International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 05-01-2022, Accepted: 20-01-2022, Published: 05-02-2022
Volume 7, Issue 2, 2022, Page No. 233-236

Recent turmeric plants agronomy analysis and methodology using Artificial intelligence

S Umamaheswari[1], Laxmi Ganesh Kathawate[2], W B Shirsath[3], Samata Gadde[4], P Saradha[5]

[1] Associate Professor, Department of Zoology, Sri GVG Visalakshi College for Women, Udumalpet, Tamil Nadu, India

[2] Assistant Professor, Department of Chemistry, Sharadchandra Pawar Mahavidyalaya, Lonand, Khandala, Satara, Maharashtra, India

[3] Associate Professor, Department of Chemistry, Karm. A. M. Patil Arts, Commerce & Kai. Annasaheb N. K. Patil Science Sr. College, Maharashtra, India

[4] Department of Biotechnology, Acharya Nagarjuna University, Nagarjuna Nagar, Guntur, Andhra Pradesh, India

[5] Associate Professor, Department of English, Vinayaka Mission's Kirupananda Variyar Engineering College, Vinayaka Mission's Research Foundation (Deemed to be University), Salem, Tamil Nadu, India

Abstract
Bacteria and viruses are the most common disease-causing microorganisms, and they are not apparent when they first damage the plant. Only at a later stage is it apparent to human eyes, and it has infected entire plant sections. Artificial Intelligence (AI) is a rapidly growing area in all fields of employment, with the goal of automating tasks and increasing efficiency. It is also used in the agricultural industry to boost crop output by detecting disease early and classifying the type of disease that has been affected so that precautionary measures can be taken to prevent the disease from spreading to other plants in the field. Image processing on computer vision and training the model with VGG-16 architecture make this possible.

Keywords: VGG 16, CV2, turmeric plant, artificial intelligence, network

Introduction

Agriculture is the support prepare of our country, and it is the most basic concept for human foodstuff creation. Due to many sorts of disease affection, agricultural land productivity falls year after year. Turmeric plant materials are used in our daily lives for food preparation, health care, and other purposes. The most common turmeric plant diseases are Leaf Spot and Leaf Blotch, both of which are airborne diseases that can wipe out an entire crop in a short period of time. VGG 16 is a CNN (Convolution Neural Network) architecture used for sick picture classification and detection. The images are processed in a hidden layer that contains various image processing layers for training the model, such as convolutional, padding, and pooling. Artificial Intelligence (AI) is a rapidly advancing technology that is now being used in all aspects of human life, including agriculture, for improved efficiency and complex purposes [1]. The 3D dimensional analysis is a futuristic analysis of disease and growth that uses this model to provide a 3D representation of the input image. AI is used in this analysis to help self-learn for disease and growth detection. The suggested AI approach aids disease identification and categorization on plants at any stage, whether early or later, employing image processing and a training dataset. For training and testing, the dataset is divided into two folders: diseased and non-diseased. Image segmentation helps to detect neuron value on each pixel image in the given folder, and the model is trained based on neuron value [7]. Finally, the real-time image is analysed and compared with the trained model to provide output results to the users. The following is how the rest of the paper is organised: The block diagram and hardware description are defined in Sections II and III. Sections IV-VI discuss comparative analysis, flow charts, and VGG16.

Description of Hardware

The IP Camera catches real-time photographs of the Turmeric plant from the agricultural land. The IP camera, which is connected to the internet via a router and collects data by capturing photos from agricultural land, stands for Internet Protocol. The router is a device that connects IP cameras, The programme analyses and compares input photographs from the field with training data in it. During the analysis, it was discovered that the input data was disease-infected, which meant that the input data had to be matched with trained data, and an output model in terms of message format had to be generated as a) Name of disease impacted b) Precaution steps to cure the sickness. With the help of the router, this output data are generated and sent to the user in message format to their email or default SMS app.

Also included in the Raspberry Pi 4 bundle are the sending message service apps.In addition, a field view monitor is attached to a Raspberry Pi kit to provide customers with a live view of plant analysis on agricultural property. The monitor also provides specific plant views, zoom-in of a selected location on land, and warnings of any dangerous insects or animals inside the land. It also serves as a security measure, keeping an eye on and protecting the agricultural land from outside influences.

Block Diagram

As illustrated in Fig. 1, the suggested concept consists of an Internet Protocol camera (IP), a Raspberry Pi 4 router, and a field monitor.

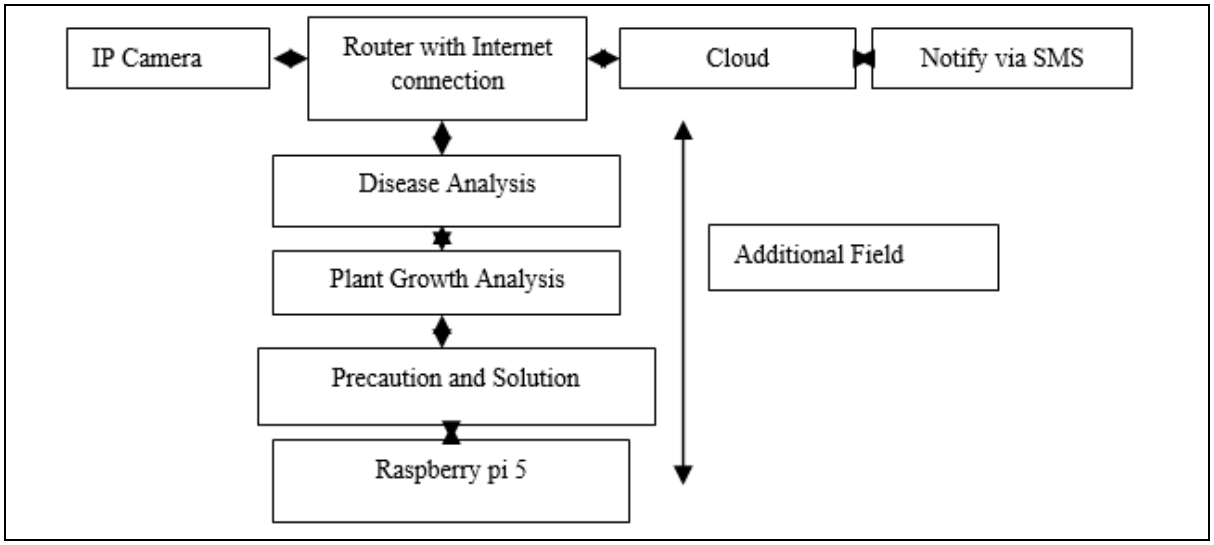

Fig 1: Block Diagram of Proposed Model

Plant leaf images

Early on, a Convolutional Neural Network can help detect infected and non-infected leaf images based on the model's accuracy level.As a result, the VGG-16 architecture serves as an effective tool for detecting and treating disease considerably sooner than it affects other plants in agricultural land.As a result, we may increase our agricultural productivity while also conserving our land from excessive fertiliser and pesticide use.VGG-16 acquired an overall accuracy of 0.9624 and a loss of 0.8719, which was a superior accuracy value than Alex-net, hence VGG-16 is recommended for this model.

Turmeric plants

Many countries' economies are based on agriculture. Turmeric is one such crop that is widely grown in various parts of the world. The disease that affects the plant has a significant impact on the crop harvest. Leaf blotch, leaf spot, and rhizome rot are the most common infections that affect the plant. Among the illnesses described, rhizome rot is a hazardous and highly destructive disease that causes more than 65% crop loss in turmeric production. The Pythium species is the most common cause of rhizome rot. Because the illness affects the rhizome, which is present underground, farmers are unable to observe or forecast the sickness at an early stage.

As a result, we propose a method for early detection of pythium and notification to farmers. The geographical distribution of turmeric, agronomy, major and minor illnesses, and disease management strategies are all covered in this study. Turmeric is considered India's third most popular spice and cash crop [1]. Our country, known as the "Land of Spices," is a major producer, distributor, and consumer of turmeric [2]. Erode, widely known as the "Yellow City of India," is the largest turmeric producer in Tamil Nadu. Turmeric is grown to a limited level in Karnataka and Kerala. Around 2 lakh barrels of produced turmeric are generated each year, with 92 to 95 percent being consumed within the country and the remainder 5 to 8% being distributed [6]. The taxonomic categorization of turmeric, according to Linnaeus, is as follows:

Agronomy of Turmeric-Various parameters for turmeric growth

Temperature

20 to 30 °C i.e. (68 to 86 °F)

Rainfall

Turmeric needs substantial level of yearly rainfall to survive [49].

Soil

It can be grown in divergent types of soil like black to sandy soils, red soils, clay loams, ashy loams and stiff loams

pH
A line up between 4.5 to 7.5 is the best pH range for the plant to thrive with good organic status

Irrigation
The number of times the plant has to be irrigated is determined by the soil and climatic conditions.
Up to 40 irrigations are necessary in sandy loams, whereas 15 to 25 irrigations are required in clayey soils [46].

Weeding
Weeding can be done at intervals of 30 days, such as 60, 90, and 120 days after planting (DAP) [43], depending on the weed strength.

Harvesting
Early crops need 7 to 8 months, medium crops 8 to 9 months, and late kinds 9 months or more [37].
Preservation of Rhizomes Turmeric takes a long time to reproduce and has a slow growth rate in the beginning. It provides benefits in terms of ideal area, shifting the space of the harvest season, and mixed cropping with other crops [25].

Mixed Cropping
Turmeric takes longer to propagate and has a slow growth rate in the beginning. It provides benefits in terms of ideal area, shifting the space of the main crop, and mixed cropping with other crops [25].

Turmeric with other crops on intercropping
As compared to alternative treatments or no mulching, methodologies turmeric at the right spacing and adding mulch yields a higher volume of rhizome. Turmeric can be mixed farmed with summer information is incomplete, a well-known green manure crop, on a bed planting method rather than other planting methods for a higher yield [26].

Fertigation
Watering allows nutrients to be delivered accurately to the root, resulting in increased nutrient uptake and efficient nutrient utilization. When comparing to farmers' other techniques, 100% fertiliser delivery by drip irrigation resulted in higher plant height and fresh rhizome.

Consumption of nutrients
Turmeric is a nutrient-dense crop because to its long development period of up to nine months or more, as well as the plant's deep rooted tendency [23].

Management Nutrient in Turmeric
By spraying 115 kg of nitrogen in three equal parts 1/3 at (emergence + lag growth stage + tillering), good quantities and quality of rhizome, oleoresin, and essential oil can be obtained. For turmeric production, neem cakes, a natural fertiliser with pesticidal characteristics, may be a preferable option because it yields more than other manures.
The sensors are attached to the turmeric plant. To capture reliable real-time data from the field, the sensors field includes pH sensor and temperature sensor. The information gathered is entered into a data model. Split the data into training and test sets after cleaning it in the data model. Make predictions after training the model with existing algorithms. The projected output is sent to the controller, which is then connected to the IoT server, allowing the end user to detect rhizome rot early on.

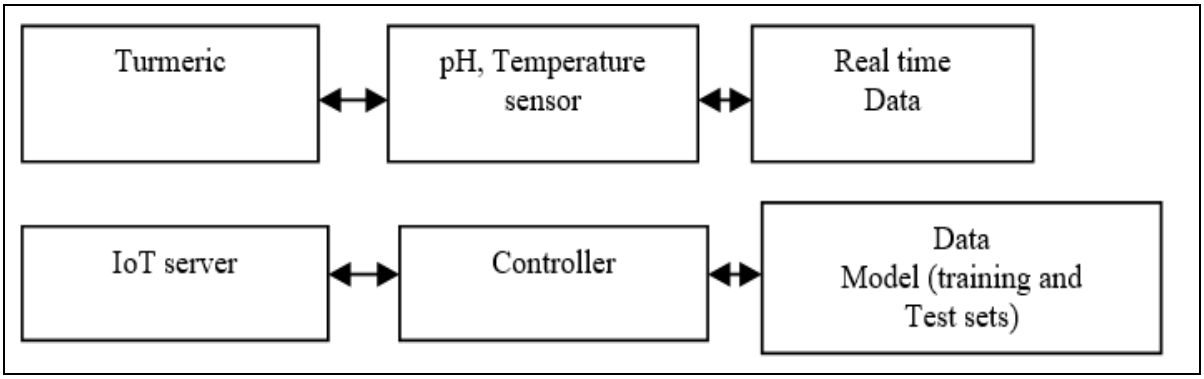

Fig 2: Methodology

Fig 3: Under Soil Monitoring of Turmeric Finger Growth Characteristics Using Artificial Intelligence

Turmeric can be grown without soil in soilless culture using a nutrient solution. In India, turmeric is consumed by around 20 million people. Plant growth and product quality can be affected significantly by changes in fertiliser management and environmental conditions. Even in artificial surroundings, the turmeric plant can be grown by keeping certain requirements. Sensors are used to acquire these data. Multiple sensors are included in the planned automated system to monitor the turmeric farm.
The relevant sensors are connected using WSN technology.

Conclusion

Turmeric is widely employed in a variety of sectors due to its numerous applications. It is second-hand crossways the world intended for check-up, foodstuff, cloth, make-up in addition to in different industry. With the use of technology, turmeric production should be boosted. In this paper, we explored the many diseases that damage plants as well as new rhizome rot detection technologies. Deep learning techniques can be used to accurately detect rhizome rot. Deep learning, slightly than a few previous predictable method, can be used to produce error-free results. The ethics motivation is gather from a concurrent atmosphere in the suggested method, which will increase the dataset volume and lead to maximum accuracy. The more datasets we train, the higher the accuracy. For rhizome rot, there is currently refusal complete monitor or disease control computing. As a result, we've devised an innovative strategy for overcoming the current difficulties.

References

1. Chitra R.” Comparative studies on growth and Yield of Conventional and Tissue culture plants of Turmeric (Curcuma longa) var. CO2”,2019:14(2):162-165, 2019
2. Kavitha K, Nakkeeran S, chandrasekar G. ” Rhizobacterial-mediated induction of defense enzymes to enhance the resistance of turmeric (Curcuma longa L) to Pythium aphanidermatum causing rhizome rot”, 2011.
3. Rajyalakshmi R, Naidu LN, Rajasekhar M, Sudhavani V. ” Genetic variability, correlation and path coefficient analysis in turmeric (Curcuma longa L.), 2013.
4. Roshan Prasad Yadav, Gaur Tarun. ” Versatility of turmeric: A review the golden spice of life”, 2017.
5. Chitra Chenniappan, Gideon Moses Daniel, Ponmurugan Ponnusamy, Mathivanan Narayanasamy,” Association of multiple fungal pathogens to rhizome rot disease of turmeric”, 2020.
6. Tanzeel U, Rehmana Md, Sultan Mahmudb, Young K, Chang b, Jian Jina, Jaemyung Shin.” Current and future applications of statistical machine learning algorithms for agricultural machinevision systems”, *Elsevier*, Computers and Electronics in Agriculture,2019:156:585-605.
7. Bashar Elnashefa, Sagi Filina, Ran Nisim Lati. ” Tensor-based classification and segmentation of three-dimensional point clouds for organ-level plant phenotyping and growth analysis”, *Elsevier*, Computers and Electronics in Agriculture,2019:156:51-61.
8. Jiahao Caia, Deqin Xiaoa, Lishan Lvb, Yaowen Ye.” An early warning model for vegetable pests based on multidimensional data”, *Elsevier*, Computers and Electronics in Agriculture 156 (2019) 217–226.
9. Vijai Singha AK, Misra b. Detection of plant leaf diseases using image segmentation and soft computing techniques”, *Elsevier*, Information processing in agriculture,2017:4:41-49.
10. Koushik Nagasubramanian, Sarah Jones, Asheesh, Singh K, Soumik Sarkar, Arti Singh & Baskar Ganapathysubramanian, ”Plant disease identification using explainable 3D deep learning on hyper spectral images”, *Springer*, Procedia Computer Science,2019:133:502-509.