Digital Image Processing

Project Report

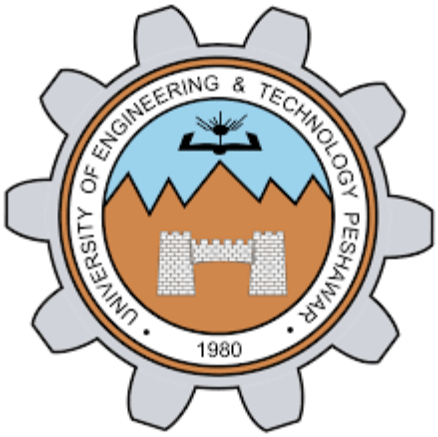
(Processing Fundus Images)

SUBMITTED BY:

SYED MUHAMMAD USMAN (16PWCSE1444)

SUBMITTED TO:

DR. AFTAB KHAN



Department of Computer System Engineering

UET, Peshawar

Objective: 1. To demonstrate your ability in constructing an image processing algorithm for a complex real life problem.

Your goal is to read the retinal fundus image, generate the mask of the Region of Interest (ROI), extract the vessels, locate the center of the optic disk (put a cross on the center when located) and trace around the boundary of the optic disk.

ORIGINAL IMAGE

REGION OF INTEREST (ROI)

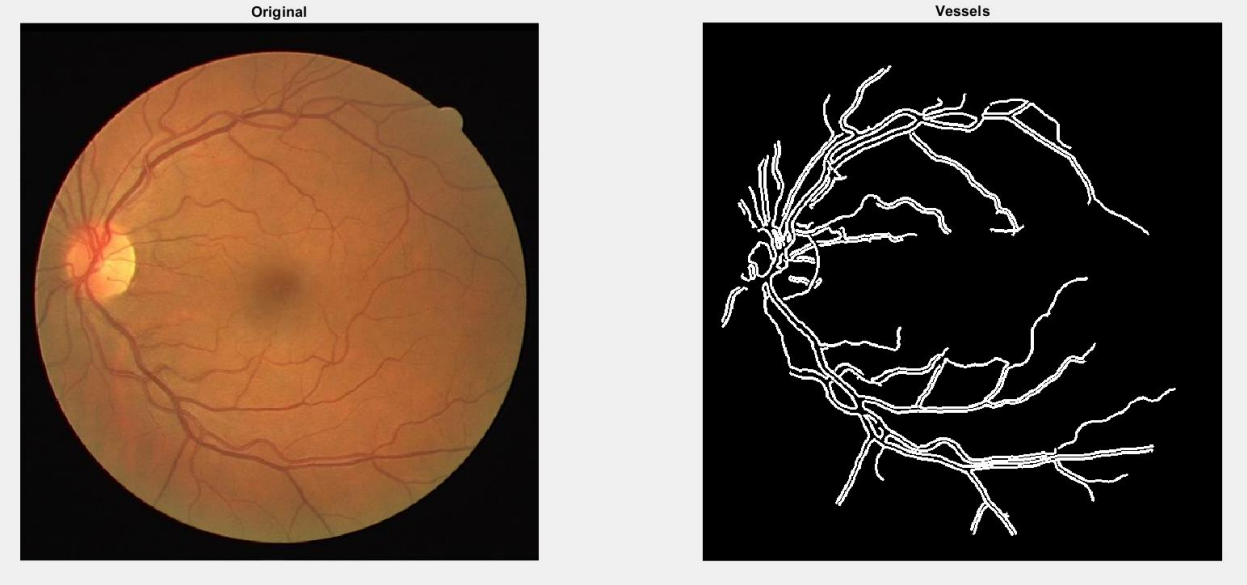
Region of Interest (ROI) is found by thresholding the image a level of 0.1.

```
%Loading the orignal image
img=imread('fundus images jpeg/A (1).jpg');
imgbw=im2bw(img,0.1); %pixels greater than level 0.1 changed to white
subplot(1,2,1)
imshow(img)
title('Original')
subplot(1,2,2)
imshow(imgbw)
title('Image Mask using thresholding')
```

EXTRACT THE VESSELS

Sobel and Canny filter are used to identify the edges in the image, which gives us the vessels along with other features. The boundary of the retina is also made prominent when sobel operator is applied. We apply sobel operator on the ROI and take out the difference of 'images with all edges' with 'image with retina boundary'. This way we are able to take out the vessels. The result is then dilates with a disk of size 1.

```
img=imread('fundus images jpeg/A (1).jpg');
img1=rgb2gray(img);
img1=im2double(img1);
[rows,cols]=size(img1);
% Power law transformation
for i=1:rows
    for j=1:cols
        temp=img1(i,j);
        newimg(i,j)=(temp^6.5);
    end
end
BW = im2bw(newimg, max(img1(:))/25);
se = strel('disk',2);
eroded = imerode(BW,se);
% imshowpair(img, eroded, 'montage')
C = corner(eroded);
figure,imshow(img)
hold on
%plot(C(:,1),C(:,2),'*');
centre=mean(C)
plot(centre(:,1),centre(:,2),'b*');
```



LOCATE THE CENTER OF THE OPTIC DISK

We take the original image and convert is to grayscale. We apply power law transformation, this enhance the white and diminishes the dark pixels. We then convert the image to binary form, this way we are able to separate optical disk with rest of the portion of the image, as the optical disk is brighter then rest of the image. We then find the corners of the optical disk and by taking mean of the corner points we get the center point.

```
img=imread('fundus images jpeg/A (1).jpg');
img1=rgb2gray(img);
img1=im2double(img1);
[rows,cols]=size(img1);
% Power law transformation
for i=1:rows
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        temp=img1(i,j);
        newimg(i,j)=(temp^6.5);
    end
end
BW = im2bw(newimg, max(img1(:))/25);
se = strel('disk',2);
eroded = imerode(BW,se);
% imshowpair(img, eroded, 'montage')
C = corner(eroded);
figure,imshow(img)
hold on
%plot(C(:,1),C(:,2),'*');
centre=mean(C)
plot(centre(:,1),centre(:,2),'b*');
```

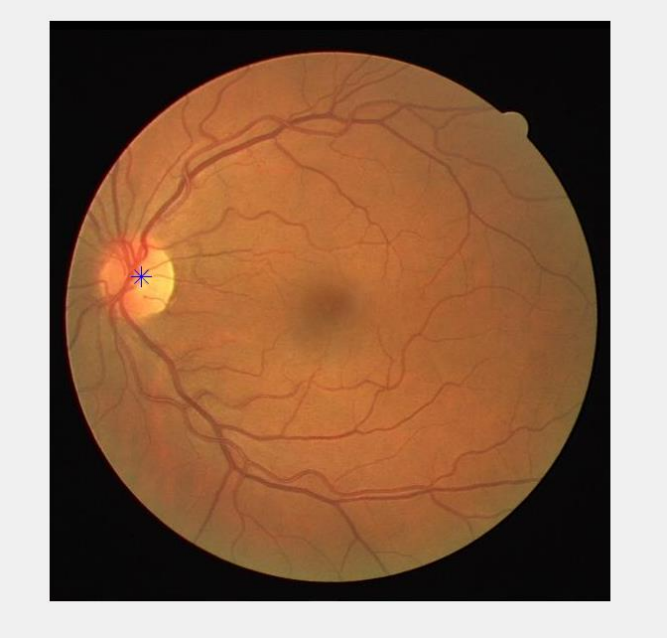

TRACE AROUND THE BOUNDARY OF THE OPTIC DISK

The process is similar to what we did above, but in this case we mark the corner points, signifying the boundary of the optic disk.

```
mg=imread('fundus images jpeg/A (1).jpg');
img1=rgb2gray(img);
img1=im2double(img1);
[rows,cols]=size(img1);
% Power law transformation
for i=1:rows
    for j=1:cols
        temp=img1(i,j);
        newimg(i,j)=(temp^6.5);
    end
end
BW = im2bw(newimg, max(img1(:))/25);
se = strel('disk',2);
eroded = imerode(BW,se);
% imshowpair(img, eroded, 'montage')
C = corner(eroded);
figure,imshow(img)
hold on
plot(C(:,1),C(:,2),'*');
centre=mean(C);
plot(centre(:,1),centre(:,2),'b*');
```