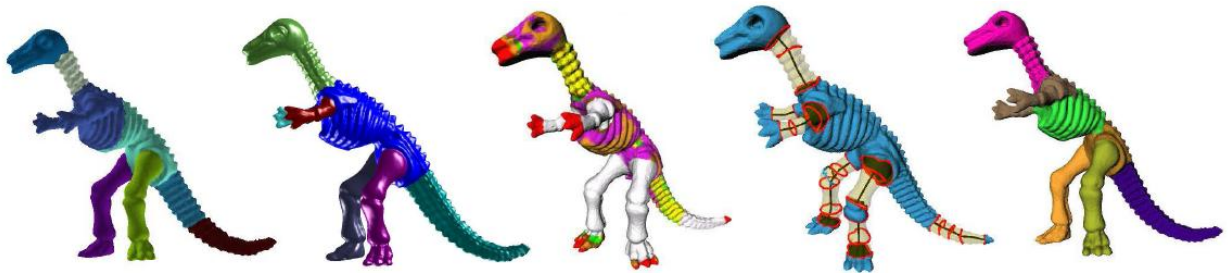
EE 4730: 3D Graphical and Geometric Modeling



Goal: This course introduces theoretic and computational background of modeling in 3D computer graphics and geometric processing, specifically, how to represent, model, and analyze 3D models and scenes. After covering/reviewing basic computer graphics programming and geometry concepts, students will learn popular 3D data representation schemes and know how to effectively use them in different graphics, computer-aided design, simulation, or animation applications.

Time/Instructor: M/W/F 12:40pm-1:30pm**,** Xin (Shane) Li (xinli@lsu.edu), http://www.ece.lsu.edu/xinli ,

Prerequisite: CSC 3102 and Math 2090 or equivalent in the areas of C/C++ programming, calculus, and linear algebra.

Tentative Course Contents:

Topics
Basic computer graphics pipeline, basic OpenGL programming
Basic 3D geometry; 2D and 3D Transformations, Projections
Graphics User Interface design, building interactive graphic user interface
Mesh Representation (most popular representation in computer graphics) ▪ Representing objects using triangle meshes; ▪ Computing geometric properties on triangle meshes (areas, normal, curvatures, geodesic curves, boundaries…) ▪ Representing meshes in multiple resolutions, and applications
Spatial-Partitioning Representation (widely used in commercial 3D modeling systems) ▪ Representing objects using regular grids, Quad-tree (2D) and Oct-tree (3D); ▪ Applications of SP-Rep.: Inter-object collision detection using hierarchical oct-tree
Parametric Representation (industry computer-aided design/manufacturing technique) ▪ Representing curves and surfaces using splines; ▪ Applications of Parametric-Pep. : Shape editing, free-form deformation
Medial Representation (for gamers and animators) ▪ Representing objects using their skeletons (skeletonization and mesh skinning) ▪ Applications of Medial Rep. : Shape Matching, Skeleton-driven Deformation
Other representations and their applications

Textbook: (not required, slides will be provided)

Chapters/contents selected from:

1. "The OpenGL programming Guide", http://www.opengl.org/documentation/red_book/ (for OpenGL programming])
2. "3D Computer Graphics", by Alan Watt, 3rd edition, Addison Wesley 1999. (for Graphics/Modeling Background)
3. "Curves and Surfaces for CAGD: A Practical Guide", by Gerald Farin, 5th edition, Morgan Kaufmann, 2001. (for Computer-aided Modeling and Design)
4. Tutorials and papers from ACM SIGGraph Conferences.

Grading Policy and Scale:

1. Four homework assignments (11+11+11+12); 45 points
2. A course project with a midterm presentation (10), a final presentation (10), and a final demo (15); a team of 2 to 3 students will pick the topic and work on it together; 35 points
3. Final Exam: 20 points

Letter grades will be assigned as follows:
A (>= 80); B (>= 70); C (>= 60); D (>= 50); F (below 50)