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# DESIGN AND IMPLEMENTATION OF SMART HELMET USING ARDUINO UNO

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***Abstract:****The increase in the number of road accidents has become the key concern to the road and traffic control system. The accidents mostly happen due to bad road conditions, driving at high speed, and driving while drunk. The fatality rate in accidents increases when the driver does not wear a helmet or drunk while driving. In this work, we propose a Smart Helmet using Arduino and ubiquitous sensors to control the on (or off) state of ignition of bike based on smart Helmet wearing (or not wearing) and drinking state (drunk or not drunk). The ignition of the bike will on if the drivers wear the Smart Helmet and not drunk, otherwise the ignition will not on anyway. In this work, we have used MQ3 alcohol sensor to detect the drinking state (drunk/ not drunk).*

**Key words:** ***Arduino, MQ3 Sensor, Smart Helmet, Ignition***

## 1. INTRODUCTION

In all developing and developed countries there is significant increase in number of two wheelers in roads. Due to bad road conditions, rough driving without wearing helmets and driving while drunk, the fatality rate in accidents increases rapidly. Head injury is becoming the key concern in the accidents. This motivates us to design and develop an effective and low cost "SMART HELMET" using Arduino and ubiquitous sensors. The state of ignition of bike is controlled based on smart Helmet wearing (or not wearing) and drinking state (drunk or not drunk). The ignition of the bike will on if the drivers wear the Smart Helmet and not drunk, otherwise the ignition will not on anyway. In this work, we have used MQ3 alcohol sensor to detect the drinking state (drunk/ not drunk).

Several related works have been done in past to assess the risk factors in road accidents on city and rural areas of developed and developing countries. The study by.D.F. Preusser et.al [1] have found that alcohol and excessive speed were common factors associated with the road accidents. The authors also suggested some countermeasures to reduce injuries in accidents by introducing laws requiring helmet use and through enforcement of speed limit and alcohol-impaired driving laws. The study byW.H Schneider et.al [2] in 2011, shows that the severe injuries were more likely to occur when alcohol was involved. In 2012, William H.Schneider et.al[3] studied about the younger motorcyclists at-fault in the event of collision, influence of alcohol, riding without insurance or not wearing helmet. Another study by R.C. Jouet.al [4] in 2012, reveals that the bike riders with age of above 60, mostly drive without helmet and proper license. The work byRosemary R. Sevaet.al [5] in 2013, found three variables to be significant predictors of motorcycle crashes- age, driving behavior and junction type. The study by K. Kim et.al [6] in 2015, revealed that overall behavior and temporal factors were more significant predictors of alcohol-involved crash pattern compare to environmental or roadway features.

The remaining work is arranged in the following manner: The hardware and Software requirements are mentioned in section 2. Component Description is explained in Section 3. In Section 4 the methodology is explained. The construction of the Smart Helmet is explained in Section 5. In section 6 results and achievements are presented. The conclusion of the study is in Section 7.

## 2. HARDWARE AND SOFTWARE REQUIREMENTS

2.1.*Hardware Used:* A full size Helmet, Arduino UNO, I.R. sensor, MQ3 Alcohol Sensor, LED (as indicator), Push button, Relay, Register,9v battery, a 5volt D.C. Motor (it acts as a prototype of a bike ignition point, used for demonstration purpose only).

2.2.*Software Platform*: Arduino IDE.

## 3. COMPONENT DESCRIPTION

I. IR Sensor: An infrared sensor (IR) is basically an electronic device that emits some radiation in order to sense some aspects of the surroundings such as heat and motion.

II. MQ3 Alcohol Sensor: It is an alcohol gas sensor detector which can sense the concentration of alcohol gas from 0.05 mg/L to 10 mg/L. This module gives output in both digital and analog system.

III. Relay: It is an electromechanical device whose operation is to a pair of movable contacts from an open position to a closed position.

IV. LED: It is a diode; here we use it as an indicator.

V. 5 volts D.C. Motor: Here we used this as prototype of a bike ignition point. Later we can upgrade it and connect with the ignition point of the bike. Moreover, this is only used for the demonstration purpose.

## 4. METHODOLOGY

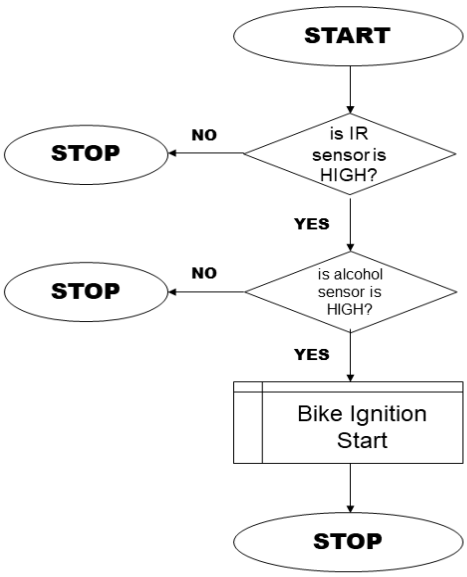


**Figure 1: Algorithm of hardware design**

The hardware design principle is depicted in Figure 1. After the push switch gets on, the infrared (IR) sensor detects the obstruction from the neck of the body part. After receiving the signal from the IR sensor, it quickly turns on the Light Emitting Diode (LED) to check the circuit, whether it is working or not. Then MQ3 gets activated and check for smell of the alcohol. If the smell is detected, then LED goes off and the circuit does not send any signal to the relay through Arduino. Otherwise the relay turns on and ignition point is connected.

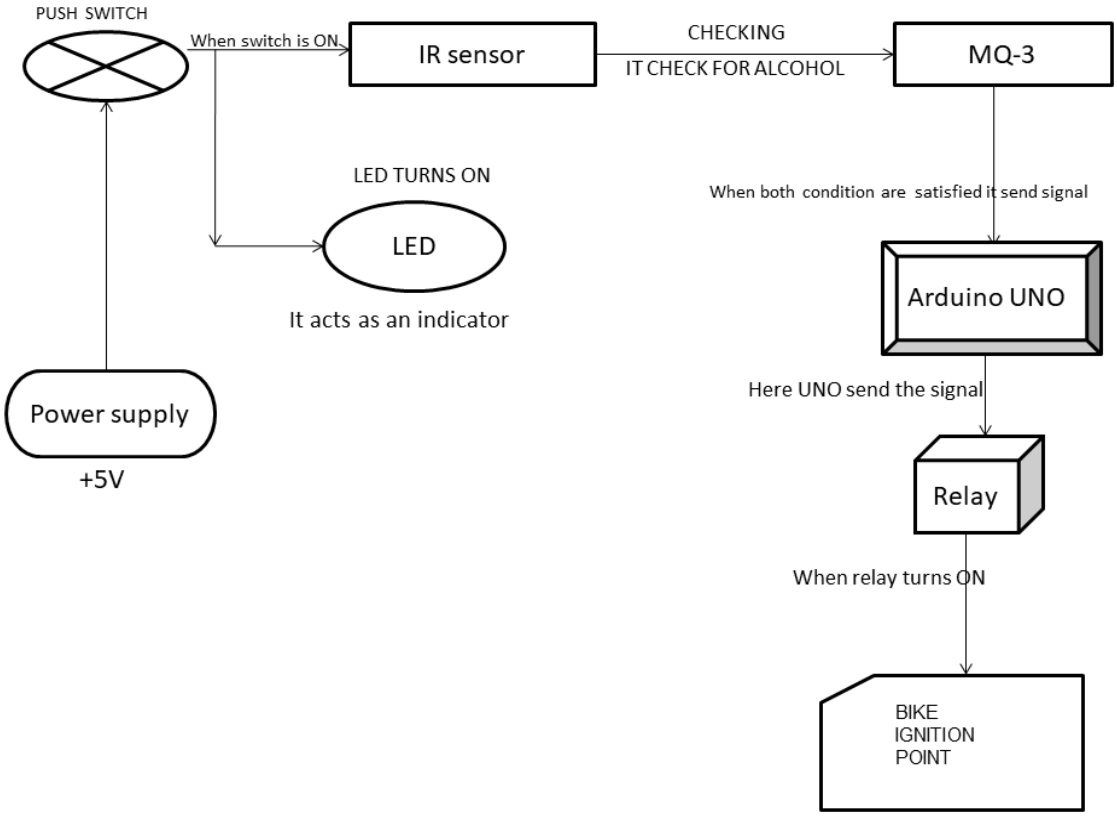


**Figure 2: Block diagram of Smart Helmet**

In this study, Alcohol Sensor, Arduino UNO, and LED is used for alert purpose. The proposed system checks the two conditions before turning ON the ignition of the bike engine. Our system includes an alcohol sensor and an IR Sensor. At first, a push switch is used at the top of the inside of the helmet, and the circuit will turn ON if rider wears it. Then, IR sensor is used to detect whether the helmet is properly located. After that Alcohol sensor get activated and is used to detect whether the biker is drunk or not, the output signal is sent to the Arduino board. Both the IR sensor and the alcohol sensor are mounted in the helmet in the different positions (mentioned earlier). If any of the two conditions is violated then the ignition of the engine will

not turned ON. Alcohol sensor MQ3 can easily detect the alcohol concentration present in the driver's breath. Sensors send output signal based on the alcohol concentration. Arduino controls all the functions of other blocks in this system. Arduino takes and read data from the sensors and process it and controls all the functions of the whole system. Arduino receives the data from these sensors and it gives a digital signal (that can be HIGH and LOW) corresponding to the output of sensors to the relay only if the two conditions of the sensors are satisfied.

## 5. CONSTRUCTION

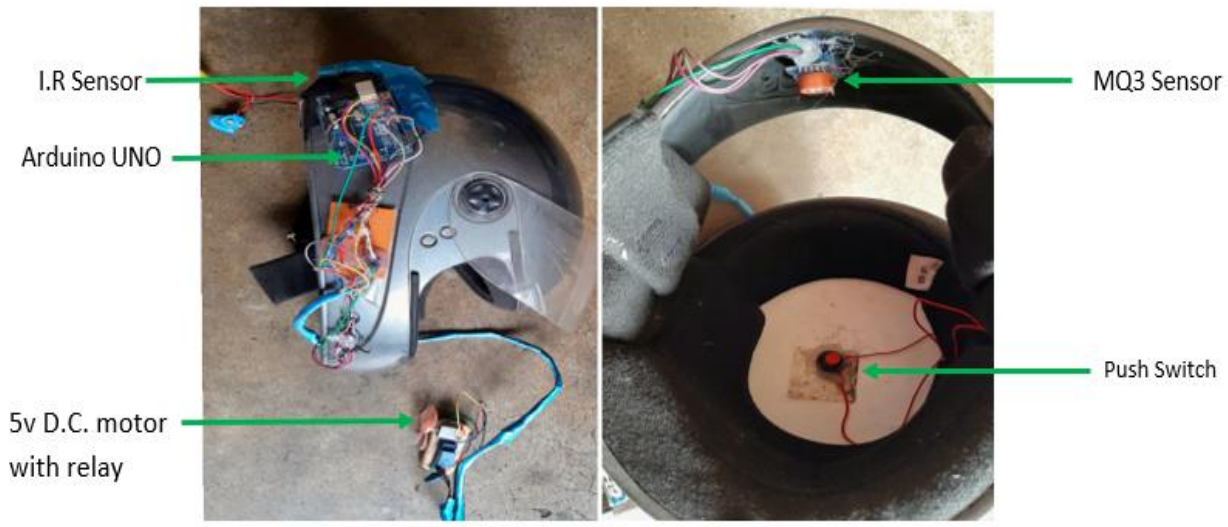


**Figure 3 Smart Helmet**

The overall system is presented in the Figure 2. In this proposed system Arduino UNO microcontroller is used to design the system. This microcontroller consumes only 5 volts from the battery supplies, that is very efficient in doing its work. The device is designed with two sensors at different position of the helmet to make it more effective. At the back-side, on neck position IR sensor is installed and in the front side a MQ3 sensor is installed for detection of alcohol. The smart helmet is presented in Figure 3

## 6. RESULTS AND ACHIEVEMENTS

At first, bikers will wear the Smart Helmet. Next the helmet's push switch will get closed and Arduino gets power-up. The IR-sensor gets activated and detects the presence of the helmet. Within a second Our MQ-3 Sensor gets activated and detects whether the bikeris drunk or not. If

there is presence of alcohol, immediately ignition of the bike engine gets off. With this proposed approach, enhanced security may be provided to the bike riders and the strict rule about wearing helmet is employed without any human surveillance effort.

## 7. CONCLUSION

Generally, helmet protects the head section from any types of shock and jerks in accidents. This smart helmet ensures more safety for the bikers. It is made in such way that the bike engine will not start if the biker does not wear it or drunk at that time. If any of these rules is violated, the rider cannot start the bike. This technology may be used to reduce manual effort and human errors. This study implements safe drive policy and thus can save the life's also. In future we want to use GPS/GSM module, biometric Security lock to make it more effective in use. In case of large demand, all the circuits may be mounted on a PCB board to make it more cost effective.

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