CMPS160 – Spring 2005

Your final will be in our classroom Tue June 7th 7:30pm-10:30pm.

The final is open-book/notes. I might well ask you how to compute some matrix for example. I wouldn't expect you to have the form of a rotation matrix memorized, thus you can use your book.

A list of topics we covered is below.

Displays

- *CRTs*
- *LCDs*
- *Raster scan vs. vector scan*
- *Gamma, gamma correction*

Line drawing, rasterization

- *Line equation*
- *DDA*
- *Bresenham's Line Algorithm*
- *Convex vs concave polygons*
- *Testing convexity*

2D Transformations

- *Vector representation of a point*
- *Matrix translation, rotation, scaling*
- *Homogeneous coordinates*
- *Composing a string of transformations*
- *Concept of changing coordinate systems*

3D Transformation

- *3D rotation around a line as $R_x R_y R_z$*
- *Matrix translation, rotation, scaling*
- *Matrix stacks*
- *Object coordinates vs world coordinates*
- *Modelview matrix*
- *Camera transform duality with object transform*
- *Hierarchical transforms*

Viewing and Perspective

- *Orthographic vs perspective*
- *World coordinates vs screen coordinates*
- *View frustum*
- *Near and far clipping planes*
- *Oblique parallel projection*
- *Concept of oblique perspective projection*
- *Viewing pipeline object -> world -> normalized -> screen*

Visibility

- *Back face detection*
- *Z-buffer (Depth-buffer)*
- *A-buffer (list of depths)*
- *A-buffer (openGL accumulation buffer)*
- *BSP trees*
- *Screen space sort vs object space sort*

Lighting, shading

- *OpenGL ambient+diffuse+specular lighting model*
- *Phong specular reflection vs. Phong shading*
- *Gouraud vs Phong shading*

Sampling theory

Point sampling
Area weighted sampling
Convolution
Duality of spatial and Fourier domain
Concept of low/high frequencies
Aliasing caused by signal with too high a frequency
Solution to aliasing (band limit single or sample at higher frequency)

Aliasing, anti-aliasing

Nyquist frequency
Super-sampling sub-pixels

Image warping, textures

Concept of UV coordinates
Texture space – object space – screen space
Bump mapping
Correct texture filtering, problems with point sampling

NPR

Haeberli's paint by numbers system

Curves, surfaces

Parametric vs implicit surface representation
Interpolation vs approximation in splines
C^1 vs G^1 continuity
Constructive Solid Geometry

Color models

Electromagnetic spectrum
Spectral colors
Color matching functions
CIE chromaticity diagram
RGB space
HSV space

Animation

Concept of key-framing
Squash and stretch

Raytracing

Basic algorithm
Shadow rays
Reflected/refracted rays
Anti-aliasing by supersampling
Distributed ray tracing for estimating integrals

Lightfields, volume rendering

Two plane parameterization of rays
Concept of 4D lightfield
Concept of volume data

Compositing

Alpha as partial pixel cover
Pre-multiplied alpha

Notable things that were in class that you should know about but which you didn't have readings for (and thus won't be on the final)

BRDFs
Mipmaps
Summed-area-tables
Oct-trees