Introduction to 3D Graphics

Computer graphics is “the creation and manipulation of graphics images by means of computer.” (Marc Berger, 1986.)

Computer Graphics
  - Rendering
  - Animation
  - Solid Modeling
  - Scientific Visualization
  - Real-time

Vector Graphics
- Draw a picture line by line.
- Advantages:
  - Straight lines.
  - Hardward supports high resolution
- Drawbacks:
  - Not solid imagery (wireframe).
  - Vector hardware continually redraws all objects.

Raster Graphics
- n x m grid of pixels
- Advantages:
  - Based on TV technology
  - Lends itself to shaded imagery
- Problems:
  - Needs a frame buffer
  - Convert objects to pixels
  - Aliasing: Screen resolution may be much less than object resolution.
Scan Conversion

- Transform 3d object into 2d object (object-based)
- “Scan” 3d object, converting it into pixels.

- Fast;
- Commonly used;
- Industry standard – OpenGL;
- Hardware support (OpenGL).

Ray Tracing

- Shoot a ray through each pixel (pixel-based)
- Find first object intersected by ray.

- Slow;
- Not commonly used;
- No hardware support.
Scan Conversion v. Ray Tracing

Scan Conversion
(CSE 581, 781, …)
• Fast;
• Commonly used;
• Industry standard (OpenGL);
• Hardware support.

Ray Tracing
(CSE 681)
• Models optics (better);
• Photorealistic rendering;
• Special effects;
• Better for understanding rendering/lighting.

Creating a Scene

• Translate & rotate objects.
• Linear algebra. (Prerequisite: Math 568 or 571.)