GAMES101 Lecture Notes

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2 Review of Linear Algebra

Assume 3-dimensional space. Dot product can be written as:

$$\begin{aligned}\vec{a}\cdot\vec{b} &= \vec{a}^{\mathrm{T}}\vec{b} \\ &= \begin{pmatrix} x_a & y_a & z_a \end{pmatrix}\begin{pmatrix} x_b \\ y_b \\ z_b \end{pmatrix} \\ &= x_a x_b + y_a y_b + z_a z_b\end{aligned}$$

Cross product can be written as:

$$\vec{a}\times\vec{b} = A^*\vec{b} = \underbrace{\begin{pmatrix} 0 & -z_a & y_a \\ z_a & 0 & -x_a \\ -y_a & x_a & 0 \end{pmatrix}}_{\text{dual matrix of } \vec{a}}\begin{pmatrix} x_b \\ y_b \\ z_b \end{pmatrix} = \begin{pmatrix} y_a z_b - z_a y_b \\ z_a x_b - x_a z_b \\ x_a y_b - y_a x_b \end{pmatrix}$$