# A Survey on Different Classification Methods on Agricultural Processing

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**Abstract – Agricultural image processing is one of most innovative and important image processing areas recognized in last few years. Because of the vast range of associated sub domain it is having the current attention of the researchers. In this paper, the exploration of different domains associated with agricultural image processing is defined. The paper has also explored the recognition model with broader view. The paper has presented a generalized framework for plant disease classification and recognition.**

**Index Terms – Agricultural, Plant, Leaf, Land Featuredset**

## 1. INTRODUCTION

Image Processing is having its valuable importance in different application areas. One of the growing fields for image processing is agricultural image processing. This processing area is a vast application area that is having the larger scope defined under different processing approaches. Some of the effective agricultural image processing areas are shown in figure 1.

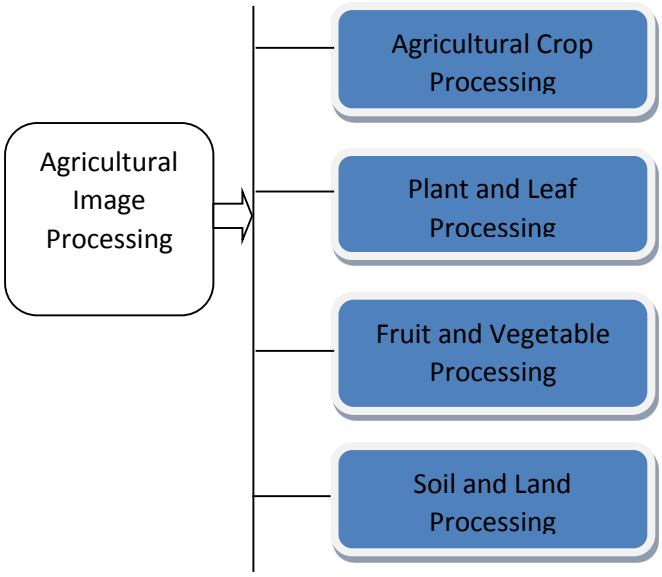


Figure 1 : Agricultural Image Processing

As shown in the figure 1 according here the division of agricultural image processing is done under the application specification. Agricultural image processing is not only limited to single object type, instead it is defined under four major application areas called, crop image processing, plant and leaf processing, fruits and vegetable processing and land and soil processing. These all application areas itself sub-divided to various integrated sub areas. These sub areas are defined under the specifications of the utilities associated with the application areas. In this section these utilities respective to the application areas are described in detail.

### 1.1. Agricultural Crop Processing

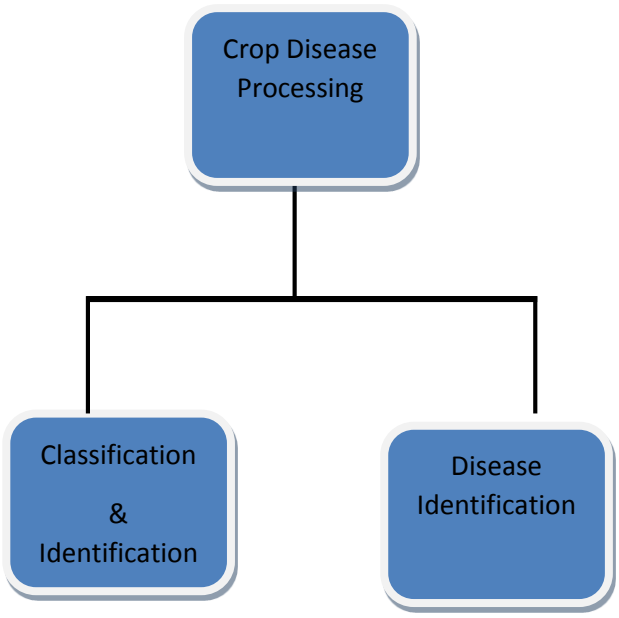


Figure 2 : Crop Image Processing

Agriculture is mainly defined in terms of crops and there is the vast variety of available crops. While integrating these crops with image processing, the first application is to identify the crop and to classify them. This classification can be done to identify the individual crop as well as crop category. Another sub area in crop processing is the identification of crop disease. These diseases include the pest and other disease detection. The

main challenge in crop image processing is the availability of large number of crops. Some of these crops are quite similar under the feature specification because of which the detection of crop and respective crop disease is a difficult task. In same way, there is lack of information available regarding the crop specific disease in terms of images. There are few diseases that can be distinguished based on the visible feature of disease.

### 1.2. Plant/Leaf Image Processing

Another important application area comes under agricultural image processing is plant and leaf image processing. This is again a vast image processing area that is used to identify various kinds of plants or trees. These plant or trees includes the flower plant, vegetable plant, and fruit plants/trees identification. This kind of identification can be done by using different part of the plant or tree. These parts include the leaf, flower, root, stub etc. The shape of the leaf, size and structure analysis comes under this category. This application area also includes the identification and classification of the plants and trees under uniquely as well as in categories. Another sub domain of plant processing includes the identification of disease based on the plant leaf and sub color and feature identification. The associated application areas comes under plant/leaf processing are shown in figure 3.

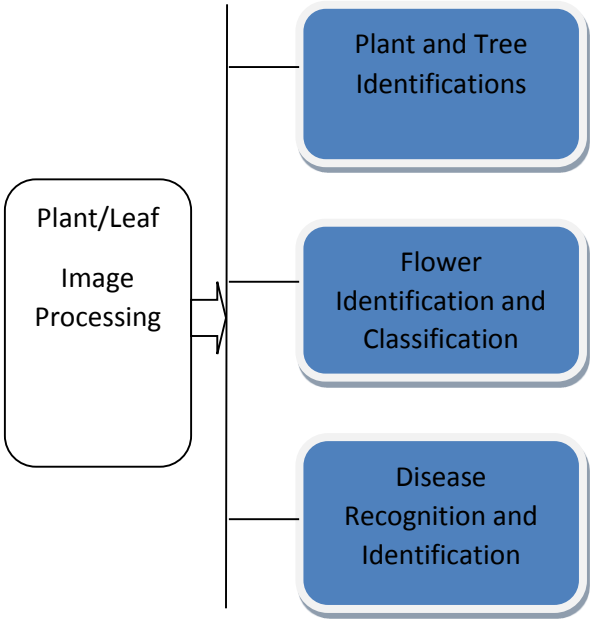


Figure 3: Plant/Leaf Image Processing

### 1.3. Fruits and Vegetable Processing

Another important application area comes under agriculture image processing is fruits and vegetable image processing. This area also having two main sides as of plants. First to recognize the particular fruit and vegetables and other to identify the associated disease if present. The identification can be performed to identify the object and disease will be done.

### 1.4. Land and Soil Processing

This application area combines itself two major sub areas called the processing of the region based on the soil type and the identification of SAR image classification. SAR images are the images extracted from the satellite. This kind of processing is used to classify the geographical areas based on the land and soil feature and region analysis. This application areas is one of the complex area that requires more intelligent processing to identify the areas.

In this paper, the exploration to the classification process is been defined. This paper includes the study of different classification approaches. In this section, the exploration of the image classification model is defined along with the major categorization of classification process. In section II, the work done in the area of image classification is defined. In section III, different image classification approaches are discussed. In section IV, the conclusion obtained from the work is presented.

## 2. EXISTING WORK

In this section, the work done by the earlier researchers in the area of image classification is discussed and presented. In this section, the work defined by earlier researchers on agricultural image processing, crop processing and leaf image processing is done. These processing areas include the object detection, recognition as well as associated disease prediction over the images. Some of the work defined by earlier researchers is given in this section. Parveiz Zeaiean[1] has defined a work based on supervised learning to identify the crop disease identification and estimation. Author used the identification of crop based on the estimation of crop region identification to identify the classification of crop. Author defined a maximum likelihood algorithm under the parallel processing to identify the effective object area based on the estimation of the crop size and area. Author defined the approach to identify the crop as well as relative class. Wilbert Long[2] has defined a work to analyze the land area based on the identification of soil identification. The images are captured from the satellite and the region classification and segmentation is done. Author identified the areas under the rules defined on land area estimation with structural information extraction. Author defined a parameter oriented learning approach with specification of supervised learning with class identification and region generation. Author presented the approach to obtain the relative class under remote sensing to identify the respective land area. Jinguo Yuan[3] has defined a work on land image processing to identify the relative regions under SAR image processing. The work is defined to generate the region processing and estimation with the region correction and atmospheric correction based estimation under the hyperion processing. Author presented an unsupervised learning

approach to identify the effective image area based on the information processing on the identified images as well as image areas. This kind of processing is also defined to obtain the accurate region generation and to obtain the region class under the characteristics analysis. Author used the PCA based approach to analyze the biographic features so that the identification of image areas will be done. Author defined the learning approach under multi scale segmentation to identify the relative regions. Y.Lanthier[4] has defined a work on the classification and segmentation of SAR images to obtain the land areas under the specification of reformation of soil. This kind of segmentation is performed based on pixel level analysis performed respective to region specification and identification. Author defined the algorithmic approach to define the clusters as well as cluster members to generate the individual regions so that the size, shape and color of these effective image areas will be generated effectively. The processing is here also been done under different processing vectors so that the clear area segmentation and area identification will be obtained. This individual image areas are generated based on the polarization so that the polarimetic data separation and generation. Author defined phase array based estimation so that the clear region identification and segmentation will be done as well as obtained. Heather McNairn[5] has defined a work on crop classification and segmentation based on polarization of the effective image areas. This kind of area segmentation includes the crop classification with the specification of diverse capability of crops as well as to classify the image areas. This specification includes the identification of intensity as well as to perform the relative diversity analysis so that the crop classification will be obtained effectively.

Haiguang Wang[6] has presented a work on the plant disease identification using neural network approach. Author uses the effective classification of disease using back propagation network as well as the analysis of the work is performed based on Radial Basis Function(RBF) neural network, Generalized Regression Networks (GRNN) and Probabilistic Neural Networks (PNNs) to identify the wheat strip under the rust and wheat identification for grape. Author has performed the analysis based on the shape and color to identify the object area as well as the disease. Haiguang Wang[7] has defined another hybrid approach using PCA and neural network to identify the different plant disease. Author defined a feature analysis based work to defined the dimension analysis using PCA approach. This approach includes the accurate detection of disease and prediction of them based on the color as well as other features analysis. Nurul Hidayah Tuhid[8] has defined a statistical analysis based approach to identify the orchid disease identification and detection based on color model analysis applied over the image. The orchid identification is based on color feature analysis. This disease itself resemble the infection and spot disease analysis over the image. Author defined the disease classification based on the image segmentation and the capture image evaluation under different parameters.

Sanjeev S Sannakki[9] has defined a neural network based work to identify the disease detection and classification. Author defined the diagnostic approach to identify the disease under the intelligent system. Author has worked specifically on grape plant. This proposed system is divided in two main stages. In first stage, the identification of object from the image is done. To perform this object detection, the segmentation approach is defined. In second stage, the masking of image can be performed under the disease prediction. To identify and classify the disease KMeans clustering approach is applied by the author. Asma Akhtar[10] has presented a work on the disease detection and prediction. Author defined a machine learning approach to perform the plant disease detection and prediction under pattern analysis. Author defined a three phase framework to identify the disease regions over the image. Author defined the work to identify the features over the image to generate the effective regions so that the effective feature extraction and selection is performed. Lung-Jen Wang[11] defined a framework to improve the image features so that effective image classification will be done. Author defined the work on preprocessing approach to improve the image effectiveness and feature analysis and improvement.

## 3. PLANT DETECTION/CLASSIFICATION MODEL

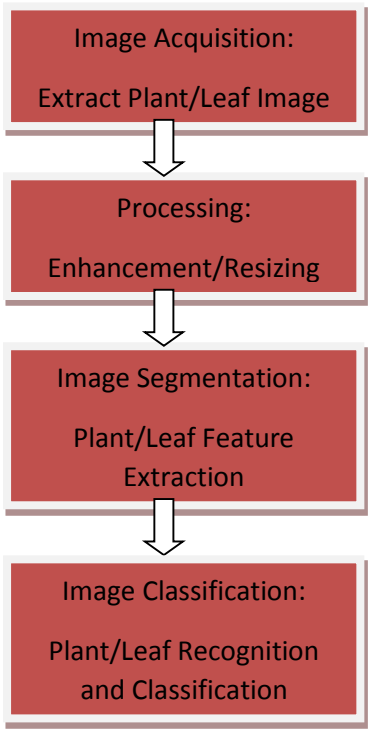


Figure 4 : Plant/Leaf Classification Model

In this section, a broader view to the plant or leaf detection as well as classification model is defined. The work is here defined as a generic frame to identify the image area. This model is here defined in the form of sequential stages defined with relative processes. These process based stages are defined in figure 4.

### 3.1. Image Acquisition

The first stage of work is to accept the plant or the leaf image as input. This acquisition is difficult to collect from primary source. Because of this, the datasets obtained from the agricultural organization can be used as the input image. To perform the effective image recognition and classification, there is the requirement of a vast dataset that can represent the adaptive image features as well as the images so that the new plant/leaf image can be recognition. To perform the effective classification there is the requirement to define the similarity between different plant images so that the group based division of these images will be done.

### 3.2. Preprocessing

The second stage of this recognition model is to improve the image features. To perform this features exploration there is the requirement to adjust the image features. This preprocessing stage itself divided in number of sub processing such as adjusting the color mode, adjusting the image resolution, image scaling and the enhancement of image features in terms of brightness and contrast. These are the standard operations performed on raw image as well as dataset images to recognize the image features effectively. The criticality of the preprocessing task increases, when the images are not accurate and having some integrated problem such as noise over the image. In such case, there is the requirement to apply denoising algorithm to repair the image. Some other problems can also found over the image during the acquisition process, to repair the image under this problem, there is the requirement of specific problem associated algorithms.

### 3.3. Image Segmentation

Image segmentation is about to extract the image feature to explore the specific image attributes. The segmentation is a process that itself defined different approaches and different ways. One of the common approach to identify the plant image is the extraction of ROI(Region of Interest) over the image. This extraction process is defined under the specification of spatial area identification over the image. This filtration process includes the area isolation over the image so that the ROI filter based extraction is defined. Another view of image segmentation is to extract the edges or the internal bounds over the image. This is identified as the region based segmentation. Based on this region segmentation to identify the effective image area. To perform the segmentation, the subdivision approaches can be applied. These approaches includes the threshold based segmentation, structure extraction, information area extraction, color or intensity value analysis etc. There are number of clustering approaches that uses the adaptive distance based algorithms to identify the image features and to extract the image regions. Once the features are extracted for dataset images, the feature dataset is presented. Now the image detection and classification is performed based on this featured dataset.

### 3.4. Classification

The classification is the final stage of the work respective to which the complete model is defined. The work is defined here to classify the image. The work is here defined to improve the analytical feature so that the effective plant/leaf recognition as well as the categorization of the images based on adaptive features. There are number of associated algorithmic approaches such as region based analysis and the feature based analysis. The region based analysis works on the shape and size of the image and the feature analysis is here defined based on the intensity and color level analysis.

In this section, the complete model is defined to identify the plant/leaf image. This is the broader view on which any algorithmic approach can be applied to identify or classify the image.

## 4. CONCLUSION

In this paper, a detailed and broader view of plant/leaf disease recognition and classification is defined. The paper has explored the agricultural image processing along with the exploration of associated application area. The paper has defined a broader model to perform he effective recognition of image.

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