TITLE OF PROJECT: FLOOR CLEANING ROBOT

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Abstract-

In this paper we propose a floor cleaning robot that can clean the floor according to the instructions given by user. This robot makes the cleaning process fast and efficient as it receives the commands from smart phone wirelessly through Bluetooth module embedded on it. On getting the commands the robot perform functions like moving in different directions and mopping the floor. This system proves to be cost effective, low maintenance and reduced human effort which makes it a very reliable product.

floor cleaning robot is a compact robotics system which provides floor cleaning service in room reducing human labor. Basically as a robot it eliminates human error and provide cleaning activity with much more efficiency. If we clean the floor manually then there is a possibility that the operator will leave some portion of the floor. Also due to manual labor involved this is time consuming and irritating to clean the floor. This is where the robot comes as an advantage. Also the robot is small and compact in size. So we can carry it and place it wherever we can on the house. The robot is very cost effective as compared to manual labor involved. The flexibility, time saving and efficiency make the robot a clean choice for cleaning the floor.

Key Words: Bluetooth Controlled, Wireless, Cleaning robot, Android Phone, Low Cost, Reliable.

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INTRODUCTION

Cleanliness is the interest of making or growing smooth, beautiful, inexperienced and snug surroundings. Cleanliness of course, isn't most effective in a single region, for example, cleanliness of the office, particularly cleanliness of the region of work, cleanliness of the school, particularly the cleanliness of the region to observe Cleanliness is an inseparable part of human lifestyles and is an interconnected detail in fitness technological to know-how . Cleanliness is a prerequisite for the conclusion of fitness, smooth surroundings will offer first-rate blessings to humans and then again grimy surroundings will provide people massive issues . The activity of cleansing the ground of a room might also additionally appear very simple, however, certainly plenty of time and strength is used . Human boundaries and existence that don't care approximately the cleanliness of the encompassing surroundings, in addition to technological boundaries that could be a component for a person to now no longer pay interest to the cleanliness in their surroundings. Therefore, researchers are innovating to make simple equipment that can assist the network or cleansing people to smooth. Researchers want to increase era whilst preserving cleanliness and preserving abreast of technology which might be presently developing. Therefore, the researcher needs to make an era layout that can smooth a room using cleansing the ground routinely. By the usage of an acquainted component, particularly the Arduino Uno because the microcontroller, the DC (direct current) motor because the driving force, that is due to the fact the electronically managed equipment gives extra comfort in its use. Then an floor cleansing robot became designed This tool may be an opportunity to assist the general public or cleanse people to smooth flooring that's carried out routinely.

Floor cleaning robot is a smartphone controlled robot that cleans your house’s floor! The rotating mops on the front of the robot along with a foam roller (used to paint walls, not here) at the back can do the job perfectly. There's also a water pump and water reservoir which can be switched on when required to throw water on the floor and make the mops moist for a proper clean. The foam roller is movable, which means you can lift it when not in use. I've also added speed controls for the driver motors. The project uses bluetooth communication via an HC-05 bluetooth module to send the commands to the most commonly used microcontroller- Arduino UNO. The robot is powered on a 12V lead acid battery, the ideal voltage for all motors used here.. The driver motor pair are 100rpm ones while for the mops I've used 75rpm plastic ones. The best part is that the mops used were homemade, from sponges and they clean just perfectly. This is a smaller version so might not be suitable for a large area. There can be tons of other features added, like making it completely autonomous, which we couldn't due to shortage of time.

OBJECTIVES:

There are four objectives of this project, which is stated in the following texts:

- To achieve wet cleaning and dry cleaning in a single run.
- To make the machine cost effective
- To reduce the maintenance cost of manually operated floor cleaning as far as possible
- To provide a substaintional solution is to the problem of manufacturing cleaner utilizing local resources while keeping it low costs.

PROBLEM IDENTIFICATION:

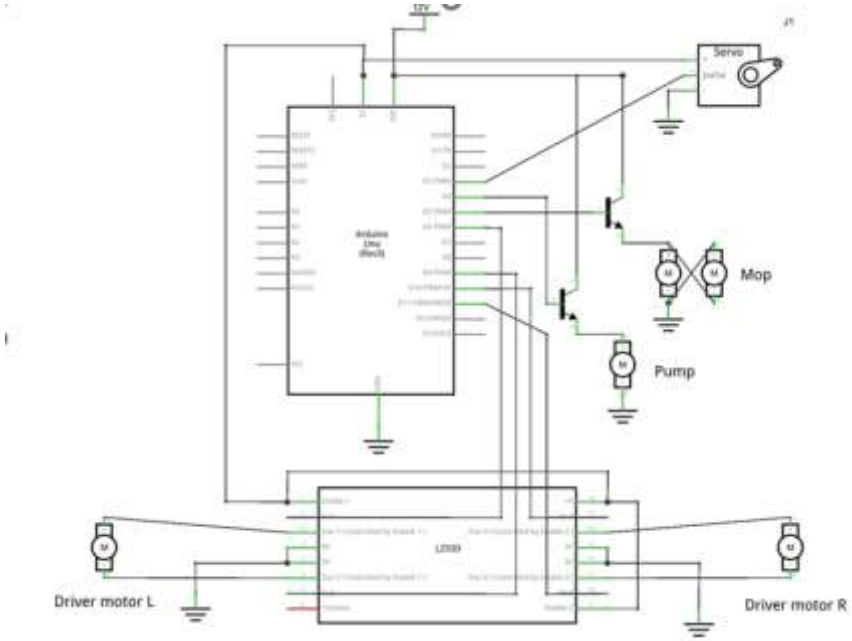
Since there are lots of problems happened during floor cleaning process, like human as well as systematic error may be happened during cleaning of floor. So to clean every Corner of Floor we are designing the robot who can do work regarded cleaning manually as well automatically.

METHODOLOGY

The first step is to prepare the base on which the parts will be placed. For this, first get a piece of plywood cut, measuring 12x9 inches.After this, drill two holes each at the back for both the motor clamps. Make proper measurements such that both should be parallel to each other. Fix them in place using some screws then attach the motors to the clamps. . To make cheap DIY circular floor moppers, you can use old compact disks along with a piece of cloth. First mark a circle on the cloth which should be bigger than the CD. Cut it using a pair of scissors. Take a needle and thread and start sewing and making folds to the cloth in such a way that it surrounds the entire CD. After you're done with all the folds, make 2-3 knots at the end and cut the left over thread. Repeat the same for the second CD. Attach wheels to both the plastic geared motors. Hot glue the wheels to the CDs. The moppers have to be placed in the front. Hot glue the motors in such a way that the cloth stays away from each other and the motors are at an equal distance from the sides. Make sure the cloth properly touches the floor.

The Water Supply Mechanism consists of a 12V water pump which carries the water from the reservoir and spills it near the mops on the floor. First mark, drill and x your pump in place. Take a 600ml empty plastic bottle and cut it into half using a paper cutter. Use the lower half and place it on the robot base using some hot glue. Take two pieces of rubber tubing. One will be connected to the inlet of pump to take water from the reservoir from the pump and the second one will be used to take water from the pump to the floor. Adding straws to the outlet will be done later. The pump can be switched on/off via your smartphone just like other controls. Roller Mechanism purpose of roller here is to stick small dust particles to itself. It will not be needed everytime the robot is moving so I decided to make a simple mechanism which can lift it up or down via a servo motor. First you need to drill a hole on the servo attachment. Drill another hole of almost same size on the roller handle as well. Use a screw to tighten the attachment and the roller. The motor will have to be placed at a height so the roller touches the floor and can be lifted easily. Use two 7x2.5 centimetres wooden pieces and hot glue the servo to their top.Solder the Circuits For the mop geared motors and the water pump to be controlled via arduino, there has to be an external circuit as both of them need 12V to run but arduino can only provide a 5V output. I used TIP122 NPN power transistors and soldered them on to a piece of perfboard. Also, we soldered some male and female headers to make +5V and Gnd power rails as these pins are limited on the arduino and we need plenty of them for each component to be connected. Follow the pictures above and solder two rails, one for each +5V and Gnd.

Connections Now this is always the typical part. You have to be accurate. For making it a bit easier, I always use jumper wires which can be swapped or removed any time. Before that, drill some holes and :x your arduino in place using some screws. Start by connecting the geared motors to the driver board. Solder some wire to the motor terminals and then connect them to the screw terminals of the driver circuit. The rest of the pins have to be connecting as per the following: Signal 1 ----D6 on Arduino Signal 2 ---- D9 on Arduino Signal 3 ---- D10 on Arduino Signal 4 ---- D11 on Arduino +5V ---- +5V on Arduino Gnd ---- Gnd on Arduino +12V (motors will move at this voltage) ---- to be connected to battery later Next comes the bluetooth module. Connections are: Vcc ---- +5V on Arduino Gnd ---- Gnd on Arduino Rx ---- Tx on Arduino Tx ---- Rx on Arduino Add a voltage divider to signal pins if you're afraid that the signal pins on arduino might burn. The two mop motors have to be connected in parallel such that the left one runs anticlockwise and the right one turns clockwise when seen from the front. Use heat shrink tubes to keep the connections safe. Solder the motor wires to the transistor circuit as per the schematic given above. Similarly connect the water pump wires as well. We will be supplying the 12V from the battery directly to the transistor circuit and then this 12V will go to the Vcc of arduino and the motor driver circuit. Connect the base of transistor two, controlling the mops to D5 on arduino and transistor one, controlling the pump to D4 on arduino. The common ground wire from all the motors has to be connected to the Gnd on arduino. What remains now is the servo motor. The connections are: Vcc ---- +5V on Arduino Gnd ---- Gnd on Arduino Signal ---- D3 on Arduino You can always have a look at the schematic.



Keep all the circuit boards, wires, tubings in place with hot glue. It should look neat, the wires shouldn't entangle and the connections shouldn't break, which can be irritating. Next, take two straws and cut them about 7cm in length. Crush and squeeze one end of both into the outlet pipe of the water pump. Bend both of them in opposite directions and glue them in place such that water ows from both the straws and falls just a little ahead of the rotating mop (look at the pictures). Don't forget to put some tape where the straws are connected so the water doesn't leak.

Upload the Code Attach the Battery Remove the Rx and Tx cables from arduino before uploading! Connect the board to a pc and program it with the code given below. You can make necessary changes. Make sure you set the correct COM port and Board under Tools. After it's done, replace the Rx and Tx wires. You'll need to remove them everytime you upload the code. Attach the BatteryFor the power source, it's your choice about the type of battery to use. The voltage should be 12V. I would recommend a single lead acid battery or 3x Li-ion 18650, 3.7V each connected in series. Use some double sided tape or hot glue to keep the battery pack in place. +Ve terminal will go to the transistor circuit from where it will go to Vcc on arduino and to the motor driver circuit. -Ve terminal will be connected to the common Gnd. Use proper battery connectors. You can even add an On/OI main switch. If the power LED on the arduino glows, it's all good. Immediately remove the source if LEDs dim rapidly and recheck all the connections. Do not use a very high voltage else the regulator on the board may overheat. Configure the App and Connect For the power source, it's your choice about the type of battery to use. The voltage should be 12V. I would recommend a single lead acid battery or 3x Li-ion 18650, 3.7V each connected in series. Use some double sided tape or hot glue to keep the battery pack in place. +Ve terminal will go to the transistor circuit from where it will go to Vcc on arduino and to the motor driver circuit. -Ve terminal will be connected to the common Gnd. Use proper battery connectors. You can even add an On/OI main switch. If the power LED on the arduino glows, it's all good. Immediately remove the source if LEDs dim rapidly and recheck all the connections. Do not use a very high voltage else the regulator on the board may overheat.The vaccum is added and the end and sensor is placed so all function stops when obstacle is there infornt.

Go to the google play store and get this app called 'Bluetooth Serial Controller' which lets you set your own control buttons and commands.

Button M1- front ,M2-Back,M3-Left,M4-Right,M5-Stop,M6-Servo motor up,M7-Servomotor down ,A-Vaccum on ,B-Vaccum off ,8-On pump,9-Off pump. To connect the robot, first pair up the bluetooth module named 'HC-05' or other. Password will be '0000' or '1234' Then connect the paired up module via the app. Press and check all the buttons on the app one by one.

CONCLUSION AND FUTURE SCOPE

Based on the findings of the analysis, design, and implementation that has been completed. As a result, some conclusions can be drawn, such as the fact that the floor cleaning robot prototype is quite effective in assisting the community to clean floors. Creating an floor cleaning robot prototype using the Arduino Uno Microcontroller via Bluetooth modulated commands . Its is cost effective and very easy to carry making it more efficient.

This can still have a lot of modifications. We were thinking to make it fully autonomous with ultrasonic/IR sensors but couldn't due to shortage of time. You can try this feature. Make it avoid rugged surfaces and walls. Add blower connected to a servo. We can also add uv sensors so that the room can sanitize .As always, possibilities are endless. . Battery monitoring, lighter body weight and to set alarm on/off time manually are the future scope of this project.

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CODE:

```
#include<SoftwareSerial.h>
SoftwareSerial ble(2,3);
#include<Servo.h>
Servo roll;
Servo hand;
Servo grip;
Servo lid;
#define m1 3
#define m2 6
#define m3 7
#define m4 2

#define P1 8
#define P2 9
#define m5 4
#define m6 5
int pos1=90;
int buz=A4;
int vc=A0;
int tr=12;
int ec=11;
void setup() {
// put your setup code here, to run once:
Serial.begin(9600);
ble.begin(9600);
pinMode(buz,OUTPUT);
pinMode(m1,OUTPUT);
pinMode(m2,OUTPUT);
pinMode(m3,OUTPUT);
pinMode(m4,OUTPUT);
pinMode(P1,OUTPUT);
pinMode(P2,OUTPUT);
pinMode(m5,OUTPUT);
pinMode(m6,OUTPUT);
pinMode(tr,OUTPUT);
pinMode(ec,INPUT);
pinMode(A5,OUTPUT);
pinMode(vc,OUTPUT);
digitalWrite(A5,0);
digitalWrite(m1,0);
digitalWrite(m2,0);
digitalWrite(m3,0);
digitalWrite(m4,0);
```

```
digitalWrite(vc,1);
digitalWrite(P1,0);
digitalWrite(P2,0);
digitalWrite(m5,0);
digitalWrite(m6,0);
roll.attach(10);
delay(200);
roll.write(90);
delay(500);
 digitalWrite(m1,0);
digitalWrite(m2,0);
digitalWrite(m3,0);
digitalWrite(m4,0);
digitalWrite(P1,0);
digitalWrite(P2,0);
digitalWrite(m5,0);
digitalWrite(m6,0);
}

void loop() {
  // put your main code here, to run repeatedly:
digitalWrite(tr,1);
delayMicroseconds(10);
digitalWrite(tr,0);
int dst=pulseIn(ec,1)/58.2;
Serial.println(dst);
if(dst<30)
{
  digitalWrite(buz,1);

    digitalWrite(m1,0);
  digitalWrite(m2,0);
  digitalWrite(m3,0);
  digitalWrite(m4,0);
    digitalWrite(m5,0);
  digitalWrite(m6,0);
delay(3000);
digitalWrite(buz,0);
}
if(Serial.available())
{
int cmd=Serial.read();
if(cmd=='1')
```

```
{
  digitalWrite(m1,1);
  digitalWrite(m4,0);
  digitalWrite(m3,1);
digitalWrite(m2,0);
  digitalWrite(m5,1);
  digitalWrite(m6,0);
Serial.println("FRONT");
}
if(cmd=='2')
{
   digitalWrite(m1,0);
  digitalWrite(m4,1);
  digitalWrite(m3,0);
  digitalWrite(m2,1);
    digitalWrite(m5,1);
  digitalWrite(m6,0);
;
  Serial.println("BACK ");
}
if(cmd=='3')
{
    digitalWrite(m1,1);
  digitalWrite(m4,0);
  digitalWrite(m3,0);
  digitalWrite(m4,1);
    digitalWrite(m2,1);
  digitalWrite(m6,0);
Serial.println("LEFT");
}
if(cmd=='4’)
{
   digitalWrite(m1,0);
  digitalWrite(m4,1);
  digitalWrite(m3,1);
  digitalWrite(m2,0);

    digitalWrite(m5,1);
  digitalWrite(m6,0);
  Serial.println("RIGHT");

}
if(cmd=='5')
{
  digitalWrite(m1,0);
  digitalWrite(m2,0);
  digitalWrite(m3,0);
  digitalWrite(m4,0);
    digitalWrite(m5,0);
  digitalWrite(m6,0);
Serial.println("STOP");
}
if(cmd=='8')
{
     digitalWrite(P1,1);
  digitalWrite(P2,0);
}
if(cmd=='9’)
{
{
  digitalWrite(m1,0);
  digitalWrite(m2,0);
  digitalWrite(m3,0);
  digitalWrite(m4,0);
    digitalWrite(m5,0);
```

```
digitalWrite(m6,0);
Serial.println("STOP");
}
if(cmd=='8')
{
    digitalWrite(P1,1);
  digitalWrite(P2,0);
}
if(cmd=='9')
{
digitalWrite(P1,0);
  digitalWrite(P2,0);
}
  if(cmd=='A')
{
    digitalWrite(vc,0);

}

if(cmd=='B')
{
    digitalWrite(vc,1);
}
if(cmd=='6')
{
if(pos1>75)
{
  roll.attach(10);
  delay(300);
  for(int ii=90;ii>=70;ii--)
  {
  roll.write(ii);
  delay(25);
  }
  pos1=70;
  //roll.detach();
}
}
if(cmd=='7')
{
if(pos1<75)
{
 roll.attach(10);
  delay(300);
  for(int ii=70;ii<=90;ii++)
  {
  roll.write(ii);
  delay(25);
  }
pos1=90;
  roll.detach();
}

}

}

if(ble.available())
{
int cmd1=ble.read();
if(cmd1=='1')
{
```

```
 Serial.println("DEVICE-1 ON");
}
if(cmd1=='2')
{
Serial.println("DEVICE-1 OFF");
}
if(cmd1=='3')
{
Serial.println("DEVICE-2 ON");
}
if(cmd1=='4')
{
Serial.println("DEVICE-2 OFF");
}
if(cmd1=='5')
{
Serial.println("DEVICE-3 ON");
}
if(cmd1=='6')
{
Serial.println("DEVICE-3 OFF");
}
if(cmd1=='7')
{

  Serial.println("DEVICE-4 ON");
}
if(cmd1=='8')
{
Serial.println("DEVICE-4 OFF");
}
}
delay(300);
}
```