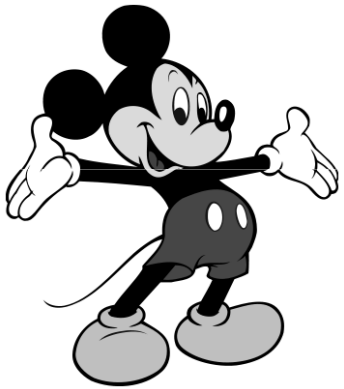
Chauvet

Lascaux



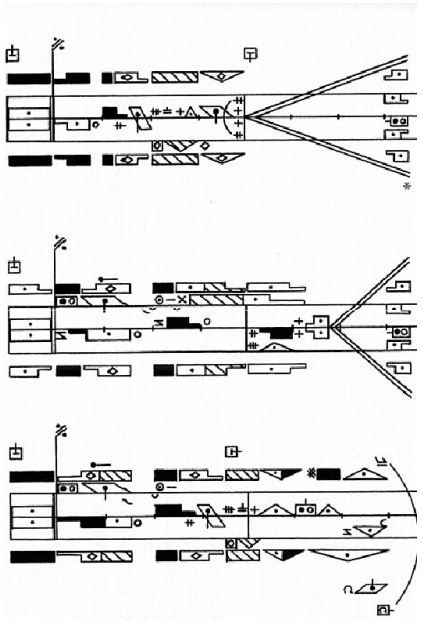
Notation systems

- speech
- music
- motion

वसंत–त्रिताल (मध्य लय)

स्थायी

नि			ग					नि							
सां	सा	म	म	–	म	नि	ध	सां	नि	ध	प	(प)	मंग	म	ग
ऋ	तु	ब	सं	ऽ	त	ब	न	फू	ऽ	ल	र	ही	ऽऽ	ऽ	ऽ
३				×				२				०			
ग				ग							ग				
म	–	म	म	म	म	नि	नि	मं	ग	–	मं	ग	रे	–	सा
सा	ऽ	द	त	अ	ति	म	न	ह	र	ऽ	फु	ल	बा	ऽ	रि
३				×				२				०			



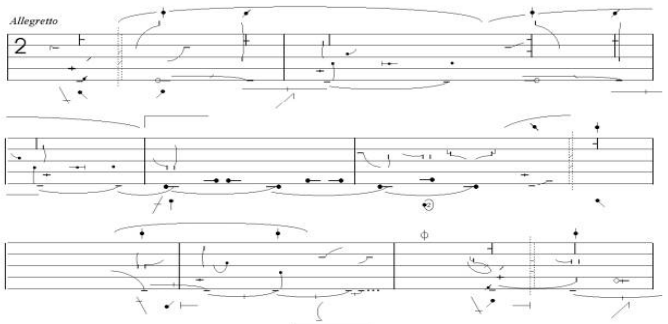
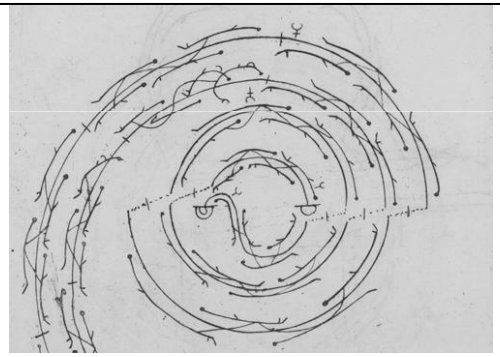
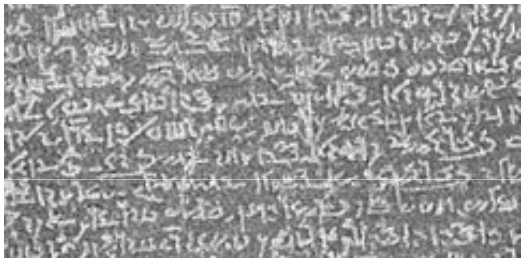
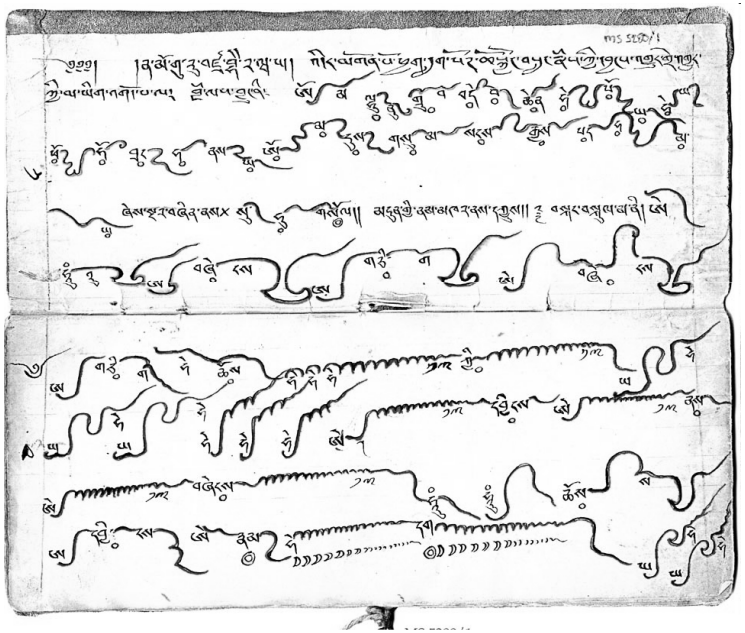

Allegretto
2


Fig. 1:



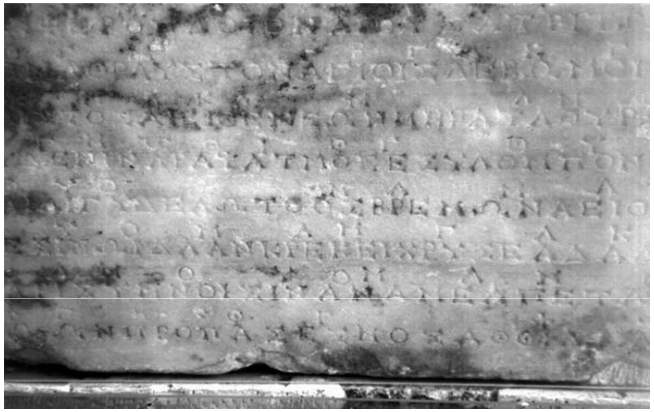


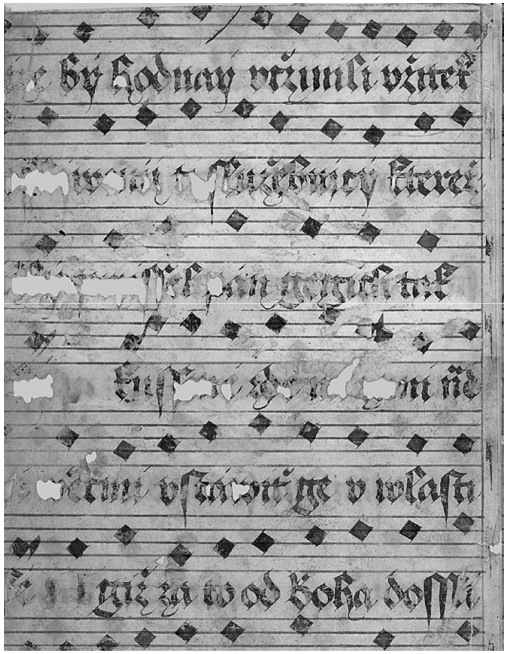


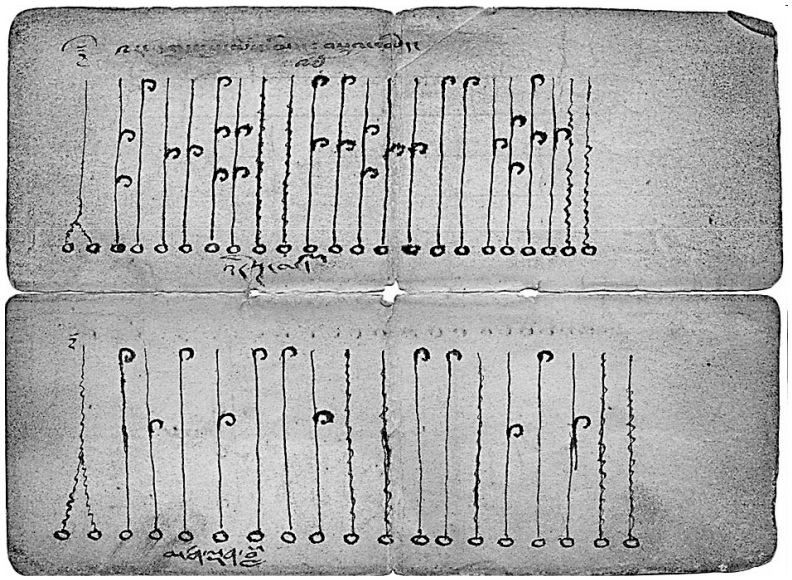
A.

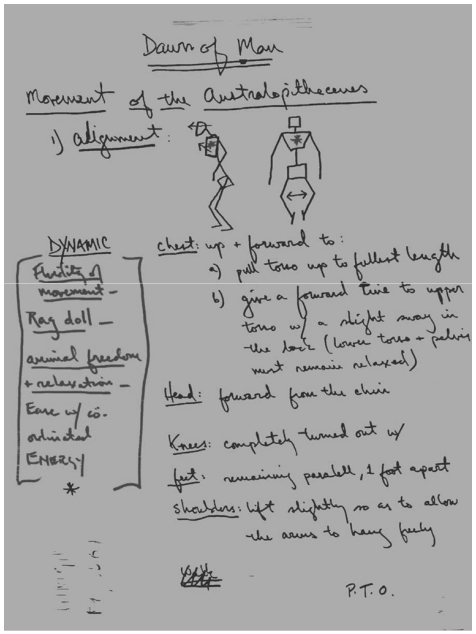
B.

19









More on Models...

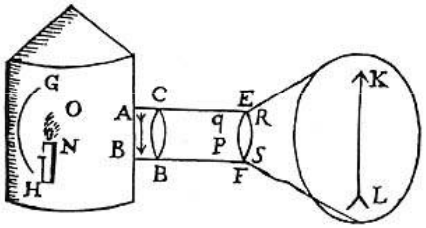
- good models are "obvious" in retrospect
- Notation is important!
  - computing with text:
    - Babylonians: cuneiform
  - computing with roman numerals
  - computing with 10 digits and modern algebraic symbols
- negative numbers?

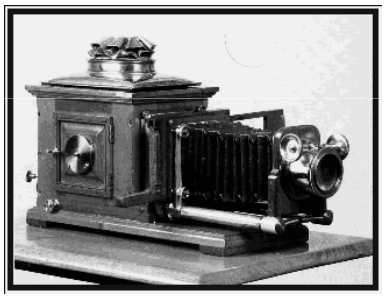
The big picture

- Data
- Models
- Users
- Viewers

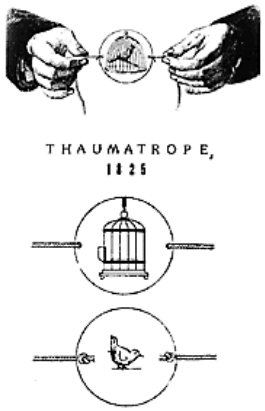
Animation Display

Animation Display





"Magic Lantern"



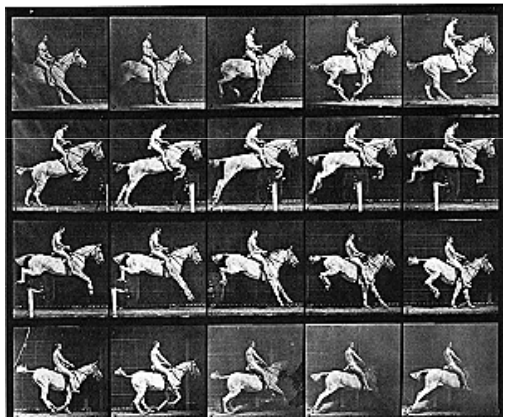
Thaumatrope

Zoetrope

Praxinoscope, 1877

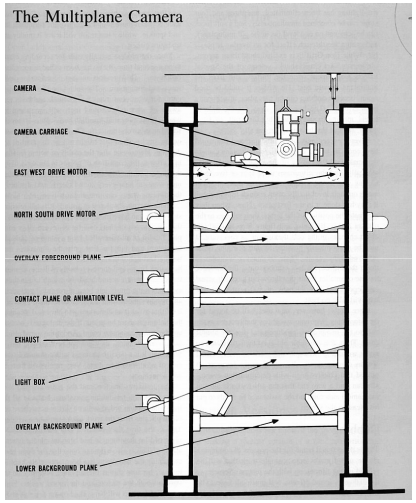
Cinematography

- 1880s



(Figure from "Animals in Motion", Muybridge)

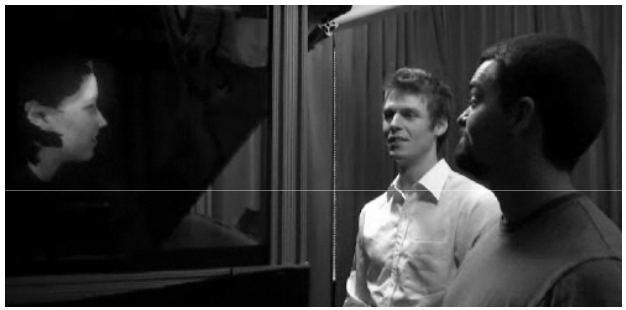
Multiplane camera (1933)

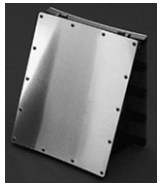


Final use at Disney:
1989, “The Little Mermaid”

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

3D Display





Jones et al., SIGGRAPH 2009

3D glasses

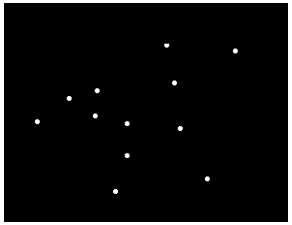
Animation Perception

Perception: frame rate

- flicker-free perception:
- “standard” film, television

Perception: Human Motion

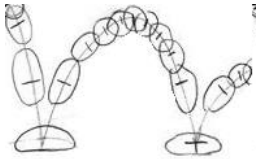
- point light displays (Johansson, 1973)
- videos, BioMotion



Exaggerating Temporal Differences Enhances Recognition of Individuals from Point Light Displays

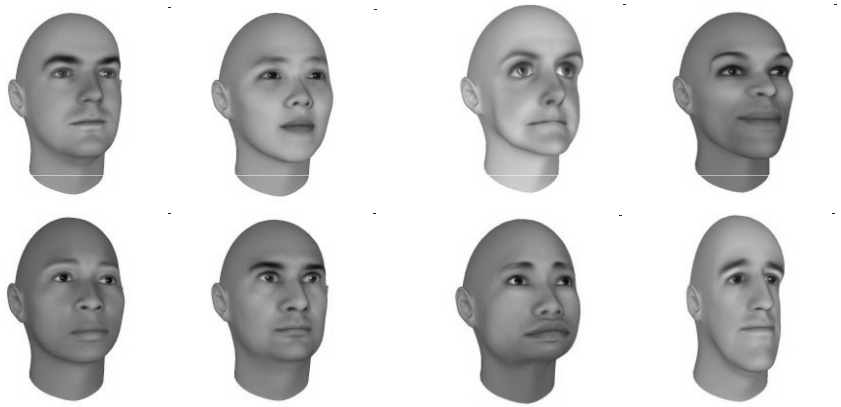
- Psychological Science, 2000

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



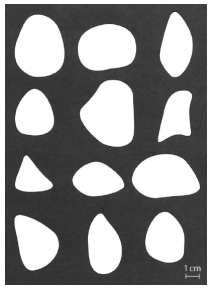
[www.thebest3d.com]

Exaggeration in face modeling



[www.facegen.com]

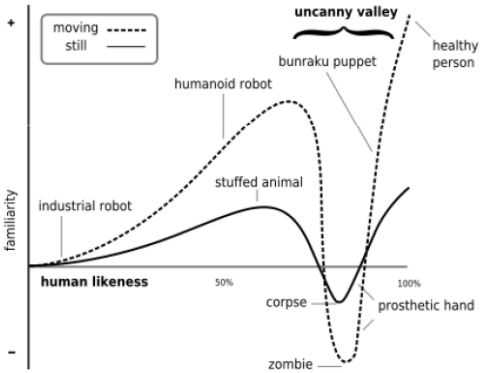
Two pathways hypothesis:
Visual Perception vs Visual Control



- "[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)



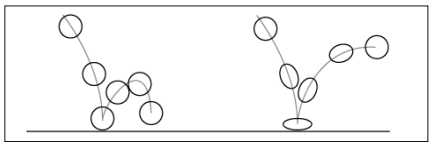
Animation History

From "Traditional" to "Modern" Animation

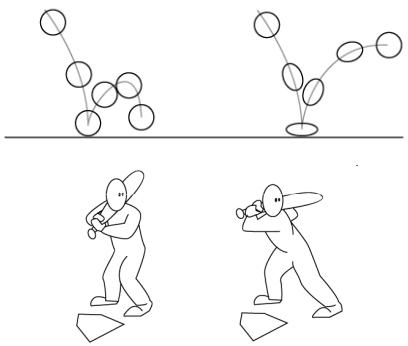
- Film Animation
  - 1914 Windsor McCay – Gertie the Dinosaur
  - 1923 Walt Disney, "Alice in Wonderland"
  - 1928 Walt Disney, "Mickey Mouse"
  - 1969 Burtnyk & Wein, NRCC, computer keyframing
  - 1988 Pixar "Tin Toy"
  - 1995 Pixar "Toy Story", full-length CG film
  - 2001 Square "Final Fantasy", CG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

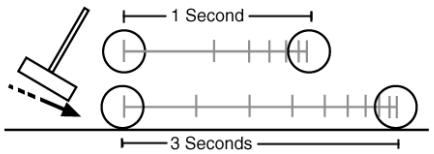
Traditional "Cel" Animation

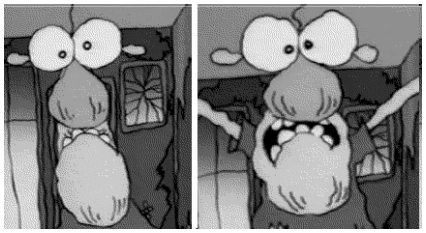
- each frame is a hand-drawn image
- "keyframes"
- "in-between" frames
  - require less skill than keyframes
- labor intensive:
  - minimum frames: 24fps x 60s x 60 min

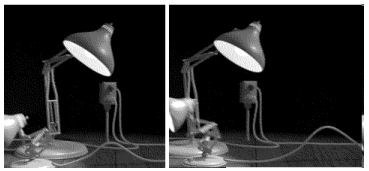


Principles of Animation





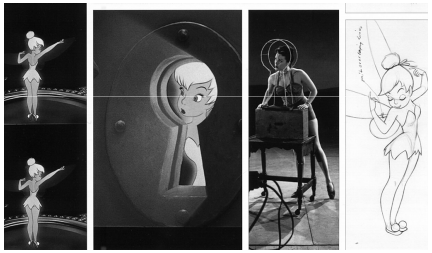




http://www.evl.uic.edu/ralph/508S99/contents.html

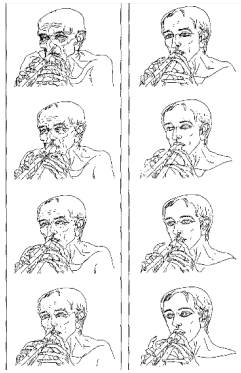
Artists using data

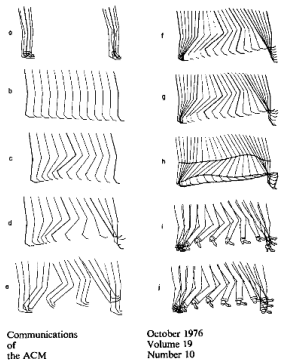
[mouseplanet.com]



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

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