

| TEAM MEMBERS | NAAN MUDHALVAN ID |
|---------------------|--------------------------|
| Gowtham M | au311521106030 |
| Dhasvan S | au311521106025 |
| Mohammed Saif A | au311521106303 |
| Anush M N | au311521106008 |

CONTENTS:

- 1.Objective**
 - 2.Introduction for Smart public restroom using IOT**
 - 3.Modules**
 - 4. Architecture of the proposed system**
 - 5.Circuit Diagram**
 - 6.Components Description**
 - 7.Arduino code**
 - 8.Circuit Simulation in Tinker**
 - 9.Introduction for smart restroom Web development**
 - 10.Web code**
 - 11.Smart restroom website**
 - 12.Website Demonstration**
 - 13.Conclusion**
- OBJECTIVE:**

In this paper, we will explore the fascinating world of smart public restrooms using IoT technology. We will delve into the components that make these restrooms "smart," their impact on

resource management, hygiene, and accessibility, and the challenges and considerations involved in implementing this technology. The potential of IoT-powered public restrooms goes beyond just the convenience of users; it extends to cost savings, reduced environmental impact, and a vision of more inclusive, accessible facilities for all users.

INTRODUCTION FOR SMART PUBLIC RESTROOM USING IOT:

The Internet of Things (IoT) has emerged as a powerful force of change, connecting everyday objects and devices to the internet and enabling them to communicate and exchange data seamlessly. One of the most exciting and impactful applications of IoT technology is the creation of "Smart Public Restrooms."

- 1.** Public restrooms play an essential role in our daily lives, providing a necessary service that directly impacts our comfort, convenience, and hygiene.
- 2.** However, traditional public restrooms often face issues such as cleanliness, resource management, and accessibility, leaving room for improvement. This is where IoT steps in, offering innovative solutions to address these challenges and elevate the public restroom experience to a new level of sophistication and efficiency.
- 3.** A smart public restroom, powered by IoT, is not just a futuristic concept anymore; it's a reality that is gradually reshaping our urban landscapes. By integrating sensors, data analytics, and automation, these restrooms can offer a range of benefits that

make the entire experience more user-friendly, sustainable, and sanitary.

MODULES:

1. Occupancy sensors: Occupancy sensors can be used to detect when a restroom is occupied and turn on lights and ventilation systems accordingly. This can help to save energy and reduce costs.

2. Dirt and odor sensors: Dirt and odor sensors can be used to detect when restrooms need to be cleaned. This information can be sent to maintenance staff so that they can clean the restrooms quickly and efficiently.

3. Water flow sensors: Water flow sensors can be used to detect leaks in plumbing fixtures. This information can be sent to maintenance staff so that they can repair the leaks before they cause water damage.

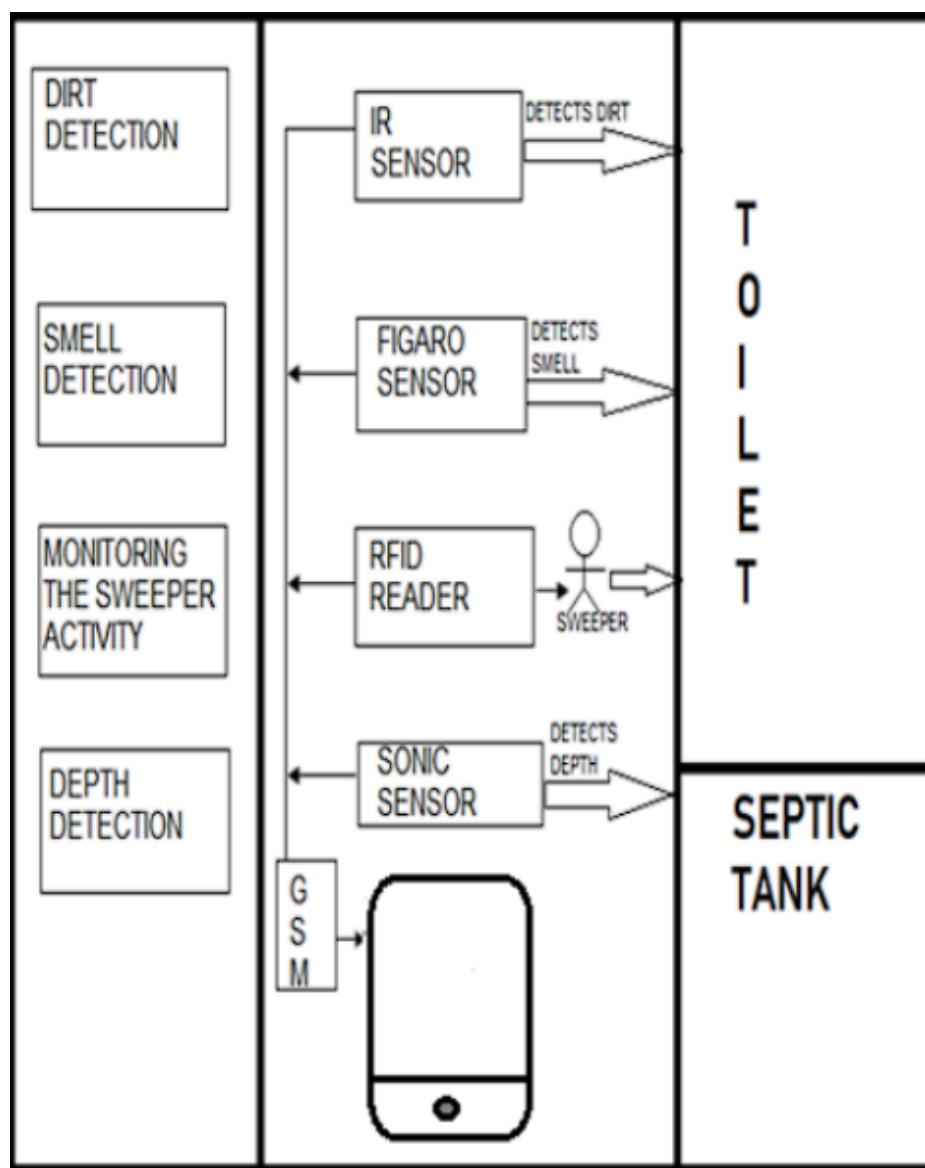
4. User feedback systems: User feedback systems can be used to collect feedback from users on the cleanliness and condition of restrooms. This feedback can be used to improve restroom maintenance and make restrooms more user-friendly.

5. Asset tracking: Asset tracking modules can be used to track the location and condition of restroom supplies, such as soap dispensers, paper towel dispensers, and toilet paper rolls. This information can be used to ensure that restroom supplies are always available and to reduce the risk of theft.

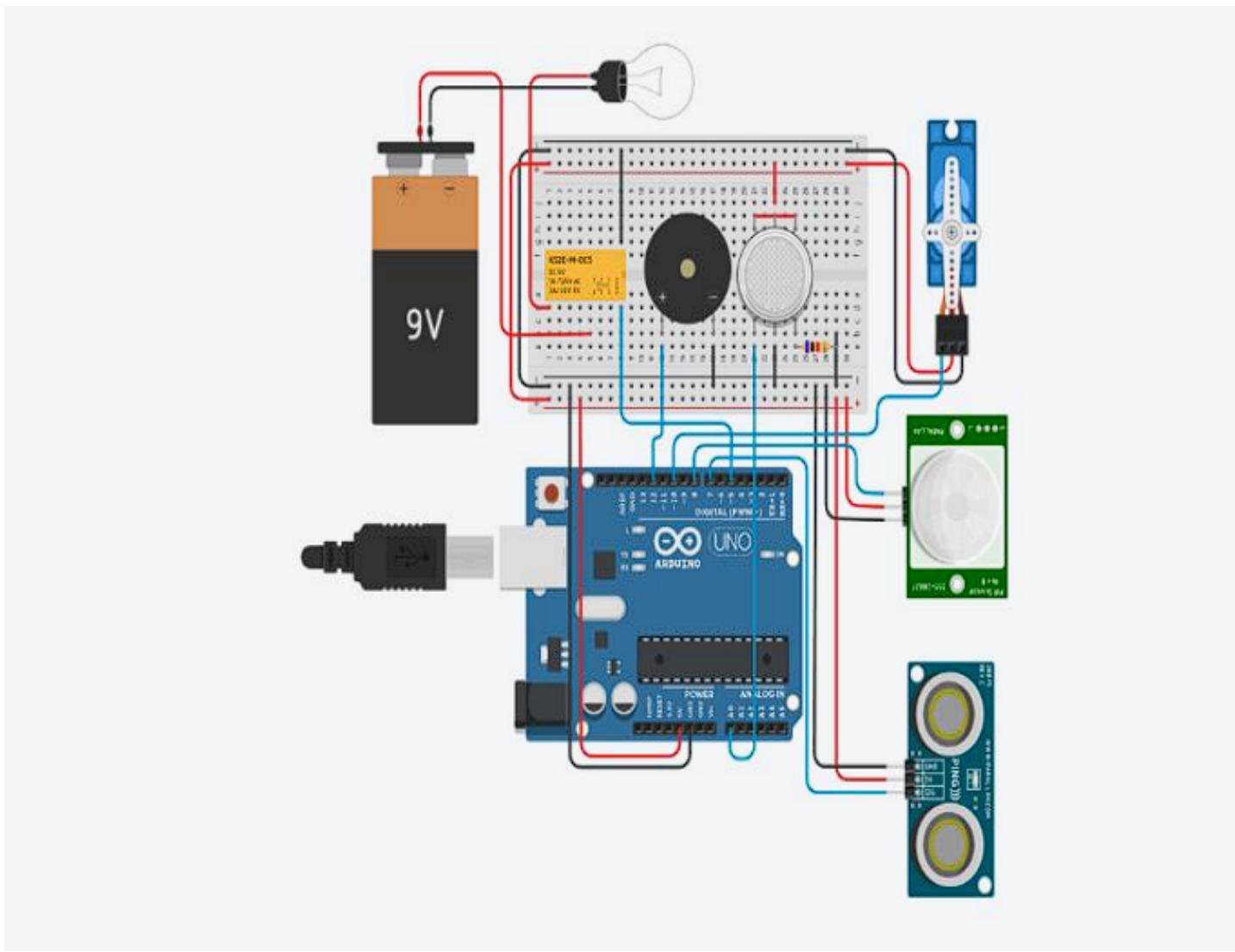
6. Data analytics: This modules can be used to collect and analyze data from the various sensors in the smart public restroom. This data can be used to identify trends, patterns, and potential problems. For example, data analytics modules can be used to identify restrooms that are frequently

dirty or to identify restrooms that are experiencing an increase in water usage.

ARCHITECTURE OF THE PROPOSED SYSTEM:



CIRCUIT DIAGRAM:



HARDWARE COMPONENTS DESCRIPTION:

1.ULTRASONIC SENSOR:

Ultrasonic sensors are electronic devices that calculate the target's distance by emission of ultrasonic sound waves and convert those waves into electrical signals. • The speed of emitted ultrasonic waves traveling speed is faster than the audible sound. • To know the distance between the target and the sensor, the sensor calculates the amount of time required for sound emission to travel from transmitter to receiver.



2.MICRO SERVO MOTOR:

A servo motor is a type of electric motor that can rotate or move to a specific position, speed, or torque based on an input signal from a controller • .A servo motor consists of three main components: motor ,sensor ,controller • A setpoint signal: This is an analog or digital signal that represents the desired position, speed, or torque of the output shaft. • A feedback signal: This is an analog or digital signal that represents the actual position, speed, or torque of the output shaft measured by the sensor.



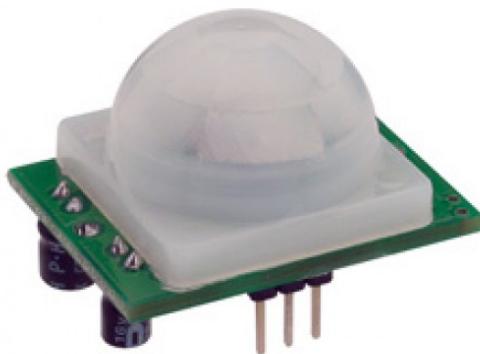
3.BUZZER:

A buzzer is an electronic device that produces a sound when powered by a direct current (DC) voltage, it is commonly used in alarms, timers, computers, and other devices that need to make a sound signal. • In IoT (Internet of Things), a buzzer can be used as an output device to indicate the status of a sensor, a device, or a system.



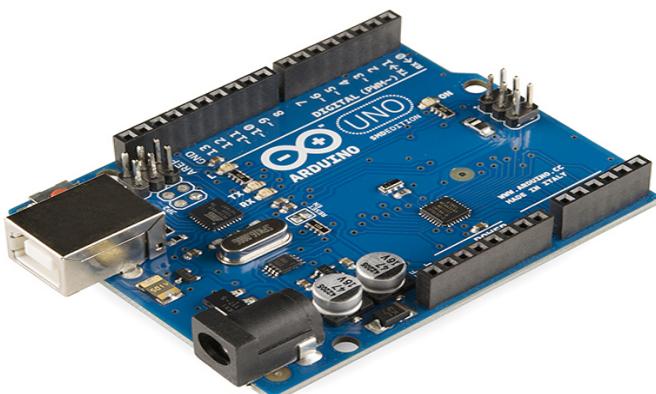
4.PIR SENSOR

A PIR is an electronic sensor which detects the changes in the infrared light across certain distance and gives out an electrical signal at its output in response to a detected IR signal. • It can detect any infrared emitting object such as human beings or animals if it is in the range of the sensor, or moves away from the range, or moves within the range of the sensor.



5.ARDUINO UNO: •

Arduino Uno is a popular open-source microcontroller board that can be used for various projects involving electronics, robotics, sensors, etc. It is a microcontroller board based on the ATmega328P (datasheet). • It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53- R0), a USB connection, a power jack, an ICSP header and a reset button. • It contains everything needed to support the microcontroller. Simply connect it to a computer with a USB cable or power it with a ACto-DC adapter or battery. • You can program the Arduino Uno using the Arduino Software (IDE), which is an integrated development environment that supports both online and offline platforms



6.BATTERY : •

9-volt batteries are electric batteries that supply a nominal voltage of 9 volts and are used in various devices like cameras, toys, smoke detectors, and more. • They have different sizes, capacities, and chemistries, and a common size is PP3. Some 9-volt batteries have a tough outer metallic casing, different terminal shapes, and no mercury inside, such as the Energizer 9V alkaline.



ARDUINO CODE:

```
#include <Servo.h>
intULT = 7;
intPIR = 8;
intBUZZ = 12;
intGAS = A0;
intBULB = 5;
intJARAKU = 0;
intKADARG = 0;
intJARAKP = 0;
intpin = 10;
ServoSERV;
longbacaULT(intpin)
{
pinMode(pin, OUTPUT);
digitalWrite(pin, LOW);
delayMicroseconds(2);
digitalWrite(pin, HIGH);
delayMicroseconds(10);
digitalWrite(pin, LOW);
pinMode(pin, INPUT);
returnpulseIn(pin, HIGH);
}
voidsetup()
{
pinMode(ULT, INPUT);
pinMode(PIR, INPUT);
pinMode(GAS, INPUT);
pinMode(BUZZ, OUTPUT);
pinMode(BULB, OUTPUT);
SERV.attach(pin);
Serial.begin(9600);
```

```
}

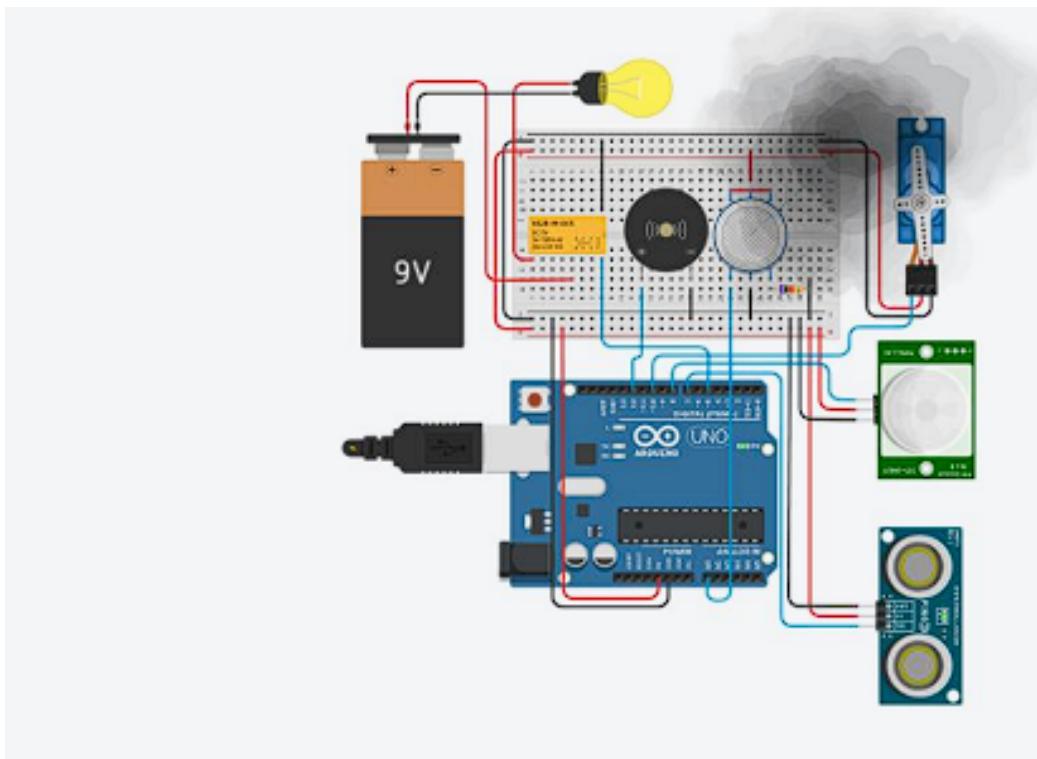
void loop()
{
JARAKU = 0.01723*bacaULT(ULT);
KADARG = analogRead(GAS);
JARAKP = digitalRead(PIR);

if (JARAKU<=120)
{
digitalWrite(BULB,HIGH);
Serial.print("\nULT : Objek Detected! ");
Serial.print(JARAKU,DEC);
Serial.print(" (Lampu Nyala)");
}
else
{
digitalWrite(BULB,LOW);
Serial.print("\nJarak: ");
Serial.print(JARAKU,DEC);
Serial.print(" (Lampu Mati)");
}
//Program Sensor Gas
if (KADARG>=400)
{
tone(BUZZ,500);
Serial.print("\nGAS : Gas Dideteksi! ");
Serial.print(KADARG,DEC);
Serial.print(" (Buzzer Bunyi)");
}
else
{
noTone(BUZZ);
```

```
Serial.print("\nKadar: ");
Serial.print(KADARG,DEC);
Serial.print(" (Buzzer Berhenti)");
}

//Program Sensor PIR
if (JARAKP==HIGH)
{
Serial.print("\nPIR : Objek Bergerak Dideteksi!");
Serial.print(" (Motor Nyala)\n");
SERV.write(180);
delay(1000);
}
else
{
Serial.print("\n(Motor Mati)\n");
SERV.write(0);
delay(300);
}
```

CIRCUIT SIMULATION IN TINKER:



When bad smell is sensed, buzzer creates a sound to notify the cleaners and also it shows the availability of the restrooms.

INTRODUCTION FOR SMART RESTROOM WEB DEVELOPMENT:

Our website is your gateway to a revolution in public restroom experiences, where cutting-edge technology meets cleanliness, convenience, and sustainability. Gone are the days of unpleasant restroom encounters. With our smart public restrooms, we're bringing you a whole new level of comfort and hygiene. Whether you're a traveler on the go, a city dweller on the move, or a business owner seeking innovative solutions, our website is here to introduce you to a world of public restrooms that are as intelligent as they are efficient.

WEB CODE:

1.HTML CODE:

```
<!DOCTYPE html>
<html lang="en">
<head>
<header>
<h1 style="display:block;background-color: rgba(6, 164, 243, 0.943);color:rgb(241, 242, 242);">SMART PUBLIC RESTROOM</h1>
</header>
<nav class="nav-2">
<a href="#data-display" class="nav-1">HOME</a>&ampnbsp;
<a href="#about-section" class="nav-1">ABOUT US </a>
```

```
</nav>
<section id="#data-display">
<h2 style="background-color: rgb(103, 198, 225);color: rgb(243, 239, 239);">INTRODUCTION</h2>

<P>Smart Toilet Management, also known as Smart Washroom Management is a big part of Facilities Management. By deploying simple IoT solutions such as sensors, facility managers can improve operational processes and washroom experience for its tenants. This is especially important as poor toilet hygiene, sanitation and waste disposal spread germs and affects public health.</P>
</section>
<section id="#about-section">
<h3 style="background-color: rgb(108, 196, 221);color: rgb(243, 239, 239);">ABOUT US</h3>
<p>Smart Public Restroom is a pioneer in the field of public restroom management, driven by a passion for improving the quality of life for all. We recognized the need for a modernized approach to public restrooms, addressing concerns of cleanliness, accessibility, and sustainability. Leveraging the capabilities of IoT technology, we've created a network of intelligent public restrooms that set new standards in convenience and hygiene. Our mission is
```

simple but profound: to enhance the public restroom experience, making it a place you can rely on when you're out and about. With the integration of IoT, we've transformed the humble restroom into a smart, efficient, and eco-friendly

facility that caters to the diverse needs of our users.</p>

<p>This website is used to Know the availability of the restroom and their cleanliness</p>

</section>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Smart Public Restroom</title>

<link rel="stylesheet" href="style.css">

</head>

<body>

<h1 style="background-color: rgb(108, 196, 221);color: rgb(243, 239, 239);>Please click the below to know the availability-status</h1>

<div id="availability-status">Checking availability...</div>

<div id="cleanliness-status">Checking cleanliness...</div>

<button id="check-button">Check Restroom</button>

<script src="script.js"></script>

<footer>

<p style="background-color: rgb(108, 196, 221);color: rgb(243, 239, 239);>© 3rd year ECE 2023 MSEC</p>

</footer>

<script src="script.js"></script>

</body>

</html>

2.CSS CODE:

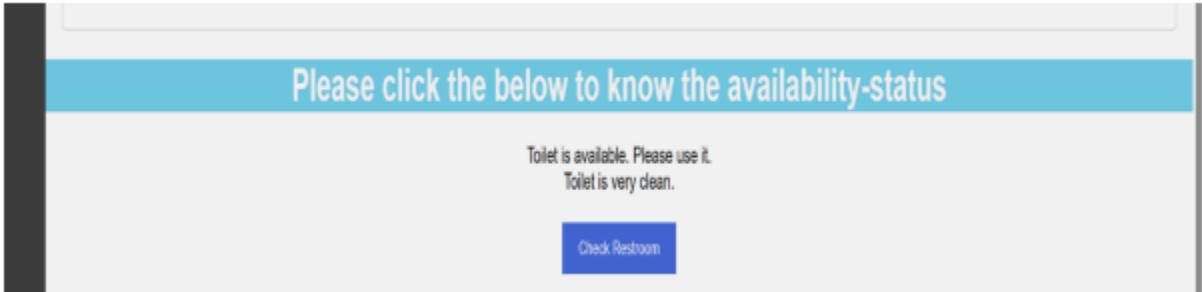
```
body {  
    font-family: Arial, sans-serif;  
    text-align: center;  
    background-color: #f1f1f1;  
    margin: 0;  
    padding: 0;  
}  
  
h1 {  
    color: #121111;  
}  
  
#check-button {  
    background-color: #338bd2;  
    color: rgb(249, 245, 245);  
    padding: 10px 20px;  
    border: none;  
    cursor: pointer;  
    margin-top: 20px;  
}  
  
#check-button:hover {  
    background-color: #4163d0;  
}  
  
section {  
    margin: 20px;  
    padding: 20px;  
    border: 1px solid #ccc;  
    border-radius: 5px;  
}
```

3. **JAVA** SCRIPT:

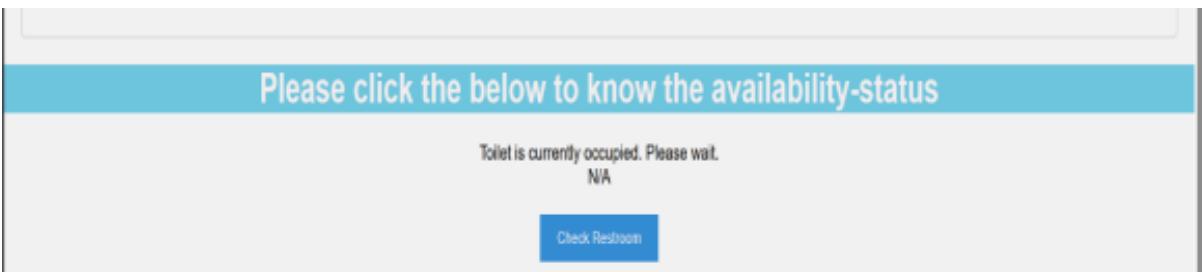
```
// Simulated availability and cleanliness data
let isAvailable = true;
let isClean = false;
function updateStatus() {
if (isAvailable) {
if (isClean) {
document.getElementById('availability-status').textContent = "Toilet is
available. Please use it.";
document.getElementById('cleanliness-status').textContent = "Toilet is
very clean.";
} else {
document.getElementById('availability-status').textContent = "Toilet is
available, but it's being cleaned. Please wait.";
document.getElementById('cleanliness-status').textContent = "Wait
until
the sweeper cleans it.";
}
} else {
document.getElementById('availability-status').textContent = "Toilet is
currently occupied. Please wait.";
document.getElementById('cleanliness-status').textContent = "N/A";
}
}
document.getElementById('check-button').addEventListener('click',
function () {
// Simulated backend data update (e.g., via AJAX or WebSocket)
isAvailable = Math.random() < 0.5; // 50% chance of availability
isClean = Math.random() < 0.5; // 50% chance of cleanliness
updateStatus(); });
// Initial status update
updateStatus();
```

WEBSITE DEMONSTRATION:

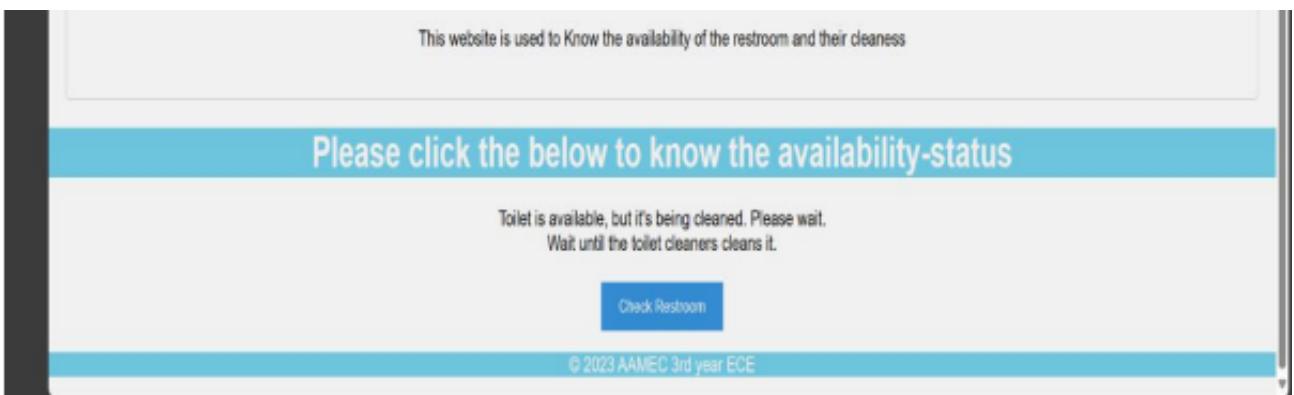
1. When toilet is available and clean, it displays the “please use it”



2. When toilet is currently occupied, it displays the “please wait.”



3. When it is available, but unclean, it displays the “please wait, wait until the toilet cleaners cleans it”



CONCLUSION:

The implementation of a smart public restroom using IoT technology offers numerous benefits that can significantly enhance the overall public restroom experience. By seamlessly integrating IoT devices and sensors, we can achieve improved cleanliness, resource efficiency, and user satisfaction. These smart restrooms can provide real-time data and monitoring capabilities, allowing facility managers to proactively address issues such as cleanliness, supply replenishment, and accessibility. Moreover, the integration of IoT technology can promote sustainability by reducing water and energy consumption.

Furthermore, a smart public restroom can enhance public health by promoting cleanliness and reducing the spread of germs. Through touchless fixtures and real-time occupancy tracking, we can mitigate the risk of infections in crowded public spaces. Additionally, user-friendly interfaces and mobile apps can provide visitors with valuable information and an improved overall experience.

Overall, a smart public restroom using IoT technology not only advances convenience and hygiene but also aligns with the broader goal of creating more efficient, sustainable, and user-friendly public spaces. As technology continues to evolve, the future holds the promise of even more innovative solutions that can further enhance the way we interact with public facilities.