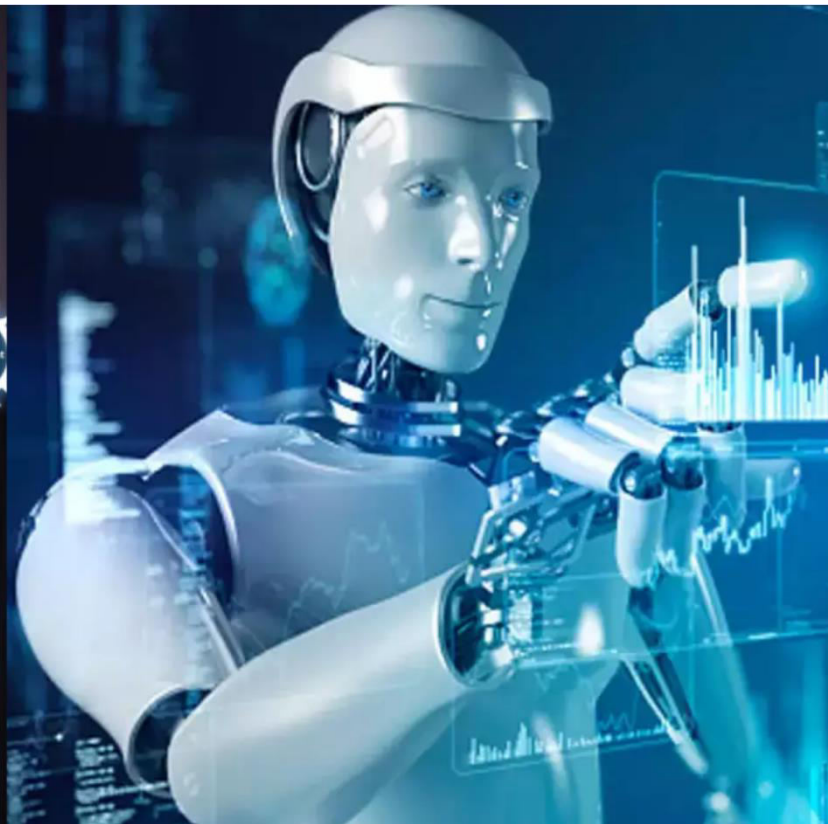




International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 5, May 2025

Android Operated Robotized Multipurpose Tractor for Farming

Pushpalatha M S, Sarah Azam, Kaviarasu S, Pavan Kumar N, Prajwal G

Assistant Professor, Department of EEE, Vidya Vikas Institute of Engineering and Technology, Mysuru,
Karnataka, India

Department of EEE, Vidya Vikas Institute of Engineering and Technology, Mysuru, Karnataka, India

ABSTRACT: Agriculture has been chosen as the primary occupation by more than 42% of the total population in the world. It can also be seen that agriculture is called as the 'Backbone of India', since more than 70% of Indian population depends on agriculture. Agriculture is the process of cultivation of plants for producing food, fiber and other desired products. The main aim of Agribot is to apply robotics technologies on the field of agriculture. According to recent studies it has been found that farmers still follow traditional methods to carryout agricultural activities because of which labor force is increased and accuracy of the final outcome is decreased. Due to lack of knowledge sometimes farmer fail to identify the disease of the leaf. This project aims to solve agriculture related issues and increase accuracy of the final outcome by developing an agriculture robot which does agricultural tasks automatically such as ploughing, leveling, seeding and irrigation.

KEYWORDS: Agricultural robot, farming, android operation, automatic and manual operation, power conversion, sensor and Bluetooth operated, system functions.

I. INTRODUCTION

Agriculture is the process of cultivation of plants for producing food, fiber and other desired products. Agriculture has been chosen as the primary occupation by more than 42% of the total population in the world. Since more than 70% of Indian population depends on agriculture, it is called as the 'Backbone of India'. According to recent studies it has been found that farmers still follow traditional methods to carryout agricultural activities because of which labour force is increased and accuracy of the final outcome is decreased. This project aims to solve agriculture related issues and increase accuracy of the final outcome by developing an agricultural robot which does agricultural tasks automatically such as ploughing, levelling, seeding and irrigation along with detection of leaf disease and indicating the farmer with suitable pesticide. The main aim of Agribot is to apply robotic technologies in the field of agriculture. Automation in agriculture is being developed to implement number of agricultural activities without any man force. Most of the countries follow the traditional methods for ploughing, seeding, levelling, and irrigation of plants. The traditional ploughing method includes animals such as buffalo or oxen that draw the soil using a tool called plough attached to them and some farmers plough using tractors. In most of the places, the seed sowing is carried out by scattering the seeds over the required area. Levelling of soil is carried out by buffalo or oxen or a two-wheel tractor using harrows and levelling boards. These techniques are carried out on wet soil and require seven to eight days for a two-wheel tractor and twelve days using draft animals for levelling per hectare of land. The other method of levelling the soil is by using a four-wheel tractor, here it takes about eight hours to level one hectare of land. These methods have the disadvantages of increased labour force; tractors can be expensive; and tractor's work rate depends on tractor's capacity and the amount of soil on which it works. Poorly maintained tractors can cause environmental pollution; well trained and experienced person is required for maintenance and driving of the tractor. There are different types of irrigation including manual irrigation, surface irrigation, drip irrigation and sprinkler irrigation. In these methods, there may be inadequate or excess of water supplied to the farm. To overcome all these disadvantages our project aims to build an agricultural robot which performs ploughing, seed sowing, levelling, irrigation functions automatically. All these functions can be controlled manually too. Robots which perform the operations manually as well as automatically are very useful to the farmers.

II. LITERATURE SURVEY

The author's M. Khosaravani et al. (IEEE, 2020), proposed "Design and implementation of an Intelligent Agricultural Robot". The research paper "Design and implementation of an Intelligent Agricultural Robot" a multifunctional agricultural robot was proposed that uses a microcontroller and various electromechanical tools for ploughing and seeding. The study highlights the use of modular design where different farming attachments can be mounted depending on the task, much like your bot's mechanical configuration. Key Insight: Modular robotic systems with interchangeable tools enhance versatility and reduce the overall cost for farmers by performing multiple functions in a single pass[1]. S. Y. Park and J. H. Kim (IEEE Sensors Journal, 2021) developed a soil monitoring system using capacitive moisture sensors interfaced with microcontrollers. Their system enabled real-time feedback on irrigation needs, reducing water waste and improving crop yield. Similar to your Agribot's design, their sensor data could be transmitted via Bluetooth to a mobile application. Key Insight: Real-time soil moisture sensing enhances precision irrigation and helps farmers make data-driven decisions. Integration with mobile devices increases accessibility in rural contexts [2]. "Design and Development of Automatic Seed Sowing Robot" by G. D. Bhosale et al. (IEEE, 2018), a DC-motor-powered dispenser controlled by a microcontroller was used to release seeds at consistent intervals. The mechanism used sensors to ensure uniform spacing, improving planting accuracy. Key Insight: Seed sowing can be made precise using gear motors and timed actuation, reducing seed wastage and ensuring uniform germination [3]. N. Sharma et al. (IEEE ICACCT, 2017) proposed a pesticide spraying robot that used relay controlled DC pumps and Bluetooth communication for remote operation. Their design reduced human exposure to harmful chemicals and allowed timely pesticide application. Key Insight: Relay-operated spraying systems are effective in automating chemical delivery while improving operator safety and efficiency [4]. In the work "Wireless Communication Based Smart Agriculture Monitoring System" by M. K. Pathan et al. (IEEE, 2020), Bluetooth modules (HC-05) were integrated with Arduino/ESP boards to provide reliable short-range communication between user and field devices. This allowed farmers to operate the robot using a simple Android app. Key Insight: HC-05-based Bluetooth systems are ideal for cost-effective, low-latency control in small field setups[5]. A. Taneja et al. (IEEE, 2019) explored low-power design techniques for agricultural automation, stressing the importance of regulated power delivery from batteries to support outdoor robotic systems. They proposed the use of voltage regulators and power management modules similar to the design in your project. Key Insight: Energy efficiency is crucial for field-deployable robots; appropriate power regulation ensures stability and prolongs battery life[6].

III. METHODOLOGY

Programmed using Arduin UNO for ESP32. Mode Selection: The bot can operate in different modes like "Ploughing Mode," "Sowing Mode," or "Spraying Mode." Motor Control: Based on inputs from the mobile app, the ESP32 sends PWM signals to the H-bridge for movement control. Sensor Data Handling: Real-time readings from the soil moisture sensor are displayed on the app or used to trigger watering. Bluetooth Commands: The mobile app sends specific ASCII codes or predefined messages to control operations. Safety Mechanisms: Stop command via Bluetooth, obstacle detection (optional), and battery status monitoring.

Transformer is used to decrease the output voltage. There are two types of transformer: Step- up transformer and Step-down transformer. Here we need to decrease the output voltage so we use a step-down transformer. In step-down transformer, primary windings are greater than secondary windings. The output of the transformer will be 12V AC. This 12V AC is given as input to the rectifier. Rectifier converts Alternating Current to Direct Current. There are two main types of rectifiers, they are: Half-wave and Full-wave rectifiers. Full-wave rectifier is again divided into Bridge rectifier and Center-tapped rectifier. Bridge rectifier consists of 4 diodes whereas center- tapped rectifier consists of 2 diodes in which one is used for forward direction and the other for reverse direction. The output of the rectifier is 12V DC.

This project focuses on the development of an android-operated robotized multipurpose agricultural vehicle capable of performing essential farming tasks with minimal human intervention. The methodology involves the integration of various hardware components, including sensors, actuators, motor drivers, and communication modules, all controlled by an ESP32 microcontroller. The robot is designed to perform activities such as soil moisture sensing, digging, seed dispensing, and pesticide spraying, aiming to reduce manual labor and improve farming efficiency.

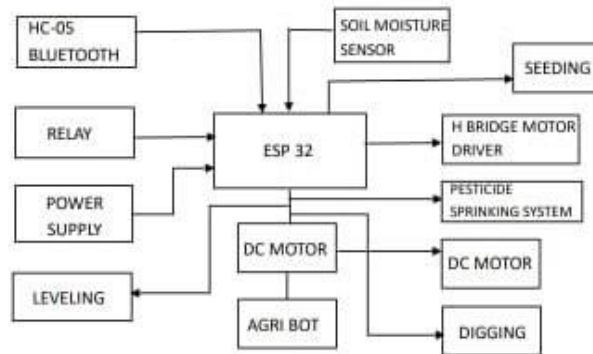


Fig 1: Block Diagram

The proposed system utilizes an ESP32 microcontroller as the central unit to control and coordinate the functions of an android-operated, robotized multipurpose agricultural vehicle. The system is designed to automate key agricultural processes such as digging, seeding, and pesticide spraying. The ESP32 receives commands via the HC-05 Bluetooth module, which allows wireless communication with an Android application. A soil moisture sensor is integrated into the system to monitor the moisture content of the soil, enabling data-driven decisions for initiating seeding operations. A level sensor is also incorporated to check the fluid levels for pesticide spraying or irrigation. The motor control operations are facilitated through a relay and an H-bridge motor driver connected to multiple DC motors. These motors are responsible for executing mechanical tasks such as operating the digging unit, seed dispersal system, and pesticide spraying mechanism. The entire system is powered by a regulated power supply unit that ensures stable voltage for both the ESP32 and the connected actuators. The smart agri-bot functions autonomously once initiated, with the ESP32 interpreting sensor data and executing the appropriate agricultural operations, thereby enhancing efficiency and reducing manual labor in field operations.

IV. EXPERIMENTAL RESULTS

These functions are done using different modes. Programming for different modes is done using different loops and functions. When single feature is considered, like shape feature which gives the lowest accuracy of 51% because rust in sugarcane leads to various shape of lesion. So, this leads to difficulty in analyzing it by extent, minor axis length, solidity and kookiness of image. In this project we are using Microcontroller ESP8266 multipurpose agricultural robot which can be accessed and controlled by using Blynk Application which is connected to the Internet (WIFI). Widgets created using BLYNK application can control the robot in forward, right, left, up, down directions. The agriculture robot efficiently performs Weed Cutting, ploughing, dig the soil, seeding and mud levelling automatically. Four wheels are connected at the base for the flexible movement of robot. DC motors are used to drive the wheels connected to the robot. L293N is used to drive/control the DC motors. A frame is used as a base for connecting and assembling everything in the agricultural robot, it consists of four motors. Two of which are gear motors and other two are toy motors. The robot encompasses following functions: Digging, Seeding, Levelling, Moisture Detection, and Irrigation.

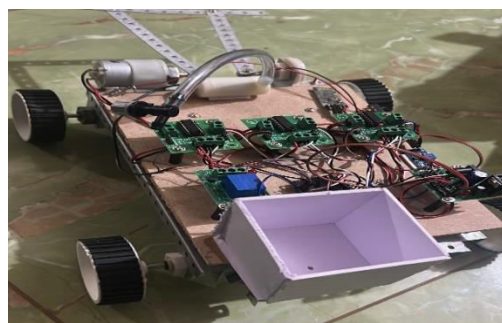


Fig 2: Functionality Testing Result

V. CONCLUSION

As agriculture has been chosen as the fundamental occupation, it is necessary to have an alternative method to carry out the agricultural activities. As to make the work of the farmers easier Agri-bot with which performs all the agricultural activities such as ploughing, seeding, levelling, sprinkling of water, spraying of pesticides, It also indicates the pesticides to be used by farmer. The main objective of this project is to build a robot that carries out the agricultural activities which are as mentioned above and also to detect the disease in the leaf which may further damage the plant. Zigbee is used for the communication purpose and power supply for the manual working of the robot. This robot is moves forward, backward, left and right during the activity. This robot is basically built for the small area purpose. In this project, image pattern classification is used to identify the leaf disease depending on texture and colour feature extraction. Initially the robot captures a digital image of the diseased leaf of a plant and these images are read in EMBEDDED C and processed and classified based on Support Vector Machine and the results are indicated. The results of this project are to identify the leaf diseases of the plants depending on appropriate features. At first, normal and diseased images of the leaf are collected and pre-processed. Next, from these pre-processed images features like of color, shape and texture are extracted. Then, these images are classified as diseased leaf and healthy leaf by using SVM classifier. Depending on the type of input image, the disease is indicated using SVM classifier. Based on the type of disease, a suitable pesticide is also indicated.

REFERENCES

- [1] Bharath Mishra, Sumit Nema, Mamta Lambert, Swapnil Nema 'Recent Technologies of leaf Diseases Detection using Image Processing Approach- A Review' 2017 International Conferences On Innovation In, Embedded and Communication System 17-18 March 2017.
- [2] Gulam amer, S.M.M.Mudassir, M.A Malik 2015 'Design and Operation of wi-fi Agribot Integrated System' international conference on industrial instrumentation and control(ICIC) may 28-30,2015.
- [3] Rahul D S, Sudarshan S K, Meghana k, Nandan K N, R Kirthana and Pallaviram Sure 'IoT Solar Powered Agribot for Irrigation and Farm Monitoring' Second International Conference on Inventive Systems and control(ICISC 2018).
- [4] Mr. V.Gowrishankar, Mr.Venkatachalam 'IOT Based Precision Agriculture Using Agribot' 2016 Global Research And Development Journal For Engineering
- [5] Rahul D.S, Sudarshan S.K, Meghana K, Nandan K N, R Keerthana, Pallaviram Sure 'Agribot For Irrigation And Farm Monitoring' Proceedings Of The Second International Conference On Inventive Systems And Control(ICISC 2018).
- [6] Qingfeng Wei, Chenxue Zhong, Jun Yu, Changshou Luo, Lei Chen 'Agricultural Robotics: Unmanned Robotic Service Units In Agricultural Tasks' 2018 2nd IEEE Advanced Information Management, Communicates, Electronic And Automation Control Conference(IMCEC).
- [7] S. Blackmore and K. Apostolidi, "The European farm of tomorrow," Transactions of the ASABE, vol. 18, no. 1, p. 6, 2011.
- [8] Y. Chen, X. Peng, and T. Zhang, "Application of wireless sensor networks in the field of agriculture," in Proceedings of the ASABE Annual International Meeting, publication no. 1110617, Louisville, Ky, USA, 2011.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details