Animation in 3D

Rigging

What is rigging ?

- Adding bones, setting up bone constraints
  - Limitations on bone movement
  - Automatic behaviours (aim-at, rotate-like)
- Setting up default “poses”
  - “muscles” (positions, effects)
  - Setting up combined bone and muscle poses
- Setting up sliders to control poses

- NOTE: terminology varies with software

Why rig characters ?

- Easier, faster animation
- Greater productivity
- More realistic/consistent animation
  - e.g. knees don't bend backwards
- Less animator frustration

- The work of a Technical Director (TD)

Facial rigging

- Facial “muscles” for facial control
  - Facial expressions - emotions
  - Lipsynch – speech
- Study facial muscles
- Study emotions and their expression
- Limited number of mouth positions used to speak

Facial rigging

- Bone rigs – bones deform the surface
  - For programs that doesn't have muscles/skin
  - To a 3D program, the head is a hollow balloon
- Muscle rigs – muscles deform the surface
  - May or may not be connected to bones
- Skin rigs – deform the surface directly
- Morph targets – whole face variations?
- (Mathematical) Expressions – algorithms

More rigging concepts

- Animation:Master Smartskin = trueSpace muscles – surface movement dependent on bone movement
- Multi-frame poses – multiple states controlled by a single slider – different parts/rates

- Rule of thumb: make the extreme position even more extreme than you imagine you'll ever need
- Cheating – imagination supplies tweens

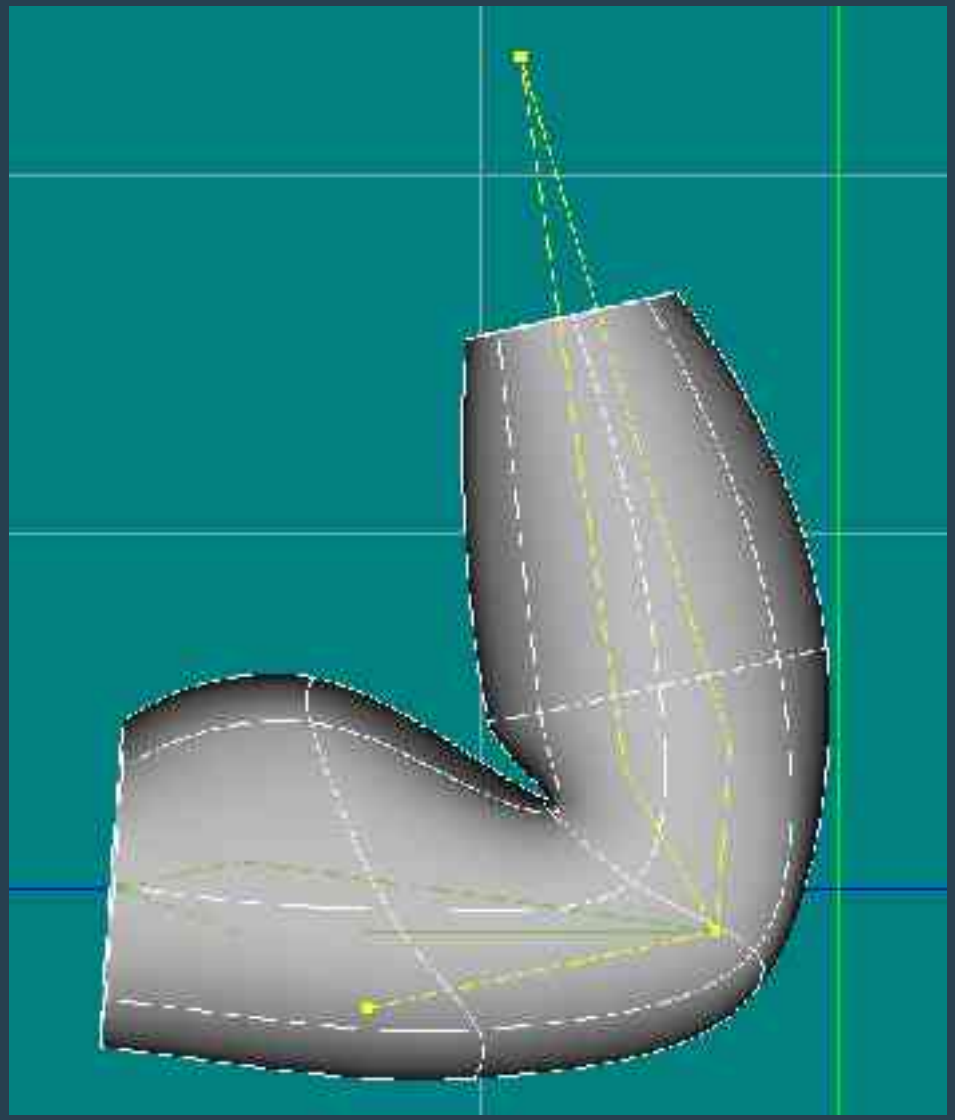
Facial muscle poses

- May or may not include jawbone
- Eyebrows
- Eyelids
- Mouth
  - Lips
  - Tongue
  - Cheeks
  - Nose “wings”
- Emotion / lipsync

Body rigging

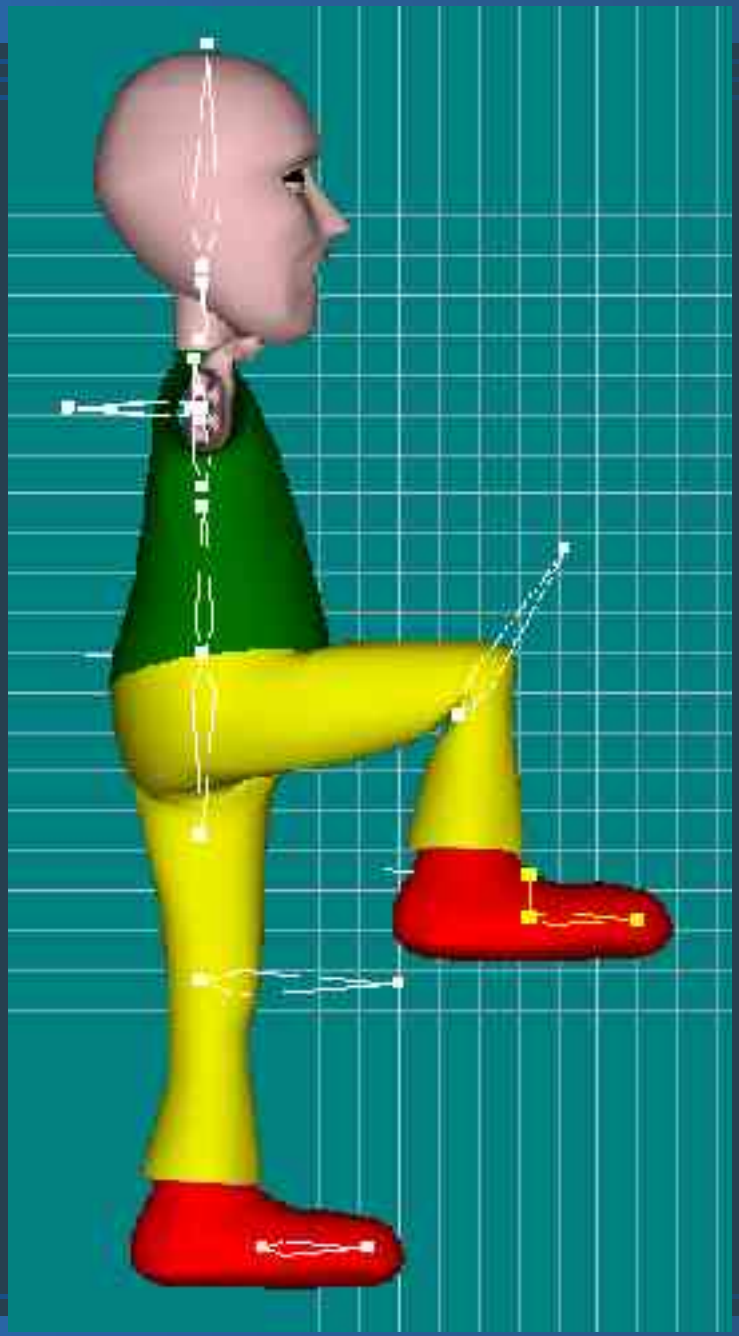
- Primarily skeletal
  - and related movement (e.g. bicep bulges)
- Some muscle / skin / morph targets
  - e.g. Breathing
- Bone rigging
  - Used for normal skeletal movement
- A study of anatomy is very useful
  - Especially when animating animals

Skeletal muscle pose



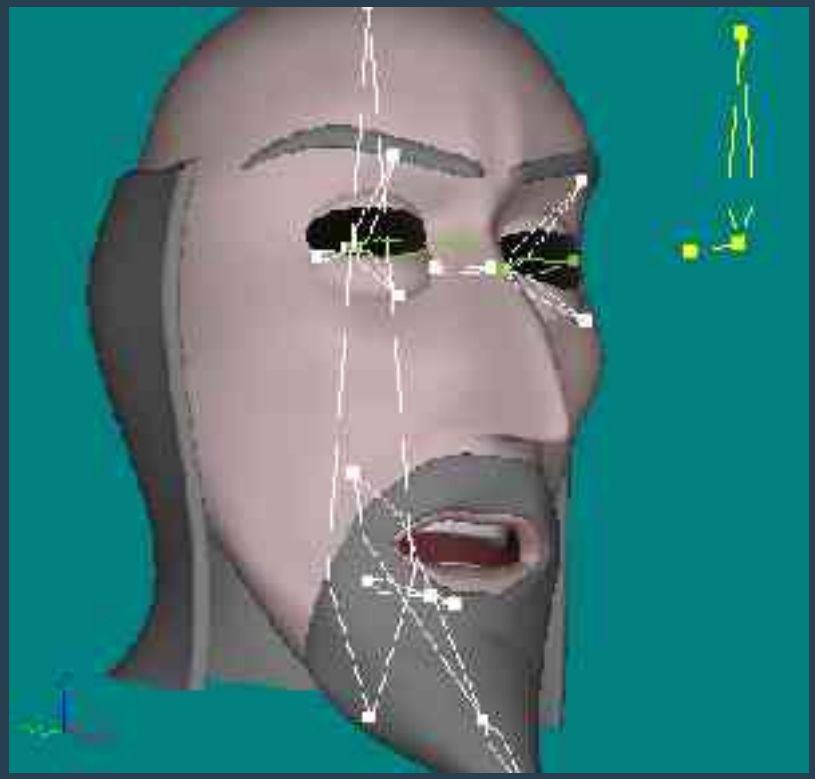
- Muscle / skin / expression / morph target
- Bicep muscle bulges as arm bends
- Bone and muscle actions may be combined or separate
- Like face, can be done with bones alone (plus constraint rigging)

Body rigging - bones



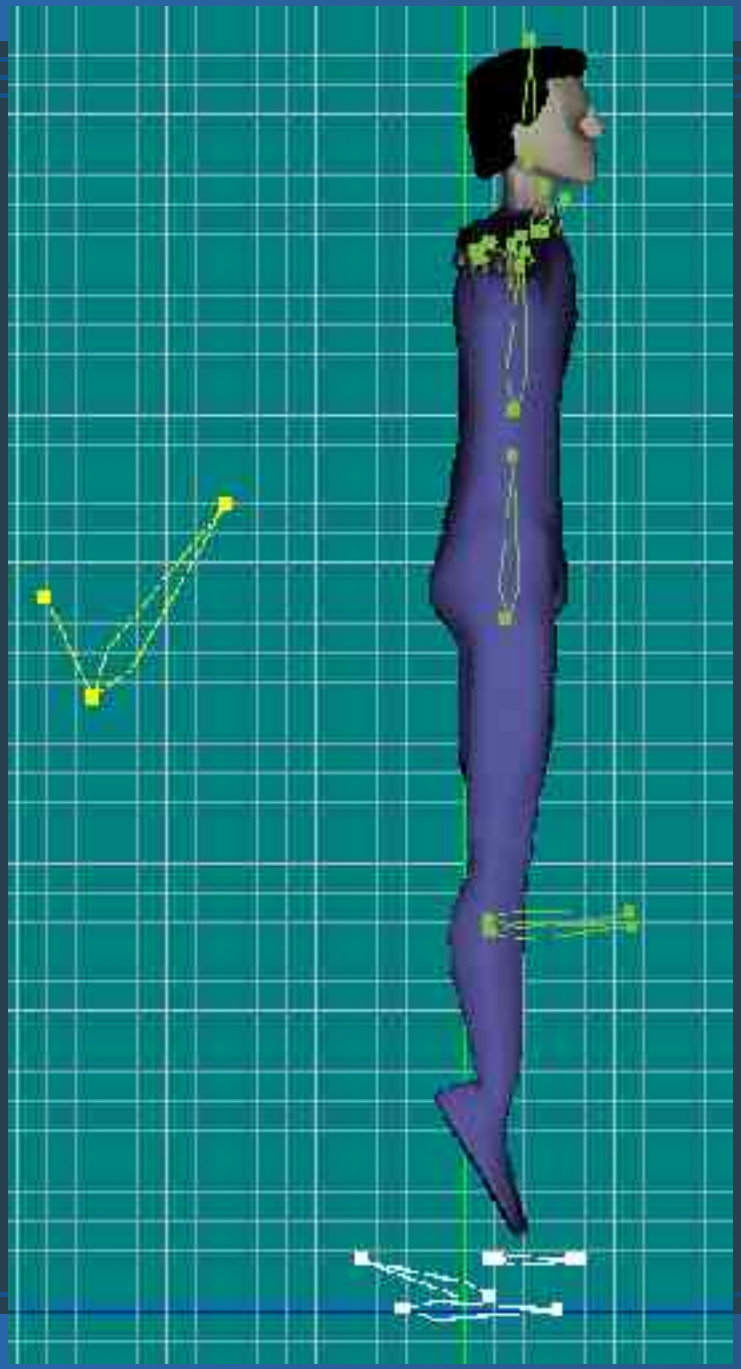
- Forward kinematics
- Inverse kinematics (IK)
- Locking (feet/hands)
- Constraints
  - Angle (relative to parent) - knees/elbows
  - Path constraint - walk
  - Surface constraint
- Degree of constraint
  - Percentage

Body rigging – more bone constraints



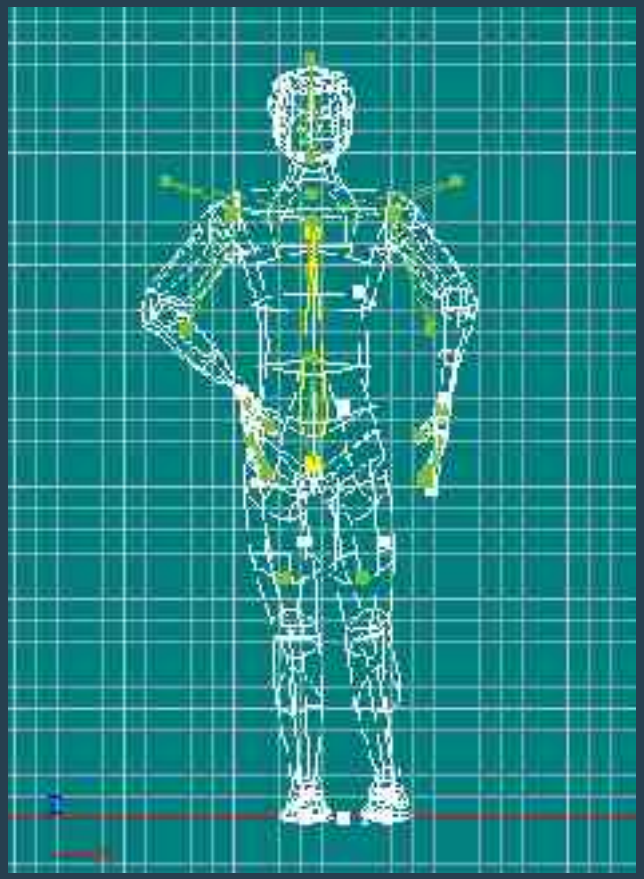
- Relative to other bones
  - Aim At - eyes
  - Orient Like - knees
  - Roll Like
  - Aim Roll At
  - Translate To - hold
  - Scale Like
- Joint stiffness

Rotational constraints



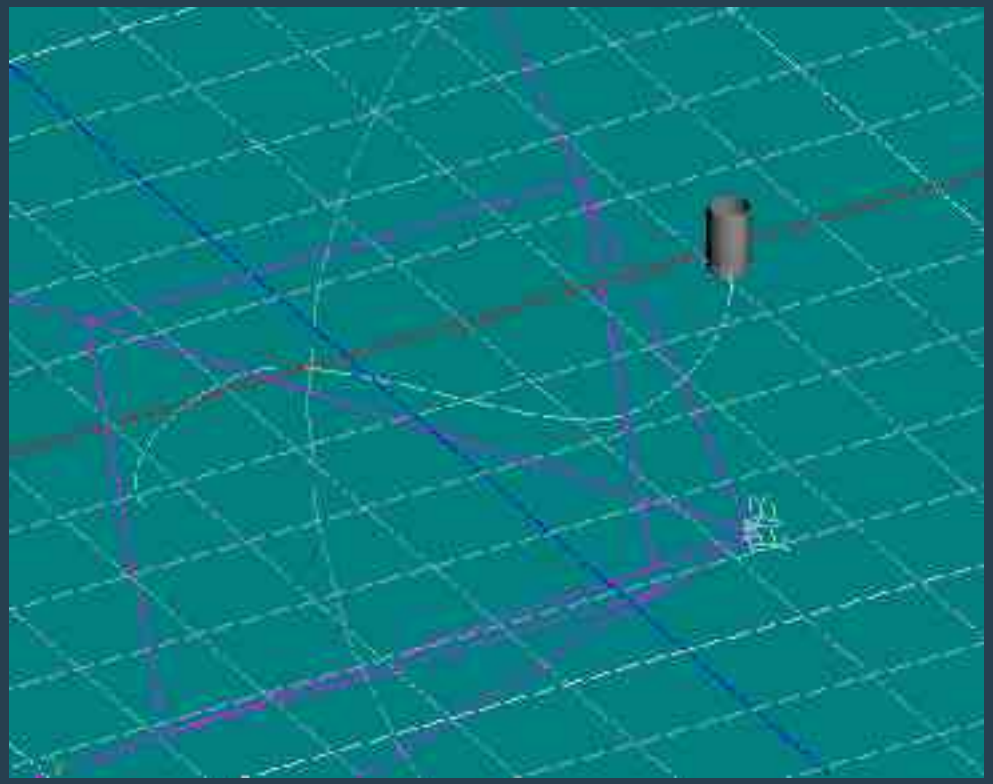
- Stop knee or elbow bending backwards or sideways
- Stop knee or elbow twisting, leading to serious surface (skin) deformation

Bone constraints: locking



- Hold bone in place (can affect other bones in Inverse Kinematic chain)
- Commonly used to anchor the feet or hands

Bone constraints: Path / surface



- Good for moving an entire character or object (e.g. Vehicle)
- Could also be used for e.g. moving a pupil over the surface of an unevenly shaped eye

High-tech bone constraints

- Dynamics/ragdoll – secondary bone movement based on movement of parent bone
  - Stiffness, damping
- Inter - object rigging
  - A light can move with a character
  - A light can move to follow a character
  - A character can pick up and put down objects
  - May be a different interface to rigging within a character

Rigging completed ...

... ready to animate!