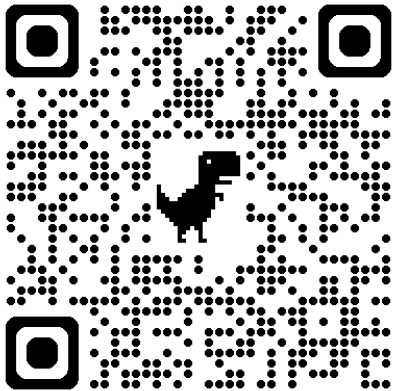




Computer Graphics

(601.457/657)

Prof. Misha Kazhdan

misha@cs.jhu.edu

Outline



- Introduction
- Syllabus
- Coursework
- Miscellaneous



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
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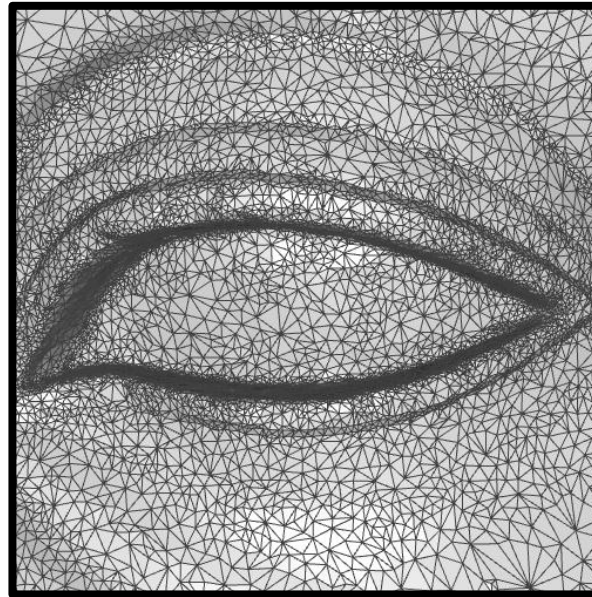


<http://paulbakaus.com/>

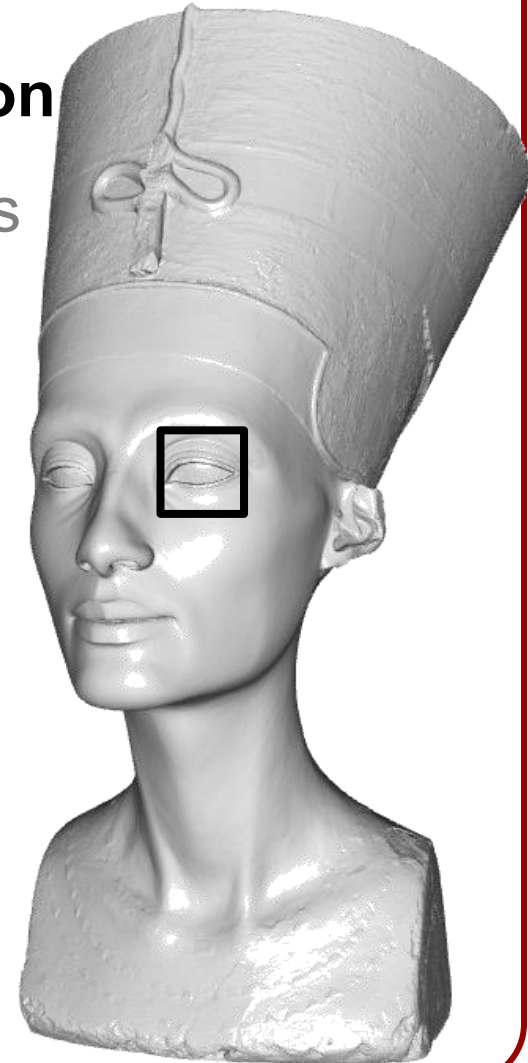


Introduction: What is CG?

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



"NefertitiHack"
Neues Museum





Introduction: What is CG?

- 2D image processing
- 3D object representation & manipulation
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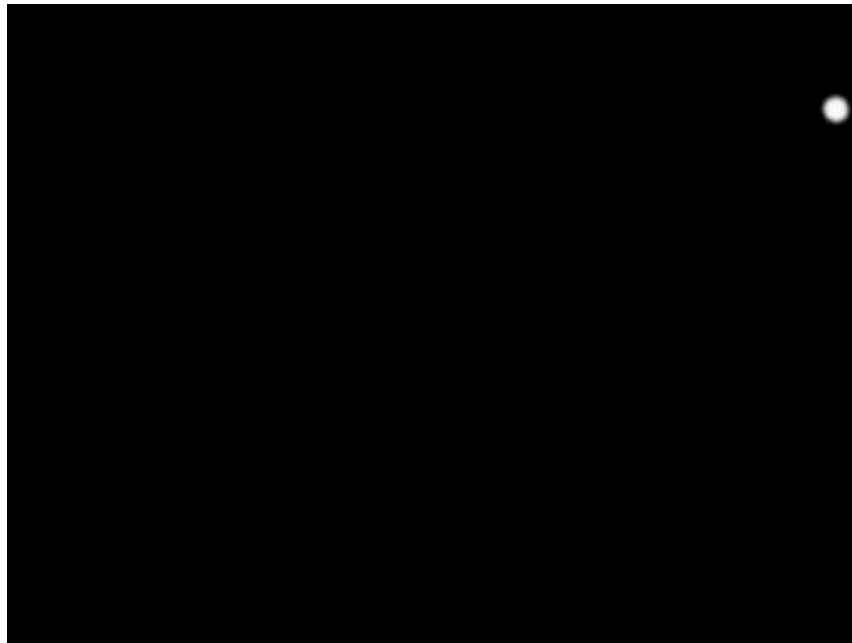


Gingold *et al.* 2004



Introduction: What is CG?

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



Fallen Art

Introduction: Applications



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



Introduction: Applications

- **Entertainment**
- Computer Aided Design
- Scientific Visualization
- Training & Education



Black Myth: Wukong" Game Science



"Avatar: Fire and Ash"
Lightstorm Entertainment



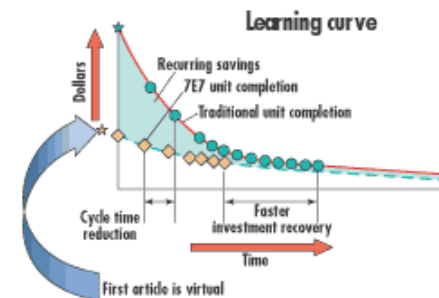
Introduction: Applications

- Entertainment
- **Computer Aided Design**
- Scientific Visualization
- Training & Education



Completely virtual model built in 3D:

- Shorten the development period
- Shorten the learning curve

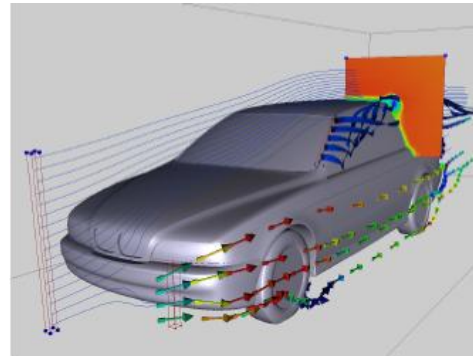


Boeing 7E7 (2003)

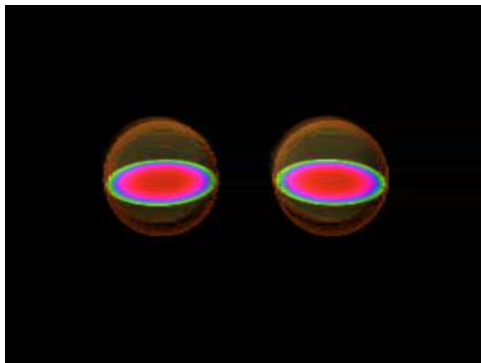


Introduction: Applications

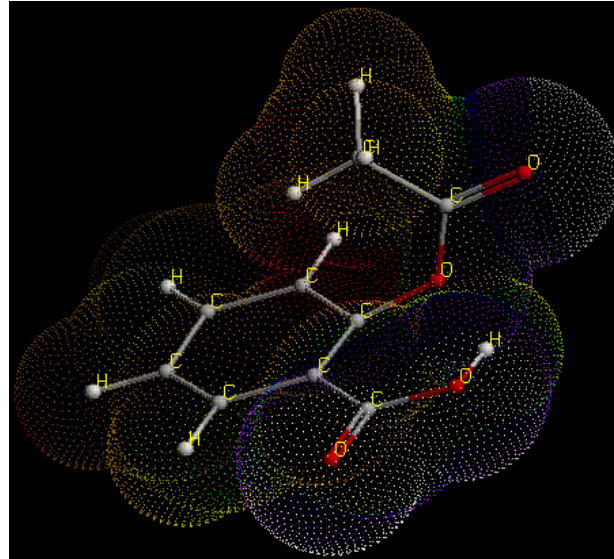
- Entertainment
- Computer Aided Design
- **Scientific Visualization**
- Training & Education



Flow Visualization
Roettger et al.



Neutron Star Collision
Courtesy of David Bock



Aspirin in RasMol
Courtesy of Michael Friendly



The Visible Human
Courtesy of NLM



Introduction: Applications

- Entertainment
- Computer Aided Design
- Scientific Visualization
- **Training & Education**

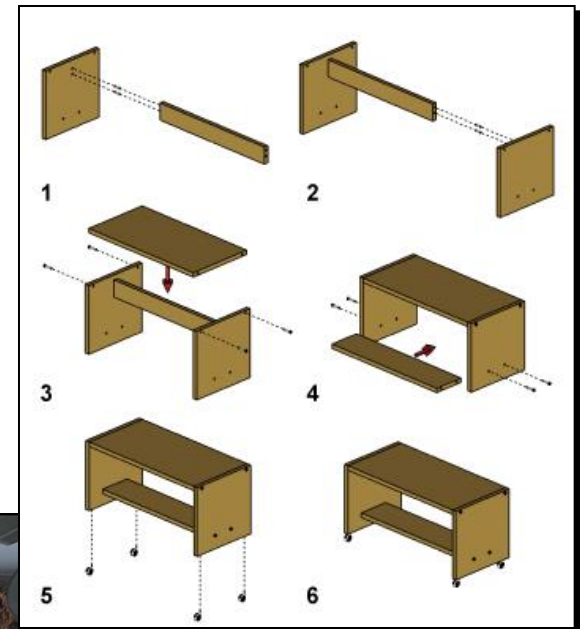


Image courtesy of
Agrawala et al.



Microsoft Flight Simulator



Outline

- Introduction
- **Syllabus**
- Coursework
- Miscellaneous



Syllabus

- Image Processing (2D)
- Ray Tracing (3D)
- Rendering (3D)
- Modeling (3D)
- Animation (4D)

Syllabus



- Image Processing
 - Quantization and Dithering
 - Sampling
 - Filters
 - Warping, Morphing, and Compositing

Syllabus



- (Offline) Ray Tracing
 - Cameras
 - Primitives
 - Lights
 - Spatial Data Structures
 - Reflection, Transparency and Refraction
- (Real-Time) Rendering
 - Coordinate Systems and Modeling Transformations
 - Viewing transformations
 - Shading
 - Textures
 - Visibility
 - OpenGL

Syllabus



- Modeling
 - Triangles
 - Splines
 - Subdivision Surfaces
 - Procedural Models
 - Point Based Models
- Animation
 - Key-Framing
 - Kinematics
 - Dynamics

Outline

- Introduction
- Syllabus
- **Coursework**
- Miscellaneous





Coursework

- Exams (30%)
- Programming assignments (60%)
- Class participation (10%)
- Labs (Required)



Coursework

- **Exams (30%)**
 - Two exams
 - Absolutely no excuses will be accepted for missing the exams. Not taking the exam at the scheduled time = 0!
- Programming assignments (60%)
- Class participation (10%)
- Labs (Required)



Coursework

- Exams (30%)
- **Programming assignments (60%)**
 - Image Processing (15%)
 - Ray Tracing (15%)
 - OpenGL Rendering (15%)
 - Animation (15%)
- Class participation (10%)
- Labs (Required)



Coursework

- Exams (30%)
- **Programming assignments (60%)**
 - Knowledge of C/C++ assumed!
 - Must be turned in by 23:59 on due date
 - **5 combined** late days
 - Notify TA in your write-up if you use a late day
- Class participation (10%)
- Labs (Required)



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.
 - Get “support code” from books, web, etc.
» **REFERENCE IT**
- It is not okay to:
 - Share code with other students
 - Copy code from other students
 - Use ideas/code from other sources without attribution



Coursework

- Exams (30%)
- **Programming assignments (60%)**
- Class participation (10%)
- Labs (Required)

Bottom line:
If you don't **LOVE** programming,
don't take this class!



Coursework

- Exams (30%)
- Programming assignments (60%)
- **Class participation (10%)**
- Labs (Required)



Coursework

- Exams (30%)
- Programming assignments (60%)
- Class participation (10%)
- **Labs (Required)**
 - We will have in-class labs to discuss the current assignment/code.
 - Attendance is mandatory

Outline



- Introduction
- Syllabus
- Coursework
- **Miscellaneous**



Miscellaneous

- <http://www.cs.jhu.edu/~misha/Fall26>
 - Your source for notes, assignments, videos, etc.:
 - No required text book.
- Piazza page:
 - <https://piazza.com/jhu/fall2026/601457657>
 - » I will not look at posts unless explicitly notified!
- Will not cover:
 - GPU programming (e.g. shaders)
 - Generative models for 2D/3D content synthesis



Miscellaneous

- Office hours:
 - » Misha's (Professor): Wednesdays 1-3 @ Malone 229
 - » Alexander Do: TBD
- Keeping in touch:
 - Email: Piazza / misha@cs.jhu.edu
 - Note:
 - » Do not send code snippets.
 - » Do not ask us if your implementation is correct.

Miscellaneous



Assignment 1:

- Image Processing
- Due September 19th @ 11:59 pm
- Even if you won't start working on the code until later, download it and try compiling ASAP to make sure that things are correctly set up on your system.