CSE 872: Advanced Computer Graphics

Fall Term 2008

1 Course Information

This course is a second computer graphics class at the graduate level. My approach in this class is to introduce and experiment with many advanced techniques. Everyone will be expected to do three significant individual projects and write one paper related to an individual project. We'll also examine new literature in the field and present papers.

Objective: Students completing this course are expected to be able to:

- Understand and work with advanced rendering methods such as radiosity.
- Design programs for advanced animation methods.
- Understand the basics of merging reality and computer graphics.
- Work with physical modeling solutions.
- Understand issues of modern game design.

There are really two topics in advanced computer graphics: speed and quality. These are often conflicting requirements and lead to very different designs. This course will seek to balance the issues of real-time graphics programming such as games and offline approaches that seek the best possible realism.

Instructor: Charles B. Owen
Office: 1138 Engineering Building
Phone: 353-6488, 337-0543 (home)
Office Hours: MTuTh, 10:00-11:00AM and by appointment.
I have an open-door policy. Feel free to contact me at any time.
cbowen@cse.msu.edu

Schedule: MW 12:30-1:50 in 041 Kresge Art Center

Textbooks: *Advanced Animation and Rendering Techniques*, Alan Watt, Mark Watt. ISBN: 0201544121

OpenGL Programming Guide, Fourth Edition, Woo, Neider, Davis, and Shreiner, Addison Wesley, ISBN 0-321-17348-1. (Optional)

The *OpenGL Programming Guide* is optional, but highly recommended as a reference for use programming assignments. It contains many useful examples and lots of information on OpenGL programming. You can access reference materials in other places, but it's often much more cryptic than in this text.

WWW: Information about the class will be posted at: http://www.cse.msu.edu/~cse872/

Prerequisites: CSE 472 or equivalent.

Angel: This class will be utilizing angel, the online course management system. This is in addition to the regular class web site, which I will also use.

Privacy: Electronic conversation via email, bulletin boards, or any of the angel features, is different from verbal communication because it retains the identity of the participant. In this course, all participants will have access to a list of names and e-mail addresses of

other course participants. Participants in the course will be able to send bulk e-mail to all other participants.

It is inappropriate to use the email features of this course to send bulk e-mail to all enrolled in the class, unless this type of activity is for a specific educational objective, e.g., to facilitate collaborative learning within the class. All use of the e-mail function within Blackboard is governed by the "Good Citizenship In Cyberspace" section contained in MSU's Acceptable Use policy (http://www.msu.edu/unit/complab/policies.html and http://www.cse.msu.edu/facility/policy.html)

Exams: Notice: This course will not have formal exams. We will, however, meet the scheduled day of the final exam for evaluation of projects. Attendance will be required.

Programming Assignments:

3 individual programming assignments will be assigned during the course of the term. Project 1 is a baseline project to demonstrate competence in OpenGL and modeling. Project 2 will examine some advanced method in ray tracing and photorealistic imaging. The third project will demonstrate some recent advancement in computer graphics.

Explorations: There will be a pool of exploration problems on the class web site. You are required to submit one problem solution on each of the four due dates in the semester. There are four due dates in the semester for a total of four problems. These answers are to be submitted as written papers in conference format suitable for submission to SIGGRAPH 2009.

Grading: These are the grading elements of the course:

Review/presentation papers:	20%
Explorations:	20%
Project 1:	15%
Project 2:	20%
Project 3:	15%
Class participation:	10%

Final grades will be based on the scale:

4.0	90%+
3.5	85%
3.0	80%
2.5	75%
2.0	70%
1.5	65%
1.0	60%

Academic Honesty: Article 2.3.3 of the Academic Freedom Report states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, the (insert name of unit offering course) adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See Spartan Life: Student Handbook and Resource Guide and/or the MSU Web site: www.msu.edu.) Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, tests and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course. Also, you are not authorized to use the www.allmsu.com

Web site to complete any course work in (insert course number here). Students who violate MSU rules may receive a penalty grade, including--but not limited to--a failing grade on the assignment or in the course. Contact your instructor if you are unsure about the appropriateness ofyour course work. (See also http://www.msu.edu/unit/ombud/honestylinks.html)

That's the university policy. My specific policies are as follows: You may discuss individual assignments with other students, but the assignment must be entirely your own work. Plagiarism just makes me mad! All work turned in must be your own. If you borrow or adapt software from a textbook or from source code that is obviously public, you must treat this as a quotation or paraphrase, acknowledging the source in the heading or the program module.

You may discuss assignments in general terms with your classmates, the course staff, or the instructor, but you are not permitted to receive solutions from others or to read or copy part or all of another person's solution to a problem.

Disabilities: Students with disabilities should contact the Resource Center for Persons with Disabilities to establish reasonable accommodations. For an appointment with a disability specialist, call 353-9642 (voice), 355-1293 (TTY), or visit MyProfile.rcpd.msu.edu.

Drops and Adds: The last day to add this course is the end of the first week of classes. The last day to drop this course with a 100 percent refund and no grade reported is Thursday, 9-18-08. The last day to drop this course with no refund and no grade reported is Tuesday, 10-14-08. You should immediately make a copy of your amended schedule to verify you have added or dropped this course.

Commercialization: Commercialization of lecture notes and university-provided course materials is not permitted in this course.

Religious Holidays: You may make up course work missed to observe a major religious holiday only if you make arrangements in advance with the instructor.

Required Activities: To make up course work missed to participate in a required activity for another course or a university-sanctioned event, you must provide the instructor with adequate advanced notice and a written authorization from the faculty member of the other course or from a university administrator.

Attendance: Students whose names do not appear on the official class list for this course may not attend this class.

Internet: Some professional journals will not consider a submission for publication if the article has appeared on the Internet. Please notify your instructor in writing if you do not want your course papers posted to the course Web site.

Disruptive Behavior: Article 2.3.5 of the Academic Freedom Report (AFR) for students at Michigan State University states that "The student's behavior in the classroom shall be conducive to the teaching and learning process for all concerned." Article 2.3.10 of the AFR states that "The student has a right to scholarly relationships with faculty based on mutual trust and civility." General Student Regulation 5.02 states that "no student shall . . . interfere with the functions and services of the University (for example, but not limited to, classes . . .) such that the function or service is obstructed or disrupted. Students whose conduct adversely affects the learning environment in this classroom may be subject to disciplinary action through the Student Faculty Judiciary process.

Course Content

- Basic and advanced modeling
- Scan conversion for photorealistic rendering
- Ray tracing and related methods
- Radiosity and hybrid methods
- Particle-based methods
- Physical modeling
- Water and fire
- Curves, splines, NURBS
- Quaterians for computer graphics
- Computational geometry
- Non-photorealistic methods
- Volume rendering and constructive solid geometry
- Gaming and simulation
- Level of detail
- Virtual and augmented reality techniques

Notice: I never specify exactly what material will be covered on any particular week and reserve the right to modify the presentation order of materials. This is for your benefit. Course progress will be based on feedback from students, be it though grades or directly. As an advanced topics course, this course will also vary the presentation depending on student topic interests.

Important Dates

October 6: Project 1 due
November 3: Project 2 due
December 15: Project 3 due

Exploration due dates:
September 8, 22.
October 20.
November 24

The course schedule is subject to change with appropriate notice.