CSE452 Computer Graphics

Spring 2016
Welcome to CSE452!!

- What is computer graphics?
- About the class
What is Computer Graphics?
What is Computer Graphics?
What is Computer Graphics?

- Modeling
- Rendering
- Animation
- Simulation
- Interaction
Where is it used?

- Entertainment
- Industrial design
- Cultural heritage
- Education
- Bio-medicine
- ...
Modeling

- Computer-aided design
  - Defining surfaces using control nets

[Image: Courtesy of Julian Sarmiento]
Modeling

- 3D scanning
  - Captures objects as point clouds
Modeling

- Procedural modeling
  - “Growing” a large scale model following preset rules

Courtesy of Bokeloh et al.
Rendering

• Photorealistic
  – Ray tracing, radiosity
    • Shadow, Reflection, Transparency, Translucency, etc.

“Soft Shadow Volumes for Ray Tracing” by Laine et al., SIGGRAPH 2005

“Shell Maps” by Porumbescu et al., SIGGRAPH 2005
Rendering

- Photorealistic
  - Using real data to illuminate the scene

“All-frequency Interactive Relighting of Translucent Objects with Single and Multiple Scattering” by Wang et al., SIGGRAPH 2005

“Real-time Soft Shadows in Dynamic Scenes” by Ren et al., SIGGRAPH 2006
Rendering

- Non-photorealistic
  - Achieving artistic effects

“Stylization and Abstraction of Photographs” by DeCarlo and Santella, SIGGRAPH 2002
Rendering

- Non-photorealistic
  - Making technical illustrations
Animation

- Interactive deformation
- Motion capture

Skeletal deformation

Tom Hanks, Polar Express
Lect 2-3: Images
Lect 4-5: Basic shapes
Lect 6-9: Camera projection
Lect 10-15: Illumination
Lect 16: User interfaces
Lect 17-21: Curves, surfaces, fractals, and dynamic objects
This Course

- Instructor: Yasutaka Furukawa
- TAs
  - Will Hardy
  - Joseph Kwon
  - Jordan Mecom
  - Alice Wang
  - Anti Zhang
- Special thanks: Tao Ju
Course webpage

- http://www.cse.wustl.edu/~furukawa/cse452
- TA office hours
- Calendar of events
- Lecture slides
- Assignments
Piazza & Blackboard

• Piazza for (Q&A)
  https://piazza.com/wustl/spring2016/cse452a/
• Blackboard for posting grades
Materials

• Textbooks (recommended)

• Lectures
  – Slides
  – Notes
Assignments

- 1 + 6 assignments total (65%)
- Each assignment has two parts (questions and lab)
  - No need to submit questions, which are to cover key information to do the lab.
- 2 weeks for each assignment (except first one)

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<td></td>
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<td><strong>Questions and Lab out</strong></td>
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<td><strong>Cover questions in class and/or post answers</strong></td>
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<td>Lab due by midnight</td>
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Exams and Quizzes

- 4 in-class quizzes + 1 take-home final (35%)
  - Your score = Max (Final, Average(Quiz1, Quiz2, Quiz3, Quiz4) )
  - All open-book
  - Focus on Math

- To prepare
  - Workshop
  - Practice questions in lectures
More on assignments

- C++
  - Windows (Visual Studio)
  - OpenGL under FLTK (see tutorial links on course webpage)
- CSE 452 Shell
  - Does a lot of things for you already
  - Demo: use as a guide, but not a standard
- Write code carefully
  - Programming builds on previous assignments
More on assignments

• Programming labs
  – *5 free late days*; use whenever you feel like
  – Late programming assignments get at most 50% credit
    \[ \text{min}(\text{max\_score\_exclude\_extra} / 2.0, \text{your\_score\_include\_extra}) \]

• To **pass the class**:  
  – Finish through all assignments (each at least 50% complete) by the due date of final.
More on assignments

• Discussion, help with coding ok
  – Put names on cover page
  – No copying. No cut-and-paste.

• Internet has many explanations – ok to refer
  – Write documentation and code yourself!

• Cheating punishable by negative grade or failing the class
Check our website carefully

- [http://www.cse.wustl.edu/~furukawa/cse452](http://www.cse.wustl.edu/~furukawa/cse452)
- In particular, the policy page [http://www.cse.wustl.edu/~furukawa/cse452/policy.html](http://www.cse.wustl.edu/~furukawa/cse452/policy.html)
Who Should Take The Class

• Strong programming
  – C++ (must), OpenGL (optional)

• Strong math skills
  – Linear algebra, geometry.

• Yes, this course is hard and heavy…
Past pictures

But lots of fun!!
Assignment 0

• Getting started with the Shell code
  – Download, modify, and compile the source code
  – Upload via online link
    • If you registered the class after Jan 15th, let me know before you start the lab. Otherwise you won’t be able to upload your lab.
    – Check course webpage for details

• Out today!
• Due Monday by midnight