Notation systems

- speech
- music
- motion
More on Models...

- good models are “obvious” in retrospect
- Notation is important!
  - computing with text:
    - Babylonians: cuneiform
  - computing with roman numerals
  - computing with 10 digits and modern algebraic symbols
- negative numbers?

The big picture

- Data
- Models
- Users
- Viewers
Animation Display

“Magic Lantern”

Cinematography

- 1880s

(Figure from “Animals in Motion”, Muybridge)
Multiplane camera (1933)

Final use at Disney:
1989, "The Little Mermaid"

(from "The Illusion of Life" Frank Thomas and Ollie Johnson)

3D Display

3D glasses

Jones et al., SIGGRAPH 2009

Animation Perception

Perception: frame rate

- flicker-free perception:
- "standard" film, television
Perception: Human Motion

- point light displays (Johansson, 1973)
- videos, BioMotion

Exaggerating Temporal Differences Enhances Recognition of Individuals from Point Light Displays
- Psychological Science, 2000

“The results suggest that exaggeration may reflect general principles of how diagnostic information is encoded for recognition in different domains.”

Exaggeration in face modeling

Two pathways hypothesis:
Visual Perception vs Visual Control

“[strong support for the idea that] the visual mechanisms mediating the perception of objects are functionally and neurally distinct from those mediating the control of skilled actions directed at those objects.”
- Goodale et al., Current Biology, 1994
Mori’s Uncanny Valley (1970)

Animation History

From “Traditional” to “Modern” Animation

- Film Animation
  - 1914 Windsor McCay - Gertie the Dinosaur
  - 1923 Walt Disney, "Alice in Wonderland"
  - 1928 Walt Disney, "Mickey Mouse"
  - 1969 Burtnyk & Wein, NRCC, computer keyframing
  - 1988 Pixar "Tin Toy"
  - 1995 Pixar "Toy Story", full-length CG film
  - 2001 Square "Final Fantasy", CG people

Traditional “Cel” Animation

- each frame is a hand-drawn image
- “keyframes”
- “in-between” frames
  - require less skill than keyframes
- labor intensive:
  - minimum frames: 24fps x 60s x 60 min
Principles of Animation

Artists using data

Computer Assisted Animation
- computer helps with keyframe interpolation

Modern 3D Animation
- rendered images of 3D models
- use time-varying parameters to model motion
  - positions, angles, joint angles
  - more abstract “rigging” controls
- keyframe is a set of parameters

http://www.evl.uic.edu/ralph/508S99/contents.html

[p. 151, "[digital] character animation 2", G. Maestri]