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Micro Controller Based Smart Helmet by Ir Motion Sensors

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Abstract*: Road accident is an unintended incident which is responsible for deaths of people worldwide. According to National Crime Records Bureau (NCRB), more than 1, 35,000 people die every year annually in Indian road accidents. The most significant cause is drunken driving and not wearing helmets while driving. The main objective here is to eradicate drunken driving and helmetless driving. In this regard, an attempt has been made by using microcontroller assisted RF transmitter and receiver unit. The IR sensor detects the presence of helmet on the head. MQ3 alcohol sensor detects the alcohol level. The comparator analyse the values and gives command to relay circuit. Thus the starting of two wheelers is controlled by the application of sensors. In addition to this, a motion sensor has also been incorporated to inform the driver about the presence of nearby vehicles.

Keywords: drunken driving; wearing helmets; microcontroller; RF transmitter; IR sensor; two wheelers.

I. INTRODUCTION

Accidents are unwanted incidents that results in the loss of property and life which is harmful. Road accidents have now become common in our day to day lives. A report from World Health Organisation (WHO) says, India stands number one among the road accidents happening every year over taking China. According to National Crime Records Bureau (NCRB), the latest report being 2015 says, there are 464674 road accidents recorded and caused 148707 deaths nationwide. The current report shows that the number of road accidents increased by 3.1% compared to 2014 and the fatalities increased by 5.1% compared to 2014. There is also a issue of concern to notice is that maximum number of road accidents happened in the National Highways (28.2%) but the length of the National Highways is just 1.5% of the total length of roads in our country. The alcohol influencing driving caused 1.5% of accidents from total accidents .From 464474 accidents nearly 6968 accidents were caused by drunken drive.

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Even though, this meagre amount of accidents caused the most number of fatalities of the persons contributing about 8.6% of the total deaths numbering to 2988 deaths in 2015. Figure 1 shows the accidents occurred in India.

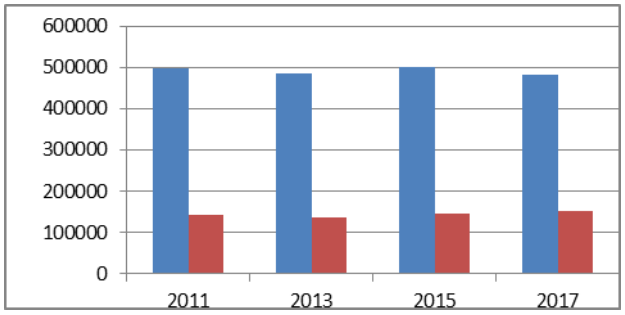

Figure 1: Accidents occurred in India

The Report also says that 42% of the drunken driving victims ended up dead. There have been various measures taken by the law enforcement. According to section 185 , 1988, of the Motor Vehicles Act , people caught driving under the influence of alcohol are punished with jail for up to 6 months or fine for up to Rs2000 or both. But still drunken driving continues to occur. So, the drunken person should not be allowed to drive so providing safety to his valuable life and others. The growth of science and Technology has been utilised to find a solution to this problem.

1.1 Importance of helmet in driving

Helmet is a component worn by the driver of two wheelers to protect the head from the deadly impact during an accident. The systematic review conducted experiments and found that helmet using reduces head injury by 69% and reduces risk of death by around 42%. A Driver without wearing helmet may sustain injuries of head, Traumatic Brain injury, bruising of brain, Skull fracture and Scalp wounds. Therefore it is mandatory to wear a helmet while driving. In this project an attempt has been made to conform helmet wearing before driving.

1.2 Scope of electronics

Electronics have now become Inseparable part of our day to day lives. Everything starting our small phones to complex missile systems electronics rules the day with wide range of human applications in all human spheres. Use of electronics in automobiles has become very popular nowadays. The most sophisticated vehicles are those that use most sensors in their operation. The use of electronics has made human activities easier by increasing accuracy and reducing time and effort needed for the activity .

Electronics has made communication very easy using RF transmission and AF systems. In this regard, an attempt has been made to utilize electronics in operating a smart helmet.

The problem to be identified here is the conformance of helmet usage and checking whether the driver is drunk or not and thereby make the decision to start or stop the vehicle. In Quest for this, we had analysed works of various authors and others to study about the works and methods employed in this aspect. The using microcontroller unit, the RF transmitter and receiver are controlled to actuate the mechanism [1]. The earlobe sensor in the helmet is fitted and senses the blood flow in the ear to detect the helmet on the head. The alcohol sensor then reads the amount of alcohol in the driver's breath and fed its signal to the microcontroller unit. Then the microcontroller unit takes action according to the input values .Then the RF transmitter sends signal to the receiver. The receiver is fitted at the vehicle and the microcontroller unit analyses the signal to send control signals to the relay circuit to ON/OFF the vehicle. If the values meet the standard specifications then the ignition is allowed and if not, the driver circuit actuates the relay and the fuel supply is cut off. Additionally a GSM module is attached to send messages to the registered mobile number if the driver is drunk [2].

An attempt has been made conform drunken driving avoidance and not to bypass helmet wearing. A switch in the helmet is used to ensure the wearing of helmet. MQ3 alcohol sensor senses the breath of the driver and sends the signal accordingly. Only if the two conditions are met, the microcontroller sends control signal to the RF encoder and transmits the signal to the receiver by Amplitude Shift Keying (ASK) [3]. The receiver after receiving the signal decodes the signal and sends it to microcontroller to operate the relay circuit to control ignition by using by using relay interface. The system uses alcohol sensor PAS32U. Here, the analogue signal from sensor to digital signal readable by microcontroller ARM7LPC2148 which then actuates the GSM module to send message to the law enforcement authorities and could be detected the place of the vehicle through GPS system. Thus various journals have been studied to learn and improve the existing methods [4-5].

The main objective of our research work is to eradicate drunken driving and helmetless driving. In this regard, an attempt has been made by using microcontroller assisted RF transmitter and receiver unit. The IR sensor detects the presence of helmet on the head. MQ3 alcohol sensor detects the alcohol level.

II METHODOLOGIES

The various components used in our experiment are

1. RF transmitter and receiver
2. Infrared sensor (IR)
3. MQ 3 Alcohol sensor
4. Ultrasonic motion sensor
5. Arduino Microcontroller
6. Comparator
7. RF encoder and Decoder
8. Relay circuit
9. Helmet
10. Connecting wires and batteries

2.1 Helmet detection

First process is to confirm the wearing of helmet by the driver. so an IR set is made to detect the presence of helmet on the head. This set up consists of two led bulbs which continuously transmits infrared signal. This leads have the capacity of receiving the infrared signal. So the two lead bulbs are fixed in a straight inside the helmet. So that it continuously transmits the signal and the deviation in the signal is noted by the comparator. It actually works like a burglar alarm, where the deviation of signal is noted as confirmation of wearing helmet. The system consists of a comparator, its limit value is set by placing a capacitor in the bread board. A light indication is made to analyse the working condition of the sensor system.

III DESCRIPTION OF IR

IR radiation is one of the electromagnetic radiations of wave length longer than of visible light at the same time shorter than microwaves. IR radiation possesses wavelengths in between 750 nm - 1 mm, spanning of five orders magnitude. The Figure 2 shows the infrared sensor in helmet

Figure 2: Infrared sensor in helmet

IR imaging is utilized extensively both military as well as civilian purposes. Military applications included acquisition of target; surveillance as well as night vision;, homing as well as tracking. Nonmilitary purpose including efficiency of thermal analysis; remote temperature sensing; short ranged wireless communication and spectroscopy with weather forecasting. IR astronomy utilizing sensor equipped telescopes for penetrating space of dusty regions like molecular clouds, detect cool objects like as planets; for viewing highly red shifted object from the early day of the universe. The Images from IR camera tend to be monochromatic since camera is generally designed through only single type of sensor respect with to single wavelength range of the radiation. Electroluminescent IR LEDs are the product which needs care in its purpose. IR LEDs have fabricated from narrow band hetero structures through energy gap from 0.25 to 0.4 ev. Be sure that not exceed I*max which are given each LED specification as well as do not utilized test instrument with the intention of contain sources or batteries through voltage greater V_{cw} max given on the specification. The Figure 3 shows the Circuit diagram of IR.

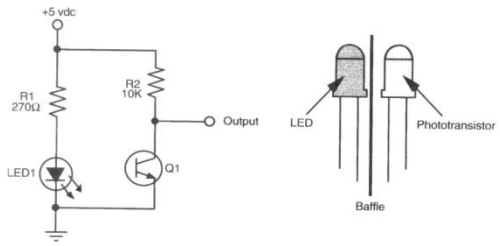

Figure 3: Circuit diagram of IR

3.1 Op-amp circuit description

The circuit symbol for an op-amp.
sV - non-inverting input
V : inverting input
V_{out}: output
V_S : negative power supply
Power supply of the pins (V_{S+} as well as V_{S-}) could be labeled with various ways. Despite of various labeling; the function remains same, for providing extra power to amplify signal. Often these pins have left out from diagram to clarity and power configurations are described from circuit as shown in the Figure 4.

- V_S : positive power supply

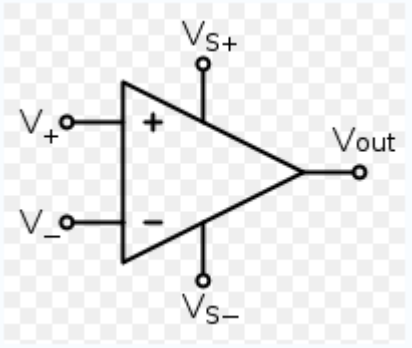

Figure 4: Comparator circuit

Figure 5 shows the pin diagram of LM324 IC.

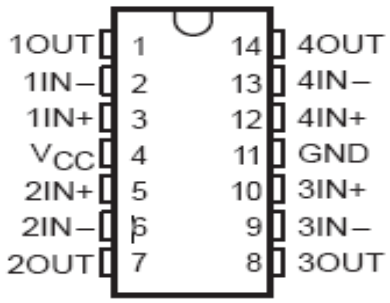

Figure 5: **The pin diagram of LM324 IC**

3. 2 Features of lm324

Short circuited protected outputs, True differential input stage, Single supply operation: 3.0 V to 32 V, Low input bias currents: 100 nA maximum; Four amplifiers per package, Internally compensated, Common mode range extends to negative supply, Industry standard pin outs.

3.2 Operation of relay:

When the supply voltage is applied to the relay coil then the current plows through the coil and forms electro-magnetic switch. By using this we can switch ON/OFF the device to be controlled. There are different specifications for relays. They are: voltage rating, current rating, type of contacts and outer model.

Current ratings is the most important specification, if the load current mis-matched with the relay current then the relay contacts may get damage. To avoid this relay must be matched with the load current. When the supply voltage is not applied to the relay, the relay contacts will be in the normally closed condition as shown below. Figure 6 shows Circuit diagram of switch.

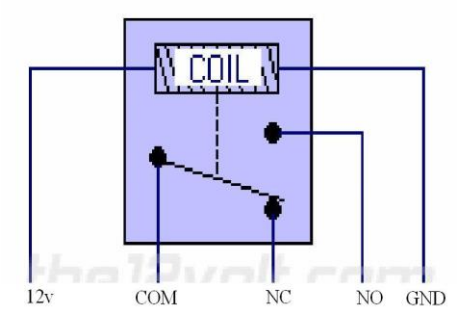

Figure 6: Circuit diagram of switch

With the help of normally closed contact [N/C] and the normally open contact [N/O]. We can switch ON/OFF the device to be controlled. Figure 7 shows Helmet with transmitter unit.

Figure 7: Helmet with transmitter unit

3.4.2 Motion sensing unit

A motion sensing circuit is implemented to detect the clearence between vehicles. By this unit ,the driver can get a allert of near by vehicles so accidents due to careless can be eliminated. Figure 8 shows Motion sensor.

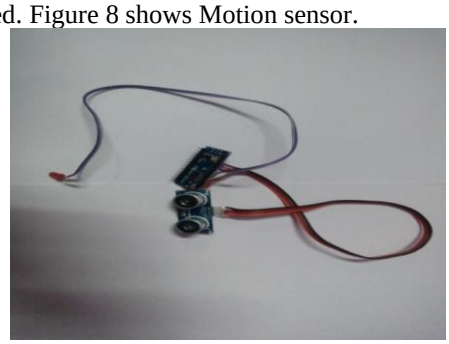

Figure 8: Motion sensor

3.5 Effectivess

Graph chart made after elimination of death from accidents. This shows that how deaths can be eliminated from accidents by using this system. Figure 9 shows the reduction of accidevt graphical view.

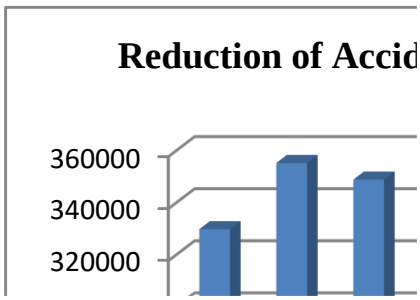

Figure 9: Reduction of accidevt graphical view

IV CONCLUSION

Thus by using the proposed system in two wheelers, the fatalities and accidents due to drunken driving can be eliminated. Thus the law of wearing helmet while driving will be implemented effectively.Automobile manufacturers should implement this system at the manufacturing stage of vehicle .

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