

# International Journal of Innovative Research in Science, Engineering and Technology

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## Public Toilet Health Check for Urban Slums

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**ABSTRACT:** Lack of requirement of public toilets has been one of the major issues for decades in semi-urban, urban and especially in rural areas, but the most important issue which has been and is still being disdained, is the maintenance of cleanliness and hygiene of the available public toilets. Due to the neglecting attitude towards this issue, condition of public toilets has been deteriorating periodically, causing numerous infections and sometimes fatal diseases because of which people prefer not using the public toilets. The purpose for choosing this problem is to mitigate the above stated problem.

**KEYWORDS:** Public Toilet, mindset, cleanliness, health maintenance, Ultrasonic Sensor, MQ-5 Gas Sensor, PIR Motion Sensor.

### I. INTRODUCTION

About the Project

There are four most Challenging aspect of the problem:

- 1) Now mostly there are 4 to 5 urinals in a public toilet, we need to implement the circuitry in each urinal and sync up the information of each cell, sending it to a single base station & then to the cloud.
- 2) Spreading awareness amongst people on how the system would work and what are the steps that needs to be followed.
- 3) Risk of circuitry being tampered.
- 4) With Changing the mindset of people by making them understand that how it is also their job to maintain cleanliness and hygiene of the public toilets.

Proposed Methodology

The main purpose of the project is to increase usability of public toilets. To track cleanliness and hygiene of the available public toilets. We are using technology to ensure that public toilet which are existing and clean, well maintained, hygienic and usable.

### II. SURVEY

One hundred percent of the population, everywhere, requires the use of a toilets. There are those within the population who are particularly vulnerable when it comes to the provision of public toilets. People with health concerns (such as overactive bladder, Urinary Tract Infection, Irritable Bowel Syndrome

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(IBS), Ulcerative Colitis, diverticular disease, Crohn's and Colitis), pregnant women and women in general, children, elderly people, homeless people, and people using wheelchairs, walkers or crutches are highly vulnerable when toilet provision in cities is inadequate. Bladder problems are more common than generally acknowledged, and certainly rarely spoken about. One in three women have post-birth incontinence (unwanted, inconvenient, excessive or uncontrollable urination), 1 in 4 women and 1 in 10 men have some form of incontinence and 1 in 3 men over 50 years of age report some bladder problems. In addition to the physical issues, the under-provision of public toilet facilities can generate enormous social costs.

There was a survey conducted at a slum area for the analysis of the urban slums facing various issues like water shortage, unclean bogs and lack of usability. Hence a survey was carried out to determine and envision it for ourselves what area unit the issues visaged by them and to seek out the particular reason behind not exploitation bogs and defecating into open. Thus, to grasp there downside we have a tendency to visited SRA i.e. Slum Rehabilitation space in Chembur to conduct one to 1 interaction with them We visited the slums to survey the condition of the bogs and through this we have a tendency to found that there have been solely a pair of bogs one for every men and girls and every of it consisting of vi Indian bathroom compartments and there have been quite five hundred individuals residing there that brings it all the way down to the quantitative relation of virtually 42:1 which means one public toilet for 42 individuals.



Fig 1: Public toilets at SRA Chembur

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Fig 2: Condition of public toilet at SRA Chembur

Given below table illustrates the values observed during the survey: -

Parameter	Observed Value (usable)	Observed Value (not usable)
Gas Sensor	300-500 ppm	850-950 ppm
Depth Sensor	8-18 cm	1-7 cm

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## III. ARCHITECTURE

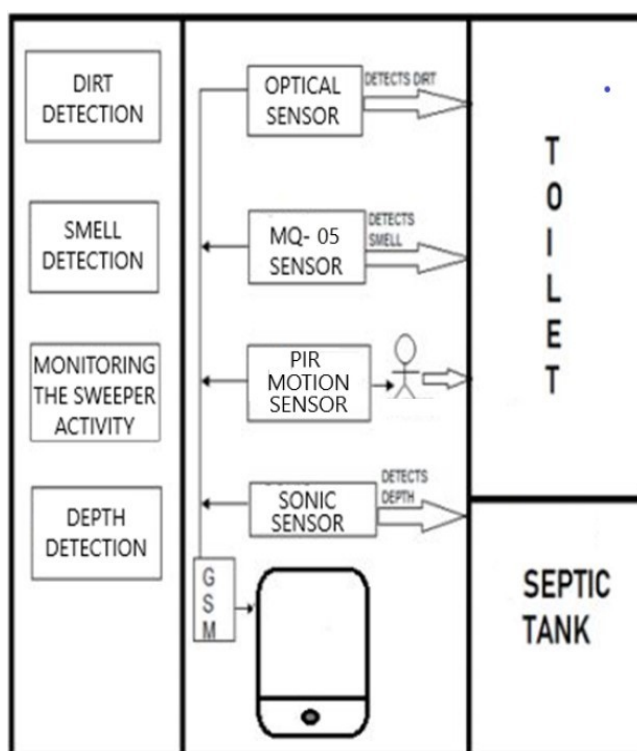


Fig 1: Block Diagram of the work process [1]

### Algorithm

1. Start
2. MQ-5 gas sensor monitors gas level of ammonia (in ppm) present in air.
3. As the threshold value of 850 ppm is crossed, serial monitor will display that critical value.
4. Then for depth detection of sewage disposal tank we use the Ultrasonic Sensor.
5. So, when the threshold value of 7cm is reached the serial monitor will display that critical value.
6. Then a PIR sensor is used to tackle the problem- lack of enough light in the toilets.
7. So, when a person enters a toilet the bulb will remain in the ON state as long as he/she is in the toilet.
8. When he/she leaves the toilet then after a delay of 5 seconds the bulb goes off.
9. In the end, all the critical value readings are sent to the civic authorities.
10. Stop.

## IV. HARDWARE

### ARDUINO UNO

The Arduino UNO is a microcontroller board supported on the semiconductor device ATmega328P microcontroller and developed by Arduino.cc. The board is provided with sets of digital and analog input/output (I/O) pins which will be interfaced to boards and alternative circuits. The board has 14 digital pins and 6 analog pins, and programmable with the Arduino IDE. It may be battery-powered by a USB cable. [5]



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## Technical Specifications:

- A. Analog Input Pins: 6
- B. DC Current per I/O Pin: 20mA
- C. DC Current for 3.3V Pin: 50mA
- D. Flash Memory: 32 KB of which 0.5 KB used by
- E. bootloader
- F. SRAM: 2KB
- G. EEPROM: 1KB
- H. Clock Speed: 16MHz
- I. Length: 68.6mm
- J. Width: 53.4mm

## MQ 5 SENSOR

The MQ-5 Gas detector will sight or live gasses like Ammonia (NH<sub>3</sub>) and Carbon Mono-oxide (CO). The module version of this detector comes with a Digital Pin that makes this detector to work even while not a microcontroller which comes in handy if you are solely trying to sight one explicit gas. If the measurement of gas is done in ppm then analog pin should be used, the analog pin is additionally TTL driven and works on 5V and thus is used with most typical microcontrollers.[7]

## ULTRASONIC SENSOR

1. The water and waste matter business have several necessities to check the amount of water in applications like flumes, weirs, pipes, tanks, wells, basins, and cooling towers. Ultrasonic sensor is cost effective and reliable. It is used to determine distance to water, it transmits a sound pulse that reflects from the surface of the water and measures the time it takes for the echo to come back.[6]

## PIR-BASED MOTION DETECTOR

A PIR-based motion detector is employed to sense movement of individuals, animals, or different objects. They're ordinarily utilized in stealer alarms and automatically-activated lighting systems. They're ordinarily referred to as merely "PIR", or typically "PID", for "passive infrared detector". It has two slots; each slot is made up of a special material which is delicate to IR. When the device is idle, each slot finds an equivalent quantity of IR, the close quantity radiated from the space or walls or outdoors. Once a heat body sort of a human or animal passes by, it first intercepts one half the PIR device that causes a positive differential modification between the two halves. Once the warm body leaves the sensing space, the reverse happens, whereby the device generates a negative differential modification. These modification pulses are what's detected. [8]

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## V. SOFTWARE

We are using Arduino integrated development environment (IDE) which is a cross-platform application. It is used to write and upload programs to Arduino board. For programming part, we are using 'c sharp'.

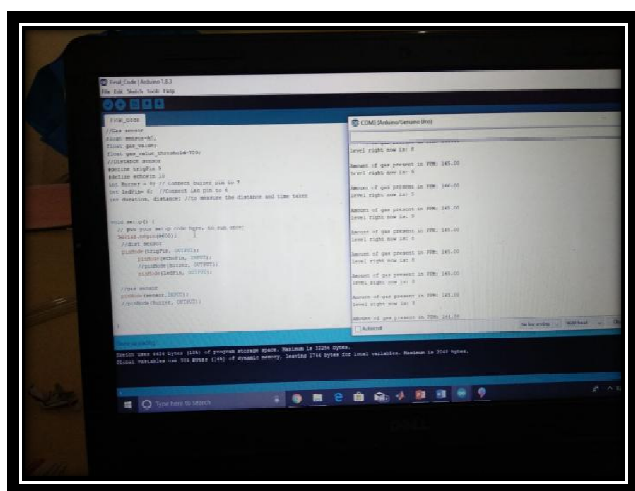


Fig 2: Readings on serial monitor

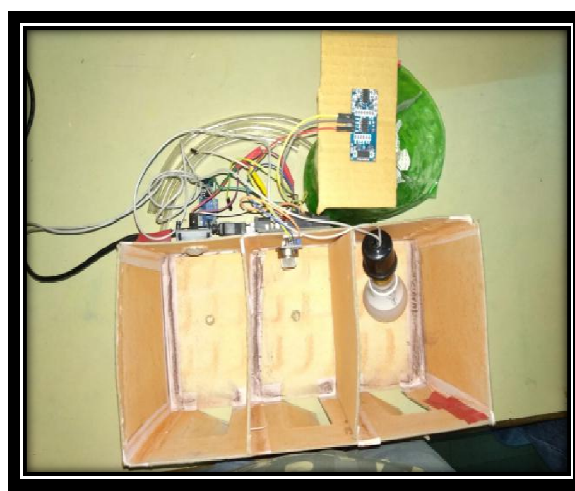


Fig 3: Model

## VI. APPLICATIONS

1. By using inexpensive and relatively easy to install sensors that track usage and footfall, facilities managers can dynamically act upon usage data in realtime.
2. Empowers facilities managers to make evidence-based decisions in order to maintain high levels of customer satisfaction, while reducing the regularity of customer or staff complaints. If proper maintenance is done throughout, simultaneous increment in footfall could also be observed especially in rural and semi-urban areas.

## VII. FUTURESCOPE

This work will increase the usability of public toilets. This paper can create the awareness among the people about the clean and hygienic toilets.

This paper can ensure the responsibilities of the sweeper. It will reduce the percentages of open defecation. It will save lives. Because every year, 200,000 infants die in India alone because of open defecation, according to a study by Brian Arbogast, director of the Water Sanitation and Hygiene Programme at the Bill and Melinda Gates Foundation.

Open defecation leads to contamination of food and water and transmits diarrhea-related diseases.

This paper serves a purpose of good sanitation which will provide a healthy living environment to everyone. Finally, this concept is the one of the stepping stone to the "Clean and disease-free India".

## VIII. RESULT & DISCUSSION

Our proposed project stresses on crucial aspects of public toilets an itation conditions such as foul odour, irregular light provisions and faulty flush tanks/septic tanks.

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We have made use of HC-SR 04 Ultrasonic sensor for depth detection of septic waste, MQ-05 Gas Sensor for ammonia gas detection and PIR Motion sensor to trigger the light switch 'on' or 'off' depending on whether the toilet cabin is in use or not.

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