IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 4, April 2021

DOI 10.17148/IJARCCE.2021.10462

Disease detection of various plant leaf using Image processing techniques

Zahid Shaikh[1], Shashank Dhandal[2], Rushikesh Ghatage[3], Aaquib Shaikh[4]

Student, Department of Computer Engineering, Trinity College of Engineering and Research, Pune, India[1-4]

Abstract- The applications based on image processing for plant disease recognition and classification is the wide area of research these days. These applications are useful for timely recognition of plant disease. The disease like fungal, bacterial and insect are the destructive disease for any plant. For example In the study, five types of tomato diseases i.e. tomato late blight, Sectorial spot, bacterial spot, bacterial canker, tomato leaf curl and healthy tomato plant leaf and stem images are classified. The classification conducted by extracting color, shape and texture features from healthy and unhealthy tomato plant image. The feature extraction process is done after the segmentation process. Extracted features from segmented images fed to classification tree. Finally, the disease classification was based on these six different types of classes. The classification of six types of tomato images yielded overall 97.3% of classification accuracy.

1] INTRODUCTION:-

Agricultural products are used to cater the dietary needs of animals as well as human beings. Agriculture has been a part of everyone's life directly or indirectly. It is the way of crop production which results in providing food, the building block of every human being. Whether a human resides in a metro city or lives in a village everyone survives on this crop production one or the other way.With the advent of civilization humans have started cultivating crops like wheat, cotton and others. With the development in every area of life there has been some vast development in the domain of agriculture also. Along with the variation in the types of crops being grown other activities were also started such as farming, raising cattle etc. But today also crop production largely contributes to the agricultural output. There have been major changes in crop production also. With the raising knowledge technology has brought some modernization in the area of crop production also. Modern agronomy makes the use of best technological devices and techniques for the increase in the yield. There has been an increased use of modern tools for easy identification of the suitable conditions for larger crop production. Various types of fertilizers and pesticides are being used to bring an increase. Even genetically modified seeds are being tested on a larger scale to pump up the overall production in any area. Crop production involves taking care of all the activities for the better yield across all the seasons. It involves complete analysis of the soil being used, the type of seeds used, the major nutrient requirement of the particular crop and many others. Yields obtained from the crops, and other sources are being used to meet the daily needs of not only the farmers, but for others also. But as every field suffers from some form of issues agriculture or crop production also faces major challenge in the form of crop diseases. With the huge demand of food around the world, it becomes necessary to focus on the crop production. It is aimed to protect the overall yield from any type of loss before reaching to the market. Besides calamities caused by nature such as draught, earthquakes, diseases also accounts to major crop yield losses. In context of quality or in the context of quality, yields are reduced due to various types of plant diseases. Plant disease can be described as some form of modification that hampers the normal processes in it. Crop production can be majorly affected by these diseases which may reduce the quality and quantity of the overall produced yield. Management of large amount of crop yield involves various timely activities such as keeping a watch for diseases, which reduces it to undesirable stuff. It also involves finding immediate cure for various challenges faced. Besides these numerous agricultural inspection techniques, morphological and structural imaging of the plant materials has been attempted non-invasively to circumvent specimen destructive issues using X- rays, magnetic resonance imaging (MRI), positron emission tomography (PET) and ultrasound imaging. However, shortcomings of low resolution and long acquisition time barricade the applicability of these methods for precise analysis. In order to overcome the aforementioned major limitations of the imaging modalities, non-destructive high resolution optical imaging techniques have gained plenty of interest recently.

Among high-resolution optical inspection modalities, optical coherence tomography (OCT) is a well known

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 4, April 2021

DOI 10.17148/IJARCCE.2021.10462

nondestructive imaging technology that provides cross sectional images of various biological tissue specimens with a micrometer range resolution. Since OCT is capable of providing real-time images with an exceptional resolution, OCT has been involved extensively in variety of medical applications including ophthalmology, dentistry, and dermatology. The scan depth of OCT is suitable for examining the internal structure of plant leaves, since it provides a higher scan depth with a microscopic resolution similar to a conventional microscope. In addition, previously demonstrated OCT based agricultural disease and material inspection studies provided a solid platform con-ring the applicability of OCT for plant material inspection .The main purpose of the proposed study was to demonstrate on-eld in situ inspection for apple leaf specimen to diagnose apple blotch using the laboratory developed compact backpack-type OCT system. An agricultural inspection method, called LAMP technique, was simultaneously performed to corm the correlation between LAMP and OCT results, which were acquired using the developed inspection modality. Therefore, our study highlights the on-eld insituinspection for apple blotch using our own developed OCT with the variation by LAMP technique and the incorporation of both OCT and LAMP techniques as an inspection protocol for the preidentification of apple blotch. In addition to the highresolution OCT cross-sectional images, automated Amplitudescan (A-scan) depth paroles provided a variation of the morphological state (as healthy or infected) emphasizing the effectiveness of proposed method as a promising diagnostic approach in agriculture.

2] RELATED WORK:-

The infection of diseases in plant or tree is a great problem in agricultural sectors. As a result, disease detection of various plants/leaves affected by fungi, bacteria, or damaged by different insects is a popular area in recent years. Researchers work on rice, apple, pepper, cotton, and other industries for detecting their diseases. The diseases on the mango tree are critical issues which creates a major problem in the production of mango. Though a few articles are available that work on identifying the diseases of mango leaves or trees, the performance of detecting diseases needs to be improved further. Krishnan and Sumatra used morphological operator to identify and recognize of bacterial leaf scorch through the analysis of histogram, HSI detraction, and intensity tuning. In this research, c-means algorithm is used for image segmentation that faces a bit problem of high-dimensional data sets. Arivazhagan et al. presented an approach for diagnosing the diseases found in citrus plant that are caused by Citrus canker, Anthracnose, etc. . Sherrill et al. elaborated method is useful in crop protection, especially in large area farms, which is based on automated techniques that can detect diseased leaves using color information of leaves. An and et al. cited an article to identify diseases on the rice plant using K-means algorithm. Another article using Kmean cluster technique is published and extracted features by color and texture to detect apple fruit diseases. Warne and Ganorkar also proposed a technique to detect diseases of cotton leaves using K-mean clustering. However, these techniques drop performance when data have different size and different density. In 2016, an article was published for identifying leaf diseases of pepper plants that using neural networks. Alba shish et al. and Ghaiwat et al presented investigation on different classification methods that can be used for plant leaf disease classification. Ranjan et al. cited a diagnosis process that is mostly visual and requires precise judgment and also scientific methods capturing images of unaffected and diseased leaf. Cajole describes the approach for detection and computation of texture information for plant leaf diseases. Bhange and Hingoliwala , and Kaur et al. did work on disease detection and classification for showing how to lead smart farming . In 2017, Madiwalar and Wyawahare conducted a comparative study on plants disease identification to explain the overall view of our recent and previous works on it in a conference . Dai et al. and Rump et al. did work taking classification algorithm, and initial plant disease classification and detection. Ihobogang's andWannous's displayed their ideas in a conference paper for designing of plant disease detection system.

3] METHODS:-

In this application developing work , we have worked on live plants, we have looked a disease on mango tree, namely 'Mango anthracnose' which mainly effected on Large numbers of spores are formed in the spots; the spores are splashed by rain onto other leaves, flowers and shoots. They germinate, infect and produce more spots and blights. Young leaves are most susceptible to infection at first, the spots are small, black and irregular, often expanding to form large dead areas that dry and fall out. On mature fruits, the fungus remains as pinpoint infections until the fruit ripens; then the infections form dark brown to black spots with orange-pink spore masses. And impact appear on the fungus causes severe damage during wet weather. It causes a blight of flowers and young shoots, leaf spots, and fruit rots. In wet weather, flower blight results in low yield and shoot dieback. Young infected fruits develop black spots, shrivel and fall off. Infection of mature fruit leads to losses in storage. Stamina causes black spots on the leaves, which may merge

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 4, April 2021

DOI 10.17148/IJARCCE.2021.10462

to form large black areas. During wet weather the fungus may cause early leaf fall. Images collected from various verified online sources. Images collected and used in the experiment are numbered as Mango anthracnose followed by sequential numbering, a sample can be seen in Fig. 1.

Fig 1

As well as on mature fruits, the fungus remains as pinpoint infections until the fruit ripens, then the infections form dark brown to black spots with orange-pink spore masses see fig 2

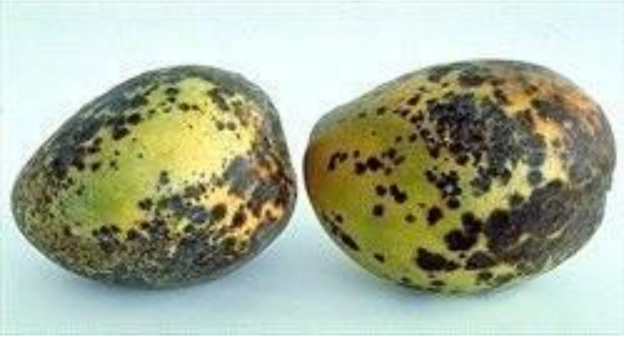


Fig 2

Look for flower blights, and spots on young leaves and fruits in wet weather. However, it is not always easy to distinguish between diseases caused by Glomerella and Stigmina. Spots of Glomerella are usually larger on the leaves, whereas those of Stigmina are about 6 mm diameter, surrounded by a wide light greenish zone see fig 3 – 4

Fig 3

We have taken a photo of mango tree disease from our application that we scan the image for finding the disease information from database,

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 4, April 2021

DOI 10.17148/IJARCCE.2021.10462

Fig 4 (Test image)

I] TEST CASE

We have included in our program that when you take a photo of one of the diseases and scan it, then that photo is found in your dataset and then its information is displayed to you from the database. In fig 4 show our datasets.

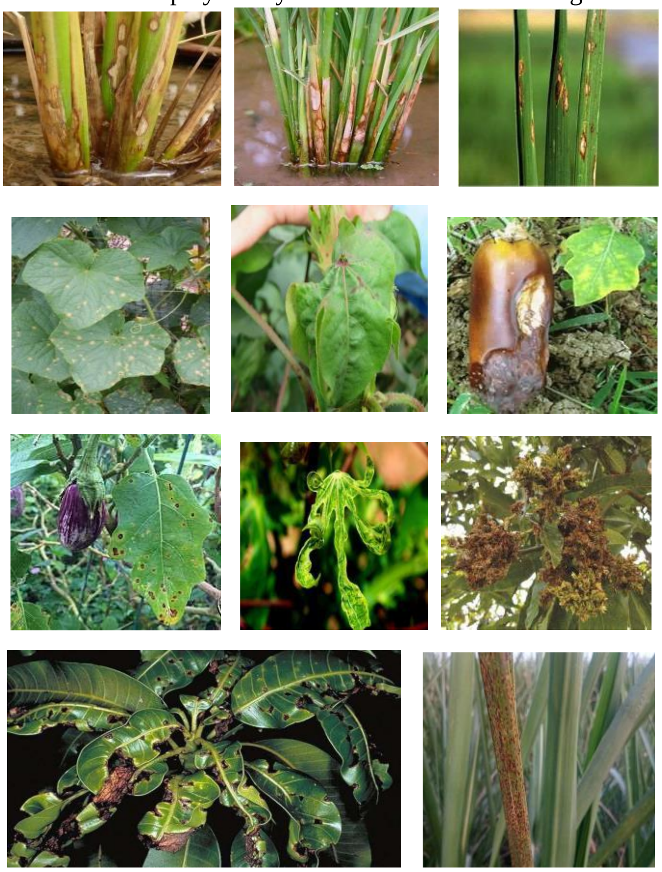


Fig 5

Fig 5 shows that some datasets were included like rice diseases, cucumber diseases, brinjal diseases, mango diseases, sugarcane diseases etc. that image matched from database and we got the name of image and then show result on our application. See Fig 5

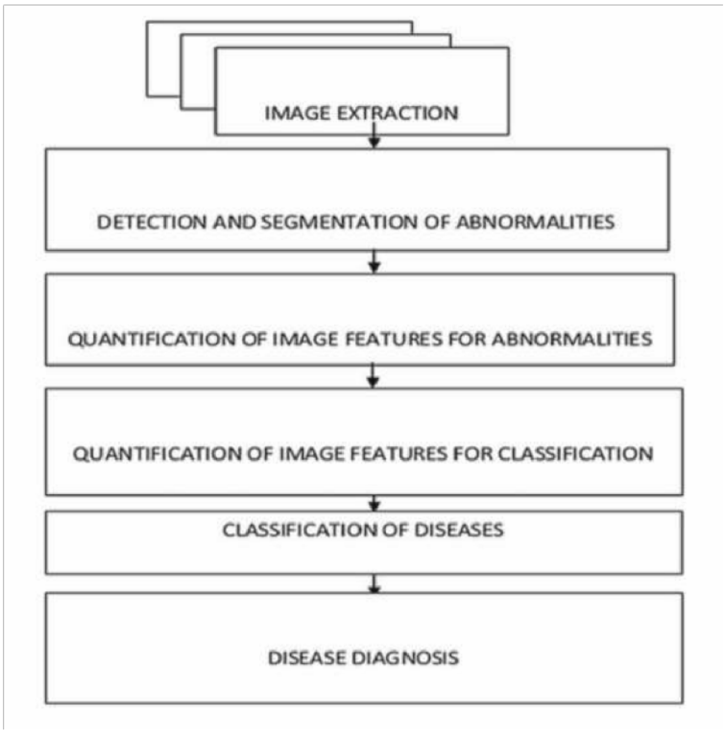
ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 4, April 2021

DOI 10.17148/IJARCCE.2021.10462

II] ARCHITECTURE MODEL:-



4] IMAGE PROCESSING ALGORITHMS:-

Basic steps of plant disease detection algorithm are,

1. Image Acquisition
2. Image Preprocessing
3. Feature Extraction
4. Classification
5. Diagnosis

Sushma R.Huddar propose a novel and unique algorithm to segregate and detect pests using image processing. The novel algorithm is based on relative difference in pixel intensities (RDI). Let α (i, j) to be the blue chroma(Cb) value of the current pixel . The relative difference of Cb intensities between the current pixel under consideration (α) and surrounding pixels are calculated and compared with a threshold value θ used an effective image segmentation algorithm for color and texture analysis. The algorithm used for texture analysis is cooccurrence matrix method. CCM method is selected for image analysis technique. In texture analysis K-means clustering technique is used. A bayes classifier is used to classify various plant diseases.

5] CONCLUSION:-

We ran multiple tests for the identification and isolation of the infected area of the leaf and stem of various plants and crops. k-means clustering was a technique that gave better results overall. These techniques were tested on a small dataset and they gave good accuracy and these techniques will be tested on a larger dataset as well. We will be expanding this work on more plants, crops and trees to detect and identify diseases. For the detection, a novel algorithm is devised to isolate the infected region more prominently. The validation of the results and the technique will also occur with testing the technique on a more elaborate dataset. For classification, a novel algorithm will give more confidence to the results.

6] REFERENCES:-

[1] D.-H. Lee, C.-G. Back, N. K. K.Win, K.-H. Choi, K.-M. Kim, I.-K. Kang, C. Choi, T.-M. Yoon, J. Y. Uhm, and H.-Y. Jung, ``Biological

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 4, April 2021

DOI 10.17148/IJARCCE.2021.10462

characterization of Marssonina coronaria associated with apple blotch disease," Mycobiology, vol. 39, pp. 200205, Sep. 2011.

[2] C.-G. Back and H.-Y. Jung, ``Biological characterization of Marssonina coronaria infecting apple trees in Korea.," Korean J. Mycol., vol. 42, no. 3, pp. 183190, 2014.

[3] G. Tamietti and A. Matta, ``First report of leaf blotch caused by Marssonina coronaria on apple in Italy.," Plant Disease, vol. 87, p. 1005, Aug. 2003.

[4] R. K. Saiki, S. Scharf, F. Faloona, K. B. Mullis, G. T. Horn, H. A. Erlich, and N. Arnheim, ``Enzymatic amplication of beta-globin genomic sequences and restriction site analysis for diagnosis of sickle cell anemia,"

Science, vol. 230, pp. 13501354, Dec. 1985.

[5] R. K. Saiki, D. H. Gelfand, S. Stoffel, S. J. Scharf, R. Higuchi, G. T. Horn, K. B. Mullis, and H. A. Erlich, ``Primer-directed enzymatic amplication of DNA with a thermostable DNA polymerase," Science, vol. 239, pp. 487491, Jan. 1988.

[6] S. Abramowitz, ``Towards inexpensive DNA diagnostics," Trends Biotech- nol., vol. 14, pp. 397401, Oct. 1996.

M. T. Iwamoto, T. Sonobe, and K. Hayashi, ``Loop- mediated isothermal amplication for direct detection of Mycobacterium tuberculosis complex, Avium, and M. Intracellulare in sputum samples," J. Clin. Microbiol., vol. 41, no. 6, pp. 26162622, 2003.

[7] Y. Mori and T. Notomi, ``Loop-mediated isothermal amplication (LAMP): A rapid, accurate, and cost-effective diagnostic method for infectious diseases," J. Infection Chemotherapy, vol. 15, pp. 6269, Apr. 2009.

N. T. Notomi, H. Okayama, H. Masubuchi, T. Yonekawa, K. Watanabe, Amino, and T. Hase, ``Loop-mediated isothermal amplication of DNA," Nucleic Acids Res., vol. 28, p. e63, Jun. 2000.

[8] J. P. Dukes, D. P. King, and S. Alexandersen, ``Novel reverse transcription loop-mediated isothermal amplication for rapid detection of foot-andmouth disease virus," Arch. Virol., vol. 151, pp. 10931106, Jun. 2006.

[9] M. A. Shahin, E.W. Tollner, R.W. McClendon, and H. R. Arabnia, ``Apple classication based on surface bruises using image processing and neural networks," Trans. ASAE, vol. 45, pp. 16191627, Sep./Oct. 2002.

[10] J. J. Gonzalez, R. C. Valle, S. Bobroff, W. V. Biasi, E. J. Mitcham, and M. J. McCarthy, ``Detection and monitoring of internal browning development in `Fuji' apples using MRI," Postharvest Biol. Technol., vol. 22, pp. 179188, May 2001.

[11] R. M. L. McKay, G. R. Palmer, X. P. Ma, D. B. Layzell, and T. A. McKee, ``The use of positron emission tomography for studies of long-distance transport in plants: Uptake and transport of 18F," Plant, Cell

[12] Environ., vol. 11, pp. 851861, Dec. 1988.

[13] D.-W. Sun and B. Li, ``Microstructural change of potato tissues frozen by ultrasound-assisted immersion freezing," J. Food Eng., vol. 57, pp. 337345, May 2003.M. R. Hee, J. A. Izatt, E. A. Swanson, D. Huang, J. S. Schuman, C. P. Lin, A. Puliato, and J. G. Fujimoto, ``Optical coherence tomography of the human retina," Arch. Ophthalmol., vol. 113, no. 3, pp. 325332, Mar. 1995.

[14] R. E. Wijesinghe, K. Park, P. Kim, J. Oh, S.-W. Kim, K. Kim, B.-M. Kim, M. Jeon, and J. Kim, ``Optically deviated focusing method based highspeed SD-OCT for in vivo retinal clinical applications," Opt. Rev., vol. 23, pp. 307315, Apr. 2016.

[15] D. Fried, J. Xie, S. Sha, J. D. Featherstone, T. Breunig, and C. Q. Le, ``Imaging caries lesions and lesion progression with polarization- sensitive optical coherence tomography," J. Biomed. Opt., vol. 7, pp. 618628,