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Smart Vacuum Cleaner Using Arduino and Bluetooth Module

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ABSTRACT: In the current hectic schedule, cleaning house and surrounding environment is more arduous. At present, there are vacuum cleaners which require humans to handle it. Thus, there is a direct need to implement vacuum cleaner which works without human intervention. An efficient method to clean the desired area has been implemented through this project. By using this vacuum cleaner, hazardous places can be cleaned which thereby reduce risks to mankind. This is achieved by implementing an autonomous system. Here, RC car which is embedded with a vacuum cleaner is used. This system has an ultrasonic sensor attached to it, that helps in avoiding large obstacles such as tables, chairs, walls etc. By measuring the distance via this sensor, the car takes the direction where the distance between obstacle and car is more, hence avoiding the collision with the obstacles. The vacuum cleaner is designed with a fan and a pipe is attached to the mouth of the bottle. The entire system is run by batteries. In recent years, people are becoming more career oriented and due their irregular working schedule it becomes challenging to maintain both home and office together especially for women. Most of the cases, they hire the cleaners to clean the home, office etc., but no trust on cleaners. To overcome the problem, Smart Vacuum Cleaner has come up with the more advancement in technology and is designed to automate cleaning process. To save the time of the people the smart vacuum cleaner helps to clean the surface of the

KEYWORDS:- Autonomous, human intervention, RC(Remote Control), Ultrasonic Sensor, Collision, Advancement.

I. INTRODUCTION

A. Overview:

A smart vacuum cleaner is an automated cleaning device that uses sensors, cameras, and other technologies to navigate through a home and clean floors and carpets. Smart vacuum cleaners are designed to be more efficient and convenient than traditional vacuum cleaners, as they can operate autonomously and adapt to different environments. Smart vacuum cleaners typically use a combination of sensors and mapping technologies to navigate through a home and avoid obstacles such as furniture, walls, and stairs. Some smart vacuum cleaners can even learn the layout of a home over time and optimize their cleaning paths accordingly. Many smart vacuum cleaners also come equipped with advanced filters to remove allergens, dust, and other particles from the air, making them ideal for people with allergies or respiratory issues. Smart vacuum cleaners can be controlled using a variety of methods, including remote control, smartphone apps, voice commands, and even gestures. Some smart vacuum cleaners can also be programmed to clean on a schedule, allowing them to clean a home even when the occupants are away. One of the main benefits of smart vacuum cleaners is their convenience. They can be set to clean automatically, allowing homeowners to focus on other tasks or activities. Additionally, many smart vacuum cleaners are designed to be compact and lightweight, making them easy to store and maneuver around a home. Overall, smart vacuum cleaners offer a more efficient and convenient cleaning solution than traditional vacuum cleaners. They can adapt to different environments, operate autonomously,

and be controlled using a variety of methods, making them ideal for busy homeowners who want to keep their homes clean with minimal effort.

B. Proposed system functions:

- Navigation: The vacuum cleaner should be able to navigate autonomously and avoid obstacles. Cleaning: The vacuum cleaner should be able to effectively clean floors and carpets.
- Mapping: The vacuum cleaner should be able to create a map of the home and optimize its cleaning path.
- Sensing: The vacuum cleaner should be equipped with sensors to detect obstacles, cliffs, and changes in terrain.
- Remote control: The vacuum cleaner should be controllable through a remote control or a smartphone app.
- Voice control: The vacuum cleaner should be able to respond to voice commands.
- Scheduling: The vacuum cleaner should be able to clean on a set schedule.
- Alerts and notifications: The vacuum cleaner should be able to alert the user when it needs maintenance or when its dustbin is full.
- Multi-floor cleaning: The vacuum cleaner should be able to navigate between floors and clean multiple rooms.
- Battery life: The vacuum cleaner should have a long battery life to allow for extended cleaning sessions.

C. Objective

The objective of this project are as follows:

- To automatically detect and avoid the obstacles.
- To collect the dust particles in the vacuum.
- To control the project through application.
- To work according to remote controlling.

D. Advantages of Smart Vacuum Cleaner:

Saves Time:As mentioned above, robot vacuums can be programmed to clean while you're busy with other tasks or even away from home. This frees up your time for more important things and helps to keep your schedule organised. Robot vacuums can also help to maintain a clean and organised workspace. If you're someone who works from home, robot vacuums can also help maintain a clean and organised workspace.

Cleans different home surface: Robot vacuums are able to clean all these surfaces effectively, using advanced technologies such as edge detection and multi-surface capability. This tiny little vacuum fits in just about any space and does every cleaning task perfectly.

Clean hard-to-reach places:Most robot vacuums have a low profile, allowing them to clean under furniture and tight spaces. This helps to ensure an overall thorough cleaning of your entire home.

Ideal for pet owners:Robot vacuums can make your life easier if you have furry friends at home. These robot cleaners can pick up pet hair and dander effectively, helping keep your home clean and allergen-free.

App Control:User can customize your cleaning task with the help of the app. A robotic vacuum is good at detecting boundaries. With sensors and a protective buffer, it can not only prevent itself from being damaged but also can avoid damaging the furniture.

Low maintenance:Robot vacuums are generally low in maintenance, requiring only regular emptying of the dustbin and occasional cleaning of filters. Compared to traditional vacuum cleaners, vacuums require less manual effort to maintain and keep running smoothly.

In conclusion, owning a robot vacuum brings convenience and efficiency to household chores. It saves time and helps to ensure that all areas of your home are thoroughly cleaned.

II. SYSTEM ANALYSIS

A. Problem Definition:

Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. This work can be very useful in improving life style of mankind. Our aim is to design the Automatic vacuum cleaner that will help to make household work convenient and much easier. It operates in autonomous mode as well as in manual mode along with additional features like scheduling for specific time and dirt container with auto dirt disposal mechanism. The flexibility, time saving and efficiency make the robot a clean choice for cleaning the floor

These days, part of individuals utilized manual vacuum cleaner to do their cleaning at home. At the same time, manual vacuum are utilized power utilization. As we probably aware, that is squandering cash and need human vitality to moving. So that's, it not handy for working individual to handle with manual vacuum and did not have enough time to clean. An addition, many of a designations regarding vacuum robot for the market are generally costly and significant within size. Therefore this really is tricky for you to clean anywhere, under beds, and also kitchen baseboards. It also exhausting task for human. So design the vacuum cleaner robot to make human task become easier and save time. It also had a minimal maintenance and use green technology. Period and also added effective.

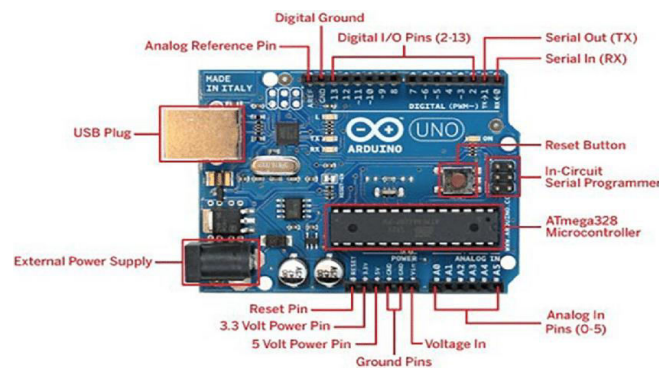


Fig:2.1 Arduino UNO

B. Implementation :

Materials flow from one location to another when a pressure difference is created between two locations. This phenomenon is the basic working principle of an ideal vacuum cleaner. When a centrifugal fan rotates it makes the air to flow by adding it external kinetic energy. Air is sucked from behind and pushed forward with pressure and so negative pressure it creates behind the fan. An ideal vacuum cleaner has such centrifugal fan in it connected to a motor. This unit has suction and discharge connections, on the suction side filter bag is fitted before the hose connection. The discharge has another air purifier filter and opened to the atmosphere. When the electric power is given the motor rotates and so the centrifugal fan. Air from the suction side is sucked into the unit, along with the air all air born particles, cat allergen, mist, dirt, and small solid particles are carried to the suction filter. They are trapped in the filter and dirt free air is pushed out from the discharge opening.

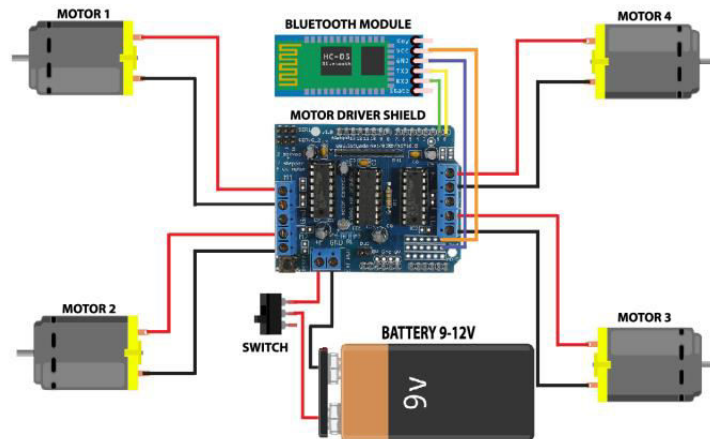


Fig:2.1

III. FUTURE SCOPE

The autonomous vacuum cleaner is not yet ready for commercialization, which was never the goal of the project. The ultrasonic sensor is able to identify obstacles. The combination of the robot shape and ultrasonic sensor system and its algorithm play well together and make the task of cleaning an unknown and unstructured environment feasible. The future work of the robot may include

- Image/video captured of objects can be fed to the controller so that the robot can clean the entire house according to the input fed.
- Currently image is captured only for edge detection for movement in proper path, not for object detection.
- The cleaning mechanism on the robot can be replaced by a handlike structure so that it can lift things from one place to another.
- Automatic charging

IV. CONCLUSION

Overall, we were satisfied with the performance of the smart vacuum cleaner. The obstacle detection and avoidance system worked well, and the remote control and voice control features were functional. While the voice recognition system could be improved, we believe that the cleaner would be a useful addition to any household. The autonomous vacuum cleaner is not yet ready for commercialization, which was never the goal of the project. Many of the achieved results are very promising. The shape of the robot is well suited for the application, especially for the task like cleaning along the wall, along legs and corners. The ultrasonic sensor is able to identify obstacles. The combination of the robot shape and ultrasonic sensor system and its algorithm play well together and make the task of cleaning an unknown and unstructured environment feasible. Households are becoming more automated, resulting in greater convenience and less time spent on home duties. While vacuum cleaners have made home cleaning easier, they are sometimes too noisy and cumbersome to be used on a regular basis. This robot shows the outcomes of the development of an autonomous mobile robot based on some new ideas that have emerged in this field over the last decade.

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