An Introduction to Computer Animation

Michiel van de Panne

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Animation Sources

algorithm

user
mocap
Motion Notation

- 1700 “Choreographie”, Feuillet
- 1852 “Stenochoreographie”, Arthur Saint Leon
- 1928 “Notation of Movement”, Margaret Morris
- 1928 “Schrifttanz”, Rudolf von Laban
- 1940 “Kinetography Laban” (Labanotation)
- 1950’s Eshkol & Wachmann: mathematical notation
- 1956 “Choreology”, Joan and Rudolf Benesh
Motion Notation

Labanotation

“Labanotation”,
Ann Hutchinson

double starting line.

2a Actions on the right side only

b An action on the right then on the left side

c A left-sided action followed by simultaneous actions on both sides

This vertical center line forms the basis of the vertical three-line staff on which structured description is written.
Motion Notation

Labanotation

“Labanotation”, Ann Hutchinson
Motion Notation

Labanotation

“Labanotation”, Ann Hutchinson

Fig. 607  * See page 468  ** See page 478

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Animation History

Film Animation

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

The Multiplane Camera

CAMERA
CAMERA CARRIAGE
EAST WEST DRIVE MOTOR
NORTH SOUTH DRIVE MOTOR
OVERLAY FOREGROUND PLANE
CONTACT PLANE OR ANIMATION LEVEL
EXHAUST
LIGHT BOX
OVERLAY BACKGROUND PLANE
LOWER BACKGROUND PLANE

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

ANIMATOR: Winsor McCay—Gertie the Dinosaur.

Cartoonist Winsor McCay was the first to recognize animation as an art form. His best remembered film is Gertie the Dinosaur, done in 1914. Historian John Canemaker points out that Gertie was the first animated personality, showing shyness and stubbornness and eventually weeping big tears when she was criticized. The audience loved it, but ten years later both the film and the techniques had been forgotten.

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

(from “The Illusion of Life” Frank Thomas and Ollie Johnson)
Expert model-makers constructed a jointed armature of a young deer for the animators to study while working on Bambi. Based on Rico Lebrun’s drawings, everything moved correctly, right down to the toes.

(from “The Illusion of Life” Frank Thomas and Ollie Johnson)
3D Animation (keyframing)

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

p. 44, "[digital] character animation 2", G. Maestri
3D Animation (keyframing)

**Issues**

- complete control over motion
- rigging character
- time consuming
- not real-time
Animation Sources

algorithm

user  mocap
Motion Capture

Muybridge, 1884
Rotoscoping

(Figure from “Animals in Motion”, Muybridge)
Motion Capture

Muybridge

(Figure from “Animals in Motion”, Muybridge)
Motion Capture

MotionStar Wireless is the first magnetic tracker to shed its cables and set your performer free. Motion data for each performer is now transmitted through the air to a base station or remote processing.

We've combined our world-famous MotionStar™ DC magnetic tracker with the best wireless technology to give you real-time, unattended motion capture. There is absolutely no performance compromise, no twist, no free.

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- Stable, long-range transmission
- Multiple-channel tracking
- High-speed data
- Motion preview
- On-site installation

(Figure from Ascension Inc.)
Motion Capture

(Figure from Northern Digital Inc.)
Motion Capture

**Issues**

- modifying mocap data
- building graphs
- annotation of data
- data cleanup
- data compression
Animation Sources

algorithm

user  mocap
Physics-based Simulation

Issues

• realistic
• simulation parameters?
• difficult to control
Simulation of Passive Motion
Simulation of Passive Motion
Simulation of Active Motion
Simulation of Active Motion