SOLAR POWERED AUTONOMOUS LAWN MOWER

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Arduino, Ultrasonic sensor, Solar panel, DC motor, Motor driver, Bluetooth module.

Introduction:

In today's world, pollution poses a significant challenge, often stemming from everyday activities, including those within our homes. Gas-powered lawn mowers exacerbate this issue by emitting harmful gases and becoming increasingly costly to operate. Additionally, their loud operation contributes to noise pollution. To address these issues, we propose the development of a solar-powered lawn mower that operates autonomously, harnessing energy from the sun. This innovative design not only reduces pollution associated with traditional mowers but also simplifies lawn maintenance by eliminating the need for manual operation. Powered by a battery charged through a combination of a power supply and solar panel, this mower utilizes solar energy to drive an electric motor, propelling a blade for efficient grass cutting. Evolving from conventional mowers, this eco-friendly solution exemplifies progress in enhancing efficiency, speed, and power while aligning with environmentally conscious practices. By tapping into renewable resources through photovoltaic panels, it mitigates reliance on fossil fuels, thereby reducing carbon emissions. The solar-powered mower represents a step towards a greener, more sustainable future, eliminating toxic emissions and noise pollution associated with traditional models. Its silent operation offers a tranquil alternative, while the sustainable energy source translates to significant cost savings in both operation and maintenance. In essence, it pioneers a path towards environmental responsibility and economic efficiency.

Objectives:

- Efficient Solar Energy Utilization: Maximize solar radiation capture by strategically angling panels and ensure effective conversion of solar energy into electrical energy.
- Comprehensive System Design: Integrate photovoltaic panels, DC to DC converter, motor, controller, linear blades, and battery into a cohesive system tailored for grass cutting tasks.

- Environmental Advantages: Address shortcomings of internal combustion mowers by eliminating the need for gasoline, thereby reducing messiness, hazards, and emissions associated with traditional mowers.
- User-Friendly Operation: Enhance user experience with an electric grass cutter powered by solar energy, offering ease of use and eliminating the inconveniences of handling gasoline.
- Operational Efficiency: Ensure the grass cutter operates effectively and requires minimal maintenance, reducing downtime compared to traditional mowers.
- Sustainability and Green Technology: Promote renewable energy use by harnessing solar power, contributing to environmental sustainability by reducing carbon emissions and reliance on fossil fuels.

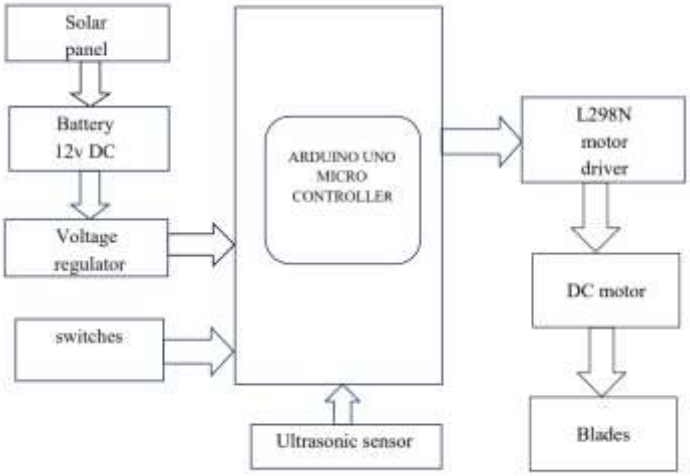
Methodology:

Components used:

1. Arduino Uno
2. Buck convertor
3. 12v Battery
4. DC motors
5. Solar panel
6. Power supply
7. Bluetooth module
8. Ultrasonic Sensors

- Assemble the necessary hardware components, including an Arduino UNO board, solar panel, 12V DC battery, voltage regulator, switches, ultrasonic sensor, L298N drive circuit, and gear motor. Ensure proper connections and wiring according to specifications.
- Install the Arduino IDE on your computer and configure it for programming the Arduino UNO board. Set up required libraries for interfacing with sensors by downloading and importing them into the Arduino IDE.
- Develop Arduino code to collect sensor data, process it, and transmit it to the IoT platform. Include functions for reading sensor values, sending data to the IoT platform, and controlling blades based on specific conditions. Implement error handling and exception cases for robust performance.
- Integrate all hardware components, upload the Arduino code to the board, and conduct comprehensive testing of the system. Test data transmission to the IoT platform, blade control based on sensor readings, and overall system responsiveness.

Block diagram of proposed system



The solar-powered grass cutter features panels strategically angled to efficiently capture intense sunlight, ensuring optimal utilization of solar radiation. These solar panels convert solar energy into electrical energy. This machine consists of the photovoltaic, dc to dc converter, motor, controller, linear blades, and battery. This automated system is designed specifically for the task of grass cutting. Solar Grass Cutter uses solar power as an energy source that addresses a number of issues that standard internal combustion engine mowers do not. An electric grass cutter with a solar charger will be easier to use. Gone are the days of grappling with messy, hazardous gasoline, and, perhaps most significantly, the switch eliminates the emissions associated with traditional internal combustion mowers.

Conclusion:

Upon establishing a Bluetooth connection, the robot's interface indicates its role as a Grass Cutting Robot and provides real-time updates on the voltage generated by the attached solar panel. To operate in manual mode, the instruction 'M' is given. It moves forward with the instruction 'F', left with instruction 'L', right with instruction 'R', and stops with instruction 'S'. This is how it operates in manual.

Transitioning to Automatic mode is a simple process facilitated by the 'A' instruction, enabling the mower to operate autonomously. Once activated, the 'G' instruction prompts the mower to begin cutting grass, with the mower utilizing its internal algorithms and sensors to navigate the lawn and make decisions. This autonomous operation streamlines the mowing process, reducing the need for human intervention and labor costs. Additionally, by relying on its own intelligence, the mower can efficiently manage varying terrain and obstacles, ensuring thorough coverage of the lawn.

Manual mode

Auto mode

Scope for future work:

Implementing artificial intelligence and machine learning algorithms can enable the mower to learn and adapt to its environment over time, improving performance and efficiency. By employing IoT technology, we can enable seamless communication between the lawn mower and the grass's water sprinkler system, ensuring that watering is temporarily paused until the lawn mowing task is finished. Additionally, the camera can utilized to capture images for feature extraction. A classification algorithm can be applied to the extracted features to differentiate between grass and other plants. Further, more improvements can be made to avoid obstacles such as pits and manholes which are common in public parks. As technology continues its swift advancement, there's ample opportunity to enhance both the capabilities and efficiency of the humble lawn mower.

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