Subject

The inspiration for this course is shape. Shape must be defined in order to populate scenes for rendering (think Utah teapot), animation (think Pixar), virtual and augmented reality (think flight simulator), and robot motion planning (think R2D2). Shape must be defined for scientific visualization (think modeling of anatomy for surgical planning). Shape must be defined for CAD/CAM (think modeling of a Porsche or 777). Shape must be defined for architectural models (think Frank Gehry and Bilbao). And, last but not least, shape must be defined for game design (think Quake and Gran Turismo), which is another recent inspiration for this course.

We shall cover many classes of shape: polygonal meshes, Bezier curves and surfaces, NURBS, subdivision surfaces, quaternion splines, and swept surfaces including quadric and ruled surfaces. Since the path followed by a moving object is a dynamic shape, we shall also study aspects of flythroughs, camera control, and collision detection. OpenGL and GLUT over C or C++ will be used for implementation.

Professor     Dr. John K. Johnstone
Time          MWF 1:25-2:15pm, EB135 (we will attempt to move into CH132)
Office Hours  M-F 12-1, CH125
Prerequisites Fluency in C or C++; mathematical maturity including linear algebra
Equipment    Linux workstation with C++/OpenGL/GLUT

Grading

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<td>2 Midterms</td>
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<tr>
<td>Final for 671</td>
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<td>Homework</td>
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<td>Participation</td>
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<tr>
<td>Research paper</td>
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Textbooks


Additional Modeling References


Conference and Journal References

- SIGGRAPH conference proceedings (see www.mhsl.uab.edu, Databases, ACM Digital Library, SIGGRAPH).


General Graphics References


Additional Language and Modeling Tool References


- www.developer.nvidia.com (particularly see the CG Toolkit and OpenGL demos)

- Getting Started with Maya 6, Alias Wavefront, 2004. (Also the online help and the Personal Learning Edition of Maya.)
Curriculum

1. OpenGL and GLUT
2. Polygon meshes
3. Bezier curves
4. Bezier surfaces
5. Quaternion splines
6. Flythroughs, camera control, and collision detection
7. Subdivision surfaces
8. Swept surfaces

Coverage

1. OpenGL Programming Guide: Chapters 1-5, 12, Appendices D-F.
   (Chapters 6 and 8-10 will be discussed in the GPU seminar.)
2. Farin: parts of Chapters 1-10, 12-16, 19, and 21.

Day 1 homework:
Read Chapters 1 and 2 of OpenGL Programming Guide; start HW1 on OpenGL; read Chapters 1-3 of Farin.