IOT BASED ENVIRONMENTAL MONITORING

A project report submitted in partial fulfilment Of the requirements for the degree of B.E in Computer Science and Engineering.

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What Is IoT-Based Environmental Monitoring?

First, let's talk about an environmental monitoring system definition and how IoT supports these processes. IoT-based environmental monitoring is the consistent collection of measurements and data from our physical environment, using sensors and connected devices. Sensors embedded in irrigation systems, pipelines, tanks, weather stations, oceanic applications, and industrial equipment — anywhere on the planet — can detect temperature, moisture, water levels, leaks, and other physical properties.

Intelligent, connected devices with embedded communications modules can then process that information using edge computing technology, and rapidly send critical data to the cloud or a data center for further action or analysis.

How IoT Technology Helps Enterprises to go Green

The trend toward green technology — supported by these environmental monitoring and remediation systems — is also a driving factor. Applications ranging from energy systems to agricultural use cases to water and wastewater management, oil and gas operations, and environmental remediation projects can gain better insights into their remote operations and improve processes to lower their impact and prevent disasters.

Using data gathered from across an entire industrial deployment, it's possible to study water treatment readings, air quality measurements, water and fuel flows, and other data in real time. Users typically utilize an analysis dashboard that aggregates that data, shows trends, spikes, and abnormalities, which in many cases eliminates the need to schedule costly truck rolls, which also burn fuel, out to every remote installation. The data-driven approach provides the critical insights needed for predictive and preventative maintenance and resource management.

Use Cases for IoT Environment Monitoring

With IoT systems, we can connect and manage wireless devices across an industrial field or across the globe for environmental monitoring and management to support better decision making, environmental sustainability and a circular economy. Let's explore some use cases that demonstrate how IoT can help the environment.

Water Quality Monitoring

Water is a vital source for the health of the planet and its people, and today, technology is needed to support clean water management and conservation. Water quality monitoring using IoT-based systems helps to control contamination and support management of this valuable resource. Using IoT systems allows water to be analyzed in buildings, water and wastewater plants, irrigation systems and industrial processes.

These advanced smart water monitoring systems using IoT technologies enable accurate measurements of contaminants, oxygen levels, additional factors, and pH levels. IoT technology allows the detection of harmful substances public it reaches homes and buildings. The innovative technology helps us to sustain our health and wellness.

Some examples include:

- ➢ Municipal water treatment monitoring
- ➢ Stormwater and groundwater monitoring
- ➢ Agricultural irrigation monitoring and control
- ➢ City water and drinking water quality monitoring

Air Quality Monitoring

Industrial processes emit organic compounds like carbon monoxide, hydrocarbons, and chemicals ("greenhouse gases") into the air. And as we know, exhaust from vehicles and methane from cattle impact the quality of our air and impact our planet.

Some real-world examples of air quality monitoring include:

- ➢ Carbon monoxide monitoring in homes and buildings
- ➢ Methane monitoring in agriculture and waste management
- ➢ Ambient air quality monitoring for pollutants, lead and toxic particulates

Energy Monitoring

With our limited global energy resources, energy monitoring is essential to conservation. IoT-based technologies can provide both the management tools and the insights to improve how we use energy. Leading energy providers today are rapidly integrating a wide range of IoT monitoring and mitigation techniques to reduce usage, as well as clean energy solutions to reduce energy consumption and promote sustainability. In the process, these techniques can also save money for everyone relying on the electric grid.

PROGRAM

```python
import paho.mqtt.client as mqtt

import json

import time

import random


# Define your IoT device's parameters

device_id = "your_device_id"

broker_address = "mqtt.broker.com"

topic = "environmental_data"


# Initialize the MQTT client

client = mqtt.Client(client_id=device_id)


# Connect to the MQTT broker

client.connect(broker_address)


while True:
    # Simulate environmental data (replace with actual sensor readings)
    temperature = random.uniform(20, 30)

    humidity = random.uniform(40, 60)

    data = {"temperature": temperature, "humidity": humidity}


    # Publish data to the MQTT topic
    client.publish(topic, json.dumps(data))


    print(f"Published: {data}")
```

```python
    time.sleep(5)  # Adjust the interval as needed


# Don't forget to handle exceptions, authentication, and actual sensor data


# To run this script, you'll need the paho-mqtt library:

# pip install paho-mqtt
```