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SOIL TESTING ROBOT WITH CROP RECOMMENDATION

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ABSTRACT

Agriculture is an important field worldwide, where there are many challenges in solving problems in conditionally estimating crops. Many solutions have been proposed regarding this problem using IOT-based services and mechanical technology to reduce manual work. Conventional soil testing techniques can be laborious and necessitate sending samples to labs for examination. In Order to improve agricultural production and decision - making, this project presents a revolutionary soil testing robot that suggests the best crops based on soil conditions. The robot has sensors to assess temperature, humidity and content of nutrients in the soil. To find the best crops for a given set of soil conditions, an integrated algorithm is used to process these data and compares them to agronomic databases. According to early testing, the robot correctly determines the condition of the soil and recommends crops that are in lines with professional agriculture advice.These recommendations are clearly communicated by the voice feature, which makes it usable even by farmers with no technical background. This interactive method allows for rapid and site-specific crop management, Which facilitates making decision easier for farmers. Tests conducted on the prototype in variety of soil types yielded encouraging results in terms of crop suitability accuracy and user satisfaction with the voice-activated feature. This robot's ability to combine voice contact and soil analysis could big impact on current farming methods, increasing agricultural productivity and efficiency. The algorithm will be improved upon in the future and

more crop option and detectable nutrients will be available.

I. INTRODUCTION

Technological developments are critical in helping farmers make educated decisions in an era where precision agriculture is becoming more and more important for maximizing crop yields and effectively managing resources. This project report describes the creation and application of a novel tool that will revolutionize farming practices and this soil testing robot with a voice function that suggests crops.

This self- sufficient robot is designed to examine the temperature, and the composition of the soil, including the nutrient content and humidity levels, right there in the field. The robot uses an inbuilt algorithm based on these crucial inputs to access and voice accurate crop recommendation specific to the conditions under analysis. This aims to promote agricultural productivity and sustainability that improves their decision- making process.

Conventional soil testing techniques can take a long time and could not give the quick results needed to make timely farming decisions. Our Soil Testing Robot tackles these problems head-on by fusing cutting-edge sensor technology with intelligent robotics to provide a quick, precise, and effective solution.

II. LITERATURE SURVEY

Crop recommendation system (ranjith macharla, Dr.k.shirisha, et al., 2022) Many solution have been proposed regarding this problem using IOT- based services and mechanical technology to reduce manuval work .These methods are mainly useful in the case of minimizing manual labor but not in the prediction process. Agrobot Lala- An Autonomous robotic system for real time In-field soil sampling and analysis of nitrates(Goran kitic,Marko panic, et al.,2022) This paper presents an autonomous robotic system an unwanted ground vehicle for in-field soil sampling and analysis of nitrates.each sample is individually analysed compared to average sample analysis in standard method each sample is georeferenced providing a map for precision base fertilizing . IOT-Enabled Soil Nutrient Analysis and Crop Recommendation Model for Precision Agriculture (Murali Krishna

Ray, Neelamadhab Padhy et al..,2023) We have proposed an IOI-enabled soil nutrient classification model to recommend crop.The model helps to minimise the use of fertilisers in soil so as to minimise productivity .

Integrati on of Voicerecognition in Autonomous Agricultural Robots (Patel,s., et al.) this literature review explores the integration of voice recognition technology in autonomous agricuiture robots. It discusses various methodologies and approaches for implementing voice control features including natural language proceesing techniques and deep learning alagorithms. Advancements in sensor technologies for soil testing robot (kumar,A., et al.) This review paper provides a comprehensive overview of sensor technologies used in soil testing robot it discusses the principles of operation advantages and limitation of various sensors for measuring soil parameters such as humidity temperature and also highlights recents advancements in sensors technology .

III. MATERAL REQUIRMENT

1. Arduino uno
2. Color sensor
3. Temperature and Humidity sensor
4. Voice module and speaker
5. Water level sensor
6. Battery

Arduino uno

The Arduino Microcontroller Unit (MCU) is a versatile and programmable open source hardware platform widely used in electronics projects. It features a user-friendly integrated development environment (IDE) that allows developers to write, upload, and execute code efficiently. With its extensive range of input and output pins, the Arduino MCU can interface with various sensors, actuators, and modules, making it suitable for diverse applications, including robotics, home automation, and embedded systems. Its accessibility and large community support contribute to its popularity among both beginners and experienced electronics enthusiasts.

Colour sensor

The color sensor will detect the color of the soil sample, which corresponds to certain nutrients or nutrient levels. Once the sensor detects the color, the robot should process this data to determine the nutrient content. This might involve comparing the

detected color with your data to determine the corresponding nutrient levels.

Overall, using a color sensor in soil testing robot can enhance efficiency, accuracy, and versatility, making it a valuable tool for soil nutrient detection.

Temperature and Humidity

Temperature and humidity sensors are electronic devices designed to measure and monitor environmental conditions. These sensors detect and quantify the ambient temperature and humidity levels in the surrounding area. They are commonly used in various applications, such as climate control systems, weather stations, and industrial processes, to ensure optimal conditions. The data collected by temperature and humidity sensors is valuable for making informed decisions in fields like agriculture and building automation.

Voice module and speaker

A voice module, often integrated with a speaker, is an audio output system designed to provide audible communication in electronic devices. It typically includes a sound processing module that can generate synthesized or recorded speech. This technology is commonly used to enhance user interaction in applications like robotics, home automation, and assistive devices. By converting information into spoken words, the voice module and speaker combination offers a user-friendly and accessible means of conveying data, alerts, in scenarios where visual displays may be impractical or unavailable.

Water level sensor

The water level sensor measures the depth the depth of water in the soil.It's typically works using conductivity or capacitance principles. It detects the change in conductivity or capacitance, indicating the presence of water.

Battery

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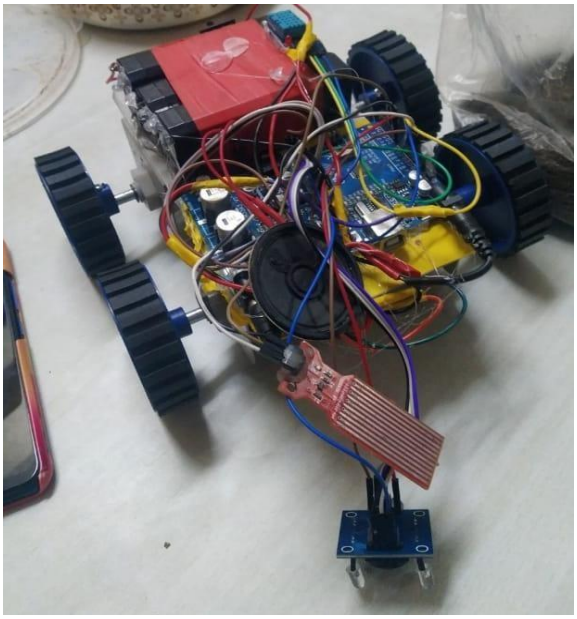
IV. METHODOLOGY

The proposed soil testing robot with voice feature automates the process of soil sampling and analysis significantly reducing time and labour requirements Real-time data collection capabilities allow , farmers to make timely decisions regarding crop management. Automation minimizes the risk of human error and ensures consistency in sampling techniques, leading to more accurate results. The inclusion of a voice feature enhances accessibility .

First we had Prepare the database that containing soil NPK values, temperature, humidity, and rainfall data for different soil types and regions. This database will serve as the reference for comparison with real-time data. Then Integrate the color sensor, temperature and humidity sensor, and water level sensor into the soil testing robot. Collect real-time data using the sensors.Compare the real-time data with the database to determine soil nutrient levels, temperature, humidity, and water levels.Use algorithms to analyze these data and give a crop recommendations based on the soil condition.Connect an Arduino to a voice module and a speaker.Use the Arduino to process the crop recommendations generated by the data analysis.Output the crop recommendations through the voice module and speaker.

V RESULT

The robot is equipped with sensors for collecting real-time data, including soil NPK levels, temperature, humidity, and rainfall. The collected data is integrated with an existing database of soil NPK, temperature, humidity, and rainfall data. Using the Arduino, the robot processes the collected data along with the existing database to analyze soil conditions.Based on the analyzed data, the robot provides crop recommendations using a voice module connected to a speaker, communicating the recommended crops to the user.



VI CONCLUSION

In terms of modern agriculture, the soil testing robot with crop suggestion system is a major achievement. The system provides accurate and timely crop selection suggestions that are customized to the unique requirements of the soil and environmental circumstances by utilizing a mix of real-time sensor data and an extensive soil database. A speech module and Arduino integration give a user-friendly layer that allows farmers with different technological backgrounds to operate the device. This research demonstrates how technology has the power to transform conventional farming processes and open the door to more effective and sustainable farming techniques.

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