Department of Computing

3rd Year/MSc Option in Computer Graphics.

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Lectures Thursday 14.00 room 308, Friday 10.00 room 311
Tutorials Friday 11.00 room 344

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 (provisional list)

1   Device independent graphics: Raster and Vector Devices, Normalised Device Coordinates, World Coordinates, The Normalisation Transformation, Output primitives, Input Primitives. (dfg)
2   Raster Graphics Algorithms 1: Line drawing, differential algorithms (dfg)
3   Raster Graphics Algorithms 2: Filling, seed filling, dithering (dfg)
4   Projection and Transformation: 3D Planar objects, projection to 2D, Homogenous coordinates, scene transformation (dfg)
5   Scene Animation: Flying Sequences, object transformations (dfg)
6   Clipping and containment in 3D convex objects, splitting concave objects. (dfg)
7   Texture mapping and anti-aliasing. (dr)
8   Polygon Rendering and Open GL (dr)
9   Shading planar polygons: Gouraud Shading, Phong Shading. (dr)
10   Using Colours: Tri-stimulus model, RGB model, YCM model, Perceptual colour spaces. (dr)
11   Ray Tracing 1: Ray/object intersection calculations Secondary rays, shadows, reflection and refraction. (dr)
12   Ray Tracing 2: Computational efficiency, object space coherence, ray space coherence (dr)
13   Ray Tracing and Computational Solid Geometry (dr)
14   Radiosity 1: Modeling ambient light, form factors (dfg)
15   Radiosity 2: Specular effects, shooting patches, computational efficiency (dfg)
16   Geometric Warping (dr)
17   Morphing Objects (dr)
18   Modelling Fire (dfg)
19   Non-photorealistic rendering (dfg)
20   Revision (dfg,dr)

Tutorials (provisional list)

1. 2D graphics, normalisation, windows and viewports
2. Raster Algorithms
3. 3D geometry Transformations and Projections
4. Texture Mapping and Differential Algorithms
5. Shading
6. Colour
7. Ray Tracing
8. Radiosity
9. Transformation and Projection (revision)
10. Warping and Morphing

Coursework

The coursework will be on shading, texturing and animation using OpenGL. It will be set after lecture 10. It will be a practical programming exercise and will be marked by demonstration during the last week of term. It will involve acquiring a 3D data set of your own face and rendering it with different lighting and texture from different viewpoints.

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 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.