7.4.4 Rigging - Posing - Inverse Kinematics

Inverse Kinematics

IK simplifies the animation process, and makes it possible to make more advanced animations with lesser effort.

IK allows you to position the last bone in a bone chain and the other bones are positioned automatically. This is like how moving someone's finger would cause his arm to follow it. By normal posing techniques, you would have to start from the root bone, and set bones sequentially till you reach the tip bone: When each parent bone is moved, its child bone would inherit its location and rotation. Thus making tiny precise changes in poses becomes harder farther down the chain, as you may have to adjust all the parent bones first.

This effort is effectively avoided by use of IK.

Automatic IK

Automatic IK is a tool for quick posing, it can be enabled in the tool shelf in the 3D view, when in pose mode. When the Auto IK option is enabled, translating a bone will activate inverse kinematics and rotate the parent bone, and the parent's parent, and so on, to follow the selected bone. The IK chain can only extend from a child to a parent bone if the child is *connected* to it.

The length of the chain is increased (if there is a connected parent available to add to it) with `Ctrl-PageUp` or `Ctrl-WheelDown`, and decreased with `Ctrl-PageDown` or `Ctrl-WheelUp`. However, the initial chain length is 0, which effectively means follow the connections to parent bones as far as possible, with no length limit. So pressing `Ctrl-PageUp` the first time sets the chain length to 1 (move only the selected bone), and pressing `Ctrl-PageDown` at this point sets it back to 0 (unlimited) again. Thus, you have to press `Ctrl-PageUp` *more than once from the initial state* to set a finite chain length greater than 1.

This is a more limited feature than using an IK constraint, which can be configured, but it can be useful for quick posing.
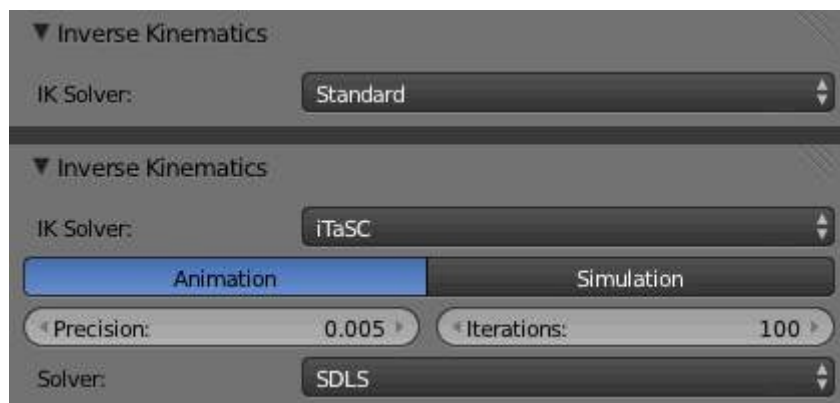
IK Contraints

IK is mostly done with bone constraints. They work by the same method but offer more choices and settings. Please refer to these pages for detail about the settings for the contraints:

- *IK Solver*
- *Spline IK*

Armature IK Panel

This panel is used to select the IK Solver type for the armature. *Standard* or *iTaSC*.

Properties > Armature > Inverse Kinematics Panel.

Most the time people will use the *Standard* IK solver. There is some documentation for the *iTaSC* "instantaneous Task Specification using Constraints" IK solver here.

Robot IK Solver

Bone IK Panel

This panel is used to control how the *Pose Bones* work in the IK chain.
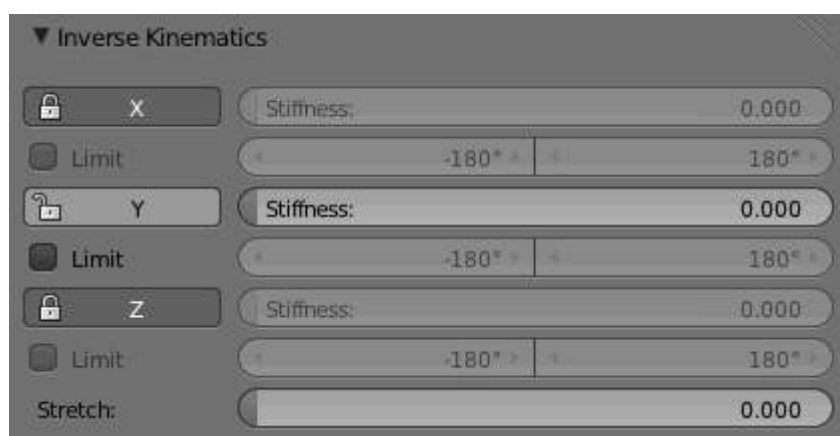
Properties > Bone > Inverse Kinematics Panel.

Lock
Disallow movement around the axis.
Stiffness
Stiffness around the axis. Influence disabled if using *Lock*.
Limit
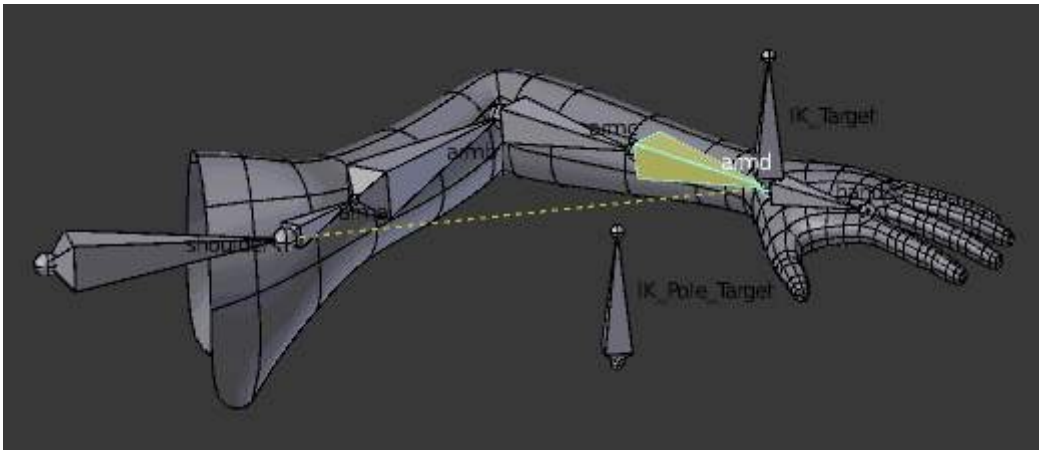Limit movement around the axis.
Stretch
Stretch influence to IK target. 0.000 is the same as disabled.

Arm Rig Example

This arm uses two bones to overcome the twist problem for the forearm. IK locking is used to stop the forearm

from bending, but the forearm can still be twisted manually by pressing R-Y-Y in *Pose Mode*, or by using other constraints.

IK Arm Example.

IK Arm Example.

Note that, if a *Pole Target* is used, IK locking will not work on the root boot.