International Journal of Engineering Research and Science & Technology

IJERST

ISSN : 2319-5991

www.ijerst.com

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International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Vol. 21, Issue 2, 2025

Smart Lawn Cutter with IoT and Bluetooth Integration

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ABSTRACT

This paper presents an innovative approach to cut the grass by using Bluetooth and IOT technology. Lawn maintenance plays a crucial role in agriculture, landscaping, and household gardening.
Traditional methods of grass cutting are labour-intensive, time-consuming, and inefficient for large areas. To overcome these challenges, automation and wireless control mechanisms have become essential in modern lawn maintenance systems. This paper presents an innovative approach to cutting grass by utilizing Bluetooth and IoT technology. The proposed system integrates a motorized cutting mechanism, Bluetooth connectivity for remote operation, and IoT for real-time monitoring, ensuring efficiency and ease of use. The system comprises key components such as a power supply, an L293D motor driver module, two DC motors, a four-wheel drive mechanism, a 16×2 LCD display, and IoT-based monitoring capabilities. Users can control the device via a Bluetooth-enabled smartphone application to execute various commands, including start, stop, direction control, and speed adjustment. This smart lawn cutter reduces manual effort, enhances precision, and offers a user-friendly approach to lawn maintenance.

Keywords: Bluetooth, IoT, smart lawn maintenance, automated grass cutter, wireless control, motorized cutting mechanism, remote monitoring, microcontroller, L293D motor driver, energy-efficient lawn care.

I. INTRODUCTION

In the 21st century, technological advancements have revolutionized various aspects of daily life, including agriculture, landscaping, and gardening. Lawn maintenance is a crucial activity for preserving green spaces in residential, commercial, and agricultural environments. However, traditional grass-cutting methods involve significant manual effort, making them inefficient, especially for large areas. Conventional lawn mowers are labour-intensive, time-consuming, and often rely on fossil fuels, contributing to environmental pollution and high operational costs.

With the rise of automation and smart technologies, innovative solutions have emerged to optimize lawn maintenance. Bluetooth and IoT-based automation provide a modern, efficient, and user-friendly approach to grass cutting. The integration of wireless control mechanisms allows users to operate the lawn cutter remotely, eliminating the need for manual intervention. Additionally, IoT connectivity enables real-time monitoring and performance tracking, enhancing system efficiency and reliability.

The increasing demand for automation and smart technologies has led to the development of intelligent lawn maintenance solutions. Wireless control systems, such as Bluetooth and IoT-based mechanisms

This paper proposes a Bluetooth-controlled green sward cutter that automates grass-cutting operations while allowing remote control via a smartphone application. By leveraging automation, wireless communication, and real-time monitoring, the system improves efficiency, reduces human effort, and provides a cost-effective solution for lawn maintenance. The implementation of this smart system has the potential to revolutionize traditional lawn care practices, making

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

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them more accessible, convenient, and environmentally friendly.

II. EXISTING METHOD

Traditional lawn maintenance primarily relies on manual grass-cutting techniques using handheld tools such as sickles, scythes, and push mowers. While effective for small areas, these methods are time-consuming, physically demanding, and impractical for larger landscapes. The advent of motorized lawnmowers brought some relief, allowing for faster and more uniform grass cutting. However, these machines still require human supervision and often depend on gasoline-powered engines, contributing to noise pollution and carbon emissions.

TABLE 1

Issues and Impacts

Issues	Impacts
High Labor intensity	Increases physical strain and operational costs
Time-consuming process	Reduces efficiency, especially for large areas
Fuel dependency	Contributes to environmental pollution and high expenses

Recent advancements have introduced semi-automated and robotic lawnmowers, some of which utilize GPS-based navigation for autonomous operation. While these systems reduce manual labour, they come with high initial costs, complex setup procedures, and limited accessibility for average users. Furthermore, most conventional robotic mowers operate within predefined boundaries and lack real-time remote-control capabilities, making them less flexible in dynamic environments.

To address these limitations, the proposed Bluetooth-controlled green sward cutter integrates wireless connectivity and IoT-enabled monitoring, offering an efficient, user-friendly, and cost-effective alternative to existing methods.

III. PROPOSED METHOD

The proposed Bluetooth-controlled green sward cutter automates the grass-cutting process while enabling real-time monitoring and remote operation. The system is designed for efficiency, precision, and user convenience.

It features a motorized cutting mechanism powered by a sharp rotating blade to ensure effective grass trimming. Bluetooth connectivity allows users to operate the cutter via a smartphone application, enabling functions such as start, stop, direction control, and speed adjustment.

IoT integration enhances monitoring by tracking system parameters like battery level, motor speed, and blade efficiency. The microcontroller, such as an Arduino, processes user commands and ensures smooth operation. To improve energy efficiency, the system optimizes motor usage and integrates renewable energy sources where feasible. Safety mechanisms, including obstacle detection sensors, prevent accidental collisions, ensuring secure operation.

TABLE 2

Components & Function

Component	Function
Arduino uno	Processes user commands and manages motor functions
L293D Motor Driver Module	Controls the two DC motors responsible for movement
DC Motors	Drives the four-wheel mechanism for mobility
Rotating Blade Mechanism	A sharp motor-driven blade ensures precise grasshanism

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ISSN 2319-5991 www.ijerst.com

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Bluetooth Module (HC-05)	Enables wireless communication with a smartphone application
16×2 LCD Display	Displays real-time system status and monitoring parameters
IoT Connectivity Module	Facilitates remote monitoring and data collection
Power Supply Unit	Provides necessary electrical power to the system components

A. Working Principle:

The Bluetooth-controlled green sward cutter operates through a smartphone application that sends commands via Bluetooth. These commands are received by the Bluetooth module, which forwards them to the microcontroller for processing. The microcontroller then directs the motor driver module to control the movement of the DC motors and the cutting blade.

Once the user initiates the operation, the system activates the DC motors, which drive the four-wheel mechanism, ensuring smooth movement across the lawn. Simultaneously, the motorized blade rotates at high speed to cut the grass efficiently. Users can control the cutter's movement, including forward, backward, left, and right directions, directly from the mobile application.

The system includes an LCD display that provides real-time feedback on the status of the lawn cutter. Additionally, IoT connectivity allows users to monitor various performance parameters, such as battery level and motor speed, ensuring optimal operation. Safety features, such as obstacle detection, prevent collisions and enhance user control.

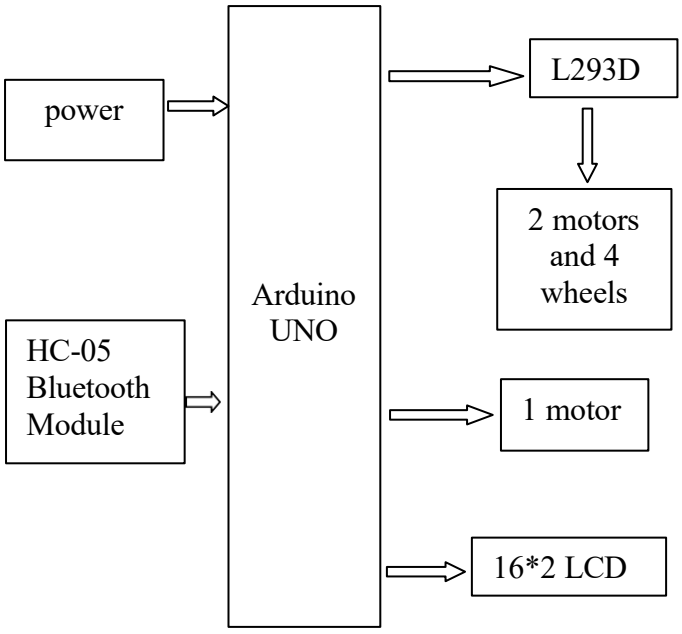
B. Challenges:

One of the primary challenges in implementing the Bluetooth-controlled green sward cutter is the limited Bluetooth range. Since Bluetooth technology has a restricted operational distance, the user must remain within a certain range to control the device effectively. This limitation makes it less suitable for large lawn areas where extended coverage is required.

Battery efficiency and power management also present challenges, as the continuous operation of motors, IoT modules, and sensors consumes a significant amount of energy. The system must optimize power usage to prolong battery life and reduce frequent recharging needs.

C. Block Diagram:

Below is the block diagram representing the working of the system



The block diagram of the Bluetooth-controlled green sward cutter illustrates the interaction between key components that enable automated grass cutting. A smartphone application sends commands via a Bluetooth module (HC-05), which communicates with an Arduino microcontroller. The microcontroller processes these commands and controls the L293D motor driver module, which regulates the movement of DC motors driving the four-wheel mechanism. Simultaneously, the rotating blade motor ensures efficient grass trimming. A 16×2 LCD display provides real-time status updates, while an IoT module facilitates remote monitoring. The entire system operates on a

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ISSN 2319-5991 www.ijerst.com

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dedicated power supply, ensuring seamless and efficient lawn maintenance.

IV. RESULTS AND DISCUSSION [Page Style]

All paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

A. Text Font of Entire Document

The entire document should be in Times New Roman or Times font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.

Recommended font sizes are shown in Table 1.

B. Title and Author Details

Title must be in 12 pt Times New Roman font. Author name must be in 11 pt Regular font. Author affiliation must be in 10 pt Italic. Email address must be in 9 pt Courier Regular font.

TABLE I
FONT SIZES FOR PAPERS

Font Size	I. Appearance (in Time New Roman or Times)		
	Regular	**Bold**	**Italic**
8	table caption (in Small Caps), figure caption, reference item		reference item (partial)
9	author email address (in Courier), cell in a table	abstract body	abstract heading (also in Bold)
11	level-1 heading (in Small Caps), paragraph		level-2 heading, level-3 heading, author affiliation
12	author name		
18	title		

C. Section Headings

No more than 3 levels of headings should be used. All headings must be in 10pt font. Every word in a heading must be capitalized except for short minor words as listed in Section III-B.

1) Level-1 Heading: A level-1 heading must be in Small Caps, cantered and numbered using uppercase Roman numerals. For example, see heading “III. Page Style” of this document. The two level-1 headings which must not be numbered are “Acknowledgment” and “References”.

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3) Level-3 Heading: A level-3 heading must be indented, in Italic and numbered with an Arabic numeral followed by a right parenthesis. The level-3 heading must end with a colon. The body of the level-3 section immediately follows the level-3 heading in the same paragraph. For example, this paragraph begins with a level-3 heading.

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Place figures and tables at the places where they needed. All tables should be in Classic 1 format with borders to heading and subheading columns. Large figures and tables may span across both columns. To do so select text above one column table and convert it in two column and then select text below one column table and convert it into two column. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence. We suggest that you use border for graphic (ideally 300 dpi), with all fonts embedded) and try to reduce the size of figure to be adjust in one column. Figure and Table Labels: Use 8 point Times New Roman for Figure and Table labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader.

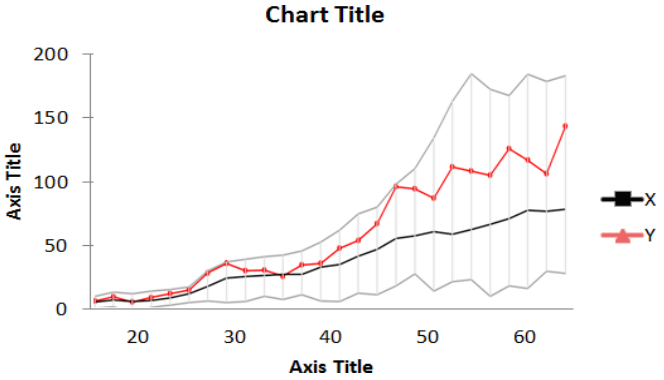

Figure 1: A sample line graph using colours which contrast well both on screen and on a black-and-white hardcopy

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

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V. CONCLUSION

The Bluetooth-controlled green sward cutter with IoT integration offers a smart and efficient solution for automated lawn maintenance. By leveraging wireless control and real-time monitoring, this system reduces manual intervention, improves efficiency, and enhances user convenience. Future improvements may include AI-based navigation, solar-powered energy efficiency, and advanced obstacle detection for enhanced autonomy.

VI. REFERENCES

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