

Project title: IoT-based self-sustained autonomous solution for the maintenance of public toilets.

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Abstract

Public toilets often suffer from inadequate hygiene, inefficient maintenance, and poor resource management, leading to an unpleasant user experience. To overcome these challenges, this project proposes an IoT-based smart public toilet maintenance system that automates cleaning, monitors environmental conditions, and optimizes water usage. The system incorporates IR sensors, gas sensors, and ultrasonic sensors to detect user activity, measure toxic gas levels, and track watertank status in realtime. Automated actuators control water spray and cleaning mechanisms, ensuring timely and effective sanitation. The collected data is displayed on an LCD screen and monitored remotely through an IoT platform, enabling predictive maintenance, reduced manual labor, and improved hygiene standards.

Conventional public toilet maintenance systems rely on manual inspections and scheduled cleaning, which are often inconsistent and inefficient. Many existing solutions include semi-automated cleaning mechanisms, but they lack real-time monitoring, leading to delayed responses to maintenance issues. Additionally, sensor-based flush systems and basic water conservation techniques have been introduced; however, they do not integrate data analytics and remote monitoring, resulting in wastage of resources and sub optimal hygiene maintenance.

The proposed IoT-based smart public toilet system provides an integrated solution that ensures automated cleaning, real-time monitoring, and efficient resource utilization. The use of gas sensors enables the detection of harmful gases like ammonia and methane, while ultrasonic sensors help track water levels and prevent wastage. The automated spray and water control system ensures immediate cleaning after each use, maintaining hygiene without manual intervention. The remote IoT-based dashboard enables real-time tracking and predictive maintenance alerts, reducing operational costs and improving overall sanitation in public restrooms.