Heimadæmi 4

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1 Spurning 1

1.1 Dæmi 1

1. $T^{-1}_{(x,y)} = \begin{bmatrix} 1 & 0 & -x \\ 0 & 1 & -y \\ 0 & 0 & 1 \end{bmatrix}$

   $T^{-1}_{(10,5)} = \begin{bmatrix} 1 & 0 & -10 \\ 0 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix}$

2. $T_{(x,y)} = \begin{bmatrix} 1 & 0 & x \\ 0 & 1 & y \\ 0 & 0 & 1 \end{bmatrix}$

   $T_{(10,5)} = \begin{bmatrix} 1 & 0 & 10 \\ 0 & 1 & 5 \\ 0 & 0 & 1 \end{bmatrix}$

3. $R_\theta = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

   $R_{90^\circ} = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

4. $S_{k_y} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & k_y & 0 \\ 0 & 0 & 1 \end{bmatrix}$

   $S_{\frac{1}{2}} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$

5. $TRST^{-1}$

   $\underline{\underline{(T_{(10,5)})(R_{90^\circ})(S_{\frac{1}{2}})(T^{-1}_{(10,5)})}}$

   $p3 = (P3_x, P3_y)$ points of the house

   $P3^T = \begin{bmatrix} P3_x \\ P3_y \\ 1 \end{bmatrix}$

   $\underline{outcome} = (T_{(10,5)})(R_{90^\circ})(S_{\frac{1}{2}})(T^{-1}_{(10,5)})(P3)$

6. $\underline{\underline{\begin{bmatrix} 0 & -\frac{1}{2} & \frac{25}{2} \\ 1 & 0 & -5 \\ 0 & 0 & 1 \end{bmatrix}}} = \frac{1}{2} * \begin{bmatrix} 0 & -1 & 25 \\ 2 & 0 & -10 \\ 0 & 0 & 2 \end{bmatrix} =$

   $\begin{bmatrix} 1 & 0 & 10 \\ 0 & 1 & 5 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} 1 & 0 & -10 \\ 0 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix}$

2 Spurning 2

2.1 Dæmi 1

1. það snýr honum um 90° svo ferir hann um vigrinn (1,1)

2.2 Dæmi 2

1. $mv = \begin{bmatrix} 0 & -1 & 1 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

2. $T_{(1,1)} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

   $R_{90^\circ} = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

3. $mv = \begin{bmatrix} 0 & -1 & 1 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} = \underline{\underline{(T_{(1,1)})(R_{90^\circ})}}$

   $p3 = (P3_x, P3_y)$ any point to be transformed

   $P3^T = \begin{bmatrix} P3_x \\ P3_y \\ 1 \end{bmatrix}$

   $\underline{outcome} = (T_{(1,1)})(R_{90^\circ})(P3)$

4. $mv = \begin{bmatrix} 0 & -1 & 1 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} = \underline{\underline{\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}}}$

3 Spurning 3

3.1 Dæmi 1

1. points of the line
   $p_1 = p_{(x_1,y_1)}, p_2 = p_{(x_2,y_2)}$

2. $\hat{u} = \frac{\vec{u}}{|\vec{u}|}$
   $\vec{u} = p_2 - p_1$

   $|\vec{u}| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

   $\hat{u} = \frac{p_2 - p_1}{\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}}$

   $Ref_{\hat{u}} = \begin{bmatrix} \hat{u}_x^2 - \hat{u}_y^2 & 2\hat{u}_x\hat{u}_y & 0 \\ 2\hat{u}_x\hat{u}_y & \hat{u}_y^2 - \hat{u}_x^2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

3. $\vec{w} = p_2 - p_1$
   $Ref_{\vec{w}} = \begin{bmatrix} \frac{\vec{w}_x^2 - \vec{w}_y^2}{\vec{w}_x^2 + w_y^2} & \frac{2\vec{w}_x\vec{w}_y}{\vec{w}_x^2+\vec{w}_y^2} & 0 \\ \frac{2\vec{w}_x\vec{w}_y}{\vec{w}_x^2+\vec{w}_y^2} & \frac{\vec{w}_y^2-\vec{w}_x^2}{\vec{w}_x^2+\vec{w}_y^2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$
   $Ref_{\hat{u}} = Ref_w$

4. $T_{(x,y)}^{-1} = \begin{bmatrix} 1 & 0 & -x \\ 0 & 1 & -y \\ 0 & 0 & 1 \end{bmatrix}$
   $T_{(x,y)} = \begin{bmatrix} 1 & 0 & x \\ 0 & 1 & y \\ 0 & 0 & 1 \end{bmatrix}$

5. $\underline{\underline{(T_{(p1_x,p1_y)})(Ref_{\vec{w}})(T_{(p1_x,p1_y)}^{-1})}}$
   $\underline{\underline{(T_{(p1_x,p1_y)})(Ref_{\hat{u}})(T_{(p1_x,p1_y)}^{-1})}}$
   $p3 = (P3_x, P3_y)$ point that is going to be reflected
   $P3^T = \begin{bmatrix} P3_x \\ P3_y \\ 1 \end{bmatrix}$
   $\underline{outcome} = (T_{(p1_x,p1_y)})(Ref_{\vec{w}})(T_{(p1_x,p1_y)}^{-1})(P3)$

6. $\vec{w} = p_2 - p_1$
   $svar = \begin{bmatrix} 1 & 0 & p1_x \\ 0 & 1 & p1_y \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} \frac{\vec{w}_x^2 - \vec{w}_y^2}{\vec{w}_x^2 + w_y^2} & \frac{2\vec{w}_x\vec{w}_y}{\vec{w}_x^2+\vec{w}_y^2} & 0 \\ \frac{2\vec{w}_x\vec{w}_y}{\vec{w}_x^2+\vec{w}_y^2} & \frac{\vec{w}_y^2-\vec{w}_x^2}{\vec{w}_x^2+\vec{w}_y^2} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -p1_x \\ 0 & 1 & -p1_y \\ 0 & 0 & 1 \end{bmatrix}$

   $\hat{u} = \frac{p_2 - p_1}{\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}}$
   $svar = \begin{bmatrix} 1 & 0 & p1_x \\ 0 & 1 & p1_y \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} \hat{u}_x^2 - \hat{u}_y^2 & 2\hat{u}_x\hat{u}_y & 0 \\ 2\hat{u}_x\hat{u}_y & \hat{u}_y^2 - \hat{u}_x^2 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -p1_x \\ 0 & 1 & -p1_y \\ 0 & 0 & 1 \end{bmatrix}$

4 Spurning 4

4.1 Dæmi 1

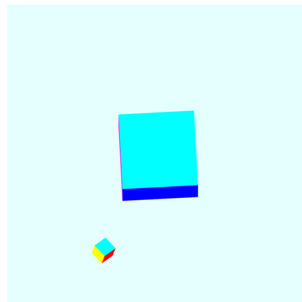
1. Dæmi 1

Mynd 1: `sp4_dæmi1`

5 Spurning 5

5.1 Dæmi 1

1. Dæmi 1
2. Made the speed and distant so they would never go below zero



Mynd 2: `sp5_dæmi1`

Heimildir

[1] Daníel Ágúst. *Heimadæmi 3*. URL: https://danielagust.github.io/TOL105M-Tolvugrafik-Daniel/Code/Heimad%C3%A6mi/heimad%C3%A6mi_4/heimad%C3%A6mi_4_index.html.

[2] Daníel Ágúst. *Heimadæmi 3 myndir*. URL: https://danielagust.github.io/TOL105M-Tolvugrafik-Daniel/Code/Heimad%C3%A6mi/heimad%C3%A6mi_4/img.html.