Animation I

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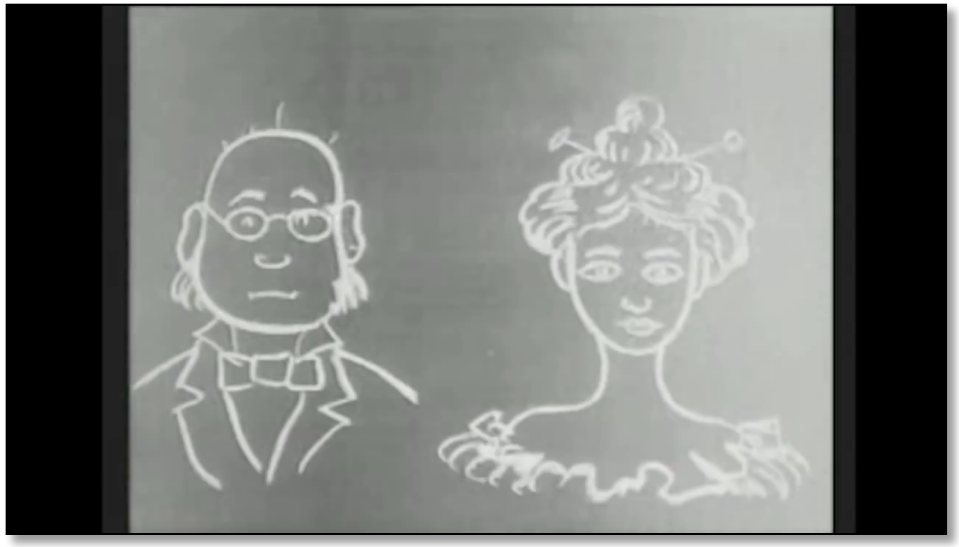
Animation

- Animation (technically): Creating sequences of images
- Animation (artistically): Bringing images to life!
  (anima ~ soul, breath of life)

Animation

- A glimpse on the history of animation

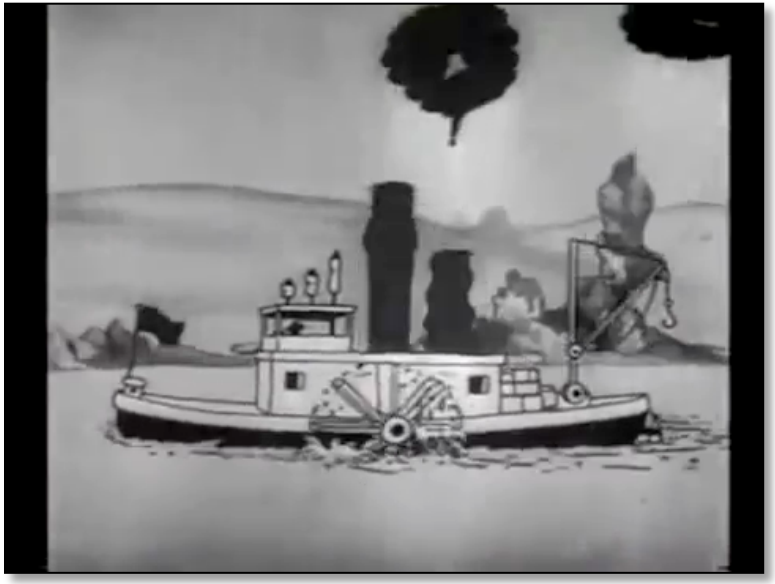
1906

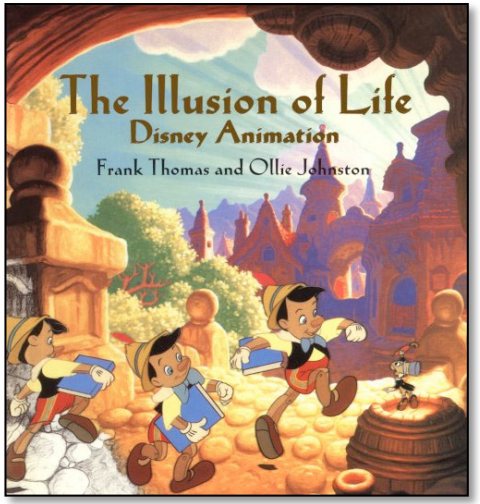


Animation

- A glimpse on the history of animation

1928



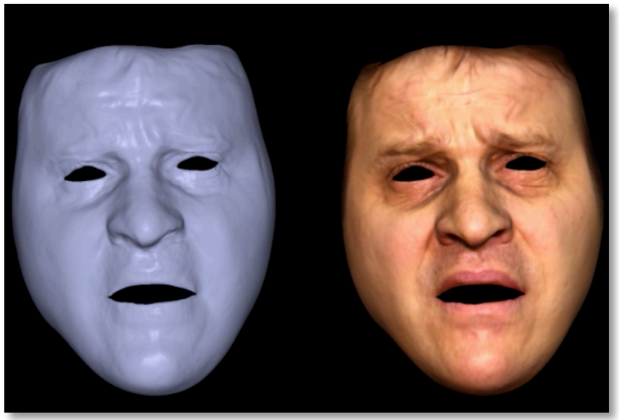


Animation

- What do we animate?

Characters

Faces

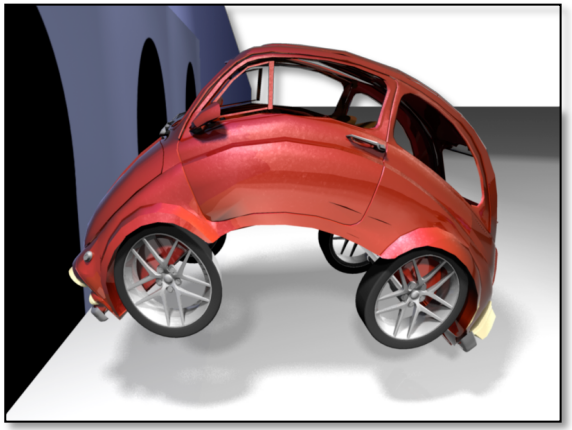


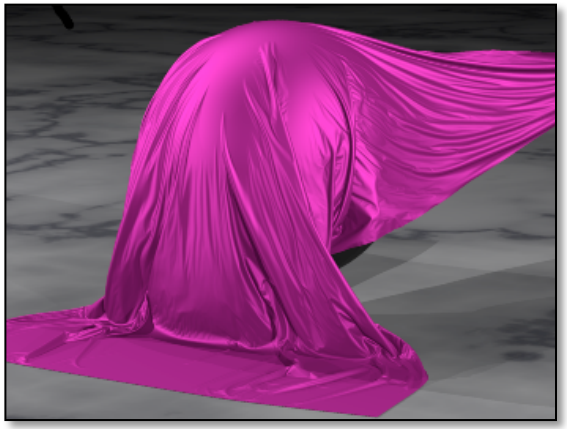
Hair

Animation

- What do we animate?

Elastic Materials Natural Phenomena Cloths

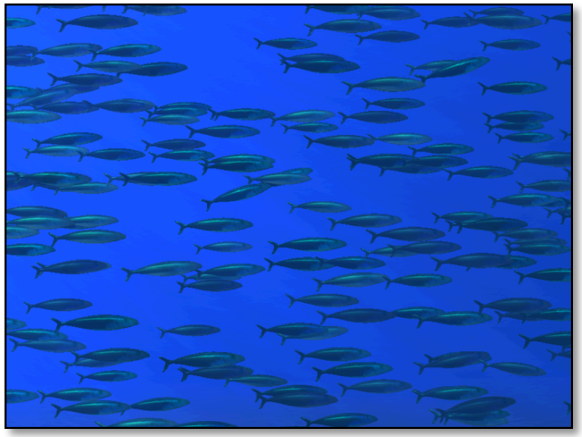




Animation

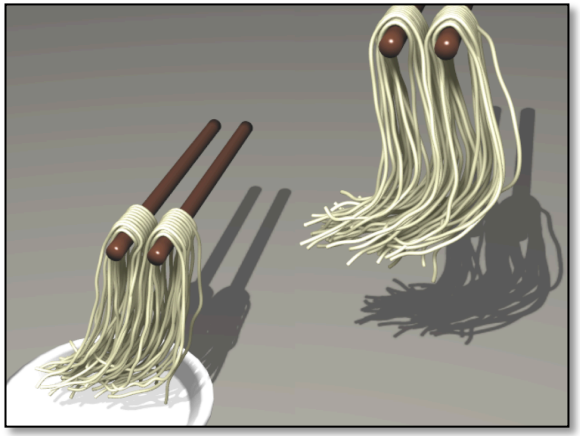
- What do we animate?

Herds



Crowds

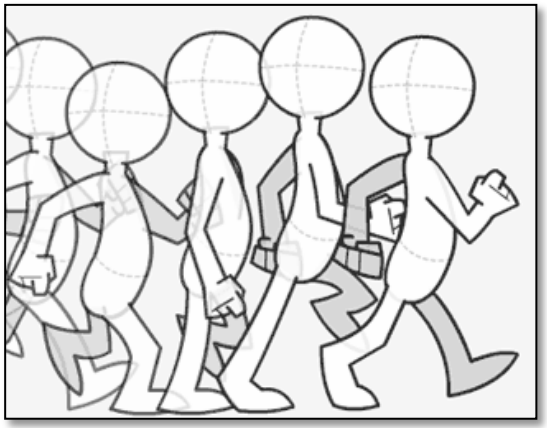
and More



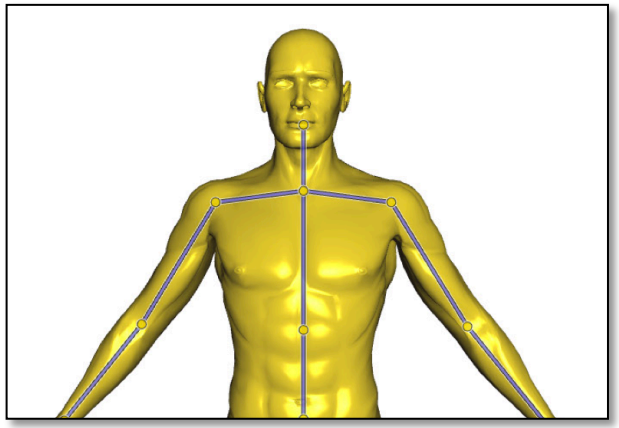
Animation

- How do we animate?

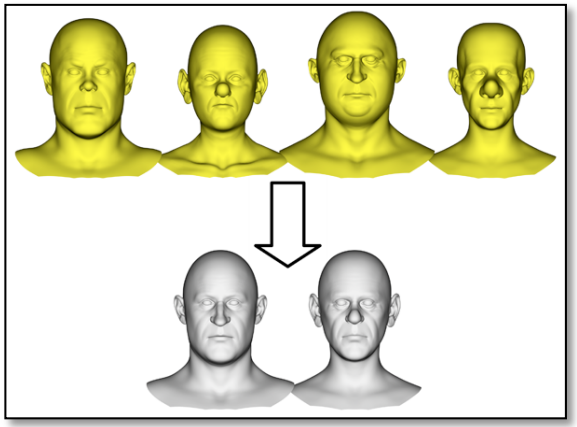
Key-framing



Skeletal



Subspace/parameters

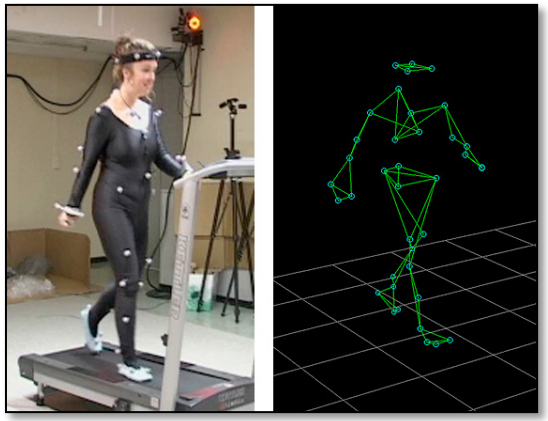


Animation

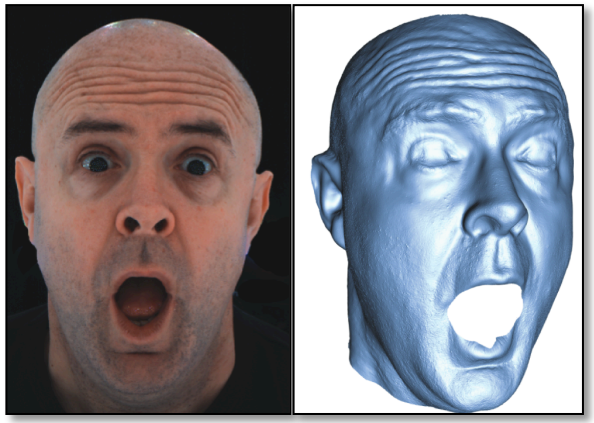
- How do we animate?

Physically-based

Motion capture



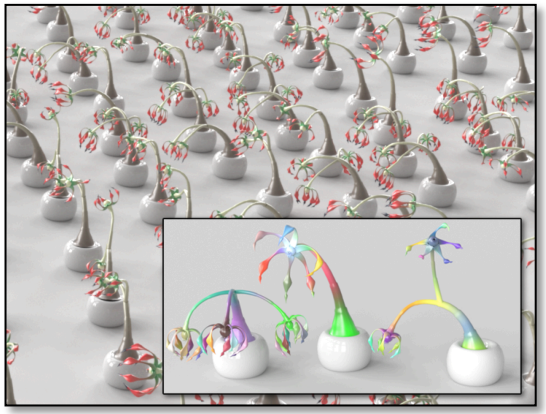
Video-based



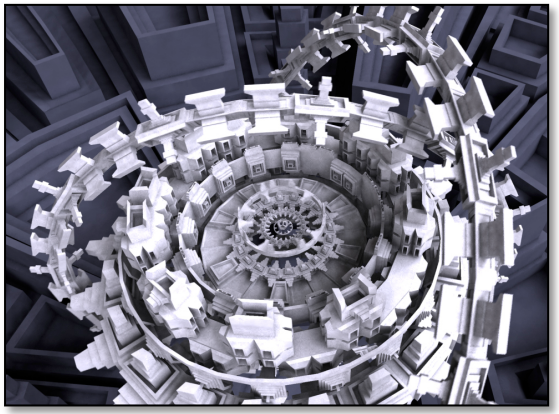
Animation

- How do we animate?

Example-based



Procedural

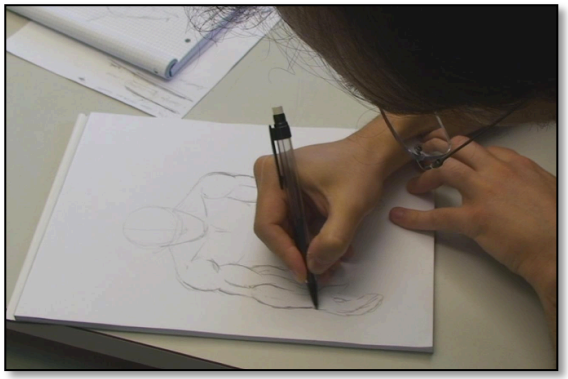


and More

Animation

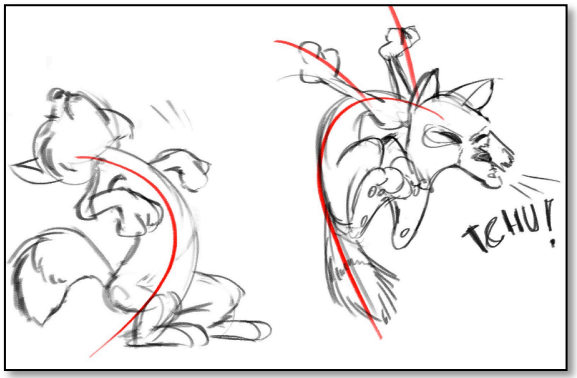
- Considerations

Control!



Efficiency

Realism & Style



Character Animation

- Character animation
  - Characters are indispensible for movies & games
  - Fast deformations with intuitive controls
  - Integrated into all major 3D modeling applications
  - Not limited to human characters

Character Animation

- Animation pipeline

1. Story boarding
   - A board for setting up the story
   - Helps planning animation

Character Animation

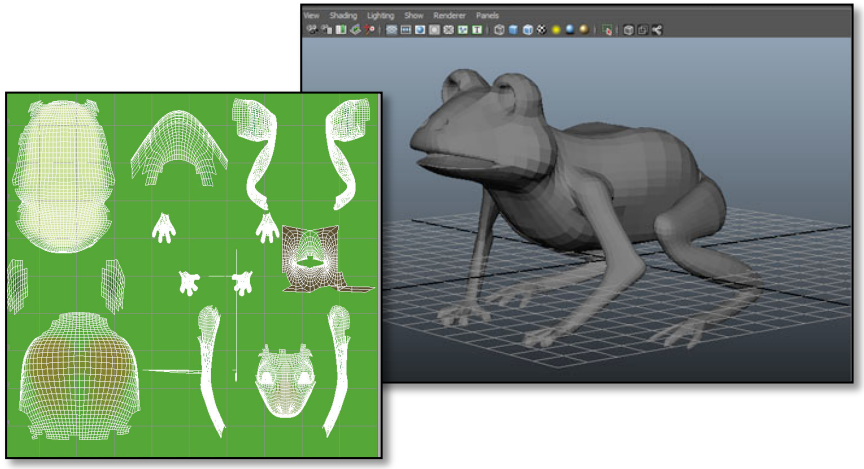
- Animation pipeline

2. Concept design
   - Sketches for characters & environment
   - Main features of the characters

Character Animation

- Animation pipeline

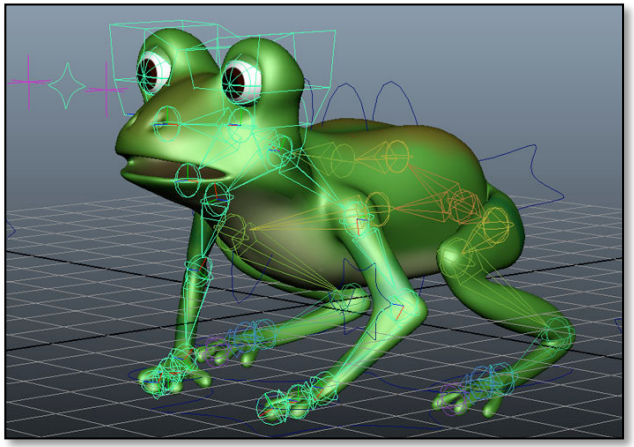
3. 3D Modeling
   - Moving to computers
   - Geometry & Textures



Character Animation

- Animation pipeline

4. Rigging
   - Embedding animation controllers
   - Construct a skeleton
   - Attach additional controls
   - Key-frame the controllers for animation



Character Animation

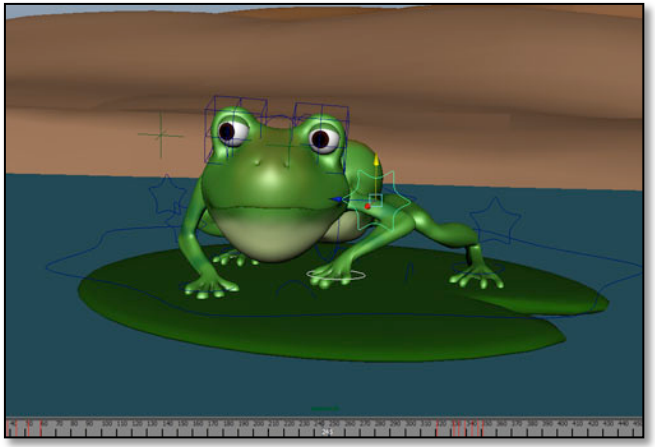
- Animation pipeline

5. Blend shapes creation
   - Create facial expressions
   - Used to generate other expressions via blending

Character Animation

- Animation pipeline

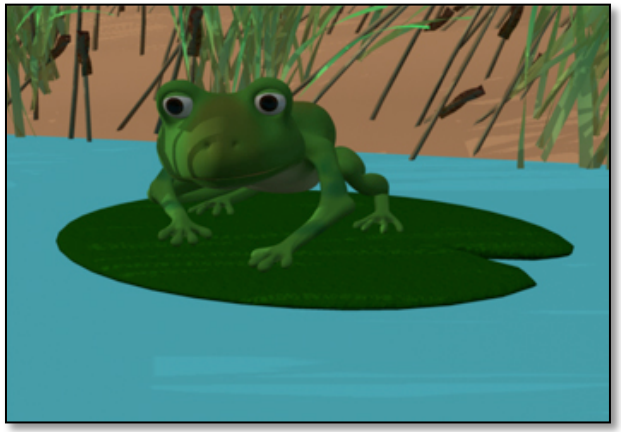
6. Animation
   - Set key-frames for controllers
   - Steer interpolation & timing with time controls



Character Animation

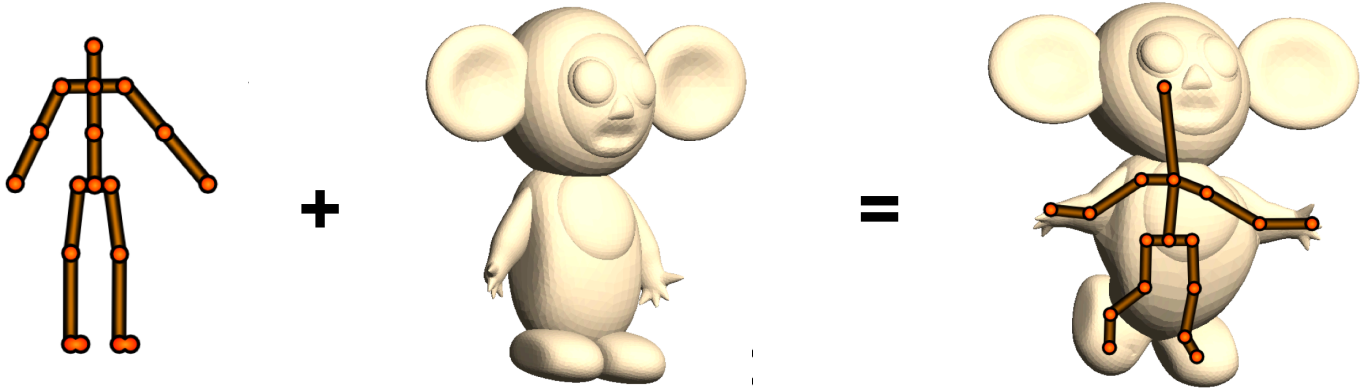
- Animation pipeline

7. Post-effects
   - Other animations (fluids, etc.)
   - Lighting & shading
   - Rendering



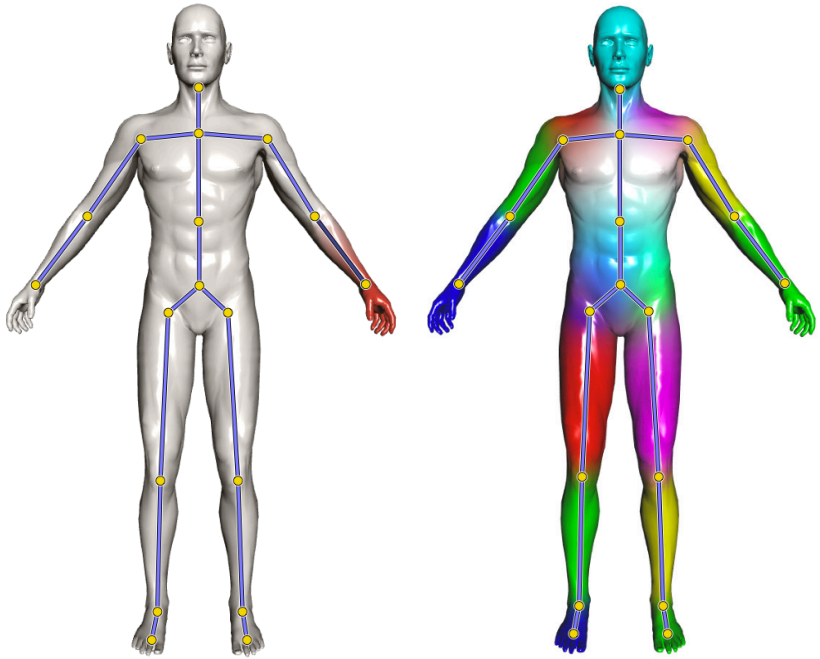
Character Animation

- Rigging
  - Attaching a skeleton to a model
  - Skeleton is key-framed to animate the model



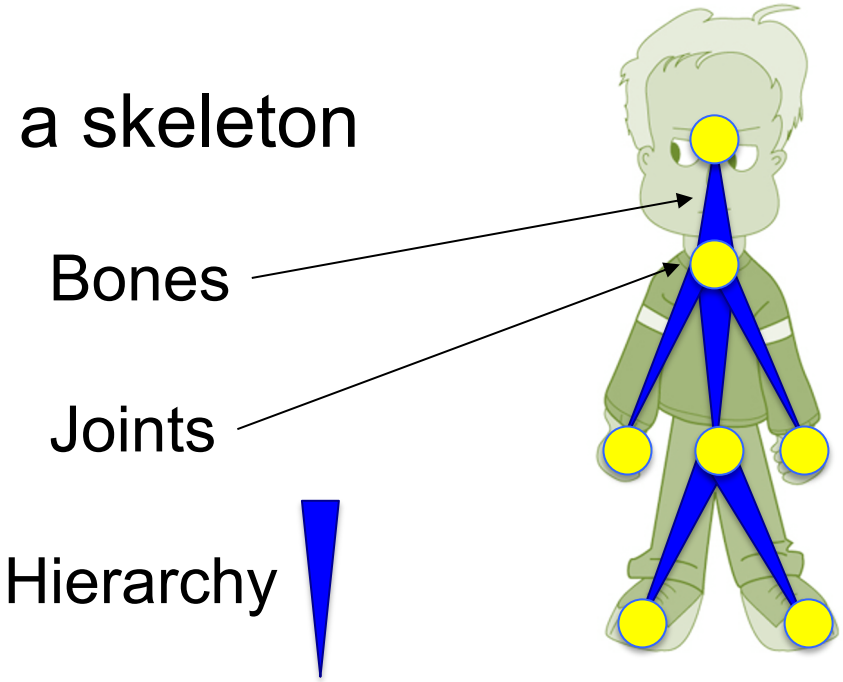
Character Animation

- Rigging
  - Embed the skeleton
  - Attach the bones to the model



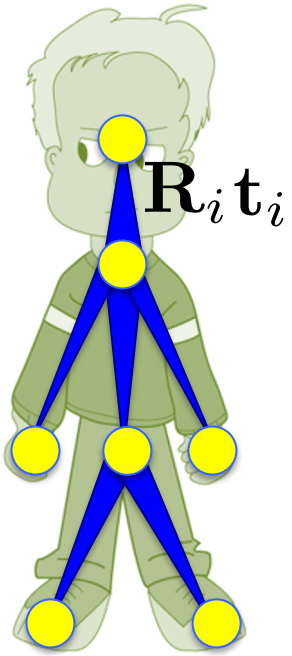
Character Animation

- Rigging
  - What is a skeleton



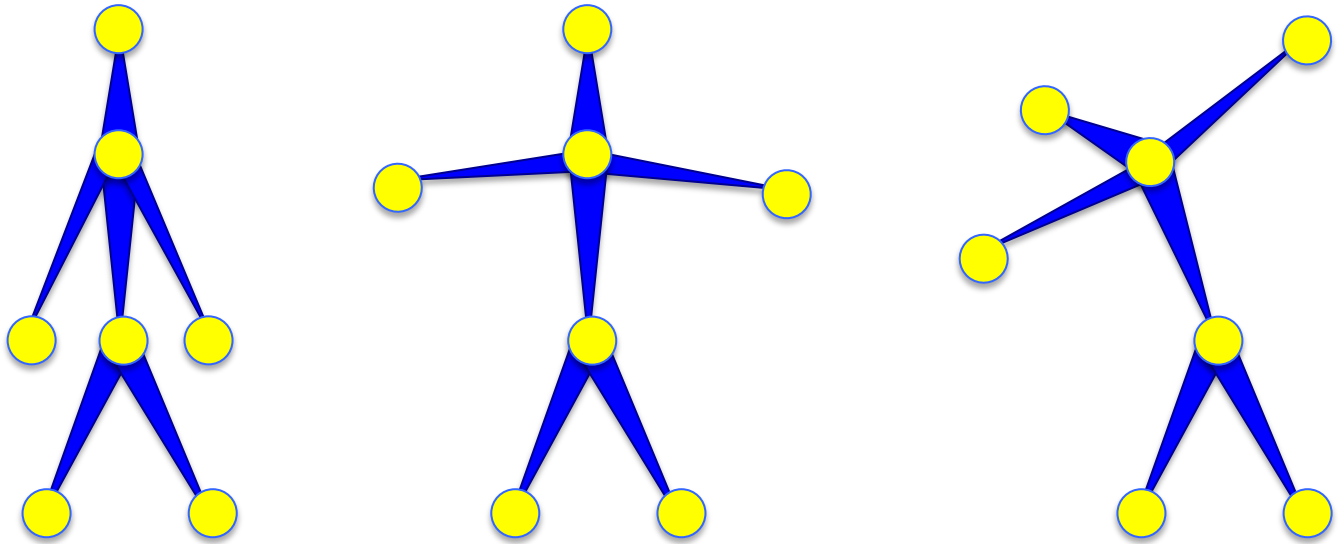
Character Animation

- Rigging
  - What is stored in a skeleton
    - Rigid transformations
    - On bones or joints
    - Bones can be transformed rigidly



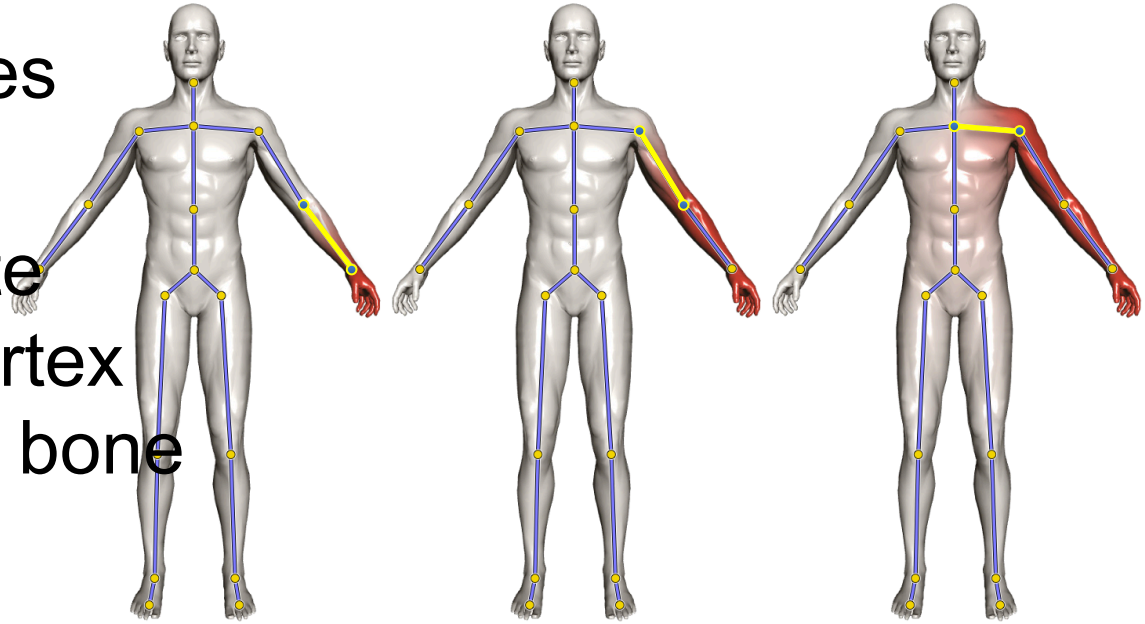
Character Animation

- Rigging
  - Bones can be transformed rigidly



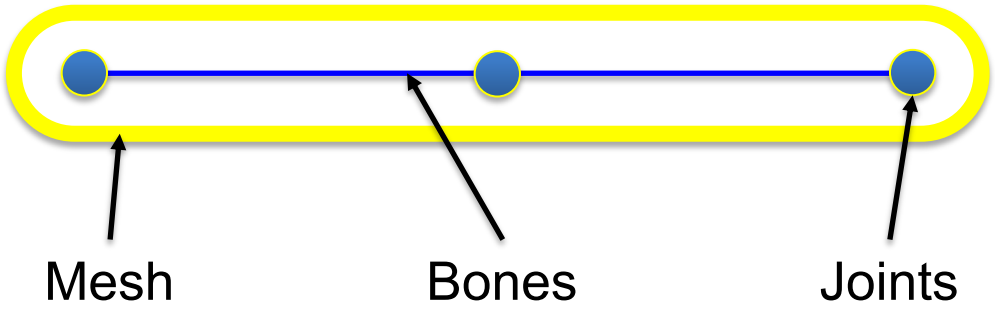
Character Animation

- Rigging
  - Attach the bones to the model
  - Weights indicate how much a vertex is effected by a bone



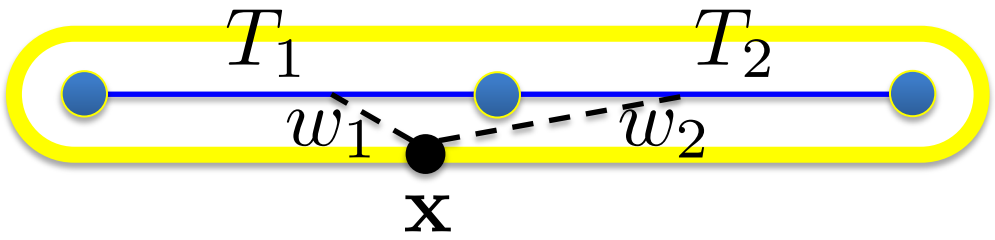
Character Animation

- Rigging
  - Attach the bones to the model



Character Animation

- Rigging
  - Attach the bones to the model



$$T(\mathbf{x}) = \text{avg}(T_1, T_2, w_1, w_2)$$

Character Animation

- Rigging
  - How to blend (average) transformations

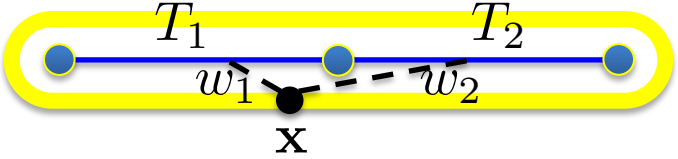
    Linear Blend Skinning

    Represent T_i with $\mathbf{T}_i$

    in homogenous coordinates

$$\mathbf{T}(\mathbf{x}) = w_1(\mathbf{x})\mathbf{T}_1 + w_2(\mathbf{x})\mathbf{T}_2$$

$$\mathbf{x}' = \mathbf{T}(\mathbf{x})\mathbf{x}$$



$$T(\mathbf{x}) = \mathrm{avg}(T_1, T_2, w_1, w_2)$$