

IOT Base Solar Grass Cutter

Tejas Bala Gawade¹, Gangaram Vitthal Gawade², Sankalp Santosh Sawant³, Aryan Anand Rawool⁴, Shankar Vilas Talavnekar⁵, Bhakti Abhay Gawade⁶, Miss.Nisha Malkar⁷

^{1,2,3,4,5,6}Students, Yashwantrao Bhonsale Institute of Technology, Sawantwadi

⁷faculty, Yashwantrao Bhonsale Institute of Technology, Sawantwadi

¹tejasgawade9119@gmail.com , ²gangaramgawade04@gmail.com , ³aryanrawool18@gmail.com

Abstract - The development of automated machinery powered by renewable energy has been aided by the growing need for environmentally friendly and energy-efficient technologies. The purpose of the Solar Panel Based Automatic Grass Cutter with Bluetooth Control is to encourage the use of clean energy, minimise fuel use, and lessen manual labour. This project creates an intelligent and effective lawn care system by combining wireless communication embedded technologies. The development of automated machinery powered by renewable energy has been, and solar energy technology. Conventional grass cutters often run on direct electricity or petrol motors. These devices need constant human labour to operate and create noise and air pollution. The suggested system, on the other hand, is economical and ecologically good because it uses solar energy as its main power source. The system is built on a chassis similar to that of an automobile, with four wheels that are moved by DC motors. For lawn cutting, a separate high-speed motor is attached to the cutting blade. To get the most sunshine, the solar panel is affixed to the top of the vehicle's framework. A rechargeable 9V battery stores the electrical energy produced by the solar panel, which is controlled by a charge controller. The Arduino microcontroller, cutting motor, motor driver module, Bluetooth module, and ultrasonic sensor are all powered by the battery. The charge controller guards against deep discharge or overcharging of the battery and guarantees safe charging. The system's central processing unit is the Arduino board. It regulates both the vehicle's motion and the cutting blade motor's performance.

Key Words - Charge Controller , Solar Panel , Gear Motor , Lawn mower .

1. INTRODUCTION :

Automation and renewable energy technologies are becoming more and more significant in a variety of engineering applications in the current world. Researchers and engineers have been motivated to create eco-friendly and energy-efficient systems by the growing worries about fuel use, environmental contamination, and energy conservation. One such instance where conventional machinery uses fossil fuels and necessitates constant human labour is lawn care. The "Solar Panel Based Automatic Grass Cutter with Bluetooth Control" project was created in order to get over these restricti

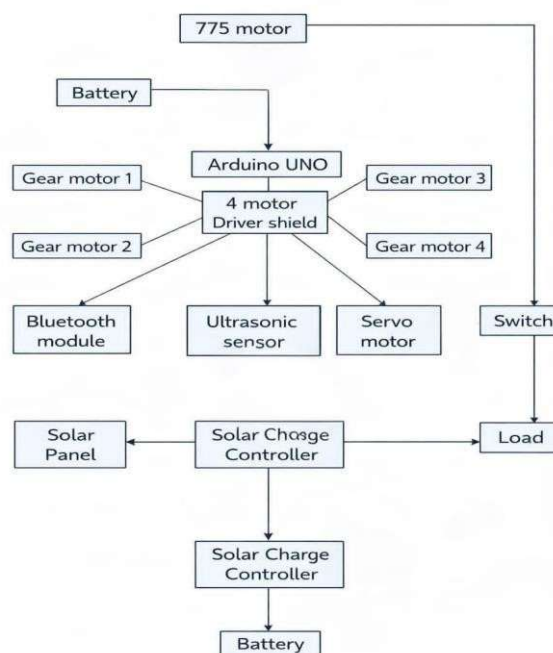


Fig No.1

Conventional grass cutters often run on electricity or petrol motors. Grass cutters that run on petrol emit toxic pollutants, generate noise pollution, and raise operating expenses as a result of growing fuel prices. Grass cutters that run on electricity require hooked connections, which restrict mobility and could be dangerous. Manual labour also necessitates constant supervision and physical exertion. Consequently, a clever, automated, and sustainable energybased solution is required.

The main power source for the suggested system is solar energy. Solar energy is abundant, clean, and renewable. Sunlight is transformed into electrical energy using a solar panel that is affixed to the vehicle's construction. A rechargeable 9V battery stores this energy, which is controlled by a charge controller. The Arduino microcontroller, DC motors, cutting blade motor, Bluetooth module, and ultrasonic sensor are then powered by the stored energy. The main power source for the suggested system is solar energy. Solar energy is abundant, clean, and renewable. Sunlight is transformed into electrical energy using a solar panel that is affixed to the vehicle's construction. A rechargeable 9V battery stores this energy, which is controlled by a charge controller. The Arduino microcontroller, DC motors, cutting blade motor, Bluetooth

module, and ultrasonic sensor are then powered by the stored energy. The lawn cutter's chassis is based on an automobile and is held up by four wheels. A motor driver module connects each wheel to a DC motor, enabling smooth forward, backward, left, and right motion. The cutting blade, which is positioned at the bottom center of the chassis, is coupled to a separate high-speed motor.

2. METHODOLOGY :

The material selection, mechanical assembly, electrical connections, and system testing are all part of the Solar Panel Based Automatic Grass Cutter project's methodical steps. First, a list of necessary parts and materials was created, including DC motors, a solar panel, a battery, a motor driver, an Arduino, an ultrasonic sensor, a Bluetooth module, and a blade mechanism. The components were bought in accordance with the necessary criteria after the material list was finalised.

The project's mechanical framework was then created and put together. Wheels were correctly mounted to provide smooth mobility, and a sturdy base frame was ready. The motor and cutting blade were firmly fastened to the base of the construction. For stability and safety, the battery was positioned in a covered area, and the solar panel was fixed. Electrical connections were made once the mechanical assembly was finished. The power distribution system and charge controller were linked to the battery. The Arduino was interfaced with the motor driver, Bluetooth module, and ultrasonic sensor. The motor driver was linked to the DC motors. In order to prevent short circuits, proper insulation and polarity were guaranteed during wiring.

Finally, a step-by-step test of the entire system was conducted. The system's overall performance, sensor responsiveness, motor rotation, blade movement, and battery voltage were all examined. Adjustments were made as needed to increase efficiency, safety, and stability. In order to produce an effective grass cutting system, the IoT-based solar grass cutter project's technique entails creating and integrating several mechanical and electronic components. A solar panel, charge controller, battery, Arduino UNO, motor driver shield, gear motors, ultrasonic sensor, Bluetooth module, and a 775 blade motor are among the parts used in the system's initial design. Sunlight is transformed by the solar panel into electrical energy, which is stored in the battery and controlled by the charge controller.

3. CONNECTION DIAGRAM :

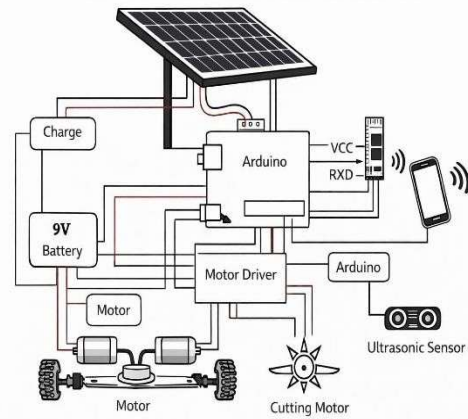


Fig No.2

efficiently store solar energy in the battery before distributing it to other parts, such as the Arduino, motor driver, wheel motors, blade motor, Bluetooth module, and ultrasonic sensor. Mounted atop the mower frame, the solar panel absorbs sunlight and transforms it into electrical power. The charge controller's solar input terminals are linked to the solar panel's output terminals. To avoid overcharging and battery damage, the charge controller controls the voltage and current coming from the solar panel. The 9V battery is linked to the charge controller's controlled output in order to charge and store energy.

The system's primary power source is the battery. The Arduino's VIN pin and the motor driver power input are linked to the battery's positive terminal. The common ground is linked to the battery's negative terminal. To guarantee correct circuit operation, every component—including the Arduino, motor driver, Bluetooth module, and ultrasonic sensor—shares a common ground connection.

mower's control system is the Arduino microcontroller. It communicates with the motor driver via control signals after drawing power from the battery. The four-wheel motors' direction and motion are controlled via the digital input pins that connect the motor driver module to the Arduino. To allow the mower to travel forward, backward, left, and right, two motors are linked on the left side and two on the right.

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4. DETAIL OF IMPLEMENTATION :

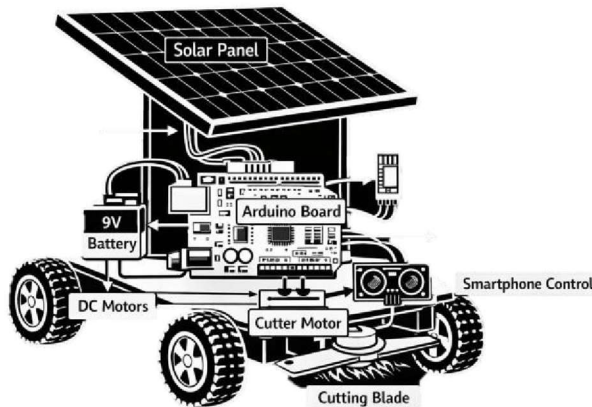


Fig No.3

The suggested lawnmower is a Bluetooth-enabled device with a battery backup system that runs on solar power. Four wheels are used in the machine's construction to provide stability, smooth motion, and simple direction control. The solar panel, rechargeable battery, DC motor, mild steel cutting blade, Bluetooth module, motor driver circuit, four wheels with bearings, and an angle bar structure to support the solar panel and frame are the main parts used in this project.

For this project, a traditional flat-type blade is chosen. There is enough lift from the flat blade to efficiently cut and remove grass. Its greater mass helps keep it stable during high-speed rotation and lessens wobbling and vibration as compared to sickle bars or tapered blades. The material of choice for the blade is mild steel due to its strength, ability to resist high rotating speeds, ease of shaping and sharpening, and affordability. Despite having superior corrosion resistance, stainless steel is not used since it is more expensive and heavier. Angle bar iron is exclusively used for frame building; it is not used for blade production. Mild steel angle bars are used to construct the lawn cutter's body structure. Because of their excellent strength-to-weight ratio, angle bars are used. They are lightweight and offer sturdy support for the battery and solar panel. The construction is economical and useful due to its ease of assembly and welding. Four wheels are fitted at the corners, the engine and blade are positioned in the bottom center, the solar panel is set on top of the frame, and the battery is housed inside the chassis.

To guarantee smooth operation and appropriate balance, the machine has four wheels. Each wheel has a ball bearing inserted to lower friction, guarantee smooth movement, boost productivity, and lessen the strain on the motor. The four-wheel arrangement guarantees appropriate weight distribution, facilitates turning, and improves stability on uneven grassland terrain. Renewable solar energy powers the system. Sunlight is captured by the solar panel and transformed into electrical energy. A rechargeable battery is used to store this energy. The wheel motors for movement, the Bluetooth control system, and

the DC motor for blade rotation are all powered by the battery. The battery keeps the machine running even when there is no sunlight. A shaft connects the cutting blade to a high-speed DC motor. The motor turns when electricity is applied, sending motion to the blade via the shaft. The grass is effectively chopped by the flat blade's rapid rotation. Bearings provide steady shaft rotation, and the blade's increased bulk lessens.

5. Function :

1. Solar panel: A photovoltaic cell that generates voltage when exposed to sunlight. The panel is positioned to capture high-energy rays.
2. Charge controller: Connects the solar panel to the battery, regulating the flow of energy.
3. Battery: Stores the electrical energy generated by the solar panel. When the battery is fully charged, it automatically disconnects from the panel.
4. Motor: Powers the blades that mow the lawn.
5. Switches: working is manually done by ON-OFF switches

6. SCOPE :

1. Use of Renewable Energy: By using solar energy as its main power source, the system lessens its reliance on fossil fuels and cuts down on harmful emissions.
2. Battery Backup System: Even under low-light or overcast conditions, continued functioning is ensured by the addition of a rechargeable 12V battery
3. Automatic Operation: By minimising manual labour and increasing efficiency in lawn care, the equipment is made to run automatically
4. Cost-Effective System: Because solar energy is freely available, operating costs are extremely low after initial installation
5. Applications in Agriculture and Domestic Settings: The system can be utilised in: Lawns in homes Gardens Parks Campuses of colleges Small fields used for agriculture
6. Potential Future Extensions: The system can be enhanced even more by including: Remote control operation or IoT Sensors for detecting obstacles method for automatic charging Intelligent navigation system.
7. Low Operating Cost: No fuel required, reducing maintenance and running cost.
8. Future Expansion – Can be upgraded with IoT, GPS, or mobile app control.

7. APPLICATIONS :

1. Used in gardens.
2. Used in play grounds.
3. Road side grass and small plant cutting.
4. Nursery applications.

8.Result

SR. NO	PARAMETER	OBSERVATION VALUES
1.	Gear motor Current	2.4amp
2.	Gear motor Voltage	12volt
3.	Gear motor Speed	500rpm
4.	775 motor Current	2.4 amp
5.	775 Motor Speed	775 rpm
6.	775 Motor voltage	12 volt
7.	Battery voltage	12 volt
8	Battery Capacity Caps	2700 mAh

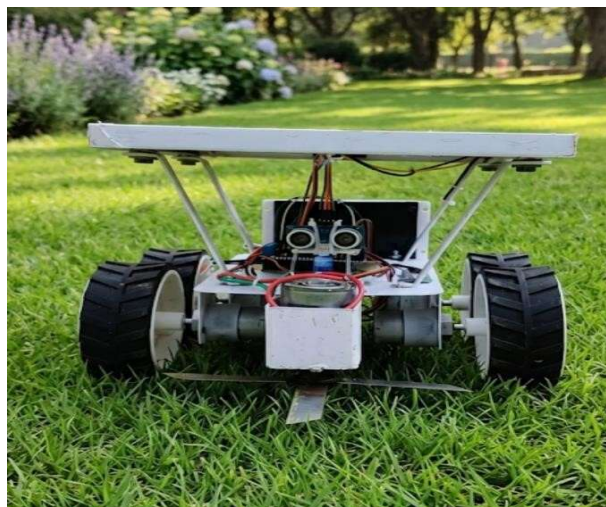


Fig No.4 IOT BASE SOLAR GRASS CUTTER

9. CONCLUSION :

The "Solar Panel Based Automatic Grass Cutter with Bluetooth Control" project effectively illustrates how wireless communication, embedded technologies, and renewable energy may be combined to provide an effective lawn care solution. The method is intended to minimise human labour, do away with reliance on fuel, and advance eco-friendly technologies. The structure's top-mounted solar panel efficiently transforms sunlight into electrical energy, which is then controlled by a charge controller and stored in a 9V rechargeable battery. The Arduino microcontroller, DC motors, cutting motor, Bluetooth module, and ultrasonic sensor are all powered by this stored energy. The system is

economical, energy-efficient, and pollution-free due to its utilisation of solar energy. The Arduino microcontroller is essential for managing the vehicle's motion and the cutting blade's functionality. All directions of travel are stable and smooth thanks to the fourwheel drive system detection, the ultrasonic sensor improves safety.

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