**IoT-Based Public Toilet Usage Tracker**

**Project Overview:**

This project tracks the usage of public toilets and provides real-time updates through IoT. It detects whether a toilet is occupied or vacant using an ultrasonic sensor and displays the status via LEDs. A GSM module (**SIM800I**) is used to send usage data to a central server or mobile phone. Additional push buttons allow users to request maintenance or report issues, and a buzzer provides audio alerts.

**Components Required:**

1. **Arduino Nano** - Microcontroller for processing and control.
2. **Ultrasonic Sensor** - To detect the occupancy of the toilet.
3. **Relay Module (2)** - To control external devices (e.g., lights or fans).
4. **SIM800I Module** - GSM-based IoT module for communication.
5. **Push Buttons (2)** -
   * One for maintenance request.
   * Another for issue reporting.
6. **LEDs (2)** -
   * Green for vacant.
   * Red for occupied.
7. **Buzzer** - To alert for special conditions (e.g., maintenance request or long occupancy).
8. **Power Supply** - For Arduino and connected devices.

**Working:**

1. **Toilet Occupancy Detection**:
   * The **ultrasonic sensor** measures the distance inside the toilet.
   * If the distance is below a threshold (indicating someone is inside), the toilet is marked as "Occupied."
   * If the distance exceeds the threshold, the toilet is "Vacant."
2. **Relay Control**:
   * The **relay module** controls external devices like lights or fans, switching them on when the toilet is occupied.
3. **User Inputs**:
   * A **maintenance button** allows users to request cleaning.
   * An **issue report button** notifies about technical problems or emergencies.
4. **Alert System**:
   * A **buzzer** provides audio alerts for:
     + Maintenance requests.
     + Extended usage (if occupancy exceeds a time limit).
   * **LEDs** visually indicate the toilet's status.
5. **IoT Communication**:
   * The **SIM800I module** sends SMS updates to a designated phone number or server, including:
     + Usage data (e.g., occupied/vacant times).
     + Maintenance requests or issue reports.

**Circuit Connections:**

| **Component** | **Arduino Nano Pin** | **Description** |
| --- | --- | --- |
| Ultrasonic Sensor | TRIG to D2, ECHO to D3 | For distance measurement |
| Relay Module 1 | D4 | To control light/fan |
| Relay Module 2 | D5 | Optional control (e.g., another device) |
| SIM800I TX/RX | TX to D10, RX to D11 | Communication with GSM module |
| Maintenance Button | D6 | User-triggered maintenance request |
| Issue Button | D7 | User-triggered issue reporting |
| Green LED | D8 | Indicates vacant status |
| Red LED | D9 | Indicates occupied status |
| Buzzer | D12 | Audio alert for maintenance/issues |

**Code Logic:**

1. Initialize the **ultrasonic sensor**, **relays**, **LEDs**, **push buttons**, and **SIM800I** module.
2. Continuously monitor the distance from the ultrasonic sensor:
   * If distance < threshold: Set **Occupied**.
   * If distance > threshold: Set **Vacant**.
3. Activate/deactivate relays based on occupancy.
4. Monitor push buttons for user input:
   * On button press, send an appropriate SMS via the **SIM800I** module and activate the buzzer briefly.
5. Send periodic updates to the server or mobile phone about usage statistics.

Project Link:- https://wokwi.com/projects/418194689972484097