Beeldverwerken assignment 2

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Theory Questions

1 Convolution

Everything outside of the signal f is considered 0

1. f * g = {4 $\underline{3}$ 1}
2. f * g = {0 0 0 1 $\underline{3}$ 4 4 3}
3. f * g = {0 0 0 0 $\underline{1}$ 0 0 0}
4. ...
5. ...
6. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$
7. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 0 \end{bmatrix}$
8. $\begin{bmatrix} 0 & 0 & 1 \\ \bar{0} & 0 & 0 \end{bmatrix}$
9. Not possible
10. $\frac{1}{9}\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$
11. Not possible
12. Not possible
13. $\frac{1}{6}\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \end{bmatrix}$

14. $$\begin{bmatrix} 0.0113 & 0.0149 & 0.0176 & 0.0186 & 0.0176 & 0.0149 & 0.0113 \\ 0.0149 & 0.0197 & 0.0233 & 0.0246 & 0.0233 & 0.0197 & 0.0149 \\ 0.0176 & 0.0233 & 0.0275 & 0.0290 & 0.0275 & 0.0233 & 0.0176 \\ 0.0186 & 0.0246 & 0.0290 & 0.0307 & 0.0290 & 0.0246 & 0.0186 \\ 0.0176 & 0.0233 & 0.0275 & 0.0290 & 0.0275 & 0.0233 & 0.0176 \\ 0.0149 & 0.0197 & 0.0233 & 0.0246 & 0.0233 & 0.0197 & 0.0149 \\ 0.0113 & 0.0149 & 0.0176 & 0.0186 & 0.0176 & 0.0149 & 0.0113 \end{bmatrix}$$
15. Unsharp masking is simply blurring an image and then substracting that blurred image from the orignal. A kernel for a blur could be something like shown above or a gaussian.(An example of unsharp masking is provided in the matlab code)
16. g = 1/2{1 0 -1}
17. ...
18. Not possible, since this would require more than one convolution kernel.
19. Not possible, a convolution kernel cannot specify differences between point.
20. The applied filters are shown in the matlab file.
21.
22. $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{||x||^2}{2\sigma^2}}$
23.
24.
25.
26.
27.

2 Implementation of Gaussian derivatives

This part was entirely made in matlab.

3 The Canny Edge Detector

1. $f(x,y) = A\,sin(Vx) + B\,cos(Wy)$
   $f'_x(x,y) = AV\,cos(Vx)$
   $f'_y(x,y) = -BW\,sin(Wy)$
   $f'_{xx}(x,y) = -AV\,sin(Vx)$
   $f'_{yy}(x,y) = -BW\,cos(Wy)$
   $f'_{xy}(x,y) = 0$