JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

SOLAR POWERED SEED SOWING MACHINE

[1]Dr. N. N. Vadaskar, [2]Priyanshu Taklikar, [3]Rajesh Bhoyar, [4]Sarthak Tibole, [5]Kuldeep Agarkar, [6]Kupeshkumar Bisen

[1]Head of Department, [2]Student, [3]Student, [4]Student, [5]Student
[1]Department of Mechanical engineering
Guru Nanak Institute of technology, Nagpur, Maharashtra

Abstract: Aiming to revolutionize the agricultural sector, this project proposes the development of a solar-powered automatic seed sowing machine that introduces advanced technological efficiencies into essential farming operations like digging, sowing, and irrigation. This innovation seeks to replace traditional, labor-intensive, and fossil fuel-dependent methods prevalent in India, with a sustainable, cost-effective solution. By harnessing solar energy, the machine will significantly reduce labor costs, increase productivity without compromising soil quality, and offer a green alternative to farmers in remote areas. This initiative not only aims to minimize environmental pollution but also to conserve government revenue and fossil fuels, marking a pivotal step towards sustainable agriculture with a multifunctional approach to seed sowing, watering, and fertilizing.

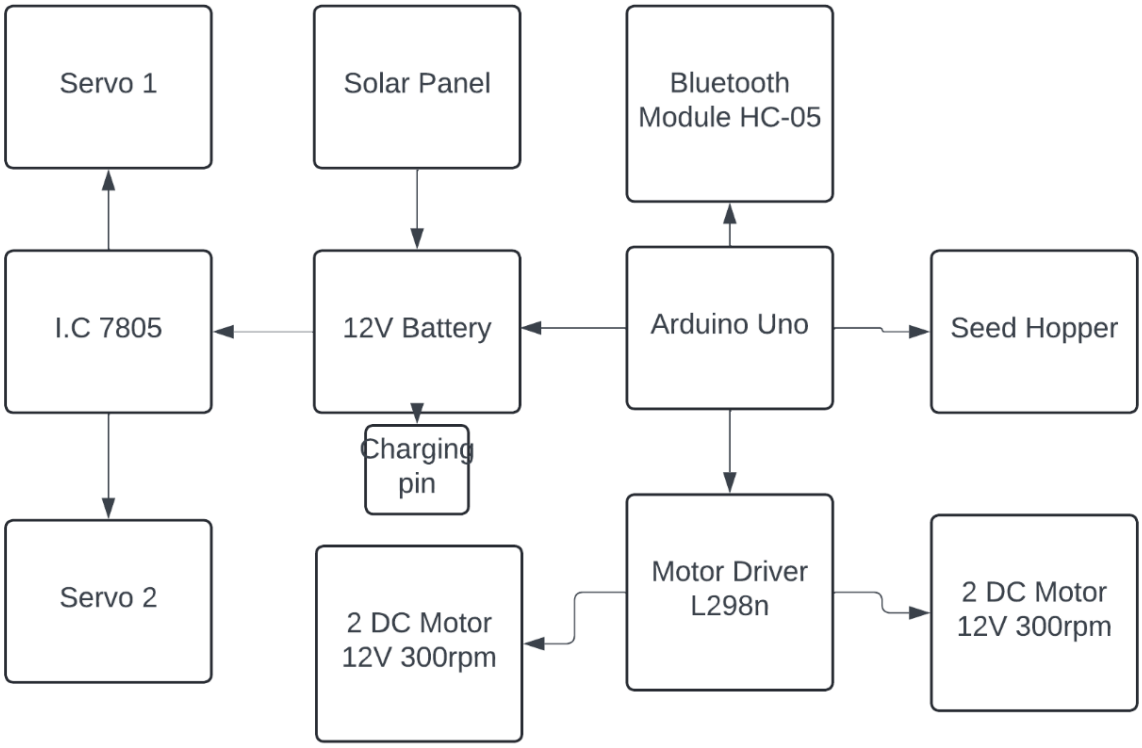
I. INTRODUCTION

For some time, atomic energy has been considered a potential solution to the energy crisis. However, recent advancements have shown solar energy to be a safer and more efficient alternative. Ongoing research aims to enhance the efficiency and cost-effectiveness of solar energy systems, particularly photovoltaic cells. A seed sowing machine aids farmers by precisely placing seeds, saving both time and money, with its primary goal being to ensure proper seed and fertilizer placement, seed spacing, soil covering, and compaction. With India's growing population, there's an increasing demand for agricultural produce, necessitating efficient high-capacity machinery for multiple cropping. Although agricultural mechanization in India is still in its early stages due to limited knowledge and access to advanced tools, seed sowing machines offer significant benefits. They reduce labor and time requirements, ensuring accurate seed distribution and saving costs associated with operations and energy consumption. This project focuses on exploring various soil seed sowing methods and developing a multifunctional machine capable of performing multiple operations simultaneously in a single pass.

II. LITERATURE SURVEY

1. Mahesh R. Pundkar et al. have developed high precision pneumatic planters suitable for various crop varieties and seed sizes, ensuring uniform distribution and spacing along the travel path. The primary function of these planters is to sow seeds and fertilizers in rows at the required depth, while also compacting the soil properly around the seeds.
2. Swetha S. et al. have devised a solar-powered seed sowing machine utilizing solar panels to harness solar energy, which is then converted into electrical energy to charge a 12V battery. This battery powers a shunt wound DC motor, enabling the machine's wheels to be driven. To minimize reliance on labor, the machine incorporates IR sensors for autonomous navigation within the field. These sensors, along with 4 post sensors, define the territory, allowing the machine to sense track length and pitch for movement from line to line.
3. Kunal A. Dhande et al. propose the replacement of complex gear systems in seed sowing machines with Hall Effect sensors, simplifying the process and reducing labor requirements. The Hall Effect sensor converts rotational motion into distance, facilitating seed sowing at precise intervals. Additionally, the machine features an adjustable system for sowing at various distances, enabling row-by-row seeding while maintaining consistent spacing.
4. Trupti A. Shinde et al. introduce a seed sowing machine equipped with battery-powered wheels and an integrated DC motor. The machine detects seed levels to prevent empty seed dispensing, triggering an alarm for replenishment. It also incorporates obstacle detection capabilities to navigate around obstacles efficiently. Each rotation of the wheel dispenses seeds from the seed drum, ensuring smooth and precise seed placement without wastage. The machine signals its completion with an alarm once the sowing process is finished.

III. BLOCK DIAGRAM



IV. METHODOLOGY

1. The machine utilizes a solar panel to harness solar energy, which is then converted into electrical energy. This electrical energy is stored in a 12V battery with a capacity of 7 Amp-hours. The battery powers a DC motor, and the generated power is transmitted to the rear driven shaft through a chain and sprocket system.
2. The entire machinery operates on solar power, eliminating the need for fossil fuels that contribute to environmental pollution. The power is transferred to the driven shaft, which is controlled by a DC motor speed controller, allowing farmers to adjust the speed as desired.
3. The soil digger tool is mounted on the chassis at a 35° angle with respect to the ground. This angle was determined by comparing it with the typical plow tool used by farmers, which typically ranges between 15° to 50° depending on the desired depth of cut.
4. Two hoppers are positioned on either side of the vehicle to hold the seeds, which are then fed into the sowing mechanism.
5. Seeds from the hoppers are collected by a fan-type arrangement, lifting them from one side and dropping them into a U-shaped vessel. From there, the seeds are deposited onto the ground through a circular opening, rotating simultaneously with the driven shaft of the vehicle.
6. To cover the seeds with soil, a plate adjuster is utilized, which redistributes the previously excavated soil over the seeds. This decision was made considering the direction of soil flow during excavation to ensure proper coverage.

4.1Material Used

Chasis Frame, 4 DC motor 12v, Motor Driver L298n, Lead acid battery 12v, Bluetooth Module SC05, Switch, Wires, Solar planal, Seed hoper, Wheels, Arduino uno, 2 Servo motors, Charging pin

4.2 Microcontroller

It is most understand the Arduino board in a microcontroller, and this microcontroller will control the instruction of our project. "Arduino is also a microcontroller."

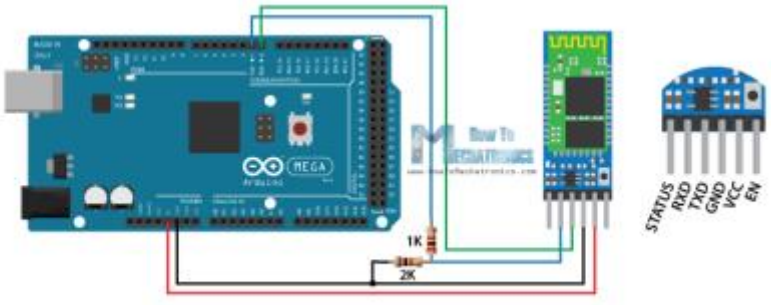
The MCU is used in a Arduino UNO R3 as a important controller. This Arduino is a 8bit device it stores all bus architecture and all signals. They are three types of memory in AT mega328:

i.Flash memory: it is used to store a application. It is 32KB memory. We don't need to upload our application every time we remove the Arduino from its power source.

ii.SRAM memory: It is 2KB memory. It is used to store many application when the running.

iii.EEPROM memory: It is 1KB memory. It is used to store a data when powered is off and powered is on again..

4.3 Circuit schematics

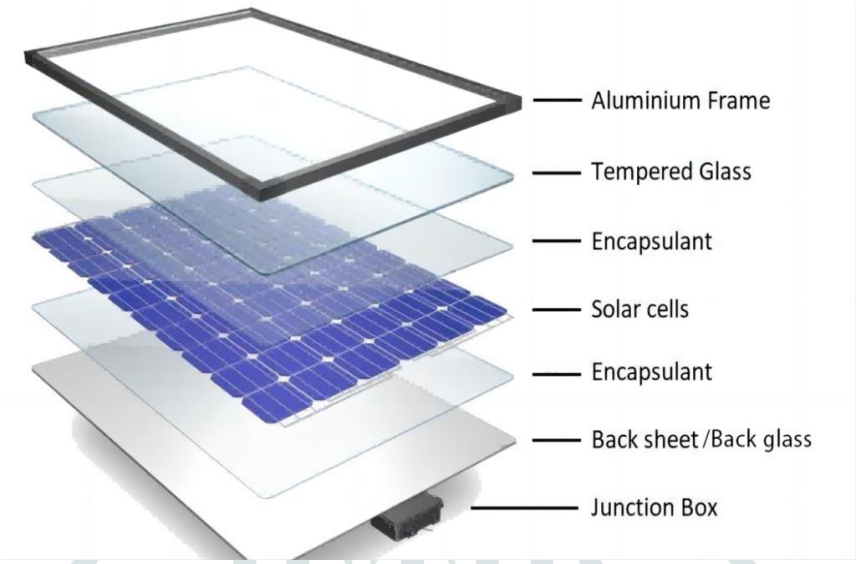


The circuit operates within a voltage range of 3.6 to 6 volts and incorporates a breakout board featuring a voltage regulator. The logic voltage level is set at 3.3 volts. A connection is established between the Bluetooth module and Arduino to ensure consistent voltage supply. This setup enables the Bluetooth module to effectively handle high data transmission to the Arduino board.

Arduino code:

We are prepared to develop code facilitating communication between the Arduino board and the phone. Firstly, we must identify the pin to which our LED will be connected, as well as the pin designated for storing data received from the phone. Subsequently, we need to configure the LED pin as an output and set it to a low state. Given our continuous communication requirement, we initiate communication at a baud rate of 38400, which is the default rate for Bluetooth communication.

4.4 Solar Pannel



The lead-acid battery, invented in 1859 by a French physicist, stands as the oldest form of rechargeable battery. Despite its low energy-to-weight and energy-to-volume ratios, its capability to deliver high surge currents results in a relatively favorable power-to-weight ratio. These characteristics, coupled with their affordability, render them ideal for providing the high currents needed by automobile starter motors in motor vehicles.

Due to their cost-effectiveness compared to newer alternatives, lead-acid batteries find widespread use, even in situations where surge current isn't crucial and other designs could offer higher energy densities. Large-format lead-acid batteries are commonly employed for backup power storage in scenarios such as cell phone towers, hospitals, and standalone power systems requiring high availability. Modified versions of standard cells may be utilized in these applications to enhance storage durations and minimize maintenance needs. Gel-cell and absorbed glass mat variants are frequently utilized, collectively known for their leak-proof properties, allowing them to be positioned in various orientations.

Solar panels are an excellent means of reducing electricity consumption. Many aspire to live self-sustainably or at least decrease their home's carbon footprint, and solar panels enable that aspiration. Comprised of photovoltaic cells, solar panels convert sunlight into electricity, which can then be integrated into the home's main electricity supply. While the technology behind solar panels is relatively old, their efficiency has markedly improved in recent years. Features of a typical solar panel include a 15W rated power output, a heavy-duty aluminum frame, a waterproof junction box (customizable), and a power guarantee of 90% within 10 years and 80% within 25 years. The glass used is typically low iron, high transparency tempered glass measuring 3.2mm in thickness. These panels are compatible with a 12V SLA battery and come in a size of 12 inches by 18 inches.

4.5 Working Principle

This solar-powered seed sowing machine operates on a vertical discontinuous working principle, which involves vertical movement coordinated with an individual's motion in an agricultural field, executing actions intermittently in relation to the horizontal working line. As the name suggests, this machine is designed for seed sowing.

Initially, the soil is drilled using a 4-inch land drill bit with a shaft diameter of 7 mm and edge diameter of 25 mm, reaching a depth of 76.2 mm. Powering this operation is a motor with a speed of 300 RPM and torque of 12 kg-cm, connected to a 12 V, 7 A DC battery, which is directly charged by a solar panel. The motor's operation is controlled by an 8-bit microcontroller, allowing for start/stop functionality and control over its clockwise and anticlockwise motion.

To dispense seeds, a hopper mounted behind the motor (as shown in the figure) is utilized, along with a lever mechanism on the handle. Pressing this lever causes seeds to be automatically released from the hopper, traveling through a pipe attached to it and being deposited into the drilled hole. An adjustable iron plate positioned at the rear of the machine covers the drilled soil, completing the seed sowing process.

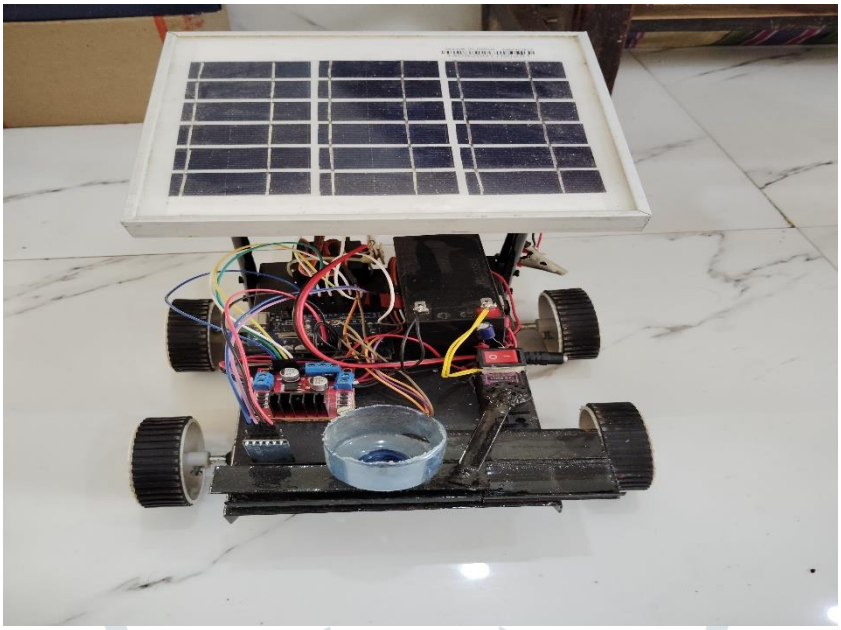
4.6 Conclusion

This semi-automatic device comes equipped with a four-wheel drive system. Engineered to be highly cost-effective, this seed sowing apparatus is economically viable and within reach for rural farmers. It boasts low maintenance requirements and offers simple adjustments, facilitating uninterrupted operation.

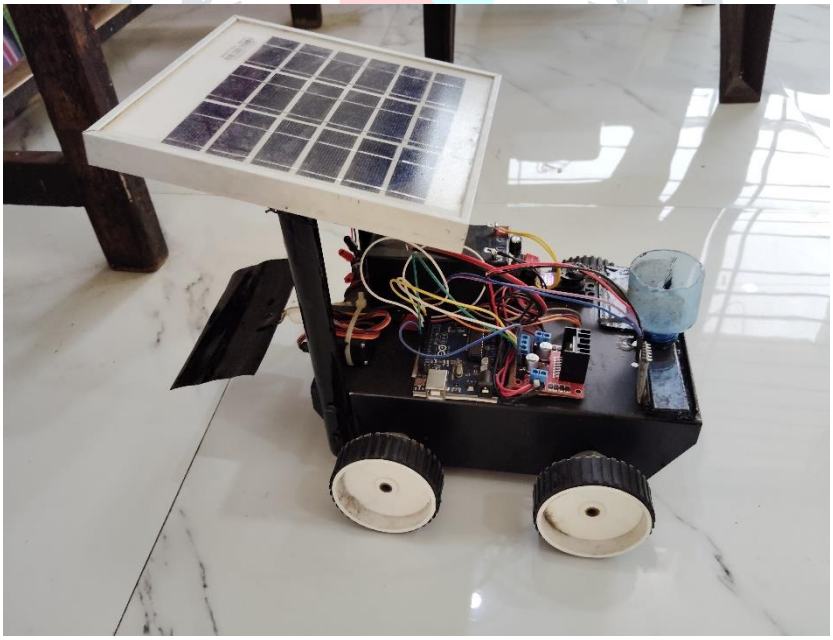
Row spacing, seed rate, seed-to-seed spacing, and seed placement depth are variables that may need customization depending on the particular crop and diverse agroclimatic conditions to maximize yields.

V. RESULTS

5.1 Results of Front View



5.2 Results of Side View



REFERENCES

[1] Chilgar, S. S., & Chilgar, S. S. (2008). Design and Fabrication of Multipurpose Solar Operated Seed Sowing Machine. International Research Journal of Engineering and Technology, 5500. www.irjet.net
[2] Swapnil, Thorat & Kasturi, Madhu & Girish, Patil & Rajkumar, Patil. (2018). Design and Fabrication of Seed Sowing Machine. 10.13140/RG.2.2.12391.75684. R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.
[3] Kolgiri, Somnath. (2016). "SOLAR SEED SOWING MACHINE".
[4] Singhal, Kalash & Prajapati, Gaurav & Saxena, Vipul. (2018). Solar Powered Seed Sowing Machine. 259-262.
[5] Suresh, D.S., Prakash, K.V., Rajendra. C.J. (2013). Automated Soil Testing Device", ITSI Transac-tions on Electrical and Electronics Engineering (ITSI-TEEE) ISSN (PRINT): 2320 – 8945, Vol. - 1, Issue -5, 2013.
[6] Prof. Pranil V. Sawalakhe , Amit Wandhare, Ashish Sontakke and Bhushan Patil, "Solar Powered Seed Sowing Machine",Global Journals of Advanced Research in Mechanical Engineering, Vol-2, Issue-4, PP.712-717, 2015.
[7] Swetha S. and Shreeharsha G.H, "Solar Operated Seed Sowing Machine", International Journal of Advanced Agriculture Sciences and Technology 2015, Volume 4, Issue 1,PP.67-71, 2015