

## AUTOMATED MOWER ROBO

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**Abstract** - A normal grass cutter moving with IC engine will run based on the energy from petrol. The major drawbacks of this technology are high running cost; create noise pollution and air pollution. Also, an IC engine requires periodic maintenance such as changing the engine oil, mechanical maintenance. It is an innovative technology of cutting grass without any pollution, electric solar grass cutter are environmentally friendly. Nowadays, the labor charge is increased day by day. This technology can help the people who are living in rural areas. This project is mainly proposal for reduce the manpower and usage of electricity. The system control is done by the Schmitt trigger circuit. The grass cutter and vehicle motors are interfaced to a Schmitt trigger circuit that controls the working of all the motor.

**Key Words:** Robotic Grass Cutter, Grass Cutter Robot, Mower Robo

### 1.INTRODUCTION

A lawn mower is a machine that is used to cut grass in a lawn. The blades of the lawn mower are generally powered by pushing the mower forward. Lawn mowers are classified based on different criteria. For example, according to the axis of rotation of blades we may have reel lawn mowers (in which the axis is horizontal) and rotary lawn mowers (in which the axis is vertical).The reel (cylindrical) lawn mower is found to be better. Rotary mowers are often powered either by an internal combustion engines or an electric motor and are generally mowed manually, with the engine only spinning the cutting blades. Rotary mowers are generally have opening by the side of the housing through which cut grasses are expelled. Some are attached with a grass collector at the exit point. The blade is seldom sharp enough to give a neat cutting point. The blade simply cuts the grass resulting in brown tips. Over the years, there have been numerous developments in lawn mower technology. But with technological advancement there also arises the need to check the impact of machines on the environment as well as on man. Pollution is the major concern with the conventional gas powered lawn mower. Human effort is another factor that needs to be reduced. Solar Powered Lawn Mower it is the design of a microcontroller and sensor based robotic lawn mower mechanism. This robotic mowing device is solar powered and its battery gets charged from sunlight while mowing on the lawn or even manually. Ultrasonic sensors is used for avoiding obstacles. This design is targeted as an alternate green option against the popular

but environmentally hazardous gas powered lawn mower. The design is built on a mobile robot which communicates with a smartphone through a Bluetooth module. mower robo uses solar energy with the help of a solar panel and solar photovoltaic cells to run an electric motor. Also this mover robo can be used automatically by using arduino and ultrasonic sensor for obstacle detection.

We performed detailed analysis to estimate the torque produced in the blade and whether it is sufficient to perform the intended job. After design and development of the lawn mower, it is tested on four different species of grass. We tried to develop a height adjustable mechanism for the cutting blade.

### 2. LITERATURE REVIEW

This "solar powered vision based robotic lawn mower" is an autonomous lawn mower that will allow the user to the ability to cut their grass with minimal effort[8]. Unlike other robotic lawn mowers on the market, this design requires no perimeter wires to maintain the robot within the lawn and also with less human effort in the manual mode operation. There are International Journal of Research In Science & Engineering e-ISSN: 2394-8299 Volume: 3 Issue: 2 March-April 2017 p-ISSN: 2394-8280 IJRIS JOURNAL| www.ijrise.org|editor@ijrise.org [277-281] some preset pattern installed in the robot, in the automatic mode operation no human effort needed for the operation and helps to cut different patterns in the lawn very easily with less time. Through an array of sensors safety takes major consideration in the device, this robot will not only stay on the lawn, it will avoid and detect objects and humans. And also it detect the land boundaries and start mowing upon the predefined pattern with the help of installed camera and MATLAB program. The Solar Powered Automatic Lawn Mower "Lawn Buddy". This project is an autonomous lawn mower that will allow the user to cut their grass with minimal effort. Unlike other robotic lawn mowers in the market, this design requires no perimeter wires to maintain the robot within the lawn. Through an array of sensors, this robot will not only stay within the lawn, but it will also avoid and detect objects and humans. This design is still in the prototype stage due to financial and time constraints. The Smart Lawn Mower for Grass Trimming[4].The present technology commonly used for trimming the grass is by using the manually handled device. In this project we have automated the machine for trimming the grass. The device consists of linear blade which is operated with the help of

the motor the power supply for the motor is by using battery. The battery can be charge by using power supply and solar panel. In case of any obstacles in the path it is sensed by using an IR sensor. If there is any variation then the device using free direction sensor and find the new path to travel. The above feature is enabled so that the damage to the hardware of the device is avoided. In future the automation of the device will play a vital role in world wide.

Mowing device is solar powered and its battery gets charged from sunlight while mowing on the lawn or even manually. Ultrasonic sensors is used for avoiding obstacles. This design is targeted as an alternate green option against the popular but environmentally hazardous gas powered lawn mower. The design is built on a mobile robot which communicates with a smart phone through a Bluetooth module. mower robo uses solar energy with the help of a solar panel and solar photovoltaic cells to run an electric motor. Also this mover Robo can be used automatically by using arduino and ultrasonic sensor for obstacle detection. We performed detailed analysis to estimate the torque produced in the blade and whether it is sufficient to perform the intended job. After design and development of the lawn mower, it is tested on four different species of grass. We tried to develop a height adjustable mechanism for the cutting blade.



Fig -1: AUTOMATED MOWER ROBO

### 3.COMPONENTS USED

1. Arduino uno
2. Motor drivers (L298N)
3. Bluetooth Module
4. Battery (12 V, 1.3Ah)
5. Solar panel (12 V, 5W)
6. DC motors
7. Cutting Blade (Steel)
8. Ultrasonic Sensor module

### 3.1 ARDUINO UNO :

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

In this Automated mower robo arduino is as main microcontroller for this robo. The Bluetooth module and ultrasonic sensor is connected to this board on digital and analog pins. With proper programming on arduino board mower can be used automatically.



Fig -2: ARDUINO UNO

Why Arduino :

1. Open source and extensible hardware
2. Open source and extensible software
3. Simple, clear programming environment
4. Cross-platform
5. Inexpensive

### 3.2 ULTRASONIC MODULE SENSOR :

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

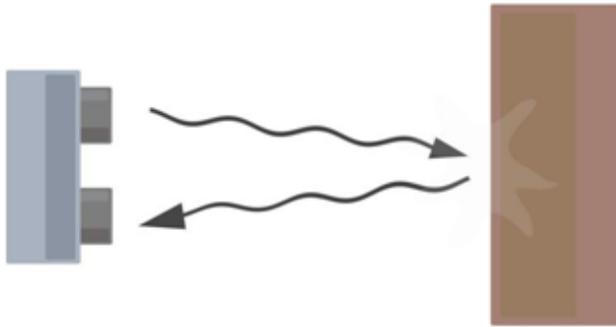


Fig -3: ULTRASONIC MODULE SENSOR

### 3.3 BLUETOOTH MODULE :

HC- 05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04- External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).



Fig -4: BLUETOOTH MODULE

### 3.4 BATTERY

Batteries are available in various volts and ampere hour range. To determine the one to use, consideration was given to the voltage and the ampere hour rating, 12V battery was selected. The ampere hour measures the length of time the battery will discharge while in use and is not charging. 1.3ampere hour battery will give a 1.3amp of current for one hour and the current required by the motor is less than that.

We used one motor of 420mAh and four motors of 220mAh in which two motors are in series with other two motors.

$$220+220+420 = 860mAh < 1300mAh$$

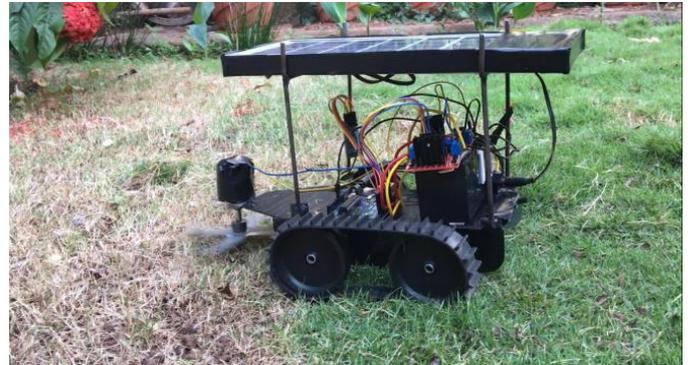


Fig -5: AUTOMATED MOWER ROBO WORKING

### 4. DESIGN ANALYSIS :

In designing the cutting blade, the force required to cut the lawn as well as the force acting on the blade was considered. The force required by any sharp object to have impact on the grass is less than 10 Newton. It is also dependent on the height, density and the area covered by the object (Atkins, 1984). Therefore, in designing the blade of the solar powered lawn mower, the force required for effective mowing should be greater than 10 Newton. A stainless steel is used in the construction of the cutting blade because of its strength and weight which can transmit same speed as that of the DC motor or a little less cause of friction.

Shearing force of most annual grasses found on most lawns is usually between 9.2N to 11.51N.

Force required by cutting blade to shear the grass is given by

$$F = T/R, \text{ where } T = \text{shaft torque}$$

$$R = \text{radius of cutting blade} = 0.075m$$

$$T = P / (2 * 3.14 * N) \text{ where } P = \text{power developed by shaft}$$

$$N = \text{Speed of motor} = 1450 \text{ rpm}$$

$$P = V * I = 12 * 420 = 5040W$$

$$T = 5040 / 6280 = 0.8025 \text{ Nm}$$

$$F = T/R = 0.8025 / 0.075 = 10.7 \text{ N}$$

Which is in given range

SOLAR PANEL CALCULATION:

$$VOLT = 12 \text{ V}$$

$$WATT = 5 \text{ W}$$

$$W = V * I$$

$$5 = 12 * I$$

I = 5/12  
I = 420ma

Time required to charge battery :Battery current/solar o/p =  
1300/420

~ 3 hrs



Fig -6: CUTTER IN ACTION

5. RESULTS AND DISCUSSION :

Table -1: Calculated Results

Sample plot	Height		
	average height of the grass before mowing (mm) Average	average height of the grass after mowing (mm) Average	Expected height of the grass after mowing (mm) Average
Elephant grass	230	80	90
Stubborn grass	234	84	90
Spare grass	111	80	80
Carpet grass	70.5	-	-

The solar powered lawnmower is designed and developed. Test is carried out using four species of grass and the result obtained is summarized as presented in Table 1. From Table 1, the average height of the grasses after mowing is lesser than the expected after the machine is adjusted to a height for the four species of grasses. Less time is spent in cutting the grasses. The efficiency of the machine is found 90%.

6. CONCLUSION :

In the world today, all machines are designed with the aim of reducing or eliminating green house gas emissions which is the major causes of climate change. This solar powered lawn mower will meet the challenge of environmental production and low cost of operation since there is no cost for fueling. A solar powered lawn mower has been developed for the use of residences and establishments that have lawns where tractor driven mowers could not be used. The machine's capacity is adequate for its purpose. The machine has proved to be a possible replacement for the gasoline powered lawn mowers.



Fig -7: AUTOMATED MOWER ROBO WORKING

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