SMART PUBLIC RESTROOM

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**Abstract:**

Public restrooms play a crucial role in urban infrastructure, offering convenience and hygiene to millions of people every day. However, traditional public restrooms often face challenges related to cleanliness, maintenance, and user experience. To address these issues, a smart public restroom module has been developed, integrating various technological advancements to create a more efficient, user-friendly, and hygienic facility.

The smart public restroom module is a modular system that can be incorporated into existing restroom structures or serve as the foundation for new construction. It consists of several key components:

1. **Sensory Automation Module:** This module incorporates occupancy sensors, touchless fixtures, and real-time monitoring systems. Occupancy sensors enable efficient resource allocation and cleaning schedules, while touchless fixtures, including faucets, soap dispensers, and toilets, enhance hygiene by minimizing physical contact. Real-time monitoring ensures that restroom supplies are adequately stocked and alerts maintenance staff to any issues.
2. **Climate and Energy Management Module:**

This module optimizes the restroom environment for users. It includes climate control systems that adjust temperature and ventilation based on occupancy and environmental conditions, enhancing comfort and energy efficiency. Energy-efficient lighting and fixtures reduce power consumption.

1. **Accessibility and Aesthetic Module:** Ensuring accessibility for all users is a priority. This module integrates features such as ramps, grab bars, and spacious stalls, making the restroom inclusive for individuals with disabilities. Aesthetic design elements provide a modern and inviting atmosphere.
2. **Connectivity Module:** To cater to the needs of the digital age, the smart restroom offers Wi-Fi connectivity and charging stations, enhancing user convenience. QR code access or mobile apps grant users entry without the need for physical tokens or keys.
3. **Maintenance and Feedback Module:** Sensors in the restroom can detect when cleaning and maintenance are required, automatically alerting maintenance staff. Users can provide feedback on cleanliness and overall condition via a mobile app or touchscreen kiosk, enabling continuous improvement.
4. **Water and Waste Management Module:** For sustainability, this module features water-conserving fixtures and efficient waste management systems to reduce environmental impact.

The smart public restroom module redefines the concept of public restrooms, transforming them into efficient, user-friendly, and sustainable facilities. Its modular design allows for easy integration into existing infrastructure, helping cities and municipalities address the challenges of maintaining clean, accessible, and technologically advanced public restrooms. The system not only enhances the user experience but also contributes to overall public hygiene and environmental conservation.

PYTHON PROGRAM

import random

class Restroom:

def \_\_init\_\_(self):

self.occupied = False

self.toilet\_paper = 100 # Initial toilet paper supply

self.soap = 100 # Initial soap supply

self.hand\_dryer = True

self.cleanliness = 100 # Initial cleanliness level

def is\_occupied(self):

return self.occupied

def enter(self):

if not self.occupied:

self.occupied = True

print("You've entered the restroom.")

def exit(self):

if self.occupied:

self.occupied = False

print("You've exited the restroom.")

def use\_toilet(self):

if self.occupied:

print("You've used the toilet.")

self.toilet\_paper -= 1

self.cleanliness -= random.randint(5, 10)

else:

print("Restroom is unoccupied.")

def wash\_hands(self):

if self.occupied:

print("You've washed your hands.")

self.soap -= 1

self.cleanliness += random.randint(10, 20)

else:

print("Restroom is unoccupied.")

def notify\_maintenance(self):

if self.cleanliness < 50 or self.toilet\_paper <= 10:

print("Maintenance needed. Restroom is not in optimal condition.")

else:

print("Restroom is in good condition.")

if \_\_name\_\_ == "\_\_main\_\_":

restroom = Restroom()

while True:

print("\nOptions:")

print("1. Enter restroom")

print("2. Exit restroom")

print("3. Use toilet")

print("4. Wash hands")

print("5. Check restroom condition")

print("6. Exit program")

choice = input("Enter your choice: ")

if choice == '1':

restroom.enter()

elif choice == '2':

restroom.exit()

elif choice == '3':

restroom.use\_toilet()

elif choice == '4':

restroom.wash\_hands()

elif choice == '5':

restroom.notify\_maintenance()

elif choice == '6':

print("Exiting program.")

break

else:

print("Invalid choice. Please select a valid option.")