Smart Helmet with Accident Avoidance System

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***Abstract*— this project is about having a smart helmet system with accident avoidance system. The main aim of this project is to make the public to wear helmet and not to drive when they are drunken and it also gives indication to other riders that the person riding the bike is not in normal condition so that major collision of vehicles can be avoided. This system has been raised to control the accidents in the cities. The project smart helmet comprises of helmet sensing button which automatically checks whether the rider wears helmet and detects whether the driver has consumed alcohol and also checks for the human body condition (Heart Beat). The helmet has the sensors which senses and sends the signal into the microcontroller say Arduino Board for checking the conditions. The RF module has a transmitter unit at the helmet and receiver unit at the bike where the data are communicated wirelessly. The power for the operation can be obtained from the two-wheeler battery or an external battery. Then while driving the bike if the person heart beat goes above or below normal rate the buzzer in the bike gives indication to the other riders that the rider is in abnormal state. This can be done through using the heart pulse sensor. Hence this intelligent system not only being smart system it can save many lives from accidents.**

***Keywords*— include at least 5 keywords or phrases**

I. INTRODUCTION

A helmet is a form of protective gear worn to protect the head from injuries. More specifically, a helmet aids the skull in protecting the human brain when accidents occur. The project aims to provide total safety for bike riders. Carelessness and drunk and drive is the major factor for many accidents. The traffic authorities give a lot of instructions to the vehicle operators. But many of them do not obey the rules. Recently helmets have been made compulsory, but still people drive without helmets. Despite creating much awareness about the accidents and importance of wearing helmet, people violate the laws. Traffic police monitoring for helmets is not the permanent solution. As traffic police cannot be present at all places. Hence to make the helmet mandatory this smart helmet with accident prevention system is founded. This system will start the vehicle if the driver wears the helmet and should be non- alcoholic. While driving if the riders pulse goes abnormal he cannot concentrate in driving for this a buzzer is used to indicate the other riders about the riders abnormal condition which eventually makes the others to slow down their speed so that accident and injuries can be avoided. All this process can be done by using microcontroller, a RF module which communicates the data wirelessly, a relay for the actuating and a buzzer for the sound indication.

II. PRESENT CONCEPT

The present concept is there is not such smart helmets are in existence. There are many advancements which gives safety for cars only. Meanwhile there are some technologies which create such smart helmet to provide the safety for the bike riders and to prevent accidents. The present concepts serve only three main purpose. They are helmet detection, alcohol detection and accident prevention. The widest technology used is the Zig bee technology for wireless communication with some microcontrollers.

Helmet Authentication- For helmet authentication purpose we are using two IR sensor and one PIR sensor. We mount one IR sensor on left side and other on right side inside the helmet. PIR sensor is used for motion detection of head inside the helmet.

Alcohol detection- To ensure that the bike rider has not consumed alcohol using the alcohol sensor. And there are some other additional technologies like fall detection, safety zone detection, theft detection and accident detection system using GSM.

III. PROPOSED CONCEPT

This proposed concept arises due to three main issues which motivates for developing the project.

1. The first step is to identify the helmet is worn or not.
2. The second is to detect for alcohol consumption.
3. The thirds step is to sense the heart rate of the rider.

Here we designed a system which checks the two conditions before turned ON the engine of the bike. Our system includes an alcohol sensor and a helmet sensing switch. A switch is used to detect whether the biker is wearing helmet. It is connected to the external battery for obtaining the power. The bike gets started only when the helmet sensing switch is in the close position otherwise the bike will not get start.

Alcohol sensor is used to detect the biker is drunk, the output is fed to the MCU. Both the switch and the alcohol sensor are fitted in the helmet. If any of the two conditions are violated the engine will not turned ON. Alcohol sensor MQ3 is used here for detecting the alcohol concentration present in the driver's breath. Sensor provides an analog resistive output based on the alcohol concentration. MCU is the microcontroller unit, which controls all the functions of other blocks in this system. MCU takes or read data from the sensors and controls all the functions of the whole system by manipulating these data.

Alcohol sensor is connected to the MCU through an interfacing circuit and the helmet sensing switch is directly connected to the MCU. MCU receives data from these sensors and it gives a digital data corresponding to the output of sensors to the encoder only if the two conditions are satisfied. These are performed by connecting the starter plug to the relay which operates the function from the receiver.

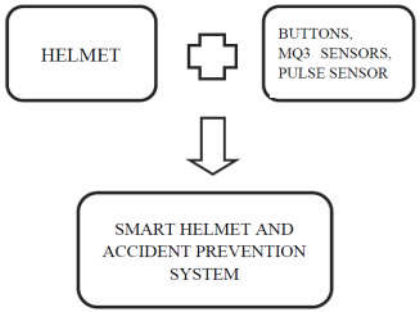


Fig 1: Smart Helmet and Accident Prevention System

Heart Pulse sensor is used here to detect the heart rate of the rider while driving. It also does the same process like other sensors communicating data with the MCU and produces the output but here the output is different. It gives the sound indication that the driver is in abnormal position to others in order to avoid the accidents.

IV. COMPONENTS USED

The components used for the smart helmet system is given in the following paragraphs.

A. TACTILE SWITCH

A tactile switch is an on/off or push button electronic switch that is only on when the button is pressed or if there is a definitive change in pressure. Another way to consider is it as momentary make or break switch. As soon as the tactile switches button is released, the circuit is broken.

1.) Mechanical Specifications:

- Operating Life: 300,000 cycles/ min.
- Operating Temperature: -25°C to +70°C

2.) Electrical Specifications:

- Rating: 50mA / 12VDC
- Contact Resistance: 100mΩ max.
- Insulation Resistance: 100MΩ min.

B. ALCOHOL GAS SENSOR MQ3

1.) Technical specifications:

- Concentration: 0.05 mg/L ~ 10 mg/L Alcohol
- Operating Voltage: 5V ±0.1
- Current Consumption: 150mA
- Operation Temperature: -10°C ~ 70°C

C. HEART PULSE SENSOR

Simply clip the Pulse Sensor to your earlobe or fingertip and plug it into your 3 *or* 5 Volt Arduino and you're ready to read heart rate! The 24" cable on the Pulse Sensor is terminated with standard male headers so there's no soldering required. of course, Arduino example code is available as well as a Processing sketch for visualizing heart rate data.

D. MICROCONTROLLER

MCU or Microcontroller is a small computer on a single integrated circuit. In modern terminology, it is a System on a chip or Soc A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of 18

E. ARDUINO

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards 19 feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

F. RF MODULE

RF (Radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly.

1.) RF Module (Transmitter & Receiver)

This **RF module** comprises of an **RF Transmitter** and an **RF Receiver**. The transmitter/receiver (Tx/Rx) pair operates at a frequency of **434 MHz**. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

G. RELAY

It is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

H. DC MOTOR

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.

I. LIQUID-CRYSTAL DISPLAY

A liquid-crystal display (**LCD**) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals.

J. BUZZER

A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, piezoelectric audio signaling device.

K. PIEZO ELECTRIC BUZZER

It can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed.

V. WOKING METHODOLOGY

A. TRANSMITTER SECTION

Our system consists of two major parts. They are

1) Helmet unit and

2) Vehicle unit.

This project describes the design of an effective safety system for a bike, in order to avoid accidents. Vehicle accidents are due to the use of alcohol nowadays. Hence wearing of the helmet with alcohol detection and monitoring the heart rate reduces the severity of the accidents and other risks. In our project we combine these three aims in a single embedded system.

This transmitter section is connected to the alcohol sensor, helmet sensing switch, heart pulse sensor, MCU, encoder and a RF transmitter. Both the switch and the alcohol sensor are fitted in the helmet while the heart pulse sensor is fixed in hand will start to count the heart beat after starting the bike. The sensor is an electronic device which converts the physical quantity into electrical quantity. MCU reads data from the sensors, finds if the driver has non-alcoholic breath and helmet sensor switch is in closed position and calculates the heart beat rate and gives corresponding digital output to an encoder only if the first two conditions are satisfied. It encodes one of the active inputs to a coded binary output. RF transmitter transmits this coded binary output from the encoder. In this RF system, the digital data is represented as variations in the amplitude of carrier wave.

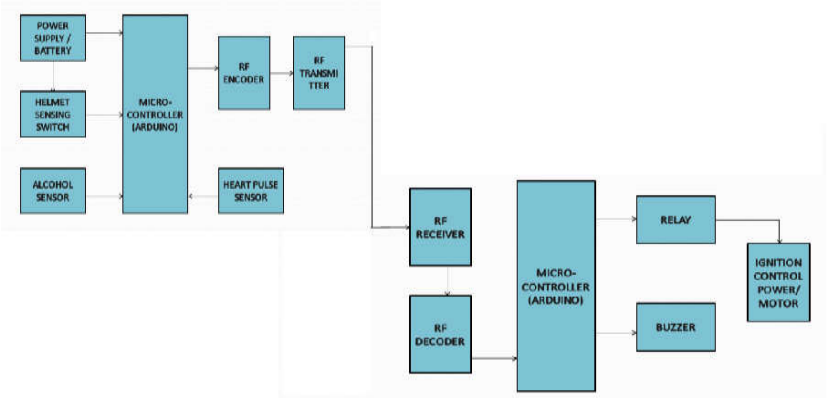


Fig 2: Block diagram of the smart helmet and accident prevention system

B. RECEIVER SECTION

The receiver section is placed on the bike. It consists of an RF receiver, RF decoder, MCU, audio, LCD display and sound indicator (buzzer). This section will get the power from the bike battery. RF receiver receives the coded binary data transmitted by the RF transmitter and given to the RF decoder. RF decoder decodes the input and gives four bit digital data to the MCU only if the address bit of encoder and decoder matches.

MCU operate the engine of the vehicle when it receives digital data from the transmitter section. The visual indication is provided by the MCU unit according to the coding. It operates the engine / dc motor when the conditions gets satisfied and the buzzer will give sound indication when the rider's heart rate goes abnormal. All these output operations are done 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.

VI. PROPOSED MODEL

A. TRANSMITTER UNIT AT HELMET

The completed model of the helmet with transmitter unit is shown in fig 3. This system consists of the transmitting unit along with the alcohol detection and the heart pulse detection circuit.

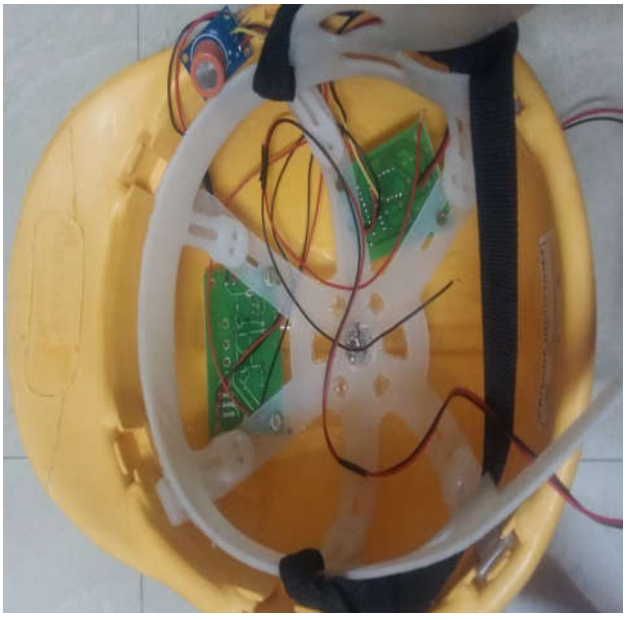
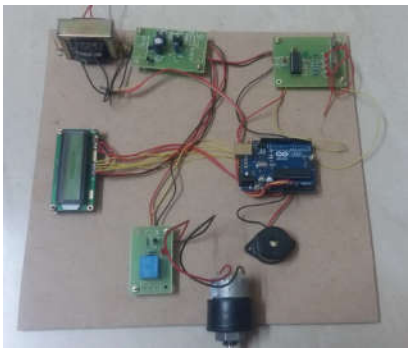


Fig 3 Transmitter unit at the helmet

B. RECEIVER UNIT AT THE BIKE

The completed model of the helmet with receiver unit is shown in fig 4. This system consists of the transmitting unit along with the alcohol detection and the heart pulse detection circuit.



VII. CONCLUSION

Nowadays, most cases of accidents area unit by motor bikes. The severities of those accidents are increased because of the absence of helmet or by the usage of alcoholic drinks. In our project 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 a safe two wheeler journey is possible which would decrease the head injuries throughout accidents caused from the absence of helmet and additionally reduce the accident rate due to drunken driving. We have a tendency to introduce advanced sensors techniques and radio frequency wireless communications are included in this project to make it a good one. Our system efficiently checks the wearing of helmet and drunken driving. By implementing this system a safe two wheeler journey is possible which would decrease the head injuries during accidents and also reduce the accident rate because of drunken driving.

REFERENCES

[1] *Abhinav Anand, Kumar Harsh, Kushal Kumar, Sourav Gouthi, Microcontroller Based Smart Wear for Driver Safety, International Journal of Research in Engineering and Technology Volume: 04 Issue: 05 on May-2015.*

[2] Mangesh Jadhawar, Gauri Kandepalli, Ashlesha Kohade, Rajkumar Komati, smart helmet safety system using atmega 32, International Journal of Research in Engineering and Technology Volume: 05 Issue: 05 on May-2016.

[3] Sudharsana Vijayan, Vineed T Govind, Merin Mathews, Simna Surendran, Muhammed Sabah M E, Alcohol detection using smart helmet system, International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 8 Issue 1 –APRIL 2014.

[4] Manasi Penta, Monali Jadhav and Priyanka Girme, published in International Journal of Research in Engineering and Technology Volume: 04 Issue: 02 on April 2015.

[5] Akshay Kumar Yalkar, Harsha Vardhan Singh N, Jagadevan V, Nandini C, K.Ezhilarasan & Pushpa Mala.S, Development Of A Smart Interface For Safety And Protection Of Automotives , International Journal of Image Processing (IJIP), Volume (9) : Issue (4) : 2015.

[6] IMPLEMENTATION OF SMART HELMET SYSTEM FOR BIKE WITH SPEED INDICATION TO GOVERNMENT, by Nayan Ramteke, Shilpa Patil, Mayur Deshmukh, Roshani Yelekar, published in International Journal of Research in Science & Engineering Special Issue 6-ICRTEST on January 2017.

[7] Subia Sayeed, Drunken Drive Protection System, International Journal of Innovations in Engineering Research and Technology ISSN: 2394-3696 VOLUME 2, ISSUE 6, JUNE-2015.

[8] A. Srikrishnan, K. Senthil Kumar and S. Ravi, Cloud Incorporated Smart Helmet Integrated with Two-Wheeler Communication Setup, International Journal on Computer Technology and Applications volume (9): Issue (4) on 2016.

[9] Muthiah M, Aswin Natesh V, Sathiendran R K, Smart Helmets for Automatic Control of Headlamps, International Conference on Smart Sensors and Systems on 2015.