Computer Vision Lab 2

Edges and contours

Authors: Jorge Alexander and Emer Rodriguez Formisano

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1. Determine the optimal edges

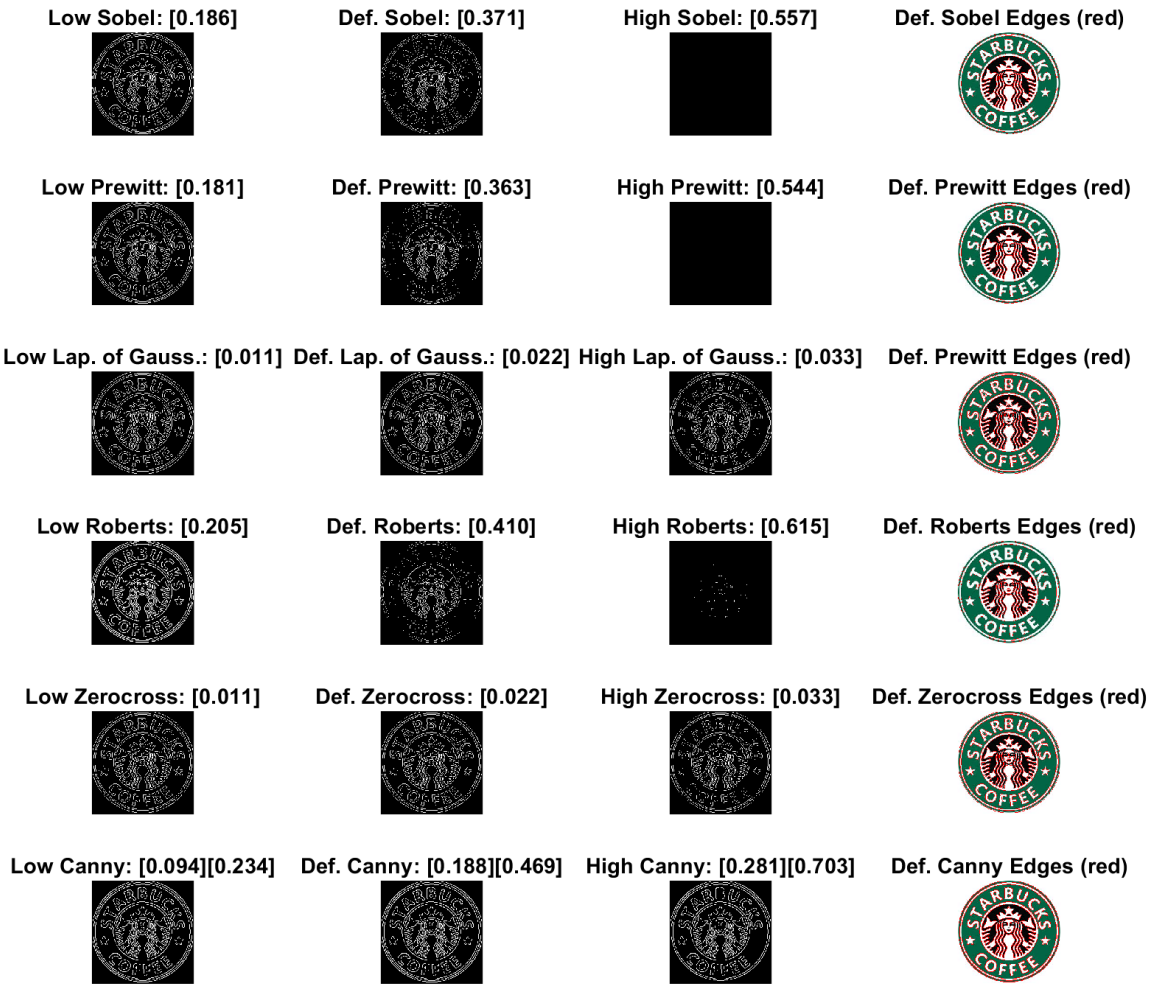
Create a file "exercise1.m" to implement the following steps:

- Read the image "starbuck.jpg" and find its edges using matlab function edge.
- Apply different operators (Sobel and Prewitt, Laplacian of Gaussian) and find the optimal parameters for each of them.
- Apply Canny edge detector (also implemented in the function edge).
- Overlap the edges on the image as shown in Fig.2 (right).
- Repeat the experiment on 3 other images.

Function showedges applies the previous points programatically for each imge and plot the results.
Here is applied to:

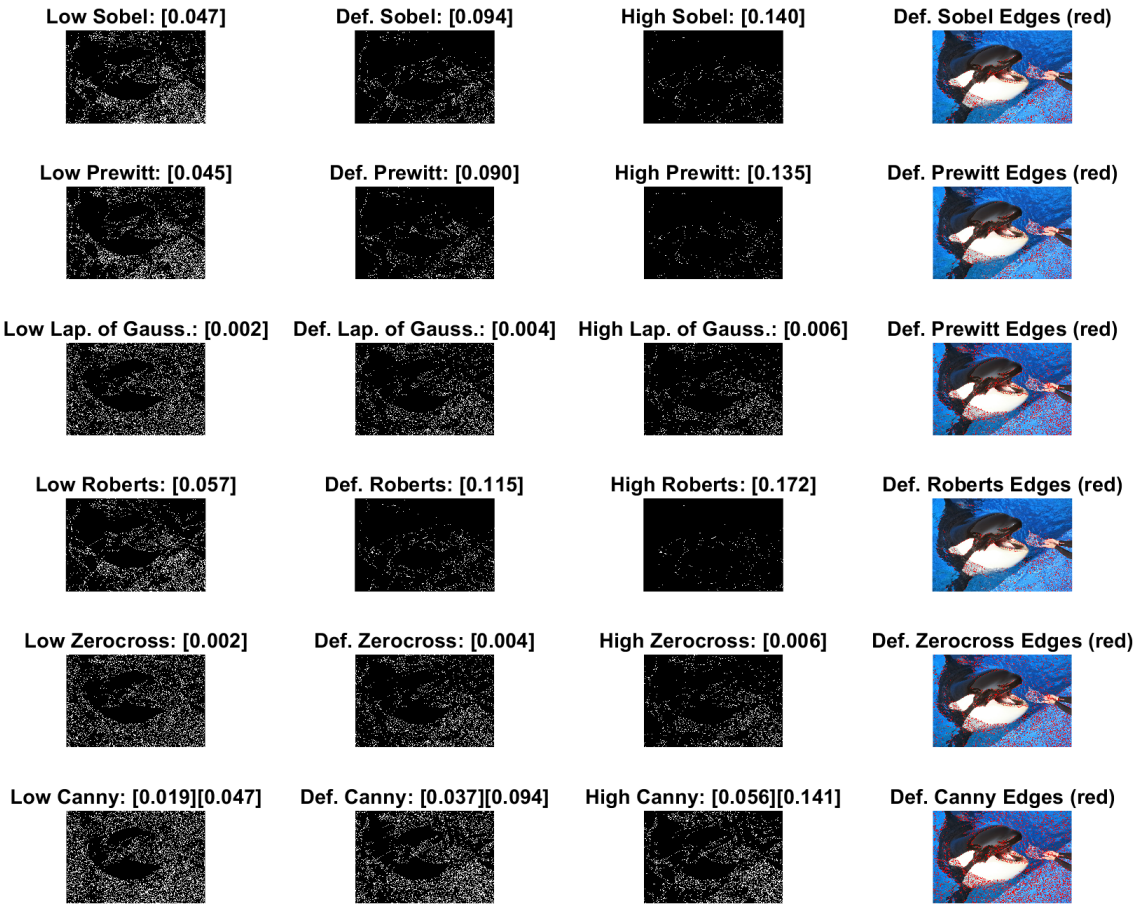
Starbucks

```
set(gcf,'Position',[0 0 1000 850]);
showedges('./images_video/starbuck.jpg')
```



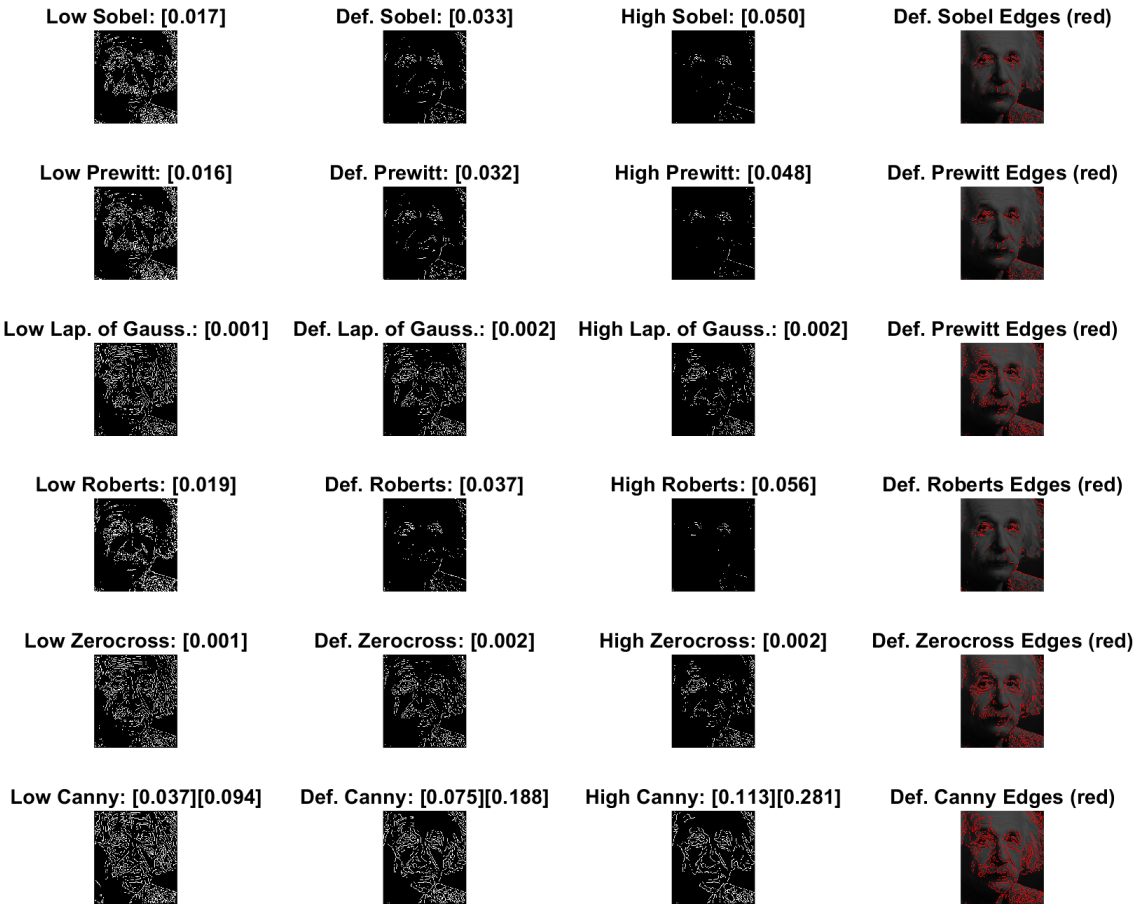
Doulphin

```
showedges('./images_video/Doulphin.jpg')
```



Einstein

```
showedges('./images_video/Einstein.jpg')
```



Answer the following questions in the report:

1. How many methods to obtain the edges of the image are implemented by the function edge?

2. Which is the best edge detector?

3. What are the advantages and disadvantages you see when extracting the edges on the different images?

4. Discuss if the parameters should be changed for the different images.

Defined Functions

```
function showedges(imageFilename)
%UNTITLED2 Summary of this function goes here
%   Detailed explanation goes here

    function overlapedImage = overlapedges(rgbImage, edges)
        redCh = rgbImage(:,:,1);
```

```
        greenCh = rgbImage(:,:,2);
        blueCh = rgbImage(:,:,3);
        redCh(edges) = 255;
        greenCh(edges) = 0;
        blueCh(edges) = 0;
        overlapedImage = cat(3, redCh, greenCh, blueCh);
    end

rawImage = imread(imageFilename);
if(ndims(rawImage)==2)
    ch = rawImage ./ 3;
    % Gray as RGB representation
    rawImage = cat(3, ch, ch, ch);
end
rawImageGray = rgb2gray(rawImage);

fixedThres = [];
multThres = [0.5, 1.5];
sigma = 2;
direction = 'both';
thinning = 'thinning';
% Sobel
[sobel, sobelThres] = edge(rawImageGray, 'Sobel', fixedThres, direction, thinning);
[sobelLow, sobelThresLow] = edge(rawImageGray, 'Sobel', sobelThres * multThres(1), direction,
[sobelHigh, sobelThresHigh] = edge(rawImageGray, 'Sobel', sobelThres * multThres(2), directio

% Prewitt
[prewitt, prewittThres] = edge(rawImageGray, 'Prewitt', fixedThres, direction, thinning);
[prewittLow, prewittThresLow] = edge(rawImageGray, 'Prewitt', prewittThres * multThres(1), di
[prewittHigh, prewittThresHigh] = edge(rawImageGray, 'Prewitt', prewittThres * multThres(2), 

% Lapacian of Gaussian
[log, logThres] = edge(rawImageGray, 'log', fixedThres, sigma);
[logLow, logThresLow] = edge(rawImageGray, 'log', logThres * multThres(1), sigma);
[logHigh, logThresHigh] = edge(rawImageGray, 'log', logThres * multThres(2), sigma);

% Roberts
[roberts, robertsThres]  = edge(rawImageGray, 'Roberts', fixedThres);
[robertsLow, robertsThresLow]  = edge(rawImageGray, 'Roberts', robertsThres * multThres(1));
[robertsHigh, robertsThresHigh]  = edge(rawImageGray, 'Roberts', robertsThres * multThres(2))

% ZeroCross
[zerocross, zerocrossThres] = edge(rawImageGray, 'zerocross', fixedThres);
[zerocrossLow, zerocrossThresLow] = edge(rawImageGray, 'zerocross', zerocrossThres * multThres
[zerocrossHigh, zerocrossThresHigh] = edge(rawImageGray, 'zerocross', zerocrossThres * multTh

% Canny
[canny, cannyThres] = edge(rawImageGray, 'Canny', fixedThres);
[cannyLow, cannyThresLow] = edge(rawImageGray, 'Canny', cannyThres * multThres(1));
[cannyHigh, cannyThresHigh] = edge(rawImageGray, 'Canny', cannyThres * multThres(2));

% Plots
subplot(6,4,1), imshow(sobelLow), title("Low Sobel: " + sprintf("[%.3f]",string(sobelThresLow)
```

```
subplot(6,4,2), imshow(sobel), title("Def. Sobel: " + sprintf("[%.3f]",string(sobelThres))),
subplot(6,4,3), imshow(sobelHigh), title("High Sobel: " + sprintf("[%.3f]",string(sobelThresH
subplot(6,4,4), imshow(overlapedges(rawImage, sobel)), title("Def. Sobel Edges (red)"), ...

subplot(6,4,5), imshow(prewittLow), title("Low Prewitt: " + sprintf("[%.3f]",string(prewittThr
subplot(6,4,6), imshow(prewitt), title("Def. Prewitt: " + sprintf("[%.3f]",string(prewittThres
subplot(6,4,7), imshow(prewittHigh), title("High Prewitt: " + sprintf("[%.3f]",string(prewitt
subplot(6,4,8), imshow(overlapedges(rawImage, prewitt)), title("Def. Prewitt Edges (red)"), .

subplot(6,4,9), imshow(logLow), title("Low Lap. of Gauss.: " + sprintf("[%.3f]",string(logThre
subplot(6,4,10), imshow(log), title("Def. Lap. of Gauss.: " + sprintf("[%.3f]",string(logThres
subplot(6,4,11), imshow(logHigh), title("High Lap. of Gauss.: " + sprintf("[%.3f]",string(log
subplot(6,4,12), imshow(overlapedges(rawImage, log)), title("Def. Prewitt Edges (red)"), ...

subplot(6,4,13), imshow(robertsLow), title("Low Roberts: " + sprintf("[%.3f]",string(robertsTh
subplot(6,4,14), imshow(roberts), title("Def. Roberts: " + sprintf("[%.3f]",string(robertsThre
subplot(6,4,15), imshow(robertsHigh), title("High Roberts: " + sprintf("[%.3f]",string(roberts
subplot(6,4,16), imshow(overlapedges(rawImage, roberts)), title("Def. Roberts Edges (red)"),

subplot(6,4,17), imshow(zerocrossLow), title("Low Zerocross: " + sprintf("[%.3f]",string(zeroc
subplot(6,4,18), imshow(zerocross), title("Def. Zerocross: " + sprintf("[%.3f]",string(zerocro
subplot(6,4,19), imshow(zerocrossHigh), title("High Zerocross: " + sprintf("[%.3f]",string(zer
subplot(6,4,20), imshow(overlapedges(rawImage, zerocross)), title("Def. Zerocross Edges (red)"

subplot(6,4,21), imshow(cannyLow), title("Low Canny: " + sprintf("[%.3f]",string(cannyThresLow
subplot(6,4,22), imshow(canny), title("Def. Canny: " + sprintf("[%.3f]",string(cannyThres))),
subplot(6,4,23), imshow(cannyHigh), title("High Canny: " + sprintf("[%.3f]",string(cannyThresH
subplot(6,4,24), imshow(overlapedges(rawImage, canny)), title("Def. Canny Edges (red)");

end
```