

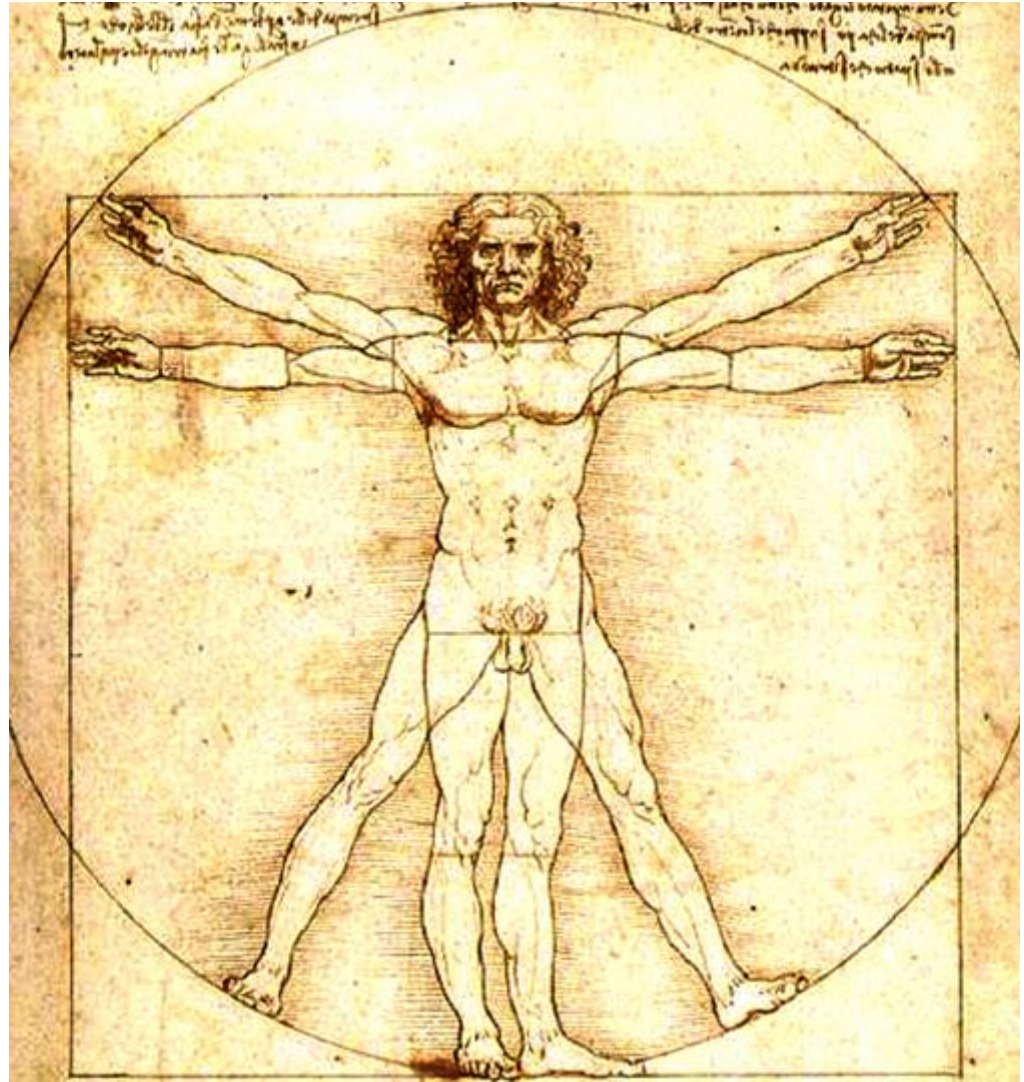


CS 775: Advanced Computer Graphics

Lecture 17 : Motion Capture

Character Animation

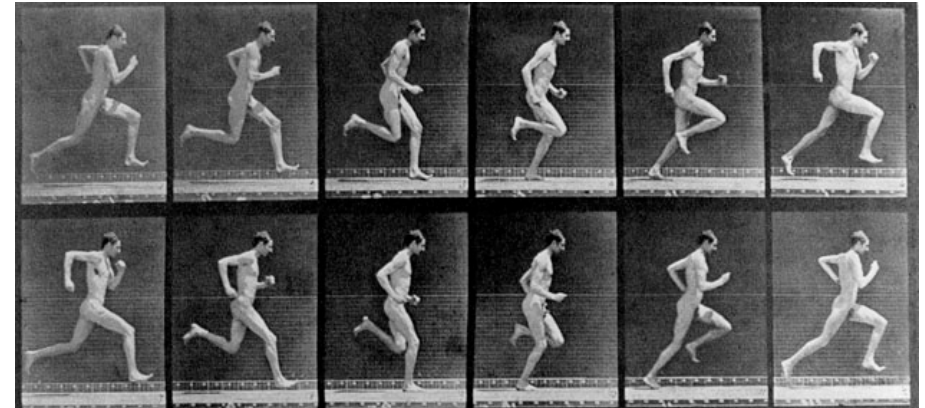
- Motion Capture
 - History
 - › Study of human motion



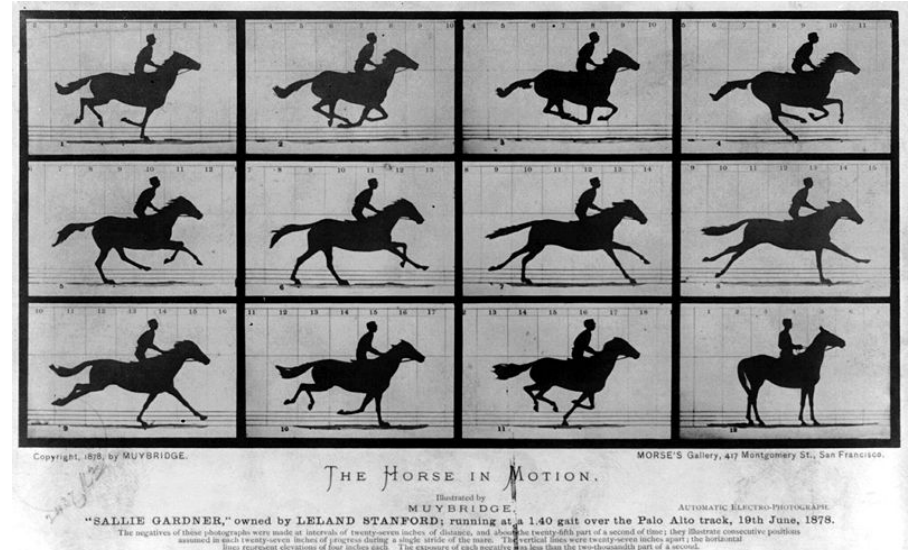
Leonardo da Vinci (1452-1519)

Character Animation

- Motion Capture
 - History
 - › Study of human motion

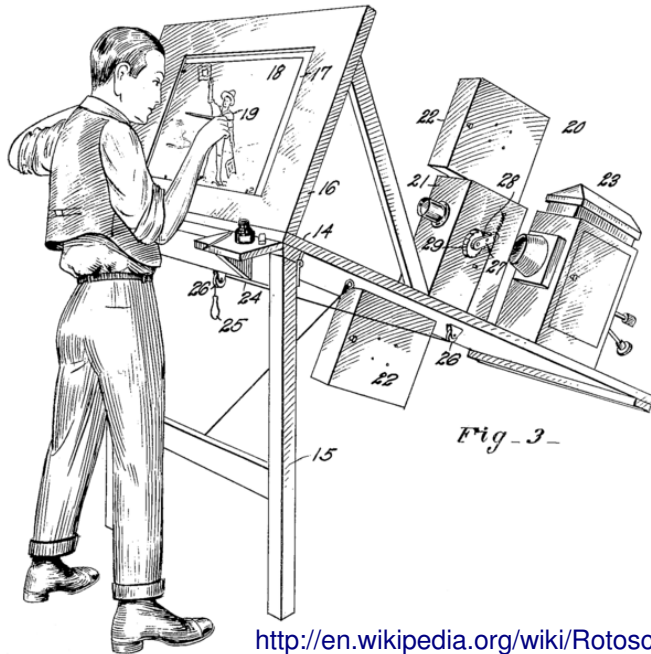


Edward J. Muybridge, 1830-1904



Character Animation

- Motion Capture
 - Capturing motion of a performer in 3D
 - The idea for using Mocap in animation comes from *rotoscoping*



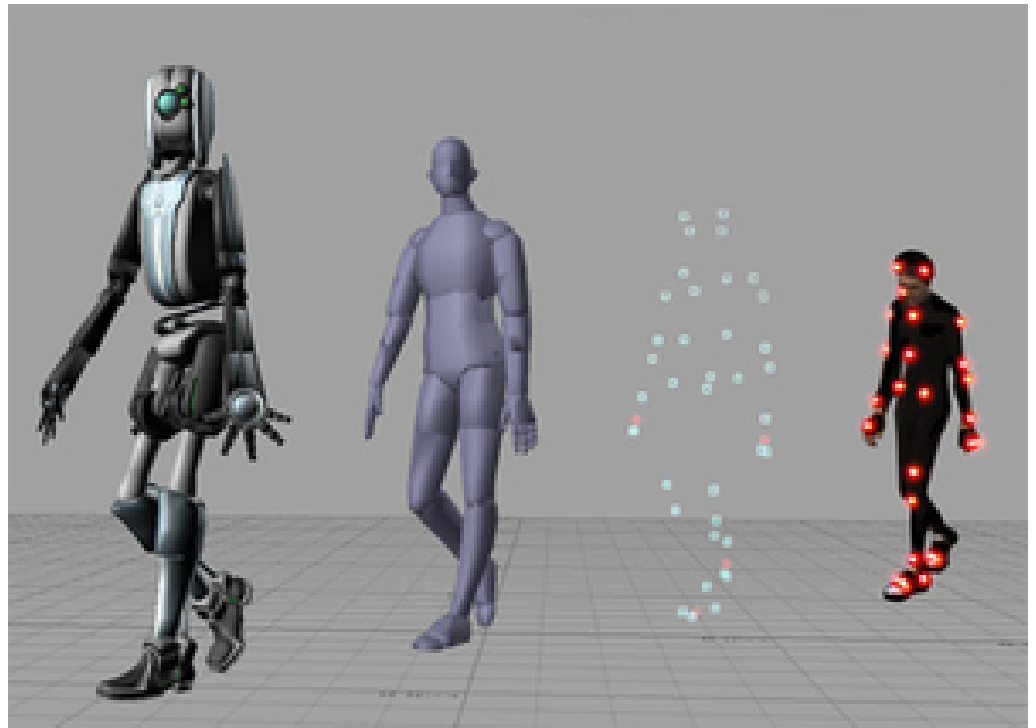
<http://en.wikipedia.org/wiki/Rotoscoping>



<http://www.youtube.com/watch?v=M3cFRVqP07E>

Character Animation

- Motion Capture
 - Capturing motion of a performer in 3D
 - Has many uses:
 - › Animation
 - › Sports
 - › Ergonomics
 - › Medicine
 - › Robotics



http://en.wikipedia.org/wiki/Motion_capture

Character Animation

- Motion Capture
 - Types of Motion capture
 - › Mechanical

Potentiometers at joints
change voltage according
to angular rotation of the
rods.

Gyro at the hips



<http://www.metamotion.com/gypsy/gypsy-motion-capture-system-mocap.htm>

- › Magnetic

Magnetic sensors and
transmitters.

Character Animation

- Motion Capture
 - Types of Motion capture
 - › Inertial
 - Single Accelerometers
 - MEMS Gyroscopes
 - Other sensors



<http://www.xsens.com>

Character Animation

- Motion Capture
 - Types of Motion capture
 - › Optical

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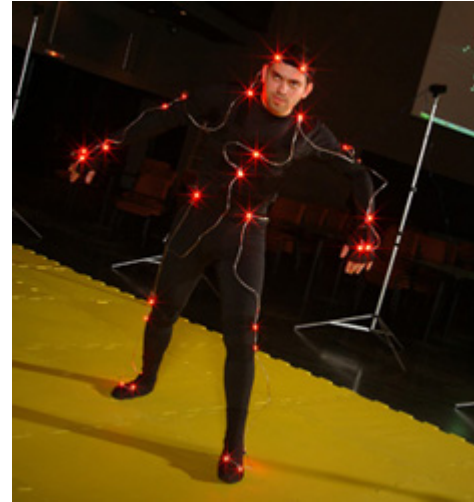


Character Animation

- Motion Capture
 - Types of Motion capture
 - › Optical

With Markers

Active



Phasespace

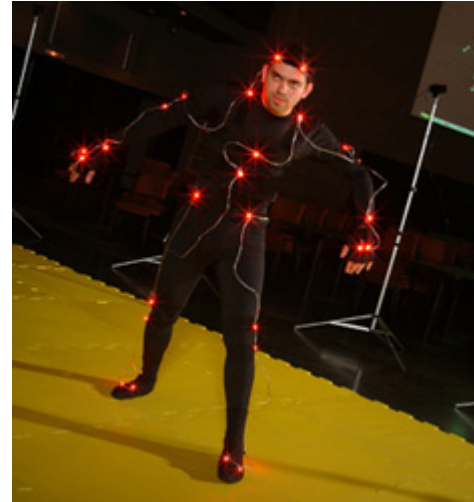
Character Animation

- Motion Capture
 - Types of Motion capture
 - › Optical

With Markers

Active

Passive



Phasespace



Vicon

Parag Chaudhuri



Character Animation

- Motion Capture
 - Optical Motion capture - Cameras



Vicon MX: Cameras with (near) infrared LED's: 4M pixels, 10-bit grayscale, 166 fps



Phasespace: Linear detectors, 12.4M pixels, 480fps

Character Animation

- Motion Capture
 - Types of Motion capture
 - › Optical

With Markers

Active

Passive

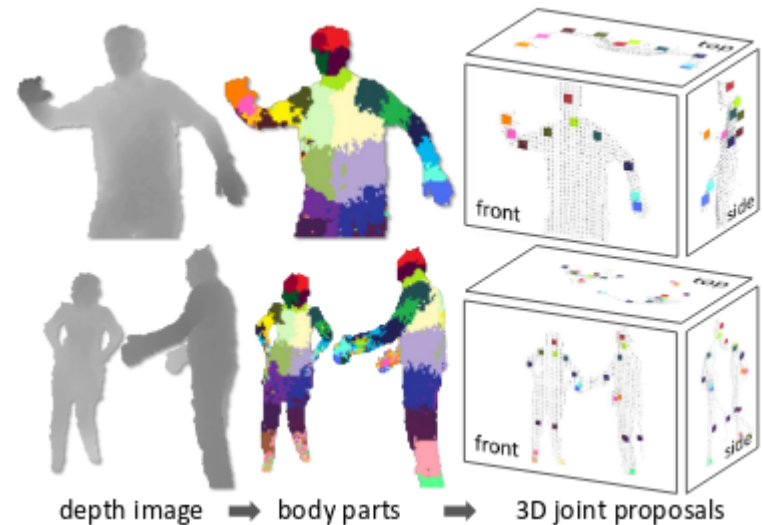
Markerless

Monocular

Kinect v1, v2



Monocular Human Motion Capture with a Mixture of Regressors,
A Agarwal and B. Triggs, CVPR 2005



Real-Time Human Pose Recognition in Parts from Single Depth
Images, Shotton et al., CVPR 2011



Character Animation

- Motion Capture
 - Types of Motion capture
 - › Optical

With Markers

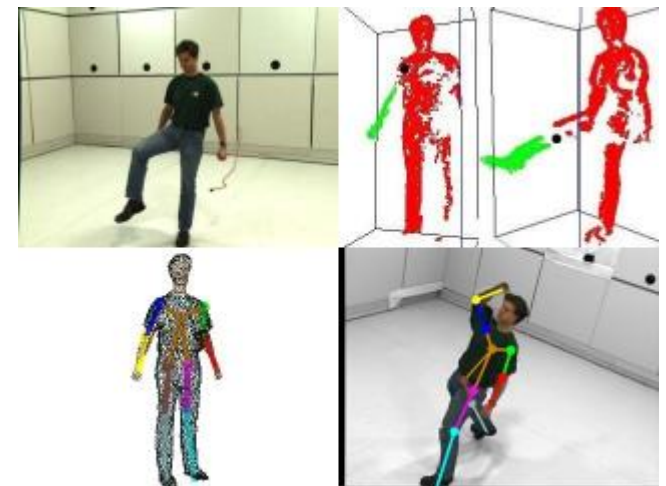
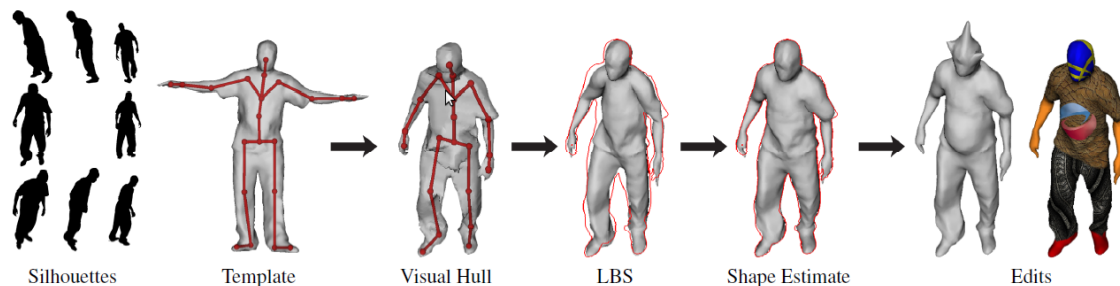
Active

Passive

Markerless

Monocular

Multi-camera

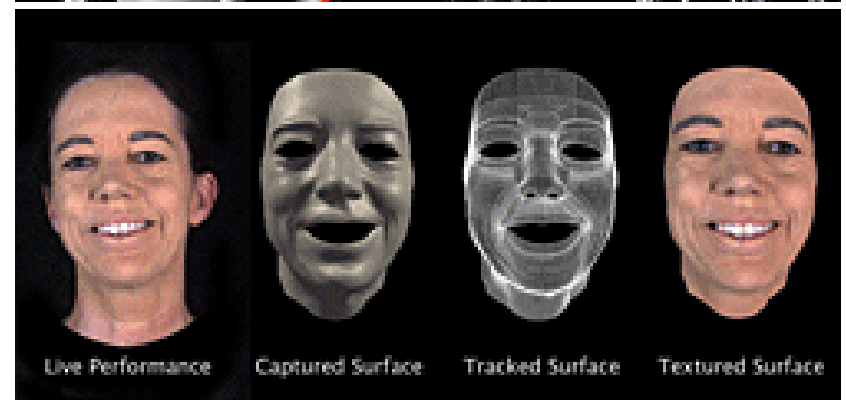
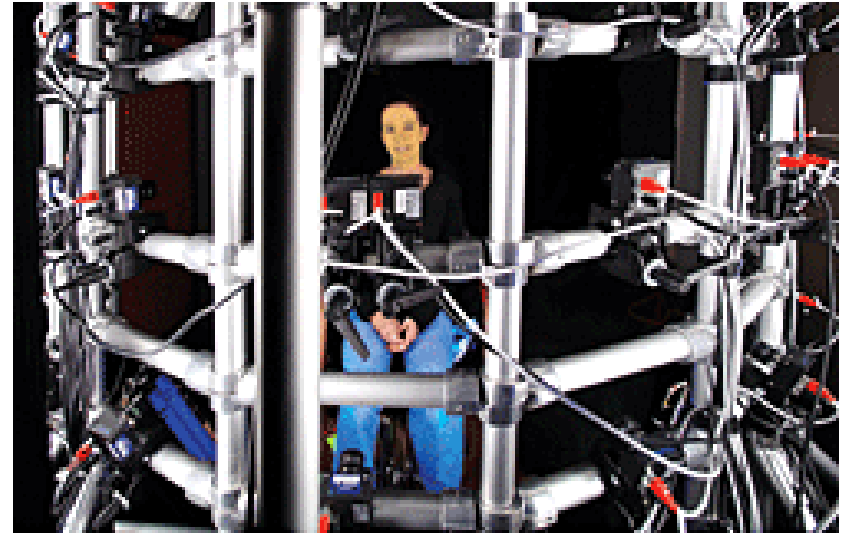


3D Human Kinematic Modeling and Markerless Motion Capture, G. Cheung, S. Baker, T. Kanade, CVPR2003

Articulated Mesh Animation from Multi-view Silhouettes, D. Vlasic, I. Baran, W. Matusik, J. Popović, ACM TOG, 2008

Character Animation

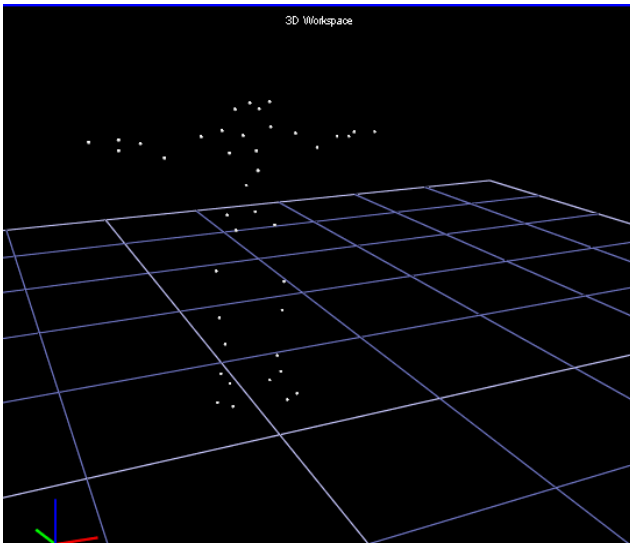
- Motion Capture
 - Facial Motion capture
 - › Scale of movement is different from full body capture
 - › Skin is not rigid
 - Performance Capture
 - › Full body and face



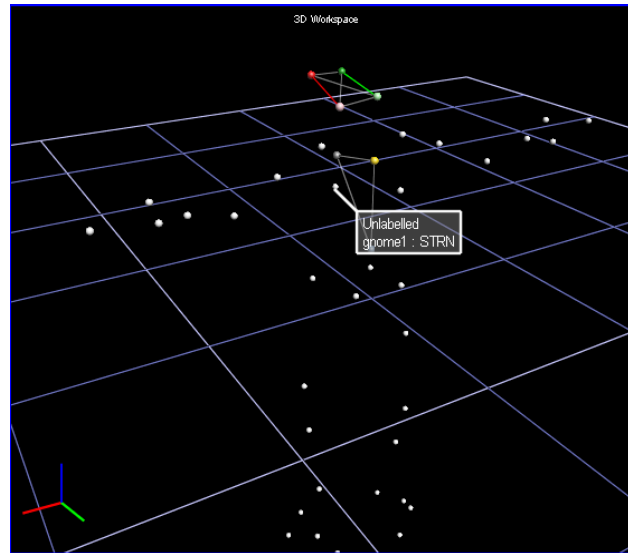
<http://www.mova.com>

Character Animation

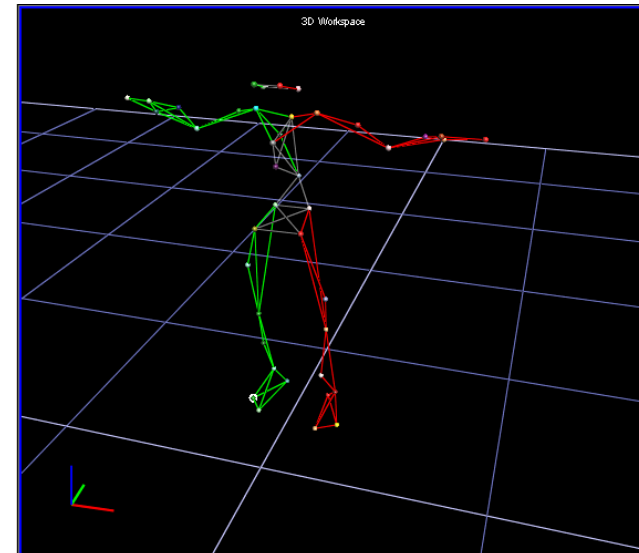
- Motion Capture
 - Processing Pipeline
 - › Calibrate, reconstruct markers and label



Markers reconstructed in 3D



Labelling in a T-frame



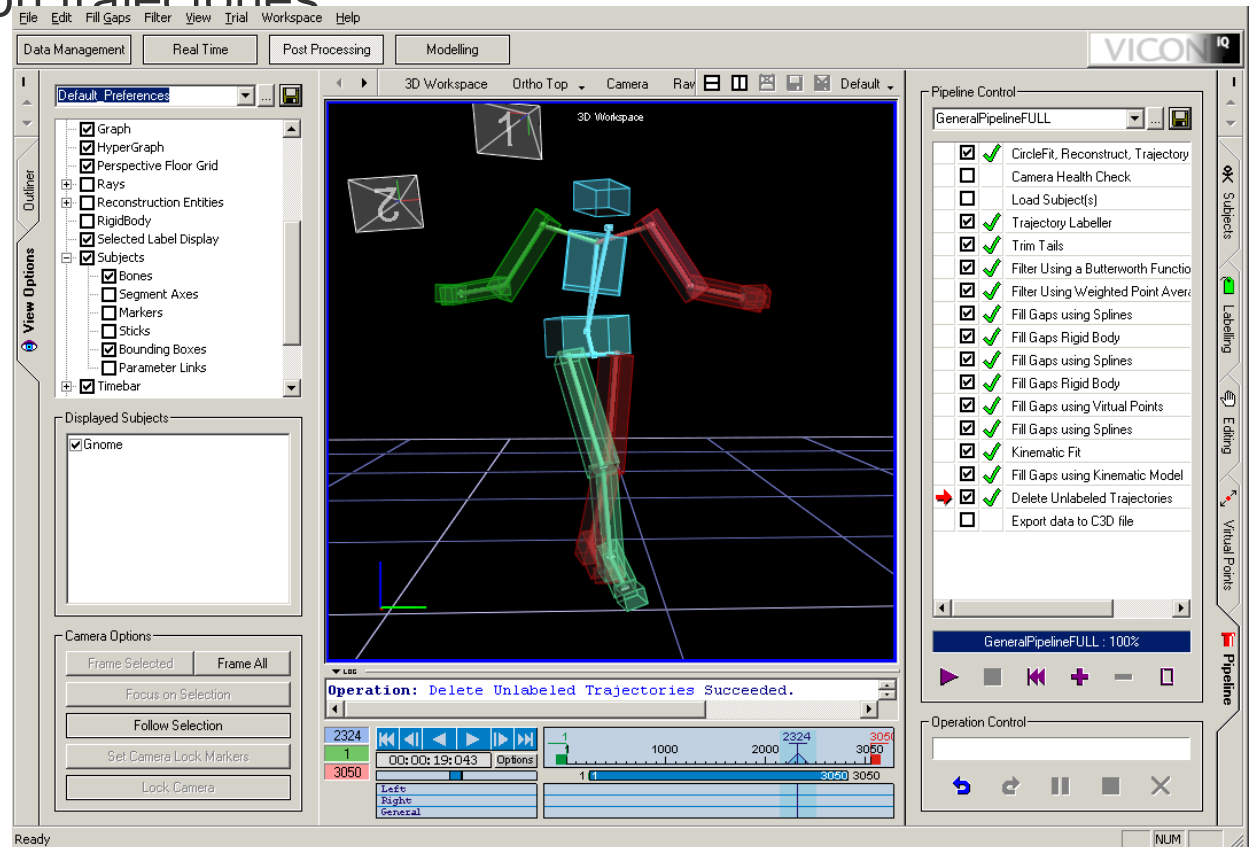
Full Labelling

Character Animation

- Motion Capture
 - Processing Pipeline
 - › Complete motion trajectories

Processing marker
trajectories

CS775: Lecture 17





Character Animation

- Motion Capture
 - Processing Pipeline
 - › Export the animation
 - BVH
 - ASF/AMC
 - C3D

Character Animation

- BVH – BioVision Hierarchy Format

```
HIERARCHY
ROOT Hips
{
    OFFSET 0.00 0.00 0.00
    CHANNELS 6 Xposition Yposition Zposition Zrotation Xrotation Yrotation
    JOINT Chest
    {
        OFFSET 0.00 5.21 0.00
        CHANNELS 3 Zrotation Xrotation Yrotation
        JOINT Neck
        {
            OFFSET 0.00 18.65 0.00
            CHANNELS 3 Zrotation Xrotation Yrotation
            JOINT Head
            {
                OFFSET 0.00 5.45 0.00
                CHANNELS 3 Zrotation Xrotation Yrotation
                End Site
                {
                    OFFSET 0.00 3.87 0.00
                }
            }
        }
    }
}
```

Character Animation

- BVH – BioVision Hierarchy Format

MOTION

Frames: 2

Frame Time: 0.033333

8.03	35.01	88.36	-3.41	14.78	-164.35	13.09	40.30	-24.60
7.88	43.80	0.00	-3.61	-41.45	5.82	10.08	0.00	10.21
97.95	-23.53	-2.14	-101.86	-80.77	-98.91	0.69	0.03	0.00
-14.04	0.00	-10.50	-85.52	-13.72	-102.93	61.91	-61.18	65.18
-1.57	0.69	0.02	15.00	22.78	-5.92	14.93	49.99	6.60
0.00	-1.14	0.00	-16.58	-10.51	-3.11	15.38	52.66	-21.80
0.00	-23.95	0.00						
7.81	35.10	86.47	-3.78	12.94	-166.97	12.64	42.57	-22.34
7.67	43.61	0.00	-4.23	-41.41	4.89	19.10	0.00	4.16
93.12	-9.69	-9.43	132.67	-81.86	136.80	0.70	0.37	0.00
-8.62	0.00	-21.82	-87.31	-27.57	-100.09	56.17	-61.56	58.72
-1.63	0.95	0.03	13.16	15.44	-3.56	7.97	59.29	4.97
0.00	1.64	0.00	-17.18	-10.02	-3.08	13.56	53.38	-18.07
0.00	-25.93	0.00						