NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS

School of Science

Information Technologies in Medicine and Biology

Direction: ***Bioinformatics***

Image Processing and Analysis

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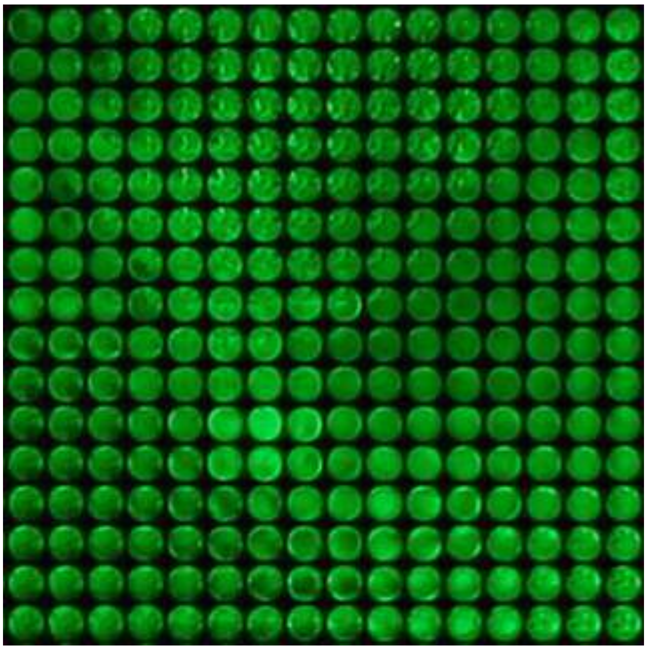
Deadline Date: 24*/05/2013*

Assignment 6

Task 1 & 2

In a lot of applications, the images in which we have to track the edges are colored, but the color of the pixels is relevant to all the pixels. For example in the following picture, received by a fluorescent microscope there exist except for the black color a lot of green shades.



So, in this task of this assignment we were asked to implement a program which will use only the green component of the RGB colors instead of the mean value of these three colors, in order to construct the greyscale image.

In this way we can achieve a grey scale image with a much greater variation (greater contrast) than that of the mean value. An even better approach is the application of the

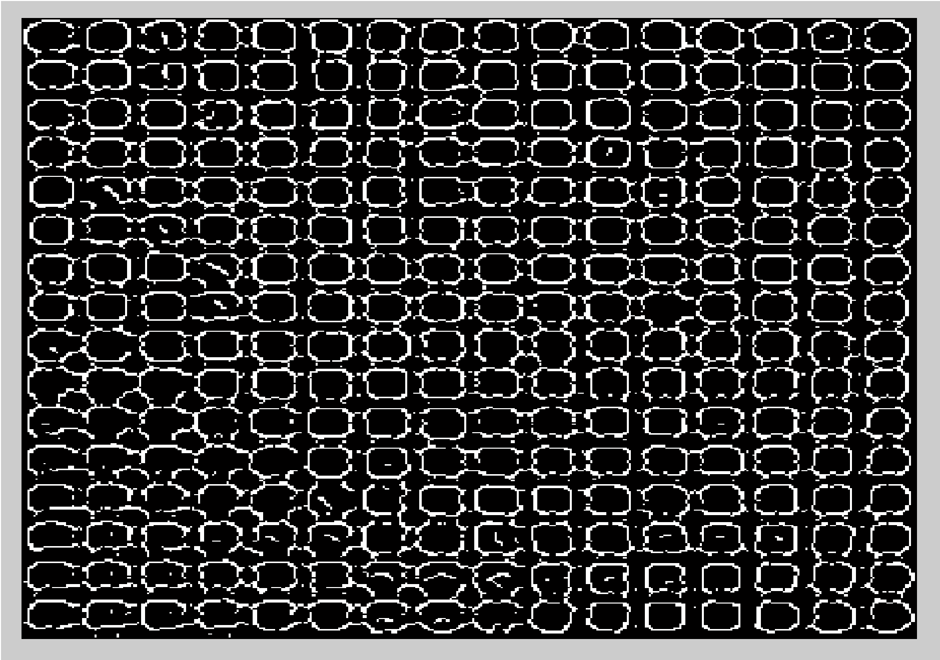
Karhunen-Loéve Transformation (KLT), known as **Principal Component Analysis (PCA)** in **RGB** field. The examination of the eigenvalues that occur and the usage as a grey scale instance of the image with the greater eigenvalue or the mean value of 2 of the instances which have the greatest eigenvalues, when they have a split ratio bigger than 10. The results occurred from the two implementations we made are as follow:

6A)

In this task we used the Canny formula for identifying the edges with a discrete computation of the edges in each color. The output image is the following:

6B)

Given the E2 image we computed the covariation matrix of the colors and even the eigenvalues and eigenvectors of the matrix. Doing the computations in the order presented in the **Appendix** code segment the resulted image is that shown below:



Appendix

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%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%
%% Author: Begetis Nikolaos - Postgraduate Student - Bioinformatics,
ITMB
%% Supervisor: Sangriotis Manolis - Professor - ITMB
%% Course: Image Processing and Analysis
%% Filename: nbegetis_6A.m
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%

function[] = nbegetis_6A()
    clear *;clc;close all;
    I  =double( imread('E1.jpg')); % Input Image from image file

    R=I(:,:,1);
    BW1 = edge(R,'canny',[0.1,0.2], 2.7); % Apply Canny for colour
red
    G=I(:,:,2);
    BW2 = edge(G,'canny',[0.1,0.2], 2.7); %  Apply Canny for colour
green

    B=I(:,:,3);
```

```
    BW3 = edge(B,'canny',[0.1,0.2], 2.7); %  Apply Canny for colour
blue

    S=BW1+BW2+BW3; %sum the above computations
    imshow(S);
end



%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%
%% Author: Begetis Nikolaos - Postgraduate Student - Bioinformatics,
ITMB
%% Supervisor: Sangriotis Manolis - Professor - ITMB
%% Course: Image Processing and Analysis
%% Filename: nbegetis_6B.m
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%

function[] = nbegetis_6B()
    clear *;,clc;,close all;
    I  =double( imread('E2.bmp')); % Input Image from image file

    %computation of the mean value
    pmeso=[mean2(I(:,:,1));mean2(I(:,:,2));mean2(I(:,:,3))];

    % # of x rows and y columns
    x=size(I,1);
    y=size(I,2);
    N=x*y   % image pixels

    Cp=0;
    for i=1:x
        for j=1:y
            p_i=[I(i,j,1);I(i,j,2);I(i,j,3)];
            Cp=Cp+(p_i-pmeso)*(p_i-pmeso)';
        end
    end
    Cov=Cp*(1/N);    % covarience computation

    % eigenvalues and eigenvectors
    [V,D]=eig(Cov);

    maxeig=max(D(:))    %   max eigenvalue

     for i=1:x
       for j=1:y
           p_i=[I(i,j,1);I(i,j,2);I(i,j,3)];
           p_v(i,j)=p_i'*V(:,3); %pixel multiplication with its
relevant max eigenvector
       end
    end

    %Canny
    BW1 = edge(p_v,'canny',[0.1,0.2], 2.7);

    imshow (BW1);
end
```