**Automatic Grass Cutting Robot**

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**1. Introduction**

Automation has transformed many sectors by improving efficiency, and lawn care is no exception. Manual lawn mowing can be time-consuming and physically demanding. This project focuses on creating an **Automatic Grass Cutting Robot** that can autonomously navigate a lawn, detect obstacles, and cut grass effectively. Using a combination of ultrasonic sensors for obstacle detection and a motor driver for controlling movement, this robot is designed to simplify lawn care by reducing the need for manual intervention.

**2. Problem Statement**

Lawn mowing requires significant time and effort, especially for larger lawns. The traditional manual method involves the use of a heavy mower and requires constant attention. Additionally, the need for precise navigation can lead to uneven cutting and possible damage to surrounding plants. The **Automatic Grass Cutting Robot** is designed to address these challenges by automating the mowing process, ensuring efficient, precise, and safe grass cutting while reducing human effort and intervention.

**3. Scope of the Solution**

The solution involves the design and development of a **grass cutting robot** that is capable of:

* Autonomous movement in the lawn area
* Detecting obstacles in its path and avoiding them
* Cutting the grass using a rotating blade mechanism
* Operating based on distance measurement to avoid collision with objects

The robot is intended for small to medium-sized lawns and aims to provide a convenient solution for routine grass cutting. It will not be designed for commercial-scale applications or very uneven terrains.

**4. Required Components**

**A. IDE (Integrated Development Environment)**

* **Arduino IDE**: The Arduino IDE is used for writing and uploading the code to the Arduino microcontroller. It is ideal for this project because it supports C/C++ programming and provides a simple interface for controlling hardware.

**B. Software**

* **Programming Language**: C/C++ for Arduino programming
* **Simulation Software**: Tinkercad for simulating the robot’s circuit and operation

**C. Hardware Components**

1. **Microcontroller**: Arduino Uno or similar microcontroller
2. **DC Motors**: Two to four DC motors to control the movement of the robot and one motor for the cutting blade
3. **Motor Driver (L293D)**: Motor driver to control the direction and speed of the motors
4. **Ultrasonic Sensor (HC-SR04)**: To detect obstacles and measure distance from objects
5. **Battery**: A rechargeable battery (e.g., Li-ion or Li-poly) to power the motors and the microcontroller
6. **Chassis**: A base structure to house all components and allow movement of the robot
7. **Grass Cutting Blade**: A rotating blade to cut the grass
8. **Switches/Buttons**: For turning the robot on/off and for emergency stops

**5. Simulated Circuit**

The robot’s circuit is simulated using **Tinkercad**, which allows for virtual testing of the circuit, motor control, and sensor interactions before constructing the physical robot. Tinkercad simulations help to debug basic logic and wiring issues.

Circuit Link: <https://drive.google.com/file/d/1HD1rwvS75C_wx3ZtQNaS-aUnvklPt9zP/view?usp=drivesdk>

Schematics Link: <https://drive.google.com/file/d/1HDugU7iwuUchL-zC-qOPHjmOtouaoLhb/view?usp=drivesdk>

**6. Demonstration of Video**

A video is recorded showcasing the working prototype of the robot. The demonstration shows:

* The robot’s autonomous navigation of a small lawn
* How the robot detects and avoids obstacles using the ultrasonic sensor
* The grass-cutting blade in operation

Link: <https://drive.google.com/file/d/1HDGhk9QhiMH4VNpZRtpF0dkboecKv-eN/view?usp=drivesdk>

**7. Code**

**Software:**

Link: <https://docs.google.com/document/d/1HFTKb0MMOtT0tSn4f1PGVkJFaHf99oW0/edit?usp=drivesdk&ouid=109770623064073487476&rtpof=true&sd=true>

**Hardware:**

Link: <https://docs.google.com/document/d/1HJ-Yez2DpPRZTAfJwP6qAaiVJUu-y21C/edit?usp=drivesdk&ouid=109770623064073487476&rtpof=true&sd=true>

## ****8. Conclusion****

The **Automatic Grass Cutting Robot** automates the process of lawn mowing by integrating ultrasonic sensors for obstacle detection, DC motors for movement, and a cutting blade for grass trimming. The robot provides an efficient, autonomous solution for lawn care, reducing the need for human labour while ensuring a safe and consistent operation. This project demonstrates the potential of microcontroller-based automation in everyday tasks, making it easier to manage small lawns with minimal effort.