Animation

Computer Graphics, CSCD18 Fall 2007 Instructor: Leonid Sigal

Key-frame Animation

- Define parameters at key frames and interpolate
 - Using splines or cubic interpolants



FIGURE 3. Squash & stretch in Luxo Jr.'s hop.



Problems

We can easily get physically implausible solutions



Solution

 Add sufficient number of keyframes so that animation looks physically plausible



Key-frame Animation

Pros:

- Very expressive
- Animator has full control over animation

Cons:

- Very labor intensive (for the animator)
- Difficult to create convincing physical realism

Use

 Potentially anything except complex physical simulations (e.g. smoke, water)

Articulated Structures

- How can we animate articulated structures (e.g. people, animals)
 - Forward Kinematics
 - Inverse Kinematics
 - Motion Capture



Forward Kinematics

What if you have articulated structure?
Specify joint parameters at key frames



Inverse Kinematics

- What if you have articulated structure?
 - Instead specify the "goal" states and solve for joint parameters



Inverse Kinematics

What if you have articulated structure?

- Instead specify the "goal" states and solve for joint parameters
- Problem: Solution may not be unique



Motion Capture

- Attach markers to the body (use the suite)
- Solve for the 3D positions of these markers by triangulating location observed by multiple cameras



Motion Capture

Pros:

Captures specific motion and style of an actor

Cons:

- Often not expressive enough
- Time consuming and expensive
- Difficult to edit

Use

Character animation (especially for articulated characters)

High Fidelity Motion Capture

Video



Physics-based AnimationSolve

F = ma

Sounds easy, and it is for very simple rigid objects that do not deform, melt, etc. etc.

Doing if for realistic objects is hard

Imagine modeling water with droplets

How about, hair with folic particles

Final Fantasy: The Spirit Within, 2001

Dr. Aki Ross' hair is only half as dense as the average human crop, however, that still left 60,000 strands to put realistically into motion. When designing the computer graphics, a fifth of the time spent was devoted to those 60,000 hairs. Physics-based Animation

Videos



Physics-based Animation

Pros:Very realistic

Cons:

- Very expensive and slow
- Very difficult to control

Use:

Various physical phenomenon