DM809

Computer Game Programming I: Graphics

Rolf Fagerberg

August/Fall 2010

Goals for Today's Lecture

- Introduction to course:

  - Motivation

  - Contents of course

  - Formalities of course

  - Textbook

  - Tentative courseplan

- Overview of 3D rendering

  - 3D worlds and models

  - Overview of the graphics rendering pipeline

  - Online vs. offline rendering

Why Computer Game Programming?

- Fun, attraction, curiosity

- Career goal (in US, game industry twice as large as movie industry in sales)

- Great display of use of many Computer Science subjects and courses:
  - Programming (DM502, DM503, DM529)
  - Algorithms and data structures (DM507)
  - Linear algebra and other math (DM527, MM501, MM502, MM505)
  - Numerical analysis (MM518)
  - AI (eg. finite automatons from DM517)
  - Computer architecture (DM506)

Computer Game Development

- Large game company (100 persons, 20 M$/year turnover):
    - Game programmers: 30–40
    - Game artists, model designers: 30–40
    - Game level designers, testers: 10–30
    - Game designers: 2
    - Game producers: 4
    - Business and management persons: 5–10

Computer Game Development

- Large game company (100 persons, 20 M$/year turnover):
  - Game programmers: 30–40
  - Game artists, model designers: 30–40
  - Game level designers, testers: 10–30
  - Game designers: 2
  - Game producers: 4
  - Business and management persons: 5–10
- Casual game company (1–5 persons, ?? $/year turnover):
  - Each person has many roles.

Computer Game Development

- Large game company (100 persons, 20 M$/year turnover):
  - Game programmers: 30–40
  - Game artists, model designers: 30–40
  - Game level designers, testers: 10–30
  - Game designers: 2
  - Game producers: 4
  - Business and management persons: 5–10
- Casual game company (1–5 persons, ?? $/year turnover):
  - Each person has many roles.

Computer games in Computer Science: the study of

Methods and principles of game programming

Computer Game Courses at Imada

Fall 2010, August/1st quarter:

DM809 Computer Game Programming I: Graphics

Not running this time (simply read book yourself, or as individual study activity):

DM810 Computer Game Programming II: AI

Fall 2010, 2nd quarter:

DM815 Computer Game Programming III: Physics

Individual study activity:

DM816 Computer Game Programming IV: Project

Computer Game Courses at Imada

Fall 2010, August/1st quarter:

DM809 Computer Game Programming I: Graphics

Not running this time (simply read book yourself, or as individual study activity):

DM810 Computer Game Programming II: AI

Fall 2010, 2nd quarter:

DM815 Computer Game Programming III: Physics

Individual study activity:

DM816 Computer Game Programming IV: Project

Other possibilities: DADIU, bachelorproject.

Subjects covered (all three courses)

- The graphics pipeline

- 3D geometry (transformation, projection)

- Shading (color, textures, lights, shading models)

- Polygonal techniques (culling, level of detail)

- Image based techniques (skyboxes, billboards,…)

- Game AI (path finding, chasing and evading, fighting, flocking,…)

- Collision detection

- Physics modeling

Subjects not covered

- Graphics APIs (self-study)

- Software engineering, testing

- Game engines

- Level editors, scripting

- Modeling

- Artwork

- Animation

- Sound, music

- Gameplay, narrative, study of genres

Textbook

Real-Time Rendering, 3rd edition
By Tomas Akenine-Möller, Eric Haines, and Naty Hoffman
Published by A.K. Peters, 2008
ISBN 987-1-56881-424-7

Very encyclopedic (1000+ pages, 1400+ references). Many techniques described (the most advanced just sketched).

Course Plan

Course plan for Computer Game Programming I:

Subject	Day	Chapters
Introduction	1	-
The rendering pipeline	1	2, 3, 18.1
Transforms	2	4, A4, 1
Shading	3,5,6	5,7,8
Textures	4	6
Image-based effects	7	10
Polygonal techniques	8,9	12
Acceleration algorithms	9,10	14

If time should permit, we could also look at: surfaces (Ch. 13).

Formal Course Description

Prerequisites: Programming (DM502+DM503), algorithms and data structures (DM507), vectors and matrices (DM527, MM505), and matematical maturity (MM501+MM502)

Literature: Textbook

Evaluation: Implementation projects (pass/fail), oral exam (7-scale)

Credits: 5 ECTS

Course language: Danish or English

Time and Place

Course runs Monday, August 16, to Friday, August 27.

Lectures each (week)day 09.15-12.00 in Imadas seminar room.

No eksaminatorier (API study and project takes up the time).

Exam is after 1st quarter. Project deadline is near end of 1st quarter.

Suggestion: read textbook in August, study API (and program project) in 1st quarter.

Project

Small project (in groups of 2–3) must be passed to attend the oral exam:

   Implement a 3D visualization of a very simple game

Programming language and graphics API of own choice. Must run on either Imada machines (Linux), or on Windows XP or Vista.

Some suggestions for API and language:

- C++ and OpenGL
- Java and OpenGL-binding (e.g. JOGL)
- C++ and DirectX

Use the net, contains many resources. Buy a book on the API.

Disclaimer

- Includes reading quite a number of pages

- Includes actual math

- Includes programming

- Includes work on issues not taught in course (graphics APIs)

Rather heavy workload, some of it on your own.