

# The Smart Vacuum Cleaner

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## Abstract

*The purpose of this study is to discuss development of vacuum cleaner robot using an Arduino uno. The main idea is primarily having sensor to sense any object like wall and dust etc... and it avoids the obstacles. Then send the output data to an Arduino that will control the robot vacuum movement. To felicitate target function interactivity in conjunction with high quality sensor play an essential role. In this we have multiple options in operating the robot like we can operate remotely using android mobile by Bluetooth, automatic function just turns on the robot its movies using the sensor, voice command robot movements can be controlled using voice. At present, there are vacuum cleaners which require humans to handle it. Thus, there is a dire need to implement vacuum cleaner which works without human intervention. An efficient method to clean the desired area has been implemented through this project.*

**Keywords:** *Vacuum cleaner robot, multiple operating, motor shield, Arduino uno, Bluetooth module*

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## I. Introduction

An Arduino-based vacuum cleaner is a cleaning device that is powered and controlled by an Arduino microcontroller. The Arduino board is programmed to control the motors, sensors, and other components that make up the vacuum cleaner. This allows for a high degree of customization and control over the cleaning process, even navigate around obstacles. Additionally, an Arduino-based vacuum cleaner can be connected to other devices and systems, such as a smartphone or a home automation system, to provide remote control. They are meant to clean our hardwood floorings, tiles, and carpets of all sorts of dirt and debris similar to regular vacuum cleaners. The biggest difference is that these robots can reduce the amount of cleaning we need to do on a daily basis. We can effectively reduce the physical effort and time we spend keeping our floors clean with the help of a robot vacuum. Although it's a bit costly, it does present a wide range of benefits, justifying our investment. So, this kind of product can have a huge market and can be profitable venture for an investor. A vacuum cleaner is an electromechanical appliance commonly used for cleaning floors, furniture, rugs and carpets by suction. An electric motor inside the appliance turns a fan which creates a partial vacuum and causes outside air to rush into the evacuated space. These forces any dirt or dust near the nozzle into a bag inside the machine or attached to the outside. The demand to reduce manpower level has led to the design and development of automatic control systems, which enables unattended operations of the machinery. The current automatic integrated systems cover all aspects of Automatic vacuum cleaner operations. Current vacuum cleaners, although efficient, are rather bulky and therefore require large manpower for proper functioning

## II. Objective

The main objective of this project is to design and implement a vacuum robot prototype by using Arduino uno, Motor shield, Ultrasonic sensor and motor with wheels to achieve the goal of this project. The ultrasonic sensor is used to measure the distance between robot and obstacle. The whole circuit is connected with 12v battery. Vacuum robot will have several criterial that are user- friendly.

## III. Problem Statement

- Disable people and old age people difficulties in cleaning houses
- Now a days hiring maids are costly most people can't afford them.
- In present era everyone is busy with their works they have not time and energy to clean house
- Present vacuum cleaner large in size and required a person to operate it.

## IV. System Requirements

### Software requirements

#### Arduino IDE:

Arduino IDE is used to read, write and upload the code into Arduino uno

### Hardware requirements

#### Arduino uno:

Arduino uno is used to connect the input and output devices, codes are executed



#### Motor Shield:

The Motor Shield is a driver module for motors that allows you to use Arduino to control the working speed and direction of the motor



**Ultrasonic Sensor:**

Ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves



**Servo Motor:**

Servo motors or “servos”, as they are known, are electronic devices and rotary or linear actuators that rotate and push parts of a machine with precision



**Geared Motor Wheels:**

A gear motor is a mechanical system consisting of an electric motor and a gearbox containing series of gears.in our project this are used for momentum



**Bluetooth Transceiver:**

Transceiver is a combination transmitter/receiver in a single package. allows you to connect a non- Bluetooth device to your smartphone or other Bluetooth-enabled device and allows you to stream from them



**Lithium-Ion Batteries:**

These batteries are the main source of power

**DC motor and Fan Jumper****Wires****V. Methodology**

The construction of project is divided into two parts

1. Mode of connectivity
2. Vacuum cleaner

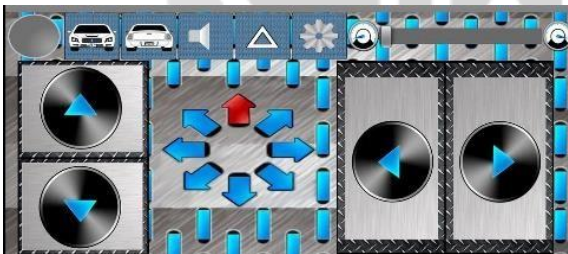
**Mode of Connectivity**

There are 3 types of mode

1. Remote control
2. Voice command
3. Automatic

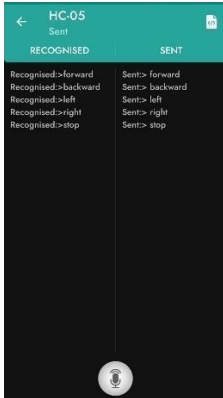
**Remote control**

As the name says remote control, we are going to control the direction of our machine with a remote using the Bluetooth module HC-05. The Bluetooth module HC-05 i/o pins are connected to Arduino uno and motor shield, as machine is switch in simultaneously Bluetooth module also switch on, then the Bluetooth module is connected with the android mobile through Arduino Bluetooth module app which is installed in android mobile.



**Voice command**

As the name suggest, our machine is controlled by voice commands which are FORWARD, BACKWORD, LEFT, RIGHT, STOP. HC-05 Bluetooth module is connected to android mobile through Arduino Bluetooth module app. As we give commands in app the machine will execute.

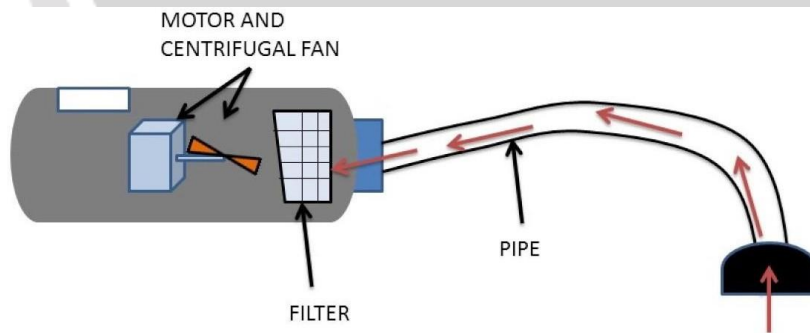


**Automatic**

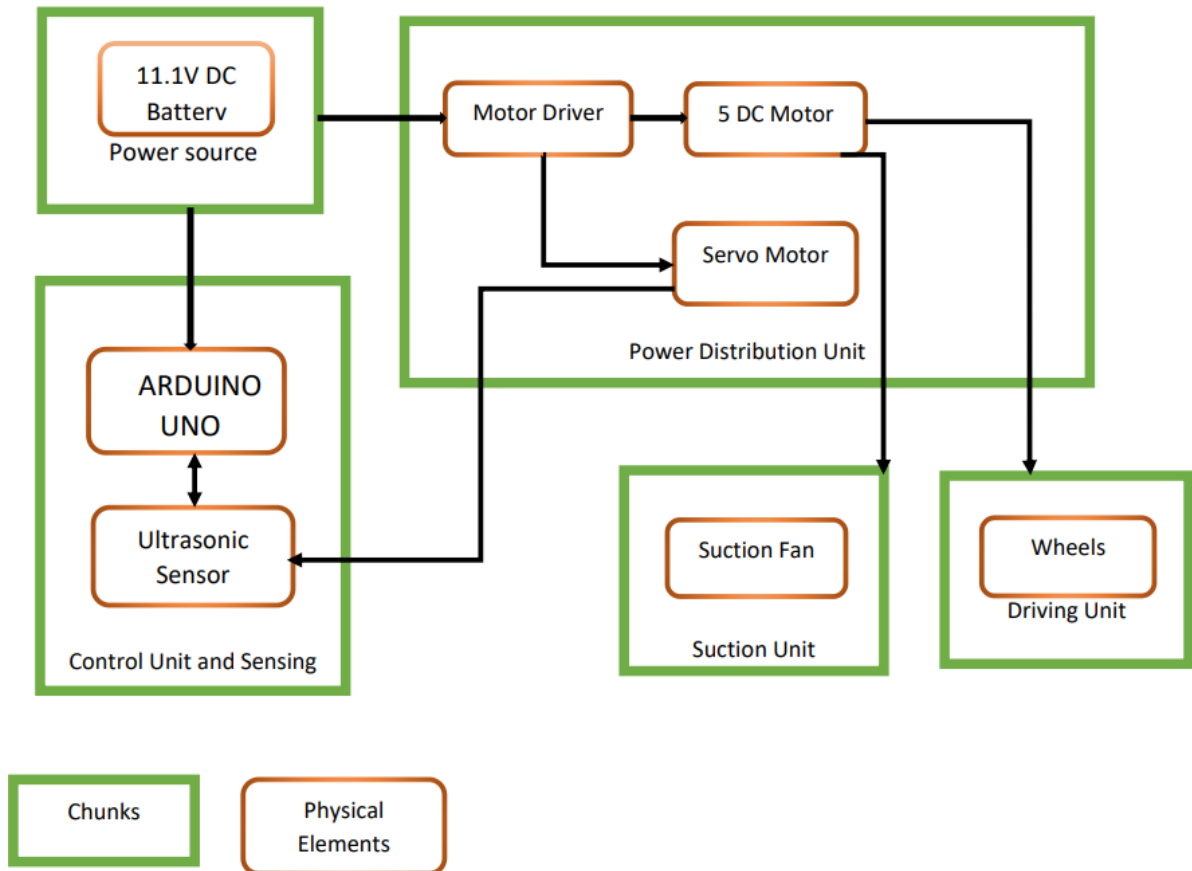
Automatic mode works using ultrasonic sensor which detect the obstacles by sending ultrasonic waves, with the help on sensor the machine avoids the collision with the other obstacle.

**Vacuum Cleaners**

Vacuum cleaner consists of one container, 12v DC motor, fan, filter, batteries, switch, long nozzle. DC motor, fan and filter are fit into container and a long nozzle is connected to container to suck the dust.



## VI. Architecture



Power source is connected to Arduino uno and motor shield in automatic mode ultra sonic sensor is activated and moves accordingly, the vacuum clear in also activated and it continuously movies and suck the dust in

## VII. Future scope

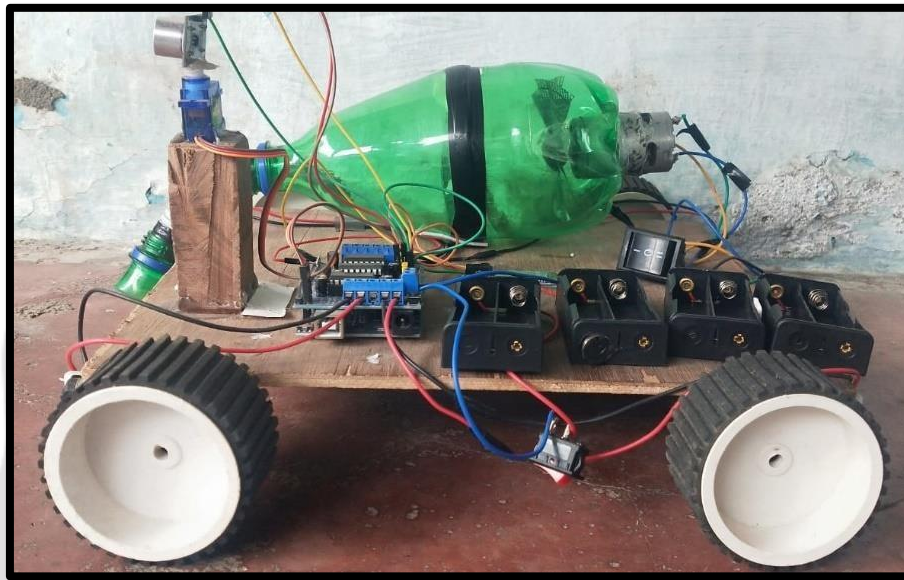
**AI and Machine Learning Integration:** Future smart vacuum cleaners will likely become even more intelligent with AI and machine learning algorithms. These algorithms could enable the vacuum cleaner to learn the layout of a home, identify obstacles, and optimize cleaning patterns over time.

**Integration with Smart Home Ecosystems:** Smart vacuum cleaners will increasingly integrate with broader smart home ecosystems, allowing them to communicate and coordinate with other

devices like smart thermostats, lighting systems, or security cameras. This integration could enable automated cleaning routines based on various triggers like occupancy status or time of day.

**Energy Efficiency and Sustainability:** As environmental concerns become increasingly important, future smart vacuum cleaners may focus on energy efficiency and sustainability. This could involve the use of eco-friendly materials, energy-efficient components, and technologies to reduce power consumption during operation.

## VIII. Output



## IX. Conclusion

In conclusion, the smart vacuum cleaner project has successfully achieved its objectives of creating a prototype that combines intelligence, automation, and efficiency in household cleaning. Through the integration of sensors, navigation algorithms, and user-friendly interfaces, the smart vacuum cleaner demonstrates promising potential in simplifying cleaning tasks and enhancing user experience. While further refinement and optimization may be necessary for commercial deployment, the project lays a solid foundation for future developments in smart home technology and robotics. Overall, the smart vacuum cleaner project represents a significant step forward in leveraging technology to improve everyday household chores and enhance the quality of life for users.

## X. References

- [1] Anshu Prakash, Murdan Pawan, Kumar Ramkissoon, "A smart autonomous floor cleaner with an Android-based controller", November 2020, DOI:10.1109/ELECOM49001.2020.9297006 Conference: 2020 3rd International Conference on Emerging Trends in Electrical, Electronic and Communications Engineering (ELECOM)
- [2] Amir Talebi, Tahere Pourseif, Rozhina Esmaeil Nezhad, Mina Mohajeri, "Smart Vacuum Cleaner in Two Modes of Remote and Automatic", July 2020 Research Journal of Engineering and Technology 07(07):5291-5298

- [3] Yuda Irawan , Muhardi , Rian Ordila , Roni Diandra, “Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor”, Journal of Robotics and Control (JRC) Volume 2, Issue 4, July 2021ISSN: 2715-5072 DOI: 10.18196/jrc.2485 240.
- [4] Faridah Hanim, Muhamad faizal Yaakub, Ili Najaa Aimi Mohd Nordin, Norain SahariDevelopment of solar panel cleaning robot using Arduino September 2020, Indonesian Journal of Electrical Engineering and Computer Science 19(3):1245, DOI:10.11591/ijeecs.v19.i3.pp1245-1250, License, CC BY-NC 4.0.
- [5] Akanksha Vyas, Satyam Chourasia, Shubham Antapurkar, Raghvendra PrasadARDUINO BASED DRY & WET AUTOMATIC FLOOR CLEANER, April 2020, International Journal of Engineering Technologies and Management Research 5(2):14-18, DOI:10.29121/ijetmr.v5.i2.2018.607, License, CC BY 4.0
- [6] Indronil Dey Niloy, Sayed Mohaiminul Hoque, Mashfiqul Hoque, Afif Bin ArfanSmart Floor Cleaning Robot, September 2023, DOI:10.1109/TENSYMP55890.2023.10223665, Conference: 2023 IEEE Region 10 Symposium (TENSYMP)
- [7] M. Vijayalakshmi, Bhargavi Baljoshi, G. Lavanya, Gouri MasterSmart Vacuum Robot, May 2020, DOI:10.1201/9781003052098-10, In book: ICT for Competitive Strategies (pp.8190)
- [8] Mrs.Y.Jyothi, P.Laxmi Prasanna, P.Vidya Sagar3, K.Uma4, P.Chandra Mahesh5, K.H.S.M.Sai , ROBOTIC VACCUM CLEANER, International Conference on Recent Trends in Engineering & Technology- 2023 (ICRTET-3), Orga Volume: 10 Special Issue: | Apr 2023 www.irjet.net p-ISSN: 2395-0072 , e-ISSN: 2395-0056
- [9] Swati Patil, S R Yelmar, S R Yedekar, S S Mhatr, Autonomous Robotic Vacuum Cleaner, April 2021, DOI:[10.47001/IRJIET/2021.504021](https://doi.org/10.47001/IRJIET/2021.504021)
- [10] Triveni., C Lalhmachhuana., R Lalrinsanga., Rebecca Lalrinzuali ,Vanlalrinchhana, Arduino Based Smart Vacuum CleanerJETIR July 2023, Volume 10, Issue 7 www.jetir.org (ISSN-2349-5162)