SMART HELMET FOR SAFE RIDING

Shilpashree P S, Abhishek, Rakesh Patil, Manjunath T S, Basavaprabhu
Email: shilpashree@sit.ac.in, abhishekrevoor@gmail.com,
rakesh.1si16ec076@gmail.com

***Abstract*— Nowadays, road accidents are significantly increasing, especially two-wheeler riders are more prone to accidental damage. The main objective of this paper is to force the rider to wear the helmet, not allow the rider to ride the two-wheeler when he drunk and provides emergency help to the rider during accident. Considering the number of motor cycle riders in our country and the number of accidents happening each year, it is evident that in most cases the accident occurs due to drunk and drive. The people involved in the accidents need to be taken care of and immediately taken to the hospital or emergency room. Hence road safety becomes major issue of concern.**

***Index Terms*—Smart Helmet, Piezo impact sensor, GSM, GPS, Arduino UNO, Radio Frequency.**

I. INTRODUCTION

In recent years, road accident is one of the major problem all over the world. Recent report says that the annual average road accident is estimated to be about 8,00,000 of which 10% occur in India which has overtaken China. The annual statistics revealed by the WHO (World Health Organization) in its global status report on road safety says that around 1,00,000 people are killed on Indian roads due to rash driving, and less usage of helmet. To reduce the post effects of accident, implementing the safety measures like helmet has reduced the deaths to some extent. Just only by improving the quality of helmet does not help to reduce the risk of life. In the proposed system, the ignition of the two-wheeler turns ON only when rider is not drunk and he/she worn the helmet. Which forces the rider to wear the helmet and not to drink during driving. The proposed system measures the amount of impact on the helmet during accident and sends alert messages to the pre-programmed phone numbers. Which provides emergency help to rider and helps to save his life during accident.

II. LITERATURE REVIEW

The total number of deaths that occur due to road accidents in the past few years have increased sharply. This is due to rash driving, ignorance of traffic rules and absence of a protective shield have been some of the most important reasons for these deaths.

A survey conducted by Ministry of Road Transport & Highways (Government of India) says that, a total of 1,57,723 Two-wheeler road accidents occurred in India in 2017. In 2017 a total of 44,366 people are dead and 1,53,060 people are injured [1]. Hence the thought of developing a system comes from social responsibility towards the society.

Hence the objective of the paper is to force the raider wear the helmet, not allow the rider to ride the vehicle when he drunk and also provide some emergency help during accident. So, this sense of moral responsibility towards the society, laid the foundation of our project "**Smart Helmet for Safe Raiding".**

III. EXISTING SYSTEM

A project which has been undertaken by keeping in view of the traffic rules and also the safety of people. This can be implemented by making wearing of helmet as mandatory, and also checking whether the rider has drunk alcohol or not [2]. The disadvantage of this method is that, the work is done only on the phenomenon of accident which is generally happens due to drink and drive. But as we know that the accident in the area is not happens only due to consuming alcohol but also other parameters are also responsible.

Smart helmet for safe rider is designed with RF link, as user wear helmet a RF signal radiate from RF transmitter and these RF signal get sensed and synchronized with the help of addressed matching by the receiver section placed in the ignition switch of the motorcycle. The motorcycle starts only when the helmet is worn [3]. The disadvantage of this system is if the helmet is stolen, the motorcycle cannot be started

IV. PROPOSED SYSTEM

The block diagram of system is shown in Fig.1 The system consists of mainly two units.

1.Helmet Unit

2.Vehicle Unit

The aim of the project is to first check whether the rider has worn the helmet or not. For this purpose, we are using leaf switches for detection. Switches are placed inside the helmet to check the availability of head inside the helmet.

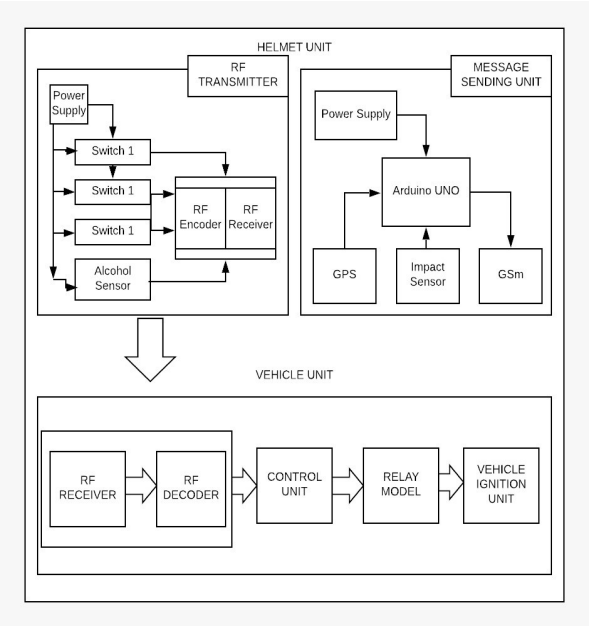

Fig. 1. Block Diagram of System

The alcohol sensor is placed in the mouthpiece of the helmet to check alcohol content in the breath of the rider. The alcohol sensor will detect only when alcohol content reaches some threshold value. The output from leaf switches and alcohol sensor are connected to the HT12E encoder. The continuously encoded value is fed to the RF transmitter to transmit data to the vehicle unit.

The piezo impact sensor is placed inside the helmet to check the impact on the helmet. When the impact or vibration reaches some threshold value it gives the electric output. GPS and GSM modules are used to find the accidental location and send the accidental message to the pre-programmed numbers. To run the piezo impact sensor and GSM-GPS modules we use Arduino-Uno board which has ATmega328P microcontroller. The Arduino is user friendly and easy to interface with any sensors or modules.

The vehicle unit contains RF receiver and HT12D decoder. The received data is given to the HT12D. the output of the decoder is further given to the control unit. When the control unit output becomes “HIGH”, then Ignition of engine will turn ON otherwise it will be in OFF condition.

OPERATION OF ALCOHOL DETECTION AND IGNITION CONTROL:

This module basically checks the whether the rider is worn the helmet or not on the first place. To achieve the same, leaf switches. Three leaf switches are placed at inner top position of the helmet. These switches become HIGH only when the rider wears the helmet. The output of these switches are given to the D0-D3 (i.e, pin 10-12) pins of the HT12E encoder.

The module also checks whether the rider drunk or not. The alcohol sensor MQ3 is placed at the mouthpiece of the helmet. The sensitive material used for MQ3 sensor is SnO2, whose conductivity is lower in clean air. It’s conductivity increases as the concentration of alcohol gases increases. The alcohol sensor gives HIGH output only when the rider drunk and wears the helmet. The output of the Alcohol sensor is connected to the D3 pin of the HT12D encoder.

This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter/receiver (TX/RX) pair operating at 434 MHz The transmitter module takes serial input and transmits these signals through RF as shown in fig 2. The transmitted signals are received by the receiver module placed away from the source of transmission. The system allows one-way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs.

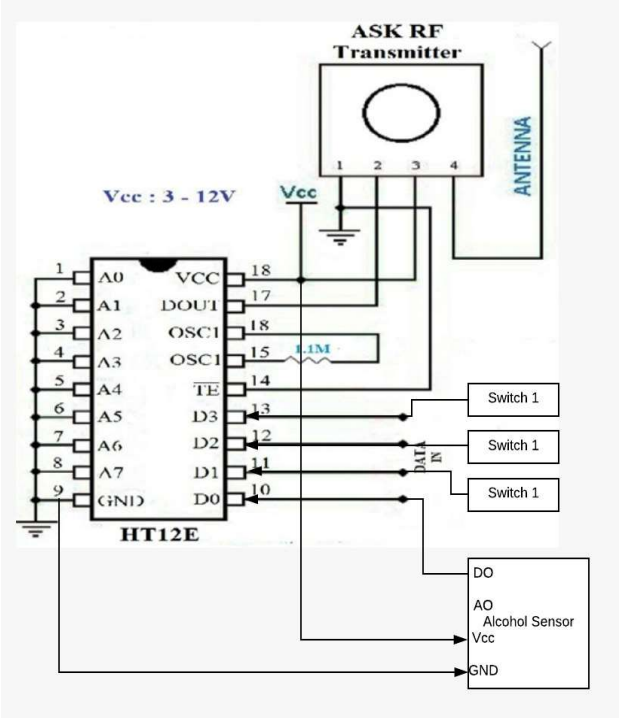

Fig. 2. Transmission operation.

Here HT12E & HT12D have been used as encoder and decoder respectively. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. Encoder IC (HT12E) receives parallel data in the form of address bits and control bits [4].

The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmission is enabled by providing ground to pin14 which is active low. The control signals are given at pins 10-13 of HT12E. The serial data is fed to the RF transmitter through pin 17 of HT12E.

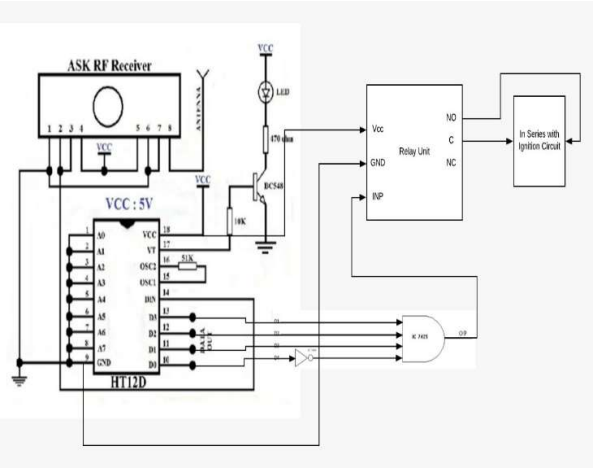

Fig.3. Receiver Circuit.

Transmitter, upon receiving serial data from encoder IC (HT12E), transmits it wirelessly to the RF receiver. The receiver, upon receiving these signals, sends them to the decoder IC (HT12D) through pin2. The serial data is received at the data pin (DIN, pin14) of HT12D as shown in Fig 3. The decoder then retrieves the original parallel format from the received serial data. When no signal is received at data pin of HT12D, it remains in standby mode and consumes very less current (less than 1µA) for a voltage of 5V. When signal is received by receiver, it is given to DIN pin (pin14) of HT12D. On reception of signal, oscillator of HT12D gets activated. IC HT12D then decodes the serial data and checks the address bits three times. If these bits' match with the local address pins (pins 1-8) of HT12D, then it puts the data bits on its data pins (pins 10-13) and makes the VT pin high. An LED is connected to VT pin (pin 17) of the decoder. The corresponding output is thus generated at the data pins of decoder IC. A signal is sent by lowering any or all the pins 10-13 of HT12E and corresponding signal is received at receiver's end (at HT12D). Address bits are configured by using the first 8 pins both encoder and decoder IC's. To send a particular signal, address bits must be same at encoder and decoder IC's. The H12D provides the decoded parallel data at pin 10-13.

Control unit circuit diagram of the system shown in Fig.4. The control unit of the system is made up of a 4 input AND gate and a NOT gate. The data taken from the pin 13 of the H12D is given to a NOT gate, and the output of the NOT gate including the other data D0-D3 is given to the AND gate. The output of the AND gate will be high only for the sequence 1110 at D1, D2, D3 and D4. The sequence 1110 at input of the AND gate confirms the following conditions,

- The rider worn the helmet.
- The rider is not drunk.

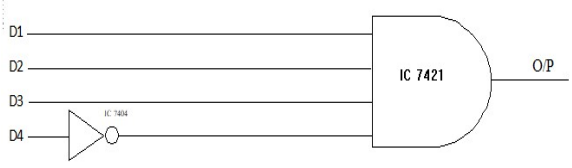

Fig.4. Control Unit.

The relay circuit is shown in the Fig 5. The output of AND gate is given to R1=1KΩ which is intern connected to transistor T1 which is actually a Darlington pair (BC548). Diode IN4007 is used in parallel with the relay coil. When a high signal is received at the resister, the transistors will be switched ON. This energizes the relay coil. When the relay coil is energized the switch position will move from normally closed to normally open against the spring. Hence the ignition will be now active. When the ignition is switched ON the vehicle is switched ON.

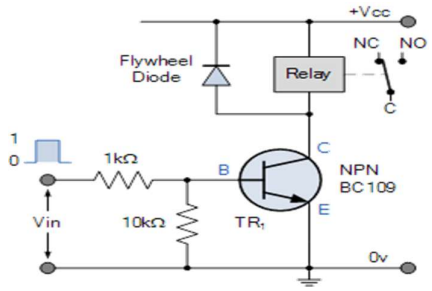

Fig.5.Relay Circuit.

OPERATION OF MESSAGE SENDING UNIT: The circuit diagram of the unit is as shown in Fig 6. The message sending unit is integral part of the helmet unit. This unit helps to send accidental alert messages to the pre-programmed phone numbers, when the rider met an accident. The message sending unit consists of Arduino UNO, GSM, GPS and Piezo Impact sensor. The circuit diagram of the message sending unit is shown in Fig.6.The Arduino gives a command to the GPS to get the location co-ordinates, when A0 pin of the Arduino reaches threshold value. It also instructs to the GSM module to send the alert message with accidental location to the phone numbers.

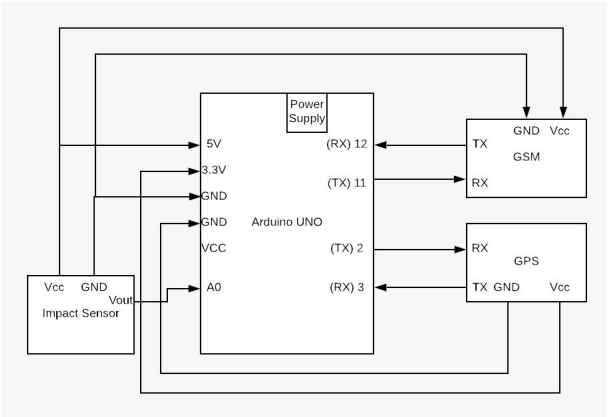

Fig.6. Circuit diagram of Message unit

The Arduino UNO is a microcontroller board based on the microcontroller ATmega328P [5]. The Arduino consists of 14 Digital pins and 6 Analog pins. A 5V power supply is given to the GSM, GPS, and Piezo impact sensor. The impact sensor helps to measure the amount of Impact on the helmet during accident. The Analog output of the Impact sensor is given to A0 p.in (it is a Analog pin of the Arduino) of the Arduino [6]. The interfacing between GSM, GPS and Arduino is shown in Fig.6.

The GPS (Global Positioning System) is a global navigation satellite system, which provides geolocation and time information to a GPS receiver on the earth. The NEO-6M GPS system is used in this system to get the co-ordinates of the accidental location. The TX pin (transmission pin), RX pin (receiver pin) of GPS is connected to Digital pin 12 and 13 respectively [7]. The GSM (Global System for Mobile communications) is a digital mobile network. It is widely used all over the world for mobile communications. The SIM800C GSM is used in the system, which helps to send the alert messages to the pre-programmed numbers during accident. The SIM800C supports Quad-band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. The TX, RX pin of the GPS module is connected to Digital pin 2 and 3 respectively.

V. RESULTS

The position of switches, alcohol sensor, working system, and alert message results are shown in Fig. 7,8,9 and 10 respectively.

Fig.7 shows the position of the leaf switches inside the full faced helmet. The switches are placed such way that it should check the availability of the head inside the helmet. When helmet worn all the switches will turn on and alcohol sensor will check the content of alcohol in the breath of the rider. Alcohol sensor is placed in mouthpiece of the full faced helmet as shown in Fig.8. Fig.9. shows the complete working system. Fig.10. shows the tested version of the accidental alert message.

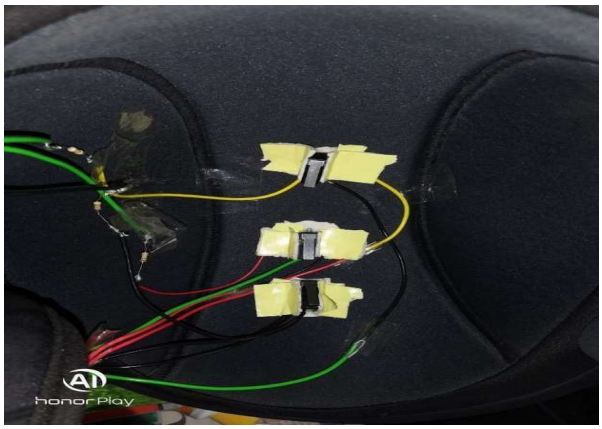

Fig.7. Leaf switches fixed inner top of the helmet

Fig.8. Alcohol Sensor placed at mouthpiece of the full-faced helmet

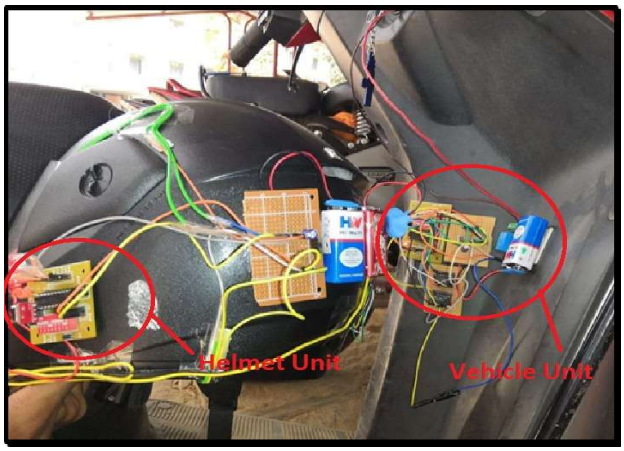

Fig.9. “Smart Helmet for Safe Raiding” working system.

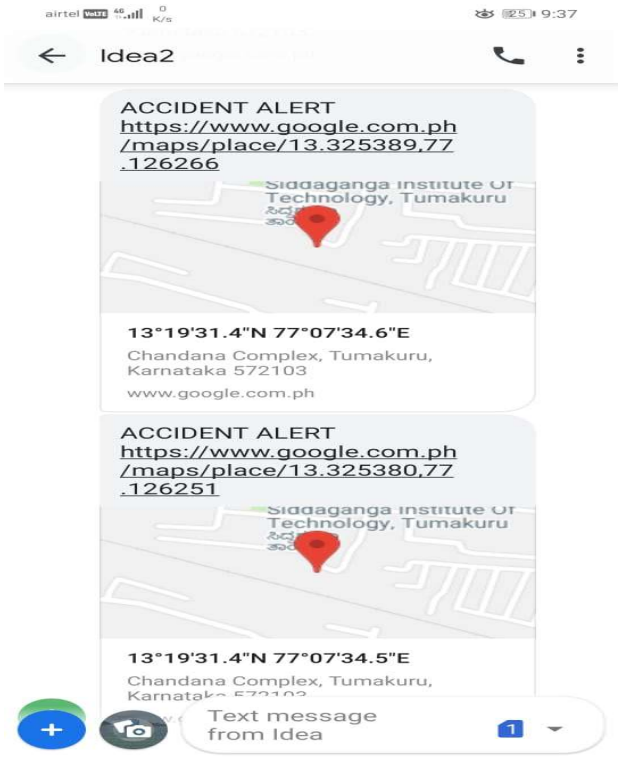

Fig.10. Accidental Alert message

VI. CONCLUSION

This project aims at a very low cost solution to the problem by making it mandatory to wear the helmet before riding a two wheeler. It has a good real life scope, if it is implemented by the government. It can be help to reduce lot of road accidents of two wheelers as it is a major cause of death. It helps in curbing the road accidents by implementing mandatory helmet protection and detection of alcohol content during the starting of the bike. Implementation of this project by the government saves a lot of time for the traffic police and most importantly saves the precious life of a person as one cannot run a motor vehicle once he is drunk and if the helmet is not present. Also family memebers will be informed as well if the accident as occurred as alert message to the programmed numbers.

REFERENCES

[1] Permanent Link: http://www.indiaenvironmentportal.org.in/files/file/road%20accidents%20in%20India%202017.pdf

[2] Nitin Agarwal et al, "Smart Helmet for Safe Riding", International Research Journal of Engineering and Technology(IRJET), vol-02, May, 2015, ISSN 23950056.

[3] Ashwini S[1SI12IT011] et al, "Design and Development of a Smart Helmet For a Two Wheeler", Mini Project Report SIT Tumakuru, 2014-15.

[4] Mohd Khairul Afiq Mohd Rasli, Nina Korlina Madzhi, Juliana Johari Faculty of Electrical Engineering University Teknologi MARA 40450 Shah Alam Selangor, MALAYSIA julia893@salam.uitm.edu.my

[5] Permanent Link: https://www.Atmel.databook.com

[6] Permanent Link: https://www.Arduino.cc/en/Reference/HomePage

[7] PermanentLink:https://steemit.com/utopian-io/@kimp0gi/interfacing-gsm-and-gps-module-using-arduino-a-step-by-step-guide-tutorial-for-tracking