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# An Overview of Different Mechanisms to Detect Plant Leaf Disease Infected Area

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**ABSTRACT:** The study of plant traits/diseases refers to the studies of visually observable patterns of a particular plant. Nowadays crops face many traits/diseases. Damage of the insect to the crop is one of the major trait/disease. Insecticides are not always proved efficient because insecticides may be toxic to some kind of birds. It also damages natural animal food chains. A common practice for plant scientists is to estimate the damage of crop/plant caused by diseases (leaf, stem) is just by a naked observation based on percentage of affected area. It results in subjectivity and low throughput. This paper provides an overview of various methods used to study plant diseases/traits using image processing. The methods studied are for increasing throughput & reducing subjectiveness arising from human experts in detecting the plant diseases.

**KEYWORDS:** K-means algorithm, complete local binary pattern, Genetic Algorithm, Image Segmentation.

## I. INTRODUCTION

In case of plant, the disease is defined as any impairment of normal physiological function of plants, producing characteristic symptoms. A symptom is a phenomenon accompanying something and is regarded as evidence of its existence. Disease is caused by pathogen. In most of the cases pests or diseases are seen on the leaves or stems of the plant. Therefore identification of plants, leaves, stems and finding out the pest or diseases, percentage of the pest or disease incidence, symptoms of the pest or disease attack, plays a key role in successful cultivation of crops. It is found that diseases cause heavy crop losses amounting to several billion dollars annually. Some diseases like root rot and phytophthora have shattered the economies of nation's production by killing entire crop in region.

Agribusiness has turned out to be a great deal more than just a way to nourish regularly developing populaces. It is imperative where in more than 70% population relies on upon agribusiness in India [6]. That implies it sustains incredible number of individuals. The plant infections impact the people directly or financially. The plant disease become the important factor which causes significant reduction in the quality and the quantity of the plants. The detection and classification of disease is important task in plant disease detection, here we proposed a novel method of the using the hybrid combination of the k means algorithm and the genetic algorithm for the detection and classification of the disease.

## II. BACKGROUND AND MOTIVATION

Agriculture is not only to feed ever growing population but it is also important source of energy. Plant diseases affect both quality and quantity of crops in agriculture production. Plant disease diagnosis is very essential in earlier stage in order to prevent and control them. The naked eye observation of experts is the main approach adopted in for detection and identification of plant diseases. But the naked eye observation is time consuming, expensive and takes lots of efforts. To remove drawbacks in existing system many system have been proposed by using different techniques. In the next section this paper present those proposed systems in meaningful way.

The management of crops required close inspection especially for management of disease infected crop that can affect the yield of crop. Image processing is a best technique for agricultural application. Image processing can detect the pest's attack from the image of plant. The detection and classification of plant diseases are important task to increase plant productivity. There are various techniques emerged to detect the plant disease such as thresh holding, region growing, clustering, Edge based detection etc. To detect plant disease, the image should go through some process like pre-processing, segmentation, feature extraction and classification processes. The pre-processing is an improvement process of image data to suppresses unwanted distortion or enhances some image features important for further

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processing. The segmentation process is to partition an image into meaningful regions and it is vital process through which image features are extracted. There are various features of an image such as grey level, color, texture, shape, depth, motion, etc. Classification process is used to classify the given input data into number of classes and groups. It classifies the data based upon selected features.

Research about existing methodologies builds up the proper registering framework to recognize the diseases using contaminated pictures of different leaf spots. Pictures are captured by a mobile camera and processed to identify diseases. The procedure developed into the framework which includes both Image handling methods and proper solution system.

In this survey, Section III gives the Literature review for Image Segmentation.

## III. LITERATURE REVIEW

Daniel Stanley Tan, Robert Neil Leong [1] used k-means clustering algorithm to group the pixels into healthy and infected clusters. The clusters were then labeled and used to train an SVM classifier that would automatically determine which clusters contain infected pixels and which clusters contain healthy pixels. Advantage for existing system that it provides a feasible robust solution for detecting infected area segmentation of Cacao Pods.

Harshal Waghmare, Radha Kokare [2] used Applications of Multiclass SVM are formulated for classification of disease identification which is observed in Grapes plants to make Decision Support Systems
(DSS) automated and easily available for farmers. The system performs segmentation of a single leaf as input and analyses it through high pass filter to detect the diseased part of leaf. The advantage for existing system that it uses various feature extraction constraints to validate accuracy and efficiency.

Vinh Dinh Nguyen, Dung Duc Nguyen [3 ] proposed analysis of LBP from the viewpoint of the local structure in order to investigate the feasibility and effectiveness of the support binary pattern for various existing binary patterns and applications. The support binary pattern successfully establishes the relationship of a pixel from various directions in the local region. Robust experiments on two common applications, disparity map generation and texture classification; demonstrate that the proposed model improves the performances of current local pattern methods. The advantages for existing system is that it provides good accuracy and efficiency in feature extraction.

Harith Al-Sahaf, Ausama Al-Sahaf [4] presented a Genetic Programming approach was used to automatically evolve rotation-invariant image descriptors to detect good key points and extract informative features simultaneously for texture image classification. Different from existing methods, the proposed GP method does not require any human intervention, needs only two instances per class and aims to tackle rotation invariances by using simple rotation-invariant features in the terminal set. The advantage for system is that it works efficiently on both continuous and discrete variables. Eg: Large data, multiple solutions

In research of M. Pietikainen, G. Zhao , A. Hadid [5], the technique is presented using the image processing as a tool to enhance the feature extraction of an image by use of Local Binary Pattern as a parameter. The local binary pattern approach has evolved to represent a significant breakthrough in texture analysis, outperforming earlier methods in many applications. Study of image analysis tasks which have not been generally considered texture analysis problems is done. Results suggest that texture and the ideas behind the LBP methodology could have a much wider role in image analysis and computer vision than was thought before.

R. Kiran Gavhale and U. Gawande [6] presented a concept of plant leaf which plays important role in disease identification and nourishment of crop. The farmers experience great difficulties in switching from one disease control policy to another. The naked eye observation of experts is the traditional approach adopted in practice for detection and identification of plant diseases. The author reviewed the need of simple plant leaf disease detection system that would facilitate advancements in agriculture. It also compared benefits and limitations of these methods and includes several steps such as image acquisition, image pre-processing and features extraction based classification.

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In work of G. Karafotias, M. Hoogendoorn [7], researchers proposed Productivity of plant decreases due to infections caused by variety of diseases. The diseases not only restrict the growth of plant but also reduce quality and quantity of crop. Different techniques are adopted for detecting and diagnosis the diseases but the better way is by using image processing. The author suggested a method in which initially the infected region is found then different features are extracted such as color, texture and shape. Finally parameter classification technique is used for detecting the diseases.
S. R. Dubey, Anand Singh Jala [8] presented the automatic detection of diseases present in the leaf image of plants. It is done with advancement of computer technology which helps in farming to increase the production. Mainly there is problem of detection accuracy and in neural network approach support vector machine (SVM) is already exist. The author discussed the various advantages and disadvantages of plant diseases prediction techniques and proposed a novel approach for detection algorithm.

Anand R ,Veni S and Aravinth J [9] suggested the method for identifying plant leaf diseases and an approach for careful detection of diseases. The proposed work diagnoses the disease of brinjal leaf using combination of image processing and artificial neural techniques. The methodology to detect brinjal leaf diseases includes K-means clustering algorithm for segmentation and Neural-network for classification. The proposed detection model based artificial neural networks are very effective in recognizing leaf diseases.
In research work of Pushkar Dixit, Nishant Singh and Jay Prakash Gupta [10] authors suggested the concept of diseases in fruit causing devastating problem in economic losses and production in agricultural industry worldwide. Author suggested a solution for detection and classification of apple fruit diseases and experimentally validated. The image processing based proposed approach is composed of the following main steps: in the first step K-means clustering technique is used for image segmentation, in the second step feature extracted from segmented image and finally images are classified into one of classes by using a Multi-class Support Vector Machine.

We have proposed an effective system which will automatically detect the prominent disease attack on crop leaf and also provide the preventive measures. The system will also compare the results with two existing systems which are Complete Local Binary Pattern and K-means Clustering Techniques. It ensures the better accuracy and efficiency than the two existing methods.

Table 1. Survey Table

| Sr no. | Title | Publication/ year | Techniques | Advantages | Research gap |
|---|---|---|---|---|---|
| 1. | A Framework for Measuring Infection Level on Cacao Pods | IEEE, 2016 | K-means clustering Segmentation Algorithm, SVM classifiers | It provides a feasible robust solution for detecting infected area segmentation of Cacao Pods. | It does not eliminate the background color and distortion caused in segmentation. |
| 2. | Detection and classification of Diseases of Grape Plant Using Color Local Binary Pattern Feature and Machine Learning for Automated Decision Support System | SPIN, 2016 | Multiclass SVM ,Decision support systems(DSS),high pass filter | It uses various feature extraction constraints to validate accuracy and efficiency. | User has to train the system for using it with required classifiers and features. |

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|---|---|---|---|---|---|
| 3. | Support Local Pattern and Its Application to Disparity Improvement and Texture Classification | IEEE, 2013 | LBP, support binary pattern | Provides good accuracy and efficiency in feature extraction. | Training of a system need to be done. |
| 4. | Automatically Evolving Rotation-invariant Texture Image Descriptors by Generic Programming | IEEE, 2016 | Genetic Programming, GP key point extraction | Works efficiently on both continuous and discrete variables. Eg: Large data, multiple solutions. | Some complications may cause because algorithm works on two or more populations. |
| | | | | | |

## IV. PROPOSED SYSTEM

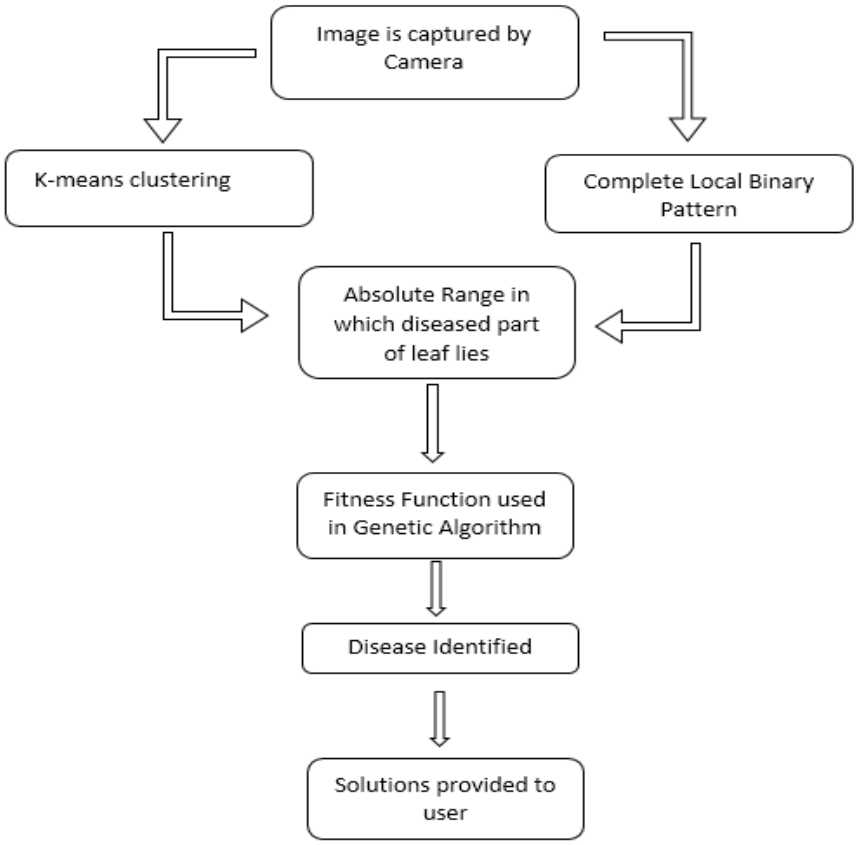


**Fig 1.** System Architecture

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Figure 1 shows the proposed system architecture. The dataset of plant leaf images is taken as an input and it is processed for both k-means clustering and Complete Local Binary Pattern methods. By using those methods, system will generate the segmented image as an output. By taking grayscale conversion and then the segmentation by two methods, user would get two segmented images and two grayscale ranges in which the disease infected part of the leaf lies. By using one of the suitable mean method which will most favorable to the system, user will calculate exact or absolute grayscale range in which the disease infected area lies.
The genetic algorithm comes in a play after user get the absolute grayscale range of disease infected area of leaf. The genetic algorithm approach uses a fitness function which only look after the values which will be acceptable by it. It will discard all the values which are not fit to the fitness function and take those values which fit into the fitness function.

In this way the disease will be identified and the system will provide a possible solution for the problem. Farmer will use those solutions and prevent the farm from prominent pest or disease attack in future.
In proposed system, Complete Local Binary Pattern and K-means clustering methods are used for comparing the efficiency and accuracy with the proposed system. Also the True Positive and False Positive features of the system are gauged.
By using this system farmer will be able to identify the prominent disease and pest attack on crop and will take necessary preventive measures.

## V. CONCLUSION

This paper analyses various techniques used for Image Segmentation in case of disease identification of crop leaves. Also it gives the advantages and drawbacks present in the different studies performed by various researchers. To deal with drawbacks in present systems we proposed a new system.

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