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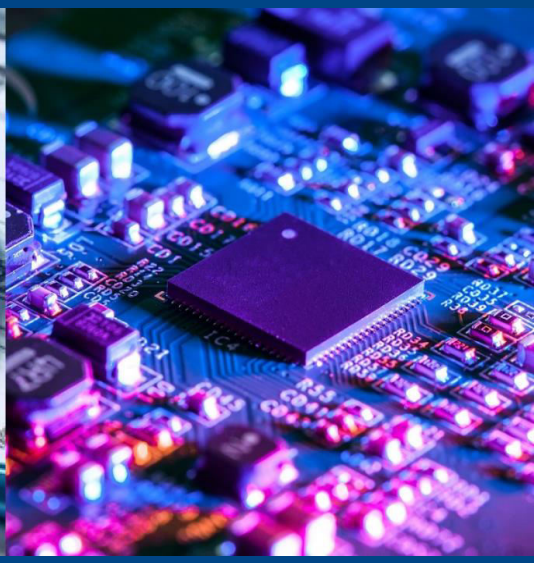

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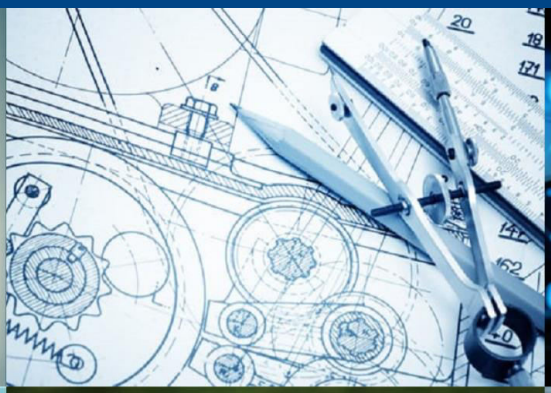

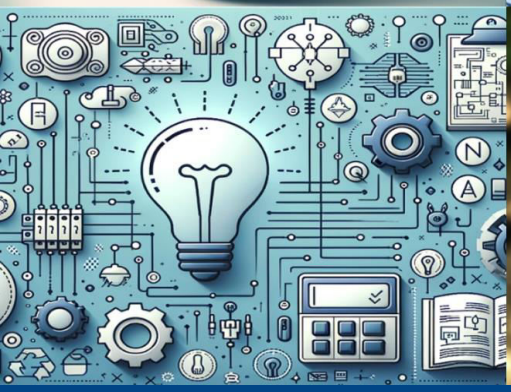

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Seed Sowing Robot using IoT

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ABSTRACT: Agriculture is a vital sector that demands continuous innovation to enhance efficiency and productivity. Traditional seed-sowing methods are labor-intensive, time-consuming, and often lack precision. This project presents an IoT-based Seed Sowing Robot designed to automate the seed-planting process, improving accuracy and reducing manual effort. Thesystemispoweredby anESP32.microcontroller,whichprovideswireless connectivity and allows remote control via the Blynk mob ile application. The robot is equipped with four BO motors controlled by an L298N motor driver for movement and a servo motor for seed dispensing.

KEYWORDS: Seed Sowing Robot , ESP32, Motor Driver, ServoMotor,

I. INTRODUCTION

Agriculture is the backbone of human civilization, playing a crucial role in sustaining the global population. With the rapid advancement of technology, automation in agriculture has become essential to increase efficiency, reduce labor dependency, and enhance productivity. Traditional seed-sowing methods require significant manual effort, which can be time-consuming, labor-intensive, and inconsistent in precision. To overcome these challenges, smart farming solutions leveraging IoT and automation are gaining popularity. [1]This project presents a Seed Sowing Robot designed to automate the seed-planting process using IoT technology. The system is built around an ESP32 microcontroller, which enables wireless connectivity and remote operation through the Blynk mobile application. The robot is equipped with four BO motors for movement, controlled by an L298N motor driver, and a servo motor responsible for seed dispensing

II. LITERATURE REVIEW

Exploring Mars and other planets aids scientists in their understanding of severe climate swings that have potential to drastically affect the planets. Humans devised a strategy for colonizing Mars. As a result, before humans set foot on Mars, t's a good idea to grow some plants on Mars and monitor them. This Automated Rover takes on the role of a human by planting and watering the plants on its own. This paper is focused on automated seed planting and monitoring using Internet of Things (IoT). Rover is a movable device that is powered by ESP8266 Node MCU controlled DC motors. Rover is equipped with a DHT11 sensor and a Wi-Fi module that continuously monitors and uploads data to Thingspeak. This rover is equipped with a plough that can be adjusted, a seed dropper, and automated water pouring equipment. An Arduino Nano can be used to control all of the actions. It estimates the distance between each seed after dropping the seed, so that it can water the seeds automatically after 12 or 24 hours. Depending on availability, the rover uses both DC battery and solar energy to power the entire setup. All the rover's actions are fully automated, and no human intervention is required.[1]

Agriculture is done in every country from ages. Agriculture is the science and art of cultivating plants. Agriculture was the key development in the rise of sedentary human civilization. Agriculture is done manually from ages. As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. IOT plays a very important role in smart agriculture [2]

Agriculture is the foundation of the Indian economy. These developments have increased the standard of living of farmers. Agro-Technology is the method of introducing technology advancement that exists in daily life and applying it to the farming sector that increases the output of the crop produced and also to develop a better mechanical machine to help the farming sector that reduces the amount a crop produced. Therefore, in this

project work, we decided to design a better mechanical system that is available at a cheaper rate to farmers and that can simultaneously sow and seed the grain. This project consists of improved machine design which can be used specifically for soybean, maize, pigeon pea, Bengal gram, groundnut etc. sowing. Various models of seed sowing [3]

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III. METHODOLOGY

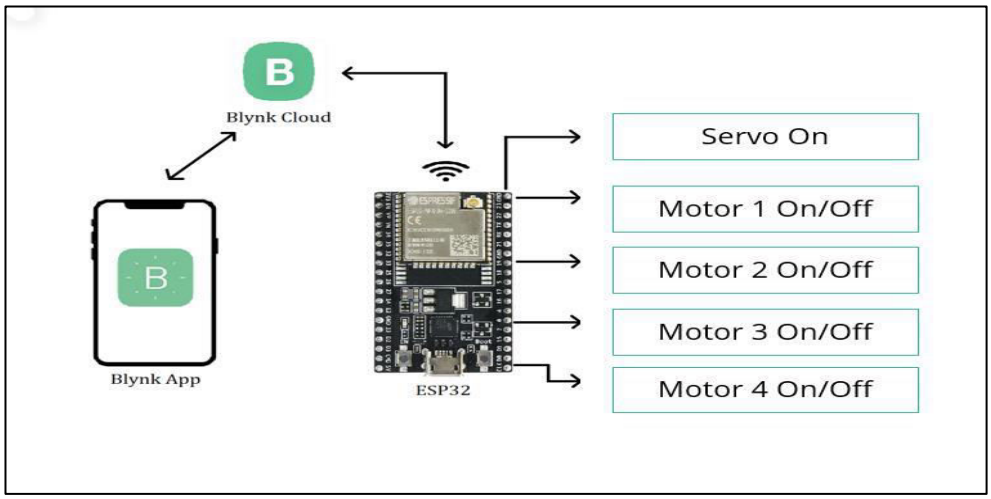

Figure.i System Architecture Diagram

1. User Interface (Blynk App)
   - Sends movement and seed-dropping commands
   - Displays robot status (position, seed level, etc.)

2. Communication (ESP8266 WiFi Module)
   - Receives commands from Blynk over WiFi
   - Controls motors & servo based on received signals

3. Motion Control (4 BO Motors & Motor Driver L298N)
   - Moves forward, backward, left, right
   - Controlled by ESP8266

4. Seed Dispensing Mechanism (Servo Motor)
   - Rotates to release seeds when commanded
   - Controlled by ESP8266

5. Power Supply
   - Battery (Li-ion or 12V supply)
   - Voltage regulation for ESP8266 and motors

IV. WORKING PRINCIPLE

The Seed Sowing Robot is an IoT-based agricultural automation system that allows remote control of seed planting operations. It is designed to minimize manual labor while ensuring precise seed distribution. The system is controlled using the Blynk mobile application, which sends commands to an ESP8266 microcontroller via WiFi. The robot is equipped with four BO motors for movement and a servo motor for seed dispensing Remote Control via Blynk App

The user operates the robot through the Blynk mobile application.
The app sends commands to the Blynk Cloud, which relays them to the ESP8266 module over WiFi.

- ESP8266 as the Central Controller

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The ESP8266 receives and processes the control signals It communicates with the motor driver to regulate the movement of the BO motors.

- Robot Movement Control

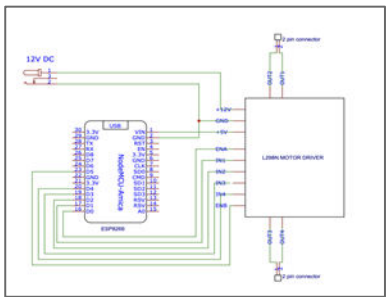
The four BO motors control the robot's navigation:
Forward Movement: All four motors rotate forward.
Backward Movement: All four motors rotate backward.
Left Turn: The right-side motors move while the left-side motors stop.
Right Turn: The left-side motors move while the right-side motors stop.
The ESP8266 ensures smooth and coordinated motion by sending appropriate PWM signals to the motor driver.

- Seed Dispensing Mechanism: The servo motor is responsible for dropping seeds at precise intervals.

Upon receiving the seed-dispensing command from Blynk, the ESP8266 signals the servo to rotate and release a seed. The servo returns to its original position after dispensing, ensuring controlled seed placement.
Real-time Feedback and Monitoring :The system can be modified to include sensors for monitoring soil conditions, battery status, or robot location.The Blynk app can display real-time data, allowing users to adjust operations remotely.

V. CIRCUIT DIAGRAM

This circuit diagram represents the interfacing of an ESP8266 NodeMCU with an L298N motor driver to control two DC motors using a 12V DC power supply.



1. Power Supply:
A 12V DC power source is used to power the L298N motor driver.
The ESP8266 NodeMCU is powered through its VIN pin, which receives 5V from the L298N module.
The GND (Ground) pins of the power source, NodeMCU, and L298N motor driver are all connected together to establish a common ground.

2. NodeMCU (ESP8266) Connections:
The NodeMCU (ESP8266) is used to control the L298N motor driver by sending signals to the input pins.D1 (GPIO5) → IN1 (L298N)
D2 (GPIO4) → IN2 (L298N)
D3 (GPIO0) → IN3 (L298N)
D4 (GPIO2) → IN4 (L298N)
D5 (GPIO14) → ENA (L298N) (Enable Motor 1)
D6 (GPIO12) → ENB (L298N) (Enable Motor 2)
These GPIO pins are configured in the Blynk app or programmed in the ESP8266 to control the motors.

3. L298N Motor Driver:
L298N motor driver is responsible for controlling two DC motors. It receives control signals from the ESP8266 and drives the motors accordingly.
1. ENA & ENB (Enable Pins):
These are connected to D5 & D6 of the NodeMCU to control motor speed via PWM signals.

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2. IN1 & IN2:
These control Motor 1 (connected to OUT1 & OUT2).
The direction of the motor is determined by setting HIGH/LOW signals to IN1 & IN2.

3. IN3 & IN4:
These control Motor 2 (connected to OUT3 & OUT4).
The direction of the motor is determined by setting HIGH/LOW signals to IN3 & IN4.
OUT1 & OUT2:
Connected to Motor 1.
OUT3 & OUT4:
Connected to Motor 2
Working Principle:
The ESP8266 NodeMCU receives commands from a Blynk application via Wi-Fi.
The received commands set the GPIO pins HIGH/LOW, which control the L298N motor driver.
The L298N motor driver provides the required voltage and current to run two DC motors.
Depending on the signals:

- If IN1 = HIGH & IN2 = LOW, Motor 1 moves forward.
- If IN1 = LOW & IN2 = HIGH, Motor 1 moves backward.
- If IN3 = HIGH & IN4 = LOW, Motor 2 moves forward.
- If IN3 = LOW & IN4 = HIGH, Motor 2 moves backward

VI. FUTURE SCOPE

The current ESP8266-based seed sowing robot offers automation and efficiency in small-scale farming. However, with advancements in IoT, AI, and robotics, the project can be significantly enhanced. Below are some potential future improvements:
Integration of AI & Machine Learning
AI-powered path optimization: The robot can use AI to analyze field conditions and determine the most efficient sowing path, reducing energy consumption.
Automated seed distribution analysis: AI can help adjust the seed drop rate based on soil type and fertility.
2. GPS-Based Autonomous Navigation
GPS or RTK-GPS module can be used to enable precise location-based seeding, reducing manual control dependency.The robot can autonomously cover large fields without human intervention
3.Advanced Sensor Integration
Moisture sensors: Detect soil moisture levels and adjust seed spacing accordingly.Temperature and humidity sensors: Help in selecting the right time for sowing, improving germination rates
Solar-Powered Operation
Solar panels can be integrated to make the system energy-efficient and self-sustainable, reducing the dependency on battery charging

VII. RESULT

Expected Output and Explanation for the ESP8266-Based Seed Sowing
Robot Using Blynk
Expected Output:
Successful Wireless Control via Blynk App

- The ESP8266 receives commands from the Blynk app through the cloud.
- The robot performs corresponding actions based on the received Motor and Servo Functionality
  The four BO motors control the movement of the robot (forward, backward, left, right).
  The servo motor controls the seed dispensing mechanism, dropping seeds at predefined intervals

VIII. CONCLUSION

The ESP8266-based seed sowing robot using Blynk successfully automates the seed sowing process, reducing manual effort and improving efficiency in farming. By integrating IoT technology, the system allows remote control via the Blynk app, making operations more convenient. The use of an L298N motor driver ensures smooth movement, while BO motors and servo motors enable precise seed placement.

This project demonstrates the potential of smart agriculture by optimizing labor, reducing errors, and enhancing productivity. Future enhancements like AI-based path planning, GPS navigation, and cloud data storage can further improve its performance, making it a valuable tool for modern farming

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