Questions to Start With
• Why are you here?
• What is Computer Graphics?
• What do you want to get out of it?
• What do you expect?
• What have you heard?
• Mechanics – 75 minute lecture too long
  – TRY for a break
• Do not want to blow a lecture on mechanics

Topics du Jour
• What is Computer Graphics – the topic
• What is Computer Graphics – the class
• Some basic things to get started

What is Computer Graphics?
• How computers create things we see

What kinds of “things we see”
• What?
  • Computer Displays
  • Movies / Video
  • Print
  • Interactive Media
    – Games
    – Virtual Reality
  • Other devices (mobile)
  • …
• Why?
  • Computer Displays
  • Entertainment
  • Design
  • Communication
  • Simulation
  • Medicine / Science

What is computer graphics?
(almost) Any picture we see!
  and a lot more than “computer pictures.”

Computers touch everything …
• All movies
• Photography (even film is printed digitally)
• Print
• …

What do we see?
What is an Image?
• Basics of Light
  – Electromagnetic radiation
    • Waves, frequencies (later)
  – Particle model
    • Travels from source to receiver
• Source to Viewer?
  – Not known until around 1000
    • Euclid and Ptolemy PROVED otherwise
  – Ibn Al-Haythan (Al-hazen) around 985
    • Triumph of the scientific method
      – Proof by observation – not authority
    • Experiment – stare at sun, burns eyes, …
    • Also figured out light travels in straight lines
Depth and Distance

- Light travels in straight lines
  - Except in weird cases that only occur in theoretical physics
- Doesn’t matter how far away
  - Can’t tell where photon comes from
  - Photons leaving source might not all make it to eye
  - Photons might bounce around on stuff
    - Longer distance, more chance of hitting something

Looking at things

- Light leaves source
- Light bounces off object
- Light goes to receiver
  - Eye, Camera
- Receiver is 2D, process is 3D
- Mathematics later
- Could be a picture (per eye)

What is Computer Graphics?

- Images - Visual Computing
- Geometry - Geometric Computing
  - Probably turned into an image at some point
- Not just pictures of world (text, painting, …)

Images

- Dictionary: a reproduction of the form of a person or object, especially a sculptured likeness
- Math: the range of a function
- A picture (2D)
- A sampled representation of a spatial thing

How to make images?

- Represent 3D World & Make a picture
  - Rendering (act of making a picture from a model)
    - Either simulate physics or other ways
- Capture measurements of the real world
- Make up 2D stuff (like painting text, …)

Kinds of Image Representations

- Old: Raster vs. Vector
- New: Sampled vs. Geometric
  - Raster: regular measurements (independent of content)
  - Geometric: mathematical description of content
- Display: vector vs. raster
Pixels

• A little square?
  – Bad model – but right idea
• A measurement (at a point)
  – In theory a point – in practice could be average over a region, ...
  – Limited precision…
• Grid? (or any pattern)
  – Key point: independent of content

What is the field of Graphics?

(as far as we’re concerned as a part of CS)

• Not content
• Not how to use graphics tools (***)

Related Fields / Courses

• Art
• Image Processing
• Computational Geometry
• Geometric Modeling
• Computer Vision
• Human Perception
• Human-Computer Interaction
• Advanced Graphics

What do you need to know?

• About images
• About geometry
• About 3D

• Importance of images in graphics classes
  – A new thing
  – Not well reflected in texts

What will we try to teach you?

• Eyes and Cameras – where images go
• Images (sampling, color, image processing)
• Drawing and representing things in 2D
  – Raster algorithms, transformations, curves, …
• Drawing and representing things in 3D
  – Viewing 3D in 2D, surfaces, lighting
  – Making realistic looking pictures
• Miscellaneous topics

How will we teach this to you?

• CS559 – Computer Graphics
• Basic course info – it’s all on the web
  www.cs.wisc.edu/~cs559-1
• Web for announcements – issues with mailing lists
Who

- Prof: Mike Gleicher
- 6385 CS
- Office Hours:
  - Tuesday: after class (11:00-11:45)
  - Wednesday 9:45-10:30
  - NOT Thursday
- gleicher@cs.wisc.edu

- TA: Yu-Chi Lai
- Mohamed Eldawy
- See the website

Books

- Fundamentals of Computer Graphics, 2nd ed
  - By Peter Shirley (and others)
  - NOT the 1st edition
  - Referred to as Shirley
  - or Tiger Book
- OpenGL Programming Guide
  - By Woo et al.
  - "red book" – common reference
  - Any version is OK for class
    - Old version is on the web

Collaboration

- Collaboration vs. Academic Misconduct
- We encourage collaboration (to a point)
  - Not on exams
  - You must do your own project work

Parts of the Course

- Exams
- Projects
- Assignments
  - Programming
  - Written
- Something due every Tuesday (start next week)

Software Infrastructure

- Visual Studio (C++ on Windows)
  - Your program must compile and run on machines in B240!
- FiTk
- OpenGL
- Class is not about tools, but we will help you with them

Other Administrative Questions?

- C++
- Workload
- Extra Credit
- Grading and Late Policies