
Course 6.837: Computer Graphics OpenGL & C++

01 - (00:04) – “Mesh Viewer”

Responsible for 3D mesh loading from OBJ files. Implemented color and light position changes.

02 - (00:17) – “Curves and Surfaces”

Implemented splines and swept surfaces to model interesting shapes. Computed local coordinate frames along the curve to display piecewise Bezier, B-spline, Catmull-ROM curves.

03 - (00:24) – “Hierarchical Modeling & SSD”

Constructed joint hierarchy and matrix stack with OpenGL primitives to render skeletons. Wrote code to set joint transforms based on joint angles. Implemented Skeletal Subspace Deformation by computing all necessary transformations by blending the weights and updating vertices of the mesh. Colored skin based on joint weights.

04 - (00:49) – “Physical Simulation: Particle System”

Implemented Euler and Trapezoidal numerical methods for solving ordinary differential equations. Used to display 2nd order systems such as simple pendulum and string of particles.

05 - (01:00) – “Physical Simulation: Cloth System”

Responsible for extension of particle system into cloth simulation. Extra features include adding gentle breeze and collision detection.

06 - (01:46) – “Ray Caster”

Responsible for implementing ray caster, depth and normal output, Phong Shading model, and texture mapping with UV coordinates.

07 - (02:10) – “Ray Tracer”

Improved ray caster to an advanced ray tracer. Improved shading model by recursively generating rays to create shadows/reflections. Added procedural solid texturing with Perlin Noise. Added supersampling to fix aliasing.

Projects and Related Works

08 - (02:21) – “Game Design: Rampart”

Unity3D & C#

Created digital multilayer build/attack/defend game meant for an interactive touch-top interface. On front end, developed shapes from primitive models, animations, and silhouette shading. On back end, designed underlying game architecture, flood-fill algorithm, A* search, blast radius interpolation, co-routines, and other data structures.

09 - (03:08) – “Game Design: Bermuda Paper Prototype”

Created own board game with the theme of the Bermuda Triangle in mind. Players have to spend resources in order to escape the triangle while overcoming obstacles on a dynamically changing board.

10 - (03:13) – “3D Models: Body Extension Design”

Body extension project associated with Visual Arts class. Project was designed to fulfill three aspects (1) interpretation of the Water Age, (2) extension of particular human body part, (3) and incorporation of college major (*Electrical Engineering & Computer Science*)

11 - (03:20) – “3D Models: Body Extension Prototype”

Physically developed spine-like apparatus by band-sawing blocks of wood from a 4 by 4 and hot gluing them to a latex tubing, LED lights and batteries were attached to the vertebrae and lit up when wood block edges touched.

12 - (03:29) – “3D Models: MIT Dome”

Printed 3D model of MIT Dome in Computer Graphics class.