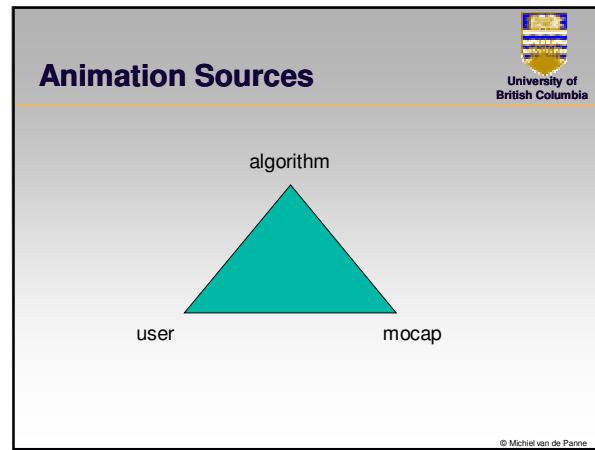


University of British Columbia

## An Introduction to Computer Animation

**Michiel van de Panne**

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### Motion Notation

- 1700 "Choreographie", Feuillet
- 1852 "Stenochoregraphic", 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

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### 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.

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### Motion Notation

#### Labanotation

"Labanotation", Ann Hutchinson

Center Line

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### Motion Notation

#### Labanotation

"Labanotation", Ann Hutchinson

Foto 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 Burtnyk & Wein, NRCC, computer keyframing
- 1988 Pixar “Tin Toy”
- 1995 Pixar “Toy Story”, full-length CG film
- 2001 Square “Final Fantasy”, CG people

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## Traditional Animation

**The Multiplane Camera**

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

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## Traditional Animation

**ANIMATOR: Winsor McCay—  
Gertie the Dinosaur**

*Cartoonist Winsor McCay was the first to recognize animation as an art form. His most famous work, Gertie the Dinosaur, done in 1914, historian John Canemaker says, "was the first animated performance of beauty and sublimeness and eventually weeping big tears when she was separated from her mate. 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)

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## Traditional Animation

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

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## Traditional Animation

**Expert model-makers constructed a jointed armature of a young deer for the animator to move 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)

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## 3D Animation (keyframing)

Jaw: 52.8  
R. Smile: 38.7  
G. +  
L. Smile: 49.6  
Lip\_Purse: 0.0  
Lip\_Close: 0.0

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

p. 44, "[digital] character animation 2",  
G. Maestri

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## 3D Animation (keyframing)

**Issues**

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

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## Animation Sources

The diagram consists of a central equilateral triangle divided into three smaller triangles. The top vertex is labeled "algorithm", the bottom-left vertex is "user", and the bottom-right vertex is "mocap".

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## Motion Capture

**Muybridge, 1884**  
**Rotoscoping**

(Figure from "Animals in Motion", Muybridge)

© Michiel van de Panne

## Motion Capture

**Muybridge**

(Figure from "Animals in Motion", Muybridge)

© Michiel van de Panne

## Motion Capture

We've combined our world-renowned motion capture with the latest technology to give you real-time, multi-camera motion capture. There's no need for mirrors or reflective markers. Our motion capture system can track up to 100 different joints simultaneously.

**MotionSift**  
cables to

(Figure from Ascension Inc.)

© Michiel van de Panne

## Motion Capture

The 3D motion measurement system from Northern Digital Inc.

(Figure from Northern Digital Inc.)

© Michiel van de Panne

## Motion Capture

**Issues**

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

© Michiel van de Panne

## Animation Sources

The diagram consists of three points forming a triangle. The top point is labeled "algorithm". The bottom-left point is labeled "user". The bottom-right point is labeled "mocap".

© Michiel van de Panne

## Physics-based Simulation

**Issues**

- realistic
- simulation parameters?
- difficult to control

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## Simulation of Passive Motion

The left image shows a person in a white suit standing on a black background, possibly a simulation of a character standing still. The right image shows a green ring resting on a blue and white checkered surface, likely a simulation of an object in a physical environment.

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## Simulation of Passive Motion

The left image is a screenshot from a paper titled "Breaking Glass: Graphical Modeling and Animation of Brittle Fracture" by James F. O'Brien and Jessica K. Hodgins. It shows a simulation of a glass being broken. The right image shows a glass of water on a blue surface, likely a simulation of a liquid in a container.

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## Simulation of Active Motion

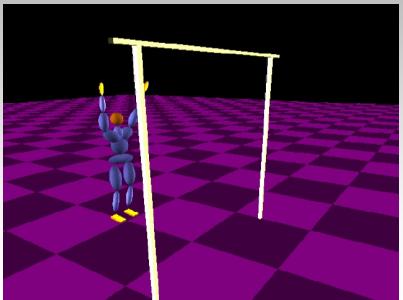
The left image shows a golden statue standing on a set of stairs against a cloudy sky, likely a simulation of a character performing an action. The right image shows a person sitting on the floor in a room, with a skeleton model nearby, possibly a simulation of a character interacting with its environment.

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## Simulation of Active Motion



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