Announcements

- **CS 466 Computer Graphics Practicum!**
  - *Register ASAP!*
  - Additional fun programming assignments
    - Subdivision surfaces
    - Full-featured ray tracer
  - Meets Wednesday after class (pending conflicts)
    - Hollister 110 (trying to change…)
  - CSUG Computer Graphics Instructional Laboratory (Rhodes 455)
- **TAs:** Yin Wang, Yi Xu, and undergrads (TBA)
- **Textbook** (Shirley et al., 2nd edition)

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**Computer graphics:** The study of creating, manipulating, and using visual images in the computer.
Problems in graphics

- 2D imaging
  - compositing and layering
  - digital filtering
  - color transformations
- 2D drawing
  - illustration, drafting
  - text, GUIs

Problems in graphics CONT’D

- 3D modeling
  - representing 3D shapes
  - polygons, curved surfaces, …
  - procedural modeling

• 3D rendering
  - 2D views of 3D geometry
  - projection and perspective
  - removing hidden surfaces
  - lighting simulation
Problems in graphics CONT'D

- User Interaction
  - 2D graphical user interfaces
  - 3D modeling interfaces
  - virtual reality

Temporal modeling
- Enright et al. SIGGRAPH 2003

- Animation
  - keyframe animation
  - physical simulation
Computer graphics: Mathematics made visible.

Graphics Applications

- Entertainment
  - film production
  - film effects
  - games
- Science and engineering
  - computer-aided design
  - scientific visualization
- Training & Simulation
- Graphic Arts
- Fine Art
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In this course

• You will:
  – explore fundamental ideas
  – learn math essential to graphics
  – implement key algorithms
  – write cool programs
• You will not:
  – learn a lot about OpenGL or DirectX
    (though you will use some OpenGL)
  – write big programs

Course Overview
Topics

- Rendering 3D scenes
  (ray tracing as the basic model)
- Images and image processing
  (featuring sampling and reconstruction)
- Geometric transformations
- The graphics pipeline
  (with a slant toward understanding graphics hardware)
- Modeling in 2D and 3D
- Color science

Images

- What is an image?
- Compositing
- Resampling

Rendering

- ray tracing
- shading & shadows
- transparency
- texture mapping

Geometric transformations

- affine transforms
- perspective transforms
- viewing

rotate, then translate

translate, then rotate
Geometric Transformations

Dreamworks/Paramount—Transformers (screenshot: www.transformersmovie.com)

Graphics pipeline

- rasterization
- interpolation
- z-buffer
- vertex and fragment ops

Modeling

- splines
- parametric surfaces
- triangle meshes

Prerequisites

- Programming
  - ability to read, write, and debug small Java programs (10s of classes)
  - understanding of very basic data structures
  - no serious software design required

- Mathematics
  - vector geometry (dot/cross products, etc.)
  - linear algebra (just basic matrices in 2-4D)
  - basic calculus (simple derivatives)
  - graphics is a good place to pick up some, but not all, of this
Course mechanics

See web site: