CS 4810: Computer Graphics

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Acknowledgement: slides by Misha Kazhdan, Allison Klein, Tom Funkhouser, Adam Finkelstein and David Dobkin
Introduction: What is CG?

- 2D image processing
- 3D object representation & manipulation
- Simulating physical processes & materials
- Animating any of the above
Introduction: What is CG?

2D image processing

• 3D object representation & manipulation
• Simulating physical processes & materials
• Animating any of the above
Introduction: What is CG?

• 2D image processing

3D object representation & manipulation

• Simulating physical processes & materials
• Animating any of the above

“Ratatouille” Pixar/Disney
Introduction: What is CG?

- 2D image processing
- 3D object representation & manipulation
- Simulating physical processes & materials
- Animating any of the above

Procedural Shader from Pixar Studios
Introduction: What is CG?

- 2D image processing
- 3D object representation & manipulation
- Simulating physical processes & materials
- Animating any of the above (4D)
Introduction: What is CG?

“You know it when you see it…”

Work by Jim Rygiel for “102 Dalmatians”
Introduction: What is CG?

“You know it when you see it… maybe.”

Work by Jim Rygiel for “102 Dalmatians”
Introduction: Applications

• Entertainment
• Computer Aided Design
• Scientific Visualization
• Training & Education
• Commerce
• Art
Introduction: Applications

Entertainment
- Computer Aided Design
- Scientific Visualization
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"El Laberinto del Fauno"

"Bioshock" 2K Games
Introduction: Applications

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Completely virtual model built in 3D:
- Shorten the development period
- Shorten the learning curve

Boeing 7E7
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Image courtesy of Agrawala et al.

Microsoft Flight Simulator
Introduction: Applications

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http://www.miniusa.com/crm/mini_entrance.jsp
Introduction: Applications

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“Cyberflower Duet” by Roman Verostko

“Conflagration” by Diane Vetere
Outline

• Introduction
• Syllabus
• Coursework
• Miscellaneous
Syllabus

• Image Processing (2D)
• Ray Tracing (3D)
• Scanline Rendering (3D)
• Modeling (3D)
• Animation (4D)
Syllabus:

- Image Processing
  - Human Vision
  - Color Models
  - Quantization and Dithering
  - Sampling
  - Filters
  - Warping, Morphing, and Compositing
Syllabus:

• Ray Tracing
  o Cameras
  o Primitives
  o Lights
  o Intersection Acceleration Data Structures
  o Reflection, Transparency and Refraction

• Scanline Rendering
  o Coordinate Systems and Modeling Transformations
  o Viewing transformations
  o Shading
  o Textures
  o Visibility
  o OpenGL
Syllabus:

- Modeling
  - Triangles
  - Splines
  - Subdivision Surfaces

- Animation
  - Key-Framing
  - Kinematics
  - Dynamics
Outline

• Introduction
• Syllabus
• Coursework
• Miscellaneous
Coursework

• Lots of work!
• Exams (30%)
• Programming assignments (60%)
• Class participation (10%)
Coursework

• Lots of work!

Exams (30%)
  o One midterm and one final
  o 3/22 and 5/11

• Programming assignments (60%)

• Class participation (10%)
Coursework

• Lots of work!

• Exams (30%)

Programming assignments (60%)
  • Image Processing (15%)
  • Ray Tracing (15%)
  • OpenGL Rendering (15%)
  • Animation (15%)

• Class participation (10%)
Coursework

• Lots of work!
• Exams (30%)

Programming assignments (60%)
  • Knowledge of C/C++ assumed
  • Must be turned in by 11:55PM on due date
  • 5 (discrete) late days

• Class participation (10%)
Coursework: Collaboration Policy

• You must write your own code
• You must reference sources of ideas/code
• It’s okay to:
  o Discuss ideas with other students
  o Get ideas from books, web sites, etc.
    » But reference it!
• It is not okay to:
  o Share code with other students
  o Copy code from other students
  o Use ideas or code from other sources without attribution and first receiving permission from me
Coursework

• Lots of work!

• Exams (30%)

Programming assignments (60%)

• Class participation (10%)

Bottom line:
Expect to do a LOT of programming in this class!
Coursework

• Lots of work!

• Exams (30%)

• Programming assignments (60%)

Class participation (10%)
Outline

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Resources

- Course web page:

- Suggested text books:
Support

• TAs:
  o Michelle McDaniel
  o Sean Arietta

• Office hours:
  o Mine: MW 1:00 – 3:00 @ Olsson 212
  o Michelle: TBA
  o Sean: TBA
  o Or, by appointment

• Keeping in touch:
  o Email classmates: cs4810-s10@collab.itc.virginia.edu
Miscellaneous

• Submitting work:
  o We will use UVa Collab
  o http://collab.itc.virginia.edu
  o Setup your workspace and find this course SOON!