Computer Vision I

Tim Luchterhand, Paul Nykiel (Group 17)

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1 Histogram Calculation

1. Matlab-Funktion:

```matlab
function H = myHistogram(im)
    H = zeros(1,256);
    [width, height] = size(im);
    for x = 1:width
        for y = 1:height
            intensity = im(x,y);
            assert(intensity >= 0 & intensity <= 255, "Not
                all matrix elements are between 0 and 255");
            H(intensity+1) = H(intensity+1) + 1;
        end
    end
    H .*= 1/(width*height);
end
```

2. Generate the plots:

```matlab
% Read the images
fruitsA = imread('images/fruitsA.png');
fruitsB = imread('images/fruitsB.png');

% Calculate the histograms
histA = myHistogram(fruitsA);
histB = myHistogram(fruitsB);

% Plot the histograms
figure();

subplot(2,2,1);
```

```matlab
13  imshow(fruitsA);
14  title('fruitsA.png');
15
16  subplot(2,2,2);
17  b = bar(0:255, histA);
18  title('Histogramm for fruitsA.png');
19  xlabel('Intensity');
20  ylabel('Probability');
21
22  subplot(2,2,3);
23  imshow(fruitsB);
24  title('fruitsB.png');
25
26  subplot(2,2,4);
27  bar(0:255, histB);
28  title('Histogramm for fruitsB.png');
29  xlabel('Intensity');
30  ylabel('Probability');
31
32  print('Histograms','-depsc')
```

3.

Abbildung 1: Plot of the histograms

4. TODO

5.

Abbildung 2: Plot of the rows

2 Local weighting

1.
$$
\begin{pmatrix}
. & . & . & . \\
1 \cdot 1 + 1 \cdot 1 & 1 \cdot 1 & -1 \cdot 1 + -1 \cdot 1 + 1 \cdot 1 & . \\
. & . & . & . \\
. & . & . & .
\end{pmatrix}
=
\begin{pmatrix}
. & . & . & . \\
2 & 1 & -1 & . \\
. & . & . & . \\
. & . & . & .
\end{pmatrix}
$$

2. TODO

```matlab
3. lena = imread('images/lena.tif');
lenaNoise = imread('images/lenaNoise.tif');

B = ones(3,3) / 9;

subplot(2,2,1);
imshow(lena);
title('lena.tif');

subplot(2,2,2);
imshow(imfilter(lena,B));
title('Filtered lena.tif');

subplot(2,2,3);
imshow(lenaNoise);
title('lenaNoise.tif');

subplot(2,2,4);
imshow(imfilter(lenaNoise,B));
title('Filtered lenaNoise.tif');

print('BoxFilter', '-depsc');
```