

Solar Tracking Autonomous Lawn Mover

¹Kiran N, ¹Darshan Kumar H K, ¹Kishor S H, ²Shivasharanaya Swamy

¹Student, School of Mechanical Engineering, REVA University, Bengaluru, India.

²Assistant Professor, School of Mechanical Engineering, REVA University, Bengaluru, India

Abstract - This paper describes the different features and technologies that could be implemented for present Grass Cutter. In today's world, Automation is a very important part of invention. Presently, manually handled devices are commonly used for cutting the grass over the lawn. Because of this, there is pollution and loss of energy. The solar lawn mower is a fully automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass cutting without the need of any human intervention. The old grass cutters need to be replaced by automated one where system will work on its own or under the guidance and obstacle detection using battery as a power source that could be charged very efficiently with solar tracking system. A solar panel will be rotating to track the sun position from one horizon to other this will reduce the problem of more power consumption.

Key Words: Solar panel, Battery, Pollution, Robot, Sensors

1 INTRODUCTION

Solar powered lawn mower can be described as the application of solar energy to power an electric motor which in turn rotates a blade which does the mowing of a lawn. Different designs have been made; each to suit a particular need or convenience. Making the process of cutting grass easier over the years, many individuals have added modification to the original design speed, efficiency and power of a mowing machine. The solar powered lawnmower is an improvement on cordless electric lawn mower. The sun provides sustainable amount of the energy used for various purposes on earth for atmospheric system. Every minute the sun radiates about 5.68×10^{26} calories of energy and the earth intercepts only 2.55×10^{18} calories (NRF, 2010). This represents only 2000 millionth of the total solar energy sent into the space.

Due to the revolution of green movement in the present scenario the the industries with major campus areas are changing the percentage of greenery in the campuses and increased greenery causes increased effort and money. According to world energy report, we get around 80% of our energy from conventional fossil fuels like oil (36%), natural gas (21%) and coal (23%). It is well known that the time is not so far when all these sources will be completely exhausted. So, alternative sources should be used to avoid energy crisis in the nearby future..In such cases the lawn mower proves to be an god sent. Due to increased availability of system on chips, the lawn mower can be automated very easily and also the reduced size and cost of Dc motors causes the system to be independent of fossil fuels to be able to tap into renewable energies. The presence of Ultrasonic sensors and light dependent resistors in a smaller and cheaper packaging cause the bot to be more aware of its surroundings. In addition, it will help to reduce the running cost of using and maintaining a lawnmower. NYSDEC(2012) were of the opinion that lawnmowers must be designed to reduce pollutions generated than at present.

system be optimized with respect to available energy and local demand pattern. The main function of the solar charger is to increase the current.

2 LITERATURE SURVEY

1.Fabrication of Solar Powered Grass Cutting Machine.(July 2015) Mr. Prof. J.Nagaraju, Mr. Vinod Kumar Reddy.

This paper provides the fabricated information about the Fabrication of "Fabrication of Solar grass Cutting Machine" which was designed such that the solar plate generates solar energy and utilizing this energy for running the grass cutter motor. They have no moving parts and hence require little maintenance and work quite satisfactorily without any focusing device. They have used the blade assembly that rotates about a horizontal axis are known as cylinder or reel mowers. Main components they have used for solar powered grass cutter are solar panel , cutter ,mechanism, electric motor. Their system is powered by an electrical switch which completes the circuit comprise the electrical motor and the battery.

2. Automatic Grass Cutter (May 2016) Sulthan Mohyuddin, Digesh K D, Vivek T K, Nazeya Khanam.

This paper mentioned that their system controlling is done by Schmitt trigger circuit. The grass cutter and vehicle motors are interfaced to a Schmitt trigger circuit that controls the working of all the motors. The photo-voltaic effect can be observed in nature in a variety of materials that have shown that the best performance in sunlight is the semiconductors as stated above. When photons from the sun are absorbed in a semiconductor, that create free electrons with higher energies than the created there must be an electric field to induce these higher energy electrons to flow out of the semi-conductor to do useful work The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage, for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photovoltaic system and batteries

3. Modification of Solar Grass Cutting Machine (April2016) Praful P. Ulhe, Manish D. Inwate, Fried D.

Wankhede, Krushnkumar S. Dhakte

This paper describes that their grass cutter easy to operate by using remote control Also, the electric grass cutter is manually operates. These grass cutter will also be will be charged from sun by using solar panels. It is also charging when work is going on. This grass cutter is having an AC charging also. These grass cutter is having spiral cutting blade to increase cutting efficiency. Grass cutter is having collecting box to collect cut grass so butted grass is put outside the lawn, ground, etc. The efficiency of a module determines the area of a module given the same rated output - an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and solar tracker and interconnection wiring.

3 DESIGN ANALYSIS

To design a Solar lawn mower, some parameters need to be considered such as the components to be used in the project, the position of the components, the structure of the main body, the advantages and disadvantages of the design and the safety factors. In our project we are designing The Solar lawn mower that is able to operate autonomously or non-autonomously. Other than that, the important factor is the efficiency. The materials and components selections including the positions are crucial to achieve a better efficiency. The overall dimensions are depending on the size or the dimensions of the solar panel. Three motors are used namely a DC motor for rear tires and the blade. The rubber rotating wheel is used as the front tires as it will automatically change the direction depending on the rear tires. One motor is implemented for each rear tire. The design is cost effective and compatible to the main objectives. The prototype is designed in multidimensional using SolidWorks.

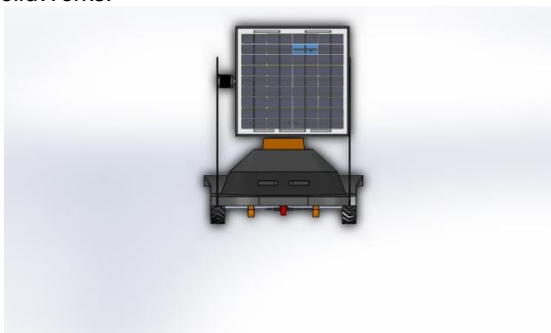


Fig 1; Front View of the Model



Fig 2; Bottom view of the model

4 COMONENTS REQUIRED

1. Arduno Nano
2. L293d9 Motor Driver
3. DC Series Motor
4. Solar panel
5. Charge controller
6. Ultrasonic sensor
7. Round disc Cutting Blades
8. ADXL335 Accelerometer

5 METHDOLOGY

An MPPT, or maximum power point tracker is an electronic DC to DC converter that optimizes the match between the solar array, and the battery bank or utility grid. To put it simply, they convert a higher voltage DC output from solar panels down to the lower voltage needed to charge batteries. The Power Point Tracker is a high-frequency DC to DC converter. They take the DC input from the solar panels, change it to high-frequency AC, and convert it back down to a different DC voltage and current to exactly match the panels to the batteries. MPPT's operate at very high audio frequencies, usually in the 20-80 kHz range. The advantage of high-frequency circuits is that they can be designed with very high-efficiency transformers and small components. The design of high-frequency circuits can be very tricky because of the problems with portions of the circuit "broadcasting" just like a radio transmitter causing radio and TV interference.

6 RESULT

The solar lawn mower project is designed to reduce the time and manual labour work. The use of electronics and robotics helps by increasing the overall efficiency of the work done. The use of solar power makes this lawn mower more pollution free and cost effective. The concept of controlling the lawn mower by mobile/ pc solves the requirement of man's presence near the mowing site and the mower can be set automatically without the view of human being. The study of photovoltaic voltages at different angles for the sun is also analysed at different intervals of time throughout the day. Thus the overall efficiency of the system has been increased.

S / N No.	Sample Plot	Coverage Area (m ²)	Battery Drop (V)	Time (s)	Lawn Height (mm)	Average height after grass mowing (mm)
1	Elephant grass	16	0.23	125	470	90
2	Carpet grass	16	0.15	115	130	92
3	Stubborn grass	16	0.28 0.22	130	600	72
4	Soft grass	16		125	400	56.6
Area			0.8v	495 sec		

7 CO 7 CONCLUSION

In the world today, all machines are designed with the aim of reducing or eliminating green house gas emissions which is the major causes of climate change. Approximately 50000 people are injured by lawn mowers in the U.S injuries are caused by humans encountering the machine cutting blade or by objects being flung by the mower. Hazards from deliberate misuse are also of concern. The goal of current research is to reduce the number of people getting injured. This solar tracking powered lawn mower will reduce the environmental pollution and low cost of operation since there is no cost for fueling. A solar powered lawn mower has been developed for the use of residences and establishments that have lawns where tractor driven mowers could not be used. The machine's capacity is adequate for its purpose. Moreover overall efficiency of the system is increased with a less human effort. The machine has proved to be a possible replacement for the gasoline powered lawn mowers.

8. REFERENCES

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