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?

- 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

alternative

- Geometry
  - Geometry for non-visual stuff, often another field

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
- …

More than Pictures? (3D Displays, …)

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)
  - Digital Photography
- 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 – its 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)
  - Or by appointment
  - Wednesday 9:30-10:15
- gleicher@cs.wisc.edu
- TA: Yoh Suzuki
  office: 3379 CS
  hours: after class Mon
- TA: Chi Man Liu (CX)
  office: 1301 CS
  hours: Thursdays
- 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 – are part of projects!
  - Programming – make sure you have mechanics
  - Written – double check on the theory
- **Something** due every Monday
  - Survey next week

Software Infrastructure

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

Other Administrative Questions?

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