VELAMMAL
INSTITUTE OF TECHNOLOGY

Approved by AICTE - New Delhi
Affiliated to Anna University - Chennai
Accredited by NBA & NAAC

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Project name : Smart India Restroom

Team name : Proj_224780_Team_2
Team members :
MOHITHA LAKSHMI N S (113321104062)
MONIKA D (113321104063)
NAGALAKSHMI M (113321104064)
NAIDU K SUJITHA S KUMAR (113321104065)

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:

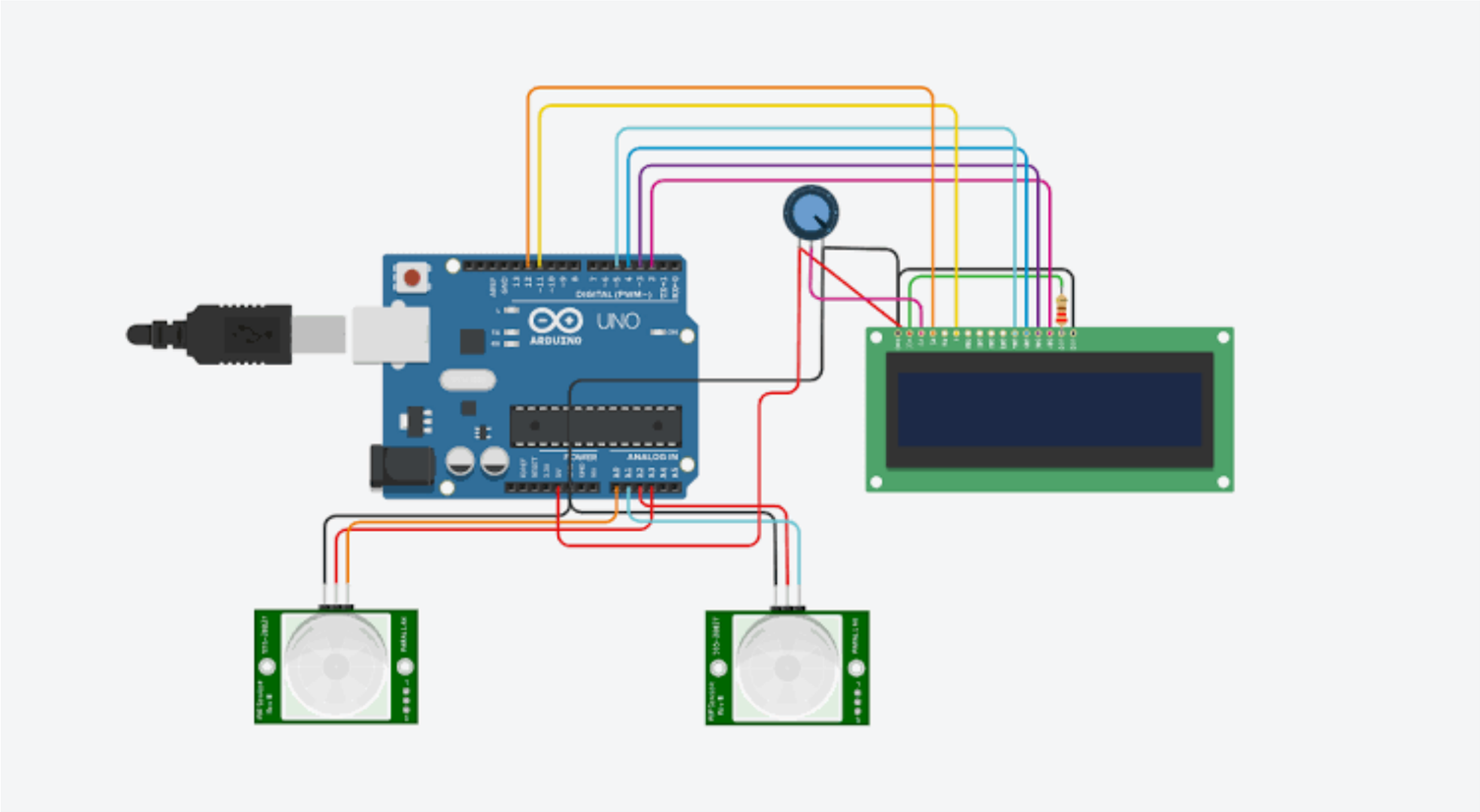
The Components that are required are:

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

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 :



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()
```

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