

## Design and Development of IOT Based Sustainable Multifunctional Machine

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**Abstract**— Automated floor cleaning machines and grass cutting machines are commonly used in developed countries since many years because of high 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 project is based upon on our innovation to design, develop and manufacture semi-automatic floor cleaning and grass cutting machine which will work on solar energy, battery or electricity. This machine is multifunctional. Four functions of cleaning like mopping, drying, wiping, grass cutting, can be performed using this machine. This multifunctional machine having advantages like less energy consumption machine as well as operational cost reduction, reduce the human effort, environment friendly and easy to handle. Base of the paper was to use renewable energy which is abundant in most of the countries, will have less environmental impact and easy to construct for commercial scale in future.

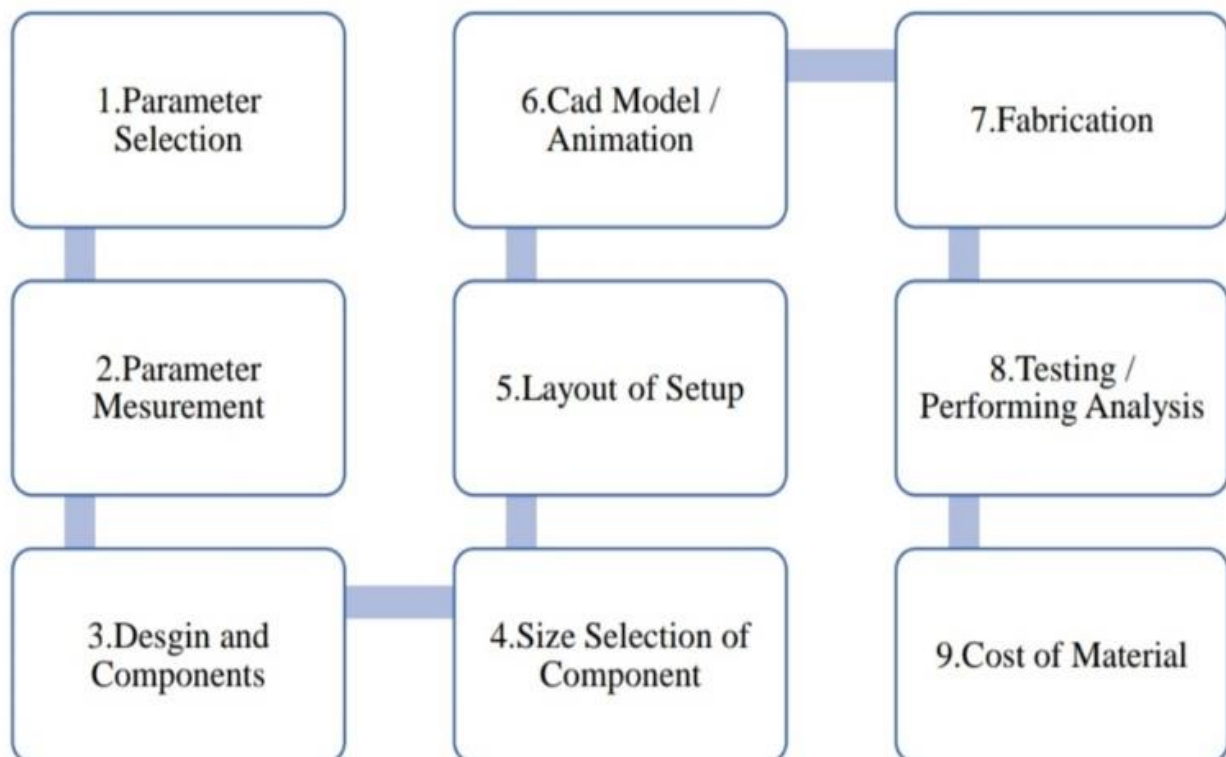
**Keywords**— Solar energy, Floor cleaning mechanism, Air- dryer, Grass Cutter etc.

### I. INTRODUCTION

In this project to fabricate the sustainable multifunction machine, which is new concept use for household purpose, which is being powered by solar generated electrical power. It is one of the most eco-friendly machine than other machines. This machine perform operations like Floor Cleaning, Drying, Grass Cutting. Cleaning machine is very much useful in cleaning floors and outside ground like 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 of waste is a very important one for our health and reduces the man power requirement.

A grass cutter is a machine used for cutting grass or lawns. A lawn is any area of grass; mostly tough grass which is neatly cut like in a private garden or a public park

### II. METHODOLOGY



## 2.1 PROBLEM STATEMENT

- Though a number of machines have been successfully developed.
- There is a need for developing a sustainable machine which uses green energy
- Developing labor in these cases can be very dangerous and time consuming.

## 2.2 BACKGROUND

Cleaning machines are made with an aim to clean only dry surface of the floor. This means that they are only sufficient in the summer and winter season but not in rainy season this is the major issue for cleaning the floor surface but during the rainy season floor cleaning machines are required which can perform the tasks when the surface contain moisture or little amount of water on the surface of floor. So we are developing the machine which can work in both dry and wet conditions.

## 2.3 OBJECTIVE

- To study solar parameters.
- To develop solar based floor cleaner machine.
- To investigate the Performance.

## 2.4 SCOPE

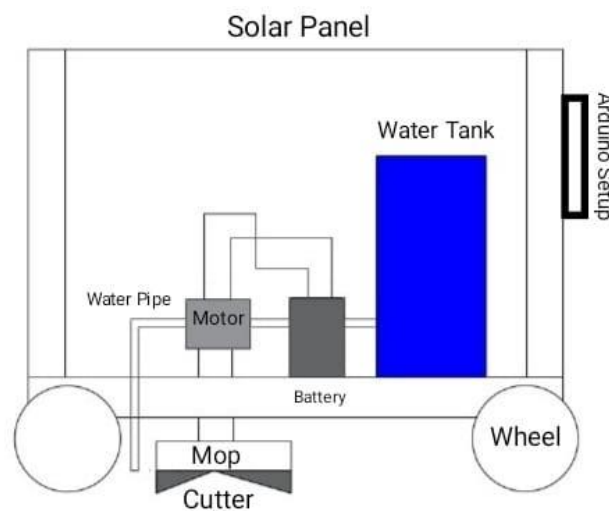
- To reduce human effort and help in quick and easy cleaning.
- To develop solar based multifunction machine which will operate for longer duration on solar energy.
- This machine used in absence of electricity or even in the night also.

## III. WORKING

### 3.1 Machine Working

Arduino receive command via remote control. These commands are generated by ask (amplitude shift keying) based remote control. Once the command received Arduino makes corresponding pin high or low. Movement of vehicle is done with two dc gear motor which is having rpm 10. They are having less speed but high torque up to 5kg.

This motors moves bidirectional so needs two control signals. If both are low or high motor remains off. For other two cases motor two cases motor move in clock wise and anti-clock wise direction. Arduino output is 0v or 5v which is given to motor driver ic l293d which is having two h bridge . with one h bridge we can control one motor bi-directionally or two motor unidirectional. Ic operates on 5v dc. And we also have to give motors operating voltage. In our case 12v. led with current limiting resistor is connected to output of ic l293d. we are using twol293d.



2D Model

### 3.2 Arduino Uno Algorithm

Then Arduino based our project

Then press required operation key (button)

Up dn right left and stop

Operation will execute till the key is pressed for moving car.

When key is pressed corresponding key code is send and when it is released stop code is send

Controlling of motor is handled by arduino uno hardware and its code.

For switching brush motor and pump we are using two buttons in remote control. They are push button switch.

### 3.3 ASK Receiver Module

We are controlling two dc motor bidirectional for forward, backward, right & left turn of car. Forward movement we have to move both motor in clockwise direction, backward movement both motor to anticlockwise direction, right turn we have two options keeping right motor off and move left motor clockwise & another way is to move right motor anticlockwise and left motor clock wise. Left turn we have two options keeping left motor off and move right motor clockwise & another way is to move left motor anticlockwise and right motor clock wise.

To control each motor we need two signals one to move clock wise and another to move anticlockwise. These signals are control by Arduino uno (atmega328) hardware board. This ic is having A0 to A5 analog inputs And 0 to 13 digital i/o out of which 8-13 pins are used for lcd 4 bits data lines and two control signals rs (register select)and ch (chip enable). Pin number 0 & 1 are for serial communication and 2& 3 pins are used for right side motor and pin number 4 & 5 are used for left side motor.

We are also controlling brush motor & pump. Thus we first make pump on and make floor wet then scrub with rotating cotton brush (mop). Back side of cleaning machine we used cotton roller to dry floor.

### 3.4 Circuit Explanation

LCD display is used to show different messages on it. LCD display is having 16 pins out of which 8pin for data signals and three control signals. Register select (RS), read/ write memory (RW) and chip enable (CE). We use four bit data lines as nibble programming mode is used it saves I/O pins. Pin number 1 & 2 is for power supply, pin 15 & 16 is for back light LED and pin number 3 is for contrast of character.

Floor cleaner unit is having battery and motor with motor driver ic L293d. 12v dc gear motor is used with 60 RPM. It can control two motors bidirectional. Two switches are provided to move motor forward, right and left. Each motor need two signal to move motor when both are high or low motor remains off and by making any one pin high motor rotates clock wise or anticlockwise. When switch is pressed motor moves clock wise. When any one motor is made on keeping another off car gets turn right or left.

ARDUINO UNO will first show welcome messages on LCD display which is having 2 lines of 16 characters per line.

Initially all outputs pin are made low hence both motor will be OFF.

Now it will wait for command from remote control for movement of car.

Remote control will transmit command till user wants do action of forward revers or any other.

### ADVANTAGES

- Manual effort is reduced.
- Operating time is less.
- Cleaning and polishing can be done at same time.
- Power consumption is less.
- This machine requires low Maintenance cost.
- In this machine Easy control of cleaning solution supply by controlling valve.
- It can be used on various places other than rough surfaces.
- By further modification the drive or movement can be made automatic.

### DISADVANTAGES

- The machine produces vibrations when used on rough floors or rough surfaces.
- Floor cleaning and grass cutting cannot be done at a same time.
- The machine is Semi-automated machine.

- It is heavy to lift.
- It is not capable to clean stair of any building.
- Maintenance of mop and blade is required.

## CONCLUSIONS

In our project we introduced a multifunctional machine. One of the key motives of our project was to cover the aspects of cleanliness in the society. The multiple applications provide a wide range of functions. Since our machine is Solar operated, it helped in making an environmentally friendly project. The use of innovative technology in our project helps in reducing human effort and also consumes less time in cleaning procedure. This means more cleaning which results in increase in overall cleanliness and supports healthy well being. Small steps in technological advancements like these will have higher impact in the long run in future.

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