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Fully Automated Solar Grass Cutting Robot

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***Abstract*— Manual grass cutting is time-consuming, labor-intensive, and can result in an uneven structure in the grass's height. Therefore, in order to avoid all of these issues, it is essential to create a system that can cut the grass without the involvement of a human. This study's robotic mower for cutting grass has a solar-powered battery. This system can be constructed for a lot less money than other ones that are presently in use. It is strong, durable, and maintenance-free. This technology avoids pollutants by charging the battery using solar energy. The robot will stop if it finds an obstacle.**

***The fully automated solar lawn cutter is a robotic vehicle that can completely cut grass without human assistance and runs on solar power. It can also prevent contact with obstructions. The system's 6V batteries power both the motors that propel the vehicle and the lawn cutter. We also use a solar panel to power the battery in order to do away with the need for external battery charging. An 8051 family microprocessor controls the functioning of each motor and is coupled to the vehicle and lawn cutter motors. It also has an ultrasonic sensor interface for item identification.**

The microcontroller moves the vehicle motors ahead if no impediments are found. To safeguard the blades, the micro controller stops the grass cutter motor when the ultrasonic sensor detects an obstruction.

***Index Terms*— BLDC Motor, Solar Panel, Microcontroller, Battery, Ultrasonic Sensor, Blades**

I. INTRODUCTION

1.1 General

Grass cutting equipment is widely used today. To provide soft grass, the most usual devices are employed. A DC motor, a relay switch for controlling the motor, and a battery for solar panel charging make up the fundamental parts of a lawn mower. It is put in a machine with the proper structure. The electric supply is connected to the motors, which have speeds of 350 and 35 revolutions per minute, via a coil of wire. The linear blades are connected in this machine. For assistance in cutting the grass, the grass cutter's blade rotates quickly. The blade will generate kinetic energy as the rpm rises. The cutting edges are incredibly precise and flawless. Additionally, using electric grass cutters in gardens, lawns, and grassy fields is much easier. The best option now on the market for improving the appearance of home lawns and gardens is a grass cutting machine. People may easily maintain and beautify their lawns and gardens with the use of a lawn mower, which is a device with rotating blades to assist us in cutting lawns at even length. There are various options available now, ranging from the most basic push-broom to the most advanced electric lawnmower. The world energy report states that conventional fossil fuels, such as coal (23%) and natural gas (21%) as well as oil (36%), supply roughly 80% of our energy requirements. without the use of a focusing tool, need minimal upkeep, and function rather well. It doesn't harm the environment like fossil fuels or nuclear power. Solar cells have a longer lifespan and have reduced running expenses. For a certain task, an embedded system integrates hardware and software.

Microprocessors and microcontrollers are a couple of the important components used in embedded goods. Microprocessors are commonly referred to as general-purpose processors since they just receive input, process it, and provide results. On the other hand, a microcontroller not only receives the data as inputs but also manipulates them, links them to different devices, regulates them, and eventually generates the output.

II. PROPOSED SYSTEM

Synchronous motors include BLDC motors. This indicates that the magnetic fields produced by the stator and the rotor revolve at the same frequency. The "slip" that is often experienced by induction motors does not occur with BLDC motors. Single-phase, 2-phase, and 3-phase BLDC motors are available. The stator has the same amount of windings regardless of its kind. Three-phase motors are the most common and commonly utilised of them. This application notice pertains to 3-phase motors. The BLDC motor stator The stator's inner perimeter of stacked steel laminations features slots that have been axially carved along them for the placement of windings.

Though the windings are arranged differently, the stator frequently resembles an induction motor in shape. Three stator windings are often linked in a star arrangement in BLDC motors. Each of these windings is created by connecting many coils to create a winding. One or more coils are inserted into the slots, connected together, and formed

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into a winding. Each of these windings is scattered around the stator's periphery to provide an even number of poles. Sinusoidal and trapezoidal motors are two different types of stator windings (EMF). See the "What is Back EMF?" section for further details. As their names imply, the back EMF of a trapezoidal motor is in the shape of a trapezium, whereas that of a sinusoidal motor is sinusoidal.

The matching motor types show sinusoidal and trapezoidal fluctuations in the phase current in addition to the back EMF. As a result, the torque output of a sinusoidal motor is smoother than that of a trapezoidal motor. Unfortunately, this results in additional costs because sinusoidal motors need more winding linkages due to the dispersion of coils on the stator's edge. The stator windings will thus need more copper as a result. Based on the capacity of the control power supply, the motor may be selected that has the required stator voltage rating. Motors rated at voltages of 48 volts or less are used in robotics, light arm motions, and other applications.

Motors with voltage ratings of 100 or above are used in appliances, automation, and industrial applications. The North (N) and South (S) poles of the rotor, which is made of a permanent magnet, alternate in pairs ranging from two to eight. Based on the desired magnetic field density in the rotor, the right magnetic material is chosen to produce the rotor. Ferrite magnets are frequently used to make permanent magnets. Rare earth alloy magnets are becoming more popular as technology advances. Although ferrite magnets are less expensive, they have a low flux density for a given volume, which is a drawback.

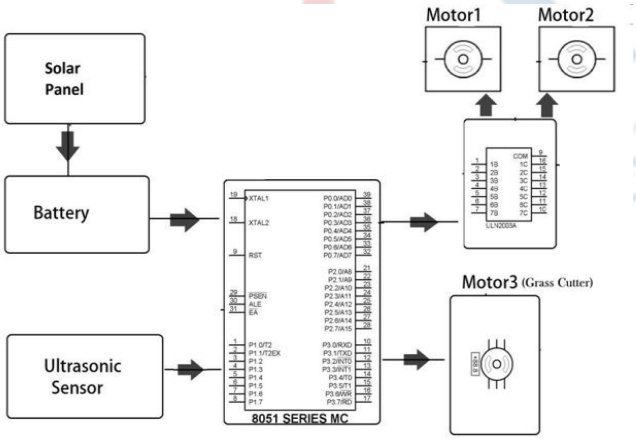

Fig. 2. Block Diagram

2.1 Advantages

There is no friction between the components, therefore maintenance is required. Because there is less friction between the parts, maintenance is minimal. It doesn't in any way harm the environment. There is no fuel cost because it runs on solar energy. longer life for solar panels. The battery can be used as a backup and be used at night. Outstanding effectiveness. We can reduce energy wastage. very approachable portable and lightweight anywhere. easy to assemble and disassemble. It has a compact layout.

III. RESULTS

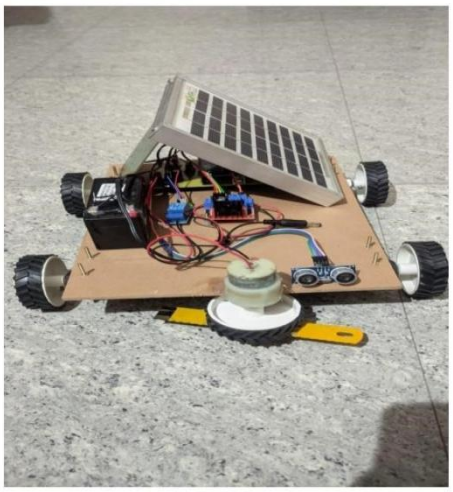

Fig 3 Hard Ware Kit

The operational outcome of the SOLAR GRASS CUTTER is as a result. This uses a 12v battery and spins at 60RPM.Installed in a grassy lawn, it automatically trims the grass without the need for human assistance. The car will stop and veer to the side until the impediment is cleared if one is found. The kit's solar panel will automatically recharge the battery as needed.

IV. CONCLUSION

The project we successfully completed has the name Fully Automated Solar Lawn Cutting Robot, and the results are amazing. It will be easier for those who take on the project for extra changes. Because it offers more advantages, such as the capacity to operate on solar energy and the absence of fuel costs, pollutants, or residue, this project is more suitable for the average person. Also, because there are fewer moving parts, there is less wear and tear. This will result in a significant increase in physical activity for the populace, and it is controllable. While the solar-powered grass cutter is running, this technology enables battery charging. This makes it considerably more effective at mowing grass. Due to these batteries' ability to be charged throughout the day, the same device may be used at night as well. The scotch yoke mechanism we used did not perform as well as we had hoped. A different approach will increase this effectiveness. The motor's speed is reduced since we used heavy materials that may be replaced by lighter ones. The type of grass being mowed should determine the blade design. The solution we accomplished benefits typical families unquestionably since it makes it possible to mow the lawn quickly and affordably. Finally, this initiative could serve as an inspiration for those who want to change things up for the better.

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V. FUTURE SCOPE

Using With the help of the resources at our disposal, we successfully completed our assignment. However, the changes and outcomes fall short of expectations. This may be enhanced further to achieve better outcomes by making the following changes. The approach we took The Scotch Yoke Mechanism does not work particularly well. Since we used heavy material, which could have been replaced by lighter material, the motor's speed was reduced. The blades' design should be based on the type of grass being cut. Another mechanism can be used to increase this efficiency .

REFERENCES

[1] Dyson, G. (1997). Darwin among the machines, The Penguin Press.

[2] Tillett, N.D., Hague, T. and Marchant, J.A. (1998) A robotic system for plant scale husbandry. Journal of Agricultural Engineering Research,69,169-178.

[3] Tang, L., Tian, L., and Steward, B. L. 2000, Colour image segmentation Shibusawa, S. 1996. Phytotechnology - An introduction to the concept and topic of a new Project. Http://phytech.ishikawac.ac.jp/WhatIs.html. Dyson, G. (1997). Darwin among the machines, The Penguin Press.

[4] Tillett, N.D., Hague, T. and Marchant, J.A. (1998) A robotic system for plant scale husbandry. Journal of Agricultural Engineering Research, 69, 169-178.

[5] Tang, L., Tian, L., and Steward, B.L.2000, Color image segmentation with genetic algorithm for in- field weed sensing, Transactions of the ASAE - American Society of Agricultural Engineers 43:41019-1028.