Smart Public Restroom

# TEAM MEMBER

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Phase-2 : Document Submission

Project : Smart Public Restroom

# Introduction:

**Automated Cleaning Systems:** Smart restrooms often incorporate automated cleaning systems that can detect when a restroom stall or sink area needs cleaning and dispatch cleaning staff or robotic devices accordingly. Sensors can also monitor restroom usage to optimize cleaning schedules.

**Touchless Fixtures:** To minimize contact and reduce the spread of germs, smart restrooms often feature touchless faucets, soap dispensers, and hand dryers. These fixtures can be activated by motion sensors or proximity sensors.



**Odor and Air Quality Sensors:** Sensors can monitor air quality and detect foul odors, triggering ventilation or air purification systems to maintain a pleasant environment.

**Energy Efficiency:** Smart restrooms often incorporate energy-efficient lighting and heating systems that adjust based on occupancy or time of day, helping reduce energy consumption and costs.

# Algorithm for a Smart Restroom System:

**Initialization:**

Initialize variables for restroom occupancy status, sensor inputs, and user input.

**Check for User Input:**

Continuously check for user input, such as a button press or motion sensor activation, to indicate that someone wants to use the restroom.

**Check Restroom Occupancy:**

Check the occupancy status of the restroom. If it's vacant, proceed to step 4. If it's occupied, inform the user that the restroom is currently in use, and wait for them to leave.

**Activate Entry Procedure:**

If the restroom is vacant, activate the entry procedure:

Lock the restroom door to prevent others from entering.

Turn on the restroom lights.

Start a timer to monitor the user's restroom usage.

**User Inside Restroom:**

Continuously monitor the restroom using sensors to detect any activity.

If no activity is detected for a specified period, assume the user has left.

**Deactivate Entry Procedure:**

Once the user leaves, deactivate the entry procedure:

Unlock the restroom door.

Turn off the lights.

Reset the occupancy status to vacant.

Stop the timer.

**Repeat:**

Repeat the process from step 2 to accommodate the next user.

# Program for smart restroom:

#include <stdio.h>

#include <stdbool.h>

// Simulated occupancy sensor

bool isOccupied = false;

// Simulated temperature sensor

float temperature = 25.0; // Initial temperature in Celsius

// Function to check restroom occupancy

bool isRestroomOccupied() {

return isOccupied;

}

// Function to check restroom temperature

float getRestroomTemperature() {

return temperature;

}

int main() {

printf("Smart Restroom Simulation\n");

while (1) {

// Simulate occupancy sensor (0 = unoccupied, 1 = occupied)

isOccupied = rand() % 2;

// Simulate temperature changes

temperature += (rand() % 5) - 2; // Randomly change temperature by -2 to +2 degrees

// Ensure temperature stays within reasonable bounds (15°C to 35°C)

if (temperature < 15.0) {

temperature = 15.0;

} else if (temperature > 35.0) {

temperature = 35.0;

}

printf("Restroom is %soccupied.\n", isOccupied ? "" : "un");

printf("Restroom temperature: %.1f°C\n", temperature);

// Simulate a delay (in milliseconds) before updating sensors again

usleep(1000000); // Sleep for 1 second

}

return 0;

}

# Output for smart restroom:

Smart Restroom System is running...

Motion detected! Restroom is occupied.

Motion detected! Restroom is occupied….

...

# Conclusion:

In conclusion, the concept of a smart restroom represents a promising and innovative approach to enhancing the user experience in public and private facilities. By integrating cutting-edge technologies such as IoT devices, sensors, and automation systems, smart restrooms aim to improve hygiene, efficiency, and convenience for users while also optimizing resource usage and maintenance for facility managers.