Smart Helmet using IoT

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***Abstract*—As we know India is second most populated country and has a large youth population, nowadays youth are fond of bikes and because of fashion, they neglect wearing helmet. Because of these, bike accidents are increasing day by day which causes deaths. Major deaths are due to head injuries which can be prevented by wearing a helmet. Drunk and drive cases are becoming more, which causes accidents and due to lack of negligence where an accident occurs and people are dying. These incidents made us develop a smart helmet using internet of things which reduce the accidents and risk of deaths, which has following features, the bike starts only if the rider wears a helmet if the rider is over drunken then the ignition will be automatically offed and if any accident occurs then through GSM modem it will send the message to the registered contact number by using a sim card.**

Keywords*—Fond; GSM modem; Internet of things; Ignition; Smart helmet.

I. INTRODUCTION

Technology is the word where we hear every corner of the world, mainly in the fields of education, manufacturing of the products, transportation, communication and health. In the field of transportation industry was always an essential part of the economy, and a tool used by the government. We have different ways of transportation for moving around the world, but motorcycles are the craziest vehicle in the young generation and as well as to the world. Motorcycle safety related to different features of the vehicle such as equipment model, design of the vehicle and as well as operator skill is special for motorcycle rider has towards the motorbikes. But they are the most unsafe road users, without a protective body, even the slightest careless can have serious injuries or may lead to the death of the rider. Not only because of the careless, but the death of the people may occur due to over speed, rash driving, over consumption of alcohol and violation of traffic rules. But the main reason for brain damage and this leads to immediate death, was the absence of helmet on the person. If the rider wears the helmet, 80% chances for avoiding head injuries and we can save a life from accidents. With the help of new technologies such as IoT, dangerous traffic situations will not occur. And modelling the motorcycles with the sensors, alert system to the rider and surroundings by a sending message, and to make it mandatory for the bike rider to wear a helmet during his/her ride. In a recent survey, every hour 4 people die in road accidents, 70% due to not wearing a helmet. Based on statistics from around the world, increasing safety regulations and by using the innovative technology, being developed to avoid such instances, and to ensure the safety of riders. The idea behind our project is to ensure the "Safety on Two Wheels" for a safe journey.

A. Objectives

The main objective of this system is to design a helmet that provides safety to bike riders and to prevent over a drink and drive cases. It detects whether the rider met with an accident if he meets, then it alerts the guardian about the accident and sends SMS.

II. PROPOSED SYSTEM

We are developing a smart helmet using the internet of things (IoT) technology, in which we ensure the safety of the bike rider. by avoiding road accidents of the bikers by,

- The system detects whether the rider is wearing a helmet or not if he wears then only the vehicle will start.
- It detects the amount of alcohol consumed by the rider, if the rider has over drunk, the bike engine will not start.
- When the bike rider meets with an accident it detects it and gives the notification to the registered contact with a location.

For the safety of the bike rider, we are using the latest technology IoT, this technology provides the advance techniques for alerting the rider and ensures that rider follows the rules and regulations. For two-wheeler rider, Helmet is the most basic protection device and it is necessary for every bicycle or motorbike riders. But it does not ensure the safety of the rider and the rider won't follow the traffic rules. Most of the people use ordinary helmet just to avoid giving challan to the traffic police, these helmets do not ensure the safety of the driver. So, to overcome these problems we need to use the smart helmet.

III. SYSTEM DESIGN

The system has two sections

- Helmet section
- Bike section

A. Helmet section

This section comprises an alcohol sensor, switch, accelerometer, microcontroller and RF transmitter. The switch examines whether the rider is wearing a helmet or not and alcohol sensor senses the rider is intoxicated or not and transmits the signal through RF transmitter to the bike section.

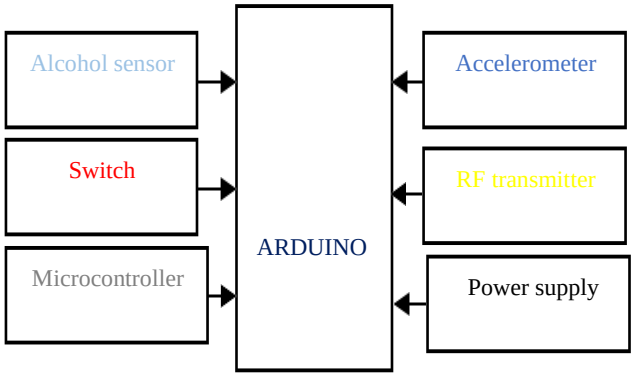

Fig. 1. Block diagram of Helmet module

Main components description

1) Alcohol sensor:

Fig. 2. Alcohol sensor (MQ-3)

An alcohol sensor detects the attentiveness of ethanol in the air when the drunk person breathes near this sensor, it discloses the alcohol gas in his breath and obtains the output based on alcohol concentration. It is placed in the helmet such a way that it can easily sense the breath of the person.

2) *Accelerometer*:

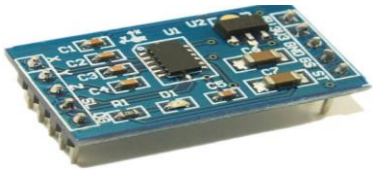

Fig. 3. Accelerometer (MMA7361)

It is an electromechanical device which is used to measure acceleration forces and the forces will be static or dynamic forces. An accelerometer will measure the vibration of the material and it is employed to continuously monitor the head inclination of the rider and position of the helmet and helpful for calculating the likelihood of accidents.

3) *RF transmitter*:

Fig. 4. RF transmitter (434-Mhz)

RF modules are 434 MHz transmitter and receiver components. RF transmitter is the wireless data transmitting device. It transmits serial data to the receiver through an antenna which is connected to the 4th pin of the transmitter. It transmits the helmet data to the bike receiver through the radio frequency signals and microcontroller will process the received data.

4) *Switch*:

Fig. 5. Switch (ON/OFF button)

A switch is an electric mechanism for ON/OFF the device, it is used to regulate the flow of electricity by interrupting or diverting the current from one conductor to another. This switch is placed inside on top of the helmet and it is pressed when the rider wears the helmet and it released when helmet takes off. Based on the switch condition the bike ignition key will be ON/OFF.

5) *Arduino*:

Fig. 6. Arduino (UNO)

Arduino is the open-source platform used for building electronic projects. It consists of both hardware circuit and software tool, and this software is used to write the code and upload into the physical board through the cable. Arduino IDE uses the simplified version of C++, but this is one of the easiest ways to write the code. Arduino can interact with sensors, motors, internet, smart-phone and the TV. Arduino has varieties of boards but the UNO is one of the most popular board in the Arduino family.

B. Bike section

This section comprises RF receiver, Microcontroller, Ignition key, GPS LCD, GSM modem and decoder. The RF receiver gets the signal from the helmet section and decodes signal using decoder if the person is over drunken then ignition will be automatically offed by the relay and if any accidents occur message will be sent using GSM modem

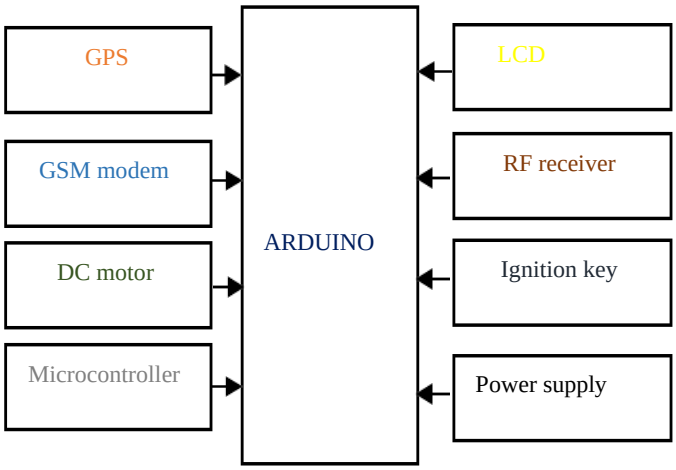

Fig. 7. Block diagram of Bike modules

Main components description

1) *GPS tracker*:

Fig. 8. GPS tracker

GPS stands for Global positioning system. GPS tracker is a navigation device, used for tracking the location of moving person, vehicle and animals. The information that is collected from the device is stored on the device inside and then is transmitted through a wireless network or cellular network. the information reported from the vehicle is the real-time location and is displayed on a map in near real-time. The software for tracking the vehicle will be available on all smartphones.

2) GSM modem:

Fig. 9. GSM modem (sim900)

A sim has to be inserted into the sim card port in modem and can be operated using a mobile device, it can send and receive messages from registered numbers.

3) *Microcontroller*:

Fig. 10. Microcontroller (P839V51RD2)

A microcontroller is a solid integrated circuit; on a single chip, it includes many devices. It is similar to the central processing unit that has decision-making capabilities. It consists of 64KB Flash and 1024 bytes RAM. The microcontroller used in products such as engines, medical devices, appliances and in embedded systems.

4) LCD:

Fig. 11. LCD (16x2)

LCD stands for liquid crystal display that it uses liquid crystals for operation. It is very popular and broadly used in electronic projects as they are used for displaying information like sensors data from the project, and commonly found in smart-phones, televisions, computer monitors and instrument panels.

5) RF receiver:

Fig. 12. RF receiver (434-Mhz)

Radio-frequency receiver is an electronic device, used to communicate between two electronic devices which are connected wirelessly. The transmission takes place through the radio waves which are of the form of electromagnetic radiation. The helmet module(transmitter) output data will be received by the vehicle module(receiver) and the process will take place by wireless technology.

IV. IMPLEMENTATION

The implementation of this system provides effective detection of accidents and is also low cost. This system provides safety measures in motorcycles and avoids road accidents. The system “Smart Helmet” accomplishes the following objectives:

- Status of the rider wearing a helmet
- Alcohol content detection and
- Accident detection and location sharing

A. *Helmet Section*

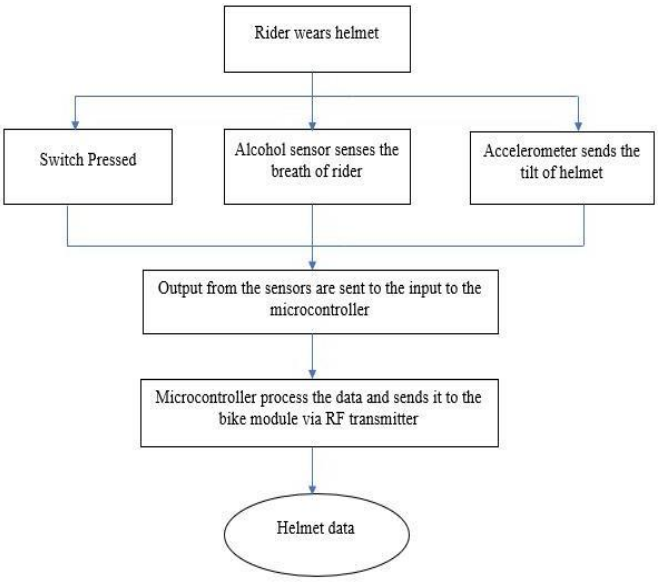

Fig. 13. Flow chart of Helmet Section

The transmitter is placed in the helmet section while the receiver is placed in a particular bike. Thus, there will be wireless communication between two modules (helmet section and bike section).

When the bike rider wears the helmet, the switch is pressed present in the helmet. While breathing the alcohol sensor present in the helmet detects the alcoholic gas, because it is placed in the helmet such a way that it can easily detect the breath of the rider. If the alcohol sensor detects that rider is over drunken then the threshold value drops and it will change the value and bike will not start because ignition will be OFF. Accelerometer embedded in the helmet measures tilting of the helmet. The output of these components in the helmet will be input for the microcontroller which is embedded on the helmet. Then the processed data which is the output of the microcontroller of the helmet is sent to the bike module through the RF transmitter.

B. Bike Section

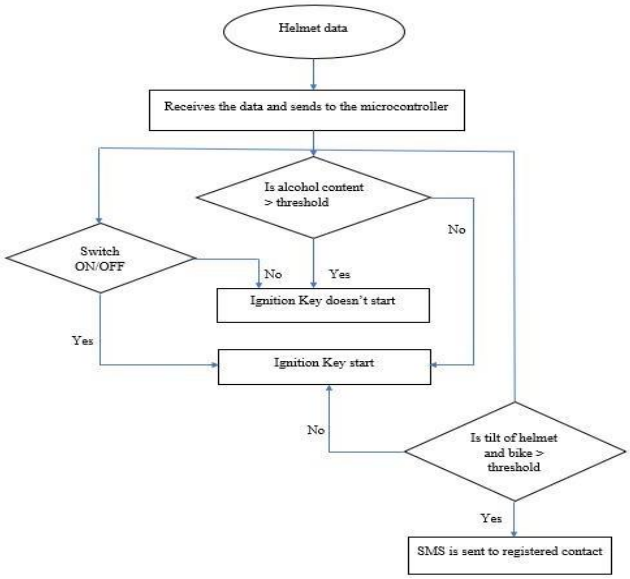

Fig. 14. Flow chart of Bike Section

RF receiver in the bike module receives the helmet data and sends to the microcontroller. Then microcontroller will make out the decisions whether to start the bike or not by reading all the data of helmet.

To start bike ignition a person must follow two conditions:

- Rider must wear the helmet since there is a switch in the helmet when the switch is pressed the ignition starts.
- The rider should not cross the threshold value of consumption of alcohol.

To start the ignition of the bike the output of the helmet data must match above two conditions when it matches only then the bike starts or else it won't start. The accelerometer will measure the condition of the helmet whether it is tilted concerning with the ground or not, if it is tilted with more than the threshold value, then it means that accident has occurred after that immediately the notification will be sent to the registered contact number using GSM and also it sends the location of the accident occurred. So that they can take victim immediately to the hospital and provide medical treatment and further they can also inform about the incident to the police station.

V. RESULT

The two-wheeler Safety System developed with IoT, Smart helmet is very safe and trustworthy. The main aim of this system prevention from injuries when a person wearing this helmet meets with an accident. It avoids Drink and Drive cases. The results can detect the accident and it sends the notification to the registered contact with 90% accurate location so that the guardians will get to know the condition of the person and can able to give the proper medical treatment. The detection of an accident is based upon the results of tilting of a helmet, it matches with the helmet fall value and the threshold value. The results show that the system detected the presence of alcohol in the breath of the rider if the rider is over drunken then bike will not start. This system will process completely based on rider activities.

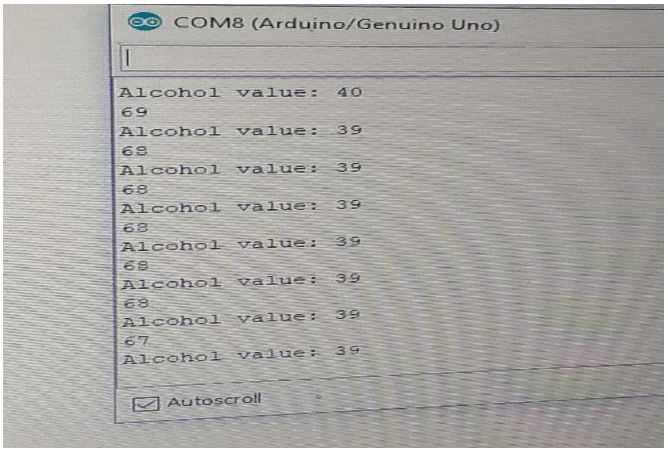

Fig. 15. Alcohol readings

Fig. 16. Helmet module

VI. CONCLUSION

The system designed provides safety of the riders, in case of accidents it will notify the registered contact and the location of the accident provides a timely safety measure. This also detects the consumption of alcohol and prevents drink and drive cases. This also ensures the person wears the helmet mandatorily.

VII. FUTURE SCOPE

We can implement various bioelectric sensors on the helmet to measure various activities and we can view the statistics of the rider. We can use voice commands to control the basic bike functionalities. Now the rider can leave the helmet on the two-wheeler while parking, without any special actions or security measures. We can use solar energy on two-wheelers for charging the electric vehicles and for mobile devices. In the future self - driving motorbikes can be developed with artificial intelligence and the rider will be safe and no accidents will occur.

ACKNOWLEDGMENT

We are so much thankful for our project guide, Prof. Ganesh D. R who supported us during the project completion and also helped us to improve the manuscripts significantly.

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