What This Course Is About

Topics covered:
- basics of interactive rendering
  - modeling, geometric transformations
  - projections, hidden surface removal
  - lighting, texture mapping, animation
  - colour perception
- as time allows
  - shadows, current hardware, curves and surfaces
  - ray-tracing, global illumination
  - input and output hardware,

What This Course is NOT About

Topics NOT covered:
- Artistic and design issues
- Usage of commercial software packages
- Other graphics courses
  - CPSC 424: Geometric Modeling
  - CPSC 514: Image-based Modeling and Rendering
  - CPSC 533A: Digital Geometry
  - CPSC 533B: Animation Physics
  - CPSC 533C: Information Visualization

Course Organization

Programming assignments:
- C++, Windows or Linux
- OpenGL graphics library / GLUT for user interface

Collaboration:
- Individual solutions unless stated otherwise
3D Graphics: History

- 2000 BC: Orthographic projection
- 1600s:
  - coordinate systems (Descartes)
  - optics (Huygens)
  - calculus, physics, optics (Newton)
- 1897: Oscilloscope (Braun)
- 1950-70: Vector display computers
- 1966: First raster display
- 1993: 500k tri/s, texmap @ 60Hz for $150,000
- 1995: Feature length CG films
- 2002: 100M tri/s for $400

Fake or Photo?

1. Class guess: Photo
   Ans: Photo

2. Class guess: Real
   Ans: X

3. Class guess: CG
   Ans: ✓

4. Class guess: Real
   Ans: ✓

Perception...

http://www.skytopia.com/project/illusion/illusion.html
Graphics: State of the Art

- Displays:
  - IBM: 3840x2400 pixels, 3km wiring, 200ppi
  - electronic paper
  - 3D printers
- Input:
  - Z-cam, Triclops
  - motion capture
- Animations: fracture, water, cloth

Projective Rendering Pipeline

OCS → WCS → VCS

- modeling transformation
- viewing transformation
- projection transformation
- perspective division

CCS → NDCS → DCS

- OCS - object coordinate system
- WCS - world coordinate system
- VCS - viewing coordinate system
- CCS - clipping coordinate system
- NDCS - normalized device coordinate system
- DCS - device coordinate system

glVertex3f(x,y,z)

glTranslatef(x,y,z)

glRotatef(th,x,y,z)

........

gluLookAt(...)

glFrustum(...)

glutInitWindowSize(x,y)

Coming Up...

Thursday, January 8:

- math review:
  - points, vectors, coordinate frames
  - basis vectors, basis functions
  - dot product, cross product
- introduction to geometric transformations