

“Variable Head Solar Grass Cutter”

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1.1 Abstract

Variable Head Solar Grass Cutter Weed Trimmer Robot is an eco-friendly, innovative option for automated lawn care. The robot harvests energy from the sun to operate, hence a cost-saving and environmentally friendly option compared to conventional grass cutting. The variable head feature permits effective trimming of grass and weeds on sloping areas, providing accuracy and versatility to various landscapes. With smart sensors, obstacle avoidance with optimal cutting efficiency. The project targets increased convenience, minimization of labor, and environmental sustainability in lawn maintenance. Keyword: Solar Powered Air Quality Monitoring System.

Variable Head Solar Grass Cutter is an energy-efficient and environmentally friendly machine for grass cutting utilizing solar power. The main aim of this project is to create a clean and renewable technology substitute for conventional fuel-driven grass cutters, which are the cause of environmental pollution and noise. This device combines a solar panel to capture solar power, which is saved in a rechargeable battery and utilized to energize a DC motor connected to a traveling cutting head.

The head variable mechanism enables the cutting blade to vary its position and angle, facilitating easy cutting on rough ground and in a curved manner around obstructions. The characteristic increases the grass cutter's flexibility to function in different conditions and minimizes the amount of manual labour. The system is silent in operation and demands low maintenance. Operations using renewable energy not only minimize the cost of operation but also increase compliance with sustainable development objectives.

CHAPTER 01

1.2 Overview of project

1. Solar-Powered Operation – It is fitted with solar panels that transform the sun's rays into electric power, energizing the motor and cutting blades.
2. Variable Head Mechanism - Its head can be tilted at various angles and at various heights, which enables effective trimming on sloping surfaces, uneven ground, and hard-to-trim areas.
3. Eco-Friendly & Cost-Effective - Reduces fuel expenses and emissions, ensuring it is an environmentally friendly way of maintaining lawns.
4. Automated & Manual Modes - There are automation options available on some models, allowing for remote or sensor-based control.

5. Lightweight & Portable - It has been designed for easy portability, such as for use in gardens, parks, and farming.

1.3 Problem statement

Conventional grass cutters are usually fossil fuel- or electricity-dependent, hence expensive, eco-unfriendly, and less effective in regions with unstable power supply. Furthermore, fixed-head grass cutters are incapable of adjusting to undulating ground and different heights of grass, resulting in uneven cutting and more labour. There is a necessity for a sustainable, flexible, and effective solution to grass maintenance. The Variable Head Solar Grass Cutter is designed to overcome these issues through the use of solar power and an adjustable cutting head mechanism to provide efficient performance on various surfaces while minimizing environmental effects and human labour.

1.4 Literature survey

The growing need for environmentally friendly solutions has motivated researchers and developers to investigate solar-powered versions of traditional machines. The grass cutter machine is one such device that has progressed from manual and petrol-based mechanisms to automated, energy-saving systems.

In [1], P. S. Prashant, K. Joshi, M. Kulkarni (2018) Solar Powered Smart Grass Cutter Designed a solar-powered grass cutter with rechargeable battery and simple automation. Emphasized eco-friendliness and low maintenance.

In [2], A. Kumar, R. Singh (2019) Design and Fabrication of Solar Grass Cutter Designed a low-cost simple solar grass cutter to minimize pollution and cost, for replacing the fuel-operated machines.

In [3], A. Patel, R. Sharma (2021) Design and Development of Adjustable Head Solar Grass Cutter Added a variable head mechanism to improve efficiency on uneven terrain. Solar power was utilized for sustainability.

In [4] S. Chavan, M. Kadam (2019) solar Based Grass Cutter – A Review Presented the advantages of solar power in gardening equipment and suggested a model with minimum safety and energy storage facilities.

1.5 Objectives

The primary aim of the Variable Head Solar Grass Cutter by Fly Sky is to create and build an effective, environmentally friendly grass cutter machine run by solar power. The project intends to decrease fossil fuel reliance and lower environment pollution through the use of renewable solar energy. Another important objective is to provide a variable head mechanism that is adaptable to varying grass heights and terrain, and that enables even cutting and minimizes labour. The cutter should be light, inexpensive, and applicable for small to medium

lawns or agricultural fields. This invention aims to advance sustainable technology while increasing the convenience and efficiency of grass care.

1.6 Overview of the report

This report illustrates the design, development, and testing of the Variable Head Solar Grass Cutter created by Fly Sky. The report starts with a comprehensive introduction of the project, giving

emphasis to the driving force for the invention of an environmentally friendly and effective substitute for traditional grass cutting machines. The report summarizes the problem statement, giving importance to the limitations of fuel-based and fixed-head cutters, and depicts the necessity for the adaptation of a solar-powered, variable head solution. The objectives section defines the project’s goals, including sustainability, flexibility, and user-friendliness.

Following the introductory sections of the report, it discusses the methodology adopted in designing the solar grass cutter, such as selecting components such as solar panels, motors, batteries, and the variable head system. Design schematics and operation principles are also included. The initial test phase is clearly described, including performance assessment under different environmental and terrain conditions. Observations, findings, and challenges experienced during testing are documented.

The report conclusion consists of major findings, suggestions for future improvements, and general potential for real-world applications in local and agricultural settings. With integration of solar energy and innovative design, the Fly Sky Variable Head Solar Grass Cutter is striving to bring about a cleaner and greener world.

CHAPTER 02

2.1 Components

1 Solar panel.

A photovoltaic (PV) panel or solar panel is a device that transforms sunlight into electricity with the aid of photovoltaic cells. It is constructed using materials that generate excited electrons when illuminated.



Solar panel

2. Motor Driver.

The L298BN motor driver regulates the speed and direction of rotation of a DC electric motor .it employs a L298N PWM system



L298BN motor driver

3 Center Shaft Motor

A rechargeable battery with stored electrical energy of 11.1 volts. Used for giving backup power, energy storage for solar panels and powering different devices.



2.1.3 center shaft motor

4 Battery.

Which converts chemical energy into electrical energy the called as Battery



11.1Volts Battery

5 Wheels.

Wheels are round pieces that facilitate easy movement by minimizing friction between an object or vehicle and the surface. They are among the oldest and most influential inventions in human history, being widely used in the fields of transportation, machinery, and robotics. Usually constructed from rubber, plastic, or metal materials, wheels function 0to roll around an axis in order to transport objects. Effectively.



wheels

Variable Head Solar Grass Cutter development entails a step-by-step methodology integrating mechanical design, electrical integration, and renewable energy use. It starts with the frame and chassis design to ensure it is light, strong, and can sustain the components. There is a solar panel on top of the frame that collects solar power, which is stored in a rechargeable battery via a charge controller. The stored energy is used to power a DC motor that operates the cutting blade.

For more functionality, a variable head system is designed where the height and angle of the cutting blade can be adjusted manually or mechanically. This facility provides effective grass cutting in uneven terrains and obstacles. The motor is mounted on the blade with a shaft and pulley arrangement for smooth transfer of movement. The whole system is mounted and tested in various grass and ground conditions to assess performance, energy usage, and cutting quality. The design is focused on low noise, zero emissions, and minimum manual labor, and it matches the ambition of creating a sustainable and user-friendly solution for grass cutting.

5 Transmitter and Receiver

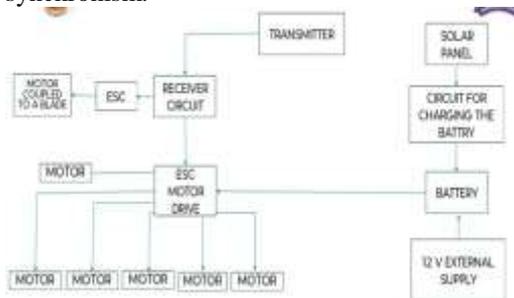
The Fly Sky FS-i6S is a 10-channel, 2.4GHz radio control (RC) transmitter with a capacitive touchscreen, suitable for various RC applications like quadcopters, robotics, and engineering vehicles, featuring AFHDS 2A technology for enhanced range and interference protection.



CHAPTER 03

3.1 Block diagram

This block diagram is a motor control system driven by a solar panel combined with an external power supply, and remotely controlled with a transmitter. The system starts with a solar panel, which supplies power to a charging circuit to charge a battery. The battery is also charged with a 12V external power supply, offering an alternative source of power. The battery subsequently drives an ESC motor drive, which regulates several motors. In terms of control, a command from a transmitter is transmitted wirelessly to a receiver circuit. The receiver transmits signals along two main paths: one to an ESC to a motor that is paired with a blade, and another to the ESC motor drive, which splits the signal to various motors to operate. These motors carry out different functions depending on the control input. The ESC motor drive gets the control signal from the receiver and power from the battery so that all motors can work in synchronism.



Block diagram

3.2 Methodology

A "variable head solar grass cutter" approach entails the design of a solar-powered lawn mower, which functions through the use of a spinning blade which cuts the grass, quite literally effecting a cut by introducing shearing action as the high-speed spinning blade is driven by a motor; the operator manually maneuvers the machine around the lawn to trim the grass and machine movement respectively.

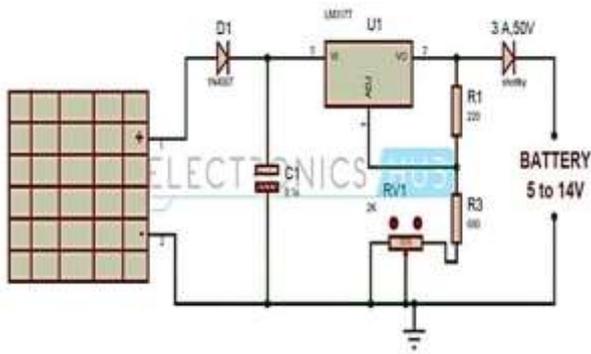
CHAPTER 04

4.1 Circuit diagram

This is a solar battery charging circuit using an LM317 voltage regulator to charge a battery for a voltage range of 5V to 14V. The circuit starts with a solar panel that produces DC voltage. The voltage is first fed through a 1N4007 diode (D1), which stops reverse current from the battery returning to the solar panel. The filtered voltage is then fed to the LM317 (U1) voltage regulator, which regulates to a controlled output voltage appropriate for charging the battery.

This whole arrangement guarantees that the battery is charged efficiently and safely from solar power with adjustable voltage regulation through the LM317 and on both input and output sides, reverse current protection solar and mechanical power to drive a load.

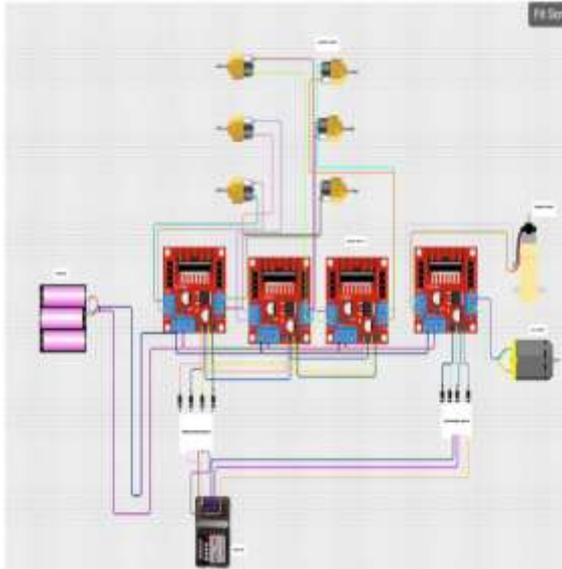
This is a circuit diagram illustrating wiring for a multi-motor robot system, most likely remotely controlled. The main parts are four L298N motor driver modules that are hooked up to several DC motors. Two motors each are driven by an L298N module, with their outputs connected appropriately. The lithium battery pack on the left side is used as the power supply, sending power to all the motor drivers. Control signals are received from a receiver module at the bottom, which receives commands from a remote controller presumably. These signals are then fed through diodes to the motor driver input pins, controlling the movement of the motors connected. These labels like "WHEEL MOTORS," "GRASS CUTTING MOTOR COUPLED TO BLADE," and "GEARED MOTOR""



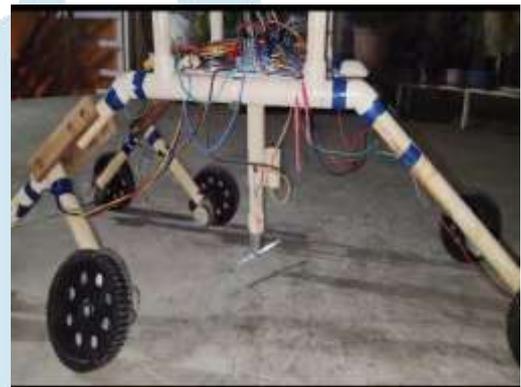
Circuit diagram for charging the battery



Variable Head Solar Grass Cutter



Motor Connection



Adjustable cutting

CHAPTER 05

5.1 Hardware Implementation

5.1.1 Hardware Picture

The Variable Head Solar Grass Cutter designed by Fly Sky is a revolutionary hardware solution that aims to offer a green and efficient way of cutting grass with the power of solar energy. The main characteristic of this grass cutter is that its cutting head is adjustable, enabling users to change the angle and height of the blade to accommodate various ground surfaces and lengths of grass. This adjustability improves cutting accuracy and efficiency.

The device uses solar panels as its power source, thus providing an environmentally friendly option compared to traditional fuel-powered mowers. The solar panels charge a rechargeable battery, which powers a DC motor attached to the cutting system. The entire assembly rests on a light structure with wheels for ease of movement. A solar charge controller is incorporated to guard against overcharging and maintain long-term durability. Fly Sky has been driven by cost-effectiveness, user safety, and eco-friendliness in the conception and execution of this project. The hardware units are combined in such a manner to deliver optimal performance at minimal maintenance, thus being suitable for household as well as agricultural purposes.

CHAPTER 06

6.1 RESULT

The Variable Head Solar Grass Cutter operated with Fly Sky transmitter has proven to deliver effective results in having a sustainable and efficient grass cutting solution. The adjustable head aspect provided accurate cutting over uneven grounds, creating an even trim of grass at different heights. Running solely on solar power, the device effectively functioned free from outside electricity or fuel inputs, emphasizing its cost-saving and environmentally friendly aspects. The battery pack and solar panel system proved to be efficient, providing a stable power supply to the motor while working. In conclusion, the project was a viable, user-friendly, and eco-friendly substitute for conventional grass cutters, and thus ideal for domestic gardens, parks, and small farming fields.

References

In [1], P. S. Prashant, K. Joshi, M. Kulkarni 2018 Solar Powered Smart Grass Cutter Developed a solar-powered grass cutter with rechargeable battery and basic automation. Focused on eco-friendliness and low maintenance.

In [2], A. Kumar, R. Singh 2019 Design and Fabrication of Solar Grass Cutter Fabricated a simple solar grass cutter to reduce pollution and cost, aimed at replacing fuel-based machines.

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In [7] A. Patel, R. Sharma (2021) Design and Development of Adjustable Head Solar Grass Cutter Introduced a variable head mechanism to improve cutting efficiency on uneven surfaces using solar power for sustainability.

In [8] R. Kumar, S. Yadav (2020) Hybrid Solar-Powered Grass Cutter Presented a hybrid model combining solar and manual power for improved usability and environment-friendly operation.

