# SMART PARKING

## ***PHASE 3:***

## Materials:

- Raspberry Pi 3b
- 32 Gb Memory card
- Raspberry Pi Adaptor
- Connecting Wires
- Ready made LCD Module

**DESINING OF LCD:**

- Pot
- Bergstrip
- Zero PCB
- Resistor
- IR Sensor
- LCD 16×2

**Pre-Requirement:**

- For this project I have used Raspberry pi Noobs Os
- Need to install the MQTT Dashboard app on mobile.
- Also need to install required python libraries in raspberry pi.

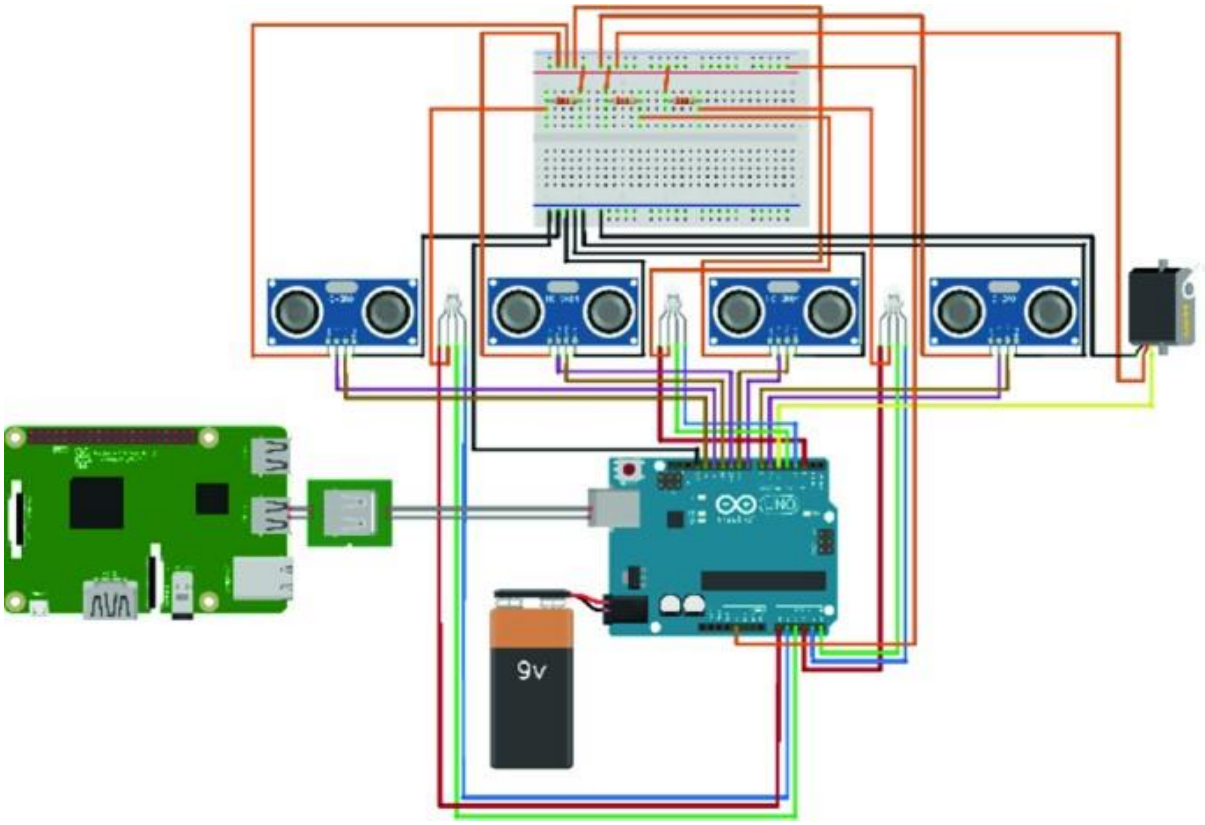
**WORKING PRINCIPLE:**

- This project presents a car parking system utilizing Raspberry Pi and MQTT (Message Queuing Telemetry Transport) protocol, with the capability to send live status updates to a mobile application. The system aims to provide real-time information about the availability of parking spaces, enhancing convenience for drivers and improving parking management.

- The architecture consists of Raspberry Pi-based sensor nodes deployed at each parking space and a central Raspberry Pi acting as the control unit. The sensor nodes detect the presence or absence of vehicles in their respective parking spaces and send this information to the central Raspberry Pi.

- Using the MQTT protocol, the central Raspberry Pi communicates with a mobile application installed on the user's device, providing live updates on parking space availability. The MQTT protocol ensures efficient and reliable communication between the Raspberry Pi and the mobile application, facilitating real-time updates and notifications.
- The mobile application displays the parking lot layout with color-coded indicators representing the availability of parking spaces. Users can view the live status of parking spaces on the application and make informed decisions regarding parking their vehicles.
- The system is implemented and tested using Raspberry Pi boards, parking sensors, and a mobile application. The results demonstrate the system's ability to accurately detect parking space occupancy and provide live status updates to the mobile application. The MQTT protocol ensures secure and efficient communication, making it suitable for real-time applications such as parking management.
- This car parking system utilizing Raspberry Pi and MQTT protocol offers a practical solution for improving parking efficiency and reducing the time and effort required to find available parking spaces. By providing live status updates on a mobile application, the system enhances user convenience and optimizes parking space utilization.

**CIRCUIT DIAGRAM:**



**PROJECT CODE:**

```
import time
import RPi.GPIO as GPIO
import time
import os,sys
from urllib.parse import urlparse
import paho.mqtt.client as paho
GPIO.setmode(GPIO.BOARD)
GPIO.setwarnings(False)



define pin for lcd


# 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
```

```
slot1_Sensor = 29
slot2_Sensor = 31
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) # DB7
GPIO.setup(slot1_Sensor, GPIO.IN)
GPIO.setup(slot2_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
LCD_LINE_3 = 0x90# LCD RAM address for the 3nd line



def on_connect(self, mosq, obj, rc):
        self.subscribe("Fan", 0)

def on_publish(mosq, obj, mid):
    print("mid: " + str(mid))

mqttc = paho.Client()                    # object declaration
# Assign event callbacks
```

```
mqttc.on_connect = on_connect
mqttc.on_publish = on_publish


url_str = os.environ.get('CLOUDMQTT_URL',
'tcp://broker.emqx.io:1883')
url = urlparse(url_str)
mqttc.connect(url.hostname, url.port)
```

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_string("Car Parking ",LCD_LINE_1)
lcd_string("System ",LCD_LINE_2)
time.sleep(0.5)
lcd_byte(0x01,LCD_CMD) # 000001 Clear display
# Define delay between readings
delay = 5

while 1:
  # Print out results
  rc = mqttc.loop()
  slot1_status = GPIO.input(slot1_Sensor)
  time.sleep(0.2)
  slot2_status = GPIO.input(slot2_Sensor)
  time.sleep(0.2)
  if (slot1_status == False):
   lcd_string("Slot1 Parked  ",LCD_LINE_1)
```

```
 mqttc.publish("slot1","1")
 time.sleep(0.2)
else:
  lcd_string("Slot1 Free  ",LCD_LINE_1)
  mqttc.publish("slot1","0")
  time.sleep(0.2)

if (slot2_status == False):
 lcd_string("Slot2 Parked  ",LCD_LINE_2)
 mqttc.publish("slot2","1")
 time.sleep(0.2)
else:
  lcd_string("Slot2 Free  ",LCD_LINE_2)
  mqttc.publish("slot2","0")
  time.sleep(0.2)
```