ISC5307: Scientific Visualization

Instructor: Dr. Xiaoqiang Wang
Department of Scientific Computing
495 Dirac Science Library
Tel: (850) 644-4274
Email: wwang3@fsu.edu

Course: ISC5307
DSL 152
Monday, Wednesday and Friday 10:10 am – 11:00 am.

Office hours: Monday, Wednesday and Friday 11:00 am – 12:00 pm., or by appointment

Course web page: BLACKBOARD

Text:
Online and hard copy handouts.
And the following books may also be useful as references.

1. *The Visualization Handbook*, by Charles Hansen and Christopher Johnson, Academic Press, 2005
2. *The Visualization Toolkit: An Object-Oriented Approach to 3D Graphics*, by William Schroeder, Ken Martin, Bill Lorensen, Third Edition, 2004

Course description:
This course is designed to introduce the students to scientific visualization for large-scale computational and experimental data. It will cover the visualization theory and practice. It will teach students the techniques for creating effective visual representations of 2D and 3D scientific data sets. The fundamental concepts, data structures and algorithms in scientific visualization will be presented and applied using datasets from different disciplines. Classic visualization techniques for scalar, vector and tensor data such as marching cubes, ray casting, splatting, streamline, and line integral convolution etc, will be discussed.

The topics include

- Introduction of visualization
- Visualization toolkits(VTK), OpenGL and Amira
- Drawing Geometric Objects
- Viewing, illumination and Shading
- Introduction to Volume Visualization
- Scalar-field visualization in 2D and 3D
- Volume rendering
- Visualization of Vector-field and Tensor in 2D and 3D
- Information Visualization
- Basics of human visual perception
- Evaluating the effectiveness of visualization
- Student Project Presentations

Course objectives: After completion of this course, the student should

- be able to write computer codes for visualization using VTK, Amira or OpenGL;
- be able to create effective visual representations of 2D and 3D scientific data sets;
- determine the most applicable technique for a specific scientific visualization application;
- be able to use existing visualization software packages;
- be aware of the human visual perception and effectiveness of visualization.

Software Platforms:

C/C++, Matlab, OpenGL, VTK, Amira

Prerequisites: All graduate students with some C/C++ programming experience are welcome to this course. (eg. CGS 4406)

Assessment and Grading Policy:

- Visualization Exercises (60%)
- Paper reading and summarization (15%)
- Final Programming Project (25%)

American Disability Act:

Students with disabilities needing academic accommodation should:

(1) register with and provide documentation to the Student Disability Resource Center; and

(2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

Academic Honor Policy:
The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://dof.fsu.edu/honorpolicy.htm.)