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Solar Power Based Multi-Purpose Agriculture Robot

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ABSTRACT: The enough part of the population in India is often dependent on agriculture as a primary source of life. Crops are agricultural through the process of planting seeds and soil in the agricultural field. But increasing expenditure connected with purchase of insects, seeds and equipments, increasing labour expenditure, the individuals involved in agricultural works are comprehensive. It requires alternative solutions. In this study, the development of the solar-based agricultural robe of the proposal of random algorithm for the enhancement of efficiency and crop production is the seed of the proposed system, insect-destroying application, solar energy-cloud. It will be reduced to get this, the system will be employed for the production of the most random forest algorithm, especially random algorithm, which can be visited through mobile application as a facilitation.

KEYWORDS: Machine learning ensemble method, Farming Initialization Process, Crop Conservation Technical, Renewing Energy Technology, Mechanical Authority System.

I. INTRODUCTION

The demanding situations related to early grass cutting era had been ordinarily related to the operational convenience and environmental sustainability of Agriculture constitutes a most important sector in the Indian economic system, using an predicted 60-70% of the population. As the united states holds the second one position globally in rice, sugarcane, groundnut, cotton and horticultural produce, the rural area reviews heightened demands. The escalating populace has caused extended meals consumption, necessitating superior agricultural manufacturing. Consequently, contemporary agricultural technology had been advanced and included to make sure advanced temporal efficiency, product great, and yield amount in agricultural practices. The proliferation of technological improvements along with the Internet of Things and device gaining knowledge of has revolutionized the area of tool monitoring and manipulate. However, a burgeoning international populace, projected to exhibit an boom of 59-ninety eight% by means of 2050, poses enormous challenges to meals manufacturing in light of deteriorating environmental conditions and climate alternate. . As a primary agricultural hub, India is mainly liable to those demanding situations, necessitating the mixing of advanced solutions in regions together with irrigation, seed cultivation, chemical programs, and crop evaluation. Notably, the lowering interest in agriculture among teenagers, a direct effect of restricted profession possibilities inside the zone, threatens to exacerbate hard work shortages and intensify the workload of individual farmers, compromising productiveness and increasing the probability of crop failure because of unpredictable weather styles. The implementation of solar-powered infrastructure in agricultural settings gives a feasible solution for reducing energy intake and selling environmental sustainability. This improvement assumes specific importance inside the face of expected labour shortage in agriculture, in an effort to possibly precipitate sizeable operational challenges. To mitigate this trouble, a novel, multipurpose, computerized farming version has been proposed.

Notably, a preceding study utilized sensors to monitor and transmit environmental statistics, along with temperature, humidity, and photosynthetic light absorption. Similar research endeavours have investigated the software of automated



systems for duties inclusive of seed sowing, pesticide spraying, and irrigation. Furthermore, crop monitoring and high-quality assessment have been explored, regarding the identification of animal intrusions and pH value analysis. Machine getting to know represents a paradigmatic framework allowing machines to emulate intelligent behaviour by way of distinctive feature of its algorithmic skills. As a subset of artificial intelligence, it has garnered great reputation as a preeminent era, facilitating the improvement of multifaceted machines that increase human labour via better productivity. Notably, research projects have hired machine studying to layout sophisticated structures, exemplified in a mission in which a tool utilised machine mastering to administer irrigation and display environmental parameters, which include temperature and humidity. The gadget leveraged a decision tree set of rules, a supervised system getting to know technique, to estimate outputs and integrate sensor data readings.

II. EXISTING SYSTEM

A highly productive, efficient agricultural sector necessitates the establishment of more productive farms and streamlined agricultural processing systems, particularly in island nations such as the Philippines, characterized by a geographically fragmented terrain. The country's agricultural distribution system is inherently vulnerable to inefficiencies and regional market fluctuations, thus exacerbating existing issues of agricultural product transportation. Specifically, the cost of transporting maize from Bankakha to Cotabato is often lower than transporting it from Cotabato to Manila, underscoring the challenges associated with a fragmented agrarian economy. Globalization has had a limited impact on the country's agricultural sector, necessitating significant progress in this area. Automation of the farming process offers potential solutions to address the current limitations of agricultural production. Although some researchers have proposed the concept of robotic farming, this approach is not a viable substitute for traditional farming methods due to its high degree of complexity. Agricultural automation is primarily driven by declining labor costs, a phenomenon commonly observed in developed countries. Agricultural automation technology can address several key challenges by ensuring precision and adaptability to varying environmental conditions. Key considerations for designing an agricultural robot include developing precision mechanisms capable of accurately performing seeding tasks, and integrating process sensors to mitigate the impact of soil moisture content on agricultural equipment performance.

III. PROPOSED SYSTEM

The methodology for solar based multipurpose agriculture robot using Random Forest Algorithm consists of two parts. First part is working principle of the proposed system and second part is overall block diagram of the proposed system.

A. Working Principle:

The proposed machine contains numerous mechanisms including ploughing, seed sowing, pesticide spraying, water spraying, extra water removal, grass slicing, and crop tracking functionalities. The device utilises the Raspberry Pi Pico board as the primary element. Integrating the aforementioned mechanisms right into a single robotic unit, the proposed device enables self sufficient operation thru the amalgamation of numerous sensors, which include water degree, DHT, and soil moisture sensors, at the side of the Random Forest algorithm. The incorporation of gadget learning technology permits the gadget to process sensor facts and generate knowledgeable selections. The Random Forest set of rules serves as the number one machine gaining knowledge of methodology, with corresponding code developed utilizing

Micro Python..

Initiation of Sensors and Data Analysis Pipeline.

1. Initially, sensor calibration can be accomplished.
2. Upon initialization, real-time signal detection occurs.
3. Collected records might be disseminated for visual presentation.
4. Stored database values can be in comparison in opposition to sensor readings.
5. Machine getting to know protocol concerning the random wooded area set of rules can be done.
6. NPK (Nitrogen, Phosphorus, Potassium) inputs can be processed, generating a resultant output.
7. Crop choice pointers can be derived based totally on output evaluation.
8. Hardware specs may be communicated to a cellular software through IoT networking infrastructure.
9. Tailored instructions might be transmitted to the farmer for informed choice-making.

B. Random Forest Algorithm:

The Random Forest algorithm is a superior supervised machine gaining knowledge of algorithm, predominantly utilised for tackling type and regression troubles. By constituting a large number of choice timber on various subsets of the



furnished dataset, it augments the accuracy of the dataset. Its improved efficacy derives from the combination of multiple choice bushes, rendering it an most excellent preference for scenarios with severa programs. Notably, the Random Forest set of rules possesses a commendable speed and accuracy, yielding outputs predicated upon the majority voting or averaging of man or woman outputs, thereby ensuring a definitive final output.

IV.METHODOLOGY

Steps Involved in Random Forest Algorithm:

- 1.Data subsampling from existing datasets is performed.
2. A selection tree version is produced from the training records set.
3. Decisions from more than one tree fashions are averaged at some stage in the voting system.
4. The very last output is determined via the bulk outcome of the consensus result.

The studies in employed a Decision Tree Algorithm; but, its instability and constrained applicability render it inadequate for several programs, thereby hindering performance. Conversely, the Random Forest Algorithm famous advanced overall performance, boasting accuracy costs of eighty-ninety% and the ability to function with more than one instances by way of counting on majority voting to are expecting consequences. Consequently, it's miles greater most suitable than the Decision Tree Algorithm for our functions.

Machine gaining knowledge of encompasses the scientific exploration of algorithms and statistical models that enable computer structures to autonomously execute unique duties by means of identifying styles and making inferences, rather than explicit instructions. It is considered an necessary element of artificial intelligence. Notably, in this mission, the Random Forest Algorithm from the area of device gaining knowledge of has been leveraged due to its propensity to yield correct results relative to different algorithms, thereby rendering it a precious asset in delivering precise suggestions for farmers.

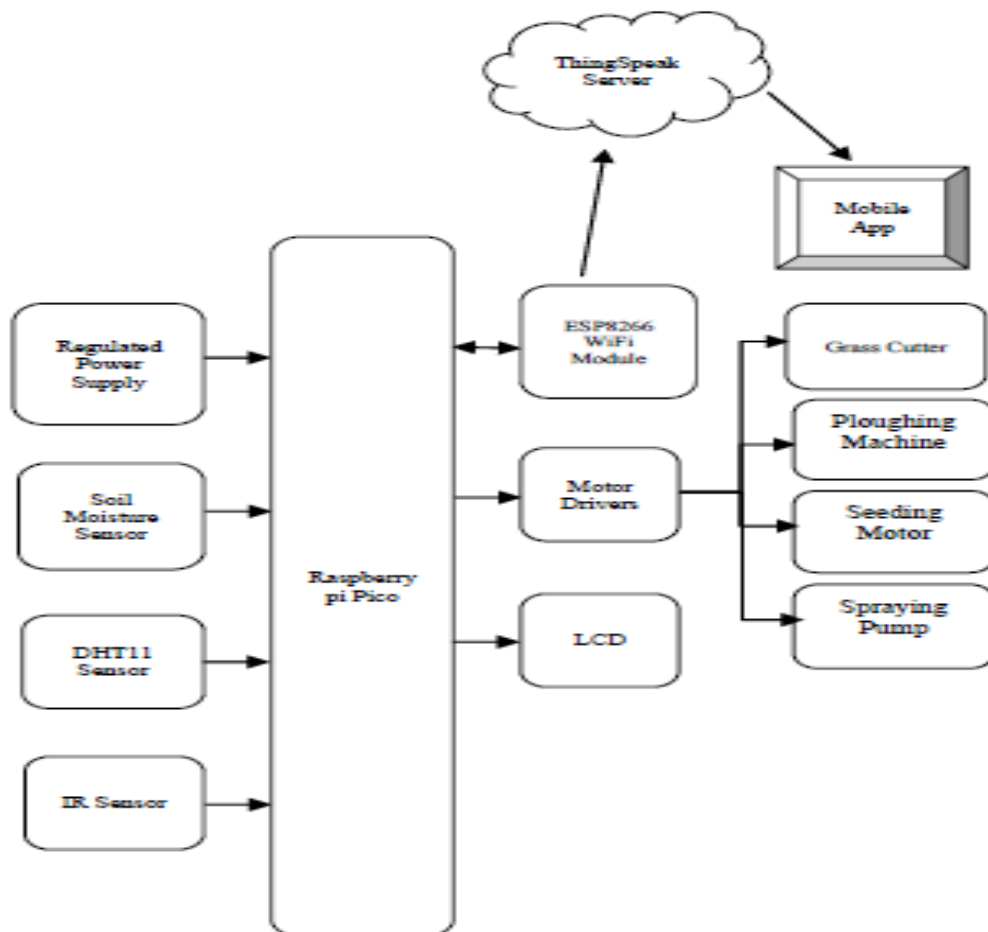


Figure 1: Block diagram



III. Flow Chart:

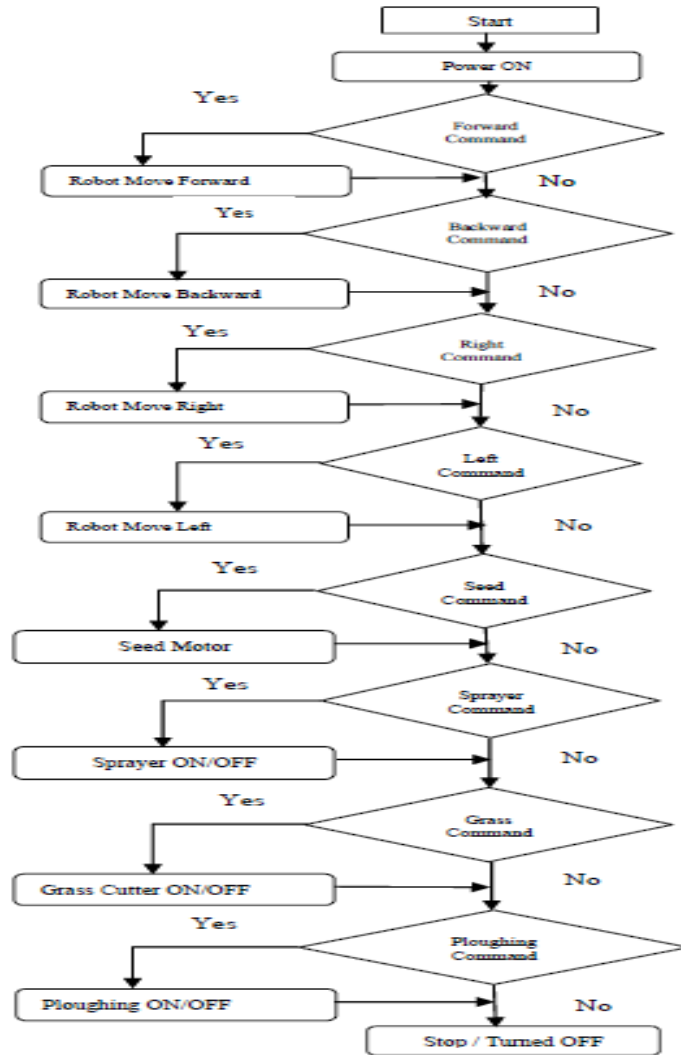


Fig 2: Flow Chart

The proposed gadget structure, as depicted inside the accompanying block diagram, integrates vital components to facilitate faraway control and environmental monitoring. Specifically, the ESP8266 WiFi module serves because the number one middleman for connecting the gadget to cellular gadgets, for that reason permitting seamless manipulate.

Incorporated within the gadget are three distinct sensor kinds: the soil moisture sensor, DHT11 temperature and humidity sensor, and IR sensor. Collectively, these sensors permit the non-stop tracking of ambient situations, thereby presenting treasured insights for agricultural practitioners regarding winning weather styles.

V. RESULT AND DISCUSSION

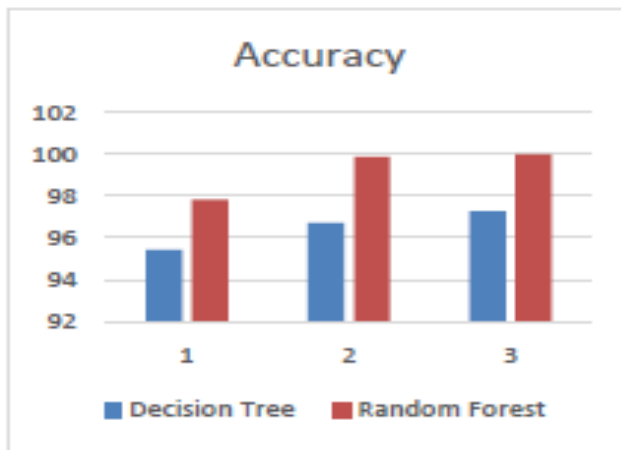
Sample Dataset

A dataset including empirical values is loaded into a Random Forest model, facilitating powerful training of the set of rules.

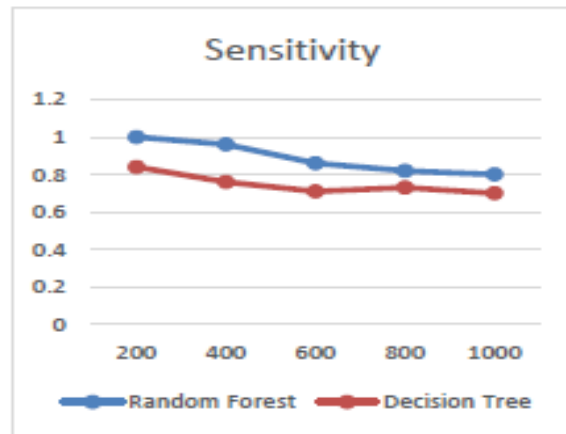


S.No	Temperature	Humidity	Moisture
1	36	76	81
2	40	86	70
3	41	79	71
4	43	75	76
5	29	76	67

Table.1: Sample Dataset



Graph.1: Accuracy for DT & RF



Graph.2: Sensitivity of DT & RF

A Solar Powered, multipurpose agriculture robot is engineered to function making use of an integrated solar panel which captures photovoltaic energy and converts it into electrical electricity. The tool features a person-activated interface which include a button, allowing an individual to input navigational commands thru tactile enter mechanisms, including switching on/off or directing movement to the left or right is shown in fig3.

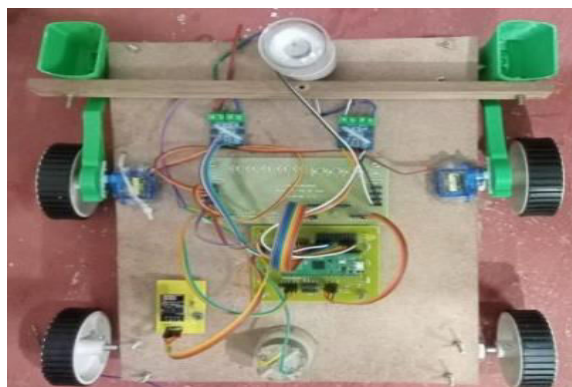


Figure3.Prototype of Robot

VI. CONCLUSION

This proposed machine utilizes a Random Forest Algorithm to automate extensive agronomic obligations, inclusive of sowing seeds, applying pesticides, irrigating fields, and water management through a piped system, in addition to nutrient analysis of Nitrogen, Phosphorous, and Potassium values. The implementation of this set of rules enables the fulfillment of substantial efficiencies through the execution of more than one operations with more desirable precision



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