Smart Solar Grass Cutter Robot

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ABSTRACT

Today, we know that solar energy is a renewable source of energy. And the fossils fuel may not be available in the future and it also pollutes to our environment. So we have to use, one of the most promising source of energy where everyone focusing on the concept of solar power and its utilization. Smartly grass cutting robot detects obstacles by the ultrasonic sensor with servo in wide range for avoiding obstacles without any need of human interaction. All the motors, sensors and cutting operation are automatically controlled by the Arduino and manually by Bluetooth module. And the cutting operation is performed by single metallic thread which is operated by DC motor (10000 rpm). Cutting robot batteries charged by a charging dock which is located in the ground separately. Charging dock is attached with the Solar panel and charging controller.

KEYWORDS: *Metallic thread, Solar Panel, DC Motors, Arduino, Sensors.*

1. INTRODUCTION

Smart solar grass cutter robots have become very popular today. Grass cutter robot is used for autonomous grass trimming. In a time where technology with environmental awareness, machines are looking for relief of their own carbon footprints. So, we prepared a model of the automatic grass cutting robot operates through solar energy, (non renewable energy. This robot reduces environmental pollution. In this robot, the powering a grass cutter by solar energy rather than the fuel energy is mainly environmentally. The gardener used hand scissors to cut and maintain lawn regularly which also takes more time. It is very difficult to maintain uniformity. But the unskilled gardener can be easily operate the solar grass cutter.

2. LITERATURE SURVEY

G. Rahul portrays the use of solar energy to start an electric motor which turns a blade which does the cutting grass. Bhosale Swapnil ,Khadake Sagar explained that the smart solar grass is automatic for the purpose of grass cutting. The system is driven by the solar energy by using solar panel and store the voltage and current in battery. The programmed grass cutting machine is structured utilizing photovoltaic source and engine speed control. Ms. Yogita D. Ambekar, Mr. Abhishek U. Ghate make the grass cutter which operates on solar energy hence save the electricity and reduces manpower. P.Amrutesh, B.Sagar, B.Venu proposed smart solar grass cutter system in uses of sliding blades to cut a lawn at an even length.

3. METHODOLOGY

I.   Block Diagram consist of following components:
1. Arduino UNO
2. Ultrasonic sensors
3. DC Gear Motor
4. 775 DC Motor for cutting
5. L298N Motor driver
6. Two (6 volt) Batteries
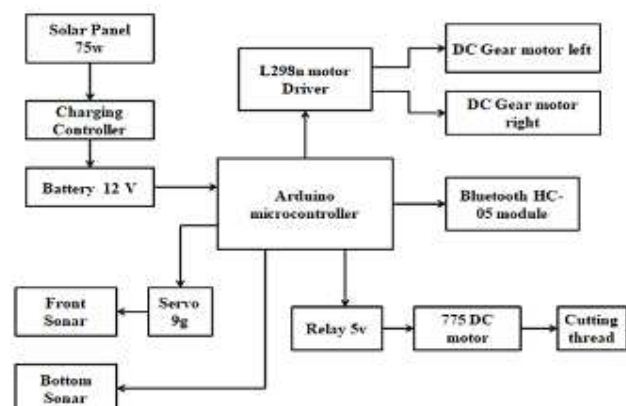7. Solar panel 75 Watt
8. Bluetooth module HC-05

Fig. Block Diagram

II. Block Diagram Description

1. Arduino uno

Arduino is a gadget which is utilized for hardware ventures. Arduino comprises a programmable circuit board (microcontroller) and a bit of programming, or IDE (Integrated Development Environment) that keeps running in the PC. It used to compose and transfer computer code to the programming board. Board requires +5v for working legitimately. It gives 20mA current.

Fig. Arduino UNO

2. Ultrasonic Sensor

The ultrasonic sensor uses ultrasonic sound to measure the distance of an object. It furnishes non-contact remove recognition with high exactness and stability in readings from 2 cm to 400 cm. Its working isn't influenced by daylight. It comes with ultrasonic transmitter (trig) and receiver (echo) for measuring distance.

Fig. Ultrasonic sensor

3. DC Gear Motors (100 rpm)

There are 4 Gear DC 12volt motors are used for movement of the wheel. The speed of the gear motor is 100 rpm on load. These Motors are driven by the motor driver L298n module. Motors require more current for work properly so this IC is used. It increases current up to 480mA.

Fig. DC Gear motor

4. 775 DC Motor (10000 rpm)

775 DC motor is used for cutting operation of the grass. It is operates on 12 volt and 2.68 Amps on DC supply. This motor has more Speed than the other DC gear motors. These Motor has speed of about 10000 rpm. Metallic thread is attached to the motor for cutting the grass. And it controlled by the relay which is trigger by the help of arduino.

Fig. 775 DC motor

5. L298N Motor driver

The L298N motor driver is a H-Bridge motor driver which provides speed and direction control of two DC motors at the same time. The driver module can drive DC motors that have voltages between 5 and 35V, with a max. current up to 3A. We can control the speed of the DC motor by controlling the supply voltage to the motor and it is done by using PWM signal. The module has two terminal pin for the motor 1 and 2, and another terminal pin for the Ground pin, the VCC pin which gives input or output 5V.

Fig. L298n Driver module

6. Batteries

Solar panel produces electricity in the day light only. It is not store energy. So, it is require to store the electricity produced. So we use batteries (6 volt each) to store electrical energy generated by the solar panel. It is also used for the powering operation system. The 6 volt batteries are connected in series for 12 volt DC supply. And it charged on the charging dock through charging socket and charging dock is connected with solar panel and charging controller.

Fig. Battery

7. Solar panel

A solar panel is a solar photovoltaic cell which is produces electricity in the sun light. Solar energy is converter through solar panel into electricity. It generates voltage upto 21 volt and 4.34 Amps. Specification of the panel is 75 watt and 17 volt on load. The solar panel is attached by the charging dock and connected with charging controller which controls the voltage and current for charging the batteries.

Fig. Solar panel

8. Bluetooth Module

Bluetooth module HC-05 is a module which is use for providing serials data to microprocessor (Arduino) through wirelessly. It can be used in a master configuration and slave configuration. We can use it for controlling the robot manually for return back into charging Dock for charging the batteries. Range of HC-05 module is 100 meters approx.

Fig. Bluetooth module HC-05

III. Software Description
1. Switch ON the Robot.
2. Arduino, Sensors, Motor driver, Bluetooth module and Relay are powering ON and commands are sending to all the components from Arduino.
1. Robot is detach by the Charging Dock and move straight and **Bottom Sonar** check the ground surface if the ground surface is less the 7cm then the relay is switching ON and it starts the cutting motor.
2. Robot moves forward if any obstacle infront of the robot then it stop and take reverse 10cm.

3. After that the **front ultrasonic sensor** is mounted on the servo motor. It moves left direction and the ultrasonic sensor measure the distance as well as right direction distance is also measure.
4. Then both the distance are compare then which one is maximum robot take turn at that direction.
5. **Bottom ultrasonic sensor** detects the ground surface. If the robot lifted up then the relay switching OFF and the cutter stop rotating so it prevent the accident.
6. **Bluetooth module HC-05** controls the robot when the trimming is completed then it is return back to the charging dock for charging the battery. So the robot is manually operated by the Smart phone through Bluetooth wirelessly for reaching the robot at the charging dock.

4. CONCLUSION
Our Robot is a fully automatic and artificial intelligently operated robot and modification in the charging the batteries by separate charging dock. Charging Dock is attached to solar panel and charging controller. Charging of the batteries are completed into 1 hour in day light. Robot is working continuously 2 hours. Robot operates automatically and also manually through wirelessly. Range of wireless is 100 meter approx. Robot are using metallic thread cutter technology (2mm thick). It has a safety feature also.

So, it provides a regular size trimming of grass by the automatic function without any human interfere. It is a futuristic robot which works without taking of any non-renewable energy source and human effort.

5. REFERENCES
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