

Introduction to Animation

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- Key technical problem is how to generate and manipulate motion
 - Human motion
 - Inanimate objects
 - Amorphous objects
 - Control

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Introduction to Animation

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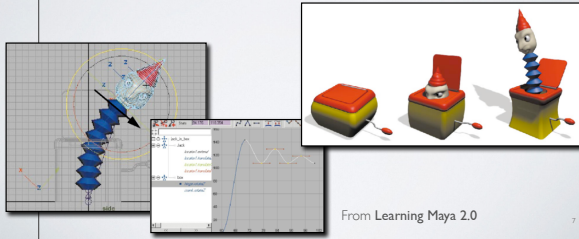
- Technical issues often dominated by aesthetic ones
- Violation of realism desirable in some contexts
- Animation is a communication tool
 - Should support desired communication
 - There should be something to communicate

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Key-framing (manual)

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- Requires a highly skilled user
- Poorly suited for interactive applications
- High quality / high expense
- Limited applicability



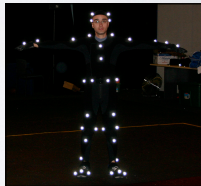
Motion Capture (recorded)

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- Markers/sensors placed on subject
- Time-consuming clean-up
- Reasonable quality / reasonable price
- Manipulation algorithms an active research area



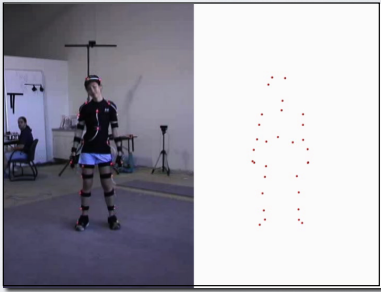
MotionAnalysis / Performance Capture Studio



Okan Arıkan

Model Construction

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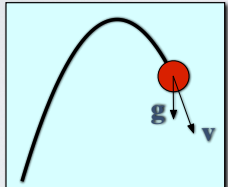
Kirk, O'Brien, Forsyth, CVPR, 2005

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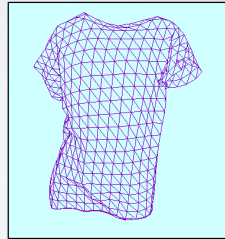
Simulation

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- Generate motion of objects using numerical simulation methods



$$\mathbf{x}^{t+\Delta t} = \mathbf{x}^t + \Delta t \mathbf{v}^t + \frac{1}{2} \Delta t^2 \mathbf{a}^t$$



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What to do with animations?

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- Video tape
- Digital video
- Print it on yellow sticky notes

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NTSC Standard

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- Used by DVD, DV, and VHS
- 720x486 resolution (sort of)
- 1.33 aspect ratio
- Limited color range
- 30 frames per second (sort of 29.97)
- Interlaced video
- Overscan regions

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Digital Video

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- Wide range of file formats
 - QuickTime
 - MS Audio/Visual Interleaved (AVI)
 - DV Stream
 - Bunch 'o images
- Some formats accommodate different CODECS
 - Quicktime: Cinepak, DV, Sorenson, DivX, etc.
 - AVI: Cinepak, Indeo, DV, MPEG4, etc.
- Some formats imply a given CODEC
 - MPEG
 - DV Streams

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Digital Video

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- Nearly all CODECS are lossy
 - Parameter setting important
 - Different type of video work with different CODECS
 - Compressors not all equally smart
 - Compression artifacts are cumulative in a very bad way
- Playback issues
 - Bandwidth and CPU limitations
 - Hardware acceleration
 - Missing CODECS (avoid MS CODECS and formats)

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Editing

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- Old way:
 - Multiple expensive tape decks
 - Slow
 - Difficult
 - Error prone
- New way:
 - Non-linear editing software
 - Premiere, Final Cut Pro, others...
 - Beware compressed solutions
 - May take a long time for final encoding

Interactive Animation

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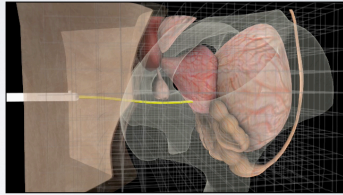
- Video Games



Interactive Animation

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- "Serious" Games



Motion Blur

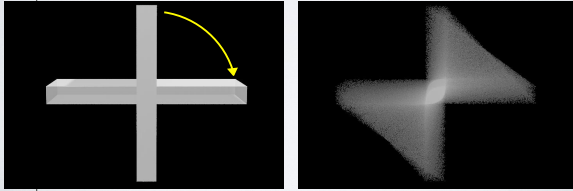
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- Fast moving things look blurry
 - Human eye
 - Finite exposure time in cameras
- Without blur: strobing and aliasing
- Blur over part of frame interval
 - Measured in degrees (0..360)
 - 30 tends to often look good

Motion Blur

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- Easy to do in a sampling framework
- Interpolation is an issue



Motion Blur

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- Velocity based blur often works poorly

