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
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- Simulating physical processes & materials
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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
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
  - Training & Education
  - Commerce
  - Art

“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
Introduction: Applications

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Flow Visualization
Roettger et al.

Aspirin in RasMol
Courtesy of Michael Friendly

The Visible Human
Courtesy of NLM
Introduction: Applications

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Microsoft Flight Simulator

Image courtesy of Agrawala et al.
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http://www.miniusa.com/crm/mini_entrance.jsp
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Art

“Cyberflower Duet” by Roman Verostko

“Conflagration” by Diane Vetere
Outline

• Introduction
• Syllabus
• Coursework
• Miscellaneous
Syllabus

• Image Processing (2D)
• Ray Tracing (3D)
• Polygon 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%)
  • Two midterms
    • 10/17 and 12/05

• Programming assignments (60%)

• Class participation (10%)
Coursework

• Lots of work!
• Exams (30%)

Programming assignments (60%)
  • Image Processing (20%)
  • Ray Tracing (20%)
  • OpenGL Rendering (20%)

• Class participation (10%)
Coursework

• Lots of work!

• Exams (30%)

Programming assignments (60%)
  o Knowledge of C/C++ assumed
  o Must be turned in by 11:55PM on due date
  o 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:
  - Discuss ideas with other students
  - Get ideas from books, web sites, etc.
    » But reference it!

- It is not okay to:
  - Share code with other students
  - Copy code from other students
  - 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%)
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Resources

• Course web page:
  o www.cs.virginia.edu/~gfx/Courses/2012/IntroGraphics

• Suggested text books (on reserve at Brown):
Support

• TA:
  • Olfat Emi (grader) and Samyukta Jadwani

• Office hours:
  • Mine: MW 1:30 – 3:30 @ Rice 505
  • Jadwani: TBA

• Keeping in touch:
  • Email classmates: cs4810-f12@collab.itc.virginia.edu
Miscellaneous

• UVA Collab:
  o [http://collab.itc.virginia.edu](http://collab.itc.virginia.edu)
  o We will use collab for submitting work, managing grades, and posting announcements
  o Setup your workspace and find this course NOW!