**Homework 1:**

**Application of Clustering on digital   
image processing**

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Clustering is an interesting part of Unsupervised Learning paradigm. The goal of Image Clustering is to find a mapping of the archive images into classes (clusters) such that the set of classes provide essentially the same information about the image archive as the entire image-set collection. Color based image segmentation is a widely used image clustering application and it gives a high discriminative power of the regions present in the image. In color based image segmentation, homogeneous regions presented in the image will be found and later these regions will be classified. Color segmentation of image is a crucial operation in image analysis and in many computer vision, image interpretation, and pattern recognition system, with applications in scientific and industrial fields such as medicine, Remote Sensing, Microscopy, content-based image and video retrieval, document analysis, industrial automation and quality control.

**K- Means Clustering Algorithm**

K-Means is used to determine the natural spectral groupings presented in the dataset. This accepts from analyst the number of clusters to be located in the data. The algorithm then arbitrarily locates, that number of cluster centers in multidimensional measurement space. Each pixel in the image is then assigned to the cluster whose arbitrary mean vector is closest. The procedure continues until there is no significant change in the location of class mean vectors between successive iterations of the algorithm.

* Step 1: chose the initial cluster centers
* Step 2: At *k*th iteration, distribute the samples {**x**} among the *c* cluster domains:

if

* Step 3: Update the cluster centers

* Step 4: If , then stop the algorithm, otherwise go to Step 2.

**Source code description**

**Step 1: Read Image**

IM = imread('Image1.jpg');

figure('color','w')

subplot(1,3,1), imshow(IM);

set(get(gca,'Title'),'String','Original');

**Step 2: Convert Image from RGB Color Space to L\*a\*b\* Color Space**

cform = makecform('srgb2lab');

**Step 3: Classify the Colors in 'a\*b\*' Space Using K-Means Clustering**

img = double(lab\_IM(:,:,2:3));

nColors = 2;

% repeat the clustering 3 times to avoid local minima

[cluster\_idx, cluster\_center] = kmeans(img,nColors,'distance','sqEuclidean', ...

'Replicates',3);

* For every object in the input, kmeans returns an index, or a label, corresponding to a cluster. Label every pixel in the image with its pixel label.

pixel\_labels = reshape(cluster\_idx,nrows,ncols);

clustered\_images = cell(1,2);

img\_label = repmat(pixel\_labels,[1 1 3]);

for k = 1:nColors

color = IM;

color(img\_label ~= k) = 0;

clustered\_images{k} = color;

end

**Step 4: Display the images**

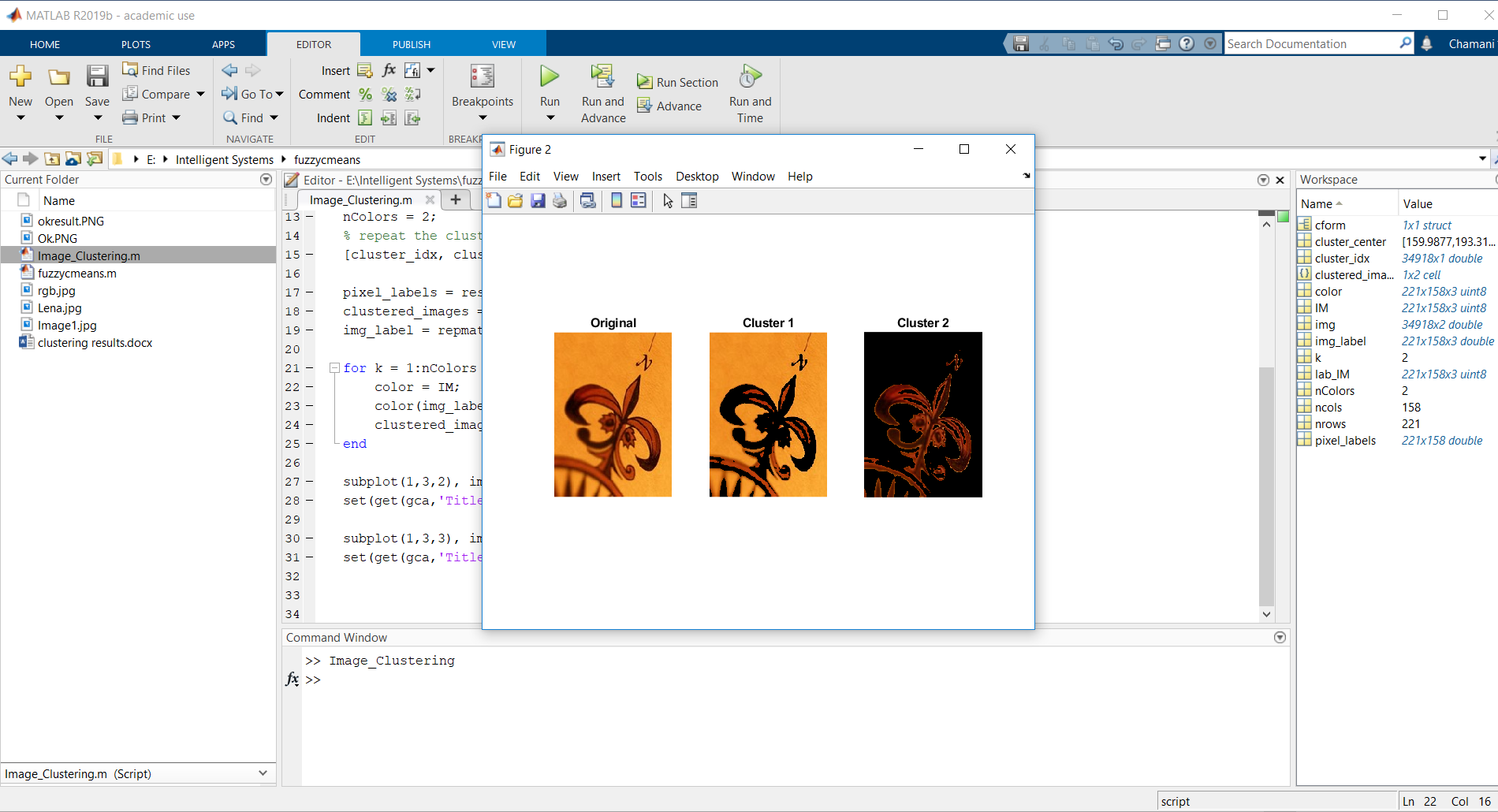
subplot(1,3,2), imshow(clustered\_images{1});

set(get(gca,'Title'),'String','Cluster 1');

subplot(1,3,3), imshow(clustered\_images{2});

set(get(gca,'Title'),'String','Cluster 2');

**Results**

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