AUTOMATIC TOIPO CLEANER

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**Abstract** _**: Health related issues are increasing day by day. New diseases are being identified in different places of India. One of the main causes of spreading diseases is unhealthy public toilets. There is a huge risk to get infected by various diseases while using such toilets. Unfortunately the mind set of people to keep toilets clean and hygienic is very poor. The negative approach of people is beyond our control. The ideas that are presented in the following project seek to provide a convenient and a hassle-free means of cleaning public and private toilets whilst maintaining hygienic and sanitary standards. Semi Automatic Lavatory or Toilet cleaning robot is designed for the purpose of keeping lavatories hygienic in both public and private places and to**_ _**replace the human effort to do such cumbersome jobs. It is automatically controlled using a Arduino UNO micro-controller, it is a three wheeled robot actuated by a DC gear motors, it is mounted on toilet seat and takes cleaning action only when no human is present in the toilet using Brushes and also avoids obstacles when found. It contains a movable mechanical linkage to produce motions which support the rotating brushes to clean the solid waste in toilets, also metering pump are employed to spray detergents/soap liquid to the flow at the beginning of cleaning process respectively.**_

**Keywords:** _**Arduino UNO microcontroller, Semi Automatic Lavatory**_

1. Introduction :

Urban sanitation is of prime importance in today's society and there exists a number of obstacles that need to be conquered [1]. An easy to implement, yet effective method to facilitate the preservation of hygienic standards would be a welcome idea, and help overcome the various hurdles faced, such as human reluctance to engage in such a task. The robot is designed in a semi automated way for good performance. Other considerations include ease of operation, power requirements and financial effectiveness. Using a low power microcontroller and a simple yet adequate line follower robot, this idea is very much practically realizable.

This lavatory cleaning robot is designed especially to clean toilet. It is equipped with different sensors which provides necessary control data and ensure the working of robot. The robot has a line follower integrated with a manipulator[2].

2. Motivation :

- This paper provides information related to the idea of automatic cleaning of lavatories. With this mind, a realizable idea would be to design a robot that is semi automated in functioning and also is competent in performance.

- This idea presented in the paper gives a helping hand to those who are not able to clean the lavatories (for ex. Handicaps, older people, etc.). It supports the lavatory cleaning in the public areas as well.

3. Related Work:

(a) Research and review of the related papers :

Description: According to the study of the cleanliness of toilets mentioned by the authors, *K.Elavarasi et al[4] ,* various sensors are required to perform the operation that also requires more capital. The biggest disadvantage of this system is that it is not cost effective and also the architechture is complex compared to the proposed system. This system provides the idea of cleaning the toilets in a smart way but it is having many disadvantages. Thus, the implementation of the system in every house is quite difficult. [4]

According to second paper of *S.M. Ashiq et al[2],* the system is applicable to the Indian toilets like railway toilets and is more cost effective than the system mentioned in the previous paper. But the fabrication process of this system is difficult as it needs to be drilled and welded. For fixing the system on the toilet, it needs a lot of time and efforts and same is applicable for the removal.

As automatic toilet cleaner is very rarely implemented, the papers available for survey are less in number. Thus after doing the survey of these papers, proposed system Automatic Toipo Cleaner, is more efficient in all aspects like the portability as well as it can be compatible for both the toilet bowls, western and indian (can be implemented by some variations). The biggest advantage of using this Toipo cleaner is that it is handy for anyone to use it. The approach behind this concept of using the robot for the purpose of sanitation can draw many parallels to present day technologies. Robots are now used to serve a range of purposes such as bathroom cleaning, dishwashing etc. Basically, it is a system which will work in the embedded system domain. This circuit consists of the mechanical assembly and is programmed in embedded C language. This idea works on the principle of different motions of

the robotic arms used in the assembly and the controller that controls the movement of the arm. The robot that is realized in the proposed system is with the help of Arduino UNO microcontroller.

### (b) Objectives of the actual system:

- To design a power supply for Arduino Uno and also design the mechanical assembly.
- To make it compatible with any common anti bacterial liquid toilet bowl cleaner for convenience and satisfaction of the user.
- To design the interfacing of motor driver IC L293D with Arduino Uno and also the interfacing between Arduino Uno and Relay.
- To program the controller such that it will rotate 2 mechanical arms using 2 DC motors at a speed of 15 rpm and 100 rpm respectively for the cleansing action.

(c) General working of the hardware:

Description: A microcontroller often serves as the "brain" of a mechatronics system. Like a mini, self-contained computer, it can be programmed to interact with hardware or a user, much like a PC connected to a small network of hardware. As the computer industry has evolved, so has the technology associated with microcontrollers. Every year microcontrollers become much faster, have more memory, and extend their input and output feature sets, all the while becoming even cheaper and easier to use.

The Arduino Uno is a microcontroller board based on the ATmega328 datasheet. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started [3].

4. System Architecture :
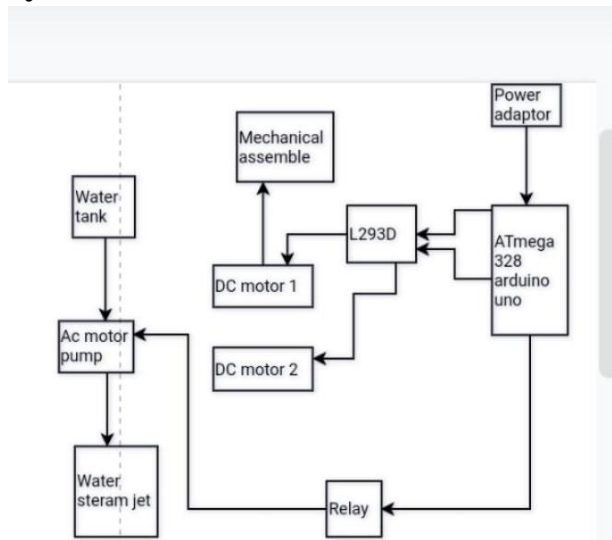
1) Proposed system will be based on the Arduino Uno platform which acts as the semi automatic cleaner for the lavatories.
2) A power adapter is used to provide the supply to the actual circuitry.
3) When the input is provided to the Arduino, it receives the command of driving the motors with the help of motor driver IC.
4) One DC motor will rotate one arm in the vertical direction and the other DC motor will rotate horizontal arm in the circular direction.
5) A relay is used to turn on the AC pump which throws the water on the arm to clean it up and water tank is provided to supply the water to the pump.
6) The brushes will be cleaning the pot for upto 50 seconds.

5. Description of the System

1) **Motor Driver L293D –**

- L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive in either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.
- L293D is a dual H-bridge motor driver integrated circuit. There are two motor drivers used to control the two dc gear motors sequential operation of the system. [3]

2) **Controller Used -**

Atmega 328p Arduino UNO microcontroller is used in this system. It is the central processing unit of the system. Basically, the work of this controller is to control the working of the two DC motors and the rotation of arms as well. This controller is selected as the programming can be done easily whereas the finding of faults in the code is also easy.[3]

3) **Water Pump -**

Water pump is a device that moves water by mechanical action. Pumps are commonly rated by flow rate, outlet pressure in meters of head etc. For the cleaning purpose there is need of water to be thrown continuously on the brush so that it cleans the bowl very well. This is the purpose of water pump that is used in the system.

4) **DC Motors -**

These are used to convert electrical energy into mechanical energy or imparting motion. The work of DC motors in the proposed system will be rotating the mechanical arms in circular as well as upward and downward directions. DC motors are used specially so that the input provided to the arms is in continuous motion and not in alternating one.

5) Battery –

A container consisting of one or more cells, in which chemical energy is converted into electricity and used as a source of power. Here, the battery works as the constant supply to the system, thus without any interruption the system works flawlessly.

6) Relay –

Relay is an electromagnetic switch operated by relatively small electric current that can turn on or off. In this system the work of relay is to switch between the two conditions of the arms, so that they can rotate in clockwise as well as anticlockwise direction.

6. Future Scope:

In future this system can be modified using sensors. There is a lot of scope in the field of embedded system, thus many changes can be implemented. This system can be made fully autonomous by minimizing and placing the whole electronic hardware under the cover of the toilet seat. It   can clean the whole pot with the seat closed. Modifications can be done according to the requirements of the user.

CONCLUSION :

This paper presents an semi automatic lavatory cleaning robot using Arduino microcontroller. The proposed method can be used in homes, labs, offices, trains etc. In future the system can be made fully automatic using ultrasonic detectors, camera etc. In the present day scenario, there are host of robots that aid us in domestic cleaning, which are similar to the one proposed above.

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