

A New Interface Paradigm for Motion Capture Based Animation Systems

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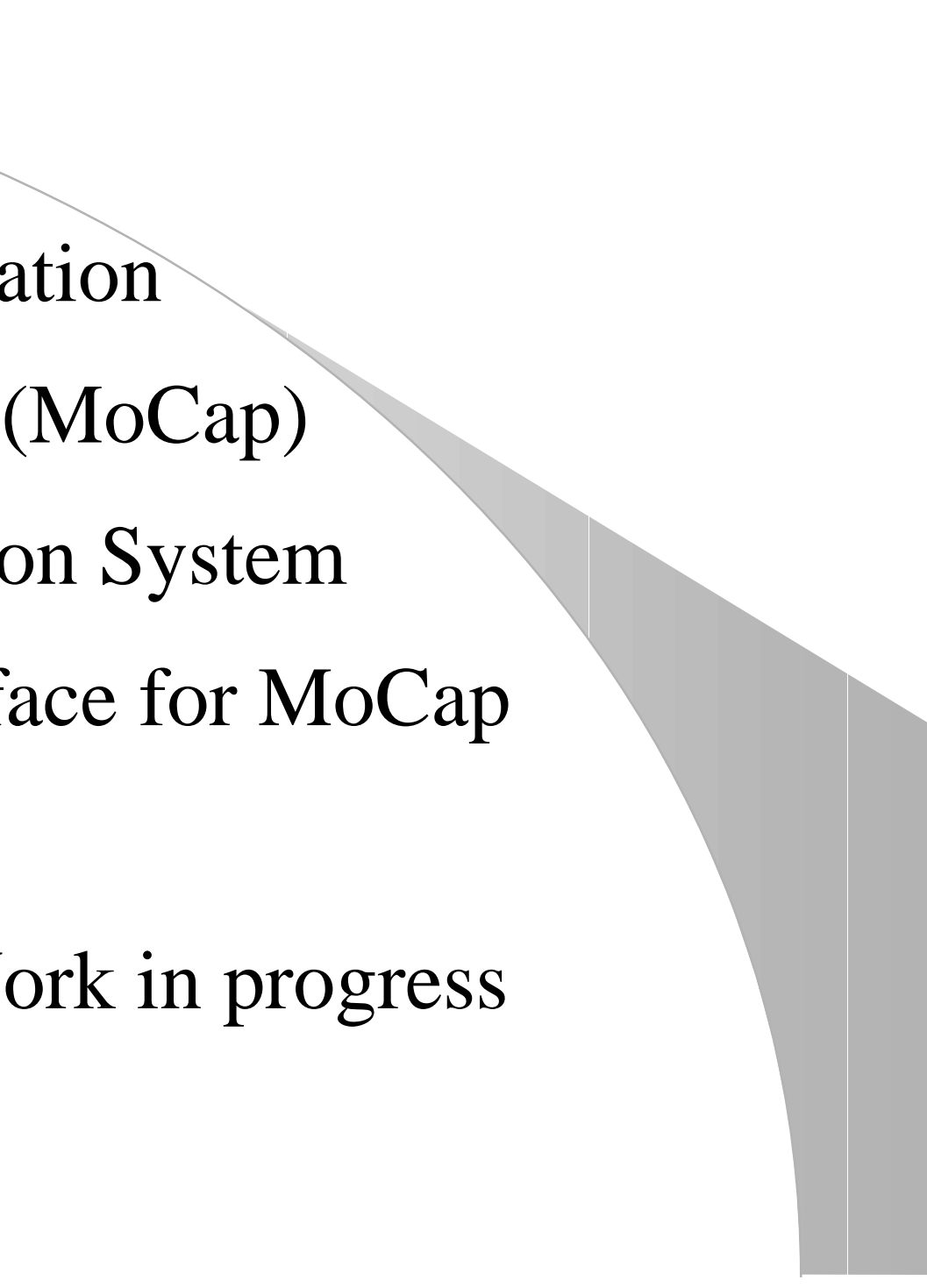
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General Outline

- Computer Animation
 - Motion Capture (MoCap)
 - MoCap Animation System
 - A Graphic Interface for MoCap
 - Conclusions
 - Future work / Work in progress
- 

Computer Animation

- Keyframing
 - interpolation between key poses.
- Procedural
 - procedure parameters over time.
- Simulation
 - physical constraints and rules.
- Motion Capture
 - sampling at points of a real subject.

Motion Capture



- Advantages

- natural looking motion.
- speed of production.

- Drawback

- data complexity and size.

Motion Capture



- MoCap is different from traditional animation data
- Existing systems are not suitable for MoCap processing

Our Motivation

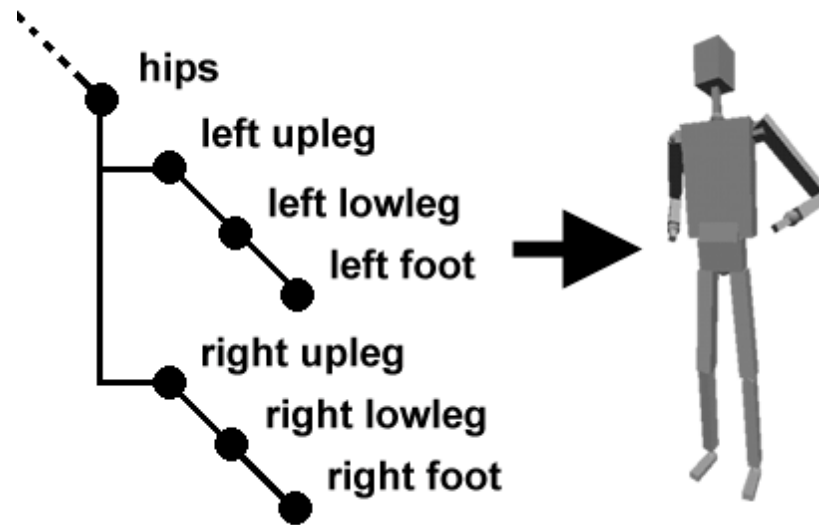
- To build an animation system focused on MoCap
- To represent well MoCap abstractions
- To implement a set of motion operations with associated interface tools
- The system will serve as a “testbed” for new operations and techniques

Characteristics of Our Animation System

- MoCap as main animation tool
- Modular architecture
(Input, Processing, Output and Interface)
- Specialized GUI objects sharing a dynamic state structure

System's Basic Entities

- Virtual Actor (skeleton)
 - topology: graph (joints+links).
 - geometry: connected limbs.

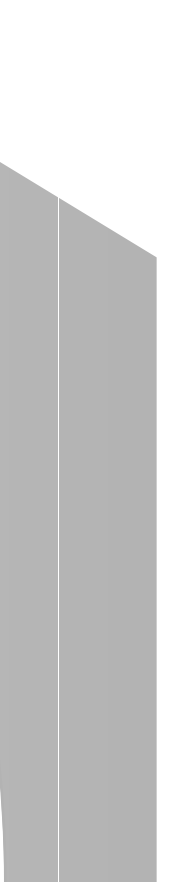
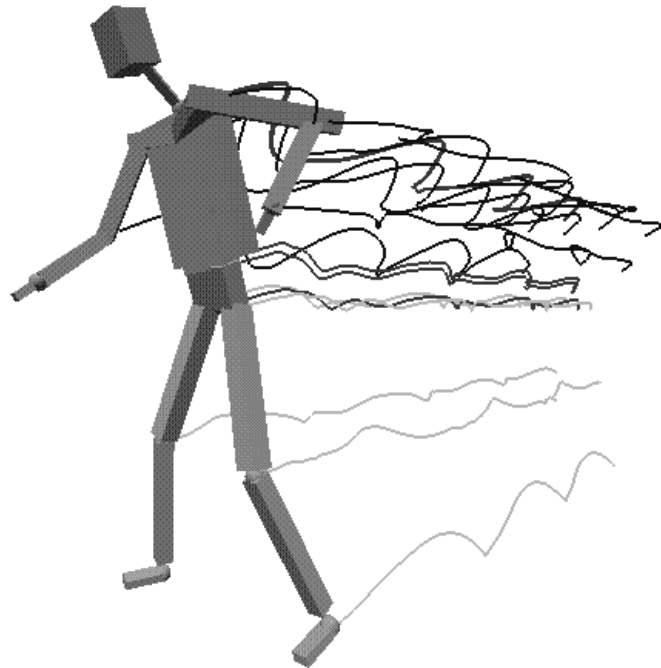


Reflects the structure of an articulated figure

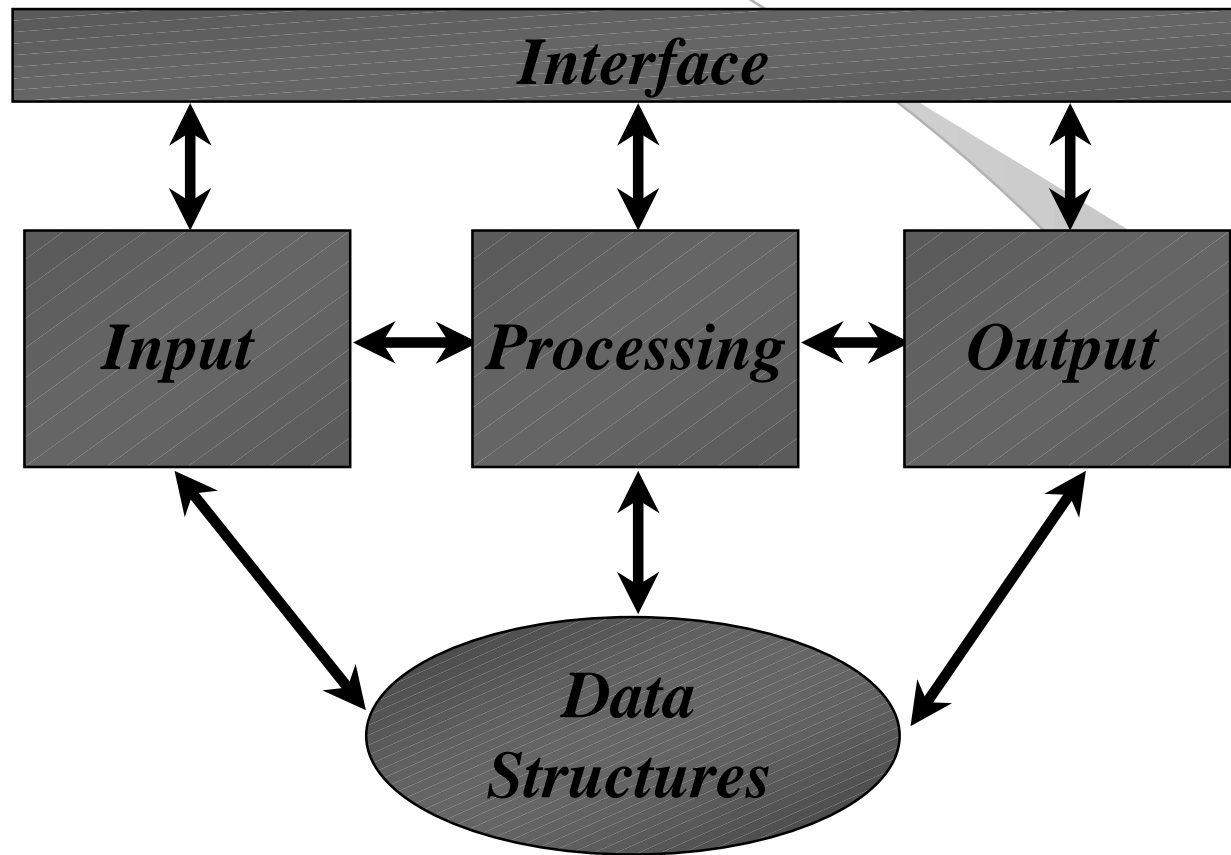
System's Basic Entities

- Motions

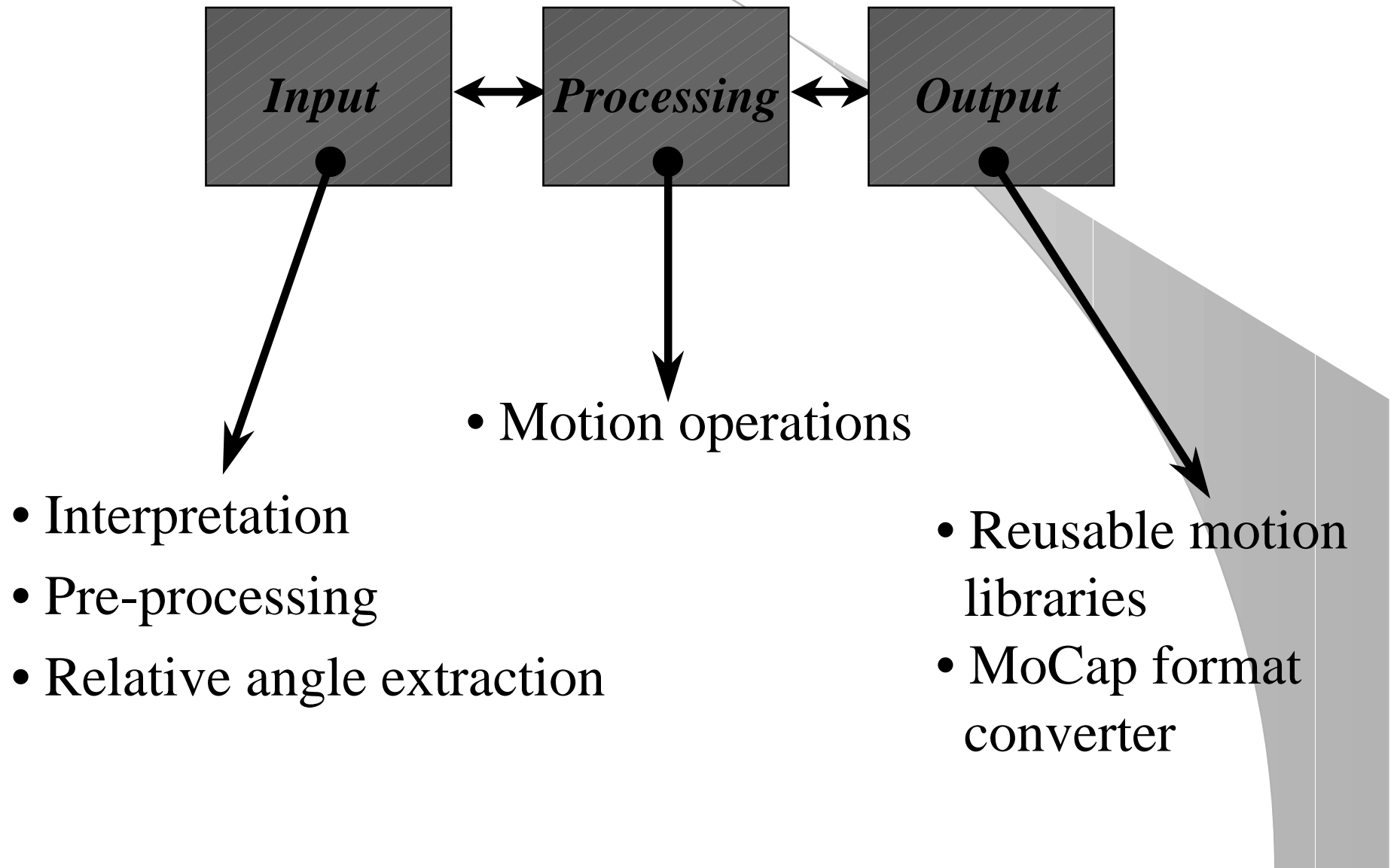
- sampled parameters over time.



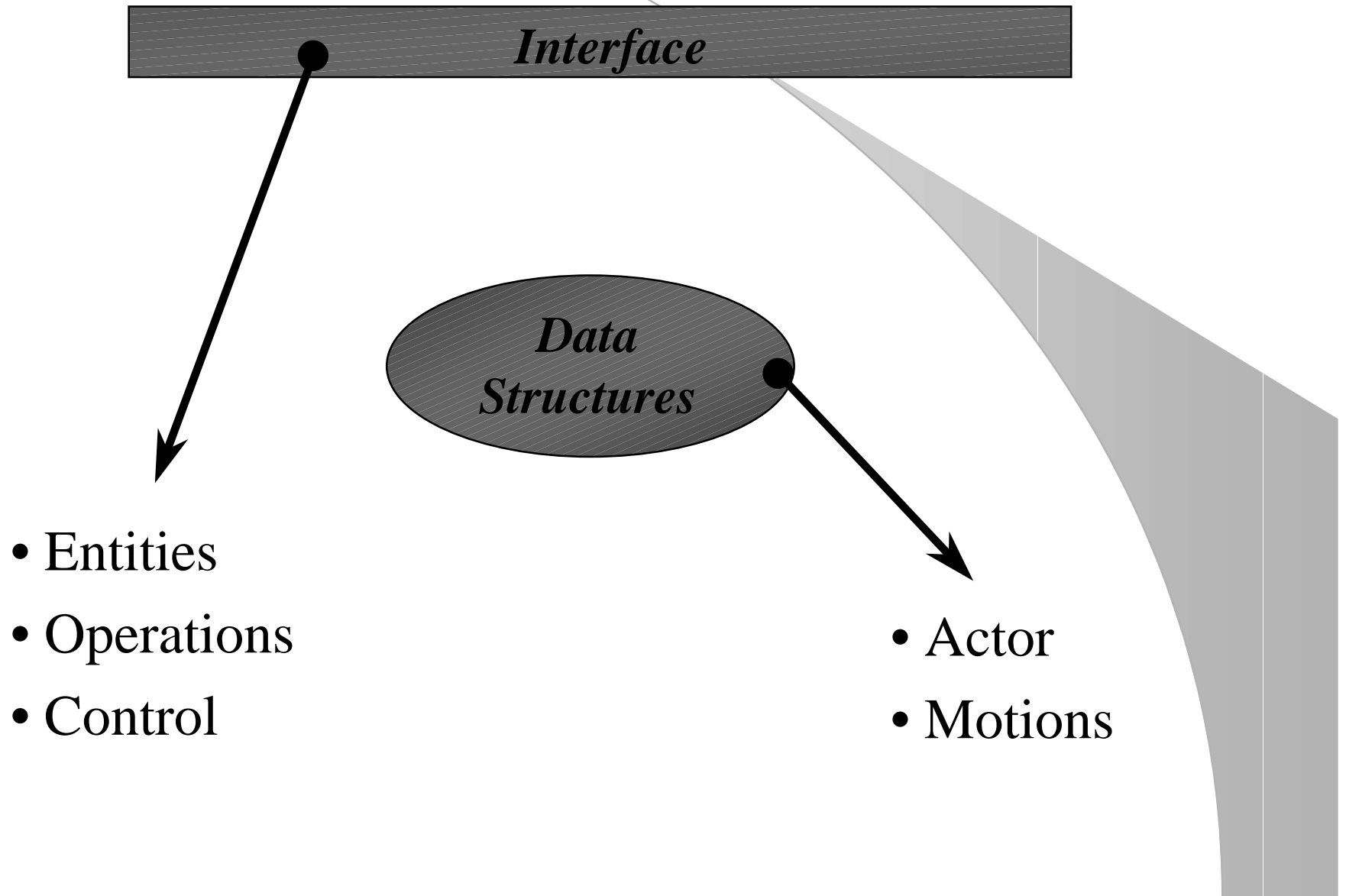
System's Architecture



System's Architecture



System's Architecture



A Graphic Interface for Motion Capture

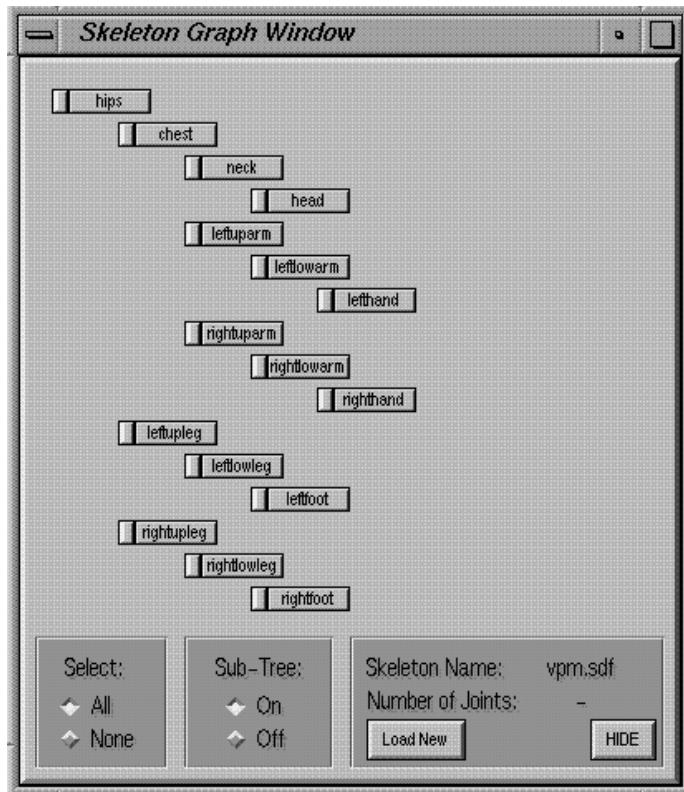
- Focus of this presentation
- Objectives
 - represent the abstractions used in MoCap.
 - provide a correct control of the operations.
 - extensible: new operations and techniques.
- Starting point Paradigm :
post-production video workstations

Basic GUI Elements

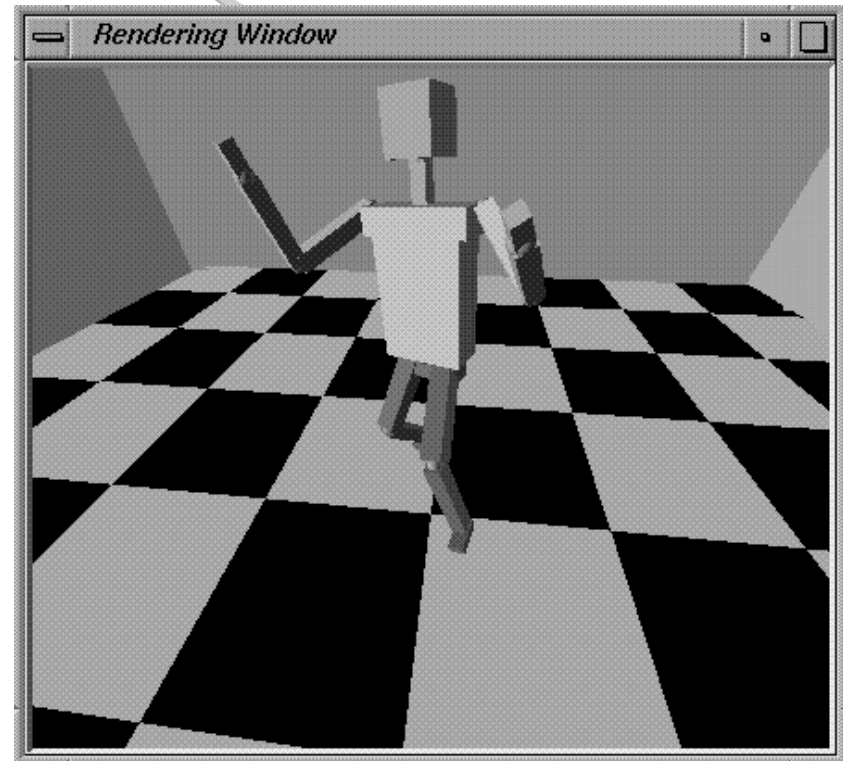
- Actor
- Motions
- Motion Operations
- Other Objects (control)

Actor

- Skeleton topology + geometry



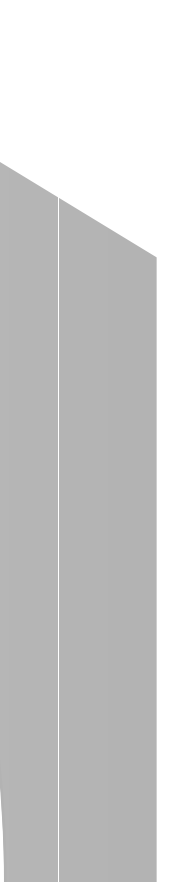
- Visual information about the hierarchy



- Different styles of representation

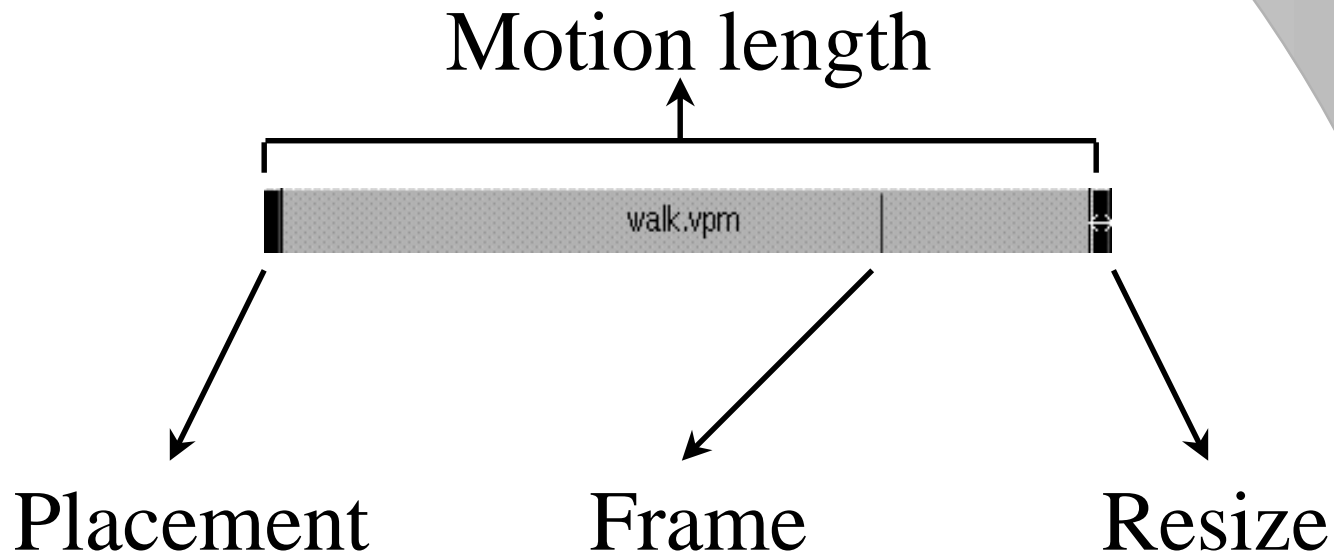
Motions GUI Elements

- Motion Bar
- Motion / Joint
- ScratchPad
- Motion Curves
- Joint Window

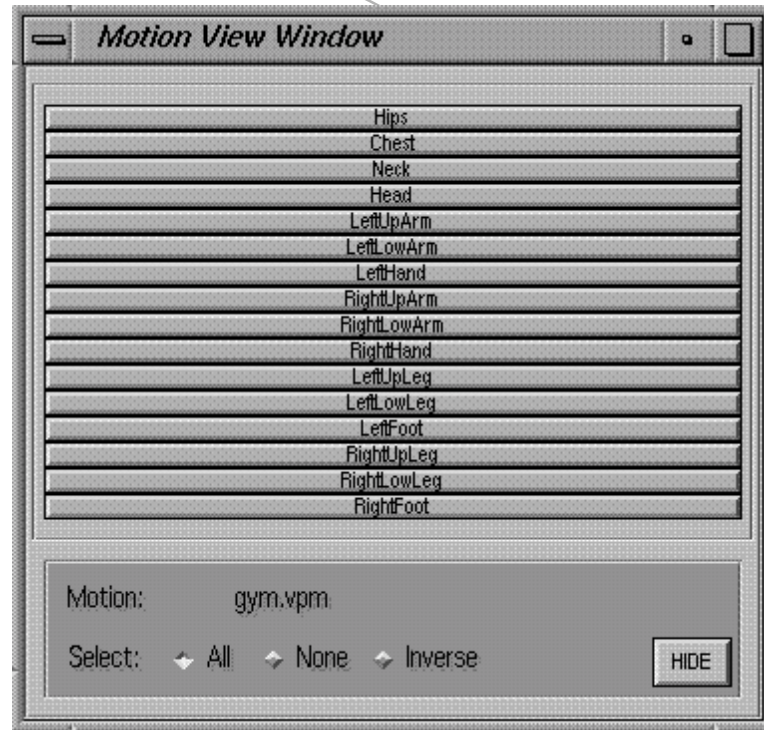


Motion Bar

- Each motion is a potentially ready animation
- We treat each motion as a horizontal bar



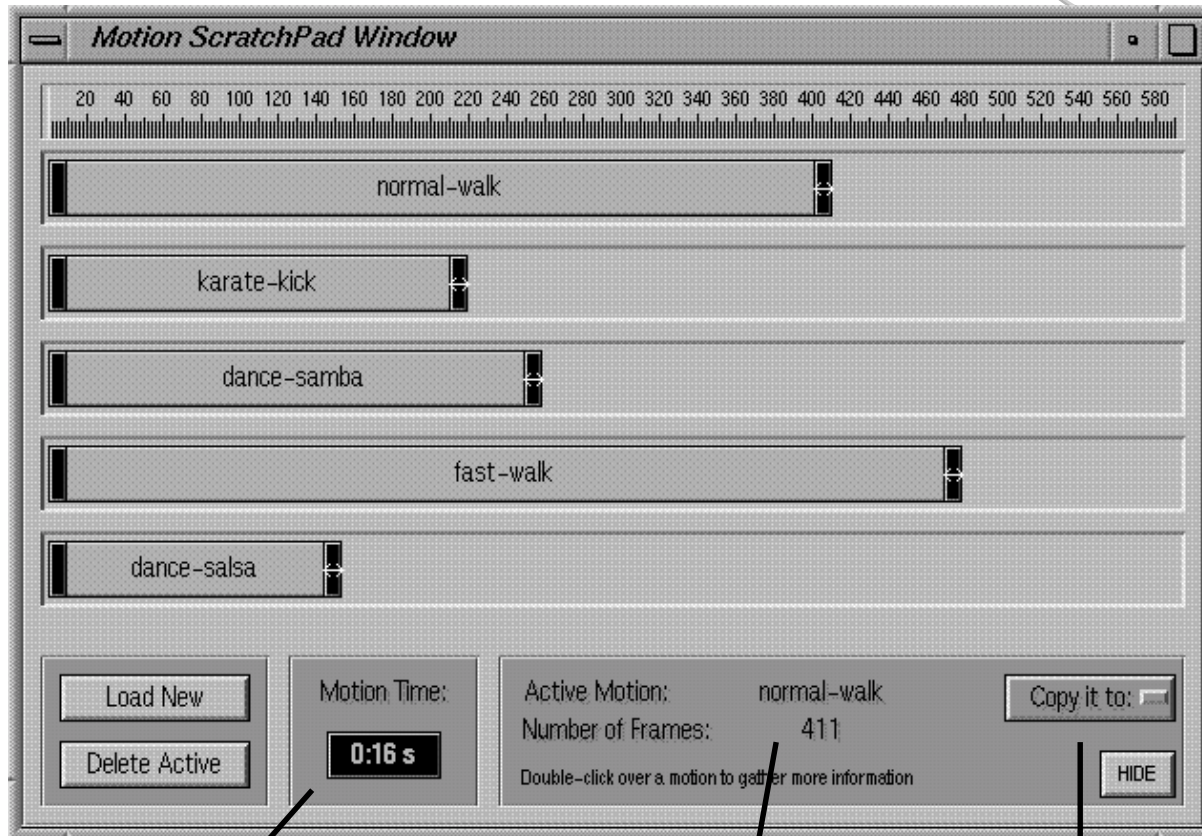
Motion / Joint



- Connects actor and motion descriptions
- Acts as a zoom into the motion bar
- Useful to select a set of joints

ScratchPad

- Motion organizer & container



Motion rails

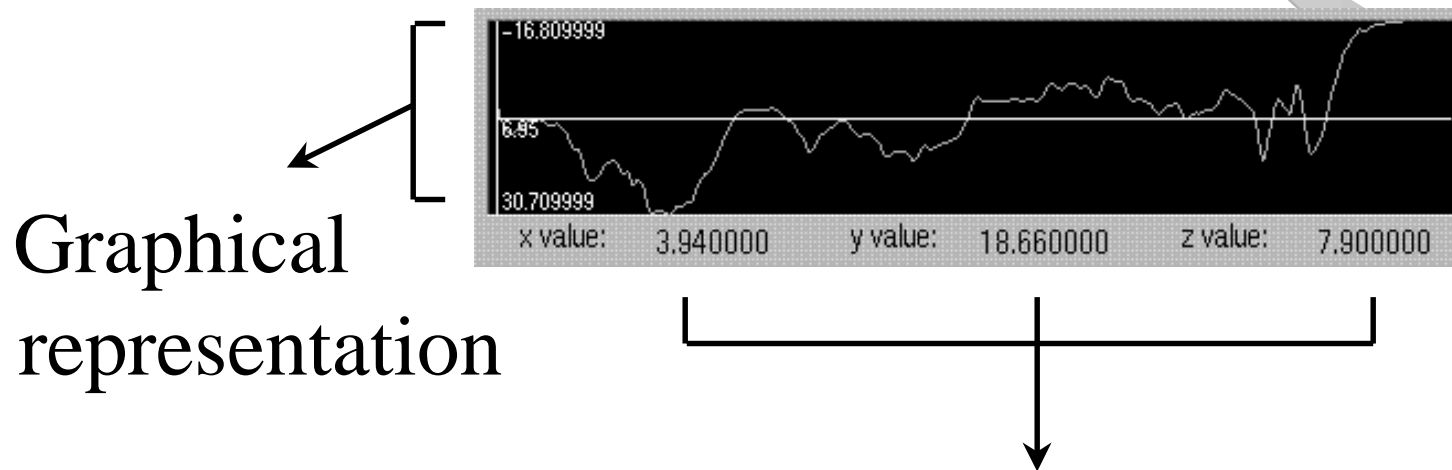
Motion time

Additional info

Gateway between
Input and Processing
Modules

Motion Curves

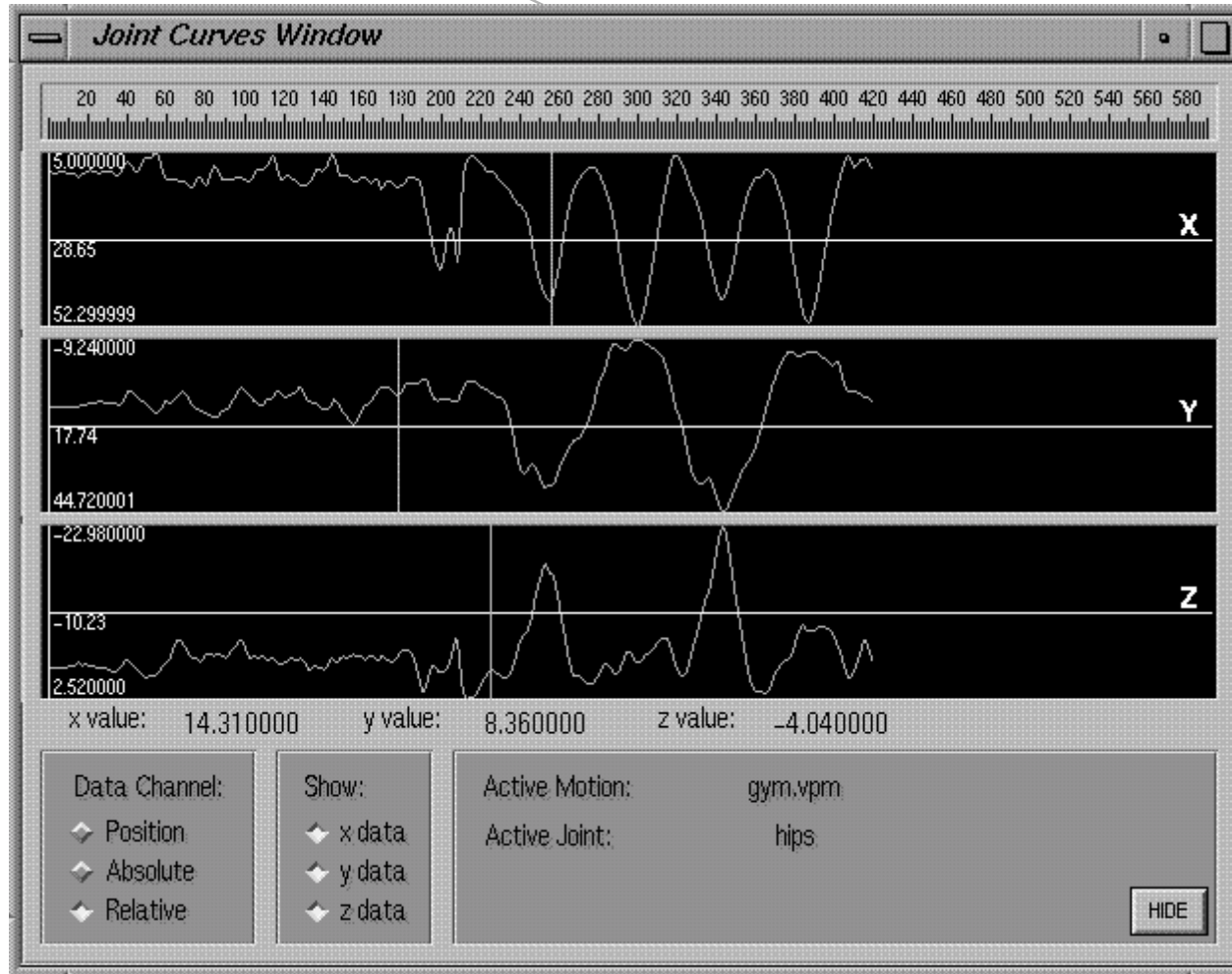
- Associated with actor's joints



Additional numeric information

GUI object allows curve editing

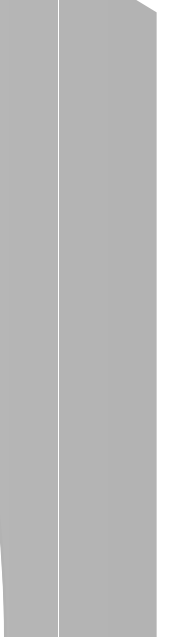
Joint Curves



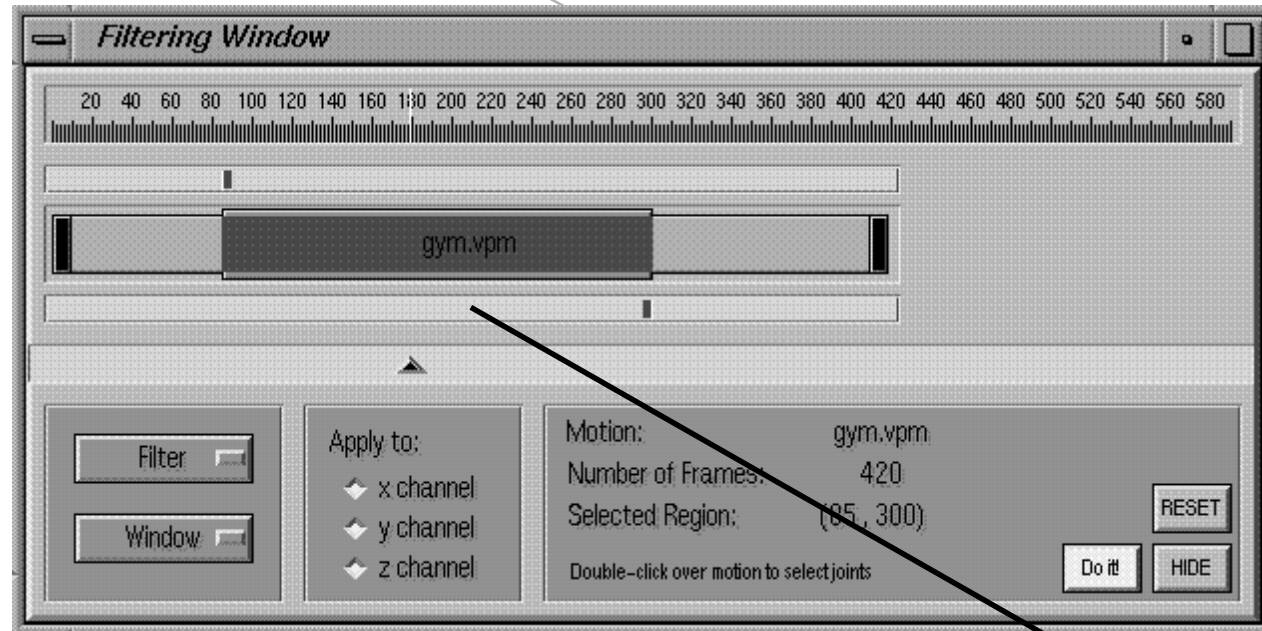
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Different data channels

Motion Operations

- Filtering (unary)
- Concatenation (n-ary)
- Blending (usually binary)
- Warping (unary)



Motion Filtering

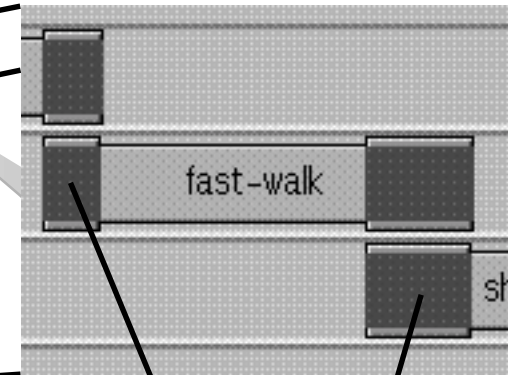
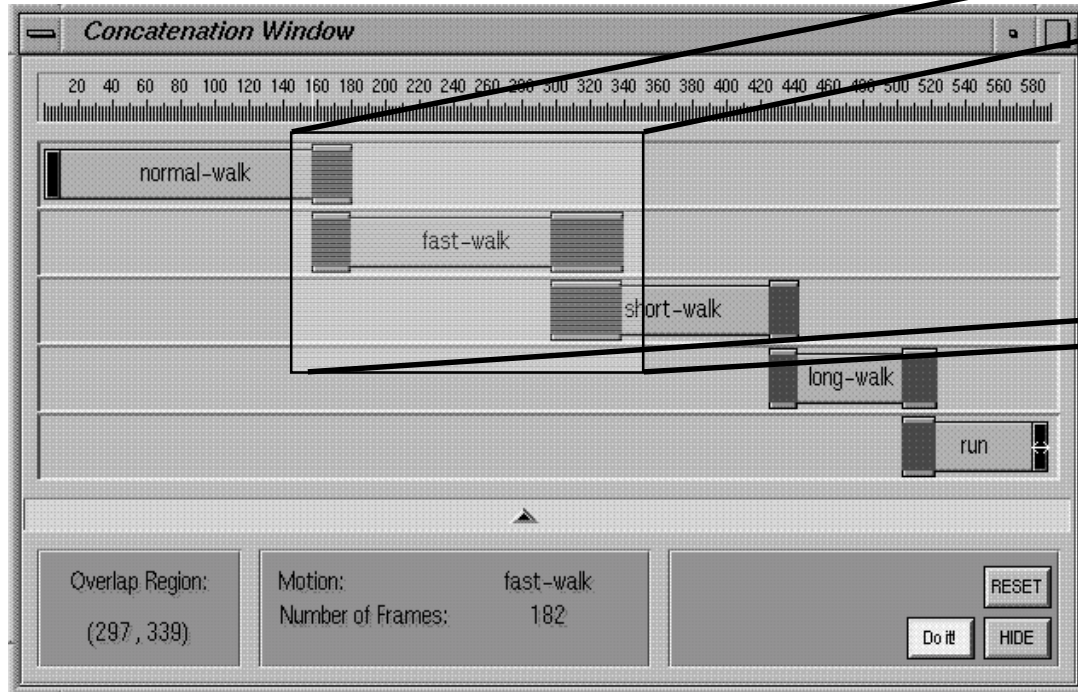


Filter parameters

Selected region

- Allows region selection
- Operation to a specific set of joints (using Motion/Joint GUI object)

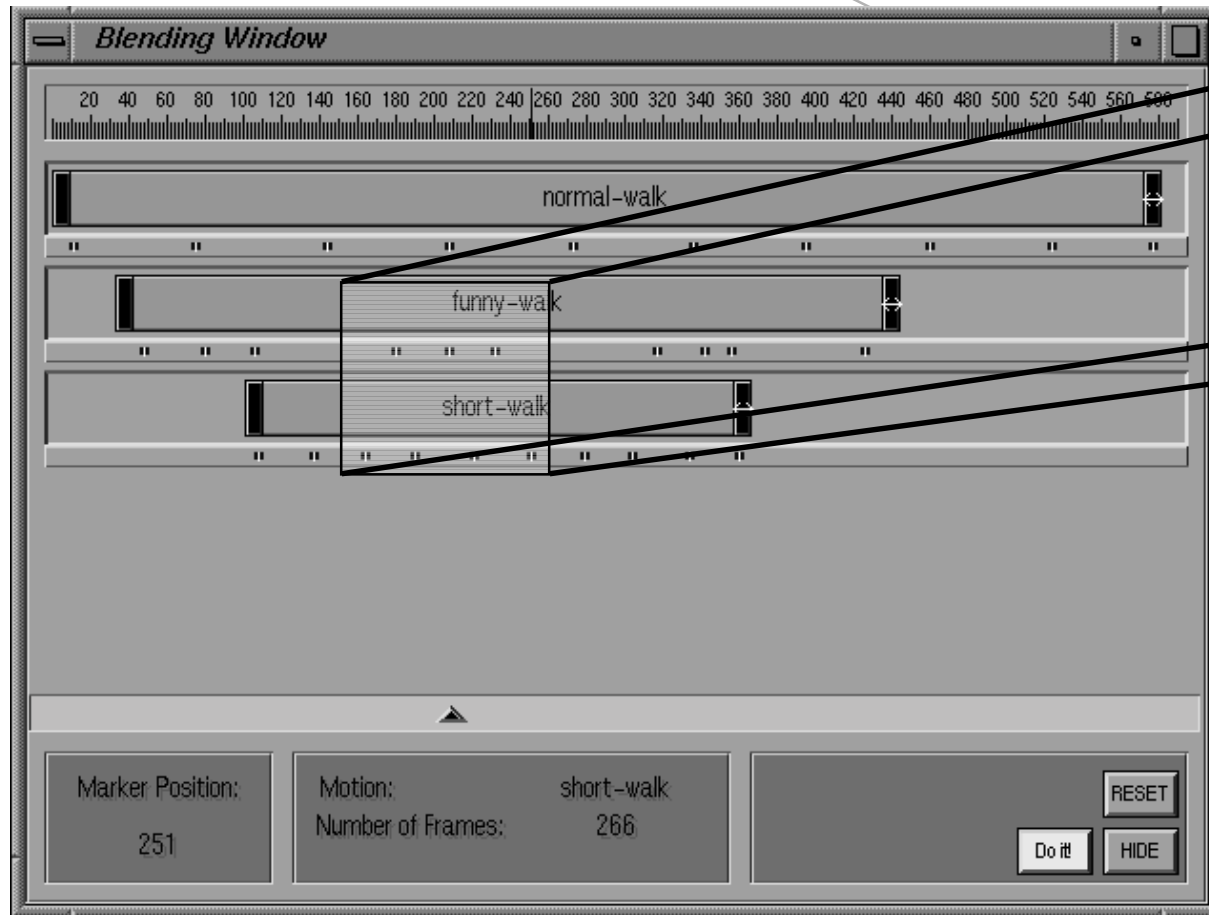
Motion Concatenation



Blending intervals

- Interactive motion positioning / resize
- Interactive definition of blending interval

Motion Blending

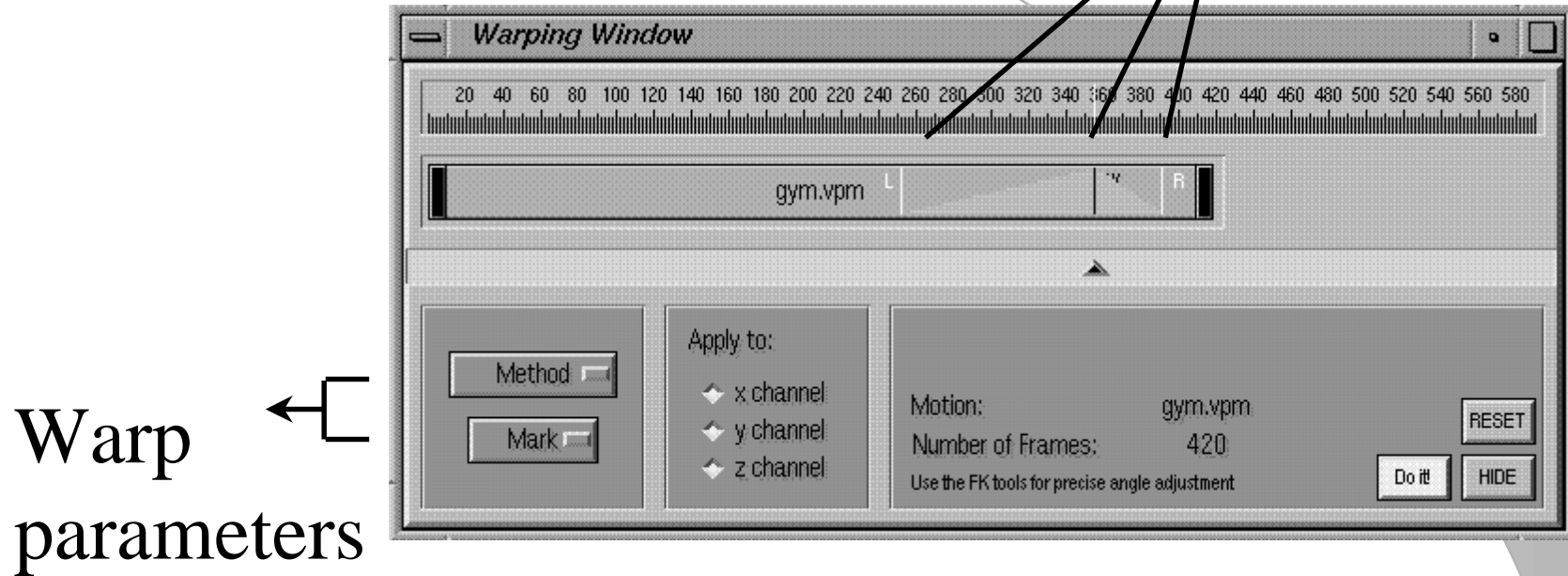


Time-markers

- Interactive motion positioning / resize
- Sequence of time-markers match events in time

Motion Warping

Keyframes & region for Warping



Warp
parameters

- Interactive modification of warp frame using forward kinematics
- Interactive positioning of keyframe constraints

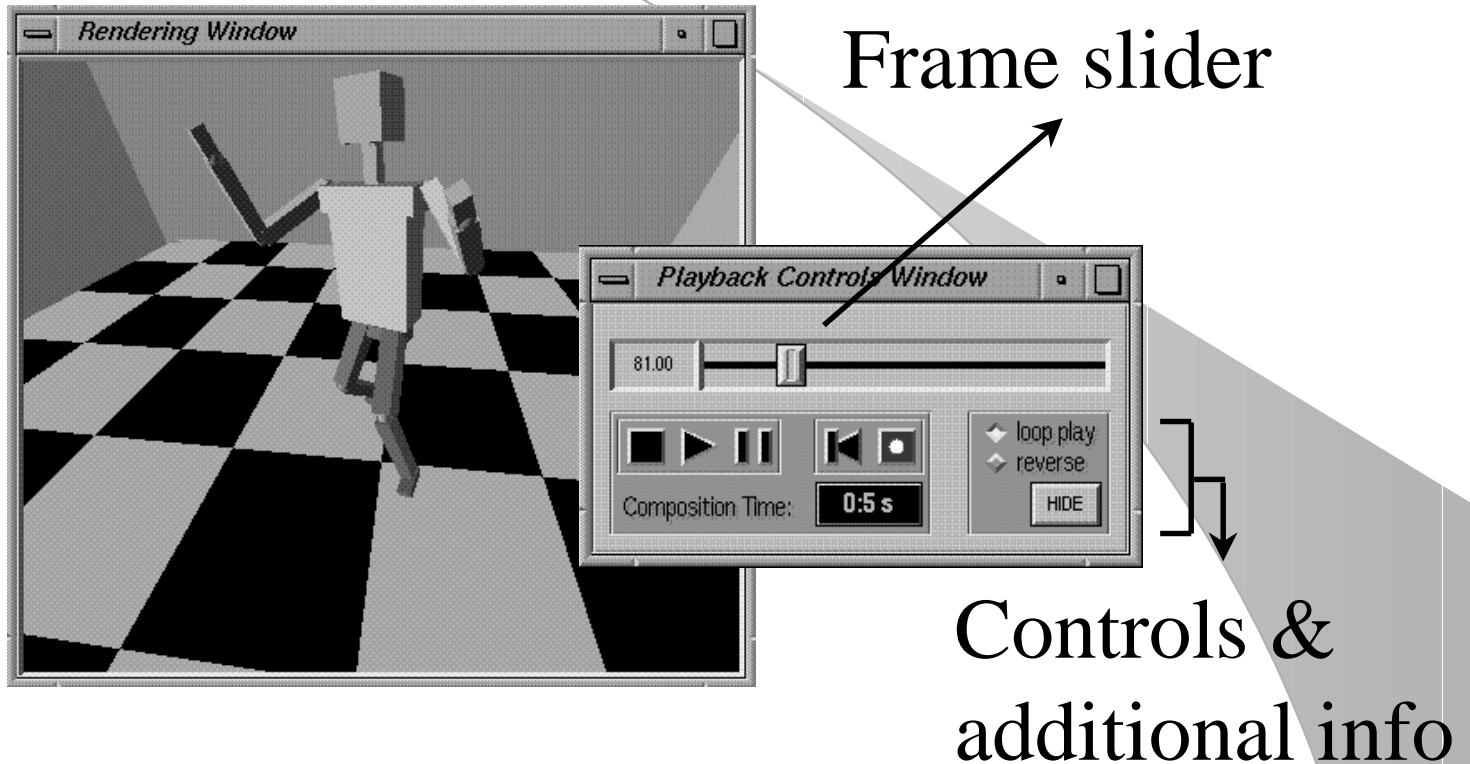
Other Objects - Camera



- Zoom in
- Zoom out
- Follow mode
- Lock joint mode
- Circle camera

- Interactive control of camera settings
- Controls adapted for MoCap

Other Objects - Playback



- Control panel similar to VCR
- Precise frame control
- Real-time preview using OpenGL

Other Objects - Additional Features

- Interactive forward kinematics joint control
- Keyframing

Implementation Issues

- C Language + UNIX
- Rendering: OpenGL
- Standard GUI facilities: XForms
- Real-time frame rates
- Tested on SGI, RS6000 and Linux

Conclusions

- MoCap based systems
 - correct representation of MoCap abstractions.
 - integration with capturing systems.
 - what is the minimum set of operations?
- Proposed GUI paradigm
 - correct representation of the problem.
 - intuitive.
 - easy integration of new techniques.

Future Work / Work in Progress

- Other motion operations
 - motion cyclification.
 - multiresolution filtering.
- New techniques
 - motion time-warping.
 - motion/sound synchronization.
- Other animation tools/techniques
 - Inverse kinematics.
 - Procedural.

Additional Info

<http://www.visgraf.impa.br/Projects/mcapture>