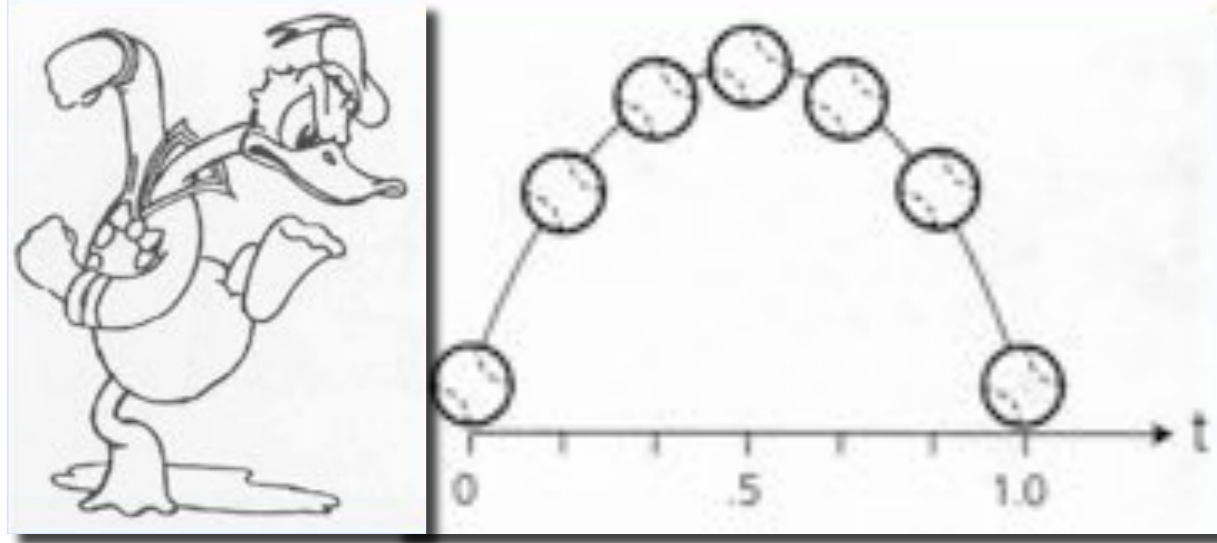


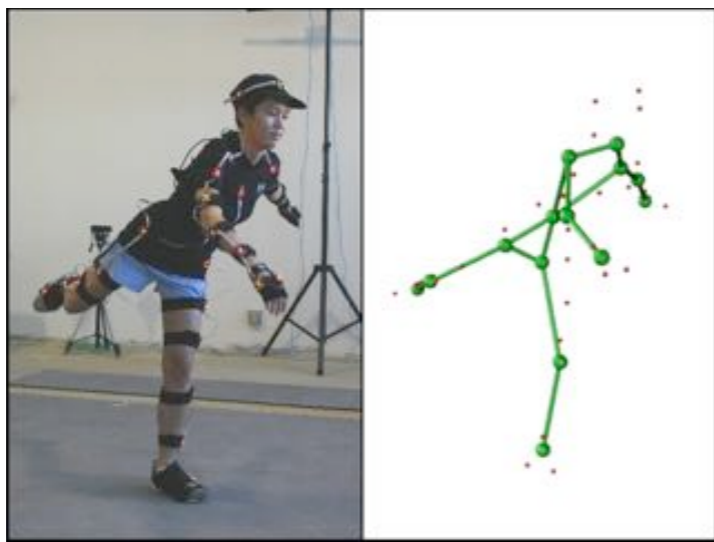
Techniques for Creating Animation



Keyframing



Procedural Animation



Data-driven Animation



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=rWKLDPfam0>

Keyframing = Traditional Animation?

Stop Motion

Boxtrolls

Kubo and the two strings

<https://www.youtube.com/watch?v=Vhpq7-c91IA>



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



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

Keyframing = Traditional Animation?



<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://www.massivesoftware.com/>

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

Physics-based Animation

A scalable
Schur-complement fluids
solver for heterogeneous
compute platforms

Haixiang Liu
Mridul Aanjaneya

Nathan Mitchell
Eftychios Sifakis

University of Wisconsin-Madison

(with audio)

Part I: Technical Description

Data-driven Animation



Motion Capture Lab

Wean 1334

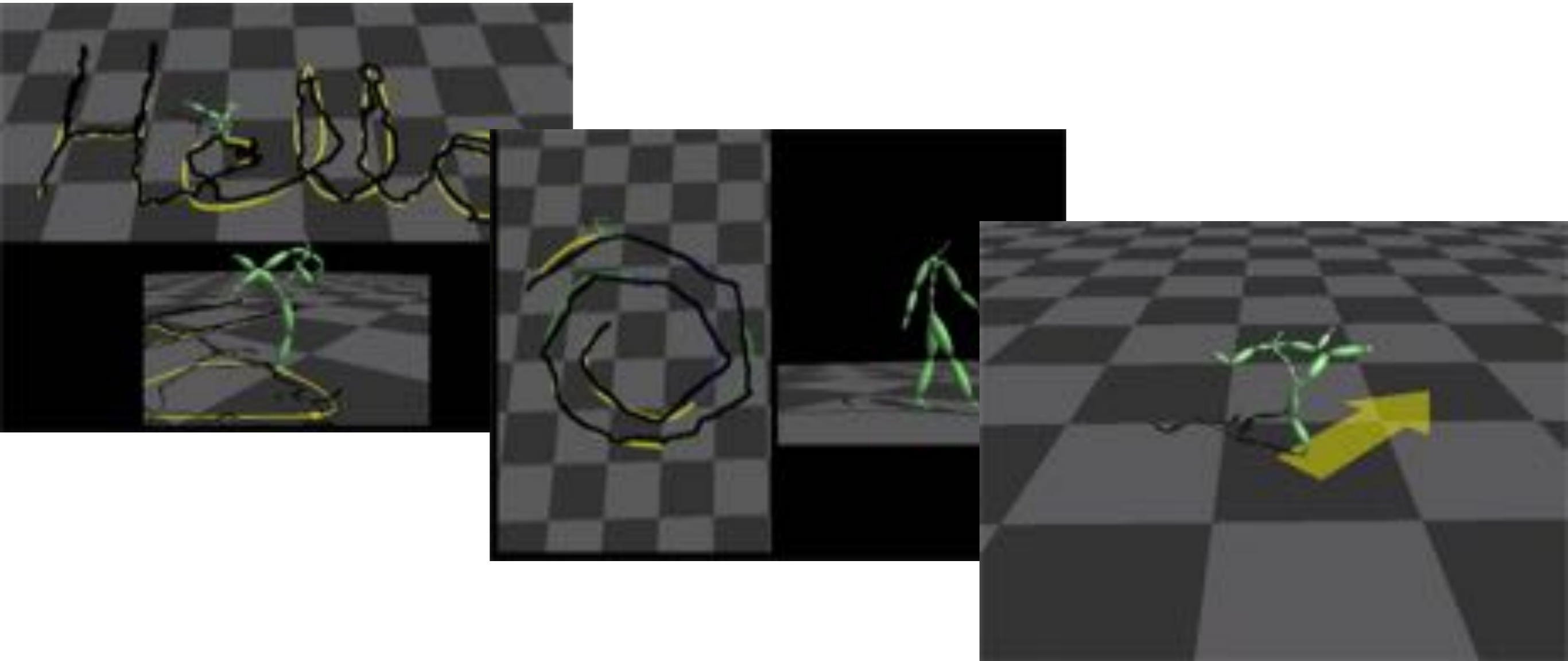


We can capture an individual performance



https://www.youtube.com/watch?v=P2_vB7zx_SQ

What about creating autonomous or responsive characters? Motion Graphs (2002)



<http://www.cs.wisc.edu/graphics/Gallery/kovar.vol/MoGraphs/>

Lucas Kovar (U. Wisconsin / ILM)
with Michael Gleicher

What about creating autonomous or responsive characters? Deep Learning (2016)

A Deep Learning Framework for Character Motion Synthesis and Editing

Daniel Holden*
University of Edinburgh

Jun Saito†
Marza Animation Planet

Taku Komura†
University of Edinburgh



Figure 1: *Our framework allows the animator to synthesize character movements automatically from given trajectories.*

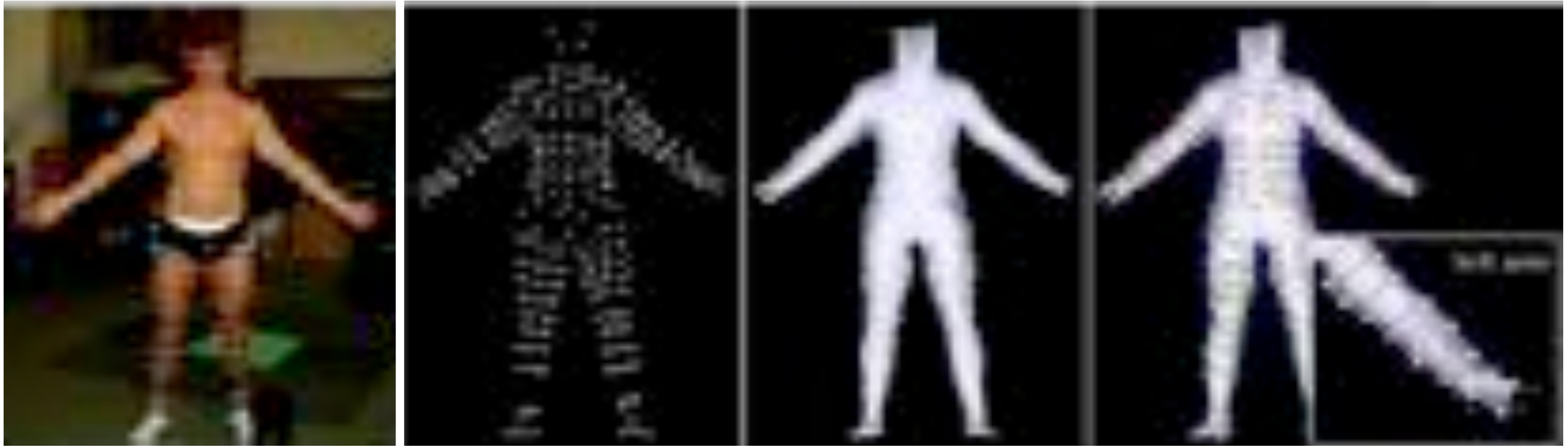
<https://www.youtube.com/watch?v=urf-AAIwNYk>

Dense Body Capture



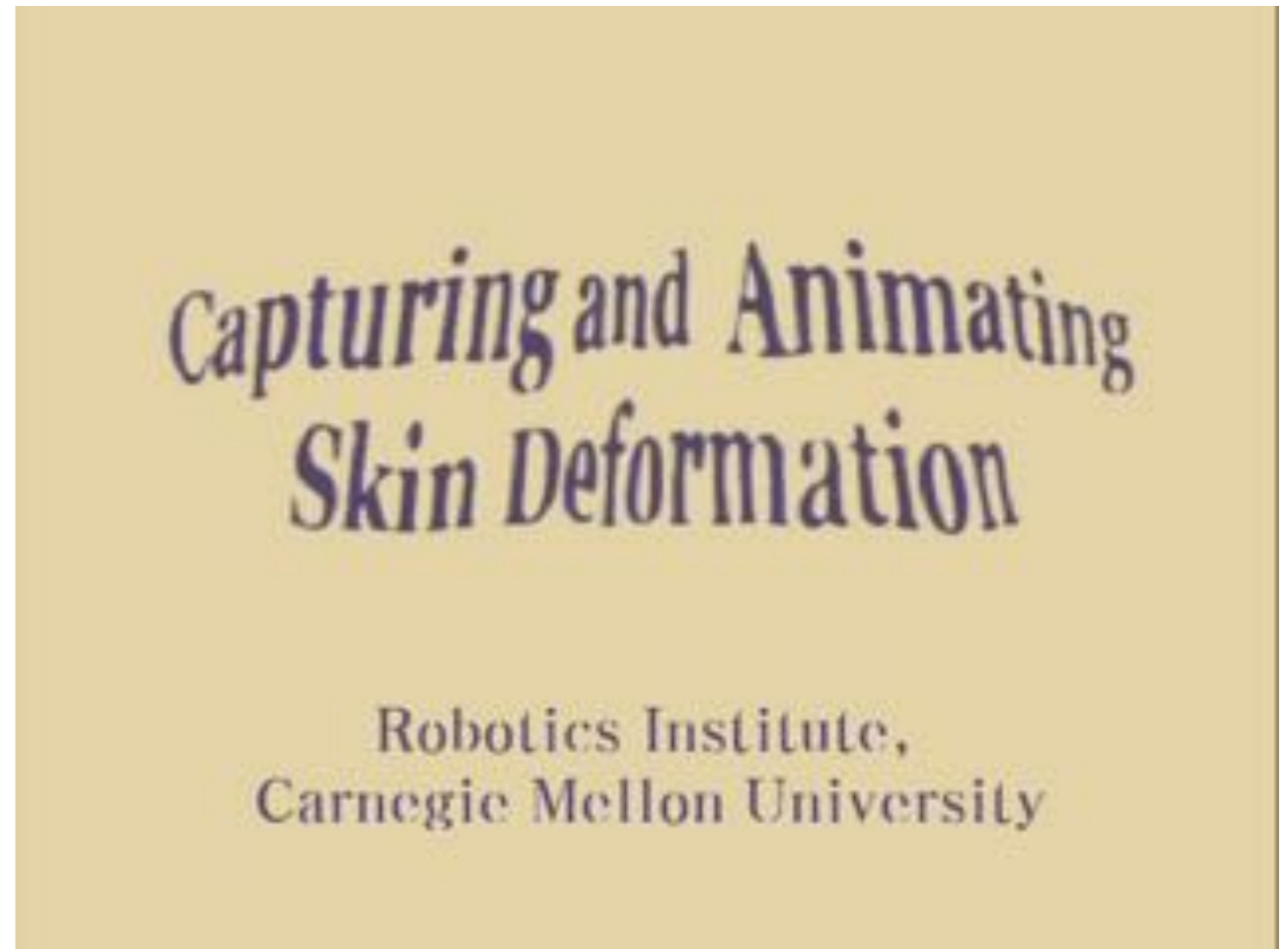
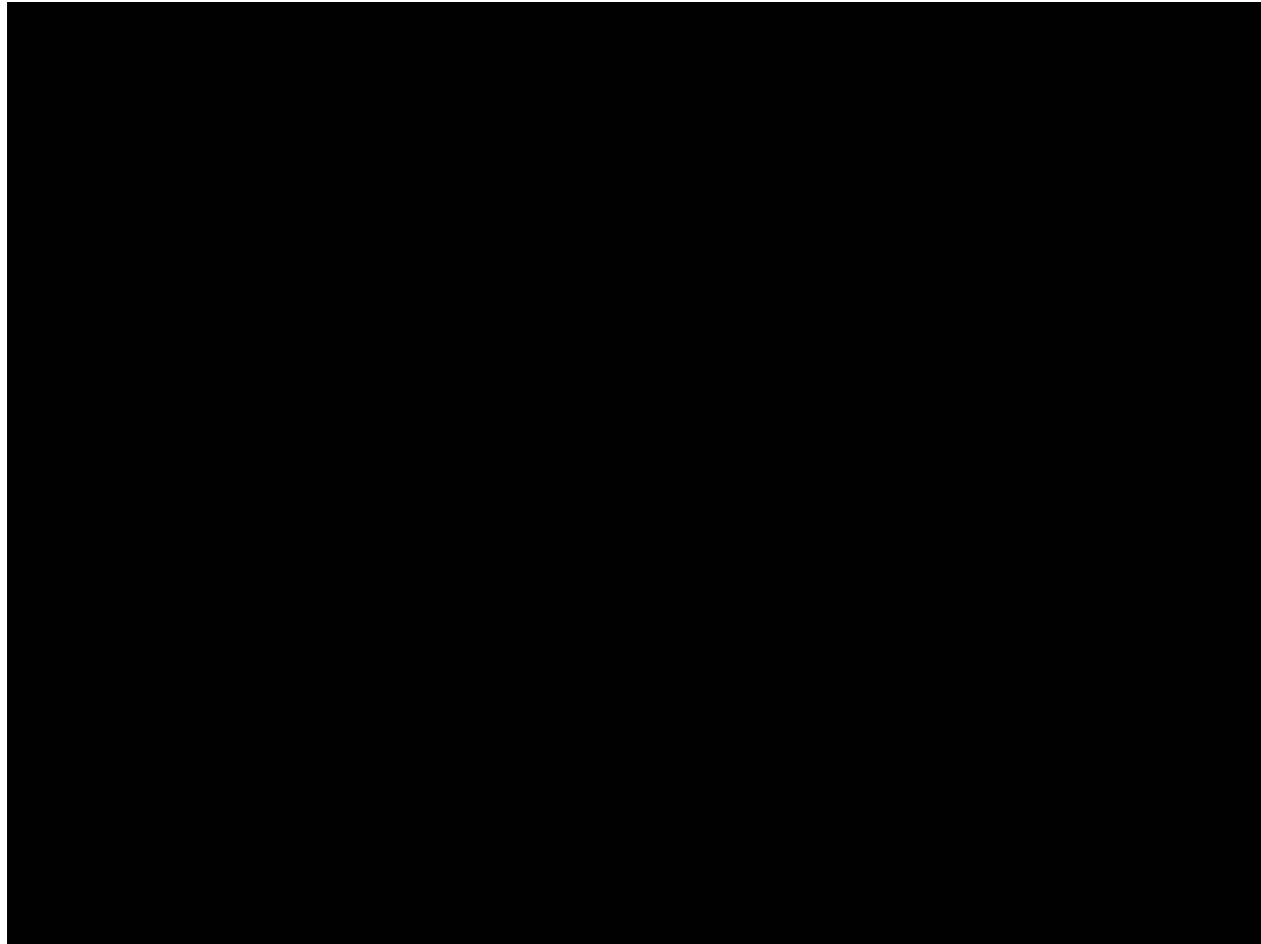
Laser Range Scanning

Dense Marker Capture



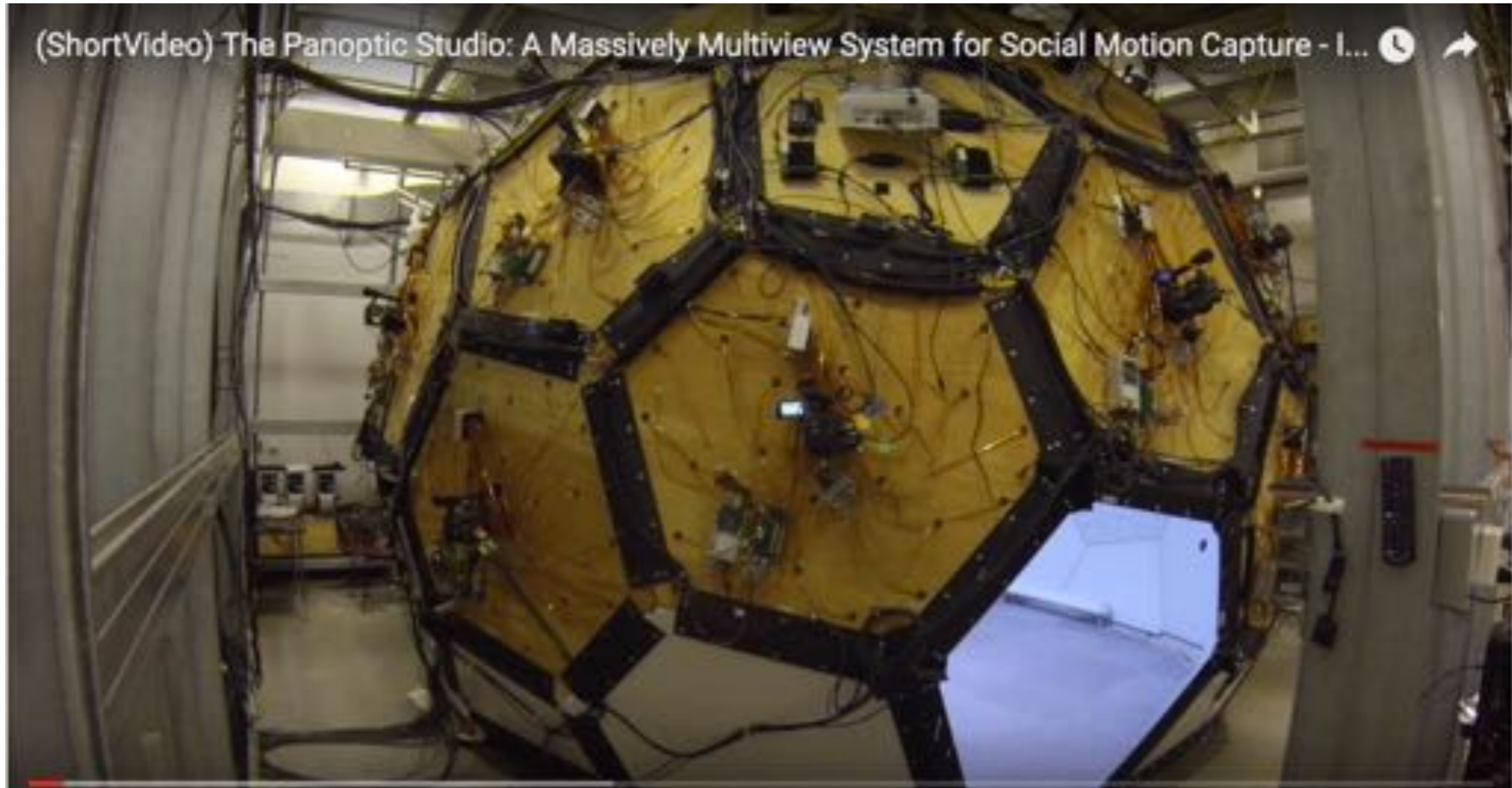
Sang Il Park (CMU / Sejong University)
with Jessica Hodgins

Dense Marker Capture



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

Panoptic Studio (CMU)



https://www.youtube.com/watch?v=wb32z_xwk0c

Performance Capture from Sparse Multi-view Video



Keyframing vs. Motion Capture

Keyframing: setup

What is accomplished?

- Define joint locations and bone hierarchy using a point and click interface
- Define joint limits
- Set up Inverse Kinematics handles
- Bind skeleton to its “skin”

Walk Cycle Variations



<http://www.amazon.com/Animators-Survival-Kit-Richard-Williams/dp/0571202284>

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

Displacement Curves

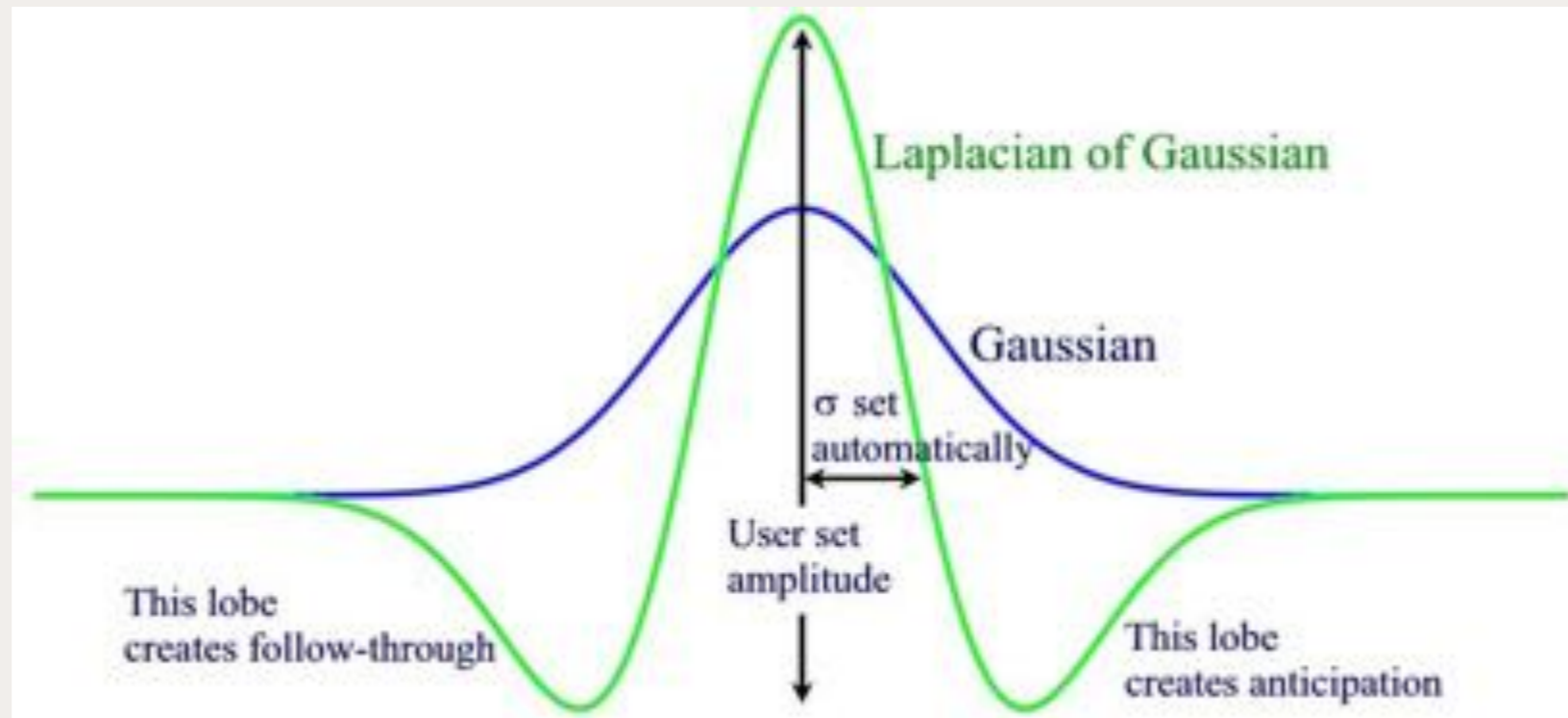


Main ideas:

- 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