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Design & Fabrication of Bluetooth Controlled Robotic Floor Cleaning Machine

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Abstract - *The project is based on manufacturing of Bluetooth controlled floor cleaning machine. The purpose behind this project is to design and develop model for cleaning wet & dry surface floors. It is very useful for cleaning the wet floors. Cleaning of floor having importance from our health point of view and this floor cleaning machine reduces the effort required for it. Hence this project is very useful in our day to day life. It is very simple in construction and easy to operate, anybody can operate this machine easily. This floor cleaning machine consist of Sponge mop, swiping brushes, Fan for reducing the cleaning time. The overall cost of this machine is also cheap. Such type of machines is widely used for this purpose but they are working under different principles and the cost is very high. In recent years, floor cleaning machines are getting more popular for cleaning large floor area in minimum time. However, in India, which is a developing country requires large type of such machines to satisfy the cleaning needs.*

Key Words: *Automatic Floor Cleaner, Robotic Floor Cleaner, Dry & Wet Cleaner, Semi-automatic robotic Floor cleaner, Robotic Cleaner, Mobile Application, Bluetooth.*

1. INTRODUCTION

In today's world, Cleanliness having a great importance. Cleanliness means that there is no dirt, no dust, no stains, no bad smells. The goals of cleanliness are health, beauty, absence of offensive odor and to avoid the spreading of dirt and contaminants to oneself and others. With the help of cleanliness, we can keep our physical and mental health clean, which will make us feel good. Cleanliness gives rise to a good character by keeping body, mind, and soul clean and peaceful. Maintaining cleanliness is the essential part of healthy living because it is the cleanliness only which helps to improve our personality by keeping clean externally and internally.

It is everybody's responsibility and one should keep themselves and their surroundings clean and hygienic. It also brings good and positive thoughts in the mind which slows down the occurrence of diseases. There are lots of options are available for floor cleaning. Available options include manual & semi-automatic cleaning. Manual cleaning requires human interference & it also took large time for cleaning. Other than this Many types of machines are widely used for this purpose. But they are working under different principles and the cost is also very high.

This project deals with the designing and fabrication of Floor cleaning Machine by using Bluetooth. The aim of this work is to develop and modernized process for cleaning the wet & dry surface floors. The machine is very simple in construction and easy to operate. It consists of moisture cotton brush, the brush cleans the floor and dried with Fan. Hence it is very useful in houses, colleges, hospitals, auditoriums, malls and workshops. The time taken for cleaning is very less and the cost is also very less. Maintenance cost is less. In this project a very simple drive mechanism is used. The size of the machine is also compact & it is portable, so we can transfer from one place to another place very easily. The floor cleaning machine is simple & modern house holding device, as even children can also operate it easily with safety.

2. LITERATURE SURVEY

[1] Survey on Bluetooth Control Technology using Arduino

Cleanbot is a smartphone-controlled floor cleaning robot which cleans a dirty floor automatically using a set of commands given to your device by a smartphone. The device communicates through Bluetooth technology via a HC05 Bluetooth module that will be used to exchange commands to the microcontroller – Arduino UNO.

[2] Survey on Automatic working of machine

Main determination of this research is to style the work automatic, scrubbing is a very tough job it requires lot of patience and lot of persons to clean and in cleaning a person may damage his/her healthiness, cleaning is more time taking work.

[3] Survey on material required for machine

This project is very useful in our day to day life. It is very simple in construction and easy to operate, anybody can operate this machine easily. This floor cleaning machine consist of moisture cotton mop, swiping brushes, wipers and vacuum cleaner for reducing the cleaning time. The overall cost of this machine is also cheap.

[4] Survey on technological advantages of machine

This study has presented a comprehensive overview of the technological advantages helped in the real life various. For the convenience of most of the people who are extremely busy in their chores. So, this has resulted in coming up with an objective of making a floor cleaner.

3. PROBLEM STATEMENT

During the manual cleaning operation some dust and dirt particle may remain on the floor and due to the action of air the dirt and dust particle transfer from one surface to another surface which create the problems during cleaning which tends to increase manual effort. Due to which desire cleaning of the surface not gain and because of that it takes more time. Manual cleaning requires human interference & also took large time for cleaning. Other than this Many types of machines are available in market for this purpose. But they are working under different principles and the cost is also very high.

4. OBJECTIVES

1. To design & develop a machine which reduces human efforts & helps in easy and quick cleaning in affordable cost.

2. To develop user friendly system so that anybody with very less basic knowledge can handle the machine.

3. To ensure safety while handling this machine.

4. To develop fully self-contained & low maintenance system.

5. To develop efficient low power consumption system.

5. DESIGN & DEVELOPMENT

The floor cleaning machine with charging unit is developed and controlled with the Bluetooth application. The various components used in the floor cleaning machine are chassis frame, plywood, two plastic boxes, Arduino Uno, DC motors, wheels, battery, charging unit, Bluetooth unit, brush, fan, cleaning sponge. It will help in the cleaning floors with less human effort and in less time.

In the design of the floor cleaning machine is very compact as compare to other cleaning machine are available in the market but has the attractive design and high durability.

The machine consists of several parts that DC motor, wiper, mope and brushes these parts are fitted on the welded chassis made up of mild steel square bar of one inch and these parts are connected electric system. For DC motor the supply is provided through SMPS which converts AC supply into 12v DC supply.

6. METHODOLOGY

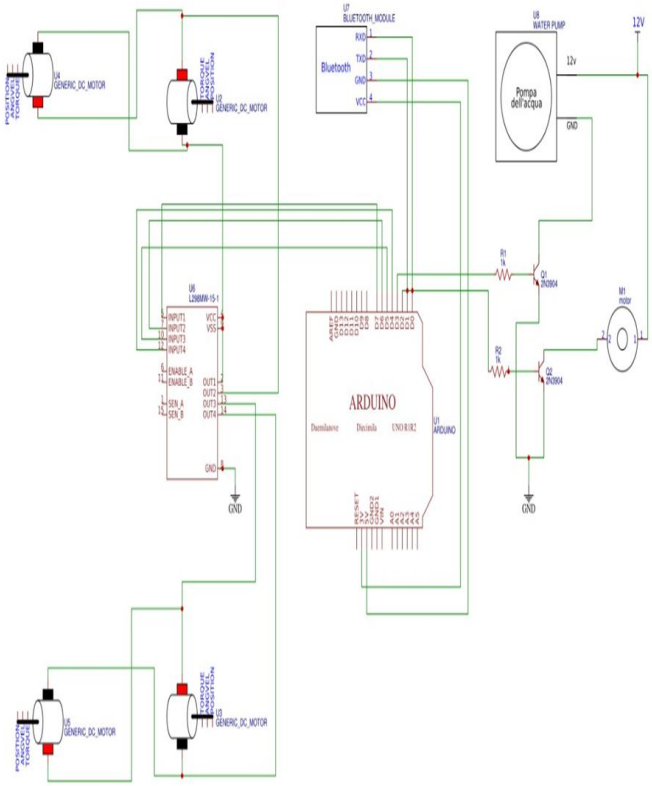

Fig. 1 – Circuit Diagram

A. COMPONENTS

Hardware Requirements

- **Arduino UNO**

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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 a AC-to-DC adapter or battery to get started.

Fig. 2 - Arduino UNO

- **Bluetooth Module (HC-05)**

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

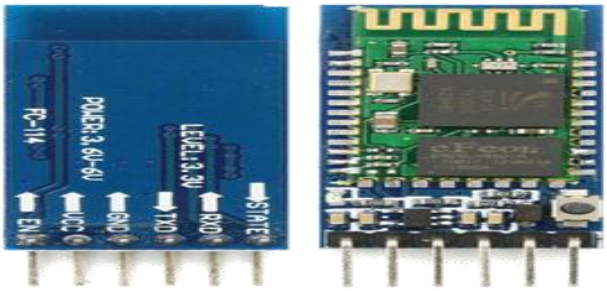

Fig. 3 – Bluetooth Module

- **DC Motor**

These motors are simple DC Motors featuring gears for the shaft for obtaining the optimal performance characteristics. They are known as Center Shaft DC Geared Motors because their shaft extends through the center of their gear box assembly. This DC Motor – 100RPM – 12Volts can be used in all-terrain robots and a variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.

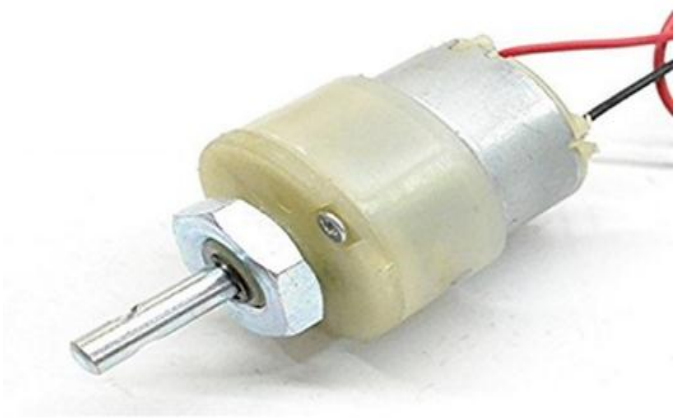

Fig. 4 - DC Motor

- **DC Motor (Non-Gear)**

The DC motor non-gear is an electrical device which converts from dc electrical energy into mechanical energy. Low cost for control achieved. Low torque at startup and high speeds. Rugged design. Simplicity of construction. It is used for simple application.

Fig.5 - DC Motor (Non-Gear)

- **Water Pump 12V**

A 12 Volt High Performance non-submersible dc water pump is a device which has a hermetically sealed motor close-coupled to the pump body. Some part of assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids.

Fig. 6 – Water Pump

- **Battery**

To store the energy and provide whenever needed is the function of battery. Usually this type of batteries are used for small applications. The battery life is good for use and they are rechargeable.

Fig. 7 – Battery

- **Fan**

It is used to dry the floor after cleaning and attached to the non- gear DC Motor. It is controlled by the mobile application and works on connected battery.

Fig. 8 – Fan Blade

- **Mobile Application**

Fig. 9 – Mobile App

7. ADVANTAGES

1. Easy to operate.

2. No skilled person required.

3. Less Maintenance cost.

4. Less noisy.

5. Clean more space in less time.

6. Less charging time.

7. Simple in construction.

8. Easy to handle.

8. RESULT & ANALYSIS

The designed Bluetooth operated robot for floor cleaning confirms its performance. After connecting all the necessary connections to controller and all other components. The robot has the ability to traverse on smooth surfaces. As the given robot operated through mobile application provides easy & flexible motion during its working. Controllers provided on mobile are user friendly. The robot performs its intended work in proper manner with less command instructions. The given robot having commands which allows rotation of cleaning brush along with water spraying. It runs smoothly & gives expected results by cleaning surfaces.

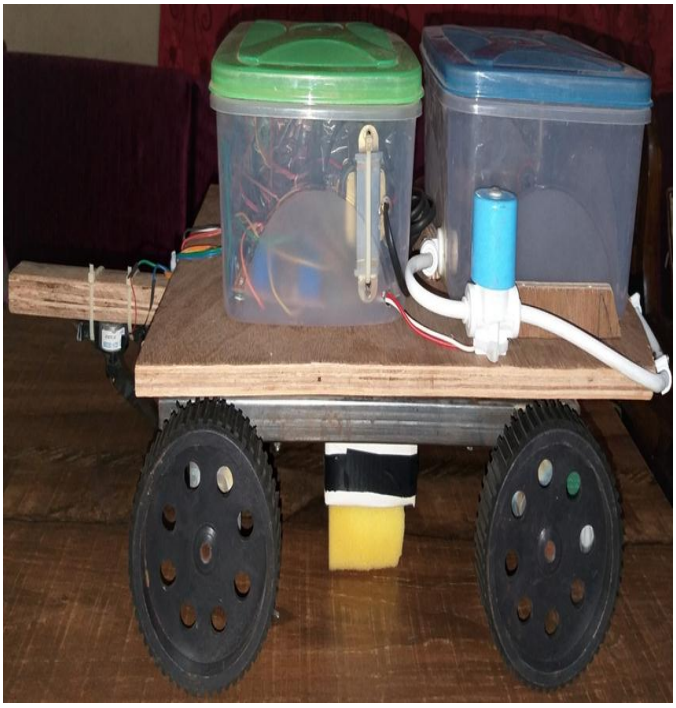

Fig. 10 – Assembled Floor Cleaning Machine

This project has been developed for small scale application. But we plan to extend this design for large scale application also. So, this Bluetooth controlled robotic floor cleaning machine confirms its performance by giving expected results by doing intended work in proper manner. It also achieves objective of low-cost machine.

Fig. 11 Working of Machine

9. CONCLUSION

The developed product is fully operational and gives desired motion. It is being tested in a room which results in successful outcome. Manually operated floor cleaning machine is an alternative for an automated floor cleaning machines during power crisis. Design is very simple and easy to fabricate. Overall the concept is very much helpful and there is lot of scope in improvisation in mechanical parts. The optimization will continue till achieving the best one. Overall the project is successful to its intent and will definitely change the era of robotics and floor cleaning. In the automation part the algorithm is designed to give 90% efficiency which is too high in current scenario. The development can be made in the field of sensing.

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