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Smart Helmet: A Protective Headgear System

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ABSTRACT- In present day scenario we encounter numerous cases of two wheeler road accidents leading to death. The main reason for severe head injuries is despite of the fact that helmets are available everywhere, people are not wearing them for protection. So we have come up with an idea of SMART HELMET. This is implemented using Arduino Uno development kit which consists of RF transmitter and RF receiver system. The bike will not get start without wearing helmet by the user or rider. An alcohol sensor is placed near to the mouth of the driver in the helmet to detect the presence of alcohol breath. If the breath of the driver is non-alcoholic then these two conditions are satisfied and the bike will get started. Here we have used LDR sensor which can turn the headlights of the bike ON and OFF automatically.

We have also used the vibration sensors in different places of helmet so that when the rider crashes and the helmet hits the ground, the sensors sense and the Arduino extract data using the GSM module and when the data exceeds minimum stress limit then GSM module automatically send message to ambulance or police or family members. Security system applied in this paper meet the characteristics of a perfect rider and the application should be highlighted. This paper will improve safety and reduce accidents, especially fatal to the motorcyclist.

KEYWORDS- Road Accident, Vibration sensor, microcontrollers, GSM module.

I. INTRODUCTION

Security and safety is one of the most talked of topics in almost every aspect. Previously the most compulsion is to wear the helmet for the bike riders. For the inconvenience caused many of them failed to wear the helmet which caused the death of the people. Keeping in the view of the inconvenience caused in the helmet we have implemented many features in the helmet which are flexible to the rider. Actually in existence system, if the person met with any accident we can't get the information regarding that accident so the person may die due to the late medication by using these proposed system can send that information like accident alert and position of the accident place to the particular number or ambulance emergency number so we can provide the medication to the victim just in time. By avoiding these problems proposed system will help.

II. LITERATURE REVIEW

An Optimal Driving System by Using Wireless Helmet by K. Rambabu1, B. Premalatha and C. Veeranjaneyulu, they have used a wireless communication between bike to helmet and bike to traffic signal and speed breaker along with Arm-7 Microcontroller which is placed in the bike module and also the voice recognition unit which records the left, right & stop.Smart Helmet with Sensors for Accident Prevention by MohdKhairulAfiqMohdRasli, Nina KorlinaMadzhi, Juliana Johari, in this paper microcontroller Peripheral Interface Controller (PIC) 16F84a along with Force Sensing Resistance (FSR) and the speed sensor (BLDC Fan) are used as sensors to operate this paper.

Alcohol Detection using Smart Helmet System by SudharsanaVijayan, et al, here they used a switch and Alcohol sensor is used.Smart Helmet Using GSM & GPS Technology for Accident Detection and Reporting System by

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Manjesh N, et al. In this paper they have used Vibration sensor, Alcohol Sensor, Temperature Sensor & Solar Cell as power supply.A Solar Powered Smart Helmet with Multifeatures by Mr.P.Dileep Kumar, et al in this proposed system Bluetooth is used.

Safety Helmets for Coal Miners Using ZigBee Technology by Monika Prasad, et al this technology is planned to be simpler and less expensive than the other WPANs, such as Bluetooth.Safety measures for "Two wheelers by Smart Helmet and Four wheelers by Vehicular Communication" Manjesh N, et al here they used VANET as network which has self-organizing, movable, more efficient, and communication establishes in decentralized manner. Here GSM and GPS are used for sending the data.

III. PROPOSED SYSTEM

A. Transmitter Unit:

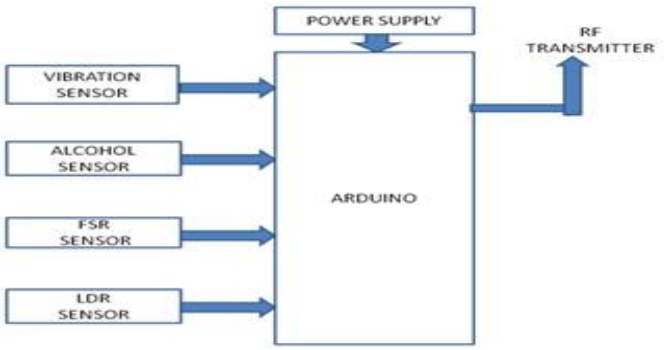

Fig 1.Helmet Unit/Transmitter Unit

This system mainly focuses on avoidance of drunken driving. Hence this system will not turn on the vehicle, when the user is in drunken condition. The system will send short message service to the friends or relatives when an accident occurs. Our system consists of two major parts. They are 1) Helmet unit and 2) Bike unit as shown in fig. This paper describes the design of an effective system for a bike, in order to avoid accidents and other malpractices. In our paper we combine these two aims in a single system. This section consists of an alcohol sensor, FSR Sensor, LDR Sensor and Vibration Sensor along with Arduino and an RF transmitter.

All the sensors are fitted in the helmet. Arduino reads data from the sensors, finds if the driver has non-alcoholic breath and helmet sensor is in proper position and gives corresponding digital output to an encoder only if the two conditions are satisfied. Also LDR the sensors respective output is given to the Arduino. It encodes one of the active inputs to a coded binary output. RF transmitter transmits this coded binary output from the encoder. Here we use the popular ASK modulation technique. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

B. Receiver Unit:

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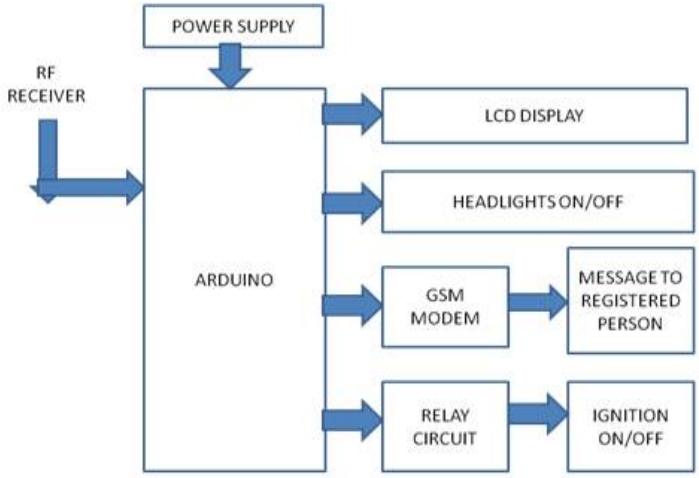

Fig 2.Bike Unit/Receiver Unit

This part consists of the signal reception and control part. Receiver section is placed on the bike; it consists of an RF receiver, Arduino, GSM module, LCD as indicator, Relay circuit. RF receiver receives the coded binary data transmitted by the RF transmitter and gives to the RF decoder. RF decoder decodes the input and gives four bit digital data to the ARDUINO only if the address bit of encoder and decoder matches. ARDUINO operate the DC motor through motor driver IC L239D when it receives digital data from the transmitter section. In case alcohol is detected by the sensor, the GSM module gets activated and a message is sent to the mobile number of a concerned person or police man, so that proper action on drunken person can be taken by the authority. The block diagram of the system at the bike is shown in Fig.

Also depending upon the LDR values, the headlights of bike will be ON/OFF. ARDUINO operate the engine of the vehicle when it receives digital data from the transmitter section, it operates the engine through a relay circuit but it cannot operate the relay directly, so a relay interface is also used here. The system is provided by the motor vehicle department to avoid abnormal circumstances.

C. Flowchart:

The first step of paper is it initializes all the port and then transmitter waits for signals getting from all of the sensors. After that it checks weather the helmet is wore or not. If Helmet is not wore then the ignition of bike will get stop. Hence the Rider can't start the bike without wearing the helmet. But if the condition satisfies then rider can start the bike.

Similarly, it checks the condition for Alcohol sensor. If the rider is drunk then ignition of bike gets stops and along with that the message will be send to the registered person's mobile no. Otherwise rider can ride successfully. Next it checks the condition for the LDR sensor. If its value is below the threshold value then the headlights of the bike will get turn ON. Otherwise it will remains OFF. Finally, the condition of vibration sensor is checked. If the value is above threshold value then the message will be send to the registered person's mobile no that "Accident Occurred". If not then rider can successfully ride on the bike.

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D. Helmet Diagram

Fig 4.Conceptual Diagram of Helmet with Different Sensors

We already mentioned that we divide a paper in two units namely helmet and bike unit. In helmet unit, the force sensing resister is placed on inside upper part of the helmet where actually head was touched with sensor surface and alcohol sensor is placed on in front of rider's mouth so that it can sense easily. We can place the vibration sensors at different places on helmet. So that the vibrations can be sensed more easily. LDR sensor is placed on the top of the helmet so that it can sense the intensity of light outside the helmet and work accordingly. And the battery and regular circuits are fixed inside the helmet as shown in the fig. Secondary controller and RF transmitter circuit was also placed on inside the helmet, antenna are located outside the helmet.

IV. RESULTS

1. LDR Sensor Output:

Here, for LDR sensor we had set the threshold value as 600. Hence if light is applied on the LDR sensor, it will sense the intensity of light and if it goes above this threshold value then the light will be ON. Otherwise it remains OFF.Following figure shows the appropriate output of the sensor below the threshold value as well above the threshold value.

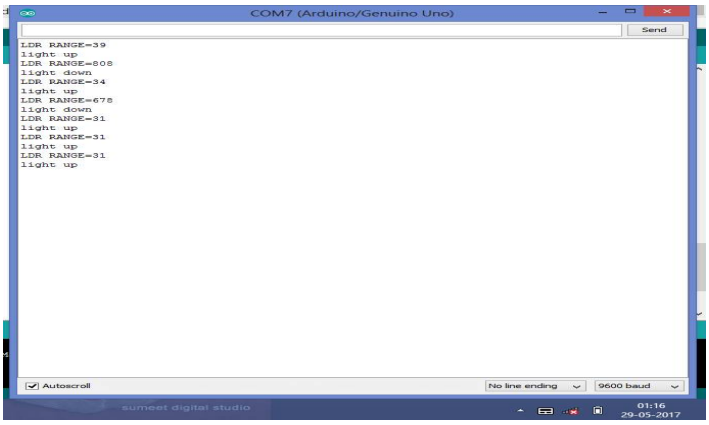

Fig 5.LDR Sensor Output

2. FSR Sensor Output:

Here, for FSR sensor we had set the threshold value as 300. Hence when the helmet is wore the force is applied on the upward direction will allow the bike to start.Following figure shows the appropriate output of the sensor below the threshold value as well above the threshold value.

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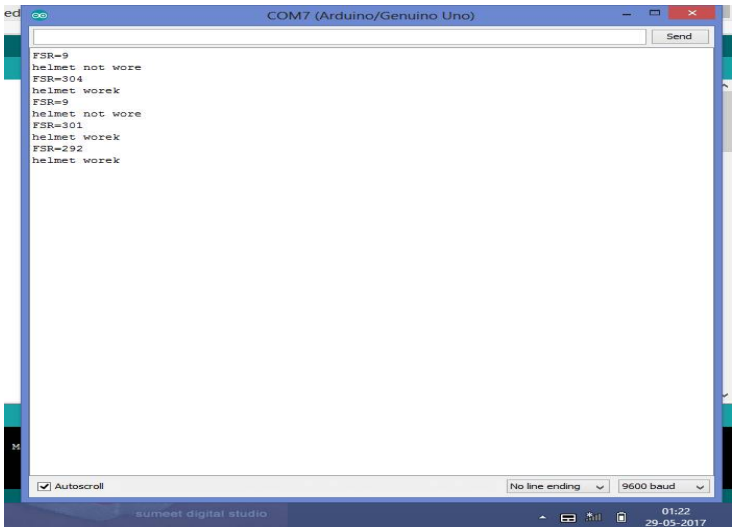

Fig 6.FSR Sensor Output

3. Alcohol Sensor Output:

Here we have set the threshold value as 300.When the riders breath is alcoholic then the will not start. The bike will start only when the riders breath is non alcoholic.Following figure shows the appropriate output of the sensor below the threshold value as well above the threshold value.

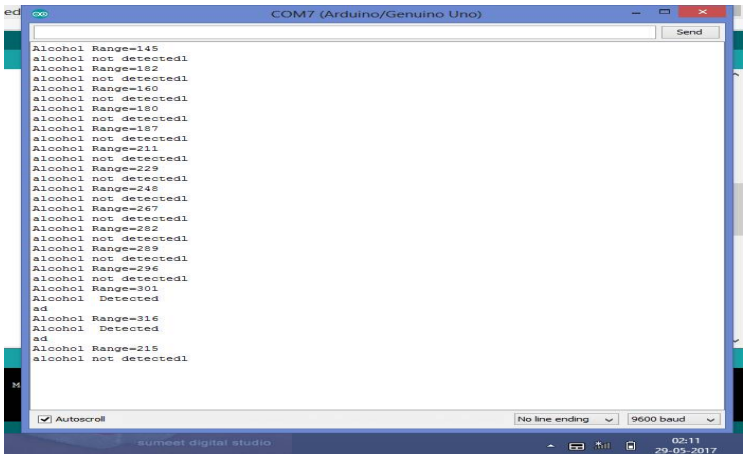

Fig 7.Alcohol Sensor Output

4. Vibration Sensor Output:

Here for vibration sensor we have set threshold value as 550.If the rider falls from the bike and intensity of the sensor goes beyond threshold value then fall is detected. Following figure shows the appropriate output of the sensor below the threshold value as well above the threshold value.

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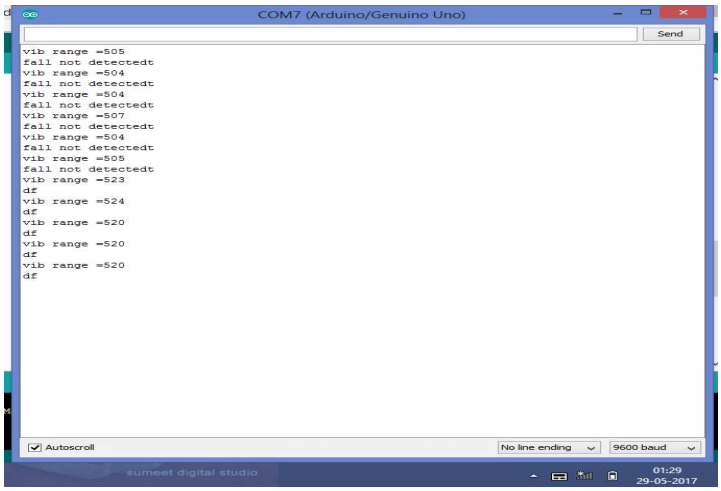

Fig 8.Vibration Sensor Output

5. Receiver Output:

Here we have shown all the Receiver output of all the sensors as follows

Fig 9.Receiver Output

6. GSM Output on Mobile:

When the alcoholic breath is detected by the alcohol sensor then message is sent to the registered number as follows.Similarly when the fall is detected when accident has occurred at that time also message is sent to the registered number as follows.

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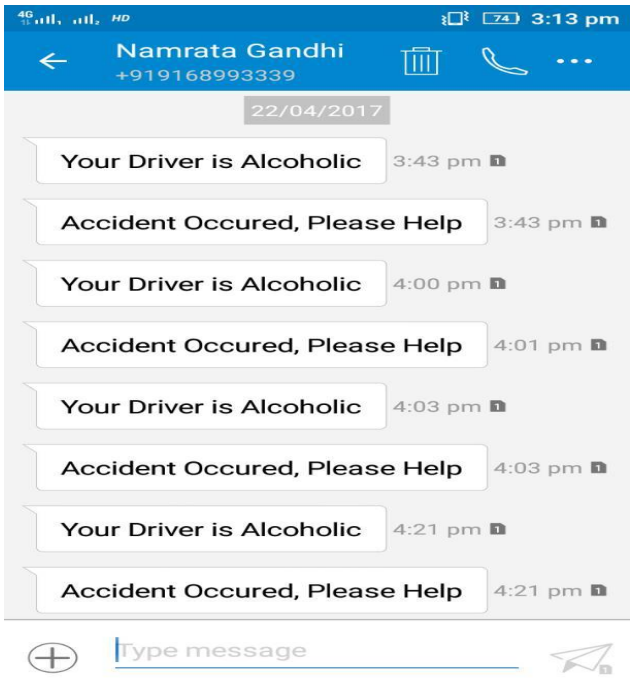

Fig 10.GSM Output on Mobile

V. CONCLUSION

This paper has a good real life scope, if it is implemented by the government. It can help to reduce lot of road accidents of two wheelers as it is the major cause of deaths in the whole world. The severities of those accidents are increased because of the absence of helmet or by the usage of alcoholic drinks. In this paper we have a tendency to develop an electronic smart helmet system that efficiently checks the wearing of helmet and drunken driving. By implementing this system will reduce the accident rate due to drunken driving.

Also the helmet is being made user friendly with the help of GSM, in case of accident it sends message to the registered person. This ensures that the victims get proper and prompt medical attention to increase the chances of survival, if met with an accident.

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