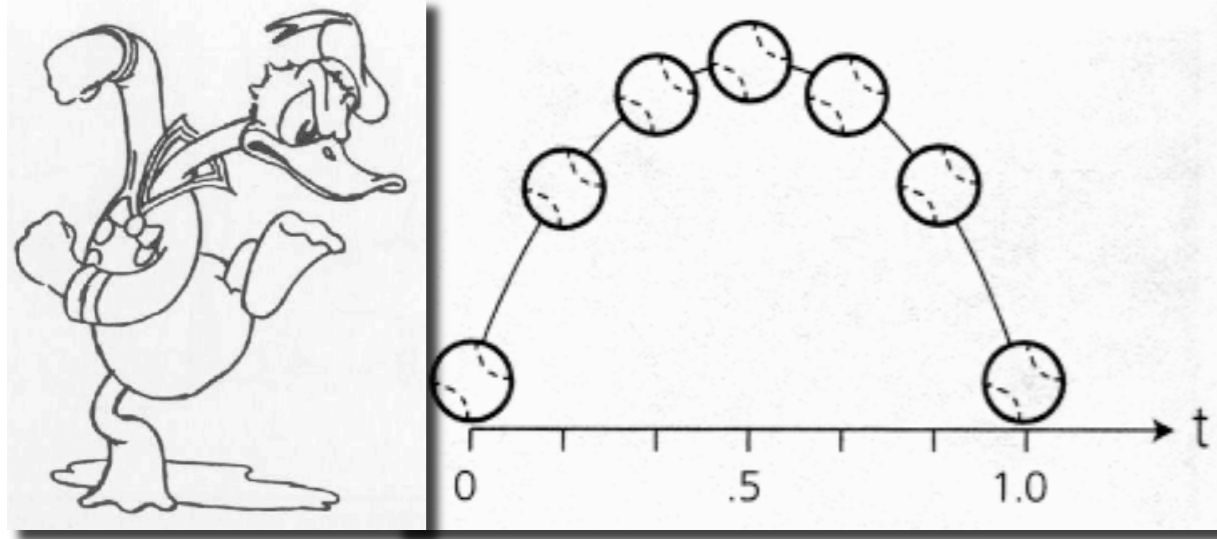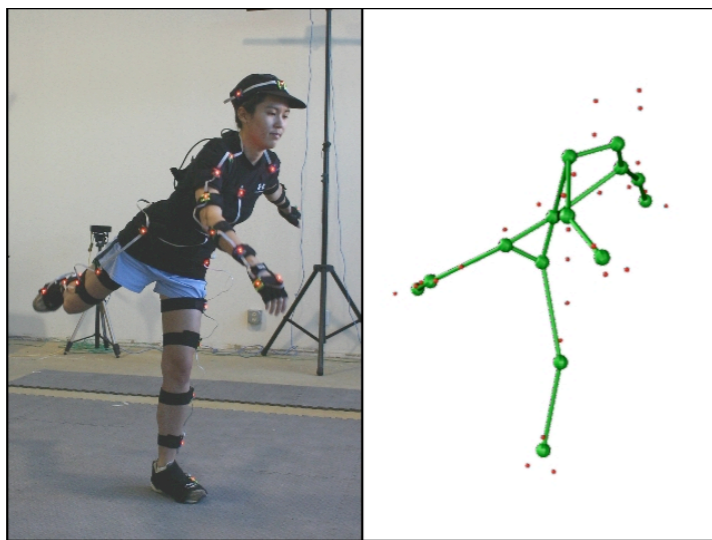# Techniques for Creating Animation
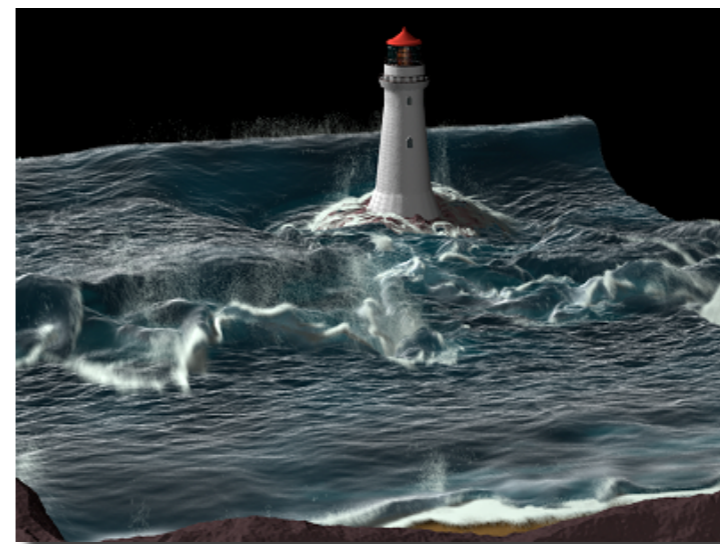

Keyframing

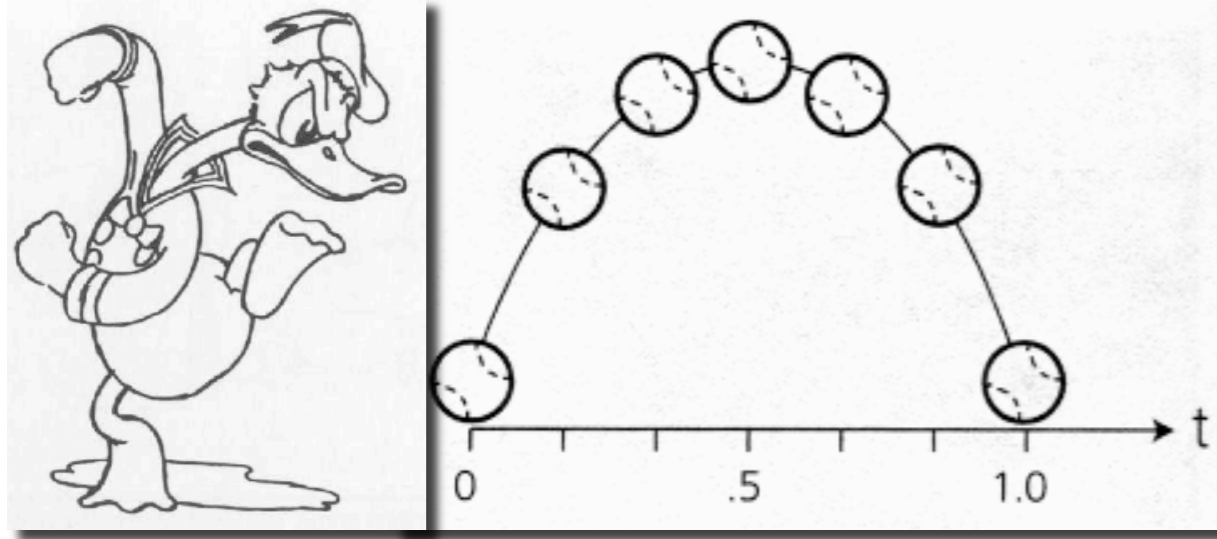Procedural Animation

Data-driven Animation

Physical Simulation

First of all..

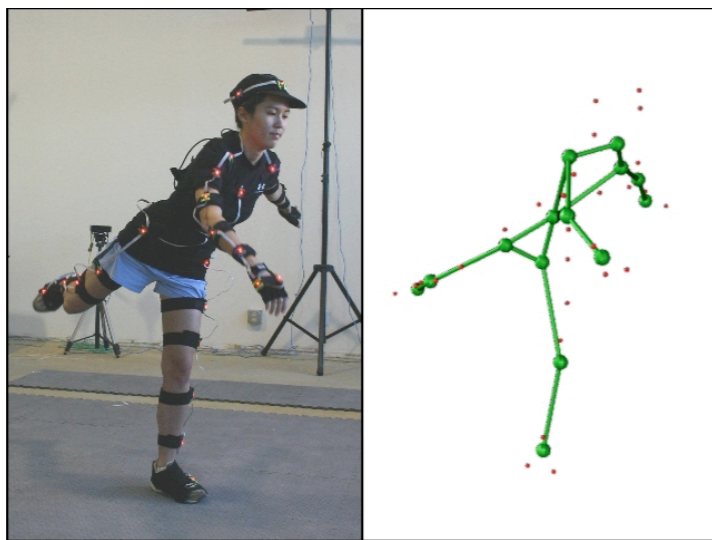# Any questions on the 5 paper selections?
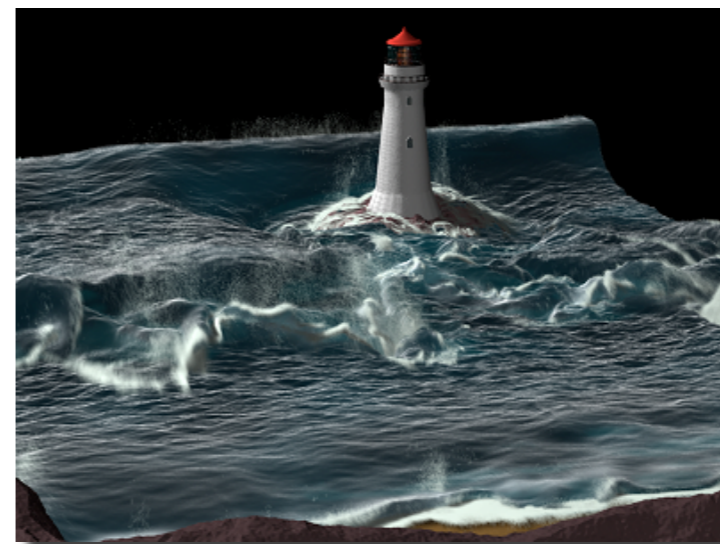
Techniques for Creating Animation

Keyframing

Procedural Animation

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Physical Simulation

Keyframing: animation
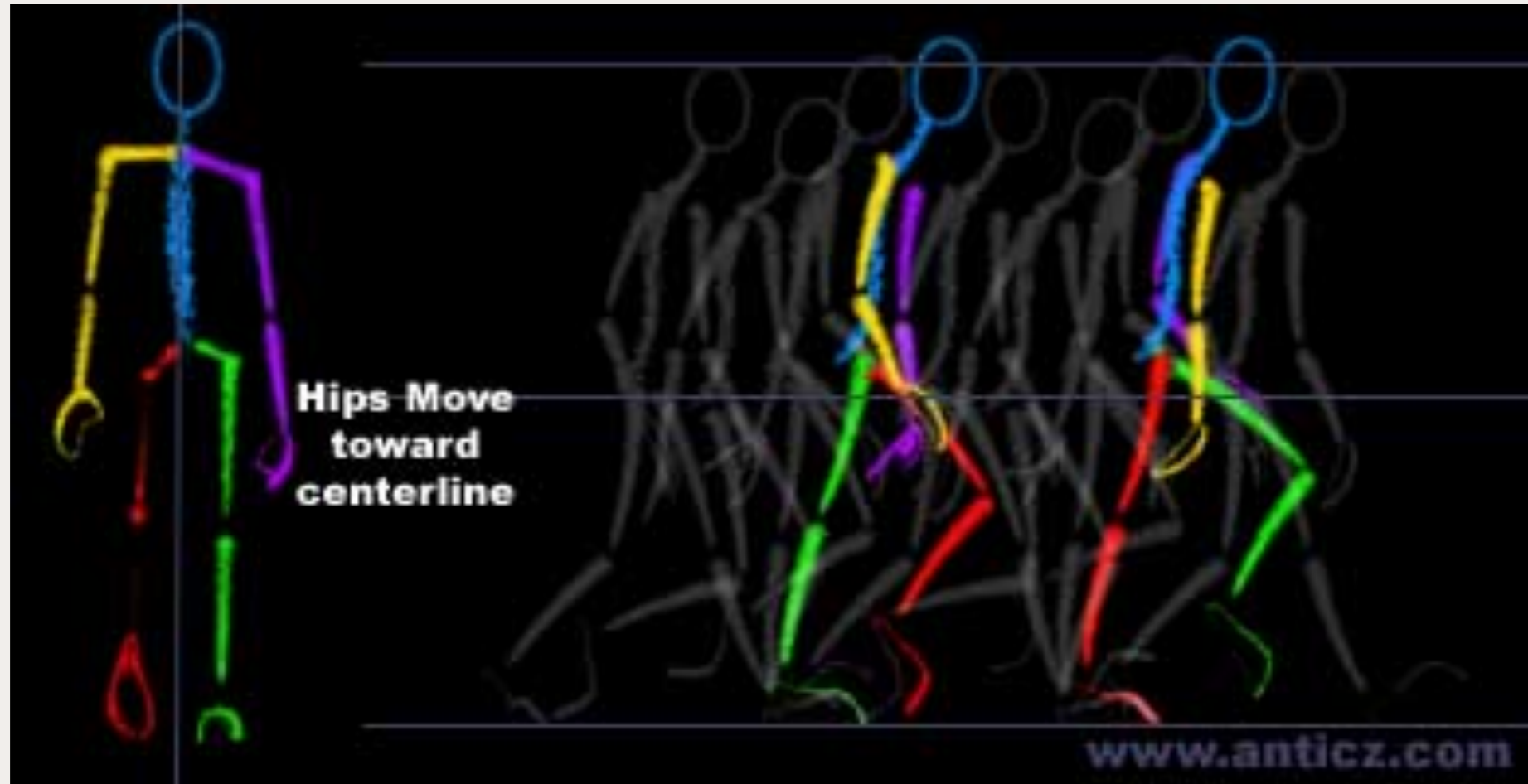
A basic walk cycle tutorial:

http://www.anticz.com/Walks.htm
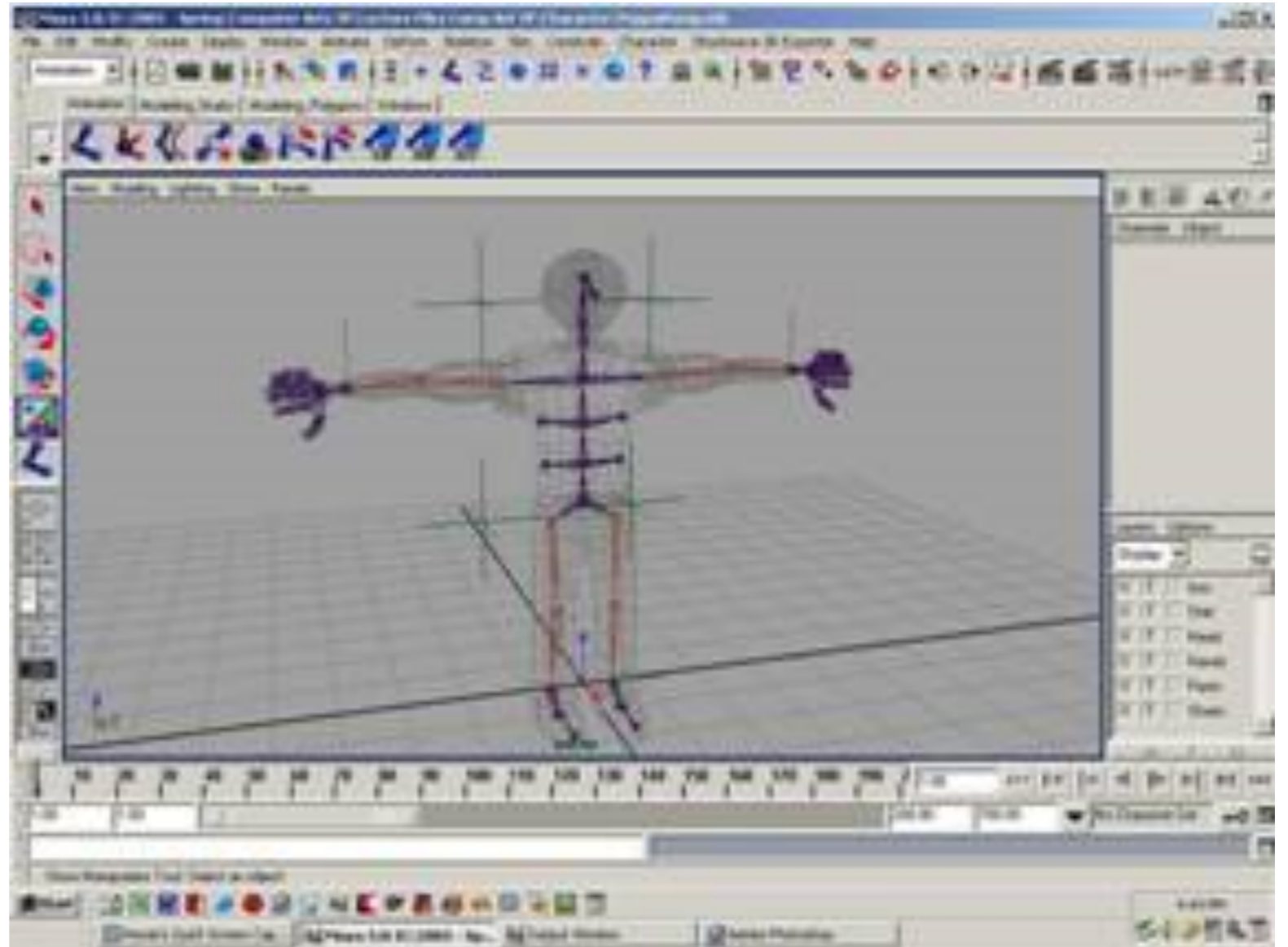
3D Keyframing: setup

Model, rig, and animate your character in Maya

http://cgi.tutsplus.com/tutorials/creating-and-rigging-a-non-deformable-wooden-character-in-maya-part-1--cg-25436

http://www.youtube.com/watch?v=rWKLPDfamm0

Keyframing = Traditional Animation?

Boxtrolls– stop motion

https://www.youtube.com/watch?v=94KG-pex6-8

Big Hero 6 – 3D modeling, animation, and rendering pipeline

https://www.youtube.com/watch?v=y6yrHkZVGF8

Keyframing = Traditional Animation?

Song of the Sea Official US Release Trailer - Irish Animated Movie HD

The Book of Life Official Trailer (2014) Zoe Saldana, Channing Tatum HD

http://www.pastemagazine.com/articles/2014/12/the-best-animated-character-designs-of-2014.html

Principles of Traditional Animation
[Lasseter, SIGGRAPH 1987]

- Stylistic conventions followed by Disney's animators and others

- From experience built up over many years
    - Squash and stretch -- use distortions to convey flexibility
    - Timing -- speed conveys mass, personality
    - Anticipation -- prepare the audience for an action
    - Followthrough and overlapping action -- continuity with next action
    - Slow in and out -- speed of transitions conveys subtleties
    - Arcs -- motion is usually curved
    - Exaggeration -- emphasize emotional content
    - Secondary Action -- motion occurring as a consequence
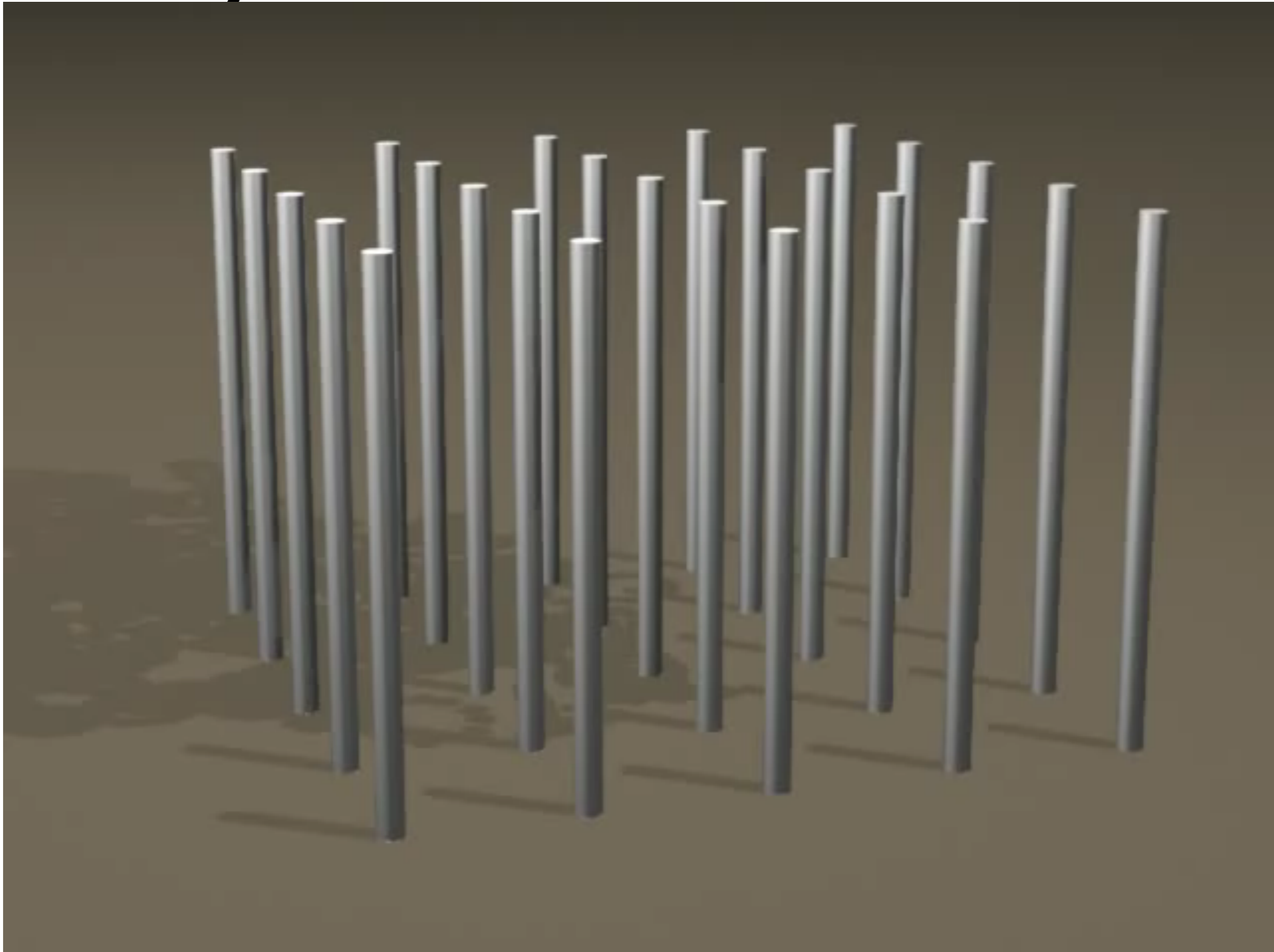   - Appeal -- audience must enjoy watching it

Procedural Animation

http://bestvfxsoftware.com/top-crowd-simulation-software-2014/

http://video.wired.com/watch/design-fx-world-war-z-building-a-better-zombie-effects-exclusive
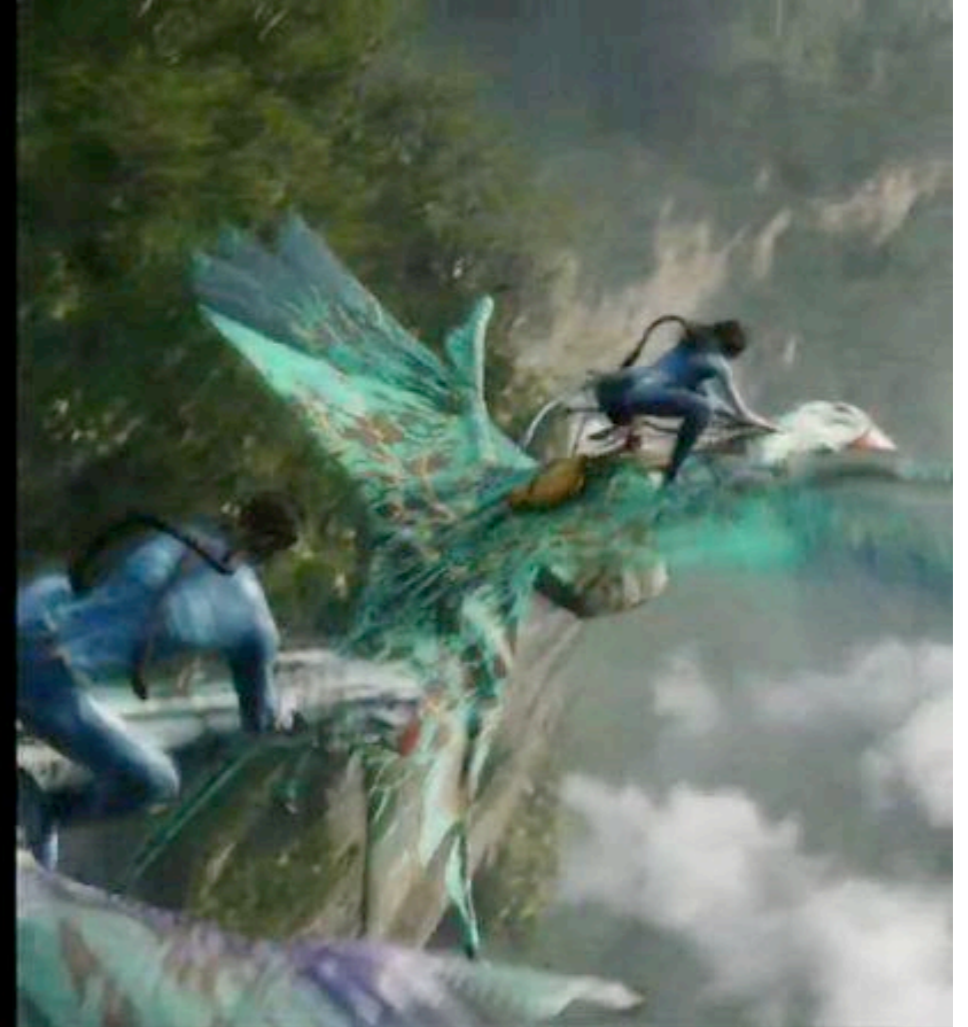
Physics-based Animation

Data-driven Animation

Motion Capture Lab
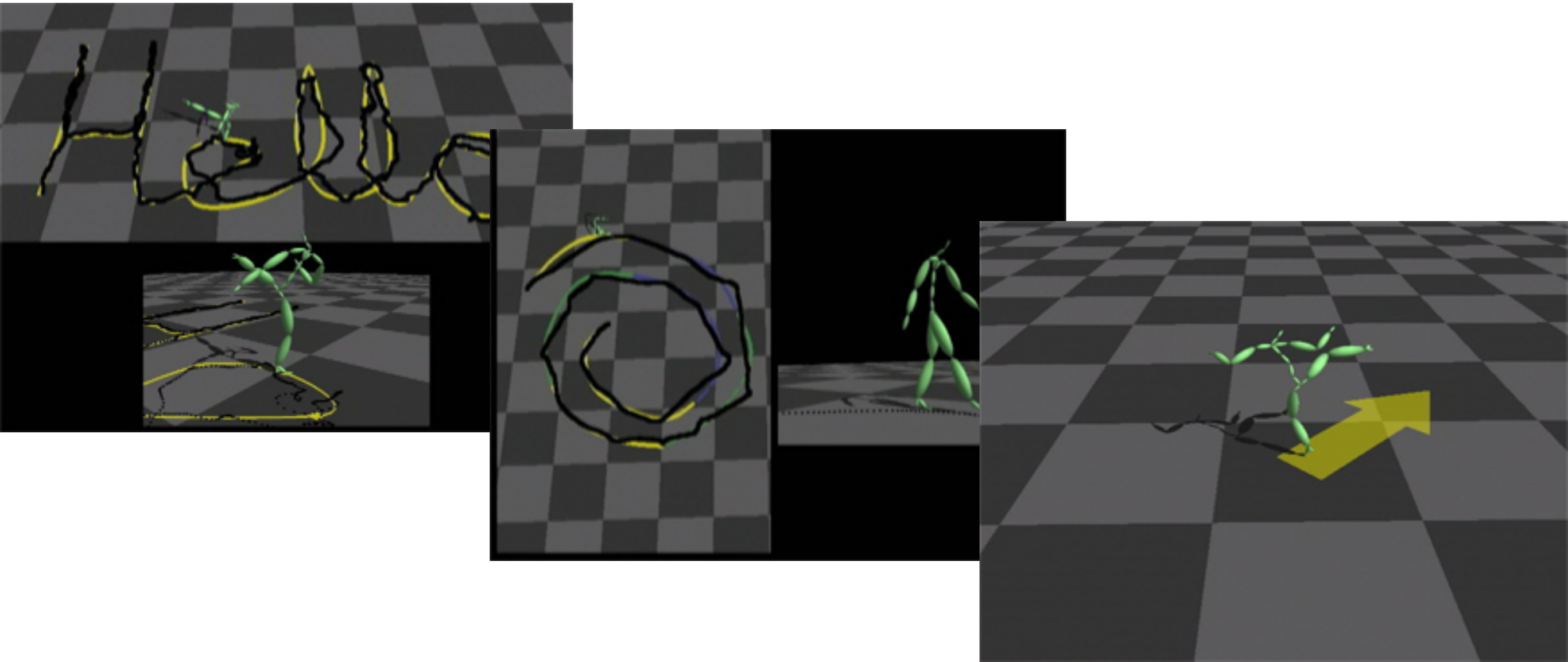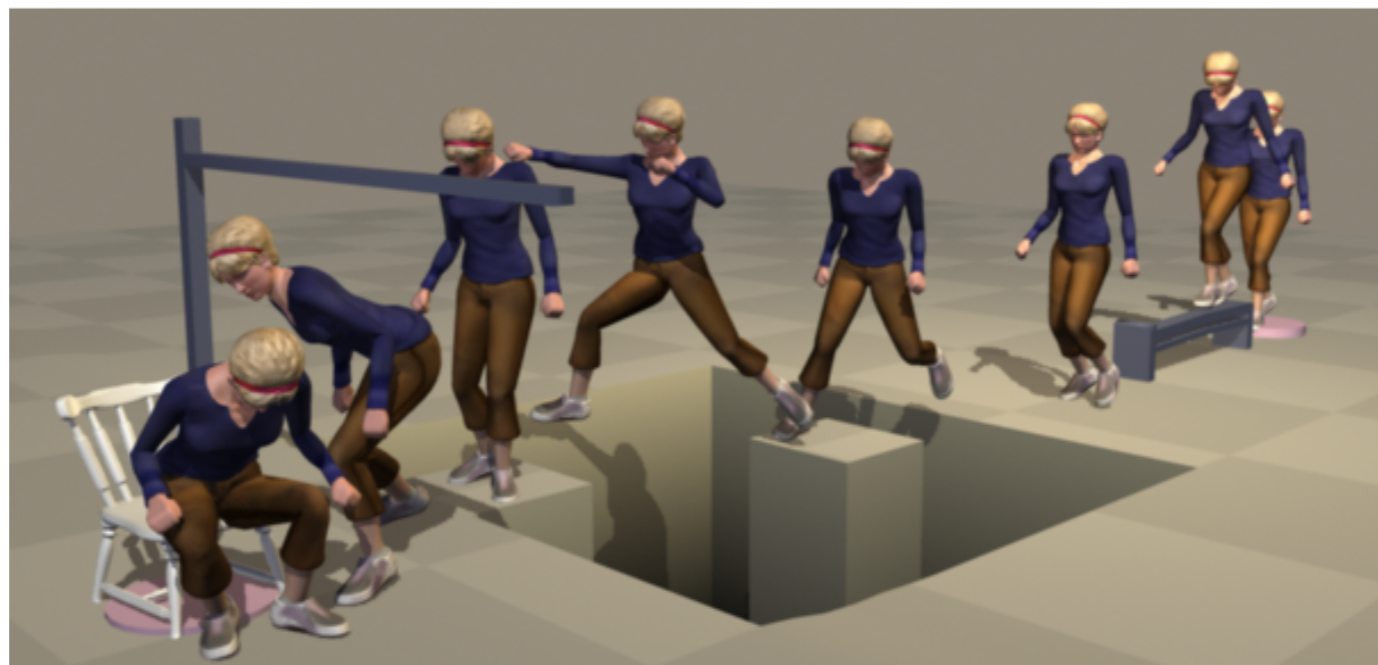## Wean 1334

We can capture an individual performance

https://www.youtube.com/watch?v=L6JXUoWeZ7Q

What about creating autonomous or responsive characters?

Interpolated Motion Graphs

http://www.seas.upenn.edu/~alla/
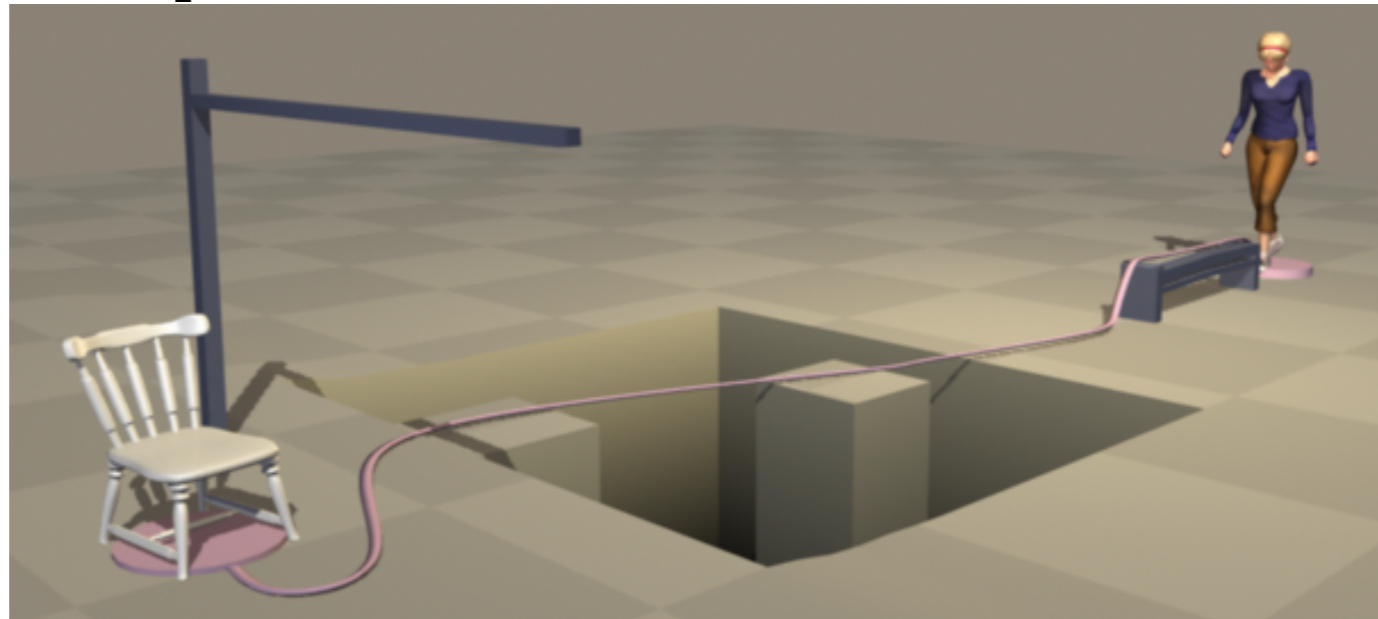
Alla Safonova (CMU / U. Pennsylvania)
with Jessica Hodgins

Interactive Editing
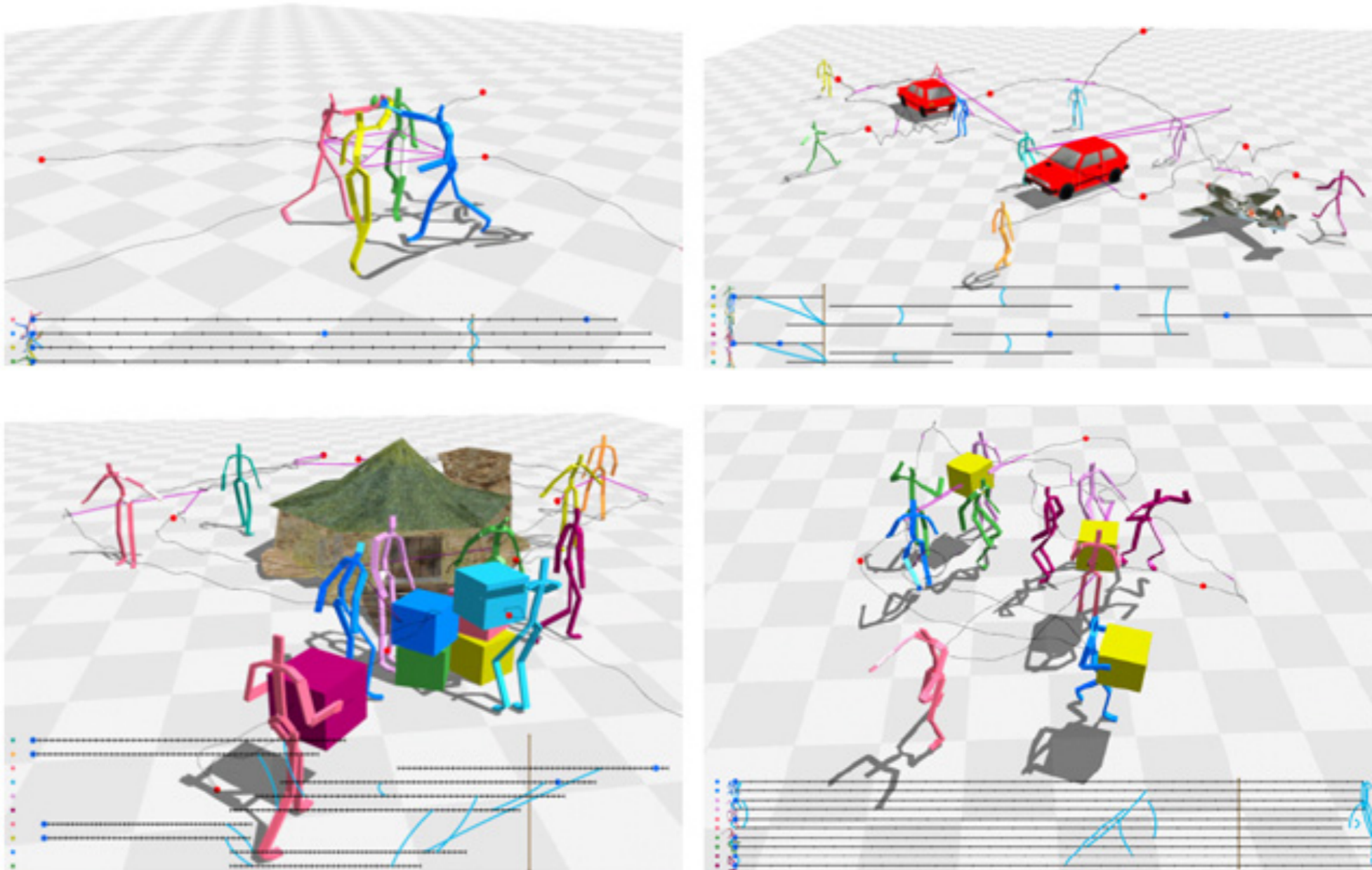
Dense Body Capture
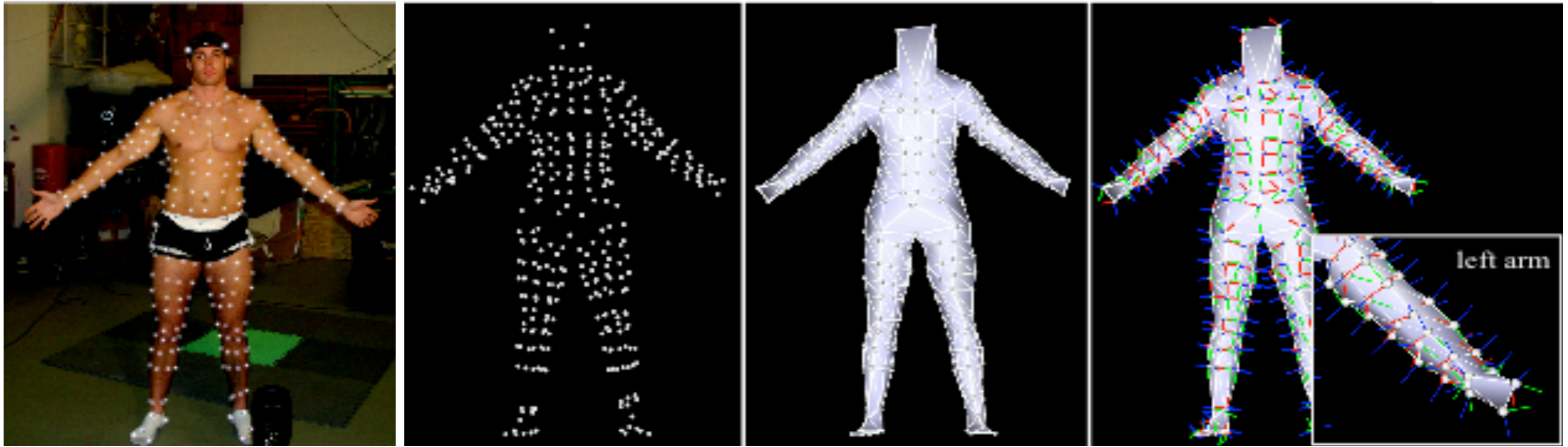

Laser Range Scanning

Performance Capture from Sparse Multi-view Video
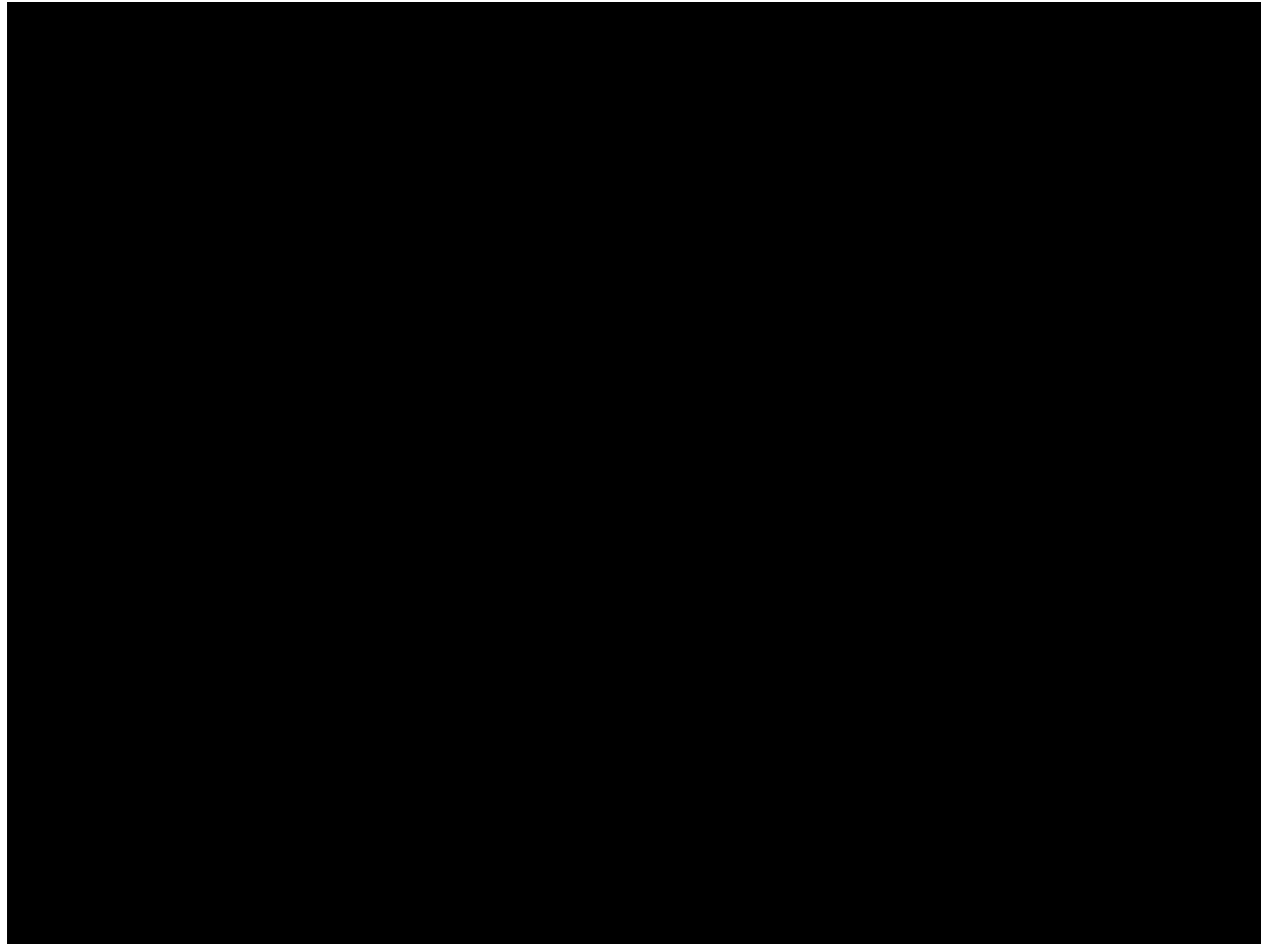

de Aguiar et al
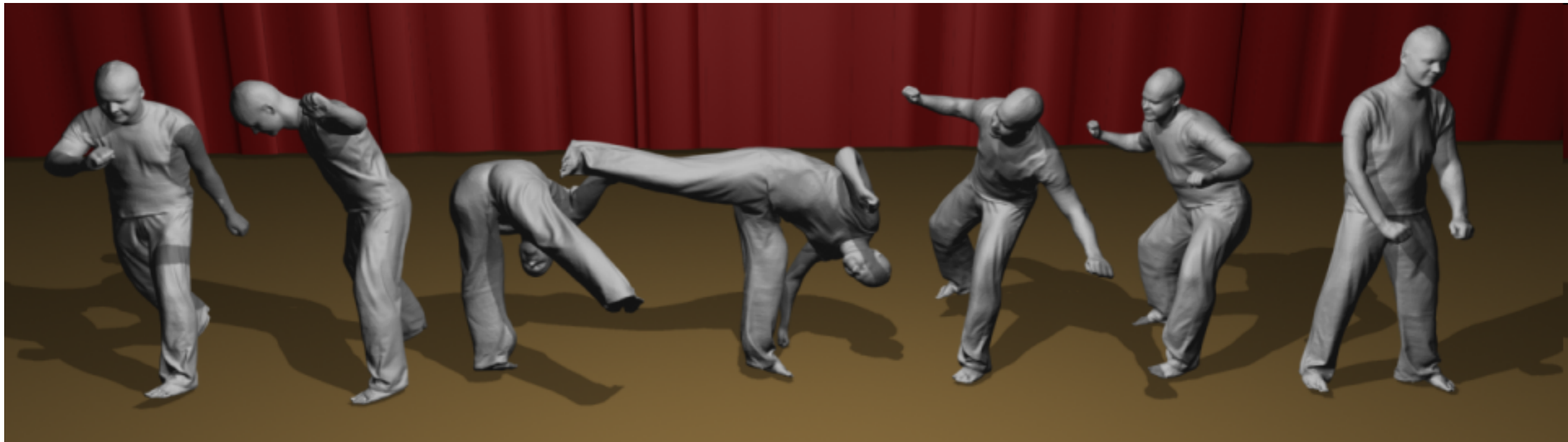
Dense Marker Capture

Sang Il Park (CMU / Sejong University)

with Jessica Hodgins

Dense Marker Capture

Capturing and Animating Skin Deformation

Robotics Institute,
Carnegie Mellon University

Sang Il Park (CMU / Sejong University)
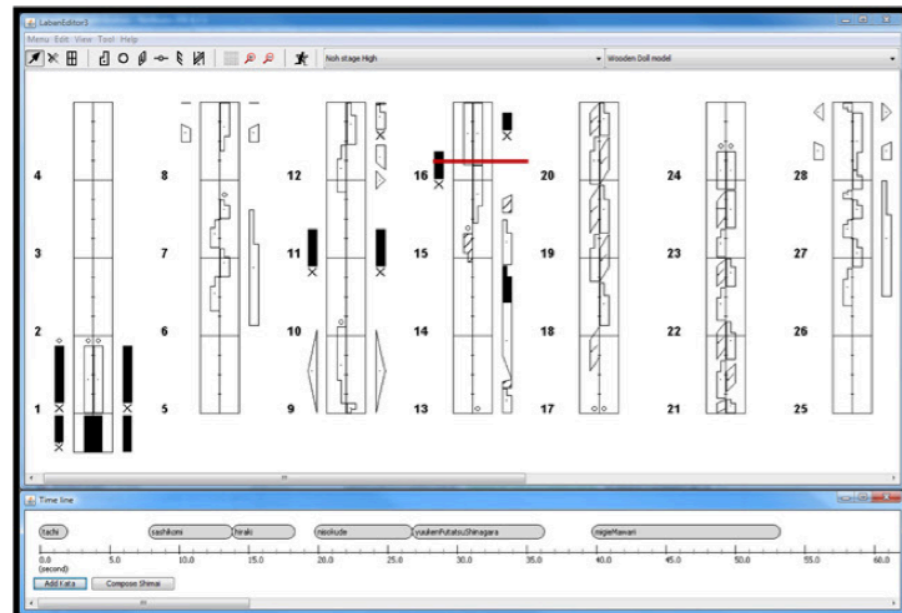with Jessica Hodgins

Motion Capture and Cloth?

Doyub Kim, Woojong Koh, Rahul Narain, Kayvon Fatahalian, Adrien Treuille, and James O'Brien

CMU and Berkeley

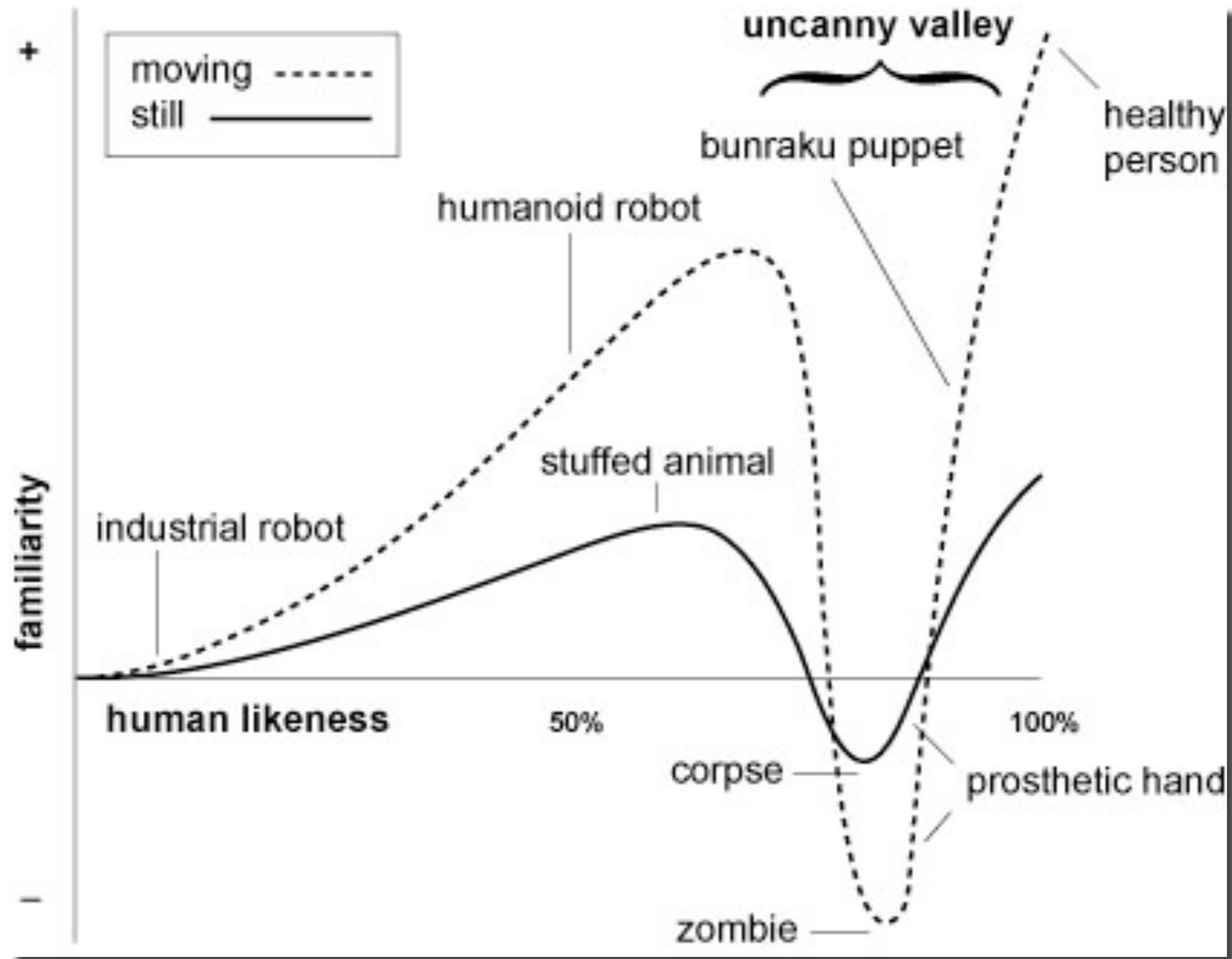http://graphics.cs.cmu.edu/projects/exhaustivecloth/

Mixing Animation Techniques

Worawat Choensawat, Sachie Takahashi, Minako Nakamura, Kozaburo Hachimura

Ochanomizu and Ritsumeikan Universities

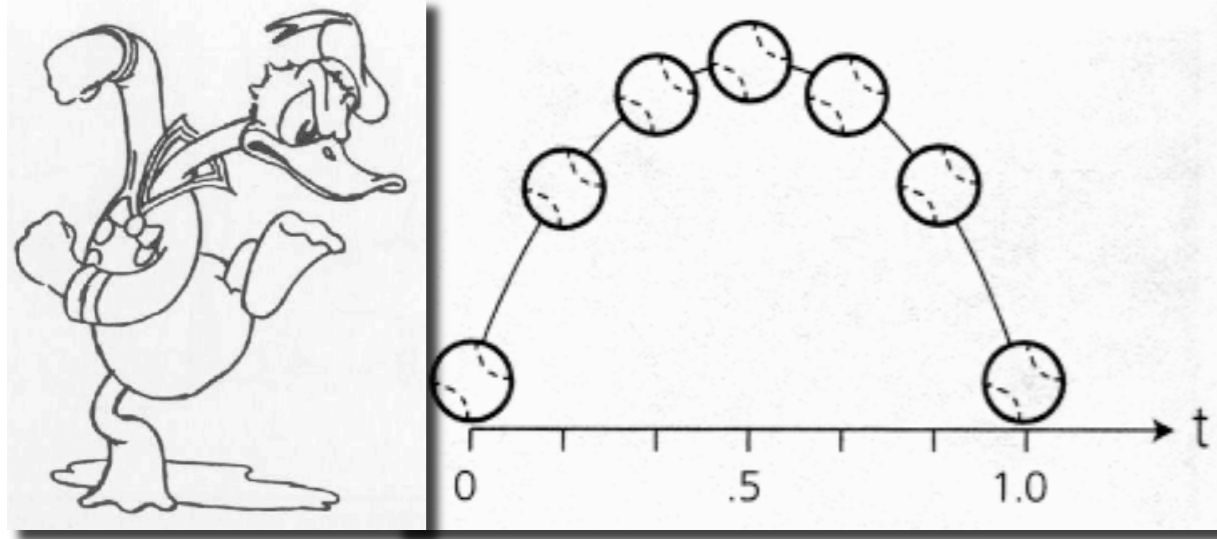http://dl.acm.org/citation.cfm?id=2342902

Uncanny Valley

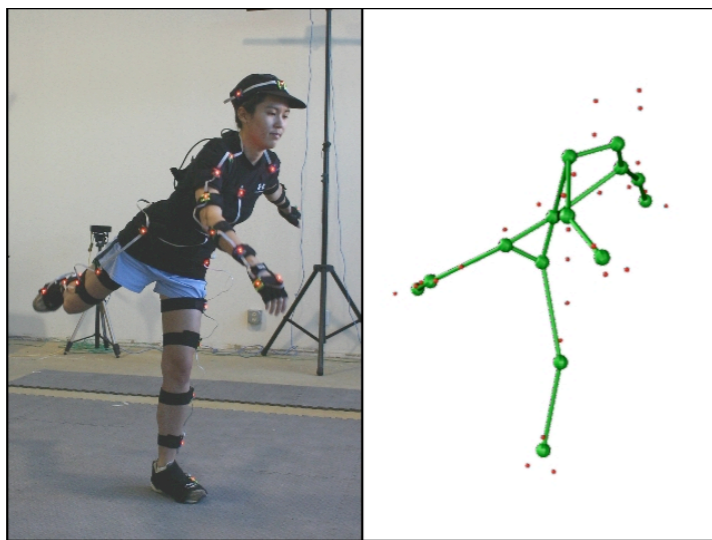# Match Character Geometry to Animation Capabilities
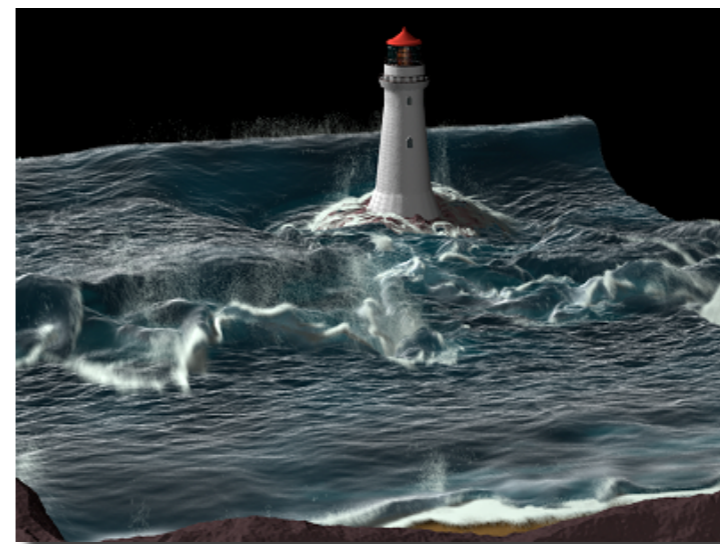
Techniques for Creating Animation

Keyframing

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Now for a few details...

Keyframing: setup
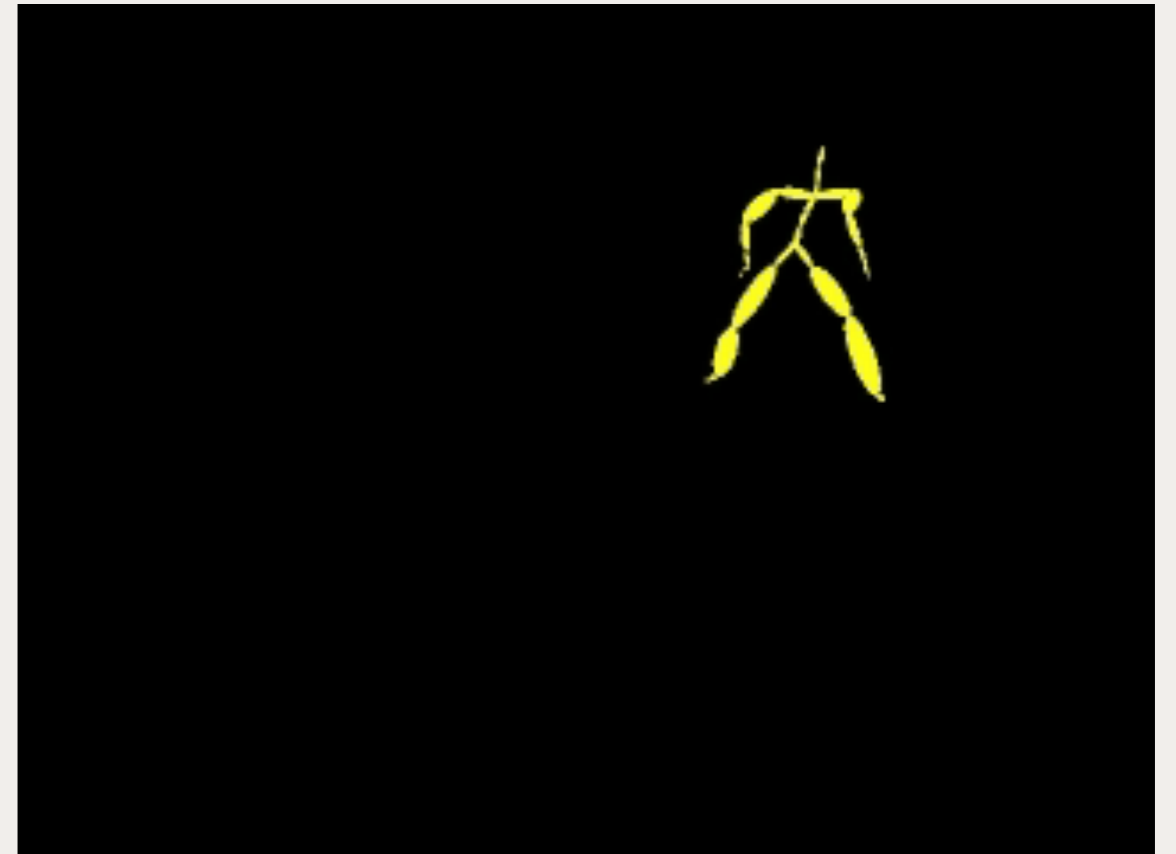
What is accomplished?

- Define joint locations and bone heirarchy using a point and click interface

- Define joint limits

- Set up Inverse Kinematics handles

- Bind skeleton to its "skin"

Walk Cycle Variations

Working with Motion Capture is Quite Different...

http://mocap.cs.cmu.edu/

CMU Mocap Database

To define a motion, we need:

   The skeleton file: ASF format

   The motion file: AMC format

Let's look at these...

Editing Motion Capture Data

How might you edit motions in such a format?

Retiming

Displacement curves

Motion "filtering"
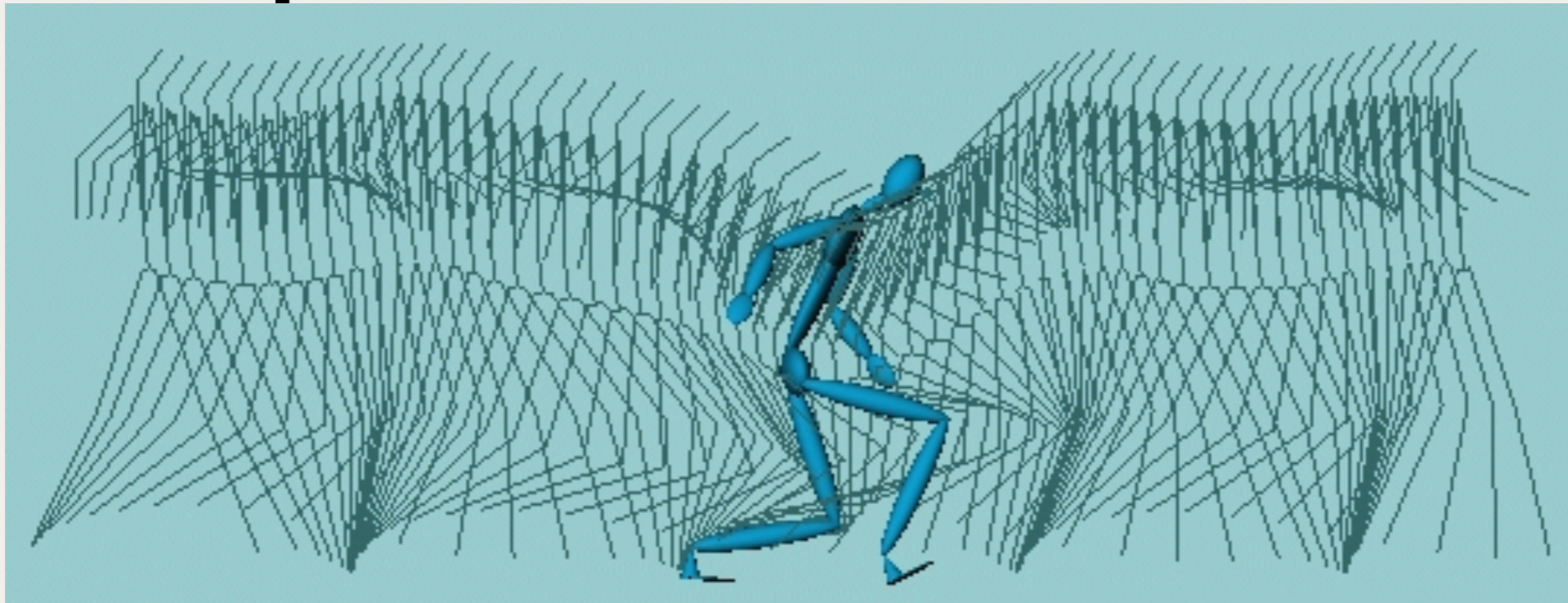
Keyframe extraction / edit keyframes

Retiming

System outline:
- Beat extraction
- Dynamics extraction (louds and softs)
- User script file determines motions
- System controls timing, dynamic range of movements
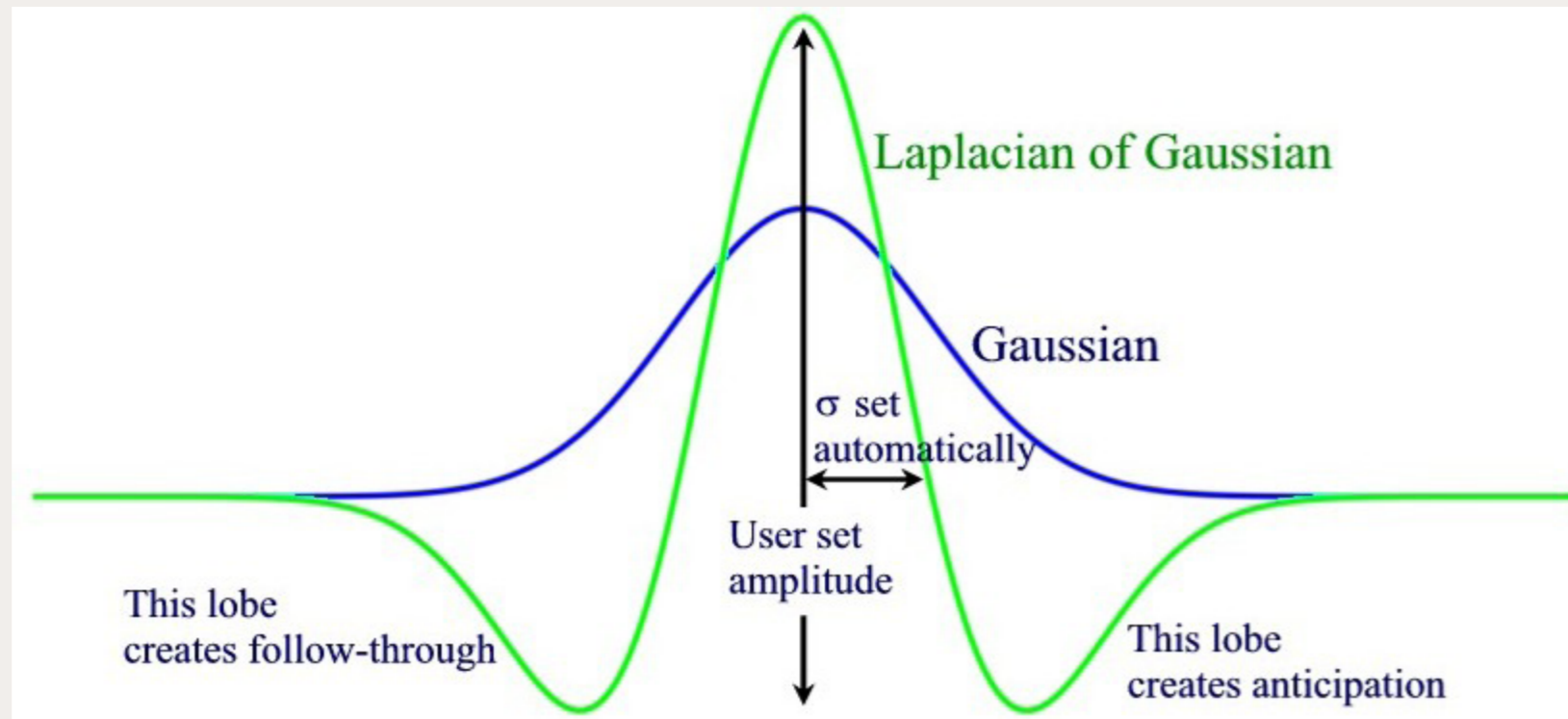
Displacement Curves

Main ideas:

- User edits → displacements to the original motion
- Displacements can be made at different resolutions in a hierarchical scheme

Jehee Lee and Sung Yong Shin, A Hierarchical Approach to Interactive Motion Editing for Human-like Characters, SIGGRAPH 99, 39-48, August 1999.

Motion Filtering

Main idea:

- A simple filter applied to a motion sequence can create squash and stretch effects and cartoon like exaggeration

The Cartoon Animation Filter
Jue Wang, Steve Drucker, Maneesh Agrawala, Michael Cohen
SIGGRAPH 2006, July 2006. pp. 1169-1173.

Keyframe Extraction

Main idea:
- Keyframes are local extrema of an embedding of the motion into a low-dimensional space

Jackie Assa, Yaron Caspi, and Daniel Cohen-Or
Action Synopsis: Pose Selection and Illustration
SIGGRAPH 2005