

# Remotely Control Lawn Mower using Solar System

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**Abstract** - The solar lawn mower is a fully automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass cutting without the need of any human intervention. The system uses 12v batteries to power the vehicle movement motors as well as the grass cutter motor. We use a solar panel to charge the battery. The grass cutter and Vehicle motors are interfaced to an Arduino Nano that controls the working of all the motors. It is also used to interface an ultrasonic sensor for object detection. The SoC moves the bot in the forward direction in case no obstacle is detected. On obstacle detection; the ultrasonic sensor monitors it and the SoC thus stops the grass cutter motor to avoid any damage to the object/human/animal whatever it is. In order to detect the boundaries the bot uses Light dependent resistors (LDR) on a right angle to trigger start event. The detection of the laser on the other side triggers the bot to stop and turn a right angle clockwise and move to next row.

**Key Words:** Arduino Nano, LDR, ultrasonic sensor, L293D9 motor driver.

## 1. INTRODUCTION

The first lawn mower was made by Edwin budding in 1830. While operating this type of lawn mower the task was somewhat difficult and laborious. Then modified grass cutter was available in market which runs on electrical energy. These types of grass cutters have some drawbacks. To overcome all the problems remote controlled solar power lawn mower is used. It consists of three dc motors, solar panel for charging purpose. One DC motor is placed vertically and one blade is attached to the motor to cut the grass very properly. Remaining four motors are provided to the four wheels of the grass cutter which rotate through 360 degree. The storage battery is used to store the energy which is received from solar plate. The stored energy will be used for to operate the five motors. In case if solar energy is unavailable then to provide alternative circuit for charging the battery. Also there is a Bluetooth transmitter and receiver. By using remote the lawn mower move forward, backward also it take turn. It is beneficial to save energy and reduce human efforts which will provide proper operation of lawn cutting.

It is having so many advantages like it is having low maintenance and ease to human, electrical charging is also available if required, it is easy to move from one place to another place for grass cutting, Operating principle is very

simple depends upon motor speed also non skilled person can easily operate this cutter. Along with the various ages of users, this lawn mower can also be used people who have disabilities and are unable to use a regular push, or riding lawn mower. It will also be automatic and will run on a charged battery with no cords to interfere with operation. This cordless electric lawn mower includes remote control capability which is less expensive than a robotic lawn mower with sensor capability. This robot lawn mower design is safe to use. With its remote control capability the lawn mower stays within the boundaries of the lawn because the user is able to have fun control over the lawn mower with the controller. It is also environment friendly. There is no need for gas, oil, and engine to use by this device because it is electric powered.

Lawn maintenance and landscaping remain one of the most important constraints from keeping a clean and fresh looking gardens and yards. Man is constantly trying to adapt to his environment/surrounding by creating a habitat suitable for his survival. Lawn mowers employing a single blade that rotates about a single vertical axis are known as rotary mowers, while those employing a multiple blade assembly that rotates about a single horizontal axis are known as cylinder or reel mowers.

There are several types of mowers, each suited to a particular scale and purpose. The smallest type is pushed by a human user and is suitable for small residential lawns and gardens. Electrical powered or fossil-engine mowers are used for larger residential lawns. Riding mowers, which resembles small tractors, are larger than push mowers and are suitable for large lawns. A transition from hand-guided or ride-on mowers to automatic electric or solar mowers is beginning to take place, with the growth in robotic lawn mower.

Nowadays, lawn mowers are useful pieces of machinery that employ a revolving blade to cut a lawn at a smooth, even length. It includes push lawn mowers, which are suitable for smaller lawns, and the ride-on mowers, which are capable to cut grass in larger lawns. 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. Motor powered push lawn mowers and riding lawn mowers create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic

maintenance such as changing the engine oil. Along with motor powered lawn mowers, electric lawn mowers are also hazardous and cannot be easily used by all. Also, if the electric lawn mower is corded, mowing could prove to be problematic and dangerous. The self-propelling electric remote control lawn mower is a lawn mower that has remote control capability. It is robotic user friendly, cost efficient, safe to use, efficient to use, and environment friendly. It can save significantly on labor cost. Along with the various ages of users, this lawn mower can also be used by people who have disabilities and are unable to use a regular push, or riding lawn mower. It will also be automatic and will run on a charged battery with no cords to interfere with operation.

## 2. BLOCK DIAGRAM

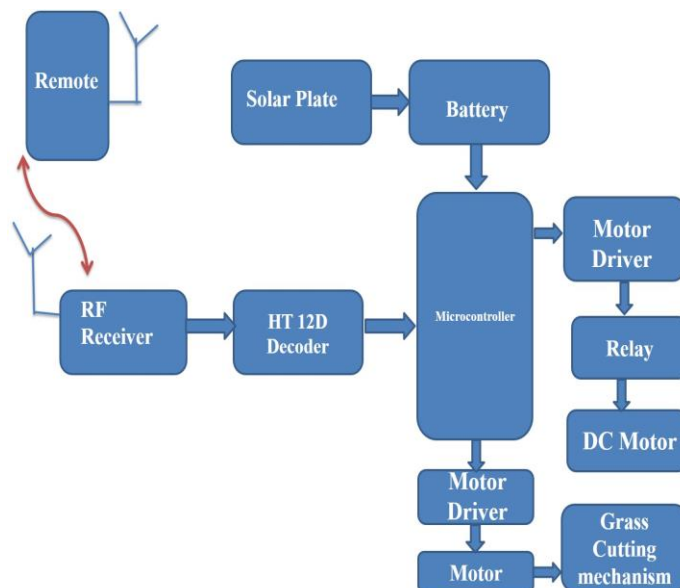


Fig. 2.1: Block Diagram of Remotely Control Lawn Mower Using Solar System

The complete block diagram of remotely control lawn mower is divided into various blocks which is shown in fig. 2.1. It consist of RF module, microcontroller, relay, solar plate, motor driver, DC motor and battery which are described as follow:

### a) Transmitter

A radio transmitter is an electronic circuit which transforms electric power from a power source into a radio frequency alternating current to apply to the antenna and the antenna radiates the energy from this current as radio waves fig. 2.1 (a) . The transmitter also impresses information such as an audio or video signal onto the radio frequency current to be carried by the radio waves. When they strike the antenna of a radio receiver, the waves excite

similar radio frequency currents in it. The radio receiver extracts the information from the received waves.

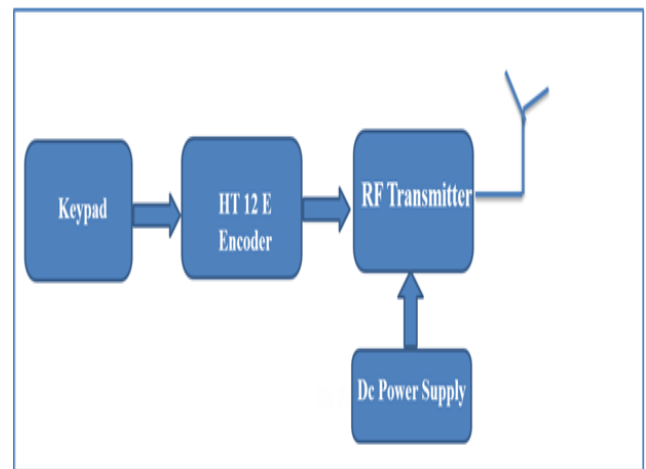


Fig. 2.1 (a): Block diagram of Transmitter

A radio transmitter has several functions and one final objective. Briefly, the functions are to generate an RF carrier wave; to amplify the carrier wave; to modulate the carrier wave with a sound wave, digital signal, or some other form of information; to amplify the modulated signal, to couple the modulated signal to an antenna; and to radiate the signal into the atmosphere. All these functions except the last are performed by circuits within the transmitter system so that the final objective is accomplished.

There are four keys in the remote for controlling the lawn cutter. The operations of the keys are:

- 1) Forward
- 2) Reverse
- 3) Left turn
- 4) Right turn
- 5) Lawn cutter

In radio communications, a radio receiver is an electronic device that receives radio waves and converts the information carried by them to a usable form. It is used with an antenna. The antenna intercepts radio waves (electromagnetic waves) and converts to tiny alternating currents which are applied to the receiver, and the receiver extracts the desired information. The receiver uses electronic filters to separate the desired radio frequency signal from all the other signals picked up by the antenna, an electronic amplifier to increase the power of the signal for further processing, and finally recovers the desired information through demodulation. The information produced by the receiver may be in the form of sound, moving images (television), or data which is shown in fig. 2.1 (b). A radio receiver may be a separate piece of electronic equipment, or an electronic circuit within another device.

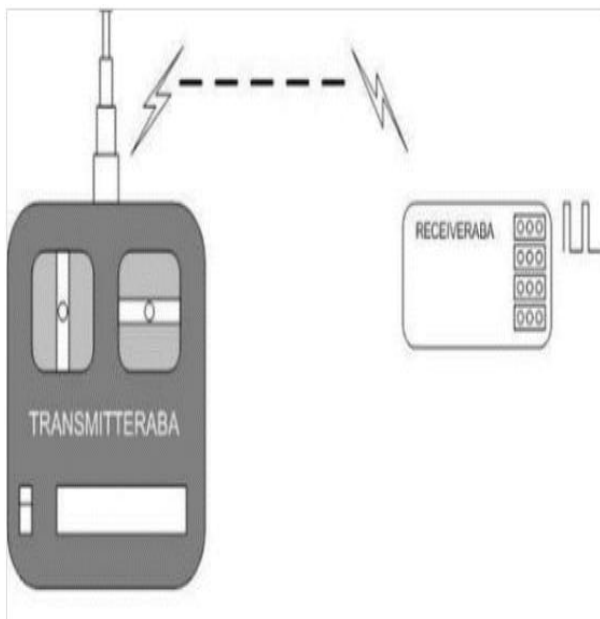


Fig. 2.1 (b): Transmitter Receiver Unit

The receiver circuit of the grass cutter is installed on the underside of the vehicle. It has an antenna that receives the encoded instructions from the transmitter. The received signals are then decoded and the given instructions are performed by the receiver. The transmitter sends signals to the receiver circuit by pulse width modulation. Radio receivers are widely used in modern technology as components of communications, broadcasting, remote control, and wireless networking systems. In consumer electronics, the terms radio and radio receiver are often used specifically for receivers designed to reproduce sound transmitted by radio broadcasting stations, historically the first mass-market commercial radio application.

### 3. CIRCUIT DESCRIPTION

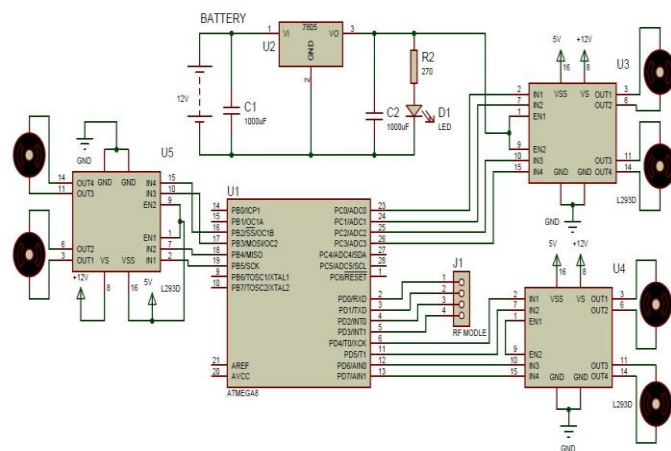
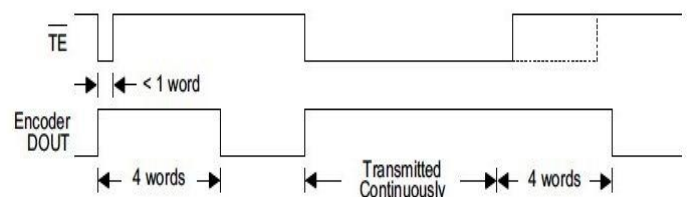


Fig. 3.1: Circuit Diagram of Remotely Control Lawn Mower using Solar System

### HT12E

HT12E starts working with a low signal on the TE pin. After receiving a low signal the HT12E start the transmission of 4 data bits as shown in the timing diagram above and the output cycle will repeats based on the status of the TE pin in the IC. If the TE pin retains the low signal the cycle repeats as long as the low signal in the TE pin exists. The timing diagram of HT12E is shown in fig. 4.1 (a). The encoder IC will be in standby mode if the TE pin is disabled and thus the status of this pin was necessary for encoding process. The address of these bits can be set through A0 – A7 and the same scheme should be used in decoders to retrieve the signal bits.



Transmission timing for the HT12E

Fig. 3.1 (a) (i): Timing Diagram of HT12E

HT12E is an encoder integrated circuit of  $2^{12}$  series of encoders. They are paired with  $2^{12}$  series of decoders for use in remote control system applications. It is mainly used in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format. Simply put, HT12E converts the parallel inputs into serial for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits

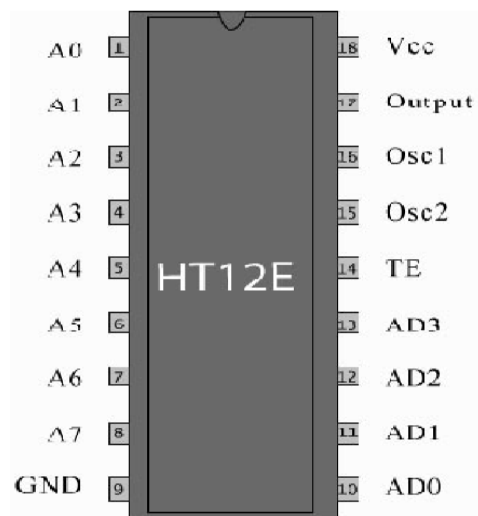


Fig. 3.1 (a) (ii): Pin Diagram of HT12E

The pin diagram of HT12E is as shown in fig. 3.1 (a) (ii). HT12E has a transmission enable pin which is active low. When a trigger signal is received on TE pin, the programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium. HT12E begins a 4-word transmission cycle upon receipt of a transmission enable. This cycle is repeated as long as TE is kept low. As soon as TE returns to high, the encoder output completes its final cycle and then stops.

#### 4. CONCLUSION

The smart lawnmower design provides minimum working time, minimizes the cost, minimum energy consumption, and mixed operation mode. Robotics is very vast field which comes with different combinations of technology this will help to reduce the human efforts and gives maximum efficient output for the work, now a day's lot of energy is wasted for mowing lawn in different areas of the world and also takes lots of human efforts for the work. Robot has a bluetooth receiver unit that receives the command and work for trimming the grass in lawn.

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