Westfälische Hochschule
Gelsenkirchen Bocholt Recklinghausen

Computergrafik

Transformation

Operationen

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Visual Computing (https://vc.w-hs.de)
Fachbereich Wirtschaft und Informationstechnik
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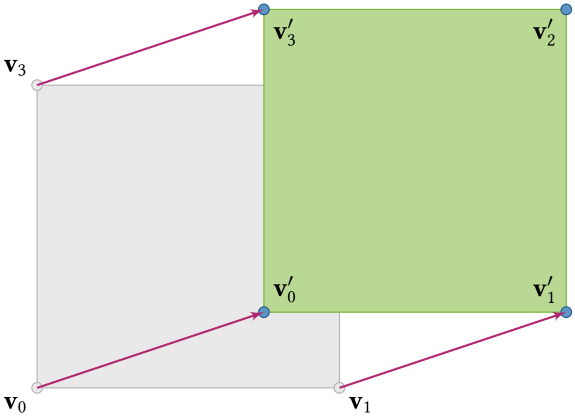
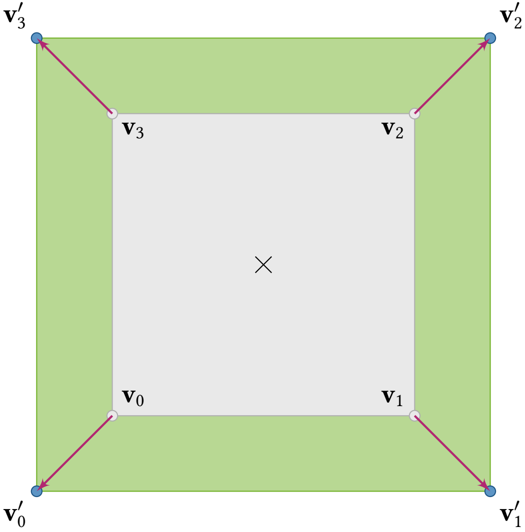
Sommersemester 2020

Translation

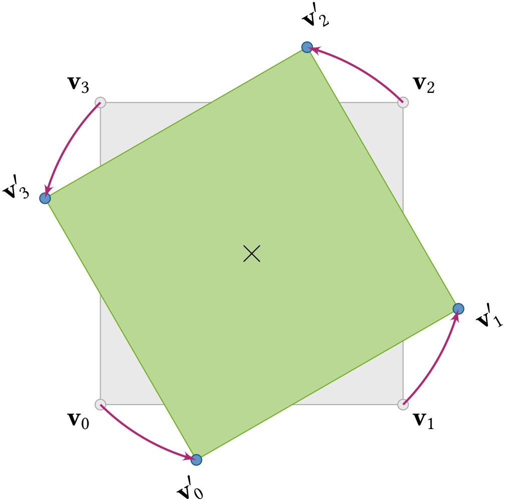


Skalierung



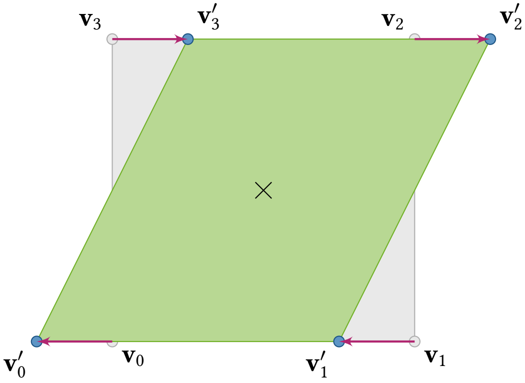
$\mathbf{v}'_3$
$\mathbf{v}'_2$
$\mathbf{v}_3$
$\mathbf{v}_2$
$\mathbf{v}_0$
$\mathbf{v}_1$
$\mathbf{v}'_0$
$\mathbf{v}'_1$

Rotation



$\mathbf{v}'_2$
$\mathbf{v}_3$
$\mathbf{v}_2$
$\mathbf{v}'_3$
$\mathbf{v}'_1$
$\mathbf{v}_0$
$\mathbf{v}_1$
$\mathbf{v}'_0$

Scherung


$\mathbf{v}_3$
$\mathbf{v}'_3$
$\mathbf{v}_2$
$\mathbf{v}'_2$
$\mathbf{v}'_0$
$\mathbf{v}_0$
$\mathbf{v}'_1$
$\mathbf{v}_1$

Transformationen

bisher

Translation:

$$\mathbf{v}_i' = \mathbf{v}_i + \mathbf{t}$$

Skalierung:

$$\mathbf{v}_i' = \mathbf{S} \cdot \mathbf{v}_i$$

$$\mathbf{S} = \begin{bmatrix} s_x & 0 & 0 \\ 0 & s_y & 0 \\ 0 & 0 & s_z \end{bmatrix}$$

Scherung:

$$\mathbf{v}_i' = \mathbf{D} \cdot \mathbf{v}_i$$

$$\mathbf{D} = \begin{bmatrix} 1 & d_{x,y} & d_{x,z} \\ d_{y,x} & 1 & d_{y,z} \\ d_{z,x} & d_{z,y} & 1 \end{bmatrix}$$

Rotation:

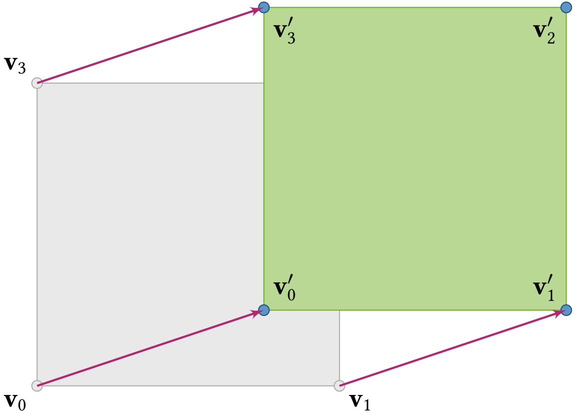
$$\mathbf{v}_i' = \mathbf{R}_k \cdot \mathbf{v}_i$$

$$\mathbf{R}_x = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\alpha & -\sin\alpha \\ 0 & \sin\alpha & \cos\alpha \end{bmatrix} \quad \mathbf{R}_y = \begin{bmatrix} \cos\alpha & 0 & \sin\alpha \\ 0 & 1 & 0 \\ -\sin\alpha & 0 & \cos\alpha \end{bmatrix} \quad \mathbf{R}_z = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Vektor

$$\mathbf{v} = \begin{bmatrix} v_x \\ v_y \\ v_z \end{bmatrix}$$

Translation



Transformationen

in homogenen Koordinaten

Translation:

$$\mathbf{v}_i' = \mathbf{T} \cdot \mathbf{v}_i$$

$$\mathbf{T} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Skalierung:

$$\mathbf{v}_i' = \mathbf{S} \cdot \mathbf{v}_i$$

$$\mathbf{S} = \begin{bmatrix} s_x & 0 & 0 & 0 \\ 0 & s_y & 0 & 0 \\ 0 & 0 & s_z & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Scherung:

$$\mathbf{v}_i' = \mathbf{D} \cdot \mathbf{v}_i$$

$$\mathbf{D} = \begin{bmatrix} 1 & d_{x,y} & d_{x,z} & 0 \\ d_{y,x} & 1 & d_{y,z} & 0 \\ d_{z,x} & d_{z,y} & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Rotation:

$$\mathbf{v}_i' = \mathbf{R}_k \cdot \mathbf{v}_i$$

$$\mathbf{R}_x = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\alpha & -\sin\alpha & 0 \\ 0 & \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad \mathbf{R}_y = \begin{bmatrix} \cos\alpha & 0 & \sin\alpha & 0 \\ 0 & 1 & 0 & 0 \\ -\sin\alpha & 0 & \cos\alpha & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix},$$

$$\mathbf{R}_z = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 & 0 \\ \sin\alpha & \cos\alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Zusammenfassung

Westfälische Hochschule

- Translation
- Rotation
- Skalierung
- Scherung
- homogene Koordinaten

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Visual Computing

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