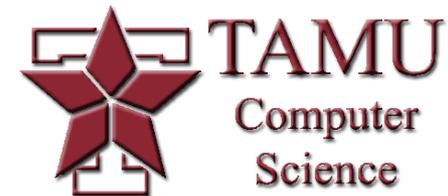


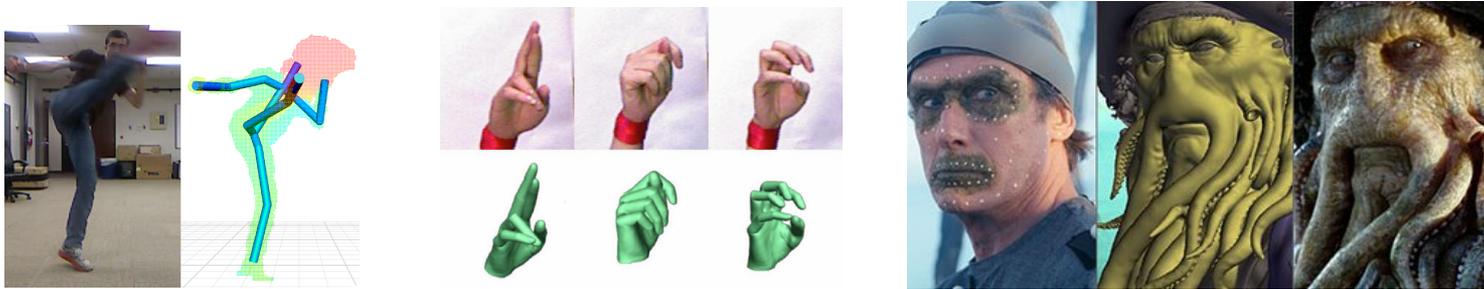
A Brief Overview of Interactive Performance Capture

Jinxiang Chai



Interactive Performance Capture

- Capture Human performance



- At interactive frame rates
- High-end vs Low-end (Quality vs. quantity)

High-end Performance Capture

- Can accurately capture 3D performances
- Highly expensive (e.g., 100K+ for optical mocap)
- Usually very intrusive, require wearing markers, sensors, special suits.
- Mainly for animating movie and game characters



Current Performance Capture Technologies

“3D Rotoscoping”: measuring 3D positions, orientations, velocities or accelerations **automatically**

Current high-end motion capture systems

- Electromagnetic
- Electromechanical
- Fiber optic
- Optical

Electromagnetic Mocap

Each sensor record 3D position and orientation

Each sensor placed on joints of moving object

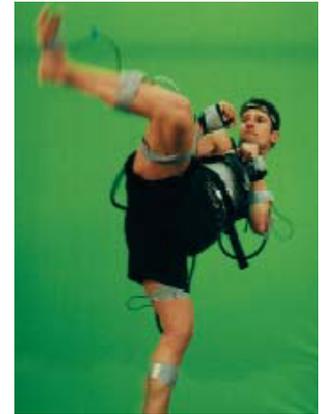
Full-body motion capture needs at least 15 sensors

Popular system:

<http://www.ascension-tech.com/>



Electromagnetic Mocap



Pros

- measure 3D positions and orientations
- no occlusion problems
- can capture multiple subjects simultaneously

Cons

- magnetic perturbations (metal)
- small capture volume
- cannot capture deformation (facial expression)
- hard to capture small bone movement (finger movement)
- not as accurate as optical mocap systems

Electromechanical Mocap

Each sensor measures 3D orientations

- including 3D accelerometers, 3D gyros, and 3D magnetometers



Electromechanical Mocap

Each sensor measures 3D orientations

Each sensor placed on joints of moving object

Full-body motion capture needs at least 15 sensors

Popular systems:

<http://www.xsens.com/>



Electromechanical Mocap

Pros

- measure 3D orientations
- no occlusion problems
- can capture multiple subjects simultaneously
- large capture volume
- portable and outdoors capture (e.g. skiing)

Cons

- getting 3D position info is not easy
- the root positions is often measured with ultrasonic position sensors
- cannot capture deformation (facial expression)
- hard to capture small bone movement (finger motion)
- not as accurate as optical mocap system

Fiber Optic Mocap

Measures 3D position and orientation of entire tape

Binding the tape to the body

Popular systems: <http://www.measurand.com/>



Fiber Optic Mocap

Pros

- measure 3D orientations and positions
- no occlusion problems
- can capture multiple subjects simultaneously
- go anywhere mocap system
- can capture hand/finger motion

Cons

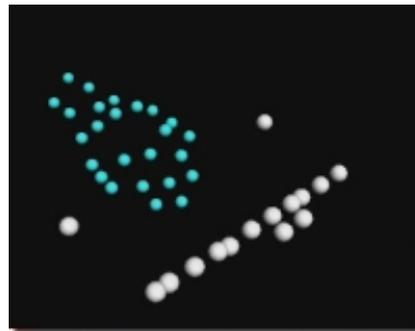
- intrusive capture
- cannot capture deformation (facial expression)
- not as accurate as optical mocap system

Optical Mocap

Multiple calibrated cameras
(≥ 8) digitize different views
of performance

Wears retro-reflective markers

Accurately measures 3D
positions of markers



[Video](#)

Optical Mocap

Pros

- measure 3D positions and orientations
- the most accurate capture method
- very high frame rate
- can capture very detailed motion (body, finger, facial deformation, etc.)

Cons

- has occlusion problems
- hard to capture interactions among multiple actors
- limited capture volume
- expensive

Low-end Performance Capture

- Low-cost (about \$100)
- Non-intrusive, no markers, no special suits, no sensors
- Accessible to every one
- Mainly used for game interfaces or Natural User interfaces

Low-end Performance Capture

- Eyetoy released by Sony in 2003



- A camera with 320 by 240 resolution.
- obtain 2D **silhouette** images of human body

Low-end Performance Capture

- Wiimote released by Nintendo in 2006



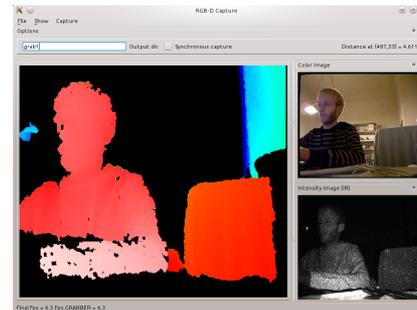
- Infrared camera (2D pointing) + motion sensors (3d acceleration)

Motion Capture Using Depth Sensors

- Kinect released by Microsoft in 2010



- Depth data+ color data



- 3D joint position over time



This class

- We will work on both high-end and low-end performance capture
- high-end: Vicon optical mocap
- Low-end: Kinect mocap



KINECT
for XBOX 360.

Typical Issues

- How to use vicon mocap technology for interactive performance?
- How to do programming with a single kinect and multiple kinects?
- How to use kinect capture for interactive performance capture?