

Automatic Solar Grass Cutter with GSM

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ABSTRACT

A Solar Powered Automatic Grass Cutting and Pesticide Spreading robot project is mainly proposal for reduce the manpower and usage of electricity. The automated solar grass cutter is an automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles using GSM system. Solar plate is used to provide the source to the battery charging. The system uses 12V batteries to power the vehicle movement motors as well as the grass cutter motor. The system control is done by the Arduino . Automation is achieved by using sensors and Arduino. Wheels and cutting operations are done using dc motors. It is also interfaced to an ultrasonic sensor for object detection. On obstacle detection the ultrasonic sensor monitors it and the Arduino thus stops the grass cutter motor to avoid any damage to the object/human/animal whatever it is. The Arduino moves the vehicle motors in forward direction in case no obstacle is detected. Arduino then turns the robotic as long as it gets clear of the object and then moves the grass cutter in forward direction again. This design is still in the prototype stage due to financial and time constraints.

Keywords : Solar Grass Cutter, GSM system, LCD, EEPROM

I. INTRODUCTION

The different types of grass cutters are available in market like, electrical grass cutter and gasoline grass cutter. In a gasoline grass cutter there is required a fuel for running a cutter and due to the engine it's produced gases so it increases pollution and also it has noisy operation. And electrical grass cutter is working on electricity though electrical motor. In electrical grass cutter used a single phase induction motor so it is required AC power. This cutter has supply through long wires so it is difficult to operate. Also due single phase induction motor the weight of the device is more so it is more difficult to operate. Also, a motor powered engine requires periodic maintenance such as changing the engine oil.

In our paper solar grass cutters have no moving parts and hence require little maintenance and work quite satisfactorily without any focusing device. It does not cause any environmental pollution like the fossil fuels and nuclear power. Solar cells last a longer time and have low running costs.

The system run with pre-programmed controller to operate minimum human involvement to done whole work within short period of time.

The main objects of this paper are:

1. Design of energy efficient mechanism using non-conventional energy resource.
2. Detection of obstacle using GSM system.
3. Cost effective solution

According to the Prof. George John [1] the project aims at fabricating a grass cutting machine system which makes the grass cutter motor running through solar energy. The “Solar Powered Grass Cutting Machine” is a robotic vehicle powered by solar energy that also avoids obstacles and is capable of automated grass cutting. The system uses 12V battery to power the vehicle movement motors as well as the grass cutter motor. A solar panel is used to charge the battery so that there is no need of charging it externally. The grass cutter and vehicle motors are interfaced to a microcontroller that controls the working of all the motors. It is also interfaced to an ultrasonic sensor for obstacle detection. The microcontroller moves the vehicle motors in forward direction in case no obstacle is detected. On obstacle detection the ultrasonic sensor monitors it and the microcontroller thus stops the grass cutter motor to avoid any damage to the object/human/animal whatever it is and it also provides an alarm. Microcontroller then turns the vehicle as long as it gets clear of the object and then moves the grass cutter in forward direction again otherwise it changes the direction.

To study by Prof. Yashit D. Tita [2] A Fully Automated Solar Grass Cutter is a device that uses blades to cut a grass at an even length. It is a very useful device which is very simple in construction. In this device power is delivered by the Solar Plate. Battery is used for storage the solar energy. We also use a solar panel to charge the battery so that there is no need of charging it externally. This device can be operated by Atmega8 microcontroller which drives all the motors of wheel. For avoid any human or a obstacles sensed by the Sensors. This device shows that how technology can be used to reduce human efforts as well as to efficiently utilize renewable sources of energy.

According to the Prof.B Venu [3] 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. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric solar grass are 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. Also, if the electric grass cutter is corded, mowing could prove to be problematic and dangerous. The prototype will also be will be charged from sun by using solar panels.

According to the Yuvraj Sahu [4] student Mechanical Department, MATS University Raipur. A robot that operates on an on-board, solar charged battery has been designed by the French manufacturer SN Eno. The Robo-Mower4 the capability of steering itself across a person’s lawn . This robot called the Atawa A34, uses built-in infrared sensors to avoid obstacles. This system uses wires buried beneath the surface of the ground to control it. It operates at a top speed of 21 ft/min. Robo-mower is a 12.5-pound solar-powered robotic lawn mower that cruise the yard continuously and silently, using an on-board computer and sensor to guide the device while it cuts the grass. Poulan Weed-Eater and its parent company A.B. Electrolux of Sweden, plan full production next year.

II. METHODOLOGY

2.1 Block Diagram

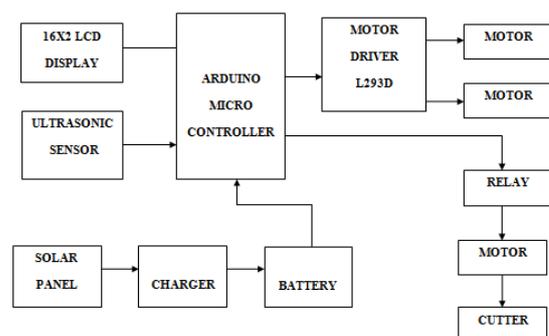


Figure 1. Block Diagram of system

The working of fully automated solar grass cutter, it has panels mounted in a particular arrangement at an angle of degrees in such a way that it can receive solar radiation with high intensity from the sun. This electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panels while batteries are charging. It also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging of batteries is low. The motor is connected through the motor driver IC which is controlled the motor performance. The power transmits to the mechanism and this makes the blade to rotate with high speed and this makes to cut the grass at an even height. The cutter and vehicle motor are controlled by Atmega8 microcontroller.

It is move the vehicle in forward direction. To avoid and protect the device from any human interaction or any large and/or small obstacles the ultrasonic sensor is used. The sensor is sensed in some maximum distance for example 1m, 2m, etc. it depends on which type sensors are used.

2.2 Hardware

Atmega 328 Controller: It has a low-power Atmel 8-bit AVR RISC-based microcontroller combines 8KB of programmable flash memory, 1KB of SRAM, 512B EEPROM, and a 6 to 8 channel 10-bit A/D converter. The device supports throughput of 16MIPS at 16-MHz and operate between 4.5-5.5 volts. In this controller 23 I/O programmable lines are available.

GSM Module: GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and

communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network.

Ultrasonic Sensor: An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

LCD (16X2): A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome.[1] LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Solar panel: The solar panel is charged through the sun radiations and it generates the power. There are mainly three type of solar panels are available in market like, monocrystalline, polycrystalline and thin film. Monocrystalline panel is more efficient than other so here this type of solar panel used. Monocrystalline panels are generally constructed from high quality silicon cell. In this device used solar panel in between ration of 12V and 240mA. This solar panel is

connected with the 12V battery through the solar battery charger.

Solar Charger: A solar charger employs solar energy to supply electricity to devices or charge batteries. They are generally portable. Solar chargers can charge lead acid or Ni-Cd battery banks up to 48 V and hundreds of ampere-hours (up to 4000 Ah) capacity. Such type of solar charger setups generally uses an intelligent charge controller. A series of solar cells are installed in a stationary location (ie: rooftops of homes, base-station locations on the ground etc.) and can be connected to a battery bank to store energy for off-peak usage. They can also be used in addition to mains-supply chargers for energy saving during the daytime.

Relay: A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Motor Driver: A motor drive, in the field of photography, is a powered film transport mechanism. Historically, film loading, advancing, and rewinding were all manually driven functions. The desires of professional photographers for more efficient shooting, particularly in sports and wildlife photography, and the desires of amateur and novice photographers for easier to use cameras both drove the development of automatic film transport. Some early developments were made with clockwork drives, but most development in the field has been in the direction of electrically driven transport.

DC Motors: Here the dc motors used are 12V brushless DC motors are running at 150RPM. 2 Motors are used to move the device in forward direction, per side one motor is used. So they work as a single unit. Another additional motor is placed at the front of the frame; this motor has blades as its propeller so that grass is cut when this motor turns on. The motors are controlled by the micro controller.

2.3 Software

- ✓ Arduino
- ✓ Embedded C
- ✓ Proteus Software

III. ADVANTAGES, APPLICATIONS AND FUTURE SCOPE

3.1 Advantages

- ✓ Energy management and conservation.
- ✓ No consummation of fuels.
- ✓ Battery better stability and efficiency in operation.
- ✓ Cost effective solution also has zero maintenance.
- ✓ And eco-friendly electric generator.
- ✓ The reduction in pollution by solar power.
- ✓ It is a natural energy source.

3.2 Applications

- ✓ Grass cutter.
- ✓ Improve gardening as well as electrically operated mechanism.
- ✓ In play grounds.
- ✓ In stadium and parks.
- ✓ For agriculture purpose

3.3 Future scope

- ✓ Efficiency can be improved by increasing the battery capacity.
- ✓ We are using this model in college campus.
- ✓ Implementing for gardening.
- ✓ Implementing for ground.

IV. CONCLUSION

This paper has presented the design and development of automatic solar grass cutter with GSM, Any object or obstacle detect by ultrasonic sensor and also cutting a grass by the blade which is connected with dc motor. This paper shows that how Atmega8 microcontroller controlled all action of DC motors and drives this device through a power which is generated by solar plate.

V. REFERENCES

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