CS 4810
Introduction to Computer Graphics

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Acknowledgement: slides by Jason Lawrence, 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?

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“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: Applications

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

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Shorten the development period
Shorten the learning curve
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Microsoft Flight Simulator

Image courtesy of Agrawala et al.
Introduction: Applications

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Introduction: Applications

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“Cyberflower Duet” by Roman Verostko

“Conflagration” by Diane Vetere
Introduction: More Videos!

https://www.youtube.com/watch?v=u3Z1hDwGEmM

https://www.youtube.com/watch?v=KF_a1c7zytw&feature=youtu.be

https://vimeo.com/94220982

https://www.youtube.com/watch?v=dgKjs8ZjQNg
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
  ▪ Cameras
  ▪ Primitives
  ▪ Lights
  ▪ Intersection Acceleration Data Structures
  ▪ Reflection, Transparency and Refraction
▪ Scanline Rendering
  ▪ Coordinate Systems and Modeling Transformations
  ▪ Viewing transformations
▪ Shading
▪ Textures
▪ Visibility
▪ 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 in-class midterms (no final)
  - 3/3 and 4/28
- 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%)
  - 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:
  - 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:
  › http://www.cs.virginia.edu/~connelly/class/2015/intro_gfx

› Suggested text books (on reserve at Brown):
Miscellaneous

‣ UVA Collab:
  ‣ http://collab.itc.virginia.edu
  ‣ We will use collab for submitting work, managing grades, and posting announcements
  ‣ Setup your workspace and find this course NOW!
Examples of Graphics Research

- http://graphics.cs.cmu.edu/projects/scene-completion/
- http://camouflage.csail.mit.edu/
- http://halide-lang.org/
- https://www.youtube.com/watch?v=FKXOucXB4a8
- http://web.engr.illinois.edu/~dhoiem/projects/popup/index.html