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## “Solar Operated Automatic Seed Sowing Machine”

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**ABSTRACT:** According to food and agriculture organization (FAO), India's 70% of rural households still depend primarily on agriculture for their livelihood. Nowadays, millions of farmers are quitting farming in search of better opportunities because of agricultural problems like more wages, wastage of seeds during seeding, theft in storage areas, lack of irrigation, more time requirement for every operation, lower yield of crops and so on. In this report documents and presents the results of the work carried out on the ways of designing and developing a prototype of Agri bot that can be helpful to overcome the problems currently faced by a farmer. In the implemented system, HC-06 Bluetooth module is interfaced with Arduino UNO to control the functionality of the robot. The implemented prototype of Agri bot can perform the tasks like ploughing the land, Drilling, sowing the seeds and water sprinkling.

**Index Terms –** Seed Sowing, Arduino Uno, HC 05 Bluetooth Module, L298 Motor Driver, DC Motors, Gear Motors.

### I. INTRODUCTION

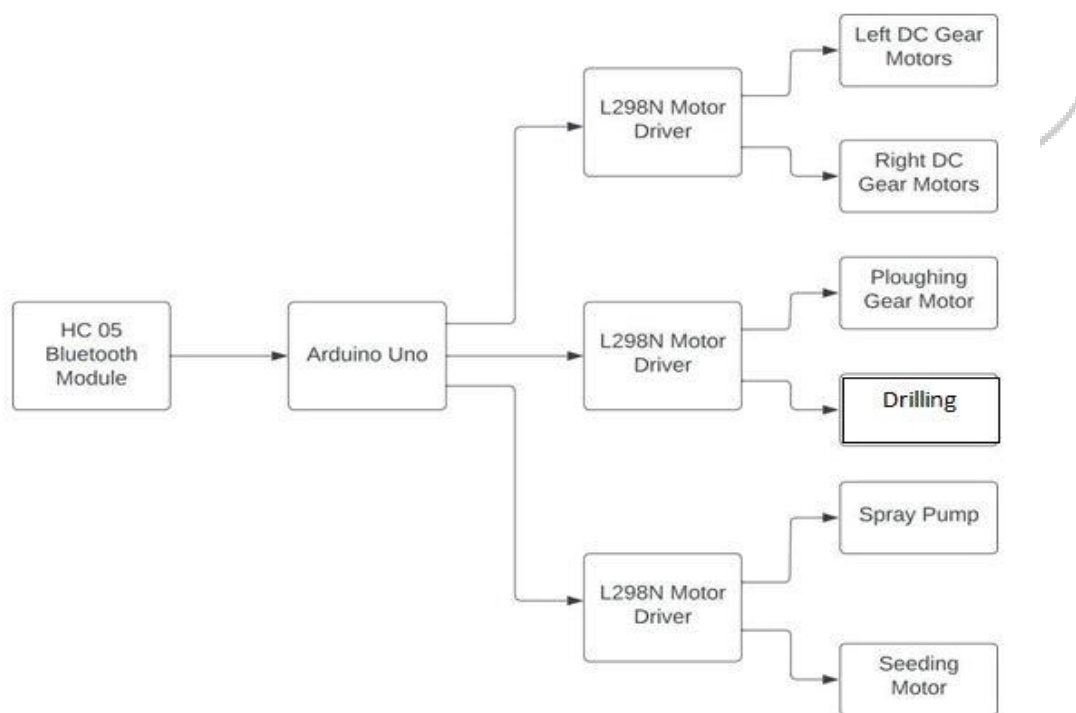
Agriculture is the main backbone of India. The history of Agriculture in India dates back to Indus Valley Civilization Era and even before that in some parts of Southern India. Today, India ranks second worldwide in farm output. The special vehicles play a major role in various fields such as industrial, medical, military applications etc., The special vehicle field are gradually increasing its productivity in agriculture field. Some of the major problems in the Indian agriculture are rising of input costs, availability of skilled la lack of water resources and crop monitoring. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts. The agricultural robot developed in this research work consists of two parts, namely a mobile base for robot movement and a seeding mechanism attached to the mobile base for crop seeding application. The mobile base has a four-wheel design for ease of movement on uneven terrains. The agricultural robot operates in accordance to the commands of an operator. As farms grow in size, together with the size of the equipment used on them, there is a need for ways to automate processes, previously performed by the farmer himself, such as controlling the fields for pests. In the field of agriculture, crop plantation begins with ploughing the land and sowing seeds. The traditional method of manually sowing seeds by hand is a highly inefficient and time-consuming process that requires a lot of human effort and can lead to health issues for the farmers due to excessive bending and ergonomic strain.

## II. PROBLEM STATEMENT

Solar-operated automatic seed sowing addresses the pressing need for efficient and sustainable agricultural practices, particularly in small to medium-scale farming and remote areas. Current manual seed sowing methods are Farmer intensive time-consuming, and often result in uneven seed distribution, leading to suboptimal crop yields and wasted resources. Traditional mechanized approaches, while more efficient, typically rely on fossil fuels, contributing to environmental pollution and incurring significant operational costs for farmers, especially those in developing regions with unreliable access to electricity or expensive fuel. The core problem lies in the lack of an affordable, eco-friendly, and highly automated seeding solution that can empower farmers to improve productivity while reducing their environmental footprint. This challenge is exacerbated by a dwindling agricultural workforce and the increasing urgency to adopt sustainable farming techniques. A solar-operated automatic seed sowing would directly mitigate these issues by offering an energy-independent, precise, and less Farmer Intensive alternative, ultimately aiming to enhance food security, farmer livelihoods, and environmental sustainability

## III. PROPOSED SYSTEM

The Proposed block diagram outline Agri bot is equipped with Bluetooth which is interfaced with the Arduino to compute the directions and functions of the entire system. The Arduino is further connected to three L298N motor drivers. One L298N motor driver has two outputs. The first L298N motor driver outputs are used to operate the left and right DC gear motors and similarly second L298N motor driver outputs are used to operate ploughing and Drilling motors whereas, the last motor driver outputs are used to operate diaphragm spray pump and seeding motor.



**Figure1: Block diagram of Agri bot model**

#### IV. SYSTEM COMPONENTS

- ATmega328 Microcontroller- It is a single chip Microcontroller of the AT mega family. The processor code inside the microcontroller is 8-bit.
- Solar panel converts sunlight into electrical energy 5.5v.
- Battery stores the electrical energy generated by solar panel.
- Dc motor provides the power to drive the sowing mechanism and the wheels.
- L298N Motor driver Module can control up to 4 DC or 2 DC motors with direction and speed control.
- HC-05 Bluetooth Module is a Serial Port Protocol module, designed for transparent wireless serial connection setup
- Lead acid Battery the rechargeable batteries are lead-lead dioxide systems 12v.
- The Arduino IDE supports the languages c using special rules of code structuring.

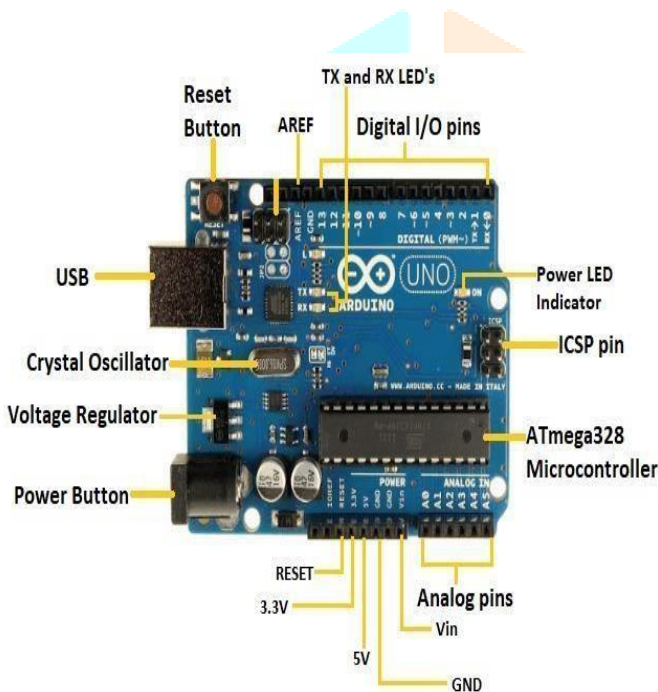


Figure 2: Arduino UNO

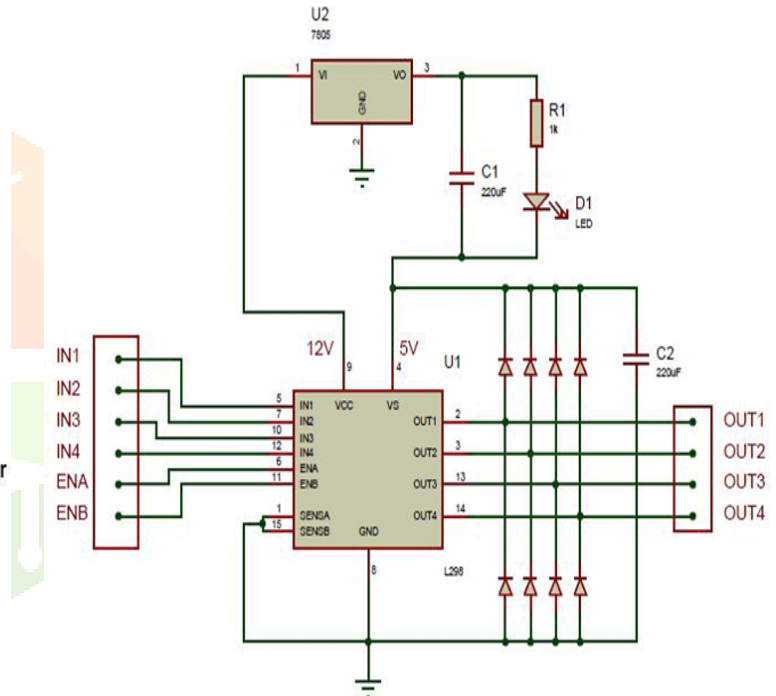
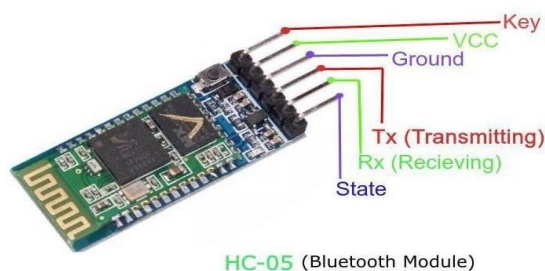


Figure 3: Internal circuitry of L298N motor driver

Figure 4: HC-05 Bluetooth module



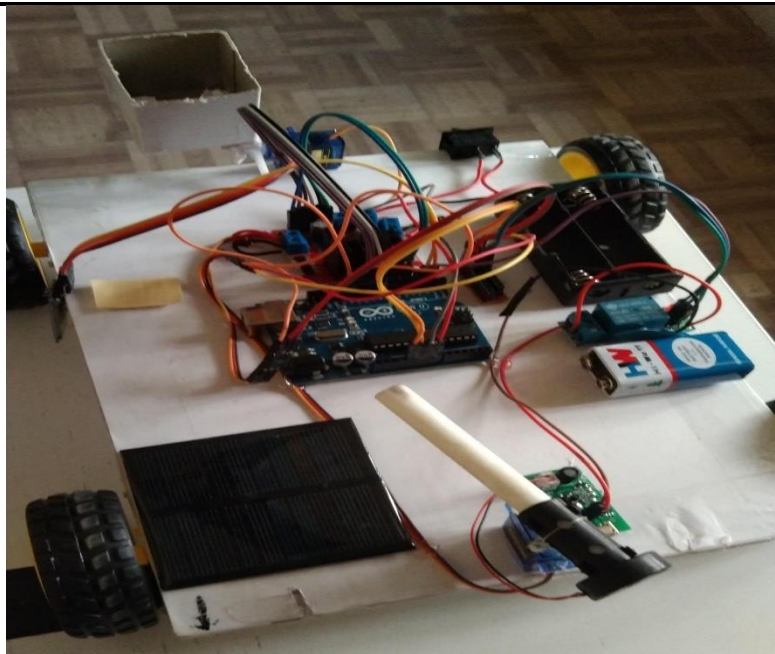
HC-05 (Bluetooth Module)

## V. WORKING MODULES

Initially, Bluetooth is connected to Arduino using mobile through 'Bluetooth RC Car' app. The Arduino which is further connected to three L298N motor drivers in order to operate the left and right DC motors, ploughing, cutting, seeding and spraying functions where the software allows user to control the entire system. The model consists of 4 wheels which are connected to four DC motors respectively. Both left motors and right motors are shorted respectively and wheels are driven by L298N motor driver. Various commands are used to move the robot in forward, reverse, stop, left, and right direction to perform various functions in the field according to the commands received by the user. Seeding function is sowing the seeds in a particular manner followed by the ploughing function. In the prototype model, a funnel will be used for storing the seeds and the shaft is connected to low rpm DC motor. As the motor rotates along with the shaft, it drifts the seeds from the funnel and drops it to the soil through a hole at the bottom with a short time delay as per the need of the user. The third L298N motor driver is responsible to carry out the seeding mechanism. If input 3 (pin 10) is high then it's corresponding output 3 is also high and hence seeding mechanism starts to function and if input 3 is low then the seeding mechanism stops.

## VI. RESULT

The implemented system of "Agri bot" which is capable of performing several agricultural tasks such as ploughing, cutting, seed sowing and water spraying. The robot has to be operated using Bluetooth to perform agricultural tasks as per the need. The Agri bot is operated with 7AH lead acid battery as the major power supply. The system has 4 wheels and a cutting blade at its anterior region, seeds for sowing in the funnel, water for spraying in the water tank and ploughing mechanism at its posterior end. Agricultural environments are subject to changes throughout the lifetime of a robotic system. For example, there could also be new crop varieties, weeds, pests, diseases, treatments, legislation, temperature change, etc., as well as new robotic technologies. In AI terms this suggests managing an open world, so techniques to enable adaptation during operation rather than at the planning phase are going to be crucial. Techniques that allow robots to find out from experience include reinforcement learning, learning from demonstration, and transfer learning to exploit prior knowledge from another domain or task. Ongoing research is investigating deep learning methods, especially in perception-related tasks involving the interpretation of sensor data, including recognition and segmentation tasks in automated weeding and fruit picking.



## VII. OBSERVATIONS

The main objective of the system is to ploughing the land, Drilling, sowing the seeds and water sprinkling. The user can control the robot to perform different agricultural tasks as per the need and can access it at any time through his smartphone. The other objectives of Agri bot are to reduce manual work, number of workers, save time and money, increase the efficiency and improve quality and quantity of productivity.

## VIII. MERITS

- Agri bot can enhance irrigation system as it is capable of reducing the wastage of water.
- Agri bot is capable of dispersing the seeds in an efficient way that can lead to higher yield of crops.
- Agri bot does not get sick or tired as that of human and there is no break required, so the efficiency and productivity increases.
- Since Agri bot is specially designed to perform specific tasks, probability of error in performing those tasks can be significantly reduced.
- People who don't belong to agricultural background can also do farming effectively with new technologies implemented in Agri bot.
- The robots can perform agricultural operations autonomously such as the spraying and the mechanical weed control, seed dispersal; allowing the farmers to reduce the environmental impact.
- The robots can protect the human workers from the harmful effects of handling the chemicals by the hand and through the system of high spraying and they can reduce up to 80% of farms by the use of pesticides.
- Agri bot offers the higher quality of fresh production, lower production costs, and the smaller need for the manual labor.



## IX. CONCLUSION

In this implemented system, a prototype of Agri bot has been designed, developed and demonstrated to perform agricultural tasks like ploughing the field, sowing of seeds, pesticides/water spraying, and Drilling. In this way we can overcome the problems related to labor wages, improper dispersal of seeds, wastage of water due to extensive irrigation and loss of soil fertility due to improper usage of fertilizers. In agriculture by using this multipurpose agricultural robot named as “AGRIBOT”, we can easily reduce the farmer’s efforts and time. The machine requires less time and less man power compared to traditional method of cultivation. The implemented system of Agri bot is battery operated and controlled by Bluetooth device. Using this robot, farmer can carry out other secondary activity along with operating the robot. By carrying out multiple activities at the same time, farmer can increase his income which results in development of Indian economy.

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