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Automated Solar Grass Cutter: An Overview

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Abstract*: *Now days we are facing the problems of environmental pollution and power cut and many other problems. To overcome these problems we are using renewable energy source like solar energy, which is implemented in our project idea i.e. "Solar Grass Cutter". Due to continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated use of abundant solar energy from the sun as a source of power to drive grass cutter. The present technology commonly used for trimming the grass is by using the manually handled device. So, the aim of our project is to develop a portable solar operated grass cutting device. In this device solar panel is connected to the battery. Then this battery is connected to battery charger which stores the energy and hence, external supply is not needed. Further we have used BLDC (Brushless dc) motor with gear system in order to control the blade speed.

Keywords: - Solar energy, Solar grass cutter, BLDC etc.

I. INTRODUCTION

The project aims at fabricating a grass cutting machine system that makes grass cutter motor running through the solar energy. The 'solar powered grass cutting machine' is a robotic vehicle that is powered from solar energy which avoids hurdles or obstacles.

In this system we use the battery to power the vehicle movement motor and grass cutter motor. The solar panel is used to charge the battery along with battery charger, so that there is no need of charging it externally. The vehicle motor and grass cutter motor are interfaced to Arduinouno, which will control all working of motor. We have also used ultrasonic sensor which will detect the obstacles and it is also interfaced with Arduinouno. With the help of Arduinouno, the vehicle motor moves in forward direction, when there is no obstacle in its path. When obstacle is detected, it is sensed by the ultrasonic sensor and Arduinouno stops the grass cutter motor to avoid any damage. Hence, grass cutter changes its direction and continues to move.

II. LITERATURE SURVEY

Currently the grass cutting machine is being used in our college for cutting the grass on large amount and we've done a survey about that machine. The overall survey of that machine is as follow-

Initial cost – 4.5 lakhs

Labour cost- the machine can't run without the weight of a person on it. So it needs a worker to run it.

Fuel cost- the machine runs for about 8 hrs per day. The cost fuel i.e. of patrol / day is 73.58Rs so around 74 Rs. So for a day 10 litters per day so the per day cost of the fuel is 740 Rs/day

Maintenance cost –it needs the minor maintenance twice per year & it costs around 25000 Rs. If it requires the major maintenance then it costs around 50000 Rs and at that time it needs to be transported to the Pune, branch of that manufacturing company. It is so because the spare parts of that machine are not available here.

Here in our college, around 20 acres of area is having lawns. So the machine is in working condition all day and 365 days of year. But the machine can't work for more than 15 minutes continuously. So the machine needs to be worked after each 15 minutes break.

TABLE 1.LITERATURE SURVEY.

Sr.no.	Parameters	Cost per day (Rs.)	Cost per month (Rs.)	Cost per year (Rs.)
1.	Labour cost	250	7500	91,250
2.	Fuel cost	740	22,200	2,70,100

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III. METHODOLOGY

Coming to the working of solar powered grass cutter, it has panels mounted in a particular arrangement at an angle in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy. Now 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 in batteries is low. The motor is connected to the batteries through connecting wires .Between these two motor driver is provided. It starts and stops the working of the motor. From this motor, the power transmits to the mechanism and this makes the blade to rotate with high speed and this makes to cut the grass.

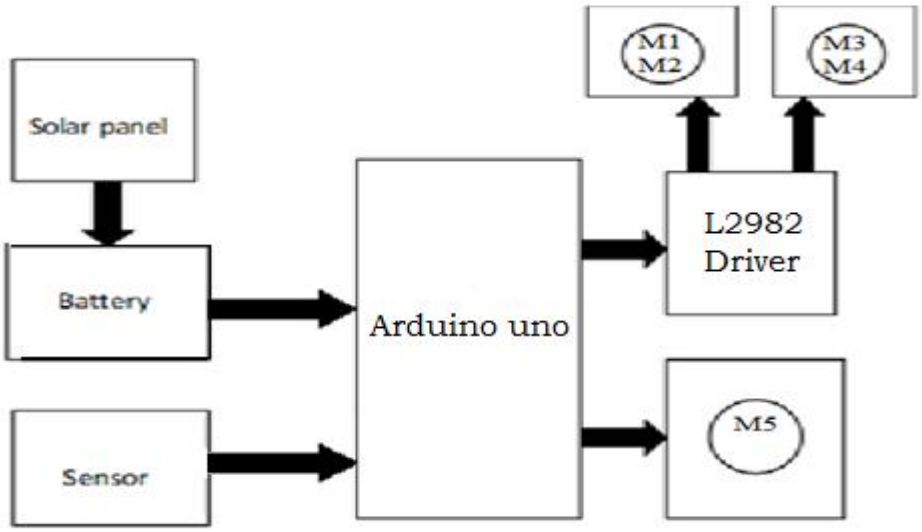

Fig.1. Block Diagram

A. The Above Block Diagram Shows a Complete View of The final Project Module

1) Source is driven from the solar energy using photovoltaic panel. This charges the battery and is utilized for powering operation of the system.
2) The system's control is done by the 8051 microcontroller.
3) Automation for object detection is achieved by using ultrasonic sensor and microcontroller.
4) Wheel movement and cutting operations are done using DC motors.
5) To achieve compatibility of microcontroller and the motors a L298 Driver circuit is used.
6) The driver circuit enhances the microcontroller's small output.
7) Toggle switch is used to select the mode of operation and DPDT switch for movement operations.
8) Wheels move when two motors are driven.

IV. COMPONENTS ATTACHMENTS IN PROJECT

A. Solar Panel

Solar energy is an important, clean, cheap and easily available renewable energy source. The sun radiates heat and light. The sun produces enormous amount of energy of heat and light through sustained radiations. The solar energy received on the earth in the form of radiation is used for heating and producing an 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. It's easy to capture and store the energy freely provided by the sun in a battery. Because it only requires a minimum of equipment, you'll be able to have safe and clean power wherever you need it

B. Battery

Depending on the size of the battery, it will usually take a minimum of 5-8 hours to charge a dead battery from a solar panel that produces 1 Amp of current. In order to most effectively charge a battery with a solar panel, you need to maximize the amount of current by keeping the panel pointed directly at the sun.

C. Charge Controller:

For smaller systems, a charge controller is not necessary, but the relatively inexpensive cost more than justifies the added performance and protection. These units will automatically disconnect the battery from the solar panel once the battery is fully charged.

D. Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P (data sheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

E. 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. As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves.

F. Motors

1) *BLDC Motor :*In order to make the operation more reliable, more efficient, and less noisy the recent trend has been to use brushless D.C (BLDC) motors. They are also lighter compared to brushed motors with the same power output. The brushed D.C motor should never be used for operations that demand long life and reliability. For this reason, BLDC motors are used in most of the modern devices. Efficiency of a BLDC motor is typically around 85-90%, whereas the conventional brushed motors are only 75-80% efficient. BLDC motors are also suitable for high speed applications. The BLDC motors are also well known for their better speed control.
2) *Wheels:* A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the main components for a device to propel in forward direction. Wheels, in conjunction with axels, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines. A Wheel greatly reduces friction by facilitating motion by rolling together with the use of axels. In order to rotate the wheels, a movement needs to be applied to the wheel about its axis, either by way of force or torque. For this project we are using 4 wheels for the propulsion of the device, so that the device will move properly.

TABLE 2
SPECIFICATIONS OF COMPONENTS

Sr. No.	Components	Specifications
1.	Solar Panel	12v,20w
2.	Battery	10 Ah, 12v, 2 Qty
3.	Ardunio Uno	ATMEGA-328
4.	Ultrasonic Sensor	LH45H2.
5.	Motor- 1. BLDC 2. DC	7000rpm, 1 Qty 300rpm, 4 Qty
6.	Driver	L2982

V. APPLICATIONS

*A.*It can be used in gardens for cutting the grass evenly.
*B.*Also it can be used in College Campus.
C. It is useful in Lawns.
D. It can be efficiently used in Agriculture areas.
*E.*It can used for cutting the grass of particular area of play grounds. e.g:-cricket, football playgrounds etc.

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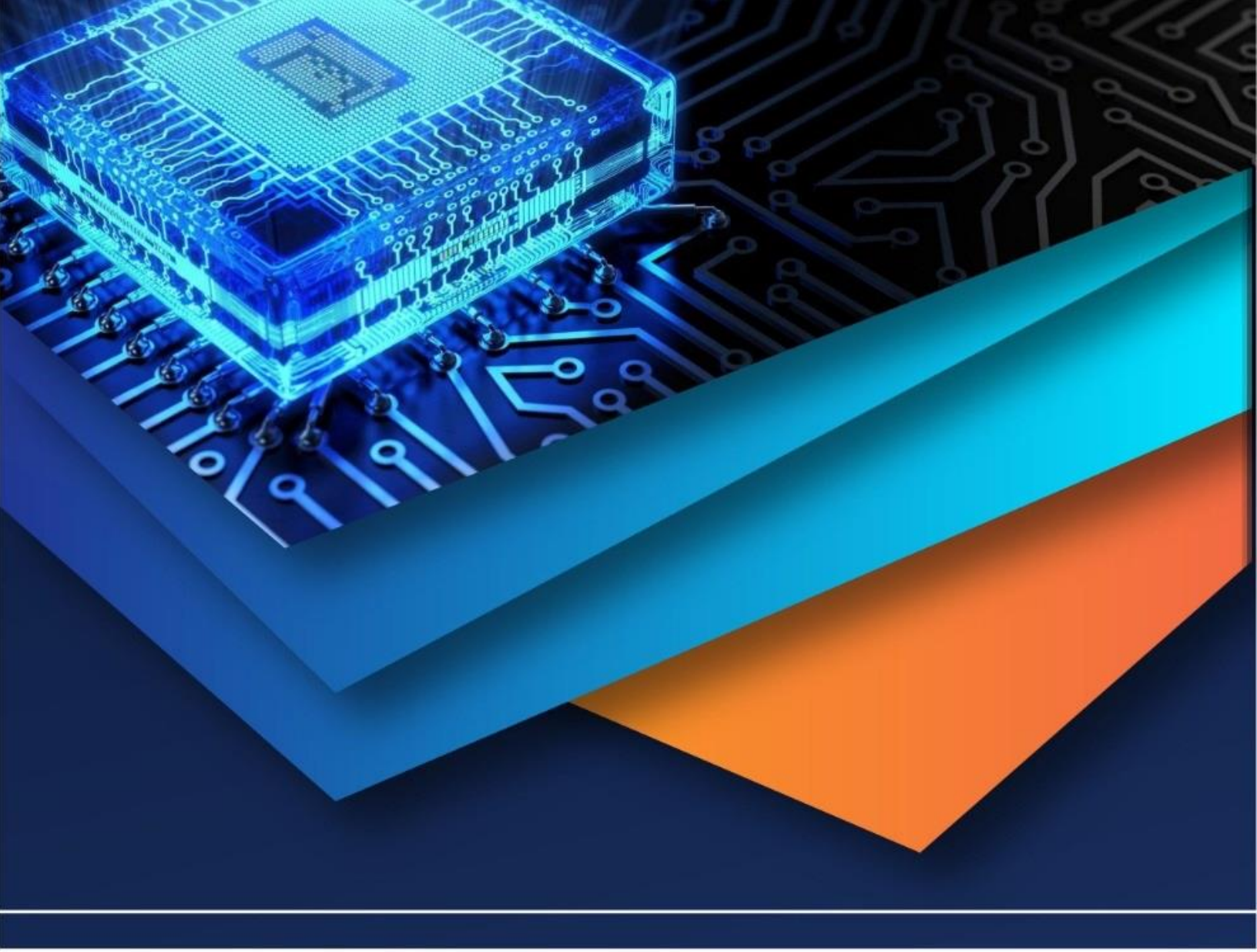

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