

# Active Bio-Enzyme Based Mist Sprayer Semi-Automatic Floor Cleaning Machine

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**Abstract--** Now days, the automatic floor cleaning machines are mostly used to make our life comfort. The use of those automated machines are more acceptable in the markets with the advancement of technology but these are not very popular due to their complex design, high cost of machine and power tariff. A semi-automatic floor cleaning machine is proposed in this paper which is able to clean the floor effectively. This semi-automatic floor cleaning machine is designed for cost reduction and user friendly. The Arduino based semi-automated floor cleaner containing active bio enzyme based sanitization process is designed here which is very useful to improve our life style.

**Keywords:** Semi-automatic floor cleaning machine, Arduino, Sanitizer mist sprayer, dry-wet cleaning, low cost and low efforts, easy fabrication technique.

## I. INTRODUCTION

These days humans lead a very hectic, enlightened and recent life. People are facing long working times. In this hectic situation everybody will want to get time saving technologies. In this regard we can give the tasks manually to the robots. For the working women, it becomes more problematic to manage home and office together [1-3]. For these problems we are going to present a cleaning machine or robot. This paper deals with floor cleansing machine which is semi-automatic. We all know that Cleaning is a very important and time consuming work in our daily life [4-5]. Also it's essential for our health. In developing countries, floor cleaning by machine is not so popular so it costs much amount of money. So we thought to build up a semi-automated cleansing device which will do dry cleaning as well as wet cleaning. It has obstacle detection also. As well as it will reduce the cost of machine [6]. Not only in household works it will help to clean large apartments like hospitals, offices, banks etc. This Autonomous robot reduces much time in lifestyle. As it contains both vacuum cleaner and mob, we can use it in summer, rainy season and also in winter. Though bio-enzymes have gained immense popularity in these recent years, they are helping us to move towards our major goal – the achievement of a sustainable life. These are an organic solution which are prepared by fermenting vegetable or fruit peels and was first developed by Dr. RosukonPoompanvong who was the founder of the organic agricultural association of Thailand. The usage of bio-enzyme has also proved to be of viable potential in cleaning the contaminated water as they are known to improve the water quality parameters, thereby making them a cost effective bio-remediator.

V. Bhute et. All [7] have made solar operated multifunctional floor cleaning machine while N. Shah et. All [8] also have designed semi-automated solar floor cleaning machine with higher efficiency. Whereas P. Ravi kumar [9] have fabricated solar powered unmanned cleaning robot.

First of all it is semi-automatic and as well as it is cost-effective. In market the full automatic machine is available in the range of minimum 25-30k (approx). But our proposed project has been made of around 5K. So it is affordable to everyone. Due to its low cost.

The area of our cleaning device is 21X28 cm. It can be accessible within a single room (10X10 ft). The energy charges that a single battery can hold 1200 mH. In our project, here we have used 4800mH charging capacity (approx).

## II. REQUIRED COMPONENTS

100rpm Geared motors	HC-05/06 Bluetooth module (Fig. 2)	2x TIP31C/TIP122 NPN power transistors
Wheels for motors	L293D motor driver board (Fig. 3)	12V Sealed lead acid rechargeable battery
Arduino UNO (Fig. 1)	Standard servo motor (180 degree rotation)	Base (Fig. 4)
Malefemale jumper wires	Bread board	12V Water pump
Male/female headers	Nuts and Screws	A 600ml plastic bottle

### A. Components Description

#### Arduino UNO R3

Here, we have used Arduino UNO R3 (Fig.1) as microcontroller which has 20 input or output digital pins of which 6 are PWM outputs and 6 are analog inputs. We have loaded program into it by computer software. Arduino will control the full system. It will receive signal from mobile application via Bluetooth and the floor cleaning machine will work when we need.





Fig. 1. Arduino Uno

**HC-05 Bluetooth module**

In our proposed model, we have used a HC-05 Bluetooth module (Fig. 2) to make a wireless connection between mobile app and the hardware system. When we require, app will give instruction, Bluetooth will receive signal and will give it to Arduino. Then our floor cleaner will start to work. It has 6 pins - key/EN, TXD, RXD, VCC, GND and state.

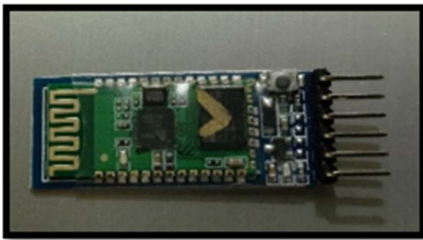


Fig. 2. Bluetooth module

**L293D Motor driver board**

In our project, our main motto to use L293D motor driver board (Fig. 3) is to drive the machine in any direction. It has 16 pins. These pins can control the two DC motors in any direction. Signal will be given by mobile app and the motor IC will help to move our machine.

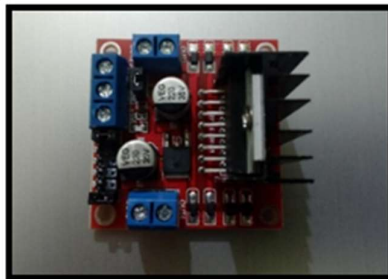


Fig. 3. Driver Module

**Base of floor cleaner**

Here, we have used a chassis board as base (Fig. 4). It is used to keep all the circuits and electronic devices. It gives a support to other components.

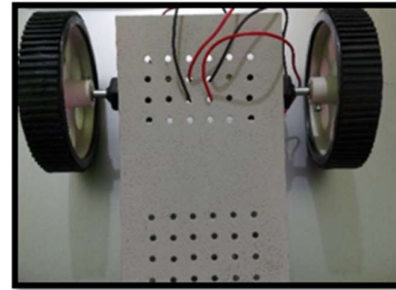


Fig.4. Base of Floor Cleaner

**100 rpm Geared Motor**

Here we have used 100 rpm – 12Volts geared motors (Fig. 5) attaching with a simple DC motor with gearbox. 3 mm threaded drill hole is present in the middle of the shaft which makes it easy to connect internally with wheels or any other mechanical appliances for controlling purpose.

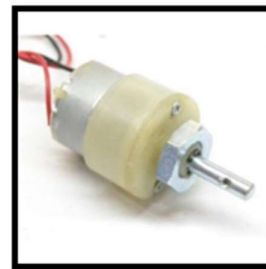


Fig.5. 100 rpm Geared Motor

**12V Water Pump**

This DC 12V Water Pump (Fig. 6) is very cheap in cost and small in size. It's capacity is 120 lit/h with low current consumption (220mA). We can connect motor outlet with tube pipe and immerse it in water. Thus results to power it & make high water level. We have to remember that the dry run may damage the motor can be damaged due to heating in terms of dry run and generate noise.



Fig.6. 12V Water Pump

**Standard Servo Motor**

Here we have used a rotational or translational Servo motor (Fig.7) whose power is supplied by a servo amplifier and can be used to apply torque or force to a mechanical system similar to an actuator or brake. It is applied to control precisely in terms of angular position, acceleration, and velocity which is associated with a closed-loop control



system. The result considers the current output & alters it to the desired condition. The speed can be calculated from the frequency of the applied voltage & the number of magnetic poles.

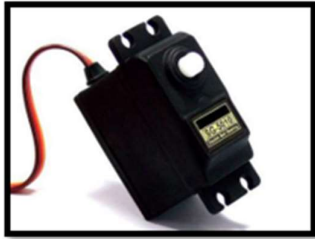


Fig.7. Servo motor (180 degree rotation)

*B. Preparation of Bio-Enzyme*

Bio-enzyme is produced by the fermentation citrus fruit peels in presence of jaggery and water. Large container with screw cap is preferred to keep the mixture. Usually this mixture kept in dark for 90 days and in initial month the cap is opened in every single day for a minute to release the accumulated gas. After a month gas production is reduced so, cap is opened once in the end of a week. Orange color liquid is obtained after completion of 90 days with some particles and undigested precipitate in the container. The liquid obtained after filtration in the container contains bio-enzyme.

III. PRACTICAL CIRCUIT & BLOCK DIAGRAM

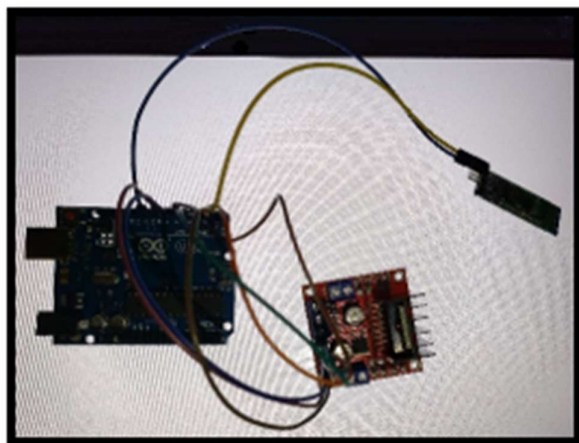


Fig. 8. Practical Circuit

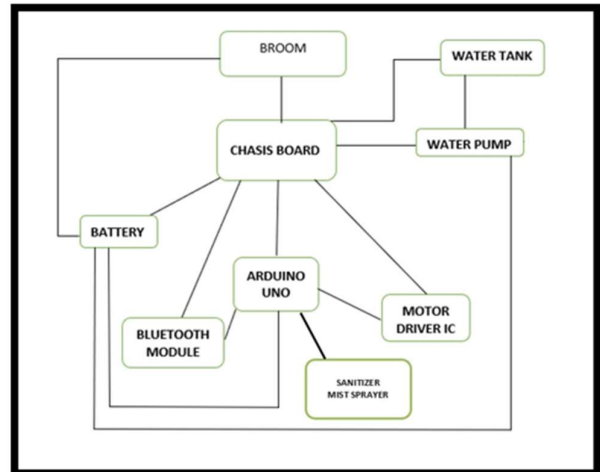


Fig. 9. Block Diagram

We know that fully automatic floor cleaning machines and robots are already exist in market. But those are so expensive. So it's not possible for everyone to afford those products. That's why we need to think for a machine which fulfills our desires at a reduced cost.

IV. OUR PROPOSED MODEL FOR THIS SOLUTION

We have designed a semi-automatic bottom drawing machine (Fig. 9) which can be the cover of fully automated machines, where as some of the factory will have to be done by manually, but still it will save the time and also will be helpful for people (10- 11).

At first we need a chassis board and we have connected motors into that. One motor is connected in front of the board with the mop and other two motors are connected with the machine. also we have placed a broom on the chassis board. also, a water pump is connected with the board and a water tank is attached with the pump.

The mop is used for wet cleaning purpose. The motor helps the mop to work. Other two motors are helped the machine for working. The water pump is used to supply water for cleaning. We use water tank to store water. also, we are using broom rather of vacuum suction motor to reduce some capitalist. After brooming we have to put the dust or dry waste in tip but if we use vacuum cleaner also we have to clean this manually. So some manual work will be demanded but cost is low which is more profitable.

Now, we need a control system. also, we have used an Arduino- UNO with Bluetooth connection. At first, we have made the connection of Arduino with Bluetooth module by shirtdress lines.

The machine controls the total system. Arduino gives the suggestion, Bluetooth makes the connection and the shaft of the motor IC helps to move the machine towards left, right, forward and backward direction (12). Leg connections (Fig. 10) are given below



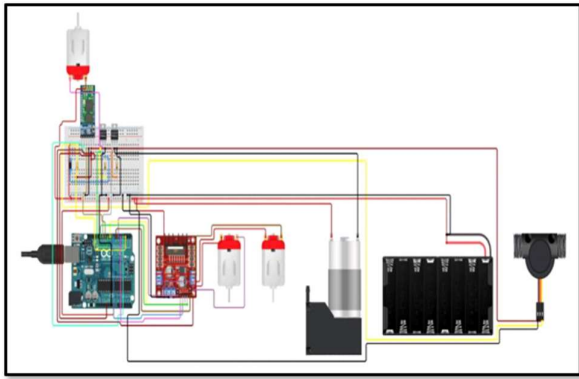


Fig. 10. Circuit Diagram

After drawing the bottom by mop, we add a sanitization section containing active bio enzymes. The two stations of the sanitizer mist- spray are connected with Arduino with the help of Bluetooth controller. The total procedure is controlled by Bluetooth controller operation of android mobile

## V. CONCLUSION

The application of this advanced technology reduces the cost extensively as well as the human effort also thus result cleaned floor. Active Bio-Enzyme based mist sprayer semi-automatic floor cleaning machine is designed here with higher impact for developing countries in future. Active bio-enzymes are also advantageous as microbes in bio enzyme based sanitizer are able to reach very small cracks on surfaces that can also eliminate soiling and malodour but traditional chemicals are unable to do so.

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## VII. BIOGRAPHIES



Sneha Dey has born in Kolkata, West Bengal, India on 28th August of 2001. She has passed her Madhyamik exam in 2017 and Higher Secondary exam in 2019 from Taki House Government Sponsored Girls' High School, Sealdah. Now, she is pursuing Bachelor of Technology 4th Year in Electronics & Communication Engineering Department from Guru Nanak Institute of Technology. She has one journal paper named Mist Sprayer Arduino Based Semi-automatic Floor Cleaning Machine (Kolkata, West Bengal, IJIRT, 2022) and two international conference papers in AICTE & FOSET, 2022.



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Dr. Nabaneeta Banerjee has completed her PhD degree in Nanotechnology from IEST, Shibpur, India in 2016. She has received her M.Tech degree in Instrumentation and Control Engineering from Applied physics department of University of Calcutta., Kolkata in 2011. Presently she is working as Assistant Professor in the department of Electronics & communication Engineering of Guru Nanak Institute of Technology (GNIT), Kolkata. She has also three years research experience in the field of fabrication of thin film gas sensing devices. She has eight SCI and SCOPUS publications IEEE Sensor journal, Solid State Electronics (ELSEVIER), IEEE Transaction on Electron Devices, Journal of Nanoscience and Nanotechnology (JNN), Sensor Letters (ASP) etc. She has also presented her papers in eight conferences including IEEE International conference on Nanotechnology in Beijing, China, Conference on Nanotechnology and Biosensors (ICNB 2015) in Amsterdam, Netherlands etc. She has also eleven student publications till now. She has attended so many technical seminars and workshops and has software training on C, C++, Java, Oracle, SQL dot net etc.



Dr. Sreyasree Basu was born in the district Hooghly in 7 th August 1976. She was graduated from Bethune College in 1999 and did her Mester degree in the Organic Chemistry in 2001 from University of Calcutta and Ph.D degree in 2009 from the University of Calcutta. Presently she is working as Assistant Professor in Chemistry in the Guru Nanak institute of technology, Kolkata. She has 6 publications in Pharma innovation Journal, Reactive and Functional Polymers etc.

