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Detection and Classification of Leaf Disease using Machine Learning Approach

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Abstract

We propose and tentatively assess a product answer for programmed recognition and characterization of plant leaf diseases. Moreover, even though that person has always been bad in biology but would like to know more about that plant. It simply means that he/she is interested to explore his/her knowledge in this particular area. He might be interested to know its name or about its specific features. Sometimes, he/she might be interested to search a plant if it is rare or on the verge of the existence. Indeed, even today, distinguishing proof and arrangement of obscure plant species are performed physically by master individual who are not many in numbers. Here, we are introducing another acknowledgment approach dependent on Leaf Features Fusion and Random forest (RF) Classification calculations for characterizing the various kinds of plants. The proposed methodology comprises of four stages that are preprocessing, division, highlight extraction and grouping stages. Since most sort of plants have one of a kind leaves. Leaves are not exactly equivalent to each other by attributes, for example, the shape, shading, surface and vein. There are numerous highlights of leaf, for example, Color highlights, Vein highlights, GLCM highlights, Shape highlights and Gabor highlights. These all highlights are melded by idea linking of two vectors. Along these lines, order approach displayed in this exploration relies upon plant leaves. Test results show precision and different parameters estimated in this methodology with combination of every one of these highlights or their various mix. This is a clever framework which can recognize tree species from photos of their leaves and it gives precise outcomes in less time. Here we are developing Asp.net and C# base Web application that support small farmers in analyzing the damage to their plants quickly and easily.

Keywords— *Histogram Equalization, Gaussian Filter, Haralick, Random forest.*

I. INTRODUCTION

Reliable, exact appraisals from claiming ailment force level are incredulous for A large number investigate ranges for plant pathology, including assessments about social What's more crop misfortune models, dispersal gradients, malady forecasting, understanding associations between manifestations and the environment, Also assessing germplasm for imperviousness with pathogens. In spite of the vitality from claiming guaranteeing that phytopathometric appraisals are both exact What's more precise, these appraisals need aid commonly inferred starting with visual appraisals during Different levels from claiming determination (plots, plants, or tissues). A regular approach to quantifying malady force level may be with gauge its severity, characterized here Likewise those. Amount (e. G., area) from claiming ailing plant tissue relative of the aggregate add up of powerless tissue accessible. In addition, seriousness might a chance to be communicated as those amount about lesions for every testing unit for rusts and other maladies. Sickness incidence, characterized concerning illustration the ailing extent of a population's inspecting units (plant, organs) might additionally demonstrate illness force. Frequency Furthermore different check information need aid naturally lesquerella liable to inclination and errors of observation toward raters, likewise compared for visual estimates about infection seriousness. This undertaking serves farmers and the other clients who takes consideration of the plants Anyway some way or another there are large portions instances Previously, which plants endure a considerable measure from claiming sickness like virus, microscopic organisms Other than progressions, etc all through along these lines, watching and stock course of action of all instrumentation might be enha. And a number different should beat this are malady our one task aides the farmers and the other clients on assistance plants On recouping its wellbeing.

II. RELATED WORKS

Explaining the research model, theory, the technique of collecting the data, a technique of analyzing the S. Kaur, S. Pandey, and S. Goel proposed for self-loader leaf malady location and arrangement framework for

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soybean group. From the investigation, grayscale pictures are anything but difficult to process and execute for different applications since they have better clearness and appropriate for examination than RGB pictures. Histogram night out is used to redesign the separation of the photos and gives a clear picture to human eyes. Histogram leveling is used to achieve a better quality picture in grayscale which is used in the various helpful applications, normal application, for instance, electronic X-bars, plant leaves sickness, and so forth. In this way, this kind of pictures will be utilized to investigation and determination the plant leaves maladies and decides the sicknesses dimension of the plant leaves [1].

J. Garcia and A. Barbedo proposed technique for Digital picture preparing procedures for recognizing, measuring and ordering plant ailments. This paper endeavored to exhibit an extensive overview of the issue. Because of the enormous number of references, the depictions are short, giving a smart graph of the thoughts fundamental age of the arrangements. Highlight that the work regarding the matter isn't obliged to what was appeared. Numerous papers regarding the matter couldn't be incorporated into a request to monitor the paper length - the papers were chosen as to think about the biggest number of various issues as could reasonably be expected. In this way, if the peruse wishes to achieve a progressively complete comprehension on a given application or issue, he/she can allude to the lists of sources of the separate articles [2].

R. Anand, S. Veni, and J. Aravinth proposed methodology for usage of picture getting ready framework for recognizable proof on Brinjal leaves using K-infers Clustering Method. A system for area and portrayal of leaf affliction is realized. The division of the incapacitated is figured it out. The division of the lamentable part is finished utilizing the K-Means division. By at that point, GLCM surface parts are extraction and a depiction is finished utilizing SVM. The structure has looked for after a zone of sullying in citrus leaves. Future work is to be produced for offers of planning in various plant species and to improve the outline precision [3].

R. Meena Prakash, G. P. Saraswathy, G. Ramalakshmi, K. H. Mangaleswari, and T. Kaviya proposed theory for Detection of Leaf Disease and Classification using Digital Image managing. This paper, for the most part, thinks about to the changed region of tomato aggravations and illness subject to the leaf surface. The affirmation models are set up to depict the tomato ailment and pasts in terms of professional career learning improvement, which accomplishes a standard game-plan accuracy of 89%. By and by, the general world-class depends upon relative astounding test pictures, future research will concentrate on the tangle figurings to see tomato bugs and sickness subject to relative low-quality leaf pictures [4].

S. Goel, S. Pandey, and S. Kaur proposed a technique for Plants Disease Identification and Classification through Leaf Images: A Survey. In this paper, disease conspicuous confirmation is somewhat less troublesome than its authentic plan. Once in a while it winds up difficult for a master to arrange a particular infection with 100% conviction. Improvement of systems that can arrange distinctive infectious, viral and bacterial diseases precisely may in like manner be locked in. Composing considers minerals or enhancements needs as another sort of plant sickness. The improvement of systems that can suitably isolate among defilement and an absence of thought as an incredibly inconvenient focus in light of the way that from the ace perspective detaching a polluted leaf from a lacking leaf is a capricious undertaking[5].

Jailani, M. T. Nooritawati, and U. Mara proposed methodology for Orchid Leaf Disease Detection using Border Segmentation Techniques. An image setting up the to count to find the disturbance assertion and seeing evidence is proposed. The pepper plant leaves are gone in as the heading of leaves in seeing leaf contamination. The count passes on better results and solid and terrible plants can be separated with the assistance of this calculation. With this picture examination system, unprecedented sound pepper plants can be expelled out from a making ranch which expands the capability the closeness of disease by survey the visual side effects seen on the leaves of the plants [6].

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III. PROPOSED APPROACH

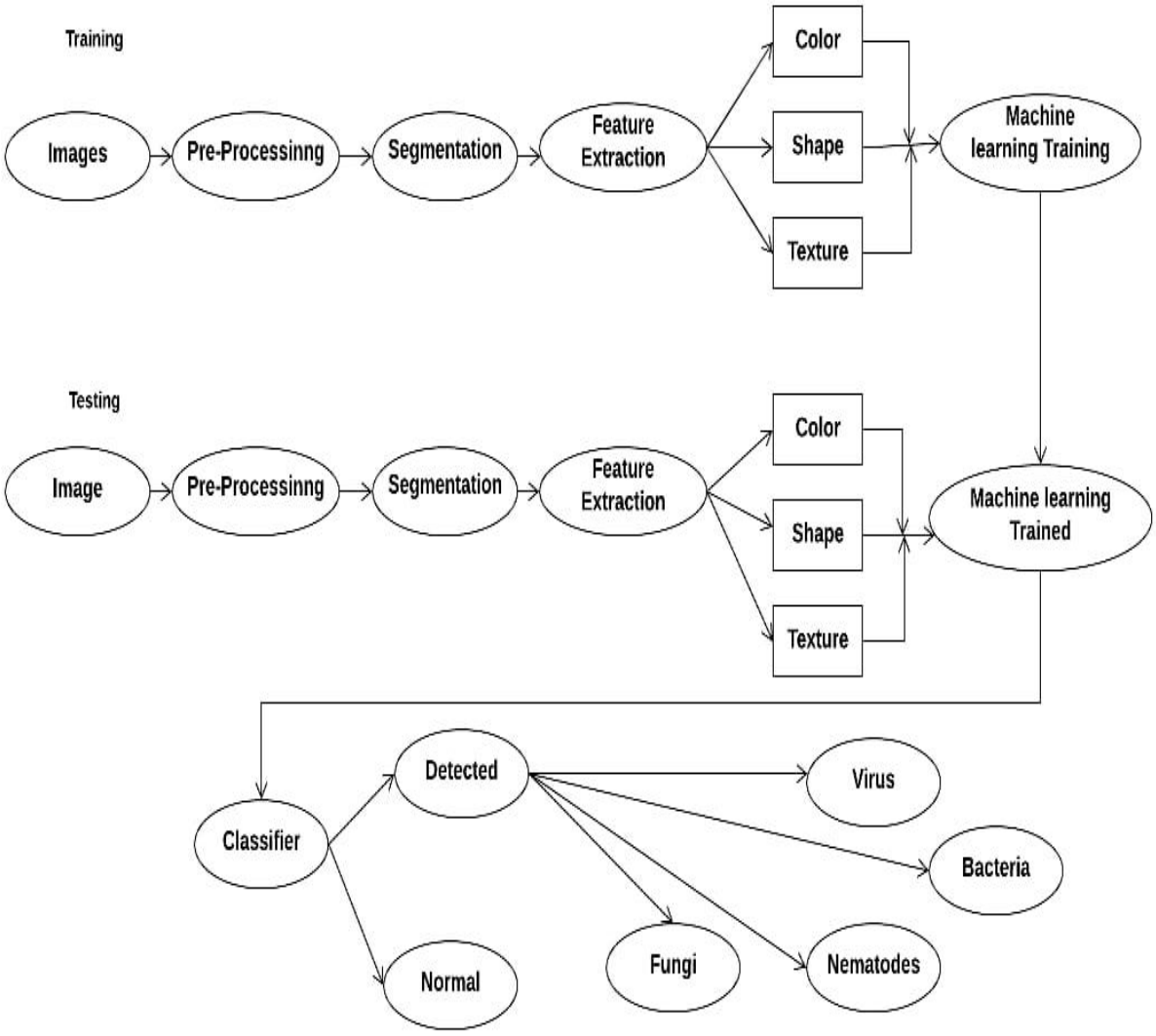

Fig. 1. Proposed Block Diagram

Training

Step 1: Select or upload images and its Label.

Step 2: Apply Pre-Processing using Histogram Equalization and Noise Removing Filter on whole image datasets.

Step 3: Apply Color and Cluster Based Combine Segmentation Approach.

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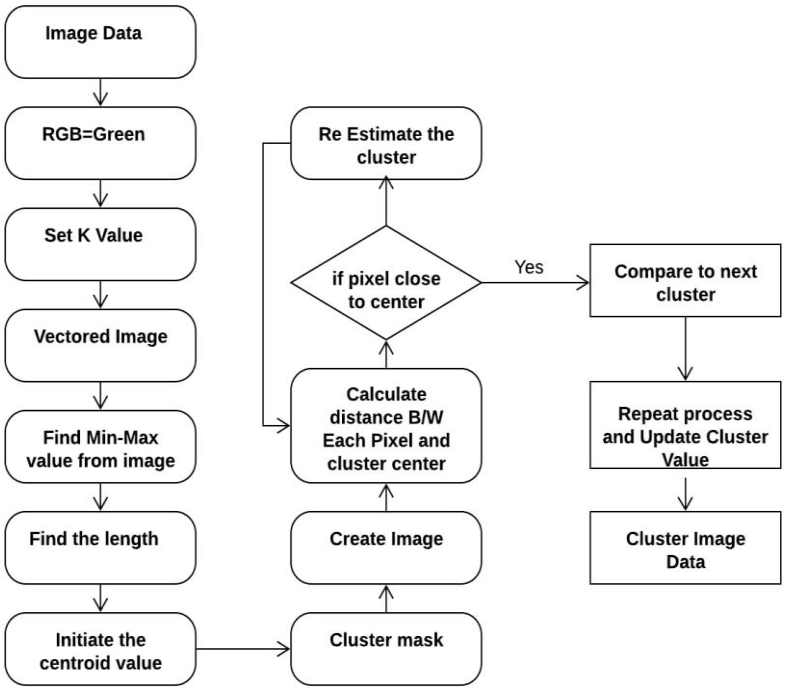

Fig. 2. Segmentation Process Diagram

Step 4: Extract Shape, Color, Vein and Texture Features for all images.

Table I: Comparison of different features

Feature	Type	Description
Shape	Area, Perimeter, Major and Minor Axis	Works with Binary Image only
Color	Color Moment	Consider Mean, STD, Skewness, Kurtosis
Texture	GLCM	Contrast, Correlation, Entropy and Variance
Vein	Vein Length	Area
Invariant	Zernike Moment	Angle and Value

Step 5: Apply Machine Learning Approach RF and make database.

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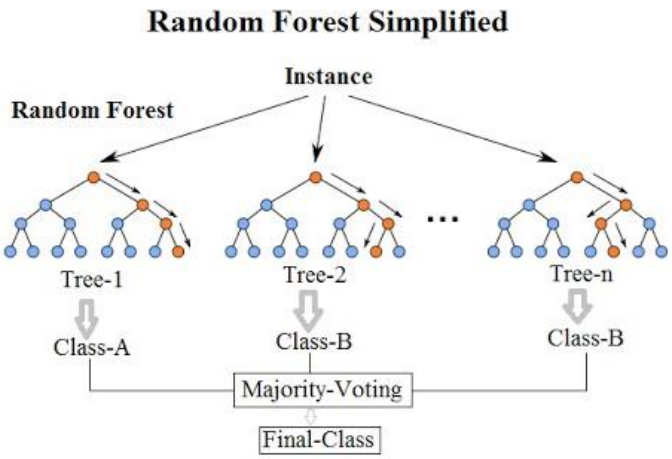

Fig. 3. Classification Random Forest

RF is an accumulation of tree-organized classifiers where each tree relies upon the estimations of arbitrary vector examined freely and the conveyance of all trees in the woodland.

Testing

Step 1: Select or upload image.
Step 2: Apply Pre-Processing using Histogram Equalization and Noise Removing Filter.
Step 3: Apply Color and Cluster Based Combine Segmentation approach.
Step 4: Extract Shape, Color, Vein and Texture Features.
Step 5: Apply Machine Learning classification Approach RF using database.
Step 6: Classify Disease type.

IV. RESULTS

Table II: Pre-Processing Results

Type	Original	Filtering	Equailizatio n
Normal			
Virus			
Fungi			
Bacteria			
Nematodes			

Table III: Segmentation and Feature Extraction

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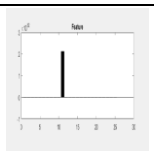
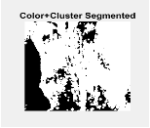
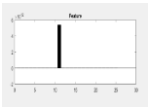
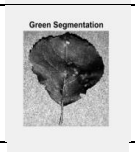
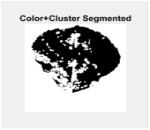
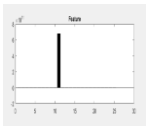
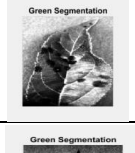
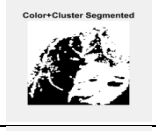
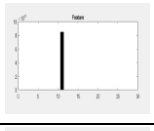
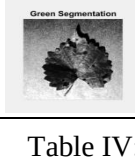
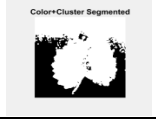
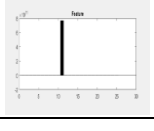
Type	Green Segmentation	Segmentation	Features
Normal			
Virus			
Fungi			
Bacteria			
Nematodes			

Table IV: Result Analysis

Algorithm	Accuracy	Precision	Recall
RF	95.83%	96%	96%
SVM	79.17%	84.50%	79%

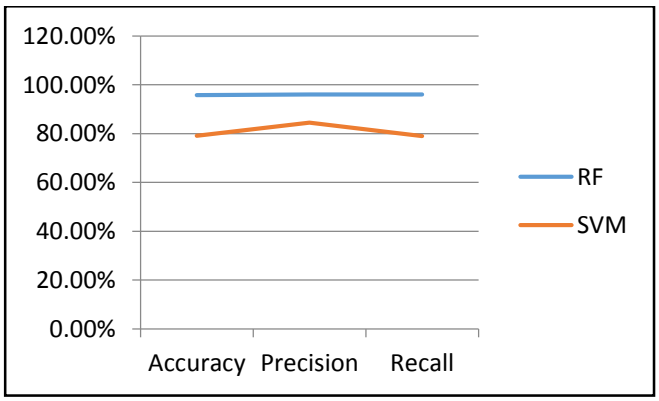


Fig. 4. Graph of Accuracy, Precision and Recall

V. CONCLUSION

An acknowledged activity of Computer Aided Plant deformity recognizable proof frameworks contains four stages, to be specific, engineering the leaf database, blessed messenger improvement, investigation (extraction

of leaf), highlight extraction and characterization. The capital aim of this analysis assignment is to propose techniques that enhance anniversary operation of bulb defect identification through leaf features. A technique for leaf grouping has been created. The strategy consolidates shape and vein, shading, and surface highlights and uses RF as a classifier. We infer that joining vein for highlight descriptors is a plausible option for grouping basically complex pictures. GLCM offer excellent invariance highlights and uncover upgraded execution than other minute based arrangements. Arbitrary Forest Classifier gives preferred exactness over some other classifier. We have use highlights combination to perceive plant deformity with precision over 90%. Regardless of the way that show of the system is satisfactory, we believe that the introduction still can be improved. Consequently, different highlights will be inquired about later on.

REFERENCES

[1] H. Q. Cap, K. Suwa, E. Fujita, S. Kagiwada, H. Uga, and H. Iyatomi, "A deep learning approach for on-site plant leaf detection," Proc. - 2018 IEEE 14th Int. Colloq. Signal Process. It's Appl. CSPA 2018, no. March, pp. 118–122, 2018.
[2] R. Anand, S. Veni, and J. Aravinth, "An application of image processing techniques for detection of diseases on brinjal leaves using k-means clustering method," 2016 Int. Conf. Recent Trends Inf. Technol. ICRTIT 2016, 2016.
[3] R. Meena Prakash, G. P. Saraswathy, G. Ramalakshmi, K. H. Mangaleswari, and T. Kaviya, "Detection of leaf diseases and classification using digital image processing," Proc. 2017 Int. Conf. Innov. Information, Embed. Commun. Syst. ICIIECS 2017, vol. 2018-Janua, pp. 1–4, 2018.
[4] J. Shijie, J. Peiyi, H. Siping, and Sl. Haibo, "Automatic detection of tomato diseases and pests based on leaf images," Proc. - 2017 Chinese Autom. Congr. CAC 2017, vol. 2017-January, pp. 3507–3510, 2017.
[5] R. Jailani, M. T. Nooritawati, and U. Mara, "Orchid Leaf Disease Detection using Border Segmentation Techniques Faculty of Electrical Engineering," no. December, pp. 12–14, 2014.
[6] J. Francis, AntoSahayaDhas D, and Anoop B K, "Identification of leaf diseases in pepper plants using soft computing techniques," pp. 168–173, 2016.
[7] N. Krithika and A. Grace Selvarani, "An individual grape leaf disease identification using leaf skeletons and KNN classification," Proc. 2017 Int. Conf. Innov. Information, Embed. Commun. Syst. ICIIECS 2017, vol. 2018-January, pp. 1–5, 2018.
[8] P. B. Padol and A. A. Yadav, "SVM classifier based grape leaf disease detection," Conf. Adv. Signal Process. CASP 2016, pp. 175–179, 2016.
[9] P. B. Padol and S. D. Sawant, "Fusion classification technique used to detect downy and Powdery Mildew grape leaf diseases," Proc. - Int. Conf. Glob. Trends Signal Process. Inf. Comput. Commun. ICGTSPICC 2016, pp. 298–301, 2017.
[10] F. T. Pinki, N. Khatun, and S. M. M. Islam, "Content based paddy leaf disease recognition and remedy prediction using support vector machine," 20th Int. Conf. Comput. Inf. Technol. ICCIT 2017, vol. 2018-January, pp. 1–5, 2018.
[11] P. R. Rothe and R. V. Kshirsagar, "Automated extraction of digital images features of three kinds of cotton leaf diseases," 2014 Int. Conf. Electron. Commun. Comput. Eng. ICECCE 2014, pp. 67–71, 2014.
[12] H. Anand Kulkarni and R. K. Ashwin Patil , "Applying Image Processing Technique to Detect Plant Diseases," International Journal of Modern Engineering Research, vol. 2, no. 5, pp. 3661-3664, September-October 2012.
[13] M. Suresha, K. N. Shreekanth, and B. V. Thirumalesh, "Recognition of diseases in paddy leaves using knn classifier," 2017 2nd Int. Conf. Converg. Technol. I2CT 2017, vol. 2017-January, pp. 663–666, 2017.
[14] K. Thangadurai and K. Padmavathi, "Computer visionimage enhancement for plant leaves disease detection," Proc. - 2014 World Congr. Comput. Commun. Technol. WCCCT 2014, pp. 173–175, 2014.
[15] S. Kaur, S. Pandey, and S. Goel, "Semi-automatic leaf disease detection and classification system for soybean culture," IET Image Process., vol. 12, no. 6, pp. 1038–1048, 2018.