Iot based Smart Parking System using Raspberry Pi

IOT_Phase 3

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Introduction :-

One of the most common problems today is a saturation of parking spaces. Vehicles continue to outnumber existing parking spaces, thus clogging roads. Incidences of violence over occupancy, deformed cars due to a space crunch, and overcharging for parking are some problems that result.
Most cities propose increasing parking spaces to combat the problem. Parks and vacant plots are used as potential parking spaces and multi-level facilities are being built, irrespective of the limited land space and resources. But their exists a silly problem. People enter the parking and then came to know that it's full. Should n't it automated ? Don't you think, we should already know if the parking has space for us or not ? Yeah, isn't it a good thought ? This project will help us show the availability of car slots to park the vehicle. This is implemented by using Raspberry Pi 3 B+ and IR Modules.

Things used in this project

Hardware components :-

1. Raspberry Pi 3 Model B
2. Modulo IR Transceiver
3. Adafruit Standard LCD - 16x2 White on Blue
4. Wires
5. Soldering kit

Software apps and online services:-

1. MQTT
2. Raspberry Pi Raspbian

MQTT Setup

MQTT stands for Message Queuing Telemetry Transport. It is a communication standard for IoT devices. This protocol is an open standard, which means anyone can access it and implement it in a networked application.

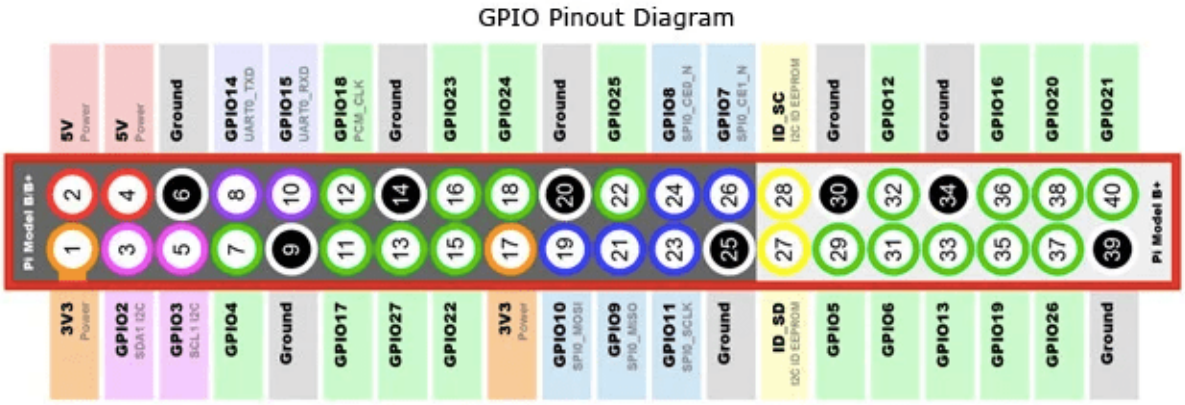
The system of MQTT is not a software package but it can be used by the developers of new software as a standard to send messages to IoT devices and receive responses back. This opens up the possibility of writing new control instruction systems and also creating IoT device monitoring tools.

The MQTT system was first created in 1999, so it has been around for more than two decades. It was written as a standard to communicate with oil pipeline equipment. As an industrial communication system, MQTT was written within the framework of the Supervisory Control and Data Acquisition (SCADA) framework. The SCADA architecture is designed to communicate with shopfloor equipment in factories and sensors and controllers in process control.

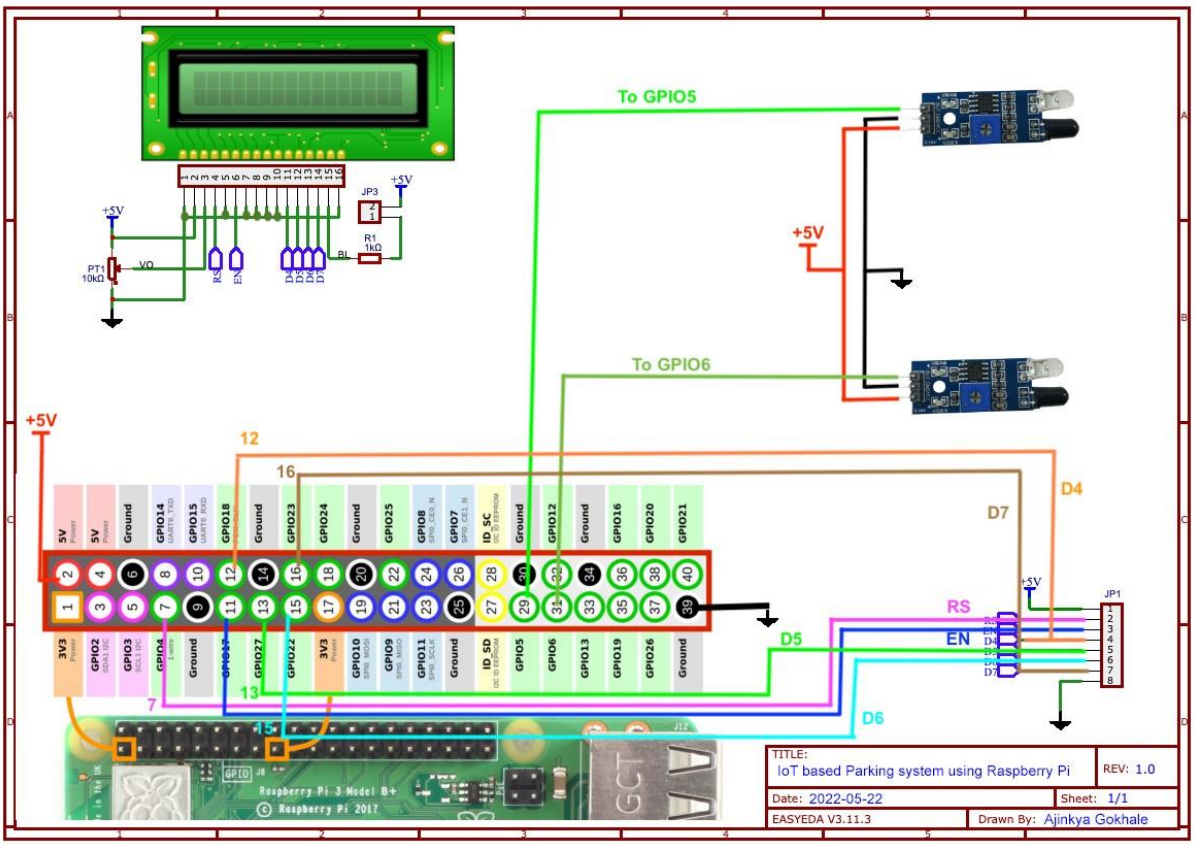
Step 1: Download MQTT Dashboard App from Playstore
Step 2: Add broker with the following parameters in your MQTT Dashboard App
Step 3: Add Toggle to the Project and rename it as slot1 and select ON value as '1' and OFF value as '0'. Select Red color for ON and Green Color for OFF with car icon.

Step 4: Everything is done, here are the examples of how it works.

PIN diagram :-



Schematic for IoT based Smart Parking Sensor



Raspberry pi

Python 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)

OUTPUT :-