Computer Animation

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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
- Arches
- 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

more drawings at the beginning and end

less drawings in the middle of the action
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”*

- Base
- Arm
- Hand

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:

- Hip
- Upper Leg
  - Knee
  - Lower Leg
  - Ankle
  - Foot
- Upper Leg (Hip Rotate)
- Hip Rotate
- Lower Leg (Knee Rotate)
  - Hip Rotate + Knee Rotate
- Foot (Ankle Rotate)
Example: Walk Cycle

*Hip Joint Orientation:*
Example: Walk Cycle

**Knee Joint Orientation:**
Example: Walk Cycle

Ankle Joint Orientation: