ARCHITECTING SMART IOT DEVICES REPORT

ON

"SMART KITCHEN"

PROJECT REPORT

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

BACHELOR OF TECHNOLOGY

IN

ELECTRICAL & ELECTRONICS ENGINEERING

Submitted By

MOIN KHAN

LOVELY PROFESSIONAL UNIVERSITY

Jalandhar - Delhi, Grand Trunk Rd, Phagwara,

Punjab 144001

ABSTRACT

In this project, I will build an **IoT Based Smart Kitchen** with **Automation** & **Monitoring System** using **NodeMCU ESP8266**. The kitchen is one of the important places in a house. The safety factor is the main aspect that must be considered during the activity in the kitchen. The existence of **gas leakage**, uncontrolled fire, **excessive temperatures** & a moist environment must be quickly identified and addressed. Apart from this, it is necessary to **monitor** & **control Kitchen Appliances** like lights, fridge, oven, etc. remotely.

INTRODUCTION

The applications of Information communication technology have brought a sea change in human life. The technologies such as sensors, Cloud Computing, Networking Technology and Nanotechnology have been used.

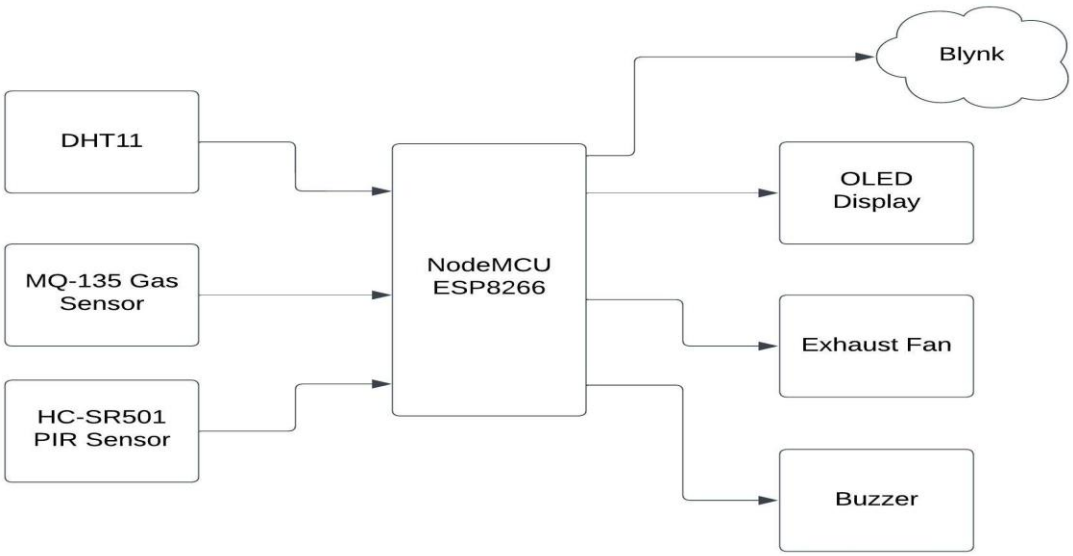
We can turn a kitchen into an IoT Based Smart Kitchen with Automation & Monitoring System using NodeMCU ESP8266. The kitchen is one of the important places in a house. The safety factor is the main aspect that must be considered during the activity in the kitchen. The existence of gas leakage, uncontrolled fire, excessive temperatures & a moist environment must be quickly identified and addressed. Apart from this, it is necessary to monitor & control Kitchen Appliances like lights, fridge, oven, etc. remotely.

The main motto of this project is to make a prototype of an IoT Based Smart Kitchen using the Internet of Things. The system uses multiple sensors, relays & NodeMCU ESP8266 Board. We can monitor all the sensor data on Blynk Applications. We can also send the command from Blynk App to control Kitchen Appliances.

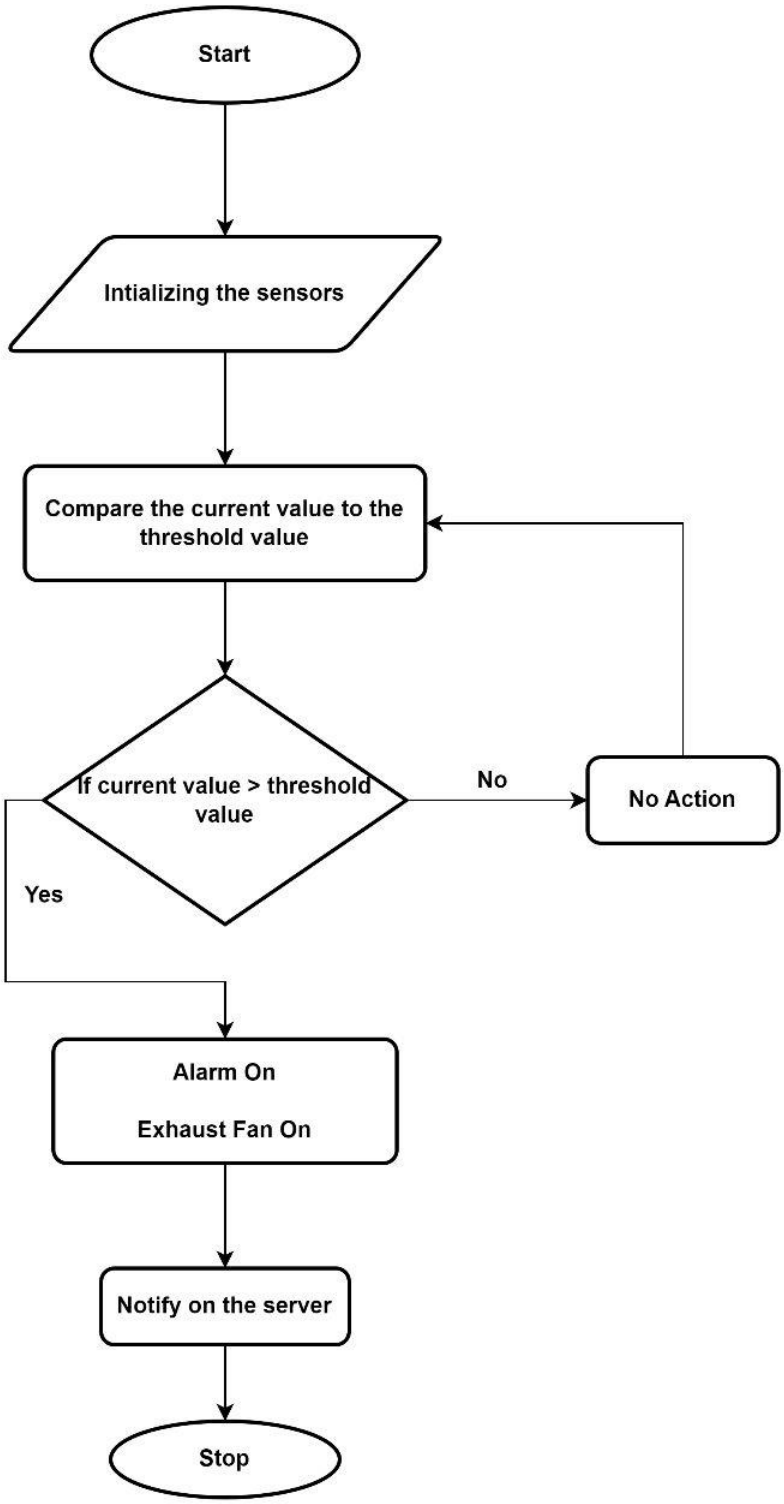
Basically, the IoT Smart Kitchen does the following tasks:

- Monitor the Kitchen **Temperature** & **Humidity** using **DHT11 Sensor** on Blynk App
- Monitor the **Air Quality Index (Gas)** using **MQ-135 Gas Sensor** on Blynk App
- Displays the Kitchen Temperature, Humidity & Gas Level on **0.96″ OLED Display**
- The exhaust fan turns ON & the **Alarm** activates, once Gas level exceeds
- Detects the presence or absence of a person in the Kitchen using a **PIR sensor**
- Sends Alarm Status, Exhaust Fan Status & Person in **Room Status** to Blynk App
- User can turn **ON/OFF** Fridge, Oven, Room Light Remotely from Blynk App

BLOCK DIAGRAM



FLOW CHART


Start
Intializing the sensors
Compare the current value to the threshold value
If current value > threshold value
No
No Action
Yes
Alarm On
Exhaust Fan On
Notify on the server
Stop

COMPONENTS DETAILS

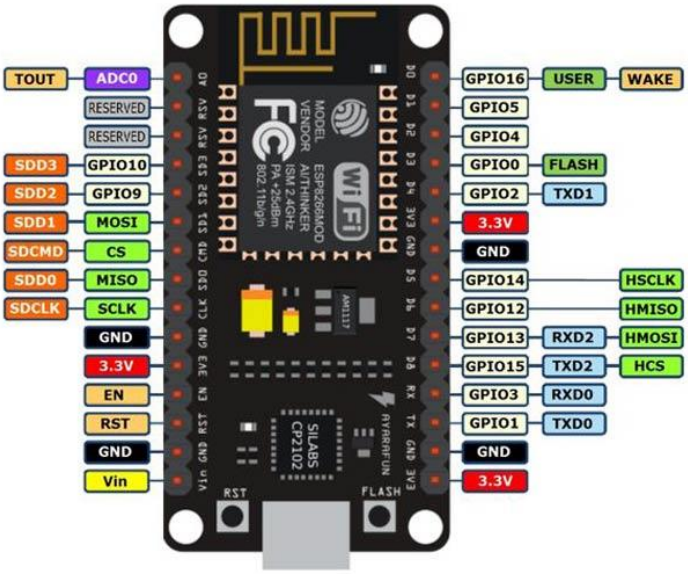
- ESP8266: NodeMCU ESP8266-12E Board
- DHT11 Sensor: Humidity & Temperature Sensor
- MQ-135 Sensor: Air Quality or Gas Sensor
- HC-SR501 Sensor: Passive Infrared (PIR) Sensor
- OLED Display: 0.96" 128X64 I2C OLED Display
- Buzzer: 5V Active Piezo Buzzer
- Relay: 4 Channel Relay Board

1. NodeMCU ESP8266:

NodeMCU is an open-source Lua based firmware and **development board** specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

Specifications & Features:

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside the IoT projects



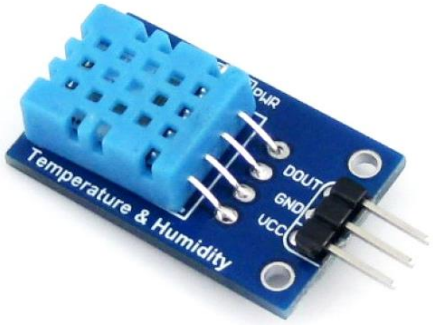
Pin Category	Name	Description
Power	Micro-USB, 3.3V, GND, Vin	**Micro-USB:** NodeMCU can be powered through the USB port **3.3V:** Regulated 3.3V can be supplied to this pin to power the board **GND:** Ground pins **Vin:** External Power Supply
Control Pins	**EN, RST**	The pin and the button reset the microcontroller
Analog Pin	A0	Used to measure analog voltage in the range of 0-3.3V
GPIO Pins	GPIO1 to GPIO16	NodeMCU has 16 general purpose input-output pins on its board
SPI Pins	SD1, CMD, SD0, CLK	NodeMCU has four pins available for SPI communication.
UART Pins	TXD0, RXD0, TXD2, RXD2	NodeMCU has two UART interfaces, UART0 (RXD0 & TXD0) and UART1 (RXD1 & TXD1). UART1 is used to upload the firmware/program.
I2C Pins		NodeMCU has I2C functionality support but due to the internal functionality of these pins, you have to find which pin is I2C.

2. DHT11 Sensor:

The **DHT11** is a commonly used **Temperature and humidity sensor that** comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data.

Specifications:

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%



No:	Pin Name	Description
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	Ground	Connected to the ground of the circuit

3. MQ-135 Sensor:

The MQ135 is one of the popular gas sensors from the MQ series of sensors that are commonly used in air quality control equipment. It operates from 2.5V to 5.0V and can provide both digital and analog output.

Specifications:

- Operating Voltage: 2.5V to 5.0V
- Power consumption: 150mA

- Detect/Measure: NH3, NOx, CO2, Alcohol, Benzene, Smoke
- Typical operating Voltage: 5V
- Digital Output: 0V to 5V (TTL Logic) @ 5V Vcc
- Analog Output: 0-5V @ 5V Vcc

4. HC-SR501 Sensor:

HC-SR501 PIR Sensor detects motion by measuring changes in the infrared (heat) levels emitted by surrounding objects. When motion is detected the PIR sensor outputs a high signal on its output pin. It has an adjustable delay before firing and adjustable sensitivity.

Specifications:

- HC--SR501 Body Sensor Module
- Adjustable delay
- Adjustable sensing range
- **Input voltage:** DC 4.5-20V
- **Static current:** 50ua
- **Sensing range:** Max 7 m

5. OLED Display:

It will display the Kitchen Temperature, Humidity & Gas Level on **0.96″ OLED Display**

Specifications:

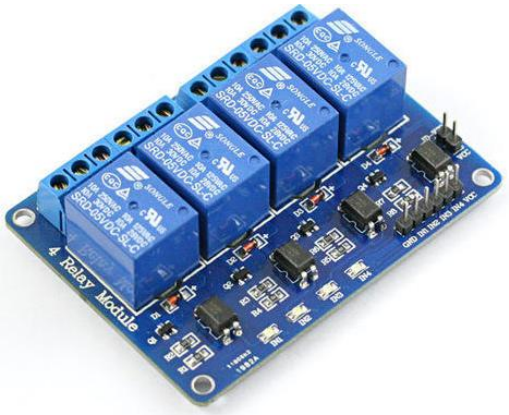
- High-resolution at 128x64 pixels
- 160 degrees viewing angle
- Lower power consumption: only 0.06W with normal use
- Power supply AC3V-5V, working very well with Arduino
- Working temperature: -30 degrees to 70 degrees Celsius
- Dimensions: L27.8 x W27.3 x H4.3 mm
- Compatible 3.3v and 5.0v chip I/O level

6. Relay: 4 Channel Relay Board

The 4 Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, PIC and etc.

Specification:

- Digital output controllable
- Compatible with any 5V microcontroller such as Arduino.
- Rated through-current: 10A (NO) 5A (NC)
- Control signal: TTL level
- Max. switching voltage 250VAC/30VDC
- Max. switching current 10A
- Size: 76mm x 56mm x 17mm



RESULTS

I have controlled all the sensor data using Blynk App. Monitored the temperature and humidity using DHT11 sensor on Blynk Application. I have monitored the Air Quality Index (AQI) using MQ-135 sensor on Blynk Application. Displayed the Kitchen temperature, humidity and gas level on Oled display on Blynk Application. Detected the presence / absence of a person in room using PIR sensor. I have turned ON / OFF fridge, oven remotely from Blynk Application.

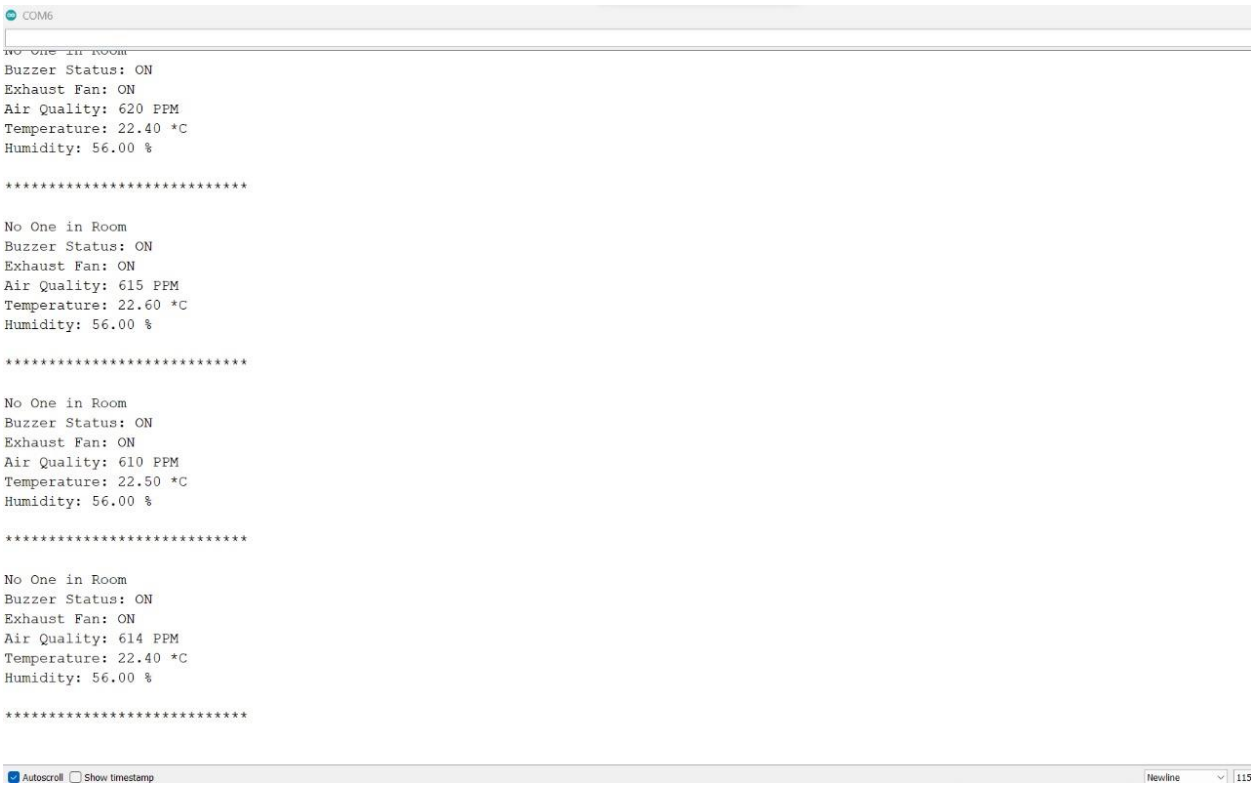


Figure 1: Displaying the Serial Monitor will display the Humidity, Temperature, Air Quality Index, Alarm Status, Human Presence, etc.

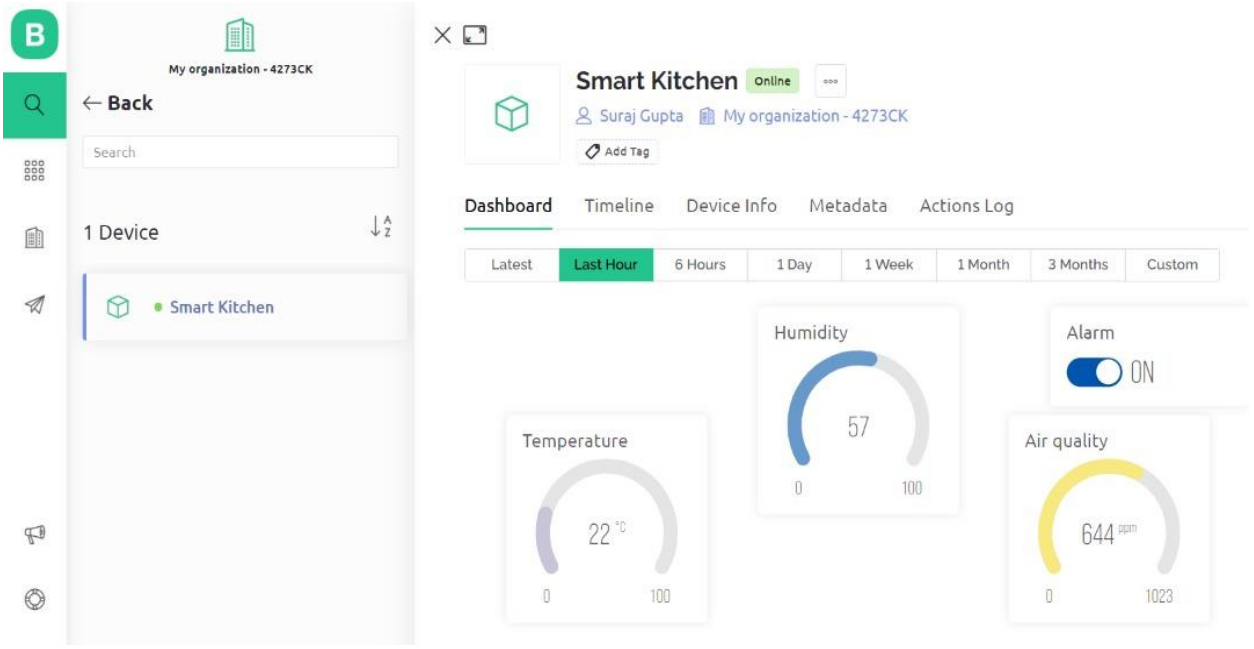
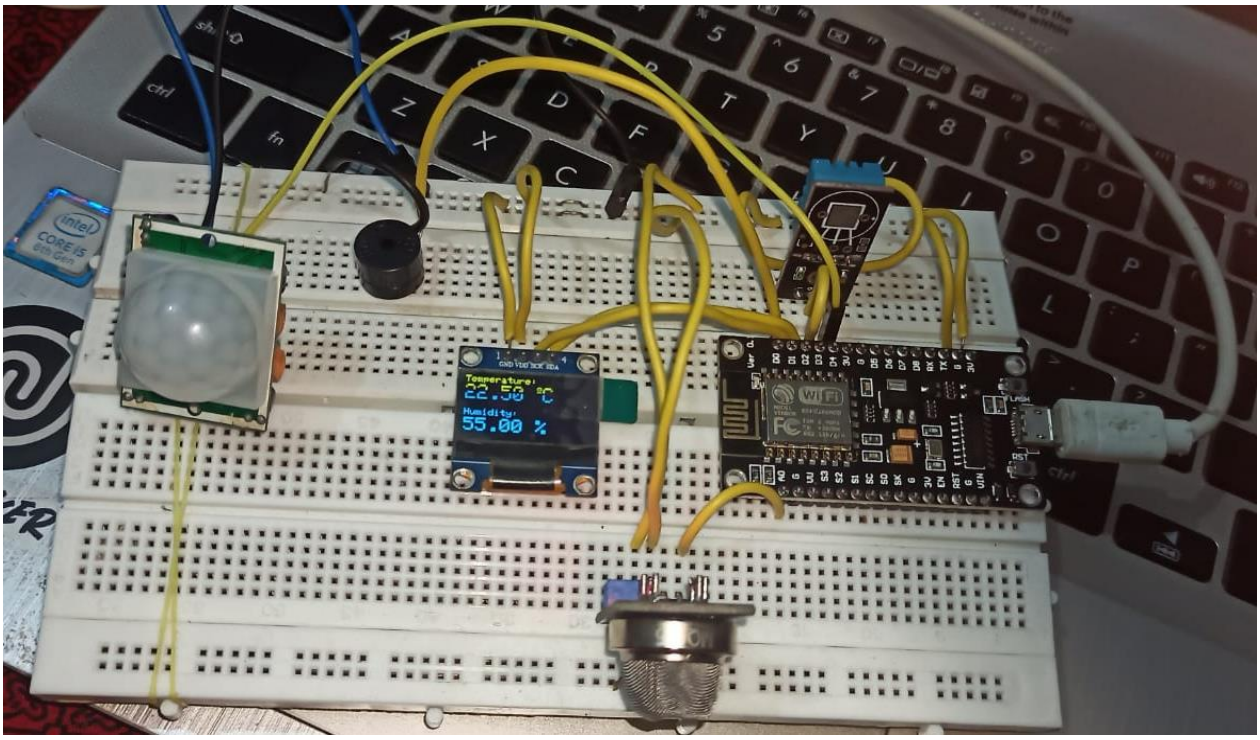
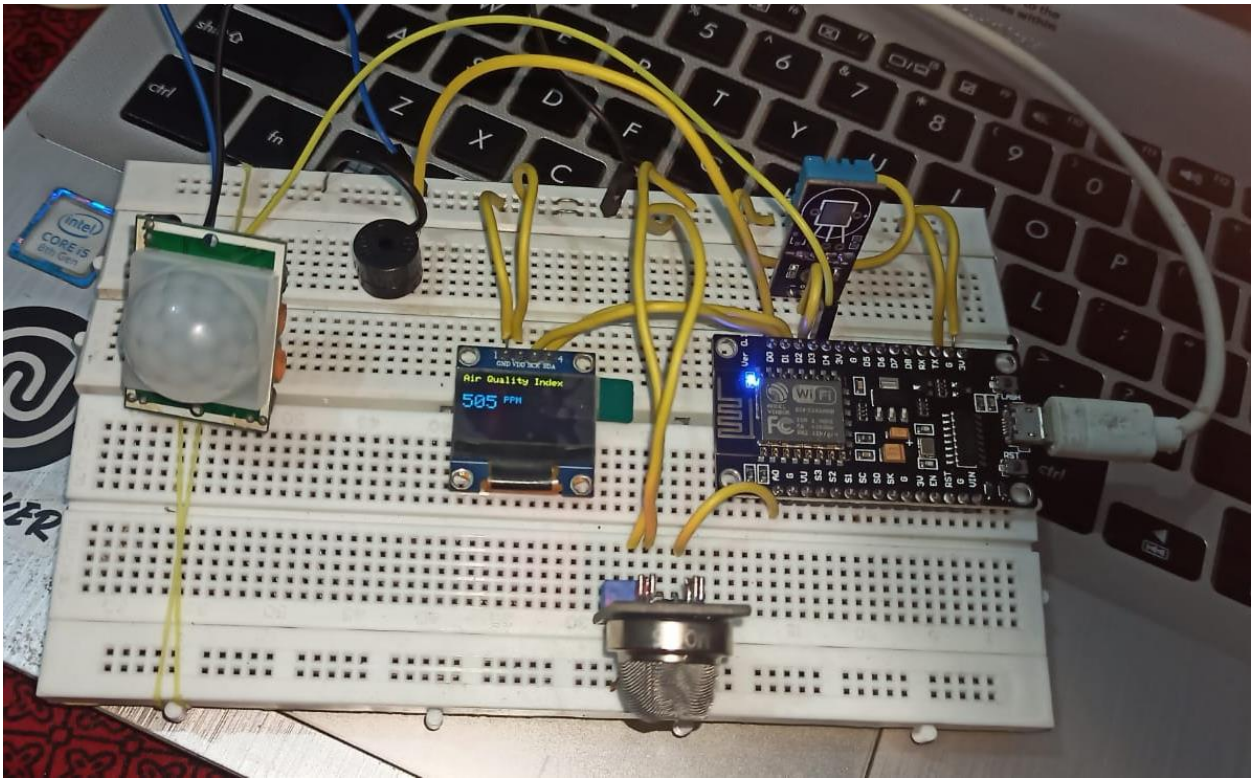


Figure 2: Displaying temperature, humidity and Air quality index on Blynk Application.





Hardware simulation

CONCLUSION / FUTURE SCOPE

- The proposed smart kitchen system concept can ensure safety, affordability, accessibility, and sustainability without any harm to human health.
- It is designed for monitoring and controlling the entire kitchen's parameters.
- This system is highly effective, economical, and user-friendly.
- This project is very useful to prevent accident due to gas leakage.
- Each flame and gas detection application has its own unique safety hazards.
- If we implement this on Broadway, it is very successful.
- The main advantage of this simple gas leak detector is its simplicity and its ability to warn its stakeholders about the leakage of the Gas.
- With the use of the internet of things (IoT) facility, the 'n' number of sensor nodes can be interconnected over the system which is supported by Wireless Sensor Network (WSN) and can be accessed wirelessly through the application. The IoT has significantly opened new avenues of research and learning.

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