International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 3, May-Jun-2023, ISSN (Online): 2395-566X

Agricultural Robot - Agricobot*

Sneha P, Anoob Suresh, Vyshak Mohan, Friya Francies
Depatment of EEE
College of Engineering,
Cherthala

Abstract- This paper proposes an IoT-based technology plat- form called "Agricobot" for farming, equipped with sensors to monitor crucial environmental parameters. The accompanying android application allows users to remotely access data from these sensors, including humidity, temperature, proximity, mois- ture, light levels, and crop images. By analyzing this data, farmers can make informed decisions and take appropriate actions, such as watering crops at specific times and applying fertilizers in the right quantities. The android application also provides insights into watering intervals for specific crops. Additionally, connecting these smart bots to smartphones enables global data access and serves as a convenient dashboard for land monitoring. Overall, this combination of devices simplifies and enhances smart farming practices, with IoT playing a crucial role in streamlining agricultural logistics.

Keywords- Sensors, Arduino Uno, DC Motor.

I. INTRODUCTION

Agriculture has been always the important occupation of the country like India where two-third of the population is dependent on it for their livelihood. The traditional system of agriculture is mostly dependent on the natural resources which sometimes yield good production and sometimes in losses.

AGRICOBOT is an robot which moves on rough and wet terrains and detect soil moisture, temperature, humidity, pesticide spraying and In cases of water scarcity, the integrated4 watering system automatically triggers to ensure efficient water distribution and meet the needs of the plants and By analyzing the collected data, we can accurately predict the most suitable crops based on the prevailing climatic conditions and atmospheric parameters.

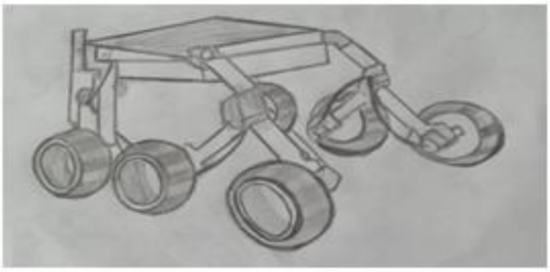

Fig 1. Agricobot.

II. LITERATURE SURVEY

Anand Nayyar and Vikram Puri 2016. Smart Farm- ing: IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring using Ar- duino, Cloud Computing Solar Technology. Proceed- ings of the International Conference on Communi- cation and Computing Systems (ICCCS-2016), DOI: 10.1201/9 781315364094-121.

Amandeep, Arshia Bhattacharjee, Paboni Das, Debjit Basu, Somudit Roy, Spandan Ghosh, Sayan Saha, Sou- vik Pain, Sourav Dey, T.K. Rana. 2017. Smart farm- ing using IOT. 8th IEEE Annual Information Tech- nology, Electronics and Mobile Communication Con- ference (IEMCON), Vancouver, BC, pp. 278-280, doi: 10.1109/IEMCON.2017.8117219.

Dewi C., Chen RC. 2020. Decision Making Based on IoT Data Collection for Precision Agriculture. In: Huk M., Maleszka M., Szczerbicki E. (eds) Intelligent Information and Database Systems: Recent Develop- ments. ACIIDS. Studies in Computational Intelligence, vol 830. Springer, Cham. https://doi.org/10.1007/978-3-030-14132-5

Lee. 2009. The Development and Application of Decision Tree for Agriculture Data. IEEE Second International Symposium on Intelligent Information Technology and Security Informat- ics. DOI 10.1109/ IITSI.2009.1

Kamilaris, F. Gao, F. X. Prenafeta-Boldu and M. I. Ali. 2016. Agri-IoT: A semantic framework for Internet of Things- enabled smart farming applications. IEEE 3rd World Forum on Internet of Things (WF-IoT), Reston, VA, 2016, pp. 442-447, doi: 10.1109/WFIo T.20 16.7845467.

Li Hong-ying, Hou Yan-lin, Zhou Yong-juan, Zhao Huiming. 2012. Crop Yield Forecasted Model Based on Time Series Techniques. Journal of Northeast Agricultural University (En- glish edition),Volume 19, Issue 1,Pages 73-77.

M. Ryu, J. Yun, T. Miao, I. Ahn, S. Choi and J. Kim. 2015. Design and implementation of a connected farm for smart farming system. IEEE SENSORS, Busan, pp. 1-4, doi: 10.1109/ICSENS.2015.7370624.

Xiaohui Wang and Nannan Liu. 2014. The application of internet of things in agricultural means of production supply chain management. Journal of Chemical and Pharmaceutical Research. Vol 6(7):pp. 2304-2310, ISSN: 0975-7384. https://www.worldometers.info/world-population/. Last accessed on 15-09-2020.

III. EXISTING SYSTEM

"Agriculture Stick" - proposed by Anand nayyar which assists farmers in getting live data for efficient environment monitoring. Andreas Kamilaris developed Agri-IoT "Mo- bius" - to monitor the environmental condition. Amandeep proposed the GPS based remote controlled vehicle.

IV. PROPOSED SYSTEM FUNCTIONS

- Soil Moisture Sensing
- Temperature Sensing
- Humidity Sensing
- Pesticide Spraying
- Integrated System
- Plant Prediction

V. ANDROID APPLICATION DEVELOPMENT: USING BLYNK CLOUD

This paper briefs the working and methodology of the pro- posed system. The hardware system used in this project is Controlled using Blynk Software and Agricobot Mobile app. This robot is fitted with a soil moisture sensor, humidity sensor, light detecting sensor, temperature sensor and water outlet pipe for watering the plants. These sensors help in monitoring the environment and its effect on the crops.

This device is connected to internet so that it can provide real-time data of all above sensors on the smartphone. This data can be used for analytics purpose and for applying any machine learning algorithm for good crop yield. This project is majorly divided into the following parts: 1. Agribot Structure 2. Hardware Devices 3. Software Component 4. Android Application Development

1. X-Axis:
The structure is made from a wooden block. the diagra- matic representation of the hardware structure smooth rods are running parallel to each other and fitted with the linear bearing for the smooth motion of the gantry (the structure that supports y and z-axis). The forward and backward motion is achieved by converting rotation motion into linear motion. For this, the threaded rod is placed in between the block. The motion to this rod is provided by a stepper motor.

2. Y-Axis: The y-axis structure is similar to the x-axis as shown in figure 1. The only difference is that the structure stands on the x-axis (as Gantry) and not lay down. The motion is again provided by rotation of the threaded rod. This axis performs the left and right motion.

3. Z-Axis:
The Z-axis performs upward and downward motion and based on the same principles as x and y axis works. The z-axis is connected with a head, which has the connection for soil moisture sensor and water outlet pipe. Combining all 3 axis X, Y and Z we get a 3-D axis motion, where the head can be moved to any point in the confined space and the plants are planted in a grid format (for ex. 4 x 4 grid planting). In this architecture the benefit of multi-cropping by planting different plants in the different grid can also be taken. Every grid is associated with its column and row number as in a matrix. plant and uploading pictures in the database.

4. Arduino Uno:
All the sensors are connected to Arduino. It controls the revolution of stepper motor using A4988 stepper motor driver.

5. Stepper Motor and Stepper Motor Driver (A4988):
This Stepper motor can be controlled precisely with different steps. The set of 3 stepper motors is used in X, Y and Z axis attached with the threaded rod to provide a 3D motion to the head. This motor is controlled by Arduino using motor driver A4988, this motor is powered by a 12v DC.

6. Temperature and humidity sensor:
LDR, Soil Moisture sensor, Water pump, Relay: These sensors are attached to Arduino and share the real-time data with it. The relay is used to ON power pump from an external power source. The relay is turned ON and plants are watered as per requirement only, when the soil moisture sensor detects low moisture in soil.

7. Software Components:
The preliminary software of this project manages the movement of the arm in the confined region. The soil moisture sensor attached with the arm is pressed under soil for checking an accurate moisture level.

Taking into account values of all sensors, threshold value is fixed and depending on it decision is taken whether to water the plant or not rm top. Collaterally it also uploads the sensor's values, so a user can get additional information about the day. This collected data can be further used for Data-Analytics process.

8. Data-Analytics:

One of the significant parts of the project is applying a Data-Analytics on the collected data of temperature, the moisture of environment, amount of sunlight and soil moisture for different plants. The weather data of that region is collected from different websites. This data can help in analysing the specific and precise need of the water for the different plants. This can result in efficiency in the watering of the plants and thus can increase the overall performance of the device.

The input for the analytics is the data extracted from sensors for temperature, environmental moisture, sunlight intensity and soil moisture. The system analyses the data and gives output of the duration or the interval of the time the device will wait to water the plant next time. Here, the water requirements for the plants are predicted through data- analytics and Machine Learning algorithms.

For example after analysing 2 days data of a medium grown Tulsi plant, it depicts the variation of soil moisture according to the surrounding temperature, sunlight, and humidity. The data visualization shows the amount of sunlight increases as the day starts, reaching a peak point and falling again at the time of sunset. The temperature follows the same pattern as of sunlight; Humidity has little variation but has a drastic effect on soil moisture. The pattern of soil moisture is inverse, low level of moisture when other data are increasing and retain less water in the soil and also seen vice versa.

This pattern is due to the two reasons: (1) High evaporation rate: Evaporation rate during hot day is much higher than the rate during the cool night. (2) Transpiration pull: It is the pull created by the plant on the underground water to evaporate from leaves so the plant can get water and minerals through it. This data can be further used, when collected in abundant for different plants, for generating an accurate Machine Learning model for prediction of the time gap for watering various plants.

Fig 2. Machine Learning model for prediction.

VI. CONCLUSION

In this paper we tried to describe Agricobot which is IoT based farmbot and will assist farmers for smart farming. It provides automated arm for watering the plants time to time and preventing from wastage of water. It also provides user all the details of environment and plant condition on finger tips using android application. It will reduce human intervention. The data is extracted from all the sensors and is used for the analysis. Machine learning algorithms or time series forecasting algorithms can be the future scope of this project which can determine the water needs of the plant, crop to be sown and other forecasting.

VII. ACKNOWLEDGMENT

We would like to express our gratitude to all those who have contributed to the development of this resume parsing application. We are especially grateful to our team members who have worked tirelessly to ensure that this application meets the highest standards of accuracy and functionality. We also acknowledge the support and guidance provided by our advisors and mentors, whose expertise and insights have been invaluable in the development of this project. We would also like to extend our appreciation to the individuals and organizations that generously provided their resumes for use in testing and refining this application. Their willingness to participate in our study has helped to improve the quality and effectiveness of this tool.

Finally, we would like to acknowledge the developers of the open-source libraries and tools used in the development of this application. Without their hard work and dedication, this project would not have been possible. Thank you all for your contributions to this project.

REFERENCES

[1] “Anand Nayyar and Vikram Puri. 2016. Smart Farming: IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitor- ing using Arduino, Cloud Computing Solar Technology. Proceedings of the International Conference on Communication and Computing Systems (ICCCS-2016), DOI: 10.1201/9781315364094-121.

[2] “Amandeep, Arshia Bhattacharjee, Paboni Das, Debjit Basu, Somudit Roy, Spandan Ghosh, Sayan Saha, Souvik Pain, Sourav Dey, T.K. Rana. 2017. Smart farming using IOT. 8th IEEE Annual Information Technol- ogy, Electronics and Mobile Communication Conference (IEMCON), Vancouver, BC, pp. 278-280,doi: 10.1109/IEMCON.2017. 8117219.

[3] “Dewi C., Chen RC. 2020. Decision Making Based on IoT Data Collection for Precision Agriculture. In: Huk M., Maleszka M., Szczer- bicki E. (eds) Intelligent Information and Database Systems: Recent Developments. ACIIDS. Studies in Computational Intelligence, vol 830. Springer, Cham. https://doi.org/10.1007/978-3-030-14132-53..

[4] "Hariharr C Punjabi, Sanket Agarwal, Vivek Khithani, Venkatesh Mud- daliar and Mrugendra Vasmatkar. 2017. Smart Farming Using IoT, International Journal of Electronics and Communication Engineering and Technology, 8(1), pp. 58–66.

[5] "Jun Wu, Anastasiya Olesnikova, Chi-Hwa Song, Won Don Lee. 2009.The Development and Application of Decision Tree for Agriculture Data. International Symposium on Intelligent Information Technology and Security Informatics. DOI 10.1109/IITSI.2009.10.

[6] "Kamilaris, F. Gao, F. X. Prenafeta-Boldu and M. I. Ali. 2016. Agri- IoT: A semantic framework for Internet of Things-enabled smart farming applications. IEEE 3rd World Forum on Internet of Things (WF-IoT), Reston, VA, 2016, pp. 442-447, doi: 10.1109/WFIoT.2016.7845467.

[7] "Li Hong-ying, Hou Yan-lin, Zhou Yong-juan, Zhao Huiming. 2012. Crop Yield Forecasted Model Based on Time Series Techniques. Journal of Northeast Agricultural University (English edition),Volume 19, Issue 1,Pages 73-77. [8] "M. Ryu, J. Yun, T. Miao, I. Ahn, S. Choi and J. Kim. 2015. Design and implementation of a connected farm for smart farming system. IEEE SENSORS, Busan, pp. 1-4, doi: 10.1109/IC-SENS.2015.7370624

[8] Xiaohui Wang ang and Nannan Liu. 2014. The application of internet of things in agricultural means of production supply chain management. Journal of Chemical and Pharmaceutical Research. Vol 6(7):pp. 2304-2310, ISSN: 0975-7384. https://docs.arduino. cc/retired/boa rds/arduino-pro-min