

Computer Graphics

LECTURE 12

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Last Class

- ▶ Geometric Objects
 - ▶ Point
 - ▶ Line
 - ▶ Vector
 - ▶ Dot Product

Today's Agenda

- ▶ Cross Product
- ▶ Plane
- ▶ Sphere
- ▶ Transformations

Cross Product

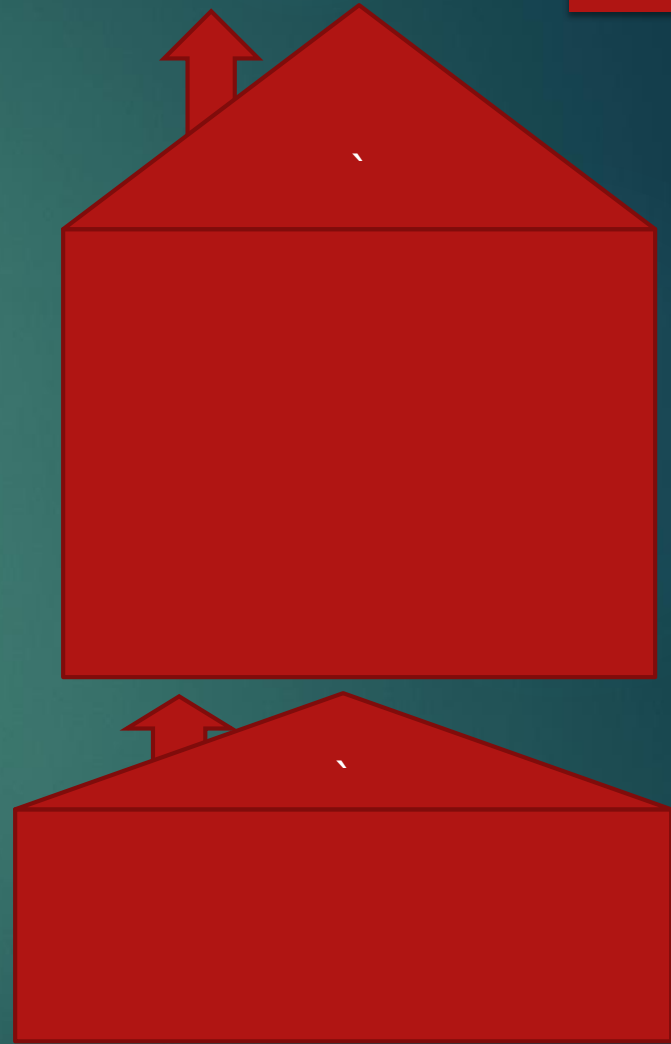
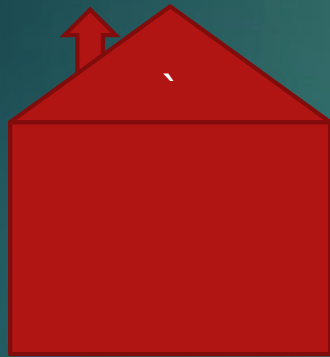
- ▶ The product of two vectors (a and b) is another vector which is orthogonal to both the vectors (a and b).
- ▶ The new vector is called **Cross Product** or **Vector Product** of the two vectors.
- ▶ Right hand rule determines the direction of the product

Transformations

Scaling

- ▶ Scaling is achieved by multiplying each graphic component by a scalar
- ▶ Scaling will be uniform if this scalar is same for all components
- ▶ Different components are scaled differently, scaling is non-uniform

Example



Scaling Operation

$$\begin{aligned}x' &= ax \\y' &= ay \\ \begin{bmatrix} x' \\ y' \end{bmatrix} &= \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}\end{aligned}$$

The matrix $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ is called scaling matrix

Summary

- ▶ Cross Product

References

- ▶ Fundamentals of Computer Graphics Third Edition by Peter Shirley and Steve Marschner
- ▶ Interactive Computer Graphics, A Top-down Approach with OpenGL (Sixth Edition) by Edward Angel.