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SMART HELMET FOR BIKE RIDERS

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ABSTRACT:

The rising number of road accidents and fatalities in India has prompted the urgent need for innovative solutions to enhance road safety. This research presents the development and implementation of a smart helmet system designed to mitigate two major risk factors: alcohol consumption by riders and the absence of helmet usage. The purpose of this study is to investigate the effectiveness of the proposed system in preventing accidents and reducing fatalities on Indian roads. The smart helmet system incorporates Arduino controllers, including Arduino UNO in the bike and Arduino Nano in the helmet, facilitating wireless communication through a radio frequency (RF) module. The helmet component consists of an MQ3 alcohol detector sensor and an infrared (IR) sensor to detect whether the rider is wearing the helmet. By integrating these sensors, the system ensures that the rider is both sober and equipped with protective headgear before allowing the bike to start. Through rigorous experimentation and validation, the principal results demonstrate the system's capability to accurately detect alcohol consumption and helmet usage. The MQ3 alcohol detector sensor effectively identifies the presence of alcohol in the rider's breath, while the IR sensor reliably detects whether the helmet is being worn. This research indicates the system offers a promising solution to reduce road accidents caused by drunk driving and the failure to wear helmets. By implementing this system, it becomes possible to prevent accidents that could potentially lead to fatalities. The integration of technology and sensors in the helmet ensures that riders adhere to safety practices, ultimately contributing to improved road safety in India.

KEYWORDS:

SMART HELMET, BIKE SAFETY, ALCOHOL DETECTION, WIRELESS COMMUNICATION, ROAD MISHAPS, ARDUINO CONTROLLERS.

INTRODUCTION

Road accidents continue to be a major concern in India, with thousands of fatalities occurring every year. According to recent data released by the Indian government, around 1.5 lakhs people die on Indian roads every year, with an average of 422 deaths and 1130 mishaps occurring daily. Unfortunately, the age group most affected by road accidents is between 18 and 45 years, accounting for approximately 67% of all accidental deaths [1].

Road mishaps are occurs due many reasons but one of the bad reason is driving or handling the vehicle with consumption of liquor beverage. In every family in India at least they have a motorcycle. To address this problem, we propose a "Smart Helmet for Bike Riders" system that aims to reduce the number of accidents caused by alcohol consumption.

In case of helmet lost over write mode is provided to ignite the vehicle through switch for 3 times, again after receiving signals from helmet unit the count in the bike controller goes zero so that again 3 chances will be provided to ignite vehicle during helmet lost.[7]

The purpose of this project is to reduce the number of road accidents caused by alcohol consumption. By requiring the rider to wear a helmet and ensuring that they have not consumed alcohol before starting the bike, we hope to significantly reduce the number of accidents on Indian roads.

PROPOSED SYSTEM BLOCK DIAGRAM:

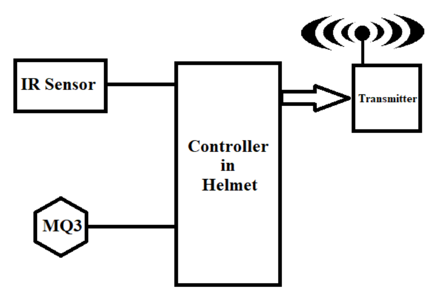

FIG 1: BLOCK DIAGRAM OF CIRCUIT IN HELMET

The above Fig 1 give a better idea about the way of sensor are connected to the controller in helmet.

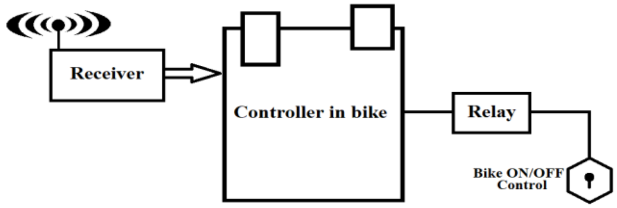

FIG 2: BLOCK DIAGRAM OF CIRCUIT IN BIKE

The Fig 2 can give a better idea about the way of ignition controlled in bike

To identify the helmet is worn an obstacles detector or any type of infrared sensor can be used, to identify the consumption of liquid beverage gas sensor can used that need to identify the smell of acetone on breath or ethanol odor on breath. If both the condition are satisfied the controller in the helmet send OK signal to the controller in the bike through radio frequency transmitter and receiver.

The receiver in the bike decodes the signal and now the controller connected in the bike to control the ignition of bike to start and stop. If one of the sensor signals is not satisfied the controller in the bike will not receive the OK signal and the bike will not get started.

HARDWARE DESCRIPTION:

The system consists of two controllers, an Arduino UNO and an Arduino Nano, and a wireless communication module using radio frequency (RF) transmitter and receiver. Arduino Nano is a compact board and the whole assembly of the sensors is very lightweight.[4] Connect the RF module to the Arduino Nano and Arduino UNO for wireless communication. Connect the [3]MQ3 alcohol detector sensor and IR sensor to the Arduino Nano. The Arduino Nano is placed in the helmet and is equipped with an infrared (IR) sensor to detect whether the rider is wearing the helmet or not and MQ3 in the helmet to detect whether the rider is consumed alcohol in the breath of the rider. The MQ-3 alcohol sensor is used in this work since it sensitive to gases and alcohol and it is able to detect existence of alcohol gases concentration at 0.05 mg/L to 10 mg/L.[5].

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FIG 3(A): SENOR USED TO DETECT HELMET WORN OR NOT

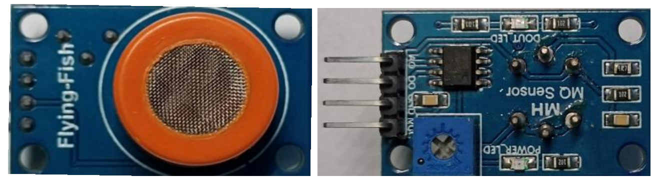

FIG 3(B): SENOR USED TO DETECT ALCOHOLIC BREATH

If sensors detect that the helmet is worn and the rider has not consumed alcohol, the controller in the helmet sends an "OK" signal to the Arduino UNO through RF Module which works in 433 kHz frequency and the bike receive the information by decoding the radio frequency using the receiver and then the rider can start bike. The Arduino UNO is equipped with a relay that controls the ignition of the bike. If either of the sensors does not detect the appropriate conditions, the "OK" signal is not sent, and the bike cannot be started.

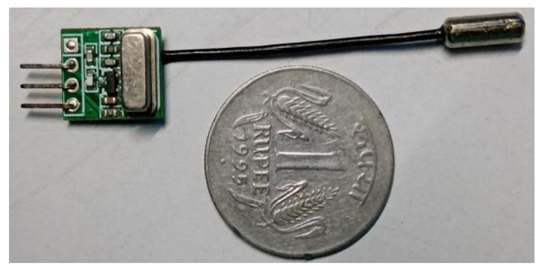

FIG 3(C): IMAGE OF TRANSMITTER WITH SIZE COMPARISON

The LCD display use to show the status or condition of the bike rider,

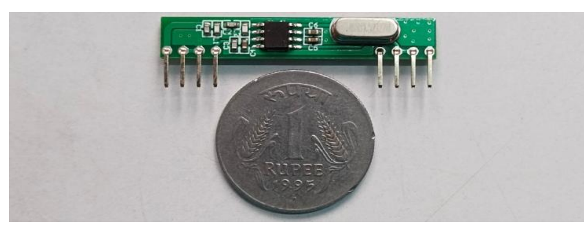

FIG 3(C): IMAGE OF RECEIVER WITH SIZE COMPARISON

FIG 4: LCD DISPLAY OF WEAR HELMET

If this fig 4 message is displayed in LCD the helmet is not wear and this command instructs the bike rider to wear helmet before start.

After the helmet is worn the sensors check for alcoholic breath if it is present it shows “Alcoholic” in LCD display Fig no (4) else its skip the command instruct and go the next step to progress.

FIG 5: LCD DISPLAY OF ALCOHOLIC DETECTOR

If this fig 5 message is appears in LCD the bike rider has an alcoholic breath beyond the limit. In India the legal age for alcohol consumption is varied from 18 years to 25 years from state to state, while some states have completely banned alcohol. For instance, state like Goa, Himachal Pradesh, Karnataka and others have a legal drinking age of 18 years. States like Delhi, Haryana and others have a legal drinking age of 25 years [2]. In Assam, the legal drinking age is 21 years and this command instructed the bike rider not allow starting the bike under this condition.

FIG 6: LCD DISPLAY OF ENGINE START

If all the conditions like helmet is worn and no alcohol detection in breath are satisfy the user or bike rider allow to start the bike which will be displayed in the LCD display Fig no (6) command instruct the bike rider can start the bike.

PROGRAMMING:

```
void setup()
{
    rf_driver.init();
    Serial.begin(9600);
    pinMode(ir,INPUT);
}
void loop()
{
    int sensorValue = digitalRead(MQ2pin);
    bool value = digitalRead(ir);
    if(value == 1)
    {
        char *msg = "0";
        rf_driver.send((uint8_t *)msg, strlen(msg));
        rf_driver.waitPacketSent();
        {
            Serial.println("Message 0");
        }
    }
    else if (value == 0)
    {
        if (sensorValue == 0)
        {
            char *msg = "1";
            rf_driver.send((uint8_t *)msg, strlen(msg));
            rf_driver.waitPacketSent();
            {
                Serial.println("Message 1");
            }
        }
        else if (sensorValue == 1)
        {
            char *msg = "2";
            rf_driver.send((uint8_t *)msg, strlen(msg));
            rf_driver.waitPacketSent();
            {
                Serial.println("Message 2");
            }
        }
    }
}
```

Program for arduino uno is given below,

```
void setup()
{
    rf_driver.init();
    Serial.begin(9600);
    pinMode(relay,OUTPUT);
    lcd.init();
    lcd.clear();
    lcd.backlight();
}
void loop()
{
    uint8_t buf[1];
    uint8_t buflen = sizeof(buf);
    char* a =     (char*)buf;
    if (rf_driver.recv(buf, &buflen))
    {
        Serial.print("Message Received: ");
        Serial.println(a);
        b = a[0];
        int c = b.toInt();
        //Serial.println(c);
```

```
        if(c == 0)
        {
            digitalWrite(relay,LOW);
            lcd.setCursor(0,0);
            lcd.print("Wear Helmet");
            delay(500);
            lcd.clear();
        }
        else if(c == 1)
        {
            digitalWrite(relay,LOW);
            lcd.setCursor(0,0);
            lcd.print("Alcoholic");
            delay(500);
            lcd.clear();
        }
        else if(c == 2)
        {
            digitalWrite(relay,HIGH);
            lcd.setCursor(0,0);
            lcd.print("Engine Start");
            delay(500);
            lcd.clear();
        }
    }
}
```

I used to write the program in Embedded C language this language is easy to use and preferred in most of the users. The Arduino IDE software allows dumping the program in the board. This software can be use in most of the platforms like Windows, Mac OS and Linux. Install the software in your PC or desktop and connect the board through USB cable selects the port in software which you have connected the controller board and the type of board you are using.

This program can be written in any language because before uploading the code will be converted into HEX code then only it dumped into the controller board.

Output with kit:

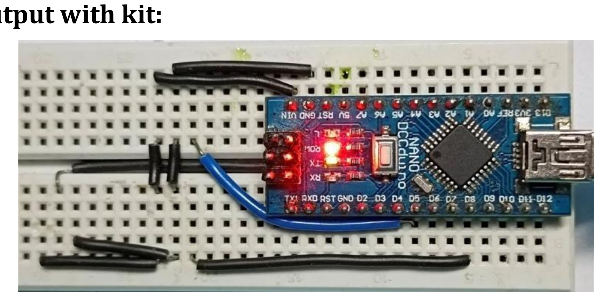

FIG 7: WIRING FOR THE CIRCUIT IN HELMET

The Circuit connection is done in a breadboard for a testing purpose and a clear understanding of how this components are working together to achieve a task.

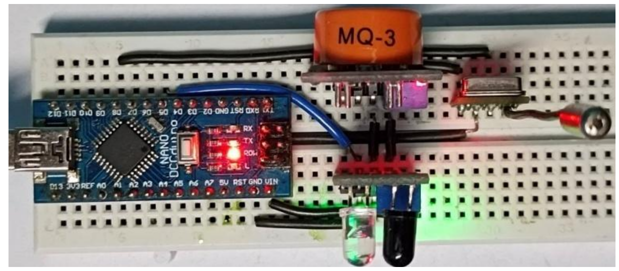

FIG 8: CIRCUIT IN HELMET AFTER CONNECTED WITH SENSORS

The Above mentioned sensors are connected in this circuit for work together and detect the helmet and the health of the person.

RESULTS:

The developed method involves integrating sensors to create a helmet. On the campus of JSREC and in the neighbourhoods around it, the planned system was created and tested. The instructions are displayed on the LCD once the helmet and bike modules have synchronized. The breath analyzer is used to detect alcohol. In the absence of alcohol, the bike starts. Through an RF transmitter and receiver, the signals are sent. The LCD shows that the helmet was either not identified or was not being worn, as seen in Figure 4,5&6. The circuit that is fixed to the bike draws the necessary power from the battery and uses less energy. The entire system is capable of running nonstop for a week. By increasing the battery's capacity, the duration can be extended.

We chose the battery with a lower capacity because we also considered the cost. A prototype, this circuit contains a lot of characteristics. It's really challenging to manage the circuit placement. The components will be minimized and made smaller in the following iteration of the prototype so that real-time execution will not present any problems for the user.

CONCLUSIONS:

In conclusion, the implementation of a smart helmet system using Arduino controllers and sensors is a promising solution to reducing the number of road accidents caused by drunk driving and riding without a helmet. The system has the potential to save lives and improve road safety in India and other countries facing similar issues. Further research and testing are required to validate its effectiveness and explore potential alternatives.

DISCUSSION:

The discussion section is the interpretation and explanation of the results obtained from the experiments and should provide a proper justification for the findings. The results of our study showed that the implementation of a smart helmet system using Arduino controllers and sensors can help reduce the number of road accidents caused by driving under the influence of alcohol and riding without a helmet.

The use of the MQ3 alcohol sensor and IR sensor in the helmet ensures that the rider is not under the influence of alcohol and that they are wearing a helmet before they can start the bike. The radio frequency transmitter and receiver allow for wireless communication between the helmet and the bike, ensuring a safe and secure connection.

This study offers a unique solution to a significant problem in India, where motorcycle-related accidents are a major issue. By reducing the number of accidents caused by drunk driving and riding without a helmet, the system can help save lives and improve road safety.

Although the results are promising, there are limitations to the study. The system has only been tested in a controlled environment, and further testing is required in real-life scenarios to validate its effectiveness. Additionally, the cost of implementing such a system on a large scale may be a concern, and alternative solutions may need to be explored.

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