

Hybrid IK For Unity

About

Hybrid IK for Unity

A fast, robust, smoothly interpolating Inverse Kinematics solution for Unity which supports joint limits! It is a hybrid system combining the best of both FABRIK and CCD techniques to achieve smooth interpolations along large ranges of motion subject to joint limit constraints.

- Author Swing Twist and Hinge Joint Limits, which are live editable
- Constrain End orientation
- Add stretch limits, with local x,y,z stretch bounds adding a positional IK component
- Add manual position and orientation constraints upon joints along the IK chain.

Finally, Hybrid IK for Unity supports authoring KEYFRAME POSE constraints, which creates a mapping between authored keyframe poses and end position targets which will guide how the joint chain interpolates as the end target moves, effectively parametrizing the space!

Quick Setup

In your scene, create a new GameObject and add a 'Hybrid Inverse Kinematics Node' component. Fill out the fields in the inspector, particularly those under IK Chain Definition.

The main fields to fill out are:

Root Node: the root node of the joint chain hierarchy

End Node: the end node of the joint chain hierarchy which is to match the target

Target Transform: the target transform towards which the IK solver will move the end target

With these set up, play the scene, move the target transform around and watch as IK moves the end target towards its target rotating joints along the chain.

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Hybrid Inverse Kinematics Node (Script)

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Process IK Joint Chain

Set Zero Rotations to Current Pose

Script

HybridInverseKinematicsNode

IK Chain Definition

Root Node

b1 (Transform)

End Node

EndTarget (Transform)

Initialize Pose From

LAST_FRAME

Node Radius

0.5

IK Target

Target Transform

TargetTransform (Transform)

End Orientation

Constrain End Orientation☐

Constrain In Global Space☐

Joint Limits

Enable Joint Limits☒

Joint Limit Strength

1

Use Strict Limits☒

Stretch limits

Enable Stretch☐

Keyframe Constraints

Enable Keyframe Constraints☐

Strictly Project To Keyframe Space☐

Add Joints Pose Keyframe

Key Pose 1	Select	Delete Key
Key Pose 2	Select	Delete Key
Key Pose 3	Select	Delete Key
Key Pose 4	Select	Delete Key
Key Pose 5	Select	Delete Key

Video Tutorials

For a more extensive setup tutorial, watch these videos:

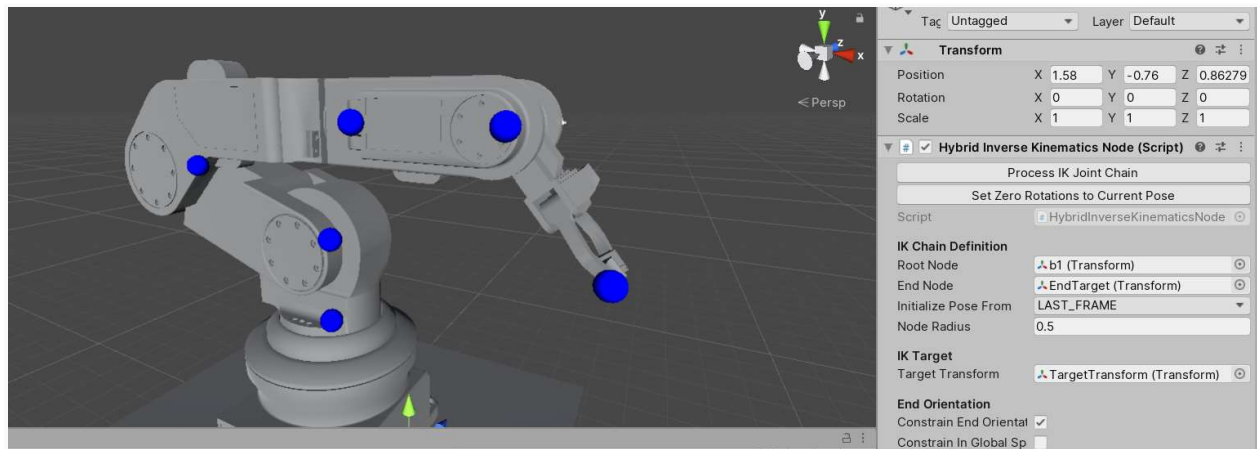
<https://www.youtube.com/watch?v=TrD8f7J1fEk>

<https://www.youtube.com/watch?v=v9jmUEIk6Vc>

<https://www.youtube.com/watch?v=oJqRngODDsI&t=319s>

Hybrid IK Options

Press the '**Process IK Joint Chain**' button to pre-process the chain. The **Node Radius** value determines the visual debug sphere size which is shown for joints when selected as in the image below.



Initialize From: Whether to initialize the transforms from last frame or from the zero pose each frame.

Constrain End Orientation: whether to constrain end-target parent rotation to match that of the target transform

Constrain In Global Space: whether to constrain end-target parent rotation to match that of the target transform in global space rather than local space

Joint Limits

Enable Joint Limits: whether to enable joint limits

Joint Limit Strength: strength of limits applied

Use Strict Limits: whether to strictly adhere to strict limits even if it means not reaching the target, simulating soft limits when stretched to extremes when disabled. If disabled, then the joint rotations will prioritize reaching target over their joint limits.

Enable Stretch: whether to enable stretch limits on joints where stretch has been enabled

Add Joints Pose Keyframe:

After manually posing the joint chain hierarchy, select the IK node and press this button to save the pose as a keyframe mapping that pose to the end target of the pose. You can preview that saved pose with the '**Select**' button or by pressing the sphere in the Scene editor which represents it, and can delete it by pressing the '**Delete**' button associated to it.

Enable Keyframe Constraints: whether to bias the IK towards the saved keyframe poses mapped to end their target positions.

Strictly Project To Keyframe Space: whether to strictly interpolate the joint rotations as a weighted sum of the saved keyframe poses and not allow additional movement outside that range.

Joint Limits

In order to add joint limits, select the joint for which you wish to add a limit and add a 'DynamicJointLimitHinge' or 'DynamicJointLimitSwingTwist' components. Hinge limit constrains rotation along one axis or hinge, swing twist limit constrains rotation to a maximum swing along 2 axis, and a maximum twist along a single axis.

With the limit selected, you can modify the limit either through the scene view handles upon it or using component fields, particularly by changing the '**Limit Angle**'.

