

CSE 872: Advanced Computer Graphics

Fall Term 2009

1 Course Information

This course is a computer graphics class at the graduate level. The first half of the course will go over general concepts in rendering, modeling and animation, as well as the basic mathematical and geometric tools commonly used in the field. The second half will consist of lectures covering recent research results, ranging from mesh processing, simulation, to non-photorealistic rendering. Everyone will be expected to complete a series of simple homework assignments, present one paper related to a chosen research topic, and complete a (team) project.

- 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 geometry processing.
 - Understand issues of modern game design.

There are really two topics in advanced computer graphics: speed (efficiency, tradeoffs) and quality (robustness, visual impact). 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: Dr. Yiyong Tong

Schedule: MW 12:40-2:00pm, Office hour by appointment

Textbooks:

- *Fundamentals of Computer Graphics* (2nd/3rd Edition), by Peter Shirley and others. AK Peters. **ISBN**: 978-1-56881-269-4.
- *Computer Animation, Second Edition: Algorithms and Techniques*(Optional)* by Rick Parent Publisher: Morgan Kaufmann; ISBN-13: 978-0125320009
- *Real-Time Rendering, Third Edition (Optional)* By by Tomas Akenine-Moller, Eric Haines, Naty Hoffman. Publisher: AK Peters; 3 edition (July 31, 2008) ISBN 978-1568814247

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 on the scheduled day of the final exam for evaluation of projects. Attendance will be required.

Programming Assignments:

Programming assignments will be assigned during the course of the term. The first assignment will be a simple step-by-step tutorial on "How to build your own OpenGL". Then small homework assignments will be given on specific topics in graphics.

Grading:

These are the grading elements of the course:

Review/presentation paper:	30%
Assignment 1:	30%
Term Project:	30%
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 of your 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. 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, Radiosity and related methods
- Particle-based methods
- Physical modeling
- Water and fire
- Curves, splines, NURBS
- Quaternions for computer graphics

- Computational geometry
- Non-photorealistic methods
- Volume rendering and constructive solid geometry
- Gaming and simulation
- Level of detail

Notice: I rarely 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 through grades or directly. As an advanced topics course, this course will also vary the presentation depending on student topic interests.