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Multi-Purpose Agriculture Machine

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ABSTRACT: This project focuses on the development of a versatile multi-purpose agriculture machine aimed at revolutionizing farming practices and reducing reliance on manual labour. By integrating features such as pesticide spraying and weed removal into a single, battery-powered rechargeable electric machine, farmers can streamline operations while minimizing costs and environmental impact. This innovative solution not only offers efficiency and convenience but also contributes to educating farmers by introducing them to advanced agricultural technologies. By empowering farmers with accessible and user-friendly tools, this project aims to enhance crop management practices, leading to healthier crops, increased yields, and sustainable farming practices.

KEYWORDS: 350W PMDC Motor, Ferrite magnetic type motor, 5LPM Water Motor, BTS7960 Motor Driver, Relays, DC-DC Buck Converter, Arduino Uno, Arduino IDE, HC-05 Bluetooth Module, Ultrasonic Sensor, RoboBoy Mobile Application, 35Ah 12V Battery.

I.INTRODUCTION

The agricultural sector stands on the cusp of a transformative revolution fueled by technological innovations aimed at optimizing efficiency, sustainability, and productivity. In alignment with this evolutionary trajectory, this project embarks on the development of a versatile multi-purpose agriculture machine poised to redefine traditional farming practices and diminish reliance on manual labour. At its core, this innovative machine seamlessly integrates essential agricultural functions such as pesticide spraying and weed removal into a single, battery-powered rechargeable electric platform. However, this is just the beginning; our vision extends far beyond the current iteration. We foresee this machine evolving into a comprehensive agricultural toolkit, capable of accommodating a myriad of equipment and functionalities essential for modern farming practices.

Beyond its technical specifications, this project embraces a holistic vision of agricultural education and empowerment. By introducing advanced agricultural technologies through this multi-purpose machine, we aim to equip farmers with the knowledge and resources needed to enhance crop management practices comprehensively. Looking ahead, our aspiration is to expand the capabilities of this machine to encompass a wide array of agricultural equipment and functionalities. From soil analysis and irrigation management to harvesting and post-harvest processing, the possibilities are limitless. By consolidating these disparate tools into a single, accessible platform, we envision not only greater efficiency and convenience for farmers but also the cultivation of sustainable farming practices that promote long-term agricultural resilience and prosperity.

II.PROPOSED SYSTEM

The proposed system entails the development of a versatile multi-purpose agriculture machine that integrates essential agricultural functions into a single, unified platform. It comprises a robust chassis housing a powerful motor, rechargeable battery system, and control unit, accommodating modular attachments for tasks such as pesticide spraying, weed removal, soil analysis, irrigation, harvesting, and post-harvest processing. Equipped with a smart control system, connectivity features, and user-friendly interface, the system enables remote monitoring and control, providing real-time data and insights for informed decision-making. Emphasizing sustainability and scalability, the system aims to revolutionize farming practices by enhancing efficiency, productivity, and sustainability while reducing reliance on manual labor and promoting agricultural education and empowerment.

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A) CIRCUIT BLOCK DIAGRAM

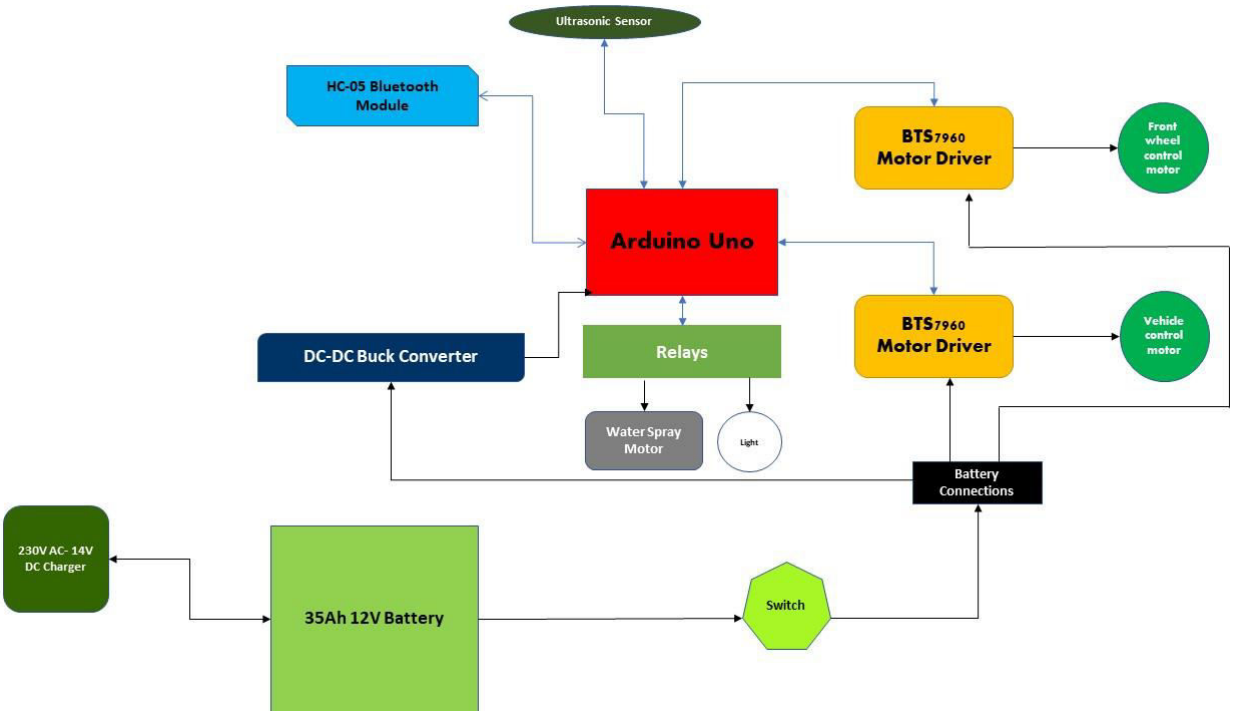

Figure 1: Circuit Block Diagram of Multi-Purpose Agriculture Machine

B) COMPONENTS

1) 350W PMDC MOTOR:
This motor operates at a voltage range of 12V to 24V, with a maximum speed of 3000 RPM (Rotations Per Minute). However, it is attached to a gearbox with a 9.89 reduction ratio, resulting in reduced output speed and increased torque, making it suitable for the agriculture machine's propulsion.

Figure 2: PMDC Motor

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2) FERRITE MAGNETIC TYPE MOTOR (WIPER MOTOR):
Typically used as a wiper motor in automotive applications, this motor operates at 12V DC and is capable of producing up to 30 Nm of torque. It enables precise control of the front wheel steering mechanism in the agriculture machine.

Figure 3: Ferrite magnetic type motor

3) 5LPM SPRAYING MOTOR:
This water motor operates at 12V DC, delivering a flow rate of 5 liters per minute, making it suitable for Spraying or other water-based agricultural tasks within the machine.

Figure 4: Water Spraying motor

4) BTS7960 MOTOR DRIVER:
This motor driver module supports a voltage range of 5V to 27V and can handle continuous currents of up to 43A, ensuring efficient and reliable control of the various motors employed in the agriculture machine.

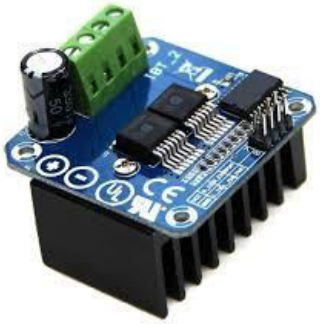

Figure 5: BTS7960

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5) RELAYS:
High-current relays with a capacity of 20A at 12V DC are utilized for controlling the on/off functions of both the 5LPM water motor, the headlight, and an additional switch, providing reliable switching capabilities.

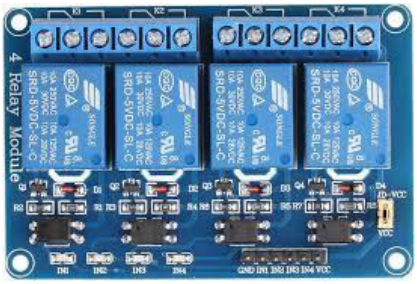

Figure 6: Relays

6) DC-DC BUCK CONVERTER:
This buck converter operates at an input voltage range of 8V to 36V and provides a regulated output voltage of 5V, ensuring compatibility between different electrical components and efficient power management. It is used to power the Arduino Uno microcontroller.

Figure 7: DC-DC Buck Converter

7) ARDUINO UNO:
Equipped with an ATmega328P microcontroller running at 16MHz, this Arduino board offers 14 digital I/O pins, 6 analog input pins, and a USB interface for programming and communication with external devices.

Figure 8: Arduino Uno

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8) HC-05 BLUETOOTH MODULE:
This Bluetooth module operates at a frequency of 2.4GHz and has a communication range of up to 10 meters, facilitating wireless connectivity between the agriculture machine and external devices for remote monitoring and control.

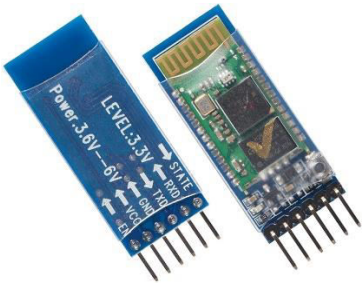

Figure 9: Bluetooth Module

9) ULTRASONIC SENSOR:
This sensor operates at a frequency of 40kHz and has a detection range of up to 4 meters, providing reliable obstacle detection capabilities for the agriculture machine's front side to prevent collisions.

Figure 10: Ultrasonic Sensor

10) HEADLIGHT:
A high-brightness LED headlight with a power rating of 5W, providing illumination for night-time operation of the agriculture machine, enhancing visibility and safety in low-light conditions.

Figure 11: LED Head light

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11) 35AH 12V BATTERY:

A high-capacity rechargeable battery providing the necessary power for the operation of the agriculture machine, ensuring extended periods of uninterrupted usage in agricultural settings

Figure 12: Battery

C) SOFTWARE USED

Arduino IDE is a software application used for programming Arduino microcontroller boards. It offers a user-friendly interface for writing, compiling, and uploading code to Arduino devices. With built-in libraries and examples, it simplifies the development process for both beginners and experienced users. Arduino IDE supports a wide range of Arduino-compatible hardware, making it versatile for various projects. It plays a crucial role in customizing and fine-tuning the functionality of Arduino-based systems, including the agriculture machine in this context.

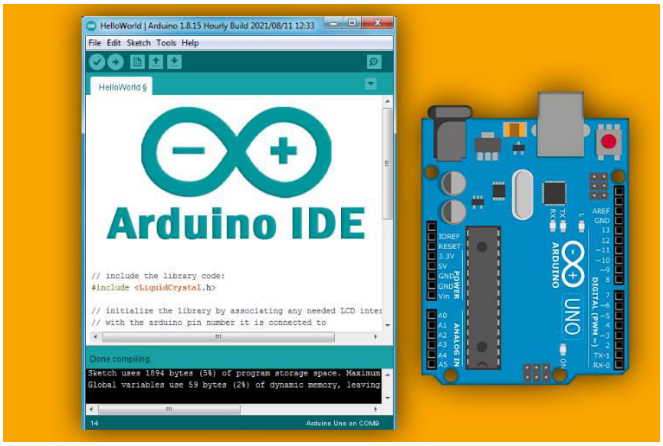

Figure 13: Arduino IDE

Arduino IDE is integral to the agriculture machine project as it serves as the primary software tool for programming and controlling the Arduino Uno microcontroller, which acts as the central processing unit for the machine. Through Arduino IDE, users can write code to define the behaviour and operation of various components and functionalities of the agriculture machine. This includes tasks such as processing sensor inputs from devices like the ultrasonic sensor, controlling motors such as the PMDC motor and Ferrite Magnetic Type Motor for steering, managing communication protocols with devices like the HC-05 Bluetooth module, and implementing logic for decision-making processes.

In essence, Arduino IDE allows users to customize and fine-tune the operation of the agriculture machine according to specific requirements and functionalities. By writing code in Arduino IDE, users can tailor the behaviour of the machine to suit different farming tasks, optimize its performance, and integrate additional features as needed. Thus, Arduino IDE plays a crucial role in realizing the functionality and effectiveness of the agriculture machine project.

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III.PROJECT MODEL AND OUTPUT

Fig14: Model

Fig15: Working with Leveling blade

Fig16: Spraying

IV. OUTPUT

The output of this agriculture machine project is a versatile farming solution tailored for crops like tomatoes, chillies, tobacco, and bitter gourd, which typically require spacing of 20-25 inches between plants. This machine automates tasks such as pesticide spraying, weed removal, and irrigation, enhancing efficiency and reducing labor costs. Its precision farming features ensure targeted application of resources, minimizing wastage and optimizing crop health. By decreasing reliance on manual labour and resource consumption, the machine contributes to cost reduction and improved profitability for farmers. Additionally, it facilitates timely management of tasks, leading to healthier crops and increased yields. With its adaptability to various crop types and spacing configurations, the machine offers flexibility to meet diverse agricultural needs. Furthermore, the project integrates mobile phone control, allowing users to remotely monitor and manage the machine's operations, providing unprecedented convenience and accessibility for modern farming practices. Overall, this agriculture machine project represents a sophisticated yet user-friendly farming solution that empowers farmers to achieve higher productivity and better crop quality.

VI.CONCLUSION

In conclusion, the agriculture machine project presents a significant advancement in farming technology, offering farmers a versatile and efficient solution for crop cultivation. By automating essential tasks and integrating precision farming features, the machine streamlines operations, reduces labour costs, and optimizes resource usage. With its adaptability to various crop types and mobile phone control capabilities, it empowers farmers to achieve higher productivity and better crop quality. Overall, this project represents a promising step towards sustainable and modernized farming practices, contributing to the resilience and prosperity of agricultural communities.

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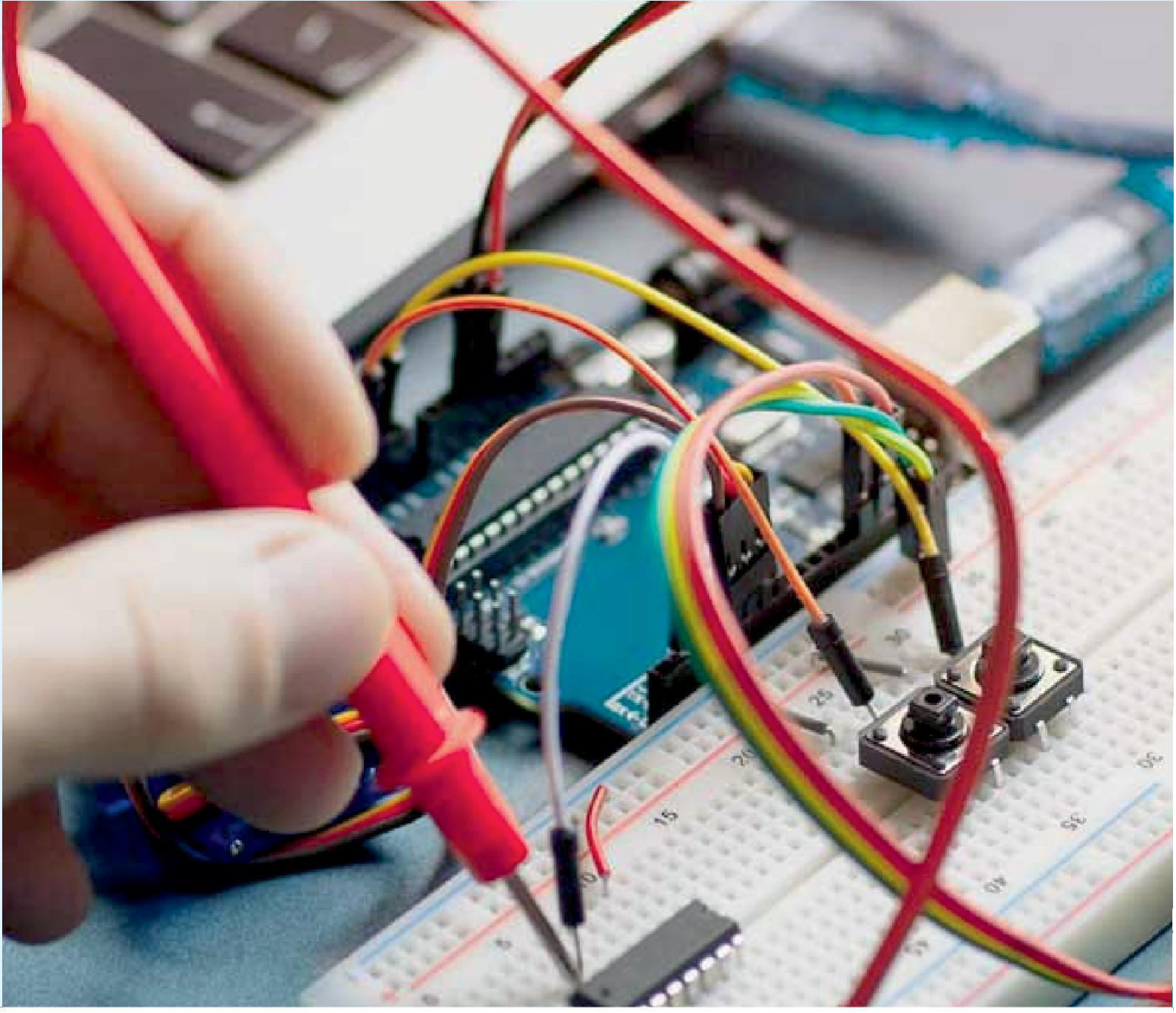

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