IJMRT: Volume (5), Issue 12, 2023
International Journal of Multidisciplinary Research Transactions
(*A Peer Reviewed Journal*)
www.ijmrt.in

ISSN (Print):2663-2381
ISSN(Online):2663-4007

IoT Based Smart Helmet for Motorcyclists

Sivaranjani S

Assistant Professor, Department of Electrical and Electronics Engineering, CK College of Engineering & Technology, Tamil Nadu, India.

DoI: https://doi.org/10.5281/zenodo.10636630

Abstract

IoT based smart helmet for motorcyclists which automatically checks whether the person is wearing the helmet and has non- alcoholic breath while driving. Here we have a transmitter at the helmet and the receiver at the bike. There is a limit switch used to ensure the wearing of helmet on the head. The ON condition of the switch ensures the placing of the helmet in proper manner. An alcohol sensor is placed near to the mouth of the driver in the helmet to detect the presence of alcohol. The data to be transferred is coded with RF encoder and transmitted through radio frequency transmitter. The receiver at the bike receives the data and decodes it through RF decoder. The engine should not ON if any of the two conditions is violated. At the point when the rider met with an accident, the sensor recognizes the condition of the motorbike and reports the accident. Then the GPS in the bike will send the location of the accident place.

Keywords: Smart Helmet, Internet of Things (IoT), GPS Technology, Accident Detection, Bike Rider's Safety.

1. Introduction

Road accident has become a huge concern in our everyday life. Due to this huge amount of population many people are facing very high road accident fatality and official figure indicates 60 deaths per 10,000 motor vehicles [1]. It is estimated that many bike riders die every-day in road accident and due to insufficient information regarding to the accidents those riders cannot

be saved as they merely find help after the occurrence of the accident. However, with increasing number of people the motorcycles are also increasing in the roads and streets.

Helmet is one of the most essential and important elements a motorcyclist must wear to avoid any possible road accidents. It ensures safety of the motorcyclist's head from the deadly impact caused by accident and provides guarantee protection to the bike riders and provides hundred percentage user reliability.

The annual fatality rate from street accidents is found to be severe. Various lives could have been spared if crisis clinical help could get mishap data and reach to the scene [3]. More than half all avenue visitor's death is amongst inclined avenue users like pedestrians, motorcyclists, and cyclists [2]. The main purpose of our project is to ensure a safety and build cost- effective system to prevent alcoholic people from riding motorcycle. This project is embedded with sensors modules and microcontroller. MQ-3 sensor is used as a breath analyzer which identifies the presence of alcohol in the user's breath if it is more than the pre -set permissible range, ignition will not start. It will provide the notification to the mobile through blynk app. This project ensures safety of the motorcyclist in two ways. Firstly, whenever a motorcyclist starts the engine it prevents any drunk rider from riding the vehicle and secondly if any accident occurs then the SW420 vibration sensor detects it and an immediate notification is sent to the mobile phones with exact accident location. However, the first condition of starting the engine is to wear the helmet for riding motorcycle. It successfully deploys the alcohol detection technology that prevents drunk bike riders from roaming around the streets making one's own life and other lives in danger.

The atmega328p microcontroller is used in this project, for bike unit we have used atmega328p microcontroller. The smart helmet will have limit switch which will be used to detect if the rider

has worn the helmet or not. MQ-3 sensor is used for alcohol detection purpose. Signal transmission between the helmet unit and bicycle unit is utilizing a RF idea. RF module in our smart helmet. It is in the transmitter side and other is used in receiver side. The receiver unit is to be placed on the bike where it will receive data and control the ignition. A DC gear motor is an example to show how the ignition system will work. There is a DC adapter that is connected to the Gear motor. A vibration sensor module which is SW420 has been used to detect road accident. The GPS module is used which provides navigation points of the accident location on the given mobile phone through blynk app. Also, there is an LCD display which will show all the outputs.

2. Literature Review

2.1. Background

There is a gradual increase in the number of motor cycles daily. The motorcycles that are recently manufactured have all the attributes in terms of mileage and performance. It is also priority for the manufactures to take the safety factor into consideration as well. The common people are buying motorcycles which are faster and powerful. In accordance with the increasing number of motorcycles the factor of safety also rises. There are a large number of road accidents those are occurring every day on the roads. There are a lot of causes behind it. The main reasons are responsible for it such as careless behavior of the driver, horrible road condition and mistake from another person on road. Head injury is one of the most severe cases that lead to body paralysis and sometimes death.

There are three major factors which motivate us for designing our project. The initial step is to determine whether the user is wearing the helmet or not. If the user worms the helmet, then the system will automatically initiate ignition of the motorcycle otherwise it will stay off until

helmet is put on by the user. To fulfill these tasks, we have used limit switch. The second step is the detection of alcohol levels. This is done with aid of MQ-3 sensor. When these two prerequisites are fulfilled then ignition will start. The third primary concern is in case of accidents, the arrival of medical assistance may be late. This is may turn out to be a matter of life or death. As after accident occurs, the longer it takes to receive medical aid, the lower the chances of the rider's survival.

The receiver unit is to be placed on the bike where it will receive data and control the ignition. We have used a DC gear motor as an example to show how the ignition system will work. We have tried to keep the receiver circuit as compact as possible. There is a DC adapter that is connected to the Gear motor. Using the GPS module in the receiver circuit we are sending location that an accident has happened. Also, there is an LCD display which will show all the outputs.

2.2. Related Work

We have tried to construct a smart helmet with a very novel approach. Although the smart helmet has been implemented in many countries, but the idea has not been introduced in South Asian countries where accident occurs frequently in every day. As our smart helmet is a bit different from conventional helmets,Bike riders will not want to use it if it is uncomfortable. So, we tried to keep it as familiar as possible for the users. We have placed all our circuits inside the helmet fabric so that they do notcontact the head. Given below is a picture of our smart helmet. There is a receiver circuit unit which is to be placed on the bike.We have tried our best to keep the receiver circuit as compact aspossible. A picture of the helmet and receiver circuit is given below:

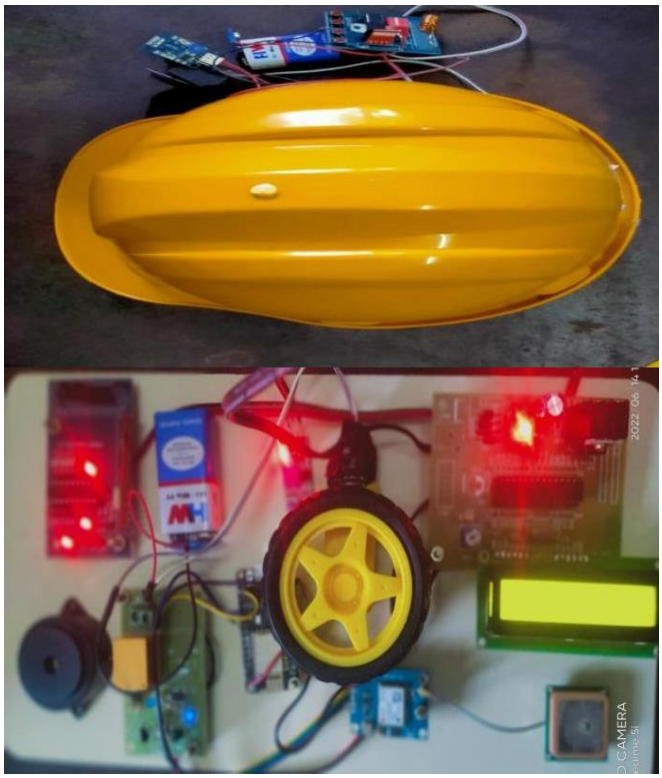

Figure.1. Helmet with Receiver Circuit

The size of the helmet is just like any other helmet and it is verycomfortable to wear. We are calling the entire helmet the transmitter circuit which will transmit data to the bike's receiver unit. The data will be sent via radio frequency communication. Various papers have managed the transmission of accident data [3], [5]. We have placed the MQ-3 alcohol sensorin-front of the rider's mouth keeping a safe distance so that it cananalyze the driver's breath and check if he/she is drunk or not. Then there is the limit switch which verifies if the helmet is wornor not. There are given conditions for both sensors. If these conditions are met, then the data will be transmitted through communication. All these sensors are connected in RF transmitter.

3. Methodology

The proposed concept arises due to three main issues which motivates for developing the project. First step is to identify the helmet is wear or not. The second is to detect for alcohol consumption. Here we designed a system which checks the two conditions before turned ON

the engine of the bike. To identify the helmet is wear or not alcohol consumption. The third step is to identify the accident detection. Our system includes Gas sensor andLimit switch. Limit switch is used to detect whether the biker is wearing helmet or not. The bike gets started only if rider if rider iswearing the helmet and has non-alcoholic breath otherwise the bike will not get start. Vibration sensor which is used to identify the accident detection. When the other vehicle hits the bike forcefully pressure will be built on switch and occurrence of accident will be detected. GPS will provide coordinates of location where accident took place and this data will be sent tosmart phones through blynk app.

Limit switch is a switch operated by the motion of a machine part or the presence of an object. It is a limit switch which is used to detect helmet is wear or not.

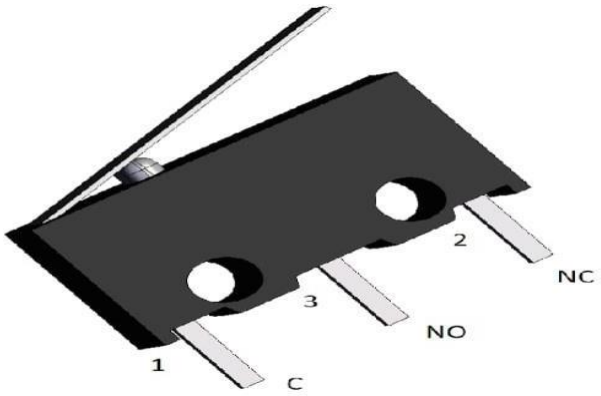

Figure.2. Limit Switch

The structure of MQ-3 gas sensor which detects the alcohol availability is shown in Fig. 3. This gas sensor module is very useful for leakage of alcohol. Because of its very high sensitivity and quick response time, measurements can be takenin as soon as possible. This sensor gives an output which is analogue resistive based on alcohol concentration. The voltage of the output from the MQ-3 sensor raises when theconcentration of gas increases. The gas sensor MQ-3 uses SnO_2which has very low conductivity rate in the atmosphere and thisSnO_2 material is used as a gas sensing material. In our atmospheric condition where alcohol gas is present, the conductivity of the gas sensor MQ-3 increases along with the concentration of the alcohol gas

raises. So, this MQ3 gas sensoris alcohol sensor which can be able to identify the alcohol concentration on anyone's breath. When the alcohol gas presents in the air, the full sensor's conductivity provides greater value along with the increasing value of gas concentration.

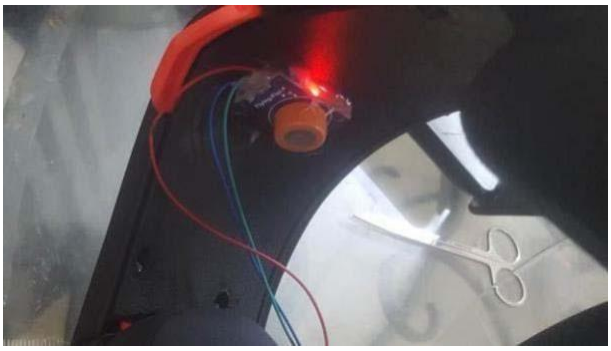

Figure.3. MQ-3 Alcohol Sensor

GPS (Global Positioning System) module and is used for navigation. The module simply checks its location on earth andprovides output data which is longitude and latitude of itspositions. The Global Positioning System (GPS) is a satellite- based navigation system which is used to detect the location where the accident will be taken place. It detects the Longitudeand Latitude values of particular place and sends it to mobile phones through blynk app. The GND and VCC are connected accordingly shown in the Fig. 4.

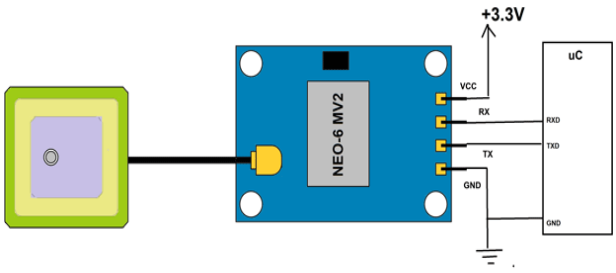

Figure.4. Connection between Arduino and GPS

4. Block Diagram

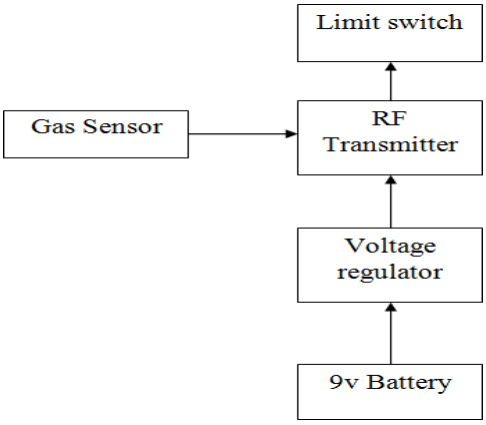

Figure. 5. Block diagram of Transmitter Circuit

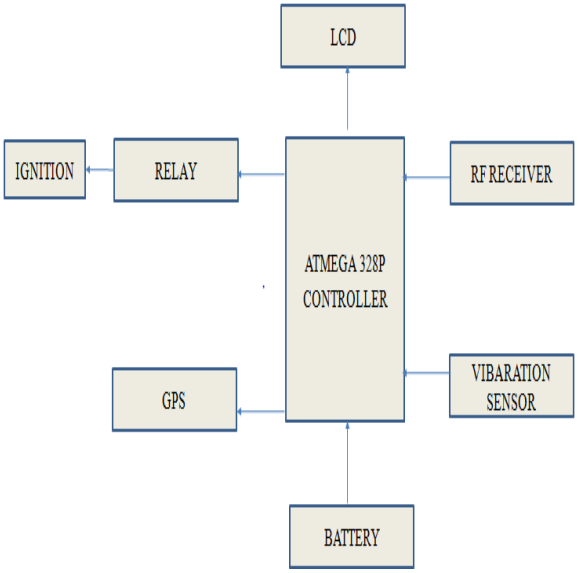

Figure.6. Block Diagram of Receiver Circuit

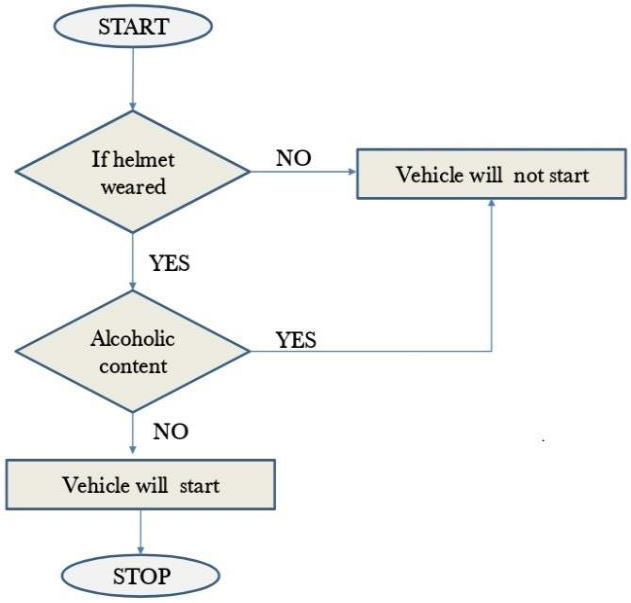

Figure.7. Flow Chart Ignition of Bike

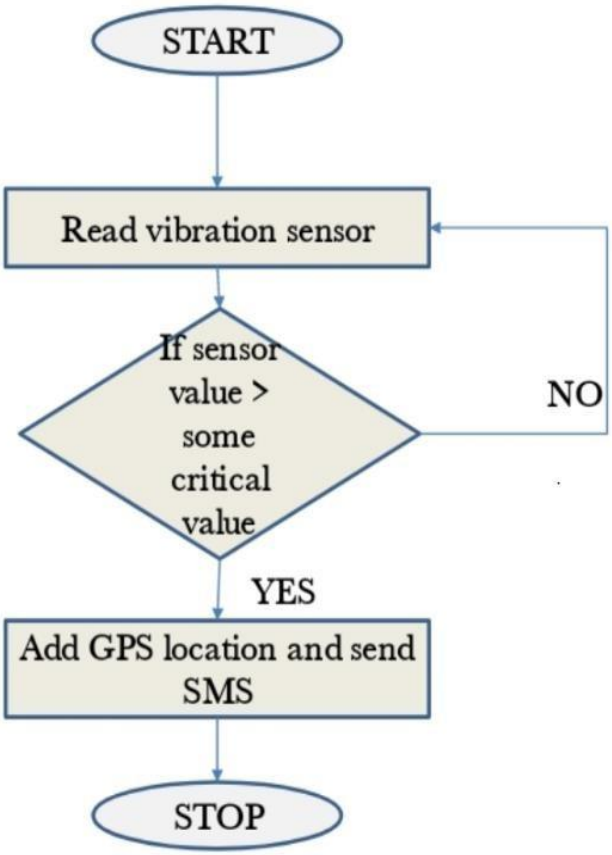

Figure.8. Flow Chart When Accident Takes Place

5. Results

The smart helmet is developed and tested for various conditions to find out how effectively it operates. There are mainly 4 different conditions the smart helmet is tested for. When the user is drunk and he is not wearing any helmet, the bike will not start. The limit switch will detect no helmet and the MQ-3 Alcohol sensor will detect alcohol and disable the ignition of the bike. When the user is wearing helmet the limit switch will give positive signal but since the user is drunk the MQ-3 sensor will give negative reading and as a result the bike will not be able to start.

Figure.9. LCD Display while Driver is drunk

Table.1. Shows Different User Condition Due to MQ-3 Sensor Reading

User Condition	MQ-3 Sensor Reading	Condition of Bike
Drunk and No Helmet	Positive	0
Drunk and Wearing Helmet	Negative	0
Sober and No Helmet	Positive	0
Sober and Wearing Helmet	Positive	1

When the user is sober the MQ-3 sensor will give positive reading but since the user is not wearing any helmet so the limit switch will send negative signal and the bike will not start. It means Bike condition is 0. There is only one condition where the bike will start which is considered as bit 1. The user is sober so the MQ-3 sensor will send positive signal and the user is wearing the helmet so the limit switch will also send positive signal. As a result, the bike can

now be started. There are also other components that work together to detect the bike accident and help locating the Bike Rider. GPS module is built into the smart helmet system [10]. The GPS part of the system detects the location where the accident has happened and shows its location in the Google maps.

This way the bike rider's life can be saved. A screenshot of notification and location is given in Fig. 9

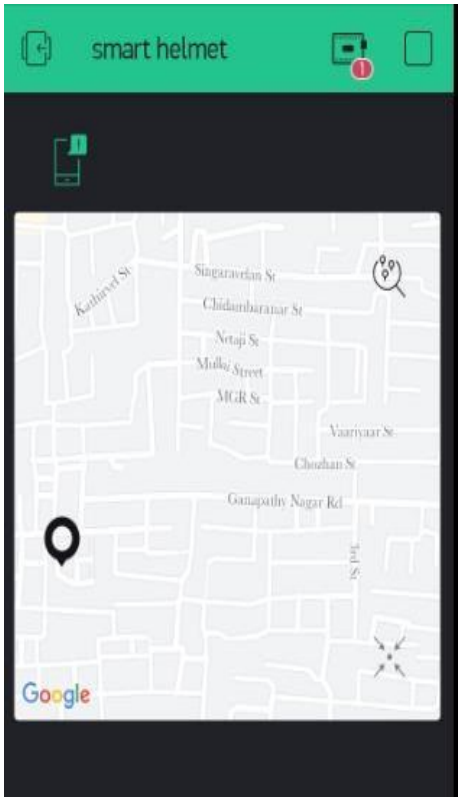

Figure. 10. Screenshot of Accident Location

6. Conclusion

The "IoT based smart helmet for motorcyclists" was designed such that the driver alcohol content status, helmet status and accident location is transmitted to the owner on his mobile phone as a notification through blynk app. The microcontroller gets the information regarding the alcohol through the alcohol sensor and alerts about the condition being sensed using Buzzer

and also automatically the motors of the vehicle turns off using relay switch. In this paper by considering without helmet accidents and drunken driver problem may be solved by using frequency transmission and reception as the final conclusion states that wear the helmet while driving to avoid the accidents stop the drinking while driving. Also the implementation of the project is very simple when compared with other projects. Because of the hardware connections are not difficult so it can implement on the existing bike.

REFERENCES

[1]. Sayan Tapadar, Arnab Kumar Saha, Dr. Himadri Nath Saha, Shinjini Ray, "Accident and Alcohol Detection in Bluetooth enabled Smart Helmets for Motorbikes"978-1-5386-4649-6/18/$31.00 ©2018 IEEE.

[2]. Hemangi S. Ahire, Madhuri B. Kamble, Prajakta K. Khade, Rohini A. Ghare, Prof. B.V. Jadhav, "Vehicle Accident Detection and Alerting System", Volume 6 Issue I, January 2018.

[3]. Akansha Rajputa, Amit Saxenaa, Achint Agarwalb, Aman Bhatiab and Aman Mishrab, "Smart Helmet with Rider Safety System, Volume 4, Issue 3, 2017[IJAERE]

[4]. B.Shyam Sundar, C.Velmurugan,"Smart phone based accident detection and rescue system Vol-3 Issue-2 2017, IJARIIE-ISSN(O) 2395- 4396.

[5]. Prajitha Prasad A, Reshma Mohan,"Smart Helmet and Intelligent Bike System", ISSN: 2393-8374, 2394-0697, VOLUME-5, ISSUE-5, 2018.

[6]. Yovan Felix A., Jesudoss A. and Albert Mayan J., "Entry and Exit Monitoring using License Plate Recognition", in Proc. International Conference on Smart Technologies and Management, 2017, pp. 227-231.

[7]. M. E. Alim, S. Ahmad, M. N. Dorabati and I. Hassoun, "Design & Implementation of IoT Based Smart Helmet for Road Accident Detection," 2020 11th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2020, pp. 0576-0581.

[8]. M. A. Rahman, S. M. Ahsanuzzaman, I. Rahman, T. Ahmed and A Ahsan, "IoT Based Smart Helmet and Accident Identification System,"2020 IEEE Region 10 Symposium (TENSYMP), 2020,pp.14-17,doi:10.1109/TENSYMP50017.2020.9230823.

[9]. S. Chandran, S. Chandrasekar and N. E. Elizabeth, "Konnect: An Internet of Things (IoT) based smart helmet for accident detection and notification," 2016 IEEE Annual India Conference (INDICON), 2016, pp.1-4, doi: 10.1109/INDICON.2016.7839052.

[10]. Shoeb Ahmed Shabbeer, Merin Meleet "Smart Helmet for Accident Detection and Notification" 2nd IEEE International Conference on Computational Systems and Information Technology for Sustainable.