IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

Agriculture Robot

B. Hanumanthu[1], G. Bhavana[2], K. Swathi[3], CH. Sandeep[4], B. Ravichand[5]
Associate Professor, Dept. of Electronics & Communication Engineering[1]
UG Students, Dept. of Electronics & Communication Engineering[2,3,4,5]
Christu Jyothi Institute of Technology & Science, Jangaon, Telangana, India

Abstract: *The agricultural robot is used to reduce human efforts made by farmers during farming. There are many aspects to the future of this Agri-bot. Agriculture is considered one of the most important economic activities in India. The bot uses various techniques that help us track the various activities involved in the farming process such as soil moisture level, soil type, different nutrients levels in the soil, suggestion of the crop to be cultivated. The multi functionality of the robot will also help the farmer use the same robot to extract weeds, maintain records on soil data, and make it available at any time as it will be stored in a cloud server. Farmers using bots will be easier to monitor the field. In recent years, robotics in agriculture sector with its implementation based on precision agriculture concept is the newly emerging technology. The main reason behind automation of farming processes 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. Designing of such robots modelled based on particular approach and certain considerations of agriculture environment in which it is going to work. These considerations and approaches are discussed in this project. Also, prototype of an Agriculture Robot is presented which is presented which is specifically designed for seed sowing task only. It is a four wheeled vehicle which is controlled by microcontroller..*

Keywords: IoT, Arduino, Soil Moisture Sensor, Wi-Fi module

I. INTRODUCTION

Agricultural robots, also known as "Agri-robots," are advanced machines designed to perform various farming tasks autonomously or semi-autonomously. These robots are part of the larger field of precision agriculture, which aims to increase efficiency, reduce labor costs, and improve crop yields. With global challenges like increasing food demand, labor shortages, and the need for sustainable farming practices, agricultural robots are playing a pivotal role in transforming modern agriculture. They can perform tasks such as planting, harvesting, weeding, spraying, and monitoring crop health with greater precision and consistency than human labour.

Key components: Arduino Microcontroller, Soil Moisture Sensor, Servo Motors, DC Motors/Stepper Motors, Water Pumps, Battery Pack, Wheels or Tracks, Motors and Motor Drivers, Wi-Fi or Bluetooth Module, RF Modules.

Internet of Things (IoT)

The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects. The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects. From any time, any place connectivity for anyone, we will now have connectivity for anything IoT involves embedding sensors, software, and other technologies into physical objects, allowing them to collect and exchange data. This connectivity enables devices to be monitored and controlled remotely, creating a smarter and more automated world.

Agriculture Robot

An agriculture robot project typically centres on designing and developing a robotic system capable of automating key agricultural tasks to enhance efficiency and productivity. The robot collects environmental data using sensors that measure parameters like temperature, humidity, and soil moisture. A camera module captures images of crops, which are then sent to the Arduino board or microcontroller for further analysis. The collected sensor and image data are processed to detect abnormalities in crops, such as signs of disease or unfavourable growing conditions. This analysis helps in making informed decisions about crop management. The robot navigates the farm using motorized wheels, allowing it to monitor different areas autonomously. Data collected and analysed is either displayed on an LCD screen or sent to a remote server for additional review. A feedback loop ensures that the robot can adapt to changing conditions; sensors monitor the outcomes of its actions and relay feedback to the microcontroller. Based on this feedback, the robot adjusts its behaviour through decision-making algorithms. Communication modules enable the robot to interact with external systems, such as mobile apps or cloud platforms, ensuring real-time updates and control.

II. EXISTING SYSTEM

These existing systems provide valuable insights and serve as a foundation for the development of the Solar-Powered Remote Operated Multipurpose Agriculture Robot (SPROMAR), addressing limitations and exploring opportunities for innovation and improvement in agricultural automation and sustainability. Traditional Agricultural Machinery Conventional farming equipment such as tractors, Plows, seekers, and sprayers are widely used for various agricultural tasks. These systems are typically powered by fossil fuels and require manual operation. Automated Farming Equipment: Automated farming machinery, including self- driving tractors and drones, have been developed to enhance efficiency and precision in agriculture. These systems often utilize GPS and sensor technologies for navigation and task execution. Solar-Powered Agricultural Tools: Some existing agricultural tools and equipment incorporate solar power for energy supply. For example, solar-powered irrigation systems and solar pumps are used to optimize water management in farming operations. Multipurpose Agricultural Robots Several research projects and commercial products focus on multipurpose agricultural robots capable of performing multiple tasks such as planting, weeding, and harvesting. These robots are designed to increase efficiency and reduce labor costs.

III. PROPOSED SYSTEM

The proposed system introduces a remote-operated multipurpose agriculture robot designed to revolutionize farming practices through automation and advanced technology. Farmers can control the robot remotely using a user-friendly interface accessible via a mobile app or web portal, enabling real-time monitoring and management from anywhere with an internet connection. The robot integrates autonomous navigation capabilities powered by sensors, GPS technology, and machine learning algorithms, allowing it to navigate efficiently, avoid obstacles, and follow pre-defined paths within the field.

Equipped with sensors and cameras, the robot facilitates data collection and analysis on critical parameters such as soil moisture, nutrient levels, and pest infestations, ensuring informed decision-making and proactive crop health management. It also includes integrated weather monitoring sensors to provide real-time updates on environmental conditions like temperature, humidity, and rainfall, aiding farmers in adapting to weather-related challenges and optimizing farming practices accordingly.

By leveraging solar power and cutting-edge technologies, this system offers a sustainable solution for modern agriculture, aimed at improving productivity, reducing labor costs, and optimizing resource utilization. The robot embodies environmental stewardship and resource efficiency, empowering farmers to transition towards smarter, sustainable, and more efficient farming practices that benefit both their crops and the planet.

Software Employed

In the development the Agriculture Robot, the Arduino Software IDE plays a central role. This open-source platform provides an intuitive interface for writing, compiling, and uploading code to Arduino-compatible microcontroller boards. Developers utilize the Arduino IDE to write code that interfaces with sensors, processes data, and controls other system components. Once the code is written, it is compiled into machine-readable instructions and uploaded to the microcontroller board, such as the Arduino Nano, via a USB cable.

For operating the agriculture robot, we have used Open-source application called telnet which is used to give commands to the robot. for every single task we have to give a particular command to perform the task. It is also used to check the soil condition using the soil moisture sensor. Soil moisture sensor checks whether the soil is Dry or Wet. If the soil is wet then the sensor sends the information to the motor using Arduino and motor will get on.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

IV. RESULTS AND DISCUSSIONS

Agriculture robots have revolutionized the farming industry, offering numerous benefits and opportunities for growth. These robots are designed to perform various tasks, such as Seeding, Crop Protection, Field Information Collection, and Crop Harvesting Overall, agriculture robots have the potential to transform the farming industry, and ongoing research and development are addressing the challenges and limitations of these technologies. Agricultural robots, or agribots, have significantly transformed farming practices by automating labour-intensive tasks and improving efficiency. These robots are used for activities like planting, harvesting, weeding, and monitoring crops. They leverage advanced technologies such as AI, machine learning, and GPS navigation to optimize operations, reduce waste, and enhance productivity. For example, harvesting robots can identify ripe produce and pick it with precision, minimizing food waste. Additionally, IoT-enabled robots provide real-time data on soil conditions and crop health, enabling informed decision-making. Overall, agricultural robots contribute to sustainable farming by reducing reliance on manual labour and fossil fuels.

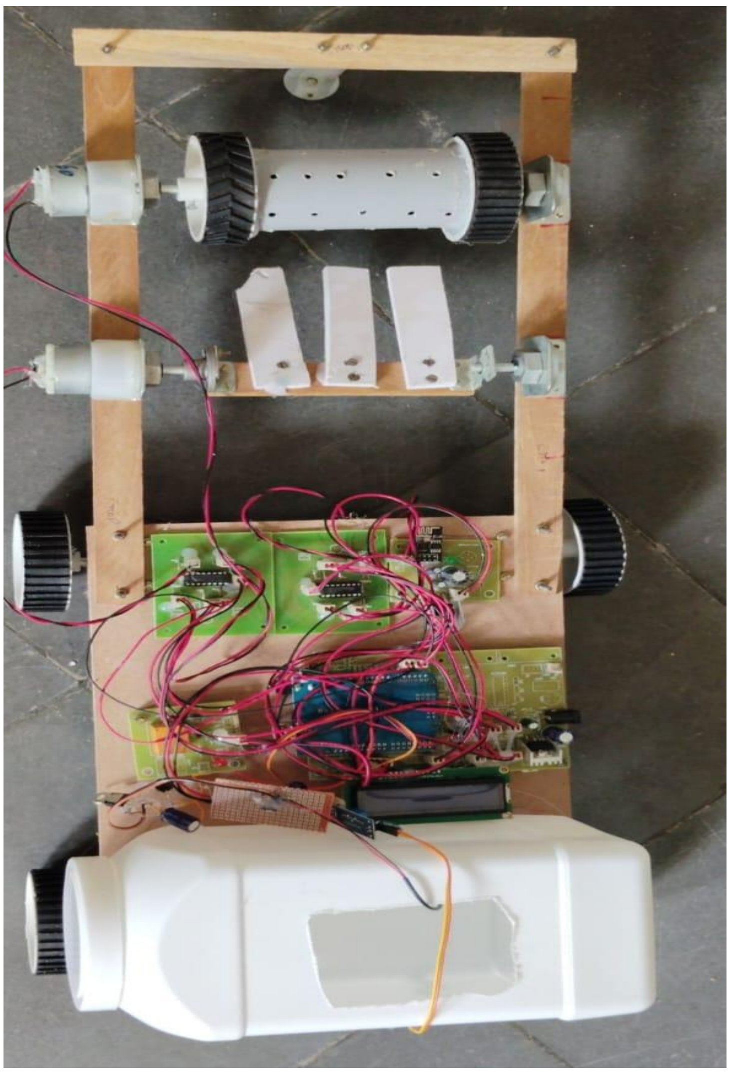

Figure: Agriculture Robot kit

DOI: 10.48175/IJARSCT-25885

V. CONCLUSION

In conclusion, agriculture robots hold immense potential to revolutionize the farming industry. By automating labour-intensive tasks such as planting and monitoring crop health, these robots improve efficiency, reduce labour costs, and increase precision in farming practices. The integration of AI, machine learning, and advanced sensors allows for real-time data collection and analysis, enabling farmers to make more informed decisions. Although challenges like high initial costs, technical limitations, and the need for specialized knowledge persist, continued advancements in robotics and technology are expected to address these issues. Overall, agriculture robots are paving the way for more sustainable, efficient, and productive farming systems.

REFERENCES

[1]. Piper, Patrick M., et al. "Designing an autonomous soil monitoring robot." 2015 Systems and Information Engineering Design Symposium. IEEE, 2015.

[2]. Mahendran, R., G. C. Jayashree, et al. "Application of computer vision technique on sorting and grading of fruits and vegetables." J. Food Process. Technol 10 (2012): 2157-7110.

[3]. Kumar, Satish, et al. CS Robots for Precision Agriculture." Electronic Proc. of 13th National Conference on Mechanisms and Machines. 2007.

[4]. Ankit Singh and Abhishek Gupta published a paper on “Agri-robot” (IJARCCE2015).

[5]. Fale, K. V., et al. "Autonomous farming robot with plant health indication,'." International Journal of Advanced Technology in Engineering and Science (2015): 248-251.

[6]. Kulkarni, V. A, et al. "Advanced Agriculture Robotic Weed Control System." J. Adv. Research in Electrical, Electronics and Instrumentation Engg 2.10 (2013): 5073- 5081.

[7]. Shiva Prasad B S, Ravish Ankara M N “Design and implementation of seeding and fertilizing agriculture robot” (IJAIEM-2014).

[8]. Shaik, Karee Mulla, et al. "GPS based autonomous agricultural robot." 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control (ICDI3C). IEEE, 2018.

[9]. Ranjitha, B., et al. "Solar powered autonomous multipurpose agricultural robot using Bluetooth/android app." 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA). IEEE, 2019.

[10]. Jerosheja, B. R., and C. Mythili. "Solar Powered Automated Multi-Tasking Agricultural Robot." 2020 International Conference on Innovative Trends in Information Technology (ICITIIT). IEEE, 2020