Helios-smart solar helmet

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***Abstract* - Road accidents in India are very common and are increasing with such a rate that it is getting important to control them. Most of the accidents occur by drunk driving or not wearing helmet while driving and it gets very difficult to find a person, when the person meets with an accident in remote areas. Motivated by the above mentioned reasons, this paper aims on developing an inexpensive smart helmet that could save lives.**

***keywords* - GSM, GPS, Gyro Sensor, IR Sensor, Bluetooth Module.**

I. INTRODUCTION

In today's fast paced era most of accidents happen due to drinking and driving. Many countries are forcing the drivers to wear helmets, however rules are being violated. In developing the smart helmet, the technical aspects are to identify whether the rider wears a helmet or not, if the rider has consumed alcohol, getting the location if the accident occurs and sending accident alert message to the emergency services.

The prime motive of our project is to make a prototype of a protective helmet for safety of the rider. It's objectives are bike activation on wearing helmet, alcohol detection, accident location tracking, accidental alert system and anytime charging system.

II. LIMITATIONS IN EXISTING SYSTEM

There is tendency of rider to not wear helmet when traffic checking is not being done. The vehicle may be turned on or may get stolen by by- passing the ignition switch and also testing alcohol consumption of each individual rider is almost impossible. After accident there is significant delay in getting medical help at the accident location due to unknown location.

III. EXPERIMENTAL SETUP

For the setting up of this prototype following components are used:

GSM MODULE

As shown in Fig.1 , SIM900AGSM/GPRS module is used. It is reliable and ultra-compact. It is a Dual-band GSM/GPRS solution in a SMT module. Module requires a sim card to send SMS to registered mobile numbers. Configuration of module is 24mm x 24mm x 3 mm.

Fig.1. GSM module.

Fig.2. GPS module.

GPS MODULE

SIM28M is a standalone or A- GPS receiver. Equipped with built in LNA. Global Positioning System (GPS) provides three-dimension of location (latitude, longitude, and altitude) with precise time. An antenna is used to define location. As shown in fig.2.

GYRO SENSOR

This are also known as angular velocity sensors as they sense angular velocity. This is used in helmet to detect fall of rider. If the Gyro sensor detects angular velocity more than threshold it sends a signal to the microcontroller. As shown in fig.3.

Fig.3. Gyro sensor.

Fig.4. Infrared sensor

INFRARED SENSOR

An Infrared sensor is used here to detect if the rider has worn the helmet or not. If the rider did not wear the helmet bike ignition will not start. It emits a infrared radiation to sense the surrounding environment. As shown in fig.4.

MQ-3 SENSOR

As shown in fig.5 , a low cost and highly sensitive gas detector sensor which is used to detect the alcohol. It can detect concentrations from 0.05 mg/L to 10 mg/L. If the concentrations are higher than specified then it sends a signal to the microcontroller.

Fig.5. MQ-3 Sensor

BLUETOOTH MODULE

As shown in fig.6 , this HC05 module is designed for wireless communication. It is used as master configuration in bike and as slave configuration in helmet. Each module has an unique IP address.

Fig.6. Bluetooth Module

ARDUINO UNO

Arduino Uno in fig.7 is a microcontroller based on Atmega328. This microcontroller has 14 I/O pins, it is used where less number of pins are required we installed it in the bike.

Fig.7. Arduino Uno

Arduino Nano

Arduino Nano is a microcontroller based on Atmega 328P. This microcontroller has 22 I/O pins , it is used where more pins are required. we installed it in our helmet.As show in fig.8.

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Fig.8. Arduino Nano

Liquid Crystal Display

LCD uses liquid crystal to produce a visible image as shown in fig.9. A 16*2 LCD is a very basic display which is attached on bike setup. 16 characters can be displayed in 2 lines and each character is displayed in a 5*7 pixel matrix.

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Fig.9. Liquid Crystal Display

Solar Panel

Photovoltaic cell uses photovoltaic effect to convert solar energy into electrical energy. A panel consist of several photovoltaic cells, current produced by all of them together adds enough electricity to power our helmet's battery pack, as shown in fig.10.

Fig.10. Solar Panel

IV. WORKING

The helmet works with the help of sensors, bluetooth modules and Arduino boards. Firstly an IR sensor detects if the helmet is on and alcohol sensor MQ-3 checks the alcohol level. If rider does not wear the helmet or after wearing the helmet the alcohol level is higher than specified limits, a signal is sent to the Arduino nano which is interfaced to the bluetooth module in helmet, this bluetooth module is connected via wireless master bluetooth module in bike and thus signal is carried away. After receiving the message, Arduino Uno will turn off the ignition of bike.

Gyro sensor is a device used to measure angular velocity or displacement. When installed in the helmet it measures the orientation of helmet in terms of three dimensional axis. While riding the bike if an accident happens and rider falls from the bike then the gyro sensor detects the change in angles and thus detects the fall and sends a signal to the Arduino nano which triggers a buzzer, which if not attended and turned off within 10 seconds via a physical button sends an SMS with the help of GSM module along with location coordinates to the registered mobile number.

A solar panel is attached right on the upper surface of helmet to collect solar energy and convert it into electrical energy. This energy is stored in a battery pack installed in the helmet. Battery powers all the components in the helmet including Arduino board , bluetooth module , Infrared sensor, gyro sensor and GSM module. This makes our helmet independent in terms of power requirement. In case of low solar input and higher demand battery can be charged using 12V power supply charger. While all components in bike are supplied with power supply from bike's battery unit.

Connections of this helmet for accident alert system starts with Tx pin of gps module being directly attached to pin 10 of arduino. Using software serial library, serial communication on pin 10 and 11 occurs. Tx and Rx pins of gsm module are connected to pin D2 and D3 of arduino. For gsm interfacing, software serial library is used. The display's data pins d4, d5, d6, and d7 are connected to pin 6, 7, 8, and 9 of arduino. For setting of lcd , a potentiometer can be used.For detecting accident , gyro sensor is used and the x,y, z-axis adc output pins are connected to arduino adc pins a1, a2, and a3.

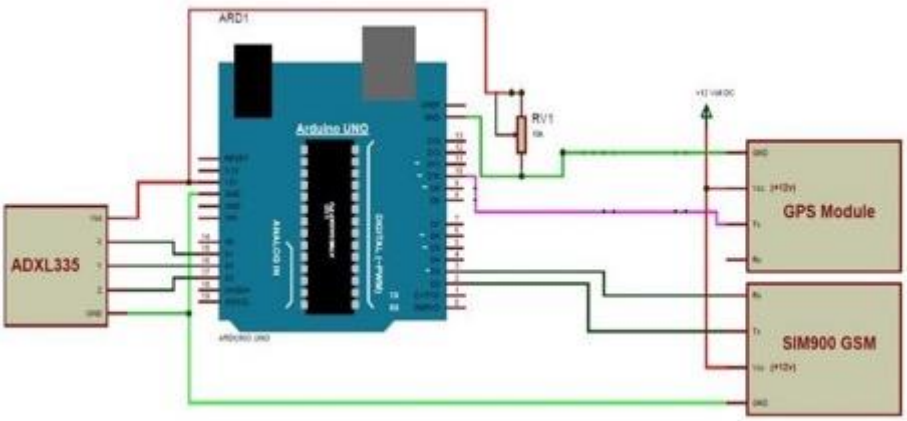

Fig.11. Circuit Connection

V. RESULT

No Helmet

This is the output message shown in fig.12 , displayed when the rider does not wears helmet .

Fig.12. No Helmet Message

Alcohol Consumption

This is display message shown in fig.13, is the output when the rider has consumed more than the permissible level of alcohol.

Fig.13. Drunk Driving Message

Accidental Alert

This message shown in fig.14 , consists the location of accident which is sent to the default number and emergency services.

Fig. 14. Accident alert message.

Solar Panel

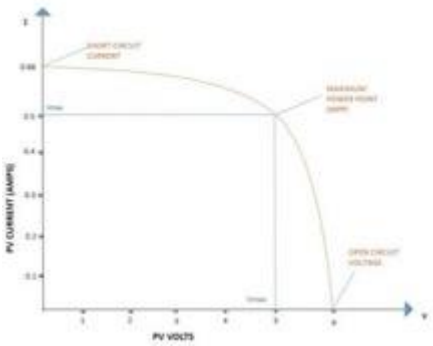

Fig.15.Photovoltaic Array Current-Voltage Curve

VI. CONCLUSION

In attempting to make riding a bike safer and to ensure helmets being worn by vehicle riders, we developed Helios- Smart solar powered helmet.The whole system together provides rider safety through a series of facilities .

VII. FUTURE ASPECT

Advance modifications like integration of speed monitoring and warning system , Voice recognition and command system, daily ride statistics and anti-sleep alarm can also be induced in this helmet to make it even more efficient.

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