



SMART VACUUM CLEANER ROBOT

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Abstract

Cleaning homes and the surrounding area is more challenging now because of the hectic routine. There are vacuum cleaners on the market right now that need human intervention. Thus, using a vacuum cleaner that doesn't require a human is crucial. Through this effort, an effective cleaning technique has been put in place. By putting in place an automated system, this is accomplished. This system's ultrasonic sensor aids in avoiding substantial obstructions including walls, tables, chairs, and other furniture. The robot avoids colliding with barriers by moving in the direction where there is a greater space between it and the obstruction after measuring the distance with this sensor.

Keywords: Arduino UNO, ultrasonic sensor, servo motor, arduino motor shield, lead acid battery, gear motor, jumper wires.

I. Introduction

One of the key responsibilities of each and every person is keeping the environment around us clean. More personnel will be required to clean an area that is larger. There are some sites that are so filthy that cleaning the most significant negative influence on health. People are more susceptible to allergies, watery eyes, colds, coughs, rashes, etc. due to the presence of dust in the environment. Vacuum cleaners can be used in the home to clean carpets, floors, and other surfaces. Due to the space's size, it can be used well at colleges. When an obstruction is spotted, an ultrasonic sensor mounted to the robot's front measures the distance. The fan in a vacuum cleaner is powered by a battery.

Scope of work

1. The smart vacuum robot is designed to collect dry dust particles on smooth tiles without the assistance of a human.
2. It is easy to use and reasonably priced.
3. If constructed with the right materials, this smart vacuum cleaner may be able to thoroughly clean the entire house and maintain a tidy environment.

Problem statement

To design a vacuum cleaner that is intelligently programmed to clean the floor.

Need of project

1. Because there is a lot of dust and little rubbish in the homes as a result of the environment's increasing pollution.
2. It would take human effort to clean up such dust and little amounts of rubbish.
3. By automatically cleaning the floors of the house without any instructions, the intelligent vacuum cleaner robot can help to reduce such human efforts.

Objective

The following are the project's goals:

1. To fill the vacuum with dust particles.
2. To recognize and avoid obstacles automatically.
3. To save time and make the least amount of human work possible.
4. To scrub floors and carpets.



II. Literature

By reviewing different paperwork and techniques of used several cleaning robots, we've started acting on our design of "Smart Vacuum Cleaner Robot". The papers surveyed for literature are as follows:

1.F. Vaussarda, J. Finkb, V. Bauwens, P. Retornaza, and D. Hamela produced the "Lessons learnt from Robotic vacuum cleaners entering the home ecology" in their paper. It prioritizes power consumption, navigation, cleaning performance, and energy efficiency, and it covers all of the useful cleaning regions, but it is inaccurate. Also mentioned in this document are seven various types of cleaners, each with its own manufacturer.

2.T.B.Asafa and T.M.Afonja designed the "Vacuum cleaning robot" using Arduino 2560, which is spherical in shape and sucks dirt through a retractable trash bin on the top. It also has a cooling fan and a suction fan that can produce a vacuum that sucks or attracts dirt within the dustbin. The ultrasonic sensor detects the barrier, and the power supply utilized in this project is 28.8V. The disadvantage of this vacuum cleaner is that it has a smaller dustbin than other modern vacuum cleaners.

3.Vimala, S. Manikandan, T. S. Aravinth, S. Birundh Devi, and S. Sathiya Gopika designed "Arduino Based Floor Cleaning Robot". As a controller, they employ the PIC16F877A. Information about the robot is shown on an LCD. The disadvantage is that it is manual, has limited cleaning capabilities, and is expensive. Before operating the equipment, we need to clean it first.

4.Iwan Ulrich, Francesco Mondada, and J. D. Nicoud invented the "Autonomous vacuum cleaner robot". It operates in real-time in a real-world setting. With the ready to interfere sensor, it enhances the speed. It can be used for mobile control navigation systems, the robot has one arm for cleaning, and it can also be used to crash through walls. As a result, it is efficient, but because it is enormous, it will not fit into a small space. This vacuum cleaner uses a mobile navigation system for direct navigation and obstacle detection.

5.M. Ranjit Kumar and N. Kapilan collaborated on "Design and implementation of smart floor cleaning robot using Android App". The Arduino UNO was used to control their project. It's a wireless robotic system that's also a manual system because it's controlled by an android appt hat's run by a person. There striction is that it does not clean damp floors, does not reach small areas, and leaves unclean areas.

6. Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor YudaIrawan¹, Muhardi², RianOrdila³, RoniDiandra⁴ 1, 2, 3 Department of Information System, STMIK Hang TuahPekanbaru, Pekanbaru, Indonesia. The entire floor cleaning robot is divided into several parts, namely consisting of an Ultrasonic Sensor, Motor Shield L298, Arduino Uno microcontroller, Servo, and Dc Motor. This tool works when the Arduino Uno microcontroller processes the ultrasonic sensor as a distance detect or and a DC motor as a robot driver, then the DC motor is driven by the Motor Shield L298.

III. Methodology
Block diagram

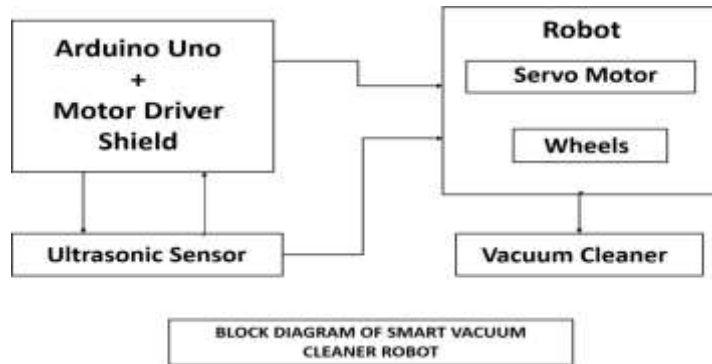


Figure 1: Block Diagram

In this project we have used Arduino Uno, ultrasonic sensor, servo motor, motor driver and vacuum cleaner. This all works on a battery. There will be a button to start the robot, after starting robot code in Arduino Uno get started, after that ultra sonic sensor measure the distance and if there are no any obstacles then it will move forward. If there are any obstacles then it turns left. Motor driver drives the motor and the robot will collect particles from floor through vacuum cleaner. In our project we have used water bottle attached with the pipe at the front of bottle and there is fan attached at the last of bottle. It creates the vacuum and the particles are absorbed in bottle. So, in this manner our project smart vacuum cleaner will work.

Algorithm

- Step1: Selecting components:
- Step2: Circuit designing and mounting:
- Step3: Program coding and debugging:
- Step4: Simulating circuit:
- Step5: Final result

Flow diagram

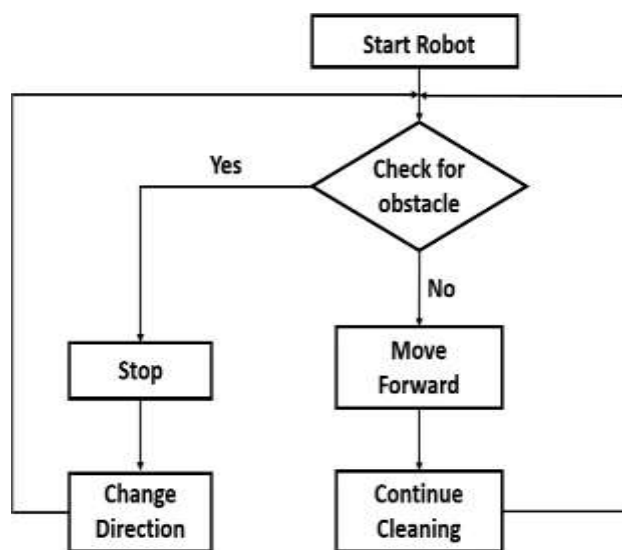


Figure 2: Flow Diagram

Implementation

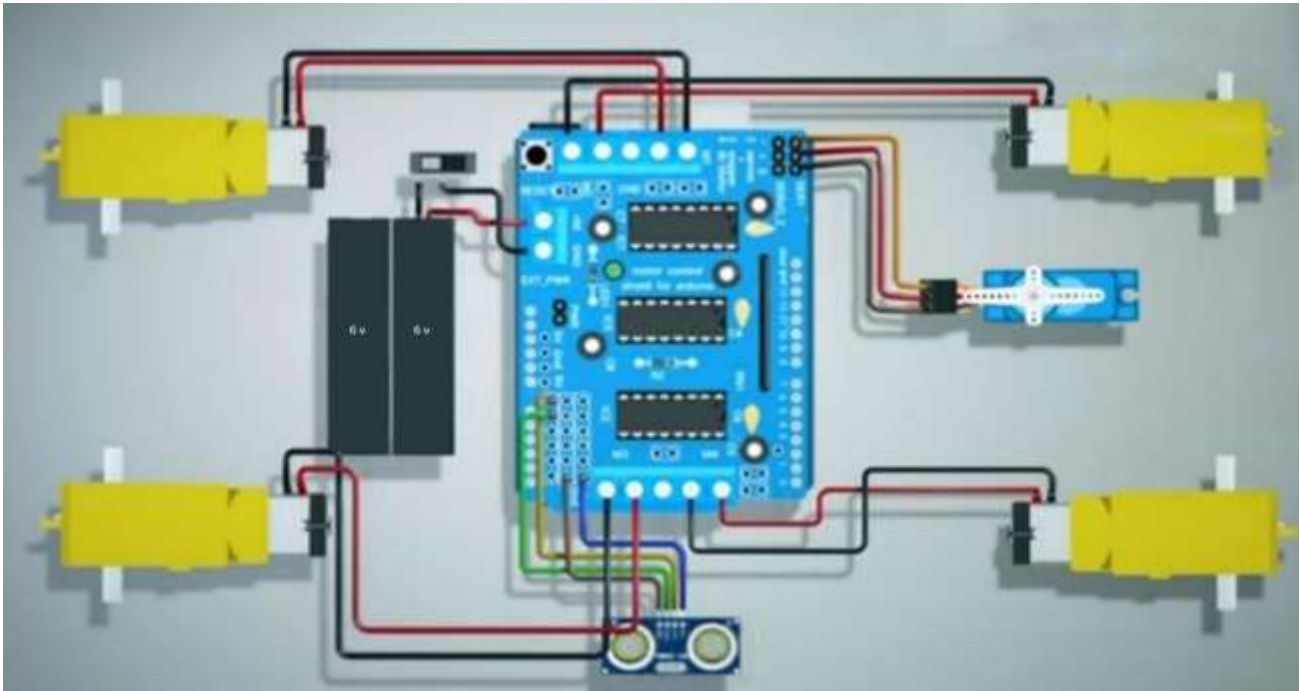


Figure 3: Implementation

Utilizing an ultrasonic sensor, the hardware for the robot and application are integrated. The robot is automated to accomplish the primary cleaning goal. The robot's testing revealed the feature that allows users to control (on/off) the robot's cleaning process.

Modules & Specifications

Sr.No.	Modules	Specifications
1	Servo Motor(SG-90)	4.8Vto6VDC
2	Gear Motor	3Vto12VDC
3	Arduino Motor Shield (L298D)	46V
4	Arduino UNO	7Vto12V
5	Ultrasonic Sensor (HC-SR04)	5V
6	Lead Acid-battery	6V

IV. Results

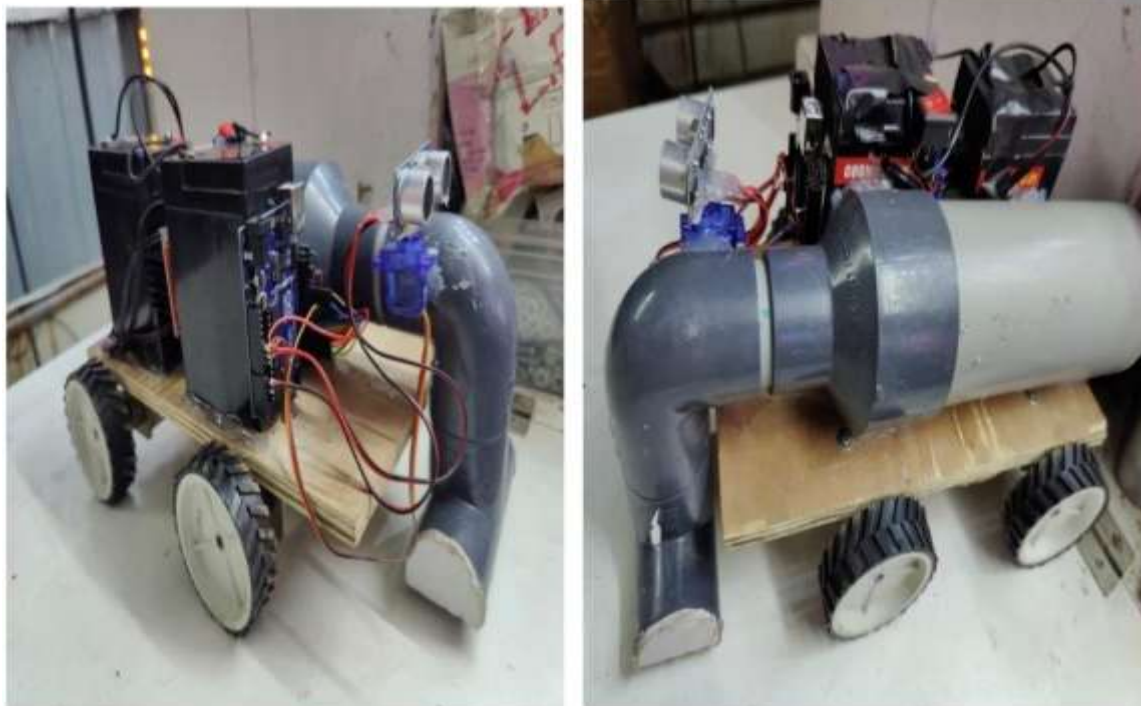


Figure 4: Results

V. Conclusion

The created robot is completely functional and follows logic when navigating. It is run to more effectively remove dry dust particles from the air. Robots are wireless devices; therefore, they can navigate a vast region. Additionally, less human interaction means less human work. In order to improve cleaning, self-dust disposal, and cleaning schedule scheduling, the robot can be upgraded with features including sensing, detecting, and moving in the direction of dust.

VI. References

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