

EMBEDDED BASED AUTOMATIC GRASS CUTTING MACHINE BY SOLAR ENERGY

¹Amol Kapase, ²Bhanuprasad N, ³Bharath Kumar A, ⁴Kiran Kumar Warad, ⁵Dharamendara. M
^{1,2,3,4}Student, ⁵Assistant Professor
School of Mechanical Engineering
REVA University, Bangalore, India

Abstract: The grass cutter uses a solar based energy source, which is easier to use, more advantageous compared to others source especially for gas based source of power. But our solar grass cutter is based on solar power because this energy is a renewable source of energy and easy to work, so we made solar powered grass cutter machine. These days we are facing the problems like pollutions, power cuts 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. So we have thought of doing the project on the solar powered automated grass cutter machine which makes the grass cutter machine running through solar energy.

The main target is to reduce human efforts in grass cutting filed such as lawn. In the solar grass cutter IR sensor will be used to detect and avoid the unnecessary objects in the field during operation. Solar panel is used to charge the battery so that there is no need of charging the battery externally. The grass cutter uses 12V battery to power the motor s. The machine runs on the Bluetooth controller through android application. The operation and working principle and also the design parameters of automatic grass cutter are discussed in the paper.

Keywords: Solar energy, Aurdino nano, Bluetooth Controller, IR sensor.

I. INTRODUCTION

Now a day's the technological advancement are mostly designed to reduce the manual work and save labor power and time. The conventional grass cutting machine equipments are manually handled. This project is designed to reduce labor power and time in grass cutting at agricultural field. In a day to day life lots of development work has been pending but there are still some labor power required for a small work. In our project we are trying to make daily purpose robot which is able to cut the grasses in a lawn. The project work is done on the proper application based fabrication. The system will have the some automatic work and any obstacle detection. The system has the power source of battery and the solar panel is placed at top of the system. Earlier day's the grass cutter moving with engine which creates noise pollution due to the loud engine and air pollution due to the combustion in engine. Also a motor powered engine requires periodic maintenance such as changing the oil. The electric solar grass are environmental friendly

In large size of lawn in the park, schools, college are maintained manually. The gardener used hand scissors to cut and maintain lawn regularly which also takes more time. It is not easy and also difficult to maintain lawn regularly which also takes more time. The present technology commonly used for trimming the grass is by the manually handled device. The device consists of blade which operated with the help of the motor the power supply for the motor is by battery.

The concept of solar energy is not new but its various applications are, this is due to the unpopularity of its applications resulting from the previously accomplished sources of energy like fossil fuels and woof fuels. The world awareness of fossil fuels pollution, most countries and peoples are turning to harvest it both in large and small scale.

1.1 Literature review

A. E. Naresh, Boss Babu and G. Rahul[1] According to author, if any obstacle comes in front of grass cutter then it sense by IR sensor and gives signal to the microcontroller to change the direction or stop the grass cutter until the obstacle is removed. The main objective of this paper is to move the grass cutter is different directions to prepare various designs as per requirements. By using link mechanism the height of the cut can be adjusted. The unskilled labour can easily operate this device.

B. Sujendran S. and Vanitha p. [2] In this paper author explained that wireless grass cutter. There are two main components such as transmitter and receiver. Transmitter continuously transmits the rays if any obstacle come in front of grass cutter then the rays are reflected back towards the receiver. They have used solar panel so it is not required to charge battery externally and battery is continuously charged at constant voltage when grass cutter is in working. Because of two DC motor both forward and backward motion of grass cutter can simultaneously possible.

C. Praful P. Ulhe, Manish D. Inwate, Fried D. Wankhede and Krushankumar S. Dhakle. [3] In this paper author explained that solar plate which is placed above the grass cutter generates solar energy and use this energy for working the grass cutter. Also using driver circuit for controlling the speed of motor as per requirement. Solar panel, battery, DC motors and blades these components are used for preparing grass cutter. For preventing battery from overcharging and over discharging regulator is placed into the system and it should be placed in series. They have provided LCD display unit which displays voltage generated during solar rays trapping.

D. Vicky Jain, Sagar Patil, Prashant Bagane, Prof. Mrs. S .S. Patil [4] Author prepared manually handle device. The battery can be charged by using solar panel as well as external power supply and DC motor which is controllable is used for changing the direction of grass cutter as per need are used. The most modern regulator is used for preventing overcharging and discharging of battery which saves span of battery. Due to industrialisation more electricity is required for various industrial applications and electrical.

E. Ashish Kumar Chaudhari et. Al [5] In this paper the author used solar panel so that it does not required to charge battery externally and battery is charged at constant voltage when grass cutter in working. The battery is charged in day time by using solar panel and it is stored so we can use grass cutter at night time also. Because of two DC motor both forward and backward motion of grass cutter can simultaneously possible.

F. Pankaj Malviya et. Al [6]In this paper author explained that solar panel which is placed above the grass cutter generates solar energy and use this energy for working the grass cutter. Also, using driver circuit for controlling speed of motor as per the requirement. Solar panels, batteries, DC motor, solar charger, circuitry and blades these components are used for preparing grass cutter.

G. C. B. Mills [7]Today, new technology is bringing us improved mower versions. Low emission gasoline engines with catalytic converters are being manufactured to help reduce air pollution. Improved muffling devices are also being installed to reduce the noise pollution. ", these new mowers will quietly cutting lawns without the common cloud of blue smoke hanging in the air, for about an hour per charge. Prices are comparable to a high-end gasoline powered mower.

H. Davidge E D [8] I'm planning on moving my entire fleet to propane. Not only is it better for the environment, it also increases my productivity. I'm saving money on fuel, and labor costs as well, since my crew isn't spending time filling up at the pump. Propane has no additives and is a clean burning system. I save on maintenance since there is no carburetor or fuel filter to maintain.

I. Edwin Beard Budding [9] Budding obtained the idea of the lawn mower after seeing a machine in a local cloth mill which used a cutting cylinder mounted on a bench to trim cloth to make a smooth finish after weaving. Budding realized that a similar concept would enable the cutting of grass if the mechanism could be mounted in a wheeled frame to make the blades rotate close to the lawn's surface.

J. P.Bulski [10] Bulski identify the sound created by the machine is making noise pollution. He research on sound created by the machine and giving the result how to remove the sound while cutting the grass of lawn or ground. As looking to the petrol engine it make air pollution to environment so from my recommendation it should be implement on electric operated lawn mower.

K. Praful P. Ulhe [11] In this paper they have prepared manually operated grass cutter with spiral roller blades due to spiral blades increases the efficiency of 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 grasses.

L. Ransome [12] The first was produced by Ransomes in 1902. JP Engineering of Leicester, founded after World War I, produced a range of very popular chain-driven mowers. About this time, an operator could ride behind animals that pulled the large machines. These were the first riding mowers. In the United States, gasoline-powered lawn mowers were first manufactured in 1914 by Ideal Power mower.

M. Thomas Green & Son [13] He introduced a mower called the Silence Messer (meaning silent cutter), which used a chain drive to transmit power from the rear roller to the cutting cylinder. These machines were lighter and quieter than the gear-driven machines that preceded them, although they were slightly more expensive. The rise in popularity of lawn sports helped prompt the spread of the invention. Lawn mowers became a more efficient alternative to the scythe and domesticated grazing animals.

1.2 Scope of the project:

To allow for greater flexibility in the design, a custom built platform will be used. Much experience has already been gained with the other sensors working on the first two generations of autonomous lawn mowers. This is the key system that will enable the mower to recognize objects, avoid them, and can move also in a pattern.

II. METHODOLOGY

The following methodology was followed by the design of proposed project

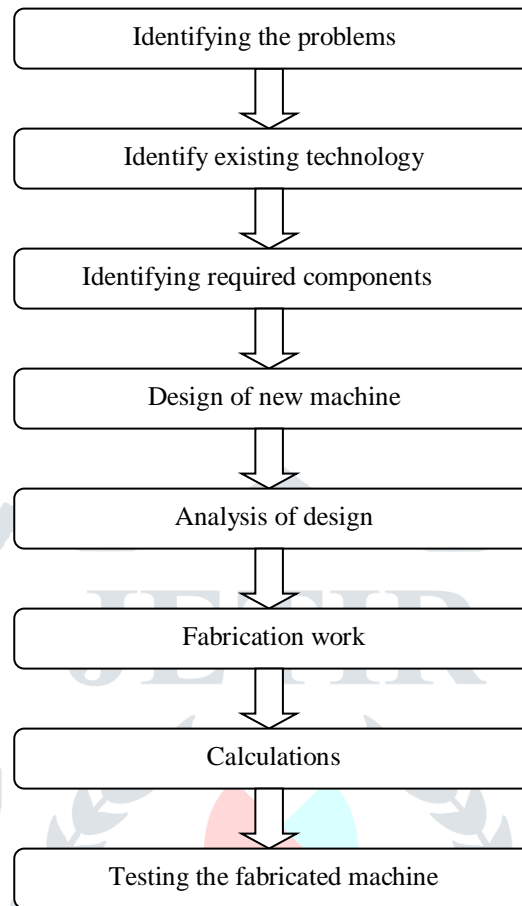


Fig.1: Methodology steps

2.1 Proposed design methodology

Block diagram description

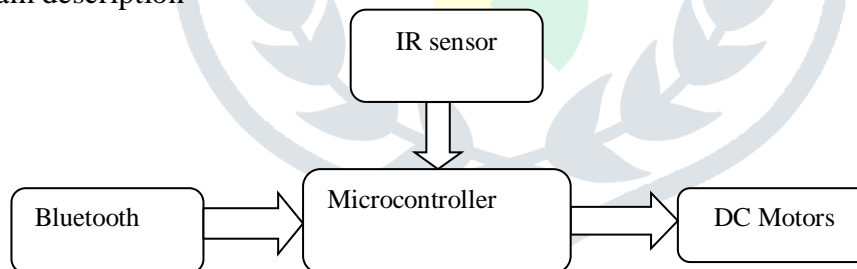


Fig.2: Block diagram of grass cutter machine

Working : The design contains a microcontroller, IR sensor, DC motor, node MCU all these together combined we get a grass cutter machine. I used only an IR sensor to detect if the machine was heading into an object. Safety is the main concern when designing a machine with blade. Determining where to place our sensors is crucial to the overall effectiveness of our design. The microprocessor must be in the robot to protect it from the natural elements. IR sensor will be mounted directly in front of the machine for maximum detection. The microcontroller moves the vehicle motors in forward direction in case no obstacle is detected Batteries are use for power generation for the machine movement and the battery is rechargeable. There is a need for Ad fruit server login for creating toggle feeds for the machine such as forward, reverse, left, right and motor ON and OFF. The bluetooth module can receive and transmit signal range of 9 meter.

2.2 Components of solar grass cutter machine

Table 1: components of grass cutter machine

Sl. no	Item	Quantity
1	DC Motor	4
2	DC Motor	1
3	Solar panel	1
4	Battery	1
5	IR Sensor	1
6	Blade	1
7	Wheels	4

2.3 Component description

- **Arduino ATmega328P:** Arduino is brain of overall system. Arduino is single-board microcontroller intended to make building interactive objects or environments more accessible. Introduced in 2005, the Arduino designers sought to provide an inexpensive and easy way for hobbyists, students, and professionals to create devices that interact with their environment using and actuators.
- **DC Motor:** A DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates a electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°. A simple DC motor typically has a stationary set of magnets in the stator and an armature with a series of two or more windings of wire wrapped in insulated stack slots around iron pole pieces (called stack teeth) with the ends of the wires terminating on a commutator.
- **IR Sensors:** A Sensor converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) in to a signal which can be measured electrically. Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals to detect and avoid the object to reduce the chances of failure of blade.
- **Battery:** The cell in the basic electro-chemical unit in a battery, consisting of a set of positive and negative plates divided by separators immersed in an electrolyte solution. In typical lead acid battery each cell has a nominal voltage of about 2.1 volts so there are 6 series cells in a nominal 12 V battery. The active materials in a battery are the pasted compositions materials that form the positive and negative plates and are reactants in the electro-chemical cell. The amount of active material in a battery is proportional to the capacity a battery can deliver. In lead acid batteries the active materials are lead dioxide (PbO₂) in the positive plates and metallic sponge lead (Pb) in negative plate which react with sulphuric acid (H₂SO₄) solution during the battery operation.
- **Bluetooth:** Bluetooth module is used to cover the short distance and also pint to point wireless data transmitter and receiver. The range of distance varies from module to module depending on the version of the module being used. In this project we are using the bluetooth module (HC 05 Bluetooth Module) and how to interface bluetooth module to computer via USB. By using this bluetooth module we can send appropriate commands to select the role of operations.

III EXPERIMENTAL WORK

The figure below shows the conceptual design of machine that was prepared by using Solid Edge V19. The main parts are IR sensor, arduino, cutting blade, motors, circuit board, etc.

3.1 Conceptual design:

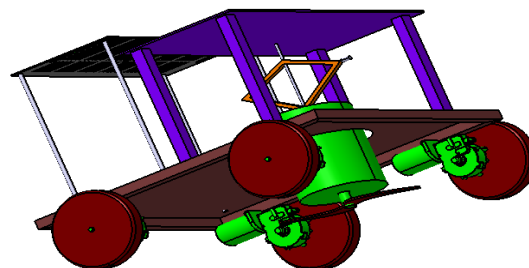


Fig.3: Conceptual design

3.2 Actual model:

Electrical energy of the battery is converted to mechanical energy through a set of blades designed to achieve cutting operation. The electric circuit ensures power transfer from the battery to run the D.C. motor, whilst the solar panel power to continuously recharge the battery while in operation. The cutting blades tap power from the D.C. motor. When the power switch is on, the electrical energy from the battery powers the motor which in turn actuates the blades. The solar panel generates current to recharge the battery, thereby compensating for the battery discharge. The rotating blades continuously cut the grass as the mower is propelled forward and the cut grass. Height of cut is adjusted by means of the link mechanism via the lift rod.



Fig.4: Actual model

IV RESULTS AND DISCUSSION

It consumes non renewable energy like solar energy available at free. It means that greenhouse effect, air pollution, environmental hazardous gas powered lawn mower and reduces human effort. Smooth and easy handling of the machine is possible when we control system by bluetooth module. The automated grass cutting machine uses a continuous track wheel which helps to operate by bluetooth the machine in different terrains. There is no killed worker is required to operate machine. The machine can be controlled by simple programming and at less time. It is high accurate compared to other projects because it detects the obstacle and stop or changes the direction it will perform as per the instructions given. Therefore equipment should be protected from damage and also reduces risk. By adjusting mechanism we have achieved the different length of grass.

V Conclusion

The automated grass cutting machine is a lot of more efficient and effective as compared to traditional one. The process in science and technology is a non-stop process. New things and new technology are being invented. Our project entitled “Automatic grass cutting machine by solar energy” is successfully completed and the results obtained are satisfactory. This project 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 also this can be operated by solar energy. The grass cutting in hilly areas and many other terrains are difficult with the existing machines, but the automated grass cutting machine rectifies those difficulties. This system has the facility of changing batteries while the solar powered grass cutter is in motion.

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