CS3353 Course Outline
Computer Graphics

August 27, 2009

Instructor: John E. Howland
TEXT: "Interactive Computer Graphics A top-down approach with Open GL, 5th Edition" and "OpenGL, A Primer, Third Edition", both by Edward Angel.

1 Course Objectives

- Introduce interactive computer graphics concepts
- Introduce the architecture of computer graphics devices
- Introduce the mathematical representation of graphic images
- Develop graphics programming skills

2 General Information

This course will consist of lectures which will involve classroom use and demonstration of computer graphic concepts together with programming laboratory problems. Our Unix workstations will be the principle laboratory graphics machines, although, other available machines may be used such as Macintosh OS X or other PC's. Laboratory programming will be accomplished using C, C++, J or Scheme programming languages and the OpenGL graphics Application Programming Interface.

3 Examination Schedule

Examinations will be given according to the following schedule. There will be a final examination or a final project and project presentation during the final examination period.

- September 17, 2009
- October 15, 2009
- November 19, 2009
- Final Exam Period, Tuesday, December 15, 12:00 p.m., 2009 in HAS 340

4 Academic Integrity and Honor Code

All students are covered by a policy that prohibits dishonesty in academic work. The Academic Integrity Policy (AIP) covers all students who entered Trinity before the Fall of 2004. The Academic Honor Code covers all those who entered the Fall of 2004 or later.

The Integrity Policy and the Code share many features: each asserts that the academic community is based on honesty and trust; each contains the same violations; each provides for a procedure to determine if a violation has occurred and what the punishment will be; each provides for an appeal process. The main difference is that the faculty implements the AIP while the Honor Code is implemented by the Academic Honor Council. Under the Academic Integrity Policy, the faculty member determines whether a violation has occurred as well as the punishment for the violation (if any) within certain guidelines. Under the Honor Code, a faculty member will (or a student may) report an alleged violation to the Academic Honor Council. It is the task of the Council to investigate, adjudicate, and assign a punishment within certain guidelines if a violation has been verified.

Students who are under the Honor Code are required to pledge all written work that is submitted for a grade: On my honor, I have neither given nor received any unauthorized assistance on this work and their signature. The pledge may be abbreviated pledged with a signature.

5 Laboratory Problems

Several laboratory problems will be assigned. These problems are to be done on an individual basis following the Trinity University Academic Integrity Policy or Honor Code.

These programs will be submitted in machine readable form. Each program must contain adequate comments and documentation in the source code itself. In addition, each program should include written documentation describing its internal organization, data structures and operation. This written documentation shall be turned in on the due date for the laboratory problem in hardcopy form. When a program is submitted, it will first be subjected to a series of machine tests. Subsequently, each program will be hand graded. Each problem submission must include a printed listing of the programs. Programs received after the due date, may not be given maximum credit. Laboratory problems should be e-mailed to cs3353@leda.cs.trinity.edu

6 Class Discussion and Participation

Some class discussion will be conducted outside of class on a local mail list, http://www.cs.trinity.edu/mailman/listinfo/csci335 . Each student should subscribe to the CSCI3353 list and contribute to the discussion when appropriate. Such contributions may include responses to topics posted by others or by posting new discussion topics. The instructor will be reading the list and may contribute discussion topics from time to time. Discussion topics should be limited to the course but may cover any aspect of the course. This discussion list will be archived but not moderated. This means that all of the discussion will be saved so that it can be accessed at any time, but what you post to the group will be seen by all readers in unedited form. It is up to you to engage in friendly conversation and debate. Personal attacks are sure to cause you to be flamed by others and are not encouraged. The mailing list archives may be accessed at http://www.cs.trinity.edu/pipermail/csci3353 . This portion of each student's grade is subjectively determined by such things as correctness of answers to questions and quality of contributed discussion threads as well as class attendance.

7 Grading

Read biology professor Blystone's words (http://www.cs.trinity.edu/˜jhowland/blystone-Grades.pdf) on grades.

The approximate breakdown on grading will be as follows. Exams will be used to determine 45% of the final semester grade. Programming homework and class projects will be used to determine 40% of the final semester grade. Class discussion and other subjective measures will be used to determine 5% of the final grade and the final examination will be used to determine the remaining 10% of the final grade.

8 Topics

- Interactive Computer Graphics

- History
- Applications
- Programmer's Model

- Basic Interactive Graphics Programming Models, Picture Description, and Interaction A Simple Graphics Package
  - Graph Plotting
  - Windowing
  - Clipping
  - Segmentation
  - Viewports
  - Character Strings
  - Symbol Layout
  - Data Structures
  - Interactive Programming
  - Input Devices

- Graphics Hardware
  - Display Technology
  - Random Scan Devices
  - Input Devices
  - Rastor Scan Devices

- Implementation of a Simple Graphics Package Geometrical Transformations
  - 2D Transformations
  - Homogeneous Coordinate System
  - Matrix Representation
  - Viewing Transformation
  - Functional Composition of 2D Transformations
  - Efficiency
  - 3D Transformations
  - Homogeneous Coordinate System
  - Matrix Representation
  - Functional Compostion of 3D Transformations
  - Change of Coordinate Systems

- Viewing in Three Dimensions
  - Projections
  - 3D Viewing Transformations
  - Clipping

- Advanced Topics
  - Raster Algorithms
  - Filling Regions
  - Polygon Clipping
  - Algorithms for Removing Hidden Edges and Surfaces