Techniques for Creating Animation

- Keyframing
- Data-driven Animation
- Procedural Animation
- Physical Simulation
Reminder

Send me your 5 paper selections by Tuesday
Techniques for Creating Animation

Keyframing

Data-driven Animation

Procedural 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://www.youtube.com/watch?v=rWKLPDFamm0
Keyframing = Traditional Animation?

ParaNorman – stop motion
http://www.youtube.com/watch?v=CGnBT0J5jCs

Brave – 3D animation using Pixar’s animation pipeline
http://www.youtube.com/watch?v=7IXKCzko2gM
Keyframing = Traditional Animation?

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://www.youtube.com/watch?v=W5pNPJAhsBI
Data-driven Animation

http://graphics.cs.cmu.edu/
Lab Demo Tues. Jan 22
meet in WeH 1334
Motion Graphs Videos

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

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

http://www.seas.upenn.edu/~alla/

Alla Safonova (CMU / U. Pennsylvania) with Jessica Hodgins
Interactive Editing

http://mrl.snu.ac.kr/~jehee/
Jehee Lee (Seoul National University)
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

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

The Uncanny Valley is a graph that illustrates how familiarity with human likeness affects our perception of entities. The x-axis represents human likeness, ranging from 0% to 100%, with 50% being the midpoint. The y-axis represents familiarity, with + for moving and - for still. As entities become more human-like, there is a sudden drop in familiarity, creating a valley. This phenomenon is observed with various entities, including bunraku puppets, healthy persons, stuffed animals, corpses, prosthetic hands, and zombies.
Match Character Geometry to Animation Capabilities
Techniques for Creating Animation

Keyframing

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Procedural Animation

Physical Simulation
Physics-based Animation

http://physbam.stanford.edu/~fedkiw/
Now for some 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

Danielle Sauer and Yee-Hong Yang, Music-driven character animation, ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP), Volume 5 Issue 4, October 2009
Displacement Curves

Main ideas:
• User edits $\rightarrow$ displacements to the original motion
• Displacements can be made at different resolutions in a hierarchical scheme

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
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