

Development Of Solar Grass Cutter for Agriculture Applications

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Abstract: Now a days manually operated grass cutting machines are used for Agriculture purpose and these machines are by fossil fuels. Which leads to atmospheric pollution. Hence it is necessary to develop sustainable grass cutting machines for Agriculture purpose. In this study, the machine is developed by using dc motors. Arduino microcontroller, solar panel, and batteries. The solar energy is trapped by using solar panel. The solar converts solar energy to electrical energy which is used to charge the battery. The motor receive power from battery to operate the machine and it can used for many cutting applications.

This study provides the route map towards the development of eco-friendly grass cutter machine and it also reduce the effort of skilled labour.

KEYWORDS: Arduino nano microcontroller, Solar panel, Motor drive, Dc motor, Ultrasonic Sensor, Batteries, Robotic body, Arduino IDE.

I. INTRODUCTION

The automation is useful at various stages of human life. The manual grass cutting is possible using human being but it usually consumes time and energy of human being. Also the manual grass cutting is inefficient and many time results in non-uniform structure of grass. Hence to avoid all these issues it is better to use automated grass cutting robot machine which can be operated through automatically based on ultrasonic sensor. This research implements the android operated grass cutting robot. This robot motion includes following motions forward, backward, left turn, right turn and grass cutter on/off. All these motions are controlled by ultrasonic sensor. This robot is operated by using 12V battery. To charge this battery solar panel is connected above the battery. The Literature survey on the development of solar grass cutter is presented below.

Implemented a design in which the blades of cutter are placed at the middle of four wheels of robot. This will create disturbance during the grass cutting process. If the size of grass is larger, this will stop the wheel and hence this system cannot be used in a efficient manner [1]. Bincy Abraham et al.

Proposed a similar system of grass cutting robot. But this system cannot control by android smart phone. It has ultrasonic sensor which can detects the obstacle. This system automatically changes its path if the sensor senses any obstacle. Also, this system does not contain four wheels. Hence sometimes it creates a problem of balancing in real time working scenario[2]. Rishabh Gupta et al.

Sivarao, T.J.S. Anand, Hambali, Minhat, Faizul Their article gave a review of studies on autonomous tractors. An autonomous tractor may work without or with little human control since it is self-propelled and steered along a predetermined path. Such a solution can assist the agriculture industry since it cuts labour expenses and time while also increasing production efficiency by eliminating human mistakes. For a number of causes, many research and innovations have been done, with outcomes ranging from promising to impractical for commercial

implementation. Sensors, global navigation satellite systems, machine vision, laser triangulation, and transmitters are among the devices used. As a result, we stayed away from solar-powered lawnmowers [3]. The biggest advantage of using hydrogen instead of lawnmower run by gasoline is environmental.

Pratik Patil, Ashwani Bhosale, Prof. Sheetal Jagtap The authors described about an automated lawn mower that will let customers trim their grass with minimum effort. It will recognize and avoid objects and people while mowing using a range of sensors. The major purpose of this autonomous lawn mower is for the user to utilize the keypad to specify the area to be mowed as well as the desired grass height [4]. An ATmega328P microprocessor, multiple sensors, an LCD display, and a keypad are all included in this design.

Vicky Jain shows a preparation of wireless grasscutter that involves transmitter and receiver that reduces manpower [5].

Ashish Kumar Chaudhari manufactured a grass cutting machine that uses blades. The grass cutter can be manually operated and simultaneously works automatically with use of equipment embedded in the system [6].

G. Rahul shows the use of solar energy used to power the electric motors and to turn the blades [7].

Lanka Priyanka describes about automatic grass cutter that helps the users to cut grass in their garden with minimum or no effort. There are different sensors that are used in this system that helps in the detection of any obstacle on the way of the machine during the process of cutting the grass [8].

Bhagyashri R Patil has proposed a design of solar powered grass cutting machine includes DC motors, Blade, and solar panel. Solar and battery can be used as power source [9].

Mrs. Melba noted that solar panel was placed above grass cutter which takes energy from the sun, use it as power for working of the grass cutter [10].

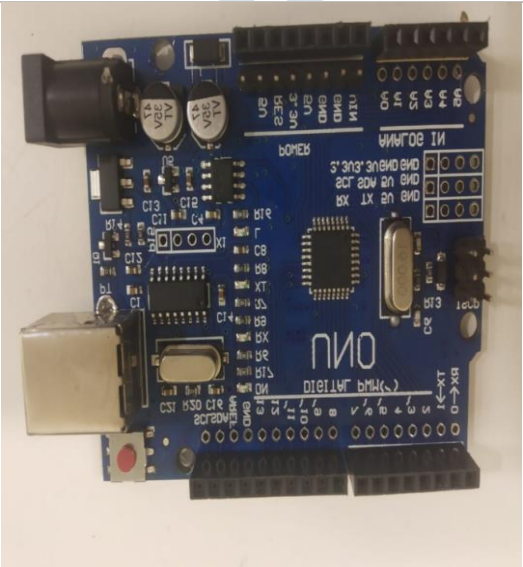
P. Bulski et al. determine that the machine's sound causes noise pollution. He investigates the sound produced by the equipment, with the goal of removing the sound while also reducing the grass mostly on field or even the floor [11]. Because using a motor pollutes the environment, my suggestion is to use an electric lawn mower.



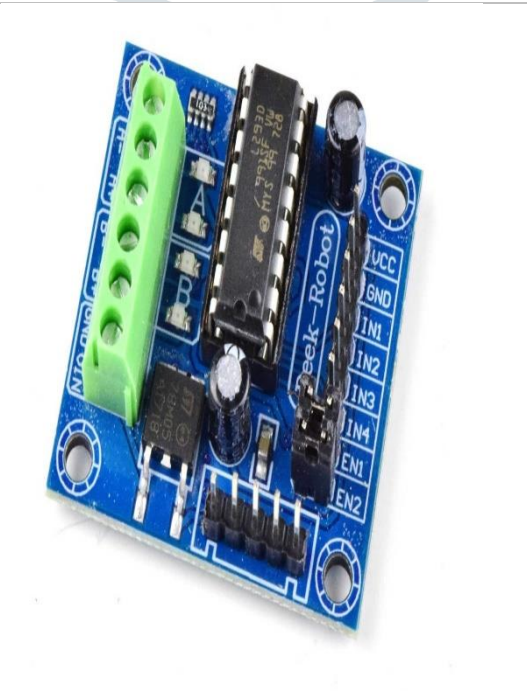
Praful P. Ulhe et al. have used a hand grass cutter with spiral roller blades to boost slicing efficiency. The mower has a height-adjustable loop trimming element [12]. The lawn cutter could cut all varieties of grasses equally.



From the literature survey it is identified that fabrication and testing of grasscutter using solar and ultrasonic sensors is very limited. Hence the present work an attempt is made on the Development of Automated Solar grass cutter for agriculture applications.

II. MATERIALS & METHODOLOGY:

1. Construction of Cutter machine:

S. No	Components	Images	Description
1.	Arduino nano Microcontroller		The Arduino microcontroller is an open-source electronics platform based on easy-to-use hardware and software, with various models offering different specifications for input/output, memory, and processing capabilities.

<p>2. Solar Panel</p>			<p>A solar panel is a photovoltaic device that converts sunlight into electricity, typically composed of silicon cells, with specifications including wattage, efficiency, dimensions, and voltage output.</p>
<p>3. DC Motor</p>			<p>A DC motor is an electro-mechanical device that converts electrical energy into mechanical motion, characterized by specifications such as voltage, current, power rating, speed, torque, and physical dimensions.</p>
<p>4. Motor Drive</p>			<p>A motor drive is an electronic device that controls the speed, torque, and direction of an electric motor, typically specified by voltage rating, current capacity, control interface, and protection features.</p>

5.	Ultrasonic Sensors		<p>A motor drive is an electronic device that controls the speed, torque, and direction of an electric motor, typically specified by voltage rating, current capacity, control interface, protection features.</p>
6	Blades		<p>The function of grass cutter blades is to efficiently cut grass and other vegetation. These blades are designed to have sharp edges that rotate at high speeds, slicing through the grass as the cutter moves forward. Different types of blades are available depending on the specific cutting needs, such as mulching blades for finely chopping grass or heavy-duty blades for tougher vegetation. It's essential to ensure the blades are properly maintained and sharpened to maintain their cutting effectiveness.</p>

❖ Working Principle:

The working principle of an automated solar grass cutter is pretty fascinating. These machines are designed to efficiently trim and maintain grassy areas without the need for manual labour.

The basic idea behind an automated solar grass cutter is to utilize solar energy to power the machine. It usually consists of a solar panel that captures sunlight and converts it into electrical energy. This energy is then stored in a battery, which powers the grass cutter.

Now, let's dive into the detailed working principle of an automated solar grass cutter. When you turn on the machine, the solar panel starts absorbing sunlight. The solar energy is then converted into electrical energy through a process called photovoltaic conversion. This electrical energy is stored in the battery for later use.

The grass cutter is equipped with a motor that drives the cutting blades. When you activate the grass cutter, the electrical energy from the battery is sent to the motor, which in turn starts rotating the cutting blades. The blades move in a circular motion, cutting the grass evenly and efficiently.

To ensure precise cutting, the grass cutter is equipped with sensors and control systems. These sensors detect the presence of grass and obstacles in the cutting path. The control system analyses the sensor data and adjusts the cutting height and direction accordingly. This helps in avoiding any damage to the grass cutter or the surrounding objects.

The automated solar grass cutter is also designed to be environmentally friendly. It operates silently, without emitting any harmful gases or pollutants. Plus, since it runs on solar power, it reduces the dependency on fossil fuels and helps in reducing carbon emissions.

In terms of maintenance, an automated solar grass cutter requires regular cleaning and inspection. The solar panel needs to be kept clean to ensure maximum sunlight absorption. The cutting blades should be sharpened or replaced when necessary to maintain optimal cutting performance.

Overall, an automated solar grass cutter offers a convenient and eco-friendly solution for maintaining grassy areas. It harnesses the power of the sun to efficiently trim the grass, eliminating the need for manual labour and reducing environmental impact. It's a great example of how technology can be used to make our lives easier while being mindful of the planet.

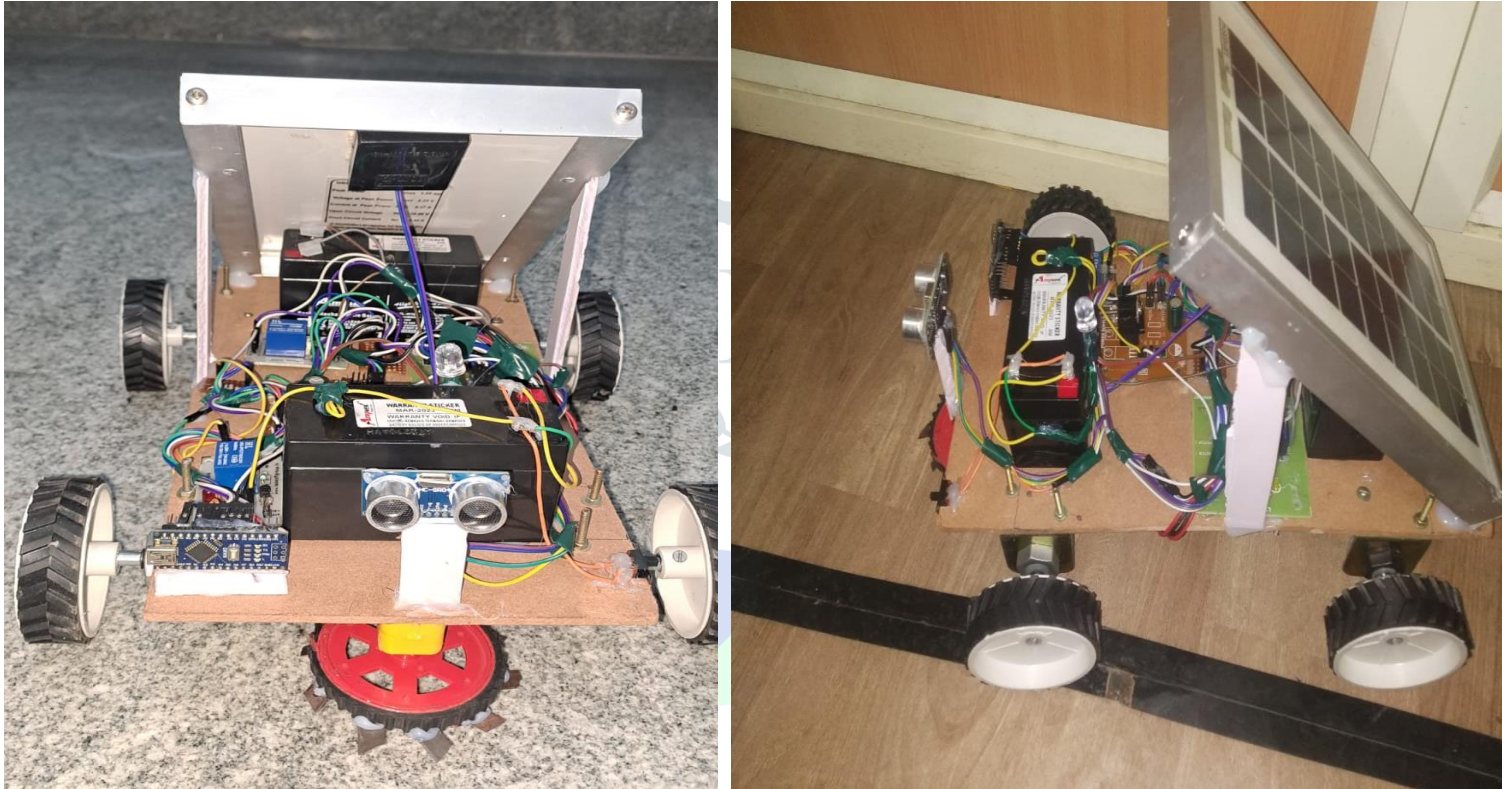


Fig1: Automated Solar Grass cutter

2. Benefits Of Present System:

Using an automated solar grass cutter comes with several benefits. Let me tell you about a few of them:

- ❖ **Time and Effort Saving:** With an automated solar grass cutter, you can say goodbye to the manual labour of cutting grass. It does the work for you, saving you time and effort. You can focus on other important tasks while the grass cutter takes care of the trimming.
- ❖ **Reduces Physical Effort:** The machine does most of the work, so there's less pushing, pulling, and bending for the person using it. It's easier on the body.
- ❖ **Cost-effective:** Since an automated solar grass cutter runs on solar energy, it eliminates the need for fuel or electricity. This can result in significant cost savings in the long run. You don't have to worry about rising fuel prices or electricity bills.
- ❖ **Environmentally Friendly:** As the name suggests, an automated solar grass cutter operates using solar power. It doesn't emit any harmful gases or pollutants, making it an environmentally friendly choice. By using renewable energy, you contribute to reducing carbon emissions and protecting the environment.
- ❖ **Precision Cutting:** These grass cutters are equipped with sensors and control systems that ensure precise cutting. They can detect grass height and obstacles, adjusting the cutting height and direction accordingly. This results in even and well-maintained grassy areas.
- ❖ **Can Reach Difficult Areas:** It can get into tight spots and around obstacles where larger machines or manual tools can't, ensuring a complete and tidy cut.
- ❖ **Low Maintenance:** Maintaining an automated solar grass cutter is relatively easy. Regular cleaning and inspection, along with blade maintenance, are usually the main tasks. Compared to traditional grass cutters, the maintenance requirements are minimal.

So, there you have it! These are some of the benefits of using an automated solar grass cutter. It saves you time and effort, reduces costs, and contributes to a greener environment. It's a smart and convenient way to keep your grassy areas well-maintained.

III. CONCLUSION

With the man power will required less and the cost of the robot will also decrease. The unskilled person can also easily use this robot for grass cutting purpose. And we can also check the reading of Ultrasonic sensor. In the future, AV mechanization and image processing might be added to fully automate the system. In future we can cut the grass in different size by adjusting the blades.

IV. ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

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