A

Mini Project Report on

"Smart Helmet"

Submitted in partial fulfilment of the requirements for the award of the degree of

Bachelor of Technology in

Electronics & Telecommunication

Submitted by

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Under the guidance of

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CERTIFICATE

This is to be certified that this is a Bonafide record of the project presented by the students whose names are given below of Third Year B. Tech V semester (2021-22) of Electronics and Telecommunication Department, Government College of Engineering, Karad have completed their Mini Project entitled

"Smart Helmet"

They have submitted their Project Report for the partial fulfilment of the curriculum of the Degree of Bachelor of Electronics and Telecommunication from Government College of Engineering, Karad.

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Examiner	Project Guide	(Head of Department)
		Dept. Of Electronics & Telecomm.
		GCE, Karad

Date: / / 2021

DECLARATION

We

1. Chinmay Kulkarni
2. Pratiksha Thorat
3. Komal Suryawanshi

hereby declare that the Project Report entitled,

"Smart Helmet"

done by our group under the guidance of Project guide and External Examiner In partial fulfilment of the requirement for the award of the Degree of Bachelors of Technology (Electronics and Telecommunication) of Government College of Engineering, Karad in the academic year 2021 – 2022.

Prof. A. Shinde
Project Guide
GCE, Karad

External
Examiner

ACKNOWLEDGEMENT

It gives us a great pleasure in bringing out the project report titled Smart Helmet. This project is something that could not have been implemented without the co-operation of many people who have involved in this project. We take this opportunity to express our thanks for all the people who had helped us in the completion of this project.

We sincerely thank to Prof. Ashwini Shinde with his help and guidance this project would not be in its present form. The keen interest taken by the guide in our project helped us to solve difficulties.

We are thankful to our respected H.O.D. Prof. Supriya Diwan mam who provided us the opportunity to work on this project and helped us a lot by providing valuable suggestions.

ABSTRACT

The main goal of this project is to design and develop an embedded system to transform a helmet into a smart, multi-sensor connected helmet (Smart Helmet) to improve motorcycle safety. The conventional helmet is used for the safety of driver's head. It does not serve any other purposes in case of any untimely accidents. The major cause for the loss of lives in accidents is due to the delay to reach the hospital. A smart helmet is a special idea which makes motorcycle driving safer than before. This can be implemented using Raspberry Pi, which itself is a PC.

The core idea of Smart Helmet is to implement a smart system, which can sense and take actions to improve driver's personal safety. Thereby enhancing cooperation between man and machine in an automatic and smart way. Hidden in the helmet structure, the designed system is equipped with a dense sensor network including alcohol gas level and a touch sensor to check if the rider is wearing the helmet, in addition, vibration sensor, and eventually the user's smart phone. Smart Helmet performs rich context awareness applications; breath alcohol control; data display and wireless communication with the vehicle.

The aim of this project is to make à protection system in a helmet for the safety of bike rider. The smart helmet that is made is fitted with different sensors responsible for detection.

LIST OF CONTENTS:

CHAPTER 1

INTRODUCTION

In recent times helmets have been made compulsory in Telangana State. Traffic accidents in India have been increased every year. As per Section 129 of Motor Vehicles Act, 1988, every single person riding a two-wheeler is required to wear protective headgear following the standards of BIS (Bureau of Indian Standards). Also drunken driving under the influence (DUI) is a criminal offence according to the Motor Vehicle act 1939, which states that the bike rider will get punishment. Currently bike riders easily escape from the law. These are the three main issues which motivates us for developing this project.

A traffic accident is defined as any vehicle accident occurring on public highway roads. The thought of developing this project comes to do some good things towards the society. Two-wheeler accidents are increasing day by day and lead to loss of many lives. The main aim of our project is to build a safety system to reduce the probability of two-wheeler accidents. If any accident occurs nobody is there to give information to the ambulance or parents. This is a situation we observe in our day-to-day life, a thought of finding some solution to resolve this problem come up with this idea of giving the information about accident as soon as possible and in time. Smart helmet focusing on three major applications which are helpful in our day-to-day life. At first and most one is the ignition of the bike will not happen if we are not wearing the helmet. Secondly alcoholic driving is not possible by using this smart helmet. If the rider is alcoholic, the bike will not start. Third application is accident detection. If person met with an accident, no one is there to help him and simply leaving or ignoring the person. In such situation informing to ambulance or family members through mobile to rescue him for an extent.

Smart Helmet for Accident Detection and Reporting system, vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to raspberry pi. So, when the rider crashes and the helmet hit the ground, these sensors sense and then raspberry pi extract GPS data and when the data exceeds minimum stress limit then Twilio automatically sends message to ambulance or family members. Hence smart helmet is a special idea which makes motorcycle driving safer than before.

CHAPTER 2

LITERATURE SURVEY

Some of the papers reviewed related to the topic are:

2.1 Paper 1:

K. Sudarsan, P. Kumaraguru Diderot, "Intelligent Helmet" international Journal of Science and research (IJOFR) Volume 3 Issue 3, March 2014.

Methodology:

In India still most of the people prefer two wheelers compared to other form of vehicle due to simplicity and its low cost. One important problem is bike riders suffer from inadequate roads and bad driving conditions. Other important problem with bikers is that most of the time they don't like to wear helmet which could be fatal when accidents happen. Two wheelers in everyone's life play vital role, moreover the safety is considered to be primary of all. According to some statistics 50% of accident occurs due to bad conditions of road and not wearing helmet. To avoid accidents and to encourage people to wear helmet a project is to be introduced that includes smart interactive robotic helmet with features like road hazard warning, wireless bike authentication and traffic adaptive mp3 playback. This helmet will warn the rider when road hazard is ahead, helmet will also communicate with rider if he is not wearing it and will perform wireless bike authentication that act as prevention from theft. It will also adjust the volume of the speakers automatically while rider is listening to music as a safety precaution.

2.2 Paper 2:

Mr. G. V Vinod & Mr. K. Sai Krishna "SMART HELMET" INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY [ISSN: 2277-9655, Impact Factor: 5.164, CODEN: IJESS7, April, 2018].

Methodology:

In the system of Helmet &vehicle are using Arduino UNO, Vibration Sensor, Alcohol Sensor, Temperature Sensor, GSM and GPS. A smart helmet is a special idea which makes motorcycle driving safer than before. The working of this smart helmet is very simple, vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So, when the rider crashes and the helmet hit the ground, these sensors sense and gives to the microcontroller board, then controller extract GPS data using the GPS module that is interfaced to it. It also has an alcohol detector sensor which detects whether the person is drunk and switches off the engine if the sensor output is high.

2.3 Paper 3:

Snehal Chorge, Hemkedar Kurale, Sonali Deshmukh and Deepa Mane "SMART HELMET: SMART SOLUTION FOR BIKE RIDERS AND ALCOHOL DETECTION" INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR) [Article DOI: 10.21474/IJAR01/2289, Int. J. Adv. Res. 4(11), 1891-1896, ISSN: 2320-5407, November 2016.

Methodology:

In this system Helmet &vehicle are Controller, IR sensor (helmet detection), MO3A (alcohol detection), RF Encoder, RF transmitter, RF Decoder, RF Receiver. In order to overcome this an intelligent system, smart helmet is proposed, it detects the helmet and also the alcohol present in rider's breath. This system has a pair of transmitter and receiver, the transmitter is placed in the helmet and the receiver is placed at the bike ignition. There are different sensors to ensure the helmet is on the head. These vibration sensors are placed in helmet where the probability of hitting is more. An alcohol sensor is placed near mouth of the rider. The alcohol sensor detects the presence of alcohol in rider's breath. The data of the detection of helmet and alcohol is coded with RF encoder and then transmitted through radio frequency transmitter. The receiver at the bike receives the data and the data is decoded using RF decoder. The result of presence of helmet and the alcohol detection is analyzed on the smart phone. The proposed system will be so designed that if one of the two conditions are violated then also the bike won't start. The bike will start only if the both conditions are followed. This smart helmet will help the rider to compulsory wear helmet and restrict drink and drive condition. MCU controls the function of relay and the ignition, it controls the engine through a relay and a relay interfacing circuit.

2.4 Paper 4:

Hajer Salim, Malathi B. N, "Accident notification system by using two modem GPS and GSM" International Journal of Applied Information Systems (IJAIS) Foundation of Volume 8– No.3, February 2015.

Methodology:

Accidents are increasing automatically in the Sultanate of Oman where the people lose their lives because the unavailability of proper medical facilities in a timely manner. When an accident occurs the vibration sensor gives the signal to the microcontroller, which sends the information to the control room through GSM network. In this system we use Mikrobasic software, and use GSM technology to send a text message to the police in the place of the accident, which is determined by GPS. This system is applied in navigation systems to keep track of children and animals.

CHAPTER 3

PROBLEM STATEMENT AND AIM

3.1 Problem Statement

As the bikers in our country are increasing, the road mishaps are also increasing day by day, due to which many deaths occur, most of them are caused due to most common negligence of not wearing helmets, also many deaths occur due to lack of prompt medical attention needed by the injured person. The project aims at the security and safety of the bikers against road accidents.

3.2 Project Aim:

"Development Smart Helmet"

To achieve the proposed Aims, the Objectives are-

1) Status Of Rider Wearing Helmet
2) Alcohol Content Test
3) Accident Detection
4) Accident Location

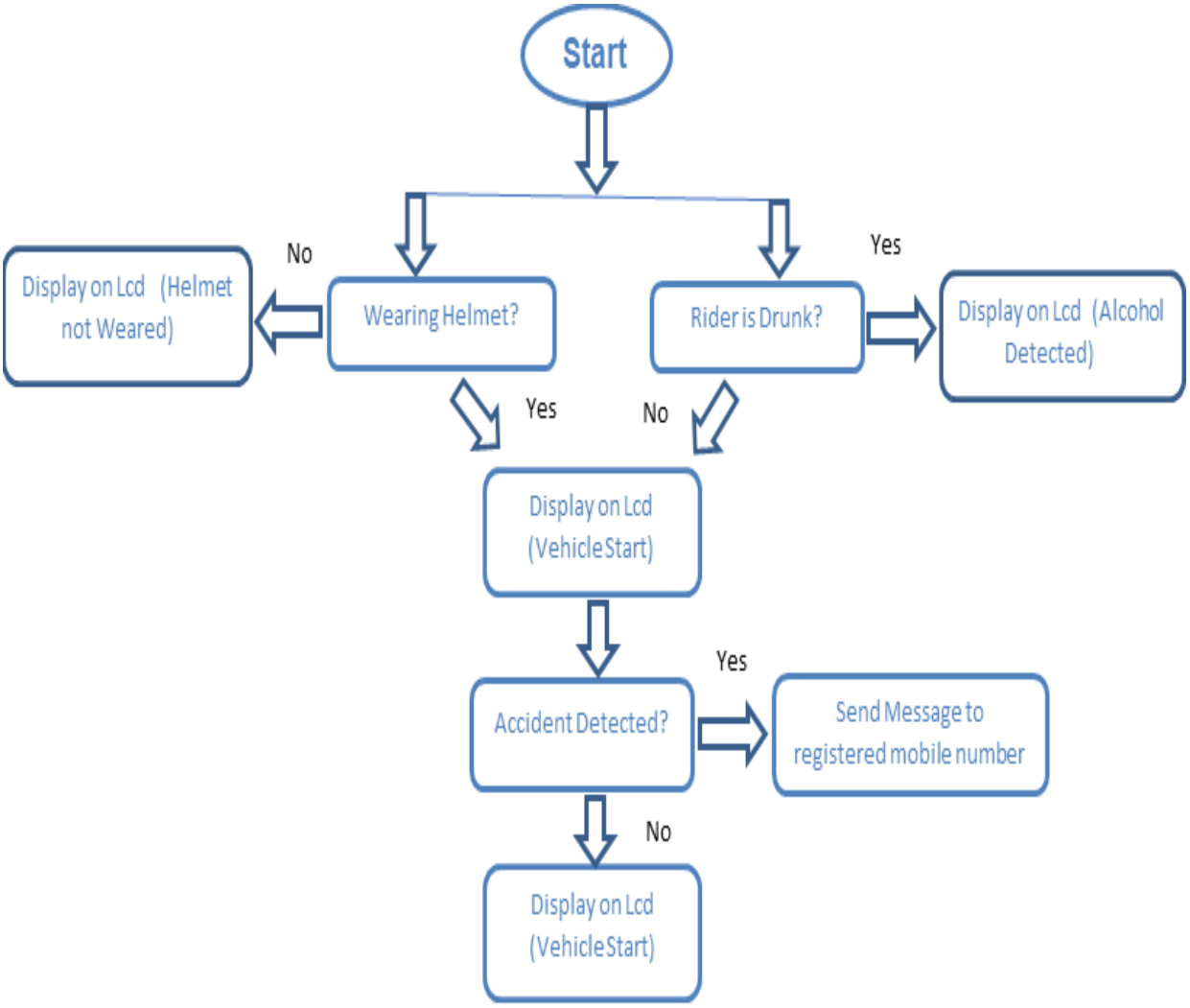
CHAPTER 4

DESIGN EXPLANATION

4.1 Proposed System Architecture:

- In the smart helmet, the Raspberry Pi which controls all of the other input modules and output systems.
- The MQ3 Gas Sensor is used for alcohol detection which prevents drunk driving by not allowing the driver to start the bike if any alcohol is detected.
- The touch sensor is used for helmet detection. If the driver is trying to ride the bike without wearing the helmet, the bike motor will not start.
- The vibration sensor is for accident detection and reporting. The vibration sensor detects if any accident has occurred. If the vibration sensor detects any accidents, the Twilio API service transmits the current location of the bike rider and then sends the location to the registered mobile number.
- The entire project was designed virtually using Proteus Design Suite 8 and the programming for the modules was done using Python 3.

4.2 Flow Diagram



4.3 COMPONENTS USED IN THE PROPOSED DESIGN:

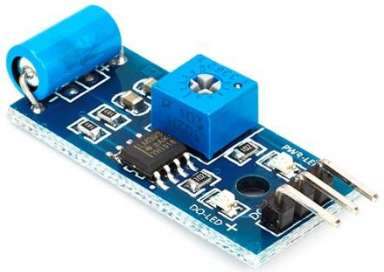
- Raspberry Pi
- Vibration Sensor (SW 420)
- Alcohol Sensor (MQ 3)
- Touch Sensor (TTP 223)
- Twilio
- Jumper Wires
- LCD

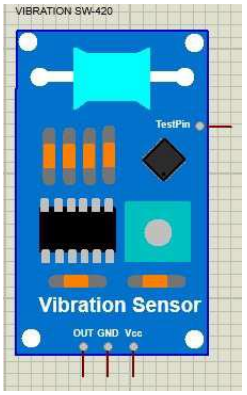
Hardware:

(1) Raspberry Pi

The Raspberry Pi is a series of small single-board computers Fig2.Block diagram of Raspberry Pi This block diagram describes Model B and B+. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-port USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro-USB (OTG) port. Unlike all other Pi models, the 40 pin GPIO connector is omitted on the Pi Zero with solderable through holes only in the pin locations

(2) Vibration Sensor:





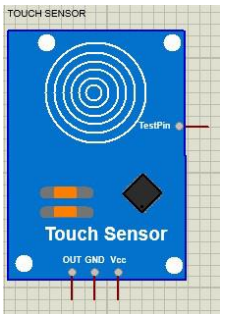
In our project, fall detection is done using a SW-420 vibration sensor. This sensor is attached to the helmet and detects any sort of large vibration such as the rider falling off a bike or any sort of accident. Vibration Sensors are used for vibration detection. They are mostly used in those projects where vibration detection is necessary like we can use it for security purposes and can place them on doors and windows. So, if someone tried to break the doors or windows then the vibrations will be detected by this sensor and buzzer can trigger. The Grove - Vibration Sensor (SW-420) is a sensitivity non-directional vibration sensor. When the module is stable, the circuit is turned on and the output is high. When the movement or vibration occurs, the circuit will be briefly disconnected and output low.

(3) Alcohol Sensor

In order to detect alcohol traces in the driver's breath, Smart Helmet includes the MQ-3 Gas Sensor. This device has high sensitivity to alcohol and small sensitivity to benzene, which is not to underestimate in automotive applications. Moreover, it has a very simple drive circuit. the MQ-3 drive circuit: a 5V line supplies both the heating and the sensing resistance of the sensor, the latter changes its value depending on alcohol gas levels in air and determines the voltage drop on a load resistance. In the Smart Helmet, the MQ-3 is designed to be sampled using the 2.5V MCU ADC internal reference so both a 5V supply line and an output deamplification circuit were required.

(4) Touch Sensor:

A touch sensor is an electronic sensor used in detecting and recording physical touch. A touch sensor works like a switch, where when there's contact, touch, or pressure on the surface of a touch sensor, it opens up an electrical circuit and allows currents to flow through it. In our project the touch sensor is used to detect if the helmet is touching the head of the bike rider or not. If the helmet does not touch the head of the rider, the bike engine stops functioning.



(5) LCD 16x2:

The LCD screen is more energy efficient and can be disposed of more safely than a CRT can. Its low electrical power consumption enables it to be used in battery powered electronic equipment more efficiently than CRTs can be a 16x2 LCD display is used in the project which displays the count or number of rotations.

Software Used:

(1) Twilio:

Here we have used Twilio Application to send the message to ambulance or family members through their API-based SMS Services.

CHAPTER 5

CODE AND IT'S OUTPUT

Code

```
#!/usr/bin/python
from subprocess import call
import time
import RPi.GPIO as GPIO
#import pio
#import Ports
import serial as s
GPIO.setmode(GPIO.BOARD)
GPIO.setwarnings(False)

#pio.uart=Ports.UART() # Define serial port

'''
define pin for lcd
'''

serial = s.Serial ("/dev/ttyS0", 9600)     #Open port with
baud rate

# Timing constants
E_PULSE = 0.0005
E_DELAY = 0.0005
delay = 1


# Define GPIO to LCD mapping
LCD_RS = 7
LCD_E  = 11
LCD_D4 = 12
LCD_D5 = 13
LCD_D6 = 15
LCD_D7 = 16
alcohol_Sensor = 18
touch_Sensor = 29
vibration_sensor = 33
```

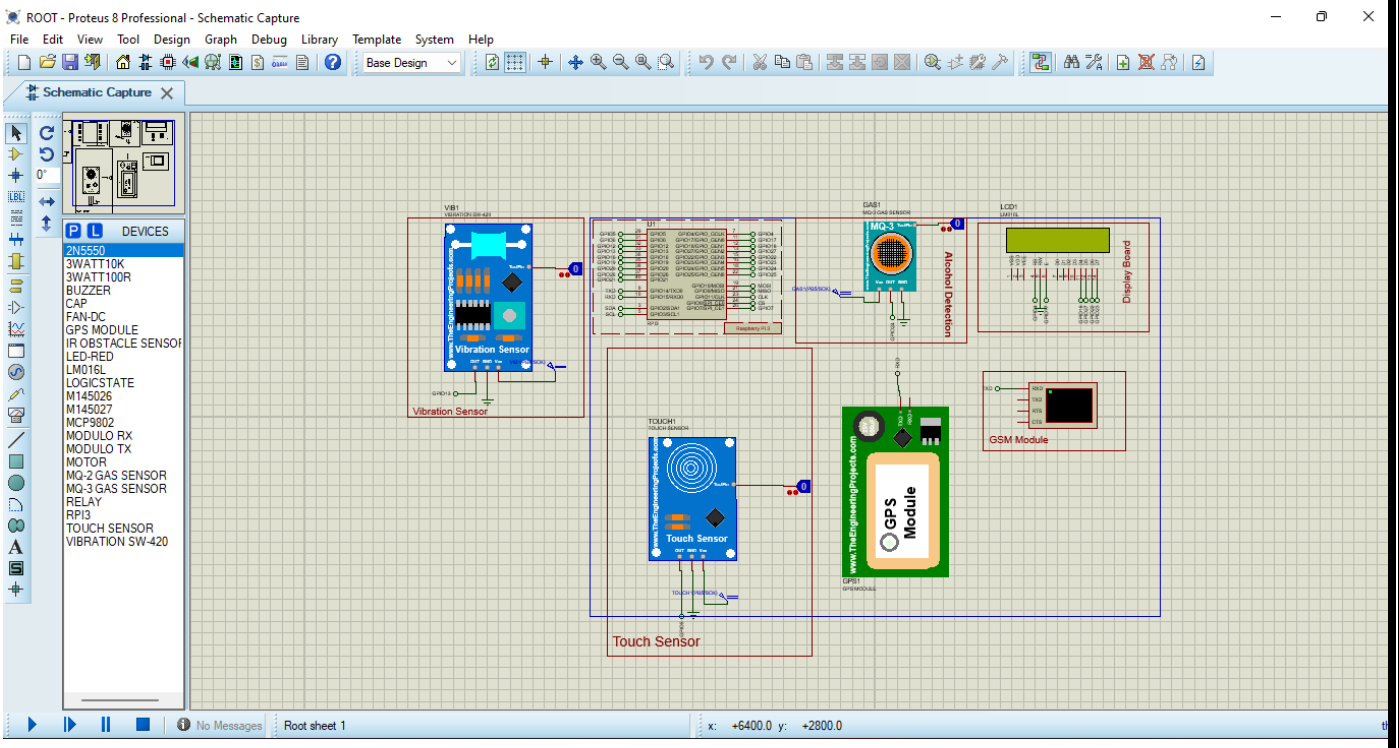
```
GPIO.setup(LCD_E, GPIO.OUT)  # E
GPIO.setup(LCD_RS, GPIO.OUT) # RS
GPIO.setup(LCD_D4, GPIO.OUT) # DB4
GPIO.setup(LCD_D5, GPIO.OUT) # DB5
GPIO.setup(LCD_D6, GPIO.OUT) # DB6
GPIO.setup(LCD_D7, GPIO.OUT)

GPIO.setup(alcohol_Sensor, GPIO.IN)
GPIO.setup(touch_Sensor, GPIO.IN)
GPIO.setup(vibration_sensor, GPIO.IN)

# Define some device constants
LCD_WIDTH = 16    # Maximum characters per line
LCD_CHR = True
LCD_CMD = False
LCD_LINE_1 = 0x80 # LCD RAM address for the 1st line
LCD_LINE_2 = 0xC0 # LCD RAM address for the 2nd line


'''
Function Name :lcd_init()
Function Description : this function is used to initialized
lcd by sending the different commands
'''

def lcd_init():
  # Initialise display
  lcd_byte(0x33,LCD_CMD) # 110011 Initialise
  lcd_byte(0x32,LCD_CMD) # 110010 Initialise
  lcd_byte(0x06,LCD_CMD) # 000110 Cursor move direction
  lcd_byte(0x0C,LCD_CMD)  #  001100  Display  On,Cursor  Off,
Blink Off
  lcd_byte(0x28,LCD_CMD)  #  101000  Data  length,  number  of
lines, font size
  lcd_byte(0x01,LCD_CMD) # 000001 Clear display
  time.sleep(E_DELAY)

'''
Function Name :lcd_byte(bits ,mode)
Fuction Name :the main purpose of this function to convert
the byte data into bit and send to lcd port
'''
```

```
def lcd_byte(bits, mode):
  # Send byte to data pins
  # bits = data
  # mode = True  for character
  #        False for command

  GPIO.output(LCD_RS, mode) # RS

  # High bits
  GPIO.output(LCD_D4, False)
  GPIO.output(LCD_D5, False)
  GPIO.output(LCD_D6, False)
  GPIO.output(LCD_D7, False)
  if bits&0x10==0x10:
    GPIO.output(LCD_D4, True)
  if bits&0x20==0x20:
    GPIO.output(LCD_D5, True)
  if bits&0x40==0x40:
    GPIO.output(LCD_D6, True)
  if bits&0x80==0x80:
    GPIO.output(LCD_D7, True)

  # Toggle 'Enable' pin
  lcd_toggle_enable()

  # Low bits
  GPIO.output(LCD_D4, False)
  GPIO.output(LCD_D5, False)
  GPIO.output(LCD_D6, False)
  GPIO.output(LCD_D7, False)
  if bits&0x01==0x01:
    GPIO.output(LCD_D4, True)
  if bits&0x02==0x02:
    GPIO.output(LCD_D5, True)
  if bits&0x04==0x04:
    GPIO.output(LCD_D6, True)
  if bits&0x08==0x08:
    GPIO.output(LCD_D7, True)

  # Toggle 'Enable' pin
  lcd_toggle_enable()

'''
```

```
Function Name : lcd_toggle_enable()
Function Description:basically this is used to toggle
Enable pin
'''
def lcd_toggle_enable():
  # Toggle enable
  time.sleep(E_DELAY)
  GPIO.output(LCD_E, True)
  time.sleep(E_PULSE)
  GPIO.output(LCD_E, False)
  time.sleep(E_DELAY)
'''
Function Name :lcd_string(message,line)
Function  Description :print the data on lcd
'''

def lcd_string(message,line):
  # Send string to display

  message = message.ljust(LCD_WIDTH," ")

  lcd_byte(line, LCD_CMD)

  for i in range(LCD_WIDTH):
    lcd_byte(ord(message[i]),LCD_CHR)

lcd_init()
lcd_string("welcome ",LCD_LINE_1)
time.sleep(0.5)
lcd_byte(0x01,LCD_CMD) # 000001 Clear display
lcd_string("Smart Helmet ",LCD_LINE_2)
time.sleep(0.5)
while 1:
# Print out results
alcohol_data =  GPIO.input(alcohol_Sensor)
touch_data =  GPIO.input(touch_Sensor)
vibration_data =  GPIO.input(vibration_sensor)
print("alcohol: " + str(alcohol_data))
print("touch:" + str(touch_data))
print("vibrations:" + str(vibration_data))
time.sleep(2)

if(vibration_data == True):
```

```
if(touch_data == True):
lcd_byte(0x01,LCD_CMD) # 000001 Clear display
lcd_string("Helmet ",LCD_LINE_1)
lcd_string(" Weared  ",LCD_LINE_2)
time.sleep(0.5)
if(alcohol_data == True):
lcd_string("Alcohol Detected  ",LCD_LINE_1)
time.sleep(0.5)
else:
lcd_byte(0x01,LCD_CMD) # 000001 Clear display
lcd_string("Vehicle Start ",LCD_LINE_1)
time.sleep(0.5)
else:
lcd_byte(0x01,LCD_CMD) # 000001 Clear display
lcd_string("Helmet",LCD_LINE_1)
lcd_string("not Weared  ",LCD_LINE_2)
time.sleep(0.5)
else:import sendsms
```

Output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File Edit View Tool Design Graph Debug Library Template System Help
Schematic Capture
DEVICES
2N5550
3WATT10K
3WATT100R
BUZZER
CAP
FAN-DC
GPS MODULE
IR OBSTACLE SENSOR
LED-RED
LM016L
LOGICSTATE
M145026
M145027
MCP9802
MODULO RX
MODULO TX
MOTOR
MQ-2 GAS SENSOR
MQ-3 GAS SENSOR
RELAY
RPI3
TOUCH SENSOR
VIBRATION SW-420
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GPS Module
GSM Module
Alcohol Detection
Display Board
No Messages
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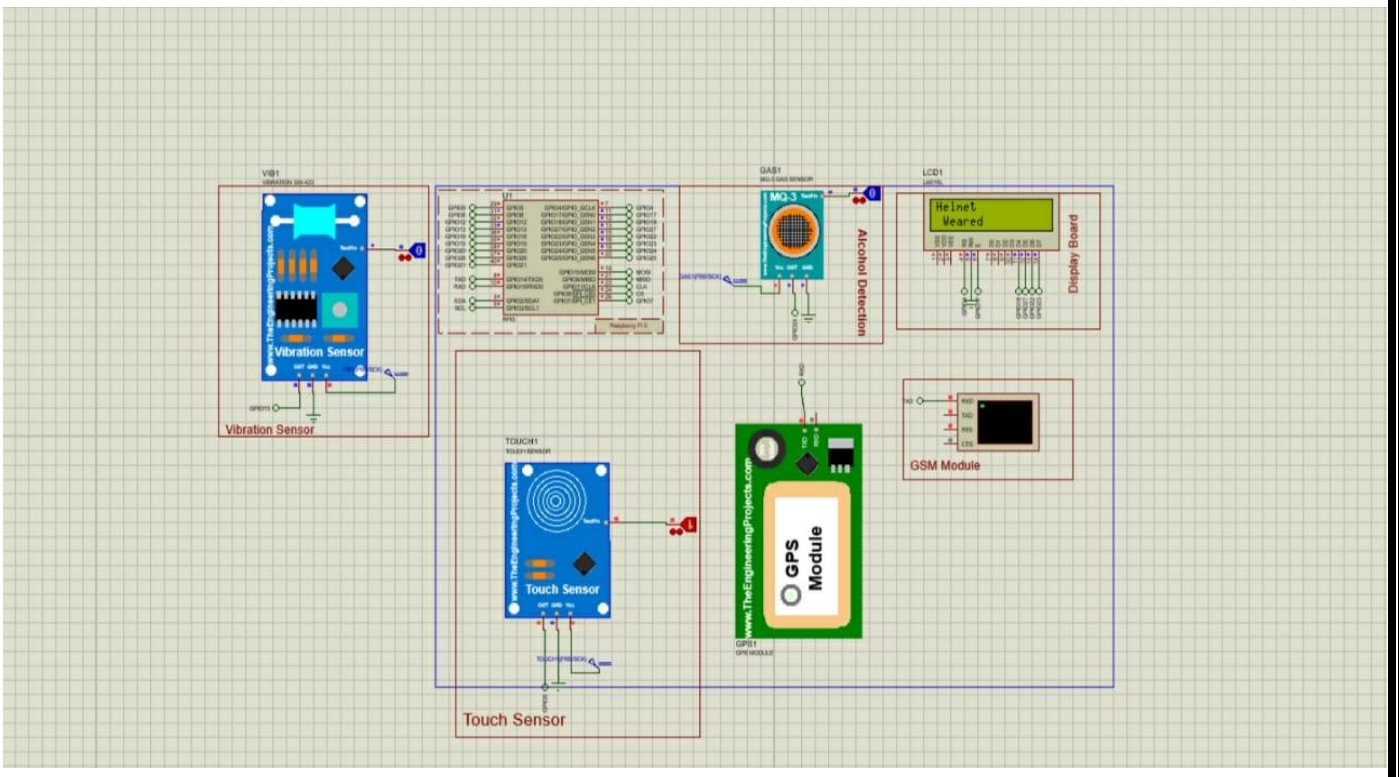
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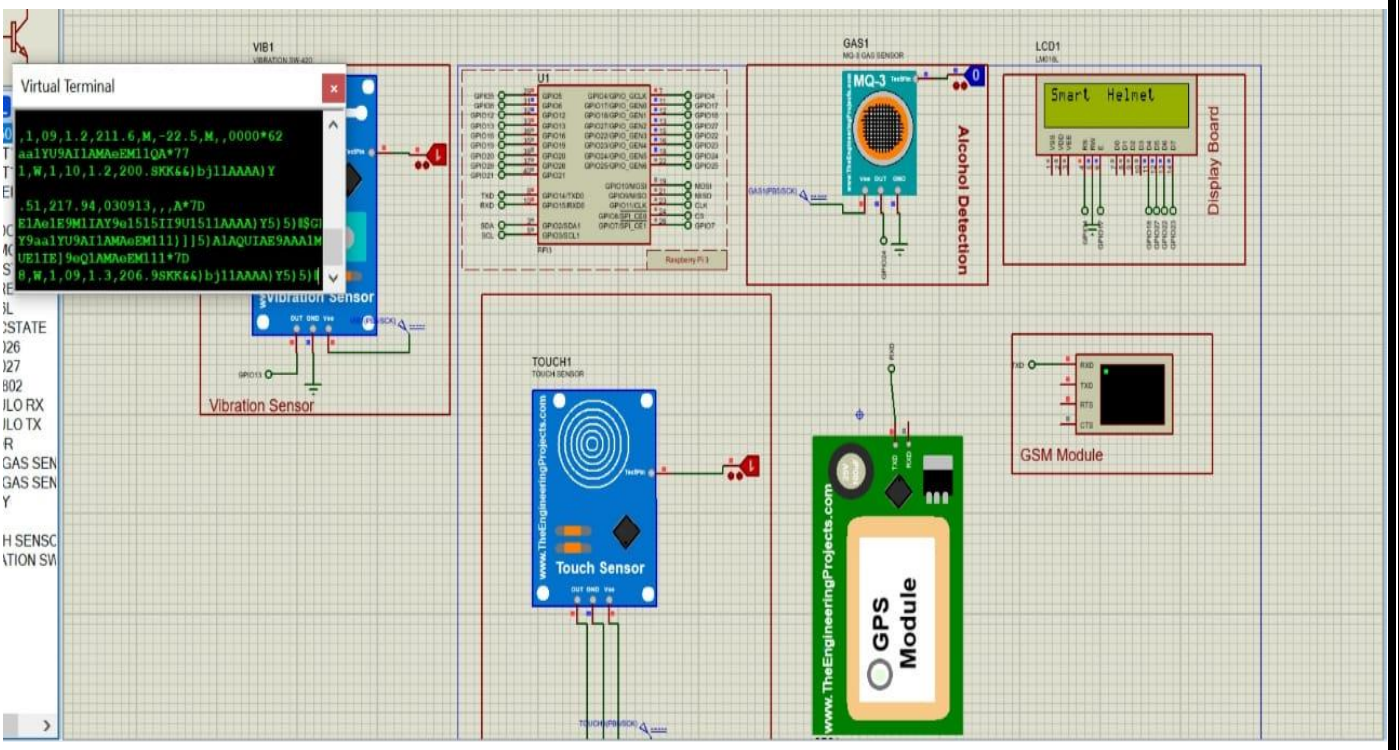
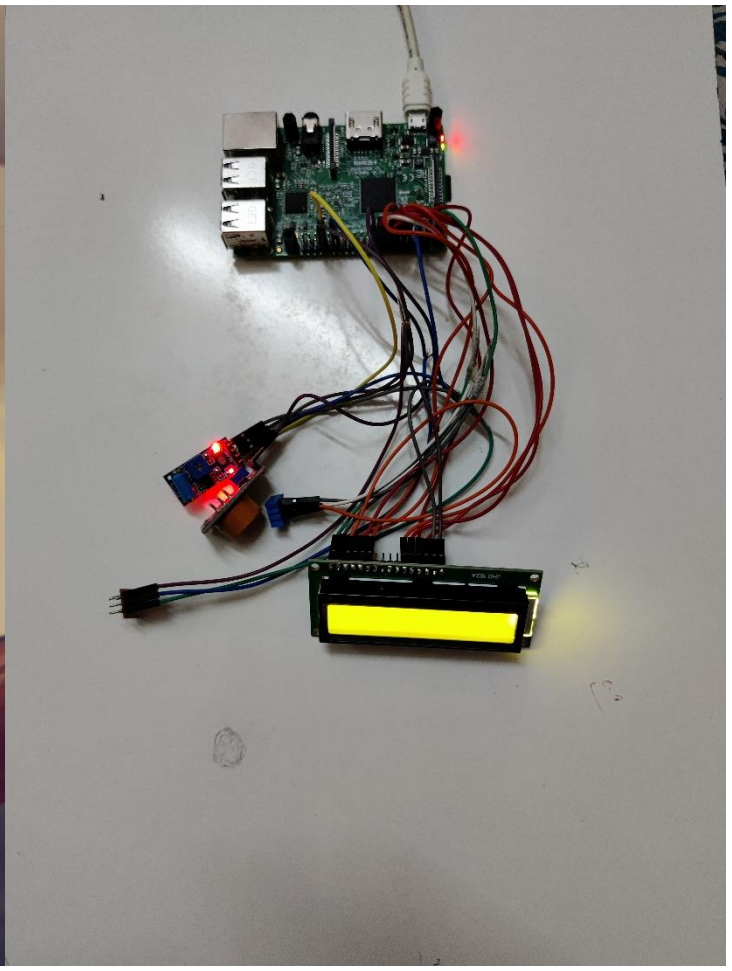
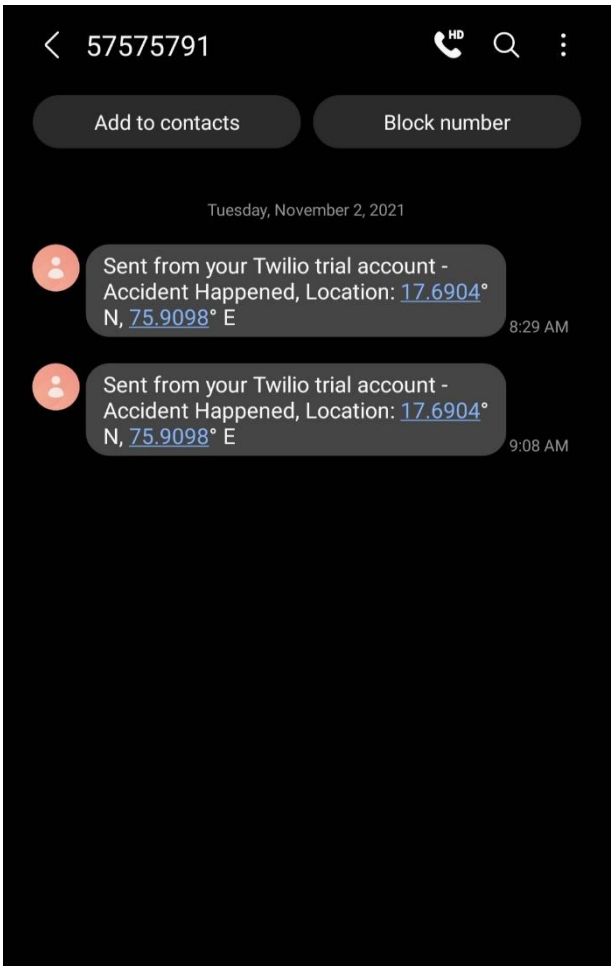
Weared


Virtual Terminal
VIB1
Vibration Sensor
U1
GAS1
MQ-3
Alcohol Detection
LCD1
Smart Helmet
Display Board
TOUCH1
Touch Sensor
GPS Module
GSM Module
www.TheEngineeringProjects.com


Helmet
not Wearred




57575791
Add to contacts
Block number
Tuesday, November 2, 2021
Sent from your Twilio trial account - Accident Happened, Location: 17.6904° N, 75.9098° E
8:29 AM
Sent from your Twilio trial account - Accident Happened, Location: 17.6904° N, 75.9098° E
9:08 AM

CHAPTER 6

RESULT AND DISCUSSION

The helmet unit receives the supply from internal source. The first stage of helmet unit checks whether the head is touch with helmet or not. If it touches with head, it enables the alcoholic sensor to check the alcohol consumption of a person. Based on the Ethane content in the breath, the alcoholic sensor detects the drunken person.

With the help of smart helmet detection, driver without helmet can be avoided. If rider does not wear helmet, then the LCD will display as “HELMET NOT WEARED”

If sensitivity of MQ-3 is more than the helmet module will communicate with the LCD and then the LCD will display as “ALCOHOL DETECTED”

Arrange of frequency generated depending upon the vibration produced due to accident or obstacle. if the frequency is greater than the threshold value then Twilio API Service sends location of accident to saved SIM number

6.1 Advantages:

- Detection of accident in remote area can be easily detected and medical services provided in short time.
- It will reduce the probability of accidents by simply avoiding drunken drive by using alcohol detector
- Decrease in death rates due to head injuries.
- Security system for motorcycles.
- Provide wireless connection security

6.2 Disadvantages:

- Person rides the bike even in the areas where mobile network lacks.
- When the helmet is dropped down accidentally, the system treats it as an accident.

6.3 Applications:

- It can be used in real time safety system.
- We can implement the whole circuit into small VLSI chip that can be embedded into the helmet and bike unit.
- It can be designed for less power consuming safety system.
- This safety system technology can further be enhanced in car or another vehicle by replacing the helmet with seat belt.

6.4 Future Scope:

- Further improvements can be done such as adding obstacle detection in fog using infrared cameras.
- We control the speed of a bike depending on the road conditions using remote keyless system method
- with respect to RF transmitter-receiver.
- It can be used in real time safety system. We can implement the whole circuit into small module
- later. This safety system technology can further be enhanced into four-wheeler also by replacing helmet with seatbelt.

CHAPTER 7

CONCLUSION

The government has taken initiative by making compulsory Helmet and NO Drink and Drive. According to analysis only 10% bike riders follow these rules. Many a times these rules are violated. The previously developed Helmet only detects the presence of helmet and not the alcohol. The proposed system provides a “Smart Helmet” which detects the alcohol consumed by the rider and whether the rider has worn the helmet or not. This system consists of an android application. The result obtained from the sensors i.e., IR Sensor for Helmet detection and MQ3 for alcohol detection will be analyzed on the smart phone. Hopefully the proposed system will provide the rider’s safety and restrict Drink n Drive condition and the traffic rules will also be followed. We presented Smart Helmet that results as a life-saving smart helmet, which the user can always rely on during the driving experience. The whole system is at a mature level and ready to be shown as a demonstration.

The designed Smart helmet ensures the safety of the rider by making it necessary to wear helmet, and also ensures that the rider hasn’t consumed alcohol more than the permissible limit. If any of these prime safety rules are violated, the proposed system will prevent the biker from starting the bike. The system also helps in efficient handling of the aftermath of accidents by sending a SMS with the location of the biker to the police station. This ensures that the victims get proper and prompt medical attention, if he/she met with an accident.

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