

15-462: Computer Graphics

Math for Computer Graphics

Note

- We began with a discussion of Barycentric Coordinates today. Slides for that portion of the class are bundled with the slides from Tuesday's class.

Transformations

Translation, rotation, scaling

2D

3D

Homogeneous coordinates

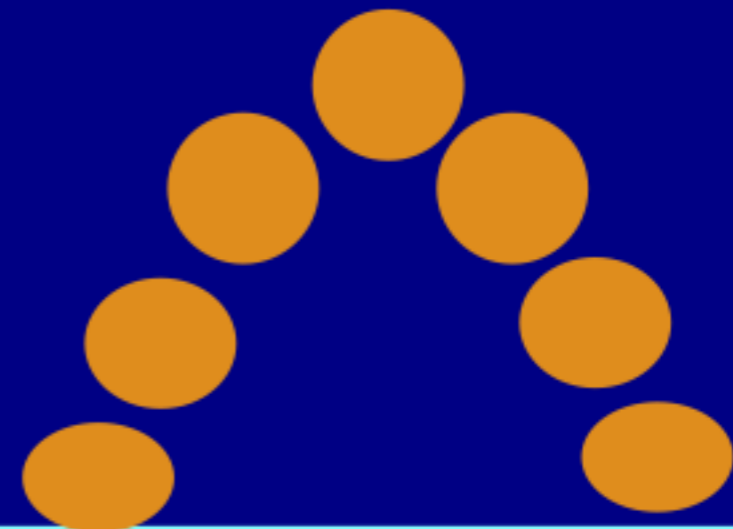
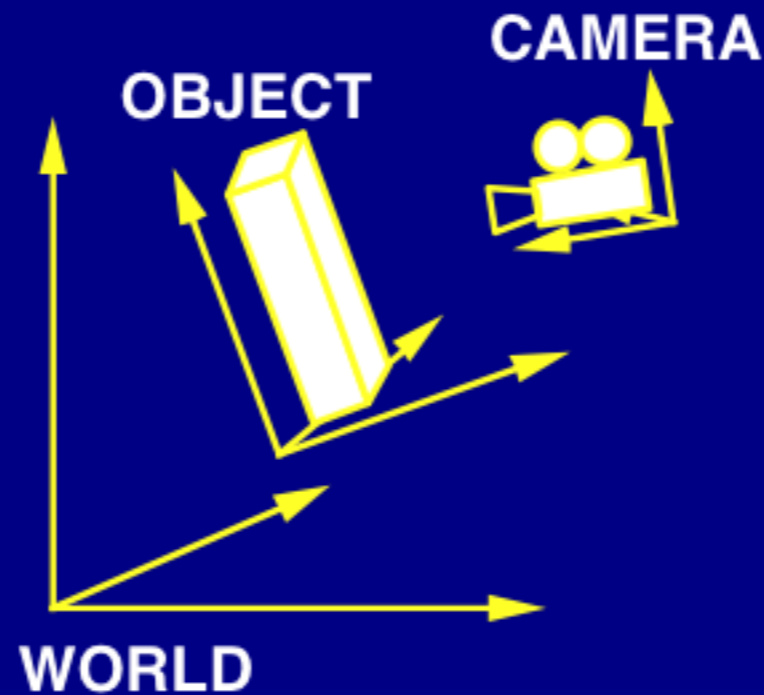
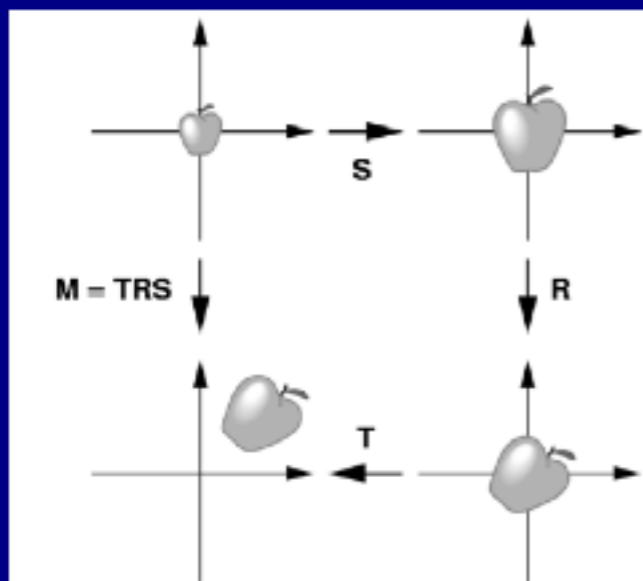
Transforming normals

Examples

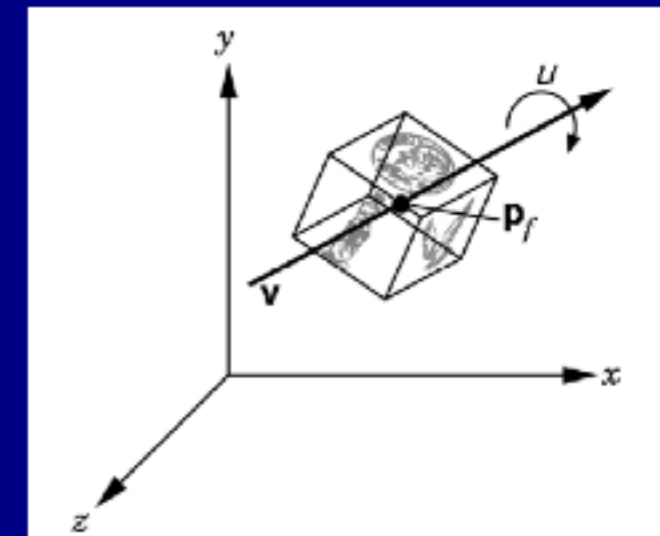
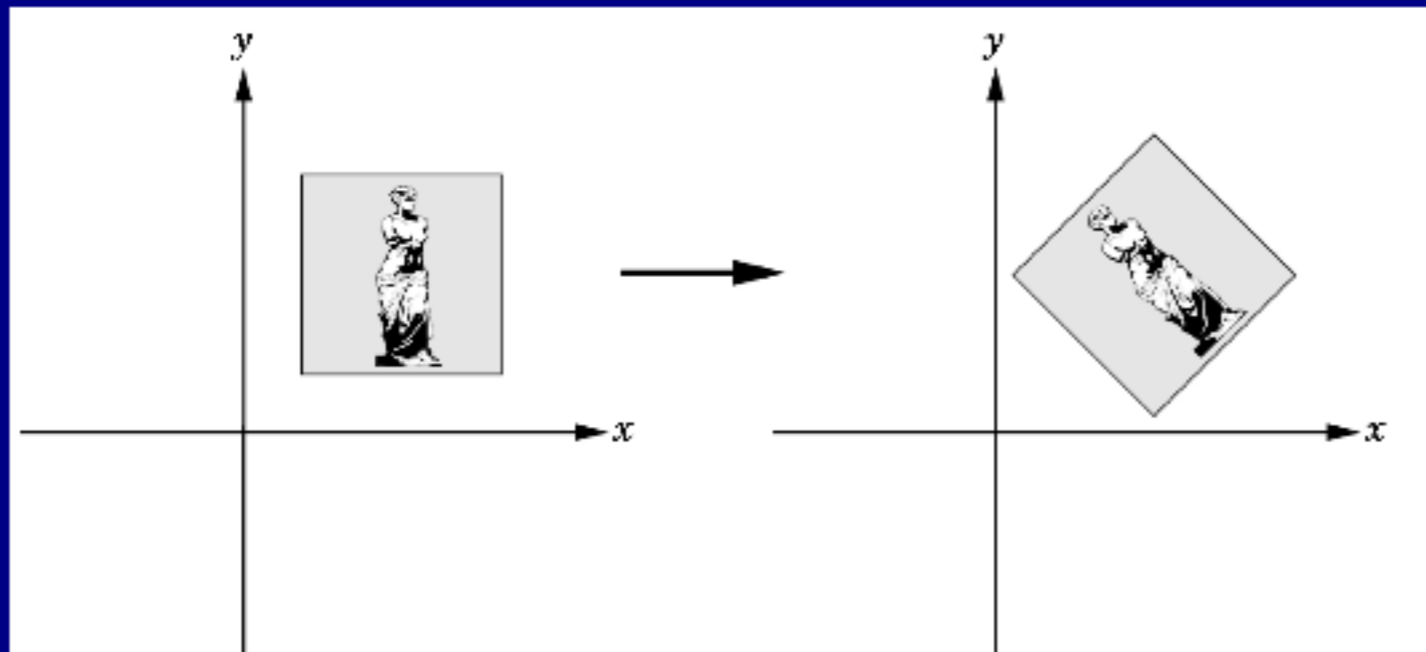
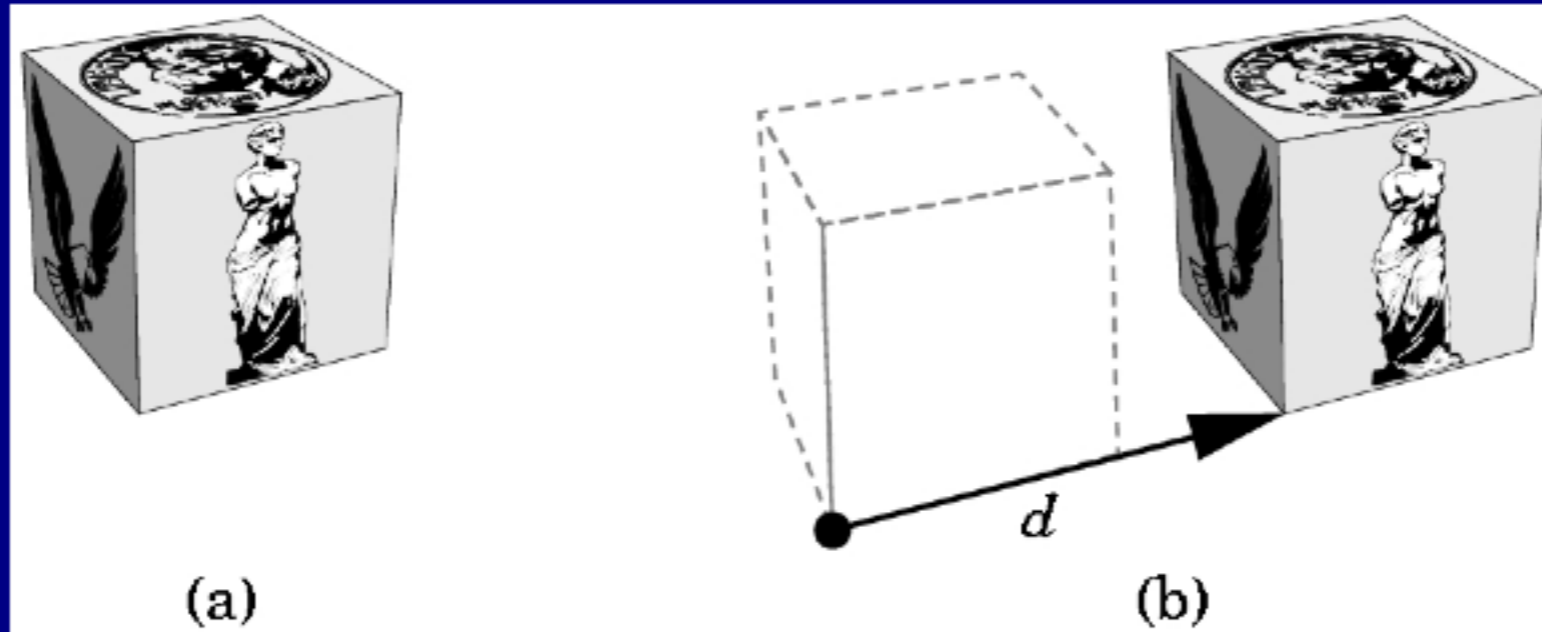
Shirley Chapter 6

Uses of Transformations

- Modeling
 - build complex models by positioning simple components
 - transform from object coordinates to world coordinates
- Viewing
 - placing the virtual camera in the world
 - specifying transformation from world coordinates to camera coordinates
- Animation
 - vary transformations over time to create motion

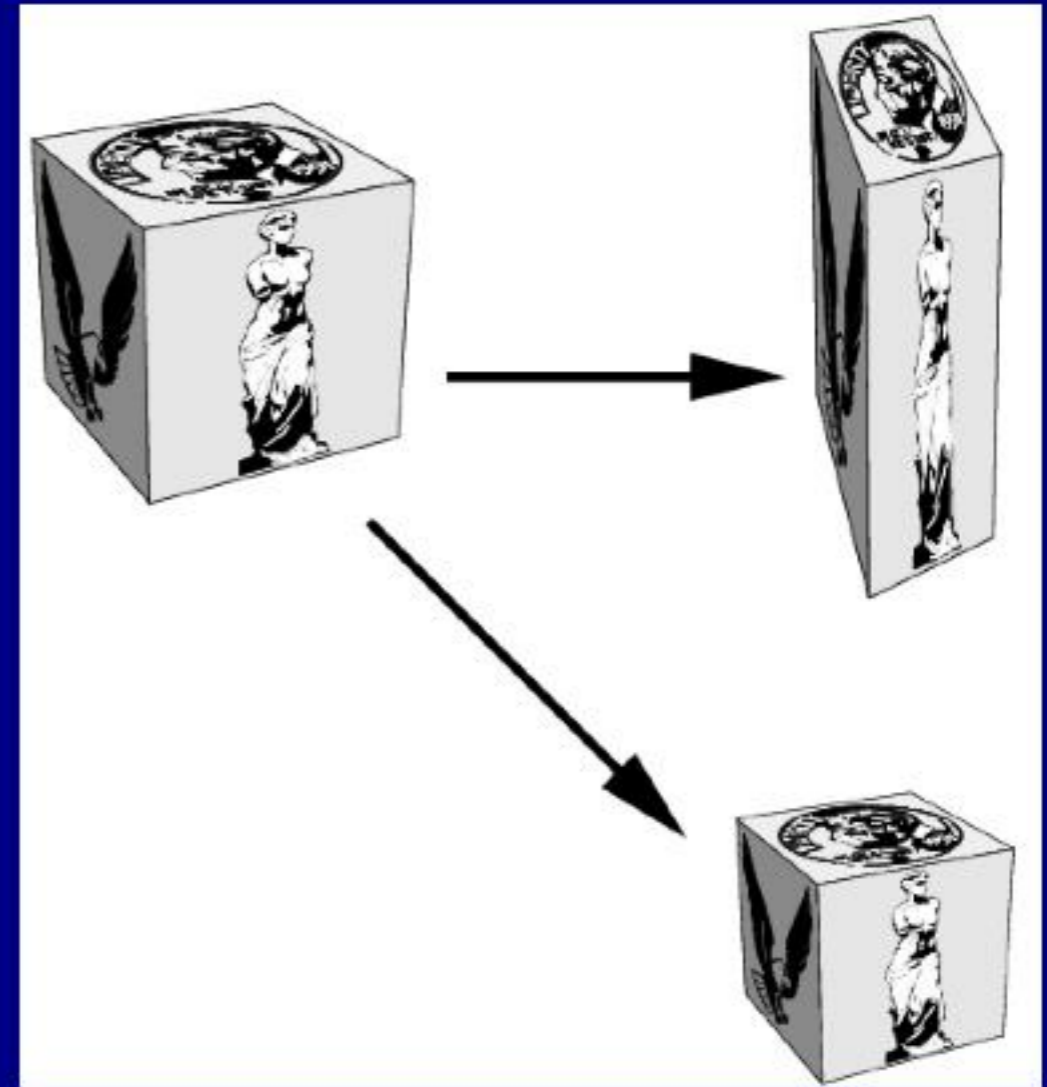
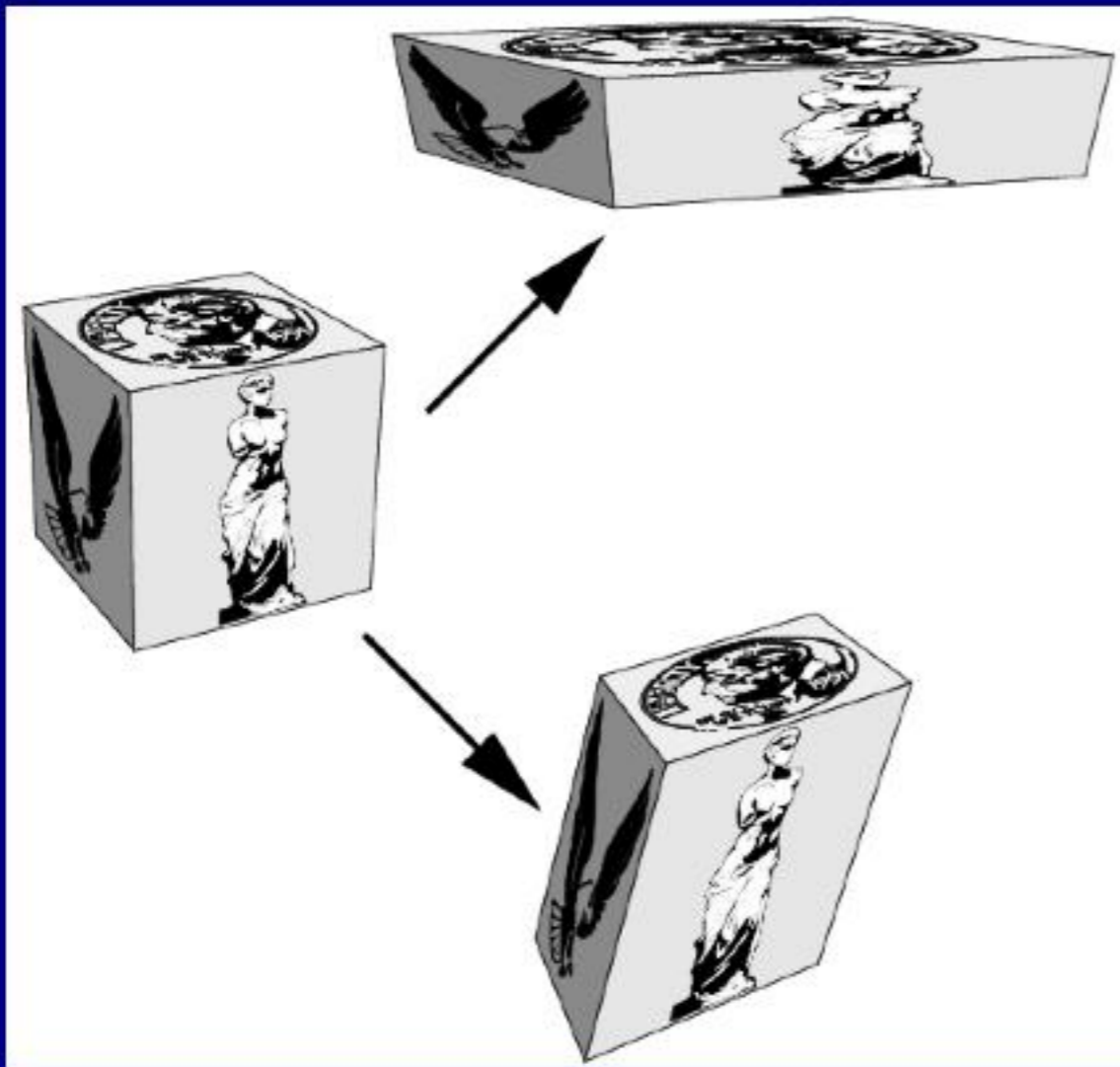


Rigid Body Transformations



Rotation angle and line about which to rotate

Non-rigid Body Transformations



Distance between points on object do not remain constant

Basic 2D Transformations

Scale

Shear

Rotate



chalkboard

More Notes

- Things to remember from our discussion at the board today
 - If you want to build a transformation matrix easily, think about what happens to each basis vector, i.e., to the unit vectors in the x, y, and z direction.
 - Properties that you must have for a rotation matrix are:
 - Unit magnitude rows/columns
 - Orthogonal rows/columns
 - Rows/columns u, v, w such that $u \times v = w$

By the way...

- Thanks for all the questions / interaction in class. This is my best class in 10 years and I look forward to the rest of the semester!