International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 5, Issue 4
April 2018

# Rice Plant Disease Detection Based on Clustering and Binarization

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**Abstract:** *In agricultural field, rice cultivation plays a vital role. But their growths are affected by various diseases. There will be decrease in the production, if the diseases are not identified at an early stage. The main goal of this work is to develop an image processing system that can identify and classify the various rice plant diseases affecting the cultivation of rice namely brown spot disease, leaf blast disease and bacterial blight disease. This work can be divided into two parts namely, rice plant disease detection and recognition of rice plant diseases. In disease detection, the disease affected portion of the rice plant is first identified using KNN and Clustering classifier. The detection accuracy rate is found to be 95.16%. In disease recognition, the rice plant disease type is recognized using classifiers namely k-Nearest Neighbour (k-NN) and Support Vector Machine (SVM). By this approach one can detect the disease at an early stage and thus can take necessary steps in time to minimize the loss of production.*

***Keywords:*** ***Plant, Leaf, Diseases, Image, Agriculture etc.***

## I.INTRODUCTION

India is well known for agricultural country; wherein about70% of the population depends on agriculture. Farmers have wide range of multiplicity to select suitable crops for their farm. However, the cultivation of these crops for optimum yield and quality produce is mostly technical. It can be improved by the aid of technological support. The management of perennial crops requires close controlling especially for the management of diseases that can affect production significantly and afterword the post-harvest life. The image processing is best technique used in agricultural applications for following purposes. Predict plant disease from image of plants. The plant disease diagnosis is limited by human visual capabilities because most of the first symptoms are microscopic. This process is tedious, time consuming. There is need for design system that automatically recognizes, classifies and quantitatively detects plant disease symptoms. In case of plant disease the disease is known as any impairment of normal physiological function of plants, producing characteristic symptoms. A symptom is a reality accompanying something and is observed as evidence of its existence. Disease is caused by pathogen which is any agent causing disease. Disease management is a challenging task. Mostly diseases are seen on the leaves on plants or stems of the plant. Precise quantification of these visually observed diseases, pests, traits has not studied yet because of the complication of visual patterns .In most of the cases diseases are seen on the leaves or stems of the plant. Therefore recognition of plants, leaves and finding out the diseases, symptoms of the disease attack, plays a important role in successful cultivation of crops. Hence developing a computer vision system to detect, recognize, and classify disease affected on crops which will avoid human interference and hence lead to précised unbiased decision about disease infection and its further valuation. The development of an automated system also helps farmers avoid consulting divine. Automatic detection of leaf diseases is most important research topic as it may prove gain in monitoring large fields of crops, and thus automatically detect the diseases from the symptoms that present on the plant leaves. This enables machine vision that is to provide image based and image processing plays important role.

## II.PLANT DISEASES ANALYSIS AND ITS SYMPTOMS

Detection of plant disease and assessment of the amount on individual plants or in plant populations is required where crop loss must be related to disease, for plant disease surveys, in plant breeding

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to assess host susceptibility, to make cost-effective disease management decisions in crop production and to better understand many basic biological processes (e.g. co-evolution). Disease assessment is also required for aiding in the settlement of crop insurance claims, aspects of crop biosecurity (biocrimes) and possibly terrorism. The RGB image feature pixel counting techniques is extensively applied to agricultural science. Image analysis can be applied for the following purposes:

1. To detect plant leaf, stem, and fruit diseases.
2. To quantify affected area by disease.
3. To find the boundaries of the affected area.
4. To determine the color of the affected area
5. To determine size & shape of fruits.

Following are some common symptoms of fungal, bacterial and viral plant leaf diseases.

**Bacterial disease symptoms**

Bacterial diseases include any type of illness caused by bacteria. Bacteria are a type of microorganism, which are tiny forms of life that can only be seen with a microscope. Other types of microorganisms include viruses, some fungi, and some parasites. Millions of bacteria normally live on the skin, in the intestines, and on the genitalia. The vast majority of bacteria do not cause disease, and many bacteria are actually helpful and even necessary for good health. These bacteria are sometimes referred to as “good bacteria” or “healthy bacteria.”

**Viral disease symptoms**

Symptoms of viral diseases vary depending on the specific type of virus causing infection, the area of the body that is infected, the age and health history of the patient, and other factors. The symptoms of viral diseases can affect almost any area of the body or body system. Symptoms of viral diseases can include:

• Flu-like symptoms (fatigue, fever, sore throat, headache, cough, aches and pains)

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• Gastrointestinal disturbances, such as diarrhoea, nausea and vomiting

• Irritability

• Malaise (general ill feeling)

• Rash

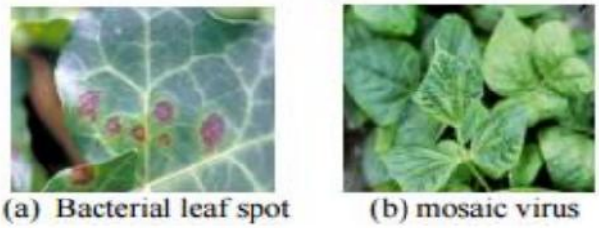


**Figure 1. Bacterial and Viral disease on leaves**

**Fungal disease symptoms**

Fungi that are common in the environment often cause fungal diseases. Most fungi are not dangerous, but some types can be harmful to health. Mild fungal skin diseases can look like a rash and are very common. Fungal diseases in the lungs are often similar to other illnesses such as the flu or tuberculosis. Some fungal diseases like fungal meningitis and bloodstream infections are less common than skin and lung infections but can be deadly. These areas are covered with white to greyish on the undersides as shown in figure.


**Figure 2. Fungal disease on leaves**

## III.JUSTIFICATION AND LIKELY BENEFITS

The plant leaf classification is the major problem in today's world. In this work I have studied the different plants real time artificial prototype model for detection of rice leaf diseases based on their color, shape and other features. Our method is more accurate then the exiting one. The previous work studied with the help of SVM and different methods but I will use different classifiers and morphological operators in this work.

## IV. THE PROPOSED APPROACH – STEPBY-STEP DETAILS

This section will discuss some of the popular classification techniques that are used for plant leaf classification. In plant leaf classification leaf is classified based on its different morphological features. Some of the classification techniques used are Neural Network, Genetic Algorithm, Support

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Vector Machine, and Principal Component Analysis, k-Nearest Neighbor Classifier. Plant leaf disease classification has wide application in Agriculture. 1) k-Nearest Neighbor: k-Nearest Neighbor is a simple classifier in the machine learning techniques where the classification is achieved by identifying the nearest neighbors to query examples and then make use of those neighbors for determination of the class of the query. In KNN the classification i. e. to which class the given point is belongs is based on the calculation of the minimum distance between the given point and other points. As a classifier the nearest neighbor does not include any training process .It is not applicable in case of large number of training examples as it is not robust to noisy data. For the plant leaf classification the Euclidean distance between the test samples and training samples is calculated. In this way it finds out similar measures and accordingly the class for test samples. A sample is classified based on the highest number of votes from the k neighbors, with the sample being assigned to the class most common amongst its k nearest neighbors.k is a positive integer, typically small. If k = 1, then the sample is simply assigned to the class of its nearest neighbor. In binary (two class) classification problems, it is helpful to choose k to be an odd number as this avoids tied votes [19][20]. Nearest neighbor method is easy to implement also quite good results if the features are chosen carefully. The K-Nearest Neighbor (KNN) Classifier is works well on basic recognition problems. The main disadvantage of the KNN algorithm is that it is a slow learner, i.e. it does not learn anything from the training data and simply make use the training data itself for classification. Another disadvantage is this method is also rather slow if there are a large number of training examples as the algorithm must have to compute the distance and sort all the training data at each prediction. Also it is not robust to noisy data in case of large number of training examples. The most serious disadvantage of nearest neighbor methods is that they are very sensitive to the presence of irrelevant parameters. 2) Support Vector Machine: Support Vector machine (SVM) is a non-linear Classifier. This is a new trend in machine learning algorithm which is used in many pattern recognition problems, including texture classification. In SVM, the input data is non-linearly mapped to linearly separated data in some high dimensional space providing good classification performance. SVM maximizes the marginal distance between different classes. The division of classes is carried out with different kernels.SVM is designed to work with only two classes by determining the hyper plane to divide two classes. This is done by maximizing the margin from the hyper plane to the two classes. The samples closest to the margin that were selected to determine the hyper plane is known as support vectors .Fig below shows the support vector machines concept. Multiclass classification is also applicable and is basically built up by various two class SVMs to solve the problem, either by using one-versus-all or one versus-one. The winning class is then determined by the highest output function or the maximum votes respectively.

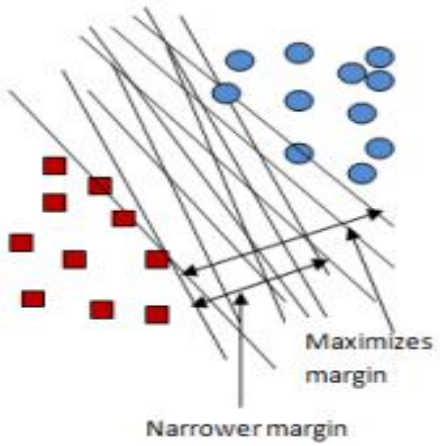


Figure3: Support vector machine

## V.RESULT & DISCUSSION

In this section different snap shorts are shown. All these snap shorts are solve the problems that is already discussed in previous paper. These snap shorts are given below:


Figure 4: Input Graphical user Interface

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Figure 5: Input Image and Enhanced Image

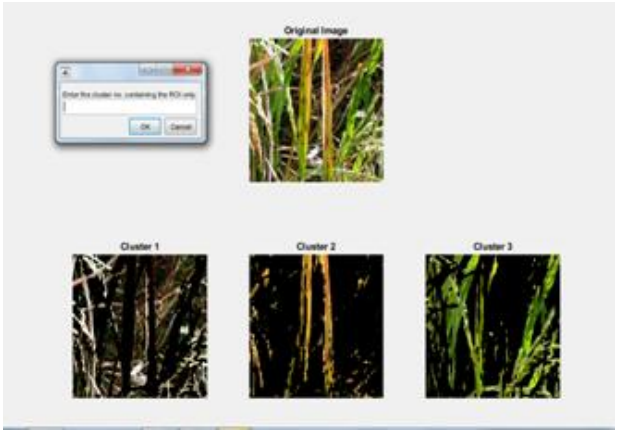

Figure 6: Clustering on Input Image

Figure 7: Segmented Image after clustering

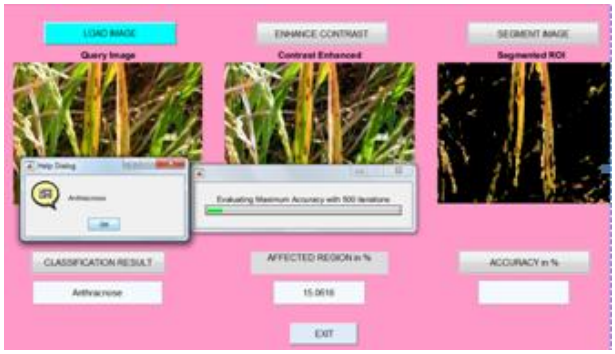

Figure 8:Type of Disease and affected region %

Figure 9: Accuracy of the output image

## VI.CONCLUSION & FUTURE WORK

From study of above classification techniques we come up with following conclusion. The k-nearest-neighbor method is perhaps the simplest of all algorithms for predicting the class of a test example. An obvious disadvantage of the k-NN method is the time complexity of making predictions. Disease management could be a difficult task. Largely diseases area unit seen on the leaves or stems of the plant. Precise quantification of those visually determined diseases, pests, traits has not studied nevertheless attributable to the complexness of visual patterns. The aim of the work is to develop a Rice Leaf recognition program supported specific characteristics extracted from photography. In this work different filters and morphological operators are applied with color model. In this maximum accuracy is achieved after detecting the disease on rice leaf i.e. 95.16%. In future this work is extended on rice category classification and rice counting in rice image.

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