

PROJECT REPORT ON

AIR Quality Index Monitoring System

(UNDER THE PARTIAL FULFILMENT OF THE
UNIVERSITY FOR COURSE OF T.Y.BSC
COMPUTER SCIENCE)

SUBMITTED BY:

Mr. RITESH A. PATIL

GUIDED BY:

Ms. VAISHNAVI ASSAR

DEPARTMENT OF COMPUTER SCIENCE PARLE TILAK
VIDYALAYA ASSOCIATION'S
MULUND COLLEGE OF COMMERCE
S.N.ROAD, MULUND (WEST), MUMBAI-80

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Finally I thank all my friends and family members who have directly or indirectly helped me in completing my project.

Thank You.

RITESH ADHAR PATIL

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1.Title :

Title of the Project: **Air Quality Index Monitoring System**

Type of Project: IOT PROJECT.

Developed by: RITESH PATIL.

2.Introduction

Air is the most important element for living. The air we breathe today is a mixture of harmful pollutants in high concentration. Pollution is rising with the growing development. Due to the increase in air pollution life is becoming imperil to us and other living things. People are surrounded by the contaminated objects and affecting their health. This poses a threat to the future generation. Sampling air quality is an important but difficult task. Hence, we wanted to raise this system to check pollution levels and to take necessary precautions and measures to reduce this for better future and cleaner.

This project is aimed to develop an IOT based application to deal with air pollution. Comparing air quality conditions at different locations. AQI helps in analysing the change in air quality.

I have used a Arduino Uno in this system. I use MQ 135 Sensors which detect the Air Quality and Temperature to the Arduino code.

2.1 Features

- High reliability, scalability and high load support.
- Moderated system.
- No additional software is needed.
- Easy installation.
- Easily programmable.
- Any time, anywhere.

3. Requirement Specification

3.1 Software Requirements

- Arduino IDE.
- Basic C , C++ programming knowledge.

3.2 Hardware Requirements

- Arduino UNO
- Laptop for coding stuff and installing IDE
- Minimum Storage space (ROM) of 50-60 MB for IDE.
- Minimum RAM of 512MB.
- Breadboard , LED , Buzzer , Jumper wires. (Male-Male)
- Connector to connect Battery and Arduino.

This project needs access to: Electricity if required

3.3 Data Requirements

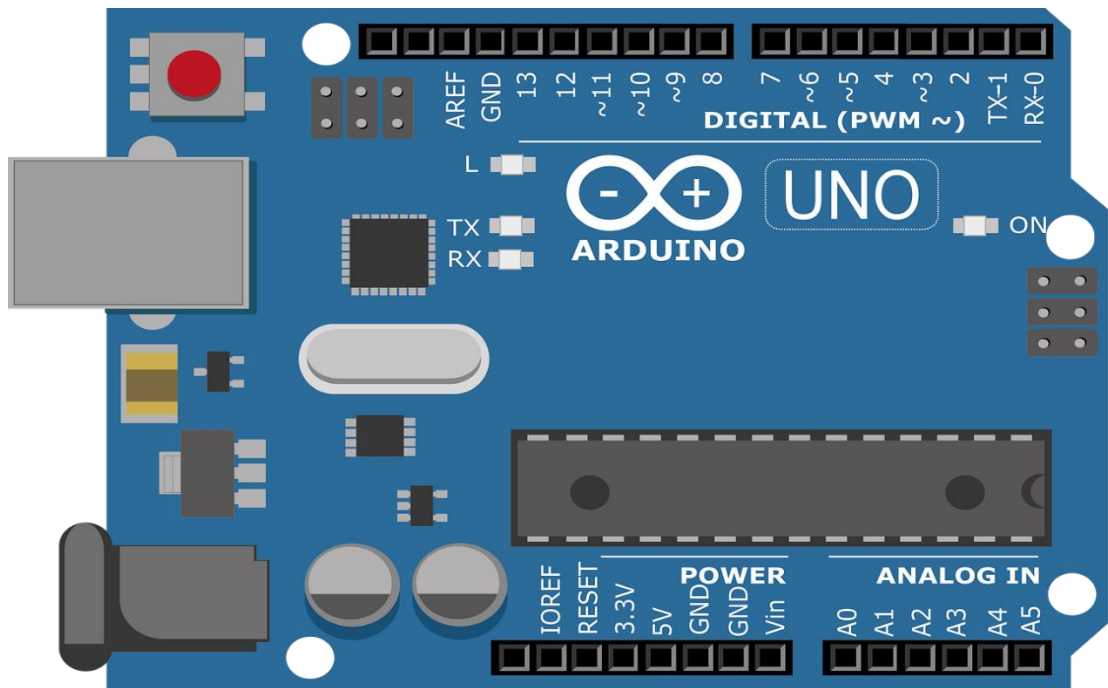
- String
- Integer

3.4 Facts Finding Questions

- What is the current project system about?
- How is the work currently being done by the project?
- What are the difficulties you are finding with the current project?
- How to work MQ 135 Sensors & Arduino Uno?
- How to show Air Quality?
- What is the unit of Air Quality?

WHAT IS ARDUINO?

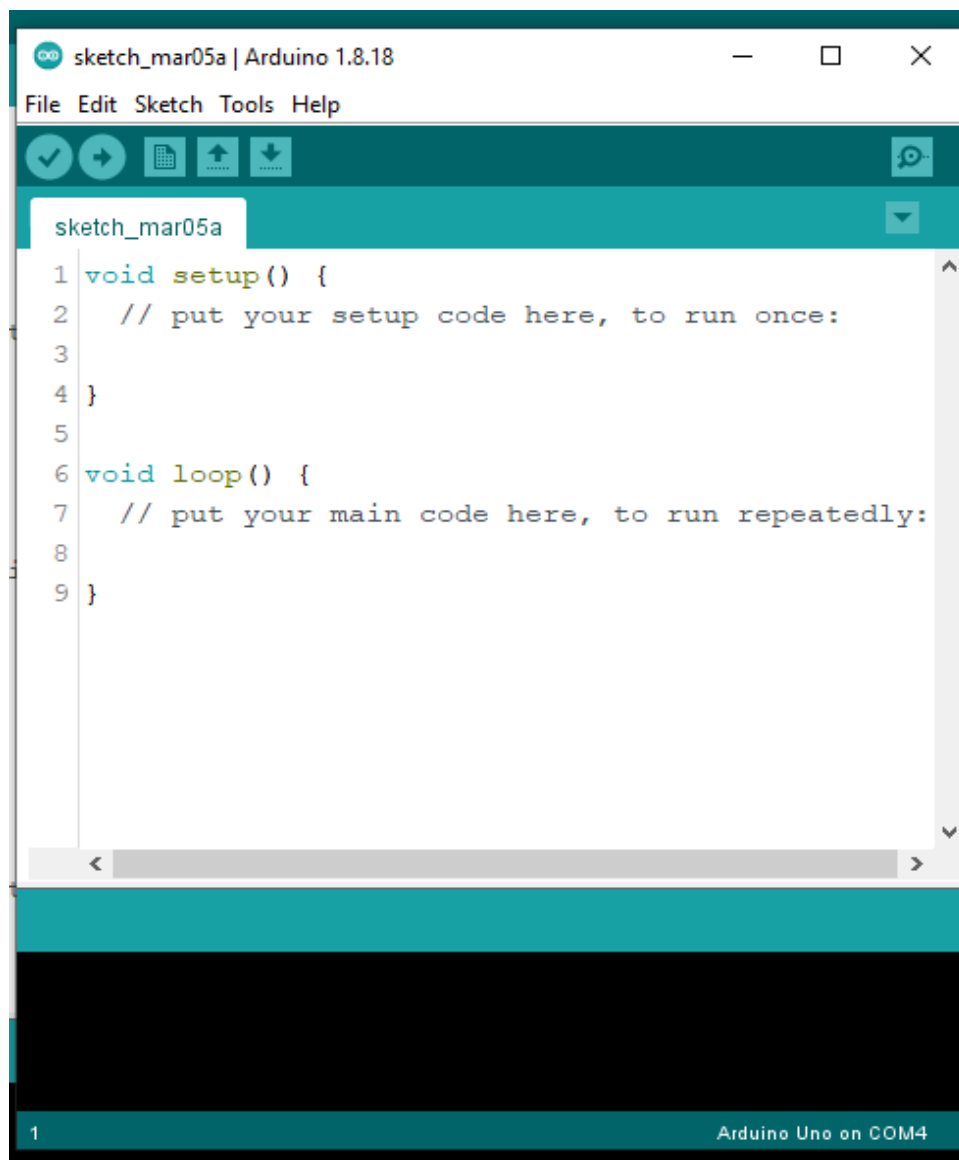
- Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.
- The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a lowcost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.
- The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.
- Dissimilar utmost previous programmable circuit boards, the Arduino does not need a dispersed piece of hardware (called a programmer) in order to load new code onto the board – you can just use a USB cable.
- It uses a streamlined version of C++, making it easier to learn to program.



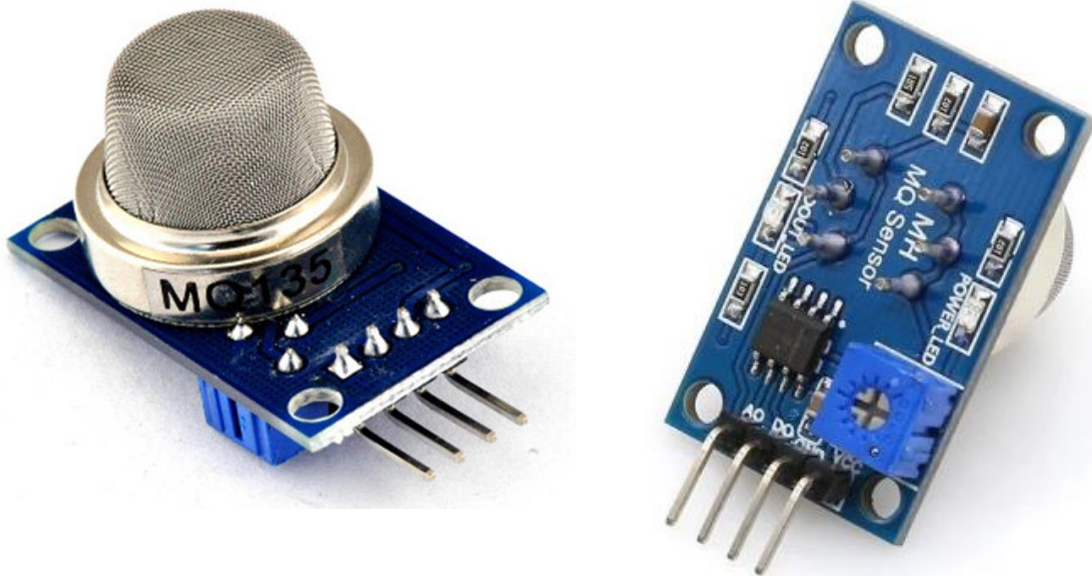
ARDUINO IDE

- The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.
- This software can be used with any Arduino board.
- The source code for the IDE is released under the GNU General Public License, version 2
- The Arduino IDE supports the languages C and C++ using special rules of code structuring.
- The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

- User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub `main()` into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution.
- The Arduino IDE employs the program `avrdude` to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.



MQ 135 Sensors:-



MQ-135 is an air quality or air pollution measuring sensor device. It can detect various chemical contents in air and give appropriate voltage variation at the output pin depending on the chemical concentration in air.

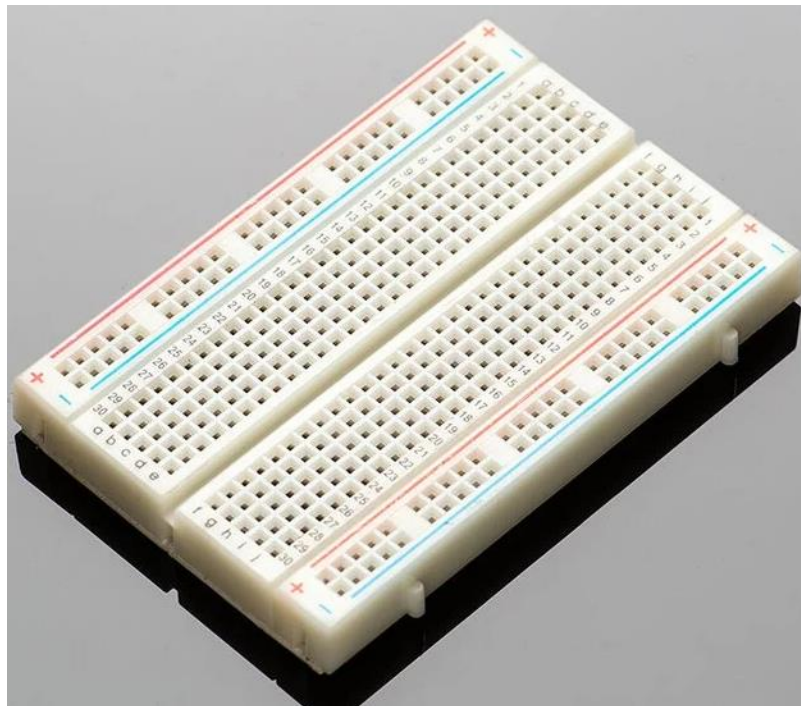
It can detect alcohol, Benzene, smoke, NH₃, butane, propane etc. if anyone of the stated chemical concentration rises, the sensor convert the chemical concentration in air to appropriate voltage range, which can be processed by Arduino or any microcontroller. It cannot tell what kind of chemical concentration rose in the air

MQ-135 Sensor Features

- Wide detecting scope
- Fast response and High sensitivity
- Stable and long life
- Operating Voltage is +5V
- Analog output voltage: 0V to 5V
- Digital output voltage: 0V or 5V (TTL Logic)

Pin Configuration :

Pin No:	Pin Name:	Description
For Module		
1	Vcc	Used to power the sensor, Generally the operating voltage is +5V.
2	Ground	Used to connect the module to system ground.
3	Digital Out	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer.
4	Analog Out	This pin outputs 0-5V analog voltage based on the intensity of the gas.

Breadboard:-

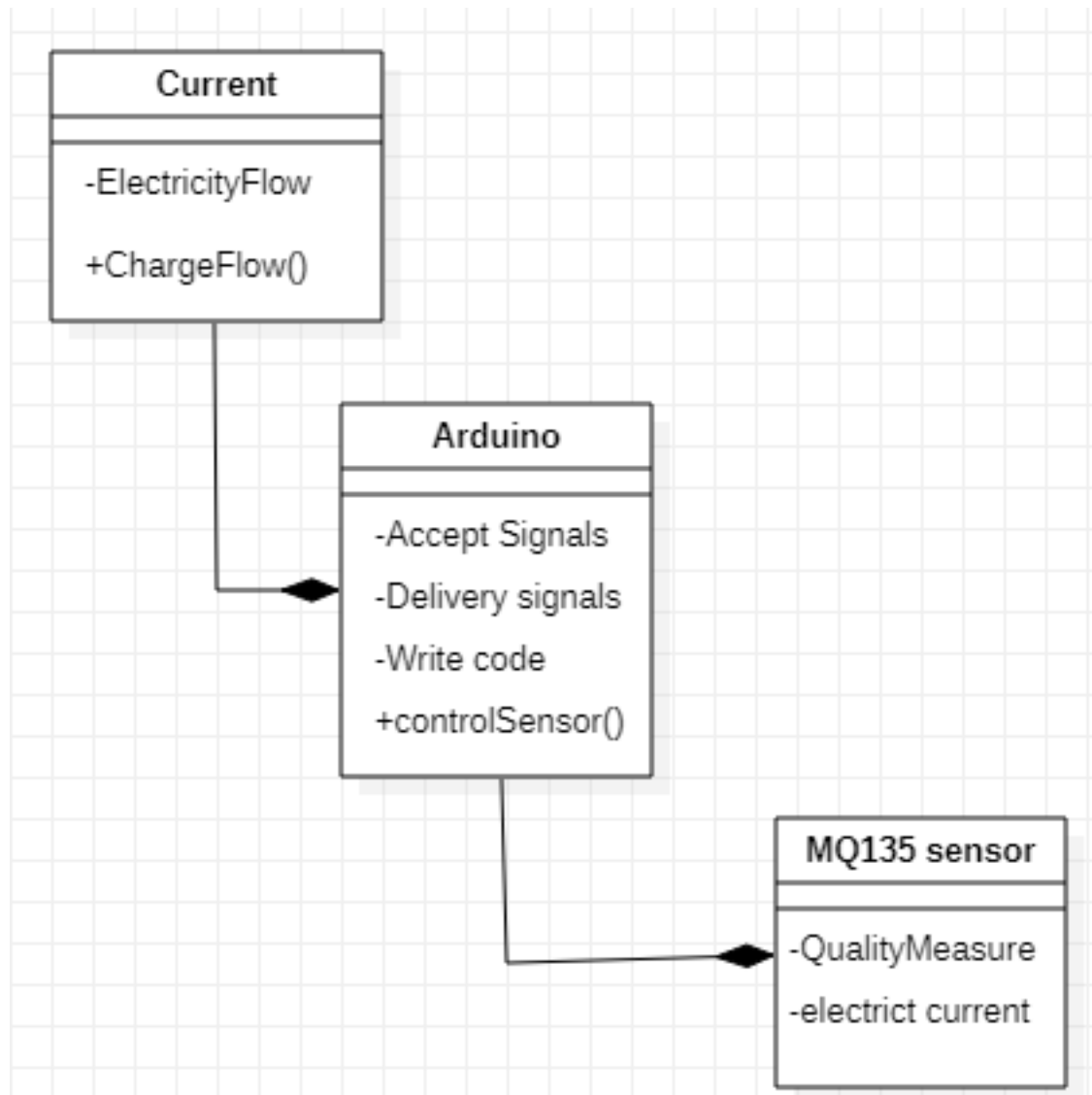
A Breadboard is simply a board for prototyping or building circuits on. It allows you to place components and connections on the board to make circuits without soldering. The holes in the breadboard take care of your connections by physically holding onto parts or wires where you put them and electrically connecting them inside the board. The ease of use and speed are great for learning and quick prototyping of simple circuits. More complex circuits and high frequency circuits are less suited to breadboarding. Breadboard circuits are also not ideal for long term use like circuits built on perfboard (protoboard) or PCB (printed circuit board), but they also don't have the soldering (protoboard), or design and manufacturing costs (PCBs).

4.System design details

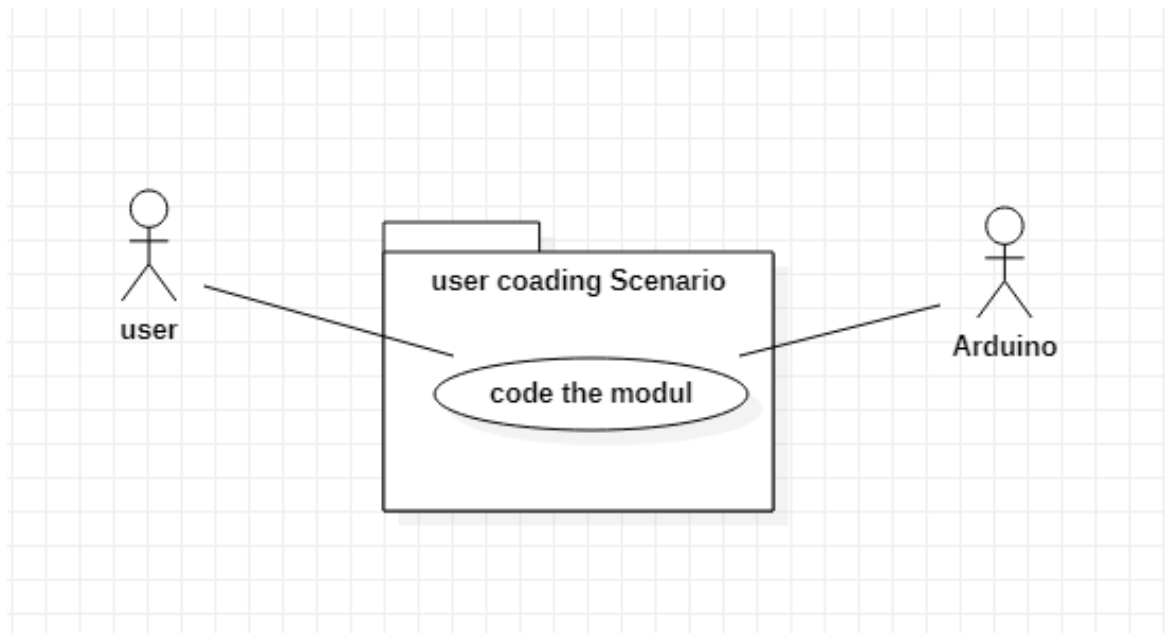
4.1 Event Table

Sr. no	Event	Trigger	Source	Activity	Response	Destination
1	IDLE Sensor	Gives signals of Arduino	Arduino	Turns ON the Arduino	Arduino LED ON	Arduino
2	Sensor detection for Air	Indicates Quality	MQ 135 Sensor	Signals the Arduino	Digital message to Arduino	Arduino
3	Sensor detection for absence of Water	Only Arduino LED ON	MQ 135 Sensor	Signals the Arduino	Digital message to Arduino	Arduino
4	Battery	Flows Current	Battery	Supplies power	Arduino	Arduino

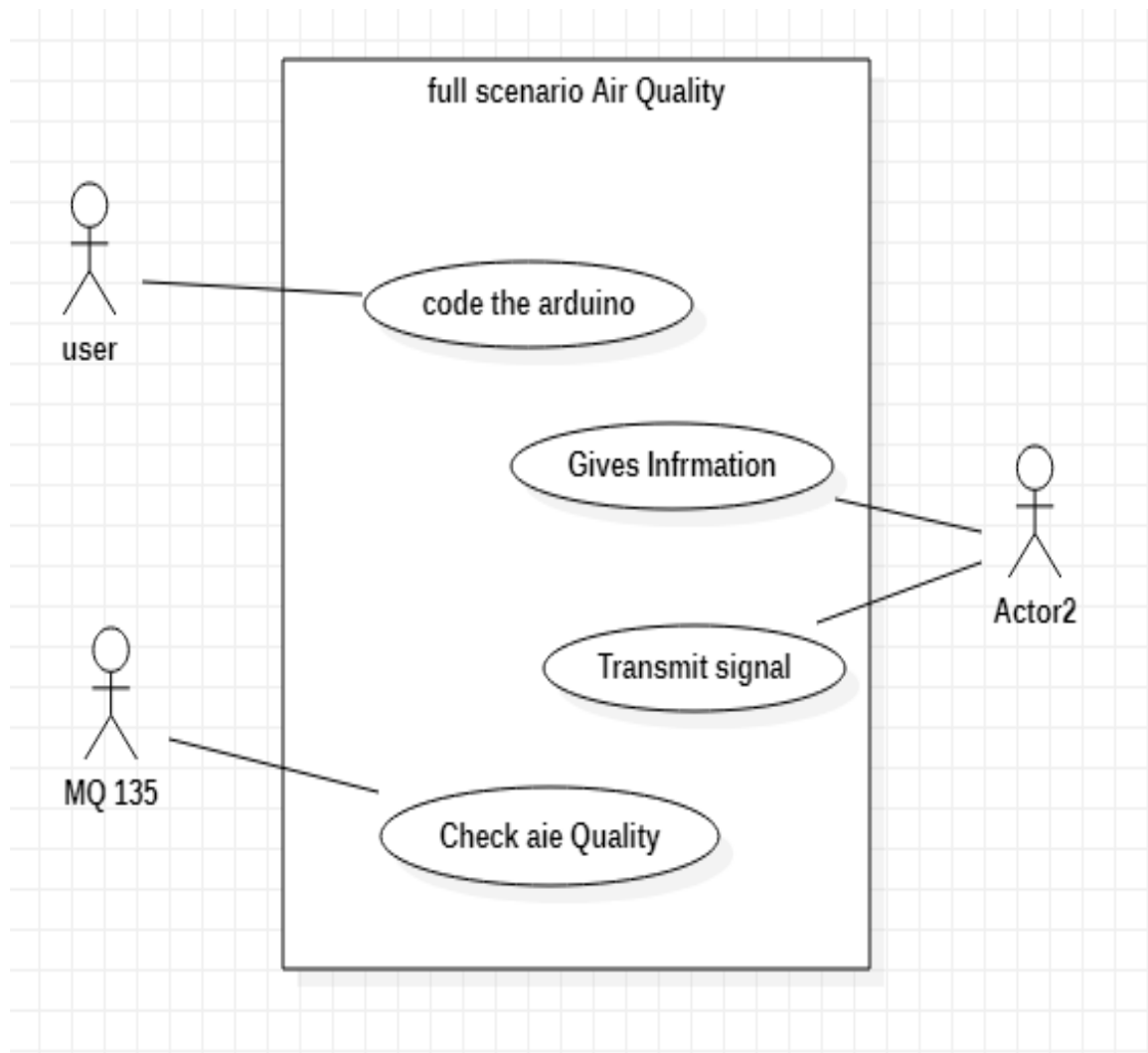
4.2 Class Diagram



4.3 Use Case Diagram

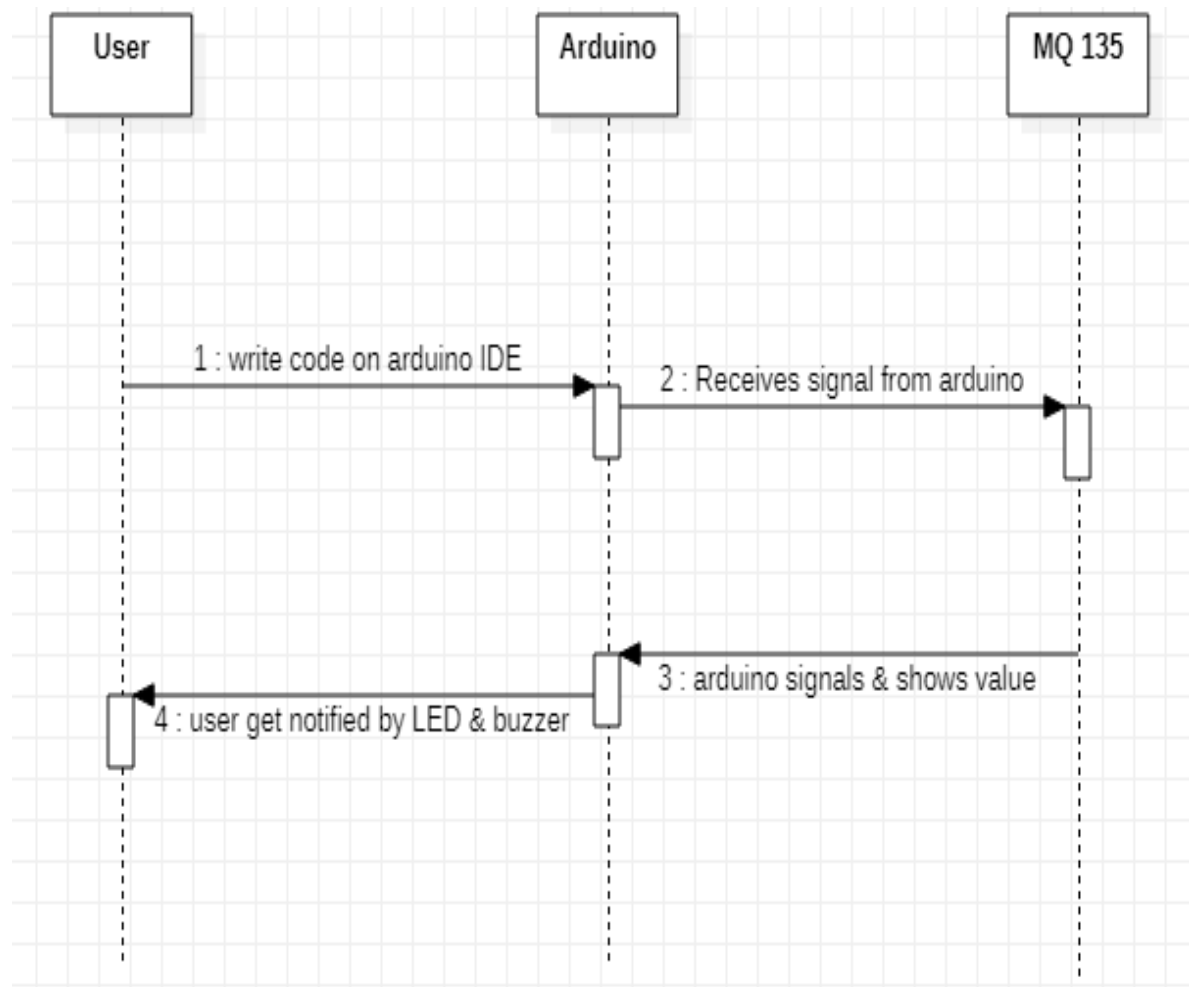


4.3.1 Use case diagram for user coading Scenario

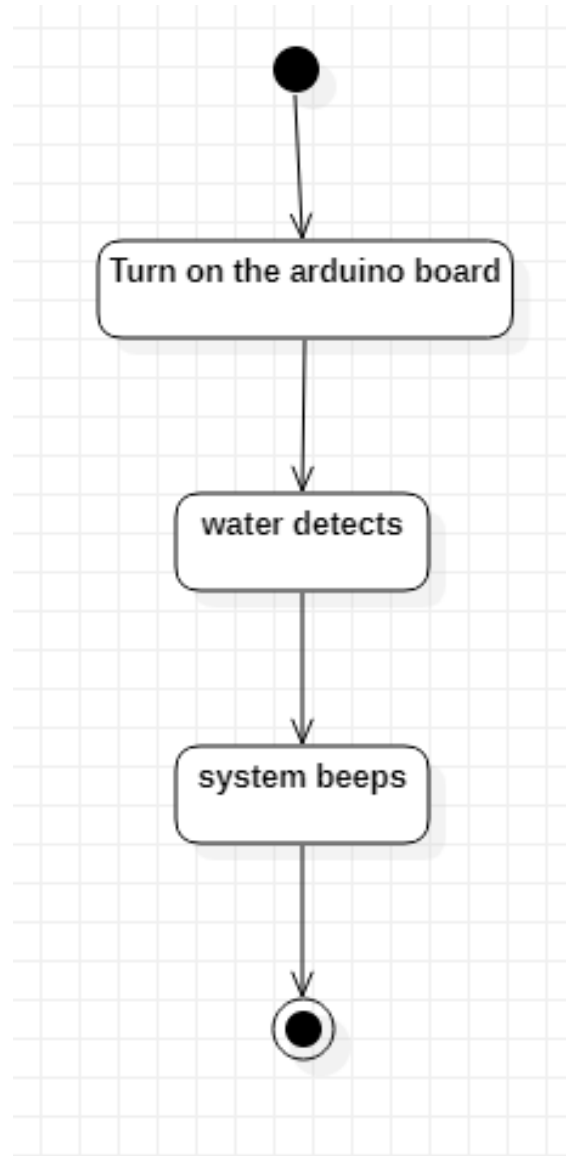


4.3.2 Use case diagram for Air Quality Index Monitoring System

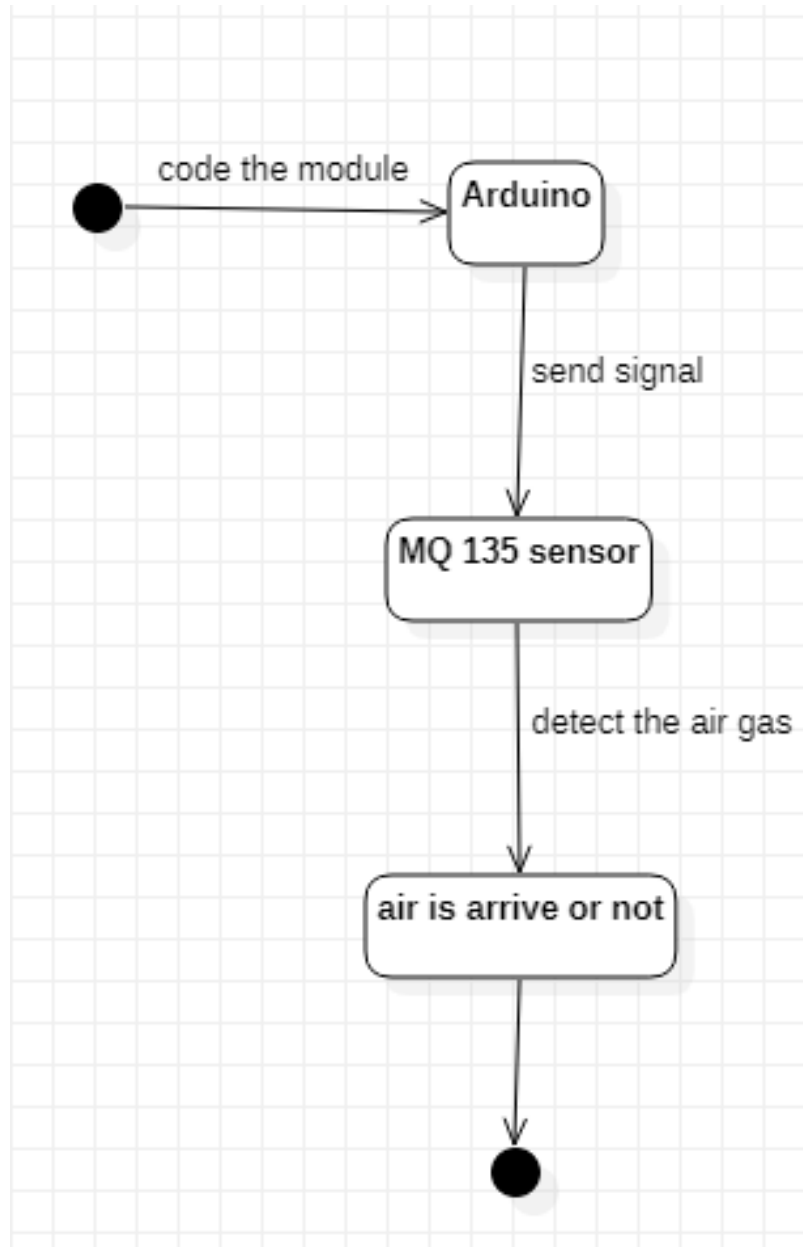
4.4 Sequence Diagram



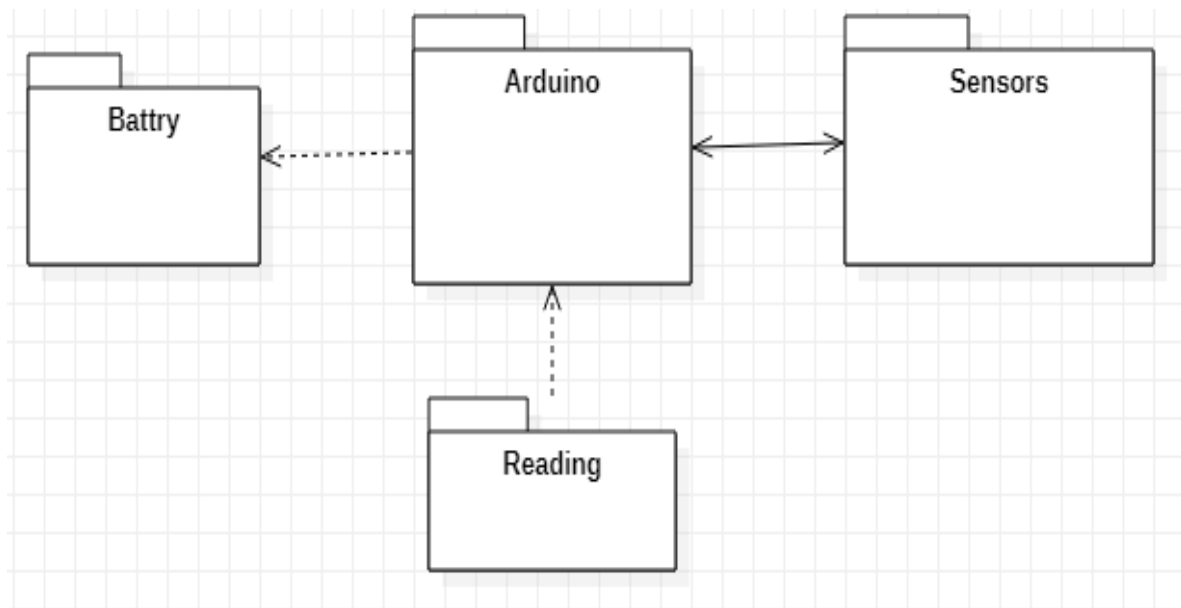
4.5 Activity Diagram



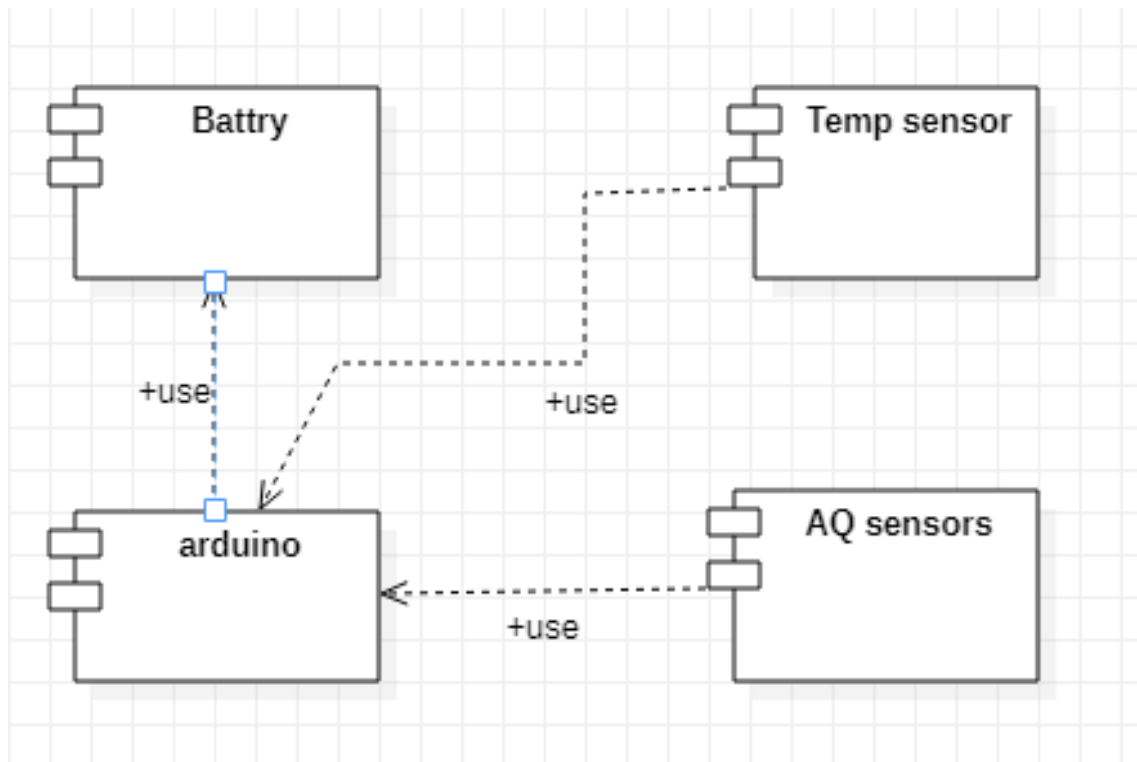
4.6 State Diagram



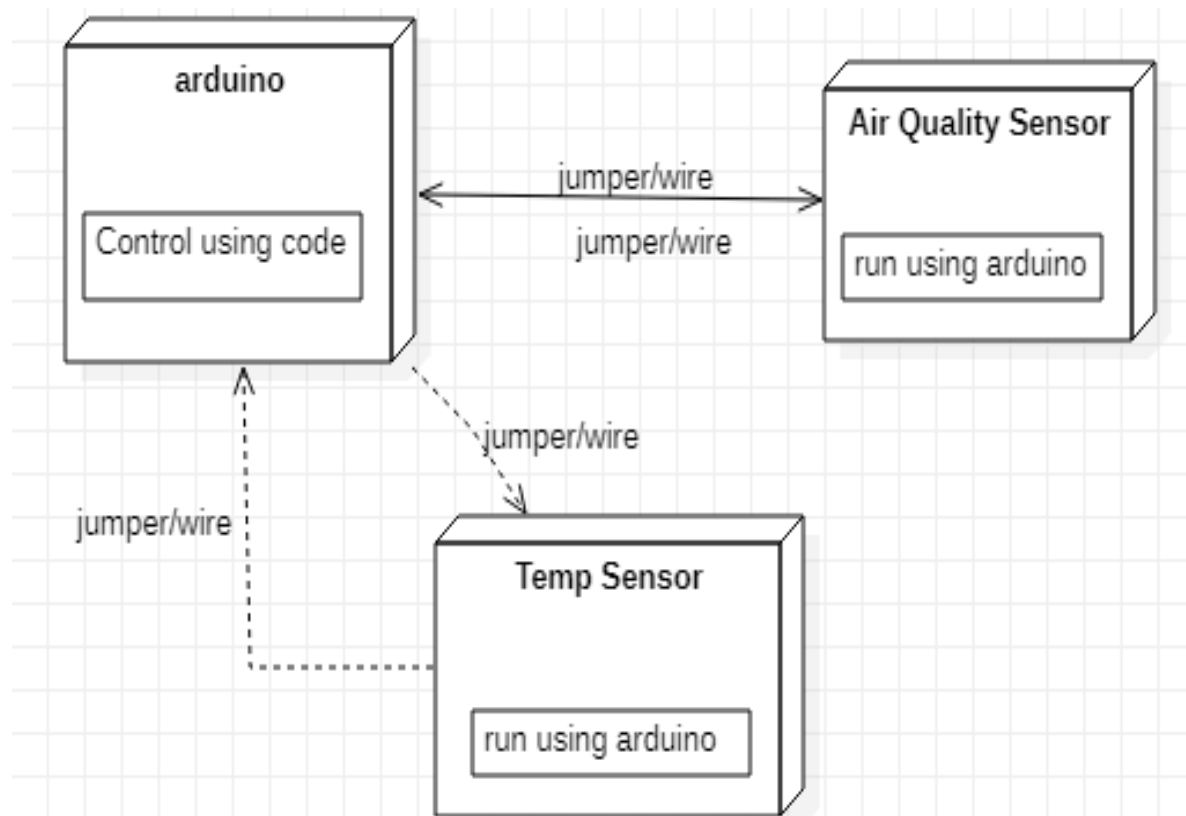
4.7 Package Diagram



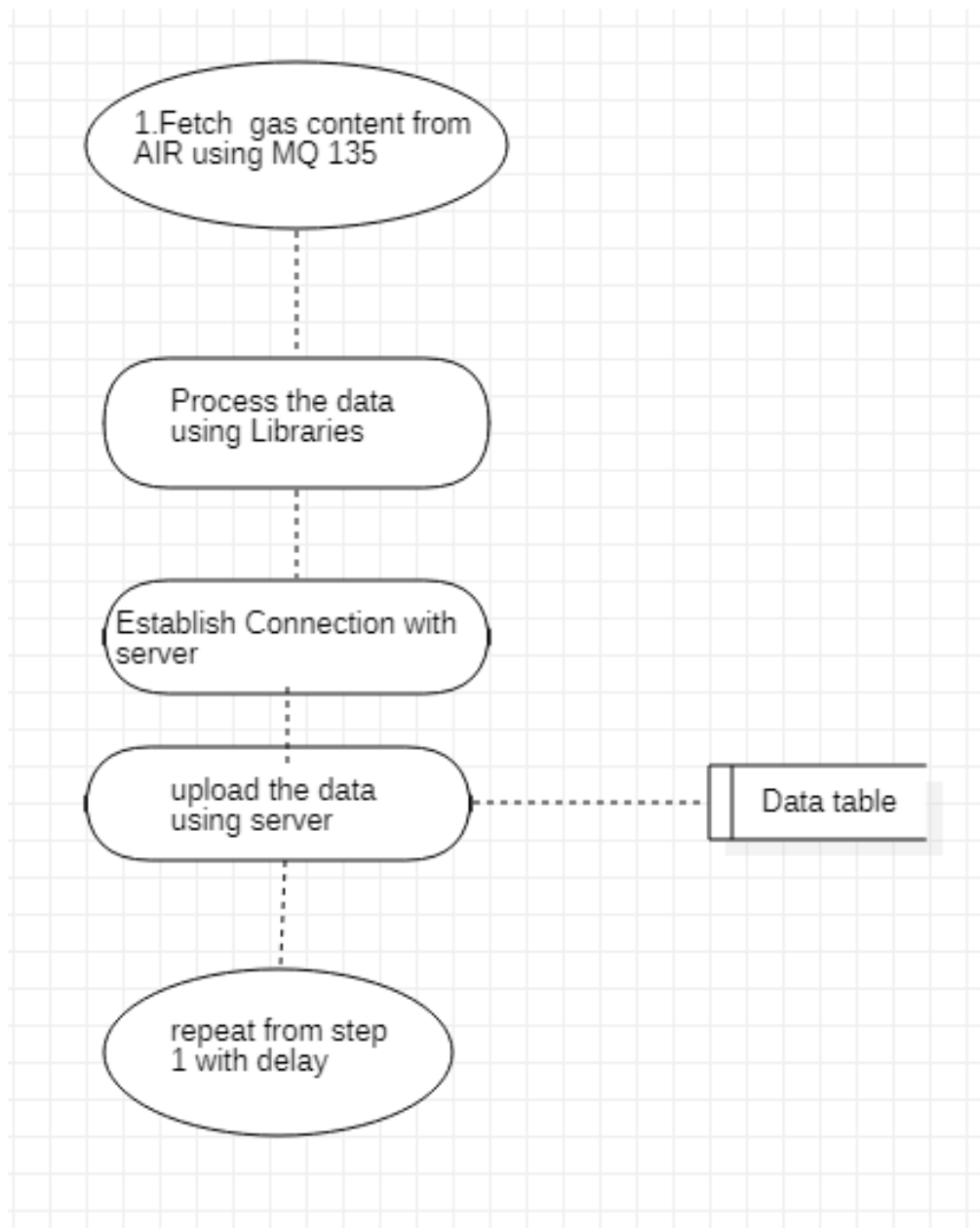
4.8 Component Diagram



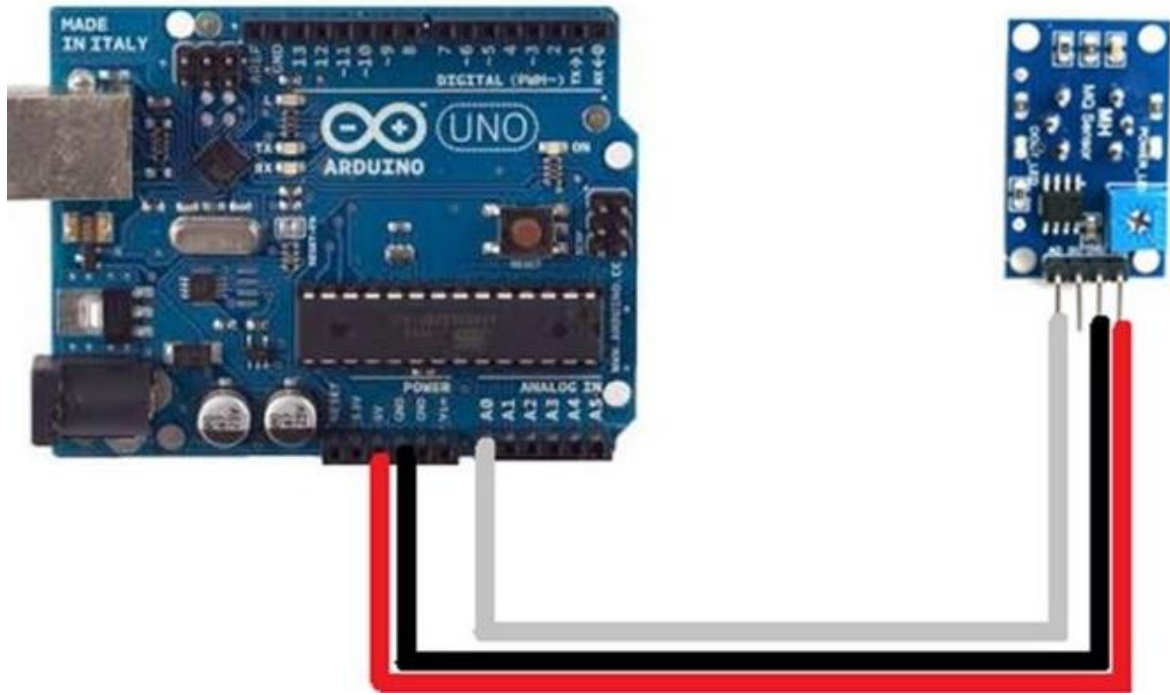
4.9 Deployment Diagram



4.10 Database Flow Diagram



4.11 Connection Diagram for Air Quality



5 .SYSTEM IMPLEMENTATION

Source code:-

```
int air_quality;
const int ledpin = 13;
const int pot = A0;
//const int buzzer = 12;
void setup()
{
  Serial.begin(9600);
  pinMode(ledpin, OUTPUT);
  //pinMode(buzzer, OUTPUT);
  pinMode(pot, INPUT);
}
void loop()
{
  Serial.print("Air_Quality = ");
  air_quality = analogRead(pot);
  if(air_quality>550)
  {
    digitalWrite(ledpin, HIGH);
    //digitalWrite(buzzer, HIGH);
    Serial.println(air_quality);
    delay(2000);
  }
  else
  {
```

```
digitalWrite(ledpin, LOW);  
//digitalWrite(buzzer, LOW);  
Serial.println(air_quality);  
delay(2000);  
}  
}
```

6. Results

6.1 Naming Conventions:

6.1.1 Controls:-

No.	Name	Type	Description
1	MQ 135	Sensor	Allows Arduino to check air quality

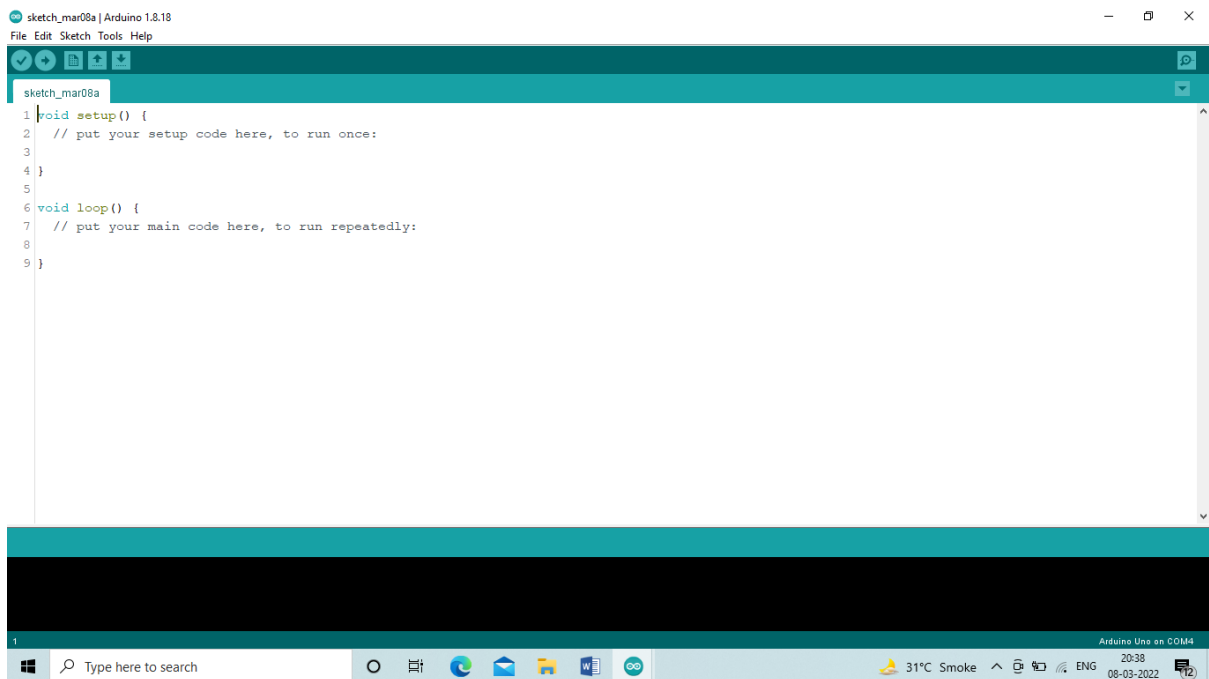
Control List for Air Quality

6.1.2 Controls:-

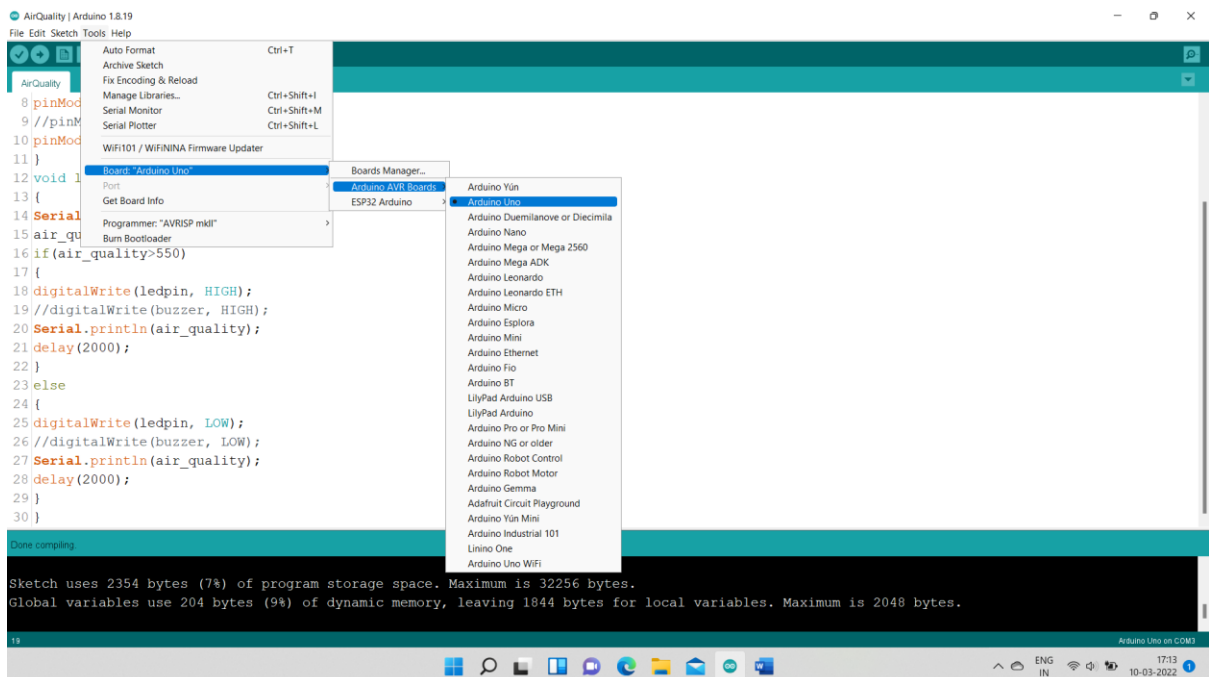
No.	Name	Description
1	Activity_main	Show Arduino is ON.

Activity/Layout list for Air quality

6.2 screenshots

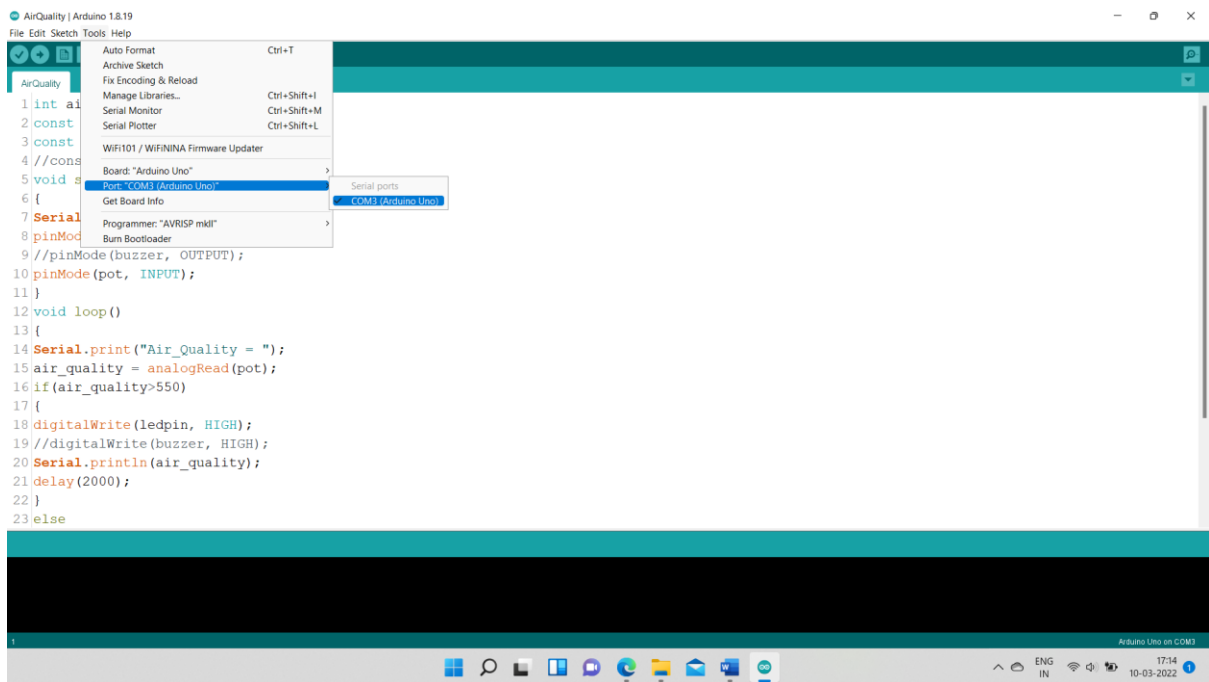


Arduino IDE for Air Quality

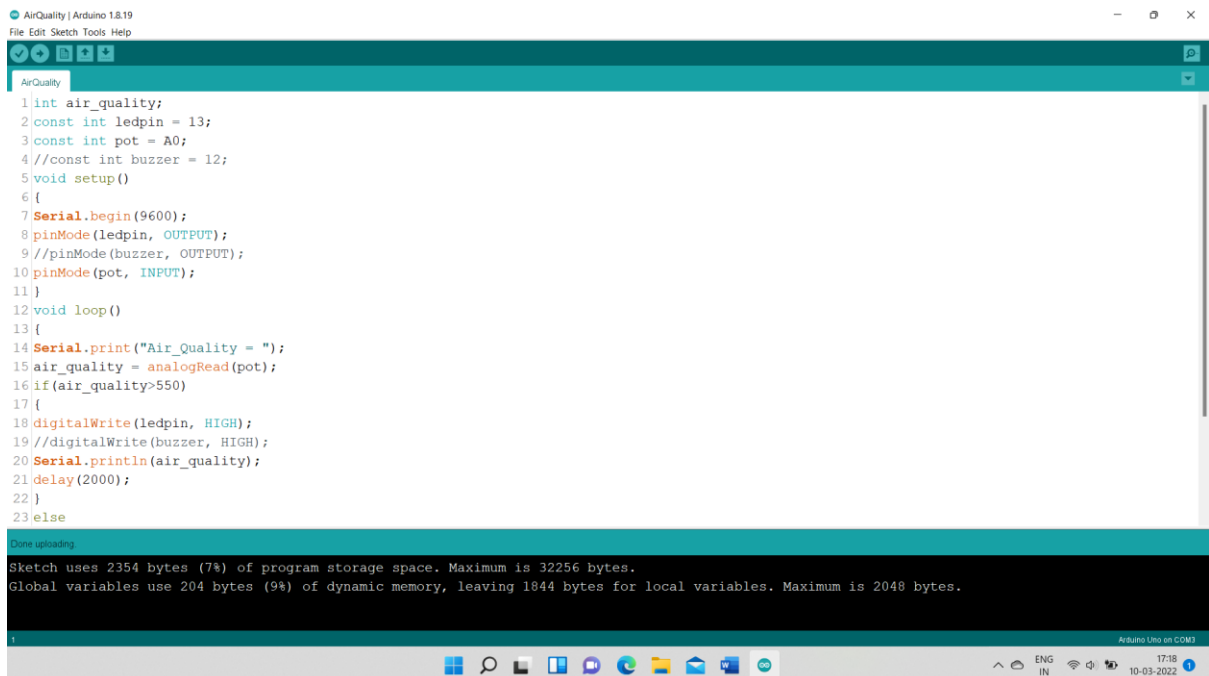


Select board

Air Quality Index Monitoring System



Select port



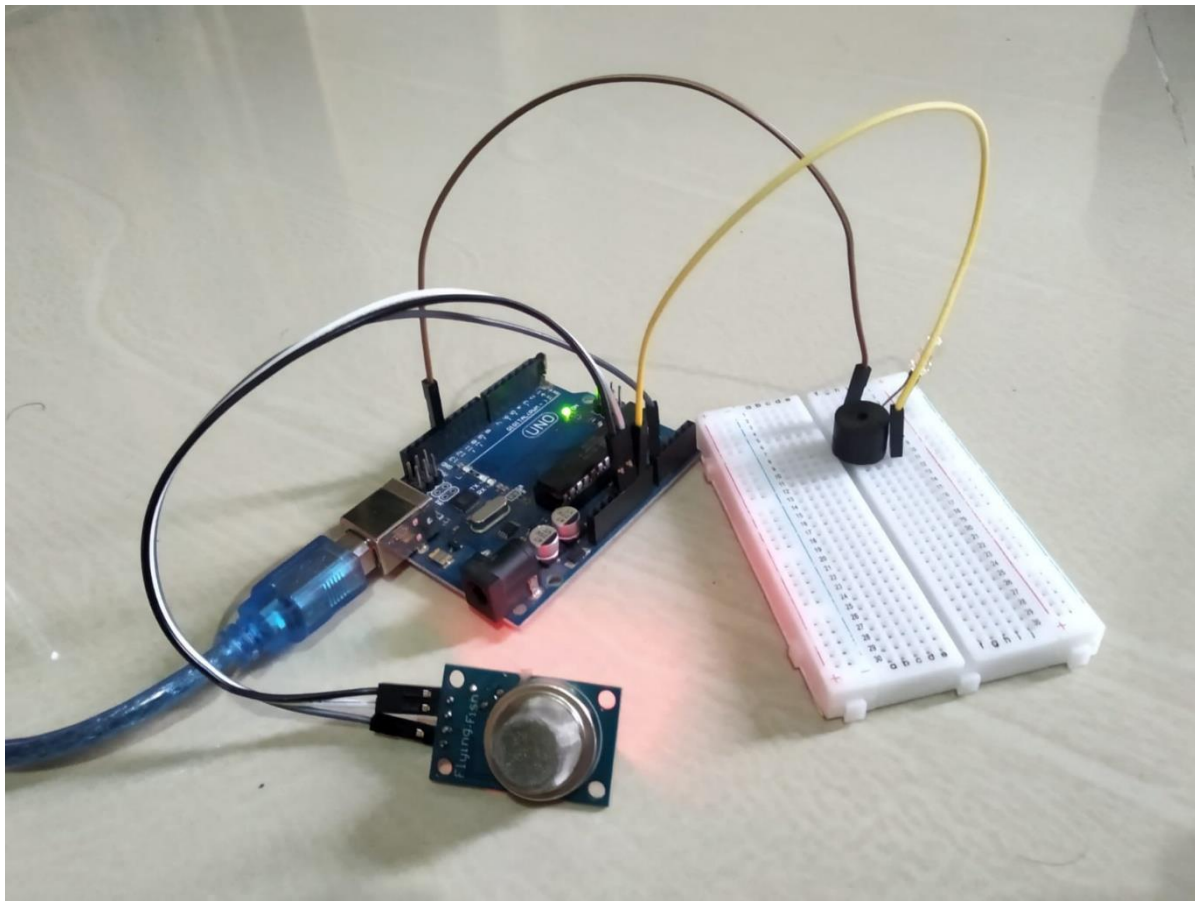
Done Uploading

Air Quality Index Monitoring System

```
COM4
20:31:14.133 -> 0
20:31:16.093 -> Air_Quality = 438
20:31:16.093 -> 0
20:31:18.097 -> Air_Quality = 439
20:31:18.097 -> 0
20:31:20.101 -> Air_Quality = 436
20:31:20.101 -> 0
20:31:22.108 -> Air_Quality = 447
20:31:22.108 -> 0
20:31:24.108 -> Air_Quality = 463
20:31:24.108 -> 0
20:31:26.112 -> Air_Quality = 477
20:31:26.112 -> 0
20:31:28.117 -> Air_Quality = 466
20:31:28.117 -> 0
20:31:30.117 -> Air_Quality = 458
```

☐ Autoscroll ☒ Show timestamp Newline 9600 baud Clear output

output



Arduino with connection for MQ 135

7. Future Enhancement

- It can be improved future by adding more sensors to existing system like dust particles sensors and etc.
- Interface GPS module to screen the contamination at precise area and transfer on the website page for the netziens.

8. Conclusion

- Monitoring the environmental parameters especially with respect air plays very important role to ensure healthy environment for living beings. We have seen various hazards being caused at Delhi due to air pollution. There are many reasons for causing air pollution but knowing their concentration at various locations helps to take decisions on prevention measures.
- The proposed application works on the principle of IOT, data read from sensor are processed by the processor (ESP32) then uploaded to database, these data are analyzed and displayed to users, and user could fetch this information over phone or webserver and take proper action to prevent pollution.

9. References

- [https://en.wikipedia.org/wiki/Internet of things](https://en.wikipedia.org/wiki/Internet_of_things)

10 . Annexure

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