Computer Animation Lessons, Principles, Papers

1. Introduction
2. Keyframe animation
3. Animation curves
4. Forward and inverse kinematics
5. Finite state machine
6. Motion planning
7. Camera animation
8. Rigging and skinning
9. Mass spring systems
10. Ragdoll physics
11. Forward dynamics
12. Inverse dynamics

1. Straight ahead and pose to pose
2. Arcs
3. Timing
4. Ease-in and ease-out
5. Staging
6. Follow through and overlapping action
7. Anticipation
8. Exaggeration
9. Secondary action
10. Appeal
11. Solid drawing
12. Squash and stretch

1. Improv -> Motion doodles
2. Principal components -> Improv
3. Motion doodles -> Optimo
4. The line of action
5. Sketchimo
6. Symbicon
7. Through-the-lens camera control
8. Pinocchio
9. Subdivision surfaces in character animation
10. Motion graphs
11. Artist-Directed dynamics
12. Space-time constraints
Motivation: Paleolithic animation (-32 000)
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Motivation: Parthenon frieze (-600)

Motivation: optical theatre by Emile Reynaud (1892)
Motivation: pauvre pierrot by Emile Reynaud (1892)
Motivation: fantasmasmagorie (1908)
Motivation: Little Nemo (1911)
Motivation: multiplane camera (1935)
Motivation: Snow White (1937)
Motivation: sketchpad (1963)
Motivation: a computer animated hand (1972)
Motivation: Pixar’s Toy story (1995)
Motivation: Pixar’s Geri’s game (1997)
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Motivation: Hayao Miyazaki and artificial intelligence (2016).

This is a presentation of an artificial intelligence model which learned certain movements.
Motivation: Fable Studio and real-time animated virtual beings (2019)
PRINCIPLES OF CHARACTER ANIMATION

~1930, Studios Disney

The Illusion of Life
Disney’s Ollie Johnston and Frank Thomas
Source

- PRINCIPLES OF TRADITIONAL ANIMATION APPLIED TO 3D COMPUTER ANIMATION
- John Lasseter, Pixar, SIGGRAPH 1987
Principle 1 - Straight ahead and pose-to-pose
4. Straight Ahead & Pose to Pose
There are two main approaches to hand drawn animation. The first is known as *straight ahead action* because the animator literally works straight ahead from his first drawing in the scene. He knows where the scene fits in the story and the business it has to include. He does one drawing after another, getting new ideas as he goes along, until he reaches the end of the scene. This process usually produces drawings and action that have a fresh and slightly zany look, because the whole process was kept very creative. Straight ahead action is used for wild, scrambling actions where spontaneity is important.

The second approach is called *pose-to-pose*. Here the animator plans his actions, figures out just what drawings will be needed to animate the business, makes the drawings concentrating on the poses, relates them to each other in size and action, and then draws the inbetweens. Pose-to-pose is used for animation that requires good acting, where the poses and timing are all important.

Improv: A System for Scripting Interactive Actors in Virtual Worlds

Ken Perlin / Athomas Goldberg
Media Research Laboratory
Department of Computer Science
New York University

Figure 4: Actors communicate with each other through a shared blackboard.

Figure 5: Users interact with both the Behavior Engine and the Animation Engine through an author-defined user-interface.
1) Description
2) Clarity of Exposition
3) Quality of References
4) Reproducibility
5) Strengths and weaknesses
6) Rating (1-5)

1) Problem statement
2) Scientific contributions
3) Experimental validation
4) Limitations
5) Impact