

# Design and Development of Automatic Lawn Mower

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**Abstract :** The present technology used for trimming the grass is by using manual method. For that reason we have developed an automatic machine for trimming the grass. The components of the lawn mower are interlinked. Solar panel is connected to the battery. Battery is in turn connected to a DC motor, this will rotate the blade in high speed as per the gear ratio and cut the grass. This device involves both Bluetooth connection and manual switch. In case of any obstacles detected the sensor will sense it and takes the right turn to avoid damage to machine. The microcontroller will control all the functions of the Lawn mower. The aim of this project is to make the grass cutter which operates on solar energy hence save the electricity and reduces manpower. This device will help in building of eco-friendly system. Grass cutter operates automatically hence it does not require skill person to operate.

**KEYWORDS:** Grass cutter, solar panel, DC motor, renesas microcontroller, Bluetooth.

## I. INTRODUCTION

A lawn mower is an important equipment to maintain the beauty of the lawn. The mower is mechanized with revolving blades to cut a lawn at an even length to make it good-looking. There are two basic types of the lawn mower. The one that comes with a blade that rotates along a vertical axis is called a rotary mower and the one that employs a blade assembly that rotates around the horizontal axis is known as a cylinder or reel mower. Lawn mowers are built with different designs, each made for a particular purpose

Mowing the lawn with a standard motor powered lawn mower is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, or disabled people. A lawn mower is an important equipment to maintain the beauty of the lawn. The Project is about to trim the grass in the lawn without the human interaction and in this machine we use solar panel for charging the battery, renesas microcontroller is used to control all the functions such as ultrasonic sensor and dc motor, it is also used to control the speed of dc motor.

Sliding mechanism is used for adjusting the height of the blade. The machine involves Bluetooth for receiving the data from the mobile, and it is also provided with a manual switch for better working. The prototype is robotic eco-friendly, safe to use, low cost and it does not involve human interaction.

## II. LITERATURE SURVEY

### 2.1 Prof. C. J:

Shende: In this paper they have prepared manually handle device which is capable to cut the grass. This device consists of linear blades and it does not affected by climatic conditions. The main objective of this paper is to move the grass cutter in 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.

### 2.2 C. B. Mills:

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.

### 2.3 Davidge E D:

"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.

### 2.4 Edwin Beard Budding:

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.

### 2.5 Ms. Lanka Priyanka:

In this paper they have fabricated grass cutting machine with tempered blades are attached to this grass cutter. This grass cutter is manually operated as well as automatic operated. The materials commonly used GI sheet, motor, wheel, Al sheet, switch, wire, square pipe and insulating material.

### 2.6 P.Bulski: 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.

### 2.7 Praful P. Ulhe:

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 grasses.

### 2.8 Randsome:

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.

## III. COMPONENTS

### 3.1 Battery



Fig: 3.1 Battery

- Battery used is 12 V 1.3 A
- Rechargeable by Solar Panel

### 3.2 Renesas Microcontroller

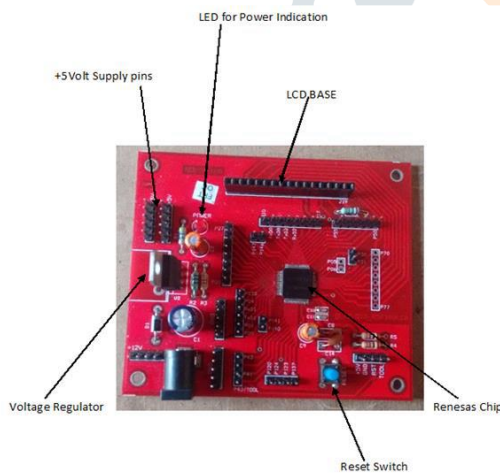


Fig: 3.2 Renesas microcontroller

- Renesas is a 16 bit microcontroller.
- 16 to 512KB of ROM and 2 to 32KB of RAM Operates with 5v power supply.
- Totally 3 UART for Serial Interface.
- Totally 0-7 channels for timer with built in PWM features.
- Most of the pins of Renesas have multi-task features.
- Cost of Renesas microcontroller is comparatively less.

### 3.3 Cutting blade



Fig: 3.3 Cutting blade

- Stainless Steel.
- 7.5 cm in length.

### 3.4 DC Motor



Fig: 3.4 DC motor

- DC motor Speed (N) = 60 rpm for Wheels.
- DC motor Speed (N) = 1000 rpm for Blade.
- Cutter Motor = 30 mm in diameter.

### 3.5 Ultrasonic sensor



Fig: 3.5 Ultrasonic sensor

- Ultrasonic sensors are devices designed for non contact sensing of solid and liquid objects.
- The sensor will detect the object in order to safe guard the mower.

### 3.6 Solar Panel

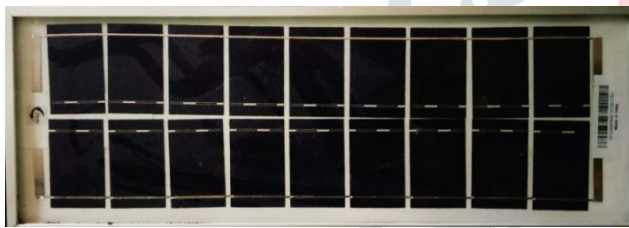


Fig: 3.6 Solar panel

- Voltage = 12 V.
- Watt = 5 W.

## IV. 3 D Model of the Lawn Mower

### 4.1 Front view

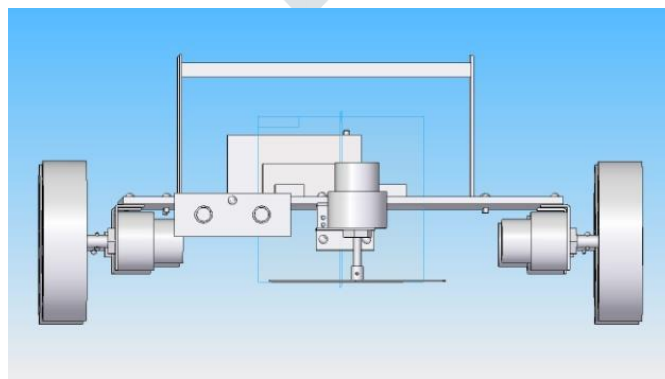


Fig: 4.1:- 3D model of lawn mower ( Front view )

4.2.1 Top view

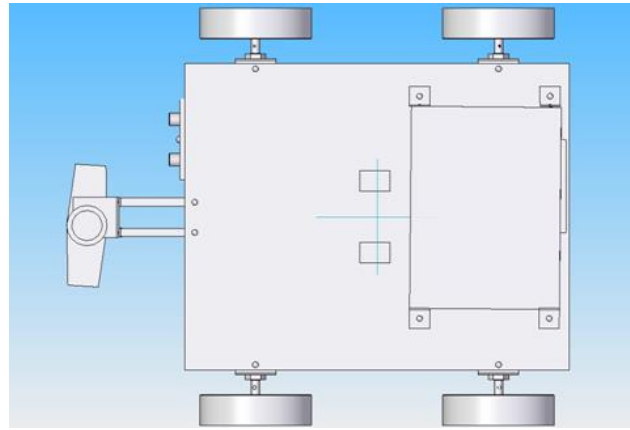


Fig: 4.1: 3D model of lawn mower ( Top view )

4.3 Side view

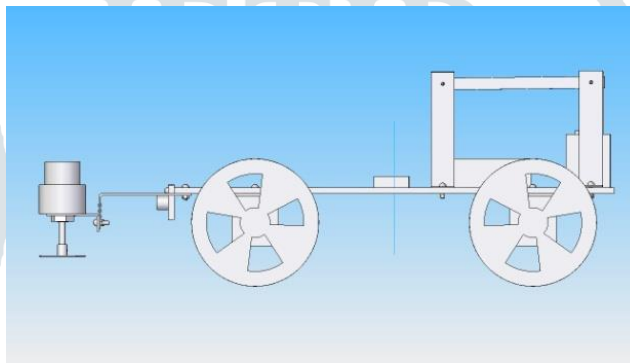


Fig: 4.1: 3D model of lawn mower ( Side view )

4.2 Isometric view

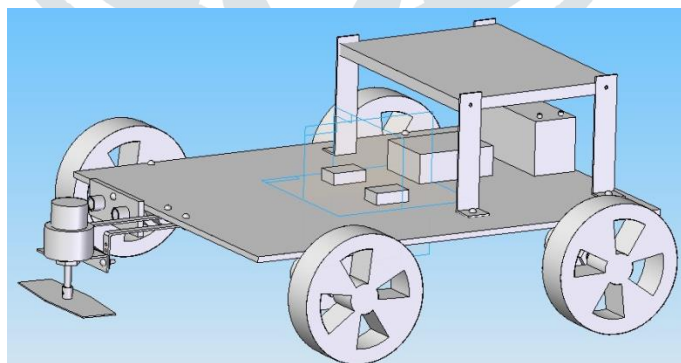


Fig: 4.1: 3D model of lawn mower ( Isometric view )

V. Designing of Lawn Mower

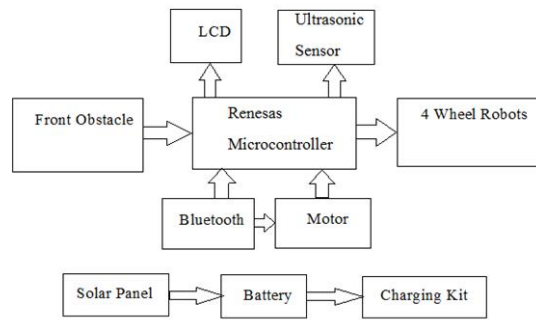


Fig: 5.1:- Model design of lawn mower

VI. Modelling of Lawn Mower

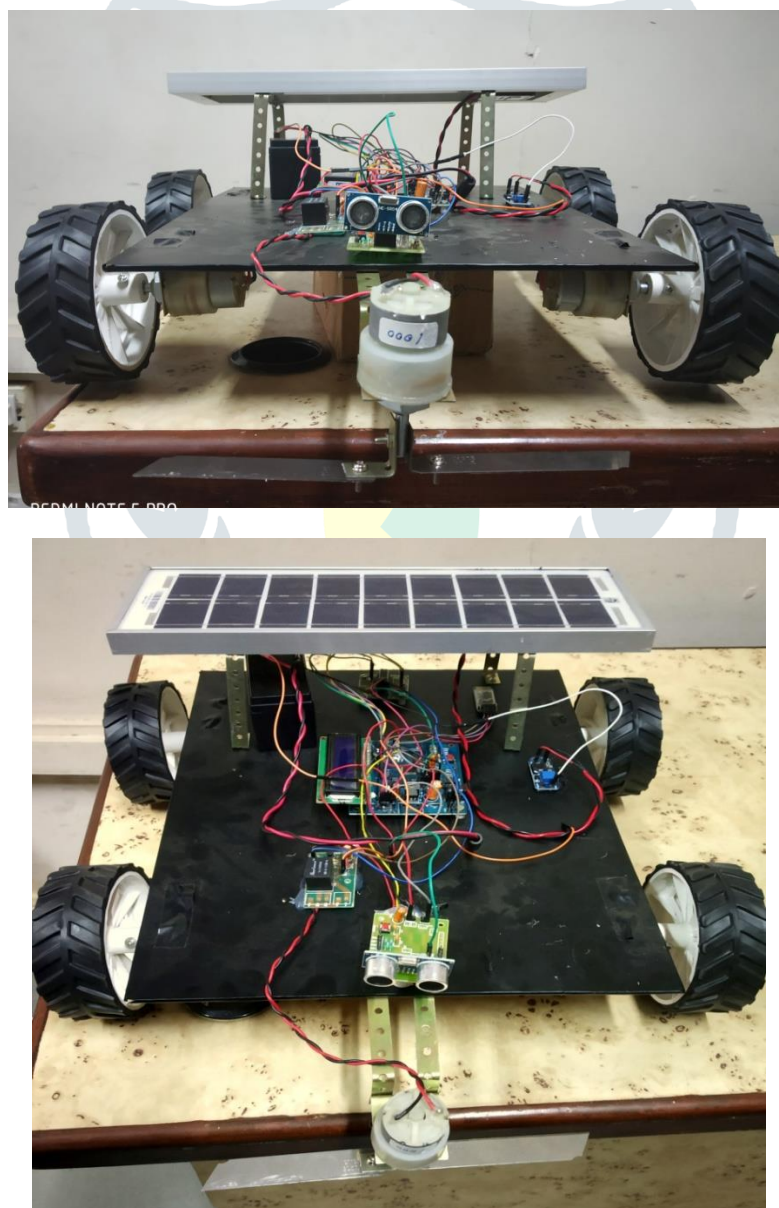


Fig: 6.1: Final model of lawn mower

## VII. Calculation

### 7.1 Design of Frame

- Frame design for safety FOR 30.3 cm\*38 cm\*4 mm

### 7.2 Dc motor

- No of Teeth in Pinion =24
- No of teeth in Gear = 60

### 7.4 Solar panel calculation

- Volt = 12 V
- Watt=5 W
- $W = V \times I$
- $5 = 12 \times I$
- $I = 5/12$
- $I=0.416$  amps

### 7.3 Design Parameter

- DC motor Speed (N) = 60 rpm for Wheels
- DC motor Speed (N) = 1000 rpm for Blade
- Cutter Motor = 30 mm in diameter

### 7.5 Wheel specification

- Plastic wheel
- Width = 40 mm
- Thickness = 5 mm
- Diameter = 110 mm

## VIII. Methodology:

It has solar panel mounted on top of model in a particular arrangement with 12 V & 5 W, hence it can receive high intensity solar radiation easily. Solar panel converts solar energy into electrical energy. This electrical energy is stored in the battery. The motor is connected to the battery through connecting wires. The cutting blades tap the power from dc motor and which in turn actuates the blades and hence rotating blades cut the grass. Automated lawn mower, are mower automatically along the edge of a swath which has been cut within or around an area of uncut grass. That includes a sensor assembly mounted on the front of the mower to detect the edge of the swath by sensing the difference in height between uncut grass and the cut grass in the swath. In front of the lawn mower, also got a one touch sensor, that means it will be automatic avoid collision with obstacles along its pathway. The lawn mower cutting tool or blade can be adjustable about 1cm~3cm, this function is let the user choose which height of the grass. This mower using the solar panel to generate the power, and rechargeable lithium battery, let the mower moving more time.

It is a fully automated machine powered by energy that also avoids obstacles without the need of human interaction. The system uses 12 V & 1.3 A battery to power the vehicle movement motors as well as grass cutting motor.

The grass cutter and the vehicle motors' are interfaced to an Renesas Microcontroller and it is an advanced microcontroller that controls the working of all the motors. It is also interfaced to ultrasonic sensors for object detection. The microcontroller moves the vehicle motor in forward direction in case no obstacle is detected. On obstacle detection the ultrasonic sensor monitors it and the microcontroller thus turns to right and operation performs and certain point the grass cutter motor stops to certain cycles to avoid any damage to the object/human/animals.

Microcontroller thus turns the robotic as long as it gets clear of the object and then moves the grass cutter in forward direction again and so on.

## IX. RESULTS AND DISCUSSION

The Design and Development of Automatic Lawn Mower fabrication and test has been successfully completed.

We check the working of the grass cutter after completion of the project. The cutting blade is adjustable with the sliding mechanism, and the blade material is made up of stainless steel. The solar panel is used to charge the battery that in turn saves the power and this power is used to operate the dc motor.

The speed of the dc motor that is connected to wheels is 60 rpm and the speed of the dc motor that is connected to cutting blade is 1000 rpm. The ultrasonic sensor is used to detect the object to avoid damage to the lawn mower. Bluetooth is used to control and operate the lawn mower with less effort and also manual switch or toggle switch is provided in it.

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