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 [ijirset@gmail.com](mailto:ijirset@gmail.com)

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# IoT Based Multifunction Agriculture Robot

Pratiksha Karale<sup>1</sup>, Satyam Pawar<sup>2</sup>, Harshal Mhetre<sup>3</sup>, Prof. A. V. Nimkar<sup>4</sup>

UG Student, Dept. of ENTC., JSPM's Imperial College of Engineering & Research, Pune, India<sup>1,2,3</sup>

Assistant Professor, Dept. of ENTC, JSPM's Imperial College of Engineering & Research, Pune, India<sup>4</sup>

**ABSTRACT:** The world's largest industry that is essential to the growth of a country's economy is agriculture. The process of applying modern technologies to improve the crops that are produced is known as agro technology. Utilizing agro technology not only increases crop productivity but also aids in the creation of machinery appropriate for performing mechanical tasks in agricultural settings. As a result, the overall cost of manufacturing is minimized, time is saved, and the process's effort is decreased. Before creating a new product, the behaviour of the technology and its place in society must be taken into account. This is because the new technology must also be economically viable or procedure. A seed-planting device that helps farmers collect the best produce with the least amount of work has been developed in this work. A mechanical tool that facilitates sowing operations and is Internet of Things (IoT) managed has been created. The project's main goal is to use an Android application to simulate seeding crops and applying fertilizer. The robot's inherent structure makes it easy to operate. The lack of labour needed in agriculture lately is a concern for the future, as is the aging of the farming population and the growing global population. The goal of this project is to build the m robot in order to reduce operating costs and improve seed planting accuracy.

**KEYWORDS:** Atmega 328P microcontroller, Wi-Fi module, Internet of Things module, sensors.

## I. INTRODUCTION

For a very long time, agriculture has been and will continue to be the foundation of the Indian economy. The impact of agricultural output on the environment is a major topic of discussion these days, and industrial needs are rising. The majority of Indian towns currently lack enough trained labour in the agricultural sector, which hinders the development of developing nations. As a result, farmers must engage in agriculture activities using advanced technologies. Distributing the seeds and fertilizers by hand is part of the manual approach. Therefore, automation of the industry is necessary to solve these issues. This project's creative idea is to carry out tasks like covering the field, applying fertilizer, planting seeds, and determining whether the soil is fit for cultivation automatically to minimize the need for human labour. The system will be used for communication, sensing, monitoring, and controlling. Parameters like soil moisture content and obstacle detection are detected using several types of sensors. The microcontroller will make the required decisions based on the sensor's output. If the soil is suitable for cultivation, it can be ascertained with the help of the moisture sensor's output. The process of sowing seeds can begin whenever the soil is ready. Additionally, fertilizer spraying operations can be carried out at the desired moment. An Android application can be used to control the robot's operations..

## II. LITERATURE SURVEY

S r . N o	Title of the Paper	Year of Publication	Publisher	Methodology	Conclusion
1	Development of IoT based smart security and Monitoring Devices for Agriculture	2016	Tanmay Baranwal, Nitika, Pushpendra Kumar Pateriya	Methods were accentuated to solve various problems and delivering real time notification and electronic devices are integrated using Python scripts.	An IOT device was designed and tested which is capable of analyzing sensed information and transmitting it to user. Based on test cases, 84.8% success was achieved.

2	Automatic control of irrigation system in paddy using WSN	2016	A. Satya, B. Arthi, S. Giridharan, M.Karvendan, J. Kishore	Water level and moisture sensors are used to measure water level and moisture of soil. GSM modem sends SMS about the time taken to fill the farm with water to the farmer.	The system automatically irrigates the field through the entrance valve when the water level is lower than the threshold level and also according to the moisture of the soil.
3	Design and operation of Wi-Fi Robot Integrated system	2015	G.Amer, S.M.M Mudassir, M.A.Malik	Robot is controlled with Arduino Mega board having ATMEGA microcontroller. The powerful Raspberry Pi, a mini computer, is used to control and monitor the working of the robot.	The walking algorithm allows it to instantly change direction and walk in any new direction without turning its body. An under body sensory array allows the robot to know if a seed has been planted in the area at the optimal spacing and depth.
4	Solar-powered Android based Speed Control of DC motors through Secure Bluetooth	2015	Abhishekh Khanna, Priya Ranjan	Microcontroller-based remote control methodology using android is applied and motor's speed is controlled through it.	The smartphone sends/receives data microcontroller using Bluetooth. Display of motor position using sensors can be sent by microcontroller to the smartphone.
5	Web based service to monitor automatic irrigation system for agriculture field using sensors	2014	M.Usha Rani, S.Kamalesh	Automatic irrigation system using Arduino with moisture, water flow sensor.	When particular moisture level is reached, water flow is allowed and pressure is updated in database.

### III. PROBLEM STATEMENT

1. In the future, we will mechanically handle the sowing and fertilizer spraying processes due to a lack of competent labour. This robot is controlled, which means it follows a path set by the controller and turns left or right when it encounters impediments. The Internet of Things dashboard helps select the operation and microcontroller that fully control the robot. A DC motor mounted on the robot's rear can be used as the seed sowing mechanism. To maintain a consistent distance between two seeds, a distance computation mechanism is employed. The motor is driven by the feedback mechanism. It functions when the car is moving straight ahead; it breaks down when the car is turning or moving into a different row additionally The solar panel is used to recharge the battery.

### IV. OBJECTIVES

- 1) Data collection using sensors.
- 2) Processing data, evaluating it against intended states, and determining what has to be done to alter the system's state.
- 3) An actuator that performs the required operation, such as spraying fertilizer or planting seeds.

V. METHODOLOGY

A. Block Diagram:

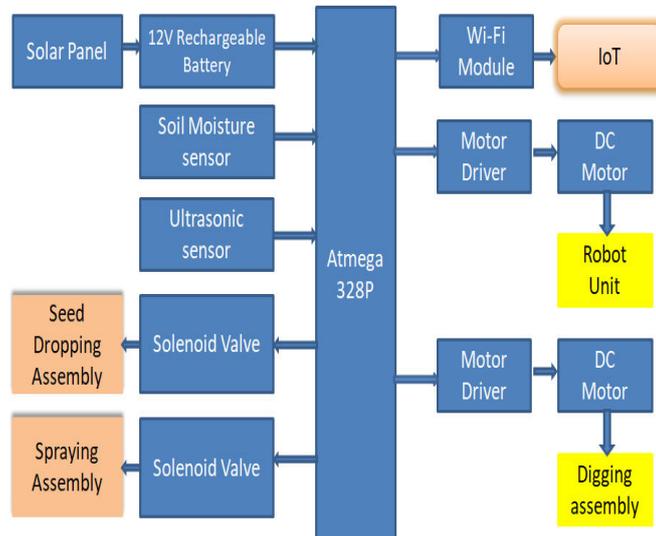


Fig1. Block Diagram of Proposed System

The solar energy is collected by the solar panel, transformed into electrical energy, and then used to charge a 12-volt battery. The purpose of the soil moisture sensor is to ascertain whether the soil has the necessary moisture content for the targeted crops, which include sunflower, jowar, and wheat. An apparatus that uses ultrasonic sound waves to gauge an object's distance is called an ultrasonic sensor. To find out if there are any obstacles in the way, utilize HC-SR04. A drill bit is used to drill into the earth to a predetermined depth. Here, the depth is 5 cm for the required crops. The instruction to drop the seeds into the drilled hole is then sent by the microcontroller. Thus, in this manner, the drilled holes are uniform. depth as well as. The ATmega328 gives the motor driver IC L293D the order to proceed after the predetermined amount of seeds have been deposited into the hole. After receiving inputs from the Atmega328, the L293D IC sends the appropriate signal to the motors. In order to run them through the controller, we need a motor driver. In our circuit, the L293D motor driver IC will be used as the link between the motor and microcontroller. A motor driver L293D provides the supply voltage for four 60 rpm motors that have been employed. A motor driver is necessary since the motors being utilized have a 12V supply voltage, which a microcontroller cannot give. Now that plants are growing in the desired manner, nutrients are sprayed. The user will receive a reminder through the Android application to remind them to spray fertilizer. The user will then only need to issue the command to start the fertilizer spraying process, and the robot will do the work on a regular basis. Robots in the field will be maneuverer using an Android application that is controlled via a Wi-Fi Module interface. With an Android application, you can keep an eye on every move from any location. Thus, fertilizer will be sprayed correctly, seedlings will be successfully planted in the ground, and monitoring can be carried out via an Android application.

B. Component Specification:

1- ATMEGA328P microcontroller:

It is the central component of the system, interconnected with all the sensors and other hardware components needed to accomplish the intended task. It serves as the platform for hardware. All other components are interfaced to this controlling unit. It is an 8-bit, high-performance, low-voltage microcontroller from the AVR family that uses less power and is built on an improved RISC architecture with 131 potent instructions. The majority of instructions complete one machine cycle. It can operate at up to 16 MHz of frequency. It is a 32-bit I/O microcontroller with 40 pins.

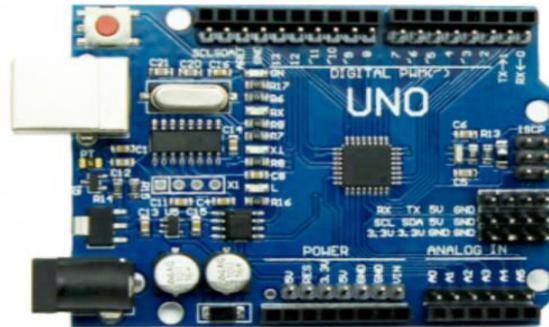


Fig 2 ATMEGA328P microcontroller

### 2- Oil Moisture Sensor

In essence, soil moisture refers to the amount of water that is present in the soil. The soil moisture sensor HL-69, which has two conducting probes, can be used to measure this. Based on the variation in resistance between the two conducting plates, it is possible to determine the amount of moisture present in the soil. The resistance will drop and the conductivity between the plates will improve when the sensor is submerged in the water. Here, we'll use this sensor to check whether the soil has the right amount of moisture for the growth of sunflower, jowar, and wheat.

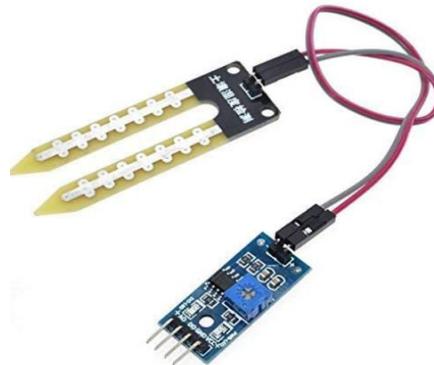


Fig 3 Soil moisture sensor

### 3- Ultrasonic Sensor:

The HC-SR04 Ultrasonic (US) sensor module has four pins. It is a widely utilized sensor that finds usage in numerous applications that call for object sensing or distance measurement. The sensor operates using the straightforward equation:  $\text{Distance} = \text{Speed} \times \text{Time}$ . The ultrasonic receiver module receives the ultrasonic wave that the ultrasonic transmitter sends out. The ultrasonic wave travels through the air and is reflected back toward the sensor when it encounters any object. This sensor will be used to detect any objects in the route in this instance.



Fig 4 Ultrasonic Sensor

#### 4- Wifi Module:

The MQTT (Serial Port Protocol) module known as the Wi-Fi module is intended for the construction of transparent wireless serial connections. This module is a superb wireless communication option because it may be utilized in a Master or Slave configuration. This gadget is used to communicate wirelessly with Wi-Fi capable devices (such as smartphones). Serial communication (USART) is used for communication between it and microcontrollers. Here, Wi-Fi is necessary since we will be using our phones to monitor the robot's operations.

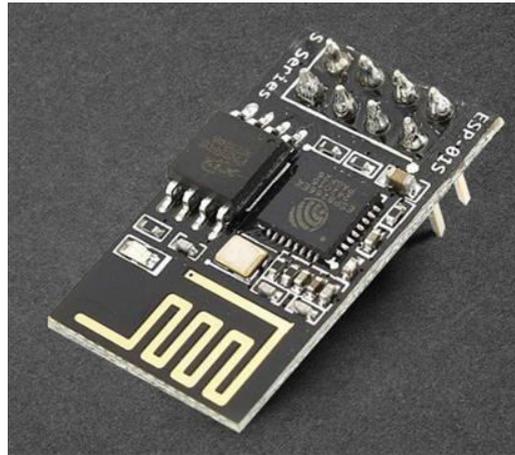


Fig 5 Wi-Fi module

#### 5- Motor Driver L293D:

Actuators are the devices that genuinely provide movement or perform tasks similar to those of motors. There are many different kinds of motors that run on different voltages in the real world. Therefore, a motor driver is required to run them through the controller. In our circuit, we use an L293D motor driver IC to link between the motor and microcontroller. A set of two DC motors can be controlled concurrently in any direction by the 16-pin integrated circuit L293D. It indicates that a single L293D IC can be used to operate two DC motors.

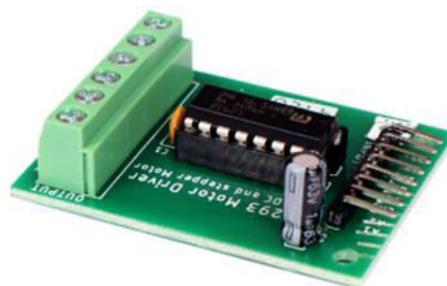


Fig 6 Motor Driver L293D

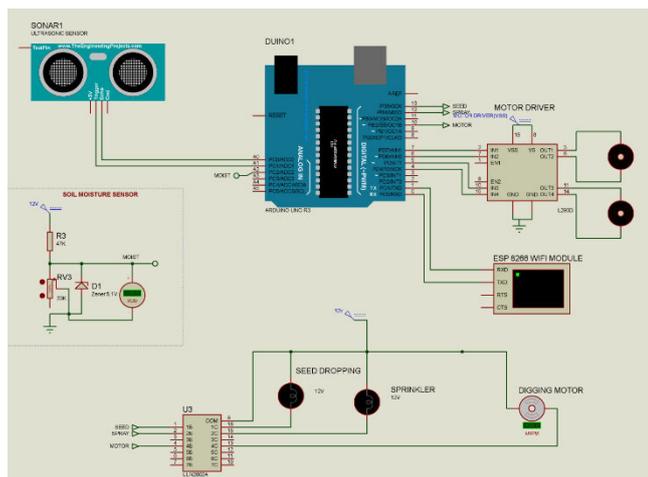
#### 6- Solar Panel:

Result Disc to meet the system's power needs, a 5 watt solar panel with a 12 V output is used as the supply. The solar panel's energy is stored in a 12V lead-acid battery. The solar panel will begin storing solar energy in the battery when it is exposed to sunlight and the voltage across it is higher than the voltage in the battery.



Fig 8 Solar Panel

### RESULT



### VI. CONCLUSION

The goal of this project is to create a fully automated product. This project will effectively build and install a wirelessly controlled, solar-powered seed-sowing and fertilizer-spraying robot in a real-time setting. The suggested system will be created with an effective output at low power and low cost. It will also be possible to control the mobile robot with an Android application and add more accessories to it. This wirelessly controlled robot provides a manual substitute for dispersing seeds and fertilizers. By performing the tasks of fertilizer spraying and seeding, this robot will reduce the need for human labor as well as labor costs, labor time, and energy consumption.

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