

Department of Computing

3rd Year/MSc Option in Computer Graphics

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Timetable Spring Term 2009:

Lectures Monday 16.00-17.00 room 145 and Wednesday 10.00-11.00 room 311

Tutorials Wednesday 11.00-12.00 room 311

Course webpage: <http://www.doc.ic.ac.uk/~dfg/graphics/graphics.html>

This course is intended to cover the fundamental aspects of computer graphics that would be utilised in the most prominent of its applications. The course is self contained but since it is offered to all third year and MSc students, there will be some duplication of the material covered in the first year computer course. This will be presented at a level more appropriate to third year teaching.

Lectures

- 1 Device Independent Graphics, Projection and Transformation: 3D Planar objects, projection to 2D, Homogenous coordinates, scene transformation (dfg)
- 2 Transformations for Scene Animation: Flying Sequences, object transformations (dfg)
- 3 Analysis of 3D scenes: Clipping and containment in 3D convex objects, splitting concave objects. (dr)
- 4 The graphics pipeline (dr)
- 5 Texture mapping and anti-aliasing. (dr)
- 6 Shading planar polygons: Gouraud Shading, Phong Shading. (dr)
- 7 Using Colours: Tri-stimulus model, RGB model, YCM model, Perceptual colour spaces. (dr)
- 8 Introduction to Spline curves, cubic spline patches and Bezier Curves (dfg)
- 9 Introduction to Surface Construction, Bezier Surfaces, the Coon's patch (dfg)
- 10 Ray Tracing 1: Ray/object intersection calculations Secondary rays, shadows, reflection and refraction. (dr)
- 11 Ray Tracing 2: Computational efficiency, object space coherence, ray space coherence (dr)
- 12 Radiosity 1: Modeling ambient light, form factors (dfg)
- 13 Radiosity 2: Specular effects, shooting patches, computational efficiency (dfg)
- 14 Geometric Warping (dr)
- 15 Morphing Objects (dr)
- 16 Modelling Fire (dfg)
- 17 Non-photorealistic Rendering (dfg)
- 18 Kinematics and Animation

Tutorials

- 1 3D geometry Transformations and Projections
- 2 Coordinate space transformations
- 3 Texture Mapping and Differential Algorithms
- 4 Shading
- 5 Colour
- 6 Curves and Surfaces
- 7 Ray Tracing
- 8 Radiosity
- 9 Warping and Morphing

Coursework

The coursework will be a series of practical programming exercises using OpenGL, and may be done in groups of up to three. It will involve rendering a 3D data set with different lighting and texture from different viewpoints, and some warping and morphing.

Books

There are many good books on graphics. Our advice is don't bother to buy one unless you really feel you want one. We will hand out comprehensive notes on each subject covered. Some possibilities for reference are:

Interactive Computer Graphics – A top down approach with OpenGL, E. Angel, 2nd edition, Addison Wesley, 2000, well suited for this course, many examples in OpenGL

Computer Graphics: Principles and practice. J. D. Foley et al, 2nd edition, Addison Wesley, 1996 very comprehensive – “The Bible of Graphics” - but rather verbose.

3D Computer Graphics, Alan Watt Addison Wesley 2000 Very clearly written, but doesn't cover all the course material.