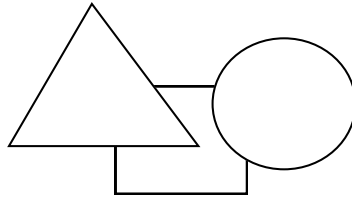


ME 575 GEOMETRIC MODELING SPRING 2011



Audience

Graduate students

Recommended Prerequisite

C/C++ programming, Excel/VB programming, or consent of instructor

Instructor

Dr. S. Jayaram, ETRL 252 B, 335-1900, sjayaram@wsu.edu

Course Description

Participants will study the mathematics behind the creation of complex shapes related to computer aided design. The creation and manipulation of parametric curves and surfaces will be studied. The creation and manipulation of solid models will be presented. Methods for detecting intersections between geometric objects, collision detection, tessellation and rendering of surface models, and properties of the various types of curves and surfaces will be discussed. Coordinate systems and transformations of points, vectors, and coordinate systems will be discussed.

Textbook

“The Essentials of CAGD”, Gerald Farin and Dianne Hansford, ISBN 1-56881-123-3

Course Format

The course will consist of three hours of lectures per week. Homework assignments will include mathematical and programming assignments to implement geometric modeling methods. Use of computer graphics techniques will be required for display and input. There will be two in class tests and several homework assignments.

There will be one set of paper presentations by students in the class. Each student will be required to thoroughly read and understand a recent technical paper and make a 10 minute presentation. There will be one project aimed at a specific application of geometric modeling methods.

Grading Policy

Tests	50
Paper Presentations	10
Project	20
Assignments	20

Topics to be covered

1. Three-Dimensional Geometry:
 - Points, Vectors
 - Affine Transformations
 - Lines and Planes
 - Coordinate System Transformations
 - Euler angles and Quaternions
 - Viewing Transformations

2. Parametric curves:
 - Algebraic Form
 - Linear Interpolation
 - The deCasteljau Algorithm - Bezier Curves
 - Conics and Hermite Curves
 - B-Spline Curves
 - NURB Curves

3. Parametric surfaces:
 - Coon's Patch
 - Ruled Surfaces
 - Bezier Surfaces
 - B-Spline Surfaces
 - NURB Surfaces

4. Solid modeling:
 - Boundary Representation
 - CSG

5. Integration of geometric models with CAD:
 - Creating B-Spline curves and surface data for objects
 - Importing data into CAD to create complex geometries

6. Relational properties between objects:
 - Surface Intersections
 - Distance Computations
 - Collision Detection
 - Curves on Surfaces
 - Surface Subdivision
 - Surface trimming