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An Image Based Diagnostic Expert System for Green Leafy Vegetables and Herbs

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ABSTRACT: The project relates to the broad fields of image processing and artificial intelligence is an application of expert system that provides systems the ability to automatically learn and improve the old methods. The main aim of this project to develop an expert system which can identify the and gives the preventing system for plant diseases since the agriculture sector needs a proper awareness of the making end user to understand about the farming issues. The steps required in the process are pre- processing, training and identification and prevention. The diseases considered are :bacterial leaf spot on spinach, downy mildew on basil, leaf spot on coriander, which can cause heavy loss to crop. The Expert system based up on fuzzy rule logic is exploited for detecting the pathology of the leaf. This paper suggests an artificial intelligent based machine learning expert system which can provide more accurate results related to the identification and classification of leaf diseases. In his work, disease classification on these crops are carried out using entropy values such as MSE and PSNR achieved good results.

Keywords: *leaf*diseases, expert system based fuzzy rules, machine learning, basil, spinach, coriander, downy mildew, leafspot

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I. INTRODUCTION

The emergence and development of plant diseases and pest outbreaks has become more common unsettled than ever due to pollution. Thus, in the area of control leaf diseases most research has been focused on the automatic identification of disease. Automatic leaf/plant disease identification by visual inspection can be great benefit to those users who have little or no information about the crop they are growing. The plants or the leaves considered for experimentation in this work are: spinach, basil, coriander the purpose of the below table clearly depicts the various plants and their symptoms of disease.

S.NO	Plant/leaf	Symptoms	Image
1	spinach	Bacterial leaf spot on spinach can infect all green parts of the leaf.It is dusty appearance or black spot patches occurring on leaf.	
2	basil	Downy mildew on basil can infect upper surfaces on leaf . It is turn yellowish green.	
3	coarinder	Leaf spot on coarinder can infect dark brown in leaf edges.	

Expert system: The expert system is a one of the area of artificial intelligence and it is decision-making capabilities of a human experts. Expert systems are often used to advice. An expert system defined as three parts:

1. User-interface: This system allows to the non- expert user to query the expert system to receive advice.
2. Knowledge base: It is a collection of facts and rules.
3. An inference –engine: The inference engine is like a search engine they knowledge base information that matches the users query.
4. The rule based systems, the inference engine determines the rules antecedents are sastified by the facts IF-THEN rules.

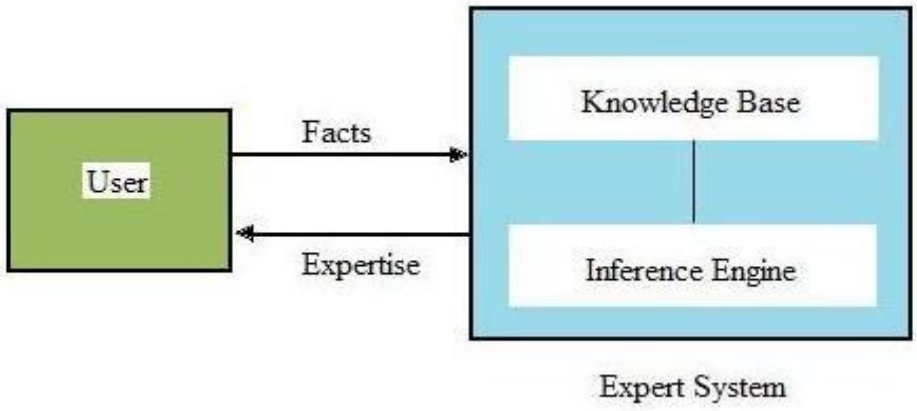

Figure 1: Expert System

II. RELATEDWORK

The remainder of the paper is organized as follows :

Various techniques of image processing and pattern recognition have been developed for detection of diseases occurring on plant leaves, stems, lesion etc. by the researchers. The sooner disease appears on the leaf it should be detected, identified and corresponding measures should be taken to avoid loss. Hence a fast, accurate and less expensive system should be developed. The researchers have adopted various methods for detection and identification of disease accurately. One such system uses thresholding and back propagation network. Input is grape leaf image on which thresholding is performed to mask green pixels. Using K-means clustering segmented disease portion is obtained. Then ANN is used for classification [1].The other method uses PCA and ANN.PCA is used to reduce the dimensions of the feature data. To reduce the no. of neurons in input layer and to increase speed of NN.Sometimes threshold cannot be fixed and object in the spot image cannot be located. Hence authors proposed LTSRG-algorithm for segmentation of image [2]. In cucumber leaf disease diagnosis, spectrum based algorithms are used [3].In the classification of rubber tree disease a device called spectrometer is used that measures the light intensity in electromagnetic spectrum. For the analysis SPSS is used[4] .In citrus canker disease detection uses three level system. Global descriptor detects diseased lesion. To identify disease from similar disease based regions zone based local descriptor is used In last stage two level hierarchical detection structure identifies canker lesion . For identification of disease on plant and stems first segmentation is carried using K-means clustering[5]. Feature extraction is done by CCM method[6]. Segmentation is done by using greddy algoithm[7].With relevance to grapes, the fruit mostly suffer with tree types of diseases viz Powdery Mildew, Downy Mildew and Anthracnose[8].

III. PROPOSED SYSTEM

The main concern of the proposed study is to design and develop such an image based expert system to identify diseased leaves of green vegetables and herbs. The system works in two phases, where the first phase deals with identification of the disease and the second phase generates an expert system based advice for the cure and prevention of the disease. The below fig2 depicts the architecture of the proposed system.

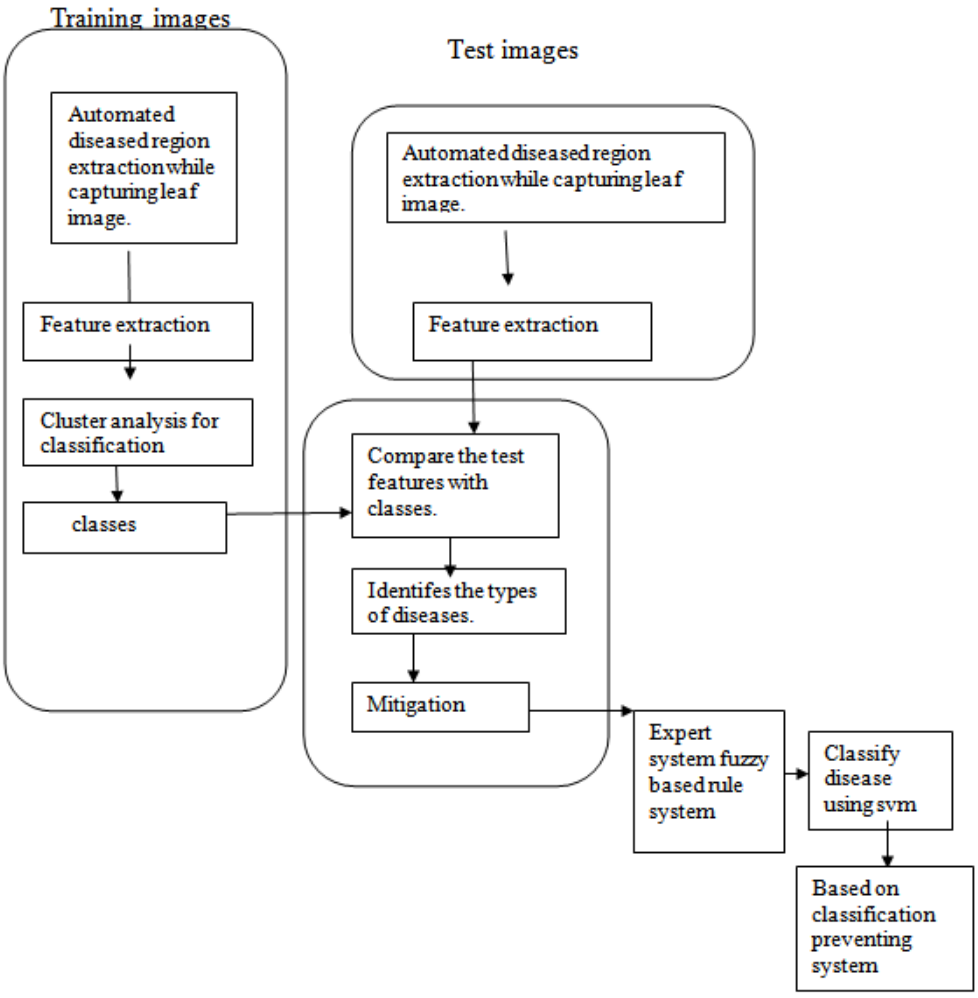

Figure 2: proposed system Architecture

IV. METHDOLOGY

This section explains in detail methodology of proposed system .

1. Data set creation: It contains different types of diseased leaves images and non diseased leaves images on green leafy vegetables and herbs. All the images are in JPEG format and were taken from different online sites from Google.
2. Image acquisition: Image acquisition is the first phase of the work flow in which digital images are acquired with help of mobile, camera or we can use the previously stored material in departmental database. Obtained image can be single leaf image or multiple leaves image. Obtained image can be completely unprocessed and will go through further steps for identification of leaf disease. In the presented paper all the images are taken in jpeg format and then further steps are performed on images for identification of leaf disease.

3. Image pre-processing: The pre-processing is defined as improve of the image data the remove background noise.

4. Feature extraction: In Feature extraction step we extract relevant information from the given train and test data sets by applying the fu_moments, haralick texture, and color histogram to achieve the extracted diseased portion of the leaf. Based up on the numerical values attained in the diseased region. At this step algorithm is prepared for identification of diseased area portion.

Algorithm

Step1: Check to ensure that the user has installed Image processing Toolbox in Python .

Step2: Load the image into Python (with full file location)

Step3: Get the dimensions of the image

Step4: Convert the image to HSV color space

Step5: calculate the black pixels

Step6: black pixels of leaf is outside

Step7: Mask the H, S, and V images

Step 8: Plot the histogram of the hue area

Step9: hue of between 0.15 and 0.5 "healthy".

Step 10: Call anything else (that is not background) "diseased."

Step11: Compute the diseased area fraction

Step12: end

5.Image classification**:** The classes are obtained from the training and test feature classes. We compare both training and testing classes to identify the disease based up on the numerical values attained in the diseased region, the name of the disease is revealed by applying svm classifer.

1. Svm classifer: Support Vector Machine is machine learning technique which is basically used for classification. It is a kernel based classifier;

Algorithm

1. upload image and read it into pix [][]
2. Initialize Pix [][] with image pixels
3. for i=0 to pix [][]. len
   a. match pix [][] attributes with dataset pixels' attributes
   b. store matching result in db
4. end for
5. calculate weights for every pixel
6. calculate z for matching diseases z=sum (w)
7. take average of z=avg (z)
8. Filter diseases having z value less than avg(z)
9. transfer the output wich will be delivered to user

Results :

Figure3: Alfalfa yellow spot on basil

5. Fuzzy rule based expert system:

We have implemented a fuzzy rule expert system which is used for performing the preventing measures for leaf diseases. The rule based systems, the inference engine determines the rules antecedents are sastified by the facts. IF-THEN rules can be expressed as:

- The fuzzy rule with maximum value is

- IF entropy and PSNR [9] value is HIGH AND MSE[10] value is HIGH AND LEAF Is having spots AND THEN NEED DISEASE DIAGNOSIS.

- The fuzzy rule with minimum value is

- IF entropy and PSNR value is LOW AND MSE value is LOW AND LEAF Is GREEN AND THEN HEALTY CROP

- The combination of the all the possible situations of the input values are LOW, MED and HIGH It is a fuzzy rules shows all possible outputs for all possible inputs.

Results

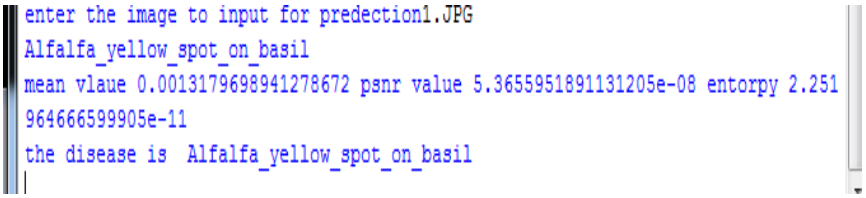

Figure 4: Disease classification basing on the entropy values *of MSE and PSNR*

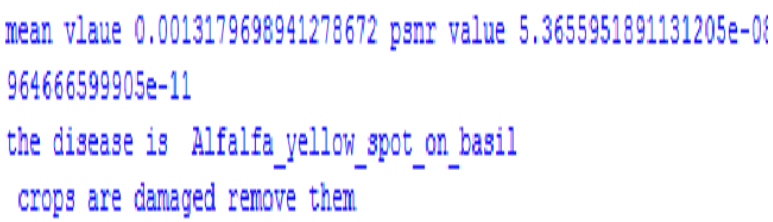

Figure5: Disease preventing basing on the entropy MSE and PSNR by using expert system

V. CONCLUSION

The use of automated Automation of expert system for in the field of agriculture are gaining increasing demand with the technological advancement. In agricultural field loss of yield mainly occurs due to widespread of disease. Mostly the detection and identification of the disease is noticed when the disease advances to severe stage. Which leads to loss in terms of yield, time and money. The proposed system is capable of detecting and preventing the disease at the earlier stage as soon as it occurs on the leaf.

REFERENCES

[1]. Sachin D. Khirade, and A. B. Patil, "Plant Sainin, M. S., Ahmad, F., & Alfred, R. (2016). Comparison of half and full-leaf shape feature extraction for leaf classification. doi:10.1063/1.4960932 disease detection using image processing," IEEE

[2]. Phattarachairawee, S., & Ketcham, M. (2017). An algorithm image Enhancement for Segmentation Palm-Leaf Manuscript. 2017 International Conference on Digital Arts, Media and Technology (ICDAMT)

[3]. Li, H., Feng, J., Yang, W., Wu, X., Li, Z., & Liu, W. (2011). Spectrum-based method for quantitatively detecting diseases on cucumber leaf. 2011 4th International Congress on Image and Signal Processing.

[4]. May, D. M., Vissage, J. S., & Few, D. V. (1990). New Tree-Classification System Used by the Southern Forest Inventory and Analysis Unit. doi:10.2737/so-gtr-076

[5]. M., G., & S., P. (2016). Tomato Disease Segmentation using K-Means Clustering. International Journal of Computer Applications, 144(5), 25-29. doi:10.5120/ijca2016910270

[6]. Diao, Z. H., & Wu, Y. Y. (2011). Research on Feature Extraction of Wheat Leaf Disease Image. Advanced Materials Research, 317-319, 1326-1329. doi:10.4028/www.scientific.net/amr.317-319.1326

[7]. Patil, B. M., & Amarapur, B. (2017). Segmentation of leaf images using greedy algorithm. 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS). doi:10.1109/icecds.2017.8389830

[8]. Padol, P. B., & Sawant, S. D. (2016). Fusion classification technique used to detect downy and Powdery Mildew grape leaf diseases. 2016 International Conference on Global Trends in Signal Processing, Information Computing and Communication (ICGTSPICC). doi:10.1109/icgtspicc.2016.7955315

[9]. Hore, A., & Ziou, D. (2010). Image Quality Metrics: PSNR vs. SSIM. 2010 20th International Conference on Pattern Recognition. doi:10.1109/icpr.2010.579

[10]. Mean squared error. (2018, September 02). Retrieved from https://en.wikipedia.org/wiki/Mean_squared_error

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