**Smart Public Restroom**

**Overview:**

Design a smart public restroom system that enhances user experience, promotes hygiene, and conserves resources using IoT technology.

**Key Features**:

**1. Occupancy Tracking**: Use motion sensors to detect restroom occupancy. Display real-time availability on a digital board outside the restroom to reduce waiting times.

**2.Automatic Sanitization:** Implement UV-C light or automatic disinfectant sprays to sanitize toilet seats and high-touch surfaces after each use.

**3. Water Conservation:** Install water flow sensors and smart faucets to regulate water usage. Implement a timer to turn off taps automatically when not in use.

**4. Energy Efficiency:** Use occupancy sensors to control lighting and ventilation. Lights and fans should activate only when someone is inside.

**5. Smart Toilet Paper Dispensing**: Incorporate sensors to monitor toilet paper levels. Send alerts for refills to maintenance staff to ensure a continuous supply.

**6. Hygiene Monitoring:** Include air quality sensors to measure restroom air quality. If poor air quality is detected, trigger ventilation or air purifiers.

**7. IoT Dashboard:** Develop a user-friendly dashboard accessible via a mobile app. Users can check restroom availability, cleanliness status, and provide feedback.

**8. Sustainability Metrics:** Calculate and display statistics on water and energy savings achieved by the smart restroom system to raise awareness.

**9. Emergency Alerts**: Install panic buttons inside the restroom that, when pressed, send alerts to security personnel in case of emergencies.

**10. Data Analytics:** Collect data on restroom usage patterns, feedback, and resource consumption. Analyze this data to optimize restroom operations further.

**Benefits:**

* Improved user experience with reduced wait times.
* Enhanced hygiene through automated sanitization.
* Conservation of water and energy resources.
* Real-time monitoring and maintenance alerts.
* Data-driven insights for continuous improvement.

**Materials Needed:**

* 1. Motion sensors
  2. UV-C lights or disinfectant sprays
  3. Water flow sensors
  4. Smart faucets
  5. Occupancy sensors
  6. Toilet paper sensors
  7. Air quality sensors
  8. IoT hardware (e.g., Raspberry Pi, Arduino)
  9. Mobile app development tools

**Challenges:**

* + Cost-effective implementation.
  + Ensuring privacy and security of user data.
  + Regular maintenance and monitoring of IoT devices.



