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Solar Powered Smart MultifunctionalFloor Cleaning Robot

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Abstract: *The conventional floor cleaning machines is most widely used in airport platforms, railway platforms, hospitals, bus stands, malls and in many other commercial places. These devices need an electrical energy for its operation and not user friendly. In India, especially in summer, there is power crisis and most of the floor cleaning machine is not used effectively due to this problem, particularly in bus stands. Hence it is a need to develop low cost,user friendly floor cleaning machine. In this project, an effort has been made to develop a solar powered mobile operated floor cleaning machine so that it can be an alternative for conventional floor cleaning machines. In this work, modelling and analysis of the floor cleaning machine was done using suitable commercially available software.The conventionally used materials were considered for the components of floor cleaning machine. From the finite element analysis, we observe that the stress level in the mobile operated floor cleaning machine is within the safe limit. Automated floor cleaning machines are commonly used in developing countries since many years because ofhigh cost of labor, time, efforts and affordability. The concept is not popular in developing or emerging economic countries. Reasons for non-popularity are cost of machine and operational charges in terms of power tariff. This article is based upon on our innovative project to design, development and manufacturing of semi-automatic solar powered mobile operated floor cleaning machine which will work on solar energy, mobile communication, battery or electricity. A semi-automatic floor cleaning machine is developed by keeping basic consideration for less energy consumption, machine as well as operational cost reduction, reduce the human effort, environment friendly and easyto handle. Base of the project was to use renewable energy which is abundant in most of the countries, will have lessenvironmental impact and easy to construct for commercial scale in future*

Keywords *— Solar Energy, Floor Cleaning Mechanism , Air dryer etc.*

I. INTRODUCTION

Cleaning machine is very much useful in cleaningfloors and outside ground in hospitals, houses, auditorium, shops, bus stands and public place etc. In modern days interior as well as outside cleaning are becoming an important role in our life. Cleaning ofwaste is a very important one for our health and reduces the man power requirement. Many of floorcleaning machines are available but we developed machine is very simple in construction and easy tooperate. Anybody can operate this machine easily.

Hence it is very useful in hospitals, any large area space. The time taken for cleaning is very less and the cost is also very less. Maintenance cost is less. Much type of machines is widely used for this purpose. In our project we have made the machine to operate in a fully mechanical way with a little amount of electrical components. The Floor cleaner is of very simple construction and is very easy to operate; anyone can operate it without any prior training of any sorts with safety. It is very important one in any hospitals, hotels,bus stands etc.

In recent years, conventional floor cleaning machines are most widely used in airports, railway stations, malls, hospitals and in many commercial places, as cleaning is one of the important parameter for the sanitation and government regulations. For maintaining such places, cleaning the floor is the major task which is necessary. There are conventional floor cleaning machines available to perform floor cleaning operations in above said places. Generally a conventional floor cleaning machines requires electrical energy for its operation. In India, especially in summer there is power crisis, in majority of places. Hence cleaning the floor using the conventional floor cleaning machines is difficult without electricity. In this project an effort has been made to develop a manually operated floor cleaning machine so that it can be an alternative for conventional floor cleaning machines during power crisis. A manually operated floor cleaning is developed with major list of objectives, one; to achieve simultaneous dry and wet cleaning in a single run, secondly to make the machinecost effective and thirdly to reduce the maintenance cost of the manually operated floor cleaning machine as far as possible. In recent years, finite element method is most widely used to analyze the mechanicalcomponent design and hence we have used it in the present work.

II. PROBLEM STATEMENT

- Cleaning machine is very much useful in cleaning floors and outside ground in hospitals, houses, auditorium, bus stands and public place etc.
- In modern days interior as well as outside cleaning are becoming an important role in our life. Cleaning of waste is a very important one
- for our health and reduces the man powerrequirement.
- Many of floor cleaning machines are availablebut we developed machine is very simple in construction and easy to operate.
- The time taken for cleaning is very less and thecost is also very less. Maintenance cost is less.Much type of machines is widely used for thispurpose.
- In our project we have made the machine to operate in a fully smart controllable way witha little amount of electrical components. The Floor cleaner is of very simple construction and is very easy to operate; anyone can operate it without any prior training of any sorts with safety.Anybody can operate this machine easily. Hence it is very useful in hospitals, anylarge area space.

III.OBJECTIVES

- To develop a mobile operated cleaningmachine that helps in easy and quick.
- To provide the alternative method for roadcleaning.
- To reduce human efforts.
- To save the time.
- To reduce the cost.
- To beautify the floor.
- To remove stains dirt.
- To remove grit and sand which scratch andwear down the surface.
- To make the environment sanitary
- To develop solar powered multifunction floorcleaning machine.

IV.METHODOLOGY

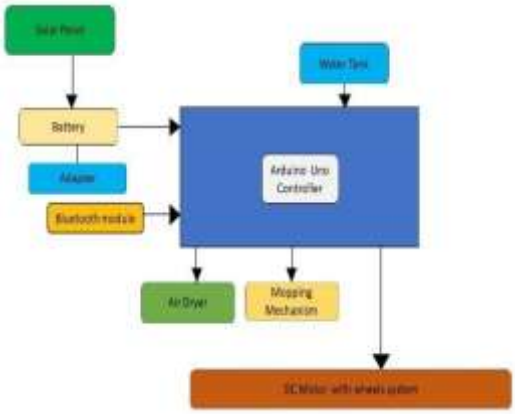

Fig. 1. Block Diagram

V.WORKING

When Solar Panel of 20W is applied and their electricenergy stored in battery. 12V DC battery supply is provided to the electrical switch board of the machine.The main supply from electrical board is supplied to SMPS , during working DC is supplied to the Mopingprocess and SMPS. Moping process is used to operatethe DC motors which perform a key role in cleaning operation. There are single D.C motors one is used to rotate the mop for cleaning the middle surface that is covered by the chassis. The DC motor used for rotation of the mop having high torque than the motor used for the brushes. The other two DC motors havinghigh RPM are used to clean the front section of the floor the DC motor rotates the brushes through the shaft which is connected to the shaft of the motor through nut and bolt. During summer season the uneven particles which collects on the surface of the floor are clean through the front mopping mechanism can be adjusted with the help of arc provided on the left hand side of the chassis.

During the rainy season the working of floor cleaning machine slightly changes in this condition the water and dust or dirt particles are brought into the middle section of the chassis through the rotating mopping. The rotational direction of the mopping

are opposite toeach other in order to collect the more amount of waterin the middle section and this mixture of water and dirtis collected The third motor rotates the mop for efficient cleaning. At the bottom of the water tank water spray pump is provided which supply the fresh water for efficient cleaning the supply of fresh water iscontrolled through the control valve. In the water flowing tube number of holes are created for equal amount of water Different button in the electrical board is provided to control the electrical supply of each equipment of the floor cleaning machine.

Following are the steps to operate the cleaningmachine

- Power up the entire system by using 12V leadsacid battery.
- The projects require 1 mobile phones one as the transmitter and another at the receiver endBluetooth module.
- First download Bluetooth app from mobilephone. Connect the project Bluetooth model by searching it in app. After connection followthe commands below.
- These signals will be processed by using Bluetooth decoder on the receiver (robot).
- These values are processed by Arduino uno.
- Here we are interfacing H-Bridge to the controller for the DC geared motor to rotate
- Connect Bluetooth of your mobile to this app.

VI.CODE DESCRIPTION

```
#include<reg51.h>

sbit m1a=P1^0;sbit m1b=P1^1;

sbit m2a=P1^2;sbit m2b=P1^3;

sbit relay1 = P1^4;sbit relay2 = P1^5;

sbit relay3 = P1^6; sbit relay4 = P1^7; #define lcd_data P2

sbit lcd_rs = P2^0;sbit  lcd_en  =  P2^1;
void delay(unsigned int value)
{
unsigned int i,j; for(i=0;i<value;i++)for(j=0;j<1275;j++);
}
void lcdcmd(unsigned char value)                    // LCDCOMMAND
{
lcd_data=value&(0xf0); //send msb 4 bits lcd_rs=0;   //select command register
lcd_en=1;              //enable the lcd to executecommand
delay(3); lcd_en=0;
lcd_data=((value<<4)&(0xf0));         //send lsb 4 bitslcd_rs=0;          //select command register lcd_en=1;
                       //enable the lcd to execute command
delay(3);
lcd_en=0;

}
void lcd_init(void)
{

lcdcmd(0x02);
lcdcmd(0x28);  //intialise the lcd in 4 bit mode*/lcdcmd(0x0e);//cursor blinking lcdcmd(0x06);      //move the cursor to
right sidelcdcmd(0x01);    //clear the lcd

}
void lcddata(unsigned char value)

{

lcd_data=value&(0xf0); //send msb 4 bitslcd_rs=1;    //select data register
lcd_en=1;              //enable the lcd to execute datadelay(3);
lcd_en=0;
lcd_data=((value<<4)&(0xf0));         //send lsb 4 bitslcd_rs=1;          //select data register
lcd_en=1;              //enable the lcd to execute datadelay(3);
```

```
lcd_en=0;

delay(3);
}

void msgdisplay(unsigned char b[]) // send string tolcd
{
unsigned char s,count1=0;for(s=0;b[s]!='\0';s++)
{
count1++; if(s==16) lcdcmd(0xc0);if(s==32)
{
lcdcmd(1);count1=0;
}
lcddata(b[s]);
}
}

unsigned char serrcv()
{
unsigned char rx;while(RI == 0); rx=SBUF;
RI=0;
return rx;
  }
void tx(unsigned char ch)
{ SBUF=ch;
while(TI == 0);TI=0;
}
void main()
{

unsigned char rcv;P2=0x00; TMOD=0x20; TH1=0xFD; SCON=0x50; TR1=1;

P1=0x00;

lcd_init();
msgdisplay("SMART FLOOR CLEANINGROBOT");
delay(300);

while(1)
{
rcv=serrcv();if(rcv == 'f')
{
lcdcmd(0x01); msgdisplay("Front..");

m1a=1;m1b=0;m2a=1;m2b=0;
}

if(rcv == 'b')
{
lcdcmd(0x01); msgdisplay("Back    ");
m1a=0;m1b=1;m2a=0;m2b=1;
}

if(rcv == 'l')
{
lcdcmd(0x01); msgdisplay("Left..");m1a=0;m1b=1; m2a=1;m2b=0;
}

if(rcv == 'r')
{
lcdcmd(0x01); msgdisplay("Right.  ");
```

```
m1a=1;m1b=0;m2a=0;m2b=1;
}

if(rcv == 's')
{
lcdcmd(0x01); msgdisplay("Stop...");m1a=0;m1b=0; m2a=0;m2b=0;
}

if(rcv == '1')
{
relay1=1;
}
if(rcv == '2')
{
relay1=0;
}


if(rcv == '3')
{
relay2=1;
}
if(rcv == '4')
{
relay3=0;
}

if(rcv == '5')
{
relay4=1;
}
if(rcv == '6')
{
relay4=0;
}


}
```

VII.COMPONENTS AND RATINGS

Sr. No	COMPONENT S	SPECIFICATION & RATINGS
1	Solar panel	20 watt
2	Adapter	12V 2Ah
3	Battery	12V 2Ah
4	Bluetooth module	HC-05 5V
5	Arduino Uno	9-12V
6	Relay Board	12V
7	Motor Driver	12V
8	DC Motor	12 volt
9	DC Water Pump	12 volt
10	LCD Display	5V
11	Air Dryer	12V
12	Mop Mechanism	
13	Other	

- **Project Hardware**

Fig. 2. Project Hardware

VIII.APPLICATIONS & ADVANTAGES

- Hospitals – floor cleaning machines are usedin hospitals for both wet and dry cleaning. Inorder to obtain hygienic surface.
- **c**omputer centers – To maintain the desired cleaning surface finish.
- colleges – it is mainly used to clean the dustwhich is collected on the surface.

IX.ADVANTAGES

- Power consumption is less:
- This machine requires low Maintenance cost.
- In this machine Easy control of cleaningsolution supply by controlling valve.

X.CONCLUSIONS

The use of innovative technology not only reduces cost significantly but also reduces thehuman effort while increasing the effectiveness of floor cleaning. Reduced human effort means more frequent floor cleaning which results in increase in overall cleanliness and supports healthy well-being. Small steps in technological advancement likethis will have higher impact in long run in future, making India a better country.

XI.FUTURE SCOPE

If panel used of high watt, then the machine can be used during night time for garden lighting or room lighting. Because we can store more power. And at night time however you keep it aside. So the power inthe battery can be used for this purpose. By using onevalve in the pipe we can also use it for gardening i.e. pouring water for plants. By connecting one box type carrier we can use it to transport files, books or other stuffs from one place to other in office or any other place. Grass cutting can be made more efficient by adding still more two motors with blades in the front side of the machine.

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