

Low Power Intelligent Robotic Floor Cleaner using Solar Panel

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Abstract— Households today are increasingly adopting home automation technology, which provides greater convenience and frees up more time for people. One area that is gaining strength is the use of domestic robots, although the market is still relatively new and emerging. Nevertheless, experts predict significant growth in this field as more people accept the benefits of having robots perform everyday tasks.

The aim of this project is to create a prototype for an autonomous floor cleaning robot, which will streamline the cleaning process and eliminate the need for manual vacuuming. The vacuum robot will be designed with user-friendly features to ensure ease of use. It will bring together both dry and wet cleaning operations using a vacuum cleaner as well as wet cleaning brush.

Keywords— Domestic Robots, Solar Cleaner, Smart Cleaner, Self-Monitored

I. INTRODUCTION (HEADING 1)

Nowadays floor cleaning robots are extensively used in different platforms such as field, road, hospitals and in other marketable places. Most of them require an electrical energy for its operation and not human friendly. As we know in India, especially in summer, there's extreme power deficiency and most of the floor cleaning robot aren't effective due to this problem. Therefore, it's required to develop a low-cost, human-friendly floor cleaning robot. In our model, we have tried to develop a solar powered mobile operated floor cleaning robot. In our model the analysis of the robot is done using commercially available software. This kind of ideas aren't popular in developing countries because of the cost of robot and power shortage. Our model is based on our innovative idea to development and manufacturing a robot which will work on solar energy, mobile communication, battery and electricity. This robot is designed by keeping consideration for lower energy consumption as well as cost reduction, moreover this

robot is made from the things easily available in our home and it is easy to handle. Here, we will be using renewable energy which is present in abundance and will have lower environmental impact and easy to construct. M. Ranjit Kumar, et.al [1] mentioned in his paper about the inconvenience of using a floor cleaning machines that work on electrical power as we know that we have a power crisis in India during summer season. They observed that most of the electrically operated floor cleaning machines are not used efficiently because of power crisis. To find the solution to this problem they created a user friendly and cost-effective floor cleaning machine, that can be manually operated which is a best solution for the floor cleaning machine that is electrically powered. They designed a 3D model using finite elements analysis software and suitable commercially available 3D modelling software for the analysis of the cleaning machine. The material properties of the floor cleaning machine were of conventional materials and they found that the stresses developed in the manually operated floor cleaning machine is in the safe limit and hence decided to design it.

Dhiraj M. Bankar, et. al. [2] designed a prototype model for cleaning the floor using a simple chain drive mechanism that can be easily repaired and operated.

Himani Patel, et. al. [3] designed a prototype model of a floor cleaning machine that can work on a large-scale area i.e., cleaning floors in hospitals, houses, auditorium, shops, computer center etc. It contains a moisture cotton brush to clean the floor and after cleaning it will be dried by small blower. This machine performs both sweeping and mopping operations simultaneously. In this model they have used dc motor and a single vacuum pump instead of 2 that will also reduce less consumption of power it is also stated that time taken for cleaning is very less further this machine can effectively clean floor including the corners and it is cost effective and have a very low maintenance.

Saravanan N, et. al. [4] developed a floor cleaning machine which consists AC motors, brush in the form of belt, conveyor belt, wet wipers, trash-container, trash pan and frame. The belt roller gets input from the AC motor through the belt. Throughout length of the belt brush is attached, which connects the two rollers. Both roller and conveyor brush belt arrangement rotate in clockwise direction. The dust collector is kept at small distance from the floor to collect any dust on the floor through the brush and put in trash container placed on backside of the chassis. All the parts of the machine are placed on the frame.

T. Jayananda Kumar, et. al. [5] proposed a floor cleaning machine that will work on IOT control system to clean office and household floors. They have used both wet floor and vacuum cleaning technique for dry floor cleaning.

Shailesh Dhomne, et. al. [6] have designed a manual floor cleaning machine that will clean both wet and dry floor using modernized process. It consists of a storage box to store a dust. This model is made keeping in mind about efforts reduction, easy handling and being environment friendly. It is electrically powered machine.

II. METHODOLOGY

A. Hardware

MOTOR DRIVER MODULE:



A motor driver module (L298N) is a high-power motor driver monolithic circuit of 15- lead Milliwatt and Power (SO20 packages). This motor driver can control up to 4 DC motor or 2 DC motors with directional and speed control .It contains 4 INR pins INR 1 and 2 is used to control the spinning direction of motor A or we can also call it as motor A input pins and INR 3 and 4 are used to control the spinning direction of motor B,ENA enables PWM signal for motor A and ENA enables PWM signal for motor B the output pins i.e. 1 and 2 provides output for motor A and 3 and 4 provide output for motor B here, 12v input is taken from the dc power source and it supplies power of 5v for the switching logic circuitry inside L298N IC and lastly there is a ground pin GND. This will help our model for the required movement.

B. DC Gear Motor



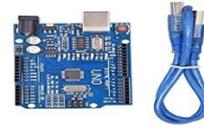
- Rated RPM: 200
- Operating voltage: 4-12 V
- Torque Range: 5 Kg-cm (Approx.)

C. BO Motor



- Rated RPM: 100
- Operating voltage:3-12v

D. Arduino Uno



- Microcontroller: ATmega
- Operating Voltage: 5V
- Input Voltage: 7-12V Input Voltage (limits): 6-20V
- Digital Input Pins: 14 (of which 6 pins provide PWM output)
- Analog Input Pins: 6
- DC Current per input Pins: 40 mA DC Current for 3.3V Pins: 50 mA
- Flash Memory: 32 KB (ATmega) of which 0.5 KB is used by the bootloader
- SRAM: 2 KB (ATmega)
- EEPROM: 1 KB (ATm)
- Clock Speed: 16 MHz

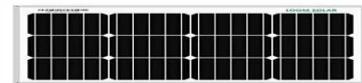
E. 12V-1.2Ah Battery:



- Rated voltage: 12 V
- Capacity:1.3Ah
- Weight:0.5kg

F. Solar Panel

A Solar panel (also known as “PV panels”) is a device that captures the energy provided by the sun in the form of sunlight and converts it into electric energy in the form of dc electricity.



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G. Solar Panel Battery Controller



It helps in charging of battery using solar panel in Controlled manner.

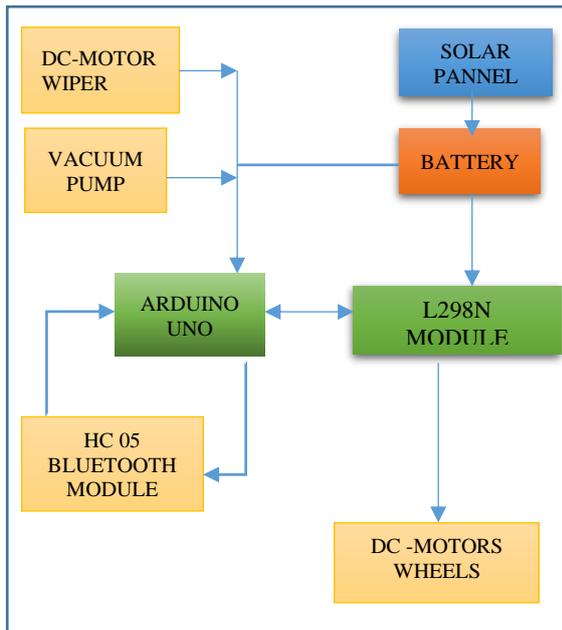
H. Software Used

- For Programming “Arduino IDE” version 2.0.3
- For Controls “BluetoothRCcar”

(<https://play.google.com/store/apps/details?id=braulio.calle.bluetoothRCcontroller&hl=en>)

III. MODELLING & ANALYSIS

A. Block Diagram



B. Flowchart

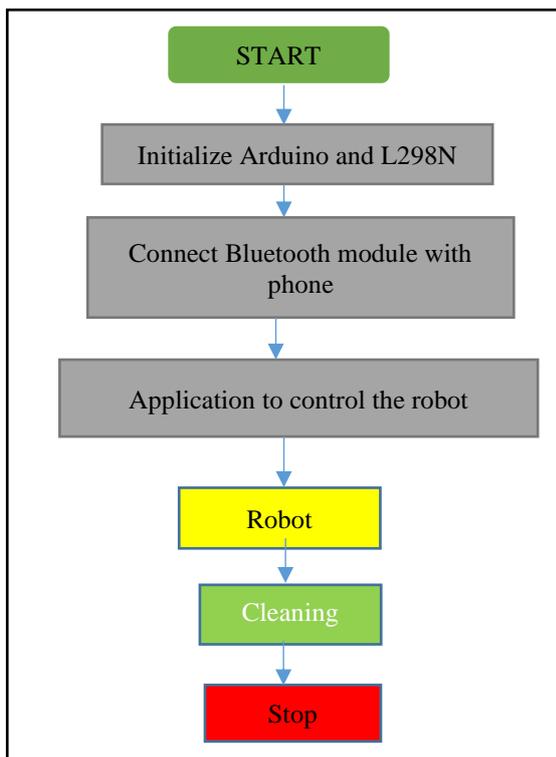


Fig. a: Demonstration

C. Conclusion

In latest years, robotic cleaners have taken essential interest in robotic studies due to their effectiveness in assisting humans in floor cleaning programs. Our robot will help in daily cleaning tasks and simplify it. It will bring together both dry and wet cleaning operations using a vacuum cleaner as well as wet cleaning brush. It will help people to save time and to avoid dust and unnecessary harassment.

D. Acknowledgements

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E. References

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