

# Mobile Operated Solar Powered Lawn Mower

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**Abstract—** This paper present a design of remote controlled grass cutter which will act like a robot. By using mobile as a remote we are going to control the movement of four wheels which will be going to perform grass cutting operations very smoothly. This system 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 though 360 degree. The storage battery is used to store the energy which is received from solar plate. The stored energy will used for to operate the five motors. In case if solar energy in unavailable then we are going to provide alternative circuit for charging the battery. Also there is a Bluetooth transmitter and receiver. We are going to use mobile as a remote. By using remote we can move the grass cutter forward, backward also we can take turn.

**Keywords—** Mobile, lawn mower, DC Motor, solar panel, robot, Bluetooth transmitter and receiver.

## I. INTRODUCTION

Grass cutter or lawn mowing 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. Even though electric lawn mowers are environmentally friendly, they too can be an inconvenience. 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. This prototype is robotic user friendly, cost efficient, safe to use, efficient to use, and environmentally friendly. It can save significantly on labor costs.

In large size of lawn in the park, schools, college, are maintained manually. The gardener used hand scissors used to cut and maintain lawn uniformly. Moving the grass cutters with a standard motor powered grass cutters is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, grass cutter moving with engine create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. It is not easy and also very

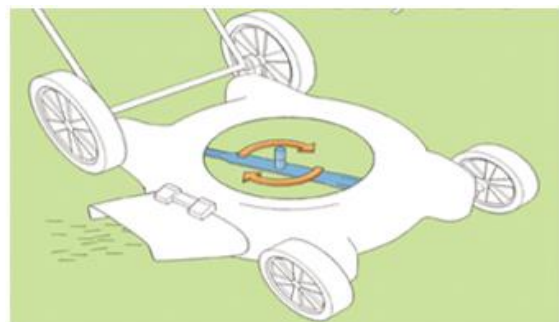
difficult to maintain uniform size. Also a motor powered engine requires periodic maintenance such as changing the engine oil.

Even though electric solar grass cutter is environmentally friendly, they too can be an inconvenience. Along with motor powered grass cutter, electric grass cutters are also hazardous and cannot be easily used by all. This system is an autonomous solar grass cutter that will allow the user to the ability to cut their grass with minimal effort.

## II. LITERATURE SURVEY

Rotary mowers were not developed until engines were small enough and powerful enough to run the blades at sufficient speed. Many people experimented with rotary blade mowers in the late 1920s and early 1930s, and Power Specialties Ltd. introduced a gasoline-powered rotary mower. KutKwick replaced the saw blade of the "Pulp Saw" with a double-edged blade and a cutter deck, converting the "Pulp Saw" into the first ever out-front rotary mower.

One company that produced rotary mowers commercially was the Australian Victa company, starting in 1952. Its mowers were lighter and easier to use than similar ones that had come before. The first Victa mowers were made at Mortlake, an inner suburb of Sydney, by local resident Mervyn Victor Richardson. He made his first model out of scrap in his garage and then moved to a shed behind St Mary's Church of England, where the first Victa mowers were manufactured, going on sale on 20 September 1952. The new company, Victa Mowers Pty Ltd, was incorporated on 13 February 1953. Photograph 2.1 shows the rotary mower.



Photograph 2.1: Rotary Mowers

The venture was so successful that by 1958 the company moved to much larger premises in Parramatta Road, Concord, and then to Milperra, by which time the mower

incorporated an engine, designed and manufactured by Victa, which was specially suitable for mowing, rather than employing a general-purpose engine. Two Victa mowers, from 1958 and 1968 respectively, are held in the collection of the National Museum of Australia. The Victa mower is regarded as something of an Australian icon, appearing en masse, in simulated form, at the opening of the Sydney Olympic Games in 2000.

### III. SYSTEM DEVELOPEMENT

#### 3.1 Solar Lawn Mower

The lawn mower or grass cutter is made up of an induction motor, a battery, an alternator, three collapsible blades, and a link mechanism. The power and charging system comprises of an alternator which charges the battery while in operation. The D.C. motor forms the heart of the machine and provides the driving force for the collapsible blades. This is achieved by the combined effect of mechanical action of the cutting blades and the forward thrust of the mower. The system is powered by an electrical switch which completes the circuit comprising the induction motor and the battery. The IR sensor is finding the path to avoid the obstacles and machine damage. The shaft fitting mechanism with which the height of cut is altered.

Solar grass cutter are based on the use of small but powerful engine that provides enough torque to spin a very sharp horizontal blade that cuts the grass upon contact. The blade is located in the deck that prevents grass from flying all over the place when struck. In most cases, the motor is situated at the top of the deck, which is usually mounted on four wheels. There is also a bag connected to the deck that is used to collect cut grasses the opinion that lawnmowers must be designed to reduce pollutions generated than at present. It uses the photovoltaic panel to generate the energy needed to power the mower. It is assumed that a lawnmower using solar as the energy source will address a number of issues that the standard internal combustion engine.



Photograph 3.1: Solar Grass Cutter

A lawnmower with solar energy will be easier to use, it eliminates down time by frequent trips to the gas station for fill-ups and danger associated with gasoline spillage. The dangerous emissions generated by the gasoline spillage and that of the internal combustion engine into the atmosphere are eliminated. The solar powered lawnmower will help to reduce air pollution as well as noise pollution produced by other types of lawnmowers. In addition, it will help to

reduce the running cost of using and maintaining the lawn mower.

#### 3.2 The Rack for Solar Panel

Photograph 3.2 shows the rack for solar panel. This is the main solar panel safety device. It provides tight and safe holding reducing the risk of a new panel. The design was done within our specific panel dimensions, modifications can be done to accommodate other panel sizes. Some factors that were taken into account included;

- The base stands of the holder (firm to enable steady positioning)
- The height from the ground, (high to reduce obstacle interference)
- The weight and strength of the materials used (for durability and mobility)
- The corrosion resistance of the materials. (In corrosive environments)



Photograph 3.2: The Rack for Solar Panel

#### 3.3 Blade

This is the most important part and when designing for this, safety as a major factor was put into consideration as the blade when in operation can be a safety hazard. Also the weight of the blade and how to mount it on the motor shaft is also a key consideration. Moreover the sharpness of the blade is another important aspect and this will depend on the power and the RPM of the motor used.

The key connects the rod to the shaft and keeps the rod from slipping while the shaft is rotating. Then I cut the rod to length and welded it to a 1/8" thick metal plate that the mower blade will be bolted to. After the blade mount was finished being fabricated Inserted it on to the shaft.

#### 3.3 Controller Unit

Fig. 3.1 and 3.2 shows the pic controller circuit and relay control circuit respectively. These circuits consist of various components like PIC 16F877P which is the heart of this system which contains program to give command to the motors. Below circuits also consists of voltage regulator, relays, resistors, capacitors, crystal oscillator, diodes and LED etc. for different functions.

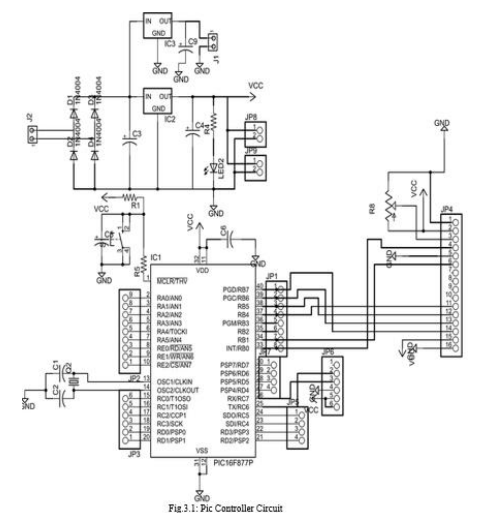


Fig 3.1: Pic Controller Circuit

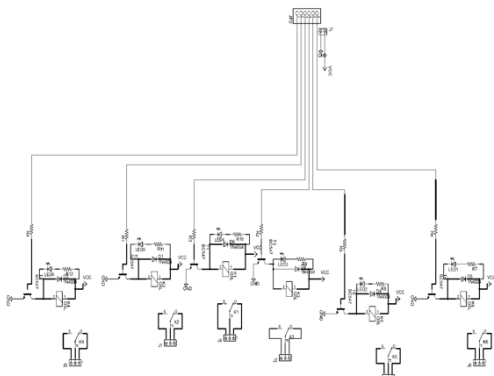
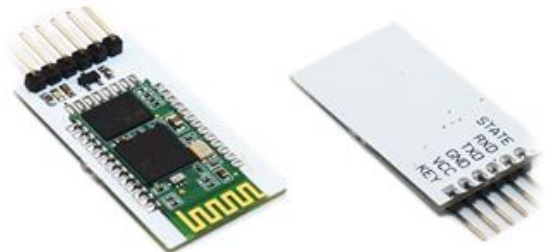


Fig 3.2: Relay Control Circuit

3.4 Bluetooth Modem

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3 Mbps Modulation with complete 2.4 GHz radio transceiver and baseband.



Photograph .3.4: Bluetooth Modem

It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm.

3.4 Permanent Magnet DC Motor

A DC motor is a mechanically commutated electric motor powered from direct current (DC). The stator is stationary in space by definition and therefore so is its current. The current in the rotor is switched by the

commentator to also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque.



Photograph 3.5: PMDC motor

DC motors have a rotating armature winding (winding in which a voltage is induced) but non-rotating armature magnetic field and a static field winding (winding that produce the main magnetic flux) or permanent magnet. Different connections of the field and armature winding provide different inherent speed/torque regulation characteristics. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current.

The introduction of variable resistance in the armature circuit or field circuit allowed speed control. Modern DC motors are often controlled by power electronics systems called DC drives.

In this system we used three Johnson metal geared motors. Two motors are having speed of 100 rpm which are connected to the front wheels of the project. Remaining one motor having a speed of 1000 rpm is connected to the grass cutter.

3.5 Mobile as a Remote

In remote controlled solar powered grass cutter we used the mobile as a remote to control the movement of grass cutter. We installed the android application in the mobile. by using Bluetooth modem we connect the mobile to the grass cutter and in this way we are going to control the movement of grass cutter.

By using mobile as a remote we can start and stop the grass cutter motor according to our requirement. Also we can move the grass cutter in forward, reverse,

Left and right according to our requirement. Hence in this way we can control the grass cutter by using mobile as a remote.

IV. CONCLUSION

This system is more suitable for a common man as it is having much more advantages i.e., 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. It can be easily handled. This system is having facility of charging the batteries while the solar powered grass cutter is in motion. So it is much more suitable for grass cutting also. The same thing

can be operated in night time also, as there is a facility to charge these batteries in day light.

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