

CMSI 371

COMPUTER GRAPHICS

<http://myweb.lmu.edu/dondi/fall2005/cmsi371>

Fall 2005 — Doolan 219
TR 3:00–4:15pm, 3 semester hours
Office Hours: TR 1:30–3pm, 4:30–6pm

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Course Objectives

To master the principles of the art and science of computer graphics and become proficient in the design and programming of interactive graphics applications. The emphasis is on learning how to architect and write graphics software, rather than on learning how to use graphics software that has already been developed. Students will be exposed to basic computational geometry and OpenGL programming, while gaining valuable exposure to other technologies such as graphics in Java.

Course Requirements

Mastery of a high-level programming language such as Java or C++; expert knowledge of data structure and algorithm design; proficiency with vector and matrix operations; some familiarity with object-oriented programming, computer hardware, and operating systems; ability to document, demonstrate and explain one's own software; willingness to participate actively in class discussions.

Materials and Texts

- Edward Angel, *Interactive Computer Graphics: A Top-Down Approach with OpenGL*, Fourth Edition, Addison Wesley, 2006.
- Mason Woo, editor, *OpenGL® 1.2 Programming Guide, Third Edition: The Official Guide to Learning OpenGL, Version 1.2*, Addison Wesley, 1999.
- Assorted handouts and sample code to be distributed throughout the semester.

Alternatively, much of the content in the above materials is available in various forms on the Worldwide Web; starter links are available on the class Web site. Do not hesitate to search for and find additional sources of information regarding the techniques, tools, and paradigms that we will discuss.

Course Work and Grading

Graded coursework consists of accumulated homework (20%), 2 quizzes (30% or 15% each quiz), 1 graphics project (30%), and 1 final exam (20%). Letter grades are determined as follows: $\geq 90\%$ gets an A– or better; $\geq 80\%$ gets a B– or better; $\geq 70\%$ gets a C– or better. Fractions of a percent ≥ 0.5 round up to the next integral value. The instructor may curve your grade upward based on qualitative considerations such as degree of difficulty, effort, class participation, time constraints, and overall attitude throughout the course. Grades are never curved downward.

Homework

Homework consists of questions, exercises, and programming assignments to be given throughout the semester. Homework is where you can learn from your mistakes without grading penalty: if you do the work and submit it on time, you will get full credit, regardless of correctness. What goes around comes around — the effort you put into your homework pays off in the tests and the project. The homework submission deadline is always the beginning of class on the designated due date. Any submissions after

this deadline receive half credit. Occasionally, extra credit homework may be assigned. Fulfilling extra credit work is counted *on top of* the 20% allocation of homework to your final grade.

Graphics Project

You will design and implement a cross-platform, interactive graphics application using OpenGL. *Interactive* means that the user can make dynamic changes to the application's model or display. The project consists of these deliverables:

1. *White paper* describing/proposing what you will do: submit as a text file using CVS (see below). Due September 27, 10% of the project grade. Upon submitting your white paper, we will “process” your proposed project and should have it finalized on or before October 11.
2. *Midsemester progress report* — a session where you show me what you've done so far. We will also look at the state of your source code and supporting files at this juncture. Currently scheduled for October 27, 10% of the project grade.
3. *Source code and supporting files* — this should be everything a “customer” will need to compile, run, and use your project. To be submitted via CVS, due December 6 (your final source submission == whatever is in CVS on December 6), 70% of the project grade.
4. *Final presentation* — time to show off! This is a session at the end of the semester to share your labor of love with everyone in the class (and perhaps other folks in the department). Currently scheduled for December 8, 10% of the project grade.

Sample ideas: an interactive 3D weather map; a 3D “working model” of a real-world device (clocks, vehicles, cell phones, calculators); a 3D construction set of some kind (Lego bricks, buildings, landscapes, faces); a physics simulation (sports, fireworks, heavenly bodies). And oh yes, a graphics-oriented game, with emphasis on the graphics, not the game.

Use of CVS: CVS stands for Concurrent Versions System — it is a source code management system that many development shops use for managing, storing, and updating their source code. We will use CVS to manage your project files and mark milestones in your code. Your Keck Lab accounts automatically come with CVS set up in your home directories.

Project grading criteria: Project deliverables #1, #2, and #4 follow the same policy as homework — what matters is that you fulfill them on time, and you will get full credit for them; half credit if they're late. Project deliverable #3 is your meat and potatoes, and will be graded on the following criteria:

1. *Design (30%):* How good is the overall structure of the program? Is it clear, easy to understand, flexible, and easy to maintain? Is it elegant or innovative? How closely does it follow the “one change, one place” rule of thumb?
2. *Functionality (30%):* How well does the program work? Does it accomplish the project's goals? Are its results accurate or correct? Does it perform its tasks in a reasonable amount of time?
3. *Naming (20%):* Are program entities — classes, subroutines, variables, etc. — clearly and consistently named? Do their names correspond to their functions and roles?
4. *Comments (15%):* Are comments provided where appropriate? Are the comments clear and well-written? Does the project take advantage of any special support for comments provided by the project language or platform (e.g. Javadoc in Java)?
5. *CVS use (5%):* Do you commit your code at reasonable intervals? Do you provide adequate descriptions of your commits?

Tests

Quiz 1 is initially scheduled for October 13; Quiz 2 is initially scheduled for November 17. The final exam is scheduled for December 13. All tests are open-*paper*-everything; no sharing. Electronic look-ups may also be allowed depending on the scope or subject matter. You may neither solicit nor give help while an exam is in progress. Late and/or missed tests will be handled on a case-to-case basis; in all instances, talk to me about them.

Attendance

I am not a stickler for attendance, but I do like having a full class. Remember that the late registration and change of program deadline is September 2. The deadline for withdrawal or credit/no-credit status is November 4.

University Policy on Academic Honesty

Loyola Marymount University expects high standards of honesty and integrity from all members of its community. Applied to the arena of academic performance, these standards preclude all acts of cheating on assignments or examinations, plagiarism, forgery of signatures or falsification of data, unauthorized access to University computer accounts or files, and removal, mutilation, or deliberate concealment of materials belonging to the University Library.

Course Topics and Schedule

This schedule may change based on the actual ebb and flow of the class; deadlines, exams, and university dates (*italicized*) are less likely to change than lecture topics.

September	Focus on interfaces: how to use OpenGL; how to do computer graphics in Java
<i>September 2</i>	<i>Late registration and change of program deadline</i>
September 27	Project prospectus due
October	Focus on implementation: graphics and memory; transforms; object modeling
October 11	Projects finalized
October 13	Quiz 1
<i>October 25</i>	<i>Undergraduate holiday; no class</i>
October 27	Midsemester progress report
November	Viewing and projection; clipping; hidden surface removal; shading
<i>November 4</i>	<i>University withdraw/credit/no-credit deadline</i>
November 17	Quiz 2
<i>November 24</i>	<i>Thanksgiving; no class</i>
December	Graphics primitives; miscellaneous topics (time permitting)
<i>December 6</i>	<i>Final submission of source code/supporting files</i>
<i>December 8</i>	<i>Final project presentations</i>
<i>December 13</i>	<i>Final exam, 2:00 PM</i>

You can view the class calendar on the Web at <http://ical.mac.com/dondi/LMU>. If you have an iCalendar-savvy client (i.e. Mozilla Calendar, Ximian Evolution, KOrganizer, Apple iCal, etc.), you can subscribe to the class calendar at <webcal://ical.mac.com/dondi/LMU.ics>. On-the-fly updates and adjustments to the class schedule will be reflected in this calendar.