Slides 6 + 7 →

Previously in 3D: $\bar{v} = \begin{bmatrix} \bar{v}.\hat{x} \\ \bar{v}.\hat{y} \\ \bar{v}.\hat{z} \end{bmatrix}$

or $\bar{v} = (\bar{v}.\hat{x})\hat{x} + (\bar{v}.\hat{y})\hat{y} + (\bar{v}.\hat{z})\hat{z}$

Now, with the fictitious dimension added:

$$\bar{v} = \begin{bmatrix} \bar{v}.\hat{x} \\ \bar{v}.\hat{y} \\ \bar{v}.\hat{z} \\ \bar{v}.\hat{f} \end{bmatrix}$$

vector in (3+1)D

$\bar{v}.\hat{f}$ → always set to 1

For a "real" vector $\bar{v}$ however, e.g. a vector in 3D, $\bar{v}.\hat{f} = 0$

Slides 13-21 →

projection and reflection, we'll use

$\bar{v}.\hat{n}$ = component of $\bar{v}$ along $\hat{n}$

$\bar{v} - (\bar{v}.\hat{n})\hat{n}$: part of $\bar{v}$ perpendicular to $\hat{n}$

Slide 16 →

$$\begin{aligned} \bar{w}_p.\hat{x} &= \bar{v}.\hat{x} - (\bar{v}.\hat{n})(\hat{n}.\hat{x}) \\ &= v_x - (v_x n_x + v_y n_y + v_z n_z) n_x \\ &= (1 - n_x^2) v_x - n_x n_y v_y - n_z n_x v_z \end{aligned}$$

and so on...

Slide 19 + 21 →

$$\begin{aligned} \bar{w}_r.\hat{x} &= \bar{v}.\hat{x} - 2(\bar{v}.\hat{n})(\hat{n}.\hat{x}) \\ &= v_x - 2(v_x n_x + v_y n_y + v_z n_z) n_x \\ &= (1 - 2n_x^2) v_x - 2n_x n_y v_y - 2n_z n_x v_z \end{aligned}$$

and so on...