

The Metric Tensor

A large, semi-transparent graphic of the Vizle logo, consisting of a grey 'V' and 'z' icon above a light green box containing the word 'Vizle' in white.



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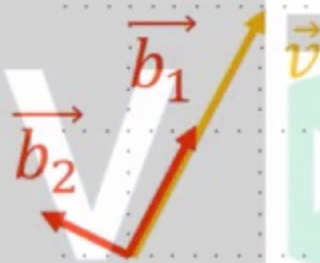
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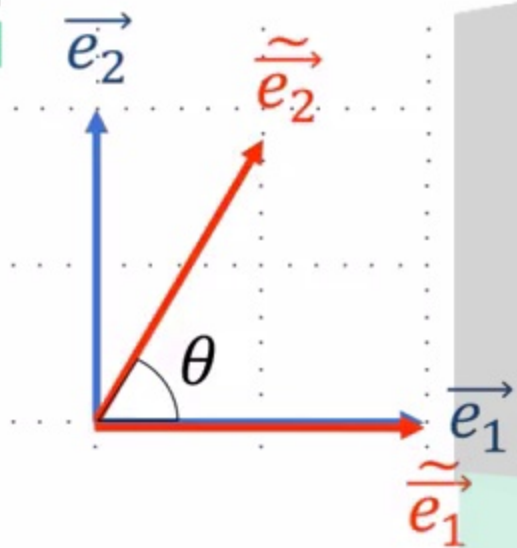
$$\vec{v} = 1\vec{a}_1 + 0\vec{a}_2$$

$$\|\vec{v}\|^2 = (1)^2(\vec{a}_1 \cdot \vec{a}_1)$$



$$\vec{v} = 2\vec{b}_1 + 0\vec{b}_2$$

$$\|\vec{v}\|^2 = (2)^2(\vec{b}_1 \cdot \vec{b}_1)$$



$$\tilde{e}_1 = e_1$$

$$\tilde{e}_2 = (\cos \theta) e_1 + (\sin \theta) e_2$$

$$\tilde{e}_1 \cdot \tilde{e}_1 = 1$$

$$\tilde{e}_1 \cdot \tilde{e}_2 = \cos \theta$$

$$\tilde{e}_2 \cdot \tilde{e}_2 = 1$$

$$g_{\vec{e}_i} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}_{\vec{e}_i}$$

$$g_{\tilde{e}_i} = \begin{bmatrix} 1 & \cos \theta \\ \cos \theta & 1 \end{bmatrix}_{\tilde{e}_i}$$

$$\| \cdot \|^2 = \tilde{v}^i \tilde{v}^j \tilde{g}_{ij}$$

$$= (B_a^i v^a) (B_b^j v^b) (F_i^k F_j^l g_{kl})$$

$$= v^a v^b g_{kl} (\underbrace{B_a^i F_i^k}_{\delta_a^k} \underbrace{B_b^j F_j^l}_{\delta_b^l})$$

$$= v^a v^b g_{kl} (\delta_a^k \delta_b^l)$$

$$= v^k v^l g_{kl}$$

$$\star \tilde{v}^i = B_j^i v^j$$

$$v^i = F_j^i \tilde{v}^j$$

$$\star \tilde{g}_{ij} = F_i^k F_j^l g_{kl}$$

$$g_{kl} = B_k^i B_l^j \tilde{g}_{ij}$$



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