

A Review of Fully Automated Grass Cutter Using Solar Power

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Abstract: From time immemorial, the solar has been the main source of strength for lifestyles on earth. The solar energy turned into being used immediately for functions like drying clothes, curing agricultural produce, keeping meals, etc. Even today, the strength we originate from fuel-wood, petroleum, paraffin, hydroelectricity and even our food originates obliquely from sun. Solar strength is almost unbounded. The total electricity we achieve from the sun some distance exceeds our electricity demands. Ever for the industrial revolutions human has been depending on fuels, power and wind power. For human expansion in many nations there is examine and trials are taking place the sun power and the wind electricity, so we make our new concept sun powered grass cutting machine in these concept we cut grass at the agricultural merchandise or on small plants in lawns and gardens. The fully automated solar grass cutter is a completely automatic grass cutting robotic automobile powered by solar electricity that still avoids barriers by using ultrasonic sensor and it is successful for automatic grass cutting without the want of any human interaction.

Keywords: Solar panel, Grass cutter, DC motor.

1. Introduction

Now-a-days, pollution is that the major issue within the universe. Just in case Gas powered grass cutter because of the emission of gases it's accountable for pollution. Conjointly the value of fuel is increasing therefore it's not economical. Historically, grass cutter is usually gawky items of machinery that involves heaps of strength and energy to use. These gift and high-tech grass cutters but, are creatively designed to form the complete landscaping method abundant easier and easier for the user. From robotic grass cutter that may implausibly cut the grass for North American country to those who square measure smartly powered by alternative energy, these convenient and easy to use. There is no oil, and no pollution. Simply clean air, less noise, and inexperienced grass. The other objective is that the automated field cutter must differentiate between grass and concrete whereas observance its surroundings endlessly. We tend to needed associate degree inaudible device to sense if the field cutter was heading into associate degree object. Safety is

that the main concern whereas coming up with the field cutter. Because it has blades we tend to needed our field cutter to not be in operational mode if it absolutely was being control within the air by the user. The field cutter we would have liked a device to notice orientation. The measuring instrument was therefore utilized in field cutter so it will not operate once user hold it. Associate degree automatic field cutter can relieve the consumer from mowing their own lawns by avoiding each environmental and sound pollution. The project used Arduino Uno microcontroller, electrical motors, batteries, driver motor, and Bluetooth module. The project has 3 classes particularly electrical, software and mechanical. Electrical sections contain electrical elements, batteries and motor. 12-volt three Ampere batteries square measure connected serial circuit. The motive force motor controls the speed and direction of the grass cutter. The code sections deals with development of the robot Application for wireless transmission and building program for the Arduino Uno microcontroller. They used Application for developing associate degree application to manage the grass cutter. The project is often controlled by victimization Bluetooth affiliation. Arduino IDE is employed to transfer the code to the Arduino Uno microcontroller. Mechanical section deals with constructing the case and installing the wheels, blade and caster wheels of the grass cutter.

2. Motivation and Objective

A. Motivation

The lawn mower industry has not seen any disruption in product development in the recent past. The advent of electric motors and small sized So as motivated us to implement these developments into lawn mower designs and also previous human effort and time is being lost doing a job which is naturally redundant. The usage of highly explosive materials in the regular household could cause house few and other humanly losses. The onerous to manage nature of the engine was improved upon by the oversimplified performance characteristic of the electrical motor we have a tendency to

wished to save lots of this human effort that might be place to raised use.

B. Objective

- To reduce consumption of fossil fuels by using solar power.
- The devices will be controlled by android application.
- It helps to reduce human efforts for cutting grass.
- Its helps to reduce pollution.
- This project gives accuracy for grass cutting.
- This project has very less cost.

3. Block Diagram and Working

A. Component used

- Arduino Uno
- Ultrasonic Sensor
- Bluetooth Module
- Motor Driver
- DC Motor
- 12v Battery Supply
- Solar Panel

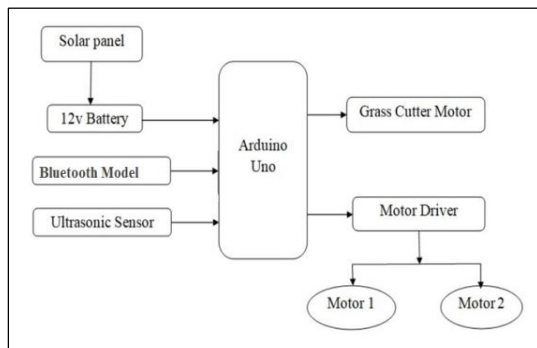


Fig. 1. Block diagram

1) Arduino Uno

The Arduino Uno is a microcontroller board based totally on the ATmega328. It has 14 digital input/output pins (of which 6 pin can be used as PWM outputs), 6 analog inputs, 16 MHz crystal oscillator, a USB connection, an energy jack, an ICSP header, and a reset button. It contains the whole lot needed to aid the microcontroller; simply connect it to a computer with a USB cable or electricity it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding forums in that it does now not use the FTDI USB-to-serial driver chip. Instead, it capabilities the Atmega8U2 programmed as a USB-to-serial converter.

The Arduino Uno can be powered through the USB connection or with an external electricity deliver. The power supply is chosen automatically. External (non-USB) electricity can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's strength jack. Leads from

a battery may be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

2) Ultrasonic sensor

- The Ultra sonic distance sensor provides precise, non-contact distance measurements from about 2cm to 3meters. It is very easy to connect to Micro Controllers, propeller chip, or arduino, requiring only one I/O pin. The sensor has a male 3-pin to supply ground, power and signal. The header may be plugged into a directly into Solder less Bread board, or in to a Standard 3- Wire Extension Cable. The sensor detects objects bye matting a short ultra-sonic burst and then" listening" for the echo. Under control of a host micro controller, the sensor emits a short 40 KHz burst. This burst travels through the air, hits an object and then bounces back to the sensor. The sensor provides an output pulse to the host that will terminate when the echo is detected hence the width of this pulse corresponds to the distance to the target.
- Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:
 - (1) Using IO trigger for at least 10us high level signal,
 - (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
 - (3) If the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time×velocity of sound (340M/S))/2.

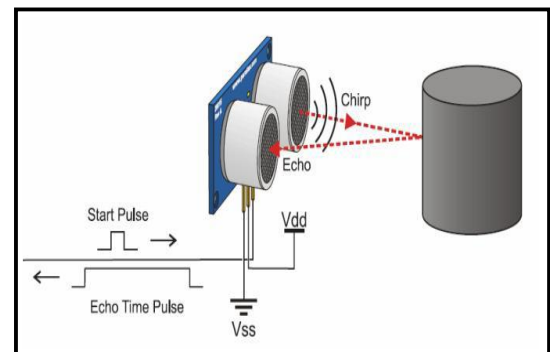


Fig. 2. Ultrasonic sensor

3) Bluetooth module

HC-05 module is a Bluetooth module, designed for transparent wireless serial (SPP-Serial Port Protocol) connection setup. HC-05 is a Bluetooth device used for wireless conversation with Bluetooth enabled gadgets like Smartphone.

It communicates with microcontrollers using serial communication (USART). The HC-05 Bluetooth module has 3.3 V level for RX/TX and microcontroller can detect 3.3 V level, so, there may be no want to shift TX voltage stage of HC-05 module. But we want to shift the transmit voltage level from microcontroller to RX of HC-05 module.

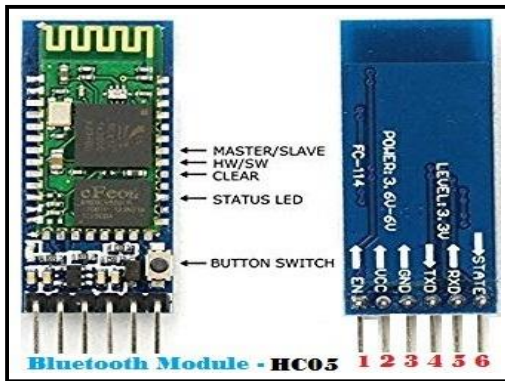


Fig. 3. Bluetooth module HC-05

4) Motor Driver

L298N Dual H Bridge Motor Driver is a motor controller breakout board which is commonly used for controlling velocity and route of motors. It also can be used to control the brightness of positive lighting initiatives such as excessive powered LED arrays. An H-bridge is a circuit which can force a current in both polarity and be controlled with the aid of pulse width modulation.

This twin bidirectional motor motive force is based totally on the very popular L298 Dual H-Bridge Motor Driver Integrated Circuit. The circuit will let you effortlessly and independently control two motors of as much as 2A every in both directions. It is ideal for robotic packages and well applicable for connection to a microcontroller requiring just more than one control lines in keeping with motor. It also can be interfaced with simple manual switches, TTL common sense gates, relays, etc. This board prepared with electricity LED indicators, on-board +5V regulator and safety diodes.

5) DC motor

The main characteristic of this motor is to convert electrical electricity to mechanical electricity. The working principle of this motor especially depends on electromagnetic law, which states that every time a magnetic subject is formed inside the vicinity of modern wearing conductor & cooperates with an outdoor field, then the rotating motion may be generated. Once the series motor is started, then it'll supply utmost pace as well as torque slowly with excessive speed.

6) 12V Battery Supply

- Lithium Ion Battery is used to deliver the electricity for the rotation of the Motors, the specs of the Battery is 12V voltage and 3A ampere hours. Batteries are a collection of 1 or greater cells whose chemical reactions create a waft of electrons in a circuit. All batteries are made up of 3 simple components: an

anode (the '-' side), a cathode (the '+' side), and some type of electrolyte (a substance that chemically reacts with the anode and cathode).

7) Solar Panel

- Solar panel refers to a panel designed to absorb the sun's rays as a supply of energy for generating electricity or heating, single solar module can produce only a limited amount of power, most installations contain more than one module. A photovoltaic system normally includes an array of photovoltaic modules, an inverter, and a battery percent for storage, interconnection wiring, and optionally a solar tracking mechanism.

B. Working

For controlling Fully Automated Grass Cutter we have an android application here we use RC-CAR Control application. Here for controlling we give two different Modes namely,

- Manual Mode
- Automatic Mode

Manual Mode: In this mode we control fully automated solar grass cutter by manual controls given in RC CAR Control application. We can handle it like mobile car game. In this mode we can give command forward move, reverse move, left move, right move and stop.

Automatic Mode: As per name it is fully automated mode. Whenever we choose this mode it works automatically by default it go forward movement and cut grass till whenever any obstacle is not detected. If any obstacle is detected by Ultrasonic Sensor Grass Cutter is stop at that moment and rotates by 90° at right side and then it goes forward and cut grass. After that this cycle become repeats and it work continually.

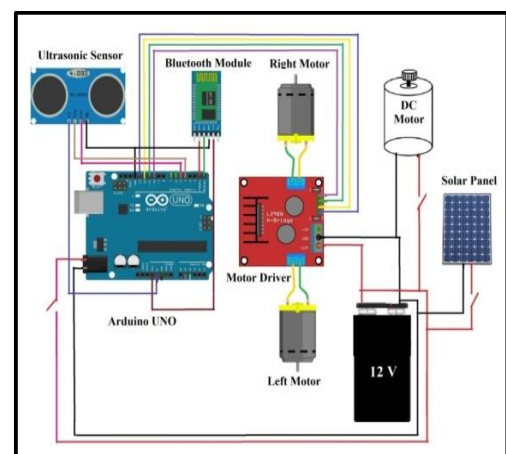


Fig. 4. Circuit diagram

1) Operating steps

- Step-1: Install RC CAR Control application in mobile handset.
- Step-2: Tern ON switches which give supply to

Arduino UNO and Motor Driver.

- Step-3: Connect bluetooth module connection through mobile bluetooth.
- Step-4: For manual mode use given arrows for movement of grass cutter.
- Step-5: For automated mode tap on Ultrasonic sensor option.

4. Future work

- Design of blades should be done based on types of grass is used to cut.
- Add camera for give a simple way to see the location of the lawn mower.
- Attach wi-fi and Xbee module for longer distance of wireless control for the Lawn Mower.
- Size can be reduced to make it compact.
- We can use this product as floor cleaner simply changing blades by floor cleaner mop.
- Design this product on the IoT (Internet of Things).

5. Result

A. Machine performance evaluation

The evaluation of the Fully Automated Solar Grass Cutter was carried out during the day time from 11am, and lasted for 5 hours on a flat, smooth lawn. The evaluation of the machine on the standard lawn was based on the following parameters: Area coverage, Lawn availability, energy consumption and machine intervention during test time. Operating parameters were set as recommended for the lawn area in order to minimize uncut areas and maximize availability. All installations on the machine were carried out in accordance to the design prior to the start of the test. It's ensured that the battery was fully charged

Table 1
Bluetooth distance test result

Attempt	Distance	Remark
1	5m/16ft	Functional
2	10m/32ft	Functional
3	20m/64ft	Functional
4	30m/96ft	Functional
5	40m/128ft	Functional
6	50m/140ft	Functional
7	58m/190ft	Functional
8	60m/192ft	Not Functional

6. Conclusion

The design of fully automated solar grass cutter was tested successfully under manual and automatic operational modes.

Table 2
Battery discharging test result

Attempts	Procedures	Charge of Battery	Area (meter)	Remarks
1	1.Turn on the Device. 2.Measure the voltage of the Battery. 3.After 1hour of using.	12.5V	30x10	Functional
2	1.Turn on the Device. 2.Measure the voltage of the Battery. 3.After 2hours of using.	10V	30x15	Functional
3	1.Turn on the Device. 2.Measure the voltage of the Battery. 3.After 3hours of using.	5V	30x15	Not Functional

Compared to manual mode, the autonomous operation of the lawn mower resulted in a more efficient way of cutting the lawn, greatly reducing the cutting time by about 57%. By our design determinately we conclude that the fully automated solar grass cutter robot with impediment avoidance plays very key role in these days because to reduce pollution due to gas and petrol engines, it reduces the jeopardy for the users.

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