Computer Animation
CPSC 426

Fall 2005

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Contact

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  or by appointment
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  http://www.cs.ugrad.ubc.ca/~cs426

Lectures

- Slides will be on the web site, in the schedule
  - Note: may not print properly from Acrobat on UNIX machines -- use pdf2ps to keep embedded fonts
- Take notes to augment the slides
  - I will say and write important things on the board that are not on the slides
- Stop me if you're confused
  - One of the biggest lessons in university: always ask if you don't understand!

Reference

- Text: *Computer Animation*, R. Parent
  - I'll try to cover all the material in class lectures; use this as a second opinion and reference if you want
- Web:
  - I'll post links or suggest papers to read on the course website
  - Other resources as appropriate
- For programming:
  - Favourite C++ reference, OpenGL books, RenderMan, …

Evaluation

- Assignment 0: 5% (warm-up)
- 3 real assignments: 10% + 10% + 10%
  - Programming plus some theory
- More details on how to submit in the assignments
- Final project: 25%
  - Short film or interactive piece
  - Do it in teams
- Final exam: 40%

Policies

- Late
  - Without a good reason, I subtract 20% per day late; demo deadlines are firm and can't be extended.
- Cheating
  - UBC policy is very clear on cheating (e.g. plagiarism) of any kind
  - See UBC policy #69
    - http://www.universitycounsel.ubc.ca/policies/policy69.html

Facilities

- Computer labs same as cs314
  - Linux machines tux*nn*.ugrad.cs.ubc.ca and lin*nn*.ugrad.cs.ubc.ca
  - Downstairs in CICSR 011 and 005
- Software:
  - GLUT, Pixie (RenderMan), ffmpeg
  - See web-page for more information
- I will provide starter code in C++

What this course isn't

- This is about the computer science of animation, not the art (or industry)
  - No animation packages
  - But you might still want to check out Maya, Houdini, SoftImage, 3Ds Max, Blender, … See the web-page for links
- For the final project you will produce a small animation
  - But it doesn't have to be a "real" film! Think 10-20 second demonstration of techniques.

Overview

- Animation principles
- Keyframing and interpolation
  - Artist specifies almost everything, the computer just makes it smooth
- Kinematics
  - Joints, articulated figures
- Procedural animation
  - Rules and simulations automatically produce the animation
- Data driven
  - Motion capture
- Advanced topics

Notes

- Please find and read:
  - John Lasseter, "Principles of traditional animation applied to 3D animation", SIGGRAPH'87
  - For SIGGRAPH papers, find on the ACM Digital Library, www.acm.org/dl (accessible from a UBC computer)
- Summarized in text, section 1.2.6 (pp. 10-12)
  - And for your interest, check out rest of chapter 1 on history, how production works, etc.

Assignment 0

- Find it on the web
- Get a strip of clear 16mm film at my office hours tomorrow
- Use **permanent** felt-tip markers to draw an animation, frame by frame
  - Write your name at the start!
- Return to me on Monday in office hours
  - No late submissions accepted!
- Also a simple math problem (warm up), hand in on Monday too

Animation Basics

- Persistence of vision
  - We see a bright flash for a while after it's gone
  - A sequence of images shown fast enough is hard to distinguish from true motion
    - What is fast enough?
    - Foveal vs. Peripheral vision
- Frame rate (fps=frames per second)
  - Film: 24
    - Often shown at 48, each frame twice, to reduce flicker
    - Sometimes animated "on twos" = 12fps, "on threes" = 8fps, or even slower
  - TV: ~30 for NTSC, 25, for PAL
    - Interlaced - double the speed to reduce flicker
  - Computers: 60Hz or more, games prefer 60fps

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Motion Blur

- Every bit of light persists in our vision for a while---fast moving objects leave a blurred streak
- Similarly, film/video cameras leave shutter open for a while
  - Moving objects blurred from position at start of shutter time to position at end
- Without motion blur (or tricks to simulate it) get strobing effect
  - Temporal aliasing -- akin to "jaggies"
  - Spinning wheels
  - Stop Motion vs. Go Motion

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Aside: Rendering Motion Blur

- Note: if strobing not apparent, don't bother
  - Also, sometimes already accounted for in animation (see later: "squash and stretch", "exaggeration")
- Ideally, figure out how to render to best fool the human eye
  - But nobody has figured that out: instead render to mimic a regular movie camera
- At each pixel, don't just compute the light coming into the camera at an instant
- Instead sum up the light that hits the camera during the shutter time
  - Approximate with appropriate sampling

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Next Class

- Splines: the basis for smooth movement
- Assignment 0 has a question on splines, along with a brief introduction
  - I'll go through it in class on Friday