Introduction

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Lecture objectives

 Learning graphics applications, problems, and topics to be covered in this class.

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Course missives

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Announcement: Hold List

- I'll let in as many students as there are seats
- If on hold list:
 - See me after class
- Decisions by next class

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Overview

- Instructor:
 - Jian Chen, ITE357, jichen@umbc.edu
 - Office hours: TuTh 1:00-2:00pm or by appointment
- TA
 - Alisa Burdeyny, ITE 353, <u>alburde1@umbc.edu</u>
 - Office hours: MW 2:30-3:30 pm or by appointment
- Class website:
 - <u>http://www.csee.umbc.edu/</u>
 <u>courses/undergraduate/435/Fall13/</u>
- Class discussion group:
 - Log on to blackboard to see it;
 - Community credits (class participation)

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Textbook

- Textbook:
 - Required: Fundamental of computer graphics, 3rd edition, Shirley, 2005.
 - Recommended: OpenGL programming guide (free)

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Grading

- Distribution
 - 45% Programming (6)
 - 10% homework (5)
 - 15% midterm exam (1)
 - 25% final exam (1)
 - 5% participation
 - Online: get credits for community spirit
 - In-class: ask questions and respond to questions
 - A: 90-100; B: 80-90; C: 70-80; D: 60-70; F: <60</p>
- Late penalty:

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- 10% / day, no more than 2 days for homework and no more than 4 days for programming; 2 free late days
- Do me a favor: do not cheat!

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Survey

• You have it in front of you.

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Graphics and its applications

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What is Computer Graphics

 The study of creating, manipulating, and using visual images in the computer.



SIGGRAPH 1992

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Just a collection of teapots



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Graphics Applications

- Entertainment
 - Film production
 - Film special effects
 - Games
- Science and engineering
 - Computer-aided design
 - Scientific and information visualization (big-data problems!)
- Training and simulation
 - Virtual reality
- Graphics arts
 - Non-photorealistic rendering
 - Fine art
- Interaction

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Applications: Rendering



Avatar 2009

http://www.youtube.com/watch?v=xTWLBuTak6I

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Supporting technologies















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Introduction

Graphics Applications

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Science and engineering

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Applications: Big data problems!

Scientific visualization



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Applications: Big data problems!

Information visualization



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Applications: Virtual Reality

 Training, Simulation, and situation awareness



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Applications: Virtual Reality

 Immersive design: study what-ifscenarios



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Applications: Art



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Applications: Interaction



http://www.youtube.com/ watch?v=vcBIUsQEE3E





http:// www.hardwarelook.com/news/ microsoft-free-hand-3dinteraction-future-ofgamingmust-see_429.html







nVidia GeForce[™] chip



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Applications: Interactive Programming



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Problems in Graphics

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Problems in Graphics

- 2D imaging
 - Compositing and layering
 - Digital filtering
 - Color transformations
- 2D drawing
 - Illustration, drafting
 - Text, GUIs
- 3D modeling
 - Representing 3D shapes
 - Polygons, curved surfaces,.
 - Procedural modeling







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Problems in graphics (cont'd)

- 3D rendering
 - 2D views of 3D geometry
 - Projection and perspective
 - Removing hidden surfaces
 - Lighting simulation



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Problems in graphics (cont'd)



http://www.youtube.com/watch?v=su504HbsX8c

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Problems in graphics (cont'd)

- User interaction (We just talked about this)
 - 2D graphical user interfaces
 - 3D modeling interfaces
 - Virtual reality
- Animation
 - <u>http://physbam.stanford.edu/</u>
 <u>~fedkiw/</u>



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Computer graphics: Math made visible

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Course Overview

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In this class

- You will:
 - Explore the fundamental ideas
 - Learn math & graphics algorithms
 - Modeling | Transformation | Projections | Polygon renderings | Texture mapping | lighting | Ray tracing
 - Implement core algorithms
 - Have fun and learn graphics!
- You will not:
 - Learn a lot about OpenGL
 - Write big programs

Topics

- Modeling in 2D and 3D
- Rendering 3D scenes
 Texture mapping | ray tracing
- Image and image processing
- Geometric transformation
- The graphics pipeline



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Introduction

Modeling vs. Rendering

Modeling

- Create models
- Apply materials to models
- Place models around scene
- Place lights in scene
- Place the camera
- Rendering
 - Take "picture" with camera
- Both can be done by modern commercial software:
 - Autodesk Maya[™], 3D Studio Max[™], Blender[™], etc.



Prereqs (next lecture): Math Review

- Normalized vector
- Matrix multiply
- Vector multiply
- Trigonometry
 - Angles | sin, cos, tan & their relationships
- Dot product
- Cross product
- And more ...

Enjoy the adventure!