

Smart Hybrid Fully Automatic Solar Grass Cutter

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Abstract-

Grass cutting is an important task in gardening and landscaping, which requires a significant amount of time and effort. Manual grass cutting using a traditional lawn mower can be labour-intensive, time-consuming, and can result in environmental pollution. To overcome these challenges, an automatic solar grass cutter using a microcontroller has been designed and implemented. This system provides an efficient and environmentally friendly solution for grass cutting while reducing the workload of gardeners and landscapers. The solar panel provides the necessary power to operate the system, making it energy-efficient and environmentally friendly. The system is also equipped with a rechargeable battery that stores the solar energy and can be used when there is no sunlight. The system is designed to be fully automatic, which means that it can operate without human intervention.

Keywords: Solar power, Microcontroller, Solar Energy, Ultrasonic sensor, motors, Robot, L298N motor driver, AT mega 328P.

I. INTRODUCTION

Maintaining large areas of grass manually can be a daunting task, especially when the grass is spread across a vast landscape. The problem of maintaining large areas of grass manually can be attributed to several factors. Firstly, it is a labour-intensive task that requires a lot of time, effort, and resources. Manually mowing large areas of grass requires the use of heavy-duty mowing equipment, which can be costly to purchase and maintain. Automatic grass cutters have been developed to solve the problem of maintaining large areas of grass manually. The fully automated solar grass cutter 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 interaction. These devices use advanced technologies such as microcontrollers, sensors, and solar power to automatically cut grass without human intervention. The use of automatic grass cutters eliminates the need for manual labour and helps to save time and money. One of the main advantages of using automatic grass cutters is that they can cover large areas of land quickly and efficiently. This is particularly useful for golf courses, parks, and other large open spaces where manual grass cutting is time-consuming and labour-intensive. With automatic grass cutters, the cutting process is automated, and the machines can work for extended periods without the need for human supervision.

II. OBJECTIVES

- i. To study the problems with grass cutter.
- ii. The project is powered by solar energy hence the consumption of fossil fuel is reduced.
- iii. The main objective is to reduce human efforts by using fully automatic grass cutter
- iv. In keeping with the motivation behind the project the goals of this project was to reduce end-user work through the utilization of an easy-to-use device.
- v. The autonomous design eliminates the need to go outside and mow your lawn every week

III. LITERATURE SURVEY

From time immemorial, the sun has been the major source of energy for life on earth. The solar energy was being used directly for purposes like drying clothes, curing agricultural produce, preserving food articles, etc. Even today .The energy we originate from fuel-wood, petroleum, paraffin, hydroelectricity and even our food originates obliquely from sun. Solar energy is almost unbounded. The total energy we obtain from the sun far exceeds our energy demands. Ever since the industrial revolutions human have been dependent on fuels, electricity and wind energy [1]. Nowadays, solar energy has been known as a renewable energy source. It is an alternative energy to that of fossil fuel and it can be collected from the renewable resources such as sun, wind and hydro. This paper introduces a new development of grass cutter, named as Smart Solar Grass Cutter, by using solar irradiance as a primary energy source with the presence of a solar panel. This grass cutter prototype is developed to reduce air pollutant and improve the current design specifically the blade position based on the previous studies. [2]. These days we are facing the problems like pollutions, power cut problem etc. In order to overcome these problems, we have thought about the device, which can be performing its functions without causing any of these problems. This project aims at developing a portable solar operated grass cutting device, as there is power shortage. So we have decided to make a solar energy operated device [3]. This paper summarizes and reviews technological development for making efficient and cost effective grass cutter. Our aim is to study the various developments in the grass cutter machines and their performance. We are trying to make the new innovative concept mainly used in agricultural field. We are going to fabricate the grass cutting machine for the use of agricultural field, to cut the crops in the field as well as to cut the grass [4]. In this paper they have prepared manually operated grass cutter with spiral roller blades due to spiral blades increases the efficiency of cutting. For adjusting the height reel cutter is component placed on grass cutter. This grass cutter used to cut the grass uniformly and also it can cut the different types [5].

IV. PROBLEM STATEMENT

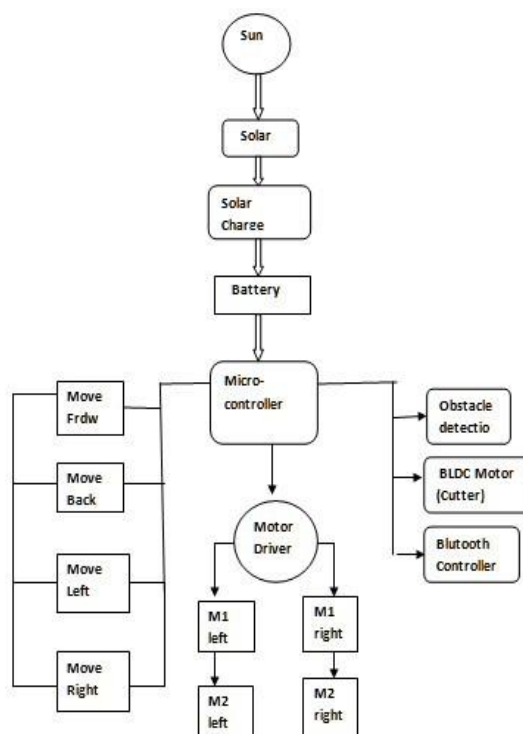
Nowadays, solar grass cutters are commonly found in everywhere all around the world Normally we see the grass cutter machine was used in the housing park and residence bungalow the commercial is like the industrial sector, we typically see the manually and conventionally used grass cutter machine with fuel as power source. Before last few years everyone used non renewable (i.e. Gas and oil) energy based grass cutter. The cost of the fuels used for cutters is also rising. Thus our aim is to research

Alternative power sources such as solar power. To solve this problem, we have found there is high demand to a product which solving this problem and make people easier to mow their lawns.

PROPOSED DESIGN &METHODOLOGY

To design a Smart Solar Grass Cutter, some parameters need to be considered such as the components to be used in the paper, the position of the components, the structure of the main body, the advantages and disadvantages of the design and the safety factors. The Smart Solar Grass Cutters 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 microcontroller will be programmed to ensure both motors at the rear wheels will be having the same speed when it is required if the grass cutter is needed to move to the right direction, the left motor will be having a higher speed compared to the right motor and vice versa

FLOWCHART



Block Diagram

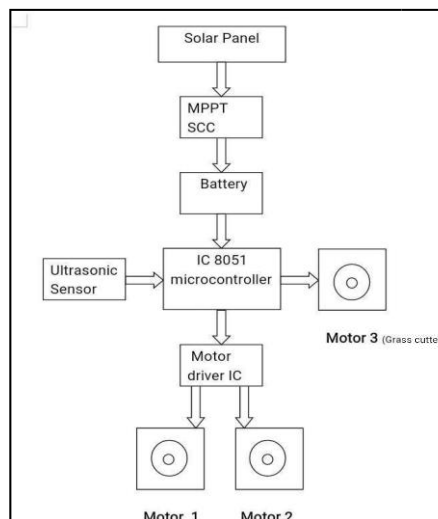


Fig 1. Block Diagram of Fully Automatic SolarGrass Cutter

WORKING:

The solar panel is mounted on the grass cutter machine receives the solar power from the sun. This solar power stored in the battery. The working principle of solar grass cutter is it has panels mounted in a particular arrangement at frame that it can receive solar radiation with high intensity easily from the sun. The solar panels convert solar energy into electrical energy, using photovoltaic effect and stored in battery. The main function of the solar charge controller is to increase the current from panels while batteries power-driven by solar energy. It also detects the obstacles in the path based on that changes the movement direction.

COMPONENT DESCRIPTION

8051 Microcontroller circuit:

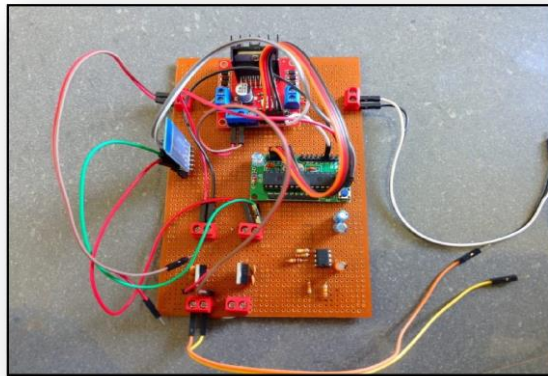


Fig 2. microcontroller Circuit

The grass cutter motor and vehicle motor are interfaced to an 8051 microcontroller family. It controls the working of all the motors. The microcontroller then turns the robotic as long as it gets clear of the object and then moves the grass cutter in forward direction again

Specification

- AT Mega 28 Pin
- AT Mega 328P smart analog and digital microcontroller

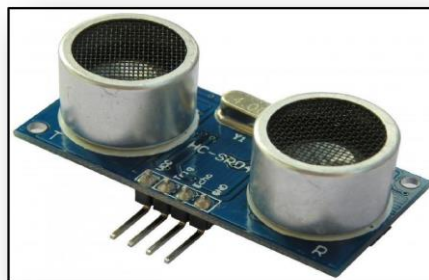


Fig 3. Ultrasonic Sensor

Ultrasonic sensors are used for the obstacle detection. When obstacle is get detected then the ultrasonic sensor monitors it and microcontroller stops the grass cutter motor for safety of the vehicle.

Specifications:

- Digital 5m Range

- 5 V operated

Solar panel:

Fig 5. Solar panel

Solar panel is used to charge the battery. The grass cutter is based on the solar system so we cannot use any fuel for the operation. Thus, the cost is automatically effective. The cost of labour is very effective.

Specification:

- Operating voltage-12 V
- Monocrystal PV cell
- Charging Time 5 To 6 Hours
- Solar charger – 12v, 10AH

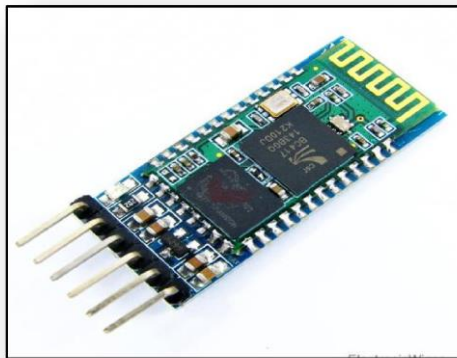
Bluetooth Control:

Fig 6. Bluetooth Control

The grass cutter machine is controlled by Bluetooth using a mobile phone, so it can operate easily. The controlling device of the system is Raspberry pi. Bluetooth module and DC motors are interfaced to the Raspberry pi. The data received from the android phone application by the Bluetooth module is given as an input to the Raspberry pi and the controller acts accordingly on the DC motor of the solar grass cutter.

Specification:

HC05 Bluetooth Controller

MPPT Charge Controller:

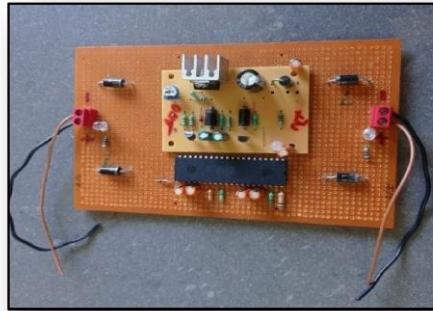


Fig 7. MPPT Charge Controller Circuit

The MPPT Charger controller ensures that the loads receive maximum current to be used (by quickly charging the battery). Maximum power point could be understood as an ideal voltage at which the maximum power is delivered to the loads, with minimum losses. MPPT solar charge controller allows user to use PV module with a higher voltage output than operating voltage of the battery

Specification

Operating voltage-12 V

Current-10 Ah

RESULT

Our project fully automated solar grass cutter is successfully completed and results are obtained satisfactorily.





The capacity of the battery was 13Ah and discharging current was 4. amps and the output of the solar panel was 12 v and 3 watts. The discharging time was calculated by dividing the battery capacity by the discharging current. The discharging time was 2 hours approximately. Using the formula $E=VI$, we calculated the charging the time which was approximately 5 to 6 hours. It initializes the starting point for cutting grass If objects detects from all 4 sides that is left side, right side, from forward side and reverse side then grass cutter moves to cut the grass.

V. ADVANTAGES

- 1) It produces less noise Pollution than the Conventional grass cutter which uses Gasoline / Diesel as its Fuel.
- 2) No fuel consumption Compact Size andportable
- 3) Easy to move from one place to another place Operating Principle is simple
- 4) Non Skilled person can also run this machine.

VI. FUTURE SCOPE

The blade can be changed from the ground by using the rack and pinion mechanism. More sensors can be added to increase the automation and result accuracy. The solar panel can be fixed with light sensors. Thus depending upon the arrangement of the sun, the panel will be slanting, such that the sun rays are incident normally to the solar panel. With this the device would be constant capable of trapping the solar energy at times when the strength of the sun light is less. If panel used of high watt, then the machine can be used during night time for garden lighting or room lighting, because we can accumulate more power. Also we can use for the floor cleaning purpose using a broom by replacing the blade.

VII. CONCLUSION

In the world today, all machines are designed with the aim of reducing or eliminating greenhouse gas emissions which is the major causes of climate change. This device is more suitable for a common man as it is having much more advantages i.e., no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components and this can be operated by using solar energy. 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. The machine has proved to be a possible replacement for the gasoline powered grass cutter. In this paper provides the fabricated information about the "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. Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented.

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