
Air Quality
Monitoring

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 awarenessabout air quality and health impact.

Project Objective

Sensor Development

Deployinganetworkof IoTsensorstomeasure key air quality parameters, such as particulate matter (PM), nitrogendioxide (NO2),ozone(O3),andothers.

Real-Time Monitoring

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

Data Analytics

Employingdataanalyticsandmachinelearning algorithms to analyze the collected data, identify patterns, andpredictairqualitytrends.

Alert Systems

Developingautomatedalertsystemsthatnotify relevant stakeholders or the public when air qualitylevelsexceedpredefined thresholds.

Integration with Existing System

Integrating IoTair quality data with existing environmental monitoring systems anddatabases for acomprehensive view.

Energy Efficiency

Designing IoTdevicesand systemswith a focuson energy efficiencytoensuresustainableandlong-term operation.

Scalability

Creating a scalable infrastructure that can accommodate anincreasingnumberofsensorsand datapointsastheproject expandsUser.

Feedback Mechanism

Establishingafeedbackmechanismtogatherinsights from users and continuously improve the system basedontheir experiencesandneeds.

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 concentrationofthegas.

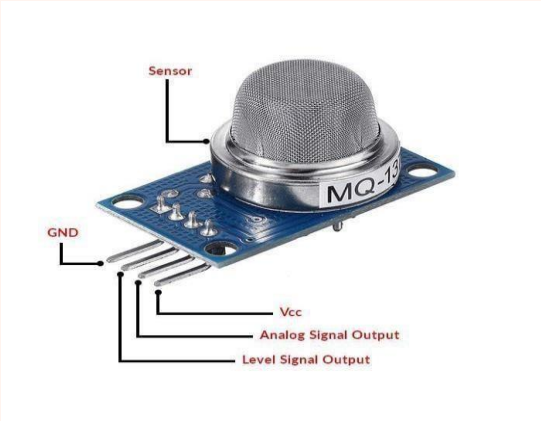
Particulate Matter Sensors

Thesesensorscanmeasure theconcentrationof particulatematterintheair, helpingtoassessairquality.

Temperature and Humidity Sensors

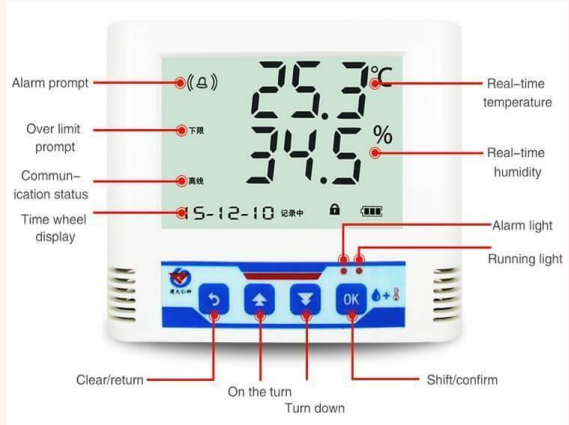
Thesesensorsmeasureboth temperatureandhumidity, providingessentialdatafora comprehensive understandingof environmentalconditions.

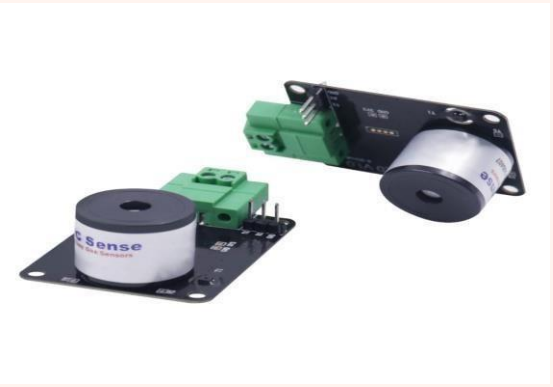
GasSensors



ParticulateMatterSensors

TemperatureandHumidity sensors





Carbondi oxide Sensors

Carbon Di Oxide (CO2)Sensors

CO2sensorsarecrucialforassessingindoorair quality. Theymeasure the concentration of carbondioxidein theair.

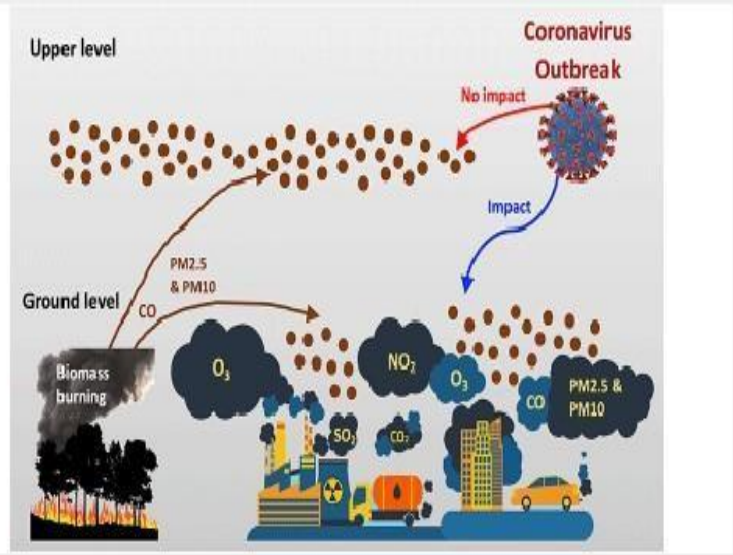
Ozonesensors

Ozone (O3) Sensors

Thissensorcandetectvariousgases,including ozone, and is commonly used in air quality monitoring systems.

Platform Development

Developing a platform for air quality in IoTinvolves integratingsensorstocollectairqualitydata,utilizing a communicationprotocol likeMQTT,andcreatingauser interface fordatavisualization. Considerscalability, real- time analytics,andsecurityinyourdesign.



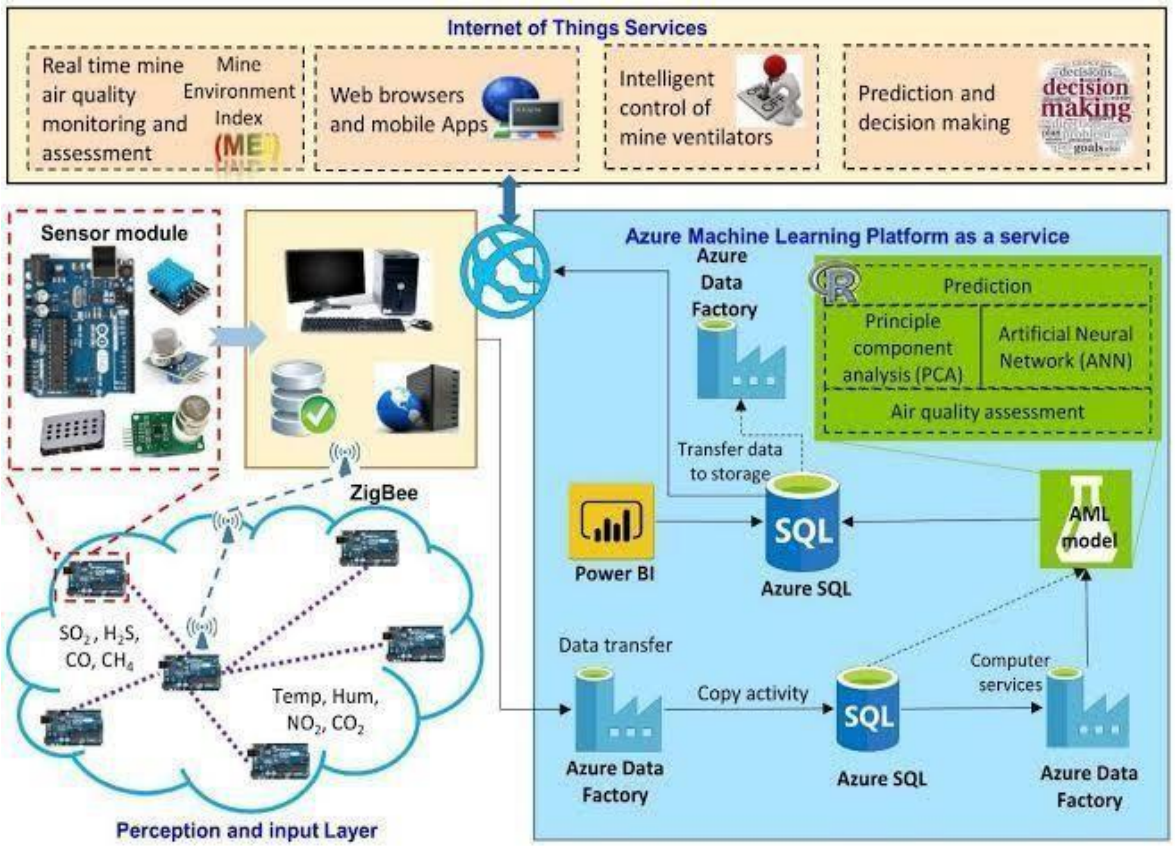
```
# importing pandas module for data frame
import pandas as pd

# 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



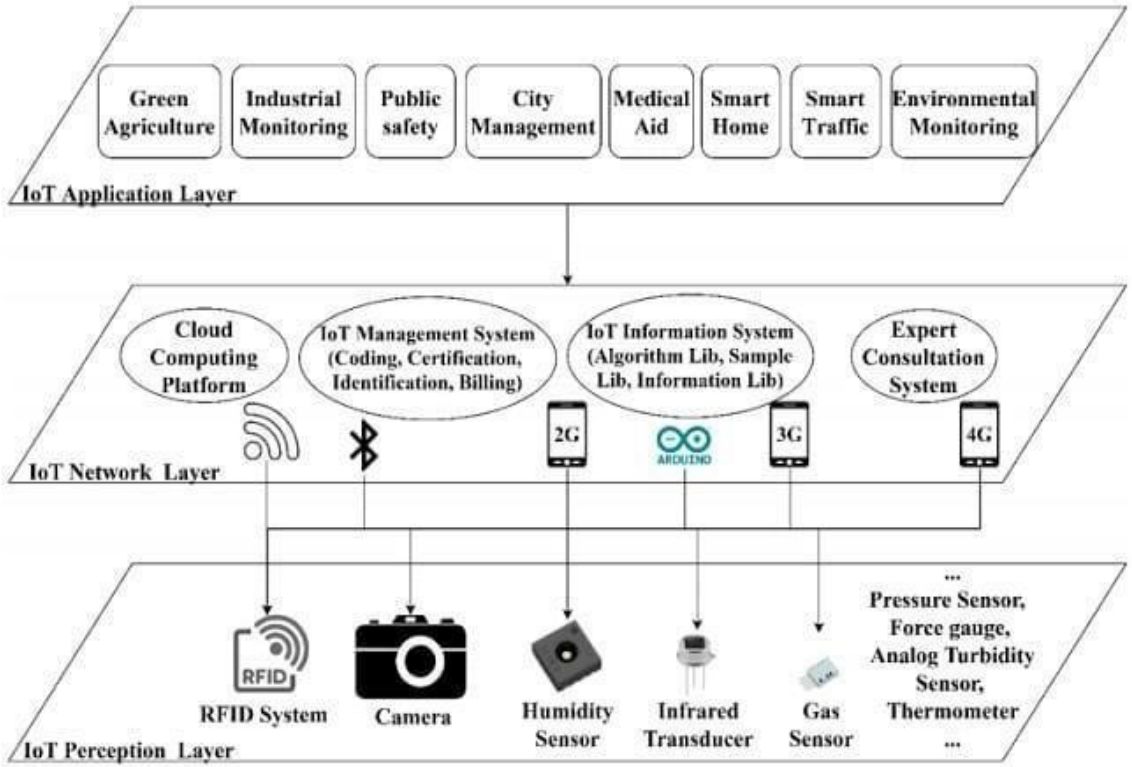
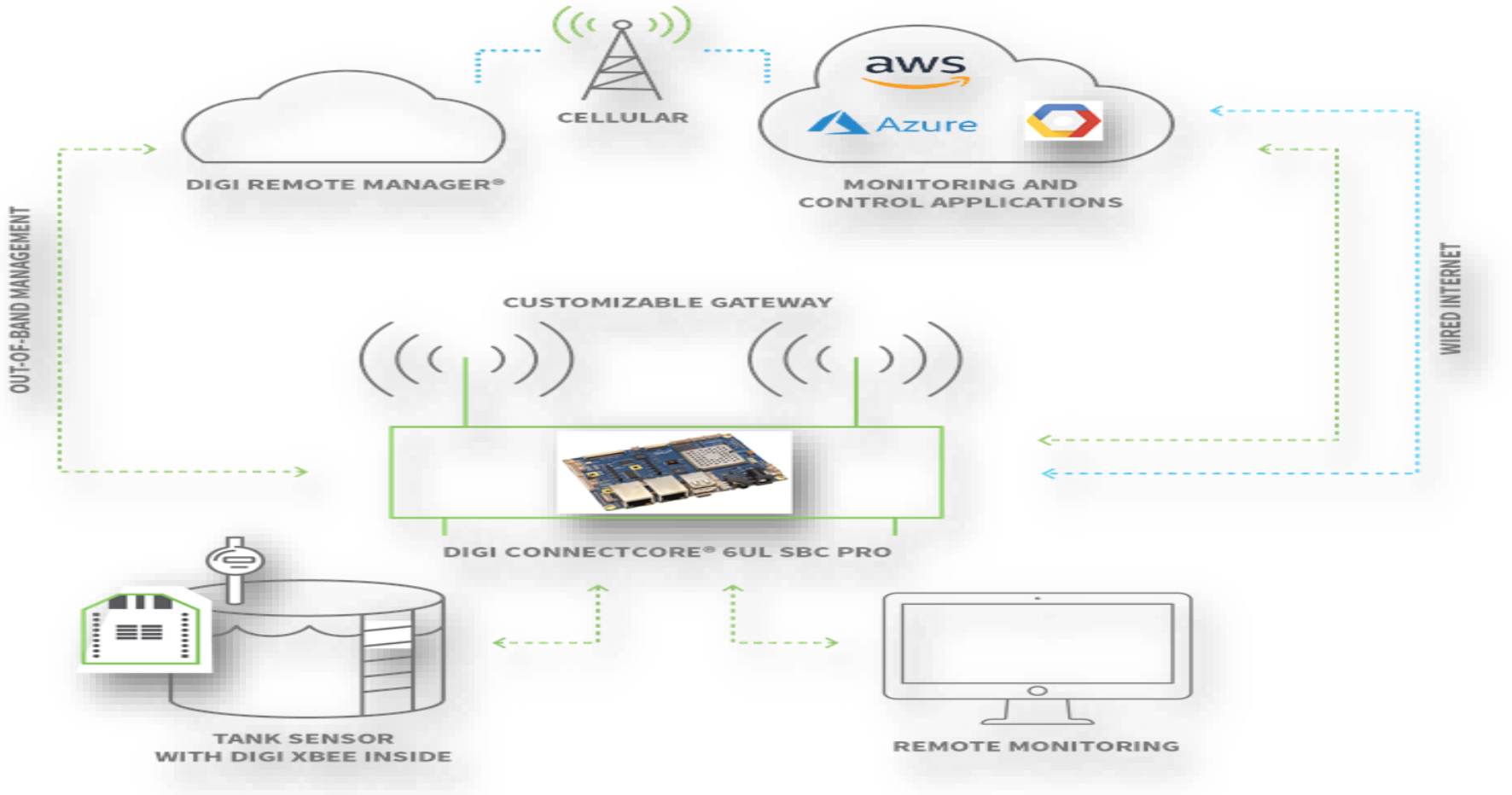


Diagram Of IOT Devices And Data Platform



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 efforts 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

GITHUB :https://github.com/aShalimd/Air-Quality-Monitoring.git

Thank you

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