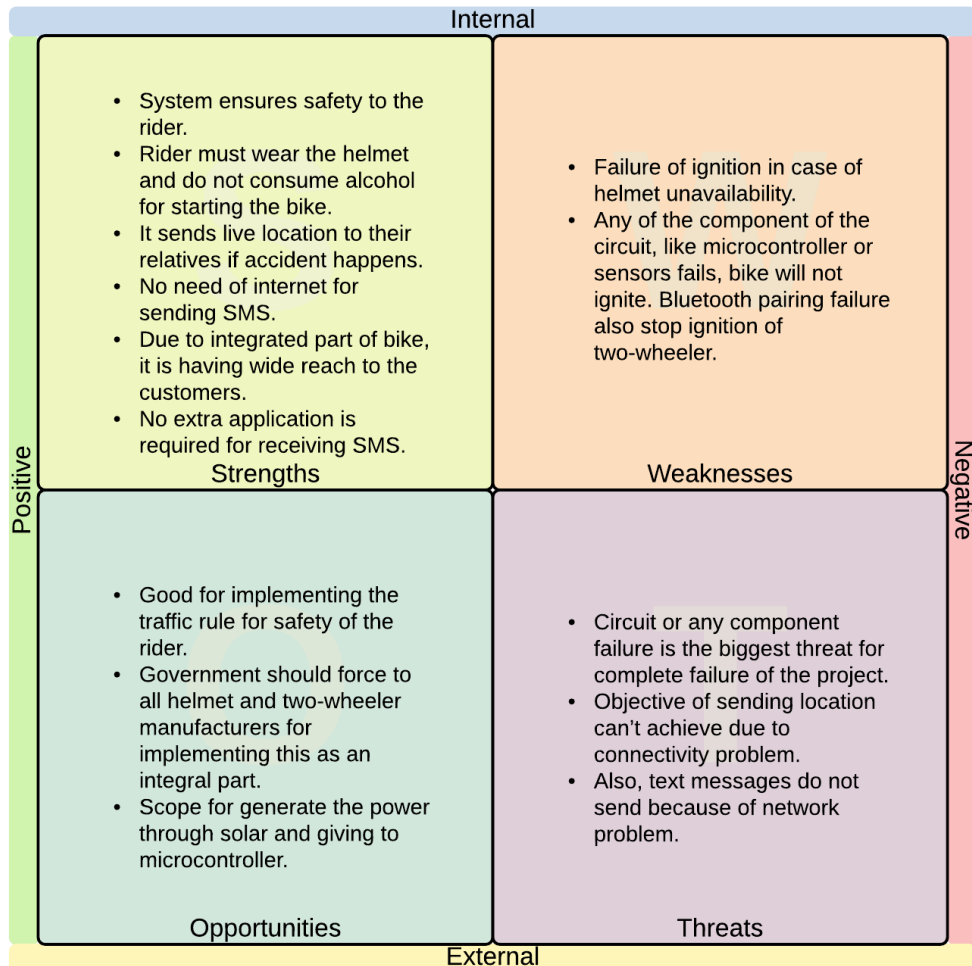


Figure 2.1: SWOT Analysis

System mainly focused on safety of rider by checking compulsory wearing helmet and passing through alcohol test which is major strength of the system. Also, sends live location to relatives via SMS if accident occurs. So, no need of extra application

and internet. System is having wide reach to customers due to helmet is integrated part of two-wheeler. System stops due to problems like helmet unavailability, circuit component failure, Bluetooth pairing failure etc. which is weaken part of the system.

System is having opportunities like implementing traffic rules, compulsory implement by helmet and two-wheeler manufacturers forced by government. Any sensor or microcontroller failure and network connectivity problem are major threats for system.

Chapter 3

Design: analysis, design methodology and Implementation strategy

3.1 Requirement analysis and gathering

The basic requirement of any project is to gather all the required information about problems and subsequent solutions. Therefore, our team finds major causes of death of riders. Furthermore, we analyze all the problems and their solutions and based on that we find the best suitable solution that is Smart Helmet which has some functionality like alcohol detection, accident detection, reporting system and many more.

3.1.1 Feasibility study

Present innovation is based on helmet with the purpose of to save human's life. To solve this, our team first research on the reasons behind road accidents and based on these various solutions are found to reduce it. Among which we decide to implement the helmet which have some functionalities like alcohol sensor, Infrared sensor, ultrasonic sensor, GSP/GSM Module which help to reduce the death of the rider's and provide reporting when accident occur.

3.1.2 H/W and S/W requirement

Hardware and software are the basic requirement of any system. Hardware and software are not important individually.

Hardware

- Arduino UNO R3 & Nano.
- MQ135 Alcohol Sensor.
- Infrared Sensor.
- HC-SR04 Ultrasonic Sensor.

- Neo 6m GPS Module.
- A6 GSM/GPRS Module.
- HC-05 Bluetooth Module.
- LED (Light Emitting Diode).
- Jumper wires.

Software

- Arduino IDE Software.
- C/C++.

3.1.3 Block Diagram

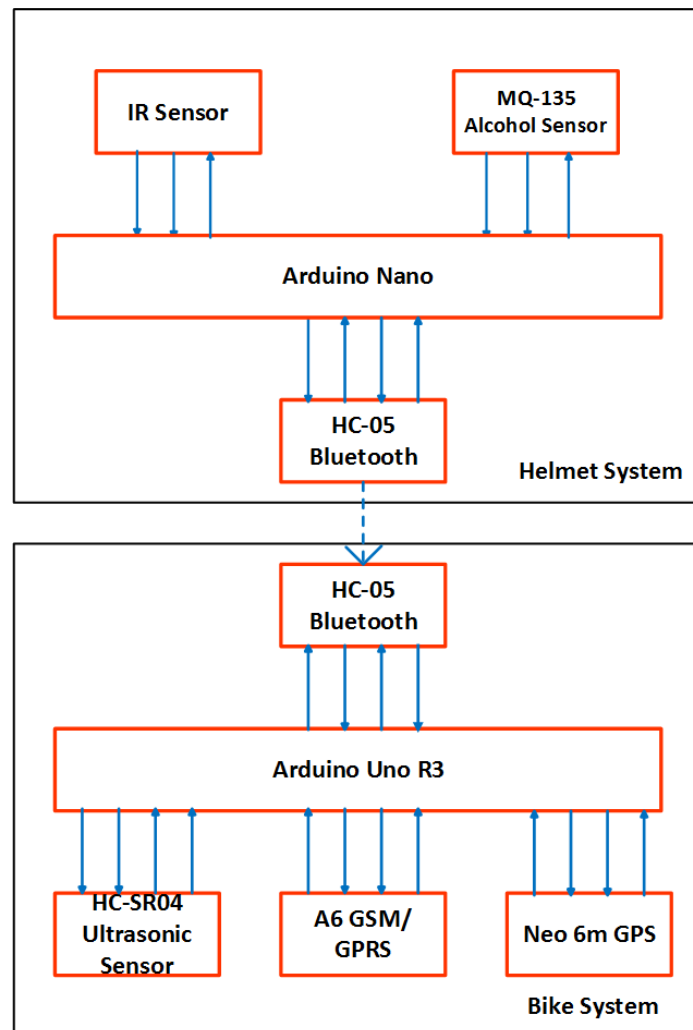


Figure 3.1: Block Diagram

3.2 Designing methodology

3.2.1 BMC Canvas

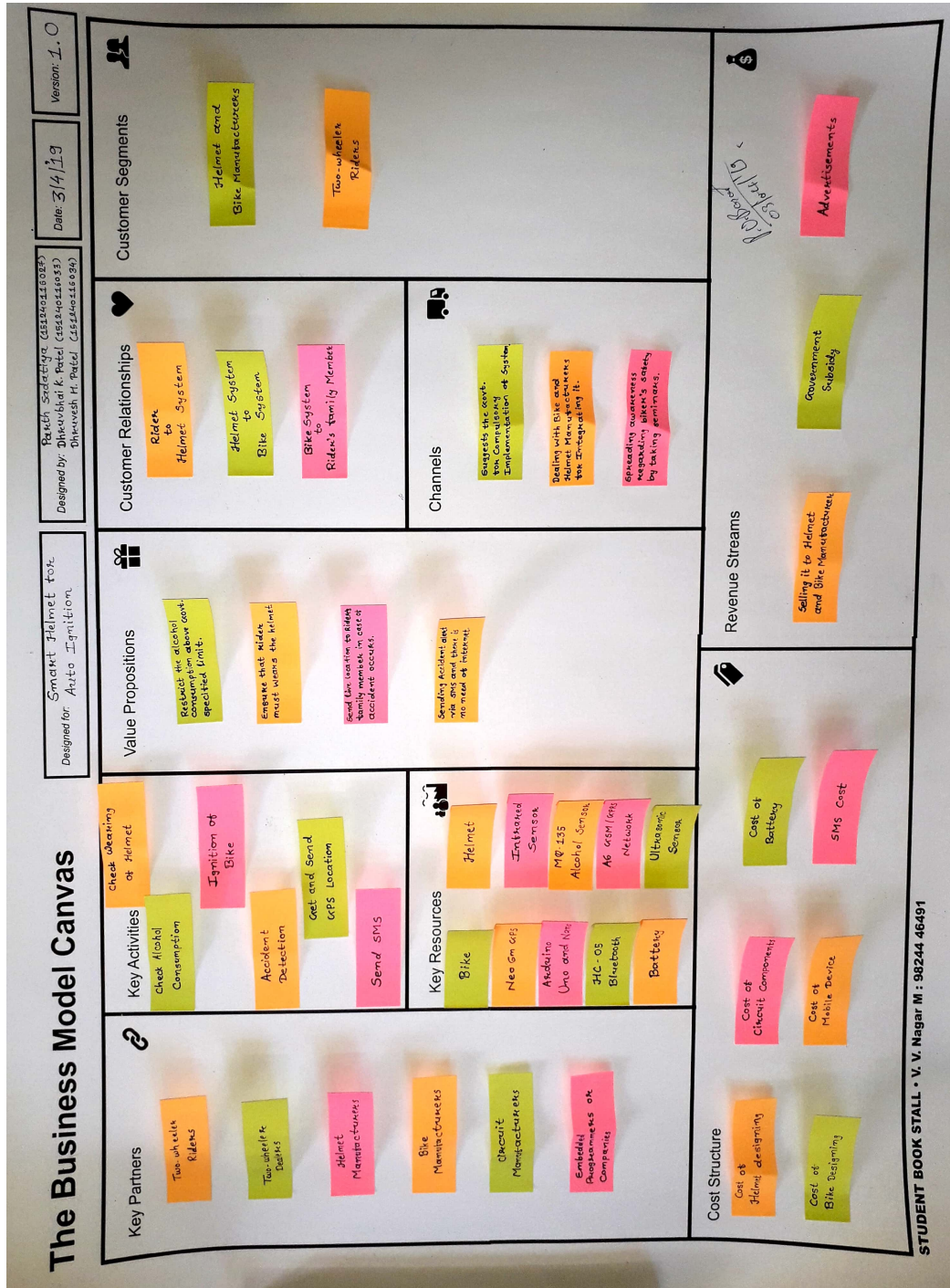


Figure 3.2: BMC Canvas

Chapter 4

Implementation

4.1 System flow

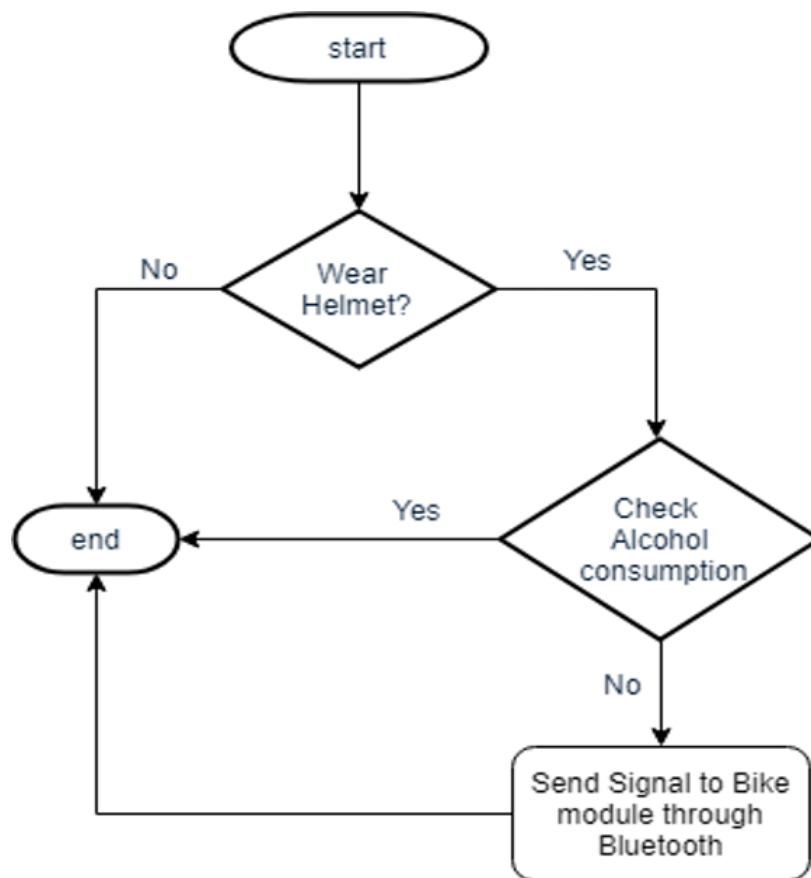


Figure 4.1: Helmet system flow

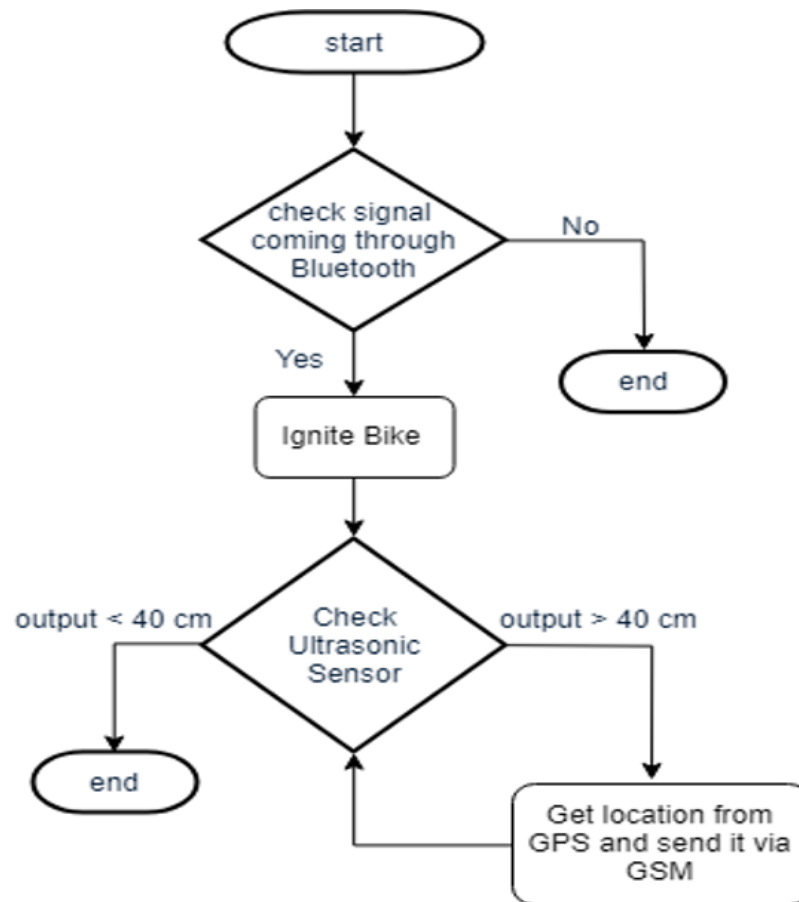


Figure 4.2: Bike system flow

There are 4 entities in system which are rider, Helmet, Bike and relative. When rider wears helmet, IR sensor which is present in helmet module, detects head of rider and gives response. If response is positive then alcohol test will do by alcohol sensor. If it detects alcohol below consumption limit, then it sends both responses to bike circuit through bluetooth module. Bike circuit receives both responses and take necessary action based on that response. If both responses are fulfilling condition for ignition then bike will be start. Also, after ignition of bike, reporting system which resides in bike circuit, continuously sense ultrasonic sensor which helps to detect accidents and sends the live location getting from GPS to family member via GSM.

4.2 Program/ module specification

4.2.1 Arduino UNO R3 & Nano

Arduino UNO R3 and Arduino Nano both are functionally same however, the difference is in size. Arduino Nano is smaller than arduino Uno R3. Both Arduino are a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. Programs can be loaded on to it through the easy-to-use Arduino software. It has 14 digital pins which provide digital output, 6 analog pins provides analog output, 3 ground terminals, 2 power source with 3.3V and 5.0V respectively. As you can see in the figure 4.3 & 4.4.



Figure 4.3: Arduino UNO R3



Figure 4.4: Arduino Nano

4.2.2 Infrared Sensor

An infrared sensor is an electronic device, that emits in order to sense presence of object. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received. Figure 4.5 shows IR Sensor. This circuit comprises of the following components

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo ohms.
- Variable resistors.
- LED (Light Emitting Diode).

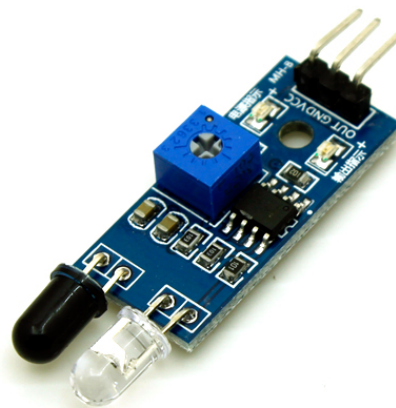


Figure 4.5: Infrared Sensor

4.2.3 MQ135 Alcohol Sensor

MQ135 is used as the alcohol sensor which is low-cost semiconductor sensor. It can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. The sensitive material used for this sensor is SnO₂(stannic oxide), whose conductivity is lower in clean air. It's conductivity increases as the concentration of alcohol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs. MQ135 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc. Figure 4.6 shows MQ135 alcohol sensor.



Figure 4.6: MQ135 Alcohol Sensor

4.2.4 HC-05 Bluetooth Module

HC-05 Bluetooth module 4.7 is an easy to use Bluetooth SPP (Serial Port Protocol) module which is designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature).



Figure 4.7: HC-05 Bluetooth Module

4.2.5 HC-SR04 Ultrasonic Sensor

As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.



Figure 4.8: Ultrasonic Sensor

4.2.6 Neo 6m GPS Module

The Global Positioning System (GPS) As you can see in the figure 4.9. is a satellite-based navigation system made up of at least 24 satellites. GPS works anywhere in the world for 24 hours a day irrespective of any weather conditions, with no subscription fees or setup charges.

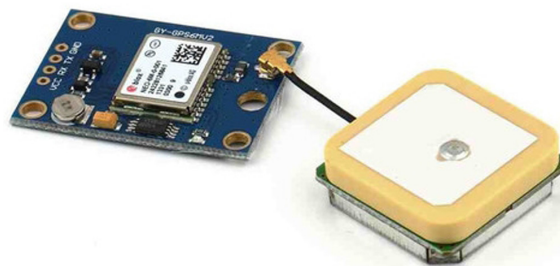


Figure 4.9: Global Positioning System(GPS)

4.2.7 A6 GSM/GPRS Module

GSM (Global System for Mobile communication) is an international standard for mobile telephones. It is an acronym that stands for Global System for Mobile Communications. It is sometimes referred to as 2G, as it is a second-generation cellular network.

The Arduino GSM shield is a a GSM modem. From the mobile operator perspective, the Arduino GSM shield looks just like a mobile phone. From the Arduino perspective, the Arduino GSM shield looks just like a modem.



Figure 4.10: GSM Module

4.3 Implementation snapshots

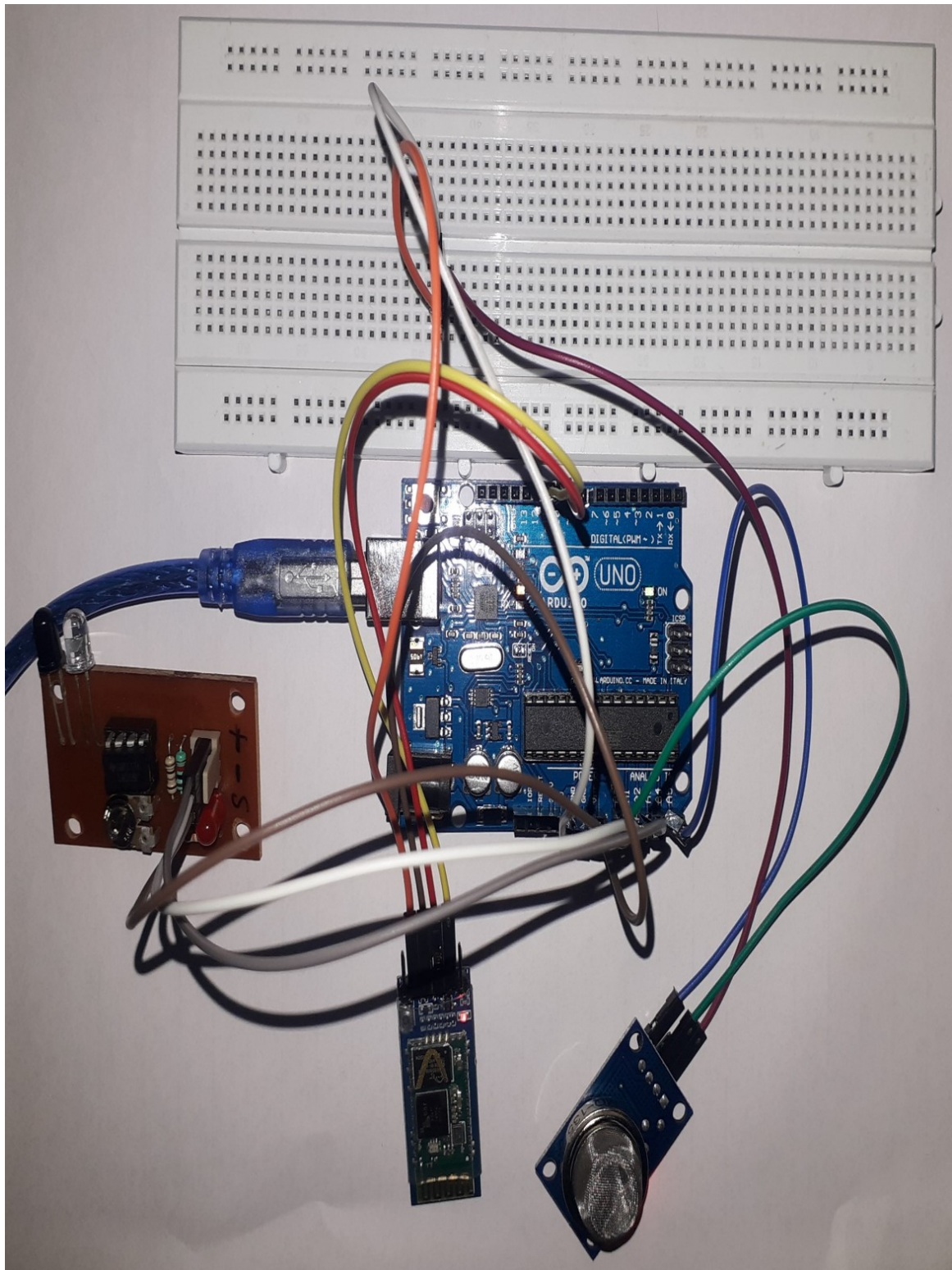


Figure 4.11: Helmet System

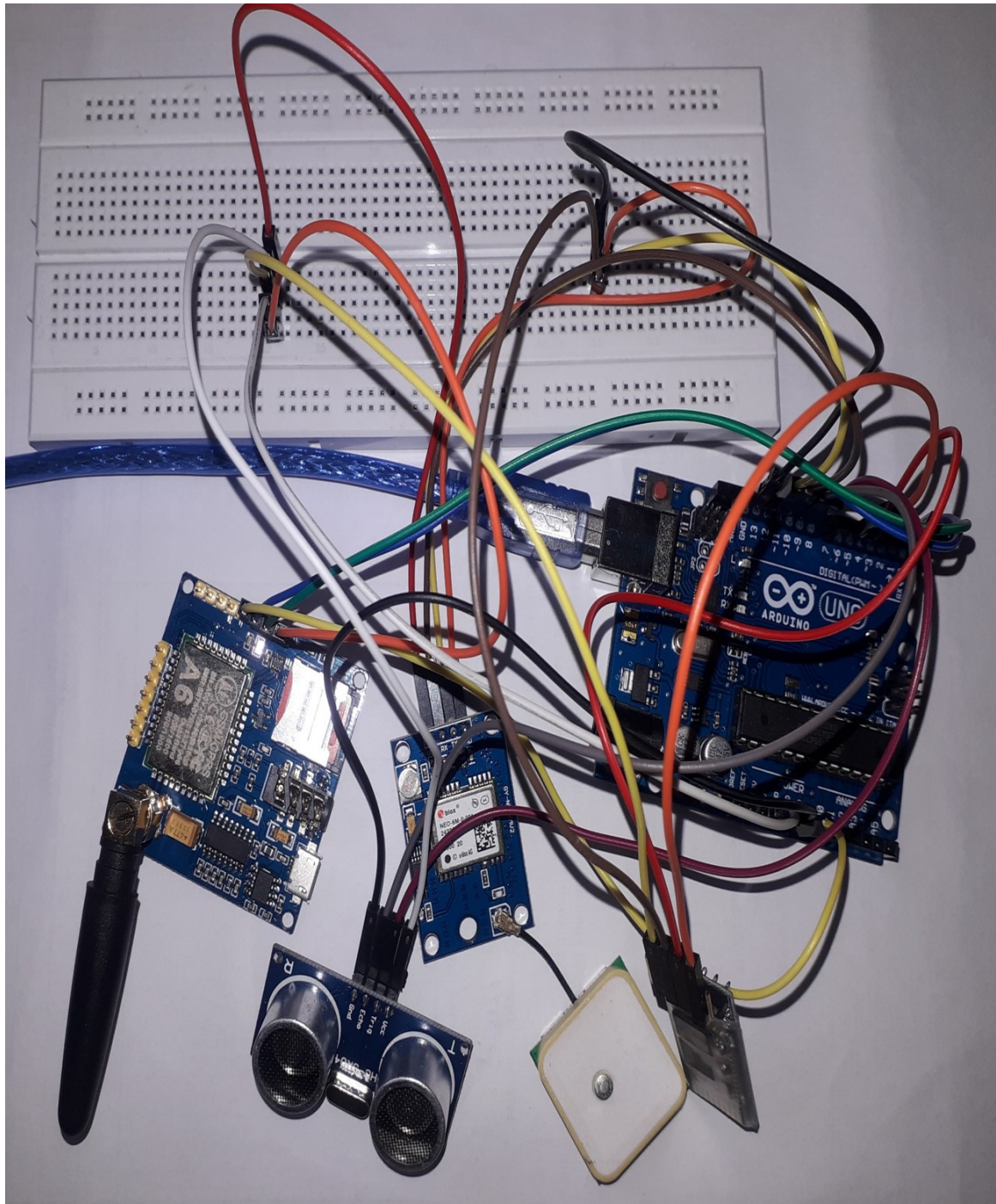
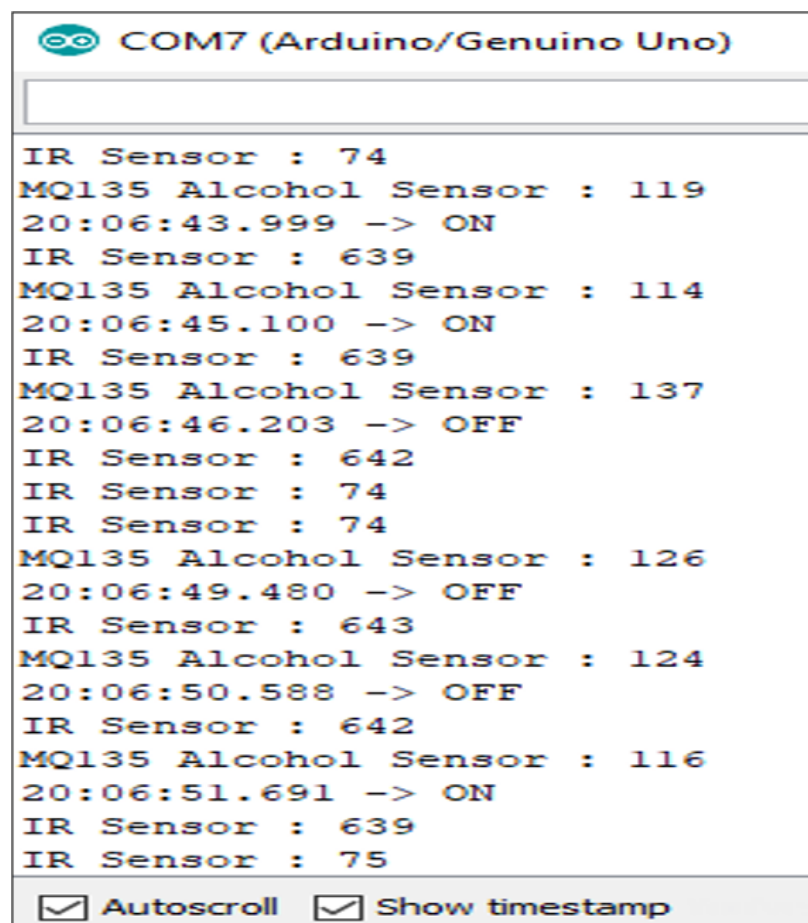


Figure 4.12: Bike System

Chapter 5

Testing & Validation

5.1 Primary safety measurements



```
COM7 (Arduino/Genuino Uno)

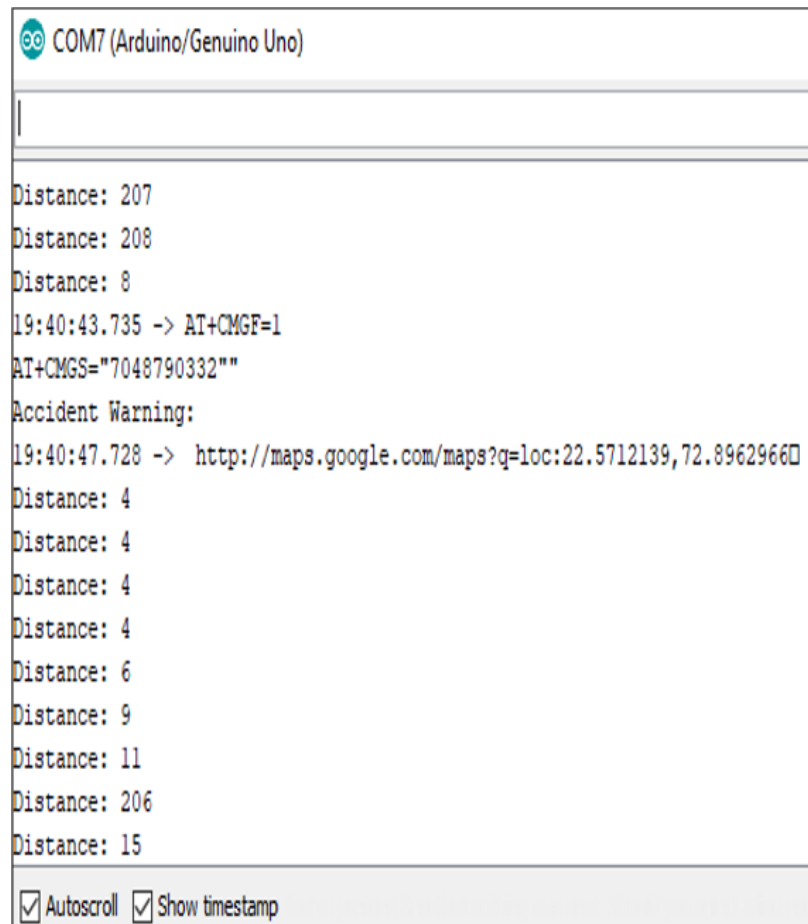
IR Sensor : 74
MQ135 Alcohol Sensor : 119
20:06:43.999 -> ON
IR Sensor : 639
MQ135 Alcohol Sensor : 114
20:06:45.100 -> ON
IR Sensor : 639
MQ135 Alcohol Sensor : 137
20:06:46.203 -> OFF
IR Sensor : 642
IR Sensor : 74
IR Sensor : 74
MQ135 Alcohol Sensor : 126
20:06:49.480 -> OFF
IR Sensor : 643
MQ135 Alcohol Sensor : 124
20:06:50.588 -> OFF
IR Sensor : 642
MQ135 Alcohol Sensor : 116
20:06:51.691 -> ON
IR Sensor : 639
IR Sensor : 75

☒ Autoscroll ☒ Show timestamp
```

Figure 5.1: Rider's safety measurements

Figure 5.1 depicts that if analog value of IR sensor is less than 250 then it detects that rider is not wearing helmet otherwise it proceeds for alcohol testing through MQ 135 Alcohol sensor where if its analog value is less than 120 then it gives signal to bike module by using Bluetooth for action of ignition.

5.2 Accident detection measurements

The image shows a screenshot of the Arduino IDE serial monitor window. The title bar reads "COM7 (Arduino/Genuino Uno)". The monitor displays a series of distance measurements and a timestamped location. The data is as follows:

```
Distance: 207
Distance: 208
Distance: 8
19:40:43.735 -> AT+CMGF=1
AT+CMGS="7048790332"
Accident Warning:
19:40:47.728 -> http://maps.google.com/maps?q=loc:22.5712139,72.8962966
Distance: 4
Distance: 4
Distance: 4
Distance: 4
Distance: 6
Distance: 9
Distance: 11
Distance: 206
Distance: 15
```

At the bottom of the window, there are two checkboxes: "Autoscroll" and "Show timestamp", both of which are checked.

Figure 5.2: Accident detection

Figure 5.2 represents bike module which starts with receiving signal through Bluetooth and decide for ignition. Also, it sends rider's present location through SMS when accident detects using ultrasonic sensor.

5.3 Receiving accident warning

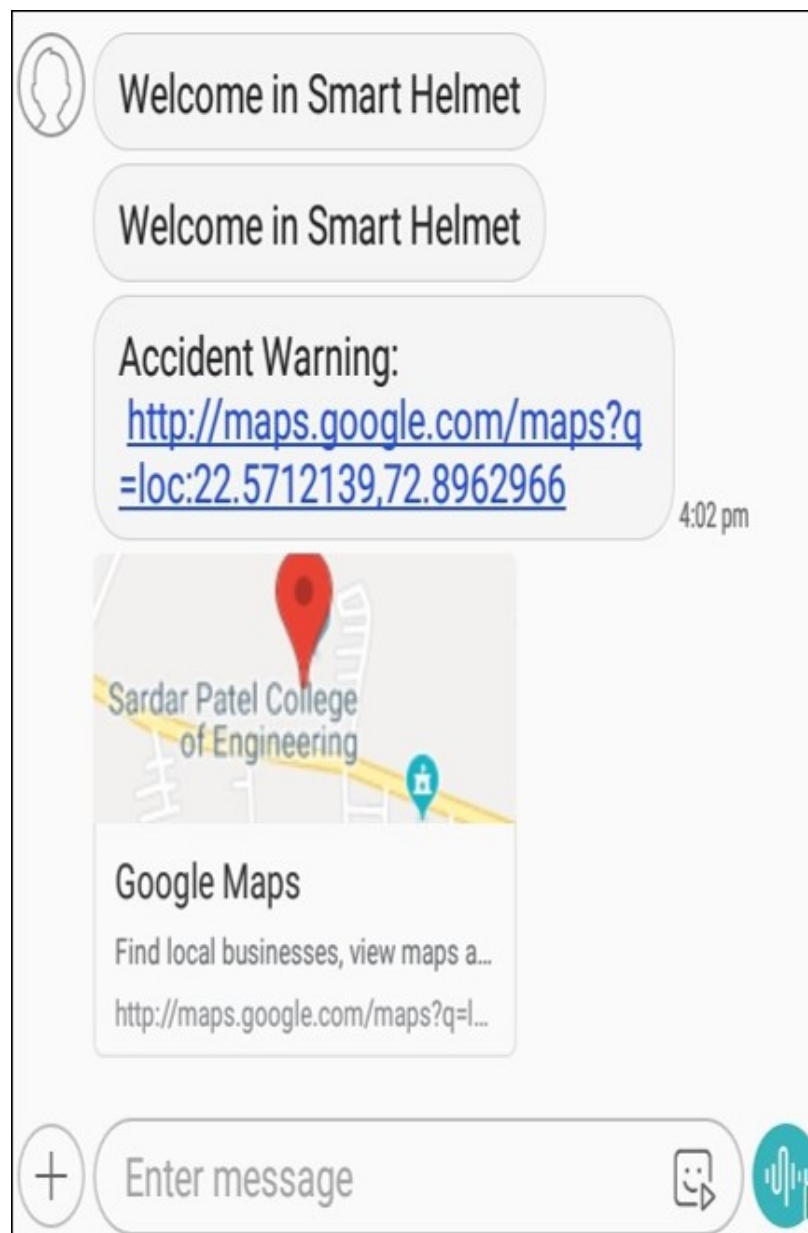


Figure 5.3: Accident message with location

Figure 5.3 demonstrates format of accident warning message with GPS coordinates. Link available in SMS directly opens google map to find the location of accident place.

Chapter 6

Conclusion

System ensures the safety of riders, by making it compulsory to wear helmet throughout ride and ensures that rider has not consumed alcohol. If any one of these prime safety rules are violate, the ignition system prevent rider to start a bike. Furthermore, reporting system helps to inform family member for immediate treatment via SMS with location in case of accident occurs.

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