

AUTOMATIC FLOOR CLEANER

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I. ABSTRACT: *This research is based on design and construction of a floor cleaning robot using some automation. Arduino based mobile controller is used to control the machine and obstacles as well, and to change left direction after right direction. It is applied with L293D Arduino Shield. In this system, four motors (DC motor) with L293D Motor Driver Board is used for robot movement, and other motor is used for the purpose speed control of cleaner. The wireless connection between remote control and robot is established by using Bluetooth. A 12V rechargeable Battery is used for external Power Supply. ATmega328P microcontroller-based Arduino UNO board is applied as the heart of the system. For its stable domestic response simulation test & experiments are performed.*

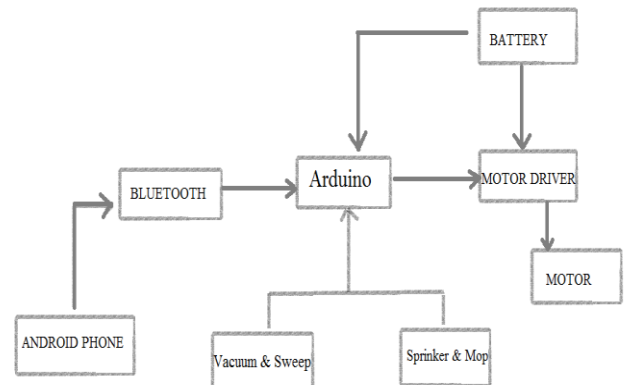
Key Words: Floor Cleaner, Arduino, Bluetooth, Motor Driver, DC Motor.

II. INTRODUCTION

In our day to day life, cleaning is performed repeatedly. In various developing countries, Broom is used as most essential cleaning tool, which has least efficiency & also time consuming. The main purpose of this project is to reduce time consumption & also human effort. To fulfill it some automation is performed. The vacuum cleaners present in the market have the problem of high cost as well as high human effort. AFC is an electromechanical machine which can perform tasks like cleaning, sprinkling of water & suction of dust particles. Firstly our main target was to develop device which can clean. As the time goes our purpose also changed like addition of vacuum & sprinkler system in it. It performs vacuum suction as well as mopping operation. Spinning brush is used for mopping and it works on 12V supply. Vacuum Duct is placed at the front of the robot in order to collect the dust while moving. When the robot is on auto mode, it moves forward and performs cleaning action. Wall or obstacle detected in front, it will turn back by Mobile Control and execute the cleaning action also.

III. BLOCK DIAGRAM

Figure shows the system block diagram of automatic floor cleaning robot. Android phone is used to control the direction of robot. The system needs five motors- one motor is used to rotate the Mop and four motors are used to drive the wheels with encoder feedbacks.

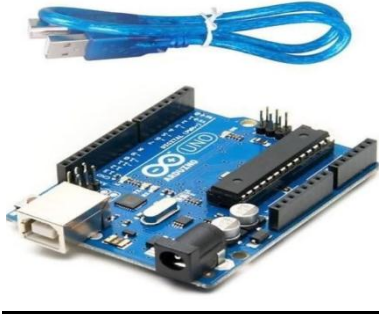


IV. DESIGN CONSIDERATIONS

1. ARDUINO

The Arduino Uno is a microcontroller physical board on which certain computer codes are uploaded. It consists of two things first is physical programmable circuit board & a piece of software, or IDE which uses simplified version of C++. Its major components are USB connector, Power port, Microcontroller, Analog input pins, Digital pins, Reset switch, crystal oscillator, USB interface chip & TX RX LEDs. USB connector is used to load the programme into arduino board from IDE. The arduino board can be powered through a AC to DC adapter or battery. For this purpose Powerport is given in arduino. The component of arduino board which stores our programme is Microcontroller(ATmega 328P). The arduino UNO basically contains 6 analog input pins labeled as "Analog 0 to 5" having very high internal resistance so they are used for

measuring voltage not current. It also contains 14 digital pins labeled as "Digital 0 to 13", can be used as input & output switch. USB interface chip acts as signal translator. TX RX LEDs are LEDs which blinks whenever the arduino board transmits or receives data.



2. MOTOR DRIVER BOARD

A motor driver acts as an interface between the motors and the controls circuits. A high intensity current is required by motor while controller circuit requires low current signals. The main function of this component is to get high current signal from signal of lower strength for driving the motor.



3. DC MOTOR

A DC motor is a type of motor operated by direct current that converts direct current electrical power into mechanical power. It consists of various components such as stator, a rotor, armature & commutator with brushes. By generating magnetic fields of opposite sense inside the motor makes it to turn. Approx all DC motors have some internal mechanisms. By changing the strength of current in field windings or by using a variable supply voltage, speed of DC motor can be altered over a wide range.



4. BLUETOOTH

HC-05 module is very easy to use. It is designed for wireless communication purposes. It can be used in master or slave configuration. It consists of 6 pins which are Key, VCC, GND, TXD, RXD & State. Key helps to bring the module in AT command mode. Module will work in command mode if key is set too high otherwise it will work in Data mode. The voltage is applied to VCC. Ground pin of module is GND. To transmits & receive serial data TXD & RXD pins are used respectively. State tells us whether module is connected or not.



5. VACUUM SYSTEM

The work of vacuum system is to suck the dust particles. We have made it with the help of plastic bottle, body spray bottle, small piece of clothe with net etc. The main purpose of using the above components was to reduce cost of project. By putting the switch in ON position it starts to suck dirt particles which are collected inside the system. It works on the fact that inside the bottle vacuum pressure is created while outside is atmospheric pressure so it is the tendency of particles to move from high pressure to low pressure.

6. SPRINKLE SYSTEM

Now, our focus was to design a system which can make the surface wet by sprinkling water i.e. sprinkling system. Water is stored in a chamber that has an opening controlled by a motor. By putting this motor to ON position, water or cleaning liquid starts flowing from the chamber using DC pump. It is connected to a shower type arrangement via connecting pipe. The sprinkler system has a number of holes arranged sequentially which can be modified manually. Across the width equal wetness can be ensure by using this arrangement.

V. METHODOLOGY

To design & development of system a number of software & hardware techniques were used. We used a 12V DC motor, L293D IC, Vacuum mechanism, Sprinkler Mechanism and Arduino to develop our system.

Firstly for placing different components of the system a base is prepared. For this, first get a piece of plywood cut. After this, drill two holes each at the back for both the motor clamps. These holes should be parallel to each other & then with the help of screws fix them & attach motors to the clamp.

Next step is to make water sprinkler system .This consists of a water pump which carries the water from the reservoir and spills it near the mops on the floor. Now pump is fixed at drilled place..Take a empty plastic bottle and cut it into half using a paper cutter. By using glue lower part & robot are attached. Two rubber tubing pieces are used one is connected to inlet of pump which takes water from reservoir & other sprinkles the water to floor via outlet of pump. Now we have to make vacuum system of the project. We used plastic bottle, body spray bottle etc for making it. This is connected to battery. When battery turns on it starts to work. Now Arduino uno is connected to the robot. For making Gnd rails we soldered some male & female headers also. The positive terminal will go to VCC on arduino via transistor circuit while common Gnd is connected to negative terminal of battery. Use proper battery connection. Glowing of LEDs on arduino shows its good working. A HC-05 module Bluetooth is also used which is connected to Arduino & it also helps to receive signals from mobile so that robot can perform its functioning.



VI. WORKING

The aim of this project is to design and develop an Autonomous Application based Vacuum Cleaning Robot.

In this Project we use Arduino Microprocessor which is connected to Power supply (5-12V). From external source we charge the battery. This voltage is stored in battery. We have used voltage regulator to regulate this voltage as this stored voltage is higher than required voltage of arduino Here we use relay driver, A relay as we all know is an electromechanical device which is used in the form of a switch .it is connected to solenoid valve. It consists of one input and one output. By using the relay driver we can operate dc motor and cleaning mechanism. For moving the wheels in clockwise or anticlockwise direction motor is used also for pick and place operation we use motor.

Various tasks can be performed by it such as cleaning, sprinkling & suction of dust particles. The testing of the robot showed that it can achieve almost all the functionalities which were planned to implement originally. Operation is based to save the energy of the robot and to clean the particular place. Customers are provided with the user friendly interface to operate the robot without any difficulty. Vacuum cleaner has the reliable circuitry Copyright and it has the safety circuit which rectifies different poles and restricts high voltage to affect the circuitry. The evaluation makes this project a reliable & cost effective. It works with less energy consumption.

VII. REFERENCES

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