Character Skinning

COS 426
Kinematic Skeletons

- Hierarchy of transformations ("bones")
  - Changes to parent affect all descendent bones

- So far: bones affect objects in scene or parts of a mesh
  - Equivalently, each point on a mesh acted upon by one bone
  - Leads to discontinuities when parts of mesh animated

- Extension: each point on a mesh acted upon by more than one bone
Linear Blend Skinning

• Each vertex of skin potentially influenced by all bones
  ○ Normalized weight vector $w^{(v)}$ gives influence of each bone transform
  ○ When bones move, influenced vertices also move

• Computing a transformation $T_v$ for a skinned vertex
  ○ For each bone
    » Compute global bone transformation $T_b$ from transformation hierarchy
  ○ For each vertex
    » Take a linear combination of bone transforms
    » Apply transformation to vertex in original pose

$$T_v = \sum_{b \in B} w_b^{(v)} T_b$$

• Equivalently, transformed vertex position is weighted combination of positions transformed by bones

$$v_{\text{transformed}} = \sum_{b \in B} w_b^{(v)} (T_b v)$$
Assigning Weights

- Painted by hand
- Automatic: function of relative distances to nearest bones
- Smoothness of skinned surface depends on smoothness of weights!