CS 405 Computer Graphics

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Course Content

This course is an introduction to computer graphics, modeling, animation, and rendering. Topics covered include basic image processing, geometric transformations, geometric modeling of curves and surfaces, animation, 3-D viewing, visibility algorithms, radiosity, ray tracing, shading, and volume rendering. Students gain experience by developing their own graphics programs producing simple animations.

In the second part of the course, we will cover data visualization basics and how to create interactive visual analytics tools.

Objectives

The objective of this course is to understand the workings of computer-generated images, animations, and visualizations. The students will master the basics of computer graphics in theory and practice. At the final project of this course is design and development of a computer game from scratch.

Recommended or required reading

Reading material will be distributed.

Course Outline

This is the first course on computer graphics, introducing the basics of 2D and 3D graphics. There will be tutorials on Linear Algebra, Signal Processing, Software Engineering, and Advanced Graphics Topics. There will special emphasis on data visualization and 3D interactive software development.

Course Policies

Plagiarism: There is no teamwork encouraged in this course. You are expected to research and develop course projects alone. You can use some allowed resources but before using them you must contact the course instructor or assistants to make sure that you are not crossing the line. **This is very important.**

Plagiarism and academic integrity are very important issues. You only have your reputation in the academic world. And it takes only one mistake and it is forever lost. As long as you are a student the rule is simple: be honest

and open to your Professor/Adviser. Explain him all the sources you used and how you used. If you are doing something you will get embarrassed explaining to me, you are doing something wrong. ***Any plagiarism will lead to grade F without any exceptions.***

Project: There will be two projects:

3D Projects. Implemented on OpenGL with C++. The project requirements will be distributed separately.

Data Visualization Project. Implemented with Python and/or Javascript. The project requirements will be distributed separately.

Assignments: Every other week there will be a graded written or coding assignment.

Grading

Ray Tracing	15%
3D Projects	~~40%~~ 55%
Visualization Project	15%
Assignments	30%

We will take the best two of all 3 Assignments into consideration. The weight of each Assignment will be 15%, 30% in total.

We will take the better one of the Ray Tracing and Visualization Project and contribute to 15% of the total grade.

The 3D project will have two parts instead of three and each part will have equal weight. In total the 3D project will have 55% of the total grade instead of 40%

Participation is expected and highly rewarded…

We will announce deadlines for each project separately.

Week-1

Course   Introduction / Linear Algebra

Assignment   None

Week-2

Course   Representation, Camera Projections

Assignment   None

Week-3

Course   Shading, Illumination

==Assignment   Linear Algebra, Representations==

Week-4

Course   Ray Tracing

Assignment   None

==**Project**   **Ray Tracing**==

Week/Date   5 /

Course   Transformations

~~Assignment~~   ~~Camera, Shading & Illumination~~

Week/Date   6 /

Course   Models, Mesh

Assignment   None

~~**Project**   **3D Project I**~~

Week/Date   7 /

Course   Models, Mesh

Assignment   ~~Transformations, Models~~

Week/Date   8 /
Course   Animations
Assignment   None
Project   3D Project I

Week/Date   9 /
Course   Curves
Assignment   Mesh, Animations

Week/Date   10 /
Course   Textures
Assignment   all topics until week 10

Week/Date   11 /
Course   Textures
Assignment   ~~Textures~~
Project   3D Project II

Week/Date   12 /
Course   Data Visualization
Assignment   None

Week/Date   13 /
Course   Data Visualization

Week/Date   14 /
Course   Data Visualization
Project   Data Visualization
Assignment   all topics until week 14