CS 4204 Computer Graphics

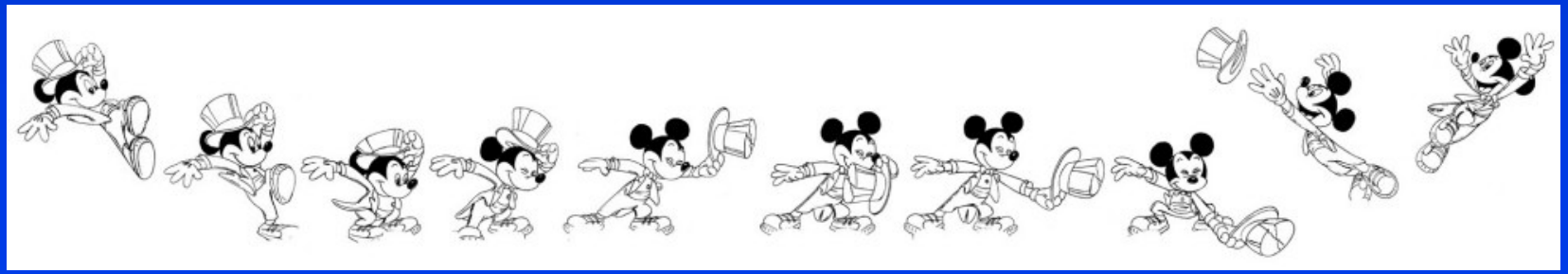
Computer Animation

Yong Cao

Virginia Tech

Objective

- *Principles of Animation*
- *Keyframe Animation*

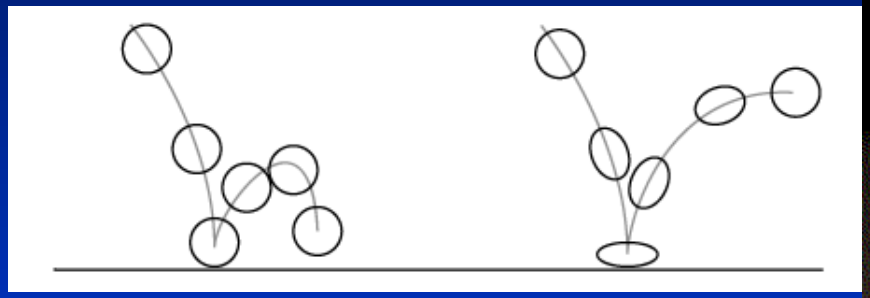


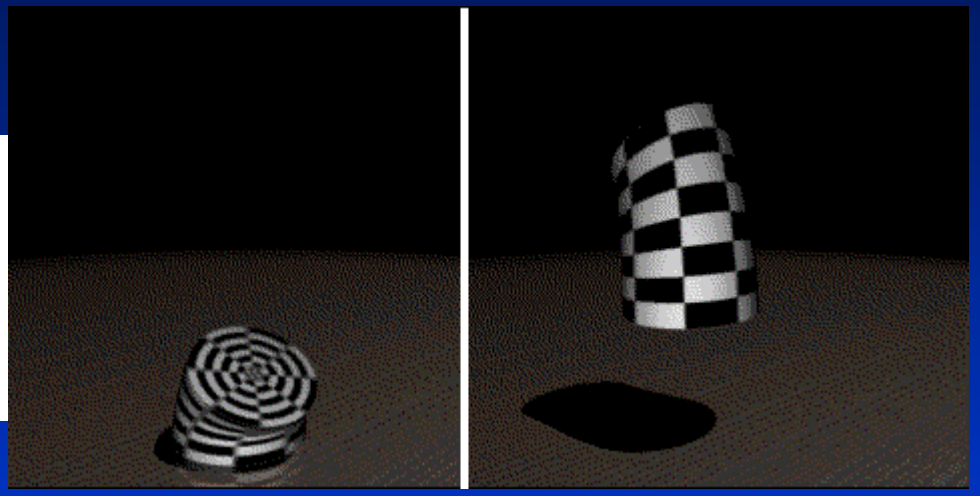
Principle of Traditional Animation – Disney

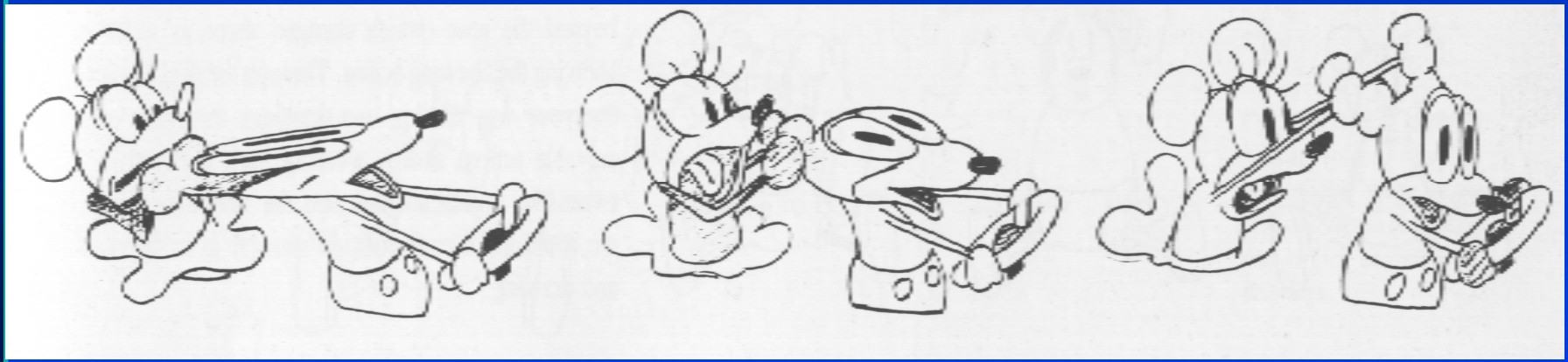
- *Squash and Stretch*
- *Slow In and Out*
- *Anticipation*
- *Exaggeration*
- *Follow Through and Overlapping Action*
- *Timing*
- *Staging*
- *Straight Ahead Action and Pose-to-Pose Action*
- *Arcs*
- *Secondary Action*
- *Appeal*

http://www.siggraph.org/education/materials/HyperGraph/animation/character_animation/principles/prin_trad_anim.htm

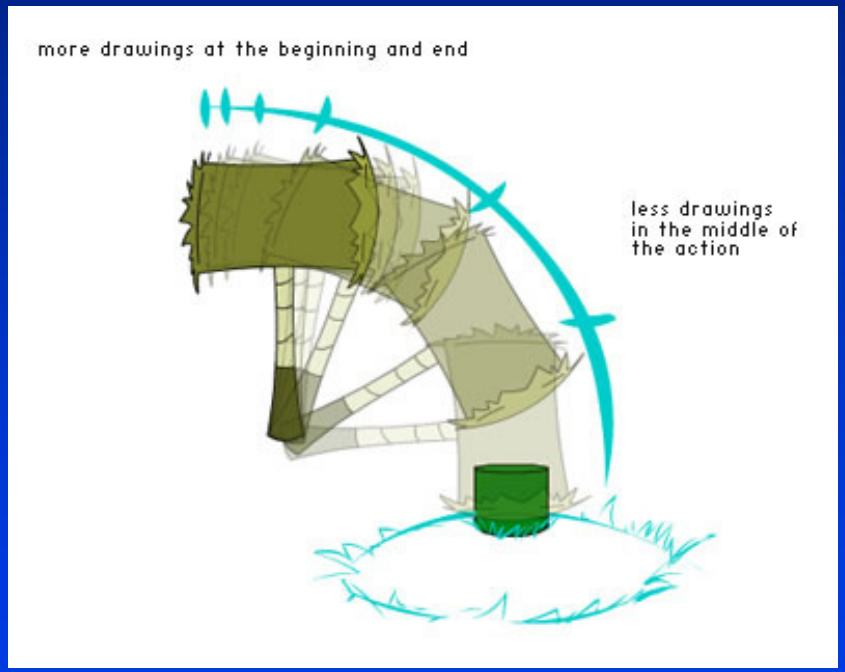
Squash and Stretch

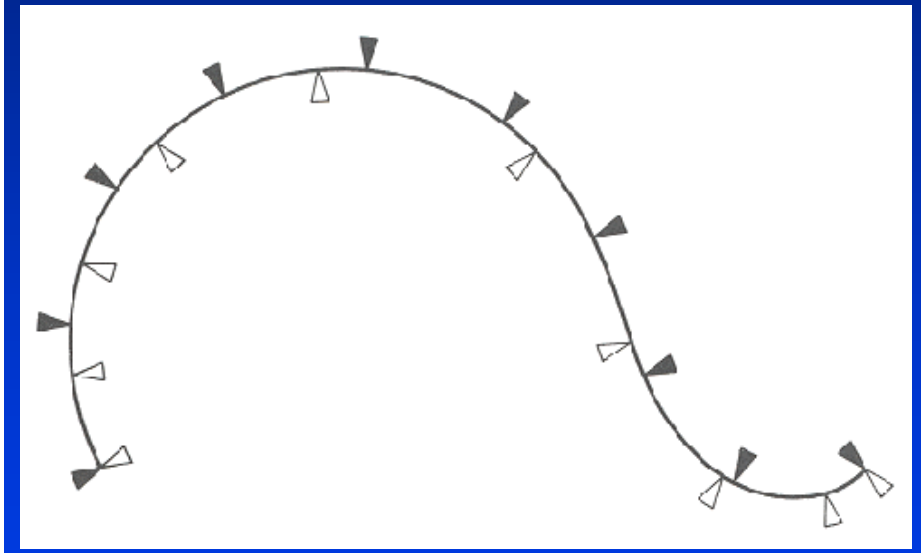




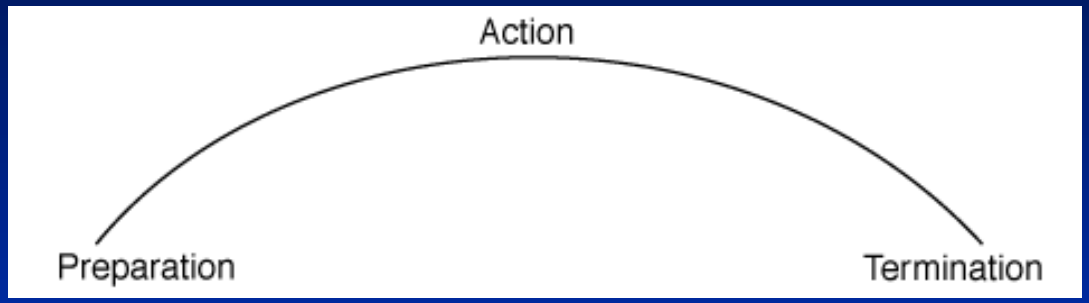


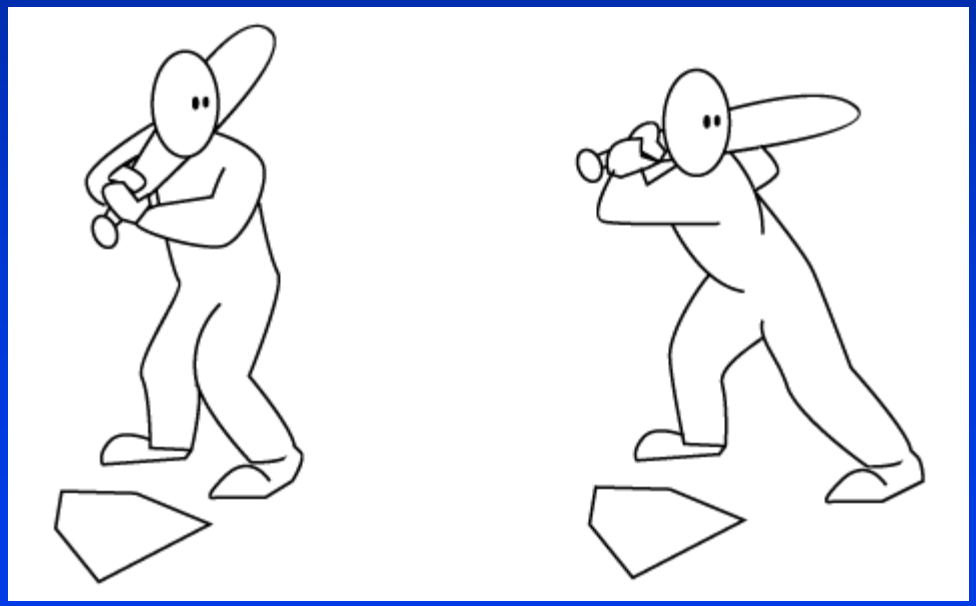
Slow In and Out



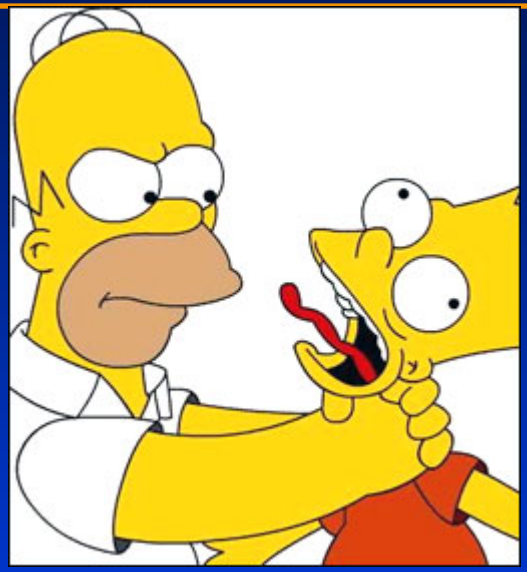


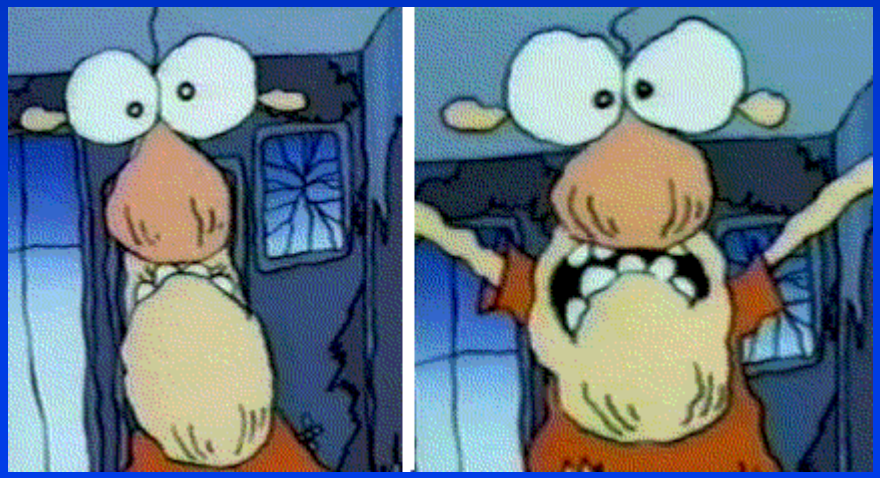
Anticipation





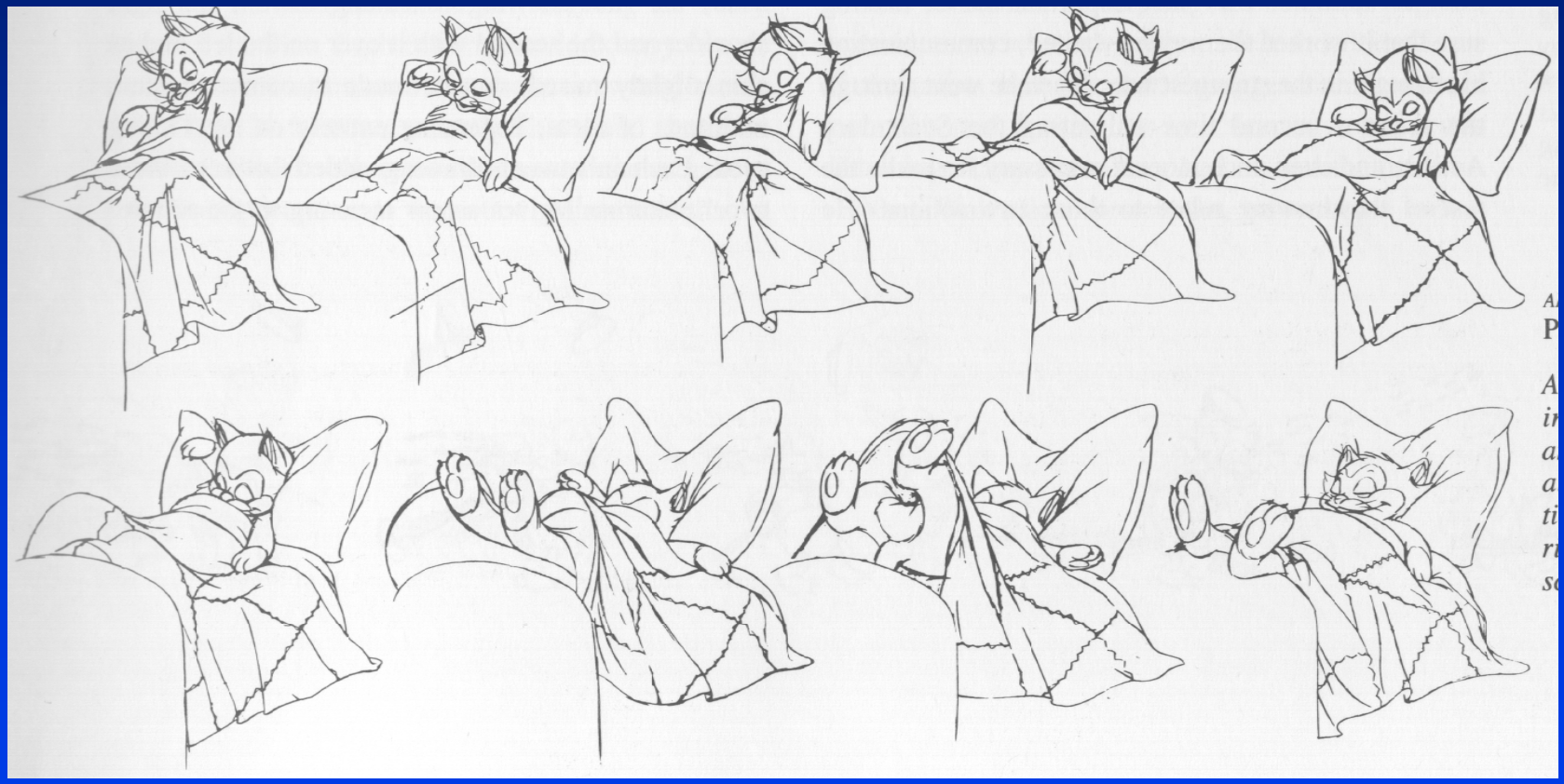
Exaggeration





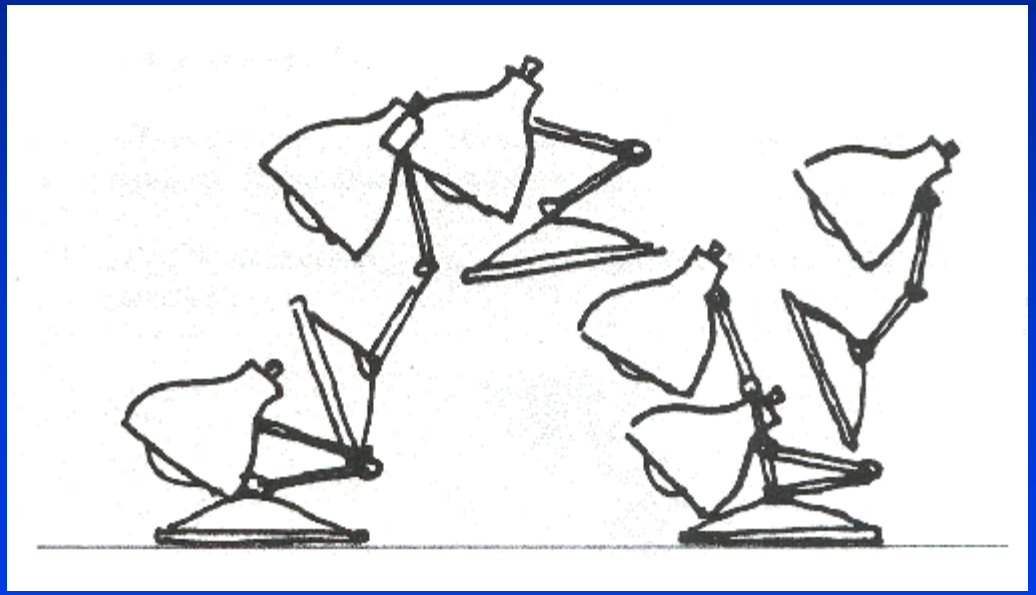
Timing and Follow through

Secondary actions



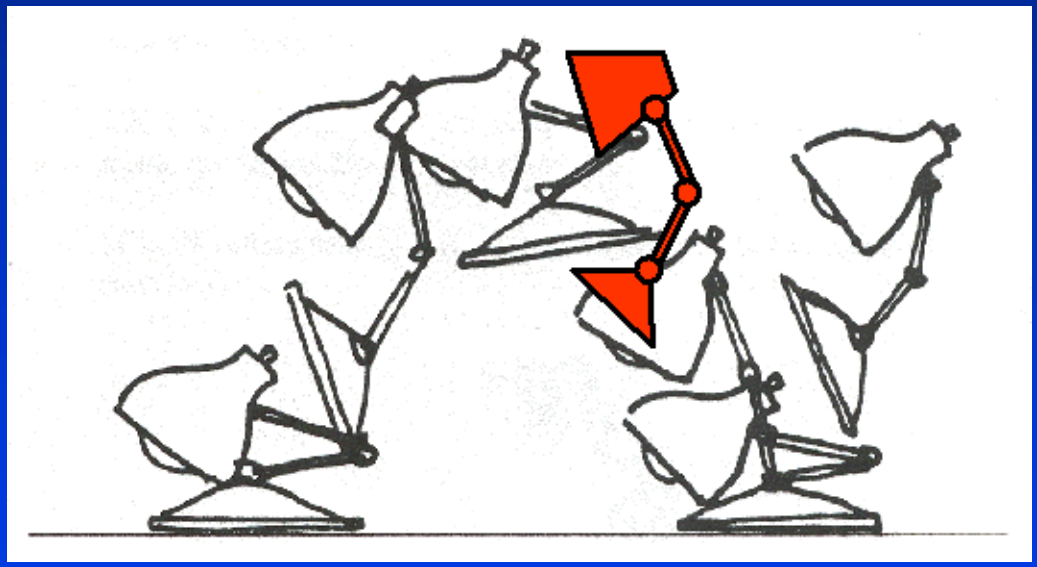
Keyframe Animation

Define Character Poses at Specific Time Steps Called "Keyframes"



Keyframe Animation

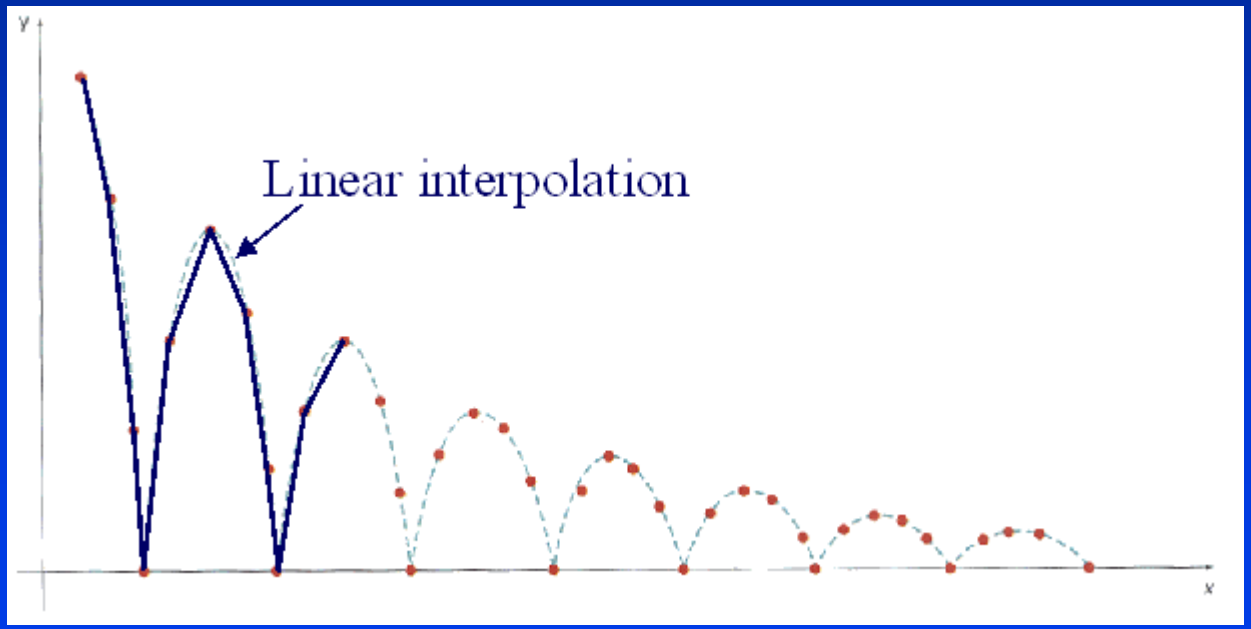
Interpolate Variables Describing Keyframes to Determine Poses for Character in between



In-betweening

Linear Interpolation

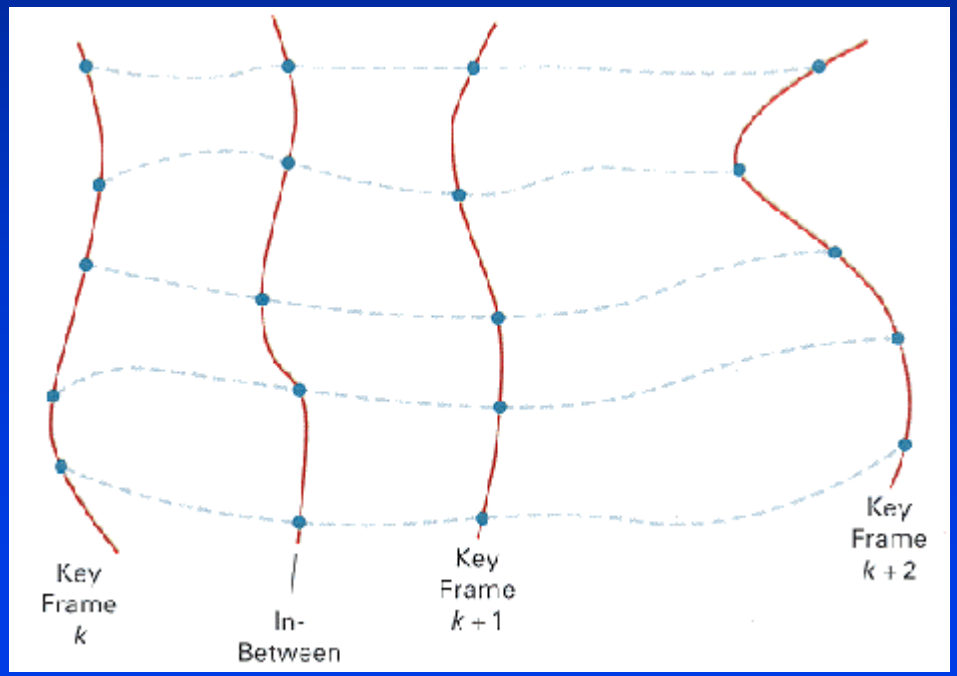
Usually not enough continuity



In-betweening

Spline Interpolation

Maybe good enough

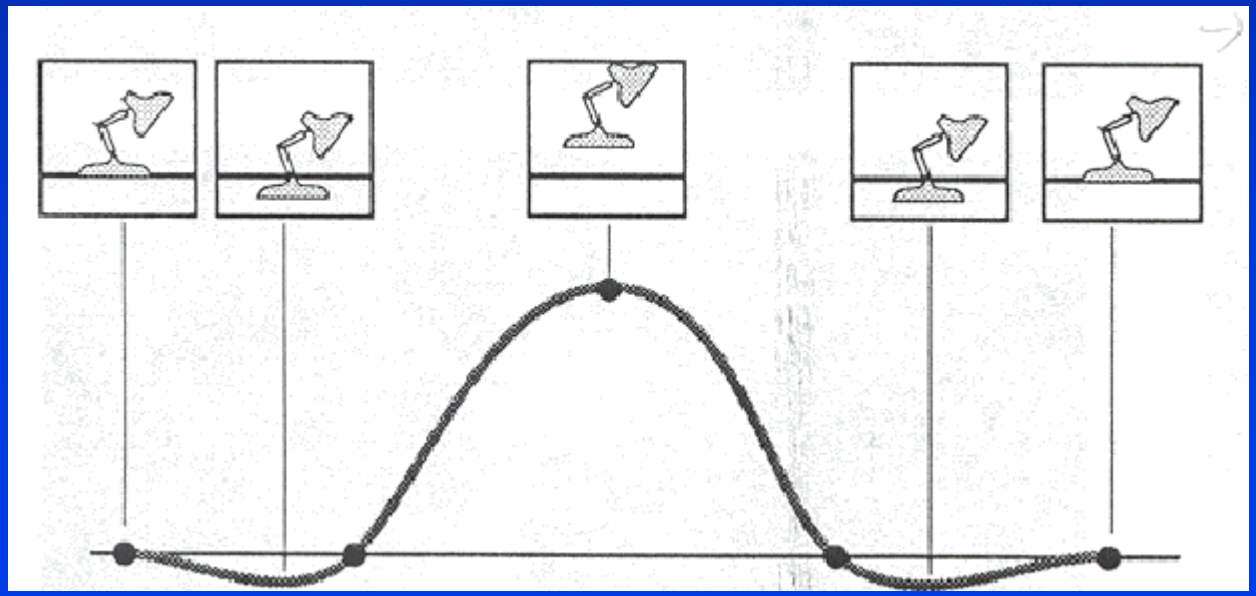


In-betweening

Cubic Spline Interpolation

Maybe good enough

May not follow physical laws !!

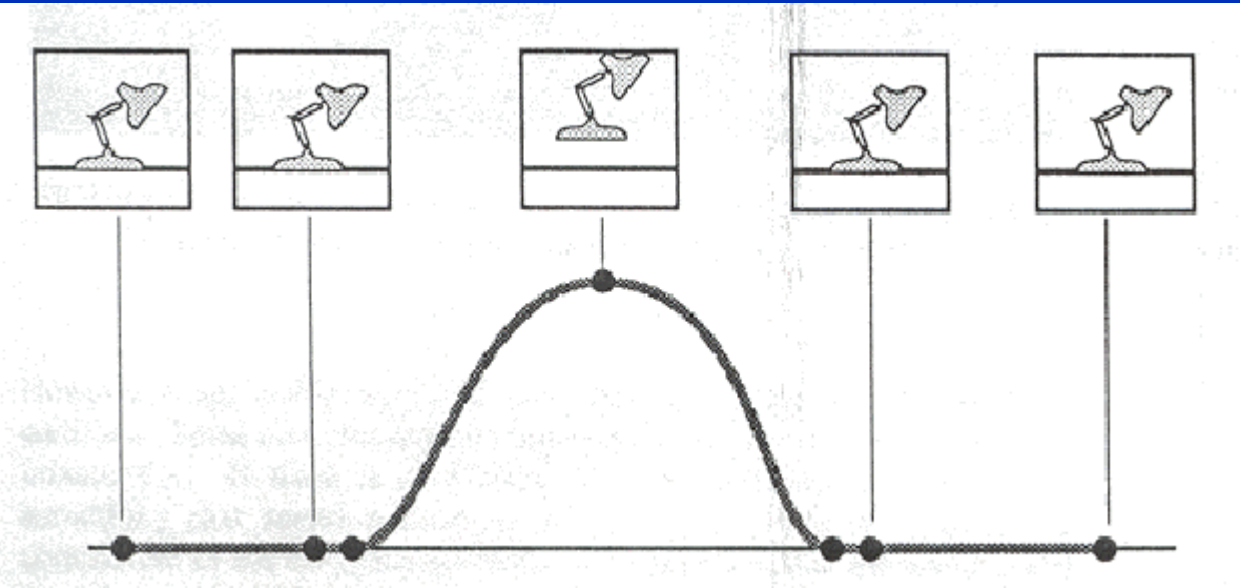


In-betweening

Cubic Spline Interpolation

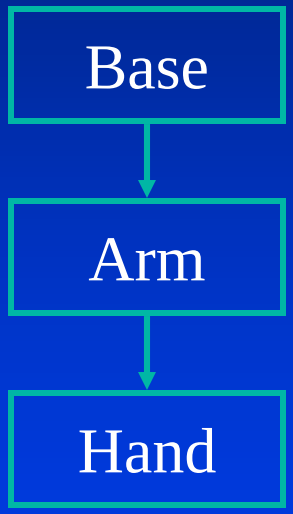
Maybe good enough

May not follow physical laws !!

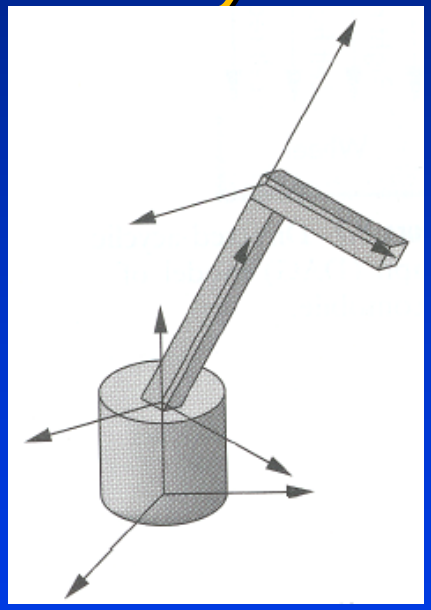


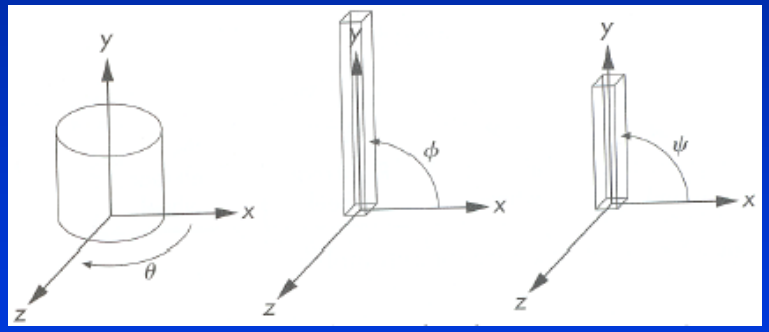
Articulated Figures

Character Poses Described by Set of Rigid Bodies Connected by "Joints"



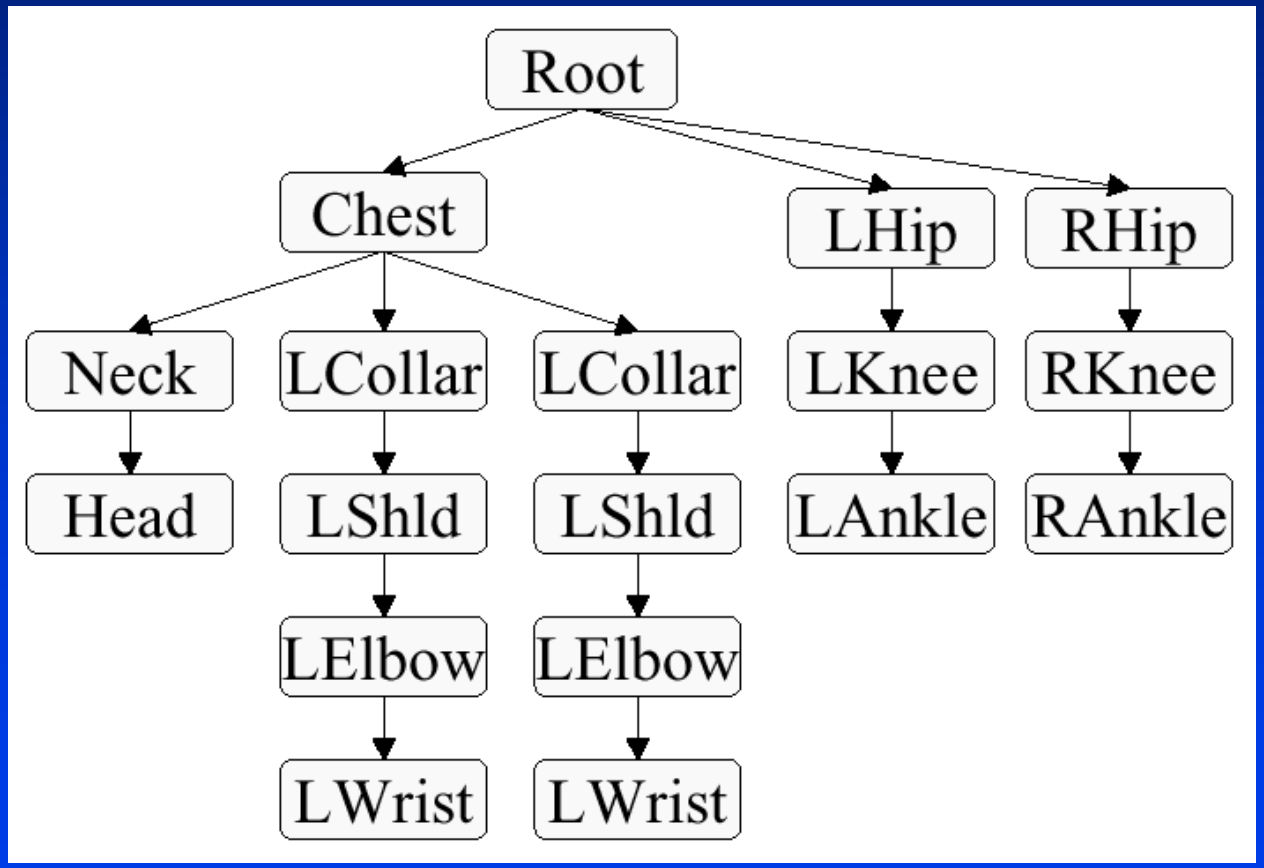
Scene Graph

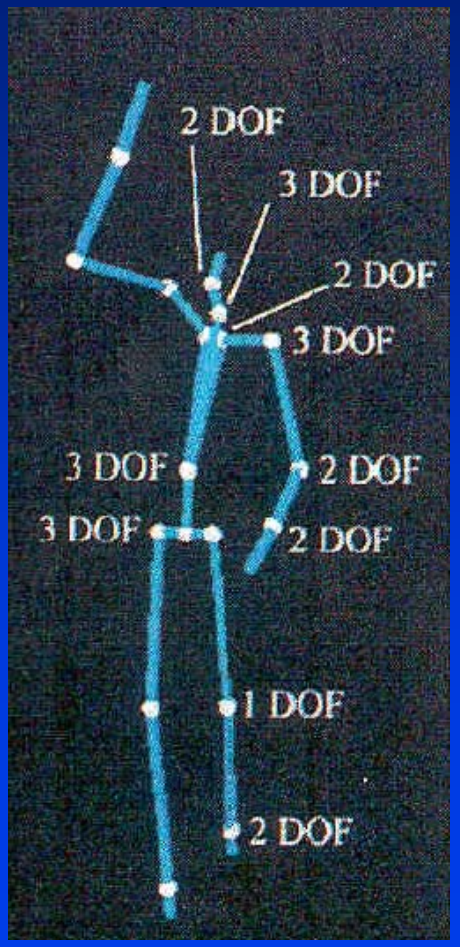




Articulated Figures

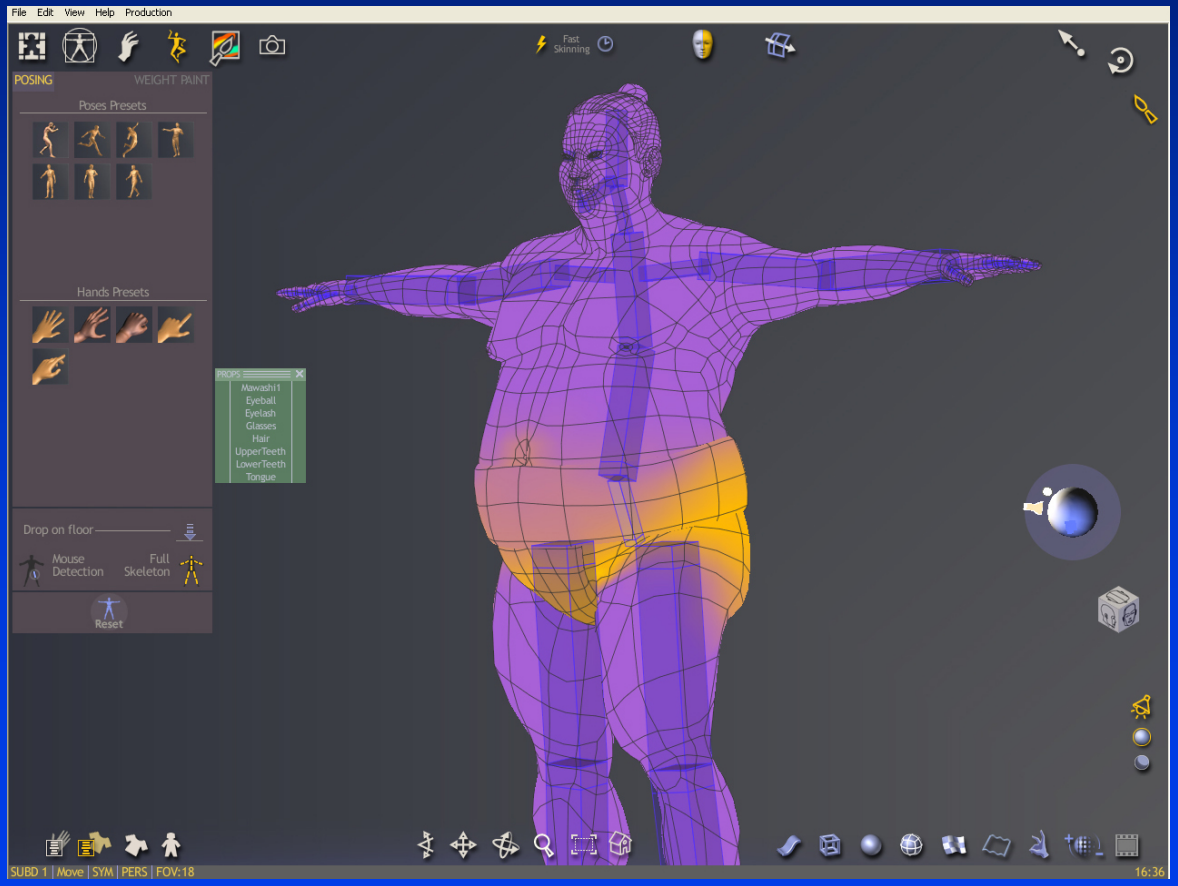
Well-Suited for Humanoid Characters





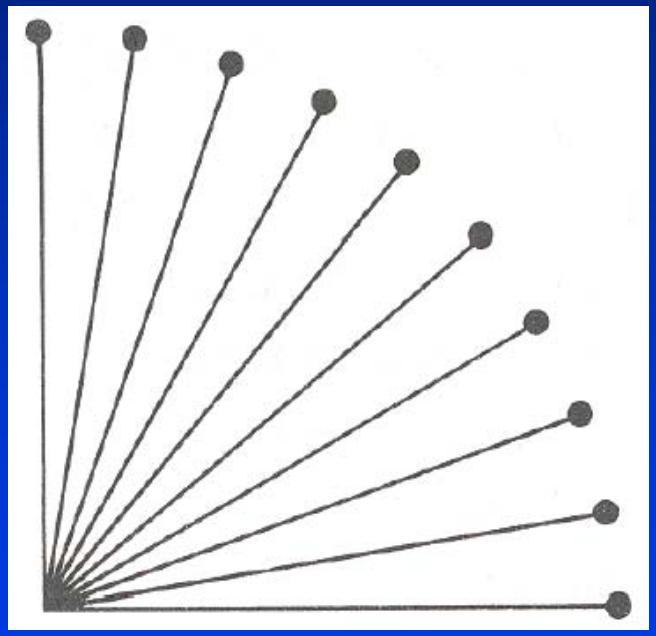
Articulated Figures

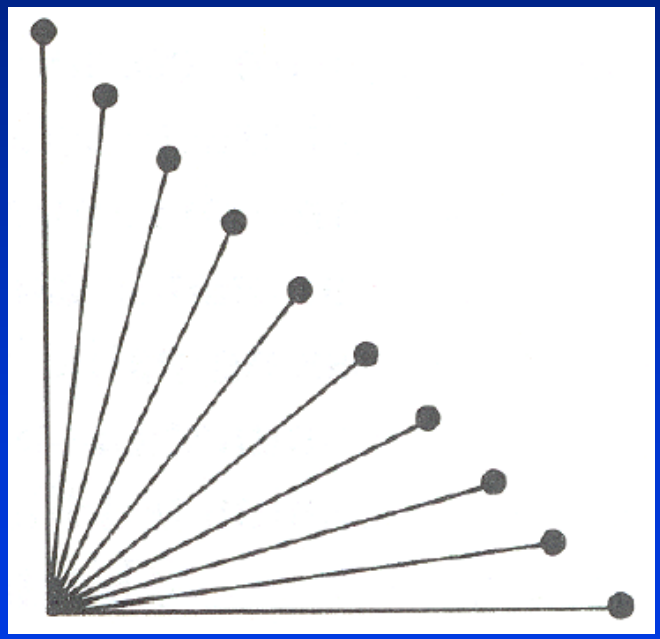
Joints Provide Handles for Moving Articulated Figure



In-betweening

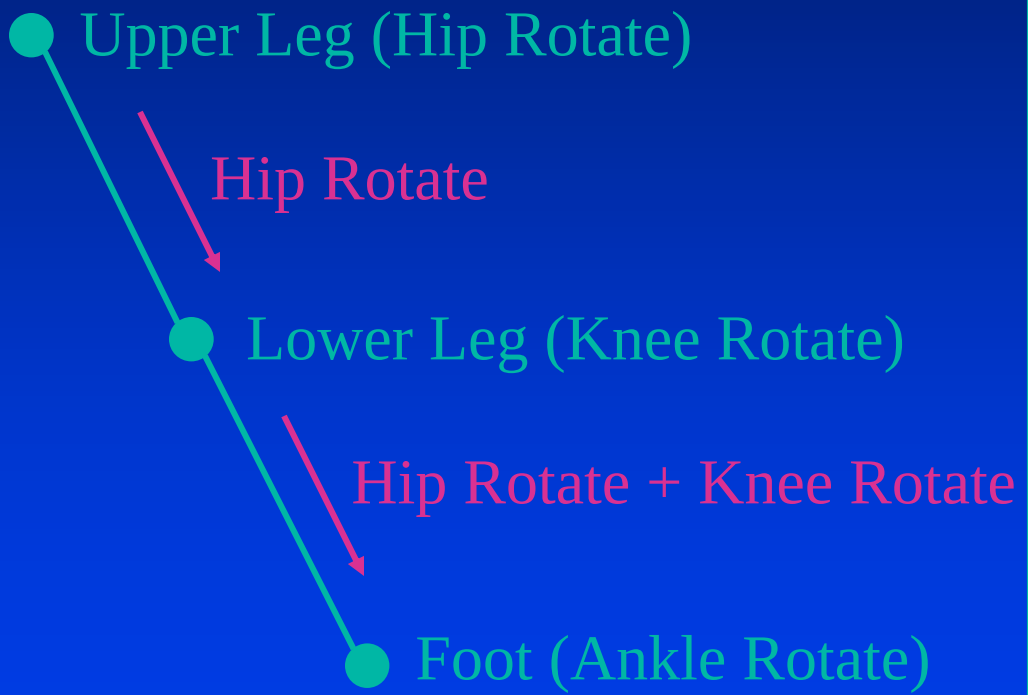
Compute Joint Angles between Keyframes





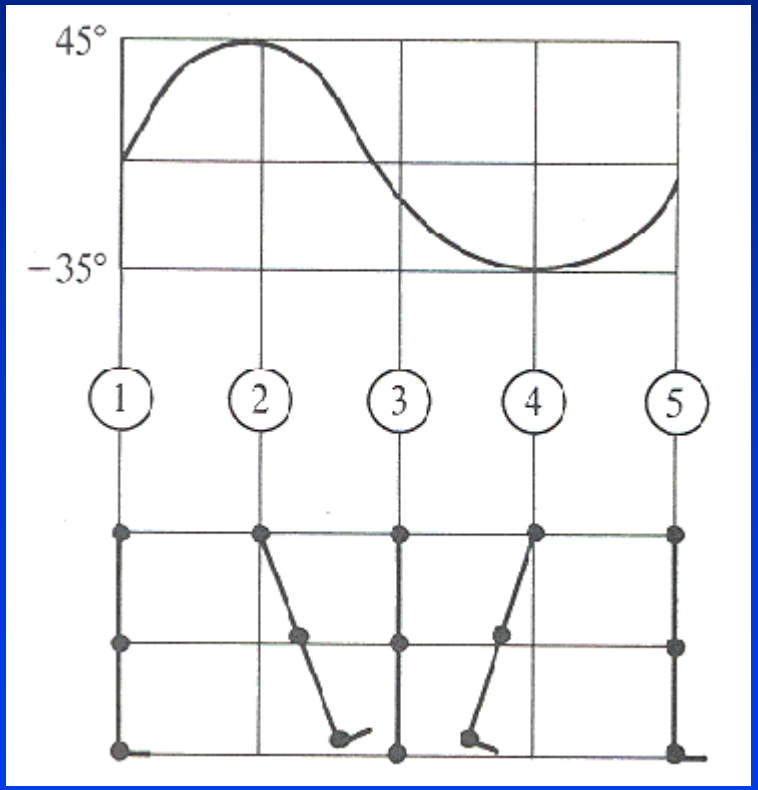
Example: Walk Cycle

Articulated Figure:



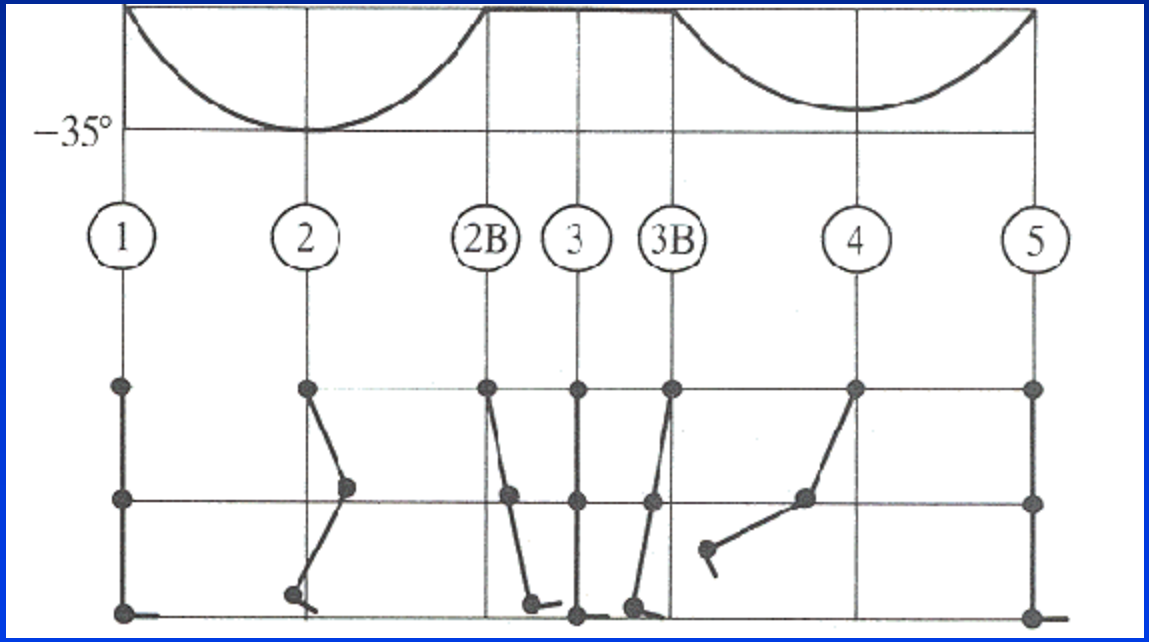
Example: Walk Cycle

Hip Joint Orientation:



Example: Walk Cycle

Knee Joint Orientation:



Example: Walk Cycle

Ankle Joint Orientation: