

Computer Animation

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IMPA – Instituto de Matemática Pura e Aplicada

Outline

- Wireframe Animation
- Motion Graphics
- Procedural Animation
- Motion Capture
- Facial Animation
- Ray Tracing
- Blobby Shapes
- 3D Cartoon Shading

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Wireframe Animation

- My First Steps (1976-1979)
Newman and Sproull, 1973
"Principles of Interactive Computer Graphics"
 - Plotter
 - IBM 1130
 - Fortran
- Undergraduate Final Project - ESDI, 1979
First Computer Generated Film Made in Brazil
 - Simple Graphics Package
 - Plotted Frame-by-Frame
 - Shot on Animation Stand

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"A Imagem no Computador"



* SIBGRAPI Video Show, 1992

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Motion Control

Montreal, 1981-1982

- National Film Board
 - Brazil / Canada Cooperation
 - French Animation Group (*La Faim*)
- Computer Controlled Animation
 - Oxberry 35 mm Animation Stand
 - Motion Control Computer
- Graphics Experiments

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"Graphisms"



• NFB, 1982

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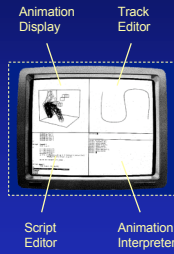
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Procedural Animation System

MS. MIT Media Lab 1984

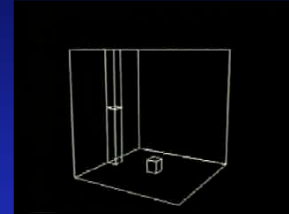
- Animation Abstractions
 - Scripts / Tracks
- System Architecture
 - Extension Language
 - Multiple Windows (X11)
- Different Levels
 - Authoring
 - Interaction



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“Scripts”



- (inverse kinematics, forward dynamics, collision detection)
MIT Media Lab, 1984 - with David Zeltzer

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Motion Capture

MS. UFRJ, 1998

(supervisor of Fernando Wagner)

- MOCAP Animation System
 - Intuitive Interface
 - Signal Processing Approach
- Thesis Award
 - XII CTD - SBC, 1999
 - VI CLEI - UNESCO, 1999

* paper SIBGRAPI, 1997

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“Animação por Movimento Capturado”



* SIBGRAPI Video Show, 1997

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Facial Animation

MS. PUC-Rio, 2002

(supervisor of Paula Lucena)

- Real -Time Facial Animation
 - Lip Synch + Facial Expressions
 - Annotated Text Input
 - Client / Server JAVA Implementation
- Potential Applications
 - Internet, Entertainment
 - Education, Tele-Collaboration
- Collaboration with Ken Perlin

* paper WTDCGPI, 2002

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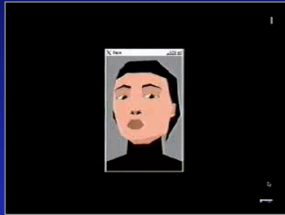
“Expressive Talking Heads”



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“Expressive Talking Heads”



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The Ultimate Renderer

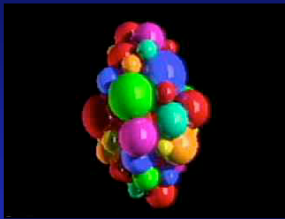
Fantastic Animation Machine, 1985

- Designed the “in-house” 3D System
 - Modeler
 - **Renderer** (*it’s all about the look...*)
 - Animation
- Multi-modal Visualization
 - Wire / Hidden Line
 - A-Buffer, *Phong* Shading
 - Distributed Ray Tracing
 - Texturing, Special Effects

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“F.A.M. Demo”



* ACM-SIGGRAPH *Electronic Theater*, 1986

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2D Texturing Implicit Objects

IMPA, 1995

(joint work with Zonenschein, Figueiredo, Wyvill)

- Texture Mapping Implicit Surfaces
 - 3D textures: *Trivial*, (Embedding Space)
 - 2D textures: *Hard*, (Lack of Natural Parameterization)
- Extrinsic Projection Method
 - Transfer Texture from a Canonical Space
 - “Natural” Projection, i.e. Blended Gradient Field
 - Physically-Inspired: ODE, Particle System

* Tech Sketch ACM-SIGGRAPH, 1997 - paper SIBGRAPI, 1998

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“Textura com Sistema de Partículas”



* SIBGRAPI *Video Show*, 1997

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Piecewise Implicit Objects

PhD. University of Toronto, 1994

(advisor: Demetri Terzopoulos)

Complete Modeling Framework (*Decomposition + Adaptation*)

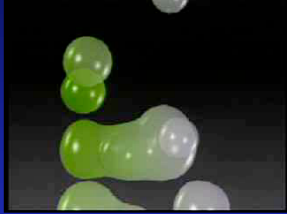
- Smooth Implicit Model
 - Multiscale Edge Analysis / Synthesis
- Hierarchical Implicit Representation
 - Multiscale B-Spline Basis
- Adapted Simplicial Decomposition
 - Physics-Based Simulation

* Paper SIBGRAPI, 1998

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"Bobby Bubbles – TV Globo"



* SIBGRAPI Video Show, 1997

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3D Shading for Cartoon Animation

- Ms. PUC-Rio (supervisor of Hedlena Almeida)

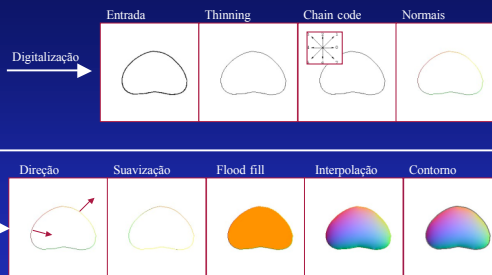
"Lumo: Illumination for cel Animation", S.F. Johnston



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Pipeline



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Questions?