

**A
PROJECT REPORT
ON
SMARTPHONE OPERATED LAWN MOWER**

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INTRODUCTION

Nowadays pollution is a major issue for whole world. Pollution is manmade and can be seen in own homes, industries, and power plants. In case Gas powered lawn mowers due to the emission of gases it is responsible for pollution. Also the cost of fuel is increasing hence it is not efficient and battery type equipment is also extra cost of power. So the Smartphone powered lawn cutters are introduced. Battery powered lawn mower can be described as the application of Electrical energy to power an electric motor which in turn rotates a blade which does the mowing of a lawn.

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 lawnmowers 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 smartphone control lawn mower is a lawn mower that has Bluetooth 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.

OVERVIEW OF THE PROJECT

This project involves the idea to couple the potential of mobile with microcontroller to operate the grass cutter. The functioning of mobile controlled is similar to the radio frequency remote system which consists of a transmitter and a receiver unit. Therefore, Smartphone mobile phones are used for effective transmission and reception of signals. The grass cutter is controlled by the mobile phone held by the user, which communicates with the mobile phone attached to the device. The received signal is processed by the microcontroller with the help of Bluetooth module. The microcontroller communicates with the motor driver which drives the device in forward, reverse, right and left direction according to the key pressed on the transmitter mobile. Grass cutter attachment is attached to the device to perform the grass cutting operation.

ABSTRACT

Many of the wireless-controlled robots use RF modules. But this project make use of Android mobile phone for robotic control. The control commands available are more than RF modules. For this the android mobile user has to install an application on her/his mobile. Then user need to turn on the bluetooth in the mobile. The wireless communication techniques used to control the robot is Bluetooth technology. User can use various commands like move forward, reverse, move left, move right using these commands which are sent from the Android mobile. Robot ha a Bluetooth receiver unit which receives the commands and give it to the microcontroller circuit to control the motors. The microcontroller then transmits the signal to the motor driver IC's to operate the motors.

LITERATURE SURVEY

For the manufacturing of a smartphone controlled grass cutter we referred various literature, papers etc. The review of previous method used given below: In this lawn mower uses an D C Power based energy source, which is easier to use, more advantageous comparing to other energy source especially for gas based source of power .But our lawn cutter is based on solar because this energy is a chargeable energy source and it is easy to work. So we made solar powered lawnmower.

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy. In this solar based lawn mower, the advantage of powering a lawn mower by solar rather than by gasoline is mainly ecological. We manufactured this lawn cutter because it is very easy method and many overcome produced from this type lawn cutter.

The self-powered objective is to come up with a mower that is portable, durable, easy to operate and maintain. It also aims to design a self-powered mower of electrical source; a cordless electric lawn mower. The heart of the machine is a battery powered dc electric motor. It is also useful method for our lawn mower. It is similar to our lawn cutter using display and keypad.

The present technology commonly used for trimming the grass is by using the manually handle device. In this project we have automated the machine for trimming the grass. The device consists of linear blade which is operated with the help of the motor the power supply for the motor is by using battery. The battery can be charge by using power supply and solar panel.

2.2 HISTORY

The first lawn mower was invented by Edwin Budding in 1830 just outside Stroud, in Gloucestershire, England. Budding's mower was designed primarily to cut the grass on sports grounds and extensive gardens, as a superior alternative to the scythe, and was granted a British patent on August 31, 1830.

Budding's first machine was 19 inches (480 mm) wide with a frame made of wrought iron. The mower was pushed from behind. Cast iron gear wheels transmitted power from the rear roller to the cutting cylinder, allowing the rear roller to drive the knives on the cutting cylinder; the ratio was 16:1. Another roller placed between the cutting cylinder and the main or land roller could be raised or lowered to alter the height of cut. The grass clippings were hurled forward into a tray-like box. It was soon realized, however, that an extra handle was needed in front to help pull the machine along. Overall, these machines were remarkably similar to modern mowers.



Fig: An early cylinder reel mower

Two of the earliest Budding machines sold went to Regent's Park Zoological Gardens in London and the Oxford Colleges. In an agreement between John Ferrabee and Edwin Budding dated May 18, 1830, Ferrabee paid the costs of enlarging the small blades, obtained letters of patent and acquired rights to manufacture, sell and license other manufacturers in the production of lawn mowers. Without patent, Budding and Ferrabee were shrewd enough to allow other companies to build copies of their mower under license the most successful of these being Ransoms of Ipswich, which began making mowers as early as 1832.

This machine was the catalyst for the preparation of modern-style sporting ovals, playing fields (pitches), grass courts, etc. This led to the codification of modern rules for many sports, including for football, lawn bowls, lawn tennis and others

From the late nineteenth century through the middle of the twentieth century, DC-to-AC power conversion was accomplished using rotary converters or motor-generator sets (M-G sets). In the early twentieth century, vacuum tubes and gas filled tubes began to be used as switches in inverter circuits. The most widely used type of tube was the thyatron. The origins of electromechanical inverters explain the source of the term inverter. Early AC-to-DC converters used an induction or synchronous AC motor direct-connected to a generator (dynamo) so that the generator's commutator reversed its connections at exactly the right moments to produce DC. A later development is the synchronous converter, in which the motor and generator windings are combined into one armature, with slip rings at one end and a commutator at the other and only one field frame.

The result with either is AC-in, DC-out. With an M-G set, the DC can be considered to be separately generated from the AC; with a synchronous converter, in a certain sense it can be considered to be "mechanically rectified AC". Given the right auxiliary and control equipment, an M-G set or rotary converter can be "run backwards", converting DC to AC. Hence an inverter is an inverted converter.

FURTHER IMPROVEMENTS

It took ten more years and further innovations to create a machine that could be drawn by animals, and sixty years before a steam-powered lawn mower was built.

In the 1850s, Thomas Green & Son of Leeds introduced a mower called the SilensMessor (meaning silent cutter), which used a chain to transmit power from the rear roller to the cutting cylinder. These machines were lighter and quieter than the gear driven machines that preceded them, although they were slightly more expensive. The rise in popularity of lawn sports helped prompt the spread of the invention. Lawn mowers became a more efficient alternative to the scythe and domesticated grazing animals.

Manufacture of lawn mowers took off in the 1860s. By 1862, Ferrabee's company was making eight models in various roller sizes. He manufactured over 5000 machines until production ceased in 1863. The first grass boxes were flat trays but took their present shape in the 1860s. James Sumner of Lancashire patented the first steam-powered lawn mower in 1893.

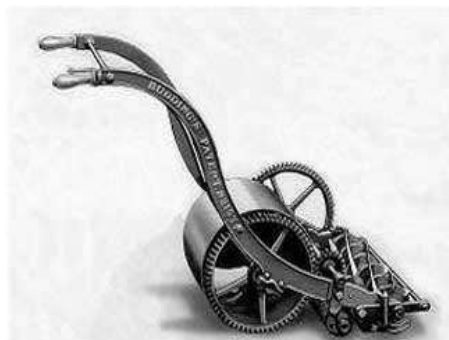


Fig: Commercial lawn mower

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The first United States patent for a reel lawn mower was granted to Amariah Hills on January 12, 1868. In 1870, Elwood McGuire of Richmond, Indiana designed a human-pushed lawn mower, which was very lightweight and a commercial success. John Burr patented an improved rotary-blade lawn mower in 1899, with the wheel placement altered for better performance. Amariah Hills went on to found the Archimedean Lawn Mower Co. in 1871.

In the United States, gasoline powered lawn mowers were first manufactured in 1914 by Ideal Power Mower Co. of Lansing, Michigan, based on a patent by Ransom E. Olds. Ideal Power Mower also introduced the world's first self-propelled, riding lawn tractor in 1922, known as the "Triplex." The roller-drive lawn mower has changed very little since around 1930. Gang mowers, those with multiple sets of blades, were built in the United States in 1919 by the Worthington Mower Company.

2.4 ROTARY MOWERS

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 Mort lake, 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.

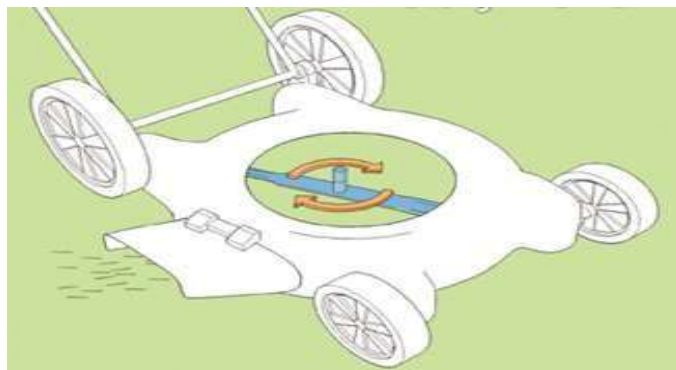


Fig: Rotary mowers

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

ELECTRIC GRASS CUTTER

The lawn mower or grass cutter is made up of a three motor, a battery, blades, and a link mechanism. The power and charging system comprises of an alternator which charges the battery while in operation. The D.C. motors forms the heart of the machine and provides the driving force for the blades and rear wheels. 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 in DC motor and the battery. The shaft fitting mechanism with which the height of cut is altered.

An electric grass cutter with a solar charger will be easier to use. There is no messy dangerous gasoline to deal with. Most importantly it eliminates the emissions of an internal combustion mower. A lawn mower is a device which by means of one or more revolving blades issued to cut grass or other plants to an even length. Lawn mowers employing a blade that rotates about a vertical axis are known as rotary mowers, while those employing a blade assembly that rotates about a horizontal axis are known as cylinder or reel mowers. Electrical grass cutter are based on the use of small but powerful motor 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.



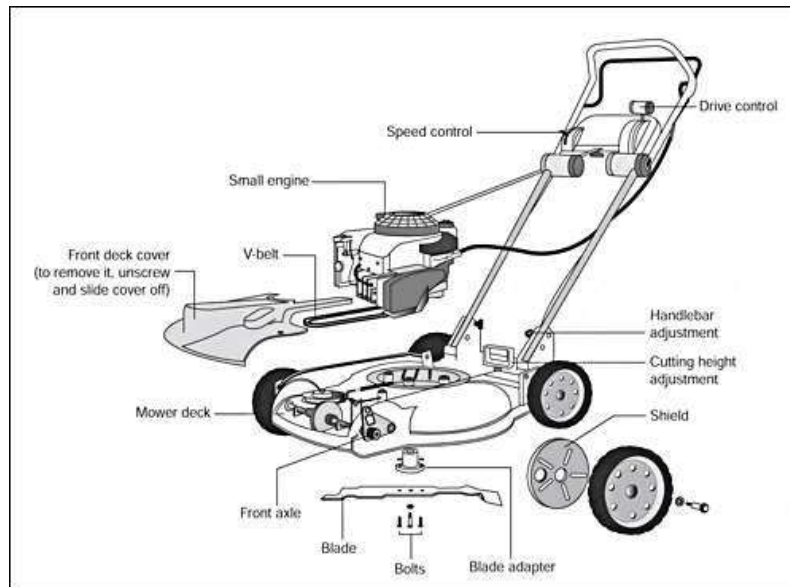
Fig: Solar grass cutter

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 and electric motors lawn mowers do not. 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 a lawnmower.

Main Parts of Lawn Mower:

The main components of the solar powered grass cutter

- 1-Solar panels
- 2-Brush less DC motor
- 3-Solar charger
- 4-Mechanism used
- 5-Circuit breaker
- 6-Blades
- 7-Batteries



BUMPER

The physical bumper is made up of an inner square created by PVC pipe. The outside has PVC pipe with attached sheet metal that is attached to the inner square with PVC pipe loaded by a spring. There is a bolt through each spring connecting the outside and inside layer of the PVC pipe. The spring allows the bumper to compress when the mower has contact with an object. The bumper also has bolts through it that are there to activate the pushbuttons.

MOTORS

The Lawn Bot has a total of two motors. The blade mower came attached to the mower's body frame. Both of its terminals are attached to a specified slot on the main terminal block. The other two motors are used to move the wheels of the mower. They are both attached to the mower's body frame with two U-bolts. The terminals for these two motors are attached to the motor driver's terminals.

CUTTING PATTERNS

The lawn mower will have two types of cutting styles: spiral and random. The user will place the robot in the center of their lawn and let it cut. To achieve this cutting pattern both wheels must turn at two very different speeds with the outmost wheel moving the fastest

TYPES OF LAWNMOWERS

CYLINDER LAWN MOWERS:

Cylinder lawn mowers consist of a cylinder and a number of horizontal blades that spiral around it. If adjusted to the correct height a cylinder mower will give the best cut of any lawn mower. They are however, best suited to flat lawns and can be difficult to use on bumpy or tall grass.



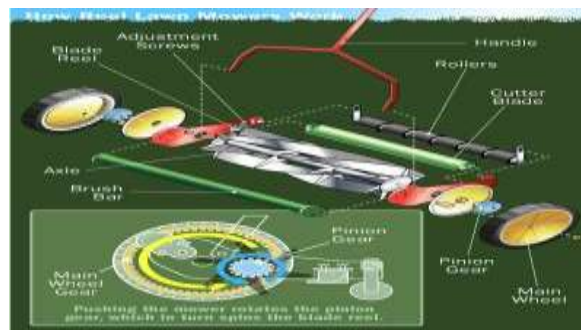
Fig: Cylinder Lawn Mowers

THE MAIN PARTS OF A CYLINDER REEL MOWER

Blade reel cylinder consists of numerous (3 to 7) spiral blades that are attached to a rotating shaft. The blades rotate, creating a scissor-like cutting motion.

Bed knife is the stationary cutting mechanism of a cylinder/reel mower. This is a fixed horizontal blade that is mounted to the frame of the mower.

Body frame the main structural frame of the mower onto which the other parts of the mower are mounted. Wheels these help propel the mower in action. Generally, reel mowers have two wheels. Push handles the "power source" of a manually operated reel mower. This is a sturdy T- shape handle that is connected to the frame, wheels and blade chamber. Motor the power source of a reel mower that is powered by gasoline or electric



Main parts of cylindrical mower

PETROL LAWN MOWERS

These lawn mowers fall under the rotary type mowers. They are powered by internal combustion engines. Such engines can be either two-stroke or four-stroke cycle engines, running on gasoline or other liquid fuels. Internal combustion engines used with lawn mowers normally have only one cylinder. Power generally ranges from two to seven horsepower (1.5 to 5.25 kW).

Petrol lawn mowers come in both the 2 stroke and 4 stroke cycle engines;

2 stroke lawn mowers are more powerful, less expensive, have a better power to weight ratio, and can be operated in any orientation. However, they are also louder, less fuel efficient, and do not last as long due to the high revolving engine. They also require the petrol to be mixed with oil prior to use in order to lubricate the engine. 4 stroke lawn mowers by comparison are not as powerful, but contain an oil sump (a separate oil chamber) and don't need the fuel to be pre-mixed. This saves the operator from mixing the fuel but it also means that the mower cannot be tipped. On one side as it will cause the oil to fall out of the sump into the fuel chamber.



Fig: Petrol lawn mower

ELECTRIC LAWN MOWERS

Rotary mowers powered by electric motors are increasingly popular. Usually, these mowers are moved by manual motive power the on-board engine or motor only spins the blades. These have the disadvantage of requiring a trailing power cord that limits its range and so these are only useful for relatively small lawns, close to a power socket. There is the obvious hazard with these machines of mowing over the power cable, which stops the mower and may put users at risk of electrocution.



Fig: Electric Lawn Mower

HOVER LAWN MOWERS

Hover mowers are powered rotary push mowers that use a turbine above the spinning blades to drive air downwards, thereby creating an air cushion that lifts the mower off the ground like a hovercraft. The operator can then easily move the mower as it floats over the grass. Hover mowers can also be applied to very long grass and even light scrub, since their lightness permits most operators to lift the mower up and then let it sink slowly down while the blades progressively chop up the vegetation.



Fig: Hover Lawn Mowers

The lifting action is made even easier when the mower is swung around with the handle held against the operator's mid-body to provide leverage. The action of air lifting the mower off the grass makes it hover a few centimeters above the ground thus making it very easy to push around the garden and, providing that you are not interested in getting stripe.

RIDING LAWN MOWERS

A popular alternative for larger lawns is the ride-on mower. The operator is provided with a seat and controls on the mower and literally 'rides' on the machine. Most use the horizontal rotating blade system, though usually with multiple blades. A common form of ride-on mower is the lawn tractor.

These are usually designed to resemble a small agricultural tractor, with the cutting deck mounted amidships between the front and rear axles. of their maneuverability. Mowing decks on ride on mowers are rotary and have two or three cutting blades.



Fig: Riding Lawn Mower

ROBOTIC LAWN MOWERS

A typical robotic lawn mower requires the user to set up a border wire around the lawn that defines the area to be mowed. The robot uses this wire to trim and in some cases to locate a recharging dock. Robotic mowers are capable of maintaining up to 5 acres of grass. Electricity usage varies from about 100 watts for 1/2 acre to 500 watts to maintain 5 acres. Robotic lawnmowers are increasingly sophisticated, are self-docking and contain rain sensors nearly eliminating human interaction for mowing grass. Some models will adapt their programming by detecting the speed in which grass grows as needed to maintain a perfect cut lawn.



Fig: Robotic lawn mowers

PLASTIC WHEELS

The plastic wheels will be connected to the DC motors. As soon as they create the torque, these wheels will help the move



Fig: Plastic wheels

THE FRAME OF SOLAR GRASS CUTTER

A mild steel plate was used in the construction of the frame due to its strength, workability, availability and cost effectiveness. The frame provides support for the electric motor, battery as well as the handle frame. The diameter of the deck is 25cm and height 40cm deck is also made of four hand lever adjusters which are used to raise and lower the deck to the desired height of cut. Each is made of flat metal with five spin hooks to aid the operation. They transmit the load of 15kg to the wheel equally and length of each is 30 diameters.

DC MOTORS

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 commutator 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. 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.

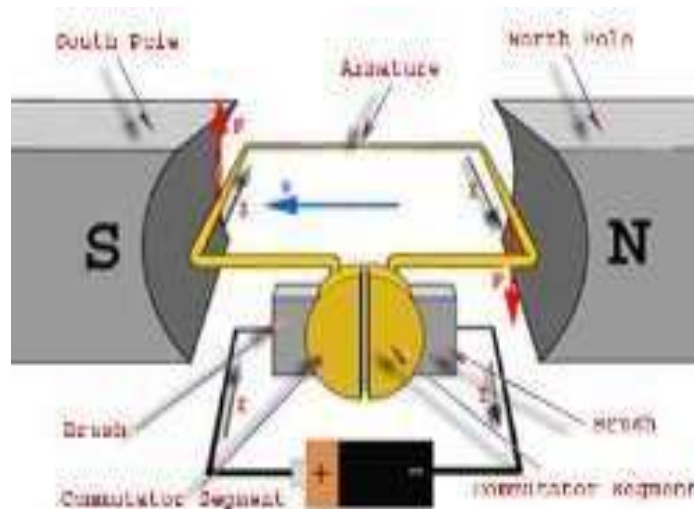


Fig: DC Motor

The introduction of DC motors to run machinery eliminated the need for local steam or internal combustion engines, and line shaft drive systems. DC motors can operate directly from rechargeable batteries, providing the motive power for the first electric vehicles. Today DC motors are still found in applications as small as toys and disk drives, or in large sizes to operate steel rolling mills and paper machines.

DC motors are configured in many types and sizes, including brushless, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. DC motors are most commonly used in variable speed and torque. Motion and controls cover a wide range of components that in some way are used to generate and/or control motion.

Areas within this category include bearings and bushings, clutches and brakes, controls and drives, drive components, encoders and resolvers, Integrated motion control, limit switches, linear actuators, linear and rotary motion components, linear position sensing, motors (both AC and DC motors), orientation position sensing, pneumatics and pneumatic components, positioning stages, slides and guides, power transmission (mechanical), seals, slip rings, solenoids, springs. Motors are the devices that provide the actual speed and torque in a drive system. This family includes AC motor types (single and multiphase motors, universal, servo motors, induction, synchronous, and gear motor) and DC motors (brushless, servo motor, and gear motor) as well as linear, stepper and air motors, and motor contactors and starters.

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field.

As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion. Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

Every DC motor has six basic parts axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. In most common DC motors (and all that Beamers will see), the external magnetic field is produced by high-strength permanent magnets.

The stator is the stationary part of the motor this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor rotates with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout with the rotor inside the stator (field) magnets. The geometry of the brushes, commutator contacts, and rotor windings are such that when power is applied, the polarities of the energized winding and the stator magnet(s) are misaligned, and the rotor will rotate until it is almost aligned with the stator's field magnets. As the rotor reaches alignment, the brushes moves to the next commutator contacts, and energize the next winding. Given our example two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a "flip" of the rotor's magnetic field, and driving it to continue rotating.

In real life, though, DC motors will always have more than two poles (three is a very common number). In particular, this avoids "dead spots" in the commutator. You can imagine how with our example two-pole motor, if the rotor is exactly at the middle of its rotation (perfectly aligned with the field magnets), it will get "stuck" there. Meanwhile, with a two-pole motor. There is a moment where the commutator shorts out the power supply (i.e., both brushes touch both commutator contacts simultaneously). This would be bad for the power supply, waste energy, and damage motor components as well.

Yet another disadvantage of such a simple motor is that it would exhibit a high amount of torque "ripple" (the amount of torque it could produce is cyclic with the position of the rotor). So since most small DC motors are of a three-pole design, let's tinker with the workings of one via an interactive animation (JavaScript required). You'll notice a few things from this -- namely, one pole is fully energized at a time (but two others are "partially" energized). As each brush transitions from one commutator contact to the next, one coil's field will rapidly collapse, as the next coil's field will rapidly charge up (this occurs within a few microsecond).

We'll see more about the effects of this later, but in the meantime you can see that this is a direct result of the coil windings' series wiring. There's probably no better way to see how an average dc motor is put together, than by just opening one up. Unfortunately this is tedious work, as well as requiring the destruction of a perfectly good motor. This is a basic 3-pole commutator, with 2 brushes and three commutator contacts.

An electrostatic motor is based on the attraction and repulsion of electric charge. Usually, electrostatic motors are the dual of conventional coil-based motors. They typically require a high voltage power supply, although very small motors employ lower voltages. Conventional electric motors instead employ magnetic attraction and repulsion, and require high current at low voltages.

A piezoelectric motor or piezomotor is a type of electric motor based upon the change in shape of a piezoelectric material when an electric field is applied. Piezoelectric motors make use of the converse piezoelectric effect whereby the material produces acoustic or ultrasonic vibrations in order to produce a linear or rotary motion. In one mechanism, the elongation in a single plane is used to make series stretches and position. An electrically powered spacecraft propulsion system uses electric motor technology to propel spacecraft in outer space, most systems being based on electrically powering propellant to high speed, with some systems being based on electrodynamics tethers principles of propulsion to the magnetosphere.

MOUNTING THE MOTOR

Here two motors are connected to wheels which is used to move the cutter it get supply from battery and another motor is fixed on center and it is used to cut the grass this motor can adjustable with the help of nut. These motors are the fixed to mild steel bed. Here we are using high torque motors.

BLADES

A blade is that portion of a tool, weapon, or machine with an edge that is designed to cut and/or puncture, stab, slash, chop, slice, thrust, or scrape surfaces or materials. The blade is seldom sharp enough to give a neat cutting. The blade simply tears the grass resulting in brown tips. However, the horizontal blades are easy to remove and sharpen or replace. Existing engine trimmers suffer from high initial cost, high levels of engine noise, high fuel consumption rates and high operator's fatigue in long-run.

Mower blades are the cutting components of lawn mowers. They are usually made of sturdy

metals as they must be able to withstand high-speed contact with a variety of objects in addition to grass. The materials used (as well as size, thickness, and design of the blades) vary by manufacturer. A blade may be made from a flaking stone, such as flint, metal (usually steel), ceramic, or other material. Here we used two blades i.e. fixed blade and sliding blade.



Fig: Grass cutting blade

The first known lawn mower sported a cylinder cutting gear made of iron. It was used to mow sporting grounds and wide-ranging gardens. As manufacturers changed the design and structure of mowers, the cutting mechanism also developed and evolved into several varieties, including cylinder/reel blades, deck blades, mulching blades, and lifting blades.

FIXED BLADE

The blade which has no motion is called Fixed blade. This fixed blade is welded to the frame

.And this is placed below the sliding blade.



Fig: Fixed Blade

SLIDING BLADE

This blade slide over the moving blade .This blade is connecting to wheel and this is connected to DC motor.



Fig: Sliding blade

MOUNTING THE 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.



Fig: Mounting the Blade

Unfortunately, when removing the old blade from the old mower I was unable to salvage the piece that attached the engine shaft to the mower blade. This meant that it was necessary to fabricate my own blade mount. I found a piece of metal rod about 3/4" in diameter in the scrap pile in the HSU metals lab. I bored a hole into the rod at about 3/8" in diameter (the motor shaft diameter). This would allow the rod to slide over the motor shaft. Next the rod needed a key way milled to allow a key to be inserted.

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 an 1/8" thick metal plate that the mower blade will be bolted to. After the blade mount was finished being fabricated I inserted it on to the shaft. Then to make sure the mount was supported vertically I drilled a small hole completely through the mount and shaft. This allowed me to insert a bolt as an added safety measure.

When the blade mount was securely mounted I bolted the mower blade to it using two 3/8" nuts and bolts with washers. All in all the fabrication of the blade mount went well.

THE MOWER BLADE

The blade is to be designed in such a way with high accuracy because it is essentially the cutting tool of the mower; a picture of an ordinary gas lawn mower blade.



Fig: Mower Blade

Various critical factors governed by the motor speed were considered in choosing the blade material, they include:

- The strength of the blade material

- The blade size in length

- The blade size in thickness

- Safety to the user

Apart from all these factors combined, the need for an easily sharpened material was also considered in the case of maintenance. So as to achieve maximum efficiency from the motor hence the whole lawn mower, the blade must be absolutely sharp. Sharpening is done quite often by grinding.

The blade has to be mounted firmly to the motor shaft so as to guarantee maximum safety and regular rotation. A balance on the blade has to be achieved such that there is even rotation of blade i.e. a split taper bushing and a pulley is used to mount and align the blade onto the motor shaft preventing vibration and excessive wear on the motor shaft and bearings.

Split bushings have an advantage in the way they hold the pulley very firmly to the shaft and can accommodate a lot of vibration. The bushings also have a slot to prevent rotational slippage. The pulley helps in fastening the taper bushing to the shaft. After fabricating the blade we bolt it onto the bushing collar using two bolts

of the same thread form to those of the bushing. Now the blade is firmly mounted on our mower. The number of blades that spiral around the cylinder determines the quality of the finish, the more blades, the better and the cut. Cylinder mowers can also be fixed with a roller which flattens the grass giving a smooth finish. A cylinder mower with a rear roller will give the best striped effect. Some cylinder mowers are entirely hand driven whereas others may have the blades driven by an engine. Self-propelled cylinder mowers use an engine to propel themselves forward as well as to turn the blades. This can save the operator a lot of energy as little effort is required to move the mower around the lawn.

TYPES OF GRASS CUTTING BLADES

REEL OR CYLINDER BLADES

Used in reel or cylinder mowers, cylinder blades are composed of three to seven helical blades welded in a horizontally rotating cylindrical reel, creating a scissor-like cutting action. Unlike other types of mower blades, reel/cylinder blades cannot be replaced. Therefore, a broken blade requires replacement of the entire mower. For dull or rusty blades, cleaning and sharpening kits are available.



DECK blades

It also known as the standard or straight mower blade, this is the most commonly used blade on rotary mowers. The blade of a rotary mower is usually mounted directly to the crankshaft of its engine, but it can be propelled by a hydraulic motor or a belt pulley system.



Fig: Deck blades

MULCHING BLADES

A mulching blade, also known as an all-purpose blade, features a curved surface which allows it to work in three ways: lifting, mowing, and mulching. First, the blade pulls the grass up and cuts it. Then, clippings are sucked inside the deck and are chopped into tinier pieces. Finally, the blade's innermost curve produces air pressure to blow the small clippings out, where they are used to feed the soil.



Fig: Machining Blades

DESIGNED MODEL

WORKING PRINCIPLE OF SMARTPHONE OPERATED LAWN MOWER

The working principle of smartphone operated grass cutter is it has Bluetooth module mounted in a particular arrangement at an in such a way that it can receive signals with high intensity easily from the smartphone. The electrical energy is stored in batteries. The motor is connected to the batteries through microcontroller design pcb with connecting wires . switch 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 designed solar powered lawnmower comprises of direct current (D.C) motor, a rechargeable battery, a stainless steel blade and control switch. mowing is achieved by the D.C motor which provides the required torque needed to drive the stainless steel blade which is directly coupled to the shaft of the D.C

motor. The solar powered lawnmower is operated by the switch on the board which closes the circuit and allows the flow of current to the motor which in turn drive the blade used for mowing. Performance evaluation of the developed machine was carried out with different types of grasses.

OPERATION PRINCIPLE OF DC MOTOR

Electrical energy of the battery is converted to mechanical energy through a set of blades designed to achieve cutting operation. The electric circuit ensures power transfer from the battery to run the D.C. motor, whilst the solar panel power to continuously recharge the battery while in operation. The cutting blades tap power from the D.C. motor. When the power switch is on, the electrical energy from the battery powers the motor which in turn actuates the blades. The solar panel generates current to recharge the battery, thereby compensating for the battery discharge. The rotating blades continuously cut the grass as the mower is propelled forward and the cut grass. Height of cut is adjusted by means of the link mechanism via the lift rod



Fig: DC Motor Blade

BRUSH

A brushed DC electric motor generating torque from DC power supply by using internal mechanical commutation, space stationary permanent magnets form the stator field. Advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed.

Disadvantages are high maintenance and low life-span for high intensity uses. Maintenance involves regularly replacing the carbon brushes and springs which carry the electric current, as well as cleaning or replacing the commutator. These components are necessary for transferring electrical power from outside the motor

to the spinning wire windings of the rotor inside the motor. Brushes consist of conductors.

Torque is produced by the principle of Lorentz force, which states that any current-carrying conductor placed within an external magnetic field experiences a force known as Lorentz force. The actual (Lorentz) force (and also torque since torque is $F \times l$ where l is rotor radius) is a function for rotor angle and so the green arrow/vector actually changes length/magnitude with angle known as torque ripple) Since this is a single phase two pole motor the commutator consists of a split ring. So that the current reverses each half turn. The brushed electric motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary magnets and rotating electrical magnets. Like all electric motors or generators, torque is produced by the principle of Lorentz force, which states that any current-carrying conductor placed within an external magnetic field experiences a torque or force known as Lorentz force. Advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed. Disadvantages are high maintenance and low life-span for high intensity uses

BATTERY

To do store energy, therefore to ensure flow of electricity when the sun is not shining, it is necessary to store some of the energy produced. The most obvious solution is to use batteries, which chemically store electric energy.

Batteries are groups of electro-chemical cells (devices that convert chemical energy to electrical energy connected in series. Battery cells are composed of two electrodes immersed in electrolyte solution which produce an electric current when a circuit is formed between them. The current is caused by reversible chemical reactions between the electrodes and the electrolyte within the cell. Batteries that are re-chargeable are called secondary or accumulator batteries. As the battery is being charged, electric energy is stored as chemical energy in the cells. When being discharged, the stored chemical energy is being removed from the battery and converted to electrical energy.



Fig : Battery

The batteries are used as a storage device for solar energy which can be further converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage, for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs, it is necessary that the overall system be optimized with respect to available energy and local demand pattern.

BATTERY MOUNTING

Once the motor was mounted needed to find a place for the battery to sit. As mentioned in the mounting the motor section, the base of the motor was facing the rear of the mower and would provide a solid mounting surface for the battery mount. To get the proper weight distribution I wanted to mount the battery as close as could to the back wheels. This would allow the handle bars to serve as a lever and allow the mower to easily pivot when on its back wheels. Using a piece of stainless steel purchased from a local scrap yard fabricated the battery mount. It started by placing the battery in the center of the square piece of stainless steel. Then marked the outline of the battery on to the steel. Next cut the corners to allow the

sides that extend beyond the battery to be folded up. After folding up all four sides welded them together for support. The battery fits tightly into the mount so no excess strapping is needed.

MECHANICAL ARRANGEMENTS

In the first phase we just considered only about the mechanical arrangements, which is responsible for rotating the cutter motor. For this the team members divided the work into two divisions. The mechanical arrangement & Programming suction

ANDROID PLATFORM

Android devices are powerful mobile computers and they become more and more popular smart phones used worldwide. They becomes more and more popular for software developers because of its powerful capabilities and open architecture, also it's based on the java programming language. Because Android uses the Java programming language getting started with the Android API is easy; the API is open and allows easy access to the hardware components. Android devices provide numerous communication interfaces like USB, Wi-Fi and Bluetooth, that can be used to connect to the robot. We think it is a great platform for a robotic system control, because it's much cheaper than any other ARM-based processing unit. We use android platform because it is the widest used in the word and runs the largest number of Smart phones worldwide.

Connectivity and Communication:

For the communication of the device with the cell phone or a mobile we are using the Bluetooth device. The Bluetooth device (HC-05) is attached to the device that receives the data from the mobile and also can transmit the data. Bluetooth: is a wireless communications protocol running at 2.4 GHz, with client-server architecture, suitable for forming personal area networks. It is designed for low power devices such as mobile phones. Bluetooth now comes as standard on the majority of

mobile phones, and desktop computers. It can be easily fitted with a module to allow Bluetooth communication. Bluetooth is the only appropriate communications protocol because there is no fear of getting the frequency interference. Bluetooth uses the MAC Address of the device. The Bluetooth gives the connectivity between two devices using their MAC Address.

System Explanation:

car using Bluetooth module HC-06 and 89c2051 microcontroller with your Here at this robot I have used a Bluetooth module to control the device via 2 DC motors. the robot is control by an android phone application Microcontroller used is AT89S51 from 8051 family to work in a serial communication UART mode the communication is configured on 9800bps to communicate it with the Bluetooth module. The Bluetooth module used is a HC-05 in smd package which works on a 3.3v and have a serial communication with any device connected to it the communication speed can be configured on various speed via AT Command. The BT module is a SPP supported profile so it can be connected easily to any module or phone. In this profile the data can be sent and receive to module. The BT module is connected to the RX pin of microcontroller. The L293D is a motor driver IC to operate the motors in any direction required dependent on the logic applied to the logic pins. A readymade compact size chassis I have used to avoid the chassis assembly the chassis contains 2 decks the lower is used for BO motors fitting the upper is used as a battery stack .on top the plate the board is mounted by screw fitting. A smart phone Android operated robot. Now here is a simple to control your robot/robo android Smartphone device. The controlling devices of the whole system are a microcontroller. Bluetooth module, DC motors are interfaced to the microcontroller. The data receive by the Bluetooth module from android smart phone is fed as input to the controller. The controller acts accordingly on the DC motor of the robot. The robot in the project can be made to move in all the four directions using the android phone. The direction of the robot is indicators using the LED indicators of Robot system.

Purpose

The purpose of our research is to provide simpler robot's hardware architecture but with powerful computational platforms so that device designer can focus on their research and tests instead of Bluetooth connection infrastructure. This simple architecture is also useful for educational robotics, because students can build their own robots with low cost and use them as platform for experiments in several courses. The main purpose of this project is to develop a remote user interface to control a robot via a wireless technology. There is a need to communicate with the robot remotely in order to control the robot movements and pass critical data both ways. Bluetooth communication will enable us to control the robot up to 10 meters without the need for direct sight which means that the robot could be located behind a wall or some other object and the communication would not be lost.

CONCLUSION

The project is more suitable for 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 a single smart phone. This will give much more physical relaxation to the people and can be easily handled. So it is much more suitable for grass cutting also. The project which we have done surely reaches the average families because the grass can be trimmed with minimum cost and with minimum time. Finally the project may give an inspiration to the people who can obtain better option.

