# PROJECT

Building a smart public restroom using IoT involves various components and technologies. Below, I'll provide you with a high-level Python code example for a simplified smart public restroom system. Keep in mind that this is a basic example, and a real-world implementation would require more robust hardware, sensors, and a backend system for managing data.

# Innovation:

Smart public restrooms can greatly enhance user experience and hygiene. Here are some innovative ideas

Automated Cleaning: Incorporate sensors and

robotics to automatically clean and disinfect

restroom fixtures and floors, reducing the need for

human intervention.

Touchless Fixtures: Use touchless faucets, soap dispensers, and flush mechanisms to minimize germ transmission.

Energy Efficiency: Utilize smart lighting and HVAC systems that adjust based on occupancy to save energy

# Requirements:

The Components that are required are:

1. Raspberry Pi (or any other IoT device)
2. Sensors (e.g., occupancy sensor, door sensor, ultrasonic sensor)
3. IoT Platform (e.g., ThingSpeak for data visualization)
4. Actuators (e.g., LED lights, fans)
5. Relay module for controlling actuators
6. Internet connectivity

# PROJECT OBJECTIVE

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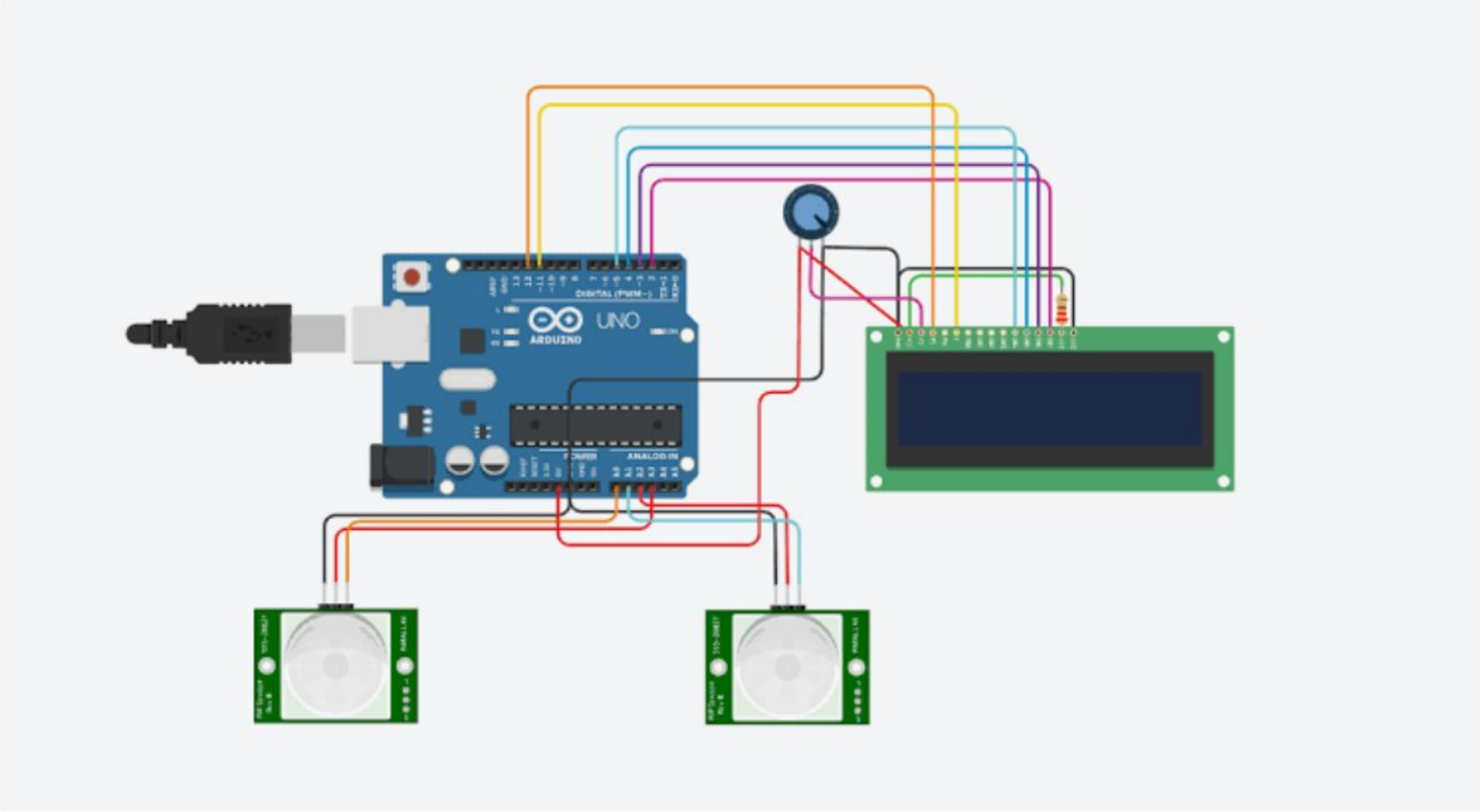
- Below, I'll provide you with a high level Python code example for a simplified smart public restroom system.
- Keep in mind that this is a basic example, and real-world implementation would require more robust hardware, sensors, and a backend system for managing data.
- Now a days the smart Restroom is essential More in Hitech city and more are comfortable with this.

# RASPBERRY PI INTEGRATION:

- Our proposed system is a smart
- monitoring system designed to monitor the hygiene of public toilets. Unhygienic toilets can be detected by different parameters such as water levels, and various gases evolved, humidity. temperature etc. Ammonia gas is the most dominant gas that can be sensed in an unhygienic toilet. We will be using the MQ-135 gas sensor the determine the amount of ammonia present in the room

# Arduino integration :



# PLATFORM REQUIRED:

- **Data analysis platform:** Through the data collected by smart gateways and smart controllers, a data analysis platform is established to analyze and process public toilet usage data, sanitation data, and energy consumption data, providing city managers with more scientific decision-making basis.

- **Intelligent management:** Through the intelligent gateway and intelligent controller, realize the intelligent management of public toilets, including real-time monitoring, remote control, real-time data analysis of public toilets, etc., to improve the management efficiency and service quality of public toilets.

# WEB DEVELOPMENT TECHNOLOGIES:

- **Front-End:** You can use HTML, CSS, and JavaScript for creating a web based dashboard or user interface. Frameworks like React, Angular, or Vue.js can simplify the development process
- **Back-End:** You might need a server to handle data processing, user authentication, and other backend functionalities. You can use Node.js, Python, Ruby, or any other server side technology.
- **Databases:** Use databases (e.g., MySQL, PostgreSQL, MongoDB) to store and retrieve data.
- **APIs:** Create APIs to connect the front-end and back-end. RESTful or GraphQL APIs are common choices.

# code implementation:

- Hardware Components:
- Wi-Fi Module (for internet connectivity) Power Supply 00000
- Raspberry Pi (or similar single-board computer)
- Water Flow Sensor
- Solenoid Valve (for controlling water flow)
- Software Components:
- Python (for programming) MQTT (for communication)
  - cloud server (for data storage and remote control)

## PYTHON CODE

```
import RPi.GPIO as GPIO
import time
import requests

# Set up GPIO pins
OCCUPANCY_SENSOR_PIN = 18
DOOR_SENSOR_PIN = 23
ULTRASONIC_TRIGGER_PIN = 24
ULTRASONIC_ECHO_PIN = 25

GPIO.setmode(GPIO.BCM)
GPIO.setup(OCCUPANCY_SENSOR_PIN, GPIO.IN)
GPIO.setup(DOOR_SENSOR_PIN, GPIO.IN)
GPIO.setup(ULTRASONIC_TRIGGER_PIN, GPIO.OUT)
GPIO.setup(ULTRASONIC_ECHO_PIN, GPIO.IN)
```

```
# Function to read ultrasonic sensor
def read_ultrasonic_sensor():
    GPIO.output(ULTRASONIC_TRIGGER_PIN, True)
    time.sleep(0.00001)
    GPIO.output(ULTRASONIC_TRIGGER_PIN, False)
    pulse_start_time = time.time()
    pulse_end_time = time.time()

    while GPIO.input(ULTRASONIC_ECHO_PIN) == 0:
        pulse_start_time = time.time()

    while GPIO.input(ULTRASONIC_ECHO_PIN) == 1:
        pulse_end_time = time.time()

    pulse_duration = pulse_end_time - pulse_start_time
    distance = (pulse_duration * 34300) / 2  # Speed of sound = 34300 cm/s
    return distance
```

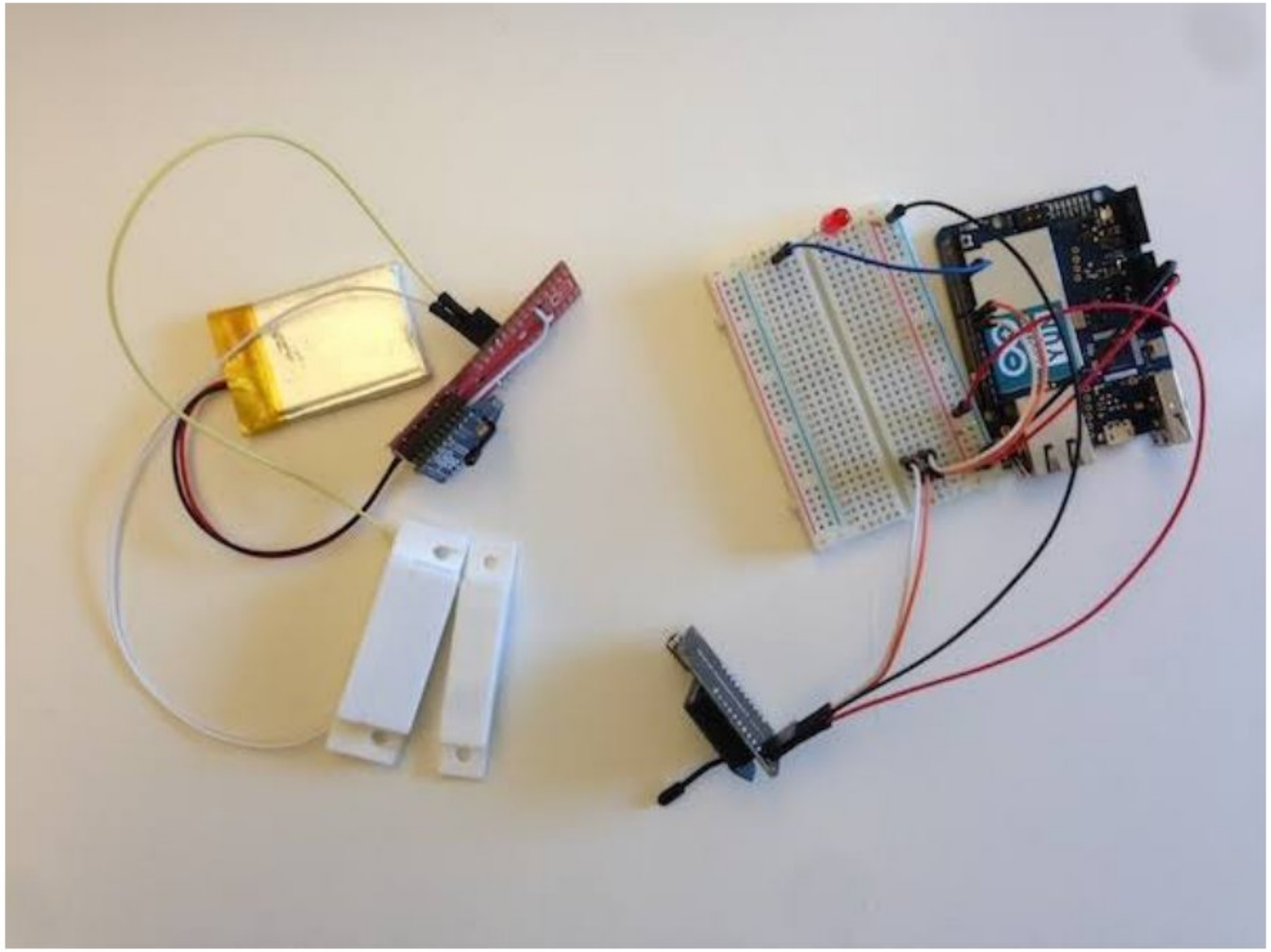
```
pulse_duration = pulse_end_time - pulse_start_time
    distance = (pulse_duration * 34300) / 2  # Speed of sound =
34300 cm/s
    return distance

# Function to send data to IoT platform
def send_data_to_iot(occupancy, door_status, distance):
    url = "https://api.thingspeak.com/update"
    params = {
        "api_key": "YOUR_API_KEY",
        "field1": occupancy,
        "field2": door_status,
        "field3": distance
    }
    response = requests.get(url, params=params)
    print("Data sent to IoT platform:", response.text)
try:
    while True:
        occupancy = GPIO.input(OCCUPANCY_SENSOR_PIN)
        door_status = GPIO.input(DOOR_SENSOR_PIN)
        distance = read_ultrasonic_sensor()
```

```
 # Control actuators based on sensor data
        # For example, turn on lights and fans when occupancy is detected
        if occupancy == 1:
            # Activate actuators
            GPIO.output(LED_PIN, GPIO.HIGH)
            GPIO.output(FAN_PIN, GPIO.HIGH)
        else:
            # Deactivate actuators
            GPIO.output(LED_PIN, GPIO.LOW)
            GPIO.output(FAN_PIN, GPIO.LOW)

        # Send data to the IoT platform
        send_data_to_iot(occupancy, door_status, distance)

        time.sleep(5)  # Update data every 5 seconds

except KeyboardInterrupt:
    GPIO.cleanup()
```

# Smart Public Toilets Making Public toilet smart and hygienic:

- **USER COUNTER:** The requirement is that sensor that can be mount on the head(top) of the door to count the user with reasonable accuracy.Also,it should be rigid enough to protect from vandalism.when a person passes beneath the PIR sensor which will be mounted on the head(top)of the Toilet it detects the motion of the person This gives a high pulse at the output.This pulse will remain High for a specific timeout and then become low for a certain time nad become ready again to detect another motion.

- So, when motion is detected output goes HIGH for 2.7 – 2.9 seconds (approx.) and becomes LOW. Now, its output will not have LOW for the guaranteed period and will become ready to detect motion.



# Smart Public Restroom

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## SMART PUBLIC RESTROOM

A smart public restroom is a modern and technologically enhanced public bathroom designed to provide a more convenient and hygienic experience for users. These restrooms often incorporate touchless fixtures such as automatic faucets and hand dryers, reducing the need for physical contact and minimizing the spread of germs. They also utilize occupancy sensors to inform users of restroom availability in real time, reducing wait times and enhancing overall convenience. Smart public restrooms are not only user-focused but also resource-efficient, featuring energy-saving lighting and water-conserving fixtures. They play a crucial role in promoting cleanliness, accessibility, and sustainability in public spaces, contributing to a positive user experience and environmental conservation.

In addition to user-centric benefits, smart public restrooms often include features like accessibility for individuals with disabilities, surveillance cameras for security, and data-driven maintenance to ensure a clean and safe environment. This combination of technology and thoughtful design makes smart public restrooms a valuable addition to public areas, improving overall hygiene and user satisfaction while helping to conserve resources and promote inclusivity.

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# CONCLUSION

Smart restroom technology is transforming the way we experience public and private restrooms. With features like occupancy sensors, oder detection, and supply level monitoring, smart restrooms enhance hygiene, efficiency, and user satisfaction. The implementation of smart restroom management systems and monitoring systems streamlines operations, optimizes resource allocation, and ensures a safe and pleasant restroom experience.

As technology continues to evolve, the future of smart restrooms looks promising, with AI-powered systems, voice-activated controls, and blockchain-based solutions on the horizon. By embracing these advancements, facilities can create smart restrooms that meet the ever-changing needs and expectations of users.

# THANK YOU