Solar Power Dual Grass Cutter Robot Automatic and Android App Based

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Abstract- Grass cutting is an essential activity in gardens, lawns, parks, and agricultural fields for maintaining cleanliness and proper plant growth. Conventional grass cutting machines generally operate using petrol engines or manual power which increases fuel consumption, operational cost, and environmental pollution. In addition, these machines require continuous human effort and supervision. To overcome these problems, a Solar Powered Dual Grass Cutter Robot with Automatic and Android App Based Control is proposed. The system uses solar energy as the primary power source which is stored in a rechargeable battery through a solar charging system. The robot can operate in two modes: automatic operation and manual control through an Android mobile application. The system consists of components such as a solar panel, battery, charge controller, microcontroller, motor driver circuit, DC motors, dual cutting blades, Bluetooth module, and Android mobile application. The dual blade cutting mechanism increases grass cutting efficiency and reduces the total operation time. The robot can move in different directions and cut grass automatically or by user control using a smartphone. This system provides an eco-friendly, energy-efficient, and cost-effective solution for lawn maintenance while reducing human effort and fuel consumption.

I. INTRODUCTION

Grass cutting and lawn maintenance are important activities in residential areas, parks, playgrounds, gardens, and agricultural lands. Regular trimming of grass improves the appearance of landscapes and also supports healthy plant growth. Traditional grass cutting machines are usually operated using petrol engines or electric power, which require continuous human involvement. Petrol based grass cutters produce harmful gases such as carbon monoxide and carbon dioxide which contribute to environmental pollution. They also produce high noise levels and require regular fuel supply and maintenance. On the other hand, manually operated grass cutters require significant physical effort and time.

With the rapid development of automation technology and renewable energy systems, modern solutions are being developed to reduce manual labor and environmental impact. Solar energy is one of the most abundant and renewable sources of energy available on earth. It can be converted into electrical energy using photovoltaic cells.

In this project, a solar powered dual grass cutter robot is designed and developed which uses solar energy to operate the system. The robot can move automatically and can also be controlled using an Android smartphone through Bluetooth communication. This system improves efficiency, reduces pollution, and minimizes human effort in grass cutting operations.

II. SYSTEM OVERVIEW

The Solar Power Dual Grass Cutter Robot is a robotic system designed to perform automatic grass cutting operations with minimal human involvement. The system consists of electrical, electronic, and mechanical components working together to perform the required functions. The solar panel acts as the main energy source of the system. It converts sunlight into electrical energy using photovoltaic cells. The generated electrical energy is then regulated by a charge controller and stored in a rechargeable battery. The battery provides a stable power supply to the entire system including the microcontroller, motor driver circuit, DC motors, and Bluetooth module. The microcontroller serves as the main control unit of the robot and processes commands received from the Android mobile application. The motor driver circuit acts as an interface between the microcontroller and the DC motors. It controls the direction and speed of the motors based on commands received from the microcontroller. The DC motors are used to move the robot in different directions such as forward, backward, left, and right. The system also includes dual rotating blades which are powered by separate motors. These blades rotate at high speed and cut the grass effectively. The dual blade mechanism allows the robot to cover a larger cutting area and improves the efficiency of the grass cutting process. The Bluetooth module enables wireless communication between the robot and the Android smartphone. The user can send commands from the mobile application to control the robot movement and blade operation.

III. LITERATURE SURVEY

1) Several researchers have worked on developing automated grass cutting systems using robotics and renewable energy technologies. The objective of these systems is to reduce manual labor and improve efficiency in lawn maintenance.

2) Many researchers have developed automatic grass cutting machines which operate without continuous human intervention. These machines are designed to move across the lawn and cut grass using rotating blades.

3) Some studies have focused on solar powered robotic systems which utilize renewable energy sources instead of fossil fuels. Solar energy based systems are environmentally friendly and help reduce operational costs.

4) Other research works have implemented Android based control systems where robots are controlled using mobile applications through Bluetooth or Wi-Fi communication. This allows users to operate machines remotely and increases convenience. Recent developments in robotic systems have also included sensor based obstacle detection, GPS navigation, and artificial intelligence based path planning to make grass cutting robots more efficient and fully autonomous.

5) These research studies demonstrate that combining solar power, robotics, and wireless communication technology can significantly improve the performance and efficiency of grass cutting systems while reducing environmental impact.

IV. OBJECTIVES

- To design and develop a solar powered dual grass cutter robot.
- To reduce human effort required for lawn maintenance.
- To utilize renewable solar energy as the primary power source.
- To develop an Android application for wireless control of the robot.
- To improve grass cutting efficiency using dual cutting blades.
- To reduce fuel consumption and environmental pollution.
- To develop a low cost and energy efficient grass cutting system.
- To promote the use of renewable energy in robotic applications.

V. IMPLEMENTATION DETAILS

A. Solar Panel

The solar panel is the primary energy source of the system. It converts sunlight into electrical energy using photovoltaic cells. These photovoltaic cells absorb sunlight and generate direct current (DC) electricity through the photovoltaic effect. The generated electrical energy is used to charge the battery and supply power to the robotic system. The use of solar energy makes the system environmentally friendly and reduces dependency on conventional energy sources such as electricity.

B. Charge Controller

The charge controller plays an important role in regulating the electrical energy coming from the solar panel. It controls the voltage and current supplied to the battery to ensure safe charging. Without a charge controller, the battery may get overcharged which can damage the battery and reduce its lifespan. The charge controller prevents overcharging and also protects the battery from deep discharge conditions.

C. Charge controller

The charge controller is used to regulate and control the electrical energy coming from the solar panel and piezoelectric sensors before storing it in the battery. It prevents overcharging and protects the battery from damage. The charge controller also manages the proper flow of electricity so that the battery charges safely and efficiently.

D. Rechargeable Battery

The rechargeable battery stores the electrical energy generated by the solar panel. The stored energy is then used to power the microcontroller, motor driver circuit, DC motors, and other electronic components of the robot. The battery ensures that the robot can operate even when sunlight is not available, such as during cloudy weather or evening time. The battery provides a stable DC power supply required for proper operation of the system. Rechargeable batteries such as lithium-

ion or lead-acid batteries can be used depending on the design and power requirements of the robot.

E. *Microcontoller*

The microcontroller acts as the central processing unit of the robotic system. It controls the movement of the robot and manages communication between different components. The microcontroller receives commands from the Android mobile application through the Bluetooth module and processes them accordingly. Based on the received commands, the microcontroller sends control signals to the motor driver circuit which controls the DC motors. The microcontroller also manages the operation of the cutting blades and ensures proper coordination between the robot movement and grass cutting mechanism.

F. *Motor drive circuit*

The motor driver circuit is used to control the speed and direction of the DC motors. Since the microcontroller cannot supply enough current to directly drive the motors, a motor driver circuit is required. The motor driver acts as an interface between the microcontroller and the motors. It amplifies the control signals from the microcontroller and provides sufficient current to drive the motors. By using the motor driver circuit, the robot can move forward, backward, turn left, and turn right based on the commands received from the Android mobile application.

G. Dual cutting blade mechanism

The robot uses a dual blade grass cutting mechanism to improve cutting efficiency. Two cutting blades are mounted at the bottom of the robot and are connected to high-speed motors. When the motors rotate, the blades spin rapidly and cut the grass. The dual blade system increases the cutting area compared to a single blade system. This mechanism reduces the total time required for grass cutting and provides better coverage of the lawn area. The blades are designed using lightweight and strong materials to ensure durability and effective cutting performance.

G. Android Mobile application

The Android mobile application acts as the user interface for controlling the robot. Through this application, the user can send commands to the robot using Bluetooth connectivity.

The application provides control options such as:

- Move Forward
- Move Backward
- Turn Left
- Turn Right
- Start Cutting Blades
- Stop Cutting Blades

This makes the system easy to operate and allows the user to control the robot from a safe distance without direct physical interaction.

. VI . ADVANTAGES

- Uses renewable solar energy which reduces electricity consumption
- Environment friendly system with zero fuel emissions
- Reduces human effort and manual labor
- Low operating and maintenance cost
- Wireless control using Android smartphone
- Efficient grass cutting using dual blade mechanism
- Portable and easy to operate
- Suitable for small and medium lawn areas

VII.APPLICATIONS

- Residential gardens
- Public parks
- Lawns and playgrounds
- Schools and college campuses
- Agricultural fields
- Hotels and resorts landscaping areas
- Smart home gardening systems
- Commercial landscape maintenance

CONCLUSION

The Solar Power Dual Grass Cutter Robot provides an efficient and innovative solution for automatic grass cutting using renewable energy. The system uses solar energy as the primary power source which reduces dependency on fossil fuels and minimizes environmental pollution. The integration of dual cutting blades improves the grass cutting efficiency while the Android mobile application provides easy and convenient control of the robot. The proposed system reduces manual effort, saves energy, and provides an environmentally friendly solution for maintaining lawns and gardens. This project demonstrates how the combination of solar energy, robotics, and wireless communication technology can

be used to develop modern automated systems for everyday applications.

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