Safeguarding Two Wheeler User's Lives Using Smart Helmet

K.Premalatha , J.J.Nandhini

Abstract: This paper proposes smart helmet for two wheeler riders. The smart helmet consists of two modules one is the helmet module and other one is engine module. The helmet module has inbuilt alcohol sensor, vibration sensor, a limit switch. These sensors communicate wirelessly with the two wheeler module of the two wheeler through RF transmitter. GPS and GSM system are kept closer to the engine. The engine module receives the information from helmet module through RF receiver. The spark plug is shorted to ground with the help of relay, which is connected to the controller. The relay senses and releases the spark plug from ground unless the signal comes from the controller. The proposed smart helmet doesn't allow the vehicle to start unless the rider wears his/ her helmet. The proposed smart helmet also detects accidents and inform to the ambulance service through Global Positioning System (GPS) and Global System for Mobile communication (GSM). The smart helmet is developed and tested for various conditions such as two wheeler key not detected, Helmet not wore by the driver, alcohol is detected from the driver and when an accident occurs.

Key Words: Smart Helmet, PIC, Accident Prevention

I. INTRODUCTION

Nowadays road accidents are getting increased day by day in our country due to carelessness of people on the road. Especially two wheeler accidents are more common in our country. This happens because most of the people don't wear helmet. Even though our government keep on insisting awareness through various advertisements in theatre, newspaper and in public places but our people still doesn't care and are not following the rules. In order to prevent and stop the accidents, a smart helmet for two wheeler riders have to be developed. paper aims at the security and safety of the two wheeler riders against road accidents. There are many methodologies which uses IoT for preventing accidents. But it is considered as solution for reducing accidents [1]. But the human life saving is made primarily by using smart helmet. Communication devices based helmet [2] and Arduino based smart helmet is available with some demerits [3]. A helmet is a form protective gear to protect the head from injuries. The circuit in each helmet is designed in such a manner that the two wheeler won't start unless the rider wears the helmet. The limit switch installed on the Two wheeler detects whether the rider wears his/her helmet or not and then closes the circuit and start the Two wheeler. An in-built alcohol detection sensor will check the presence of alcohol in rider's breath and if detects the presence of alcohol closes the circuit and doesn't allow the vehicle to start to prevent accidents due to drunken driving [4]. In case of an accident, the GPS system installed in smart helmet will globally locate the two wheeler and an immediate message will be sent to family members/ambulance service. The smart helmet boasts with rechargeable battery and charger pin so that at any cause if the battery gets over the rider can charge the battery through this. The communication between sensor and GSM happens through Radio Frequency transmitter and receiver.

More specifically, a helmet aids the skull in protecting the human brain. The primary goal of a motorcycle helmet to protect the rider's head during impact, thus preventing or reducing head injury and saving the rider's life [5], [6]. The survey concluded that helmets reduce the risk of head injury by around 69% and death by around 42%. The main objective of this smart helmet is to make the motorcycle rider safer than before. [7],[8]This is implemented using some of the sensors like Alcohol sensor, vibration sensor, GSM, GPS and PIC controller.

II. SYSTEM CONFIGURATION

A helmet is a form protective gear to protect the head from injuries. More specifically, a helmet aids the skull in protecting the human brain. The primary goal of a motorcycle helmet to protect the rider's head during impact, thus preventing or reducing head injury and saving the rider's life. The survey concluded that helmets reduce the risk of head injury by around 69% and death by around 42%. The main objective of this smart helmet is to make the motorcycle rider safer than before. This is implemented using some of the sensors like Alcohol sensor, vibration sensor, GSM, GPS and PIC controller.

III. CONTROL METHOD

Helmet module consists of alcohol sensor, limit switch and a Radio Frequency transmitter to transmit information of sensor to the pic micro controller. In helmet module there is an alcohol sensor which detects the breath of rider and if he is boozed it sends information to the PIC through RF transmitter and receiver and opens the relay circuit which in turn turns off the Two wheeler. And there is a limit switch inside the helmet which allows the rider to start the Two wheeler only after wearing the helmet, if he removes the helmet during his ride the Two wheeler stops. Two wheeler module consists of vibration sensor, GSM, GPS and a Radio Frequency receiver to receive signals from the sensor.

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K.Premalatha , Assistant professor, Electrical and Electronics Engineering, Kumaraguru College of Technology, Coimbatore-641049, Tamil Nadu, India.

J.J.Nandhini,Assistant professor, Electrical and Electronics Engineering, Kumaraguru College of Technology, Coimbatore-641049, Tamil Nadu, India.
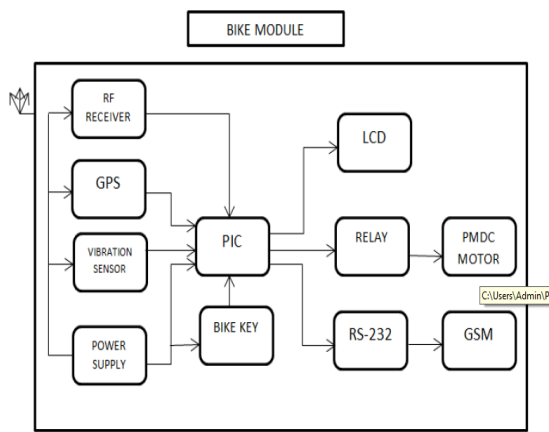
Figure 1. Architecture Receiver side

The vibration sensor attached to the Two wheeler, when the rider met with an accident the vibration sensor vibrates and sends information to the Radio Frequency transmitter and from there Receiver receives the information and sends to PIC micro controller.
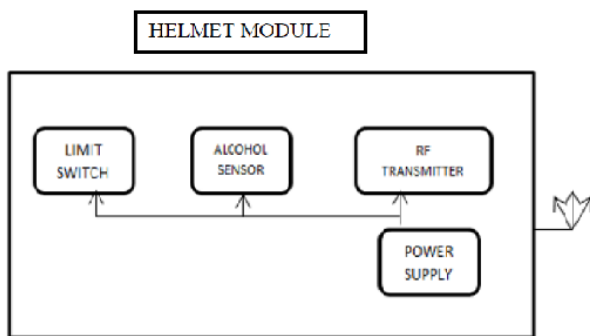

Figure 2. Architecture Transmitter side

Through PIC microcontroller GPS sends the location (both latitude and longitude) and with the help of GSM the information is passed to the ambulance service.

IV. RESULTS AND DISCUSSION

The various stages of module's working condition as shown in Figure 3. is explained in various stages:
Conditions:

A. If Two wheeler key not detected process

When the Two wheeler rider doesn't insert his key as shown in Figure 4. there the key returns '0' to the microcontroller and thus circuit opens and the motor doesn't run. This information is displayed in the LCD as' Key not inserted' which is connected to the microcontroller. And this message in the LCD insist the rider to insert his key, then the circuit closes and allows the motor to run.

B. If helmet not wore process

When the Two wheeler rider doesn't wear his helmet as shown in Figure 5. there the limit switch returns '0' to the microcontroller and thus circuit opens and the motor doesn't run. This information is displayed in the LCD as' Helmet not wore' which is connected to the microcontroller. And this message in the LCD insist the rider to wear his helmet, then the circuit closes and allows the motor to run.

C. When alcohol is detected process

When the Two wheeler riders breathe is detected with alcohol the alcohol sensor(MQ-3) returns '0' to the

microcontroller and thus circuit opens and the motor doesn't run. This information is displayed in the LCD as 'Alcohol detected and bike is stopped' which is connected to the microcontroller. And this message in the LCD insist the rider not to ride the bike unless he becomes normal, then the circuit closes and allows the motor to run.

D. When accident occurs process

When the Two wheeler rider met with an accident the Vibration sensor returns '0' to the microcontroller and thus circuit opens and the motor doesn't run. This information is displayed in the LCD as 'Accident occurred' which is connected to the microcontroller. After this the global location is send to the ambulance number. Once when the vibration sensors detects the vibration when rider met with an accident, immediately the information is send to the PIC micro controller and then with the help of GPS the location is tracked and this location with the Latitude and Longitude information is send to the ambulance service with the help of GSM.
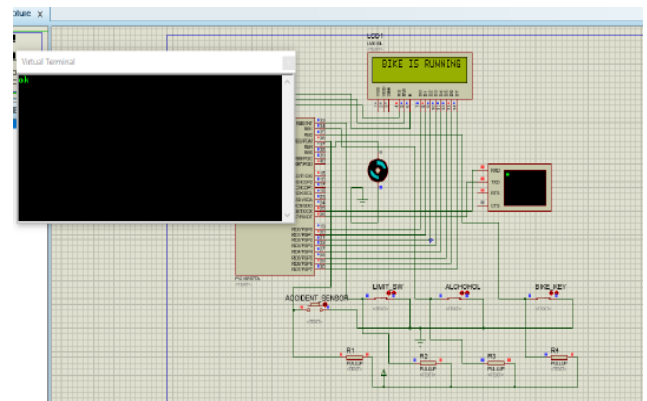

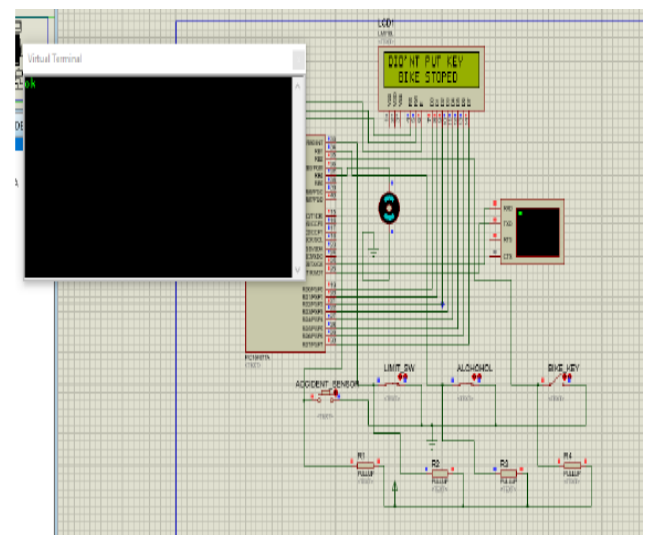**Figure 3. Proteus simulation – Working model**
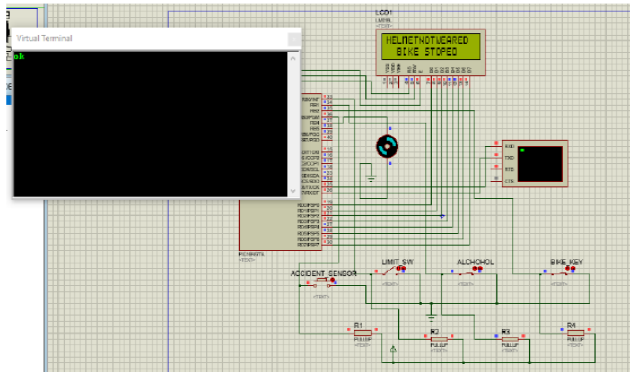

Figure 4. Case –Two wheeler key not detected
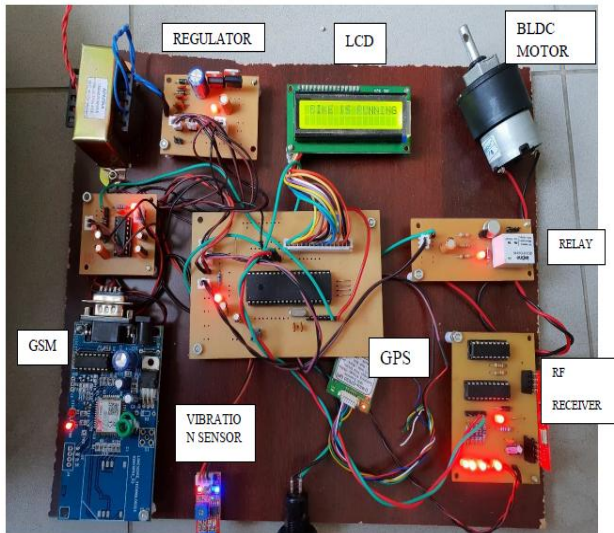
Figure 5. Case – Helmet Usage

Figure 6.HardwareWorkingMode

V. HARDWARE IMPLEMENTATION

The hardware implementation of the internal module of smart helmet is modelled as shown in Figure 6. The

(a) When alcohol is detected in riders breathe

(b) When rider doesn't wear the helmet

(c) When rider met with an accident and finally the ambulance number with respected location is simulated in Proteus. The simulation result for the final working model which satisfies the following conditions such as the rider must wear his helmet, inserts the Two wheeler key and doesn't get boozed the circuit closes and engine gets started. If the sensor detects alcohol, vibration return '0' to the micro controller and limit switch return '1' to the micro controller. Thereby circuit closes and motor runs.

VI. CONCLUSION

According to National media every single day there occurs 1317 Two wheeler accidents in India and over 413 deaths which is huge in number. This prototype increases safety for the rider. This allows to ignite the vehicle only after wearing the helmet because of this restriction everyone wears helmet before starting the vehicle. Moreover, the vehicle doesn't get started if the rider is boozed. This helps in the reduction of road accidents. And also has GPS technology if the rider met with an accident immediately the location is send to ambulance service through GSM.

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