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Identify and Classify Normal and Defects of Prunus_armeniaca Using Imaging Techniques

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Abstract: ***The Prunus_armeniaca fruit is classified manually in wholesale markets, supermarkets and food processing plants on a normal or defects basis. The aim of this research is to replace the manual sorting techniques using computer vision techniques and applications by proposing techniques for identify and recognitions patterns through the use of 150 fruits of Prunus_armeniaca, 10 for the testing stage in fresh and 10 for testing stage in case of defects. The fruits Prunus_armeniaca collected from growing trees in the large fields of Salah al-Din province\Iraq. The system designed for classification based on the color image taken inside a black box used camera pixel resolution of (13 mega) with a constant intensity of light. . Used K-mean in phase segmentations and only computed 13 features derive statistics from GLCM .classification phase used SVM classify fruit into two class, either (normal or defects) .Results the system success rate reach 100%.The work done using MATLAB R2016a.***

Keywords**:** Prunus_armeniaca , GLCM ,SVM, K-mean

1. INTRODUCTION

Fruit production plays a vital role in any country Economically.It is part of agricultural production and industrial production (juices, dried fruit, and jam). Fruits are the main source of health because they contain minerals, vitamins, fiber and other nutrients, which form the main part of the balanced diet because it is considered the main factor of health and physical activity. . In general, fruits are of different sizes, shapes and colors, so the process of determining the quality of fruits is very important in export and packaging of foodstuffs, need a vision machine to check the quality, and efficiency of fruit. use of photography in the process of obtaining images because the images are a major source and important in the agricultural sciences through which data and information is recorded as well as the reproduction of this information and reporting use of image processing has prominent effects in the analysis of images and digital treatment works to improve the image of the microscope to the optical range The analysis of images and digital treatments in agricultural sciences has been adapted to distinguish between fruits in terms quality . The analysis and processing of images is also important in terms of time and material costs, where they are considered more economical than working hands, development of agriculture and crops agricultural of importance and terms of prices and quality all these factors linked to fruit .Prunus_armeniaca from summer fruits that can be eaten fresh or dried, a fruit of high nutritional value and has many benefits of them, maintains the health of the heart and eye and removes toxins body and resists cancer Anemia, stroke. It is thought to be a low-fat fruit with high sugar content. The importance of this type of fruit plays an important role in many of the food processing industry, such as juices, breeder and dryer, so the process of manual sorting of The large quantities is very expensive and waste of time building an incubation based on computer vision is considered more economical in terms of time and effort required[1]. Image segmention is a process that pairtion a input Image 'I' into m sub regions. Strong literature on image segmentation is Permissible [2]. Clustering is the process splting in the sense of a particular pattern partion into groups with specific patterns where each section contains a similar pattern .Studied clustering problems on different scales especially in the field of applications including neural networks, AI, and statistics [3 4 5]. K-Means algorithm Is an unsupervised aggregation algorithm that classifies input data points into multiple categories based on the inherent distance from each other. The algorithm assumes that the characteristics of the data constitute a vector area and try to find natural clusters in it [6 7 8]. Machine learning is about the general structure of learning from data use a class of algorithm called (SVM) the most active scan where focus on distinguishing patterns [9 10] Support Vector Machines (SVMs) is distinctive and evolving style of classification compared to other methods such as neural networks, artificial and decision trees because they rely on the theory of automatic learning. They have great features including high precision, athletic and engineering capability, do not need a large number of training samples [11 12]. Pattern recognition system essentially include the following steps: first step, Data acquisition and preprocessing: Here the data from the surrounding environment is taken as an input and given to the pattern recognition system. The raw data is then preprocessed by extracting object of interest from the background. Tow step, Feature extraction: Then the relevant features from the processed data are extracted. These relevant features collectively form entity of object to be classified. Hired, Decision making: Here the desired operation of classification or on the description of the extracted features.

2. METHODS

This describes the process of analysis and design, This project is divided in few processes which are imaging, pre-processing, feature extraction, database, classification, training and testing. The details of each element are described in figure(1).

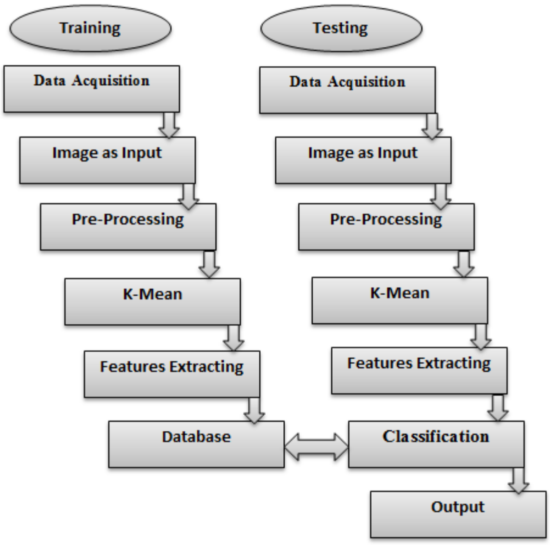


Figure1 Block diagram of the system

- **Data Acquisition:** The fruit Prunus_armeniaca was collected from trees in large farms in Salah al-Din/ Iraq collected 150 samples, the colored images of Prunus_armeniaca **is** input to the designer system, a small room was designed for photography in order to maintain the conditions for all of the samples used as a stable light source, The camera is a black paper box with a black rectangular base to reduce shadow and reflections. The light is only used on the camera's flash Captured using a phone camera with a pixel of (13 mega). resolution .The camera is 20 cm away from all the samples taken. Capture 55 images for 55 samples are considered normal and 75 images of 75 samples are considered defective from Prunus_armeniaca . Show figure (2).
- **Preprocessing:** For all input image resize (256 * 256).Followed by image segmentation techniques to remove the background area since our paper only focuses on the fruits. Selsct a K-Mean clustering algorithm for segmentation, RGB image segmentation uses color as homogeneity criteria for spliting. The varieties of K-Mines have been explored for the color image segmentation by paper researchers for decades. The nonlinear conversion of the color components is three layer luminosity layer,Color classification in Space using K meanschromaticity-layer is repersent tow layers ,Color classification in Space using K-mean clustering. Show figure (3).
- **Features Extracting:** Structural method using gray-level co-occurrence matrices (GLCM) and defined statistical measures for texture. Co-occurrence Matrix provides information on the structure and pattern of the texture, and it co-occurrence used to Computational characteristic are calculated as these charactrestic are highly sensitive to differences in light but are nevertheless popular in various areas of texture analysis [13 14 15]. After segment the interest object ,convert RGB segment to gray level and drive features from GLCM computed for each sample either(normal and affected). Statistics features descriptors which are (Contrast, Correlation, Energy, Homogeneity, Mean, Standard Deviation, Entropy, RMS, Variance, Smoothness, Kurtosis, Skewness, and IDM). As $g_{ij(i,j)^{th}}$ entry in GLCM Based on the definition where g is the number of possible gray levels. $\sum$ is sigma (used for the summation) operator, Ng = L=Number of distinct gray levels in the images. μ is mean,σ is variance, P (I) is defined as: [13 14 15 16 17 18 19].

$$p(I) = \frac{\text{number of pixels with gray level I}}{\text{total number of pixels in region}} \quad (1)$$

Expression of GLCM descriptors are:

$$Contrast = \sum_{ij=0}^{l-1} g_{ij} \ (i-j)^2 \quad (2)$$

$$Correlation = \frac{\sum i \sum l(ij)\ gij\ \mu x \mu y}{\sigma x \sigma y} \quad (3)$$

$$Energy = \sum i \sum j\ (g_{ij})2 \quad (4)$$

$$Entropy = -\sum_i \sum_j g_{ij} log_2 g_{ij} \quad (5)$$

$$Homogeneity = \sum_{i,j=0}^{l-1} \frac{g_{ij}}{1+(i-j)2} \quad (6)$$

$$Variance = \sum_i \sum_j (i-\mu)^2 \quad (7)$$

$$\mu = \frac{\sum_{i=0}^{g-1} ip(i)}{\sum_{i=0}^{g-1} p(i)} = \frac{\sum_{i=0}^{g-1} ip(i)}{n} = \sum_{i=0}^{g-1} ip(i) \quad (8)$$

$$Skewness = \sum_{i=0}^{g-1} (i-\mu)^3\, p(i) \quad (9)$$

$$kurtosis = \sum_{i=0}^{g-1} (i-\mu)^4 p(i) \quad (10)$$

$$Standard\ deviation = \sqrt{\mu_2 g_{ij}} \quad (11)$$

$$IDM = \sum_{i=0}^{l-1} \sum_{j=0}^{l-i} \frac{1}{1+(i-j)^2} p(i-j) \quad (12)$$

$$\text{Smoothness} = 1 - \frac{1}{1+\sigma^2} \quad (13)$$

$$Root\ mean\ square = \sqrt{mean(i^2)} \quad (14)$$

Show figure (4).

- **Classification:** In the classification, texture features are derived as that of the training and compared with corresponding feature values stored in the database. use methods SVM (support vector machine) supervised binary classification algorithm works on a set of points based of the spatial dimension to generate [math](N-1)/[math] the separation of those points into two class of features SVM considered the best in finding the best separation line where looking for the nearest point that said by the vector supporting this points such as vector and the best line A break the one on which the work depends. SVM find the points near and draw a line to connect those points by vector subtracting from two classes then declare SVM the best line of separation is a vertical line on the line connection. Show figure (2).

- **Training :** The database was built on the basis of the features extracted for each sample used in the training phase 130 Prunus_armeniaca sample 55 sample normal and 75 defects samples the results were calculated and saved in the database which will be used later in the classification process.
- **Testing:** The test phase used 20 Prunus_armeniaca samples 10 of which were normal and 10 defects were input 20 samples of the system was classified 10 normal and 10 defective. Classification patren in machine learning are evaluated for their performance by :

accuracy = (correctly predicted class / total testing class) × 100% . (15)

The accuracy can be defined as the percentage of correctly classified instances :-

(TP + TN)/(TP + TN + FP + FN). (16)

standard performance measures:

True-PositiveRate=TP/TP+FN (17)

False-PositiveRate=FP/FP+TN (18)

True-NegativeRate=TN/TN+FP (19)

False-Negative Rate = FN / FN + TP (20)

where FP, TN, TP and FN represent the number of false positives, true negatives, true positives and false negatives,respectively.

For good classifiers, TNR and TPR both should be nearer to 100%. Similar is the case with precision and accuracy parameters. On the contrary, FNR(False-Negative Rate) and FPR(True-Positive Rate) both should be as close to 0% [20] . Show Table(1).

Table 1: Describes the details of the test with accuracy.

Samples Normal	Result Test	Result Test Classify	Samples Defects	Result Test	Result Test Classify
Sample 1	Normal	√	Sample 1	Defects	√
Sample 2	Normal	√	Sample 2	Defects	√
Sample 3	Normal	√	Sample 3	Defects	√
Sample 4	Normal	√	Sample 4	Defects	√
Sample 5	Normal	√	Sample 5	Defects	√
Sample 6	Normal	√	Sample 6	Defects	√
Sample 7	Normal	√	Sample 7	Defects	√
Sample 8	Normal	√	Sample 8	Defects	√
Sample 9	Normal	√	Sample 9	Defects	√
Sample 10	Normal	√	Sample 10	Defects	√

3. RESULTS AND DISCUSSION

It observed that using the algorithm K-Mean to separate the object concerned from the background and by manual input by selecting the class after the separation to calculate the features, which consider the best features that are reliable in the classification of the change is very clear of the values of those features, It (SVM) considered one of the best works and has been given accurate results and the system was 100%. Show figure (5).

4. CONCLUSION AND FUTURE WORK

The purpose of this method of classification using SVM and training feature of the classification between Prunus_armeniaca (normal and defects) , the results were very satisfactory and accurate classification 100% future business development work to automatic classification .

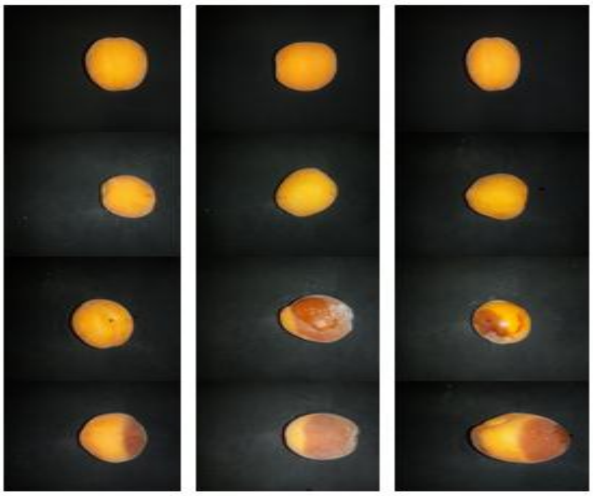


Figure2 Pattern sample normal and defect Prunus_armeniaca

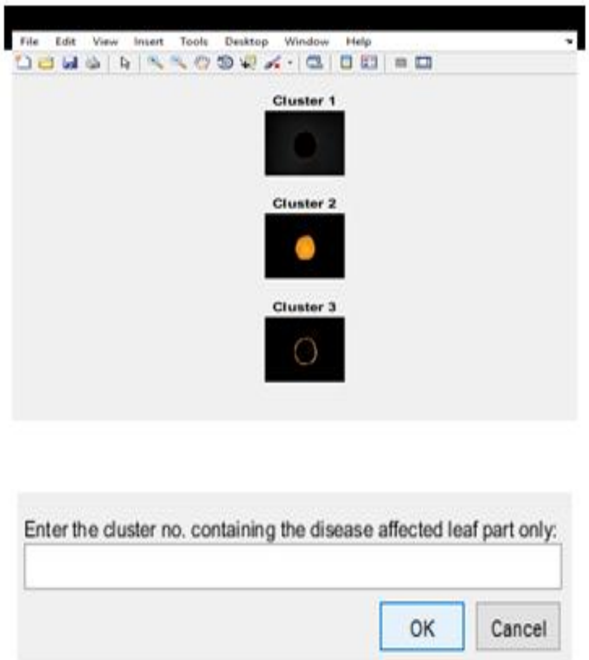


Figure3 Preprocessing to separate the object from the background by using K-Mean, and selecting the class to calculate the features.

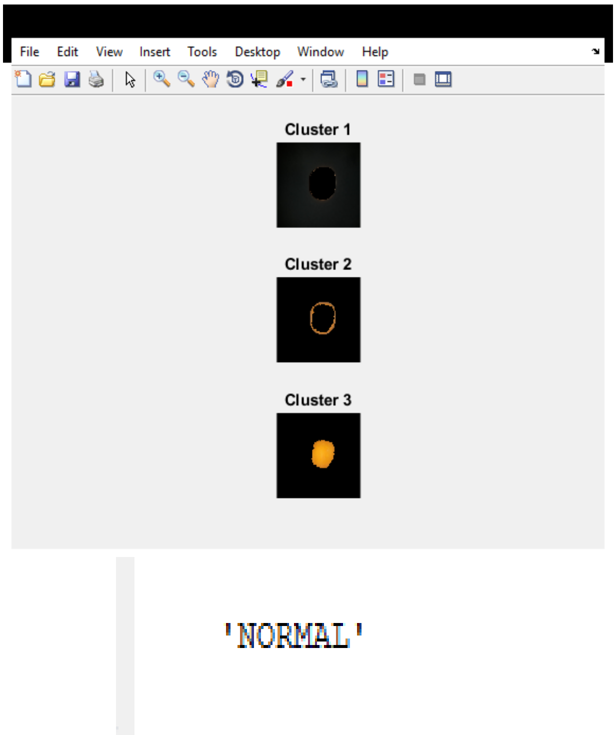
0.053301	0.976436	0.905729	0.997515	7.539515	36.65778	0.604942	1.601037	1065.562	0.999999	28.78151	5.132535	255
0.064353	0.97401	0.904297	0.996662	7.954981	37.92887	0.601277	1.621625	1143.541	0.999999	27.60935	5.010077	255
0.0631	0.973392	0.904275	0.996499	7.870203	37.73643	0.60241	1.628957	1132.071	0.999999	28.16615	5.062393	255
0.060305	0.974378	0.906189	0.997059	7.653147	37.12935	0.597428	1.595899	1096.713	0.999999	28.57134	5.109901	255
0.126586	0.896938	0.920202	0.990715	5.128837	28.05838	0.511605	1.546911	665.7808	0.999999	38.3368	5.875589	255
0.131438	0.894768	0.919583	0.990549	5.190416	28.28504	0.514353	1.5576	676.6076	0.999999	37.94829	5.845958	255
0.131309	0.893402	0.920135	0.990587	5.132016	28.08835	0.51077	1.547832	666.8911	0.999999	38.29558	5.873497	255
0.120514	0.893556	0.921172	0.991025	4.884891	26.9777	0.503992	1.531658	614.7203	0.999999	39.56019	5.961892	255
0.217928	0.888263	0.907358	0.988689	6.86632	33.7718	0.561391	1.730011	987.4663	0.999999	27.80395	5.036939	255
0.171534	0.931529	0.88797	0.989424	8.809243	38.41767	0.696399	1.95711	1238.869	0.999999	21.951	4.441961	255
0.135968	0.879616	0.926063	0.989687	4.636395	26.3051	0.466466	1.512625	608.5619	0.999999	39.48535	5.994824	255
0.133655	0.880137	0.926433	0.989819	4.603819	26.18505	0.465256	1.510254	602.7797	0.999999	39.83491	6.01901	255
0.141622	0.881475	0.926223	0.989574	4.757653	26.93753	0.465539	1.51294	638.228	0.999999	39.04565	5.965099	255
0.128225	0.908016	0.911623	0.989836	5.676165	29.25958	0.572316	1.680299	727.9429	0.999999	33.08564	5.466283	255
0.141333	0.882249	0.925051	0.989434	4.787883	26.94705	0.474304	1.524686	636.5539	0.999999	38.75072	5.940619	255
0.128578	0.908658	0.911661	0.989816	5.733893	29.52761	0.571028	1.680233	741.4036	0.999999	33.0385	5.460267	255
0.141751	0.880696	0.925232	0.989424	4.759328	26.8471	0.47299	1.521485	631.9939	0.999999	38.98416	5.958192	255
0.142394	0.881141	0.926071	0.989503	4.784555	27.00067	0.465006	1.512824	640.7785	0.999999	38.46223	5.924631	255
0.143454	0.880003	0.926316	0.989509	4.765477	26.93503	0.46348	1.510448	637.9458	0.999999	38.55918	5.932888	255
0.137928	0.885335	0.925207	0.989503	4.817915	27.07661	0.47355	1.5264	643.4362	0.999999	38.6438	5.930231	255
0.140884	0.884694	0.923018	0.98913	4.904565	27.24398	0.487728	1.548316	648.7164	0.999999	37.87855	5.869167	255
0.19396	0.868158	0.922232	0.989539	5.413077	29.77875	0.480984	1.490025	769.9822	0.999999	36.22156	5.756982	255
0.141655	0.917432	0.890535	0.990558	7.202363	33.28314	0.708688	1.850069	916.1837	0.999999	27.16923	4.92903	255
0.151004	0.918281	0.890461	0.990816	7.451232	34.20375	0.708805	1.849116	967.486	0.999999	26.44332	4.866376	255
0.150972	0.917858	0.890943	0.990815	7.443595	34.22265	0.705822	1.840198	969.3732	0.999999	26.54463	4.875126	255
0.198297	0.864334	0.922482	0.989632	5.406885	29.79704	0.477381	1.485015	772.0323	0.999999	36.33092	5.764811	255

Contrast	Correlation	Energy	Homogen	Mean	Standard_	Entropy	rms	variance	smoothne	Kurtosis	Entropy	IDM
0.0569	0.979905	0.855881	0.994764	10.08513	42.38623	0.910607	2.135777	1285.068	0.999999	21.93333	4.447126	255
0.053365	0.981021	0.854061	0.994866	10.04518	42.56906	0.922066	2.114938	1291.832	0.999999	21.8904	4.44852	255
0.057221	0.979784	0.855582	0.994691	10.08542	42.4073	0.912457	2.136921	1286.121	0.999999	21.91025	4.445418	255
0.053301	0.980237	0.855644	0.994897	9.841104	41.69347	0.916835	2.118627	1243.167	0.999999	22.08582	4.466439	255
0.05343	0.980556	0.87358	0.995848	9.330091	41.12468	0.796492	1.876857	1210.394	0.999999	23.96586	4.669081	255
0.05343	0.980805	0.871224	0.995639	9.337467	41.49608	0.810302	1.895083	1224.369	0.999999	23.80472	4.664871	255
0.053141	0.980707	0.871364	0.995656	9.193493	41.40233	0.80895	1.876121	1218.575	0.999999	24.03103	4.694816	255
0.057253	0.979864	0.870853	0.995373	9.794704	42.04343	0.803526	1.901862	1260.179	0.999999	23.23786	4.577344	255
0.055036	0.980314	0.873066	0.995549	9.510811	41.48651	0.795994	1.881509	1231.072	0.999999	23.65692	4.631451	255
0.053719	0.980645	0.871244	0.995543	9.23032	41.32304	0.815377	1.884311	1213.574	0.999999	23.68614	4.662089	255
0.053687	0.980619	0.870146	0.995559	9.271877	41.53866	0.817898	1.887079	1224.186	0.999999	23.80356	4.670609	255
0.05494	0.980332	0.872372	0.995483	9.414304	41.51287	0.800517	1.886799	1229.416	0.999999	23.7952	4.656468	255
0.052948	0.980517	0.870446	0.995697	9.161184	41.19953	0.817625	1.879306	1204.038	0.999999	24.02951	4.692171	255
0.04543	0.983468	0.873902	0.996222	9.514784	41.10399	0.795476	2.033356	1300.805	0.999999	23.61989	4.612557	255
0.04845	0.982849	0.873358	0.99582	9.534283	41.32329	0.802688	2.043469	1312.096	0.999999	23.24697	4.590044	255
0.048675	0.982799	0.872959	0.995851	9.545963	41.34821	0.805618	2.049506	1314.307	0.999999	23.17251	4.583694	255
0.049735	0.982447	0.87142	0.995888	9.547008	41.44541	0.814539	2.064996	1317.351	0.999999	23.1086	4.582327	255
0.049414	0.982486	0.871382	0.995905	9.535787	41.40277	0.814203	2.065512	1314.98	0.999999	23.16623	4.587	255
0.04845	0.983199	0.871362	0.995876	9.875013	41.92103	0.811124	2.070945	1350.828	0.999999	22.67742	4.51598	255
0.049671	0.982833	0.871556	0.995672	9.853013	41.8307	0.811423	2.060476	1344.641	0.999999	22.60771	4.510281	255
0.049767	0.982432	0.857276	0.996131	10.15671	42.28376	0.890036	2.231752	1343.681	0.999999	21.89796	4.436198	255
0.048578	0.983343	0.857095	0.996133	10.30265	42.87976	0.8873	2.232126	1381.125	0.999999	21.74145	4.423284	255
0.049092	0.982951	0.857651	0.996051	10.049	42.53971	0.88869	2.222762	1358.129	0.999999	21.88311	4.451984	255
0.048932	0.983055	0.85838	0.996132	10.15129	42.62964	0.880257	2.21881	1367.096	0.999999	21.96705	4.451815	255
0.049478	0.982884	0.858086	0.99609	10.16636	42.65901	0.881992	2.219928	1368.162	0.999999	21.93052	4.447896	255

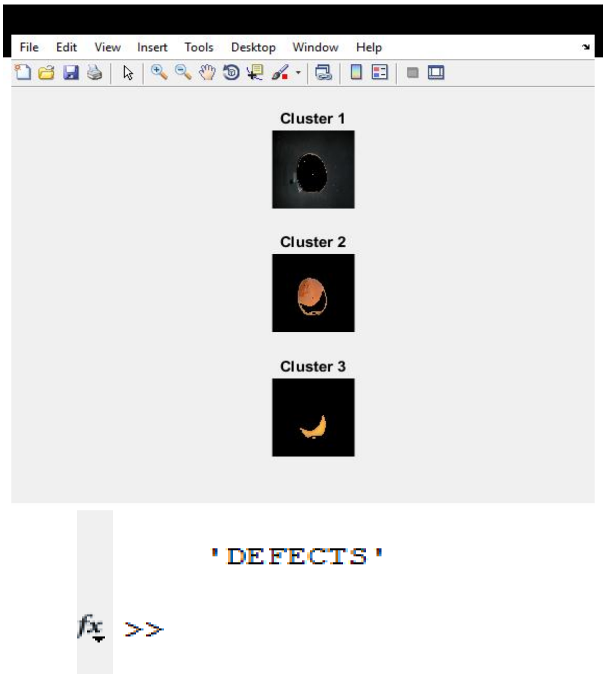
0.150458	0.917487	0.890967	0.990775	7.409339	34.06835	0.70527	1.842391	962.7482	0.999999	26.57979	4.8775	255
0.121542	0.897473	0.931557	0.993315	4.574288	27.10923	0.449936	1.407102	650.2727	0.999999	44.33799	6.367238	255
0.125783	0.898236	0.932066	0.993504	4.671728	27.64875	0.446809	1.4006	676.6326	0.999999	43.68329	6.326505	255
0.123084	0.902222	0.931148	0.993514	4.757499	27.96521	0.453449	1.413535	690.8577	0.999999	43.29405	6.293887	255
0.119968	0.903804	0.931208	0.993616	4.708416	27.75349	0.453913	1.413874	680.8099	0.999999	43.55305	6.3158	255
0.120675	0.898536	0.931251	0.993391	4.594571	27.16332	0.452383	1.411316	652.6226	0.999999	44.18915	6.355339	255
0.12498	0.901531	0.930932	0.993398	4.788331	28.10736	0.454476	1.41415	697.6602	0.999999	43.15219	6.28373	255
0.145478	0.882385	0.936828	0.993284	4.307941	26.84221	0.403806	1.427595	657.9672	0.999999	48.60512	6.67999	255
0.158233	0.887143	0.933575	0.992985	4.748859	28.61026	0.42382	1.472947	743.8782	0.999999	44.60818	6.406749	255
0.154378	0.888687	0.934282	0.993042	4.692219	28.42211	0.419878	1.461701	735.0089	0.999999	45.1092	6.443277	255
0.09947	0.963084	0.899809	0.994193	7.92112	39.57215	0.612586	1.735032	1273.66	0.999999	29.02626	5.197947	255
0.151871	0.891066	0.93419	0.993018	4.713968	28.51261	0.420704	1.466686	739.8565	0.999999	44.9192	6.430287	255
0.152321	0.891439	0.933709	0.993024	4.766731	28.67195	0.42461	1.471035	748.1449	0.999999	44.35713	6.389539	255
0.08061	0.963662	0.878691	0.991334	8.989979	36.7952	0.766292	1.988817	1081.258	0.999999	18.90817	4.109595	255
0.228884	0.868204	0.917354	0.988432	6.214944	32.43287	0.493327	1.54719	892.7263	0.999999	30.05444	5.274382	255
0.251695	0.870872	0.916995	0.987785	6.574997	34.07981	0.493035	1.551171	986.724	0.999999	28.97884	5.193589	255
0.241446	0.874995	0.917676	0.988033	6.510891	33.83567	0.491759	1.545428	972.3251	0.999999	29.14895	5.209569	255
0.1111	0.930548	0.901686	0.991277	6.393109	32.63793	0.63704	1.613746	838.2822	0.999999	34.73714	5.605247	255
0.111614	0.930291	0.901329	0.991252	6.409024	32.63916	0.639246	1.617624	838.3626	0.999999	34.50884	5.586759	255
0.127293	0.950309	0.845089	0.99011	11.40691	40.46762	0.956339	2.434467	1197.82	1	14.4063	3.530162	255
0.082635	0.902421	0.924298	0.992339	4.107259	23.22455	0.473717	1.683882	487.5527	0.999999	42.13338	6.157956	255
0.063614	0.951509	0.946317	0.996514	4.040896	27.44499	0.349547	1.08072	627.5545	0.999999	57.85932	7.35092	164
0.073253	0.922832	0.888541	0.990824	5.565621	26.05883	0.70259	2.094534	564.6594	0.999999	31.39038	5.236447	255
0.125076	0.951715	0.802723	0.988693	12.87526	41.95053	1.23135	2.960656	1297.607	1	14.14031	3.433508	255
0.12604	0.947876	0.827655	0.989935	11.41855	40.4819	1.083686	2.634032	1228.346	1	16.96693	3.793635	255
0.06959	0.913119	0.906341	0.992291	4.726405	23.95485	0.594281	1.925133	508.0299	0.999999	36.12103	5.638411	255
0.047325	0.983566	0.857611	0.996241	10.05677	42.54556	0.889535	2.225916	1359.119	0.999999	21.86205	4.449523	255
0.047839	0.982996	0.857425	0.99629	10.11278	42.13733	0.89053	2.228565	1334.778	0.999999	21.96358	4.44253	255
0.04739	0.983188	0.874975	0.996191	9.601893	41.50749	0.789435	2.078268	1342.852	0.999999	23.39803	4.596148	255
0.047614	0.982812	0.874737	0.99611	9.337093	41.14447	0.794097	2.078266	1317.469	0.999999	23.87897	4.660924	255
0.047807	0.982759	0.875609	0.996173	9.315584	41.02393	0.791448	2.063399	1310.847	0.999999	23.796	4.653555	255
0.048321	0.982494	0.87548	0.996004	9.27456	41.06087	0.788377	2.069857	1313.51	0.999999	24.04867	4.680013	255
0.046201	0.983402	0.875326	0.996195	9.364965	41.2159	0.789803	2.07325	1322.759	0.999999	23.83862	4.656141	255
0.047614	0.9829	0.875147	0.99611	9.371131	41.22356	0.790707	2.074789	1323.73	0.999999	23.8208	4.654162	255
0.049863	0.982173	0.876424	0.996078	9.476971	41.30057	0.778735	2.061949	1332.72	0.999999	23.73741	4.633132	255
0.04212	0.983714	0.885843	0.996433	8.488085	39.42968	0.732948	1.916319	1226.356	0.999999	26.33578	4.913488	255
0.041189	0.983878	0.885783	0.996595	8.305611	39.3428	0.732164	1.900507	1218.686	0.999999	26.74002	4.965845	255
0.040996	0.984068	0.884626	0.99662	8.396139	39.48802	0.740679	1.913395	1224.773	0.999999	26.42015	4.933329	255
0.051373	0.979049	0.899524	0.996304	7.753872	37.81397	0.650309	1.716274	1143.597	0.999999	29.1449	5.176127	255
0.050699	0.979253	0.899282	0.996426	7.842096	38.0202	0.644981	1.72241	1156.252	0.999999	29.18428	5.168706	255
0.051759	0.979095	0.899551	0.996254	7.736635	38.0557	0.645366	1.717141	1158.002	0.999999	29.39506	5.207527	255
0.049253	0.979538	0.898556	0.996415	7.601275	37.66662	0.660308	1.729058	1132.253	0.999999	29.49747	5.224904	255
0.050506	0.979308	0.899197	0.996395	7.847259	38.03256	0.645135	1.725161	1157.138	0.999999	29.17847	5.167849	255
0.043052	0.983208	0.888717	0.996828	8.585733	39.24613	0.710206	1.87115	1214.383	0.999999	25.69079	4.841669	255
0.042956	0.983141	0.889421	0.996876	8.520997	39.07581	0.706138	1.861806	1204.822	0.999999	25.83671	4.856661	255
0.042763	0.983284	0.88921	0.996901	8.557339	39.19163	0.707226	1.865808	1211.812	0.999999	25.78913	4.851331	255
0.055133	0.978036	0.891824	0.996529	8.413168	39.06186	0.690217	1.80934	1197.931	0.999999	26.70495	4.934194	255
0.055357	0.978529	0.89148	0.99656	8.465659	39.32315	0.690988	1.813389	1214.003	0.999999	26.52594	4.923386	255
0.054618	0.978567	0.892512	0.996627	8.381189	39.08787	0.685832	1.801398	1200.474	0.999999	26.76113	4.945391	255
0.060337	0.975299	0.907278	0.996286	7.513205	37.20545	0.589726	1.626286	1119.125	0.999999	29.9603	5.241339	255
0.061687	0.975717	0.90634	0.996313	7.635723	37.62766	0.593743	1.63966	1143.615	0.999999	29.5324	5.206316	255
0.065896	0.974516	0.906124	0.996282	7.819296	38.05947	0.584923	1.638044	1171.104	0.999999	28.90315	5.135746	255

0.12604	0.947876	0.827655	0.989935	11.41855	40.4819	1.083686	2.634032	1228.346	1	16.96693	3.793635	255
0.06959	0.913119	0.906341	0.992291	4.726405	23.95485	0.594281	1.925133	508.0299	0.999999	36.12103	5.638411	255
0.088032	0.941128	0.851739	0.991187	8.325509	32.75856	0.929513	2.467487	798.9453	0.999999	21.87019	4.329176	255
0.103261	0.90138	0.910184	0.99186	5.137888	26.23197	0.565908	1.896065	621.0962	0.999999	34.12187	5.514556	255
0.059984	0.878962	0.945389	0.993559	2.582667	17.86064	0.353575	1.197169	287.332	0.999998	65.66459	7.712652	255
0.096739	0.882889	0.932039	0.992629	3.769195	23.04224	0.439951	1.446153	479.5546	0.999999	48.74161	6.658708	255
0.093237	0.918982	0.905809	0.992413	5.312693	28.10578	0.612286	1.571023	642.4881	0.999999	37.65949	5.837407	255
0.113831	0.922973	0.903309	0.990164	6.284005	30.42049	0.603031	1.71935	759.9693	0.999999	28.70644	5.081346	255
0.129365	0.908077	0.901806	0.991024	6.007968	29.98724	0.637041	1.745446	735.7892	0.999999	32.55335	5.405962	255
0.081735	0.910758	0.894082	0.991936	5.172379	26.41842	0.688083	2.01234	613.0498	0.999999	36.44295	5.705545	255
0.096321	0.900519	0.898825	0.990858	5.134608	25.56743	0.645641	1.778606	525.8557	0.999999	34.17503	5.501641	255
0.0471	0.970312	0.926593	0.996299	5.3708	30.96173	0.493391	1.2108	729.6207	0.999999	42.03441	6.228905	255
0.09253	0.924119	0.910325	0.992689	5.576955	27.9893	0.562441	1.584639	612.1716	0.999999	32.29989	5.369594	255
0.109237	0.906805	0.922282	0.993557	5.016997	27.23289	0.49454	1.398394	583.1657	0.999999	37.54822	5.814019	255
0.098892	0.912281	0.90814	0.992289	5.491141	27.39523	0.575357	1.591811	573.611	0.999999	32.52044	5.376906	255
0.097285	0.935576	0.896199	0.992845	6.751493	30.45995	0.652302	1.812361	745.0796	0.999999	24.56794	4.679092	255
0.126715	0.939044	0.877231	0.993243	8.939872	36.2074	0.769818	2.072937	1033.026	0.999999	18.87894	4.091118	255
0.085912	0.943561	0.893098	0.992956	6.972987	31.19781	0.6778	1.811779	766.5351	0.999999	25.02332	4.704057	255
0.096546	0.943271	0.892963	0.993484	7.35112	32.66622	0.680993	1.815483	839.9716	0.999999	24.0722	4.624653	255
0.08045	0.864307	0.935432	0.992014	3.120464	20.10162	0.405683	1.608934	378.3294	0.999998	57.02666	7.186665	255
0.055261	0.874604	0.940986	0.993116	2.564987	17.73806	0.370694	1.437159	290.8015	0.999998	66.10129	7.763438	255
0.049574	0.983397	0.834164	0.994982	11.55695	44.23133	1.065909	2.590324	1459.502	1	18.36632	4.038818	255
0.134747	0.940941	0.891031	0.990364	8.493008	36.73668	0.672682	1.872403	1121.889	0.999999	20.11941	4.282279	255
0.092241	0.882601	0.919387	0.991587	4.202048	22.45351	0.503343	1.539236	427.8993	0.999999	36.63861	5.71579	255
0.092627	0.883734	0.919833	0.992011	4.297595	22.88895	0.500165	1.50788	433.8269	0.999999	35.44012	5.639091	255
0.083759	0.896787	0.938693	0.993034	3.512107	22.2897	0.399516	1.343394	452.4032	0.999998	52.93371	6.928291	255

Figure 4 Show the features computed for each Prunus_armeniaca (Normal and Defects).



A



B

Figure 5 Show the result testing
(A) Normal
(B) defect

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