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Automated Seed-Sowing and Farming Machine Designs Fabrication, and Technology

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ABSTRACT - In the farming process, often we used conventional method of ploughing and seeding operations that takes more time and more labor cost. Currently, farmers use separate machine for seeding and ploughing and, they are using different machine for different crops that takes more time and cost because of separate process. So, in this project, we combine both the process using single machine. The proposed system takes less amount of time in the process and costs involved in equipment hiring, ploughing, and seeding also very low compared to existing systems. The machine also reduces the human effort require to handle the equipment for ploughing and sowing the seed. In the seeding process, seeds of different crops have different average size that require different equipment. In our project we overcome this issue with the single machine adaptable to different crops. This in turn reduce the equipment cost and makes easily accessible for small farmers. For effective handling of the machine by any farmer or by any untrained worker we simplified its design. Proposed work also makes adjusting and maintenance of the machine is simplified. Using Arduino Microcontroller for controlling the whole process and also using the servo motors for precise control of seed rating.

KEYWORDS - Single Machine, Sowing, Ploughing, Arduino Microcontroller, Servo Motor

I. INTRODUCTION

India's dependence on agriculture is well acknowledged. It is significant to India's economy. Yet the current generation lacks agricultural understanding. This is categorically affecting the development of this country. Because they are unfamiliar with traditional farming methods. In olden days peoples use animals like oxen for soil preparation, but now they don't know how treat them for agriculture.

Farmers will therefore need to adopt modern technologies for farming tasks like digging and seeding among others. At the same time with the increasing demand for food in India, farmers need to be able to produce higher yields more efficiently. By decreasing the time and labour necessary to prepare fields for planting, ploughing and seed-sowing machinery makes it possible to accomplish this.

In order for Indian farmers to effectively prepare their fields for planting crops, ploughing and seed-sowing machinery is a necessary piece of agricultural equipment. These devices are made to carry out two crucial farming tasks like ploughing, which entails aerating and turning the soil and sowing, which entails burying seeds. In India, the usage of ploughing and seed-sowing machinery has been slowly rising as more farmers become aware of their advantages. These tools help farmers increase crop yields while being economical and requiring less labour.

They also give farmers the opportunity to prepare their fields more rapidly, allowing them to plant crops earlier in the season, which may lead to higher yields. Almost 30% of a farmer's crop is lost due to low seed quality, ineffective agricultural methods. By adopting innovative technology, such as seed-sowing machinery, it will be possible to reduce time required for seed sowing and eliminate seed waste.

Automated seed sowing is a modern technique to plant seeds in an efficient and accurate manner. This method has increasingly popular in recent years due to its ability to save time, reduce labour costs, and improve crop yields. One of the most commonly used technologies in automated seed sowing is the Arduino UNO microcontroller. The Arduino is a small, programmable device that can be used to control various components of an automated seed sowing system, such as motors and sensors.

II. LITERATURE REVIEW

In order to give the seeds a suitable soil cover, these papers reviewed in this literature survey suggest that these technologies can reduce manual labour, improve accuracy and precision, and lead to increased yields and decreased costs for farmers.

[1] Saurabh Umalkar, Anil Karwankar (2016) this paper presents the strategy used in this work is focused on creating a system that uses solar energy to power the agrobot to minimize labor costs while also speeding up digging and seeding operations. This machine uses a solar panel to collect solar energy, which is then transformed into electrical energy to fill a battery, which then supplies power to a shunt wound DC motor. To control a robot in the field, a Wi-Fi link running an Android application is used along with digital compass and ultrasonic sensors.

[2] K. Karthikeyam, S. Shyam Sundar, C.B. Selva Subramaniam, and P.S. Sivakumar (2017) this paper presents to design and develop a semi-automated multipurpose agricultural wheel hoe to reduce the man power required for the operation of the wheel hoe. [3] A.O. Onwualu et al. (2019) This paper presents the design and development of a semi-automatic seed planter machine that can be used by small-scale farmers. The machine is designed to reduce the amount of time and labour required for planting, while also improving accuracy and reducing the number of seeds wasted during planting.

[4] M.A. Khojastehnazhand et al. (2020) This paper proposes an automated seed sowing system for greenhouse environments. System utilizes a robotic arm and machine vision to detect and sow seeds in a precise manner.

The authors suggest that this system can reduce the amount of time and labour required for seed sowing while improving the quality of the crops. [5] ADEDEJI Kasali A, LAMIDI Sheriff B, OKE Elijah S and ABESHINBIOKE Olanrewaju U (2021) Automation of agro-technology involves the implementation of recent technologies to develop crops. In this research work, an automatic seed-sowing machine was designed, fabricated, and developed using Arduino programming as the control.

The machine comprises the chassis, power units, and programmed Arduino chips for the automation of the machine. At the end of the test, the machine saves time, energy is more efficient, and has no seed wastage.

[6] S.P. Shirke et al. (2021) This paper presents the design and development of a seed sowing robot that uses machine vision and a robotic arm to sow seeds. The robot is designed to operate in a wide range soil types and can be customized to plant various types of seeds. The authors suggest this technology can improve the efficiency and accuracy of seed sowing while reduced amount of manual labour required.[7] N. B. Narkhede et al. (2019) This paper presents an automated ploughing system that uses GPS and machine vision to control a ploughing machine.

The system is designed to reduce the amount of time and labour required for ploughing while improving the accuracy and precision of the ploughing process. The authors suggest that this technology can lead to increased yields and decreased costs for farmers.

[8] M. B. Gaikwad et al. (2020) this paper presents the design and development of an automated ploughing machine that uses GPS and machine vision to plough fields. The machine is designed to reduce manual labour and improve the accuracy and precision of ploughing. The authors suggest that this technology can lead to increased yields and decreased costs for farmers.

[9] M. Arun, V. Velusamy (2021) This paper presents the design and development of a robotic ploughing system that uses GPS and machine vision to plough fields. The system is designed to reduce manual labour and improve the accuracy and precision of ploughing. The authors suggest that this technology can lead to increased yields and decreased costs for farmers while also promoting sustainable agriculture practices.

III. EXISTING SYSTEM

In already existing system having separate equipment's for ploughing and sowing seeds, which has many drawbacks.

1. Cost:

Purchasing two separate machines can be expensive, and requires a larger initial Investment than purchasing a single machine that can perform both tasks.

2. Storage Space:

Separate machines require additional storage space, which may be a concern for small farms or limited storage facilities.

3. Maintenance:



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- Two machines require more maintenance than one, which can be time-consuming and costly.
4. Soil Compaction:
If the plough is used after the sower has compacted the soil, it can cause soil which can affect crop growth.
 5. Time Management:
Using separate machines for sowing and ploughing requires additional time to switch between them, which can be inefficient and reduce productivity.
 6. Soil Health:
Using separate machines can also cause damage to the soil, which can lead to erosion, nutrient loss, and decreased crop yields over time.

Overall, while having separate machines for seed sowing and ploughing may seem like a good idea in theory, there are several potential drawbacks that need to be considered. Ultimately, the decision to use separate machines will depend on the specific needs and circumstances of each individual farm or operation.

IV. PROPOSED SYSTEM

In this proposed system we have a combinational and conventional method for ploughing and seeding operations with a single machine. So, it has a several advantage for small- and large-scale farmers.

1. Cost-Effective:
A combined machine is usually less expensive than purchasing two separate machines, making it a cost-effective option for smaller farms or operations with limited budgets.
2. Space-saving:
A combined machine takes up less storage space than two separate machines, which can be especially useful for farms with limited storage facilities.
3. Time-efficient:
Using a combined machine saves time as it eliminates the need to switch between two separate machines. This results in increased productivity and reduced labour costs.
4. Soil conservation:
A combined machine can help conserve soil by reducing the number of passes required over the field, which can minimize soil erosion and prevent soil compaction.
5. Precision:
Combined machines can provide precise seed placement and soil preparation, which can result in higher crop yields and better crop quality.
6. Flexibility:
Combined machines are often versatile and can be adapted for different types of soil and crops, making them a flexible option for farmers with diverse needs.

Overall, using a combined machine for seed sowing and ploughing can be efficient and cost-effective option for farmers looking to maximize their productivity while conserving soil and resources.

V. BLOCK DIAGRAM

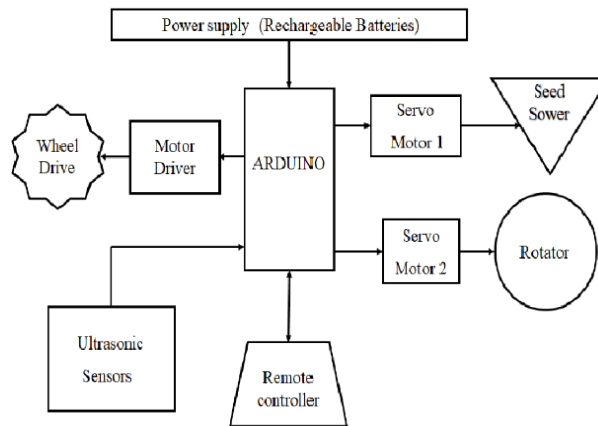


Fig [1]: Block diagram

VI. HARDWARE REQUIREMENTS

ARDUINO: The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a types B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltage between 7 and 20 volts, such as a rectangular 9-volt battery. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

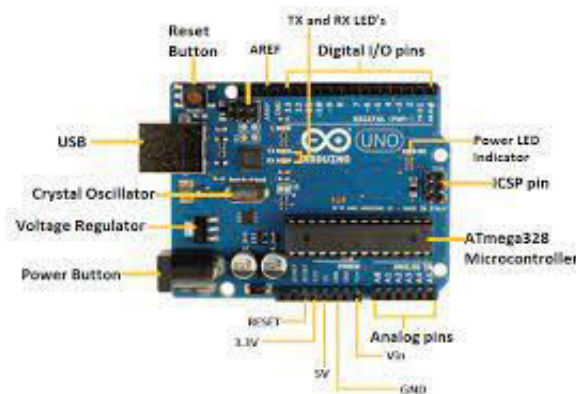


Fig [2]: Arduino UNO

ULTRASONIC SENSORS: Ultrasonic sensors can detect the movement of targets and measure the distance to them in many automated factories and plants. Sensors can have an on or off digital output for detecting the movement of objects, or an analog output proportional to distance. They can sense the edge of the material as part of web guiding system.

Ultrasonic sensors are widely used in cars as parking sensors to aid the driver in reversing into parking spaces. They are being tested for a number of other automotive uses including ultrasonic people detection and assisting in autonomous UAV navigation.



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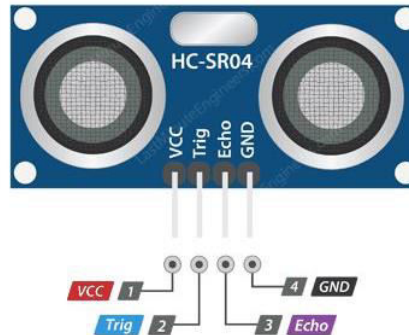
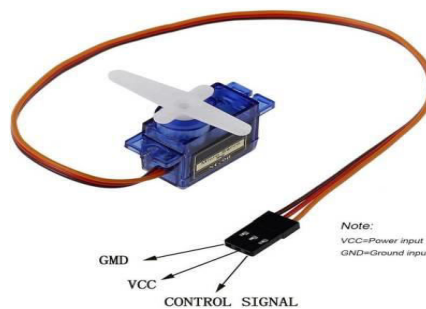


Fig [3]: Ultrasonic Sensor

SERVO MOTOR: A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analog or digital) representing the position commanded for the output shaft. The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller.

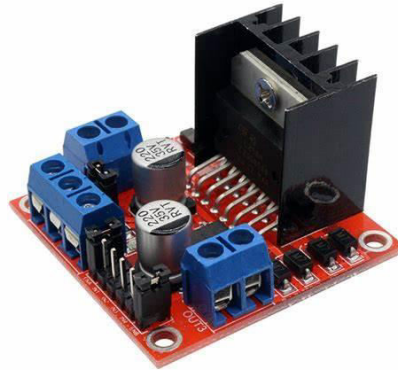
If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped).



Fig[4]: Servo Motor

MOTOR DRIVER: A motor driver is an electronic circuit that is used to control the speed, direction, and torque of an electric motor. It is typically used in robotics, industrial automation, and other applications where precise control of a motor is required. There are many different types of motor drivers, but they all generally work by controlling the voltage and current supplied to the motor. The simplest type of motor driver is a switch, which can turn the motor on or off. However, more advanced motor drivers use pulse width modulation (PWM) to control the motor speed, or even closed-loop feedback systems to control the motor position and torque.

Some common types of motor drivers include: H-bridge motor drivers: These are the most common type of motor driver and are used to control the direction of DC motors. They use four switches arranged in an "H" configuration to control the voltage and current supplied to the motor. Stepper motor drivers: Stepper motors require precise control of the current supplied to the coils in order to move accurately. Stepper motor drivers typically use a technique called micro stepping to achieve this level of precision.



Fig[5]: Motor Driver

VI. DESIGN & FABRICATION

Designing, fabricating, and developing an automated seed-sowing and ploughing machine using Fusion 360 is an interesting project. Here is an overview of the steps involved in the process:

Design: The first step is to design the machine using Fusion 360. This includes creating a 3D model of the machine, including all the components and parts, such as the plough, seed hopper, wheels, and motors. Fig[5] The design should also include the mechanical and electrical systems required for automation.

Simulation: After the design is complete, you can simulate the machine's movement and behaviour using Fusion 360's simulation tools. This step will help identify any potential issues or problems with the design before the fabrication process.

Fabrication: Once the design and simulation are complete, you can begin fabricating the components and parts. This may involve 3D printing, CNC machining, or other fabrication methods, depending on the complexity of the machine.

Assembly: After all the components and parts are fabricated, you can begin assembling the machine. This may involve wiring the electrical components, connecting the mechanical systems, and testing the machine's movement.

Testing and Refinement: The final step is to test the machine and refine the design as necessary. This may involve making adjustments to the machine's movement, improving the automation system, or making other changes based on the testing results.

Overall, designing, fabricating, and developing an automated seed-sowing and ploughing machine using Fusion 360 requires careful planning, attention to detail, and a thorough understanding of mechanical and electrical systems. But with the right approach, it can be a rewarding and fulfilling project

ROTATING BLADE:

Rotating blades can be incorporated into the design of an automated seed-sowing and ploughing machine to aid in the soil preparation process. The following are some considerations for designing [6] and implementing rotating blades:

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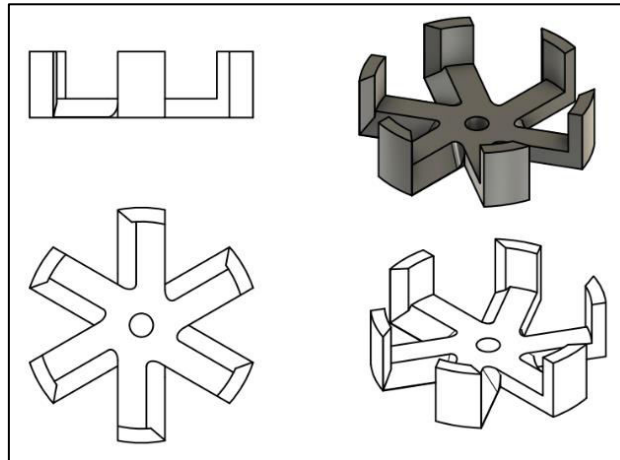


Fig [6]: Blades

Blade Design: The design of the blade will depend on the type of soil and the depth of tilling required. The blade must be sturdy and sharp enough to cut through the soil without bending or breaking.

Blade Placement: The blades should be positioned in a way that maximizes their efficiency. This placement will depend on the specific design of the machine, the soil conditions, and the intended purpose of the blades.

Safety: Safety should be a top consideration when designing and implementing rotating blades. Proper shielding and safety guards must be installed to prevent injury to operators and bystanders.

Maintenance: The blades will need regular maintenance to keep them sharp and functioning properly. The maintenance schedule should be clearly defined and communicated to operators.

PLATE BODY:

The plate body of an automated seed-sowing and ploughing machine serves as the structural framework and should be made from a strong and durable material. The design should consider the weight of the machine, the soil conditions, and the intended use. Manufacturing processes such as welding, bending, and cutting may be required to shape and assemble the plate body, and the surface can be finished with a coating or paint for protection. Using Fusion 360, the plate body can be designed and simulated, and the assembly can be visualized and analysed.

Plate Thickness: The thickness [8] of the plates will depend on the required strength and weight of the machine. Thicker plates will provide greater strength but will also add weight to the machine.

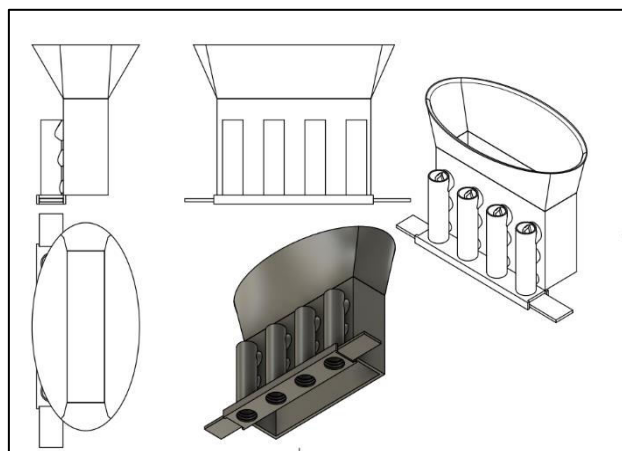


Fig [7]: plate body

To assemble the blade, plates, and plate body, you will need to follow a specific process to ensure that all components fit [9] together correctly.

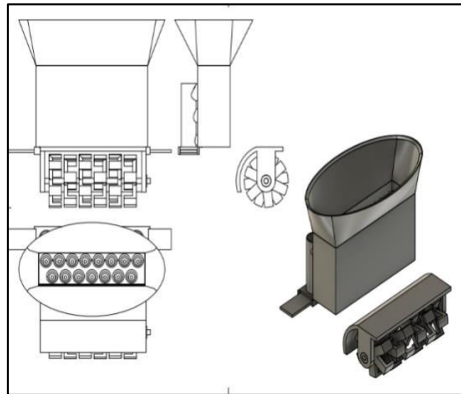


Fig [9]: Assembly view

VI. FEATURE SCOPE

- a. **Soil preparation features:** This would include the design of the plough, cultivator, and any other attachments required to prepare the soil for planting.
- b. **Seeding features:** This would include the design of the seed hopper, seed metering system, and planting mechanism.
- c. **Power and mobility features:** This would include the design of the engine, transmission, wheels, and any other components required to power and move the machine.
- d. **Safety features:** This would include the design of safety guards, emergency stop switches, and other safety features required to protect operators and bystanders.

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