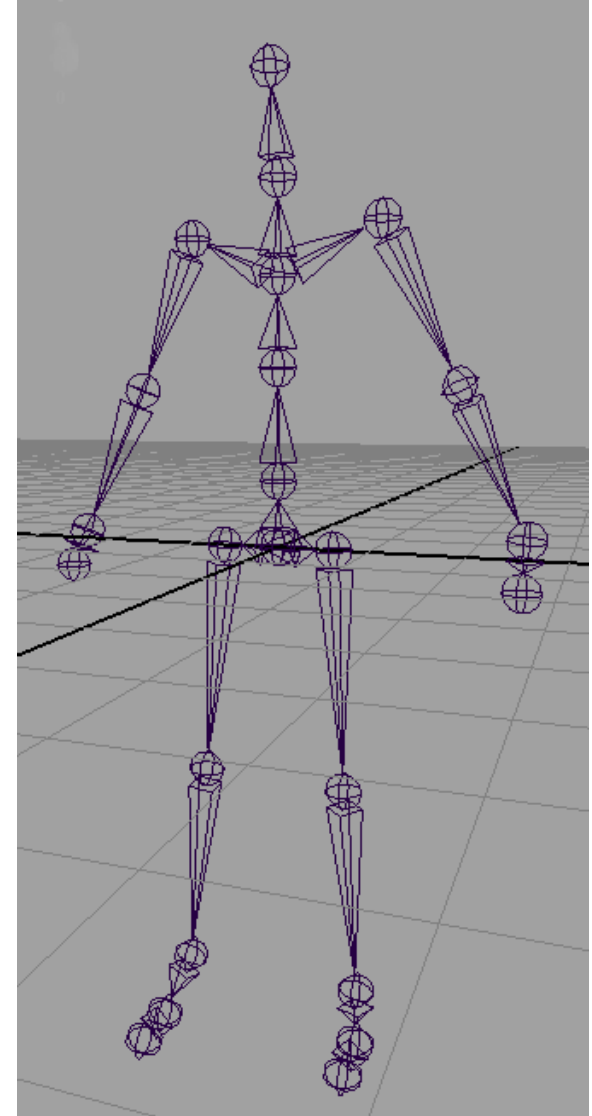# Character Skinning

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

$$v_{transformed} = \sum_{b \in B} w_b^{(v)} \left(T_b v \right)$$

Assigning Weights

- Painted by hand

- Automatic: function of relative distances to nearest bones

- Smoothness of skinned surface depends on smoothness of weights!