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DETECTION & ANALYSIS OF FRUIT DISEASES USING CLUSTER BASED DEEP LEARNING

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Abstract - *A good and healthy fruits play a vital role in maintaining the good health environment. Apart from serving as source of food, some fruits have properties. Even though in our surrounding we have fruits, we can't get it at our door step instead we refer fastest cure without knowing its side effects. The reason behind this is lack of knowledge about fruits among the normal ones. So, a Vision based technique has been used to create automated system which helps even common man to identify fruits around them.*

The goal is to extract certain features from the input image by applying different techniques like thresholding, segmentation. In processing stages the input image is applied to CBC classifier in order to classify image. In this paper, it is analyzed that fruits have successful rate in detecting the disease in it by using image processing.

***Key Words*: Image preprocessing, Image Enhancement by DWT, Clustering models by MLC, Feature extraction, Cluster based classification.**

1. INTRODUCTION

Fruits are consumed in every home. A good fruit is used with the intention of maintaining health, to be administered for a specific condition. Our ancestors had enough knowledge about fruits, so they could identify them very easily. But now days it is too difficult for a common man to identify fruits which are available around him. So, in this paper Computer vision-based approach is used to make common man to identify and recognize fruits.

A diseased fruit is bad to health and will be have no use in general. To identify disease in the fruit first we consider fruits to classify them. Fruit classification can be done based on various features like its color, texture and shape. But in our paper, we have considered fruits color, shape and texture. The images are initially trained to get the image properties. The image properties are later used for the recognition.

Figure 1.1: sample fruits

1.2 Statement of problem

Fruits play a vital role in the field of Indian science called Ayurveda. Apart from serving as source of food, some fruits have properties. Even though in our surrounding we have fruits, we can't get it at our door step instead we refer fastest cure without knowing its side effects. The reason behind this is lack of knowledge about those fruits among the normal ones. If the fruit has the disease in it than it will be of no use in general cases. Hence the use of the fruits will be only if it is in a good condition.

2. LITERATURE SURVEY

[1] In the planet earth there many uncountable types of the flowers and fruits. To detect and classify different species is a challenging task. Use of the feature space with the combination of local texture features and also using the wavelet decomposition and also by the adaptive co-occurrence matrix statistics, shape features has been processed on the multiple fruit leaves. The CBC based classifier has been used in the final stage to get the accurate type of the fruit species.

[2] The author has proposed two-dimensional moment based on the image pixel invariants for the geometric figures in the planar model. By using the translation and the simulation and also based on the orthogonal transformations has been derived. The invariant feature set under the general linear transformations in the 2D included. Theoretical and practical formulation models based on the visual pattern recognition has been used in the invariants simulation program has been used to get the result.

[3] Theorem of moment invariants which is a revised version has been proposed in the pattern recognition to enhance the problem proposed in the fundamental theorem. This will not affect similitude (scale) and also doesn't has the effect on rotation invariants. The illumination of an image has been the main aspect of the proposed work by the author. The use of the four invariants has been derived in this work by author to recognize the fruits. The accuracy has been impressive with the pre dataset.

[4] The efficient computer-aided fruits species identification (CAPSI) has been proposed. The shape matching technique has been proposed for the accurate detection of then fruits leaf. Firstly, Douglas - Peucker approximation algorithm bee proposed in the determination of the original leaf shapes sequence of invariant attributes has been adopted. A new modified dynamic programming (MDP) algorithm has been proposed in the dynamic statebased fruits leaf recognition. Accuracy and the efficiency of the work has been demonstrated.

[5] Recognition of the fruits species by suing the natural leaf images has been proposed. The fruits leaf images have been initially analyzed by using the two different type of the shape modeling. Moments-Invariant (M-I) model and Centroid-Radii (C-R) model has been adopted for the above-mentioned models. ForM-I model to improve the overall accuracy, hybrid set involving both M-I and C-R models with the Neural networks has been proposed by the author to get the better results

2.1 Existing System

Fruits play a vital role in the field of Indian science of called Ayurveda. Apart from serving as source of food, some fruits have properties. Even though in our surrounding we have fruits, we can't get it at our door step instead we refer fastest cure without knowing its side effects. The reason behind this is lack of knowledge about the fruits among the normal ones

2.2 Proposed System

In the proposed system Vision based technique has been used to create automated system which helps even common man to identify fruits around them. We have carried out the experiment of fruits detection based on the shape and color components. In this paper we proposed an automatic fruits identification system using the digital image processing techniques is used to train and classify the fruits pixels and leaf pixels by k-means and EM algorithms with Lab a*b* color space model.

Advantages of proposed System

- Work better in case of the sluggish images.
- Increased accuracy as will work on the Region of selected.
- Will help use to understand and decide the level of input.
- Use of two algorithms will help in efficient and accurate result.

3. METHODOLOGY

The proposed system for detection and reorganization of fruits by using CBC classifier in the main modules.

1) Image preprocessing
2) Image Enhancement by DWT
3) Clustering models by MLC
4) Feature extraction
5) Cluster based classification

3.1 Image Preprocessing

The preprocessing is a sequence of operation that performs on scanned input images. It primarily enhances the image illustration for higher segmentation. The task of preprocessing is to phase the required pattern from the image and perform normalization, noise filtering and smoothing. The preprocessing also defines a solid illustration of the segmented model. After segmentation, binarization procedure is used where it will convert a grey scale to a binary image.

3.2 Image Enhancements: De-noise

Image Enhancement is the most significant and difficult technique in the image study. The image enhancement is used to improve the clarity of an image, and provide a better transform representation for image processing by contrast adjustment. The image enhancement technique is different from one field to another field according to its objective. Enhancement of the image includes the color transformation (if needed), image contrast enhancement image adjust () based on the base of the user requirement.

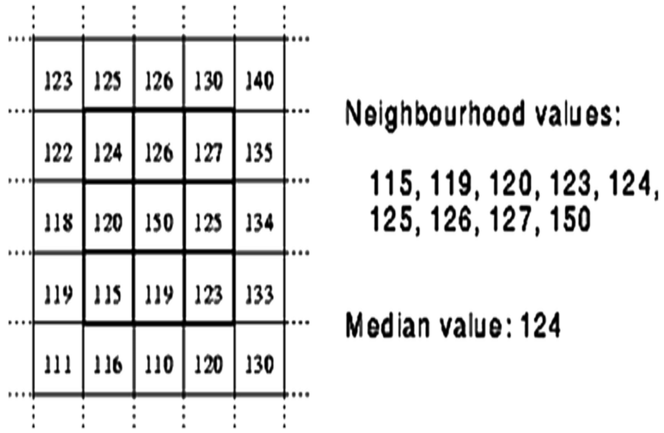

Fig 3.2. Mean value estimation

The Discrete Wavelet Transform is accordance to a sub band coding, it was set up for the speedy computation of Wavelet Transform. The major advantage of Discrete Wavelet Transform is that it is effortless to implement and reduce the instant management for the resources. The Discrete wavelet transform is as shown in figure

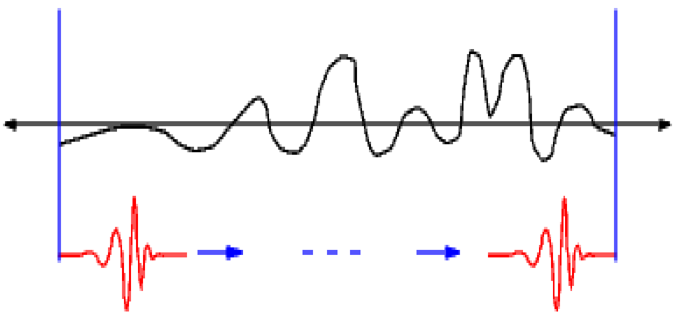

Fig 3.2.1: Non-linear Denoise by DWT

3.3 CLUSTERING MODELS EM ALGORITHM WITH K-MEANS

K-means and EM algorithm are generally same and are used in common to find the natural clusters in the range of the given data by varying the input type parameters. The K-means algorithm starts with acquiring the digital image uploaded by the user. k-means is applied for color space transformation result l*a*b (luminosity and chromaticity layer) and the k-means clustering used to segment the fruits pest images. Clusters are formed for pest images based on intensity or the color r the texture or the location of the input pixel.

If the obtained partition has no pixel value associated with it, simply ignored in this implementation. The algorithm continues until the pixels are not changing their partitions associated with it or the partitions values changing by set of small amounts are acceptable.

The image pixels are grouped into the similar grouped of 'K' as follows:

I(x,y)={image(p1,p2..pn = K(1,2,3..n)} ....Eqn(3.1)

Each of these pixels will exhibit the property based on the individual color band. Every Pixel in the image is compared with each other and side pixel for grouping. The K means clustering will use the mean value instead of the average value. The clustering of the pixel with the data value of the pixel in the same color band in the image will help the system to group the pixels as follows.

$$\phi(cluster, data) = \Sigma\left\{\Sigma(xi - ci)^{T}\right\}(Xi\text{-}cj)$$

.........Eqn (3.2)

But due to range of the color value (data) in the RGB color band is 0 to 255. The data values include neighbor values, but the neighbor values are of same mean value, hence it makes K-means algorithm less efficient in the exact grouping of the pixels.

$$E[z_{ij}] = \frac{p(x = x_i \mid \mu = \mu_j)}{\sum_{n=1}^{k} p(x = x_i \mid \mu = \mu_n)}$$

$$= \frac{e^{-\frac{1}{2\sigma^2}(x_i-\mu_j)^2}}{\sum_{n=1}^{k} e^{-\frac{1}{2\sigma^2}(x_i-\mu_n)^2}} \qquad \text{........Eqn(3.3)}$$

This is used to serve the weights for the lower expression. The sigma squared used in the equation of the expectation gives the covariance value of the pixel. E step will compute the weight or expectation of the pixel for every partition than next step is to perform the maximization or M step. The equation for the maximization is given by

$$\mu_j \leftarrow \frac{1}{m}\sum_{i=1}^{m} E[z_{ij}]\ x_i$$

Partition value of the pixel j ischanged to average value of weight pixel, the user is allowed to choose the best possible result for the feature extraction based on the clustering of the pixel.

3.4 Feature extraction

In this process of Feature, Extraction the leaf images are possessed by using the regionprop () method of feature extraction in 2 types.

- Extraction of Feature in pattern
- Extraction of Feature in Texture

Extraction of Feature in pattern:

1. Height.
2. Width
3. Boundaries.
4. Line curve.

The image features are extracted from input segmented image. The functions used are regionprops (), bwconncomp () methods.

The connected components form the input image is extracted based on the 8 cc values. These connected co-ordinate values are passed for the regionprops () for the feature extraction.

- **Contrast: it is the** square variance. It is the calculation of intensity contrast linking with the neighbor pixel. Increase in (i-j) will also increase contrast exponentially. Contrast is zero, when (i-j) = zero

$$\textbf{Contrast}=\sum_{n=0}^{Ng-1} n^2 \sum_{|i-j|} Pd(i,j)$$

- **Correlation:** perfectly +ve image correlation value = 1.

$$\textbf{Correlation}=\sum_{i,j=0}^{n-1} Pi,j\left[\frac{[(i-\mu i)(j-\mu j)]}{\sqrt{(\sigma i^2)(\sigma j^2)}}\right.$$

- **Smoothness:** it measures relative smoothness of the intensity in the region. R =0, if constant intensity and 01 with large excursions regions.

$$\textbf{Smoothness}=1-\frac{1}{(1+\sigma^2)}$$

- **Mean: its** average intensity of the image pixel.

$$\textbf{Mean}=\sum_{i=0}^{L-1} ZiP(Zi)$$

- **RMS:** its mean for the set of the numbers. It averages the series of numbers which indicate the square root of arithmetic mean of square numbers

$$\textbf{RMS}=\sqrt{\frac{1}{N}}\sum_{i=1}^{N} Xi^2$$

$$R=\sum_{x=1,y=1}^{x=w,y=h}\frac{R(I(x,y))}{w\times h}\text{-----------------}$$

$$G=\sum_{x=1,y=1}^{x=w,y=h}\frac{G(I(x,y))}{w\times h}\text{-----------------}$$

$$B=\sum_{x=1,y=1}^{x=w,y=h}\frac{B(I(x,y))}{w\times h}\text{-----------------}$$

The formula for population skewness is:

$$\mu_3=\frac{\sum(x-\mu)^3}{N}\text{----------}$$

The corresponding sample statistic is the third k-statistic,

$$k_3=\frac{n}{(n-1)(n-2)}\sum(x-\bar{x})^3\text{----------}$$

The corresponding computational formulas for kurtosis is

$$\mu_3=\frac{1}{N}\left(\sum x^3-3\mu\sum x^2+2N\mu^3\right)\qquad\text{-----------]}$$

and

$$k_3=\frac{n}{(n-1)(n-2)}\left[\sum x^3-3\bar{x}\sum x^2+2n\bar{x}^3\right]\text{----}$$

3.5 CLUSTER BASED CLASSIFIER:

The purpose of CBC is to classify the data set with boundaries and extent it to nonlinear boundaries. CBC becomes prominent when pixel map is used as the dataset values as input. It gives high accuracy equivalent to neural network with elaborated features. By designing the kernel function, CBC can be applied to the complex data and this model is efficient in both linear and nonlinear data handling. It uses the kernel classes for the classification of the input dataset, which is directly applied to data not needed in the feature extraction

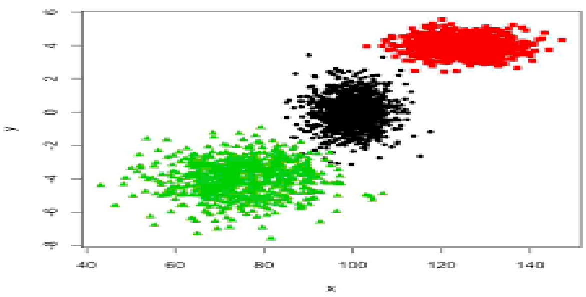

Fig.3.5: cluster grouping

The main purpose of clustering is to decide whether linear or nonlinear separable is to be applied because we have utilized the decision boundary technology for the classify of the dataset, it may end up to the nearer dataset compare to other set. When data is not linearly separable, straight line is not available.

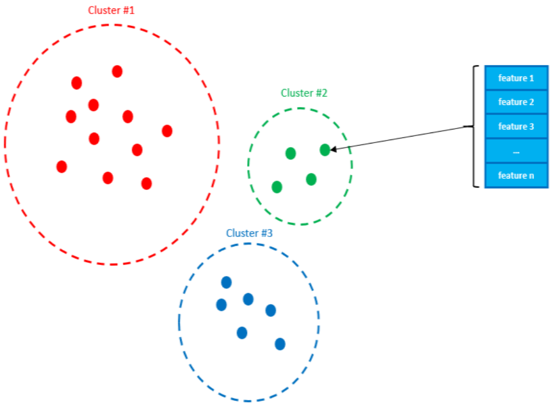

Fig 3.5.1 Cluster based classification

4. FLOW CHART

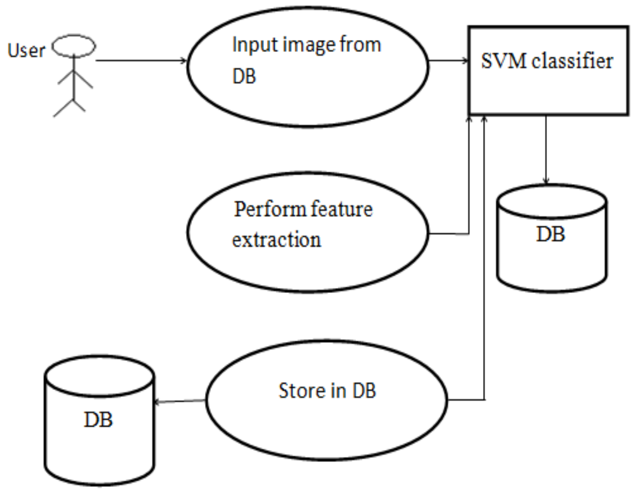

Fig: 4.1: Flow Chart

5. RESULTS:

EXPEREMENTAL RESULTS

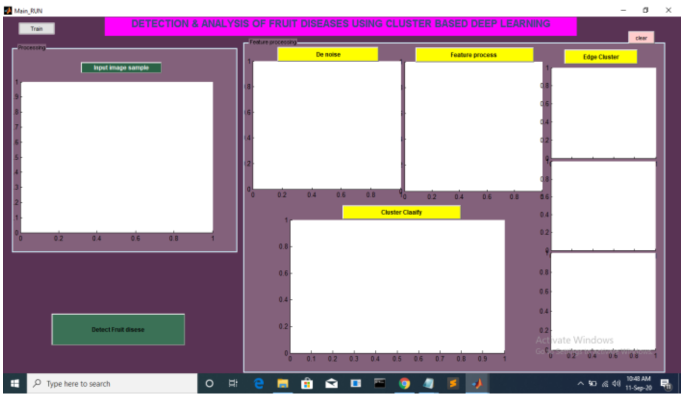

Fig 5.1: home page

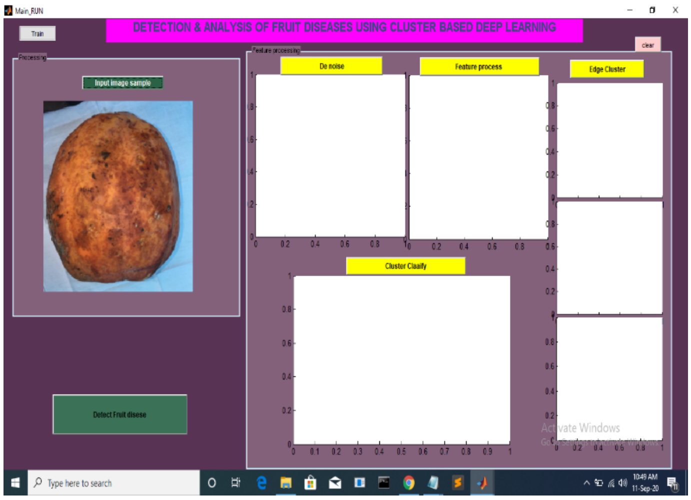

Fig 5.2: giving input

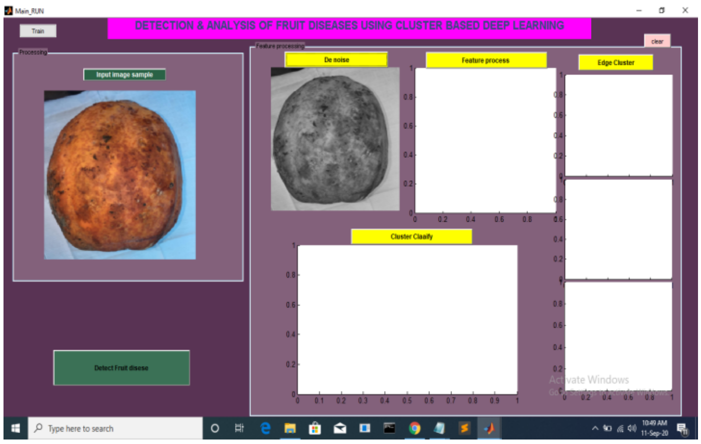

Fig 5.3: de noise

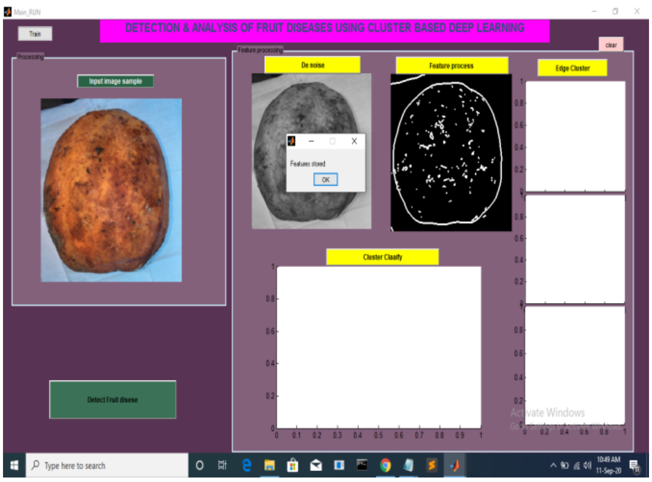

Fig 5.4: future processing

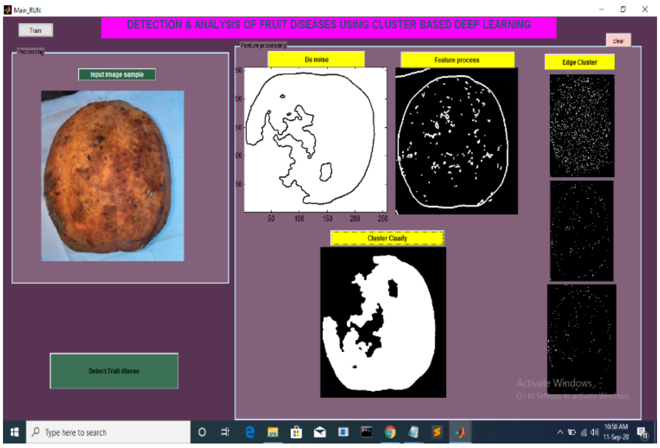

Fig 5.5: edge clusters

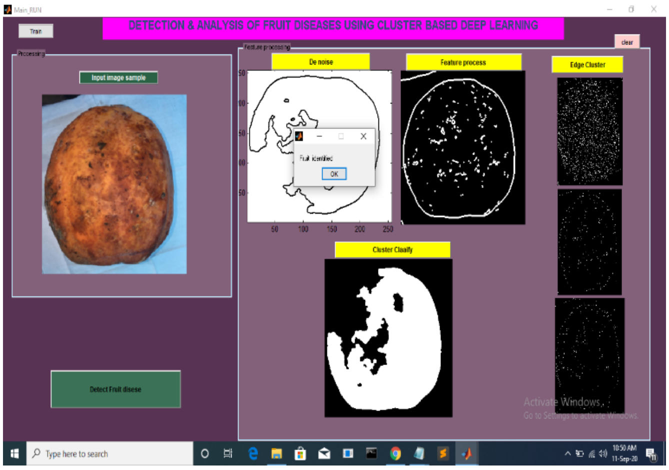

Fig 5.6: cluster classify

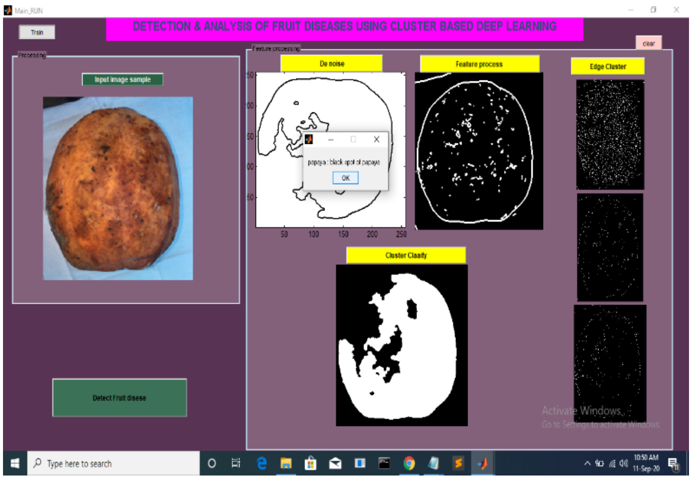

Fig 5.7: fruit disease detected

6. CONCLUSIONS

In this work we have proposed the DIP technologies for the detection of the disease in the fruit by using the standard image features like shape, texture and color with the help of the image clustering the image is processed to get the final clustering dataset is generated to get the testing dataset of features and compare to nearest neighbor to give final result.

The proposed system is to analyze use from a fruit. Same can be further used in order to identify the seeds, stem or any other parts of fruits for uses

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