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# SMART HELMET

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## Abstract

A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using Alcohol sensor , Vibration Sensor , RF Transmitter and Receiver , GSM, GPS, WIFI and Thing Speak. The working of this smart helmet is very simple, vibration sensors are positioned in the helmet where the probability of hitting is more which are connected to the microcontroller board. So, when the rider crashes and the helmet hits the ground, the vibration sensor senses and gives information to the microcontroller board, then the controller extracts GPS information using the GPS module that is interfaced to it. When the data outdoes the least stress limit then GSM module automatically directs messages to ambulance or family members. When the rider is drunk, the two-wheeler will not start. ThingSpeak is used to track the data.

## 1. Introduction

In today's era, particularly in the young generation the craze to ride a bike is swiftly increasing. The middle-class people prefer to lay two-wheelers because of their low price. As the number of two-wheelers on the road are increasing, road mishaps also increase day by day. In countries like India, where bikes are more in numbers, many people died due to inattentiveness caused in not wearing motorcycle helmets. Even though there has been non-stop alertness from the government authorities concerning helmets and seat belts a majority of drivers do not heed the advice. Most of the people use outdated helmets just to prevent from the penalty forced by traffic control police but not for safety purposes. So, these helmets do not safeguard the driver. For 2-wheeler riders, the helmet acts as a basic shield device.

The first step is to identify whether the helmet is worn or not. If the helmet is worn then ignition will start otherwise it remains off. For this, switches are used. The second step is alcohol detection. Alcohol sensor is used as a breath analyser which detects the presence of alcohol in a rider's breath and if it exceeds permissible limit ignition cannot start. Lcd will display "Rider is drunk " and the bike wont start. MQ-3 sensor is used for this purpose. When these two conditions are satisfied

then only ignition starts.The third main issue is accident and late medical help. If the rider has met with an accident,

he may not receive medical help instantly, which is one of the main reasons for death. Every second people dies due to delay in medical help, or in the case where the place of accident is unmanned. In fall detection, we place vibration sensors in the bike unit. By this mechanism accidents can be detected.

## 2. Technical Studies

### 2.1 Alcohol sensor:

MQ-3 Alcohol Sensor is used for identifying the alcohol content from breath. It can be positioned just in front of the mouth. The sensor responds to various molecules in alcohol and determines if the rider is drunk.The sensor also has a potentiometer to adjust the concentration of gases.

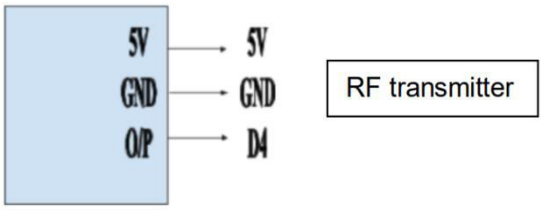


Fig.1 Connectivity block of alcohol sensor

### 2.2 Vibration sensor

Vibration sensor which is also known as a piezoelectric sensor is used for measuring several processes. When the accident occurs, it senses the pressure and sends it to the Esp32 which in turn sends the message to the registered mobile number.

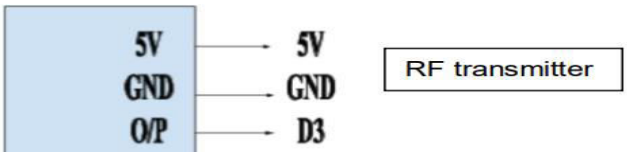


Fig.2Connectivity block of vibration Sensor

### 2.3 RF Module

The RF module comprises a RF Transmitter and a RF Receiver. The RF transmitter which operates at a frequency of 434 MHz receives serial data and transmits data wirelessly through its antenna connected at pin4.The transmitted data is received by an RF receiver operating at the identical frequency as that of the transmitter. The RF receiver receives the modulated RF signal and demodulates it .

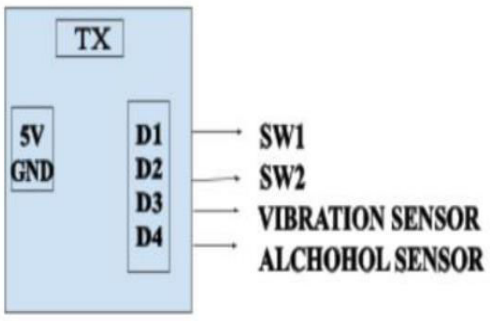


Fig 3. Connectivity block of RF transmitter

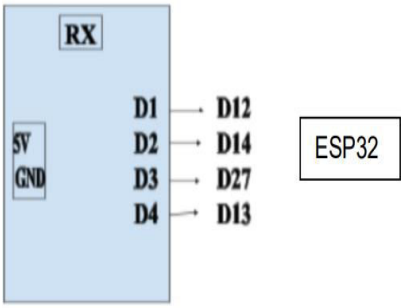


Fig 4.Connectivity block of RF receiver

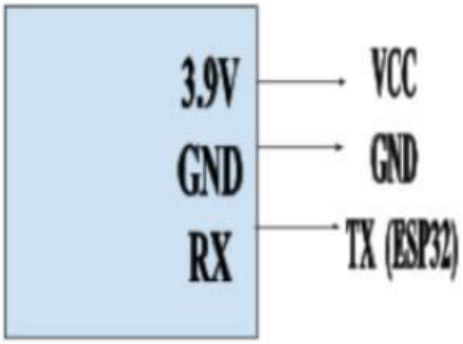


Fig 6. Connectivity block of GSM

## 2.4 NEO-6M GPS

NEO-6M GPS module is used to extract the location of the accident and the GPS data
contains latitude and longitude values using which we can find the exact position of the accident place.

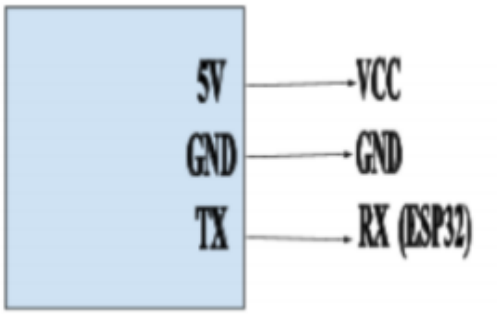


Fig 5. Connectivity block of GPS

## 2.5 GSM800L

We are using GSM800L module which has SIM card slot to place the SIM and sends SMS saying that the accident has occurred in the specified location extracted by GPS.

## 2.6 ESP32

ESP32 is a user-friendly microcontroller which can be easily interfaced with many sensors and modules .

## 2.7 Proteus

Proteus is a software which is used to create schematics and electronic prints for manufacturing printed circuit boards.

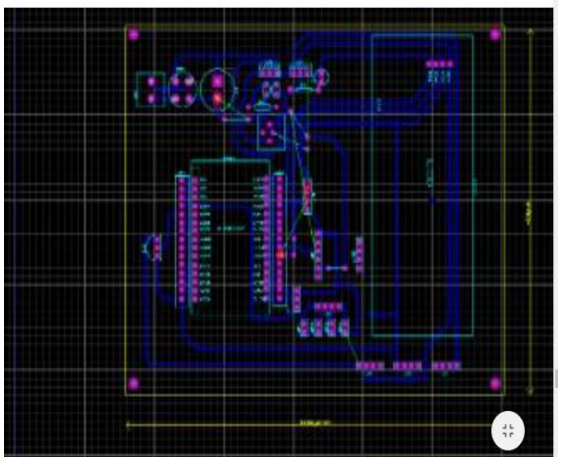

Fig 7. Schematic design of PCB

## 2.8 ARDUINO IDE

Arduino Integrated Development Environment (IDE) is a software used to write and upload programs to Arduino compatible boards .

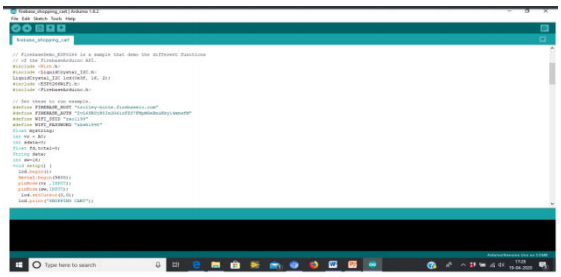

Fig 8 . Screenshot of Arduino IDE

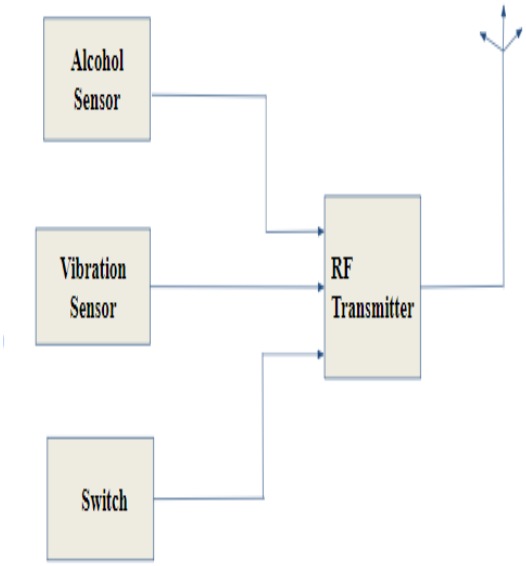


Fig.4.a Transmitting Unit

## 3. Construction

The project is divided into two units namely helmet unit and bike unit.Helmet unit also called as transmitting unit consist of MQ-3 sensor, RF transmitter, Vibration Sensor, Power supply. Alcohol sensor is placed on in front of rider's mouth so that it can sense easily. Vibration sensor is placed on inside upper part of the helmet where actually head will touch with sensor surface. Rf transmitter and switch is placed inside the helmet.

Bike unit also called as receiving unitconsists of RF receiver, Relay, LCD, GPS, GSM, ESP32, Power supply. It is placed inside the bike.The RF receiver accepts all the data from the helmet (i.e transmitter) unit. Depending on the conditions, if true,the ignition starts and bike moves. The GSM can continuously send the location information of the bike. If any accident occurs, the vibration sensor gets activated and sends the location information to the registered mobile number.

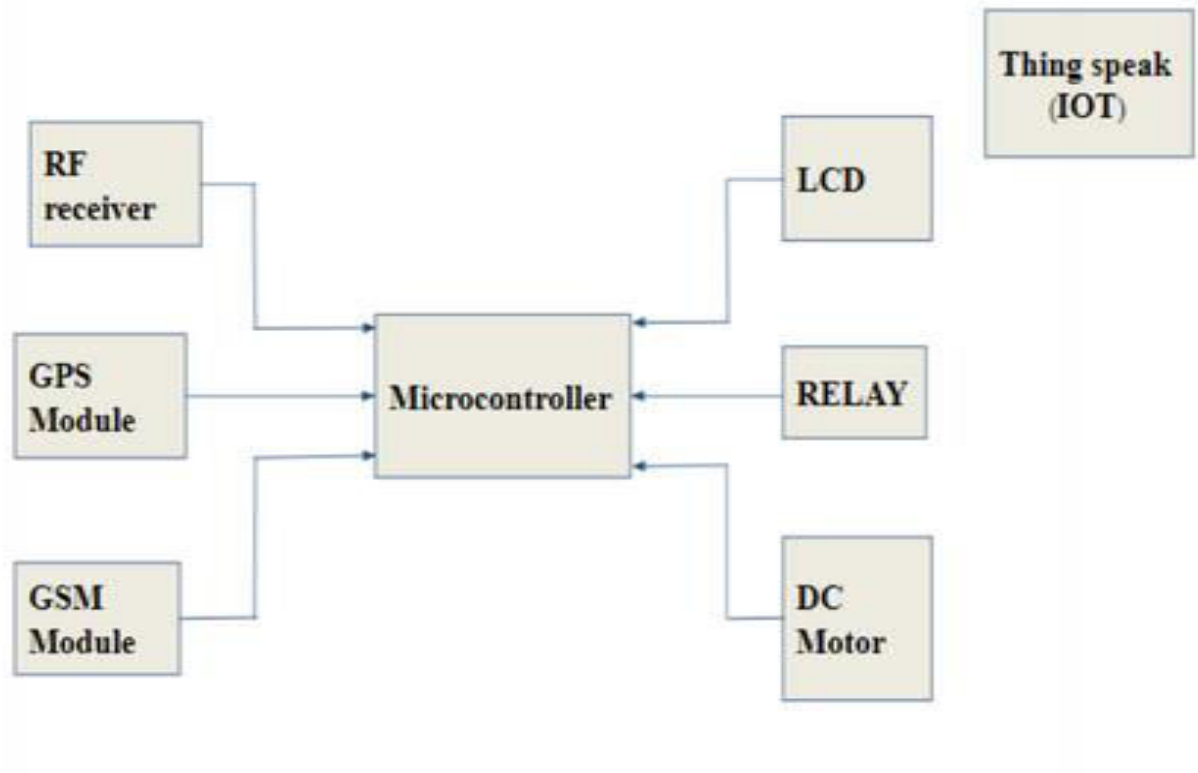


Fig 4.b Receiving unit

## 4. Working

The first step in the project is to satisfy all the conditions and the next step is accident detection using vibration sensor. If both the helmet switches are on, and if both alcohol sensors and vibration sensors output are high, as they are active low, “all ok” is displayed. If both the helmet switches are on, and if alcohol sensor output is low and vibration sensor output is high, as they are active low, “ALCOHOL DETECTED” is displayed on LCD. Hence rider cannot start the bike.If both the helmet switches are on and if alcohol sensor output is high and vibration sensor output is low, as they are active low, “PLEASE CALL THIS NUMBER :1234567890” is displayed on LCD and the message is sent to the respective person, when the accident occurs. **Thingspeak** is used for displaying the data online. We can access and monitor the data from anywhere .

## 5. Design and Realization

A smart helmet is designed using ESP32 with RF transmitter, Alcohol sensor , Vibration sensor , Switch in the helmet module (transmitting unit) and RF receiver , GPS module , GSM module , LCD , Relay in the bike module(receiving unit) . If alcohol concentration is present in human breath above the threshold limit or if the helmet is not worn then the vehicle won't start . If accident occurs and bike falls, then it displays the message on LCD and sends an SMS to the registered number along with the current geographical location. It will reduce the probability of accidents by simply avoiding the drunken driver using an alcohol detector.

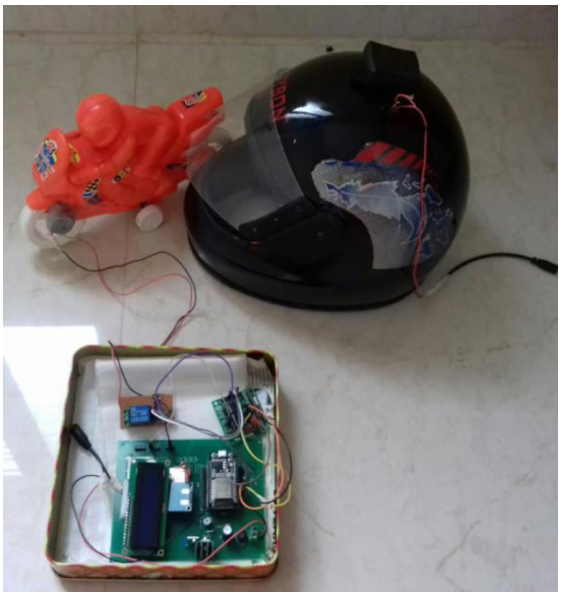

Fig 5.a Helmet with Transmitter and Receiver


Fig 5.b Status of rider to start the bike

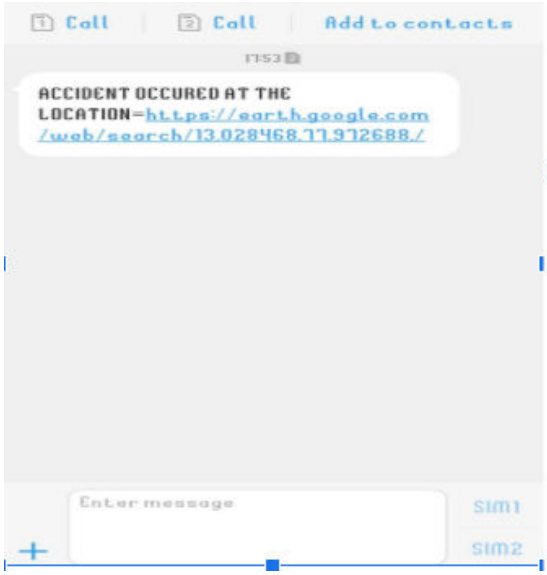


Fig 5.c Display of message send to the register mobile number

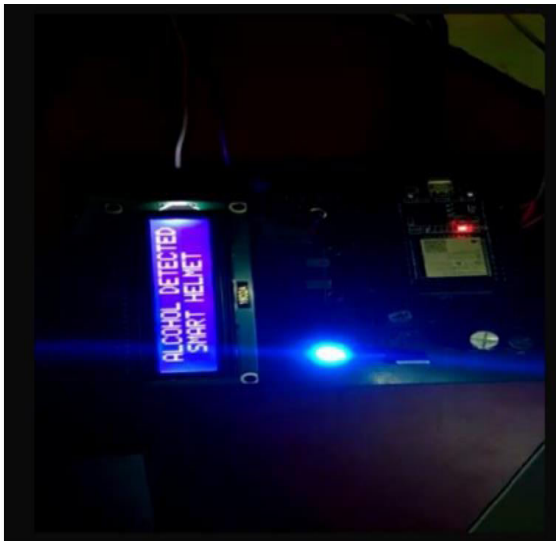


Fig 5.d Alcohol detection

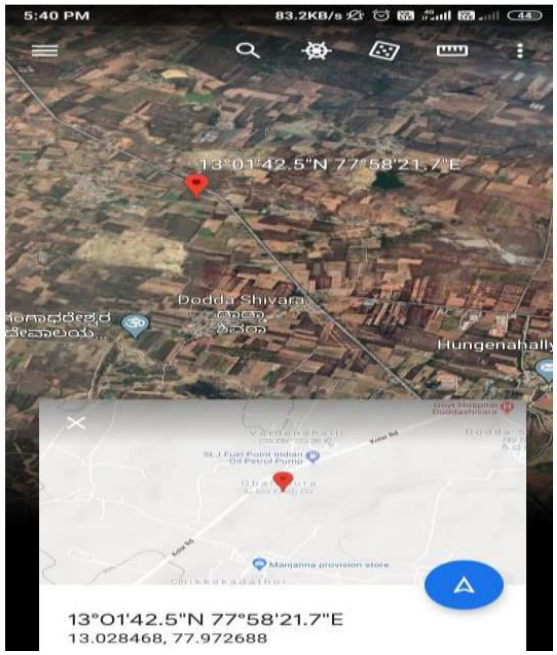


Fig 5.e Image of google map

## 6. Applications

1. It can be used in real time safety system
2. We can implement the whole circuit into small VLSI chip that can be embedded into the helmet and bike unit.
3. It can be designed for less power consuming safety system.
4. This safety system technology can further be enhanced in car or other vehicle by replacing the helmet with seat belt.

## 7. Future scope

1. We can implement various bioelectric sensors on the helmet to measure various activities.

2. We can use a small camera for recording the driver's activity. It can be used for passing messages from one vehicle to another vehicle by using a wireless transmitter.

## 8. Conclusions

The designed Smart helmet ensures the safety of the rider by making it necessary to wear a helmet, and also ensures that the rider hasn't consumed alcohol more than the permissible limit. If any of these prime safety rules are violated, the proposed system will prevent the biker from starting the bike. The system also helps in efficient handling of the aftermath of accidents by sending a SMS with the location of the biker to the police station. This ensures that the victims get proper and prompt medical attention if he/she met with an accident.

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