

# SOLAR POWERED AUTOMATED MULTI-TASKING AGRICULTURAL ROBOT

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**Abstract:** Solar-powered automated multitasking agriculture robots are an innovative solution to improve agricultural efficiency while reducing the need for human labor. In India nearly about 70 percentages of people are depending on agriculture. Numerous operations are performed in the agricultural field like seed sowing, water spraying and pesticide spraying etc. The present methods of seed sowing, water spraying and pesticide spraying are difficult. The equipment's used for above actions are expensive and inconvenient to handle. So the agricultural system in India should be encouraged by developing a system which will reduce the man power and time. In conclusion, solar-powered automated multitasking agriculture robots are a cost-effective and sustainable solution for farmers, providing them with a way to improve their productivity and reduce their environmental footprint.

**Keywords:** Agriculture, Robot, Seed Sowing, Water Sprinkling, Pesticide Spraying.

## I. INTRODUCTION

Agriculture is the backbone of rural India. Farmers face problems such as lack of timely availability of efficient workforce, as many have migrated from country side. Hence, to reduce the burden of farmers, automation in the field of farming is necessary. The main reason behind automation of farming processes is saving the time and energy required for performing repetitive farming tasks and increasing the productivity of yield by treating every crop individually using precision farming concept. The robot is able to automatically seed and water, spray pesticides according the path set by the user using the GUI that was developed.

## II. LITERATURE SURVEY

### 1. "Design and development of multi-tasking Autonomous Agricultural robot using ESP32 micro controller"

**Authors:** Rupali Patil, Kiran Navnath, Pawar Adesh Abasaheb, Hande Prajwal Prakash, Songekar Vinayak Shankar

Robotics is influencing our lives in many fields some of which are Manufacturing, Education, Healthcare, Personal Technology, etc. Robotics is also impacting the agriculture field and this can have a considerable impact on the farm produce especially since agriculture plays an important role for the Indian economy. Farmers today can benefit from the technological advancements. Automation can help in boosting the efficiency of the various processes involved right from sowing to harvesting the crops. Technology can bring in disruptive changes over the traditional laborious methods. Smart farming can help bring in a cost-effective solution for the farmer. Agriculture robots can help the farmers in automating the laborious and repetitive tasks and provide the farmer with more time at his hand for devoting to other aspects of farming that can help in improvising the overall production. With the rising population across the globe, there is a huge gap between the demand and supply of agriculture produce. Automating can definitely help in reducing this gap. This paper discusses the design and development of a prototype of a smart robot that is capable of performing various operations like sensing the soil moisture content, ploughing, seed dispensing and irrigation. The system based on the ESP32 microcontroller can run in the auto/manual mode. In the manual mode, the robot uses the wi-fi pairing app as the control device and helps in the navigation of the robot on the field. Embracing new technologies will change the face of the agricultural sector.

### 2. "A multi-purpose agricultural robot for automating ploughing, seeding, and plant health monitoring"

**Authors:** Pavithra B, Sumana Suresh, Chandana R, Nisha M, Nagashree R N

In modern era, the main problem in agricultural field include lack of labor availability, lack of knowledge regarding soil testing, increase in labor wages, wastage of seeds and more wastage in water.

To overcome all these disadvantages the robot for agriculture has been developed. The main aim of agricultural robot is

applying robotic technology in agricultural field. The agriculture robot efficiently performs ploughing, seeding and mud leveling automatically. The robot is a mechanical device which is capable of performing various tasks without human intervention. The robot works based on command given by the controller. Various sensors are used for sensing various parameters along the robotic path. The microcontroller being the heart of the robotic system manipulates entire the action of the robotic system. It also controls a wheel motion by controlling the DC motors. Motor driving circuit is used to drive the DC motor which in turn controls the wheel motion. Controlling of the robot mainly require some means of communication. One of the communication means is the wireless Bluetooth connectivity. HC-05 and HC-06 are the Bluetooth modules that are used to control the robot using Smartphone. The Bluetooth application is user friendly and data exchanging between robot and smartphones is done systematically.

**III. EXISTING METHOD**

In existing system seed sowing robots are not available. In this a person should manually sow or plough the land for seeds. It takes so much time and need labor. So, we moved to proposed this system.

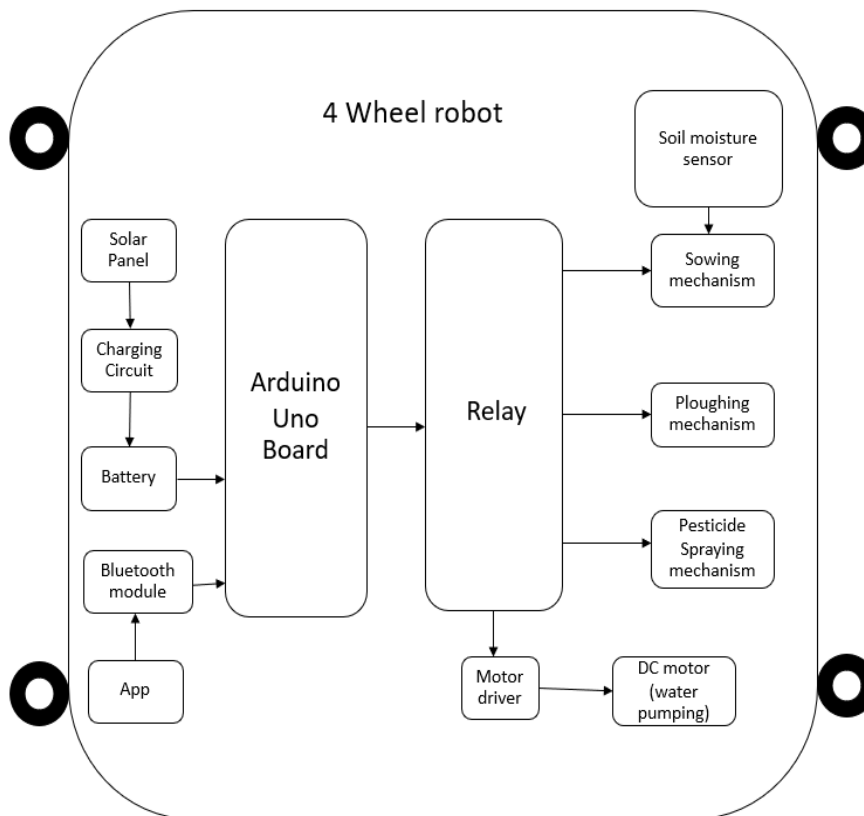
Disadvantages :

- It can lose connection in certain conditions.
- Not accurate method
- No seeding is done in this method.

**IV. PROPOSED METHOD**

We propose this “an agri-bot for” to overcome all the drawbacks in existing system. It reduces the burden of farmers, automation in the field of farming is necessary. automation of farming processes which saving the timeand energy required for performing repetitive farming tasks and increases the productivity of yield.

**BLOCK DIAGRAM :**



**Fig 1: Block Diagram**

**V. COMPONENTS**

**A. ARDUINO** Arduino Uno is a very valuable addition in the electronics that consists of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328 microcontroller. It also supports serial communication using Tx and Rx pins. There are many versions of Arduino boards introduced in the market like Arduino Uno, Arduino Due, Arduino Leonardo, Arduino Mega, however, most common versions are Arduino Uno and Arduino Mega.

#### **B. BATTERY**

Battery Collected Charge from the solar panel is used to charge the battery. Supply is passed from the battery to framework.

#### **C. SERVO MOTOR**

Servo motor can be rotated for any angle using Controller. In this framework servo motor is used below the hopper, for seeding purpose. It can act as on-off valve.

#### **D. SOLAR PANEL (POWER SUPPLY)**

Solar panel is a get together of photo-voltaic cells mounted in a structure for establishment. It utilizes sun light to produce DC. An assortment of Solar modules is known to be solar Panel and an arrangement of Panels is an Array. Varieties of a photovoltaic framework gracefully sun oriented power to electrical hardware.

#### **E. DC WATER PUMP**

DC water pumps utilizes direct current from battery to move fluid in a different way.

#### **F. BLUETOOTH**

It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications. It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air.

#### **G. RELAY**

A relay is an

circuits must be controlled by one signal. Most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

#### **H. MOTOR DRIVER**

This engine driver board is perfect for mechanical applications and appropriate for association with a Micro controller requiring only a few control lines for every engine. It can likewise be interfaced with basic manual switches, TTL rationale Gates, Relays and so on. This double bidirectional engine driver depends on the extremely used Motor Driver Integrated Circuit i.e. L293D. The circuit will enable effectively and autonomously control two engines each in the two headings.

### **ARDUINO IDE**

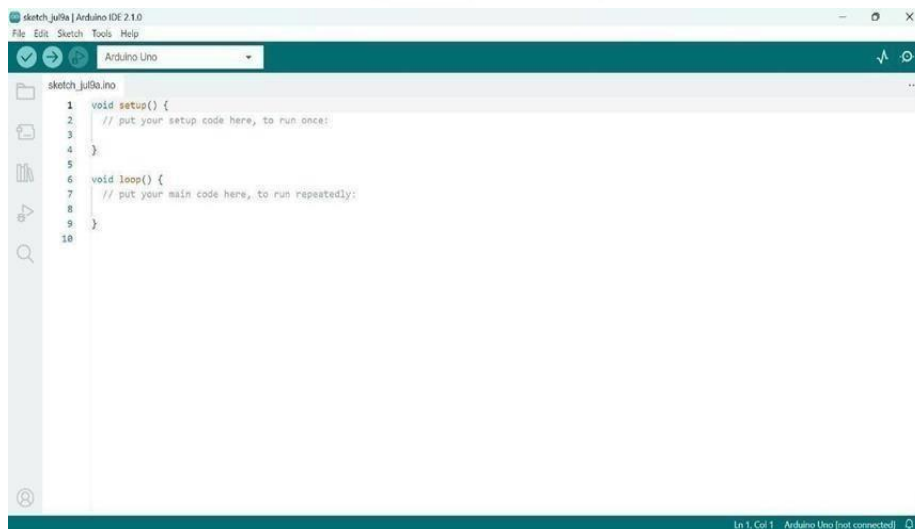
#### **SOFTWARE REQUIREMENTS**

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.

The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor

and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.



## VI. RESULTS AND DISCUSSIONS

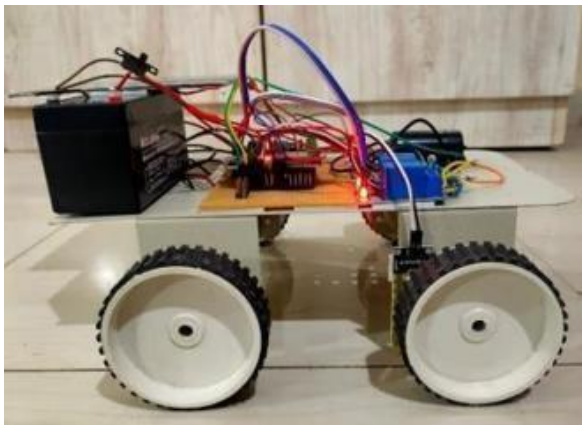


Figure 1: Base frame of robot

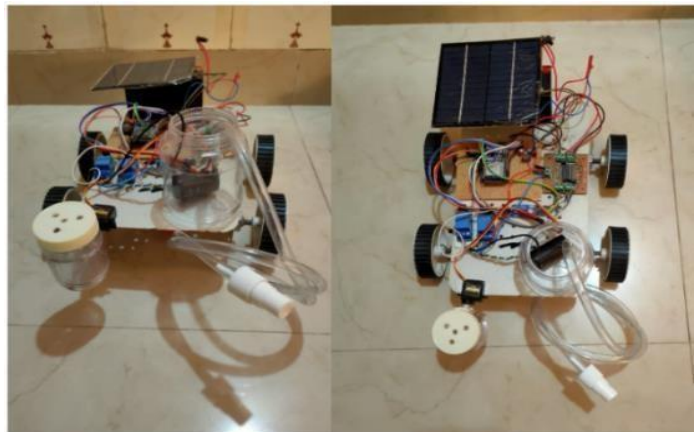


Figure 2: Hardware setup

An automated multipurpose agricultural robot has to be designed to perform the complex farming tasks like seed sowing, ploughing and pesticide spraying. The benefits of robot are reduced human intervention and efficient resources utilization. Instructions are passed to the system using Bluetooth which ensures no direct contact with human and thus safety of operator is ensured. The robot is solar powered hence it is renewable energy source. The operations are performed using android app. Innovative seed sowing, grass cutting and pesticide sprayer equipment has significant influence in agriculture. By using this advanced work, farmer can save more time and also reduce lot of labor cost.

## VII. ADVANTAGES, LIMITATIONS AND APPLICATIONS

### A. ADVANTAGES

- By the improvement of these framework physical work diminished.
- Reduce the task of rancher and it is simpler to operate by using a smartphone.
- The robot does not get worn-out or wiped out.

- Fully smart phone controlled through Arduino.
- Easy to actualize.

**B. LIMITATIONS**

- Framework should be inside the specific range.
- Robots could change the way of life/enthusiastic intrigue of horticulture.
- Experts are required to examine framework failure.

**C. APPLICATIONS**

- Used in Farming
- Used in Nurseries:

Robots in horticulture are widely used in some nursery industries for producing transplants, especially with vegetable plants for grafting and for planting vegetable seeds and plantlets in both greenhouses and open fields.

- Used in Industries which are growing fruits for juice production and more.

**VIII. CONCLUSION**

An automated multipurpose agricultural robot has to be designed to perform the complex farming tasks like seed sowing, grass cutting and pesticide spraying. The benefits of robot are reduced human intervention and efficient resources utilization. Instructions are passed to the system using Bluetooth which ensures no direct contact with human and thus safety of operator is ensured. The robot is solar powered hence it is renewable energy source. The operations are performed using android app. Innovative seed sowing, grass cutting and pesticide sprayer equipment has significant influence in agriculture. By using this advanced work, farmer can save more time and also reduce lot of labour cost.

**IX. FUTURE SCOPE**

In future, the Agri-bot self-sufficient for playing out the different rural activities. It is obvious from the exploration that there is a huge potential for applying the self-sufficient framework in different rural cycles, where it is conceivable to force satisfactory security guideline framework at a sensible expense. We have to add AI for this to improve the future presentation of this task. We can utilize night vision camera for checking evening times. We have to add ML&AI mechanization towards self-framework and self-investigation for plant infections.

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