

Survey on Solar Powered Lawn Mower Robot

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ABSTRACT

The Solar Powered Lawn Mower Robot is a grass cutting robotic vehicle powered by solar energy. Operated by RF remote. The system uses 12V battery to power the vehicle movement motors as well as the grass cutter motor. We can charge the battery either solar energy or by electric power, we have given both option to charge battery. The grass cutter and vehicle motors are interfaced to an ATmega328 microcontroller that controls the working of all the motors. It is also interfaced to 433MHz RF receiver module for receiving signals from remote. The microcontroller moves the vehicle motors in forward, reverse, left and right direction with the help of RF remote. A lawn mower/ Grass cutting machine is a machine that uses a revolving blade or blades to cut a lawn grass. 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.

Keywords : RF Remote, ATmega328, Solar Panel, Grass Cutter, Battery.

I. INTRODUCTION

From time immemorial, the sun has been the prime source of energy for life on earth. The solar energy was being used directly for purposes like drying clothes, curing agricultural produce, preserving food articles, etc. Even today, the energy we derive from fuel-wood, petroleum, paraffin, hydroelectricity and even our food originates indirectly from sun. Solar energy is virtually inexhaustible. The total energy we receive from the sun far exceeds our energy demands. Ever since the industrial revolutions human have been dependent on fuels, electricity and wind energy. For human development in many countries there is research and trials are going on the Solar energy and the wind energy, So we make our new concept solar powered grass cutting. In these concept we cut grass in lawns and gardens. Remote controlled grass cutter can be described as the application of IR technology

to operate a machine on which electric motor rotates which in turn rotates a blade which does the mowing of a grass. The design objective is to come up with the principle of solar powered grass cutting machine. Since manual grass cutting machines are very hectic to operate and electric mowers are subject to availability of electricity and thus limited working range, this project demonstrates the concept of automatic grass cutting machine which can be operated using the remote control. The designed grass cutter comprises of direct current (D.C) motor, a rechargeable battery, solar panel, cutting mechanism and an electronic circuit. Grass cutting is achieved by the D.C motor which provides the required torque needed to drive the cutting blade which is coupled to the shaft of the D.C motor. The grass cutter is operated wirelessly from a distance using the remote control provided. The remote designed has the facility for switching on and of the cutter using a switch on a

remote. The remote is also used to control the direction of travel of the machine and control its navigation.

II. HARDWARE REQUIREMENT

- ATmega328 Microcontroller
- Solar Panel 10 Watt
- Motor Driver IC L298
- DC Gear Motors 60 RPM
- 433 MHz Tx/Rx Module

III. COMPONENTS DESCRIPTION

a) DC Gear Motor



Fig. 2 DC Gear Motor

The motors are used for the movement of the robotic vehicle, which are of DC gear motors operated at 12V DC power supply. 4 motors have been used to rotate the two wheels clockwise or anticlockwise. This provides motion to the robot. Motors are arranged in a fashion called H-Bridge. H-Bridge is an electronic circuit which enables a voltage to be applied across a load in either direction. It allows a circuit full control over a standard electric DC motor. That is, with an H-bridge, a microcontroller, logic chip, or remote control can electronically command the motor to go forward, reverse, left, right and stop. A geared DC Motor has a gear assembly attached to the motor. The speed of engine is included as far as pivots of the pole every moment and is named as RPM. The rigging get together aides in expanding the torque and decreasing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where

gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will investigate all the minor and significant subtleties that make the rigging head and subsequently the working of equipped DC engine.

b) 433MHz RF Module



Fig. 3 RF Module

RF Communication Module

RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength. Frequency is measured in Hertz (cycles per second) and radio frequencies are measured in kilohertz (KHz or thousands of cycles per second), megahertz (MHz or millions of cycles per second) and gigahertz (GHz or billions of cycles per second). Higher frequencies result in shorter wavelengths. The wavelength for a 900 MHz device is longer than that of a 2.4 GHz device. When all is said in done, signals with longer frequencies travel a more noteworthy separation and infiltrate through, and around objects superior to signals with shorter frequencies.

c) Solar Panel



Fig. 4 Solar Panel

A solar panel is a set of solar photovoltaic module electrically connected. A photovoltaic module is

packaged, connected assembly of solar cells. The solar panel can be used as component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its dc output power under standard test conditions (etc) and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module.

A solitary sun oriented module can create just a constrained measure of intensity, most establishments contain various modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar track and sometimes a battery and/ or solar tracked and interconnection wiring.

Photovoltaic Principles

The photo voltaic effect can be observed in nature in variety of materials that have shown best performance in sun light is the semiconductors as stated above. When the photons from the sun absorbed in a semiconductor, that creates free electron with higher energies then the created there must be an electric field to induce these higher energy electrons to flow out of the semi-conductor to do useful work. A junction of materials, which have different electrical properties, provides the electric field in most solar cells for the photo interaction in a semiconductor.

d) Grass Cutter

The grass cutter is made up of an electrical motor, linear blade, and a link mechanism. The electric motor forms the heart of machine and provides the driving force for the driving blades. This is achieved by the combined effect of mechanical action of the cutting blades and the forward thrust of the mower. The system is powered by an electrical switch which completes the circuit comprise the electrical motor and the battery. Solar power as an energy source will address a number of issues that slandered internal combustion engines do not. 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 grass cutter is a device which by mean of one or more revolving blades issued to grass cut or other plants. Grass cutter employing a blade that rotates about a vertical axis is rotary mower.

e) Battery

Solar cell module produces electricity only when the sun is shining. They do not store energy. It is necessary to store some of the energy produced. The most obvious solution is to use batteries. 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 only technically and batteries are high in capital costs. It is necessary that the overall system must be optimized with respect to available energy and local demand pattern. Once the blade is mounted we searched for placing battery to sit. As it is moves attached to the

f) Microcontroller (ATmega328)

The superior Atmel 8-piece AVR RISC-based microcontroller consolidates 32KB ISP streak memory with read-while-compose capacities, 1KB EEPROM, 2KB SRAM, 23 universally useful I/O lines, 32 broadly useful working registers, three adaptable clock/counters with look at modes, inner and outside intrudes on, sequential programmable USART, a byte-situated 2-wire sequential interface, SPI sequential port, 6-channel 10-piece A/D converter (8-diverts in TQFP and QFN/MLF bundles), programmable guard dog clock with inward oscillator, and five programming selectable force sparing modes. The gadget works between 1.8-5.5 volts. By executing amazing guidelines in a solitary clock cycle, the gadget accomplishes throughputs moving toward 1

MIPS for each MHz, adjusting power utilization and handling speed.

IV. SOFTWARE COMMUNICATION

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an *.inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library considers sequential correspondence on any of the Uno's advanced pins. The ATmega328 likewise support I2C (TWI) and SPI correspondence. The Arduino programming incorporates a Wire library to rearrange utilization of the I2C transport; see the documentation for subtleties. To utilize the SPI correspondence, if it's not too much trouble see the ATmega328 datasheet.

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