

Image Processing Approach for Grading And Identification Of Diseases On Pomegranate Fruit: An Overview

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Abstract - In the present paper introduce an innovative approach to automatically detect and grade the diseases on pomegranate fruit. The diseased pomegranate plant shows specific symptoms colored spots that will occur on the pomegranate fruit. so it is important to monitoring the pomegranate during its growth period and at the time of harvest. The proposed system will be an efficient module that identifies the Bacterial Blight, Cercospora fruit spot, Fruit Rot, Alternaria fruit Spot diseases on pomegranate fruit. In this overview discuss with important issues related to detection of diseases and developing a prime methodology to analyze diseases. Analysis will be done to identify the type of disease and to classify the diseases images into grades depending upon their severity.

Keywords: diseases detection, Bacterial Blight, Cercospora fruit spot, Fruit Rot, Alternaria fruit, pomegranate fruit, grading, image processing

I. INTRODUCTION



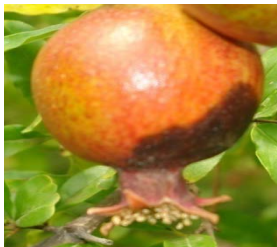


India is the second largest producer of fruits with a production of 44.04 million tons from an area of 3.72 million hectares. This accounts 10% of the world fruit production. A large variety of fruits are grown in India of which Pomegranate, apple, citrus, banana, grape, mango, guava, are the major ones. Also, India is a large low cost producer of fruit and horticulture has huge export potential. Especially in Karnataka state in India, that too around Dharwar, Bijapur, Bagalkot districts many farmers are depending on the fruits like Pomegranate, mango, and

grape and because of suitable climate condition and soil. Hence there is a major contribution from these areas in fruit production. The challenge of the precision approach is to equip the farmer with adequate and affordable technology. Fruit diseases are one of the crucial causes that reduces quantity and degrades quality of the agricultural products. plant diseases are because of environment change, water availability, temperature and many more. For disease detection various techniques are used in last few years [1]. spectroscopic and imaging techniques, Molecular techniques and profiling of plant volatile organic compounds are used for diseases detection. The spectroscopic and imaging technology could be integrated with an autonomous agricultural vehicle for reliable and real-time plant disease detection to achieve superior plant disease control and management [2]. Disease is impairment to the normal state of the fruits that modifies or interrupts its vital functions such as photosynthesis, transpiration, pollination, fertilization, germination etc. The emergence of fruit diseases has become more common now days, as factors such as climate and environmental conditions [3]. The ability of disease analysis in earlier stage is an important task. Hence an smart resolution support system for control of fruit diseases is needed. This system uses some high-tech and practical technology to properly detect and identify the fruit diseases [3-5]. Pomegranate is colorful, orange-red flowers and dense, bushy growth habit make pomegranate an attractive ornamental. Pomegranate

has improved interest today as a marketable fruit, because of the health promotions associated with its high level of antioxidants in the pulp or juice. It is more cold hardy than citrus but less hardy than many other fruits when grown in temperate regions. Also pomegranate fruit is grown for its attractive, juicy, sweet-acidic and fully luscious grains called ‘Arils’ [6]. Diseases and insect pests are the major problems that threaten pomegranate cultivation. These require careful diagnosis. The disease symptoms can be initially found on stem part which gradually pervades to leaves and then to fruits. In pomegranate fruit, diseases can be found a) cercospora, b) fruit rot, c) bacterial blight and d) alternaria fruit. The images of these diseases are shown

in Table. 1. These cercospora, fruit rot, bacterial blight and alternaria are most severe diseases of the pomegranate. The disease symptoms can be initially found on stem part which slowly permeate to fruit. On fruit, black spots appear on pericarp with cracks passing through the spots. The disease spreads as the bacterium survives on the tree as well as in diseased fallen leaves. High temperature and high relative humidity favours the disease. The disease spreads to healthy fruit and plant through wind splashed rains and in new area through infected cuttings. Therefore the present overview proposes an image processing methodology to deal with one of the main issues of plant pathology i.e disease detection and grading.

TABLE 1 SOME HARMFUL DISEASES ON POMEGRANATE FRUIT

Normal fruit	Disease	Infected Images
	<p>Cercospora (<i>Cercospora sp</i>): The affected fruits showed small irregular black spots, which later on coalesce into big spots.</p>	
	<p>Fruit Rot (<i>Aspergillus foetidus</i>): The symptoms are in the form of round black spots on the fruit and petiole. The disease starts from calyx end and gradually the entire fruit shows black spots. The fruit further rots emitting a foul odor</p>	
	<p>Bacterial Blight (<i>Colletotrichum gloesporioides</i>): The disease is characterized by appearance of small, irregular and water-soaked spots on fruit. If cracks are passing through the spots then the disease identified would be Bacterial blight.</p>	
	<p>Alternaria Fruit Spot (<i>Alternaria alternata</i>): Small reddish brown circular spots appear on the fruits. As the disease advances these spots, coalesce to form larger patches and the fruits start rotting. The arils get affected which become pale and become unfit for consumption.</p>	

II. METHODOLOGY

The methodological analysis of the present work has been presented pictorially in Figure 1. The work commence with collecting images from National Research Center on Pomegranate in Solapur, Maharashtra, India . These images are made to undergo pre-processing steps like filtering and segmentation. Then different texture and colour features are extracted from the processed image. Finally, the feature values are fed as input to the classifier to classify the given image. The system is divided into the following steps: (1) Image acquisition (2) Image Pre-processing (3) Feature Extraction and Classification (4) Grading.

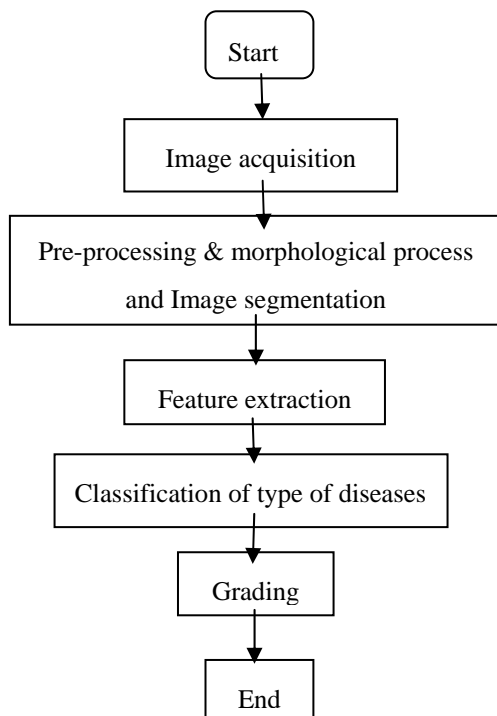


Fig.1: Procedure of analysis based on image processing

III. IMAGE ACQUISITION

Primary step of any visualization system is the image acquisition. Various methods of processing can be applied to the image to perform the many different vision tasks essential today. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the help of some form of image enhancement. For the purpose of image acquisition, author

has visited and captured images from National Research Center on Pomegranate in Solapur, Maharashtra, India. The different types of diseases such as cercospora, fruit rot, bacterial blight, alternaria fruit and unaffected sample images are mentioned in Table No.1.

IV. IMAGE PRE-PROCESSING

Image pre-processing is the technique of enhancing data images prior to computational processing . Image processing is a form of signal processing for which the input is an image; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Pre-processing uses the techniques such as image resize, erosion, dilation, segmentation, cropping, etc.

V. IMAGE SEGMENTATION

Image segmentation refers to the procedure of separation the digital image into its constituent regions or objects so as to change the representation of the image into something that is more meaningful and easier to analyze. The level to which the separation is carried depends on the problem being solved i.e. segmentation should stop when the objects of interest in an application have been isolated [7].

In this review, reason of segmentation is to identify area in the image that is qualify as diseased region. There are various methods for image segmentation.

VI. FEATURE EXTRACTION

Feature extraction is a process to select important characteristics of an image. Feature extraction is a special form of dimensionality reduction. Analysis with a large number of variables generally requires a large amount of memory and computation power or a classification algorithm which over fits the training sample. Different features like color features, size, and shape etc are

calculated. Transforming the input data into the set of features is called feature extraction. The input data will be transformed into a reduced representation set of features also named features vector.

VII. FRUIT DISEASE IDENTIFICATION

In the present overview, For the fruit disease identification problem, precise image segmentation is required; otherwise the features of the non-infected region will dominate over the features of the infected region. K-means based defect segmentation will be used to detect the region of interest which is the infected part only in the image. The proposed approach operates in two phases, i.e. preparation and categorization. preparation is required to learn the system with the characteristics of each type of diseases. First we extract the feature from the segmented portion of the images that are being used for the training and store in a feature database. After feature extraction, images are classified by using different classification techniques. These are Artificial neural network, Support vector machine, Fuzzy logic, K-nearest neighbor.

Finally any input image can be categorized into one of the module using feature derived from segmented part of the input image. This system contains two main modules, that is, feature extraction module and classification module.

CONCLUSION

From the above discussion, we can conclude that by using image processing techniques we will be able to identify and grade the diseases in pomegranates. The main motive of this system will be to improve the efficiency and productivity. The output of system will be the type of diseases and grades depending upon severity.

Other future work include the implementation of such system in real life which detects the type of disease from single image and try to provide best classification accuracy.

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