An Approach of Image Processing for the Detection of Cercospora fruit spot and Bacterial Blight disease on Pomegranate

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ABSTRACT: India is one of the well-known countries in world, in the area of pharmacy specially food horticulture. India produces nearly 5.00 lakh tones/annum of pomegranate. Fruit gradation is one of the most vital parts in fruit horticulture. The project design presented by this paper is from same problematic area. In our project design we developed systems which classify diseases affecting pomegranates using K-means clustering and SVM techniques and routing algorithm. Now a days the disease Bacterial Blight which is caused by *"Xanthomonas Axonopodis PV. Punicae"* is growing rapidly day by day in pomegranate cultivation. This is fungal bacteria and caused by many parameters like environment, air, humidity, temperature. It causes heavy losses in production quality and quantity each year, especially in climates with rainfall and high temperature. Cercospora fruit spot is caused by the fungus and the full name of this fungal disease is "*Pseudocercospora Angolensis"*. Leaves of affected plants will produce circular spots with light brown to grayish centers. We are classifying the different pomegranate variety in accordance with their diseases. This paper deals with pomegranate grading and identification of disease system with judging parameters. The specialty of design is it creates a model which helps to decide appropriate criteria for healthy fruit. This project design is acts as advance system model in Indian horticulture for deciding ranges of mean, variance, entropy values by which the quality of fruit is decided. These parameters are judging parameters of our project design.

KEYWORDS:K-means, SVM (Support Vector Machine), mean,variance, Imageprocessing, Bacterial blight.

1.INTRODUCTION:

Agriculture is the backbone of Economic System of a Given Country. The reason that we have permanent civilizations owing to agriculture. The agriculture sectorprovides resource to 65-70 per cent of the whole population. The present world provides the employment up to 59.4 per cent of the country's employment and it is the only single largest private sector occupation. Efforts are being made to boost the productivity of the pomegranate and decreasing the loss of the production. Fruit horticulture is defined as the main cause of agriculture development of any country. The quality of fruit is decided by the weight, nutrients and the main objective is in the detection of diseases. Fruit diseases or fruit plant diseases causes majoreconomic losses in agriculture.In India according to the Survey on Agriculture Production Methods (SAPM)&Improvement of Crop Statistics (ICS) nearly5.5lacks tones of pomegranate production takes place in Indiaand Maharashtra state is the most leading state in production of pomegranate. In Maharashtra around 98% of area is under production of pomegranate. In the present world of of agriculture, no sensor is available that deals with real time diagnosis and analysis of the health condition of fruit. The project design implemented in this paper focuses on disease category affecting on pomegranate that are Cercospora fruit spot and Bacterial blight. The main reason for declining the production is infection by Bacterial Blight and Cercospora fruit spot disease. Thispaper deals with detection of disease according to its characteristics and validates the fruit quality for the healthy fruit.

1.1. FACTORS THAT AFFECT THE GROWTH OF POMEGRANATE:

SOIL:

Although the pomegranates can grow in a wide variety of soil, the best soil type suitable for the growth of pomegranate is deep, heavy loamy soils that are having the good drainage capacity. It can tolerate alkalinity and salinity to the certain extent. Presence of moisture in soil causes fruit cracking and lower the yield of the fruit.

Soil Types:

pomegranates can adapt to a variety of soils like acidic sandy foam and alkaline calcoreous soils. In India these fruits can grow in rocky gravel. These fruits will not grow in clay conditions, because soil with excessive clay results in the drainage problems.

Pomegranates can also adopt to the conditions like soil to clay. Fruit yielding generally low on sands, fruit color is very poor on clay soil. In alkaline conditions the growth is low. Deep, fairly heavy, moist **soil**leads to the Optimum growth within the pH range of 5.5-7.2.

IRRIGATION AND DRAINAGE:

Drainage is one of the most important factors to consider when we choose a location to grow pomegranates and well -drained soil are suitable for the growth. Excess wet conditions also cause the fruit production, and the fruit can withstand the excessive dry conditions, water irrigation is main assert for the growth of the fruits.

CLIMATE:

Pomegranates grow in the location with tropical and cool climatic conditions. These are more sensitive to the cool conditions and can tolerate to the hot conditions up to some extent.

Climatic requirement:

➡ The growth of the pomegranate is high in arid and Semi-Arid conditions.

. ➡ At the time of fruit development and repining there should be dry weather with the temperature of >30 C.

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This paper is divided into 5 sections as - 1. Introduction, 2. Proposed work, 3. Methodology, 4. Experimental results, 5. Conclusions.

2.PROPOSED WORK:

2.1. Dataset:

There is no any standard database is available for this work. So, we collect the pomegranate fruit images from NRCP (National Research Centre on Pomegranate, Solapur) and also some images are capture from camera by realtime farming. In this research work we are using about 40 images of pomegranate fruit which are classified by proposed method. Some diseased images are shown below.

Fig.1.*(a)*_Bacterialblight_

Fig.2.*(b)*_Cercospora fruit spot_

Above two diseases show different symptoms. Depending upon these symptoms each disease is classified into their respective disease's category.

3.METHODOLOGY:

Flow of the proposed work is given below, at first the diseases images of pomegranate fruit given as input to the system. This image is pre-processed. As we are interested to identify the type of diseases the image is then segmented by using K-means clustering algorithm. Then features are extracted from segmented cluster containing diseases part. Classification is done by using multiclass SVMs

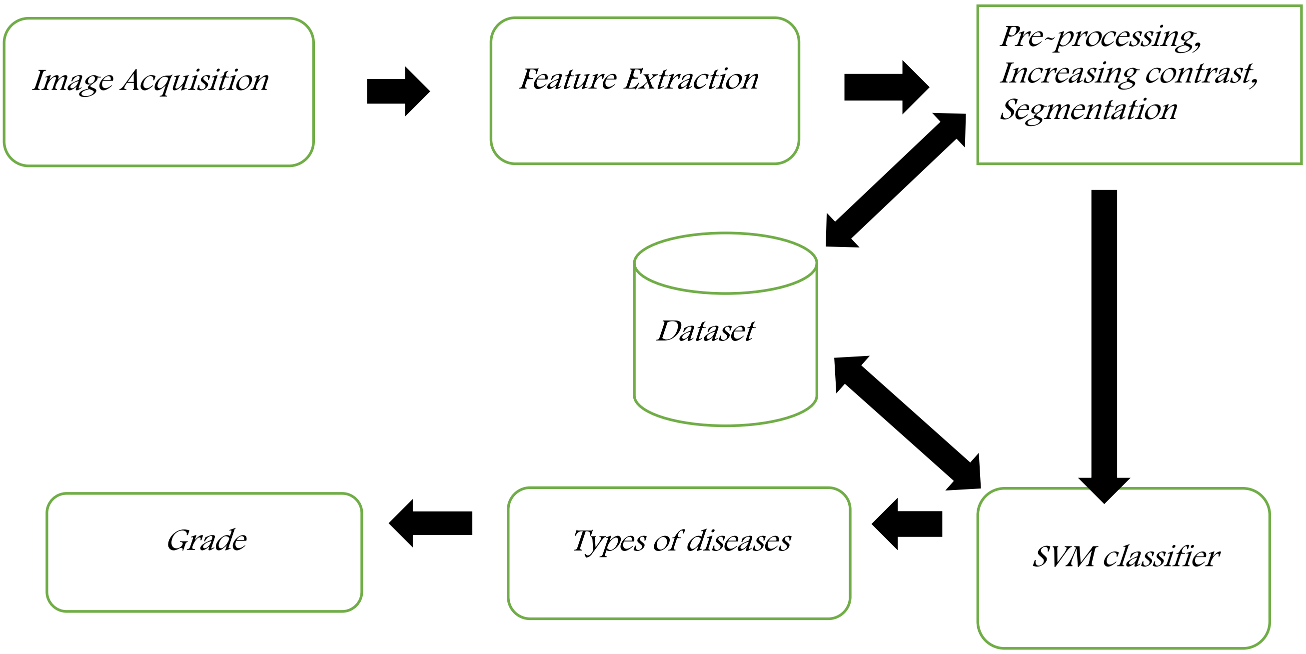

Fig.3.*Flow chart of proposed work*

3.1. Image Acquisition:

The first stage of any vision system is the image acquisition. After collecting the images, different methods of processing can be applied to the image to achieve proposed tasks.

3.2. Pre-processing:

After getting images of pomegranate fruit, image pre-processing is done. First, we should increase the contrast of the image to become more meaningful. Healthy fruit image is shown below,

Fig.4. (a)Fruit image of healthy pomegranate

After increasing its contrast, it will be look like as shown below,]

Fig.5. (b)Enhanced image of pomegranate fruit

3.3. Image Segmentation:

Image segmentation is used to partition the diseased part and healthy part of the pomegranate fruit. K-means clustering algorithm is mainly used in this paper to form the clusters. It forms the three clusters as shown below

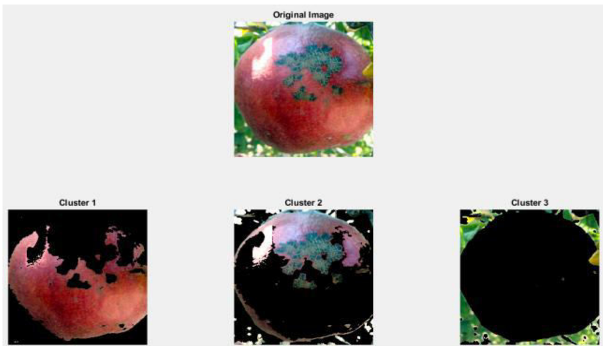

Fig.6. Segmented results of Cercospora fruit spot

3.4. Feature extraction:

Feature extraction is the procedure to opt for the important characteristics of an image. Feature extraction is the process of extracting the set of features from the input data. The thirteen revealing features that are extracted from the pomegranate fruit image are Mean, Variance, Entropy, RMS value, Standard deviation, Smoothness, Kurtosis, Skew-ness, IDM, Contrast, Correlation, Energy, Homogeneity. These are the key features which gives specific range for each disease.

3.5. Classification:

The concept used in the classification is Support Vector Machines (SVM). These machines were initially used for binary classification. A number of methods have been projected where usually we create a multiclass classifier by combining some binary classifiers. Some authors also wished-for methods that consider all classes at once. A support vector machine described in this context creates a set of hyper planes in a high and infinite-dimensional space, that can be used for classification, Multiclass SVM is used to give labels to the instances by using these machines, where the labels are drained from a finite set of several essentials. In this proposed work multiclass SVM classify the pomegranate diseases images into the respective disease category.

4.EXPERIMENTAL RESULTS:

4.1. Bacterial blight:

The features extracted from this disease are given below

Table.1.**Parameters calculated for the disease Bacterial blight**

Parameter	mean	S.D	Entropy	RMS	variance	smoothness
Sample1	13.6552	36.9434	1.4761	3.91582	1024.52	1
Sample2	16.2063	47.2358	1.9067	4.66964	1764.51	1

Parameter	Kurtosis	Skewness	IDM	Contrast	Correlation	Energy
Sample1	11.65242.94946		255	0.15781	0.928083	0.758036
Sample2	12.6007	3.0078	255	0.25239	0.918169	0.706573

Parameter	Homogeneity
Sample1	0.973409
Sample2	0.968913

From these features the diseases classified is the Bacterial blight. The result shown for Bacterial blight is given below,

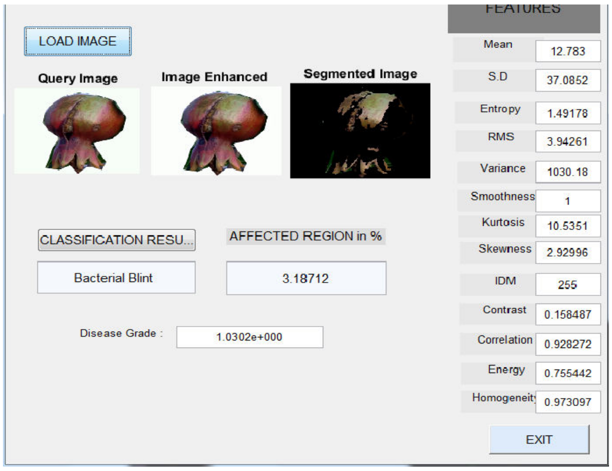

Fig.7.Sample1: Result of Bacterial blight disease

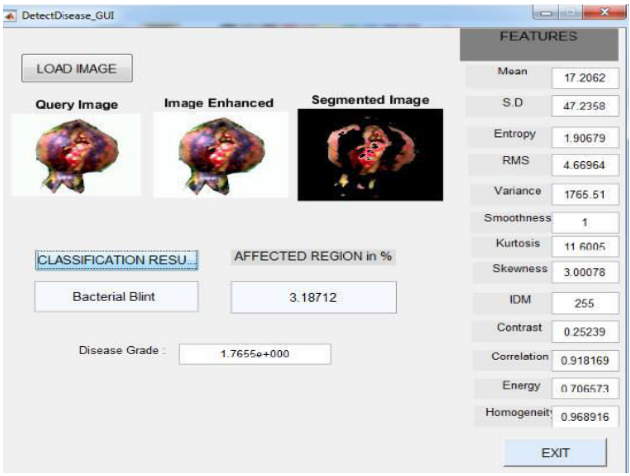

Fig.8.Sample2: Result of bacterial blight disease

4.2. Cercospora fruit spot:

Here we take the two examples of cercospora fruit spot diseases images. The value of parameters calculated from these disease images are given below,

Table.2. **Parameters calculated for the disease Cercospora fruit spot**

Parameter	mean	S.D	Entropy	RMS	variance	smoothness
Sample1	48.3948	66.679	4.5932	10.6832	4211.31	1
Sample2	48.2433	66.648	4.5804	10.6643	4210.73	1

Parameter	Kurtosis	Skewness	IDM	Contrast	Correlation	Energy
Sample1	3.85544	1.32571	255	0.97340	0.863348	0.298356
Sample2	3.86709	1.33027	255	0.97121	0.863415	0.299887

Parameter	Homogeneity
Sample1	0.895272
Sample2	0.895487

This is the range of features for cercospora fruit spot.

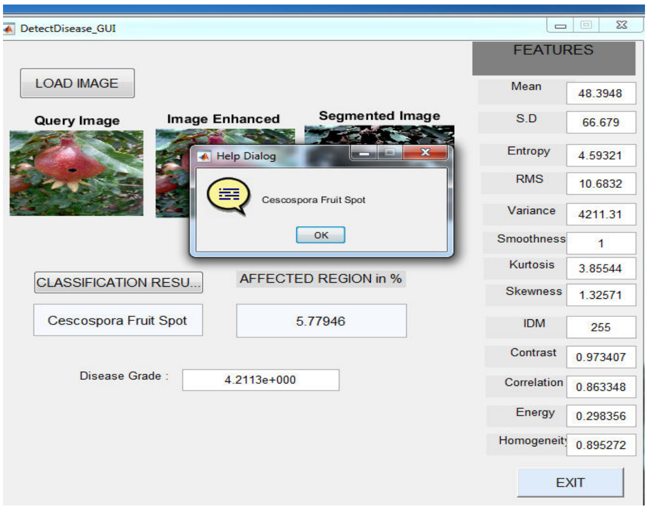

Fig.9. Sample 1: Result of cercospora fruit spot disease

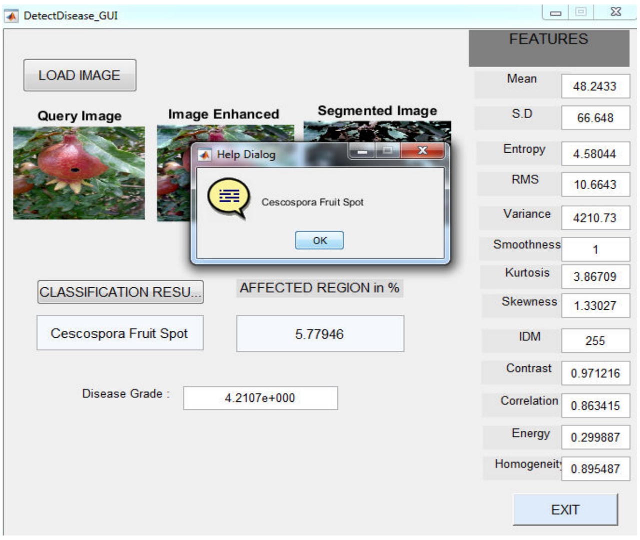

Fig.10.Sample 2: Result of cercospora fruit spot disease

5.CONCLUSIONS:

Automation in agriculture is very important to help the farmers in modern generation. This paper is useful for detecting the Bacterial blight and Cercospora fruit spot diseases on pomegranate fruit and also grading the fruit depending upon their diseased portion. Feature extraction and SVM multiclass classifier is the important steps in this work. Range of the dataset is created from the analysis of the features value. From result it can be seen that these diseases are classified very correctly.

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