

MOBILE VACUUM CLEANER

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DECLARATION

i. Recommendation of student :

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(Pravin Ravi)

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it confirms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as Final Year Project report as partial fulfillment for a diploma of Electric and Electronic Engineering (Communication).

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Supervisor

Abstract

The name for this project is Mobile Vacuum Cleaner for the purpose of cleaning the floor. The advancement of technology, robots are getting more attention of researchers to make life of mankind comfortable. This paper presents the design, development and fabrication of prototype Mobile Vacuum Cleaning Robot (CLEAR) using IEEE Standard 1621 (IEEE Standard for User Interface Elements in Power Control of Electronic Devices employed in (Office/Consumer Environments)). Subject robot operates in autonomous mode as well as in manual mode along with additional features like scheduling for specific time and cleans dirt with auto-dirt disposal mechanism. This work can be very useful in improving life style of mankind. Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. Domestic robots are entering the homes and people's daily lives, but it is yet a relatively new and immature market. However, a growth is predicted and the adoption of domestic robots is evolving. Several robotic vacuum cleaners are available on the market but only few ones implement wet cleaning of floors. The purpose of this project is to design and implement a Vacuum Robot Manual via bluetooth. Robotic Floor Cleaner is designed to make cleaning process become easier rather than by using manual vacuum.

ACKNOWLEDGMENT

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CHAPTER 1

INTRODUCTION

In recent years, vacuum cleaners have taken major attention in robotics research due to their effectiveness in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc. Basically, robotic cleaners are distinguished on their cleaning expertise like floor mopping, dry vacuum cleaning etc. Some products are based on simple obstacle avoidance using infrared sensors while some utilize laser mapping technique. Each cleaning and operating mechanism of vacuum floor cleaners has its own advantages and disadvantages.

For example, robots utilizing bluetooth are relatively faster, less time consuming and energy efficient but costly, while obstacle avoidance based robots are relatively time consuming and less energy efficient due to random cleaning but less costly. Countries like Pakistan are way back in manufacturing robotic cleaners. Importing them from abroad increases their costs. The main objective of this work is to provide a substantial solution to the problem of manufacturing robotic cleaner utilizing local resources while keeping it low costs. In this work, floor cleaning robot has been designed for consumer/office environments and its each component in accordance with IEEE Standard is discussed. Proposed design is being operated in dual modes. In one of the modes, the robot is fully autonomous and making decisions on the basis of the outputs of infrared proximity sensors, ultrasonic sensors and tactile sensors after being

processed by Arduino (UNO) controller and control the actuators (2 DC encoder motors). In manual mode, the robot can also be used to clean a specific area of a room by controlling it manually from mobile via Bluetooth connectivity.

1.1 Project Background.

Bluetooth robot are mechanical devices that are able to move if control via Bluetooth. The Bluetooth ability achieved via the availability of exterior sensors that able to receive information from the environment through distance measurement, visual images and proximity measurement. The most common sensors are distance sensors (ultrasonic, laser, etc.) capable to measure the distance to the opponent and detecting the opponent. When this ability used by the Floor Cleaner to clean the floor, it should be able to release water, soap and clean the specific place. In attempt to build an autonomous robot, researchers always faced with the necessity of build a complex system that are difficult to control or a simplified system which are not sufficient to represent the real world. The options that involves complex system are less interesting due to lack of analytical method to handle the uncertainty and concisely represent the knowledge in a practical control system. Non-analytical method such as fuzzy logic, neural-network and evolutionary computation have shown the ability for an intelligent control of complex system. In particular, the fuzzy logic has proven for handling the world uncertainty and knowledge representation.

1.2 Problem Statement

Most of the house works are done by women who are busy to build their goals and career and sometimes they do not have enough time to do or complete their house work especially cleaning.

Besides, using mops ,broom or vacuum in cleaning still need their time and energy to do it so. Moreover, it is hard to do cleaning when the house has many stairs or a bigger spaces. It's more difficult for a mother who have babies or children to clean the house.

1.3 Objectives

The objectives of the Floor Cleaner are listed as below:

i. To reduce the time consume to clean the floor. In today's world, time is money. Most families consist of young children and working parents. In such a scenario, cleaning becomes a time-consuming and exhausting task, especially in larger homes. A robotic floor cleaner does all the work by itself and requires no supervision. By investing in one of these machines, you can save yourself a lot of time and effort.

ii. To do more than one work at the same time. Higher end models of robotic floor cleaners allow you to achieve a better clean. Some features that will last for multiple cleaning sessions, advanced cleaning that can clean surface.

iii. Ideal for People with Mobility Issues

People with disabilities or mobility issues can look at robotic floor cleaners as an alternative to expensive housekeeping services. The machine can be set to clean as often as required, while requiring minimal maintenance

1.4 Scope and Project Limitation

The project is a prototype machine.

- ❖ Design for people who faces difficulties in cleaning.
- ❖ Arduino Uno, Relay and DC motor circuit were built for movement for the project.
- ❖ This device only uses battery to work.
- ❖ Wireless technology for short-range voice and data communication.
- ❖ It can only forward and backward, left and right.
- ❖ It can also do cleaning job using sponge, and vacuum.
- ❖ The command is given via smart hand phone using bluetooth

1.5 Importance of project

A vacuum cleaner is the most easy-to-use and time saving appliance which is hot-favourite in most of the domestic and commercial spaces. People often go for them in order to complete the task of cleaning their homes and areas as quickly and efficiently as possible. Especially, without them, it is nearly impossible to carry out the fine cleaning of carpets and huge sofa sets. They add the tag of comfort to the life of a person and make it easy for him to look after his domestic duties with utmost care and effectiveness.

The older versions of these machines were quiet heavy and less advanced. But the recent ones are coming in as light weight as possible. They are also equipped with the latest and super-smart technologies. The best vacuum cleaner coming these days have the best features like advanced attachments and filters that can absorb the allergens from the air which are settled in the form of dust on the carpets and other such stuff.

1.6 Conclusion.

The Vacuum Cleaner is built for people with mobility issues. This chapter explained the problem statement, project objective, project scope, contribution aspect and lastly the expected output for this project. It is important to choose the best cleaning method for your floor:

- Most slip accidents happen when floors are contaminated. Effective cleaning should remove contamination and reduce the risk of slips. Incorrect cleaning can lead to a build-up of contamination, making the floor more slippery.
- A wet cleaning process can make a floor slippery during and immediately after cleaning.

Chapter 2

LITERATURE REVIEWS

2.0 Introduction.

This chapter will explain about the overview of the robotic vacuum cleaner is an Bluetooth controlled electronic device that is intelligently programmed to clean a specific area through cleaning assembly. Some of the available products can brush around sharp edges and corners while others include a number of additional features such as wet mopping.

2.1 History.

The history of robotics is unite and connected specifically with the histories of innovation, science and the fundamental rule of advancement. Considered as a major aspect of robotics, innovation of processing, power, even pneumatics and pressure all can be considered as a feature of robotics history. In 1920, Karel Capek was played title Rassum's Universal Robot (RUR) where the word robot was initially instituted by the Czech writer (Noviny.L,1933).Currently, robotics speak to one of the best endeavour humanity have been made to create a counterfeit, aware being. In antiquated time, the Egyptians and Greeks constructed mechanical robots to perform straightforward errand to facilitate their everyday life.

Types of floor cleaners

Vacuum Steam Cleaners

It can remove the typical dirt and grime that gets tracked into your carpet fibers. The process is not too difficult but it is more involved than would be practical for part of your weekly cleaning chores.

Hardwood and laminate vacuum cleaners

It is not only classic, elegant installations, they are also the easiest to maintain and clean. There are expensive vacuum cleaners out there.

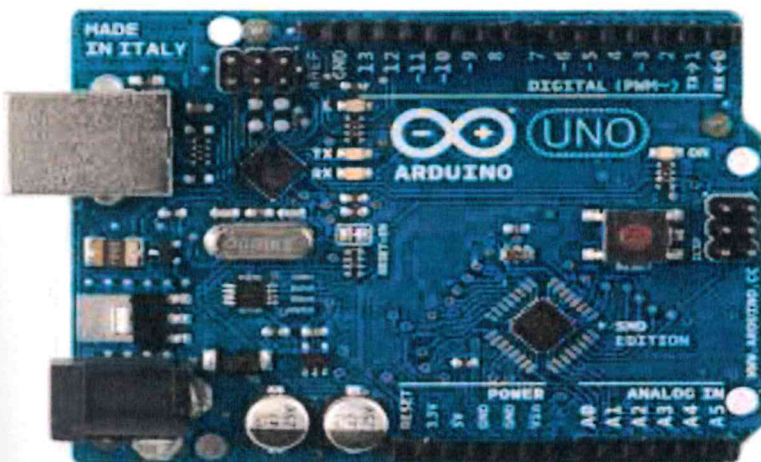
2.2 Analysis on the Issue of Project

With all the necessary background research completed it became clear what basic design components the entire system would require. First we needed the power to be supplied to the designed model which will turn on the components. Then, if the vacuum cleaner robot start moving , it will undergo cleaning process. The cleaning will be stopped when the allocated place is cleaned.

Component

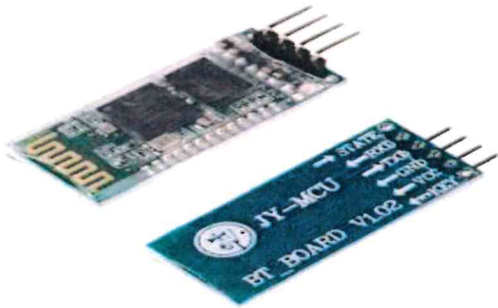
1. ARDUINO UNO

Arduino Uno is a microcontroller board. It has 14 digital input/output pins, 6 analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. Worst case scenario you can replace the chip for a few dollars and start over again. In this project, Arduino Uno is to use to recognize the voice command from Bluetooth and transmit it to DC Motor driver and trigger it. Arduino Uno is advance technology that is easy to find and to program it.



2.BLUETOOTH

Bluetooth is a standardized protocol for sending and receiving data. It's a secure protocol, and it's perfect for short-range, low-power, low-cost, wireless transmissions between electronic devices. Bluetooth serves as an excellent protocol for wirelessly transmitting relatively small amounts of data over a short range (<100m). It's perfectly suited as a wireless replacement for serial communication interfaces. In this project, Bluetooth is use to receive voice command from the hand phone and will transmit to Arduino.



3.MOTOR

Type of motor:

Motor direct current (DC Motor)

- Moving in one direction only
- used in low-power electrical appliances
- dc motor energy source is a battery

DC motor is used to make the motors to move. It is used to make the motor move left, right, forward and backward.



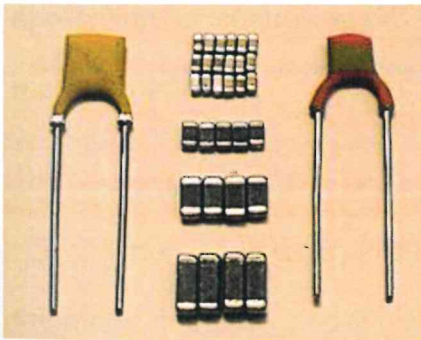
4.BATTERY

Electrical battery is a device that consists of two or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell has a positive terminal, or cathode, and the negative terminal, or anode. The terminal marked positive has a higher electrical potential energy than the terminal marked negative. When the positive terminal is connected to an external circuit, electrons will flow and deliver power to an external device. When the battery is connected to the external circuit,

electrolyte ions can move as in, allowing chemical reactions to be completed on a separate terminal and delivers energy to the external circuit. It is the movement of their ion battery that allows current to flow from the battery to perform the battery. Even technical term means a device with a variety of cells, single cells are popularly called battery.



5.CERAMIC CAPACITOR



A **ceramic capacitor** is a fixed-value capacitor in which ceramic material acts as the dielectric. It is constructed of two or more alternating layers of ceramic and a metal layer acting as the electrodes. The composition of the ceramic material defines the electrical behavior and therefore applications. Ceramic capacitors, especially the multilayer style (MLCC), are the most produced and used capacitors in electronic equipment approximately.

6. Motor Driver IC L293D

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC). It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence, H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on L293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin 9 goes low then the motor in the corresponding section will suspend working.

VCC is the voltage that it needs for its own internal operation, 5V. L293D will not use this voltage for driving the motor. For driving the motors it has a separate