MATH483 - Scientific Visualization and Animation

Professors David Bernstein and Jim Sochacki

Description: This course will introduce students to the concepts of scientific visualization and animation. Specifically, it will consider ways to: represent curves and surfaces, use representations of curves and surfaces to create static and dynamic visual content, incorporate visualization and animation techniques into models of static and dynamic systems, and use visualization and animation to improve scientific understanding.

Textbook: There is no textbook for this course. The *OpenGL Programming Guide* (v1.1) is available online if you need it. Readings are on reserve.

Outline: (though specific topics and dates may change):

Part I: Introduction

8/28	Coordinate Systems, Review of Analytic Geometry Globus and Raible
8/30	Example: Cartography
9/4	Introduction to Differential Equations
9/6	Example: Trajectories

Part II: Visualization of Multi-Dimensional Shapes and Data

9/11	Parametric Curves and Surfaces I
9/13	Parametric Curves and Surfaces II
9/18	Example: Bezier Curves and Example: Animation and Tweening
9/20	Parametric Curves and Surfaces III
9/25	Guest Lecture: 3D Printers and Rapid Prototyping
9/27	Parametric Curves and Surfaces IV
10/2	Example: Functions from ? 2 to ? 2 , from ? 3 to ? 3 and from ? 2 to ? 1 Boring and Pang and Helgeland and Andreassen
10/4	Example: Bezier Surfaces
10/9	Presentation of Assignment 2
10/11	Parametric Curves and Surfaces V

Part III: Visualization of Dynamical Systems

10/16	A Brief Review of Probability
10/18	An Introduction to Markov Chains I
10/23	An Introduction to Markov Chains II
10/25	Visualization of Markov Chains
10/30	Presentation of Assignment 3
11/1	Diffusion and Dispersion: SIR and SIS Models I
11/6	Diffusion and Dispersion: SIR and SIS Models II

Part IV: Final Project

11/8-11/15	Project Meetings
11/20	Preliminary Presentation of Final Projects
11/27	Public Exhibition
11/29	Critique
12/4	Final Project Presentations
12/6	Final Project Presentations (cont.)

You are expected to come to class prepared to ask *and answer* questions on the topics above. Attendance is not mandatory but is strongly encouraged.

Grading: Final grades will be based on your performance on: 3 programming assignments (20% each) and 1 final project (40% total).

Programming Assignments: 3 programming assignments will be assigned during the semester.

Programming Assignment 1 , Due: 9/18 (Basics)
Programming Assignment 2 , Due: 10/9
(Animation and Visualization of Simple Dynamics)
Programming Assignment 3 , Due: 10/30 (Exploratory Visualization)

Make sure you read and understand all of the policies related to programming assignments.

Office Hours: You may meet with Prof. Bernstein during his scheduled office hours or you may schedule an appointment with him. You also may meet with Prof. Sochacki during his scheduled office hours or you may schedule an appointment with him.

Software Development Tools: There are a variety of different software development tools that you might find useful, including:

C/C++ Compilers, APIs, and Utilities
File Compression/Decompression Utilities
Text Editors
UNIX-Like Utilities

Mathematical Tools: There are a variety of different numerical and symbolic math tools that you might find useful:

Math Tools