

COMP 4490 - Computer Graphics 2

Calendar Description: Methods in computer graphics including topics such as representation of curves and surfaces, viewing in three dimensions, and colour models.

Prerequisite: COMP 3490.

Outline

- 1) Matrix representation of 3D transformations (1 week)
Homogeneous coordinates in 3D. Translation, scaling, and rotation matrices and their inverses. Composition of 3D matrix transformations.
- 2) 3D viewing and the synthetic camera (1 week)
Parallel and perspective projections. Setting up a synthetic camera; world coordinates and camera coordinates.
- 3) Polyhedral display (1 weeks)
Representation of a polyhedron by vertex and faces lists. Wire frame display of a polyhedron. Visible faces as determined by the face normal. Shading based on the face normal and light direction. Flat shading display of a polyhedron. Painter's algorithm for visible faces.
- 4) Representation of curves (7 weeks)
Implicit, explicit, and parametric representations. Quadratic and cubic Bézier curves and their properties. Cubic Hermite curves. Quadratic and cubic uniform knot B-spline curves and their properties. Interpolation with cubic uniform knot B-splines. Non-uniform knot B-splines.
- 5) Representation of surfaces (1 week)
Bilinear biquadratic, and bicubic patches. Generating face and vertex lists for the polyhedral representation of a smooth surface.
- 6) Achromatic and coloured light (1 week)
Hue, saturation, and brightness/lightness. Tristimulus theory. Colour pickers.
- 7) Extra topics (1 week)
If time permits, extra topics. Example: PostScript.

Recommended Text: J. D. Foley, A. van Dam, S. K. Feiner, J. F. Hughes, R. L. Phillips, *Introduction to Computer Graphics*, Addison-Wesley. 1997.