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Automated Solar Lawn Mower Using Microcontroller.

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***Abstract*—The sun has consistently served as the fundamental energy source for life on Earth. Its direct applications include drying clothes, curing agricultural products, and preserving food. Currently, the sun also indirectly fuels various energy sources such as wood, petroleum, paraffin, hydroelectricity, and even our food supply. The energy from sunlight is nearly infinite, providing far more than we require. Since the industrial revolutions, humanity has relied on fuels, electricity, and wind energy. In light of research and experimentation with solar and wind energy for human development across multiple nations, we have introduced an innovative solar-powered grass cutting machine designed for mowing grass in agricultural settings or small gardens. This device, known as a remote-operated lawn cutter, utilizes radio frequency to power an electric motor that drives a rotating blade for effective grass cutting**

Keywords*— *Blade, solar Panel, DC Motor, Microcontroller, Sensor.

I. INTRODUCTION

These days, grass cutting machines are highly common. Grass cutters are typically employed for soft grass furnishings. In an era where environmental consciousness and technology are combining, customers are searching for methods to lessen their personal carbon footprints. Man-made pollution is something we all encounter on a regular basis, particularly in our homes. Here, we suggest a model of an automated lawnmower that runs on solar energy (non-renewable energy). An autonomous lawn cutting machine is one that will carry out the task on its own. Both environmental and noise pollution are decreased by this model. Our innovative approach for an antiquated practice will benefit the environment and the consumer. By eliminating the need for homeowners to mow their own lawns, this solar-powered autonomous grass cutter initiative will lessen noise pollution and environmental impact. This lawnmower concept is intended to serve as a green substitute for the widely used and potentially harmful fuel-powered models. In the end, the customer will reduce their daily workload while also contributing more to the environment. It is intended to continue working on this project until an appropriate design can be put into practice and finally be found to be on target.

II. LITERATURE SURVEY

According to G. Rahul, cutting grass is accomplished by using solar energy to run an electronic motor that turns a blade [1]. According to Bhosale Swapnil and Khadake Sagar, the smart solar grass is an automated device designed to trim grass. Through the use of a solar panel, the source is powered by solar energy, and the voltage is stored in a battery [2]. The solar source and motor speed control are used in the construction of the automatic grass cutting machine. The project's goal, according to Ms. Yogita D. Ambekar and Mr. Abhishek U. Ghate, is to create a solar-powered lawn cutter that uses less energy and manpower [3]. In this project, the grass cutter's numerous operations are controlled by a microcontroller. A smart solar grass cutter system with sliding blades to cut a lawn at an even length was proposed by P. Amrutesh, B. Sagar, and B. Venu. Inexperienced workers can work with ease and preserve the uniformly smooth and fine surface appearance of the lawn [4].

A. Problem Statement

Prior to this, most of the tasks had to be done by hand. Large and small machines have gradually been created to aid human activities and, as a result, lessen the amount of work that humans must do to complete tasks. The majority of tasks that once required human labour have been mechanized or replaced by machines or other equipment. Using traditional lawn mowers requires hiring qualified people. because animals like bulls are employed here.

There's a tremendous inclination to rely on technology these days. Very few people opt to cut their grass with a standard lawn mower these days due of the risks involved. Here, we suggest a model of an automated lawnmower that runs on solar energy (non-renewable energy). Automated.

B. Objective of proposed work

The following are the goals of the grass cutter robot:

- Examine different project-related documents and articles.
- To choose the proper parts required for the project's design.
- Researching several simulation tools for the project's circuit design.
- To carry out the circuit simulation in an acceptable manner.
- To build a prototype in accordance with the model.

- To diagnose and fix the circuits.
- To satisfactorily present the intended product that has been generated.
- To compile the project effort into a technical report and presentation.

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III. PROPOSED WORK

A. *Block Diagram*

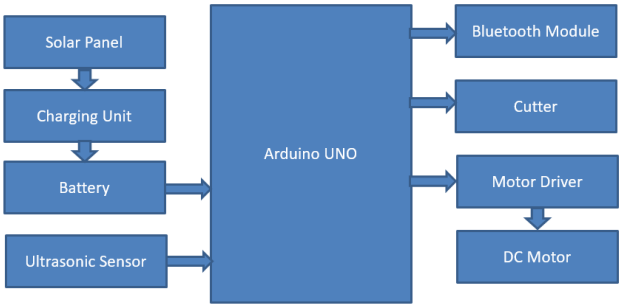

Fig 1 Block Diagram of Proposed System

The system architecture is shown schematically in Fig. 1. The robot communicates its data through an arduino board which is connected to the host computer. The lawn cutter project uses solar power. The solar energy generated by photovoltaic modules transforms solar radiation into electrical energy, which is then stored in a 12 volt rechargeable battery that may be directly charged by solar radiation.
An Arduino is interfaced with the wheel and lawn cutter motors, and it manages the operation of every motor. Additionally, an ultrasonic sensor is interfaced with it for object recognition and grass design purposes. If no obstacles are detected, the microcontroller drives the vehicle's motors ahead. The Arduino receives input from the ultrasonic sensors in the event of an interruption or obstruction. The microcontroller receives feedback from the ultrasonic sensor once it detects an obstruction. It rotates left or right according on the software that was given to the microcontroller. After a little wait, it senses once again and goes through the same process once more.

B. *Hardware Specifications*

1) ***Arduino UNO**:* The open source Arduino microcontroller board, created by Arduino.cc, is based on the Microchip ATmega328P microprocessor. A number of expansion boards and other circuits can be interfaced to the board's digital and analog input/output pins. The vehicle's movement is managed by a microcontroller that receives the embedded C program.

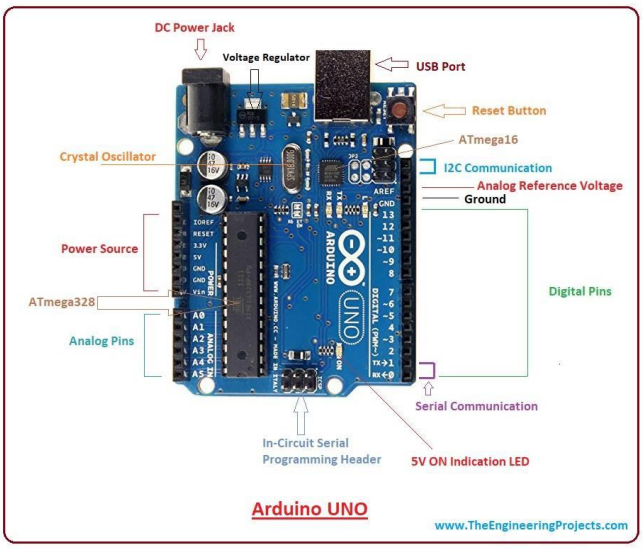

Fig 2 Arduino UNO

2) ***Ultrasonic sensor****:* The excellent non-contact range detection with high precision and steady results provided by the HC-SR04 ultrasonic range sensor is based on the premise of using sonar to estimate the distance to an item. The microcontroller and sensor are connected. Because an ultrasonic sensor emits sound waves rather than light waves like an infrared (IR) sensor does, it is deemed suitable for outdoor applications despite sunlight intensity.

Fig 3 Ultrasonic Sensor

3) ***Motor Driver****:* The vehicle is driven by an L293D dual H-bridge motor driver, which regulates its direction and speed. A DC motor with a voltage between 5 and 35 volts and a peak current of up to 2 amps can be driven by the module. The microcontroller and DC motor (wheels) are connected by a motor driver. It regulates wheel motion in accordance with the microcontroller's instructions.

Fig 4 L293D motor driver IC

4) ***DC Motor:*** Typically, a gear box is linked to a DC motor to facilitate wheel spinning. The wheel is assisted in rotating gently to cover the grass to be chopped by a DC motor running at 30 rpm. For the four wheels, we used two DC

gear motors. The 5 mm DC motor shaft has a 3 mm drilled hole in it. It is then put into the holes in the chassis and secured with threads. We made shafts strong enough to support the chassis's weight.

Fig 5 DC Motor

5) ***Solar Panel****:* The purpose of a solar panel is to collect solar radiation, which offers a source of energy for producing electricity. The way a solar panel works is that when solar radiation enters its photovoltaic cells, the photovoltaic effect causes the cells' ends to produce electromotive force, which in turn produces electricity. Direct current is the name given to this generated electricity (DC). The 36-cell panel is the one chosen to satisfy the design specifications. With a 450-degree slant, the solar panel is positioned above the chassis to maximize its ability to harvest solar energy.

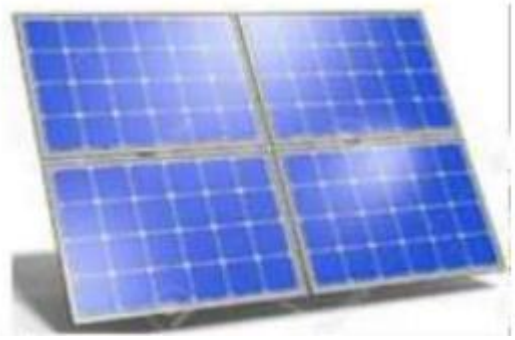

Fig 6 Solar Panel

6) ***Battery:*** The lead acid battery is chosen because it is inexpensive, lightweight, corrosion-resistant, rechargeable, and has a lower discharge rate than other batteries. There is a single 12-volt battery connected, weighing about 800g. This assisted in maintaining the vehicle's wheels in contact with the ground by applying pressure to the wheels. The solar panel charges the battery. It supplies power to the project's other electrical components.

Fig 7 Battery

7) ***Cutting Motor****:* For the grass to be cut expertly, the DC motor is connected to the cutter and placed in front of the car. A DC motor of 500 rpm is chosen because the cutter must spin at a very high speed. The battery provides power to the DC motor.

Fig 8 Cutting Motor

IV. Result Discussion

A. *Circuit Diagram*

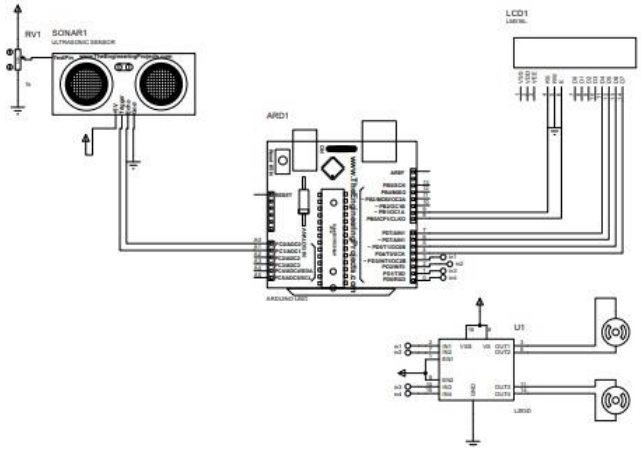

Fig 9 Circuit Diagram

B. *Advantages*

- Because it is cordless, it is simple to operate.
- Oil and gasoline are not filthy while using battery-powered lawn mowers.
- We are safe now that no contaminants have been released. Additionally, it is not bothered by air filters or spark plugs.
- A self-governing grass cutter necessitates minimal user intervention.

C. *Applications*

- This robotic grass cutter is appropriate for household gardens and lawns.
- These are extensively utilized on all athletic fields. The lawnmowers turn into a more effective substitute for the tamed grazing animals.
- It can be used to trim the grass on playgrounds and sports fields in addition to being frequently used for cutting small grasses.
- Robots of this kind offer the chance to take the place of human operators, offering cost-effective solutions.

V. Conclusion

Due to its many benefits, our idea is more suited for the average person. People will get far more physical activity from this, which is also manageable. This technique allows the batteries to be charged while the solar-powered grass cutter is operating. Because there is a feature to charge these batteries during the day, the same thing may be used at night as well.

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