

Domestic Floor Cleaning Machine

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Abstract — We know that this time is of technology Everything is almost automated in our life machinery related to Automobile, manufacturing, aerospace and many others are working on automated condition. So, our project is DOMESTIC FLOOR CLEANING MACHINE related to automation. This machine working through the automated in which power of motor is transmitted to Wheels and mope of machine rotating. Machine are working in Arduino and ultrasonic sensor mechanism and Battery connected to a solar panel and motor is used to release electrical energy and operate this machine called floor cleaner and charging a battery from solar panel.

Keywords: Solar Panel, Ultrasonic Sensor, Arduino, Battery, D.C. Motor, Scrubber, Wheels, Water Pump

I. INTRODUCTION

Cleaning machine is very much useful in cleaning floors 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 of waste is a very important one for our health and reduces the man power requirement. Many of floor cleaning machines are available but we developed machine is very simple in construction and easy to operate. 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 number 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.

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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.
- 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 smart controllable way with a little number of electrical components. The Floor cleaner is of very simple construction and is very easy to operate; anyone

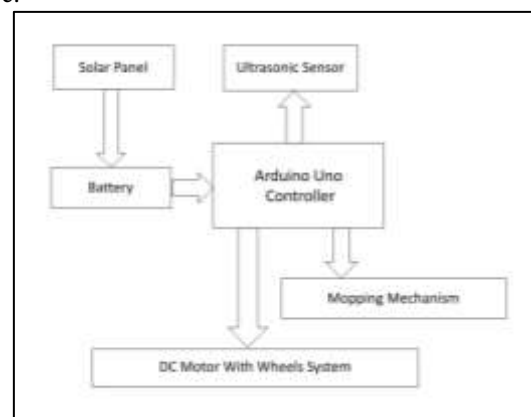
can operate it without any prior training of any sorts with safety. Anybody can operate this machine easily. Hence it is very useful in hospitals, any large area space.

III. OBJECTIVE

- To develop an Automatic operated cleaning machine that helps in easy and quick.
- To reduce human efforts
- To save the times to other activities.
- To reduce the cost of working labour
- Maintains efficiency of solar panels by keeping them clean.
- To develop solar powered multifunction floor cleaning machine.

IV. METHODOLOGY

Present work is aimed at working of an automated motion-controlled machine that could clean the floor of normal Indian house hold. Once the machine is put in ON mode it will move all over the surface without omitting any bit of floor space. When Solar Panel of 20W is applied and their electric energy stored in battery. 12V DC battery supply is provided to the electrical switch board of the machine. Again, the machine should avoid the obstacles on its path. Proper cleaning is achieved by motion of the scrubber which is relatively rotational in manner. Solar panel added this machine. 20W solar panel is applied and their electric energy stored in battery. the cleaning process is carried out by making the floor wet and scrubbing it and aga in making the floor dry. The floor should be dry after the process is complete because wet floor leads to different sort of problems as discussed above.



For this purpose, vacuum pumps are to be used. The cleaning also meets challenges like which type of debris it will meet. So dry cleaning arrangements are installed. This lead stop roper cleaning when heavier particles are there as debris particle. Thus leading to proper cleaning of the surface. There may be oily surfaces in some cases. To counter act this situation necessary disinfectants are to be used. 4-wheel drive

mechanism should be used for proper control of the machine. To control all the motors and vacuum pumps basically microcontroller of Arduino type is used. For completing the motion all over the surface spiral mechanism and particles warm optimization method is being utilized. Image sensing technique for avoiding obstacles are to be used. Optimization methods are used or increasing efficiency of movement algorithm. It ensures no repeatability of the motion over a certain space. Basically, we are to design a portable machine that could move automatically all over the floor surface avoiding obstacles and cleaning the floor.

V. LITERATURE REVIEW

A. Design and Fabrication of Floor Mopping Machine S. Mathivanan, P. Naveen kumar, A C Anbuselvan M. Bharathi, K B. Devika Assistant Professor, 2-UG Scholar Department of Mechanical Engineering, Hindustan Institute of Technology, Coimbatore-32

Thus, in our project we have designed the Automatic floor cleaning machine with the help of A.C Motor and belt transmission. The machine is designed in order to enable easy operation and to reduce the effort of human beings. Even children and aged people can handle this machine, no critical operations is needed in this machine. The ultimate need of this project is satisfied and with the help of this machine we can clean the floor easily.

B. Autonomous Floor Cleaning Robot Vijayalakshmi S.Kumbhar, Dnyaneshwari lagtap, Mansi Kulkarni Salim Lakade Assistant Professor, Department of Electronics and Telecommunication, Pimpri Chinchwad College of Engineering, Ravet-41210

This research paper explains sweeping and Mopping operations for the floor very effectively. It lowers labour cost, saves time, and offers effective cleaning. The robot is controlled by an android application and a Bluetooth module.

C. Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor Yuda Irawan, Muhandi, Rian Ordila, Roni Diandra, Department of Information System, STMIK Hang Tuah Pekanbaru, Pekanbaru, Indonesia

Based on the results of the analysis, design and implementation that has been done. So, some conclusions can be drawn, namely the automatic floor cleaning robot prototype is quite effective in helping the community or cleaning workers to clean floors was studied by liang [32]. Build an automatic floor cleaning robot prototype using the Arduino Uno Microcontroller as a data processor and an ultrasonic sensor as a distance controller which when someone blocks it, the floor cleaning robot prototype will automatically run in the direction that no one is blocking it. Automatic floor cleaning robot prototype using ultrasonic sensors can more effectively detect the distance blocking it.

D. Arduino Based Dry & Wet Automatic Floor Cleaner Akanksha Vyas, Satyam Chourasia, Shubham Antapurkar, Raghvendra Prasad Faculty & Student of ECE Dept., Medi-Caps Institute of Technology and Mgmt, India

This paper facilitates efficient and economical floor cleaning. The cleaner can perform three actions that are dry cleaning, wet cleaning, & UV sterilization. This research shows a

better & simple construction. With the help of UV Lamp, it is possible to kill more than 90% of germicides. This feature increases its application area in hospitals as well as industries.

VI. COMPONENTS & ITS DETAILS

A. Framework:

Galvanized sheet chassis will be fabricated by using rectangular angles. It will form the base of the vehicle in which other components could be easily placed for the further movement of the vehicle. It is designed in such a way that it could give good strength and reliability to the vehicle.

B. Battery:

A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in battery involve the flow of electrons from one material to another, through an external circuit. The flow of electrons provides an electric current that can be used to do work. SPECIFICATIONS: -Voltage output- 12v, Material- Lead, Charging current- 0.3A, Weight- 6.1kg.



Fig. 1:

C. Solar Panel:

Solar panels absorb sunlight as a source of energy to generate electricity. It will be of silicon material. A 12v solar panel system is the most commonly used type of portable off-grid systems and is used to power electronic items and devices that are also 12v. Such a system requires a number of things, such as a solar charge controller, a battery bank or individual batteries, and solar PV panels. As per to charge the 7Ah battery the specifications of solar panel is used to be is:- Size- 12*14 in², Capacity for generation-10 watts.



Fig. 2:

D. Ultrasonic Sensor:

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). The sensor we used is having certain specifications as:- Type:-Ultrasonic, Output:- Digital Sensor, Voltage:-5VDC Detection distance:-2cm-

400cm (0.02M- 4.0M), Static current :-< 2mA, Level output: high-5V, High precision:- up to 0.3cm.



Fig. 3:

E. Arduino-Board:

Arduino is an open-source electronics platform based on easy – to –use hardware and software. Arduino boards can read inputs- light on a sensor, a finger on a button, or a Twitter message- and turn it into an output- activating a motor, turning on an LED, publishing something online.



Fig. 4:

F. D.C. Motor (High Torque):

DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into the mechanical rotation. 4 DC gear motors of 100 rpm are connected to the wheels. And 1 D.C. motor connected to the mopper.100 RPM of the DC Motor and Voltage: -12v.



Fig. 5:

G. Motor Drive:

When voltage is applied, a motor rotates in the forward/reverse direction according to the polarity of the voltage. The rotation speed changes in proportion to the voltage. It consists of a stator of permanent magnet, a rotor with coil, a brush, and a commutator.

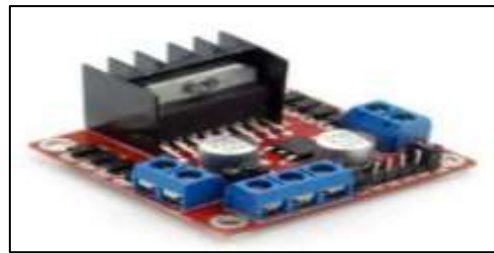


Fig. 6:

H. Wheels:

Four wheels are used in this project which are of plastic and rubber material. Its easy to mount, durable and have good friction. These wheels have a 6 mm hole for shaft with screw for fitting making it very easy to mount on motors big wheels highly durable and resistive heavy load bearing capacity. It has diameter of 7 inches and a thickness of 5 inches. It gives good friction due to which vehicle can easily runs on smooth surfaces.



Fig. 7:

I. Mopper:

Spin mops have circular micro fiber heads that help clean your floors. Spin mops are an affordable and easy-to-use cleaning solution.



Fig. 8:

VII. DESIGN OF MODE

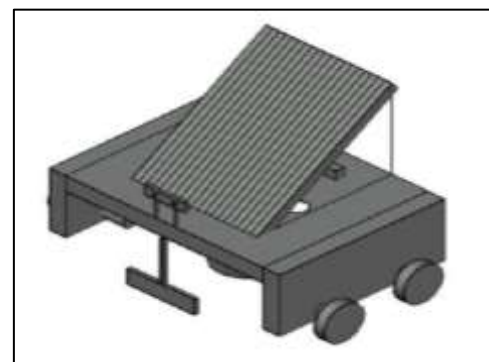
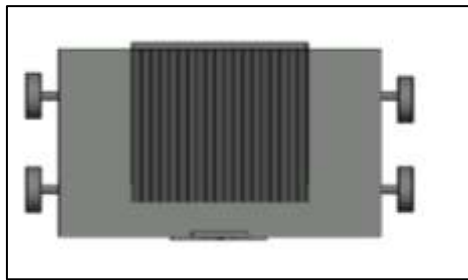
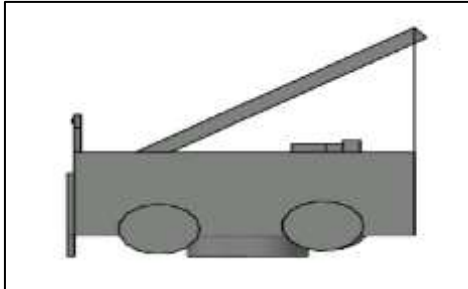


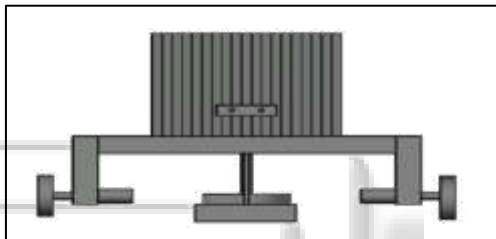
Fig. 9: 3d View of Model



Top View



Side View



Front View

Fig. 10: 2D Drawing of Model

VIII. CALCULATIONS

A. SOLAR CALCULATIONS: -

POWER REQUIRED FOR MOTOR: -

Ratings: - System voltage: 12V DC System, Current: -

$$1.33 \text{ Amps}$$

$$P = V \times I$$

$$P = 12 \times 1.33$$

$$P = 15.96 \text{ watts.}$$

PV MODULE SIZE REQUIRED: -

$$\text{PV module size} = \text{watts} / \text{Average solar insolation}$$

$$= 15.96 / 5$$

$$= 7.98 \text{ Watts}$$

$$= 8 \text{ watts approx.}$$

CURRENT PRODUCED BY SOLAR: -

$$P = V \times I / 10$$

$$= 15.96 / 10$$

$$= 1.56 \text{ amp.}$$

REQUIRED TIME TO CHARGE THE BATTERY: -

$$= \text{Amps of battery} / \text{Input}$$

$$= 7.0 \text{ Ah} / 0.90 \text{ A}$$

$$= 7 \text{ hours approx.}$$

B. CALCULATION OF TORQUE TRANSMITTED ON THE WHEEL: -

$$TW = Kw \times Wt \times R$$

Where, Kw = Coefficient of the rolling resistance

Wt = weight of the machine

Rw = Radius of the ground wheel

We have, $Kw = 0.40$,

$$Wt = 6 \text{ kg} = 6 \times 9.81 = 58.86 \text{ N}$$

$$Rw = 40 \text{ mm} = 0.04 \text{ m}$$

$$Tw = 0.40 \times 58.86 \times 0.04$$

$$= 0.94176 \text{ N-m}$$

C. POWER REQUIRED FOR MOTOR: -

For DC Gear Motor,

Speed-100rpm

Voltage-12V

Watts-16W

$$\text{Current, } I = W / V$$

$$= 16 / 12$$

$$I = 1.33 \text{ A}$$

$$\text{Power, } P = I \times V$$

$$= 1.33 \text{ A} \times 12 \text{ V}$$

$$P = 15.96 \text{ W} = 16 \text{ W}$$

Torque of Motor,

$$\text{Torque, } T = (P \times 60) / (2 \times 3.14 \times N)$$

$$= (16 \times 60) / (2 \times 3.14 \times 100)$$

$$T = 1.52 \text{ N.M}$$

($N = 100 \text{ rpm}$)

$$P = 2 \times \pi \times I \times T / 60$$

$$= 2 \times 3.14 \times 100 \times 1.52 / 60$$

$$= 15.91 \text{ watts}$$

ANGULAR VELOCITY (WHEEL):-

$$\omega = 2\pi N / 60$$

$$\omega = 2\pi \times 100 / 60$$

$$\omega = 10.46 \text{ rad/s}$$

ANGULAR VELOCITY TO LINEAR VELOCITY FORMULA: -

$$v = r \times \omega$$

Where, r = radius of the wheel in m

$$v = 0.114 \times 10.46 = 1.19 \text{ m/s}$$

IX. FUTURE SCOPE

In today's era, 95 percent of the cost of cleaning a floor is labour. Naturally, the high cost of this simple task has inspired alternative solutions and that is Automatic Floor Cleaner. From industries to homes automatic floor cleaner is used and is becoming a very important part of life as it saves time, money and reduces human efforts to a great extent. It is the future of cleaning in our fastmoving life. It is no surprise that they would probably be more reliable than the manual sweeping.

X. CONCLUSION

The use of innovative technology in our project helps in reducing human effort and also consumes less time in cleaning procedure. This means more floor 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. Thus, in our project we have designed the automatic floor cleaning machine with the help of DC motor. This machine is designed in order to enable easy operation and to reduce the effort of human being. The ultimate need of this project is satisfied and with the help of this machine we can clean the floor easily.

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