SMART PUBLIC TOILET USING IOT- [CHLORINE DETECTION, AUTOMATIC DOOR OPENING, FLOOR CLEAN SENSORS]

INTRODUCTION:

- Public toilets are an essential part of our urban infrastructure, providing a fundamental service for communities and travelers. However, the quality, cleanliness, and accessibility of public toilets have often been a topic of concern. In response to these challenges, the integration of Internet of Things (IoT) technology has ushered in a new era of smart public toilets, addressing these issues in innovative ways.

- This document explores the concept of "Smart Public Toilets Using IoT," with a focus on three vital components: Chlorine Detection, Automatic Door Opening, and Floor Clean Sensors. These integrated systems leverage the power of IoT to enhance the sanitation, accessibility, and user experience of public toilet facilities.

- In this era of smart cities and connected infrastructure, smart public toilets represent a significant step forward in delivering improved public services. The integration of IoT technology allows these facilities to adapt, respond to user needs, and maintain high standards of hygiene and safety. The following sections will delve into each component, explaining their importance and real-world applications, and highlighting how they collectively contribute to the development of cleaner, smarter, and more accessible public toilets.

OBJECTIVES:

The objective of this document is to provide a comprehensive understanding of the concept and implementation of "Smart Public Toilets Using IOT," with a specific focus on Chlorine Detection, Automatic Door Opening, and Floor Clean Sensors. The key objectives are as follows:

1. To explore the significance and role of IOT technology in enhancing the quality and functionality of public toilets.

2. To examine the specific components of Chlorine Detection, Automatic Door Opening, and Floor Clean Sensors, and understand their importance in maintaining cleanliness, accessibility, and hygiene in public restrooms.

3. To showcase real-world applications and benefits of integrating IoT technology into public toilet facilities, including improvements in water quality, user experience, and sanitation.

4. To highlight the positive impact of Smart Public Toilets on public health, user satisfaction, and urban infrastructure efficiency.

5. To provide insights into emerging trends and innovations in IoT technology for public sanitation and hygiene, offering a glimpse into the future of connected urban infrastructure.

By addressing these objectives, this document aims to shed light on the transformative potential of IoT in enhancing public services and contributing to cleaner, smarter, and more accessible cities.

1.CHLORINE DETECTION:

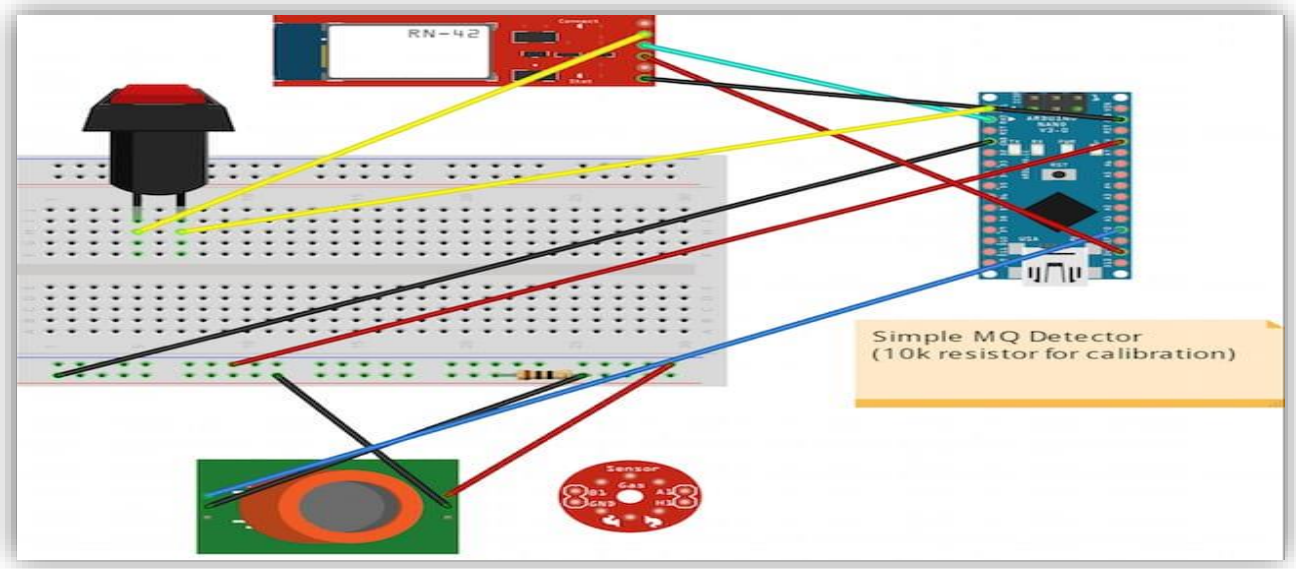
- ***Sensors*:** IoT-enabled chlorine sensors are placed within the toilet's water supply system. These sensors continuously monitor the chlorine concentration in the water used for flushing and cleaning within the toilet.

- ***Data Collection*:** Data from the chlorine sensors is collected and transmitted to a central IoT platform via wireless communication protocols (e.g., Wi-Fi or cellular).

- ***Real-time Monitoring*:** The IoT platform analyzes the data in real-time to ensure that the chlorine concentration in the toilet's water supply remains within safe and optimal levels for disinfection.

- ***Alerts and Control*:** If the chlorine concentration falls below or exceeds the predefined thresholds, the IoT system can trigger alerts for maintenance staff and, in some cases, automatically adjust chlorine levels using dosing equipment.

CIRCUIT DIAGRAM:



SMAPLE CODE:

```
import RPi.GPIO as GPIO
import time
CHLORINE_SENSOR_PIN = 17
GPIO.setmode(GPIO.BCM)
GPIO.setup(CHLORINE_SENSOR_PIN, GPIO.IN)
try:
    while True:
        chlorine_level = GPIO.input(CHLORINE_SENSOR_PIN)
        if chlorine_level == 1:
            print("Chlorine detected. Alert or action required.")
        else:
```

```
            print("No chlorine detected. The area is safe.")
        time.sleep(5);
except KeyboardInterrupt:
    GPIO.cleanup();
```

2. AUTOMATIC DOOR OPENING:

- Automatic door opening systems powered by IoT are reshaping the way we interact with physical spaces. These smart solutions use a range of sensors and connected devices to detect the presence of individuals and provide seamless, touchless access. In this document, we delve into the integration of IoT in automatic door opening, exploring its applications, benefits, and the impact it has on accessibility, convenience, and hygiene in various settings.

- *Sensors*: Smart public toilets are equipped with motion sensors such as Passive Infrared (PIR), Ultrasonic, or Microwave sensors. These sensors detect the presence of individuals approaching the toilet door.

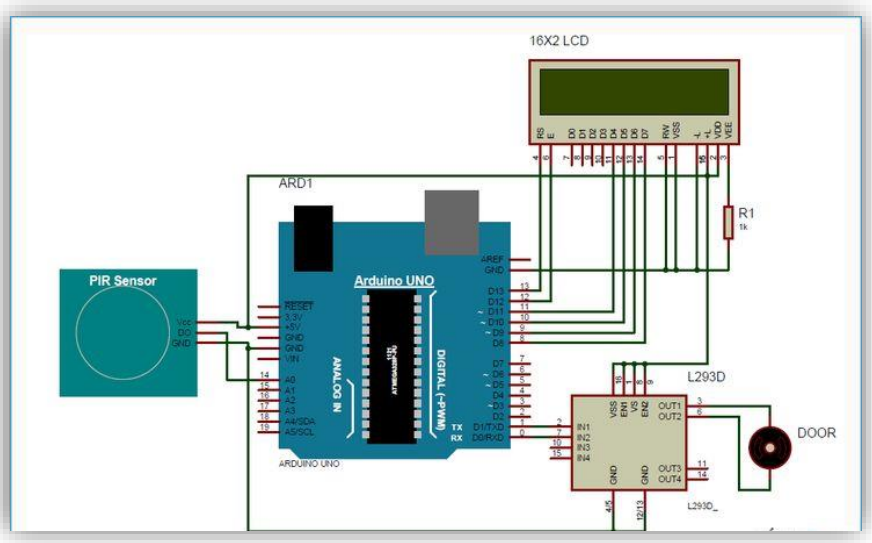
- *Data Collection*: Data from these sensors is transmitted to the IoT platform, which processes this information.

- *User Detection*: When an individual approaches the toilet facility, the IoT system processes the sensor data and identifies their presence.

- *Door Automation*: The system triggers the automatic door opening mechanism, which can involve motorized doors, sliding doors, or other automated mechanisms.

- *User-friendly Operation*: To ensure user safety, the system also includes safety sensors to prevent the door from closing when a person is in its path.

CIRCUIT DIAGRAM:



SAMPLE CODE:

```
import RPi.GPIO as GPIO
import time
PIR_SENSOR_PIN = 17
SERVO_PIN = 18
GPIO.setmode(GPIO.BCM)
GPIO.setup(PIR_SENSOR_PIN, GPIO.IN)
GPIO.setup(SERVO_PIN, GPIO.OUT)
servo = GPIO.PWM(SERVO_PIN, 50)
servo.start(0)
def open_door():
    servo.ChangeDutyCycle(7.5)
```

```
    time.sleep(2)
    servo.ChangeDutyCycle(2.5)
try:
    while True:
        if GPIO.input(PIR_SENSOR_PIN):
            print("Motion detected. Opening the door.")
            open_door()
        time.sleep(1)
except KeyboardInterrupt:
    servo.stop()
    GPIO.cleanup()
```

3. FLOOR CLEAN DETECTION:

- *Sensors*: Floor clean sensors, which can be optical, capacitive, or other suitable technologies, are installed on the toilet floor or integrated into cleaning equipment.

- *Data Collection*: These sensors continuously monitor the cleanliness of the floor. Data is sent to the IoT platform for analysis.

- ***Cleanliness Assessment*:** The IoT system assesses the cleanliness level based on the data received. It may look for signs of dirt, debris, or liquid spills.

- *Maintenance Alerts*: When the system detects that the floor is dirty or requires cleaning, it triggers maintenance alerts.

- *Cleaning Automation*: In some advanced systems, IoT can control cleaning equipment, such as robotic vacuum cleaners or automated mopping systems, to clean the floor as needed.

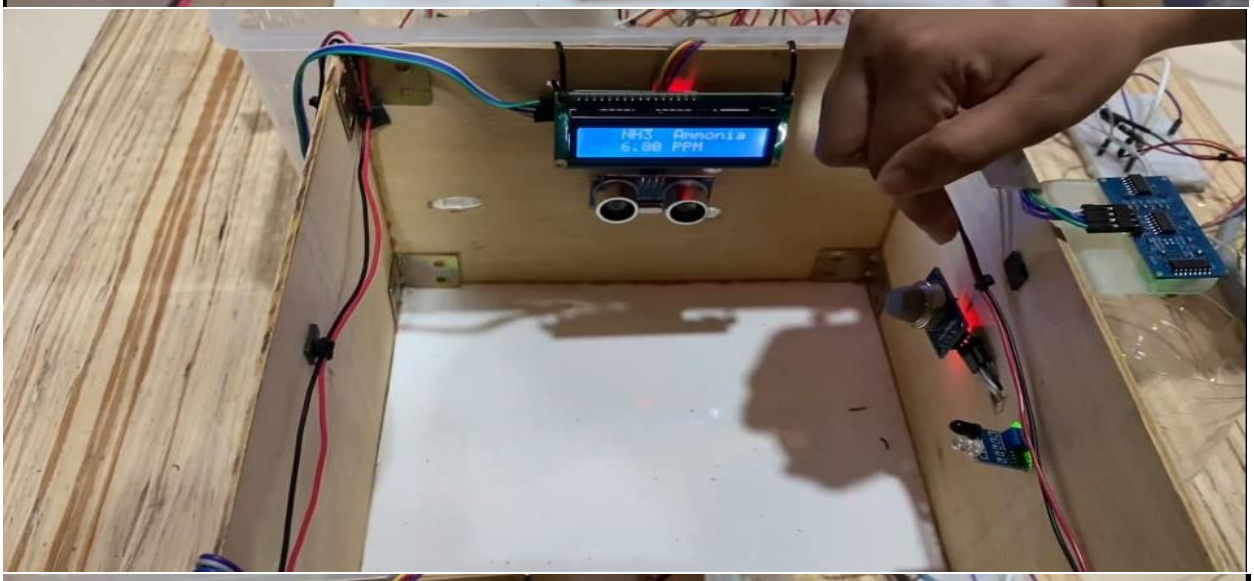
SMAPLE CODE:

```
import RPi.GPIO as GPIO
import time
DUST_SENSOR_PIN = 17
GPIO.setmode(GPIO.BCM)
GPIO.setup(DUST_SENSOR_PIN, GPIO.IN)
def is_clean():
    dust_level = GPIO.input(DUST_SENSOR_PIN)
    return dust_level == 0  sensor
try:
    while True:
        if is_clean():
            print("The floor is clean.")
        else:
            print("The floor is dirty. Cleaning required.")
        time.sleep(5)
except KeyboardInterrupt:
    GPIO.cleanup()
```

- In this era of smart cities and connected infrastructure, smart public toilets represent a significant step forward in delivering improved public services. The integration of IoT technology allows these facilities to adapt, respond to user needs, and maintain high standards of hygiene and safety.

OUR BUILTED PROJECT:


NH3 Ammonia
6.04 PPM


NH3 Ammonia
6.00 PPM

By combining these three IoT components, a Smart Public Toilet can offer several benefits, including improved water quality through real-time chlorine monitoring, enhanced user experience with automatic door opening, and better sanitation with continuous floor cleanliness assessment. This interconnected system ensures that public toilets remain clean, accessible, and safe, contributing to the overall well-being of users and the community.

CONCLUSION:

In the age of smart cities and advanced technology, the integration of IoT in public infrastructure is transforming the way we approach sanitation and public services. The Smart Public Toilet, equipped with Chlorine Detection, Automatic Door Opening, and Floor Clean Sensors, represents a significant step forward in delivering cleaner, more accessible, and safer public facilities.

Chlorine Detection using IoT ensures that water quality remains at optimal levels for disinfection and hygiene. By continuously monitoring chlorine concentrations, potential issues are detected in real-time, allowing for swift corrective action and providing safe and clean water resources for users.

Automatic Door Opening, facilitated by IoT sensors, enhances accessibility and convenience for individuals using public restrooms. The touchless, automated entry mechanism not only improves the overall user experience but also contributes to maintaining a hygienic and sanitary environment.

Floor Clean Sensors, integrated into the Smart Public Toilet, continuously assess the cleanliness of the restroom floor. By automating cleaning processes in response to real-time data, these sensors contribute to a consistently clean and safe environment.

The seamless integration of these IoT components has not only improved the quality of public restrooms but also addresses long-standing challenges related to cleanliness, accessibility, and sanitation. Smart Public Toilets are a testament to the power of technology in enhancing public services, prioritizing the well-being of communities, and providing a glimpse into the future of connected, efficient, and user-friendly urban infrastructure. As technology continues to advance, we can expect even more innovative solutions to improve the quality of public services in the cities of tomorrow.