

Smart Toilets using Turbidity Sensor

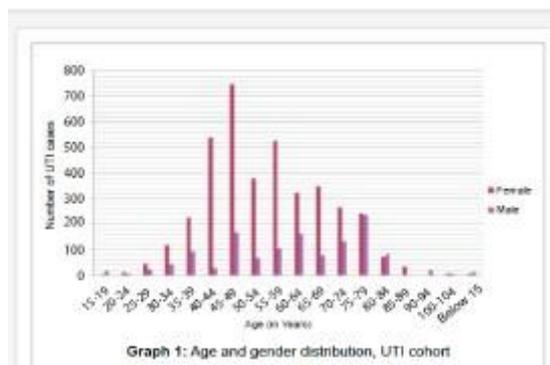
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Abstract: In the cutting edge world, the advances are definitely increased, yet at the same time the cleanliness in our nation is under major risk. The abstract of this paper is to deliver clean and hygiene and disease free toilets. All the public toilets must be clean and hygiene. In our country, our government has introduced the unique scheme called “Swachh Bharat” (Clean India). Keeping the toilets uncontaminated is the one of the objective of the Clean India scheme. This paper can be helpful to encourage the clean India project in majority. In future, it can show the emerging part in clean India scheme. In an Existing system, they are focused only on identifying the dirt of the toilets. In our proposed system, we have determined on keeping clean toilets, observing the sweeper’s working activities and also stopping the use of contaminated toilet. It can dodge many types of syndromes. It may create the consciousness amongst people about the toilet management in our country. Therefore, our development is to use safe, disease free and hygienic toilets.

Keywords: Arduino, turbidity sensor, gsm module.

I. INTRODUCTION

The clean environment without bacteria is the aim of this project. To avoid bacterial infections in common toilets. To create a bacteria-free toilets in future. Toilets in public areas like airport, Universities, colleges, schools, Offices, etc. may look clean and odourless but the bacteria level increases as people use it. Urinary tract infections account for about 8.3 million doctor visits each year, as per the survey of national medical and science submit. As per survey of Department of Infectious Disease, University Hospital Udine, Italy



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II. IMPLEMENTATION

Components

- Turbidity Sensor
- Buzzer
- Gas Sensor
- Arduino UNO
- GSM
- IR Sensor
- Wi-fi module

III. HARDWARE DESCRIPTION

Turbidity Sensor

The ARDUINO turbidity sensor detects water quality by measuring level of turbidity in the water. It is able to detect suspended particles in water by measuring the light transmittance rate and scattering rate which changes with the amount of total suspended solids (TSS) in water that is taken as sample water for measuring. As the TSS increases, the liquid turbidity level increases or vice versa.

This ARDUINO turbidity sensor has both analog and digital signal output modes consisting in it. You can select the mode according to the MCU as threshold is adjustable in digital signal mode of the system.

Turbidity sensors can be used in measurement of water quality in rivers and streams, wastewater and effluent measurements, sediment transport research and laboratory measurements as well as in many waterbodies.



Buzzer

The piezo buzzer produces sound based on reverse of the piezoelectric effect in the system. The generation of pressure variation or strain by the application of electric potential across a piezoelectric material is the underlying principle of the proposed system. These buzzers can be used to alert a user of an event corresponding to a switching action in the surroundings, counter signal or sensor input. They are also used in alarm circuits and others.

The buzzer produces a same noisy sound irrespective of the voltage variation applied to it in the system.

It consists of piezo crystals between two conductors of the system. When a potential is applied across these crystals, they push on one conductor and pull on the other of the system. This, push and pull action, results in a sound wave around it. Most buzzers produce sound in the range of 2 to 4 kHz which is acceptable.



Gas Sensor

This is a simple-to-use liquefied petroleum gas sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air around the surface. The MQ-6 can detect gas concentrations anywhere in the air from 200 to 10000ppm.



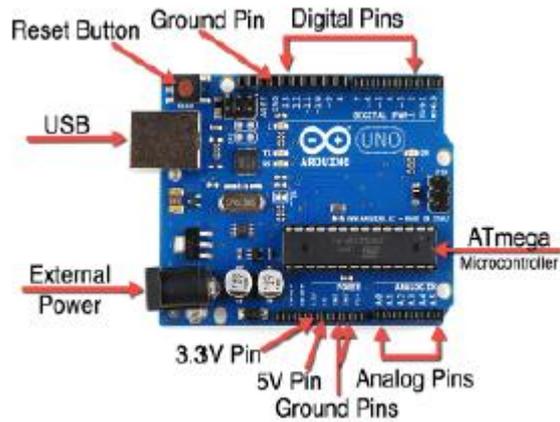
This sensor has a high sensitivity, accuracy and fast response time. The sensor's output is an analog resistance output. The drive circuit is very simple compared to others; all you need to start the sensor is power the heater coil with 5V, add a load resistance, and connect the output to an ADC. Sensitive material of MQ-2 gas sensor is SnO₂, which with lower conductivity in clean air also detected. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising in the air. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration in the air. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is with low cost and suitable for different application in realtime.

Resistance value of MQ-2 is difference to various kinds and various concentration gases in the atmosphere. So, When using this components, sensitivity adjustment is most necessary. we recommend that you calibrate the detector for 1000ppm liquified petroleum gas in air, or 1000ppm iso- butane concentration in air and use value of Load resistance that (RL) about 20 K Ω (5K Ω to 47 K Ω). When measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence in the atmosphere.

Arduino UNO

ARDUINO UNO is the microcontroller board based on the ATmega328P. It has 14 digital input and output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button on it. It contains everything that needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get start the board.

"Uno" means one in Italian. 'UNO' was chosen to mark the release of ARDUINO Software (IDE) 1.0 of the system. The Uno board and version 1.0 of ARDUINO Software (IDE) were the reference versions of ARDUINO, now evolved to newer releases of the board. The Uno board is first in the series of USB ARDUINO boards, and the reference model for the ARDUINO platform; for an extensive list of current, past or outdated boards see the ARDUINO index of the boards.



GSM

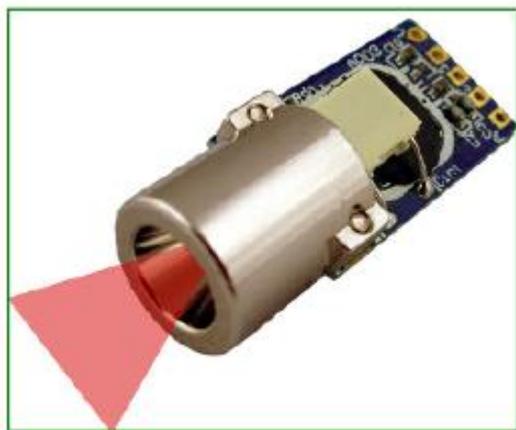
A **GSM Module** is basically a GSM Modem (like SIM 900) connected to a PCB with different output taken from the board– say TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with the PC (personal computer). The board will also have pins or provisions to attach mic and speaker, to take out +5V or other values of power and ground connections in the system. These type of provisions vary with different modules³ of the system.

Lots of varieties of GSM modem and GSM Modules are available in the market to choose from various tpes. For our project of connecting a gsm modem or module to arduino and hence send and receive sms using arduino – its always good to choose an **arduino compatible GSM Module** – that is a GSM module with TTL Output provisions in the system.

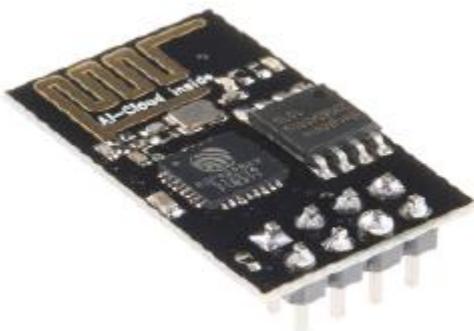


IR Sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surrounding region. An IR sensor can measure the heat of an object as well as detects the motion in the surroundings. These types of IR sensors measures only infrared radiation, rather than emitting the radiation that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations around the region it covers. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor in the surrounding regions. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED around it. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received from the source.



WiFi Module



The ESP8266 WiFi Module is a self contained SOC

with integrated TCP/IP protocol stack that can give any microcontroller in the system access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor in the system. Each ESP8266 module builds up with pre- programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much ability of WIFI as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing community in the emerging world.

This module has a powerful enough on- board processing module and storage capability allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime in the system. Its high degree of on-chip integration allows for minimal external circuitry of the system, including the front-end module, is designed to occupy minimal PCB area in the circuit. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfacing; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts in the medium.

IV. BLOCK DIAGRAM



Block Diagram of the Project

V. WORKING PROCEDURE

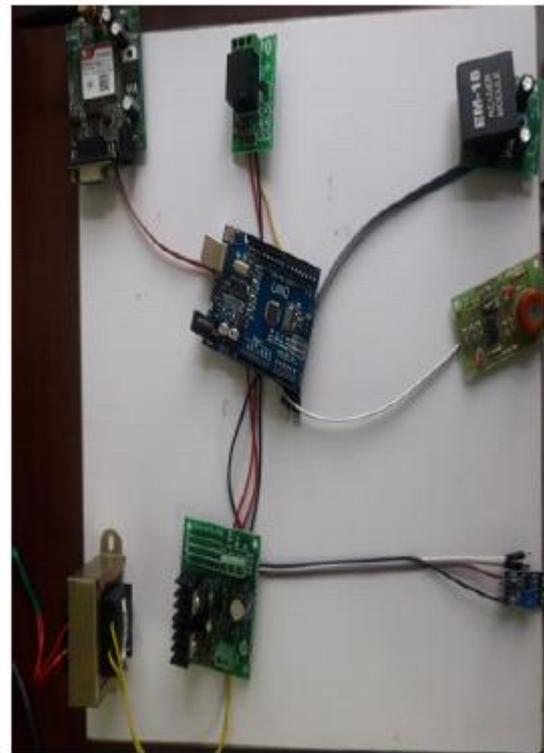
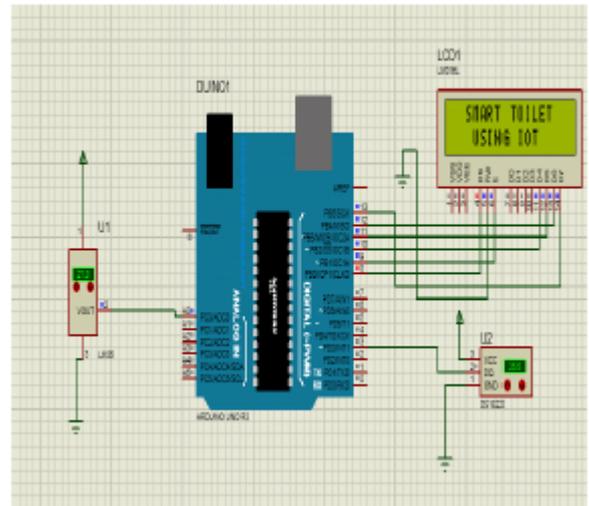
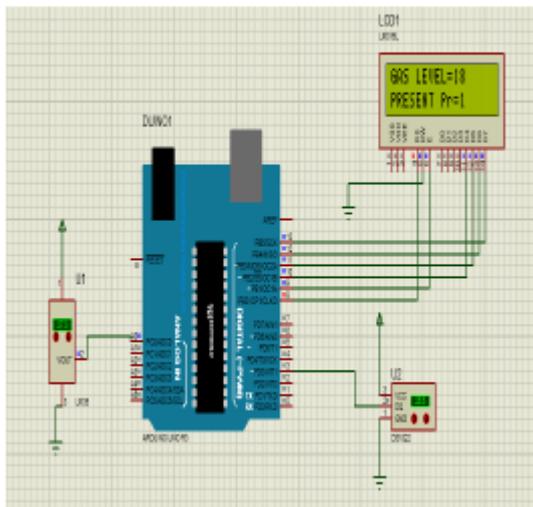
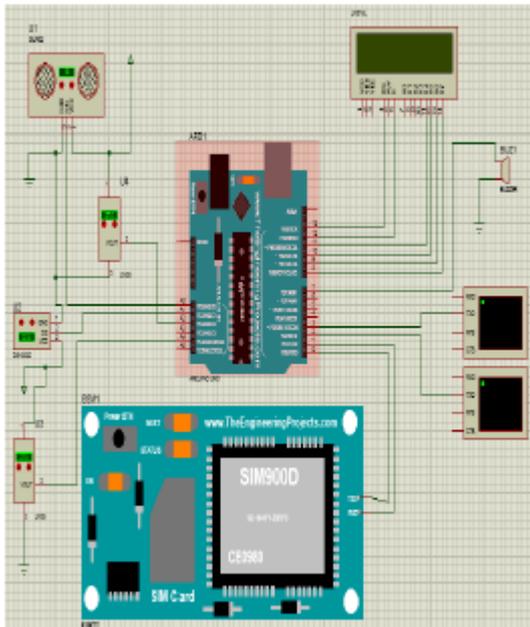
In first phase, IR sensor is used to discover the dirt present in the toilet. Here set of sample images are given as input. After a person using the toilet, the sensor senses the basin of the toilet. Then it compared to the sensed image with the input image. If the dirt present, it gives the beep sound. Then the user wants to be clean the waste by flushing again. Through this activity, people can get the awareness about the toilet management system. In the second phase, gas sensor is used to detect the unwanted gases present in the toilet. In the gas sensor, a particular range is set to be stable earlier manner.



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If the range gets increased, it can send the alert message to the sweeper. Then they cleaned it by sweeper using proper fragrant. In the third phase, turbidity sensor is used to sense the bacteria found in toilets, in case any bacteria found in the toilets it can send the alert message to the sweeper. It can be shown before and after cleaning the toilet. Then the first phase gets initiated and senses the dirt presence in the toilet. If the dirt gets noticed, it raises the alarm. Through this monitoring activity, the sweeper can realize their roles and responsibilities. Then they protect the people by disposing all the unwanted materials (dirt, unwanted gases) present in the toilet.

VI. CIRCUIT DIAGRAM AND OUTPUT



VII. CONCLUSION

Our proposed project will create awareness among the people about the proper sanitation of using toilets. It makes use of Internet of things, which is a rapidly emerging technology. Our proposed system will make everyone to strictly follow the cleanliness and proper sanitation in the toilets and to produce disease free toilets. It prevents contagious diseases that spread due to improper sanitation of the toilets. Thus by using technologies in smarter way, we can maintain cleanliness which is next to godliness. Be Clean, Be Safe.

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