International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 05 | May 2020 www.irjet.net p-ISSN: 2395-0072

Cleaning Robot using Mobile Application

Priyanka Arora[1], Anjaney Chaturvedi[2], Abhinav Srivastav[3] and Pratyush Pathak[4]

[1]*Assistant Professor, Department of Mechanical Engineering, BBDNITM, U.P., India*
[2]*Student, Department of Mechanical Engineering, BBDNITM, U.P., India*
[3]*Student, Department of Mechanical Engineering, BBDNITM, U.P., India*
[4]*Student, Department of Mechanical Engineering, BBDNITM, U.P., India*

Abstract - *There is a rapid growth in the robot industry in the past few years and specially in cleaning robots whose CAGR (COMPOND ANNUAL GROWTH RATE) is 16%. A lot of cleaning robots are already there in the market but they are facing a lot of problems while sweeping or cleaning. This research paper is about a robot cleaner that cleans away the dust using wet scrubber with the help of mobile application.*

As we are using mobile application therefore, the robot will clean every single area of the room very easily avoiding any collision with the things because of motion control of the robot. It consists of components such as Arduino UNO, Bluetooth (HC-06), Motor driving IC L239D, DC motor and power supply with chargeable battery. A number of software and hardware implementation techniques are used to design and develop this system. It has both manual and autonomous mode of operations but we are using here manual mode with the help of Android application, which gives more efficiency in cleaning the floor.

Key Words: CAGR, Arduino UNO, Bluetooth (HC-06), Motor driving IC L239D, Autonomous

1. INTRODUCTION

Robots are the devices which are built to do the jobs as per the direction given by the humans. Although robots are being used from a very long time but the recent or we can say on commercial platforms the robot were first developed in 1961 during industrial revolution. Initially robots were used to do simple tasks and are generally stationary. Later on mobile robots were introduced, these are basically the robots which are not fixed and can travel from one place to another as per their program. When mobile robots came into the market they had a greater demand due to the ability of performing new tasks, their flexibility and their multi tasking functionality .The first robotic vacuum cleaner came into existence in 1996 and was made by Swedish appliances manufacturer. After that it became very popular and this industry started growing at very fast rate. Nowadays these robots are widely used in industries, offices and in houses for cleaning purposes. Sensors are the most important part of any robot. Sensor is a device whose work is to look for the changes in its surrounding. It detects the change and gives the signal. Types of sensors that are commonly used in various applications are :- 1- Touch sensor 2-proximity sensor 3- Infrared sensor 4-light sensor 5- pressure sensor 6- humidity sensor 5- ultrasonic sensor 6- tilt sensor 7- flow and level sensor. Infrared sensors are widely used in the robot cleaner compared to other ultrasonic sensors because they are cheaper and smaller than others which makes the whole circuit compact and inexpensive. IR sensor captures the information from surroundings and also keep the robot on the track. Cleaning is always hectic and boring job whether done manually or by robot. We have tried to build a robot cleaner controlled by a mobile application which gives you the feeling of playing mobile game while cleaning the floor.

2. MODEL

2.1 Block description

1) Chassis

- Dimensions - L×B = (27.5 × 20) cm

2) Metallic Clamp

- motor mounting hole - 13.5 mm
- bracket mounting hole - 3 mm
- Material - Mid Steel
- Thickness - 2 mm

3) Dummy (free wheel)

2.2 DC Motor

DC motor is one of the most important part which is used in for the movement of machines. These motors generally convert electrical energy into mechanical energy. For the robot cleaner we are using 300 RPM gear motors.

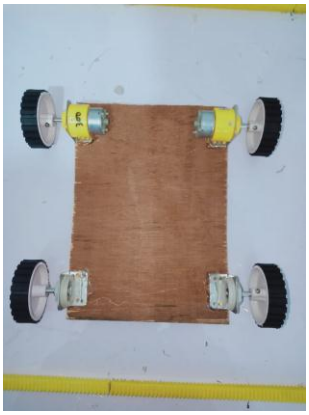

Fig -1: DC Motor, wheel, chassis, metallic clamp

2.3 Battery

A battery is a device which is used to supply the power, in case of robot cleaner we are using 12 volt chargeable battery.

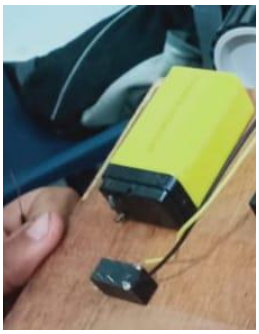

Fig -2: Battery 12 volt

2.4 Arduino UNO

The Arduino UNO is microcontroller board based on the micro chip. The board which we are using have 54 digital I/O, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button.

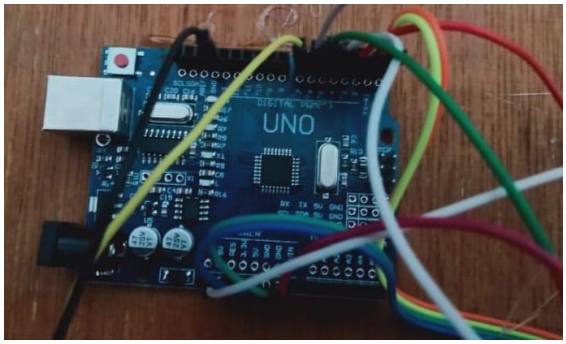

Fig -3: Arduino UNO

2.5 Motor driving IC L239D

We are using motor driving IC L239D having 16 chips. The L239D is designed in such a way that it provides bidirectional drive current of up to 600 mA. It has four input pins, four output pins. The positive terminal of motor and it is connected to a pin 3 and negative terminal to pin 6.

By this IC we can control 2 DC motors

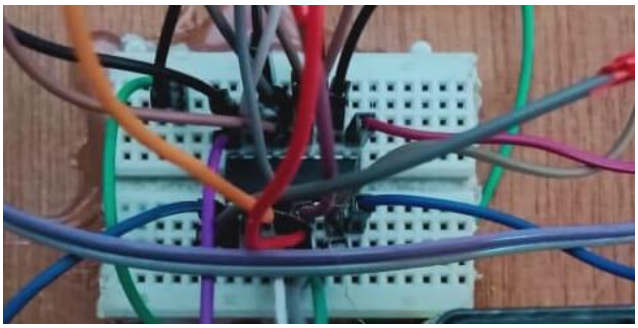

Fig -4: Motor driving IC L239D

2.6 Bluetooth

For the interaction between the robot and the mobile we are using Bluetooth (HC-06). The Bluetooth is directly connected to the robot with arduino UNO. It receives the data from mobile application and transfer it to the robot.
Attachments area

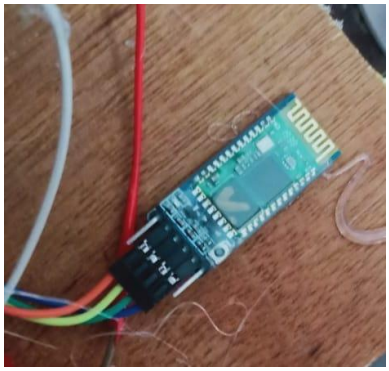

Fig -5: Bluetooth HC 06

2.7 Scrubber

We are using a scrubber, the scrubber is fixed to a ball bearing. We can detach the scrubber from the robot, where does scrubber and then use it for cleaning purposes.

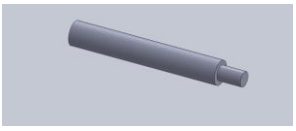

Fig-6: Scrubber [1]

2.8 Block diagram of robot

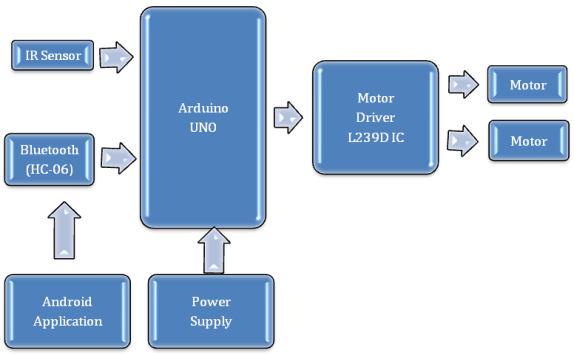

Fig -7: Block Diagram

3. CONSTRUCTION

We have initiated this project by taking a chassis of dimension (27.5×20)cm after that we have attached a metallic clamp on the corners of the chassis with the help of super glue. On the metallic clamps, dummy (free wheels) are attached on the outer side, while two 300 RPM motors are attached on the inner side of two wheels. With the help of super glue and arduino UNO, Bluetooth, motor driving IC L239D and battery are attached to chassis. Now Arduino UNO are connected to motor driving IC and Bluetooth with the help of male and female connectors. A scrubber is attached on the front face of the robot with the help of V shaped light weighted rod.

4. WORKING

When we run the mobile application it gives signals to the Bluetooth which gets forwarded to arduino UNO. Arduino then forwards the signal to motor driving IC l239d, from there it gets to the DC motor wale to move forward, backward, left or right. When robot starts moving, automatically the scrubber starts rotating and cleaning the floor, now it is up to us whether we have to use it on dry or wet floor.

4.1 Mechanism of straight motion

The IC supply equal current to motors (actuators) of both wheels due to this the robot cleaner moves straight.
Let the both wheels move with the velocity of x m/s

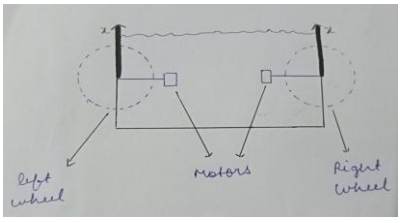

Fig -8: Mechanism of straight motion

4.2 Mechanism of spiral motion

The IC supplies less current to the left motor (actuator) as compared to the right motor, due to this the robot cleaner rotates in left direction.
Let the right wheel move with the velocity of x m/s and left wheel move with the velocity of y m/s
Here, velocity of right wheel x m/s is greater then velocity of left wheel y m/s (x>y).

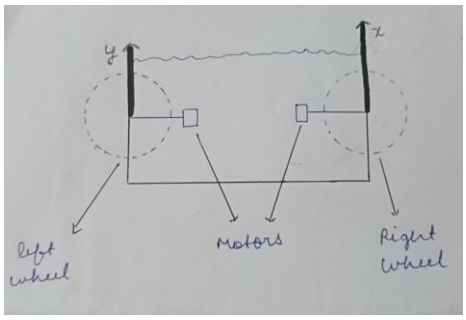

Fig- 9: Mechanism of spiral motion

If we see this relatively, the (x-y) m/s velocity of right wheel play important role to rotate the wheel.
The right wheel move (x-y) m/s greater velocity then left wheel due to the left wheel start dragging and right wheel start rotating toward left and by this robot cleaner rotate in left direction with small drag.

5. CONCLUSIONS

We have developed a robot cleaner that works smoothly. It uses mobile application for its better functionality and easiness in cleaning.

Previous models had some drawbacks like colliding with objects difficult to clean areas under furniture and cleaning of wet floor but we have tried to overcome these problems by making a compact robot cleaner of lesser dimension using scrubber for cleaning areas whether dry or wet.

Battery monitoring, self charging, dual functionality of suction and cleaning at low battery consumption and cost, setting off alarm and lighter bodyweight for shifting are drawbacks or we can see future scope of this model.

REFERENCES

[1] Ayoub Bahmanikashkoolia, Majid Zareb, Bahman Safarpoure, Mustafa Safarpourd "Application of Particle Swarm Optimization Algorithm for Computing Critical Depth of Horseshoe Cross Section Tunnel" APCBEE Procedia (2014) 9 207-211.
[2] Spyros G. Tzefestas “Mobile Robot Control Vision - Based Methods", Introduction to Mobile Robot Control (2014) - 319-383.

[3] Arnab K. Bordoloi, Md Faheemul Islam, Jiauz Zaman, Nabasmita Phukam and Nayam M Kakoty "A Floor Cleaning Robot for Domestic Environments".
[4] S Monika, K Aruna Manjusha, SVS Prasad, B. Naresh "Design and Implementation of Smart Floor Cleaning Robot Using Android App" IJITEE ISSN:2278-3075, volume - 8 - Issue - 452 March, 2019.
[5] Prof. Dr. Ir. Dirk Lefeber, Prof. Dr. Ir. Hichem Sahli "Autonomous Mobile Robot Mechanical design" Vrige university Brussel, 2004-2005.