b) $\begin{bmatrix} 1 & 0 & +3 \\ 0 & 1 & +5 \\ 0 & 0 & 1 \end{bmatrix} \cdot R(45°) \cdot \begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix}$! Umgekehrt Reihenfolge

$$\begin{bmatrix} 1 & 0 & 3 \\ 0 & 1 & 5 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 3 \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 5 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & -3\frac{\sqrt{2}}{2}+5\frac{\sqrt{2}}{2}+3 \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & -3\frac{\sqrt{2}}{2}-5\frac{\sqrt{2}}{2}+5 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 3+\sqrt{2} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 5-4\sqrt{2} \\ 0 & 0 & 1 \end{bmatrix}$$

c) $\left(T_{3,5} \cdot R_{45} \cdot T_{-3,-5}\right)^{-1}$

$= T_{-3,-5}^{-1} \; R_{45}^{-1} \; T_{3,5}^{-1}$

$= T_{3,5} \; R_{-45} \; T_{-3,-5}$

$(A \cdot B)^{-1} = B^{-1} \cdot A^{-1}$

$[A \cdot (CD)]^{-1} = (CD)^{-1} \cdot A^{-1}$

$= D^{-1} C^{-1} A^{-1}$

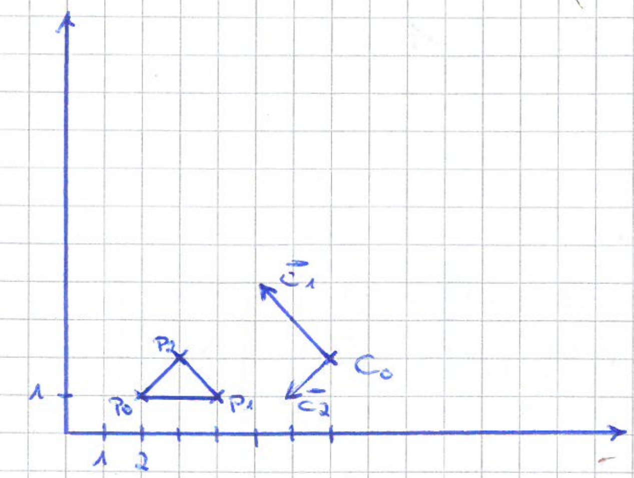
(Reihenfolge tauschen und Werte ändern)

Übungsblatt 3

Aufgabe

$\vec{p}_0 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ $\vec{p}_1 = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$ $\vec{p}_2 = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ $\vec{c}_c = \begin{bmatrix} 7 \\ 2 \end{bmatrix}$

Richtungen $\begin{bmatrix} -1 \\ 1 \end{bmatrix}$, $\begin{bmatrix} -1 \\ -1 \end{bmatrix}$



a) Normalisieren

$\vec{c}_1' = \begin{bmatrix} -1 \\ 1 \end{bmatrix} \Rightarrow \vec{c}_1 = \frac{c_1'}{\|c_1'\|} = \frac{\begin{bmatrix} -1 \\ 1 \end{bmatrix}}{\sqrt{2}}$ Länge Vektor $= \sqrt{x^2+y^2}$

$$= \begin{bmatrix} -\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \end{bmatrix} = \begin{bmatrix} -\frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} \end{bmatrix}$$

$\vec{c}_2' = \begin{bmatrix} -1 \\ -1 \end{bmatrix} \Rightarrow \vec{c}_2 = \frac{c_2'}{\|c_2'\|} = \begin{bmatrix} -\frac{\sqrt{2}}{2} \\ -\frac{\sqrt{2}}{2} \end{bmatrix}$

b)

$$C = \left[\vec{c}_1', \vec{c}_2', \vec{c}_0\right] = \begin{bmatrix} -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 7 \\ \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

(→ Transformiert vom Kamera- in Weltsystem

→ überprüfen Ursprung $C \cdot \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 7 \\ 2 \\ 1 \end{bmatrix}$)

eihenfolge!

$$\begin{bmatrix} -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 7 \\ \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 7 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

erst Rotieren, dann Transformieren

$$C^{-1} = \begin{bmatrix} -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & 0 & 7 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}^{-1}$$

$$D^c U^2 = \frac{1}{\underset{\text{Determinante}}{1}} \begin{bmatrix} -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & -7 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & \frac{7\sqrt{2}}{2}-\sqrt{2} \\ -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & \frac{7\sqrt{2}}{2}+\sqrt{2} \\ 0 & 0 & 1 \end{bmatrix}$$