Fruit Disease Detection using Image Processing Techniques

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ABSTRACT

Paper demonstrates the method for detection of fruit disease. Present days as there is restrictive interest for farming industry, successful development and enhanced production of fruit is fundamental and imperative. For this reason agriculturists require manual observing of fruits. But all the time manual observing won't give satisfactory results and they generally require guidance from master. So there is requirement for proposing an effective cultivating method which helps for better production and advancement with very less human effort, Image processing strategies are utilized for implementation of proposed system. For image segmentation K-means clustering method is applied. Four feature vectors are used in the proposed system those are colour, morphology, texture and structure of hole on the fruit. The system utilizes two image databases, one for training of already stored disease images and one more for implementation of query images. For matching of patterns and identification of fruit diseases artificial neural network (ANN) and GLCM concept is used

Key Words: K-means clustering, Artificial Neural Network**.**

1. INTRODUCTION

India is the agricultural land, India produces 44.04 million tons of fruit and it is a second largest producer of fruits. India contributes 10% in world fruit production. Indian farmers grow variety of fruits those are apple, banana, citrus, grape, mango, guava, papaya, watermelon. Fruit industry contributes around 20% of the country's development. Production of quality fruits has been decreased because of disgraceful development of fruit, absence of upkeep, and manual assessment .Quantity and nature of the agricultural items are decreased by disease of fruits. The main causes for fruit diseases are viruses and bacteria. The diseases are also caused by bad environmental conditions. There are numerous characteristics and behaviors of such fruit diseases in which many of them are less distinguishable. The diagnosis of fruit disease is important.

Application includes identifying the diseases in fruit that cause loss in production and quality showed up in reaping. Distinguishing and grouping of diseases of fruit is important to recognize what are the control factors must be taken one year from now to stay away from losses in the production. Fruit types and their respective disease are as follows.

1. Apple:

Apple fruits are susceptible to a number of fungal and bacterial diseases and insect pests. Different diseases of apple are Bitter rot, black rot, scrub on fruit, Sooty blotch and flyspeck damage. Figure 1.1 shows some images on diseases of fruit

(a) (b) (c) (d)

Figure 2.1 Diseases of Apple fruit (a) Bitter rot (b) black rot (c) scrub on fruit (d) Sooty blotch and flyspeck

2. Banana

The disease attacks banana plants at all phases of development. Infection assaults the blooms, skin and distal closures of banana heads. Different diseases of Banana fruit are Crown Rot, Anthracnose ,Cigar End Tip Rot Figure 1.2 shows some of the images of Banana fruit disease.

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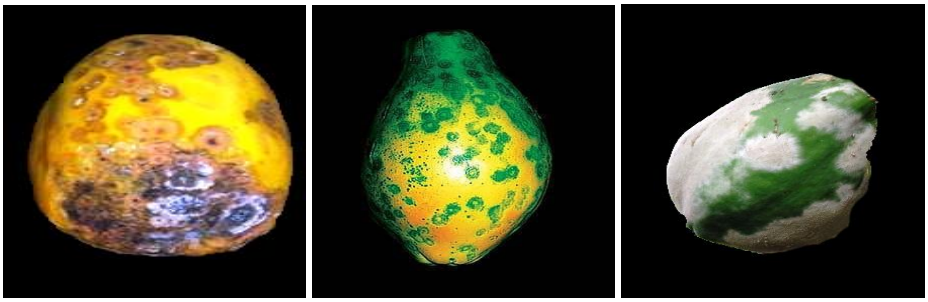
(a) (b) (c)

Figure 2.2 Diseases of Banana fruit (a) Crown Rot (b) Anthracnose (c) Cigar End Tip Rot

3. Papaya

Disease of papaya fruit include Papaya Mosaic , Anthracnose ,Leaf- Blight and Powdery Mildew. Figure 1.3 shows some of the images of papaya fruit disease.



(a) (b) (c)

Figure 2.6 Disease of papaya fruit (a)Papaya Mosaic (b)Anthracnose (c)Powdery Mildew

4.Mango

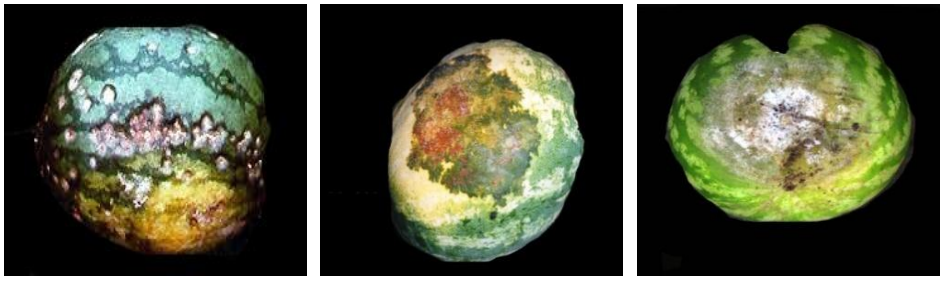
Diseases of Mango fruits are Anthracnose ,Diplodia Stem-end Rot and powdery mildew. These diseases are caused due to different environmental factors. Figure 1.4 shows some of the images of mango fruit disease.

(a) (b)

Figure 2.5 Diseases of Mango fruit (a) Anthracnose (b)Diplodia Stem-end Rot

5 .Watermelon

Disease of Watermelon fruit are Anthracnose, Bacterial Fruit Blotch, Phytophthora Fruit Rot. Figure 1.5 shows some of the images of watermelon fruit disease.



(a) (b) (c)

Figure 2.9 Disease of Watermelon fruit (a) Anthracnose (b) Bacterial Fruit Blotch (c) Phytophthora Fruit Rot

2. RELATED WORK

Tejal et. al., [2] proposed a method for automatic grading. based on the disease of the Pomegranate fruit and plant leaves grading is done. The Bacterial Blight disease of pomegranate plant is identified by the proposed system. The

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system has following steps initially, Image acquisition, and second is image Pre-processing later, Color image segmentation and Disease grading. Image Pre-processing involves removing of noise, removing the reflections in the image. K-means clustering method is used for segmentation.

Jagadeeshet. al.,[6] proposed a method for Grading and Classification of Anthracnose Fungal Disease of Fruits. Grading and Classification is based on Statistical methods. For classification authors have used neural network classifier. In the prosed method authors considered three fruits those are pomegranate, mango and grape.The classification accuracies for normal fruit type is 84.65% and affected anthracnose fruit type is 76.6% .

Jayme et. al., [8] presented a survey on different methods which use digital image processing strategies to identify and classify diseases of plant from images. Disease symptoms can appear anywhere in the plant. The system proposed is divided into three classes. The divided classes are based according to objective such as detection, classification of disease and severity quantification. Results are discussed according to techniques proposed.

Devrimet. al.,[11] presented a grading system for apples. pre-processing, classification, post-processing and decision taking are the steps involved in the proposed system. The manually segmented images are compared with resulting images . The Performances of 2 class and 3-class classifiers are compared, and result obtained for 3-class system performed better. The classifier used was a back-propagated, feed-forward, perceptron network with an adaptive learning rate.

V. Leemans et. al.,[9] proposed a hierarchical grading method for apples. Segmentation of images is performed and the features are extracted. The K means clustering algorithm is used to classify the objects. Extraction of features is done from the defects. Quadratic discriminate analysis is utilized for grading of fruits. Apple grading involves different stages. The initial stage involved is the images acquisition. Later segmentation is performed to find the possible defects. After location of defects, they are characterized by a set of features. Features includes color, shape, texture descriptors and distance of the defects to the nearest stem end. The quadratic discriminate analysis is used for grading.

3. SYSTEM ARECHITECTURE

Many steps involved in the process of detection and classification of diseases of fruit. Initially, background of input image is removed and infected part is obtained by applying image segmentation method to input image. In the next step, extraction of features is done using feature extraction methods. Later, using classification method diseases are classified. The result of classification accuracy of the obtained features is studied. The entire procedure is represented in Figure 3.1

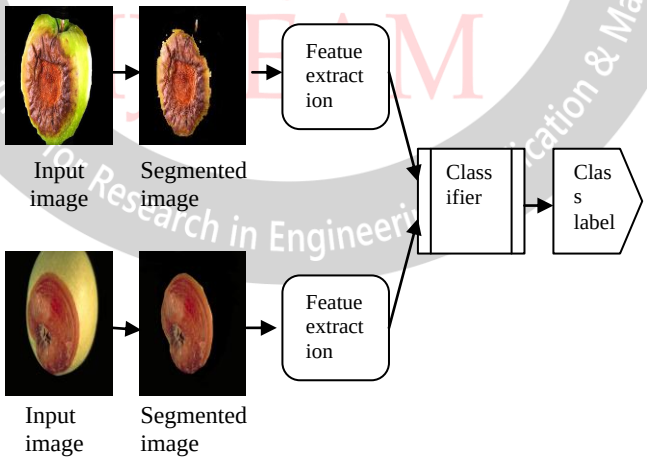

Fig 3.1 System Architecture

Image Acquisition – activity of re-establishing a picture from some origin is called as Image acquisition. Acquisition of an image is reliably the underlying condition for the work process arrangement of processing of an image. The picture acquired is altogether regular and is the outcome of any equipment which was dealt with to create it.

Image Segmentation - Before feature extracted from an image, the disease of fruit has to be segmented. segmentation of an image is the way toward isolating the digital image into its constituent parts, which changes the representation of the image, and resulting in extracting the important part and which is easier to analyze. When the

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interested part in an application is isolated the segmentation should stop. In the proposed system, the reason for division is to discover the areas in the image which is diseased regions. There are different techniques used for image segmentation. Fuzzy c- means clustering method and K-means clustering method is used in the proposed system to perform segmentation. K-Means Clustering method is a method of cluster analysis which is based on partitioning and aims on observations into k mutually exclusive clusters and every observation will belong to one of the cluster with the nearest mean. Fuzzy c-means clustering is a method of clustering which allow a piece of data to belong to more than one clusters. At the end of segmentation any one of the clusters will contain the diseased spots is being extracted

Feature Extraction-feature extraction is one of the important steps in fruit disease classification. GLCM technique is utilized for Feature extraction. The gray level co-event matrix feature extraction method, describe the surface of a picture by figuring frequent repetition of sets of pixel with particular qualities and in a predefined spatial relationship happen in a picture, brings about making a GLCM, and later separating factual measures from the framework.

Classification-extracted features from GLCM are fed in to classifier. KNN classifier is used. In KNN characterization object is characterized by a larger part of its neighbors, and the object is assigned out to the class closest among its k closest neighbors.

4. APPLICATIONS

- Gives an effective savvy cultivating method which will help for better yield and development with less human endeavors.
- With brilliant cultivating the present agriculturist can utilize choice instruments and mechanization strategies which flawlessly coordinate item, learning and administrations for better efficiency, evaluating and surplus yield
- It would likewise elevate Indian Farmers to do smart cultivating which sets aside opportunity to time choices which additionally spare time and lessen loss of fruit because of diseases.

5. CONCLUSION

This paper studies the specialized accomplishments in the field of Fruit disease detection of various fruits, The paper presents architecture of the system, survey of various proposed methods to detect and classify fruit disease. Fruit disease detection strategy would likewise elevate Indian Farmers to do smart cultivating which sets aside opportunity to time choices which additionally spare time and lessen loss of fruit because of diseases.

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