INTRODUCTION TO SMART PUBLIC RESTROOM USING IOT :

In an era of rapidly advancing technology, the convergence of the Internet of Things (IoT) and mobile applications is transforming everyday experiences, even in the most mundane of settings. Public restrooms, an essential yet often overlooked aspect of urban life, are now poised to undergo a remarkable transformation through the integration of IoT and mobile app technology. This innovation aims to enhance user convenience, improve hygiene, optimise maintenance, and promote sustainable practices.

PROJECT DEFINITION :

Create a Smart Public Restroom IoT System with a mobile app to enhance restroom user experience, optimize maintenance, and promote sustainability by integrating IoT sensors for occupancy, supply levels, and air quality, along with a user-friendly app for real-time information, navigation, and feedback.

PROBLEM STATEMENT :

Traditional public restrooms face challenges related to cleanliness, accessibility, and resource management. Users often encounter inconvenience in locating available restrooms, uncertain about their condition and supplies. Maintenance staff struggle to efficiently manage cleaning schedules and supplies. This project aims to address these issues by developing a Smart Public Restroom IoT System with a mobile app to enhance user experience, improve hygiene, streamline maintenance, and promote sustainable practices.

KEY OBJECTIVES :

1. Enhanced User Experience

     Improve the overall user experience by   providing real-time information on restroom availability and cleanliness. Facilitate touchless and convenient access through a mobile app.

2. Optimized Resource Management:
  - Monitor and manage restroom supplies (toilet paper, soap, etc.) efficiently using IoT sensors, reducing wastage and ensuring availability.
  - Automate maintenance alerts and cleaning schedules to maximize operational efficiency.

3. Improved Hygiene and Safety:
  - Ensure a cleaner and safer restroom environment by monitoring and maintaining hygiene levels with IoT sensors that monitors air.
  - Implement security measures for secure and authorized access to restrooms.

4. Sustainability and Eco-Friendliness
  - Promote sustainability by implementing energy-efficient lighting and water-saving features based on occupancy.
  - Encourage eco-friendly practices within the restroom.

5. Accessibility and Inclusivity
  - Enhance accessibility by providing features like voice commands and braille instructions for people with disabilities.
  - Create an inclusive restroom experience for all users.

6. Data-Driven Decision-Making:
  - Collect and analyze restroom usage data to optimize resource allocation and maintenance efforts.
  - Generate reports for facility managers to make informed decisions.

7. User Feedback and Continuous Improvement:
  - Enable users to provide feedback and ratings through the mobile app.

- Use feedback data to continuously improve restroom conditions and services.

 8 Integration with IoT Ecosystem
   - Seamlessly integrate the restroom system with other IoT devices and systems within the facility for cohesive operation.

9. Cost-Efficiency and Resource Optimization
   - Reduce operational costs through efficient resource management and maintenance.
   - Enhance the overall cost-effectiveness of restroom facilities.

DESIGN THINKING :
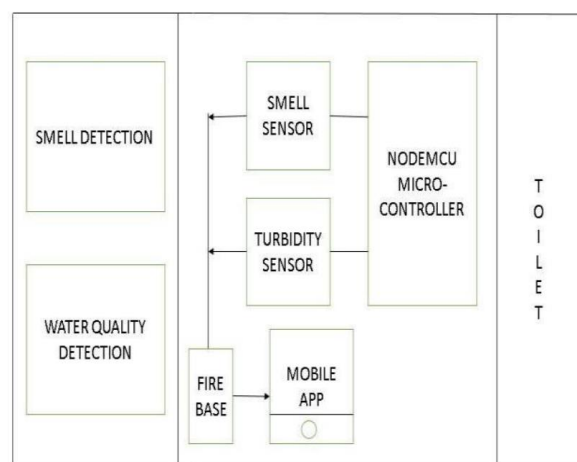
 The smell sensor is used to detect any unwanted gases present in the toilet. If any foul smell goes into the sensor,it creates a signal.

The turbidity sensor tests the transparency of the water to measure its quality and check whether any bacteria is present in the tank. If bacteria are detected, it creates a signal

All the signals are passed through the NodeMCU microcontroller where the constraints of foul smell and turbid water are checked.

All of the data is stored inside firebase, which stores all the information about the results. It is an application development software.

The data is accessed through a mobile application where the management receives the output message which informs that the toilet must be cleaned. The organization must install this application to access the alerts and view the data which has been received. Then a sweeper is sent to clean the toilet.

DETAILS OF THE MODULES:

A. TURBIDITY SENSOR

A turbidity sensor is a sensor which is mainly used to measure scattered light suspended by solids in water. As the number of total suspended solids in the watersource is increased, the turbidity level of water is increased accordingly.

Turbidity sensors can be used in the determination of water quality of small as well as large water bodies.

B. MQ3 GAS SENSOR

MQ3 gas sensor is an alcohol gas sensor which can detect the presence of gases which contain alcohol traces in them. It is made out of tin in the form of stannic oxide. It can detect alcohol, ethanol and smoke.

C. NODEMCU WI-FI MODULE

NodeMCU is a development kit that aids in making an IoT project. This module runs on ESP8266 Wi-Fi system on a chip. It is a microcontroller unit which includes a built in WiFi module.