

Motion Capture

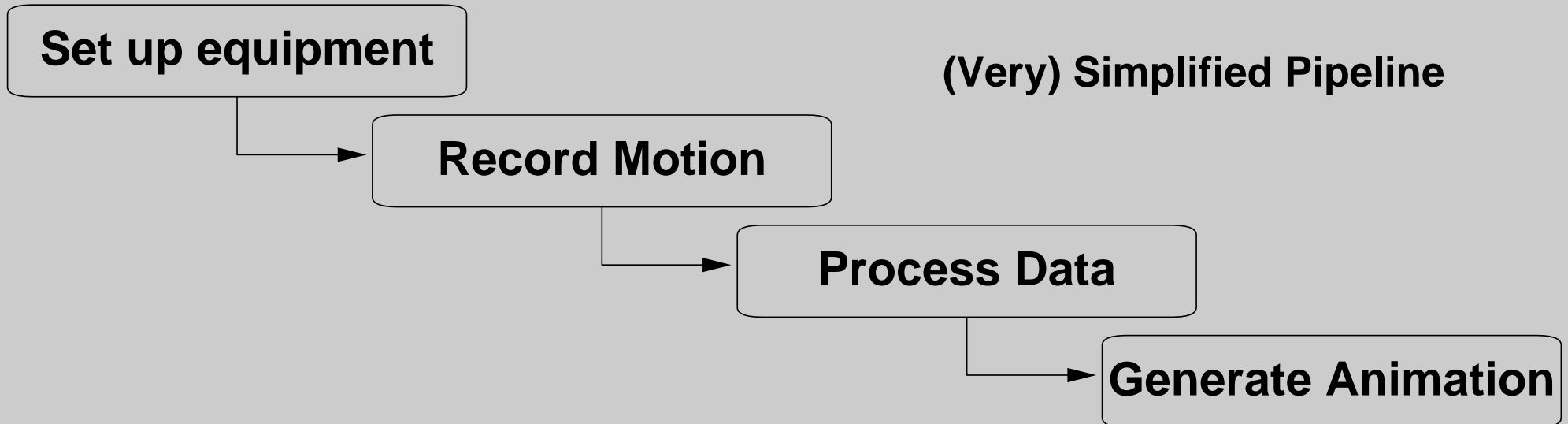
Computer Graphics

Prof. James O'Brien

What is Motion Capture?

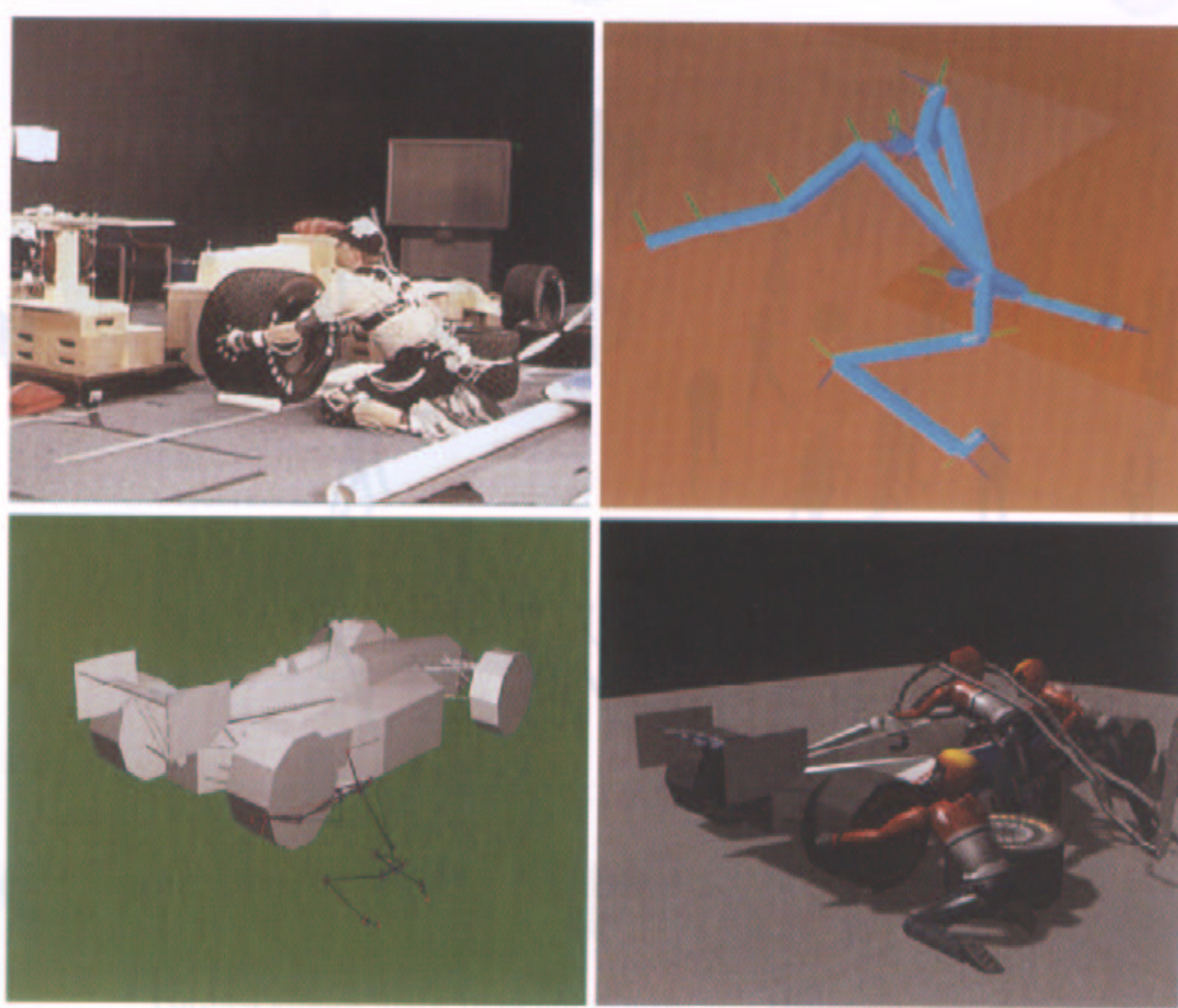
Record motion from physical object

Use motion to animate virtual object



Set up equipment

Record Motion



Various phases of the motion capture process (Bodenheimer et al., Fig. 11)

Process Data

Generate Animation

What Types of Objects?

Human whole body

Portions of body

Facial animation

Animals

Puppets

Other objects

Capture Equipment

Passive Optical

Reflective markers

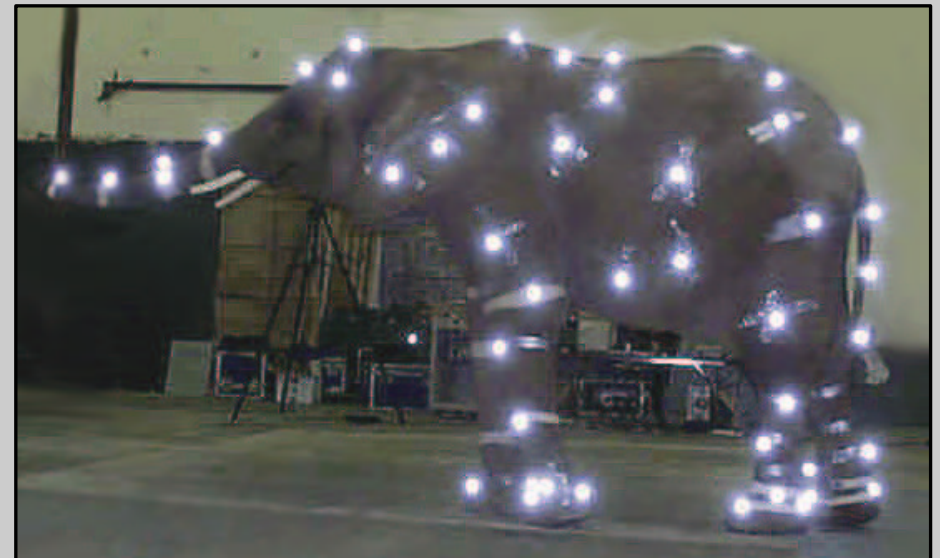
IR (typically) illumination

Special cameras (fast and selective)

Triangulate for positions



Motion Analysis



Capture Equipment

Passive Optical Advantages

Accurate

May use many markers

No cables

High frequency

Disadvantages

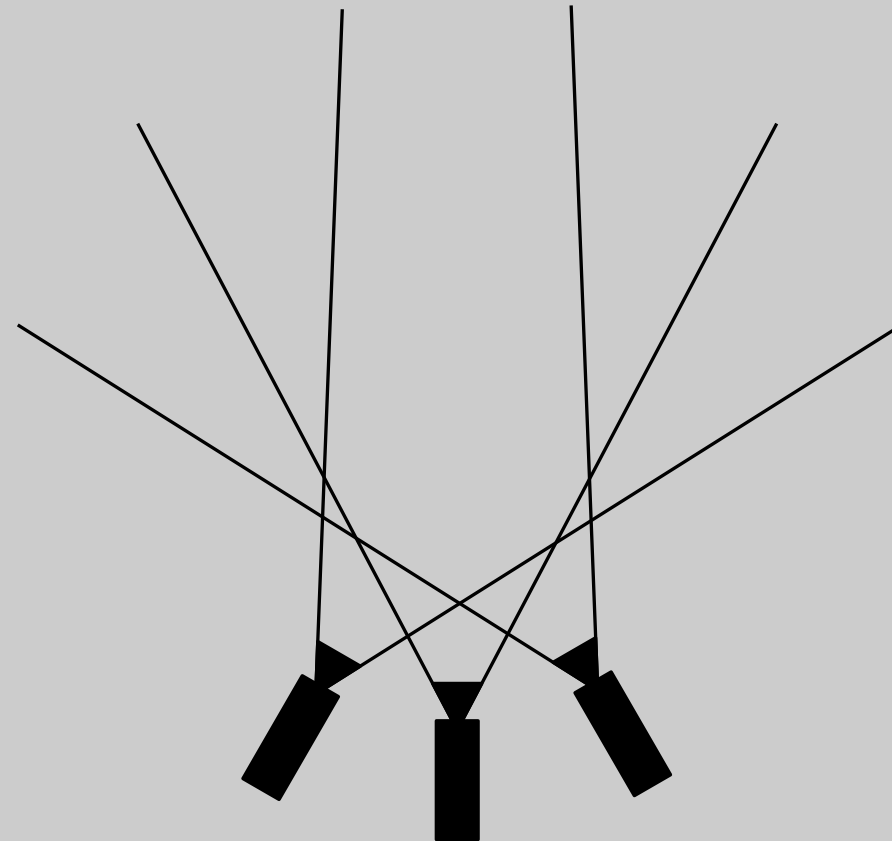
Requires lots of processing

Expensive (>\$100K)

Occlusions

Marker Swap

Lighting/camera limitations



Capture Equipment

Active Optical

Similar to passive, but use LEDs

Blink IDs -- no marker swap

Number of markers trades off with frame rate



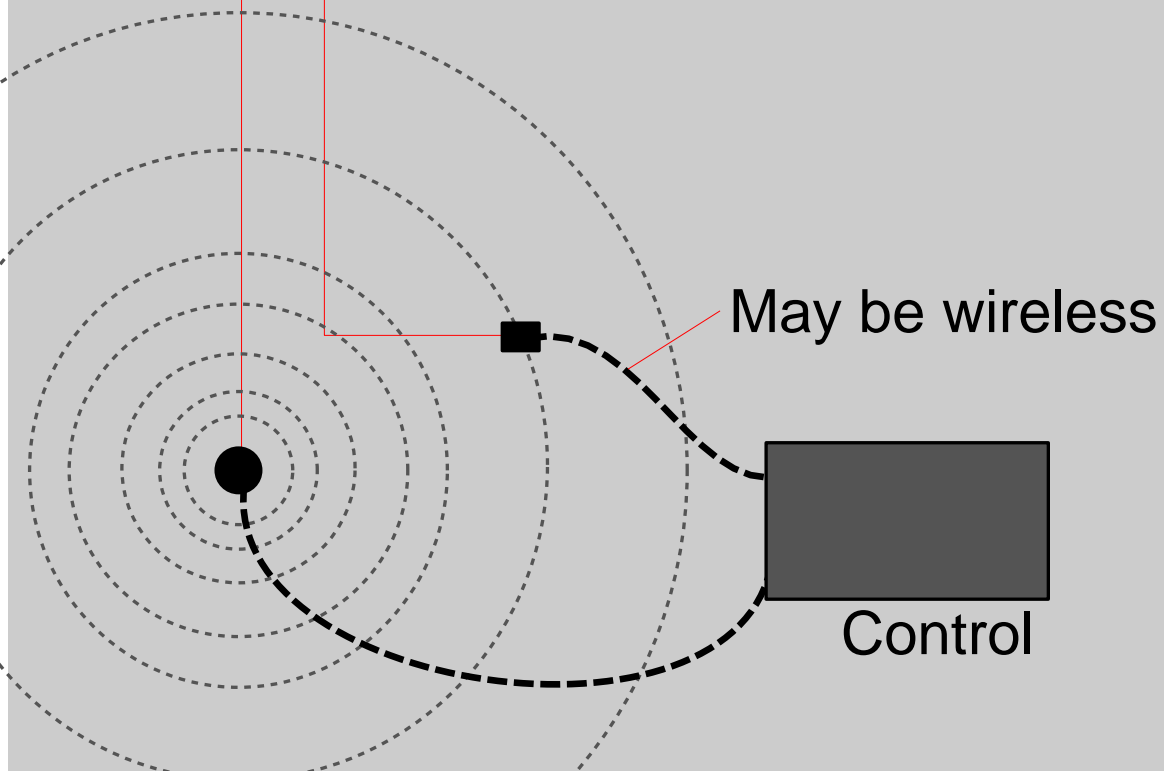
Capture Equipment

Magnetic Trackers

Transmitter emits field

Trackers sense field

Trackers report location and orientation



Capture Equipment

Electromagnetic Advantages

6 DOF data

No occlusions

Minimal cables

Minimal postprocessing

Cheap (\$5K -- \$150K)

Disadvantages

Problems with metal objects

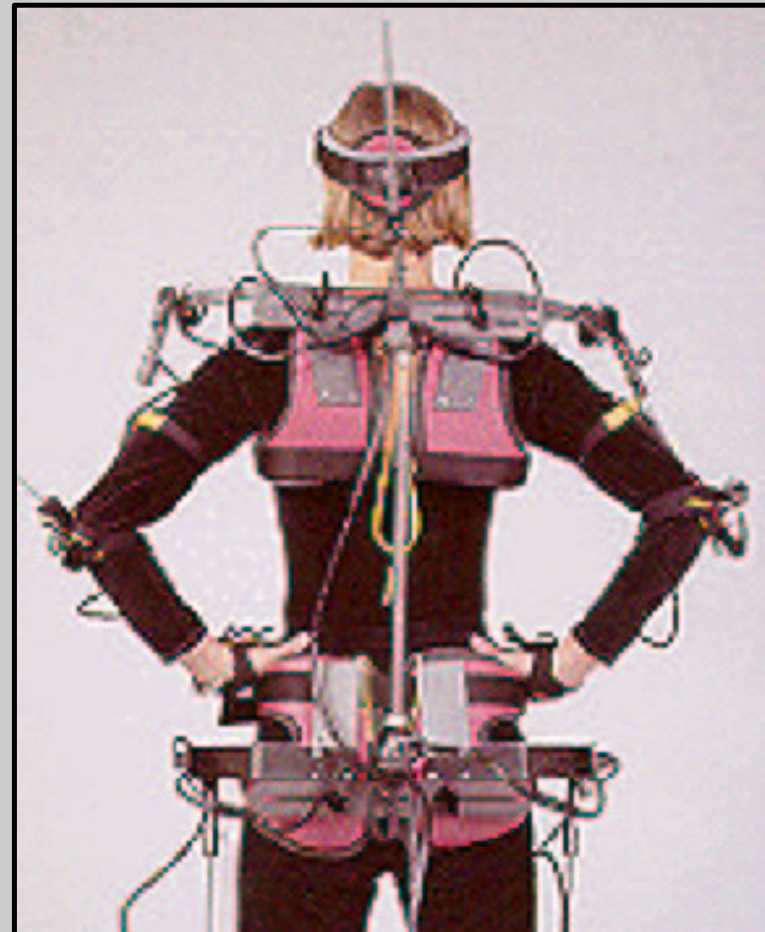
Low(er) frequency

Limited Range

Limited number of trackers

Capture Equipment

Electromechanical



Analogus

Capture Equipment

Puppets



Digital Image Design

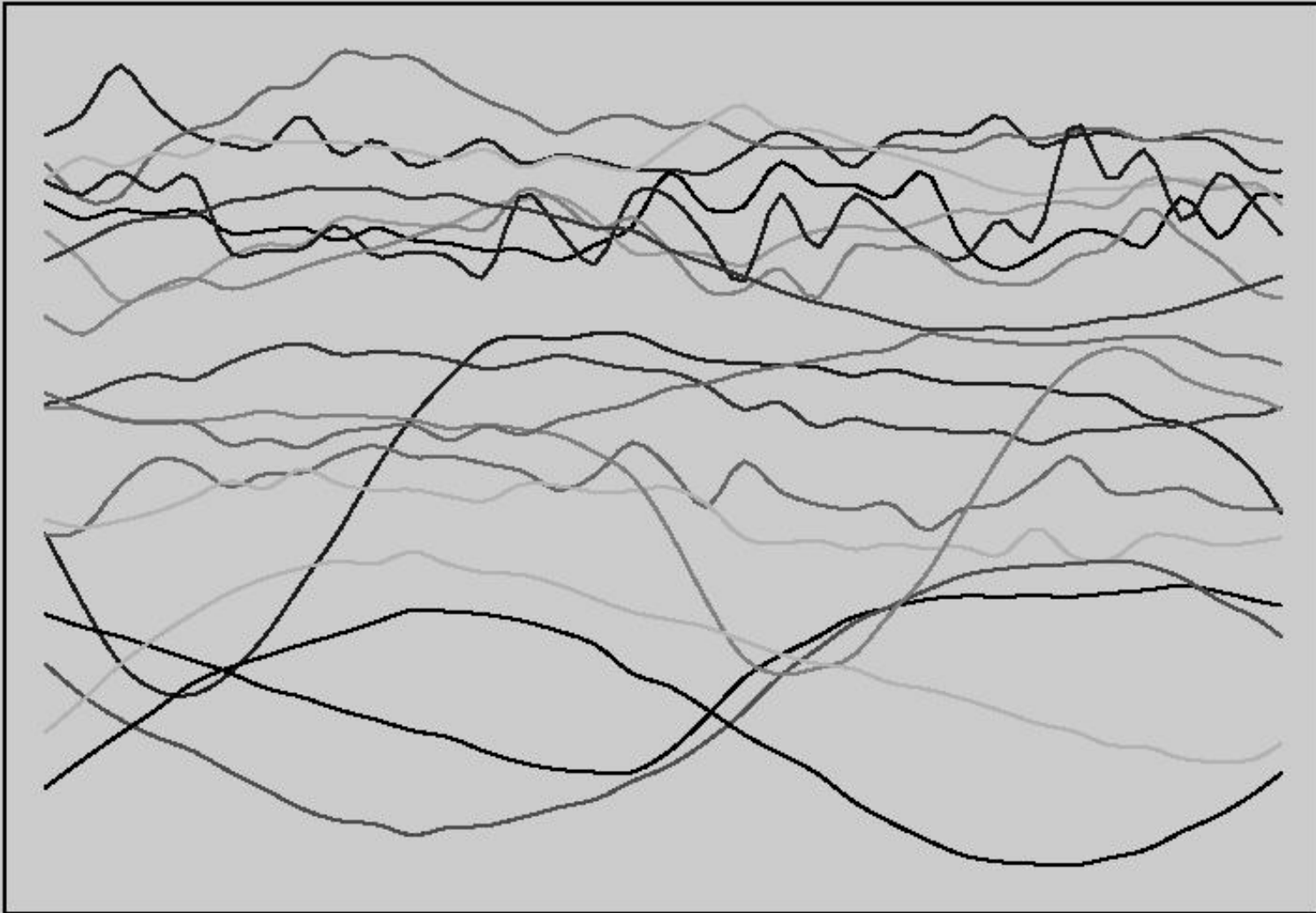


Figure 1: Some of the captured motion curves of human walking.

Suggested Reading

Fourier principles for emotion-based human figure animation
Munetoshi Unuma, Ken Anjyo and Ryozo Takeuchi
SIGGRAPH 95

Motion signal processing
Armin Bruderlin and Lance Williams
SIGGRAPH 95

Motion warping
Andrew Witkin and Zoran Popovic
SIGGRAPH 95

Efficient generation of motion transitions using spacetime constraints
Charles Rose, Brian Guenter, Bobby Bodenheimer and Michael F. Cohen
SIGGRAPH 96

Retargetting motion to new characters
Michael Gleicher
SIGGRAPH 98

Verbs and Adverbs: Multidimensional Motion Interpolation
Rose, Cohen, and Bodenheimer
IEEE: Computer Graphics and Applications, v. 18, no. 5, 1998