

# Solar Based Smart Grass Cutter

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**Abstract:** The purpose of this proposed project is to design a programmable grass cutter with solar power which no longer requires time-consuming manual grass cutting, and that can be operated wirelessly using an Android Smartphone through Bluetooth from a safe distance which is capable of cutting grass within a range of 100m. The main focus was to design a prototype that can work with little or no physical user interaction. Also, with the assistance of sensors positioned at the front of the vehicle, an automatic barrier detection system is introduced to enhance safety measurements to prevent any risks. This model helps in reducing environmental and noise pollution.

**Keywords:** Grass cutter, solar power, android, Bluetooth, sensors.

## I. INTRODUCTION

An automatic machine is a machine that can communicate with its physical environment and which can be controlled or programmed electronically to perform specialized tasks. All such machines have features of a mechanical and adjustable structure under some form of control, and they mainly have three separated phases: understanding, processing, and action. Commonly, the understandings are done by the sensors mounted on them, the on-board micro-controller or processor do the processing, and lastly, the operation is performed using motors, engines or with some other actuators. Grass is a beautiful gift from nature, which helps us to survive in various conditions, and so, the need to lessen their growth is essential to enhance the beauty and attractiveness of our environment.

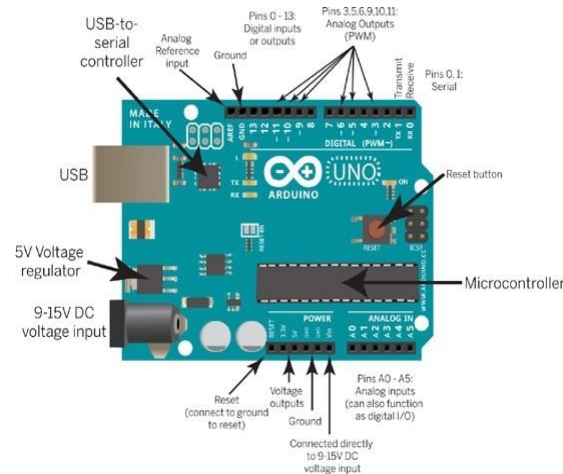
Riding and Motor-powered push grass cutters have a loud engine, which creates noise pollution and air pollution because of combustion in the engine. Traditional grass cutters are heavy machinery that requires a lot of strength and energy to operate. Therefore, human effort is another factor that needs to be reduced. A solar panel contains cells and are designed to produce electricity by capturing sunlight and does not make any pollution like fossil fuels and nuclear energy. Solar grass cutting robots are convenient to mow grass and cost-effective because of cordless electric mowers and cutter powered of solar cells that last a long time and have low running costs.

The conventional grass cutter has been limited to a particular remote through the desired actions can only be performed. In this scenario, the device will lose control if the user lost or broke the remote, leading to hazards, and the user will also waste money. To overcome this remote-control concept, controlling the grass cutter by using a Bluetooth Android mobile application along with Arduino is proposed. Using the Ultrasonic sensor, the method of identifying the barrier in front of the robot is also proposed in which the cutter stops its motion once it finds an obstacle.

Apart from the traditional grass cutting robot system, the term "Internet of Things" (IoT) is also essential for connecting robot with the internet to allow users to control grass cutter from anywhere and anytime. These wireless systems are contributing essential help to self-regulate the grass cutting device by utilizing Wi-Fi and cloud computing mechanism etc. As far as we know, no such system is developed that have all in one capability (Android mobile application with touch and voice recognition system, solar powered, monitoring the obstacles, cutting grass in special patterns). So, a need still exists for the design of solar powered automatic pattern design grass cutting robot system that supports various tasks (e.g., android mobile application control and voice recognition concepts, obstacle detection and patterns cutting) and very easy to use and can be easily assembled in a simple hardware circuit.

So here, we introduce the design and experimentally demonstrate that a grass cutting system can be controlled by just a click on the cell phone with an Android operating system, and voice recognition via Bluetooth technology which reduces human effort so that elderly users and disabled persons can fulfil their tasks by themselves, and there is no need for gas, oil, and engine to use this device because it is solar powered. This prototype is user-friendly, cost-effective, secure and eco-friendly; with its control capability, the grass cutter will stay within the boundaries of the lawn because the user can have control over the lawn mower with the controller and the working range is also increased due to the absence of main supply wires.

The innovative component of the proposed work in this system is an Arduino that is a user friendly microcontroller that can be readily available.



## II. LITERATURE SURVEY

Srishti Jain, et al [1] this paper describes a solar powered robotic lawn mower that is autonomous and allows the user to cut grass with minimum effort. The sensors used in the robotic mower helps it to stay on the lawn and to detect and avoid any obstacles in its way. A 12v 310mA solar panel is used to provide the required power to the components and also to the battery. A 12v 1.2Ah rechargeable lead acid battery is also used as a backup, and won't be over charged due to the small output of solar panel. The battery charges in 5 hours when under direct sunlight and the power is delivered to the components via voltage regulators. To detect the obstacles, they have used IR sensors which has 1m 555 IC. There are two sensors, one on each side. This is because in case the obstacle is on the left then it will move in right direction and if the right sensor detects the obstacle then it goes towards the left. However the main disadvantage is that sometimes response of the system is too slow so in real time high end DSP processors is recommended that can process much faster. Ashish Kumar, et al [2] in this paper describes an experimental study of solar powered Grass Cutter Robot. The author explains about the energy generated due to the Solar panel and how the system uses this energy to function. A battery is also used and to prevent it from over charging or discharging, a voltage regulator or a charge controller is placed into the system in series. It also specifies some extensions like using the driver circuit for controlling the speed of the motor as required and the use of LCD screens for status and energy monitoring, provisions of power banks to charge the system instantly when there is a scarcity in solar energy.

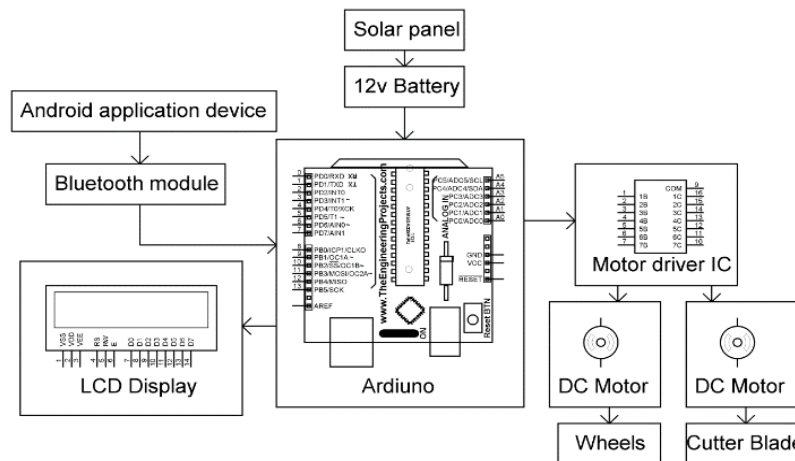
Mallikarjun Mudda, et al [3] in this paper it described about the automated solar grass cutter. In this it is explained about the grass cutting robotic vehicle powered by solar energy that also avoids the obstacles and that cuts the grass without any human interaction. Here they have used two 12v batteries one is for entire circuit and another is for cutting blade. The 10w solar panel is used to charge the batteries, solar panel gives the maximum of 18v and 580mA current. The charging circuit has been used in between the solar panel and batteries and this charging circuit consist of the voltage regulator. The microcontroller 8051 is used take input from ultrasonic sensors which is used for the obstacle detection. In this work the motors used was of 9v but the microcontroller provides 5v so they have used the motor drivers which intakes 5v and provides 12v by this way the motors are made to run. This model can also can be used in the night time because the use of rechargeable batteries. The main drawback of this model was it was more basic and until the obstacle is recognised the bot will not take the direction.

Debangsu Kashyap, et al [4] is this research it is explained about the fully automated solar grass cutter for campus cleaning. The solar panel is placed at the angle of 45° south to get the maximum intensity of solar radiation. The charge controller is used to connect the battery and the panel to protects the battery from overcharging. The microcontroller is connected with the ultrasonic sensor and the temperature sensor. The new thing in this research is 'temperature sensor', which is used to detect the temperature of the motor if the motor crossed the threshold temperature range, microcontroller controls the speed limit.

## III. METHODOLOGY

The solar grass cutter consists of solar panel, charge controller, battery, DC motor, grass cutter blade. The whole system is placed on top of four wheels and plywood board. The front two wheels are revolving wheel so that the cutter can move according to the needed direction. The solar panel is placed at an angle of 45° due south to get the maximum intensity of solar radiation. The charge controller connects the battery and the panel and protects the battery from overcharging. The DC motor is connected with the battery. The blades are attached with the motor with bolt connection. Arduino UNO board is used for automation purpose. The Arduino is connected with Ultrasonic sensor, temperature sensor and Bluetooth

module. The ultrasonic sensor is used for obstacle detection. Due to continuous using when the temperature of the motor gets increased then the LM35 temperature sensor senses the temperature. When the threshold temperature range is crossed, the microcontroller controls the speed of motor. The Bluetooth module is used to control the motor from the mobile using apps like MIT Inventor further it can also be controlled with the help of Google Assistant by connecting ESP module to the Arduino.



#### IV. CONCLUSION

The solar grass cutter is mainly designed for the campus cleaning in a sustainable and efficient way. Grass cutting or mowing is one of the main operation that is carried out in the campus for cleanliness. It is a time consuming, fuel consuming and labour intensive process. The conventional grass cutter that are used in the campus is costly. Therefore, the capital investment and operating cost both is very high. As the cutter burns diesel it creates air pollution to the campus. The noise pollution is also very disturbing for all the residents present in the campus. To rectify all the problems mentioned above the automated grass cutter that we discussed in the paper may be a good solution. The cutter can be used in both day and night time if properly charged. In rainy season due to less sunshine hours, it will take much time for full charging which is a drawback for the users. The cost of the machine is also very low as compared to the presently used cutters. The fuel i.e. solar energy is free of cost. Therefore, the operation cost is almost negligible in this case. The self-life for the solar panel is almost twenty years. Therefore, the machine will remain intact for many years. Our design implies a pollution free environment to the campus. In the conclusion, we can say that the designed model can be an economic alternative for the users inside as well as for the other users outside the campus.

#### V. ADVANTAGES

- It uses solar energy, a clean form of energy and hence does not create any air pollution.
- It has compact size and light in weight, so it can be easily moved from place to place.
- It produces less noise pollution than the conventional grass cutter which uses gasoline/diesel as its fuel.
- Wear and Tear is negligible.
- Operation of the solar powered grass cutter is user friendly so non skilled person can easily operate it.
- There is no fuel cost as it uses only solar energy.
- Operation cost is decreased and hence it is economical.

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