Techniques for Creating Animation

Keyframing

Data-driven Animation

Procedural Animation

Physical Simulation
First of all..

Any questions on the 5 paper selections?
Techniques for Creating Animation

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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?

Boxtrolls – stop motion
https://www.youtube.com/watch?v=94KG-pex6-8

Big Hero 6 – 3D modeling, animation, and rendering pipeline
https://www.youtube.com/watch?v=y6yrHkZVGF8
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://video.wired.com/watch/design-fx-world-war-z-building-a-better-zombie-effects-exclusive
Physics-based Animation

http://physbam.stanford.edu/~fedkiw/
Data-driven Animation

http://graphics.cs.cmu.edu/
Motion Capture Lab
Wean 1334

http://graphics.cs.cmu.edu/
We can capture an individual performance

https://www.youtube.com/watch?v=L6JXUoWeZ7Q
What about creating autonomous or responsive characters?

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
Dense Marker Capture

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

Sang Il Park (CMU / Sejong University) with Jessica Hodgins
Motion Capture and Cloth?

Doyub Kim, Woojong Koh, Rahul Narain, Kayvon Fatahalian, Adrien Treuille, and James O’Brien

CMU and Berkeley

http://graphics.cs.cmu.edu/projects/exhaustivecloth/
Mixing Animation Techniques

Worawat Choensawat, Sachie Takahashi, Minako Nakamura, Kozaburo Hachimura

Ochanomizu and Ritsumeikan Universities

http://dl.acm.org/citation.cfm?id=2342902
Uncanny Valley
Match Character Geometry to Animation Capabilities
Techniques for Creating Animation

- Keyframing
- Data-driven Animation
- Physical Simulation
- Procedural Animation
Now for a few 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

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