IOT Based on Plant Diseases Detection and Classification

Waleed M.Ead
Faculty of Computers and Artificial Intelligence,
Beni-Suef University, Egypt
waleedead@hotmail.com

Mohamed M.Abbassy
Faculty of Computers and Artificial Intelligence,
Beni-Suef University, Egypt.
abbassy@gmail.com

2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS) | 978-1-6654-0521-8/20/$31.00 ©2021 IEEE | DOI: 10.1109/ICACCS51430.2021.9441954

***Abstract*- Egypt is an agricultural country. In present days, the possibility of knowledge cultivation has been acquired where the field conditions are controlled and checked using the self-acknowledgement of the malady relying upon the recognizable proof of the manifestations of infection. With the objective that information about the malady occasion could be quickly and exactly provided to the farmers, consultants and experts. This accordingly reduces the checking of massive field by individuals. In sickness affirmation from picture, the key is to remove the brand name feature of the infected locale. As specified by the infection the features may change. The features that are isolated from the image are shading, shape surface and so on. Now and again for identification of the ailment more features are removed and these isolated features would construct the equipment similarly as programming cost. This further causes increase in the eccentricism and the calculation time. Subsequently it is essential to reduce the element data.**

Keywords-IOT, Plant Diseases Detection and Classification, Intelligent Agriculture practices, Picture Processing,

I. INTRODUCTION

Agriculture is presently confronted to with an ICT-revolution. The digitization of horticulture relies upon different innovations beginning from outside the rural division, as worldwide situating frameworks, distributed computing, drones, Internet of Things (IoT, etc. Generally these advancements bolster itemized information catching that on a basic level can without a very remarkable stretch be shared (cloud innovation) and deciphered with enormous information procedures. IOT is a most important point started concentrating on how to utilize IOT in agriculture [1,2].

Nowadays an incredible achievement in the present-day agriculture field. Numerous sorts of different sensors have been created for detecting agricultural objects, IOT gives a change to the remote monitoring the plant disease [3].

Application of "Intelligent Agriculture practices" through the use of advance IoT technologies would be promising in agricultural modernization and pattern of Egypt agriculture-practices improvement.

The Agricultural monitor of disease is a convoluted procedure and includes a wide range of stages and distinctive performing actors. One of the major problems which are faced by farmers is problem present in leaves. They also do not get the result as they are expecting for; which is a main reason that most of the people do not want to do farming.

II. RELATED WORK

Farm management deals with the organization and operation of a farm with the target of making a business while managing worldwide exchange, recognizability and buyer prerequisites, farming arrangements, (FMIS) is a system for gathering, handling, storing and spreading of data as information expected to complete the operations elements of the farm [4].

IoT systems and platforms are still immature for agriculture, yet there is a trend presently to apply IOT in the farming division. In Duan Yan-e et al proposed an IOT application that provides agricultural information and crop information to farmers based on gathered by wireless sensor network data [5]. This information is used to ensure that the rate of Fertilizer application and within the recommended limit [6,7].

III. MATERIAL AND METHODS

Enabling IoT technologies in agriculture through: Development and implement expert system for rice and wheat diseases. knowledge must be extricated from a human expert base.

For this proposed research, a few strategies are led, such as, taking image from smart phone camera with some expert in agriculture; analyze image about rice and wheat diseases plant disease. Construct mobile application help rice and wheat diseases consultants to more effectively distinguish the rice and wheat diseases.

This research for Farming Assistant will make farmers smart. It will assist farmers by taking care of every type of crops with the help of new coming technologies like transfer learning and image processing, it will detect if any disease is spreading in the crops along with this it will also tell the farmers that what treatment should be given to protect the crops.

Farming is not strictly about the primary production, but play a major role in improving the efficiency of entire supply chain and alleviating food security concerns. It will manage the crop failure risk and boost feed efficiency in livestock production. This proposed system will take picture of diseased leaf as input which is sent by farmers for the disease identification.

978-1-6654-0521-8/21/$31.00 ©2021 IEEE

Farmer take a picture by smartphone into system and proposed system will process the image as:

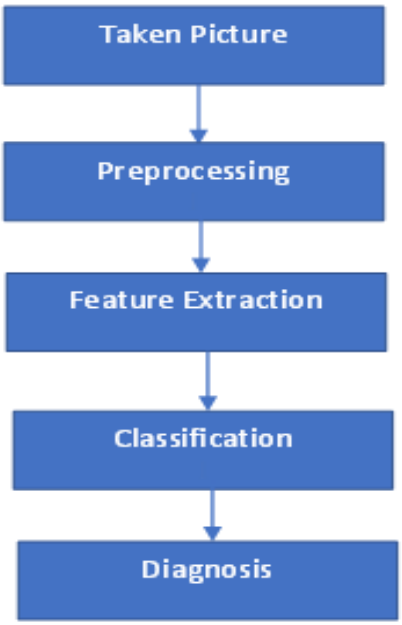

Fig. 1. Picture processing

The scientists have received different techniques for location and ID of ailment precisely. One such framework utilizes thresholding and back engendering system. Information is grape leaf picture on which thresholding is performed to veil green pixels. Utilizing K-implies grouping fragmented illness divide is gotten. At that point ANN is utilized for order [1]. The other technique utilizes PCA and ANN.PCA is utilized to diminish the elements of the element information. to diminish the no. of neurons in input layer and to speed up NN [2].

Sometimes edge can't be fixed and object in the spot picture can't be found. Henceforth creators proposed LTSRG-calculation for division of picture [3]. In cucumber leaf sickness determination, range based calculations are utilized [4].In the grouping of elastic tree illness a gadget called spectrometer is utilized that quantifies the light force in electromagnetic range. For the investigation SPSS is utilized [5].

In citrus infection illness location utilizes three level frameworks. Worldwide descriptor distinguishes sick injury. To recognize ailment from comparative sickness-based districts zone-based neighborhood descriptor is utilized in last stage two level progressive discovery structure distinguishes blister injury [6].

For recognizable proof of sickness on plant and stems first division is conveyed utilizing K-implies grouping. Highlight extraction is finished by CCM strategy. Distinguishing proof is finished by utilizing BPNN[7].With pertinence to grapes, the natural product for the most part endure with tree sorts of infections viz Powdery Mildew, Downy Mildew and Anthracnose[8]. The two illnesses are viewed as Powdery Mildew and Downy Mildew.

Fine Mildew: Powdery mold can taint every single green piece of the grapevine[9]. This ailment is most effortlessly perceived by the dusty appearance or white fine development happening in patches on natural product or leaves [10]. The white patches of fine mold produce a great many spores (conidia) which are spread by wind to cause more contaminations [11]. Free dampness isn't required for optional disease; temperature is the most significant natural factor. The picture of grape leaf influenced with late scourge is appeared underneath in Figure [12].

Fig. 2. Diseased leaf

Fleece Mildew: Early in the season, tainted leaves create yellowish-green injuries on their upper surfaces. As injuries grow, the influenced regions turn earthy colored, necrotic, or mottled. Seriously tainted leaves may twist and drop from the plant. The malady additionally assaults more seasoned leaves in pre-fall and pre-winter, creating a mosaic of little, precise, yellow to red-earthy colored spots on the upper leaf surface. Wool mold is supported by warm, wet developing seasons.

The picture of leaf contaminated with early curse is appeared underneath in Figure.

Fig. 3. Diseased leaf

Progressed picture planning is the use of PC computation to perform picture handling on mechanized pictures. It permits a lot more extensive scope of calculations to be applied to the info information and can maintain a strategic distance from

issues, for example, the development of commotion and sign bending during preparing. Since pictures are characterized more than two measurements (maybe increasingly) computerized picture preparing might be model as [multidimensional systems].

The picture is obtained from the worker by utilizing another php content GetImage. It has question to get to the picture. The picture can be gotten to by MATLAB utilizing the URL of the php record in the worker. The GUI of MATLAB has an interface which comprises of a catch called Image Select. On clicking Image Select the picture straightforwardly gets downloaded from worker. The obtained picture is pre-processed so it tends to be utilized for additional utilization.

The accompanying advances are followed for distinguishing infection in crop:

- Image Preprocessing
- Segmentation
- Feature Extraction
- Classification

A. Image processing

The picture gained is preprocessed. The preprocessing begins by changing over the RGB picture to shading space. The shading space comprises of Luminosity layer L, chromacity layer an and b. The entirety of the shading data is put away in the layers an and b. It requires to make shading structure with the goal that the RGB hued picture is changed over to L*a*b space. The capacity is makecform (), later the arrangement is applied to the picture that was gained.

B. Segmentation

There are a few calculations utilized for division yet perhaps the best technique utilized for discovery of infection is k-implies bunching. k-implies bunching is a strategy for vector quantization, initially from signal preparing, that is mainstream for group investigation in information mining. k-implies bunching intends to segment n perceptions into k groups in which every perception has a place with the group with the closest mean, filling in as a model of the bunch.

Arrange the hues a*b* shading space utilizing k-implies bunching. Since the picture has 3 hues we make three groups. Measure the separation Euclidean Distance Metric. Name each pixel in that picture utilizing results from K implies.

Given a set of perceptions (x1,x2,….,xn), where every perception is a d-dimensional vector, k implies clustering aims to segment the n perceptions into k (≤ n) setsS = {S1, S2, … , Sk} in order to limit the within-cluster sum of squares (WCSS) (amount of separation elements of each point in the bunch to the K center). As such, its goal is to determine:

$$\arg\min_{\mathbf{S}} \sum_{i=1}^{k} \sum_{\mathbf{x}\in S_i} \|\mathbf{x} - \boldsymbol{\mu}_i\|^2$$

where μi is the mean of focuses in Si.

Bunch investigation or bunching is the undertaking of collection a lot of items so that objects in a similar gathering (called a bunch) are progressively comparable (in some sense or another) to one another than to those in different gatherings (groups). In bunch investigation, the k-implies calculation can be utilized to segment the information informational collection into k segments.

Name each pixel in the picture utilizing results from K implies. At that point a clear cell exhibit is made to store the aftereffects of grouping. Followed by make RGB mark utilizing pixel_labels. Choice of fitting bunch is another significant angle. The group which shows the greatest sickness influenced part is to be chosen. In the subsequent stage of highlight extraction, the highlights of the chose group are extricated.

C. Feature Extraction

The highlights of the chose group are removed. The chose picture is changed over to grayscale since the picture is in RGB group. At the following stage the Gray Level Cooccurance Matrices (GLCM). The necessary insights are gotten from Gray level cooccurance Matrices (GLCM). The accompanying 13 highlights that is removed and assessed: Contrast, Corelation, Energy, Homogenity, Mean, Standard Deviation, Entopy, RMS. Change, Smoothness, Kurtosis, Skewness. The thirteen highlights are put away in a cluster.

D. Classification

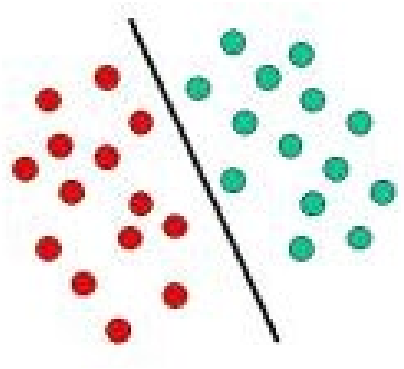

Fig. 4. Straight classifier

The above is a great case of a straight classifier as shown in figure 4, i.e., a classifier that isolates a lot of articles into their separate gatherings (GREEN and RED for this situation) with a line. Most characterization assignments, notwithstanding, are not so straightforward, and frequently increasingly complex structures are required so as to make an ideal division, i.e., effectively arrange new articles (experiments) based on the models that are accessible (train cases). This circumstance is portrayed in the outline beneath. Contrasted with the past schematic, obviously a full partition (

of the GREEN and RED items would require a bend (which is more mind boggling than a line).

IV. CONCLUSIONS

The Agricultural monitor of disease is a convoluted procedure and includes a wide range of stages and distinctive performing actors. The rundown of observing information centers through the remote system by Internet move to the database; the principle capacity of the information the board module is put away in the property information, information passage, erase, adjust, capacity, recovery and measurements, etc. The information is the center in observing framework reliant on IOT. To help ranchers by recognizing the sickness present in their plants leafs and to give the most ideal answer for that illness. To enhance the productivity of farming and to develop the interest towards farming and to reduce the effort of farmer in terms of time and money. the proposed system is to identify the disease present in plant leafs with best possible accuracy. This system will also give the solution to the disease which is present in the plant leafs. It will reduce the effort of farmers and will increase the productivity of the farmers.

References

[1] D Datta, S Mishra, SS Rajest, "Quantification of tolerance limits of engineering system using uncertainty modeling for sustainable energy" International Journal of Intelligent Networks, 2020, Vol.1, 2020, pp.1-8, https://doi.org/10.1016/j.ijin.2020.05.006

[2] Rao, A. N., Vijayapriya, P., Kowsalya, M., & Rajest, S. S. Computer Tools for Energy Systems. In International Conference on Communication, Computing and Electronics Systems, 2020, pp. 475-484. Springer, Singapore.

[3] Luigi Atzori, Antonio Iera, GiacomoMorabito. "The Internet of Things: A Survey". Computer Networks, 2010(54): 2787-2805

[4] Aditi Mehta, Sanjay Patel. "Iot Based Smart Agriculture Research Opportunities And Challenges". International Journal for Technological Research in Engineering,2016, pp:541-543.

[5] Haldorai and A. Ramu, "An Intelligent-Based Wavelet Classifier for Accurate Prediction of Breast Cancer," Intelligent Multidimensional Data and Image Processing, pp. 306–319.

[6] Foughali Karima,Fathalah Karimb,Ali frihida. "Monitoring system using web of things in precision agriculture". Monitoring system using web of things in precision agriculture, 2017.

[7] Andreas Kamilaris, Feng Gao, Francesc X. Prenafeta-Boldú and Muhammad Intizar Ali. "Agri-IoT: A Semantic Framework for Internet of Things enabled Smart Farming Applications". In Proc. of the IEEE World Forum on Internet of Things (WF-IoT), 2016(12)

[8] M.C. Hemmer, Expert Systems in Chemistry Research. CRC Press, Florida, pp. 10-29, 2008.

[9] S, D., & H, A. (2019). AODV Route Discovery and Route Maintenance in MANETs. 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). doi:10.1109/icaccs.2019.8728456

[10] Leo Willyanto Santoso, Bhopendra Singh, S. Suman Rajest, R. Regin, Karrar Hameed Kadhim, "A Genetic Programming Approach to Binary Classification Problem" EAI Endorsed Transactions on Energy, 2020, DOI: 10.4108/eai.13-7-2018.165523

[11] Roshini and H. Anandakumar, "Hierarchical cost effective leach for heterogeneous wireless sensor networks," 2015 International Conference on Advanced Computing and Communication Systems, Jan. 2015. doi:10.1109/icaccs.2015.7324082

[12] H and U. K, "Cooperative Spectrum Handovers in Cognitive Radio Networks," EAI/Springer Innovations in Communication and Computing, pp. 47–63, Jul. 2018. doi:10.1007/978-3-319-91002-4_3