

CS 4810

Introduction to

Computer Graphics

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University of Virginia

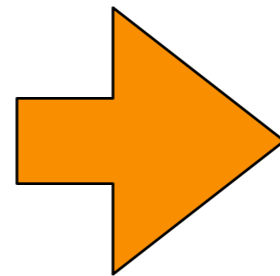
Acknowledgement: slides by Jason Lawrence, Misha Kazhdan, Allison Klein, Tom Funkhouser, Adam Finkelstein and David Dobkin

Introduction: What is CG?

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

Introduction: What is CG?

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Introduction: What is CG?

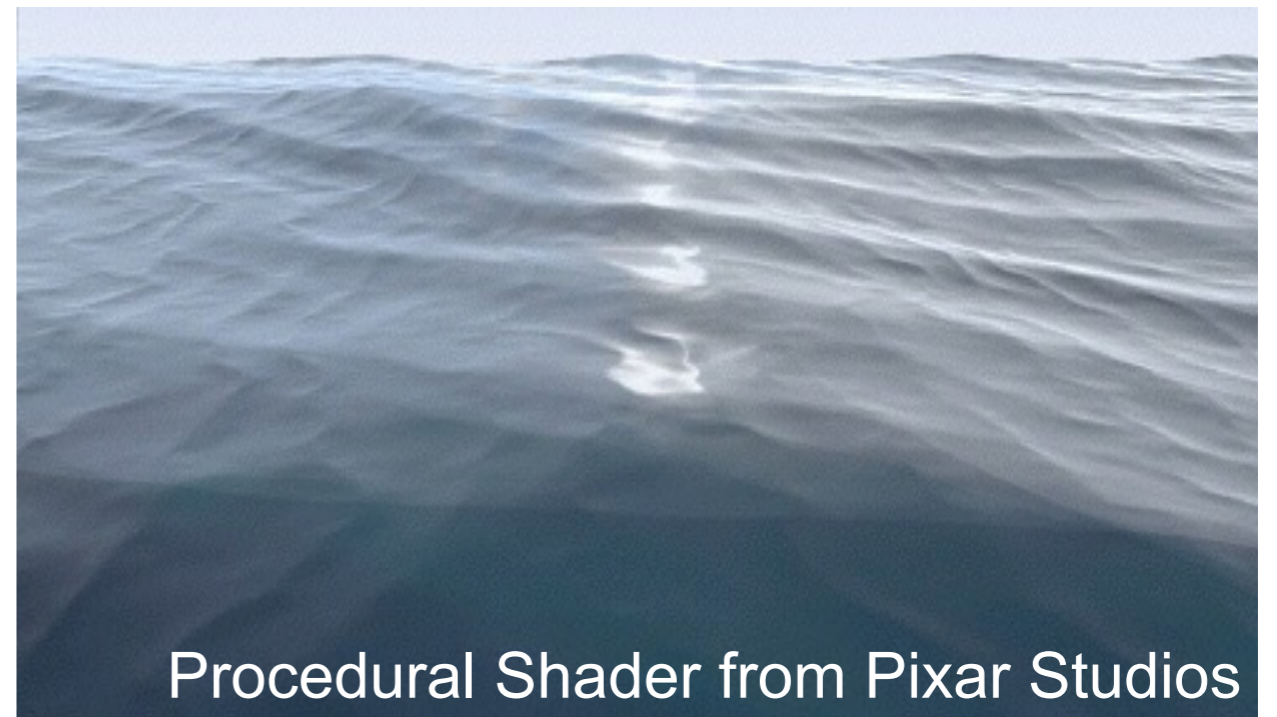
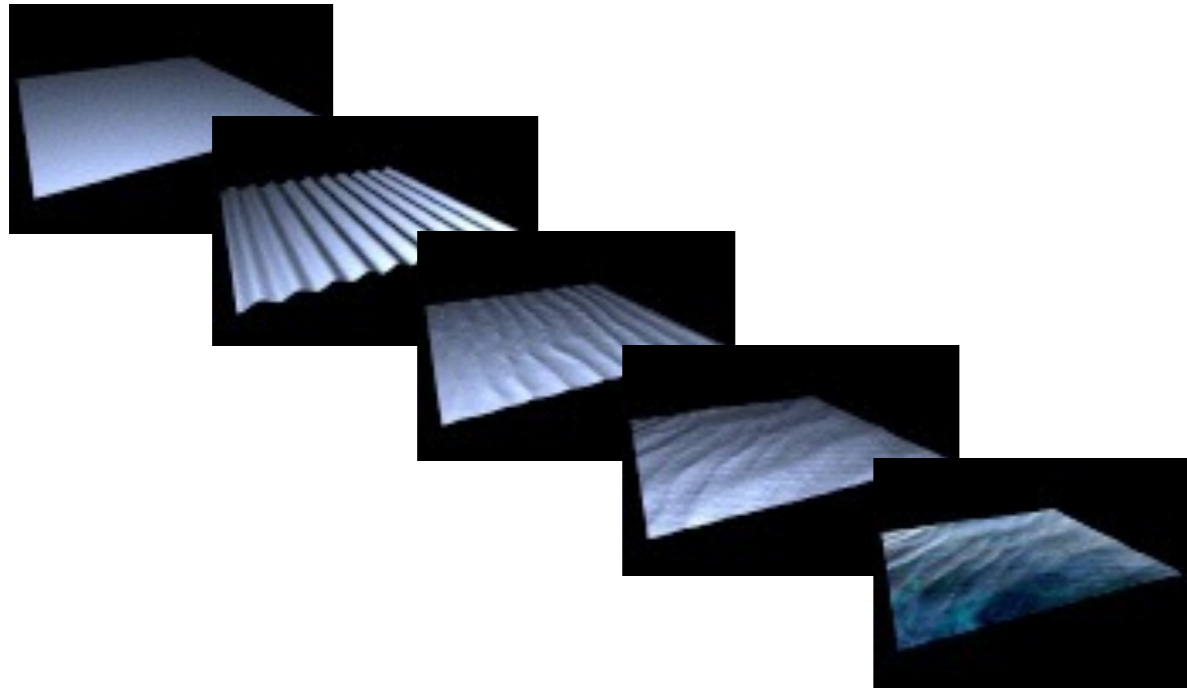
- 2D image processing
- **3D object representation & manipulation**
- Simulating physical processes & materials
- Animating any of the above



“Ratatouille” Pixar/Disney

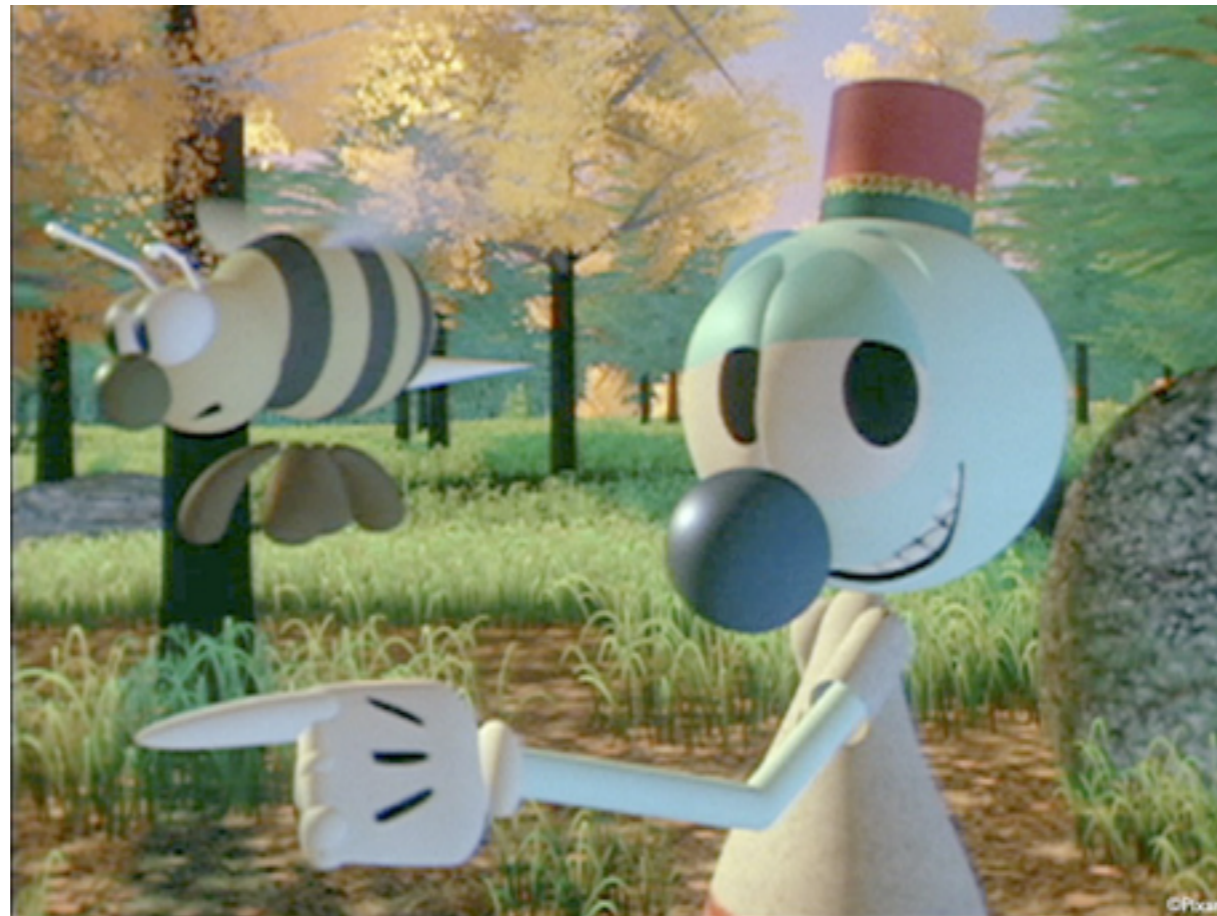
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Introduction: What is CG?

- ▶ 2D image processing
- ▶ 3D object representation & manipulation
- ▶ Simulating physical processes & materials
- ▶ **Animating any of the above (4D)**

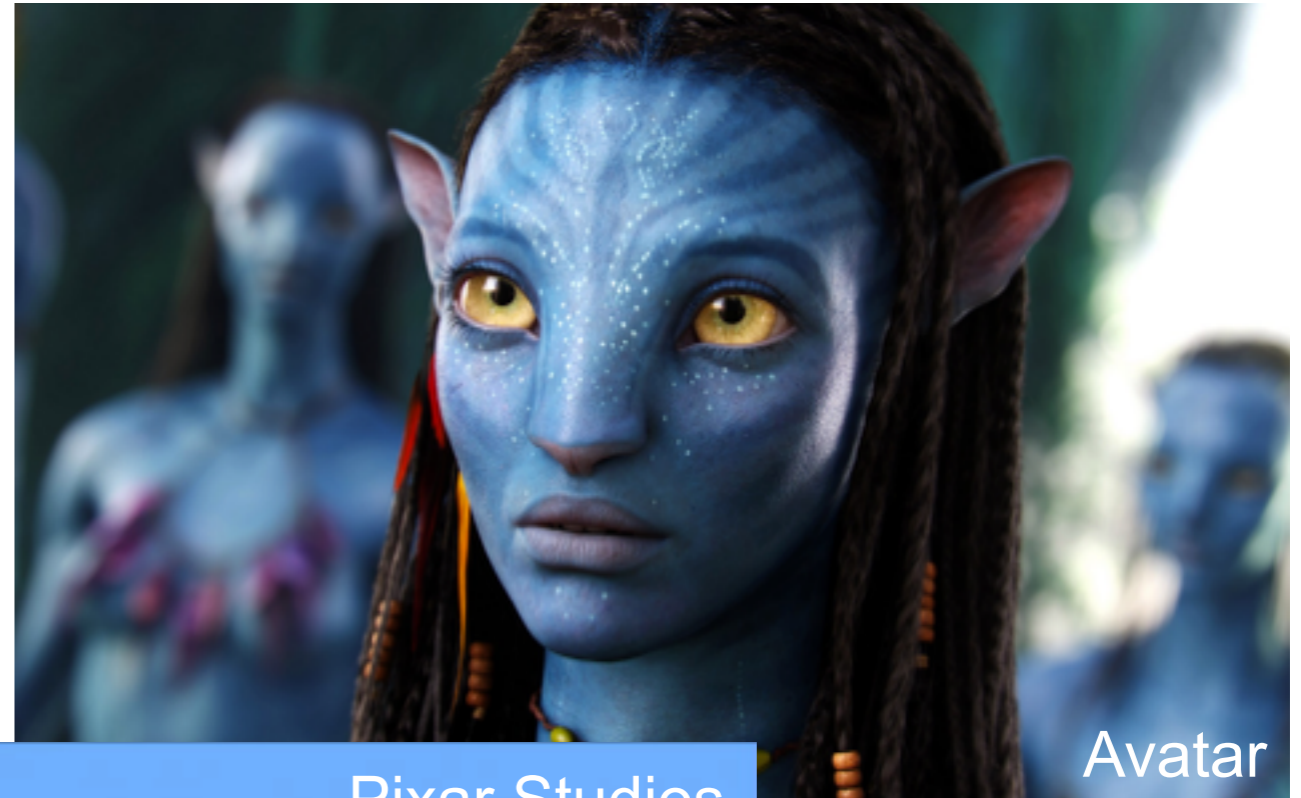


Introduction: Applications

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

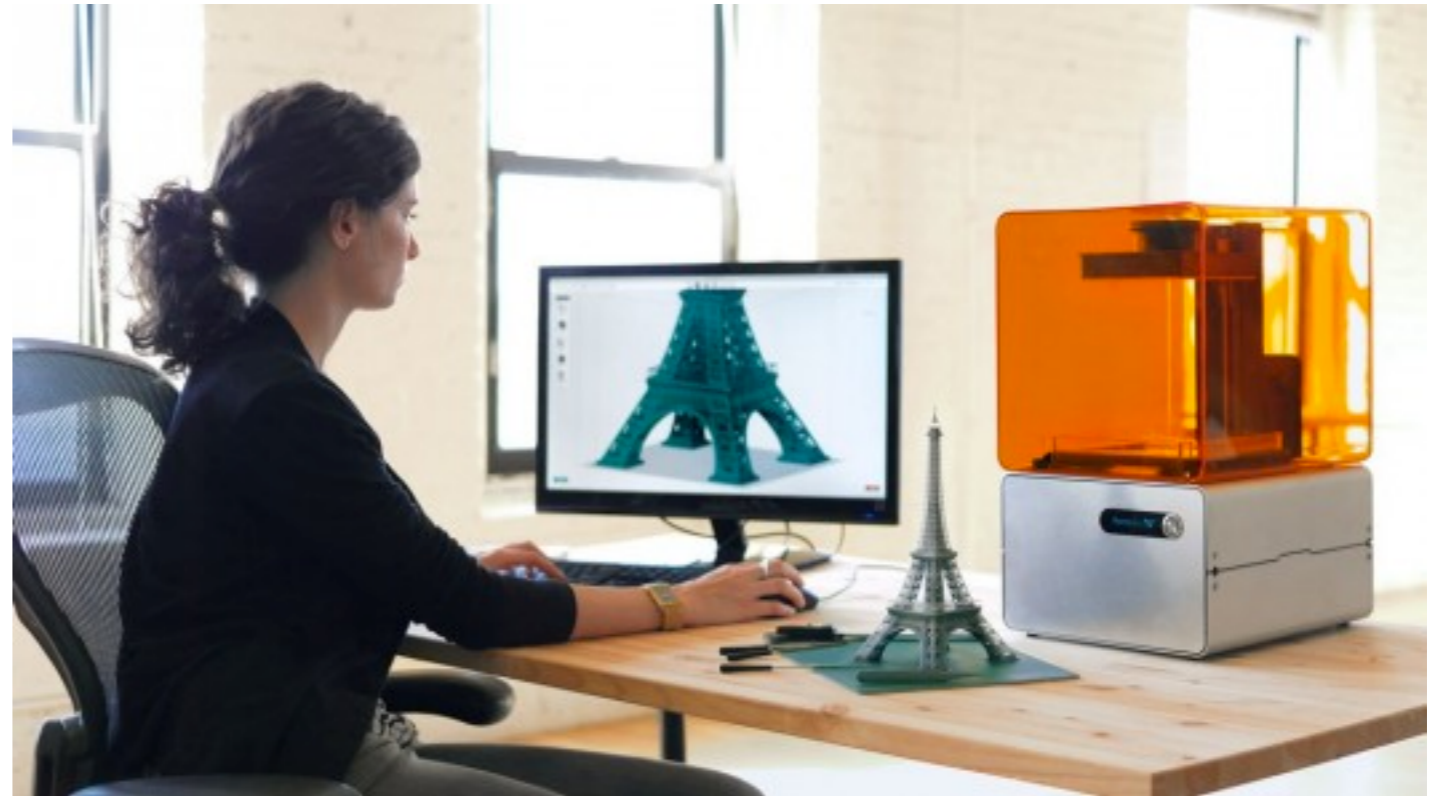
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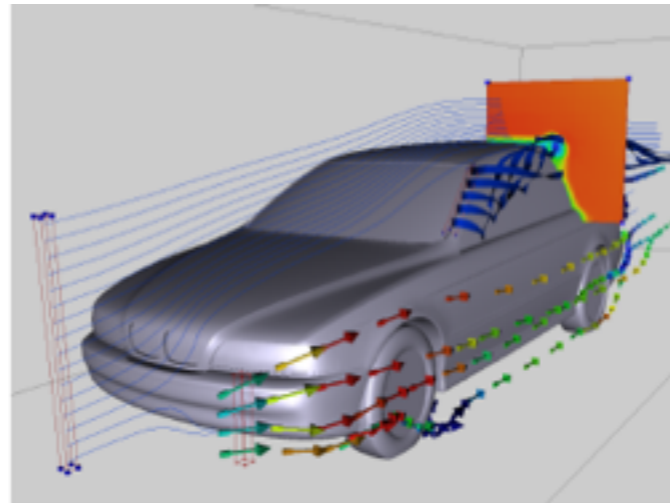


Shorten the development period
Shorten the learning curve

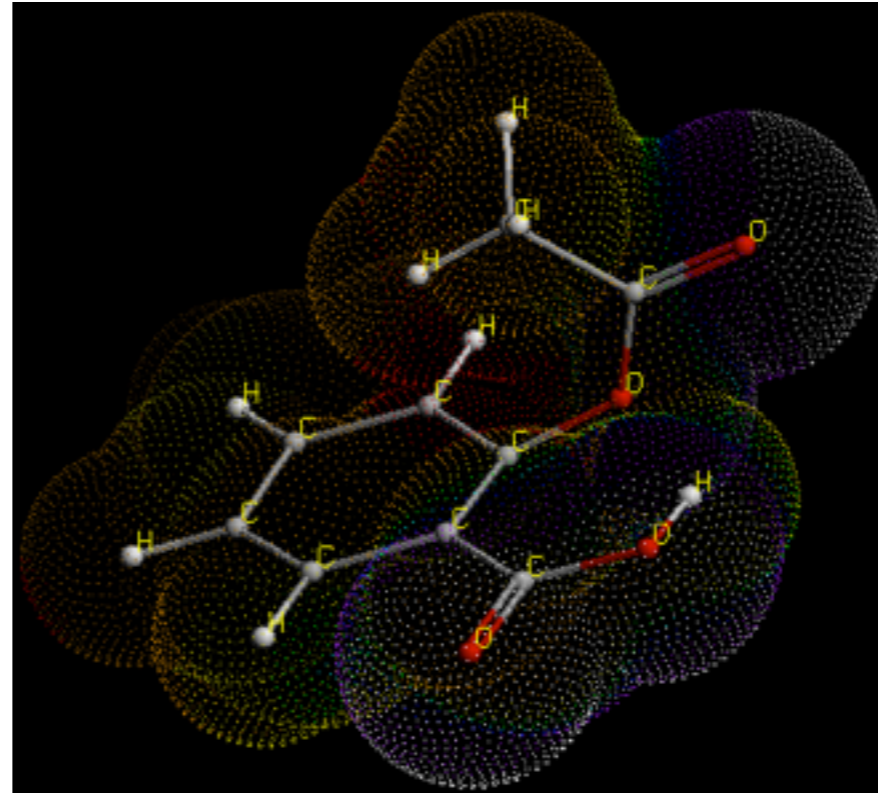


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Flow Visualization Roettger et al.



Aspirin in RasMol
Courtesy of Michael Friendly



The Visible Human
Courtesy of NLM

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Microsoft Flight Simulator

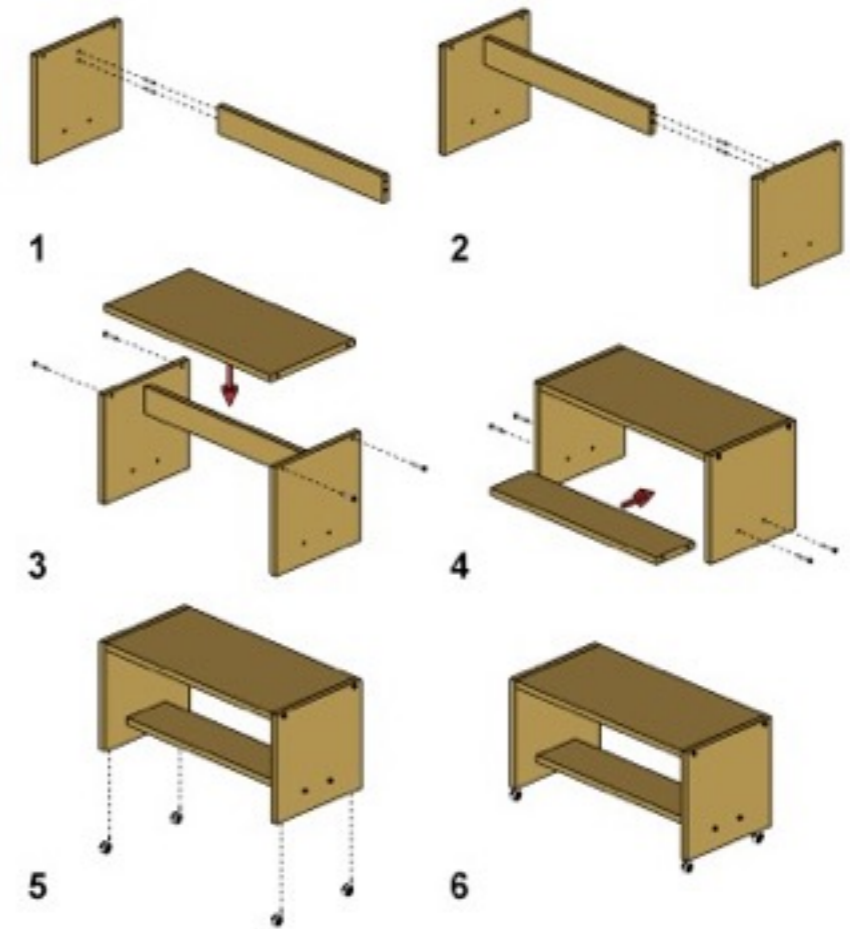
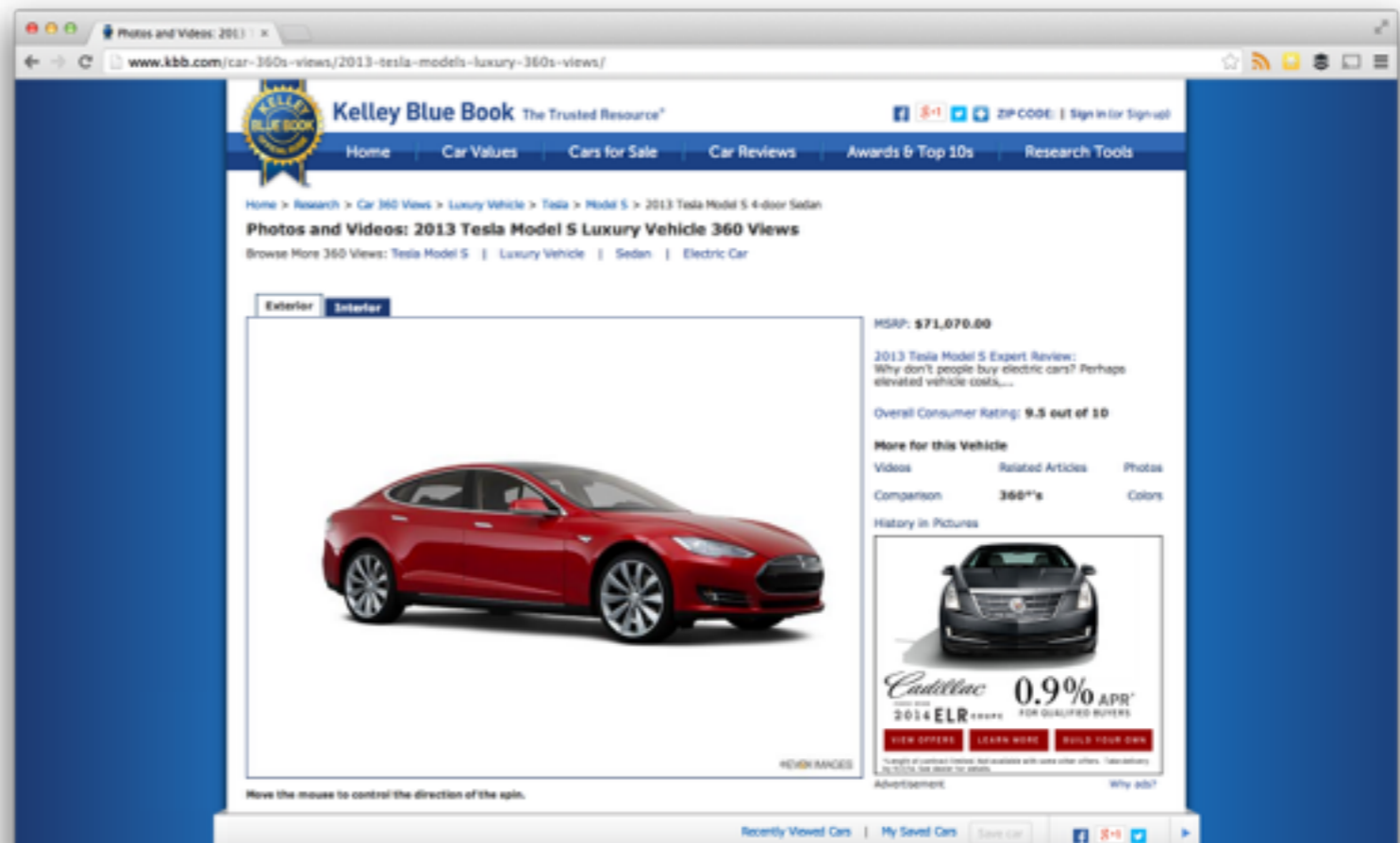


Image courtesy of Agrawala et al.

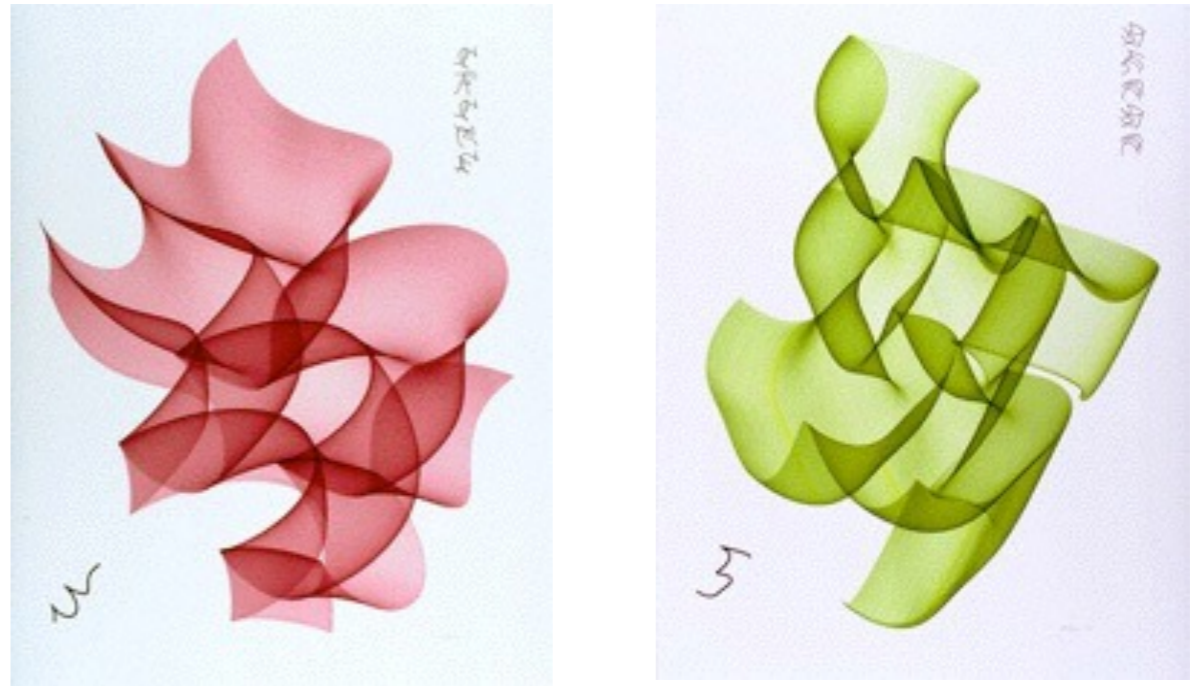
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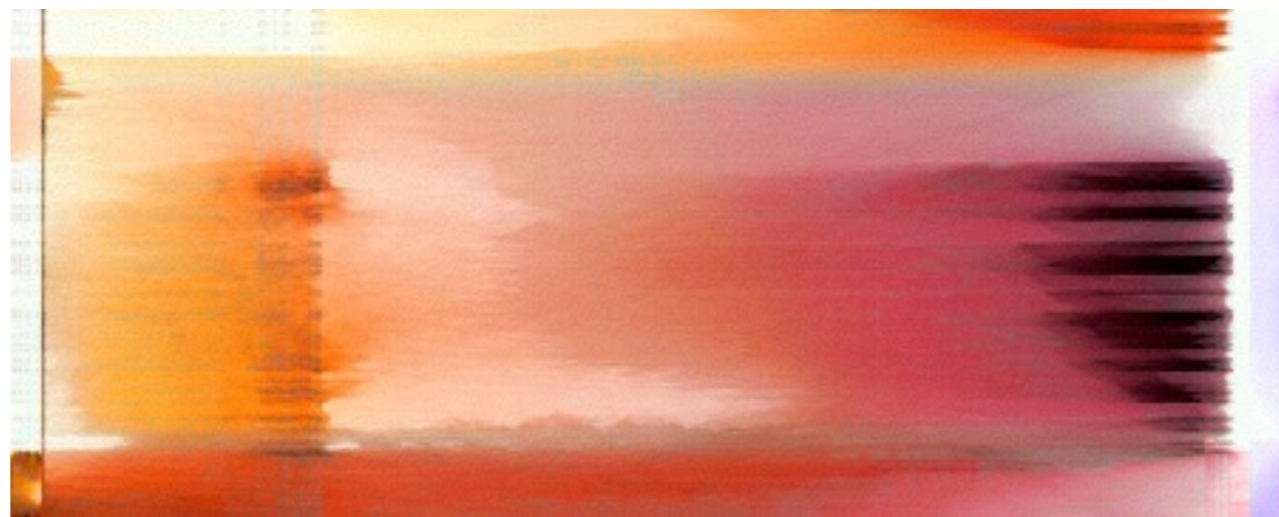


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“Cyberflower Duet” by Roman Verostko



“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
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- **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

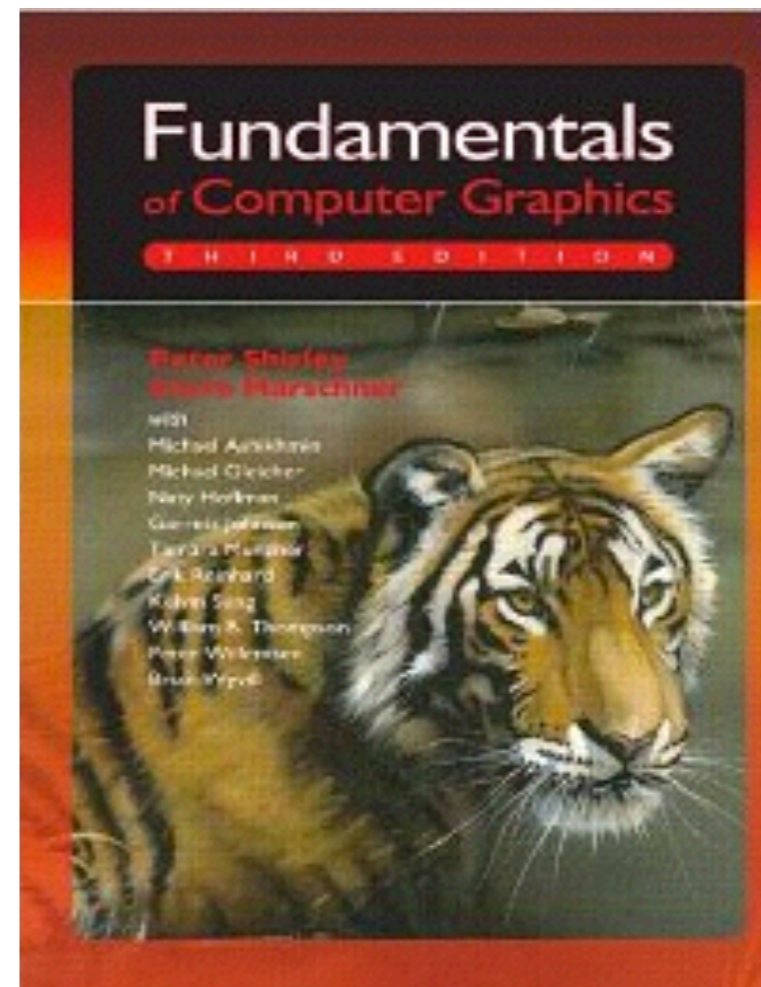
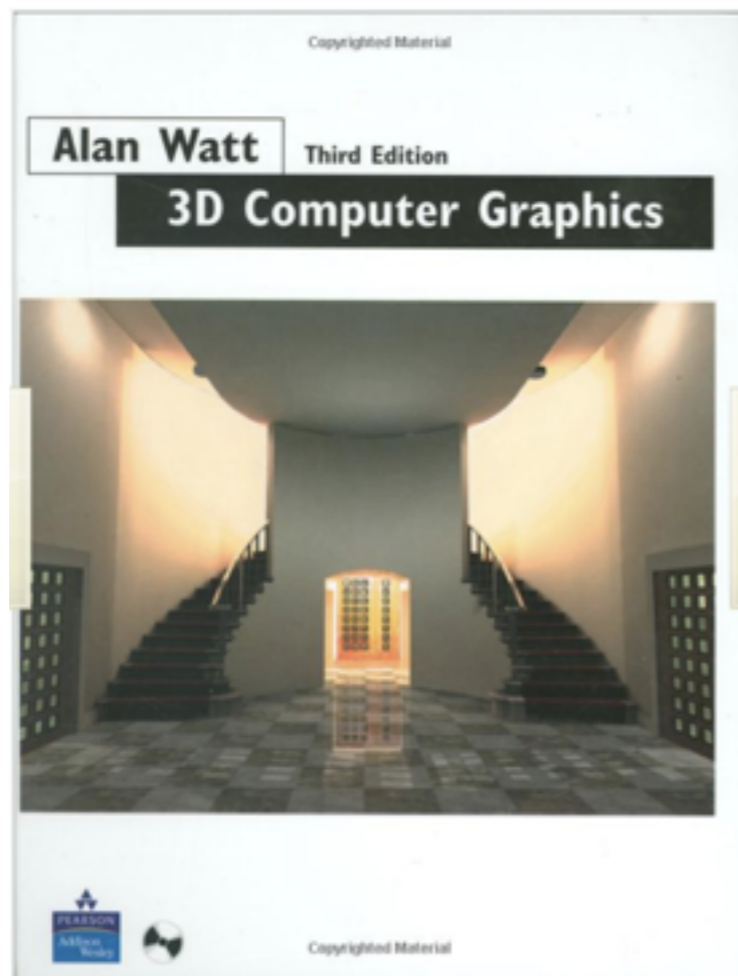
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Resources

- ▶ 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://grail.cs.washington.edu/rome/>
- ▶ <http://graphics.cs.cmu.edu/projects/scene-completion/>
- ▶ http://people.csail.mit.edu/yichangshih/portrait_web/
- ▶ <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>