Phase 3

Document submission

Project title: Smart Public Restroom

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IoT-enabled Smart Public Restrooms System

*Introduction

Public restrooms are an essential part of any community, but they are often neglected and poorly maintained. This can lead to unsanitary conditions and a poor user experience. IoT-enabled smart public restrooms systems can help to address these challenges by using sensors to collect data on restroom occupancy, cleanliness, and other factors. This data can then be used to improve restroom maintenance, reduce costs, and improve the user experience.

*Objective

The objective of this project is to develop and deploy an IoT-enabled smart public restrooms system. The system

will use sensors to collect data on restroom occupancy, cleanliness, and other factors. This data will then be used to improve restroom maintenance, reduce costs, and improve the user experience.

Sensors Used

The following sensors will be used in the system:

* Occupancy sensors: These sensors will be used to detect when someone is in a restroom stall. This data can be used to determine how often restrooms are used and to identify unused restrooms that can be closed to save energy and resources.

* Cleanliness sensors: These sensors will be used to detect the level of cleanliness in a restroom stall. This data can be used to identify restrooms that need to be cleaned and to track the effectiveness of cleaning efforts.

*Other sensors: Other sensors, such as temperature sensors and humidity sensors, may also be used to collect additional data about the restroom environment.

*IoT Python Script

The following Python script can be used to send real-time occupancy and cleanliness data from the IoT sensors to the restroom information platform:

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

# Define the MQTT broker connection parameters
broker_host = "localhost"
broker_port = 1883

# Create an MQTT client
client = mqtt.Client()
```

```python
# Connect to the MQTT broker
client.connect(broker_host, broker_port)


# Subscribe to the topic where the occupancy and
# cleanliness data will be published
client.subscribe("restroom/occupancy_cleanliness")


# Define a callback function that will be called when a
# message is received on the subscribed topic
def on_message(client, userdata, msg):
    # Get the occupancy and cleanliness data from the
    # message
    occupancy = msg.payload.decode("utf-8").split(",")[0]
    cleanliness = msg.payload.decode("utf-8").split(",")[1]

    # Send the occupancy and cleanliness data to the
    # restroom information platform
    # ...
```

Start a loop to listen for messages on the subscribed topic

```
client.loop_forever()
```

This script will connect to the MQTT broker and subscribe to the topic where the occupancy and cleanliness data will be published. When a message is received on the subscribed topic, the callback function will be called. The callback function will get the occupancy and cleanliness data from the message and send it to the restroom information platform.

The restroom information platform can be any platform that can receive and store data from IoT sensors. This platform can be used to develop a variety of applications, such as a mobile app that allows users to see the status of public restrooms in their area or a web dashboard that allows restroom managers to track restroom usage and cleanliness.

*Deployment

The IoT sensors can be deployed in public restrooms using a variety of methods. For example, the sensors could be mounted on the walls or ceilings of restrooms, or they could be integrated into restroom fixtures, such as toilet seats and urinals.

The IoT sensors will need to be connected to a power source and to a network connection. The power source can be a battery or a wall outlet. The network connection can be a cellular connection or a Wi-Fi connection.

Once the IoT sensors are deployed, they will start collecting data on restroom occupancy, cleanliness, and other factors. This data will be sent to the restroom information platform in real time.

*Conclusion

IoT-enabled smart public restrooms systems can help to improve the cleanliness, efficiency, and user experience of public restrooms. By using sensors to collect data on restroom occupancy, cleanliness, and other factors, these systems can help to identify restrooms that need to be cleaned, track the effectiveness of cleaning efforts, and reduce costs.

Thank you