AUTOMIC SEED SOWER MACHINE

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Abstract*—The "Design and Development of an Automatic Seed Sowing Machine" project focuses on the creation of a cutting-edge agricultural equipment that will revolutionize the process of sowing seeds. This machine is designed to automate the task of planting seeds in the field, reducing the manual labor involved and increasing efficiency. The development of this automatic seed sowing machine involves the integration of advanced technologies and innovative engineering concepts to ensure precision, accuracy, and reliability in seed placement. The abstract provides an overview of the project, outlining the objectives, methodology, and anticipated outcomes. It serves as a concise summary of the entire research, highlighting the significance of the automatic seed sowing machine in modern agriculture and the potential impact it will have on crop production. Through this project, we aim to address the challenges associated with traditional seed sowing methods and contribute to the sustainable advancement of agricultural practices.

Keywords— Automatic seed sower, Agricultural advancement, Arduino Uno, motor driver L289N, automation in agricultural , seed sower mechanism , Sensor Integration.

I. INTRODUCTION

The design and development of an automatic seed sowing machine is a critical aspect of modern agriculture, aiming to enhance efficiency and precision in the planting process. This introduction provides the necessary background and rationale for the need to develop such a machine. Agriculture is a vital industry that sustains human life, and the demand for increased productivity and sustainability requires innovative solutions. Traditional manual seed sowing methods are not only time-consuming and labor-intensive but also prone to inconsistencies and inaccuracies. Therefore, the motivation to design and develop an automatic seed sowing machine stems from the need to address these challenges and improve the overall agricultural practices. In this context, the introduction sets the stage for understanding the significance of developing an automated solution for seed sowing, emphasizing the potential impact on agricultural productivity, cost-effectiveness, and environmental sustainability.

In summary, the background and rationale for the design and development of an automatic seed sowing machine are driven by the need for improved sowing efficiency, precision, and sustainability in modern agriculture. This section sets the stage for the importance and relevance of the machine in addressing key issues faced by the agricultural industry today.

Moreover, the rationale behind the development of this machine is to address the challenges faced by farmers, such as labor shortages, high operational costs, and the need for precision agriculture. By integrating automation and advanced technologies, such as sensors, actuators, and control systems, the automatic seed sowing machine offers potential solutions to these challenges. The utilization of such a machine can also contribute to sustainable agricultural practices by reducing the environmental impact of conventional sowing methods and enhancing resource utilization.

The background and rationale for the design and development of an automatic seed sowing machine is rooted in the need for efficient and accurate sowing processes in agricultural practices. Traditional sowing methods are time-consuming and labor-intensive, leading to inefficiencies and inconsistencies in crop yields. The demand for improved sowing techniques has driven the innovation of automatic seed sowing machines, which aim to streamline the sowing process, minimize human intervention, and optimize seed placement for enhanced crop growth.

II. LITERATURE REVIEW

The development and implementation of seed sowing robots have garnered substantial academic and industry interest due to their potential to revolutionize agricultural practices. This literature review highlights key advancements, methodologies,

and applications explored in recent research. Studies by Chang et al. (2018) and Kim et al. (2020) discuss the design of precision sowing mechanisms that use rotating discs and pneumatic systems to ensure accurate seed placement. These systems are engineered to maintain consistent depth and spacing, critical for uniform crop growth [1]. Research by Roldán et al. (2019) emphasizes the integration of GPS, LiDAR, and computer vision for autonomous navigation in agricultural fields. These technologies enable robots to follow predefined paths and avoid obstacles, enhancing the reliability and efficiency of sowing operations [2].

According to Balafoutis et al. (2017), seed sowing robots play a crucial role in precision agriculture by reducing input waste and maximizing yield. These robots allow for precise seed distribution, which leads to optimized plant density and resource utilization [3]. Patel et al. (2020) highlights the use of AI and machine learning in seed sowing robots for tasks like path planning and adaptive control. These technologies enhance the robots' ability to operate autonomously in diverse and changing field conditions [4].

Studies by Jha et al. (2019) discuss the integration of IoT with seed sowing robots, enabling real-time monitoring and data collection. This connectivity facilitates remote management and informed decision-making, improving overall agricultural efficiency [5].

Singh et al. (2018) report that the precision and uniformity provided by seed sowing robots lead to better germination rates and higher crop yields. The controlled planting depth and spacing reduce competition among plants, promoting healthier growth [6].

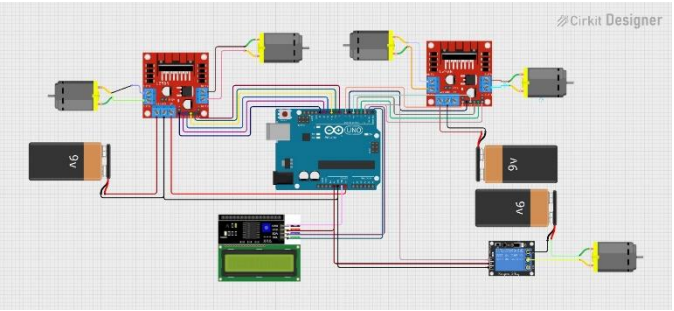
Case studies documented by Garcia et al. (2019) and Wang et al. (2021) showcase the successful implementation of seed sowing robots in various crops and environments. These studies typically report yield increases of 10-20%, highlighting the practical benefits and reliability of robotic sowing systems. Nguyen et al. (2022) discuss challenges such as high initial costs, maintenance, and the need for further technological refinement. Future research is directed towards enhancing the autonomy, reducing costs, and developing collaborative robotic systems for even greater efficiency [7].

III. RELATED WORK

Recent advancements in seed sowing robots have significantly transformed agricultural practices by integrating sophisticated design, mechanisms, and technologies. These robots are equipped with precise sowing mechanisms, such as rotating discs or air-assisted spreaders, to ensure uniform seed distribution. Navigation and control systems, often incorporating GPS, LiDAR, and cameras, enable these robots to navigate fields accurately and adapt to varying conditions. In precision agriculture, these robots enhance efficiency by planting seeds at optimal depths and intervals, thereby maximizing crop yields. Both small-scale and large-scale farms benefit from these technologies, with smaller robots reducing labor costs for smallholders and larger, highly automated robots covering extensive commercial farms swiftly. Recent advancements also include AI and machine learning for improved accuracy and IoT integration for real-time monitoring and remote management. These innovations contribute to sustainable farming by minimizing energy use and soil compaction. Key research highlights the development and benefits of autonomous field robots and smart seed sowing systems, pointing towards future directions such as enhanced autonomy, collaborative robotics, and advanced sensing technologies, which promise to further revolutionize agricultural efficiency and productivity.

IV. METHODOLOGY

A. *Circuit diagram*



B. *Hardware components*

Arduino UNO: A microcontroller to process the information taken as input from the sensors and provides a certain output.
LCD: Showing information from microcontroller so that the user comes to know the working of the robot.
Power Supply: It gives a regulated 5V to the microcontroller.

DC Motors: To collect the seeds from the box and to transfer it to the funnel a, CD is rotated with the use of DC motor. As well as for the motion of the of the robot four Dc motors are used.

Motor driver: To give high power to the motor by using a small voltage signal from a microcontroller or a control system. If the microprocessor transmits a HIGH input to the motor driver, The driver will rotate the motor in one direction keeping the one pin as HIGH and one pin as LOW.

Rely module: To switch electrical devices or systems on and off.

Plastic box: To accommodate the seeds.

CD rotator: To collect the seeds in the partitions and the transfer it to the funnel.

Funnel: To collect the seeds.

Rod: To plough the ground so that the seeds are sowed into the ground.

Rollers: To plain the surface after ploughing.

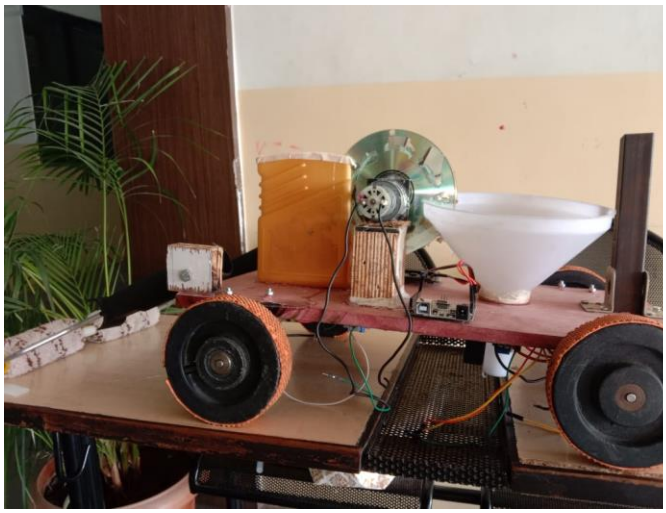
C. Software components

The programming for the project is done using the embedded C language.

Ignition and Run algorithm: To start the robot and for the robot to take turns at given specific interval of time .

LCD algorithm: To display the message when the robot is started and when the robot is stopped.

D. Actual Implementation



V.WORKING

The initial step is starting the Automatic seed sowing robot using robot. After the robot is activated, the LCD displays the message of the start of the robot. The robot moves forward in direction, the ploughing tool comes into action and the rod digs the ground creates the place for the seeds that are to be sowed. After this process, the process of seed sowing takes place. TH seed sowing instrument is placed at the middle of robot so that after the ploughing is done the seeds immediately are fallen of through the funnel. The seeds that are to sowed are paced in the plastic box and when the CD wheel rotates each partition collects a few seeds and transfers it into the funnel. After this process the rollers plain the area which has been ploughed. This cycle continues till the specified time given to the Arduino microcontroller. After the specified time is over the Robot takes the U-turn and the same process is repeated until the end of the complete field.

VI.CONCLUSION

The main goal of an automatic seed sowing system is to streamline the process of planting seeds in agriculture by automating the task. It aims to improve efficiency, accuracy, and speed while reducing the need for manual labor. Moreover, the efforts required for the sowing of seed becomes more easier for the farmers and the labor cost is also reduced which can help the farmers financially.

VII.FUTURE SCOPE

The modifications can be made in the robot by making it completely automated using green energy and Solar energy so that it can be environment friendly as well as cost efficient to the farmers. Modifications like adding an input device about the information of field like its area so that robot can automatically cover the total area without any manual interface. Addition of various components can also be done like the spraying of pesticides and water sprinkling system on the robot. All such modifications can lead to an ease to the farmers as well as the labor cost and work is saved in this entire process.

VIII.RESULTS

The deployment of seed sowing robots in agriculture has yielded significant benefits, including increased precision and uniformity in seed placement, enhanced efficiency, and reduced input costs. These robots ensure optimal plant density and depth, leading to higher crop yields and better germination rates. They also contribute to sustainable farming by minimizing soil disturbance and optimizing water and nutrient usage. Additionally, the use of seed sowing robots reduces labor requirements and allows for data-driven decision-making through advanced sensors and IoT connectivity. Case studies and field trials have demonstrated that these robots can improve crop yields by 10-20% compared to traditional methods, highlighting their transformative potential in modern agriculture.

IX. ACKNOWLEDGMENT

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