

Course: Industrielle & Medizinische Bildverarbeitung
Institute: Salzburg University of Applied Sciences
Author: Niko Jozic
Department: Information Technology & System-Management

2.1.a

```
clc, clear variables, close all, format compact;

s = 1; % Sigma
ks = ceil(3*s)*2; % Kernel size

img = checkerboard(80,3,3);
img = double(img);
img = img > 0.5;

x = -(ks-1)/2:(ks-1)/2;

gauss = exp(-x.^2/(2*s^2));
gauss = gauss ./ sum(gauss);
gauss_x = (-x./(s^2)).*gauss;
gauss_y = gauss_x';

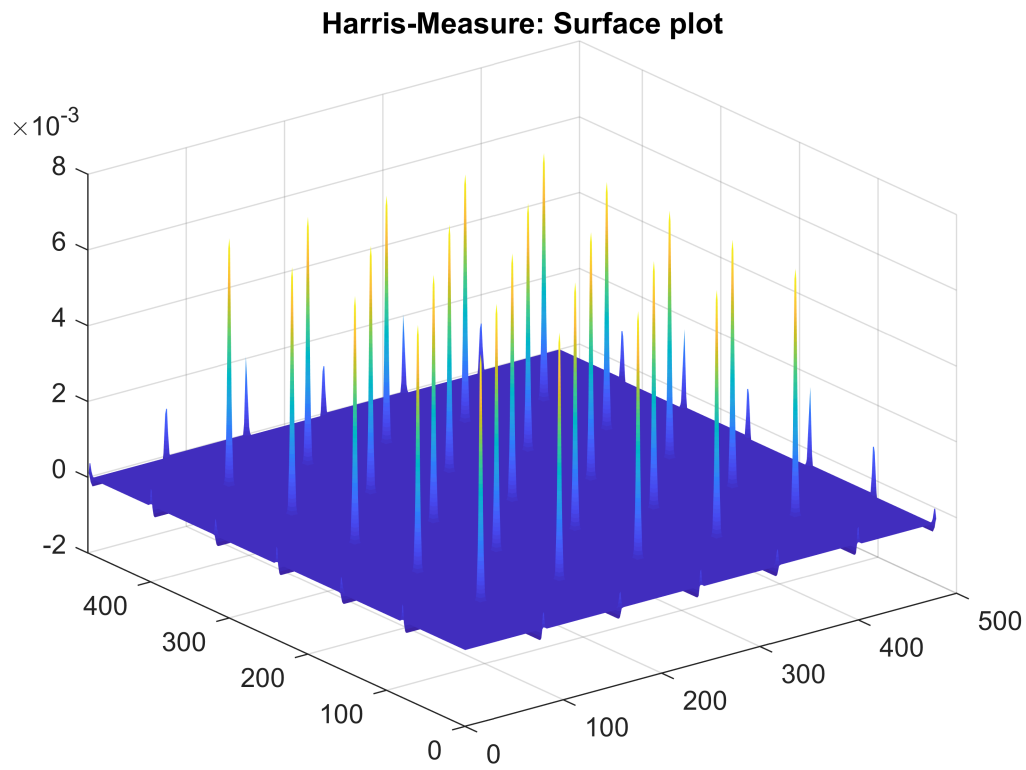
Ix = conv2(img, gauss_x, 'same');
Iy = conv2(img, gauss_y, 'same');

g = fspecial('gaussian', ks, s);

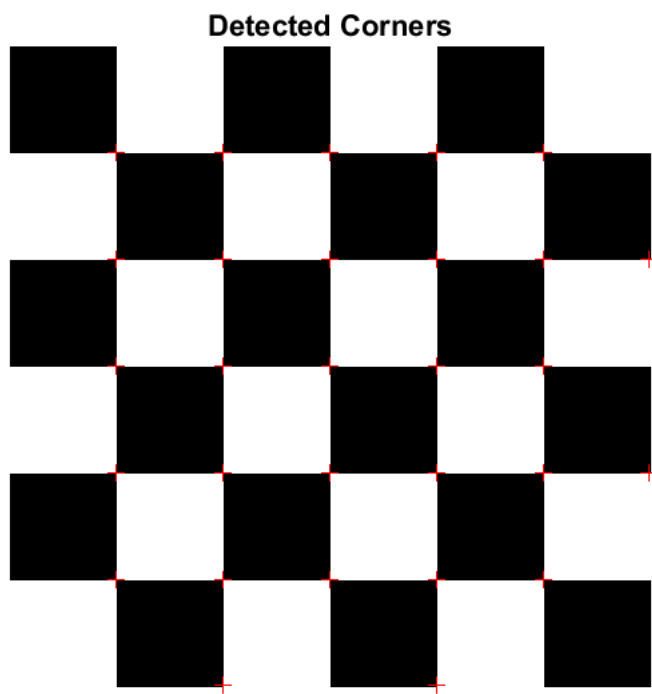
Sx = conv2(Ix.^2,g,'same');
Sy = conv2(Iy.^2,g,'same');
Sxy = conv2(Ix.*Iy,g,'same');

k = 0.04;
Harris = ((Sx.*Sy)-(Sxy.^2))-k*((Sx+Sy).^2);

figure;
surf(Harris); shading interp;
title('Harris-Measure: Surface plot');
```

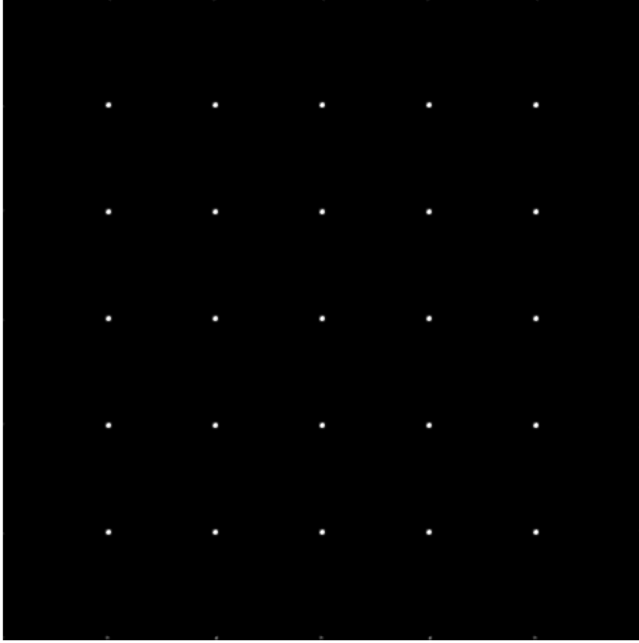


```
nonmaxsuppts(255 * mat2gray(Harris),1,80,img);  
title('Detected Corners')
```



```
figure
imshow(255 * Harris);
title('Harris-Measure: Without Non-Maximum suppression')
```

Harris-Measure: Without Non-Maximum suppression



2.1.b

```
clc, clear variables, close all, format compact;

s = 1; % Sigma
ks = ceil(3*s)*2; % Kernel size

img = imread('gantrycrane.png');
img = rgb2gray(img);
img = double(img);

x = -(ks-1)/2:(ks-1)/2;

gauss = exp(-x.^2/(2*s^2));
gauss = gauss ./ sum(gauss);
gauss_x = (-x./(s^2)).*gauss;
gauss_y = gauss_x';

Ix = conv2(img, gauss_x, 'same');
Iy = conv2(img, gauss_y, 'same');

g = fspecial('gaussian', ks, s);

Sx = conv2(Ix.^2, g, 'same');
Sy = conv2(Iy.^2, g, 'same');
```

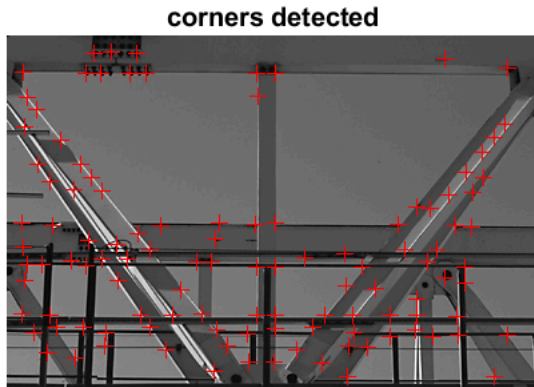
```

Sxy = conv2(Ix.*Iy,g,'same');

k = 0.04;
Harris = ((Sx.*Sy)-(Sxy.^2))-k*((Sx+Sy).^2);

nonmaxsuppts(Harris,8,35,img);

```



2.1.c

```

clc, clear variables, close all, format compact;

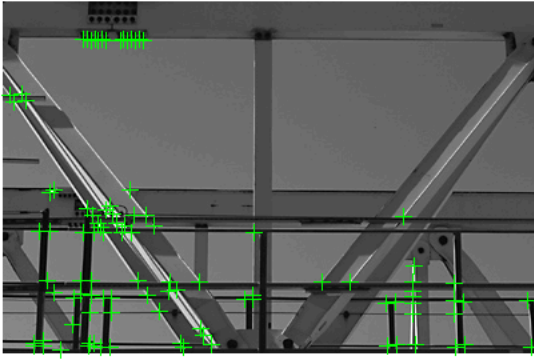
img = imread('gantrycrane.png');
img = rgb2gray(img);

points = detectHarrisFeatures(img);

imshow(img); hold on;
plot(points.selectStrongest(100));
title('Corner detection with 'detectHarrisFeatures');

```

Corner detection with 'detectHarrisFeatures'

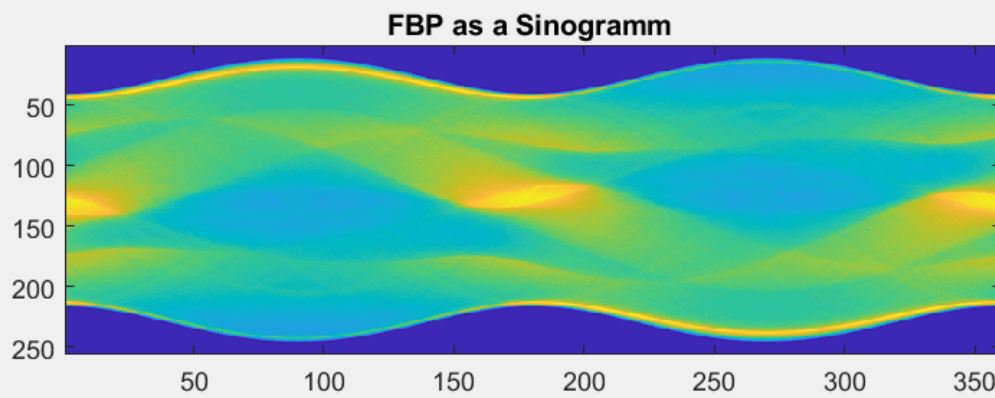
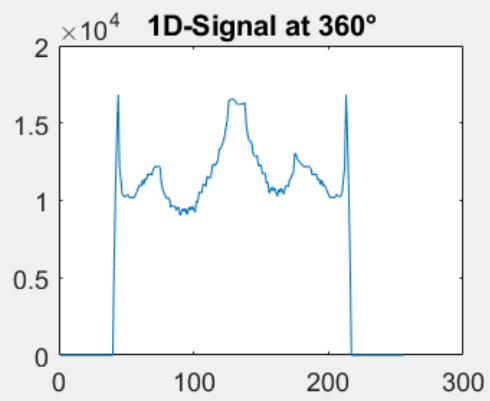


2.1.d

With non-maximum suppression, the gray value of a selected pixel is compared with the gray values of surrounding pixels. If the gray value of one of the surrounding pixels is more intense, the previously selected pixel is set to zero. Such maxima must be greater than the threshold value.

2.2.a

```
clc, clear variables, close all, format compact;  
  
P = phantom(256);  
angle = 360;  
  
tmp_projection = Projection(P,angle);
```



2.2.b

```
fbp(P, angle, tmp_projection);
```

FBP



Projection at 360*

