**CSCE 590 Introduction to Image Processing**

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SUBJECT: Assignment 2

# Chart Description automatically generated with low confidenceMedial Axis (33.3%)

After converting the image to a binary image, I sub plotted its skeleton. I then was able to plot the boundary of the image and find out the points farthest from one another and plotted the medial Axis through these points. When sub plotting the images boundary the image seems to flip for some reason. Robustness to noise refers to an algorithms ability to maintain its integrity and performance when undergoing new variables. This may account for why the boundary becomes inverted in my fourth images. Also, robustness to noise may also account for why the medial axis for the Congaree.png may look unconventional.

Chart

Description automatically generated

# Two Image Operations (33.3%)

Graphical user interface, application, website

Description automatically generated

Graphical user interface

Description automatically generated

Graphical user interface, website

Description automatically generated

Graphical user interface

Description automatically generated

I used these images to gather a familiarity with single image operations. After experimenting with these images, I felt it was necessary to acquire different images that would better represent the usefulness of these tools when combining two separate images as demonstrated below. I used a foreground and background image to allow for a smooth combination in the two images.

Graphical user interface, website

Description automatically generated

A picture containing text, outdoor object, star, night sky

Description automatically generated

A picture containing text, outdoor object, night sky, star

Description automatically generated

Once the second image was resized to match the first image, I noticed when first combining the two images that the ‘purpleGalaxy’ image’s colors were too bright and negatively affected the new image. I reduced the intensity of the images color by subtracting a Scalar from the original image. This allowed for a better combination of the two images and is more appealing to the eye than the original.

# Graphical user interface Description automatically generatedImage Transformations (33.3%)

**A picture containing shape

Description automatically generated**

**A picture containing company name

Description automatically generated**

**Code:**

**1.**

BW = imread("Congaree.png");

subplot(2, 2, 1);

imshow(BW, []);

title('Original Image');

gray = BW;

level = graythresh(gray);

binaryImage = im2bw(gray, level);

BWS = bwmorph(binaryImage,'skel',Inf);

subplot(2,2,2)

imshow(BWS)

title('Skeleton');

axis on;

subplot(2, 2, 3);

imshow(BW, []);

title('Image with Axis');

axis on;

subplot(2, 2, 4);

imshow(BW, []);

title('Boundaries with Axis');

axis on;

boundaries = bwboundaries(binaryImage);

numberOfBoundaries = size(boundaries, 2);

for Idx = 1 : numberOfBoundaries

thisBoundary = boundaries{Idx};

x = thisBoundary(:, 2);

y = thisBoundary(:, 1);

maxDistance = -inf;

for k = 1 : length(x)

distances = sqrt( (x(k) - x) .^ 2 + (y(k) - y) .^ 2 );

[thisMaxDistance, indexOfMaxDistance] = max(distances);

if thisMaxDistance > maxDistance

maxDistance = thisMaxDistance;

index1 = k;

index2 = indexOfMaxDistance;

end

end

subplot(2, 2, 3);

line([x(index1), x(index2)], [y(index1), y(index2)], 'Color', 'r', 'LineWidth', 3);

line([cx(firstIndex), cx(lastIndex)], [cy(firstIndex), cy(lastIndex)], 'Color', 'm', 'LineWidth', 3);

subplot(2, 2, 4);

plot(x, y, 'y-', 'LineWidth', 3);

line([x(index1), x(index2)], [y(index1), y(index2)], 'Color', 'r', 'LineWidth', 3);

line([cx(firstIndex), cx(lastIndex)], [cy(firstIndex), cy(lastIndex)], 'Color', 'm', 'LineWidth', 3);

end

**2.**

img = imread("pumpkin.jpg");

subplot(2,2,1)

imshow(img);

title('Original Image');

blurImg = imgaussfilt(img,8);

subplot(2,2,2)

imshow(blurImg);

title('Blurred Image');

img1 = imadd(img,100);

subplot(2,2,3)

imshow(img1)

title('Added Scalar');

img2 = imsubtract(img,130)

subplot(2,2,4)

imshow(img2)

title('Subtracted Scalar');

img = imread("pumpkin.jpg");

subplot(2,2,1)

imshow(img);

title('Original Image');

img3 = immultiply(img, 50)

subplot(2,2,2)

imshow(img3)

title('Multiply Scalar');

img4 = imdivide(img, 50)

subplot(2,2,3)

imshow(img4)

title('Divide Scalar');

img5 = imcompliment(img)

subplot(2,2,4)

imshow(img5)

title('Compliment Image');

A = imread('mountains.jpg');

subplot(2,2,1);

imshow(A);

title('First Image');

b=size(A);

B = imread('purpleGalaxy.jpg');

B=imresize(B,[b(1),b(2)]);

subplot(2,2,2);

imshow(B);

title('Second Image Resized');

subplot(2,2,3);

imshow(img2);

title('Second Image Resized with reduced Scalar');

for i = 1:b(1)

for j = 1:b(2)

for k=1:3

output(i,j,k)=(A(i,j,k)+img2(i,j,k));

end

end

end

subplot(2,2,4);

imshow(output);

title('Combined Images');

3.

I = imread('lighthouse.jpg');

subplot(2,2,1);

imshow(I)

A = imrotate(I,20);

tform2 = randomAffine2d('Rotation',[-45 10]);

A2 = imwarp(I,tform2);

subplot(2,2,2);

imshow(A);

subplot(2,2,3);

imshow(A2);

subplot(2,2,4);

imshowpair(A,A2);

A = imread("pumpkin.jpg");

subplot(2,2,1)

imshow(A);

title('Original Image');

R=rot90(A(:,:,1),1);

G=rot90(A(:,:,2),1);

B=rot90(A(:,:,3),1);

D(:,:,1)=rot90(A(:,:,1),1);

D(:,:,2)=rot90(A(:,:,2),1);

D(:,:,3)=rot90(A(:,:,3),1);

subplot(2,2,2)

imshow(D);

title('90 Degree Rotation');

A = imread("pumpkin.jpg");

subplot(2,2,1)

imshow(A);

title('Original Image');

R=rot90(A(:,:,1),1);

G=rot90(A(:,:,2),1);

B=rot90(A(:,:,3),1);

D(:,:,1)=rot90(A(:,:,1),1);

D(:,:,2)=rot90(A(:,:,2),1);

D(:,:,3)=rot90(A(:,:,3),1);

subplot(2,2,2)

imshow(D);

title('90 Degree Rotation');

theta = 30;

Img3 = imrotate(A,theta);

subplot(2,2,3)

imshow(Img3);

title('Vayring Theta angle');