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Automatic Solar Grass Cutter Using Arduino Uno

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ABSTRACT: In today's world where now renewable sources like petrol, diesel, coal are decreases day by day, so we've got to appear forward to other renewable sources of energy. Sun is that the good source of energy. because of the continual increase within the cost of fuel and also the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated the utilization of the abundant solar power from the sun as a source of power to drive a lawn tool. Cutting the grass cannot be easily done by previously used 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, an engine powered from motor requires periodic maintenance such as changing the engine oil. The prototype will be charged from sun by using solar panels. A solar powered mower was designed and developed, supported the final principle of mowing. The designed solar powered lawnmower comprises of electrical energy (D.C) motor, a chargeable battery, electrical device, a stainless-steel blade and control switch. Mowing is achieved by the D.C motor which provides the specified torque needed to drive the stainless-steel blade which is directly coupled to the shaft of the D.C motor. The battery recharges through the solar charging controller. The prototype is charged from sun by using solar panels

KEYWORDS: Solar Panel,Mower, Sensor, DC Motor, Robo

I.INTRODUCTION

In today's world pollution is a major issue for all[1]. Pollution may be manmade and may be seen in own homes. Just in case Gas powered lawn mowers because of the emission of gases it's accountable for pollution, Also the price of fuel is increasing hence it's not efficient, that the Solar powered grass cutters are introduced[2][3]. Solar powered garden tool is often described because the application of solar power to power an electrical motor which successively rotates a blade which does the mowing of a lawn[4]. But the value of these grass cutters is high. But in our automatic solar grass cutter we have used a rechargeable battery. Grass cutter robot is employed for autonomous grass trimming[5]. in a very time where technology with environmental awareness, machines are searching for relief of their own carbon footprints. So, we prepared a model of the automated grass cutting robot operates through alternative energy, (non-renewable energy[6]. This robot reduces environmental pollution. during this robot, the powering a grass cutter by alternative energy instead of the fuel energy is especially environmentally. The gardener used hand scissors to chop and maintainlawn regularly which also takes longer. it's very difficult to take care of uniformity. But the unskilled gardener is easily Operate the solar grass cutter.

II.LITERATURE REVIEW

G. Rahul portrays the utilization of alternative energy (that is solar energy) to start an electrical motor which turns a blade which does the cutting grass. Bhosale Swapnil, Khadake Sagar explained that the smart solar grass is automatic for the aim of grass cutting. The system is driven by the solar power by using solar battery and store the voltage and current in battery. The programmed grass cutting machine is structured to utilizing alternative source of energy (that is photovoltaic source) and engine speed control. Ms. Yogita D. Ambekar, Mr. Abhishek U.Ghate make the grass cutter which operates on solar power hence save the electricity and helps to reduces manpower. P.Amrutesh, B.Sagar, B.Venu proposed an idea about smart solar grass cutter system which uses of sliding blades to chop a lawn at fair length.[5]
The comparative study of pros and cons of solar powered automatic grass cutter and traditional grass cutter is presented in Table 1.

Table1: Comparison between Conventional and Solar basedGrass Cutter

Sr no.	Parameter	Automatic Solar Powered Grass Cutter	Conventional Grass cutter
1	Pollution	Doesn't cause pollution	Cause pollution
2	Fuel	Not required	Required
3	Operating Cost	Low	High
4	Load Carrying Capacity	Low	High
5	Man Power	Not required	Required
6	Installation Cost	Little bit costlier	Cheaper

III.METHODOLOGY

The device consists of Arduino UNO microcontroller, Ultrasonic sensor, and a Solar powered system. By Connecting these elements in necessary format, we get our desired system structure[7]. The Ultrasonic sensors works because the eyes of the device, to produce the specified power to the device we use the battery and to charge the battery we mount solar array at the highest of the device[8]. The battery supplies the energy to the components and in step with the commands the motor moves. And this machine will remove the hurdles on its way. The system doesn't require any human interaction for the operation of the system. Once the input is provided it'll all work by itself and because the area is roofed it'll stop by its own[7][9].
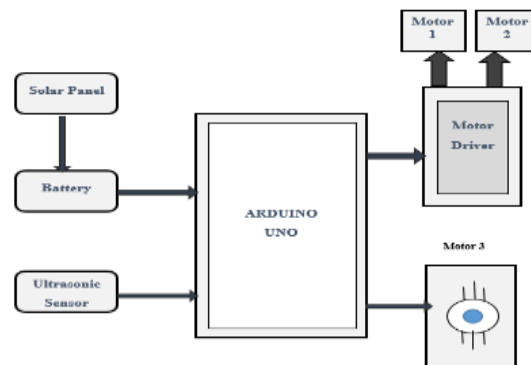

Fig1. Block Diagram of Automatic Solar Grass Cutter

IV. COMPONENT DESCRIPTON

A. Microcontroller

We have used Arduino Uno microcontroller boardwhich is generally based on the ATmega328P. It consist 14 digital input/output pins out of which 6 can be used as PWM outputs, 6 analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button also provided.
Arduino UNO contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to start. The word "Uno" which means "one" in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino[10].
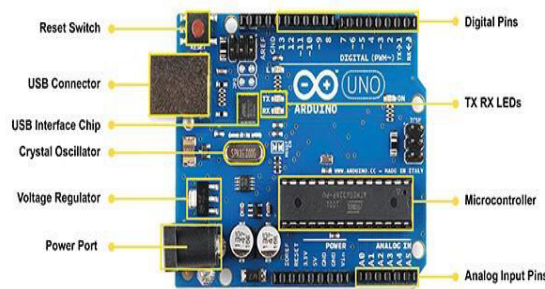
Fig2. Arduino UNO

B. Ultrasonic Sensor

Ultrasonic sensor is a device which uses electrical energy to generate ultrasound waves, and which also converts ultrasound vibrational energy back into the electrical signals. A barium titanate transducer applying piezoelectric effect is generally used in ultrasound switches[11]. The shape might be a disk or a tube.

Ultrasonic sensors are used to detect movement of targets and measure the distance to them. In many automated factories and process plants ultrasonic sensors are used. Sensors can have an on or off digital output for the purpose of detecting the movement of objects, or an analogue output proportional to distance. The ultrasonic sensor can sense the edge of material as part of a web guiding system. Ultrasonic sensors are widely used in cars as parking sensors to support the driver in reversing into parking spaces[12].

The ultrasonic sensors are being tested for a number of other automotive uses including ultrasonic people detection and assisting in autonomous UAV navigation[13]. Because ultrasonic sensors use sound instead of light for detection, they work in applications where photoelectric sensors can't. Ultrasonic are a great solution for the purpose of clear object detection, clear label detection and for liquid level measurement, applications that photoelectric struggle with because of target translucence. As well, target colour and or reflectance do not affect ultrasonic sensors, which can operate reliably in high-glare environments

Fig 3. Ultrasonic Sensor

C. Solar Panel

A solar panel is a photovoltaic cell which produces electricity it puts in the sun light[13]. Solar panel refers to a panel which is designed to soak up the sun's rays as a source of energy for generating electricity or heating, single solar module can produce only limited amount of energy. Most installations contain multiple modules. The panel is attached by the charging dock and connected with charging controller which controls the voltage and current for charging the batteries[14][15].

Fig 4. Solar Panel

D.   DC Motor

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

DC motor is employed for cutting operation of the grass. It's operates on 12 volt and 2.68 Amps on DC supply. This motor has more Speed than the other type of DC gear motors. These Motor has speed of about 4000 rpm. Metallic blade is attached to the motor for cutting the grass. And it controlled by the relaywhich is triggered by the Arduino.

Fig 5, DC Motor

E.   Batteries

Solar panel produces electricity only in the day light. It's not stored the energy. So, it's required to store the electricity produced. So, we use Lithium-Ion Battery to provide the power for the rotation of the Motors, the specifications of the Battery are 12V voltage and 2amp ampere hours.

Fig 6: Battery

V. RESULT

An Automatic Solar Grass cutter based on solar has been manufactured successfully and can be used for cutting the grass Thus the project has been successfully designed and tested. This Grass Cutter will meet the requirement of environmental production and low cost of operation as there is no cost for fuelling. The grass cutter works automatically since of controlling mechanism. With the help of ultrasonic sensor, the obstacle is also detected.

A test has been conducted to test on the operating hours of the fully charged prototype and charging time. It can be seen that there are different results which are depending on the unpredictable factor such as the weather, Due to the high intensity of the sunlight, the grass cutter may take the power direct from rather than the battery which led to extend the operating time. Other than that, the charging time of battery is affected by the intensity of the sunlight. If, light intensity of the sun is High than it might lead to less charging time. However, the battery used in robot also can be considered as one of the factors. For example, the drained battery which is 10% capacity might take longer charging time compared to 30% capacity battery. Based upon the theoretical value, the total time for 12V 4.5 Ah battery to be fully charge is 8.43 hours. In conclusion, the entitled prototype is taking shorter time to fully recharged according to the of experiment as shown in Table. Therefore, The Automatic Solar Grass Cutter can be a practical replacement the conventional grass cutter

VI. ADVANTAGES

- No long wires required.
- Compact Design and easily Moveable
- No Fuel required
- Less maintenance
- Very economical
- Anyone can operate
- Eco-friendly
- Pollution free

VII. APPLICATIONS

- Farms
- Gardens
- Stadiums
- College grounds
- Lawns and many more

VIII. CONCLUSION

Our project entitled The Automatic Solar grass cutter is successfully completed and the results obtained are satisfactory. It will be easier for the people who will take the project for the further modifications. This project is more suitable for a standard man as it is having much more advantages i.e., no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components and this can be operated by using solar energy. Our robot is an automatic and works on solar energy. Charging of the battery is requires about five to six hours in daylight. Once battery is fully charged, robot can run continuously for hours. It is a futuristic robot which works without taking of any conventional energy (like petrol, diesel) source and human efforts.
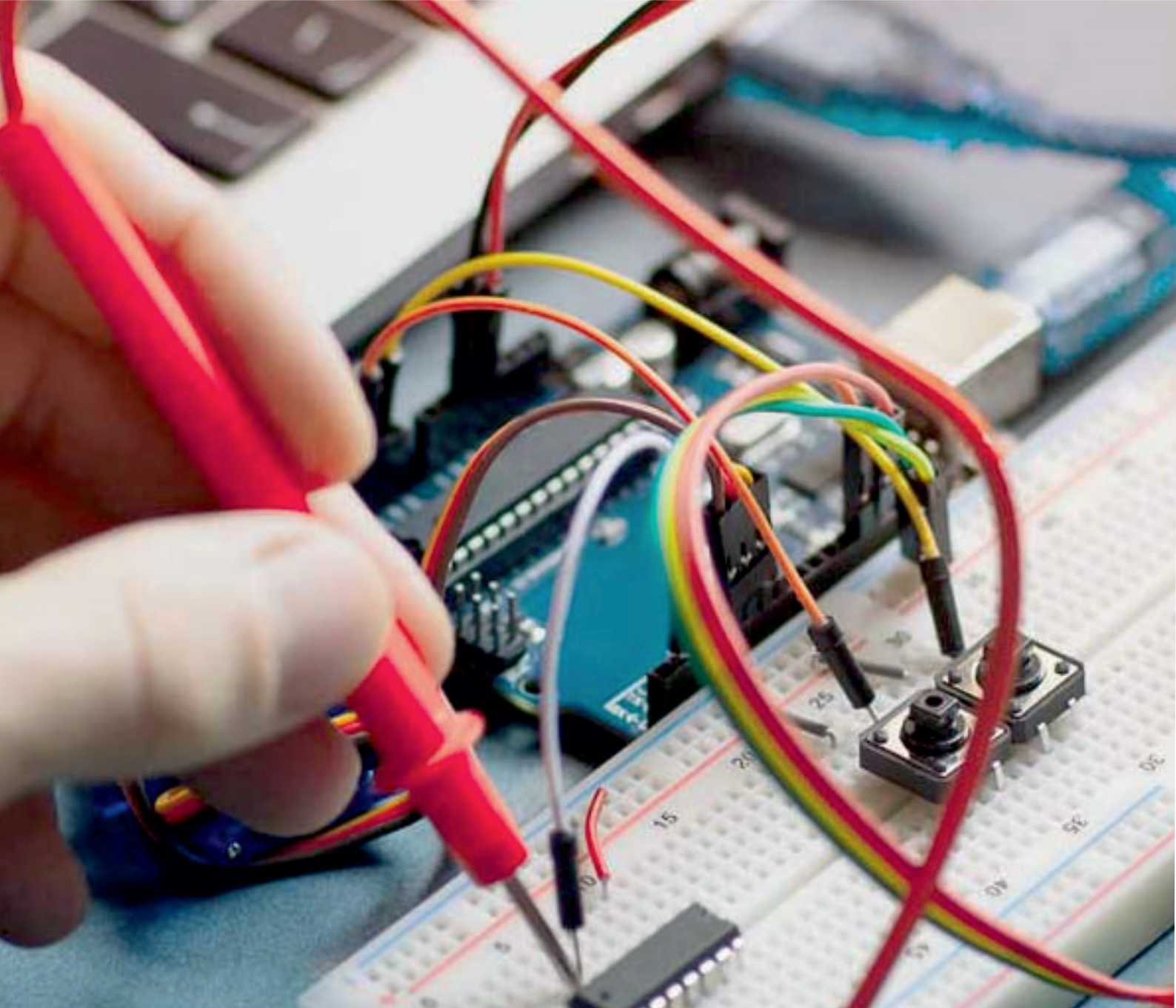
REFERENCES

[1]   S. P. Jena, S. K. Acharya, and S. K. Behera, "Structure of a smart grass cutter based on solar power," *Int. J. Innov. Technol. Explor. Eng.*, vol. 8, no. 11 Special Issue, pp. 918–920, 2019, doi: 10.35940/ijitee.K1167.09811S19.

[2]   P. Amrutesh, B. Sagar, and B. Venu, "Solar Grass Cutter With Linear Blades By Using Scotch Yoke Mechanism," *J. Eng. Res. Appl. www.ijera.com*, vol. 4, no. 9, pp. 10–21, 2014, [Online]. Available: www.ijera.com.

[3]   K. Yvon and J. L. Lorenzoni, "Hydrogen-powered lawn mower," *Int. J. Hydrogen Energy*, vol. 18, no. 4, pp. 345–348, Apr. 1993, doi: 10.1016/0360-3199(93)90049-G.

[4]   V. Bhandare, "Automated Solar Grass Cutter: An Overview," *Int. J. Res. Appl. Sci. Eng. Technol.*, vol. 6, no. 2, pp. 185–188, 2018, doi: 10.22214/ijraset.2018.2029.

[5]   A. S. Shekhawat, N. Kumar, and R. Y. | S. T. | A. P. Singh, "Smart Solar Grass Cutter Robot," *Int. J. Trend Sci. Res. Dev.*, vol. Volume-3, no. Issue-3, pp. 1479–1481, 2019, doi: 10.31142/ijtsrd23320.

[6]   P. B. Monika, V. A. Mane, R. Scholar, and A. Professor, "Automated Solar Grass Cutter," *Int. J. Sci. Dev. Res.*, vol. 2, no. 2, p. 5, 2017, [Online]. Available: www.ijsdr.org.

[7]   P. K. A. M. Vibesh, R. E. Rajesh, and K. A. Manivasagam, "Design and Implementation of Automatic Solar Grass Cutter," *Int. J. Adv. Res. Electr. Electron. Instrum. Eng.*, vol. 6, no. 4, pp. 17–21, 2017.

[8]   P. R. No, "Fully Automated Solar Grass Cutter Objective : Methodology : Conclusion :"

[9]   Akene. A, Oghenekohwo. A. P, and Oghenevwaire. S. I, "Design and Fabrication of a Solar Powered Lawnmower with Adjustable Wheels," *Int. J. Eng. Res.*, vol. V9, no. 05, May 2020, doi: 10.17577/ijertv9is050159.

[10]   G. M. Kumar, G. Sravanthi, J. A. Chowdary, D. Aparna, and V. A. Kumar, "Solar Grass Cutter Robot with Obstacle Avoidance," *Int. J. Eng. Sci. Comput.*, vol. 7, no. 4, pp. 6293–6295, 2017, [Online]. Available: http%3E//ijesc.org.

[11]   D. Kashyap, U. Bordoloi, and A. A. Buragohain, "Design of a Fully Automated Solar," *Int. J. Creat. Res. Thought*, vol. 8, no. 5, pp. 2567–2572, 2020.

[12]   S. R. P. Ajay D. Shah, Sahil J. Mujawar, Pratik R. Sutar, "Solar Powered Intelligent Grass Cutter," *Int. J. Sci. Dev. Res.*, vol. 5, no. 4, pp. 229–234, 2020.

[13]   F. B. Ismail, N. F. O. Al-muhsen, F. A. Fuzi, and A. Zukipli, "Design and Development of Smart Solar Grass

Cutter," *Int. J. Eng. Adv. Technol.*, vol. 9, no. 2, pp. 4137–4141, 2019, doi: 10.35940/ijeat.b4920.129219.

[14]   "Smart Lawn Mower for Grass Trimming." https://www.ijsr.net/get_abstract.php?paper_id=20131114 (accessed Jul. 03, 2021).

[15]   "(PDF)   Simple   Design   of   Self-Powered   Lawn   Mower." https://www.researchgate.net/publication/330760914_Simple_Design_of_Self-Powered_Lawn_Mower (accessed Jul. 03, 2021).

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