

Design of Smart Helmet Using IOT Technology for Safety and Security

S. Suresh kumar¹, V. Y. S. S. Sudirpatnaikuni², J.Priyanka³

Assistant Professor^{1, 2, 3}

Department of ECE

Lendi Institute of Engineering and Technology, Jonnada

Corresponding Author's Email: - sureshkumar62ssk@gmail.com¹

Abstract

Now-a-days most of the accidents are taking place because, of consuming alcohol before driving and drowsiness while driving. To overcome this problem, we are using alcohol detector in the helmet which detects the alcohol consumption of the person and sends the message to the nearby police stations. To overcome the drowsiness situation, we use an IR sensor when a person is in drowsy state, then the sensor activates the buzzer near the ear. Thus, he can regain the consciousness. If the person wearing the helmet met with an accident then the vibrator circuit activates and the message will be sent to family members and to the nearby hospitals.

Keywords: - Consuming alcohol before driving, Drowsiness situation, Sensor Activates, Regain the consciousness.

INTRODUCTION

We know that most of the young generations prefer two-wheelers rather than four-wheelers. But we living the society, where rules have no importance. From the past few years, we have seen that there is a huge percentage of deaths increased due to rash driving, drunk and driving. 62% of deaths are taking place in

males between the ages of 20-30 years. So, to make safety measures mandatory and decrease the deaths of livesto an extent we produced the idea of smart helmet. By designing this system, we can decrease the death ratio and we can provide required hospitability within time. In this we are using several types of sensors such as IR sensor, MQ2 sensor, and Vibration sensor

to detect the problem and pass the information to the nearby hospitals, family members through GSM/GPS.

The helmet can identify the accident, by vibration sensor. A locally assessed alcohol sensor used to examine the percentage of alcohol consumption and passes information through GPS/GSM to family members. As usually IR sensor is used to examine the drowsiness of the person. It detects and the buzzer near the ear gets activated makes the person to regain his consciousness.

Literature Survey

Vibration detector is a device which is used to detect the accidents affected persons and is a safety control system. This sort of technology detects not only accidents through vibration but also the alcohol consumption, drowsiness effects which are leads to the occurrence of accidents. Alcohol sensors can used to detect percentage of alcohol consumed by the person and drowsiness detects the state of person while driving. After the effect of a greater number of accidents in our region smart helmet has become the one of the concerns of living and saving lives of people. This type of system will be used in any region and it is one of the important parts of human system in their

daily livelihood. The proposed prototype displays an exact detection of sensors in all three aspects regarding alcohol consumption, drowsiness and accidents affected.

Whenever there is an accident the vibration sensor get activated and the information is passed through GPS/GSM. if a person feels drowsiness while travelling long distance the eye blink sensor which is nothing but IR sensor get activated and continues the process to make the person to gain his consciousness. Similarly, a person consumes alcohol and it is detected the sensor performs its activity.

Working Principle

Drowsiness is detected using an IR (Infrared) based eye blink sensor. It is made up of an infrared transmitter and a receiver. The infrared rays in our eyes are sent using an IR transmitter. The infrared rays reflected from the eye are received by the IR receiver. When the eye is closed, the rays are not reflected, and the IR receiver output is high; otherwise, the IR receiver output is low. This is used to determine if the eye is closed or open. This signal is sent to the microcontroller to signal an alarm. Drowsiness is detected via an eye blink sensor, and an auditory alarm

is subsequently given by the microcontroller. A vibration sensor is used to detect accidents. When a vibration sensor is distorted, it produces a voltage. As a result, if there is an accident, the vibration sensor will produce an output voltage. The vibration sensor is continuously scanned by the microcontroller, and the threshold values are checked accordingly. When the vibration output reaches a predefined threshold value, a GSM transmission is used to send an SMS packet containing the driver's identification and the car registration number.

When a person is riding a bike while under the influence of alcohol, a gas sensor detects this and sends a signal to the server. With the purpose of avoiding drunken and driving-related accidents. A "gas sensor" is the most important component of this system. The sensor detects if the person riding the bike has consumed alcohol. The microcontroller is at the heart of this project. It is the overall circuit's CPU. The server and the microcontroller communicate with each other. The gas sensor is located near the mouth at the bottom of the helmet. If the client inhales on it, it may detect the amount of alcohol in their breath. The sensor is installed in such a way that the

client will consistently take it in. In this case, the customer is warned and cautioned not to drive the bike because the alcohol level is detected, causing the computerized give infix of the sensor to wind up HIGH.

Existing System

Deaths increased due to either not wearing the helmet or accidents were not revealed in time or the person could not be safe due to the late indication. Sensors distributed, WIFI module ranges, microprocessor arrangements are donning structuring the system. The accident indication is done by accelerometer, the accident warning is utilized by customer and the server is framework by the micro-controller. When a person met with an accident the related contact is done by cloud administration.

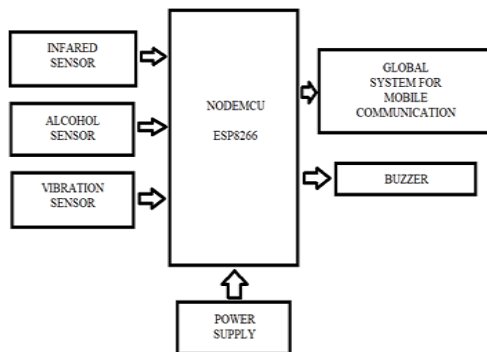
The disadvantage of present systems is 1) Clumsiness of tracking location, 2) There is no framework whether the person wore helmet or not.

Proposed System

In the proposed system we are using different sensors to detect each aspect. The sensors such as vibration sensor, Mq2 sensor and IR sensors are used. The fastest communication systems such as GSM/GPS modules are used. The first aspect is accidents, when a person met

with an accident due to the movement in helmet the vibration sensor gets activated and information is passed to there nearby hospital and to the family members through requires modules. The second aspect is alcohol consumption, the mq2 sensor which is used to detect the percentage if alcohol consumption and passes the information to family members for safety purpose. The final aspect is drowsiness, this can be overcome by IR sensor to sense and activates buzzer. These parameters are used to avoid accidents and work easier compared to earlier systems.

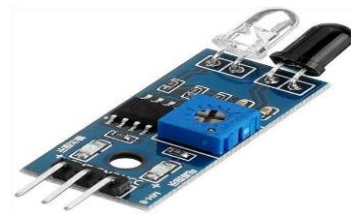
Block Diagram



IR Sensor

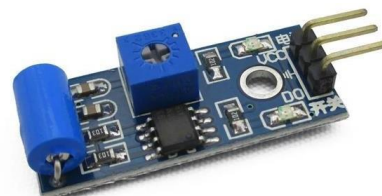
This eye blink sensor is based on infrared technology. It is made up of an infrared transmitter and a receiver. The eye blink sensor uses infrared light to illuminate the eye and measures variations in the reflected light. The results are calculated using infrared light reflected from the eye. For Eye Close, the sensor output is active

high and can be sent directly to the microcontroller for interfacing (e.g., buzzer). The driver is considered drowsy when this output remains high for an extended amount of time (threshold). As a result, a buzzer can be activated to wake the driver.



The eye blink sensor uses infrared light to illuminate the eye and measures variations in the reflected light. The results are calculated using infrared light reflected from the eye. For Eye Close, the sensor output is active high and can be sent directly to the microcontroller for interfacing (e.g., buzzer). IR sensor is a digital input device. Normally, it is made up of 0's and 1's. It has a voltage range of up to 5V.

Vibration Sensor



Vibration sensor is also called as piezoelectric sensor. When certain materials are subjected to mechanical

stress, they have the ability to produce a voltage. A piezoelectric sensor is a device that converts changes in pressure, acceleration, temperature, strain, or force to an electric charge using the piezoelectric effect. The rate at which a charge is created is proportional to the rate at which mechanical tension is applied to it. The higher the stress, the higher the voltage.

Zinc oxide (ZnO) is a mineral.

Piezoelectric materials include aluminium nitride (AlN), quartz (SiO₂), and others. The Vibration Sensor can tell if there is any impact development or vibration.

When vibration is detected, it generates a low beat flag. The digital input device is a vibration sensor. A sensor comparison circuit is contained inside the sensor, which is utilised to provide voltage to the controller. The VCC pin of the sensor is connected to the microcontroller's 5V pin. The ground is connected to the microcontroller's ground.

Alcohol Sensor

This module makes use of a breath analyser, which is a gas sensor. It is a low-cost semiconductor sensor that can detect liquor gas concentrations ranging from 0.05 mg/L to 10 mg/L. It's a standard analogue input. There are three connectors

on it: VCC, GND, and A0. The VCC pin of the sensor is connected to the microcontroller's 5V pin. The sensor's GND is connected to the microcontroller's ground. The MQ3 sensor detects ethanol in the air and is properly known as an alcohol sensor. When a drunk individual breath near an alcohol sensor, the sensor detects the ethanol in his breath and gives an output dependent on the amount of alcohol in his breath.



MQ3 is a sensor that is powered by a heater. That's why it's protected by an Anti-explosion network, which is made up of two layers of tiny stainless-steel mesh. Because we are sensing flammable gas, it assures that the heater element inside the sensor does not trigger an explosion (alcohol). It also protects the sensor by filtering away suspended particles, allowing only gaseous constituents to pass through the chamber.

GSM

The GSM Sim900A small Module is what you are looking at. The first thing you will notice about this GSM module is that it lacks an internal voltage regulator, so be cautious when applying voltages more

than 5 volts, as this module can easily be damaged. The ideal voltage for this GSM module is 4.7 volts, but you may easily power it using a 5-volt converter. If you do not have a 5v adaptor, you may create your own power supply with the lm317t adjustable variable voltage regulator. I have a full lesson on the lm317t that explainseverything.

There are a few features about the GSM sim900A module that I particularly like:

This is the most affordable GSM module on the market. Another splendid feature is that it can be readily interfaced with both 5V and 3.3V controller boards, such as the Arduino Uno, Arduino Mega, Arduino Nano, and the Nodemcu ESP8266 Wi-Fi Module and ESP32. In one of my upcoming blogs, I will go over how to interface the GSM Sim900A module with the ESP32. Pin number 1 is the VCC, which can be connected to the in my

instance, I will leave this pin unconnected because I will be powering this module with an external power supply. The ground pin on pin number 2 will be connected to the Arduino's ground. Pin 3 is for the 5v TXD, Pin 4 is for the 5v RXD, Pin 5 is for the 3.3v TXD, and Pin 6 is for the 3.3v RXD. See Figure

NODEMCU

The ESP-12E module on the Node MCU ESP8266 development board contains an ESP8266 chip with a Tensilica Extensa 32-bit LX106 RISC microprocessor. This microprocessor runs on a configurable clock frequency of 80MHz to 160MHz and supports RTOS. To store data and programmes, the Node MCU contains 128 KB of RAM and 4MB of Flash memory. It is perfect for IoT projects due to its high processing power, built-in Wi-Fi / Bluetooth, and Deep Sleep Operating capabilities.



A Micro USB jack and VIN pin can be used to power NodeMCU (External Supply Pin). It has interfaces for UART, SPI, and I2C.

Tensilica 32-bit RISC CPU Xtensa LX106
Operating Voltage: 3.3V

Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106

7-12V input voltage

UARTs: 1 SPIs: 1 I2Cs: 1 Digital I/O Pins

(DIO): 16 Analog Input Pins (ADC): 1
UARTs: 1 SPIs: 1

4 MB of flash memory

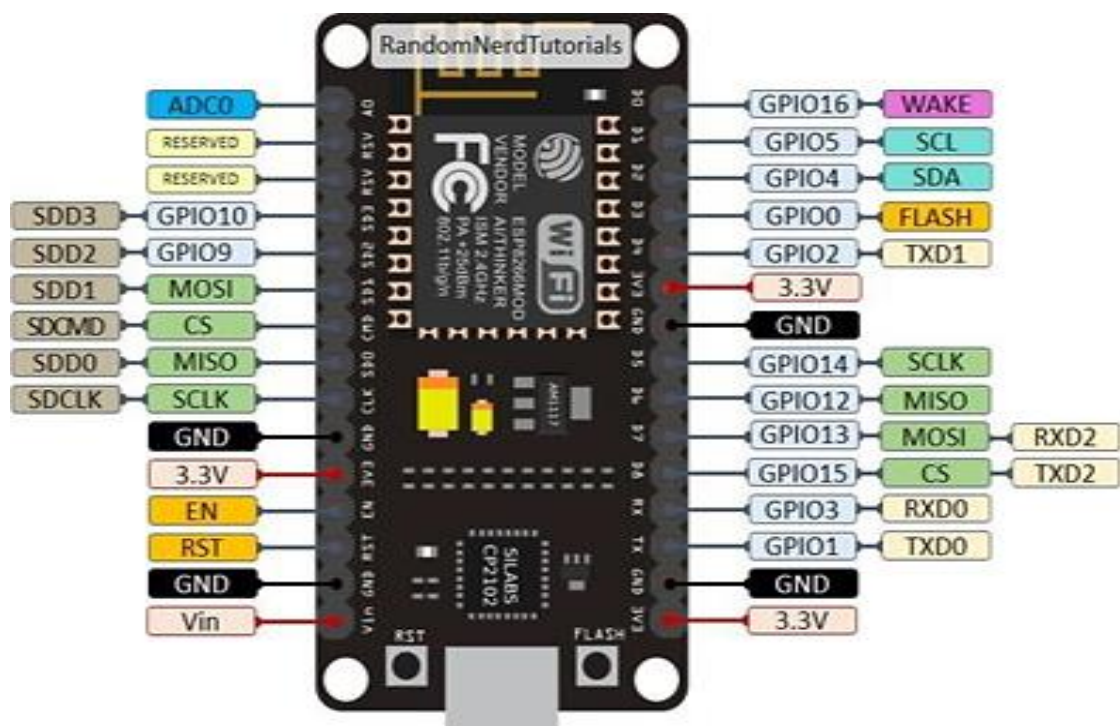
64 KB SRAM

80 MHz Clock Speed.

Onboard USB-TTL based on the CP2102 enables Plug n Play PCB Antenna.

A little module that will fit neatly into your IoT projects.

PIN DIAGRAM



NODE MCU PIN CONFIGURATION

Pin	Function
RST	Reset the Module
ADCO	ADC Pin with 10-bit
EN	Chip Enable Pin (active
GPIO16	GPIO16 pin (wake pin from
GPIO14	GPIO14 pin (HSPI CLK)
GPIO12	GPIO12 pin (HSPI MISO)
GPIO13	GPIO13 pin (HSPI MOSI)
VCC	Power Supply (max 3.6V)
SDCMD	SDIO CMD (GPIO11)
SDD0	SDIO Data 0 (GPIO7)
SDD2	SDIO Data 2 (GPIO9)
SDD3	SDIO Data 3 (GPIO10)
SDD1	SDIO Data 1 (GPIO8)
SCCLK	SDIO CLK (GPIO6)
GND	Ground Pin
GPIO15	GPIO15 pin (HSPI_CS)
GPIO2	GPIO2 pin (TXD1)
FLASH	Flash Pin (GPIO0)
GPIO4	GPIO4 pin (SDA – software
GPIO5	GPIO5 pin (SCL – software
RXD0	UART0 RXD pin (GPIO3)
TXD0	UART0 TXD (GPIO1)

Merits

- Accident’s detection in remote areas can be done easily.
- Medical support is acquired in time.
- Consumption of alcohol decreases.
- Probability ratio of deaths will be reduced.

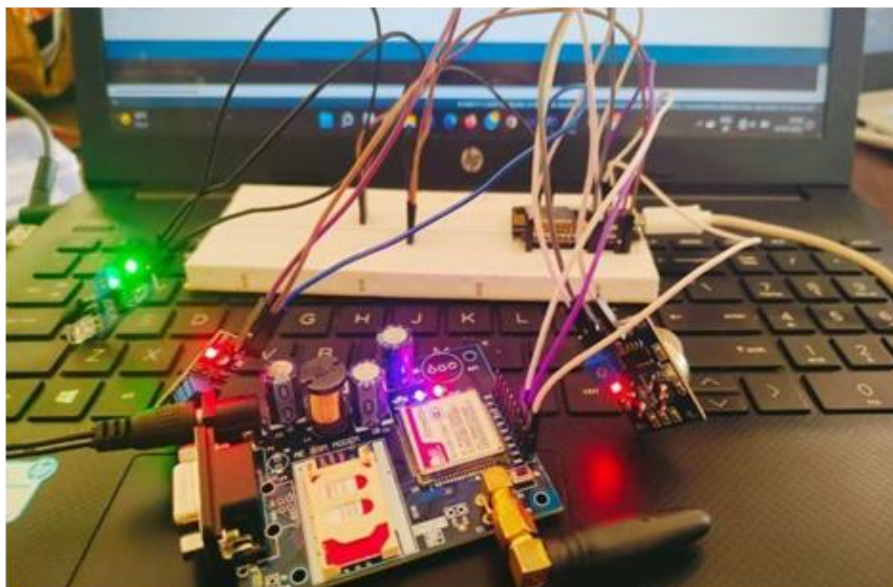
Applications

- Real-time safety and security.
- This can be further developed in car such as seat belts.
- Less power consumptions.
- Convenience can be improved.
- Risk is avoided.

RESULT

Circuit diagram

Code for interfacing of Node mcu with all sensors and GPS and GSM



Final | Arduino 1.8.19

File Edit Sketch Tools Help

```

Final
1 #define MQ2pin (0)
2 float sensorValue;
3 int led=5;
4 int sensor=4;
5 int temp=0;
6 int buzzer=5;
7 int threshold=600;
8 int val=0;
9 void setup()
10 {
11   Serial.begin(115200);
12   Serial.println("Gas sensor warming up!");
13   delay(2000);
14   pinMode(led, OUTPUT);
15   pinMode(buzzer, OUTPUT);
16   pinMode(sensor, INPUT);
17   pinMode(14, HIGH);
18 }
19 void loop()
20 {
21   sensorValue = analogRead(MQ2pin);
22
23   Serial.print("Sensor Value: ");
24   Serial.print(sensorValue);
25
26   if(sensorValue > 500)
27   {
28     Serial.print(" | Smoke detected!");
29     digitalWrite(led, HIGH);
30     Serial.println("LED TURNED ON");
31     delay(2000);
32     Serial.print("AT");
33     delay(1000);
34     Serial.println();
35     Serial.println("smLTemp=1");

```

```

TRACE #0.000 Received full packet: 01120200000000000000
Hard resetting via RTD pin...

```

```

Final | Arduino 1.8.19
File Edit Sketch Tools Help

Final
48 }
49
50 Serial.println("");
51 delay(2000);
52
53 {
54   temp=digitalRead(sensor);
55   if(temp==1){
56
57     }
58   else{
59     digitalWrite(led, LOW);
60     Serial.println("LED TURNED OFF");
61     delay(2000);
62     digitalWrite(led, HIGH);
63     Serial.println("LED TURNED ON");
64     delay(2000);
65     Serial.print("AT");
66     delay(1000);
67     Serial.println();
68     Serial.println("AT+CMGF=1");
69     delay(1000);
70     Serial.println();
71     Serial.print("AT+CMGS=");
72     Serial.print("\"+916304300424\");
73     Serial.println();
74     delay(1000);
75     Serial.print("Accident detected");
76     delay(1000);
77     Serial.println();
78     Serial.write(26);
79     while(1);
80   }
81 }

```

```

TRACE +0.000 Received full packet: 01120200000000000000
Hard resetting via RTS pin...

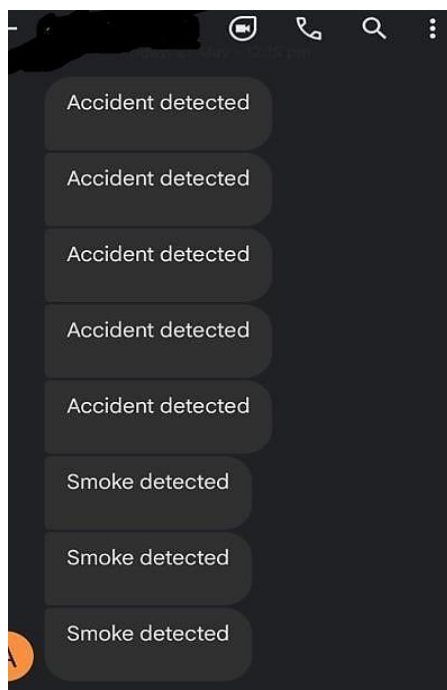
```

RESULTS IN SERIALPORT

```

COM7
03:49:21.451 -> 0
03:49:23.425 -> Sensor Value: 470.00
03:49:25.442 -> 0
03:49:27.461 -> Sensor Value: 470.00
03:49:29.434 -> LED TURNED OFF
03:49:31.450 -> LED TURNED ON
03:49:33.449 -> AT
03:49:34.465 -> AT+CMGF=1
03:49:35.458 ->
03:49:35.458 -> AT+CMGS="+916304300424"
03:49:36.444 -> Accident detected
03:49:37.463 -> □
03:49:39.831 -> Soft WDT reset
03:49:39.831 ->
03:49:39.831 -> >>>stack>>>
03:49:39.831 ->
03:49:39.831 -> ctx: cont
03:49:39.831 -> sp: 3ffffdf0 end: 3fffffc0 offset: 01b0
03:49:39.831 -> 3fffffa0: 3ffffdad0 00000000 3ffef31c 40201e10
03:49:39.831 -> 3fffffb0: feefeffe feefeffe 3ffe8500 401007f5
03:49:39.876 -> <<<stack<<<
03:49:39.876 ->
03:49:39.876 -> ets Jan 8 2013,rst cause:2, boot mode:(3,6)
03:49:39.876 ->
03:49:39.876 -> load 0x4010f000, len 1384, room 16
03:49:39.876 -> tail 8
03:49:39.876 -> checksum 0x2d
03:49:39.876 -> nsum 0x2d
03:49:39.876 -> v0b099c12
03:49:39.876 -> ~ld
03:49:39.920 -> Gas sensor warming up!
03:49:41.914 -> Sensor Value: 474.00
03:49:43.901 -> 1
03:49:45.901 -> Sensor Value: 474.00
03:49:47.943 -> 1
03:49:49.945 -> Sensor Value: 473.00
03:49:51.926 -> LED TURNED OFF
03:49:53.926 -> LED TURNED ON
03:49:55.938 -> AT
03:49:56.910 -> AT+CMGF=1
03:49:57.906 ->
03:49:57.906 -> AT+CMGS="+916304300424"
03:49:59.905 -> Accident detected
03:49:59.940 -> □
Autoscroll Show timestamp

```



CONCLUSION

Design of smart helmet using IOT technology for safety and security can identify the accident, by vibration sensor. A locally assessed alcohol sensor used to examine the percentage of alcohol consumption and passes information through GPS/GSM to family members. As usually IR sensor is used to examine the drowsiness of the person. It detects and the buzzer near the ear gets activated makes the person to regain his consciousness. This IOT Based Smart helmet senses the accidents occurred due to 3 major reasons like consuming alcohol, drowsiness while driving, late information to hospital and transmits these values to Node MCU and the Node MCU will send the information to the GSM module and then

the GSM module will send the SMS to the given number. Then the user is able to get the required services for the received input. The system is simple and could be configured with available resources in the country.

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