Air Quality Management

Project Definition

The project involves integrating IoT sensors into air quality measurement to monitor pollution free, health care, realtime monitoring, energy efficiency. The goal is to help protect human health and the environment from the harmful effects of air pollution. The project includes project objectives, IoT device setup, platform development, code implementation and real-time air quality monitoring system which raise public awareness about air quality and health impact.

Project Objective

Sensor Development

Deploying a network of IoT sensors to measure key air quality parameters, such as particulate matter (PM), nitrogen dioxide (NO2), ozone (O3), and others.

Real-Time Monitoring

Establishing a real-time monitoring system to collect continuous and instantaneous data on air quality.

Data Analytics

Employing data analytics and machine learning algorithms to analyze the collected data, identify patterns, and predict air quality trends.

Alert Systems

Developing automated alert systems that notify relevant stakeholders or the public when air quality levels exceed predefined thresholds.

Integration with Existing System

Integrating IoT air quality data with existing environmental monitoring systems and databases for a comprehensive view.

Energy Efficiency

Designing IoT devices and systems with a focus on energy efficiency to ensure sustainable and long-term operation.

Scalability

Creating a scalable infrastructure that can accommodate an increasing number of sensors and data points as the project expands User.

Feedback Mechanism

Establishing a feedback mechanism to gather insights from users and continuously improve the system based on their experiences and needs.

IOT device setup for Air quality

Gas Sensors

These sensors are widely used for detecting gases such as carbon monoxide (MQ-7), methane (MQ-4), and others. They provide analog output proportional to the concentration of the gas.
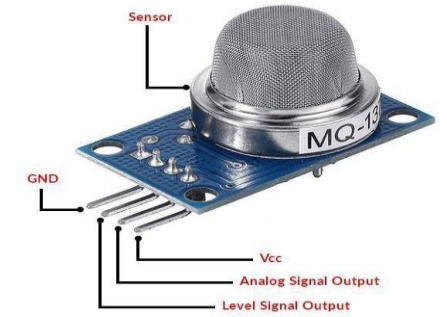
Particulate Matter Sensors

These sensors can measure the concentration of particulate matter in the air, helping to assess air quality.

Temperature and Humidity Sensors

These sensors measure both temperature and humidity, providing essential data for a comprehensive understanding of environmental conditions.
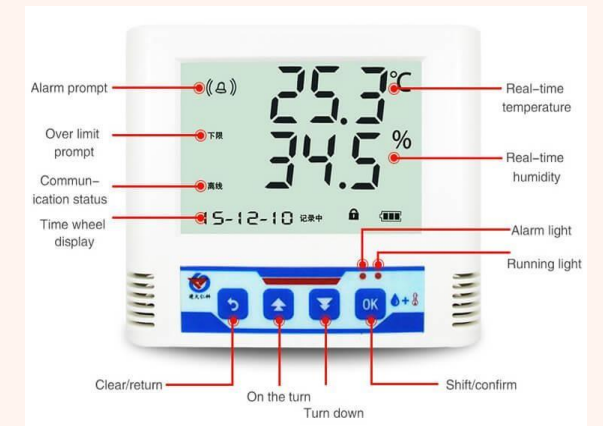

Gas Sensors

Particulate Matter Sensors

Temperature and Humidity sensors

Carbon di oxide
Sensors

Carbon Di Oxide (CO2) Sensors

CO2 sensors are crucial for assessing indoor air quality. They measure the concentration of carbon dioxide in the air.

Ozone (O3) Sensors

Ozone sensors

This sensor can detect various gases, including ozone, and is commonly used in air quality monitoring systems.

Platform Development

Developing a platform for air quality in IoT involves integrating sensors to collect air quality data, utilizing a communication protocol like MQTT, and creating a user interface for data visualization. Consider scalability, real-time analytics, and security in your design.
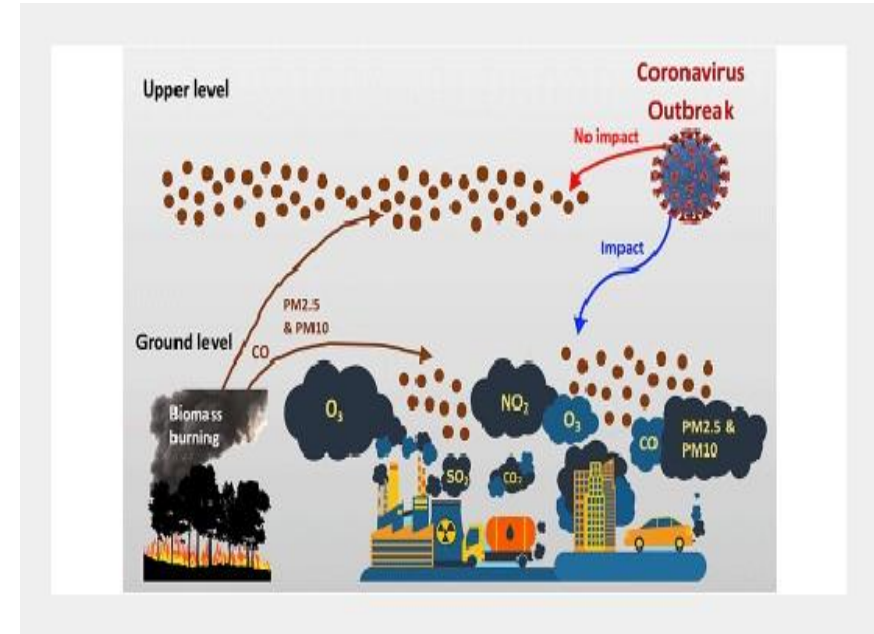
```python
# importing pandas module for data frame
import pandas as pd

# loading dataset and storing in train variable
train=pd.read_csv('AQI.csv')

# display top 5 data
train.head()
```

Output:

Code Implementation

	PM2.5-AVG	PM10-AVG	NO2-AVG	NH3-AVG	SO2-AG	CO	OZONE-AVG	air_quality_index
0	190	131	107	4	42	0	63	190
1	188	131	110	4	40	0	62	188
2	280	174	155	2	37	0	52	280
3	302	181	144	2	39	0	78	302
4	285	160	121	3	19	0	71	285

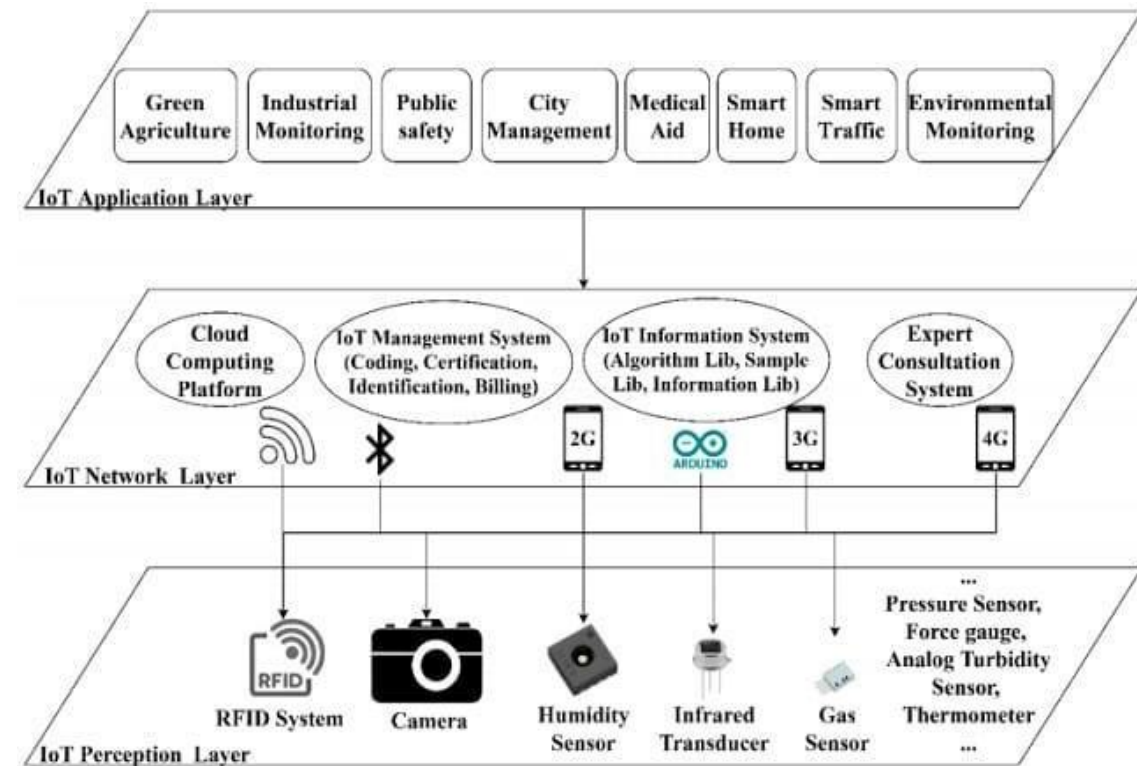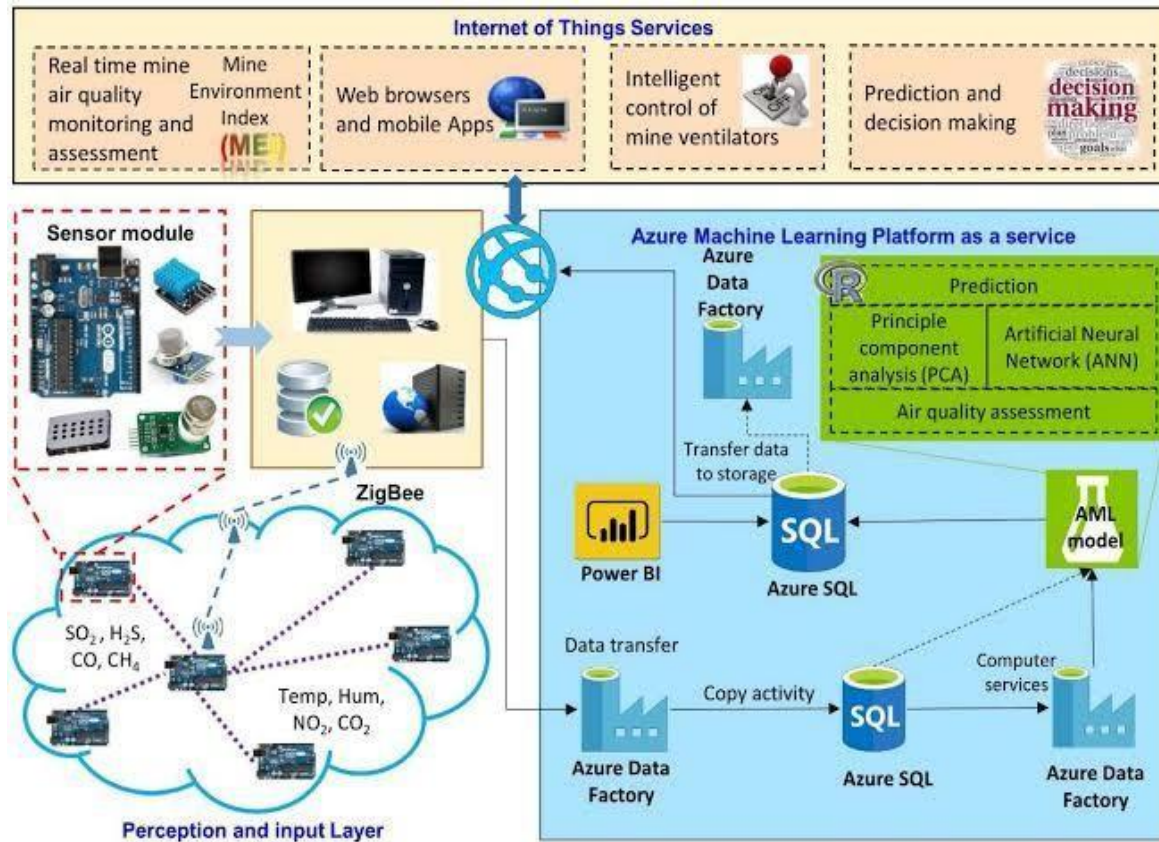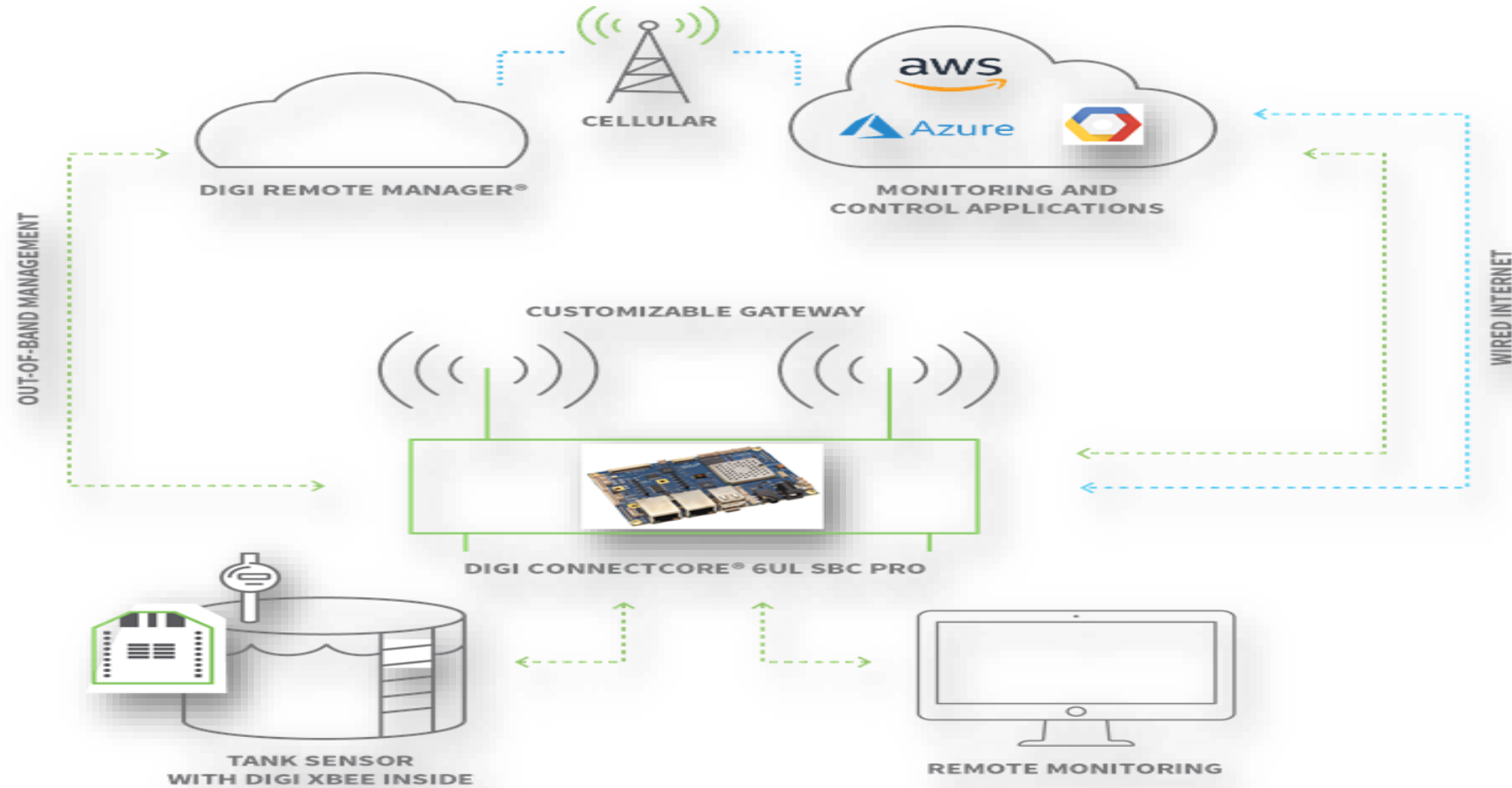# Screenshots of IOT Devices and Data Sharing Platforms

Diagram Of IOT Devices And Data Platform

Public Awareness and Education

In Town Hall meetings held by the AQMD, residents throughout the South Coast basin have asked how the public can become more involved in reducing local air pollution impacts in their communities. Local governments are encouraged to invest in public outreach activities and programs to build strong public awareness of regional and local air quality issues and health studies.air quality issues and health studies. To foster greater community involvement and support in developing public policy, local jurisdictions should consider the following activities to improve awareness of air quality and environmental justice issues. identify an individual as a contact person for environmental justice issues. participate with the AQMD in Town Hall meetings to hear citizen concerns regarding air quality and environmental justice.

Suggested Goal, Objectives and Policies/Strategies

Goal 6 Greater public awareness of the changes in personal behaviour that can be chosen to minimize air pollution

- Objective 6.1 Make air quality education a priority for the City's effort to protect

- public health and achieve state and federal clean air standards

Suggested policies/Strategies related to Public Awareness

➢ AQ 6.1.1 Provide regional and local air quality information on City's website, including links to the AQMD, CARB, USEPA and other environmental based internet sites.

➢ AQ 6.1.2 Organize city-sponsored events on topics that educate businesses and the public about compliance with air quality regulations (e.g., alternative fuels and low polluting clean household products).

EXPLANATION

Air quality monitoring involves the systematic observation and measurement of various pollutants and factors in the air, such as particulate matter, gases (like ozone, carbon monoxide, sulphur dioxide), volatile organic compounds, and more. Monitoring stations equipped with sensors or devices collect data on these pollutants to assess air quality levels. This data is used to understand pollution trends, inform the public about potential health risks, and support the implementation of policies or actions aimed at improving air quality. The measurements obtained are often compared to established air quality standards to determine if the air quality is safe or if it poses risks to human health and the environment.

Avoid Air Pollution

Thank you

Kaviya K
422621104019
University college of engineering, Panruti