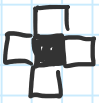
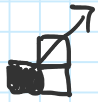
Übungsblatt 3

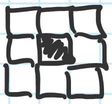
Montag, 16. November 2020 16:20

① 4 neighborhood:  only edges

(17,42) and (289,68)

- you need 2 squares to move diagonal on x and y axis 
- y axis: 68 - 42 = 26 } we need to move 26 upwards in y
- x-axis: 289 - 17 = 272 } and 272 in x direction
- (1) We have 26 diagonal steps, which will be put together with 272-26 steps in x axis (order doesn't matter)

$\Rightarrow \quad (272-26) + 2 \cdot 26 = 298$ steps or pixels in distance

8 neighborhood : 

- We need only 1 pixel for diagonal movement

$\Rightarrow \quad (272-26) + 26 = 272$ steps/pixels in distance

euclidean distance

$$d\left((17,42),(289,68)\right) = \sqrt{(17-289)^2 + (42-68)^2} \approx 273{,}23$$

②

	0	1	2	3
0	R = 40	G = 80	R = 60	G = 100
1	G = 80	r = ? g = ? B = 100	r = ? G = 100 b = ?	B = 40
2	R = 40	r = ? G = 100 b = ?	R = 100 g = ? b = ?	G = 25
3	G = 25	B = 20	G = 75	B = 20

$r_{11} = (R_{00} + R_{02} + R_{20} + R_{22}) / 4 = 60$

$g_{11} = (G_{01} + G_{12} + G_{21} + G_{10}) / 4 = 90$

$r_{12} = (R_{02} + R_{22}) / 2 = 80$

$b_{12} = (B_{11} + B_{13}) / 2 = 70$

$r_{21} = (R_{20} + R_{22}) / 2 = 70$

$b_{21} = (B_{11} + B_{31}) / 2 = 60$

$$g_{22} = (G_{12} + G_{23} + G_{32} + G_{21})/4 = 75$$
$$b_{22} = (B_{11} + B_{13} + B_{31} + B_{33})/4 = 45$$

③ $I^E = [1\ 2\ 1]$ and $I^{F_1} = I^{F_2} [-1\ 0\ 1]$

Widerspruchsbeweis:

Beh: Cross correlation is associative

Bew: $I^{E^T} \otimes (I^{F_1^T} \otimes I^{F_2^T}) = (I^{E^T} \otimes I^{F_1^T}) \otimes I^{F_2^T}$

$$\begin{pmatrix}1\\2\\1\end{pmatrix} \otimes \left(\begin{pmatrix}-1\\0\\1\end{pmatrix} \otimes \begin{pmatrix}-1\\0\\1\end{pmatrix}\right) = \begin{pmatrix}1\\2\\1\end{pmatrix} \otimes \begin{pmatrix}-1\cdot-1 + 0\cdot0 + 1\cdot1\\ -1\cdot-1 + 0\cdot0 + 1\cdot1\\ -1\cdot-1 + 0\cdot0 + 1\cdot1\end{pmatrix}$$
$$= \begin{pmatrix}1\\2\\1\end{pmatrix} \otimes \begin{pmatrix}2\\2\\2\end{pmatrix} = \begin{pmatrix}1\cdot2 + 2\cdot2 + 1\cdot2\\ 1\cdot2 + 2\cdot2 + 1\cdot2\\ 1\cdot2 + 2\cdot2 + 1\cdot2\end{pmatrix} = \begin{pmatrix}8\\8\\8\end{pmatrix}$$

$$\left(\begin{pmatrix}1\\2\\1\end{pmatrix} \otimes \begin{pmatrix}-1\\0\\1\end{pmatrix}\right) \otimes \begin{pmatrix}-1\\0\\1\end{pmatrix} = 1\cdot-1 + 2\cdot0 + 1\cdot1 = \begin{pmatrix}2\\2\\2\end{pmatrix} \otimes \begin{pmatrix}-1\\0\\1\end{pmatrix}$$
$$= \begin{pmatrix}2\cdot-1 + 2\cdot0 + 2\cdot1\\ \vdots \end{pmatrix} = \begin{pmatrix}3\\3\\3\end{pmatrix}$$

$$\Rightarrow \begin{pmatrix}8\\8\\8\end{pmatrix} = \begin{pmatrix}3\\3\\3\end{pmatrix} \ ⚡$$

$\square$