

# IOT – BASED AUTOMATIC SOLAR GRASS CUTTER WITH SCALABLE PATTERNS

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## ABSTRACT:

Grass patterns with different sizes is recently become popular in public places like parks, gardens, manual design of such pattern is tedious job and need skilled labor. We proposed a solar based automatic grass cutter with can cut the various patterns on the grass which can be scalable. Proposed grass cutter is operated remotely with little user interaction. Grass cutter is built by Arduino based bot system which can be powered by solar panel. Bluetooth communication is used in between smart phone and grass cutter to give the specific input the type of pattern and it's dimensions are given as input to the system .The grass cutting robot system can be moved to the location in the lawn remotely where the user wants to cut the grass directly or in a desired pattern .The proposed system is implemented, and it can design two different patterns on the grass with three different scaling. Due to some design constraints scaling of pattern is limited

## Keywords:

Solar panel, charging circuit, Rechargeable Battery, Arduino UNO, HC-05 Bluetooth module, DC motors,L293D motor driver, Ultrasonic sensor, Grass cutter.

## 1. Introduction:

Grass cutter machines have become very popular today. Most of the times, grass cutter machines are used for soft grass furnishing. In a time where technology is merging with environmental awareness, consumers are looking for ways to contribute to the relief of their own carbon footprints. Pollution is man-made and can be seen in our own daily lives, more specifically in our own homes. Herein, we propose a model of Bluetooth based scalable grass cutting machine

powered through solar energy (renewable energy). This model reduces both environment and noise pollution. Our new design for an old and outdated habit will help both customer and the environment. We present an Arduino-based automatic robotic system which is used for cutting grass or lawns, mostly healthy grass which needs to cut neatly like in a public park or a private garden. The purpose of this proposed project is to design a programmable automatic pattern design grass cutting robot with solar power which no longer requires time-consuming manual grass cutting, and that can be operated wirelessly using an Android Smartphone via Bluetooth from a safe distance which is capable of cutting the grass in required shapes and patterns; the cutting blade can also be adjusted to maintain the different length of the grass.

## 2. Literature Survey:

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 labor can easily operate this device.

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. Battery powered mowers are also becoming practical. Although slightly smaller with an average cutting swath of only 17-19, these new mowers will quietly be 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.

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. I save on maintenance since there is no carburetor or fuel filter to maintain."

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.

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.

P.Bulski: Bulski identify the sound created by the machine is making noise pollution. He researches 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 makes air pollution to environment so from my recommendation it should be implement on electric operated lawn mower.

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 grasscutter. This grass cutter used to cut the grass uniformly and also it can cut the different types grasses.

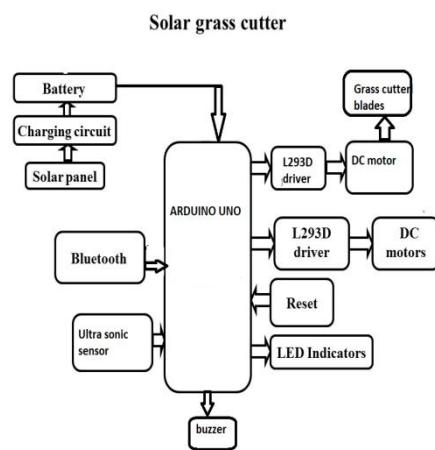
Ransome: The first was produced by Ransome in 1902. JP Engineering of Leicester, founded after World War I, produced a range of very popular chain-driven mowers. About this

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.

Thomas Green & Son: He introduced a mower called the Silens Messor (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.

Husqvarna: aSwedish manufacturer, this year is also introducing automated grass cutter to the U. S. market (it's been sold in Europe for about three years). It works much the same as the Robomow with a boundary wire implanted at the border of your lawn. The Husqvarna model, however, takes care of itself. Whereas the Robomow has to be taken out and set up and watched by the owner, the Husqvarna Automated grass cutter lives outside, mows when it's programmed to mow and automatically returns to its base for recharging.

### 3. BLOCK DIAGRAM:



**FIG: Block diagram of IOT – Based Automatic Solar Grass Cutter with Scalable Patterns**

The source is driven from the solar energy using photovoltaic panel which charges the battery and is utilized for powering operation of the system. The system's control is done by the PIC16F72 microcontroller. Wheel movement

and cutting operations are done using DC motors. To achieve compatibility of microcontroller and the motors a L298 driver circuit is used. The driver circuit enhances the microcontroller's small output.

HC-05 Bluetooth module is interfaced to the microcontroller which receives the signals from Bluetooth application. And received signal is same as given to the microcontroller. Then microcontroller will control the grass cutter according to the received pattern.

The proposed grass cutting robotic system with two different types of pattern designing on the grass cutter. The grass cutter is moving and cutting grass in triangle and rectangle pattern because the user pressed the "triangle and rectangle" pattern button on the Bluetooth application.

#### 4. Related Work:

The brief introduction of different modules used in this project is discussed below:

##### 4.1 Solar:

A solar cell or photovoltaic cell is a device that converts solar energy into electricity by the photovoltaic effect.



Fig: Solar panel

- Photons in sunlight hit the solar panel and are absorbed by semi conducting materials, such as silicon.
- Electrons (negatively charged) are knocked loose from their atoms, allowing them to flow through the material to produce electricity. Due to the special composition of solar cells, only allow the electrons to move in a single direction.

- The complementary positive charges that are also created (like bubbles) are called holes and flow in the direction opposite of the electrons in a silicon solar panel.
- An array of solar panels converts solar energy into a usable amount of direct current (DC) electricity.

#### 4.2 Charging Circuit:

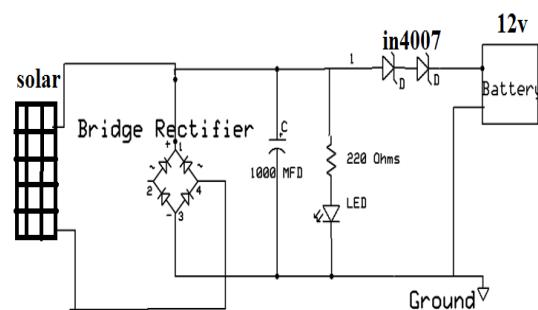


Fig: Charging circuit

Above circuit diagram take the input from 12v 15watt Solar panel and, we can see that the 12v dc is being stored into the battery with the help of rectifier and 1000MF capacitor used. We can get 12V, 2ahm Steady DC at the output terminal is fed to the rechargeable battery which can be indicated if the LED glows.

Here we are using diodes for reverse current protection. Diodes will conduct in forward bias.

##### 4.3 Rechargeable battery:

In this project we are using Lead Acid Battery 12v, 2ahm rechargeable battery which is used to store the energy from solar.



Fig: Rechargeable Battery

#### 4.4 ARDUINO UNO:



Fig: Arduino UNO

The Arduino Uno is a microcontroller board which has ATmega328 from the AVR family. There are 14 digital input/output pins, 6 Analog pins and 16MHz ceramic resonator.

USB connection, power jack and also a reset button is used. Its software is supported by a number of libraries that makes the programming easier.

#### 4.5 HC-05 BLUETOOTH MODULE:

Bluetooth transceiver we used here HC-05 is used to transmit the data from android operating smart phone. It can be operated on 3.3V to 6V DC power supply. Any serial stream from 9600 to 115200bps can be passed seamlessly from device. The range of Bluetooth is 15 meters and works on 2.4GHz ISM band.

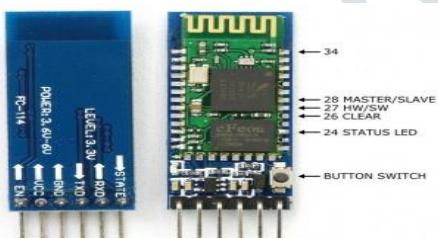


Fig: HC-05 Bluetooth

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices.

#### 4.6 DC motor:

A Direct Current (DC) motor is a rotating electrical device that converts direct current, of electrical energy, into mechanical energy. An Inductor (coil) inside the DC motor produces a

magnetic field that creates rotary motion as DC voltage is applied to its terminal. Inside the motor is an iron shaft, wrapped in a coil of wire. This shaft contains two fixed, North and South, magnets on both sides which cause both a repulsive and attractive force, in turn, producing torque.



Fig: DC Motor

In this project we are using two DC motors to moves the robot.

#### L293D motor driver:

The L293D are quad push-pull drivers capable of delivering output currents to 1A or 600mA per channel respectively. Each channel is controlled by a TTL-compatible logic input and each pair of drivers (a full bridge) is equipped with an inhibit input which turns off all four transistors. A separate supply input is provided for the logic so that it may be run off a lower voltage to reduce dissipation. Additionally, the L293D includes the output clamping diodes within the IC for complete interfacing with inductive loads. Both devices are available in 16-pin Batwing DIP packages. They are also available in Power S0IC and Hermetic DILPackage.

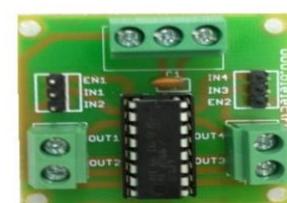


Fig: L293d motor driver

#### 4.7 Grass cutter:

This robot consists of 3<sup>rd</sup> DC motor at front side of the robotic vehicle which is attached to the grass cutter to the shaft of DC motor.



Fig: Grass Cutting Blade

## 5. 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.

## 6. Result:



Fig: Triangle pattern by solar cutter.



Fig: Circular pattern by solar cutter

## 7. Conclusion:

Our project entitled Manufacturing of solar powered grass cutter 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 no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components

and this can be operated by using solar energy. Finally, this project may give an inspiration to the people who can modify and can obtain better results. Hence i conclude that This solar powered grass cutter will meet the challenge of environmental production.

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