International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 4 Volume No.6 July – 2022
DOI:10.46647/ijetms.2022.v06i04.0043 ISSN: 2581-4621

IoAT(Internet of Agro Things) BASED AUTOMATIC PEST CONTROLDEVICE FOR SMART AGRICULTURE

Aswin B[1], Srikumar R[2], Vasanth V[3], Shanthakumari G[4]
[1]*UG – Electronics And Communication Engineering, Sri Sairam Engineering College, Chennai*
[2]*UG – Electronics And Communication Engineering, Sri Sairam Engineering College, Chennai*
[3]*UG – Electronics And Communication Engineering, Sri Sairam Engineering College, Chennai*
[4]*Assistant Professor, Electronics And Communication Engineering, Sri Sairam Engineering College, Chennai*

ABSTRACT

In Conventional Agriculture majority of the crops were infected by microbial diseases. Also, the constantly mutating pathogens cannot be known to the knowledge of the farmer, due to which, there arises a demand to develop a disease prediction system. This helpsin maintaining the crop's health. This project introduces an innovative idea of the Internet-of-Agro-Things (IoAT) with an explanation of the automatic detection of plant disease and also provide infected crops with required amount of respective pesticides. To perform this, we use a trained Convolutional Neural Network (CNN) model to perform ananalysis of the crop image captured by a health maintenance system. The image capturing along with continuous monitoring is performed by an external power supply. The sensor node houses a developed soil moisture sensor which has a high longevity compared to its peers. Areal time implementation of the proposed system is demonstrated using an externally powered sensor nodewith a camera module, a microcontroller and an IOT module, using which an agricultural officer can monitor thefield in the IOT website dedicated for it. Along with it a setof motors are fixed for spraying the pesticide.

Keywords— IoAT, CNN, Convolution Neural Network, Pest Control

1. INTRODUCTION

Insects and Rodents have always been a nuisancefor farmers. They feed on their efforts and infest on crops to spread various diseases. Controlling and maintaining their population is therefore important for a farmer toensure crop health. Pesticides and insecticides have playeda major role in preventing infestations. However, they pose different environmental and social consequences. Extremeuse of pesticides can result in severe water & soil contamination and can also intoxicate plants with harmful chemicals. Additionally, insects and bugs become reluctantagainst them with continuous exposure that forces farmersto rely on heavier pesticides. Even though other methods like genetic seed manipulation are also being used to makecrops more robust against the pest attack, they are quite expensive for practical application.

Execution of Internet of Agro Things in the agriculture sector has brought in a major developmentrelated to on-field pest management. A farm owner can now use different sensors to monitor the growth of pestsand take further countermeasures to manage them. Below is a list of different sensors that are being used to identifyand track the growth of insects.

DOI:10.46647/ijetms.2022.v06i04.0043 ISSN: 2581-4621

2. METHODOLOGY

A. *Proposed Solution*

To prevent this problem, we use a trained Convolutional Neural Network (CNN) model to perform ananalysis of the crop image captured by a health maintenance system. The image capturing along with continuous sensing and intelligent automation is performedby the solar sensor node. The sensor node houses a developed soil moisture sensor which has a high longevitycompared to its peers. A real time implementation of the proposed system is demonstrated usinga solar sensor nodewith a camera module, a microcontroller and a smartphoneapplication using which a farmer can monitor the field.

B. *Existing Work*

The existing system also provides essential features for agricultural analysis and monitoring. But theredoes not present any wireless sensors that will update the values and condition of the agricultural field. This system consists only of some of the parameters such as sensors andmicro controllers. The microcontroller used here is not as efficient.

C. *Scope of the Project*

This is an automatic device that is useful in farming. It assists the farmer in increasing crop efficiency while also reducing the requirement for physical labor. This project helps in maximizing the output of farmland using minimal resources. Farmers get to know about the frequently mutating pathogens and plant diseases.Weeding and pest and disease management will be handledby these devices. This system predicts plant diseases and has a smart irrigation system.that we can monitor the crops as well as automate the irrigation.

3. COMPONENTS USED

A. *BLOCK DIAGRAM*

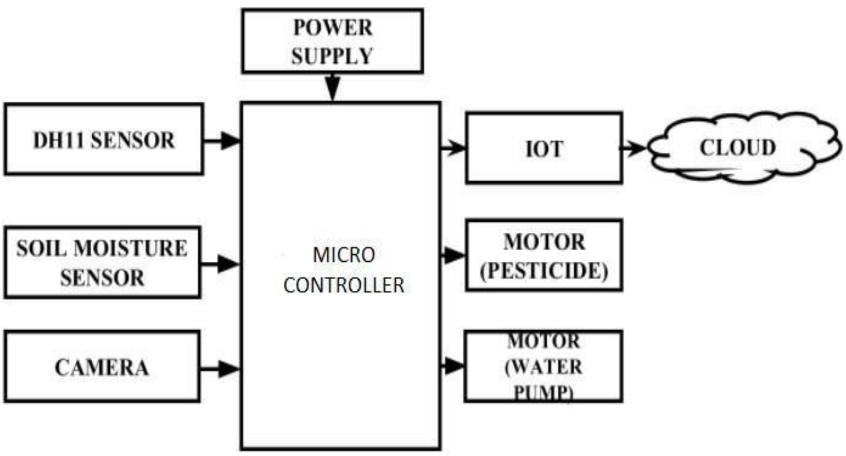

Fig 1: Block Diagram Of the system

B. *HARDWARE COMPONENTS USED*

DOI:10.46647/ijetms.2022.v06i04.0043 ISSN: 2581-4621

1. Microcontroller – ARDUINO UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed byArduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

2. DH11 Sensor

DHT11 Temperature & Humidity Sensor featuresa temperature & humidity sensor complex with a calibrateddigital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensingtechnology, it ensures high reliability and excellent long- term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost- effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The single-wire serial interface makes system integration quick and easy.

3. Soil Moisture Sensor

Soil Moisture Sensors measure soil moisture with patented TDT (Time Domain Transmission) technology. biSensors are self-calibrating for all soil types and conditions and are unaffected by salty soil conditions or soils with a high pH. BiSensors can be connected to a two- wire path or conventional wire and provide continuous measurements and real-time feedback for the controller to make smart irrigation decisions specific to the landscape the biSensor is installed in.

4. DC Motor

A direct current (DC) motor is a type of electric machine that converts electrical energy into mechanical energy. DC motors take electrical power through direct current, and convert this energy into mechanical rotation.

5. IOT Module

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send andact on data they acquire from their environments. Cloud computing enables users to perform computing tasks usingservices provided over the Internet. The use of the Internetof Things in conjunction with cloud technologies has become a kind of catalyst: the Internet of Things and cloudcomputing are now related to each other. These are true technologies of the future that will bring many benefits.

C. SOFTWARE USED

1. Arduino IDE

Arduino IDE is an open-source platform used forbuilding electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as amicrocontroller) anda piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

DOI:10.46647/ijetms.2022.v06i04.0043 ISSN: 2581-4621

2. Embedded C

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems.

4. RESULT

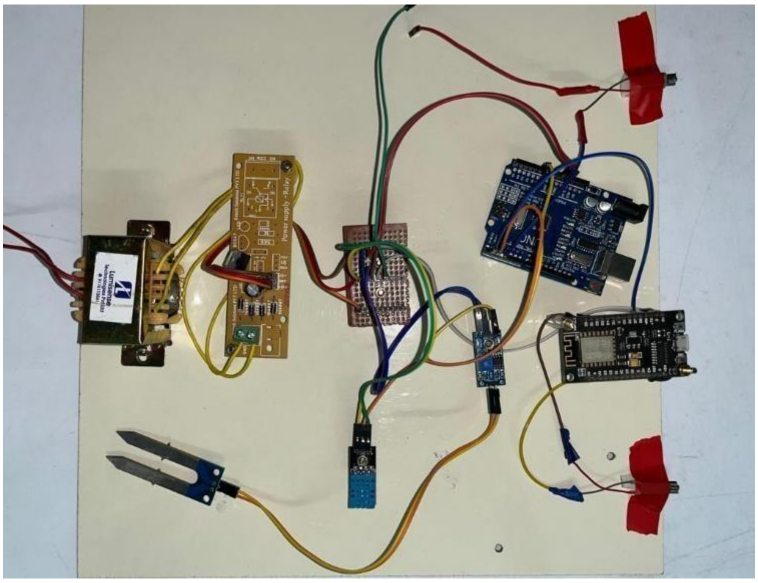

Fig 2: Field Module

5. CONCLUSION

The project deals with identifying the disease affected crop. This is achieved through the Convolutional Neural Network Algorithm. If the crop is affected by disease, thenthe information is shared through IOT module and the respective pesticides are sprayed based the disease. In the future aspects of the proposed solution, the developed IoAT app can be made available for usage in various regional languages for the ease of use by the farmer and a multi- platform app can also be developed enabling app usage in Android and iOS. A database for various other crop diseases can be built and used to train the model, increasing the efficiency of the solution and enabling coverage of more crops and their diseases. Security and privacy issues in the smart agriculture also needs research within the energy consumption constraints.

6. REFERENCES

1. Arduino based Automation of Agriculture A Step towards Modernization of Agriculture IEEE CONFERENCE 2020.
2. E Sowmiya, S Sivaranjani, "Smart System Monitoring on Soil Using Internet of Things (IoT)". International Research Journal of Engineering and Technology (IRJET), 4,2, 1070, 2017.
3. K. SravanthGoud and Abraham Sudharson, "Internet Based Smart Poultry Farm", Indian Journal of Science andTechnology", Vol (19), pl101 2015.

Website: ijetms.in Issue: 4 Volume No.6 July – 2022
DOI:10.46647/ijetms.2022.v06i04.0043 ISSN: 2581-4621

4. Internet-of-Things (IoT)-based smart agriculture: Toward making the fields talk IEEE TRANS 2019.
5. R. Brian "Farms of the Future: The Rise of IoT in Agriculture". Retrieved from https://www.link-labs.com/blog/rise-of-iot-inagriculture, 2016.
6. N Suma, S. R. Samson, S Saranya, G Shanmugapriya, RSubhashri, "IoT Based Smart Agriculture Monitoring System". International Journal on Recent and Innovation Trends in Computing and Communication, 5, 2, 177-181, 2017.
7. sCrop: A Novel Device for Sustainable Automatic Disease Prediction, Crop Selection, and Irrigation in Internet-of-Agro-Things for Smart Agriculture. IEEE SENSORS JOURNAL 2021.
8. Lopez Research LLC, "An Introduction to the Internet of Things. Part 1. Of The IoT Series", 2003.
9. Leaf Disease Detection Using Raspberry Pi.IRE Journals 2019.
10. Adinarayana, J., Huh , E., Wan, Y and Kiura, T., Becoming technological advanced -IOT applications in smart agriculture.
11. S. R. Nandurkar, V. R. Thool, R. C. Thool, "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES), 2014.
12. S. Shekhar, J. Colletti, F. Munoz-Arriola, L. Ramaswamy, C. Krintz, ˜ L. R. Varshney, and D. Richardson, "Intelligent Infrastructure for Smart Agriculture: An Integrated Food, Energy and Water System," arXiv CoRR, vol. abs/1705.01993, 2017.
13. M. S. Farooq, S. Riaz, A. Abid, K. Abid, and M. A. Naeem, "A Survey on the Role of IoT in Agriculture for the Implementation of Smart Farming," IEEE Access, vol. 7, pp. 156 237–156 271, 2019.
14. S. Kumar, G. Chowdhary, V. Udutalapally, D. Das, and S. P. Mohanty, "gCrop: Internet-of-Leaf-Things (IoLT) for Monitoring of the Growth of Crops in Smart Agriculture," in Proc.of the 5th IEEE International Symposium on Smart Electronic Systems (iSES), 2019, pp. 53–56.
15. M. Ayaz, M. Ammad-Uddin, Z. Sharif, A. Mansour, and E.-H. M. Aggoune, "Internet- of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk," IEEE Access, vol. 7, pp. 129 551–129 583, 2019.