

# International Journal of Innovative Research in Science, Engineering and Technology

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## Design of Remote Controlled Solar Grass Cutter based on Internet of Things

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**ABSTRACT:** The booming topic in technology of the present day is internet of things and automation of various machines and processes. Technologies are being improved such that there is a minimum intervention of humans in performing a task. This would also result in the reduction of errors as the machine installed to perform a particular task is pre-programmed with a certain set of instructions. The idea of the grass cutter is inspired by the same concept such that there would be less human effort and the work would be efficient and faster.

**KEYWORDS:** Artificial intelligence, automation, internet of things, solar power

### I. INTRODUCTION

The remote controlled solar grass cutter is a machine which can be employed to control the irregular growth of grass and other unwanted plants in an easy way where a person doesn't need to put his strength or drive the machine. The machine can be controlled by a person from a distance within a suitable range by just giving directions of movement to the machine through a simple remote control.

This wouldn't need much effort as it is needed in the traditional manual grass cutters. The power required to run the machine is provided by a solar energy and hence, works differently from an electric grass cutter.

It is designed such that the grass that is cut by the blade is dumped in a bag that is attached to the machine automatically.

The main components that are required to construct this machine are solar panels, a microcontroller, a cutting blade, 2 batteries, remote sensor, centrifugal pump, draft tube, motor

### II. MAIN DISCUSSION

As mentioned earlier, this grass cutter works on the energy provided by the sunlight. The solar energy is converted into electrical energy and this energy is used to run the vehicle, make the cutter blade rotate and allow the vacuum pump to dump all the cut grass into a bag attached.

The basic concept of the construction has been inspired by the concept of internet of things as different commuting, digital and mechanical objects are interconnected virtually.

The detailed description of elements and components used in the construction of a remote controlled solar grass cutter is given in the following sections.

#### Components and equipment used in the design:

##### Solar panels:

The main source to provide electricity for the vehicle to move is a solar panel. The solar panel which is made of the photovoltaic cells, grabs the sunlight and the photons of the sunlight are combined with the electrons of the cells and a DC electricity is produced. But the DC electricity can't let the vehicle move, so, inverters are used to convert the DC power to AC power. Figure 1 shows how the solar cells react with the sunlight.

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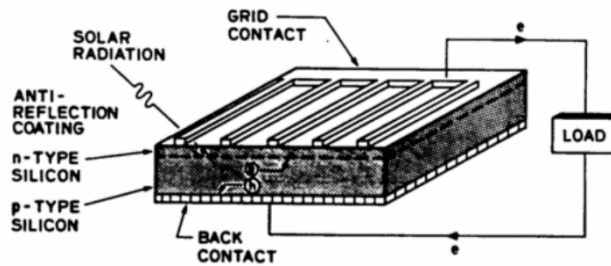


Figure 1

### Remote control:

The remote control is an electronic device which contains the transmitter circuit. It directs the vehicle in which way to move. The transmitter sends out the signals in the form of pulses or infrared light and are encoded into binary codes by an encoder. The instructions to the remote control are given by the user by switching the buttons which make the microcontroller and microprocessor activate, where the instructions are stored in the microcontroller beforehand and the transmitter sends the signals through the antenna or the LED bulb on the front side of the remote as per the switching instructions.

### Receiver circuit:

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 and the figure 2 is a representative diagram of the remote and the receiver vehicle.

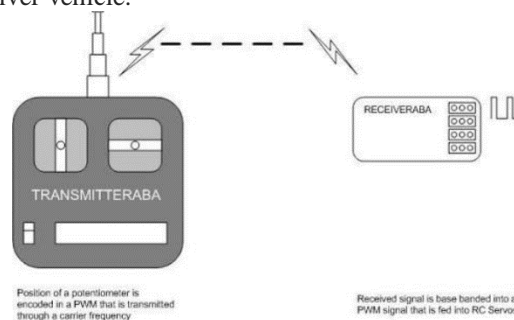


Figure 2

### Motor:

A motor is a device which converts electrical energy into mechanical energy. The electrical energy generated from the solar panels is converted into mechanical energy, which results in the movement of the vehicle. The motor is fixed in the front part of the vehicle, where power from the solar panel is directly supplied to the motor.

### Vacuum pump:

The vacuum pump is a device sucks in the things that fell on the ground with the pressure provided by the centrifugal pump through a draft tube arranged within the vacuum pump. The vacuum pump starts with the electrical energy supplied by one of the batteries used.

### Cutter blade:

This instrument is used to cut the grass on the ground. We discussed earlier that two batteries are used. As one is used to power up the vacuum pump, the other is connected to the cutter blade, and the energy received from this battery makes the cutter blade rotate and fulfils the need of the use of this machine. Figure 3 shows the blade that is used in cutting the grass.

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Figure 3

### Design and working:

The structure of the remote controlled solar grass cutter is like a car. There will be 4 wheels. The motors are attached to the front on either side. As mentioned, the motors used are of front end type. As the motor starts the front wheels start running and the rear wheels follow the front ones. The motor is switched on by the power provided by the solar energy.

The solar panels are arranged on the top of the vehicle. We use 3 panels and arrange them such that the maximum possible sunlight is grabbed. One panel is placed horizontally and the other 2 panels are placed at 45 degrees angle on either side of the first one, such that when the sunrays fall on the panels, more number of photons can be absorbed.

There are 2 batteries to be used in the machine. One to power up the grass cutter motor and the other to power up the vacuum pump. Figure 4 shows the external appearance of the remote controlled solar grass cutter, figure 5 shows how the motors and batteries are connected internally and how the cutting blade comes into action.

According to the instructions given by the user through the remote control to the receiver, the vehicle starts moving. Once it starts to move, the battery that powers up the cutter motor is activated and the blade starts to move, cutting the grass on the ground. Meanwhile, on the other side, the vacuum pump is turned on by the other battery. As mentioned earlier, the draft tube of the vacuum pump swallows the cut grass that would fall on the ground after cutting. It then sends it to a dumping bag attached to the vehicle through a centrifugal pump. Figure 6 shows the arrangement of the elbow shaped draft tube, the cutting blade and the dumping bag.

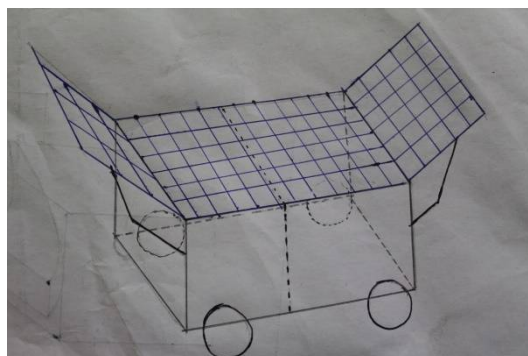


Figure 4 – the outer structure of the vehicle

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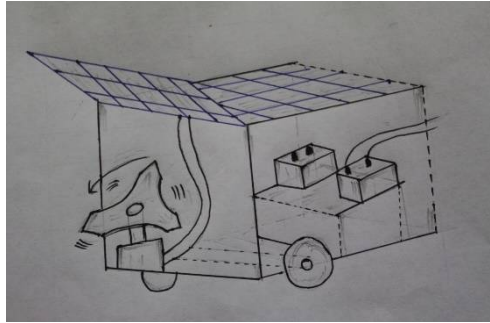


Figure 5 –representative diagram of the internal parts of the vehicle

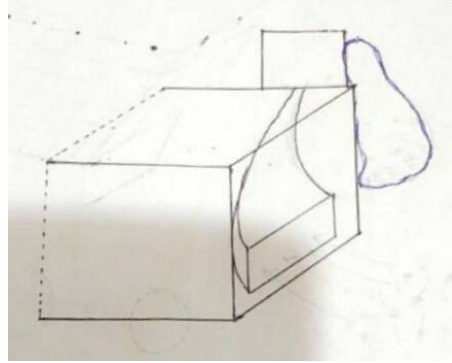


Figure 6 – diagram showing the design of the vacuum pump

## Applications:

We use a renewable source of energy to power up this machine. This would be eco-friendly and conventional energy is not consumed. It can be used in public parks, apartments, stadiums and other public and private places.

For the further improvement and ease of the working of the device, the remote control can be replaced by Bluetooth control or in-built sensors that detect obstacles.

## III.CONCLUSION

Thus, the working of a remote controlled solar grass cutter is explained and the human need is fulfilled by reducing effort, improving efficiency and automation up to some extent is achieved.

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