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[ijirset@gmail.com](mailto:ijirset@gmail.com)

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# Solar Based Automatic Lawn Mower using ATmega 328

Novita Kolhe<sup>1</sup>, Neha sawant<sup>2</sup>, Krupa wadkar<sup>3</sup>, Pratik waghe<sup>4</sup>, Assistant Prof.Nimbalkar<sup>5</sup>

U.G. Student, Department of Electrical Engineering, Mahatma Gandhi Mission's College of Engineering & Technology, Kamothe, Navi Mumabi, Maharashtra, India<sup>1,2,3,4</sup>

Assistant Professor, Department of Electrical Engineering, Mahatma Gandhi Mission's College of Engineering & Technology, Kamothe, Navi Mumabi, Maharashtra, India<sup>5</sup>

**ABSTRACT:** A Solar Powered Automatic Grass Cutting and Pesticide Spreading robot project is mainly proposal for reduce the manpower and usage of electricity. Solar plate is used to provide the source to the battery charging. It is an automated system for the purpose of grass cutting. The source is drive from the solar energy by using solar plate. The system control is done by the Arduino UNO R3. Automation is achieved by using sensors and Arduino UNO R3. Wheels and cutting operations are done using dc motors. DC battery is utilized for powering and standby mode operation of the system. The whole supply is provided through the battery and to charge the battery charger circuit is used to provide the charging for the battery.

**KEYWORDS:** motors, batteries, Solarpanel, Arduino ATmega328P, Automatic, grass cutter.

## I. INTRODUCTION

The lawn mower is an aid in the mundane task of grass cutting and tending to lawns. Due to the revolution of green movement in the present scenario the industries with major campus areas are changing the percentage of greenery in the campuses and increased greenery causes increased effort and money to tend to. In such cases the lawn mower proves to be the good sent. Due to increased availability of system on chips, the lawn mower can be automated very easily and also the reduced size and cost of Dc motors causes the system to be independent of fossil fuels to be able to tap into renewable energies. The presence of Ultrasonic sensors and light dependent resistors in a smaller and cheaper packaging cause the bot to be more aware of its surroundings. Due to the presence of arduino in the system causes and increase in the module that can be added.

## II. RELATED WORK

The paper titled "Smart Solar Grass Cutter With Lawn Coverage" by Prof. S.M.Patil. From time immemorial, the sun has been the major source of energy for life on earth. The solar energy was being used directly for purposes like drying clothes, curing agricultural produce, preserving food articles, etc. Even today, the energy we originate from fuel-wood, petroleum, paraffin, hydroelectricity and even our food originates obliquely from sun. Solar energy is almost unbounded. The total energy we obtain from the sun far exceeds our energy demands. Ever since the industrial revolutions human have been dependent on fuels, electricity and wind energy. For human enlargement in many countries there is study and trials are going on the Solar energy and the wind energy, So we make our new concept solar powered grass cutting machine in these concept we cut grass on the agricultural products or on small plants in lawns and gardens. Remote controlled grass cutter can be described as the application of Radio frequency to power a machine on which electric motor rotates which in turn rotates a blade which does the mowing of a grass. The paper titled "Automated Solar Grass Cutter: An Overview" by Vikas Bhandare. Now days we are facing the problems of environmental pollution and power cut and many other problems. To overcome these problems we are using renewable energy source like solar energy, which is implemented in our project idea i.e. "Solar Grass Cutter". Due to continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated use of abundant solar energy from the sun as a source of power to drive grass cutter. The present technology commonly used for trimming the grass is by using the manually handled device. So, the aim of our project is to develop a portable solar operated grass cutting device. In this device



solar panel is connected to the battery. Then this battery is connected to battery charger which stores the energy and hence, external supply is not needed. Further we have used BLDC (Brushless dc) motor with gear system in order to control the blade speed. Keywords: - Solar energy, Solar grass cutter, BLDC etc.

### III. METHODOLOGY

Coming to the working of solar powered grass cutter, it has panels mounted in a particular arrangement in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy as studied earlier. Now this electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panels while batteries are charging, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low. The motor is connected to the batteries through connecting wires. Between these two mechanical circuit breaker switch is provided. It starts and stops the working of the motor. From this motor, the power transmits to the mechanism and this makes the blade to slide on the fixed blade and this makes to cut the grass. The design contains a microcontroller, multiple sensors, and a solar charging system. Adding these elements together, we get our robotic lawn mower. The sensors are the eyes of our Robot. Initially, we had an idea what type of sensors we wanted to use. We used only an ultrasonic sensor to detect if the robot was heading into an object. Safety is the main concern when designing a robot with blades. We wanted our robot not to start operating if it was being held in the air by the user. Knowing that the user would be randomly holding the robot we needed a sensor to detect orientation. The power the system there are many options. With recharging batteries, there are various chemistries but we decided to go with the one that works best with solar charging. The lead-Acid was found to be the best because given a low charging current, it will not overcharge. Sizing the battery will depend on what we are powering, specifically the motors. Like batteries, there is a range of motors to choose from. We went with two 7.2V DC motors with integrated gear heads. The needed torque did not need to be a lot because we were going to have a small prototype. These motors have 100 oz-in torque which is plenty for our design.

The block diagram of automatic solar grass cutter design



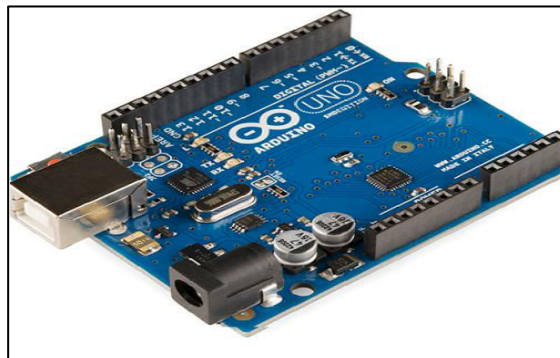
Figure 3.1.1: Block Diagram

Fig (1) circuit diagram

THE COMPONENTS USED FOR OUR PROJECT ARE AS FOLLOWS:

- Arduino Uno
- HC-05 Bluetooth module
- VNH2SP30 Motor Driver
- Planetary gear Motors
- Male to female jumper wires
- Male DC pin
- Female DC pin
- 4007 Diode
- 1k resistor
- LED
- Battery
- Sensor

## 1. ARDUINO UNO



fig(2)

The ArduinoUno ,isfig(2)an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer release

## 2. PLANETARY GEAR MOTORS



Fig(3)



The planetary geared motor **fig (3)** is always well known for its low backlash and higher efficiency characteristic to meet your higher expectation. The HD Planetary DC Geared Motor 438 RPM 29.5N-CM 12V. This is 12V DC motor which has a gearbox of 36mm diameter. The planetary type gearbox of this motor has a reduction ratio of 13.7 which produces 438 RPM with the torque value of around 29.5 N-cm.

Features:

Brushed permanent magnet DC motor

Variable speed and reversible

Planetary Gear Box.

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

A DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates a electromagnetic field aligned with the centre of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°. A simple DC motor typically has a stationary set of magnets in the stator and an armature with a series of two or more windings of wire wrapped in insulated stack slots around iron pole pieces (called stack teeth) with the ends of the wires terminating on a commutator

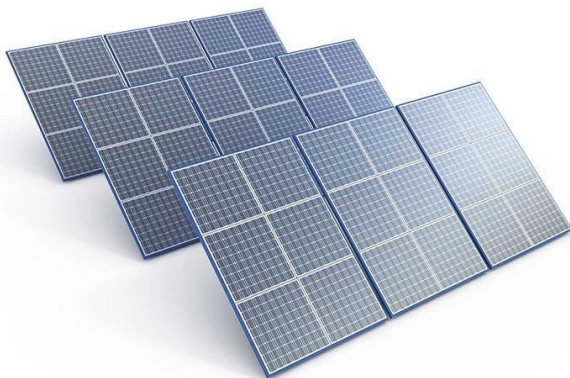
### 3. BATTERY

Fig(4)



A battery **fig(4)**, is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy.

**SOLAR PANEL** A solar panel is a device that collects photons of sunlight, which are very small packets of electromagnetic radiation energy, and converts them into electrical current that can be used to power electrical loads.



A solar panel is set of solar photovoltaic modules electrically connected and mounted on structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. A single solar module can produce only a limited amount of power; most installations contain multiple modules.

Fig(5)



**Example image of solar panel**

Features:-

5-watt monocrystalline photovoltaic solar panel-output voltage 12V-grade a solar cells-17%

Maximum/Peak-voltage: 17.3V

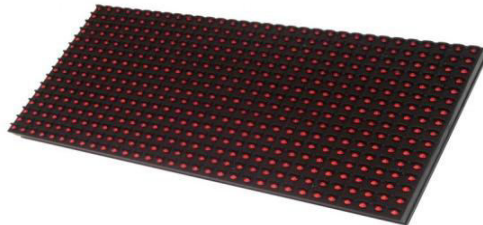
Open circuit voltage: 21.7V

Maximum/Peak current: 0.58A

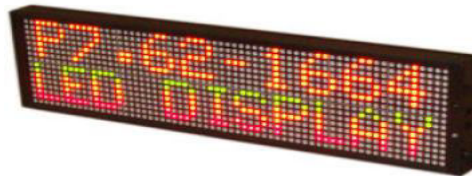
Short circuit current: 0.65A

**4. LED DISPLAY**

**Fig (6) a**



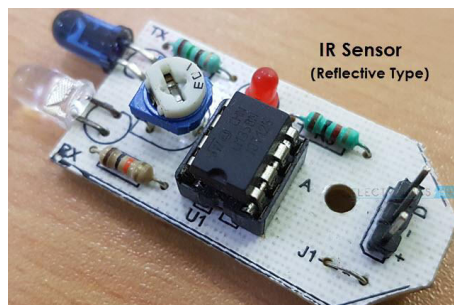
**fig (6)b**



An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16x2 LCD display is a very basic module commonly used in DIYs and circuits. The 16x2 translates a display 16 characters per line in 2 such lines. It is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are accessible to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

**5. SENSOR**

**Fig(7)a**



**fig(7)b**



**Fig(6)a circuit sensor IR**

**fig(6)b outer image of IR**

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.



#### **IV. RESULTS**

After simulating the circuit connections, following result was observed. Connections were made as per the circuit diagram and hex file of the code of arduino was attached to the arduino uno.

#### **V. CONCLUSION**

Thus, through overall project process we researched about the significance and applications of all the components that were implemented for control and operation of the circuitry. Total fabrication of the pcb layout from the components assembling to the software embedding has been done and demonstrated including designing and layout has been implemented in a successful manner.

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