Phase5 :Project documentation and submission

Objectives:

Air and sound pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Here we propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in a particular areas through IOT. System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data to microcontroller. Also system keeps measuring sound level and reports it to the online server over IOT. The sensors interact with microcontroller which processes this data and transmits it over internet. This allows authorities to monitor air pollution in different areas and take action against it. Also authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas, and if system detects air quality and noise issues it alerts authorities so they can take measures to control the issues

Specifications:

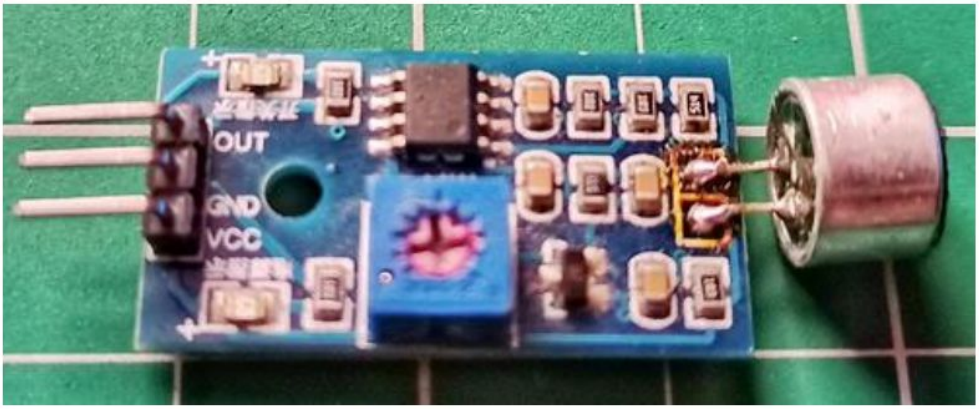
- **Hardware Specifications**
- Atmega Microcontroller
- MQ 135 Sensor
- Mic Sensor
- ESP8266 Wifi Module
- LCD Display
- Crystal Oscillator
- Resistors

- Capacitors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons
- Switch
- IC
- IC Sockets
- **Software Specifications**
- Arduino Compiler
- MC Programming Language: C
- IOTGecko

Circuit diagram and Explanation:

The microphone based sound sensor is used to detect sound. It gives a measurement of how loud a sound is. The sound sensor module is a small board that mixes a microphone (50Hz-10kHz) and a few processing circuitry to convert sound waves into electrical signals. This electrical signal is fed to on-board **LM393 High Precision Comparator** to digitize it and is made available at the OUT pin.

The module features a built-in potentiometer for sensitivity adjustment of the OUT signal. We will set a threshold by employing a potentiometer. So that when the amplitude of the sound exceeds the edge value, the module will output LOW, otherwise, HIGH. Apart from this, the module has two LEDs. The facility LED will illuminate when the module is powered. The Status LED will illuminate when the digital output goes LOW.



The sound sensor only has three pins: VCC, GND & OUT. VCC pin supplies power for the sensor & works on 3.3V to 5V. OUT pin outputs HIGH when conditions are quiet and goes LOW when sound is detected.

Working and Explanation:

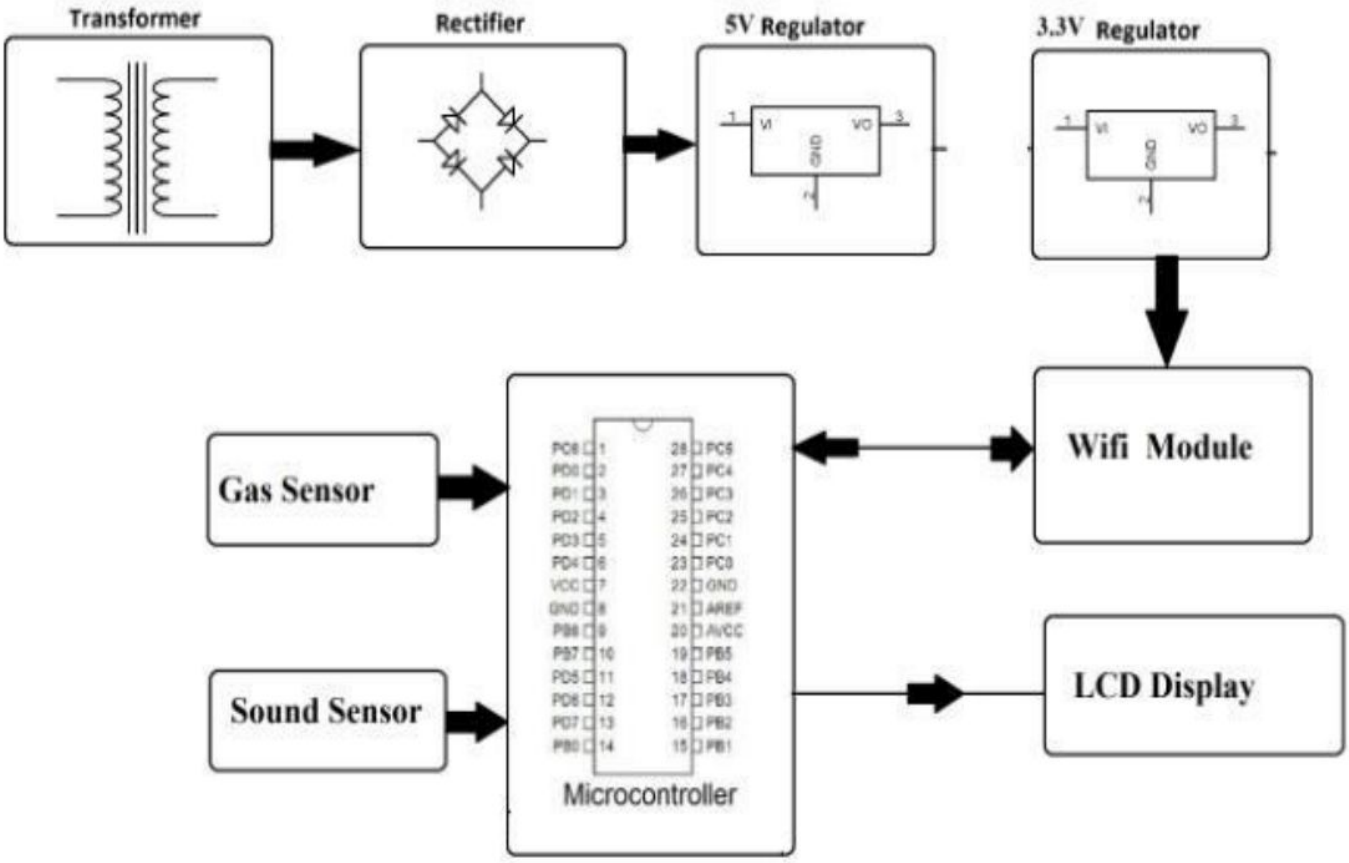
IoT (Internet of Things) has become an integral part of our lives and it has already made an impact in various sectors, including the environment. Air pollution is a severe problem that has been affecting our planet for years. Therefore, there is a need for a reliable and efficient air pollution monitoring system to protect ourselves from its hazardous effects. An IoT-based air pollution monitoring system is an ideal solution that can provide real-time data and insights about the air quality in a particular area.

An IoT based air pollution monitoring system consists of several hardware and software components that work together to collect and process data. The hardware components include sensors, microcontrollers, and communication modules. The software components consist of a cloud platform, a mobile application, and a web-based dashboard.

The IoT-based air pollution monitoring system provides several benefits over traditional air pollution monitoring systems. It can collect real-time data from multiple locations, which then analyzed to identify the sources of pollution. It helps to take necessary measures to reduce it.

The system can also alert the users if the air quality reaches a dangerous level, allowing them to take precautions to protect themselves.

Block diagram:



Coding:

```
# importing Randomforest

From sklearn.ensemble import AdaBoostRegressor

From sklearn.ensemble import RandomForestRegressor

# creating model

M1 = RandomForestRegressor()

# separating class label and other attributes

Train1 = train.drop(['air_quality_index'], axis=1)

Target = train['air_quality_index']

# Fitting the model
```

M1.fit(train1, target)

‘’’RandomForestRegressor(bootstrap=True, ccp_alpha=0.0, criterion=’mse’,

Max_depth=None, max_features=’auto’, max_leaf_nodes=None,

Max_samples=None, min_impurity_decrease=0.0,

Min_impurity_split=None, min_samples_leaf=1,

Min_samples_split=2, min_weight_fraction_leaf=0.0,

N_estimators=100, n_jobs=None, oob_score=False,

Random_state=None, verbose=0, warm_start=False)’’’

 # calculating the score and the score is 97.963607998900 66%

M1.score(train1, target) * 100

 # predicting the model with other values (testing the data)

 # so AQI is 123.71

M1.predict([[123, 45, 67, 34, 5, 0, 23]])

 # Adaboost model

 # importing module

 # defining model

M2 = AdaBoostRegressor()

 # Fitting the model

M2.fit(train1, target)

‘’’AdaBoostRegressor(base_estimator=None, learning_rate=1.0, loss=’linear’,

N_estimators=50, random_state=None)’’’

 # calculating the score and the score is 96.15377360010211%

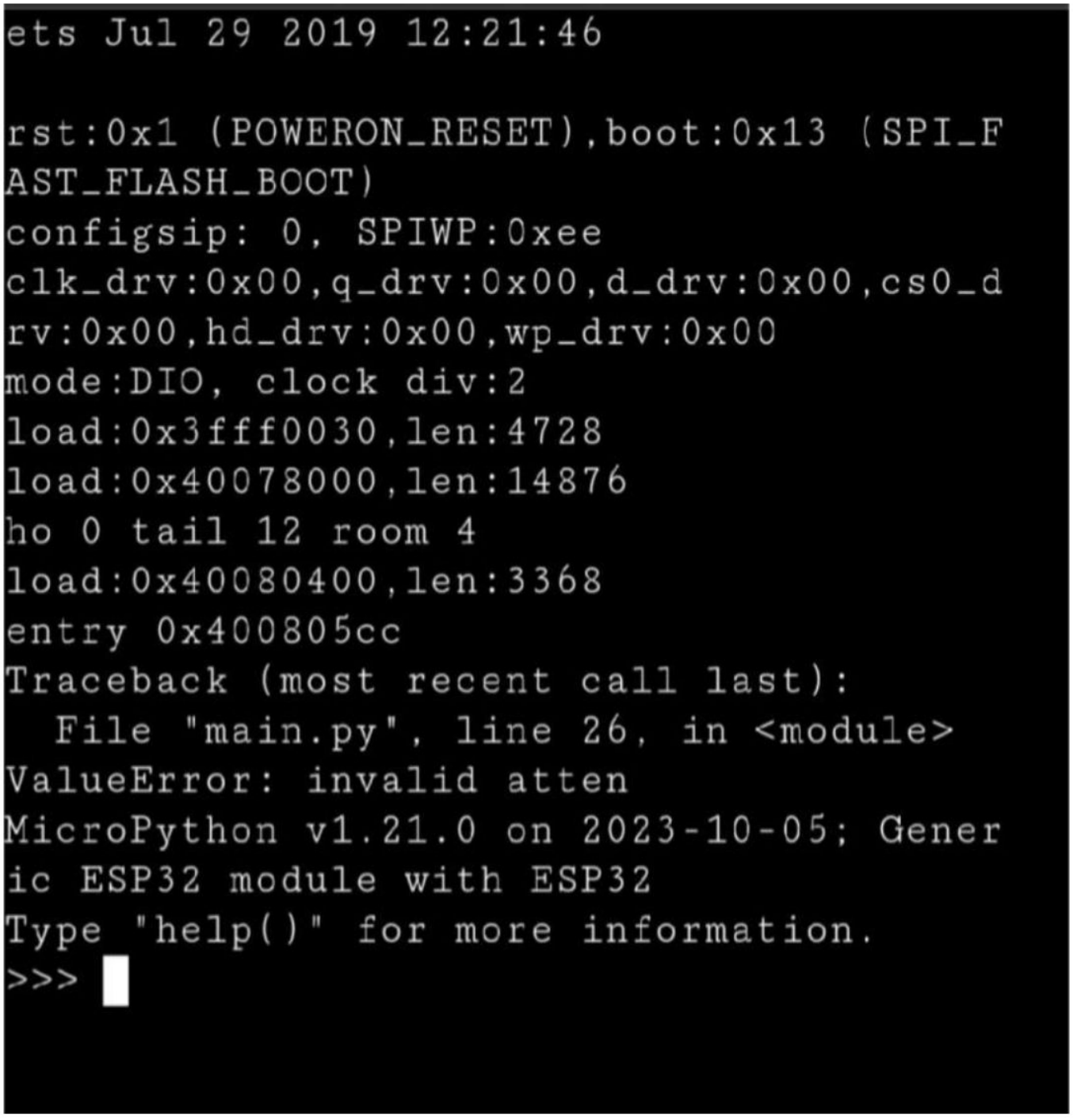
M2.score(train1, target)*100

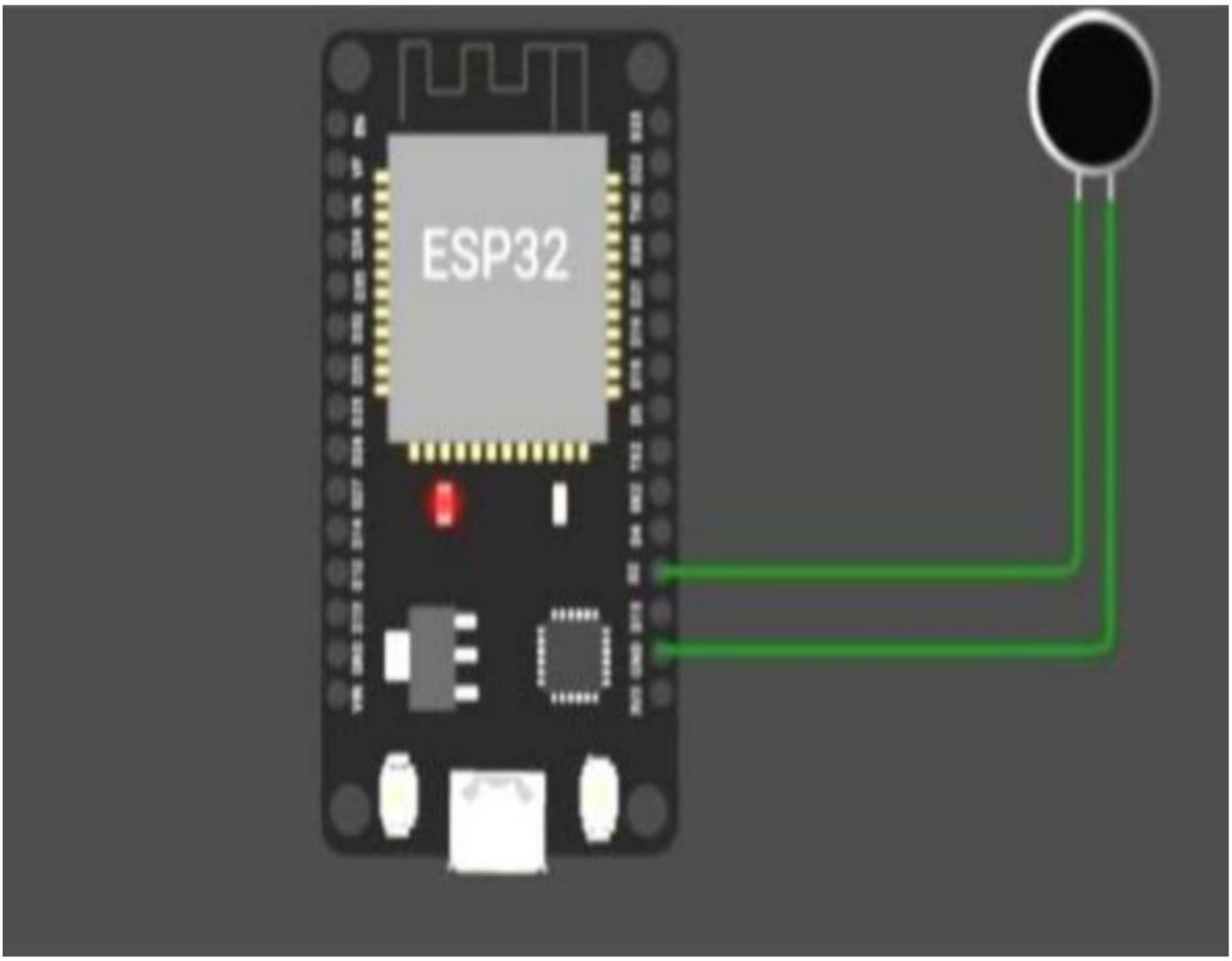
 # predicting the model with other values (testing the data)

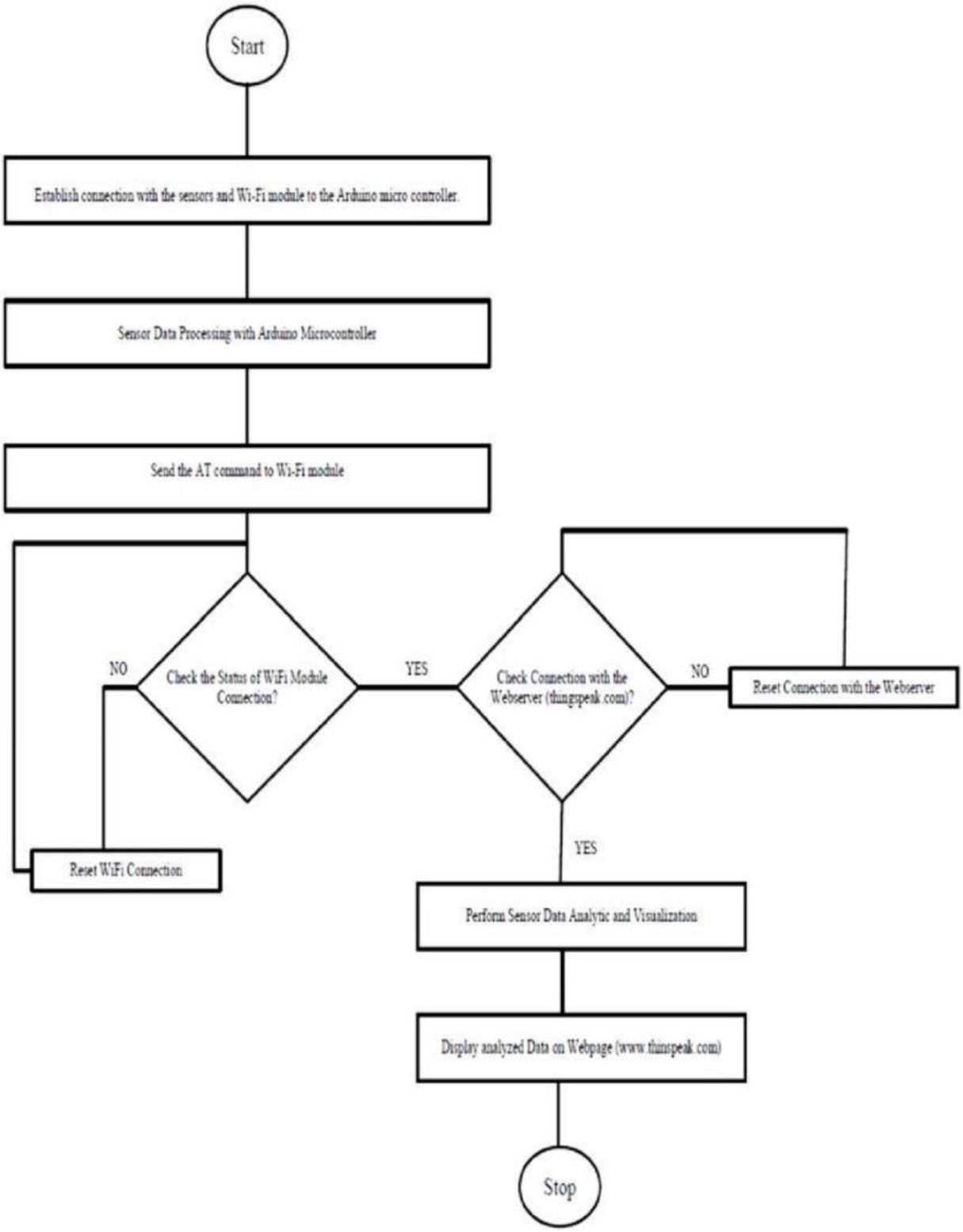
 # so AQI is 94.42105263

M2.predict([[123, 45, 67, 34, 5, 0, 23]])

OUTPUT:




ESP32


Start
Establish connection with the sensors and Wi-Fi module to the Arduino micro controller.
Sensor Data Processing with Arduino Microcontroller
Send the AT command to Wi-Fi module
Check the Status of WiFi Module Connection?
NO
YES
Check Connection with the Webserver (thingspeak.com)?
NO
Reset Connection with the Webserver
Reset WiFi Connection
YES
Perform Sensor Data Analytic and Visualization
Display analyzed Data on Webpage (www.thinspeak.com)
Stop

Applications:

1) Industrial perimeter monitoring

2) Indoor sound monitoring

3) Site selection for reference monitoring stations.

4) Making data available to users.

Conclusion:

Noise pollution is the most common problem faced by humans, thanks to various reasons that push many people to face health issues. Following standard measures can be helpful in the long term for both humans and the environment. The ultimate aim is to bring down noise pollution for a better environment.