FULLY AUTOMATED SOLAR GRASS CUTTER

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ABSTRACT

This paper studies our grass cutter machine, a device that helps in cutting grass in any precise required cut hence assisting the consumer in saving time and money.

Keywords: Solar Energy, Grass Cutter, Free Energy Solar Device

INTRODUCTION

In the current generation, most of the countries do not have sufficient skilled manpower in the agriculture sector and it affects the growth of developing countries. So it's time to automate the agriculture sector to overcome this problem by using upgraded technology for cultivation activity. The basic operation of a solar grass cutter is to cut the grass without using any other source of energy other than the sun.

Pollution is a major issue for the whole world. Pollution is manmade and can be seen in their own homes. In case Gas/Petrol 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. So Solar-powered grass cutters are introduced.

It works on a simple mechanism of rotating blades continuously cutting the grass as the mower is propelled forward the grass cutter works on the principle of slicing action of the blades. The grass is cut above the ground surface without damaging the blades when it strikes an immovable object such as rock, stone.

OBJECTIVE

Existing automated lawnmowers each have a distinct working principle, for instance, the Robomow from Friendly Robotics (2011) requires the user to perform a onetime set up where the garden perimeter is set. The perimeter is set using a battery-powered wire that is laid around the outer edges of the garden and any area where the robot is not to cover. Special sensors inside Robomow enable the wires to be recognized and the robot is therefore kept within the designated area. The robot travels on the garden in a systematic criss-cross pattern, several times from side to side to ensure that the entire area is covered and that the grass is cut from different angles (Friendly Robotics, 2011). Other technologies work around a similar principle as the Robomow, in the sense that it requires a perimeter wire to limit its cutting area. A difference between them may be added features and the cutting pattern, for instance, the Lawn Bott and the Husqvarna both have a random operating principle (LawnBott 2011, p. 7 and 8), in the sense that they do not follow any specific cutting pattern.

1. To develop equipment which reduces physical efforts of farmer, human being
2. To develop equipment which reduces time of farmer or human being
3. To develop equipment which increase area cover of farm.
4. To maintain row spacing and controls seed and fertilizer rate.

PROBLEM STATEMENT

In day to day life, in the agriculture field, there is very much shortage of farm labour. Now, farm machinery is involved and spread out over the entire zone but they have certain geometrical, economical, flexibility limitation that is in the small, undeveloped, rural and small area application limitations exist. So need for multipurpose agricultural equipment take place. Solar grass cutter aims to reduce the physical efforts of consumer required for various agricultural and personal operations such as dribbling The Cotton bushes, soya bin bushes, solver vulgarism etc.

SOLAR ENERGY

Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic's, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.

Solar energy is a very large, inexhaustible source of energy. The power from the sun interrupted by the earth is approximately 1.8/10MW, which are many thousands of times larger than the present consumption rate on the earth of all energy sources.

The quantum of energy India's land area receive from the sun is equivalent to 15,000 times sits consumption requirement (500 billion kWh) as projected for 2004. In addition to its size, solar energy has two other factors in its favour. Firstly, unlike fossil fuels and nuclear power, it is an environmentally clean source of energy. Secondly, it is free and available in adequate quantities in almost all parts of the world people live. But there are some problems associated with it. The real challenge in utilizing solar energy is an off and economic concern.

One has to strive for the development of cheaper methods of collection and storage so that large initial investments required at preset in most applications are reduced, solar energy in India.A large amount of solar radiation falling on India and for most of the country very few days are without sunshine. India lies within the latitude of 7 N to and 37 N with an annual average intensity of solar radiation as500 to 600 cal/cm/day with more such insulations available in arid and semi-arid regions. The average solar radiation falling on India in arid and semiarid regions is 7.5 K w h/m/day. Solar energy 5× 10 K w h/year potential to meet the basic energy needs of teeming millions who live in rural India.

Solar energy is an important, clean, cheap and abundantly available renewable energy. The sun radiates heat and light. The heat, light received from the sun supports the environment on the earth through the following well known natural effects.

1. Temperature balance on the earth
2. Wind due to unequal heating of water, land surfaces.
3. Heating of ocean water: ocean thermal energy (OTEC)
4. Waves in ocean: ocean wave energy
5. Tides in ocean: ocean tidal energy (due to gravitational forces)

The sun produces an enormous amount of energy of heat and light through sustained nuclear fusion reactions. The solar energy received on the earth in the form of radiation is used for heating and producing electrical energy.

Among the non-conventional sources of energy solar energy is the most promising. Hence our project is based on the solar energy conversion to mechanical energy to run a normal grass cutter.

Principle of operation

A battery is a device that converts chemical energy directly to electrical energy. It consists of several voltaic cells; each voltaic cell consists of two half cells connected in series by a conductive electrolyte containing anions and cations. One half-cell includes electrolyte and the electrode to which anions (negatively charged ions) migrate, i.e., the anode or negative electrode; the other half-cell includes electrolyte and the electrode to which cations (positively charged ions) migrate, i.e., the cathode or positive electrode. In the redox reaction that powers the battery, cations are reduced (electrons are added) at the cathode, while anions are oxidized (electrons are removed) at the anode. The electrodes do not touch each other but are electrically connected by

the electrolyte. Some cells use two half-cells with different electrolytes. A separator between half cells allows ions to flow but prevents the mixing of the electrolytes.

Each half cell has an electromotive force (or emf), determined by its ability to drive electric current from the interior to the exterior of the cell. The net emf of the cell is the difference between the emf of its half-cells, as first recognized by Volta. Therefore, if the electrodes have demand, then the net emf is; in other words, the net emf is the difference between the reduction potentials of the half-reactions. The electrical driving force or across the terminals of a cell is known as the *terminal voltage (difference)* and is measured in volts. The terminal voltage of a cell that is neither charging nor discharging is called the open-circuit voltage and equals the emf of the cell. Because of internal resistance, the terminal voltage of a cell that is discharging is smaller in magnitude than the open-circuit voltage and the terminal voltage of a cell that is charging exceeds the open-circuit voltage. An ideal cell has negligible internal resistance, so it would maintain a constant terminal voltage until exhausted, then dropping to zero. If such a cell maintained 1.5 volts and stored a charge of one coulomb then on complete discharge it would perform 1.5 joules of work. In actual cells, the internal resistance increases under discharge, and the open-circuit voltage also decreases under discharge. If the voltage and resistance are plotted against time, the resulting graphs typically are a curve; the shape of the curve varies according to the chemistry and internal arrangement employed.

As stated above, the voltage developed across a cell's terminals depends on the energy release of the chemical reactions of its electrodes and electrolyte. Alkaline and carbon-zinc cells have different chemistries but approximately the same emf of 1.5 volts; likewise, NiCd and NiMH cells have different chemistries, but approximately the same emf of 1.2 volts. On the other hand, the high electrochemical potential changes in the reactions of lithium compounds give lithium cells emf of 3 volts or more.

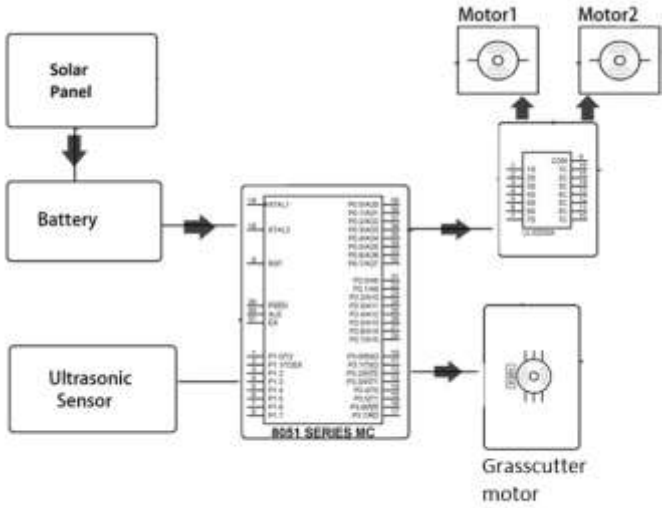

Fig. Block Diagram of Solar grass cutter

Hardware Requirements

1. BATTERY
2. Solar Panel
3. Cutter
4. Ultrasonic Sensor

5. VOLTAGE REGULATOR
6. MICRO CONTROLLER AT89S52
7. PUSH BUTTONS
8. Motor Driver L293D
9. DC MOTOR
10. RF MODULE
11. 1N4007
12. RESISTOR
13. CAPACITOR
14. LED'S

Photovoltaic Cells: Converting Photons to Electrons

Photovoltaic (PV) cells are made of special materials called semiconductors such as silicon, which is currently the most commonly used. When light strikes the cell, a certain portion of it is absorbed within the semiconductor material. This means that the energy of the absorbed light is transferred to the semiconductor. The energy knocks electrons loose, allowing them to flow freely. PV cells also all have one or more electric fields that act to force electrons freed by light absorption to flow in a certain direction. This flow of electrons is a current, and by placing metal contacts on the top and bottom of the PV cell, we can draw that current off to use externally. For example, the current can power a calculator. This current, together with the cell's voltage (which is a result of its built-in electric field or fields), defines the power (or wattage) that the solar cell can produce.

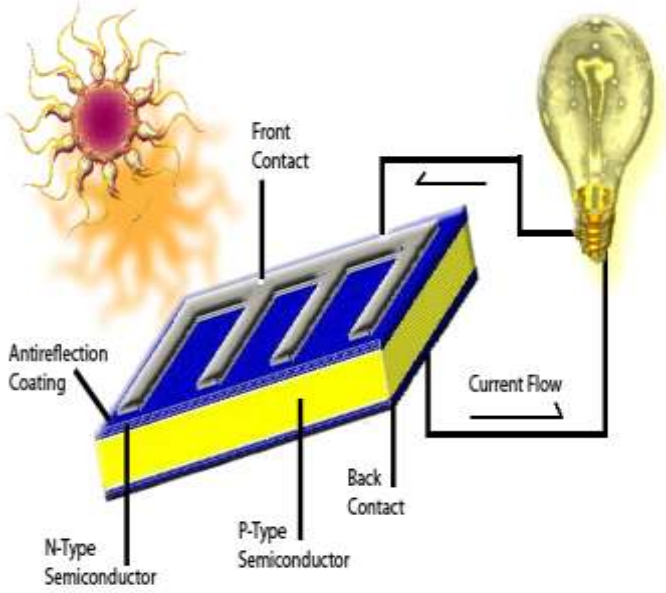

Fig. Converting Photons to Electrons

PHOTOVOLTAIC CELLS/SOLAR CELLS

How Solar Panels Work?

1. Rays of sunlight hit the solar panel (also known as photovoltaic/ (PV) cells) and are absorbed by semiconducting materials such as silicone.

2. Electrons are knocked loose from their atoms, which allow them to flow through the material to produce electricity. This process whereby light (photo) is converted into electricity (voltage) is called the photovoltaic (PV) effect.
3. An array of solar panels converts solar energy into DC (direct current) electricity.
4. The DC electricity then enters an inverter.
5. The inverter turns DC electricity into 120-volt AC (alternating current) electricity needed by home appliances.
6. The AC power enters the utility panel in the house.
7. The electricity (load) is then distributed to appliances or lights in the house.
8. When more solar energy is generated that what you're using - it can be stored in a battery as DC electricity. The battery will continue to supply your home with electricity in the event of a power blackout or at nighttime.
9. When the battery is full the excess electricity can be exported back into the utility grid if your system is connected to it.
10. Utility supplied electricity can also be drawn from the grid when not enough solar energy is produced and no excess energy is stored in the battery, i.e. at night or on cloudy days.
11. The flow of electricity in and out of the utility grid is measured by a utility meter, which spins backwards (when you are producing more energy than you need) and forward (when you require additional electricity from the utility company). The two are offset ensuring that you only pay for the additional energy you use from the utility company. Any surplus energy is sold back to the utility company. This system is referred to as "net-metering".

- Solar Energy is measured in kilowatt-hour. 1 kilowatt = 1000 watts.
- 1 kilowatt-hour (kWh) = the amount of electricity required to burn a 100 watt light bulb for 10 hours.
- According to the US Department of Energy, an average American household used approximately 866-kilowatt hours per month in 1999 costing them $70.68.
- About 30% of our total energy consumption is used to heat water.

THE SUN produces radiant energy by consuming hydrogen in nuclear fusion reactions. Solar energy is transmitted to the earth in portions of energy called photons, which interact with the earth's atmosphere and surface. It takes about 8 minutes and 20 seconds for the sun's energy to reach the earth.

THE EARTH receives and collects solar energy in the atmosphere, oceans, and plant life. Interactions between the sun's energy, the oceans, and the atmosphere, for example, create winds, which can produce electricity when directed through aerodynamically designed wind machines.

SOLAR PHOTOVOLTAIC CELLS convert solar radiation into electricity (photovoltaic literally means "light energy"; "photo" = light, "voltaic" = energy). Individual cells are packaged into modules, like the one shown at the right; groups of modules are called arrays. Photovoltaic arrays act like a battery when the sun is shining, producing a stream of direct current (DC)

electricity and sending it into the building or sharing it with the grid.

THE DC DISCONNECT SWITCH allows professional electricians to disconnect the photovoltaic array from the rest of the system. With the switch in the "off" position, workers can safely perform maintenance on other system components.

THE INVERTER converts direct current (DC) electricity generated by the array into alternating current (AC) electricity for use in the building. Most electrical loads (energy-consuming devices like lights, motors, computers, and air conditioners) in schools, homes and businesses use AC electricity.

THE TRANSFORMER ensures that the voltage of the electricity coming from the inverter is compatible with the voltage of the electricity in the building.

THE AC DISCONNECTdisconnect switch allows professional electricians to disconnect the building's electrical system from the solar photovoltaic system. With the AC disconnect switch in the "off" position, workers can safely perform maintenance on the solar photovoltaic system's components.

THE ELECTRIC METER keeps track of the amount of electrical energy produced by the solar photovoltaic system and sends electronic signals to the data acquisition system where they are recorded. Electrical energy is measured in kilowatt-hours. How much energy is contained in a kilowatt-hour? We're glad you asked. Use our calculator to find out.

Ultrasonic Sensor (Object detection)

Ultrasonic Sensor Module

Here is more easy use of the serial ultrasonic module. It will auto output the distance information via serial port after power-on, you don't need to do any trigger and calculated, just need to read the serial pin and get the distance information.

The ultrasonic sensor provides a very low-cost and easy method of distance measurement. This sensor is perfect for any number of applications that require you to perform measurements between moving or stationary objects. Naturally, robotics applications are very popular but you'll also find this product to be useful in security systems or as an infrared replacement if so desired. You will appreciate the activity status LED and the economic use of just one I/O pin.

The ultrasonic sensor measures distance using sonar; an ultrasonic (well above human hearing) pulse is transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return. The output from the ultrasonic sensor is a variable-width pulse that corresponds to the distance to the target.

MANUFACTURING TOOLS

The process of conversion of raw material in to finished products using the three resources as Man, machine and finished sub-components.

Manufacturing is the term by which we transform resource inputs to create Useful goods and services as outputs. Manufacturing can also be said as an intentional act of producing something useful. It s the phase after the design. Hence referring to the those values we will plan the various processes using the following machines:-

- Universal lathe
- Milling machine
- Grinding machine
- Power saw
- Drill machine
- Electric arc welding machine

SOFTWARE

Keil Micro Vision (Ide)

Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the µVision IDE sets all compiler, assembler, linker, and memory options for you.

Keil is a cross compiler. So first we have to understand the concept of compilers and cross compilers. After then we shall learn how to work with Keil.

TESTING

This test is performed just after the hardware soldering and configuration has been completed. This test aims at finding any electrical open paths in the circuit after the soldering. Many times, the electrical continuity in the

circuit is lost due to improper soldering, wrong and rough handling of the PCB, improper usage of the soldering iron, component failures and the presence of bugs in the circuit diagram. We use a multimeter to perform this test. We keep the multimeter in buzzer mode and connect the ground terminal of the multimeter to the ground. We connect both the terminals across the path that needs to be checked. If there is continuation then you will hear the beep sound.

COST ESTIMATION

Cost estimation may be defined as the process of forecasting the expenses that must be incurred to manufacture a product. These expenses take into consideration all expenditure involved in a design and manufacturing with all related services facilities such as pattern making, tool, making as well as a portion of the general administrative and selling costs.

PURPOSE OF COST ESTIMATING

• To determine the selling price of a product for a quotation or contract so as to ensure a reasonable profit to the company.

• Check the quotation supplied by vendors.

• Determine the most economical process or material to manufacture the product.

• To determine standards of production performance that may be used to control the cost.

Basically The Budget Estimation Is Of Two Tyres

• Material Cost Estimation

• Machining Cost

MATERIAL COST ESTIMATION

Material cost estimation gives the total amount required to collect the raw material which has to be processed or fabricated to desired size and functioning of the components.

CONCLUSION

In this paper the present work serves as Free energy solar grass cutting machine. By fabricating this project We have completed our project successfully with the available sources. But the results and modifications are not up to the expectations. Additional augmentations can be executed, by incorporating the following precise alterations to obtain better results.

The designs of blades are stationed subsequently depending upon the types of grass to be slit. Our project focuses on solar and minimum cost maintenance, which can be conveniently available and highly cost-efficient for an average family. Finally, this project may give inspiration to the people who can modify and can obtain better results.

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