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RESEARCH PAPER

Application of image processing in the field of agriculture for the work of classification of citrus plant leaf diseases

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Abstract : In the investigation of finding and analyzing leaf diseases by computer vision interestingly in the field of agriculture, attribute collection and shape categorization is main difficulty in pattern recognition and affects the propose and concert of the classifier. Leaf dots can be analytic of crop diseases there leaf spots are typically examined physically and subjected to connoisseur opinion. In this article leaf disease uncovering and diagnosis system is urbanized to mechanize the examination of exaggerated leaves and helps finding the disease type and so give remedial action. The urbanized system consists of number of stages which includes HSI alteration, histogram investigation and concentration adjustment. The other stage is segmentation which has alteration of fuzzy feature algorithm parameter to fit the submission in concern. Attribute extraction is the next coming stage which deals with number of features. Citrus plants such as lemon, orange and grapes are mainly affected by various diseases which affect the fruit production to these plants. Citrus disease identification and solution is important for increasing the quality and quantity of the production of these plants.

Key Words : Application, Image processing, Field, Agriculture, Classification, Citrus plant, Leaf diseases

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INTRODUCTION

Automation systems are now nearly all essential. A variety of researchers have required automating agricultural operations. The mechanization of disease detection is wanted for two main reasons. First, profitable citrus is formed in large area with large gaps between blocks. This wants major strain for human to administer diseases and pests. As a result, labour reduction tools are essential to capable survey for and manage diseases and pests. The next is the regular inflow of not ever occurred disease and insects. So common a range of crops, including citrus come into our country from overseas countries. Many of these countries are house to insects and diseases that don't occur in our country. Non-native species can cause disorder on local environmental and farming resources.

Here we have covered the study only at the laboratory and not at the real field, as it is having its own limitations; it requires a separate attention and separate research efforts. After having image data, correct image processing is applied. Actual image data have some

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unnecessary factors such as noise; overexposure (underexposure) to the illumination and variation of colour etc. There are numerous methods for feature extraction and also for classification purpose like SOM, SVM and Neural Network etc. The most significant face upto will be created by the native variability of colour under normal lighting conditions. This research gives a capable laboratory-based discovery method for citrus diseases, and focuses plentiful techniques, such as edge detection, RGB pixels based segmentation.

MATERIAL AND METHODS

Feature (attribute) extraction is the first step in the categorization process. The technique followed for extracting the attribute set is called the gray-level co-occurrence matrix. It is a method, in which equally the colour and texture of a picture are careful to come at sole features, which represent the image (Maheswary and Srivastav, 2008). It is very much relevant that the classification accuracies are extremely reliant on the feature set selection. In other words, the categorization correctness is as good as the feature set that is selected to represent the images. So, distrustful deliberation must be given to this particular step. A variety of researchers have used several methods of feature depiction, such as those based on shape, colour, texture, wavelet analysis, reflectance, etc. The current work is an addition of that research, only if a feasibility analysis of the technology in citrus disease classification.

Image segmentation using clustering :

In image segmentation, clustering techniques are very celebrated because they are perceptive and some are very easy to apply. A number of authors recommend their own methods and some have taken the reference of k-means. But some problems are present, for example, the number of portions of the image has to be well-known a well in advance, as well as dissimilar clusters can generate dissimilar segmentation outcome. Most of these techniques can be somewhat improved by taking into deliberation the co-ordinates of the image as attributes present in the clustering process. Here the technique is qualitatively and quantitatively tested over a set of citrus leaf images (Bhaika, 2013).

Clustering is a method of vector quantization, initially from signal processing, that is well-liked for cluster analysis in data mining field. The same situation we are using for image processing. The chief purpose of clustering technique is to divider n replications into n number of clusters in which each replication belongs to the cluster with the nearest present mean. This results in a partitioning of the data space into number of portions (Kanjalkar and Lokhande, 2014).

The problem is computationally difficult (NP-hard); however, there are efficient heuristic algorithms that are commonly employed and converge quickly to a local optimum (Marathe and Kothe, 2013).

These are usually similar to the expectation-maximization algorithm for mixtures of Gaussian distributions via an iterative refinement approach employed by both algorithms. Additionally, they both use cluster centers to model the data, however, clustering technique tends to find clusters of similar spatial extent, while the expectation-maximization mechanism allows clusters to have different shapes (Patil and Kumar, 2011).

The concept is explained by the taking a picture of a plant leaf, then we have separated the pixels of the image and plotted. So as the figure is made up of RGB we can easily find from the graph that how many pixels belong to red, green and blue part. This has been done through the clustering technique (Swetha and Sasirekha, 2016).

For clustering after the clustered out we are using one function of Matlab *i.e.* graycoprops means properties of gray-level co-occurrence matrix and the syntax is :

Stats = Graycoprops (glcm, properties)

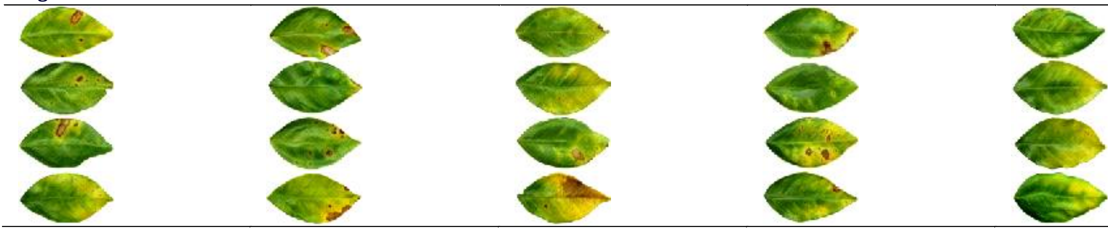
It calculates the statistics individual in properties from the gray-level co-occurence matrix GLCM. GLCM is an m×n×p array of valid gray-level co-occurrence matrices. If glcm is an array of GLCMs, stats is an array of statistics for each glcm.

Graycoprops normalizes the gray-level co-occurrence matrix so that the addition of its rudiments is equal to 1. Each constituent (r, c) in the normalized GLCM is the joint chance occurrence of pixel pairs with a distinct spatial association having gray level values r and c in the picture. Graycoprops uses the normalized GLCM to calculate properties. Properties can be a separated by comma list of strings, a cell array having strings, the string 'all', or a space alienated string. The possessions names can be shortened. (*http://in.mathworks.com/help/matlab/*).

RESULTS AND DISCUSSION

Here we have collected some numbers of citrus images having some disease and we have also collected

Fig. 1 : The numbers of citrus leaves encountered



images they are suffering from some kind of deficiencies. The disease can be alternaria, anthracnose, bacterial spot, citrus canker, citrus scab, leprosis, etc. And the numbers of deficiencies that citrus is suffering from nitrogen deficiency, phosphorus deficiency, potassium deficiency, calcium deficiency, magnesium deficiency, sulfur deficiency, iron deficiency, zinc deficiency, manganese deficiency etc. The figures of these diseases and deficiencies are presented in the Fig. 1.

For the purpose of experimentation we have taken numbers of images and classified the images like, images without any kind of processing, images with have three segments and images with have five numbers of segments. Firstly we have taken an attribute of contrast that gives a compute of the concentration contrast connecting a pixel and its neighbor over the whole picture and the result for contrast feature shown in the Fig.2 (Rafael *et al.*,2009).

The next property is correlation, returns a measure of how correlated a pixel is to its neighbor over the whole image. Correlation is 1 or -1 for a perfectly positively or negatively correlated image. Correlation is NaN for a constant image; here Fig. 3 gives the result for correlation for our classified images.

The subsequent property for image analysis is energy that returns the sum of squared elements in the GLCM. The range is from 0 to 1. Energy is 1 for a constant image; here Fig. 4 tends the result for energy for our separated image classes.

The forthcoming property for classification is homogeneity and it supplies a value that measures the nearness of the division of elements in the GLCM to the GLCM diagonal. Once again here the range is from 0 to 1. Homogeneity is 1 for a slanting GLCM (Fig. 5).

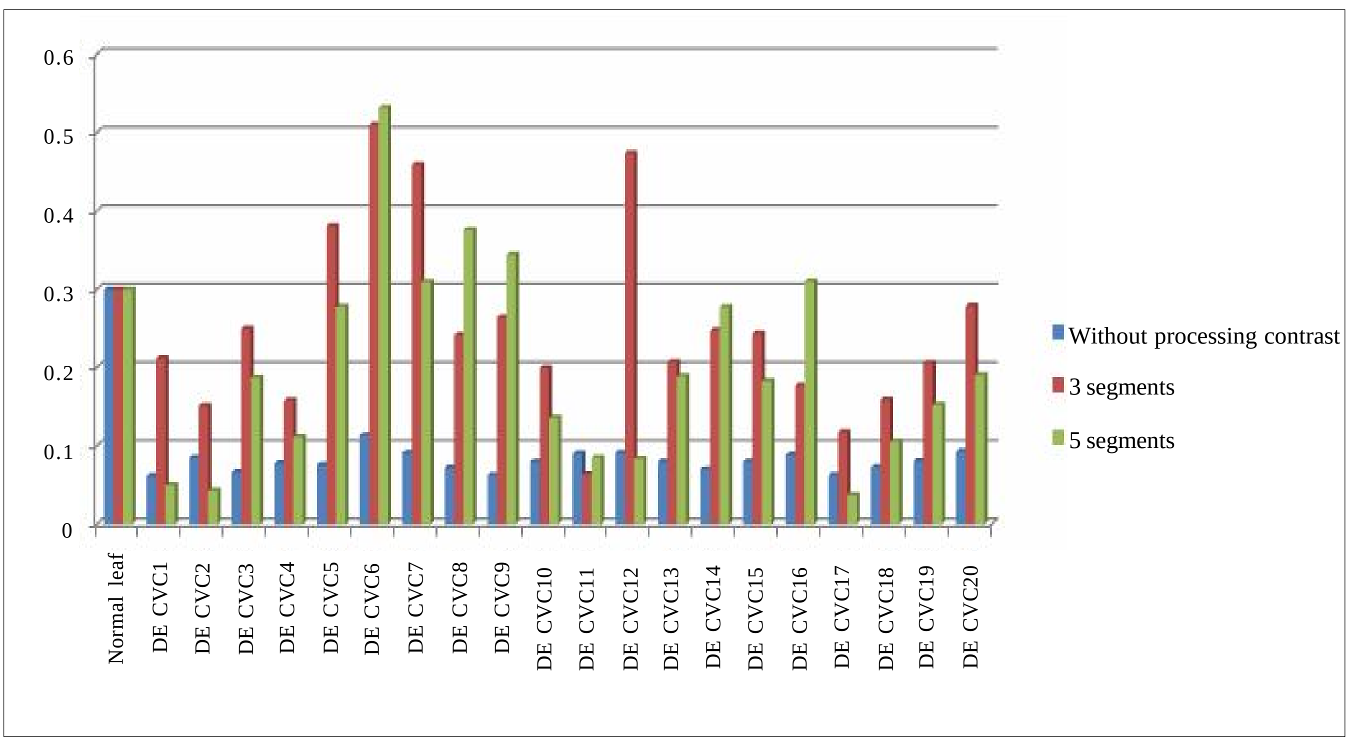


Fig. 2 : The result presenting the attribute of contrast

Entropy :

Entropy is a scalar value representing the entropy of grayscale image I. Entropy is a statistical quantify of arbitrariness that can be used to distinguish the texture of the input image. Generally entropy uses a couple of bins for logical arrays and 256 bins for uint 8, uint16, or

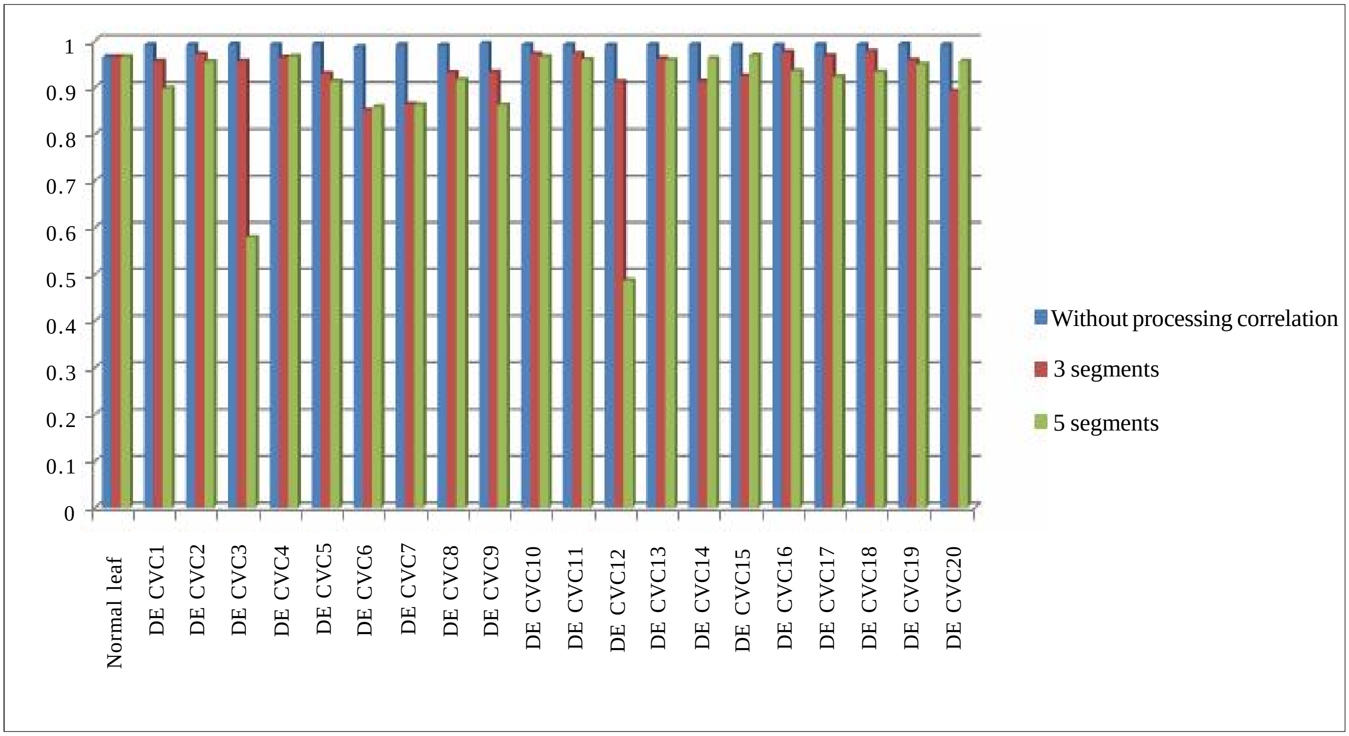


Fig. 3 : The result giving the attribute of correlation

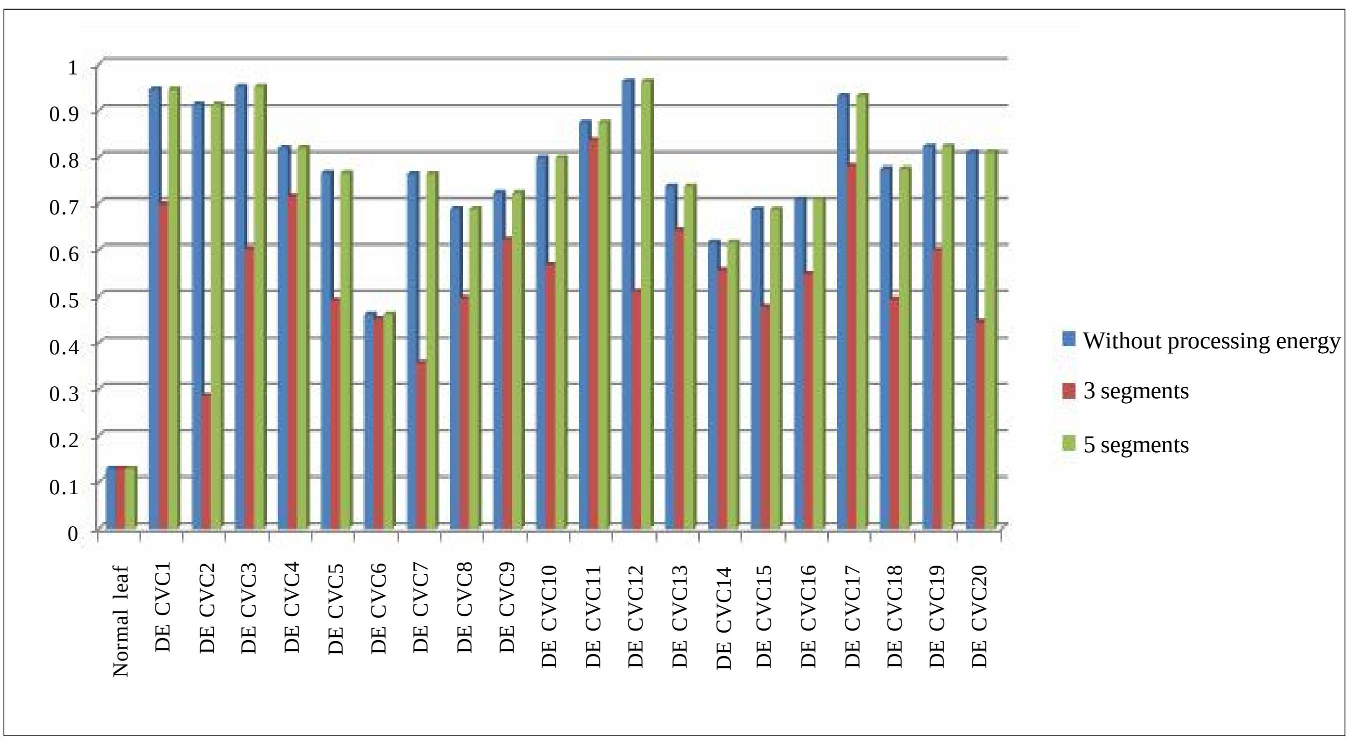


Fig. 4 : The result giving the attribute of energy

double arrays. If image has more than two magnitudes, the entropy function treats it as a multidimensional grayscale image and not as an RGB image (Fig. 6).

Kurtosis :

Kurtosis proceeds the sample kurtosis of X. For vectors, kurtosis(x) is the kurtosis of the elements in the

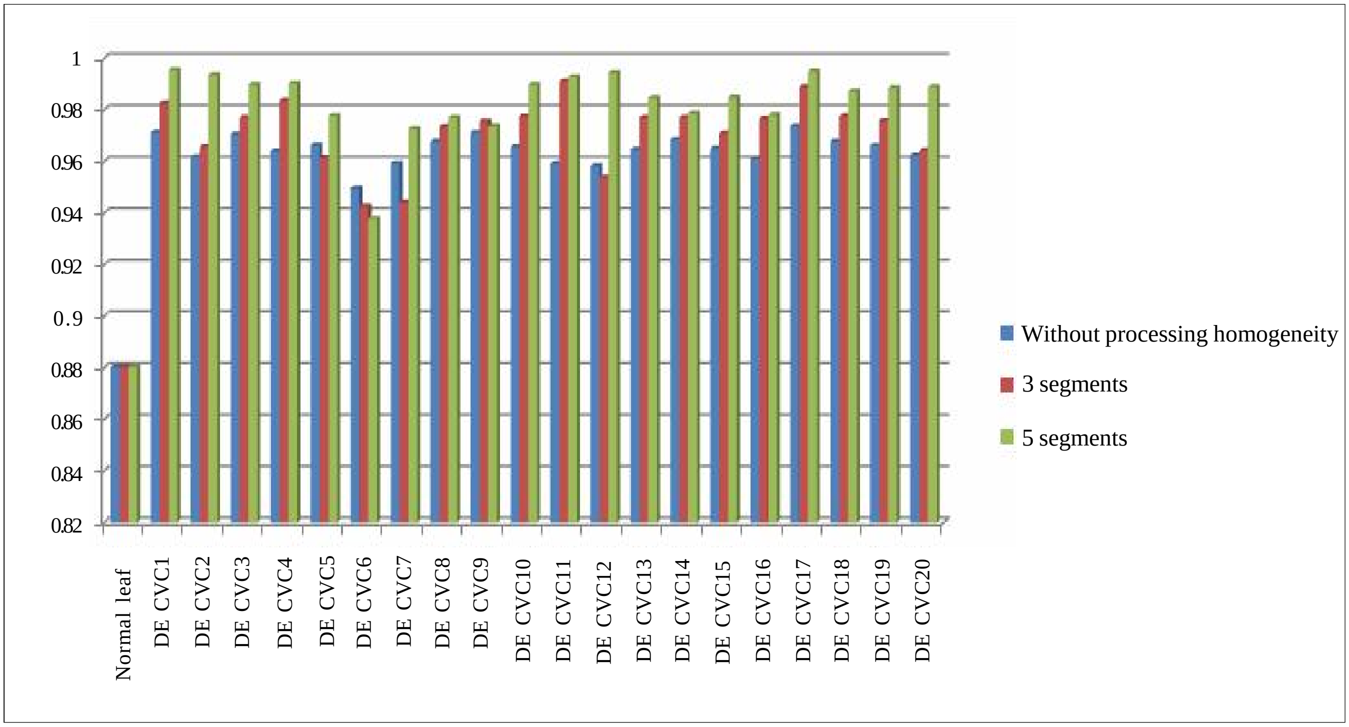


Fig. 5 : The result giving the attribute of homogeneity

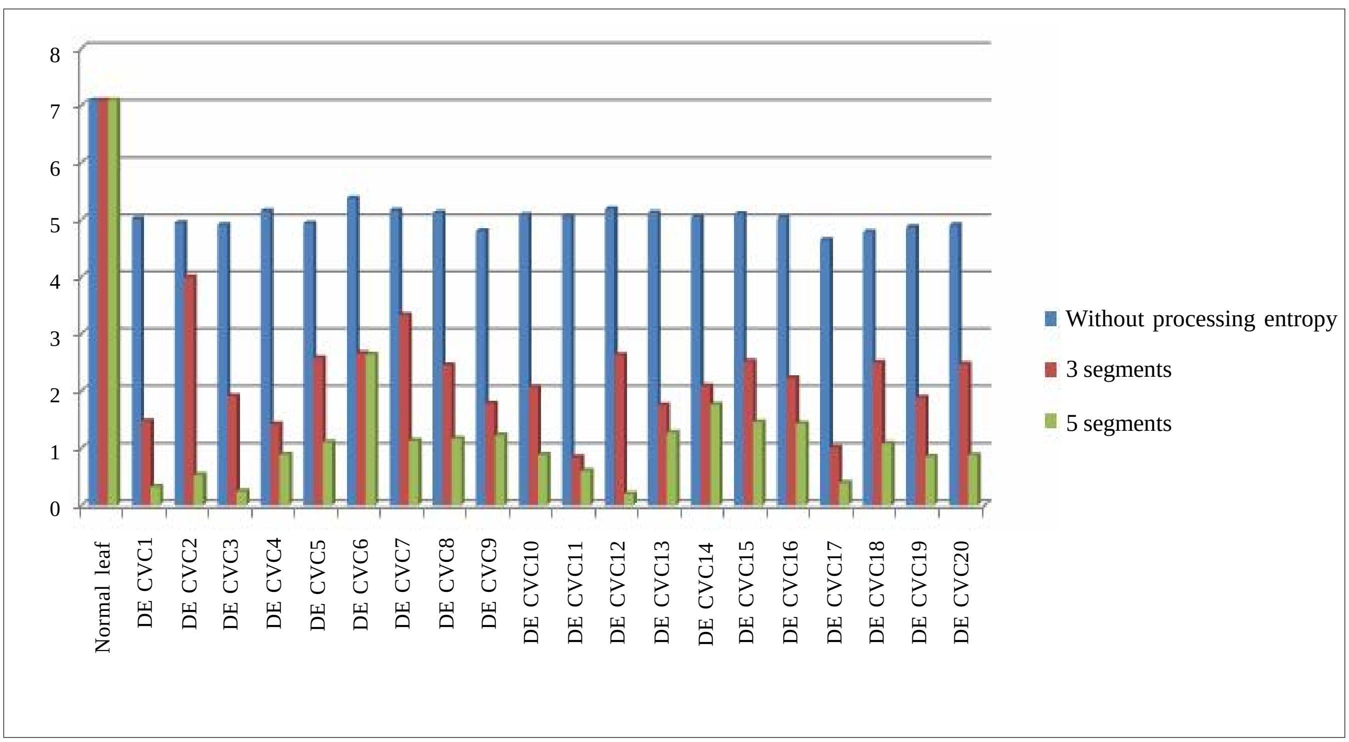


Fig. 6 : The result for the attribute of entropy

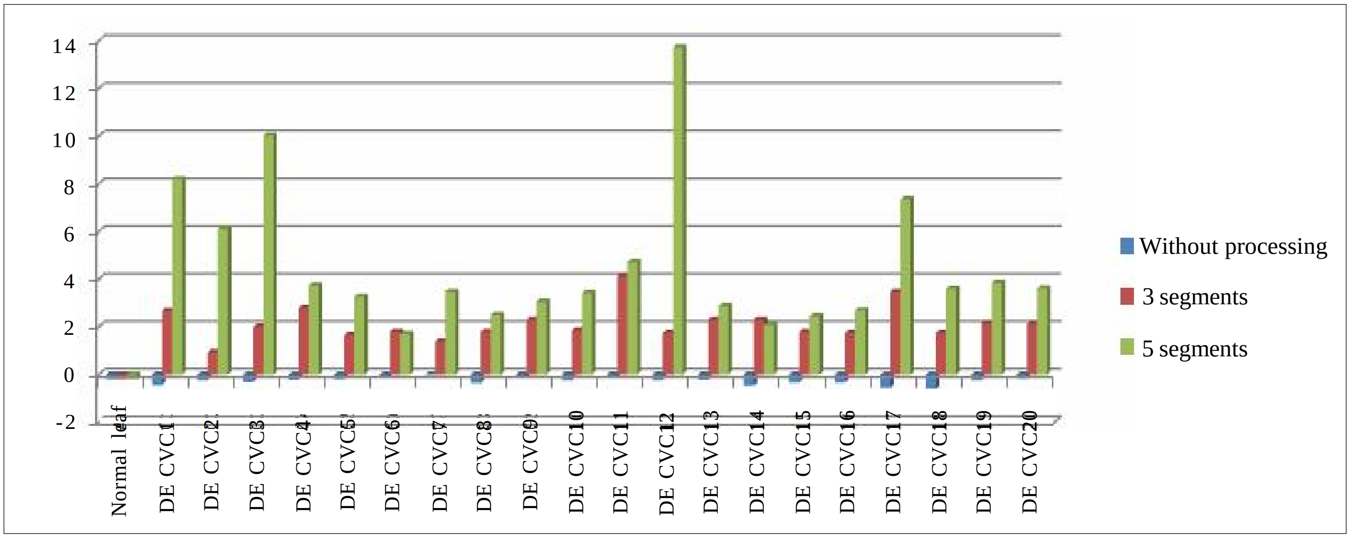


Fig. 7 : The result for the attribute of kurtosis

vector x. For matrices kurtosis(X) gives the example kurtosis for each column of X. For N-dimensional arrays, kurtosis works along the first non-singleton dimension of X. Kurtosis specifies whether to correct for bias or not. When X represents a sample from an available number of samples, the kurtosis of X is prejudiced, that is, it will be apt to differ from the population kurtosis by a methodical amount that depends on the size of the sample. You can set flag to 0 to correct for this methodical bias (Fig. 7).

Conclusion :

The leaf disease detection and diagnosis system with the assist of image processing which is able of diagnosing disorders. A set of attributes was chosen to be extracted using attribute extraction phase and those attributes were preserved in the feature database, which is intended for this reason. The acquitted leaf image parameters were equalized with the parameters of healthy and normal leaf and disease was detected. According to disease insect killer control will be done. Disease symptoms of the plant differ considerably beneath the dissimilar stage of the disease so to the correctness with which the harshness of the disease deliberate is depends upon segmentation of the picture. Easy threshold segmentation is used to compute the leaf region but sometimes due to unreliable distinctiveness of the abrasion region the calculation will be disturbed.

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