Term Project

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Digital Image Processing - Spring 2012

Cell Counting and Segmentation

input img = img1

```
% Clear all variable and close all figures.
close all; clear all;

% Read in all the images.
img1 = imread('cell1.jpg');
img2 = imread('cell2.jpg'); img2(:, :, 3) = 0;
img3 = imread('cell3.jpg');

% Choose an Image to work with in graycale.
original = img1;
img = rgb2gray(img1);
img = adapthisteq(img);
figure; imagesc(img); title('Original Image');

% Perform Anisotropic Diffusion @50 iterations and k = 2;
img = anisotropic_diffusion(img, 50, 2);
figure; imagesc(img); title('The Image after Anisotropic Diffusion');

%perform full-contrast histogram stretch
img = imadjust(img); img = adapthisteq(img);
% Reshape to a linear array of intensity in order to perform a K-means.
intns = double(reshape(img, [size(img,1)*size(img,2), 1]));

% Perform K-Means Clustering
[cluster_idx cluster_center] = kmeans(intns,3);
label_mat =  reshape(cluster_idx, [768 1024]);
figure; imagesc(label_mat); title('The Label Matrix following k-means Clustering');
colorbar;

% Choose the desired label form the label matrix.
segments = label_mat == 3;
figure; imagesc(segments);

% Extract the boundaries of the segments (Moore-Neighbor).
B = bwboundaries(segments);
figure; imagesc(original); title('Original Image with Overlaid Segmentation');

hold on;
cell_count = 0;             % Initialize a count of cells.
for k = 1:length(B)

    % Extract the boundary.
    boundary = B{k};

    % Find the perimeter...threshold based on this.
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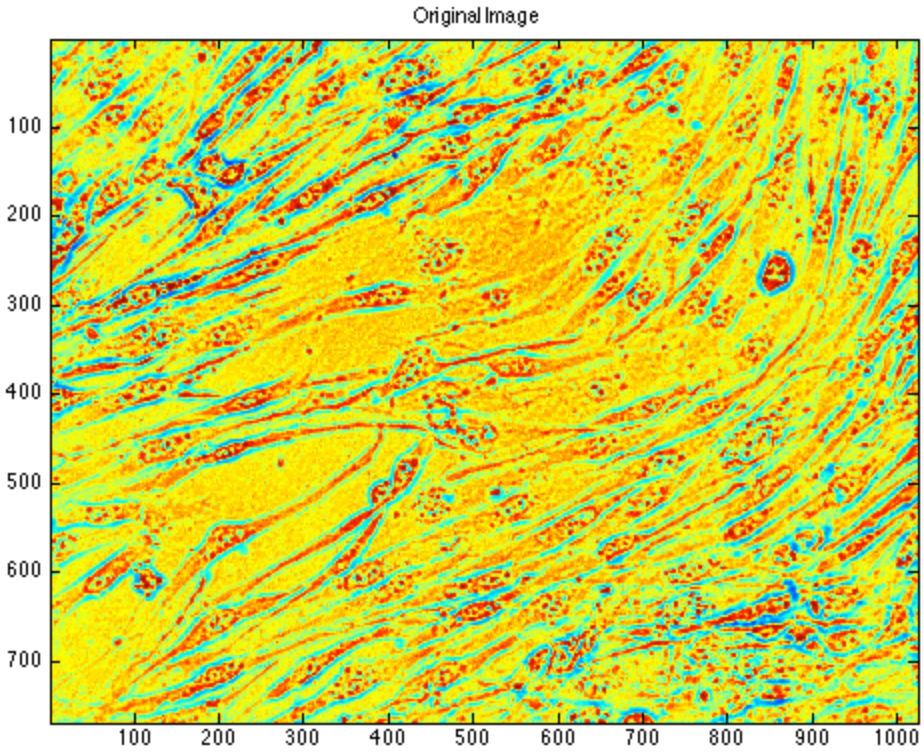
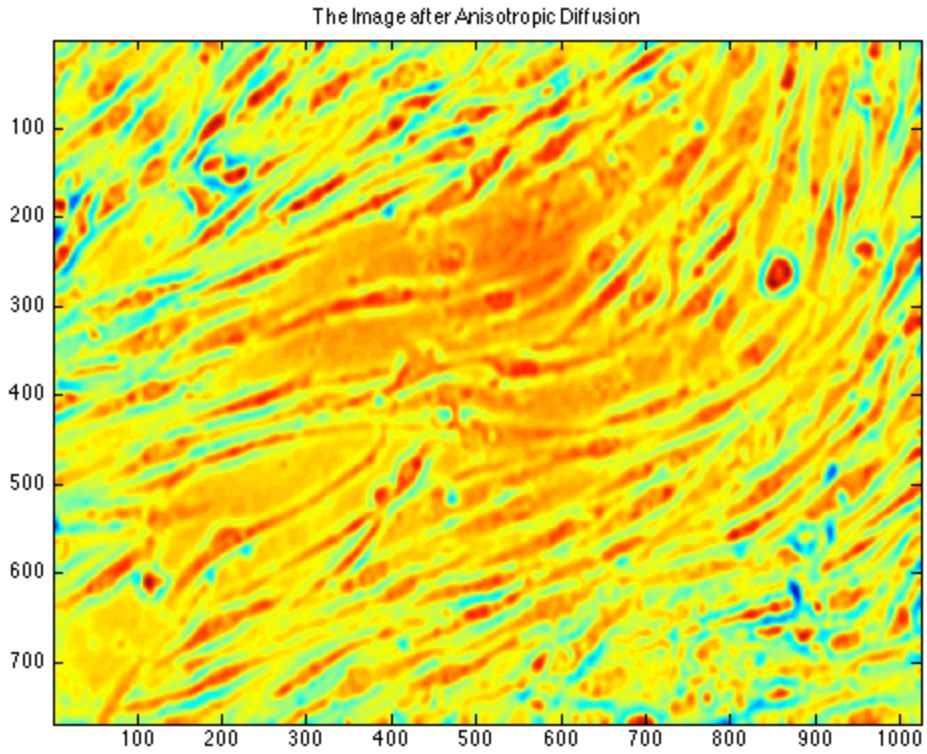
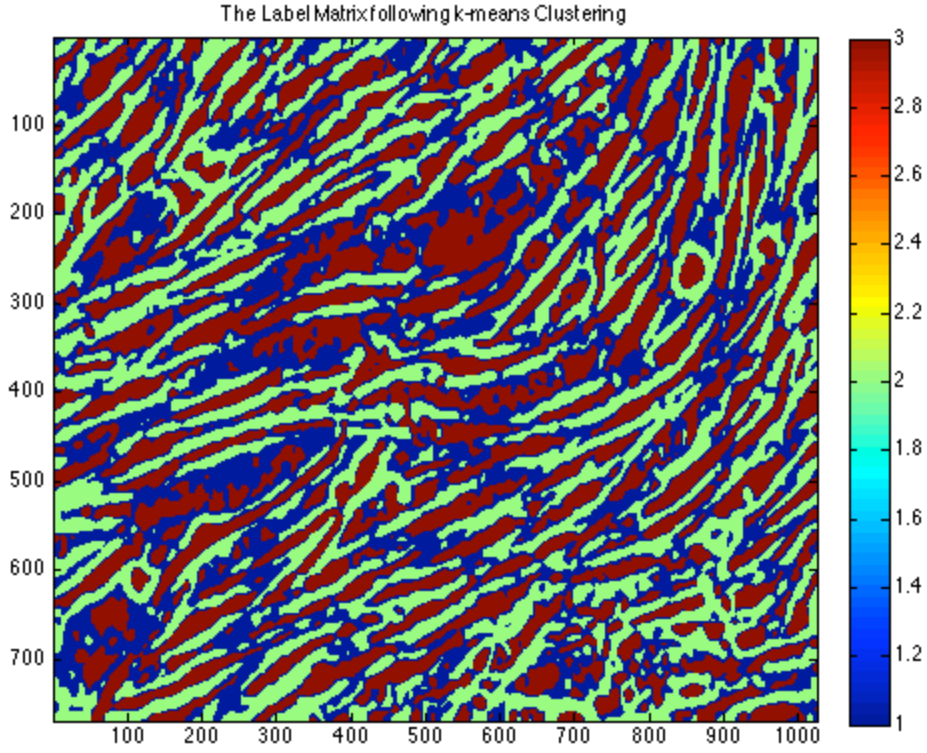
```
    perim(k) = length(boundary);

    % Set a perimeter threshold and draw the boundary if it's met.
    if (perim(k) > 100)
        cell_count = cell_count + 1;
        % Show the final segmentation on the original image.
        plot(boundary(:, 2), boundary(:,1), 'w');
    end

end
title(['Final Segmentation with ' num2str(cell_count) ' cells.']);
```




The Image after Anisotropic Diffusion
100
200
300
400
500
600
700
100
200
300
400
500
600
700
800
900
1000


The Label Matrix following k-means Clustering
100
200
300
400
500
600
700
100
200
300
400
500
600
700
800
900
1000
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1