Introduction to computer graphics

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Summary
The students study and apply fundamental concepts and algorithms of computer graphics for rendering, geometry synthesis, and animation. They design and implement their own interactive graphics programs.

Content
This course provides an introduction to the field of Computer Graphics. We will cover elementary rendering algorithms such as rasterization and raytracing, examine mathematical concepts and algorithms for geometric modeling, and then study concepts and algorithms for computer animation. Students will experiment with modern graphics programming and build small interactive demos. Complemented by some theoretical exercises, these programming tasks lead to a graphics software project, where small teams of students design and implement a complete graphics application.

Keywords
Pixels and images, 2D and 3D transformations, perspective transformations and visibility, rasterization, interpolation and lighting, raytracing, shader programming, texture mapping, procedural modeling, curves and surfaces, polygonal meshes, particle systems

Learning Prerequisites

Required courses
Linear Algebra, Calculus

Recommended courses
Numerical Methods for Visual Computing

Learning Outcomes
By the end of the course, the student must be able to:
• Explain and apply the fundamental mathematical concepts of computer-based image and geometry synthesis
• Implement a basic rendering pipeline based on rasterization and raytracing
• Design and implement geometry synthesis based on procedural modeling
• Design and implement basic computer animation algorithms
• Integrate individual components into a complete graphics application
• Coordinate a team during a software project
Teaching methods
Lectures, interactive demos, theory and programming exercises, programming project, project tutoring

Expected student activities
The student are expected to study the provided reading material and actively participate in class. They should prepare and resolve the exercises, prepare and carry out the programming project. Exercises and project are done in groups of three students.

Assessment methods
Homeworks (25%); Project (35%); Written exam in August (40%)

Supervision
Office hours Yes
Assistants Yes
Forum Yes

Resources
Bibliography
A list of books will be provided at the beginning of the class

Ressources en bibliothèque
• Polygon mesh processing / Botsch

Notes/Handbook
Slides and online resources will be provided in class

Websites
• http://lgg.epfl.ch/ICG

Prerequisite for
Advanced Computer Graphics