

Computer Graphics I

Fall 2011

CSC5870 Computer Graphics I



Course Information

- **INSTRUCTOR:** Professor Jing Hua (jinghua@wayne.edu),
- **CREDITS:** 3
- **PREREQUISITES:** CSC 2200 or 5050, MAT 2250.
 - C/C++/Java, Linear Algebra

<http://www.cs.wayne.edu/~jinghua/5870/csc5870.htm>

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Course Information

- **LECTURES:** Tuesday & Thursday, 06:00PM - 07:20PM, 325 State Hall
- **OFFICE HOURS:** Tuesday & Thursday, 5:00PM - 6:00PM (5057 Woodward, STE 14109.1)

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Textbooks

- **REQUIRED TEXTBOOK:**
 - Computer Graphics with OpenGL, 3rd Edition, Donald Hearn and M. Pauline Baker, Prentice Hall.
 - OpenGL Programming Guide, 4th Edition: The Official Guide to Learning OpenGL, Version 1.4, Addison-Wesley.
 - (available online)

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Grading Scheme

- Assignment 1: 25%
- Assignment 2: 25%
- Written exam: 50%

- Course Project 20%

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Goal

- A comprehensive overview of computer graphics

- The graphics pipeline

- State-of-art techniques in computer graphics related fields

- Future research and work in computer graphics

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Content

- **Introduction**
 - Overview, definition
 - Various application examples and areas
 - Graphics history
 - Graphics software and hardware systems
 - Graphics programming
 - User-computer interface

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Content (cont.)

- **Graphics Device and Hardware**
 - Hardware, display devices, I/O peripherals
 - Vector and raster graphics system
 - Interaction techniques

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Content (cont.)

- **Geometry and Mathematics**
 - Basic mathematics relevant to graphics
 - Coordinate systems
 - Geometric primitives
 - Curves, and surfaces
 - Solid and volumetric models
 - 2D and 3D geometric transformation
 - Parallel and perspective projection
 - Data structures

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Content (cont.)

- **Scene composition**
 - 2D and 3D geometric transformation
 - Object hierarchies
 - Viewing and clipping
 - Parallel and perspective projection
 - Object and image order rendering

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Content (cont.)

- **Rendering**
 - Rendering pipeline
 - Scan-conversion: lines and polygons
 - Shading/lighting (illumination models)
 - Color perception and color models
 - Basic optics
 - Visibility

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Content (cont.)

- **Image-based techniques**
 - Sampling
 - Filtering
 - Anti-aliasing
 - Image analysis and manipulation

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Content (cont.)

- Advanced Topics
 - Animation
 - Transparency and shadows
 - Texture mapping
 - Ray tracing, radiosity
 - Image-based rendering and modeling
 - Advanced modeling techniques
 - Case studies
 - Software packages
 -

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Content (cont.)

- Learn something you are interested through the course project
 - Interesting topic
 - Hand-on experience
 - Special instruction

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Overview

- What is computer graphics?
- Why computer graphics?
- Graphics pipeline

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What is Computer Graphics?

- Computer technology used to create, manipulate and communicate visual information.

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Why Computer Graphics?

- Computer Animation
- Computer Aided Design
- Architecture
- Visualization
- Medical Applications
- Video Games
- Computer Simulation
- ...

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Computer Animation



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Computer Aided Design (CAD)



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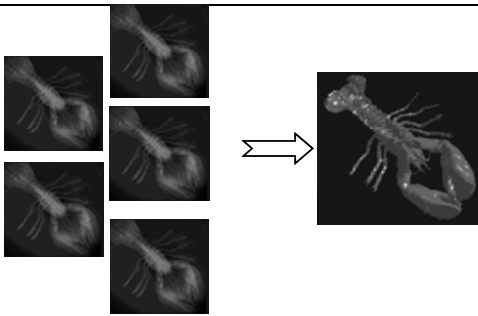
Architecture



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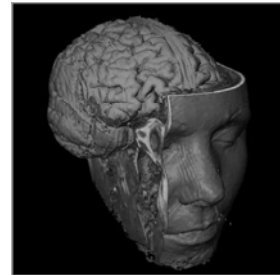
Visualization



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Visualization (Isosurfaces)



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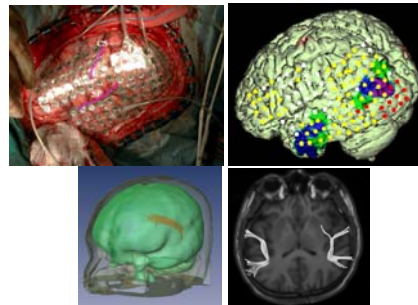
Visualization (Volume Rendering)



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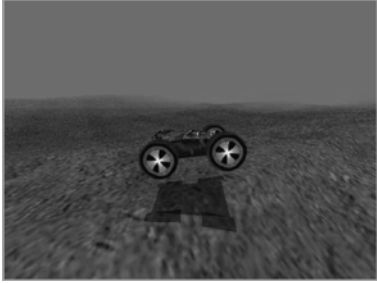
Medical Applications



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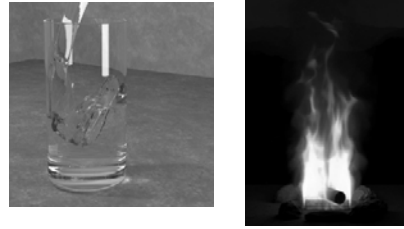
Video Games



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Computer Simulation



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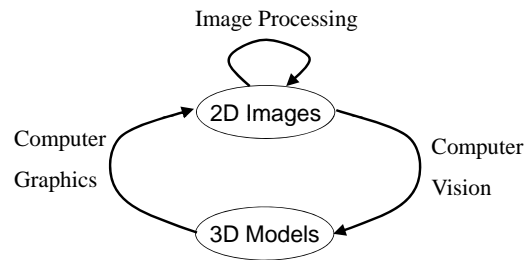
Digital Art



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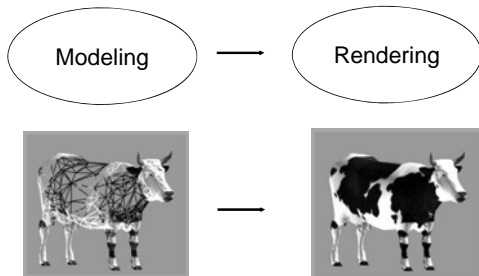
A Classical Classification



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Graphics Pipeline



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Rendering Pipeline



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Next Class

- Overview of Graphics Systems
 - Demos
 - VR
 - CG & VIS applications

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Next few weeks

- Graphics Hardware
 - Display Devices
 - Input Devices
- Graphics Software
 - OpenGL
 - FLTK
- Explain each step in the graphics rendering pipeline.

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Questions???

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Questionnaire

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