

# Performance of the Portable Robotic Vacuum Cleaner with Remote Control

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**Abstract**—In this project the proposal concept is to replace the manual work in cleaning by automated system. A vacuum cleaner is a device that uses an axial fan to create a partial vacuum to suck of dirt and dust particles from a given surface. Universal motor is used suction motor across vacuum cleaner. The universal motor is a series DC motor that is specially designed to operate on alternating current (AC) as well as on direct current (DC).The developed robot is disk-shaped, equipped with vacuuming and cleaning technology and controlled by Arduino UNO controller. Where fully charged, it will work continuously for three hours and cleans floor efficiently.The vacuum cleaner absorbed the dust. The dust free place is cleaned by the water. The directions of robotic vacuum cleaner controlled by using Wi-Fi.

**Index Terms:** Arduino, HC-05 Bluetooth, Axial fans, cylinder, DC motor, Wi-F,

## I.INTRODUCTION

Vacuum Cleaner is a device that causes suction in order to remove dirt from floors, and other surfaces. It is generally electrically drivenThe dirt is collected by either a dust bag or a cyclone for later disposal. Vacuum cleaners, which are used in homes as well as in industry, exist in a variety of sizes and models.Axial flow fan allows the vacuum cleaners to suck the dirt and dust from the floor it collects while cleaning the space. And the inhaled dust will be removed from the suction cylinder and decomposed into the dust collectors or dust bins.

## II. WORKING PRINCIPLE

In the robotic vacuum cleaner the axial fan is used to create a negative pressure for creating vacuum in order

to suck the dust or dirt on the environmental surfaces. The sucked dirt will be collected in the cylinder of the vacuum cleaner. The collected dirt will be disposed manually into the dust collectors or dust bins.

## III. HARDWARE REQUIREMENTS

1. Arduino UNO board:

The Arduino is a microcontroller board is used for control the robotic vacuum cleaner directions. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. In this, robot we are using seven analog input pins and they are 3, 5, 6, 8, 9, 10, 11.



Programme of AURDINO board in Embedded C:

```
String voice;
inti;
void led1_on() { //F
digitalWrite(8, HIGH);
digitalWrite(9, LOW);
digitalWrite(10, HIGH);
digitalWrite(11, LOW);
```

```

}
void led2_on(){//B
digitalWrite(8, LOW);
digitalWrite(9, HIGH);
digitalWrite(10, LOW);
digitalWrite(11, HIGH);

}
void led3_on(){//L
digitalWrite(8, HIGH);
digitalWrite(9, LOW);
digitalWrite(10, LOW);
digitalWrite(11, LOW);
}
void led4_on(){//R
digitalWrite(8, LOW);
digitalWrite(9, LOW);
digitalWrite(10, HIGH);
digitalWrite(11, LOW);

}
void led5_on(){
digitalWrite(7,0);

}
void led6_on(){
digitalWrite(7,1);
}
void led7_on(){
digitalWrite(8, 0);
digitalWrite(9, 0);
digitalWrite(10, 0);
digitalWrite(11, 0);
}
void setup() {
digitalWrite(7,1);
Serial.begin(9600);
pinMode(8,OUTPUT);
pinMode(9,OUTPUT);
pinMode(10,OUTPUT);
pinMode(11,OUTPUT);
pinMode(7,OUTPUT);

}
//-----
-----//
void loop() {

```

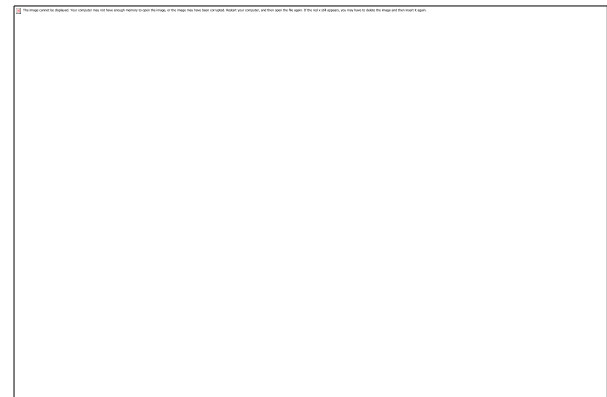
```

while (Serial.available()){ //Check if there is an
available byte to read
delay(10); //Delay added to make thing stable
char c = Serial.read(); //Conduct a serial read
if (c == '#') {break;} //Exit the loop when the # is
detected after the word
voice += c; //Shorthand for voice = voice + c
}
if (voice.length() > 0) {
Serial.println(voice);
if(voice == "1") {led1_on();}
if(voice == "2"){led2_on();}
if(voice == "3") {led3_on();}
if(voice == "4"){led4_on();}
if(voice == "5") {led5_on();}
if(voice == "6"){led6_on();}
if(voice == "7"){led7_on();}
voice="";}}

```

**.Axial Fan:**

The Axial Flow Fan is the main motor which creates pressure inside the Suction Cylinder resulting in Suction of the dirt. This Fan is fitted into the Suction Cylinder top. As the Fan rotates it produces Suction Pressure in the Suction Cylinder. This Fan is also a D.C. operated Fan, operated by Battery.



**3. HC-05 Bluetooth:**

HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration. Its communication is via serial communication which makes an easy way to interface with controller or PC.



4. Vacuum Cleaner Cylinder:

The Suction Cylinder consists of the Axial Flow Fan fitted inside it. Half of the Suction Cylinder acts as the storage tank. As the Suction Pressure is produced in the Cylinder due to the Axial Flow Fan rotation, the Dirt or Garbage is sucked inside the Cylinder and gets stored into the Cylinder bottom due to self-weight of the Garbage. The storage capacity of the storage tank is of 79 litres, which makes it able to store more Garbage. And also the number of times of removing dust bag reduces due to more storage capacity.

IV. RESULT

Trail: 1

Area of the floor (m <sup>2</sup> )	2
Power Rating (Watts)	700
Pressure (KPa)	12
Dust Collected (grams)	70
Time Consumed (Minutes)	3

Trail: 2

Area of the floor (m <sup>2</sup> )	3
Power Rating (Watts)	700
Pressure (Kpa)	12
Dust Collected (grams)	100
Time Consumed (Minutes)	4.5

The performance of the developed robot was evaluated based on navigation efficiency, sweeping capability and power consumption within the floor surface. The result have to be analysed considering this aspect. The test was performed on environment having a surface about 2-3 m<sup>2</sup>. The vacuum cleaner installed on board was used to suck up dust distributed in an uniform fashion on the floor. The robot is able to clean this kind of environment in the time given by the batteries of the vacuum cleaner, which is 12 minutes. The robot has cleaned the

surface more than 95% of dust in the room in our test.

V. PROTOTYPE



VI. CONCLUSION

The developed robot is fully operational that navigates according logic. It is operated to achieve cleaning of dry dust particles with more efficiency. Since robot is wireless device it can navigate to cover the large area. It also makes less human interaction which reduces the human work. The robot can be further used to upgrade with the functionalities such as to sense and detect as well as to move in the direction of dust which results in better cleaning, self-charging, self-dust disposal and to schedule timing for cleaning.

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