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Horizontal and vertical surface cleaning robot

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ABSTRACT

The project is used for domestic and industrial purpose to clean the floor, wall & window automatically. The cleaner is designed in such a way that it is capable of cleaning the area horizontally as well as vertically. This paper presents a floor and wall cleaning robot. However, anything can run easily on horizontal surface, the main purpose of the present study is to develop a vertical cleaning robot. Because, the lot of horizontal surface cleaning robots are already present in the market, but they can't clean vertical surfaces like windows of large buildings. It works on the principle, if we draw air in the suction cup using vacuum pump then it can stick to the surface. And robot will move on either side by using rack and pinion mechanism.

Keywords— Arduino, vacuum pump, Rack & pinion, ultrasonic sensor

1. INTRODUCTION

In this 21st century, people have a very busy life specially in cities. In this lifestyle person always find a ways of saving time. But the problem is, it is hard to find the household workers and manage them in right proper time. Thus, a lot of manual work is taken over a by robots now a days. The controller is used to drive the vacuum pump so that air inside the suction cups can be taken and robot can stick to the surface by creating vacuum inside the cups. Also, an ultrasonic sensor is used to avoid the obstacles.

In the project, main focus is to build and program it in such a way, that it can move around freely and clean a vertical area by the swiping process. Smart floor cleaning robot has been designed for home and office environments. The proposed system is a manual system because it is controlled by android application which is operated by human. The proposed system functioning is entirely depended on the commands that are received from the android app.

These types of robots are mainly adopted in places where direct access by a human operator is very expensive, because of the need for scaffolding, or very dangerous, due to the presence of a hostile environment. Recently, there have been many demands for automatic cleaning system on outside surface of buildings such as window glass by increasing of modern architectures. Some customized window cleaning machines have already been installed into the practical use. However, almost of them are mounted on the building from the beginning and they need very expensive costs. Therefore, requirements for small, lightweight and portable window cleaning robot are also growing in the field of building maintenance.

2. MOTIVATION

Robotic surface cleaner is how quite convenient compared to a regular vacuum cleaner. Also, they are seen as more convenient to use because they can clean surfaces on their own. Robotic cleaner can be kept under beds or desks. whereas a regular vacuum cleaner requires a larger amount of space. However, a downfall to a robotic vacuum cleaner is that it takes a more time to vacuum an area due to how small it is. They are also relatively expensive. Heavy to lift. Vacuum cleaners are bulky, cumbersome machine that often hard to move around the home. Running electricity bill. Depending on the vacuum cleaner model uses hundreds to thousands of watts of electricity. No reusable dustbin bags.

3. OBJECTIVES OF PROPOSED WORK

- (a) To create robot which is light in weight and flexible in operation
- (b) To clean corner space
- (c) To reduce cost
- (d) To avoid worthy electricity bills

4. LITERATURE REVIEW

| Paper | Author | Year | Description |
|--|---|------|--|
| Study of Pneumatic Glass-Wall Cleaning Robots 2012 International Conference on Computer Science and Information Processing (CSIP). | Jiujun Zhen | 2019 | Magnetic adhesion, Negative pressure, Vacuum suckers |
| A Novel Navigation System for Indoor Cleaning Robot International Conference on Robotics and Biomimetics Qingdao, China, December 3-7, 2016. | Author is Zheng Zhao, Weihai Chen*, Chen C.Y. Peter, Xingming Wu | 2016 | The image and position information of the cleaning robot will be transmitted to computer. planning are carried out on the computer. command will be sent to cleaning robot via wireless communication. Under the manual control mode, the computer will stop sending command to the cleaning robot 2016. |
| A Floor Cleaning Robot Using Swedish Wheels Koki Kikuchi Department of Advanced Robotics Chiba Institute of Technology Narashino, Japan kouki.kikuchi@it-chiba.ac.jp | Author is Koki Kikuchi Department of Advanced Robotics Chiba Institute of Technology Narashino, Japan | 2007 | Magnetic adhesion, Negative pressure, Vacuum suckers It can move along all direction by its Swedish wheels and has four cleaners with automatic switching capability. In addition, optical proximity sensors and ultrasonic sensors, pressure sensor which can help the robot to gain obstacle avoidance, impaction, and other functions. Power management system is provided signals the low battery condition, 2007. |

5. PROBLEM STATEMENT

- (a) Vacuum cleaners are bulk in weight and they take large amount of space.
- (b) They are relatively expensive.
- (c) They are heavy to lift, hard to move around home.
- (d) Use of vacuum cleaner required hundred to thousand watts of electricity.
- (e) They don't have reusable dustbin bags.
- (f) Nowadays, automatic cleaning robot are suitable to operate in floor or in windows.

6. SYSTEM ARCHITECTURE

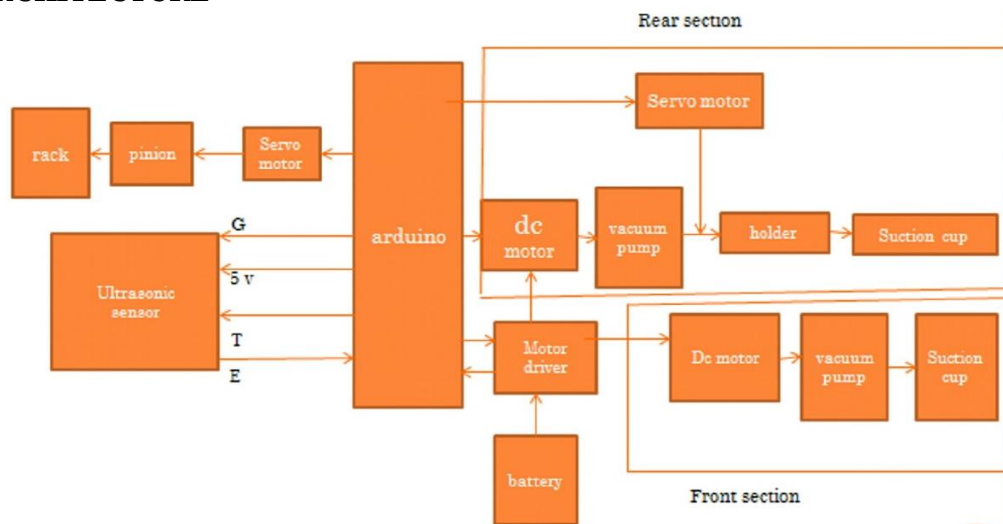


Fig. 1: System Architecture

6.1 Chassis

Chassis frame is the basic frame work of the automobile its supports all the parts of automobile attached to it. In our system chassis work as to carry all the stationary loads attach to it. Also withstand torsional vibration cause by the movement of Robot. It is the back bone of the system. All the systems and parts are attached to it. The solidity of Robot is greatly affected by the chassis of the system.

6.2 Arduino and its peripherals

Arduino gives signal to the relative servomotor and vacuum pump according to the instructions given in the program. Vacuum pumps are driven by the motor driver and motor driver is ultimately controlled by the Arduino. The obstacles can be avoided by the ultrasonic sensor.

6.3 Vacuum pump and suction cups

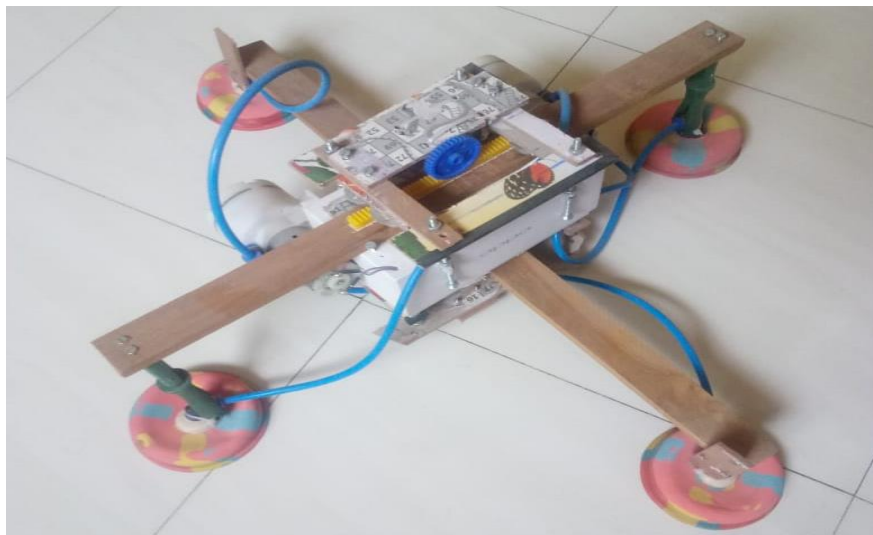
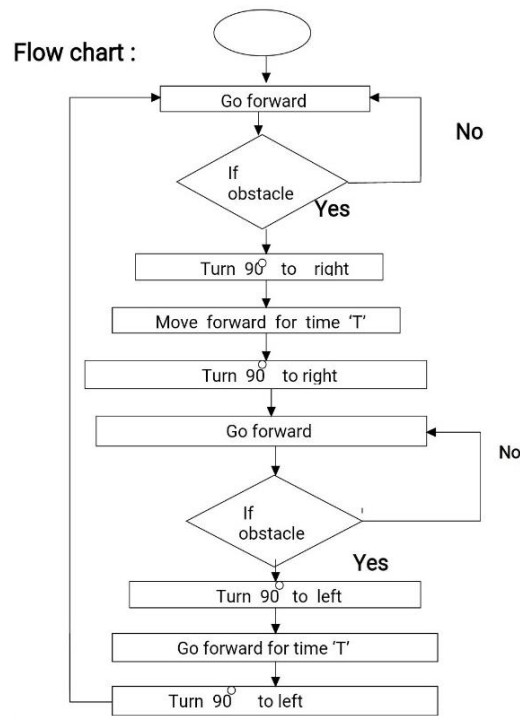
It sucks air inside of the suction cups and creates vacuum, so that robot can stick to the horizontal and vertical surfaces. There are four suction cups on all the sides of the chassis, and each two of it are connected by the wooden rod which is placed horizontal and vertical to the chassis.

6.4 Rack and Pinion, Servomotor

Rack is mounted on to the wooden rod and pinion is driven by the servo motor. By making proper rack and pinion action we can move the robot in all direction as per the requirement.

7. WORKING

Consider robot is moving forward using rack and pinion mechanism, from bottom to top and, if obstacle comes in front of the robot, then it will change its direction in downward side and now robot will move in from top to bottom. Now again if any obstacle appears in front of the robot then it will change its direction bottom to top and the cycle repeats, as per given in the following flowchart.



8. CONCLUSION

If we draw air in the suction cups using then vacuum will be created and due to this vacuum, it can stick to the surface. Using this principal, we can climb the robot on to the vertical surfaces as well. The same principal can be used on horizontal surface. In this way horizontal and vertical cleaning robots can be incorporated in one.

9. REFERENCES

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