IOT Phase 3

Problem Statement:

Public restrooms often face issues related to cleanliness and availability. To address this problem, we aim to install IoT sensors in public restrooms to monitor occupancy and maintenance needs. Data on restroom availability and cleanliness will be made available to the public through a platform or mobile app. Object detection sensors will be used to detect restroom occupancy, while additional hygiene-checking sensors like ammonia sensors. Data collected by these sensors will be sent to the cloud using the ESP8266 module on an Arduino board. This information will be used to schedule maintenance tasks and monitor restroom availability.

Objective:

The objective of this project is to create a comprehensive IoT sensor system that can monitor public restroom occupancy and cleanliness. This system will provide real-time data on a mobile app, allowing both the users and maintenance staff to access crucial information. The main goals are:

- To accurately monitor the occupancy of public restrooms using object detection sensors.
- To assess the cleanliness of restrooms through an Ammonia Sensor
- To transmit data to the cloud in real-time using the ESP8266 module
- To provide public access to restroom availability and cleanliness information via a platform or mobile app.
- To enable maintenance teams to schedule and prioritize restroom maintenance tasks based on real-time data.

Hardware used:

- Arduino board (for data collection and processing)
- ESP8266 module (for cloud connectivity)
- IR Sensor
- Ammonia Sensor

- Power supply (battery or mains)
- Enclosure for the IoT hardware
- Internet connectivity (Wi-Fi or other suitable options)
- Mobile app for data visualization

Python script:

```
from cvzone.SerialModule import SerialObject

# Initialize the Arduino SerialObject to establish connection to arduino with optional parameters
# baudRate = 9600, digits = 1, max_retries = 5
board = SerialObject(portNo='COM7', baudRate=9600, digits=1, max_retries=5)

#Initialize boolean variables to indicate occupancy and maintenance
#This boolean variable is sent to arduino in order to make sensors indicate occupancy and maintenance
occupancyFlag = [0]
maintainFlag = [0]

while True:
    #Read sensor values from arduino which is sent as an array
    sensorValues = board.getData()
    ammoniaLevels = sensorValues[0]
    occupancyState = sensorValues[1]

    #if the stall is occupied and the toilet has to be cleaned
    if ammoniaLevels > 200 and occupancyState < 100:
        occupancyFlag = [1]
        maintainFlag = [1]

    #if the stall is not occupied and the toilet has to be cleaned
    elif ammoniaLevels < 200 and occupancyState < 100:
        occupancyFlag = [0]
        maintainFlag = [1]
```

```
#if the stall is occupied and the toilet is clean
elif ammoniaLevels > 200 and occupancyState > 100:
   occupancyFlag = [1]
   maintainFlag = [0]

#if the stall is not occupied and the toilet is not clean
else:
   occupancyFlag = [0]
   maintainFlag = [0]

#Sending boolean variables to arduino indicate through sensors
board.sendData([occupancyFlag, maintainFlag])
```