

Maya Complete 4.5

Animation - Inverse & Forward Kinematics

Copy the project folder FK_Robot_Arm to your desktop, navigate to the sub-folder FK_RoboArm_001, open FK_Robo_Arm01.mb file. The scene contains a simple model of an armature which we'll rig using Set Driven Keys to generate Forward Kinematics and a skeleton for Inverse Kinematics.

Make sure you're in Animation mode and go to the Side View, position the viewport so you can clearly see the claws of the arm mechanism of the model. Marquee select the claws.

In the Menu Bar go to Modify>Add Attribute.

We're going to add a custom attribute to the Channel Box and set numerical values that will control the opening and closing motion of the claws. Type in the following information:-

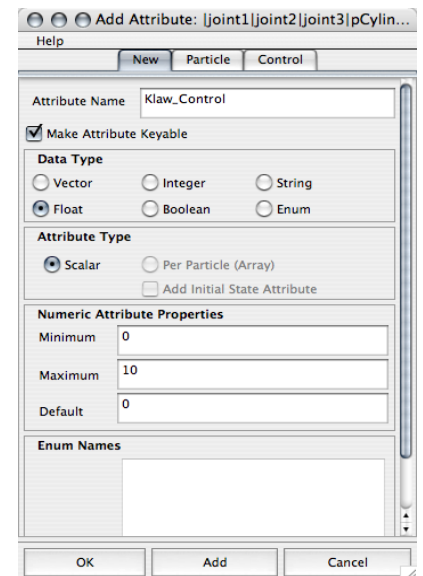
Attribute Name: Klaw_Control (or choose your own name).

Minimum: 0

Maximum: 10

Default: 0

Press OK when you're done.



The Channel Box now has an extra item in its list which you've just added. With the claws still selected go to the Menu Bar> Animate>Set Driven Key>Set, click on the box to open the options.

What we're going to do is make a connection between the Klaw_Control and the Klaws rotation. The two components should be already loaded as the Driven, click Load Driver button to bring them up in the top Driver window.

›Select the first item in the left of the Driver window.

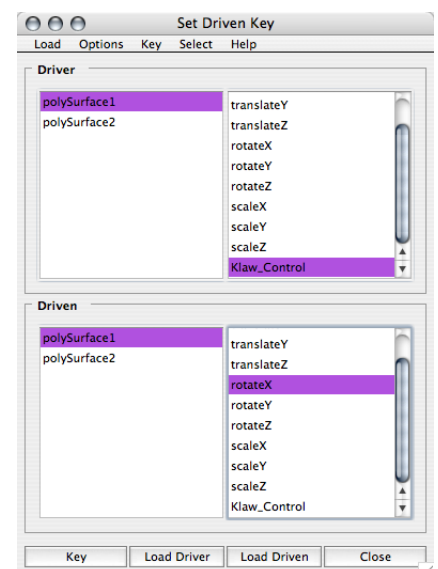
›In the righthand window select Klaw_Control,

›Select the item of the same name in the Driven window and select rotate X then hit the Key button.

We've set the closed position for this claw.

›In the Channel Box type 10 in the Klaw_Control value box.

›Rotate the claw about -50-60 degrees in the X axis, then hit the Key button in the Set Driven Key options window.



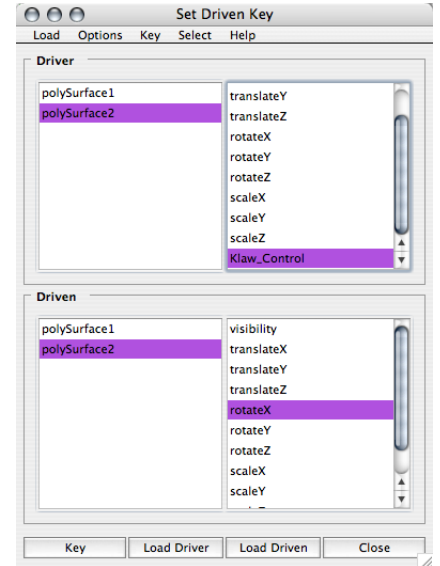
Maya Complete 4.5

Animation - Inverse & Forward Kinematics

›Select the second item in the left of the Driver window.

›In the righthand window select Klaw_Control,

›Select the item of the same name in the Driven window and select rotate X then hit the Key button.



We' ve set the closed position for this claw.

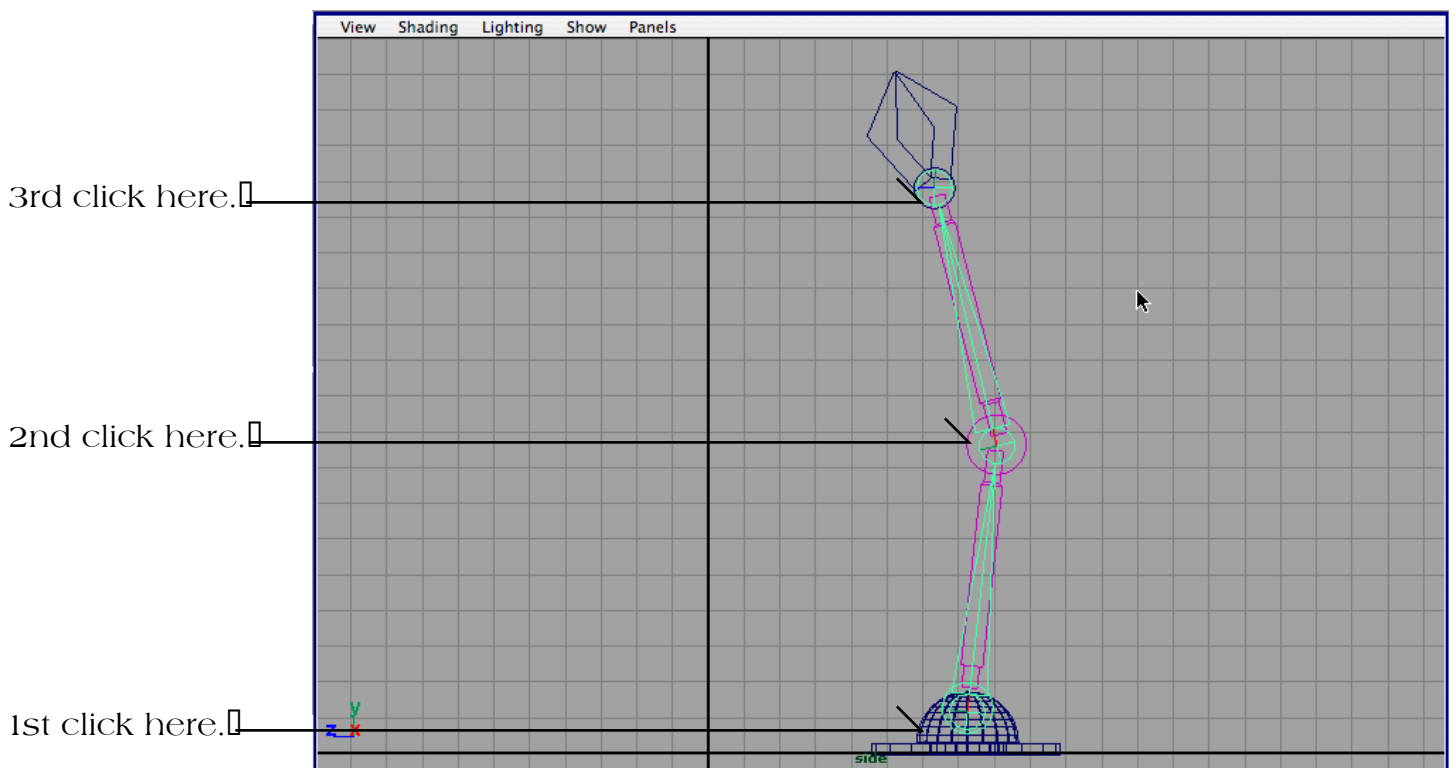
›In the Channel Box type 10 in the Klaw_Control value box.

›Rotate the claw about 50-60 degrees in the X axis, then hit the Key button in the Set Driven Key options window.

Close the Set Driven Key window. Click on the name Klaw_Control in the Channel Box, in the viewport hold down the middle mouse button and drag left and right. The claws will open and close exactly without overlapping geometry: They' re fixed to the values assigned to them, you now have Forward Kinematic functions.

Next we' ll rig some joints in to the armature for Inverse Kinematic functions. Make sure you' re in the Side View as this is necessary when drawing the skeleton in Maya.

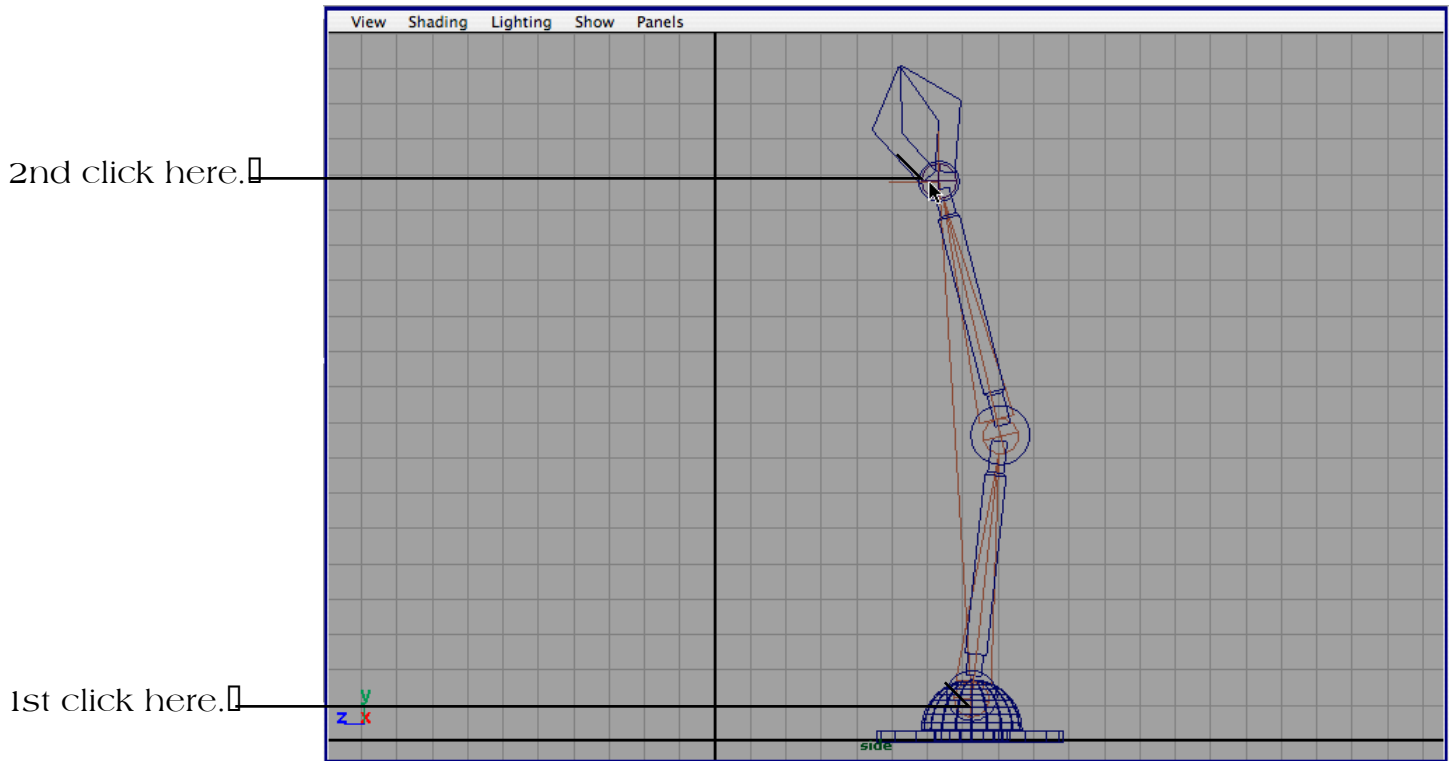
In the Menu Bar go to Skeleton›Joint Tool and click at the bottom of the armature. The order that the skeleton is drawn in is important as the first bone denotes the root of the skeleton structure as the IK will pivot around the root.



Maya Complete 4.5

Animation - Inverse & Forward Kinematics

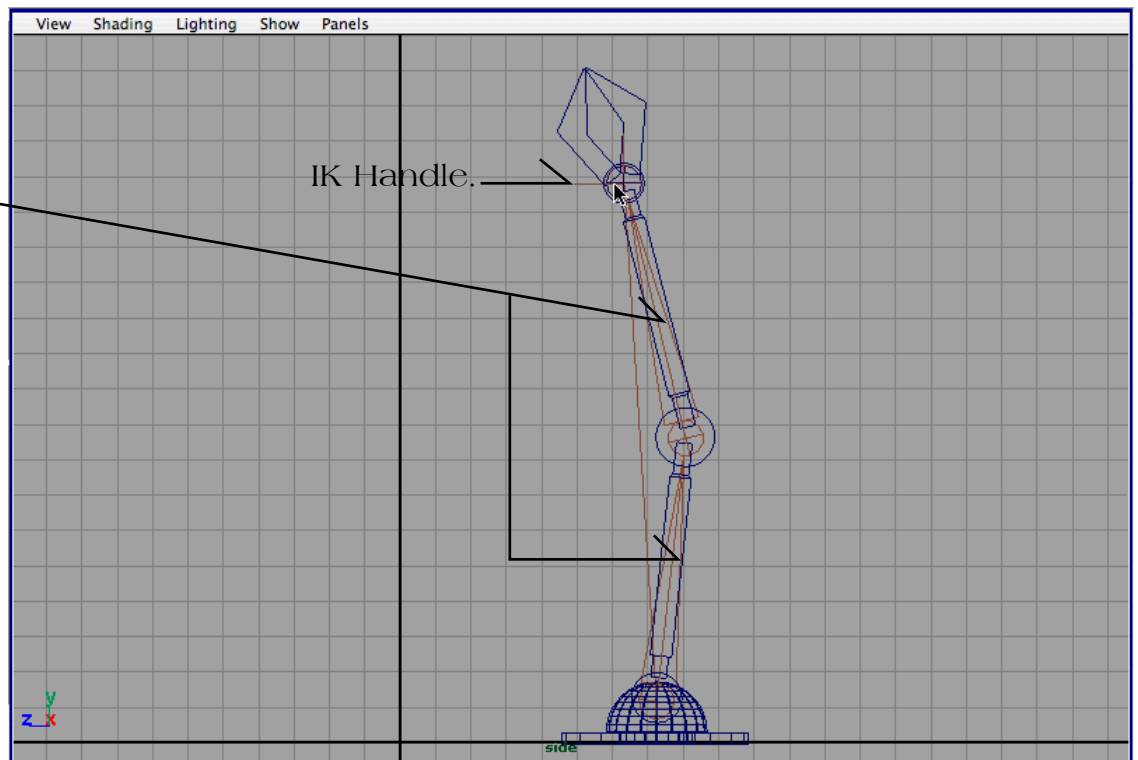
When you've drawn the joints go to Menu bar>Skeleton>IK Handle Tool



Make sure the skeleton is inside the the armature mechanism, check this by looking in other viewports. If you need to move it select the first (bottom) joint and shift select the IK Handle that's just been created (the small cross at the top of the skeleton).

Select the 1st joint (bottom of skeleton) and these two sections.

In the Menu bar go to Skin>Bind Skin>Rigid Bind. The armature has been attached to the joints, by moving the IK Handle the two selected sections will fold and open or follow where ever the the IK Handle is positioned.

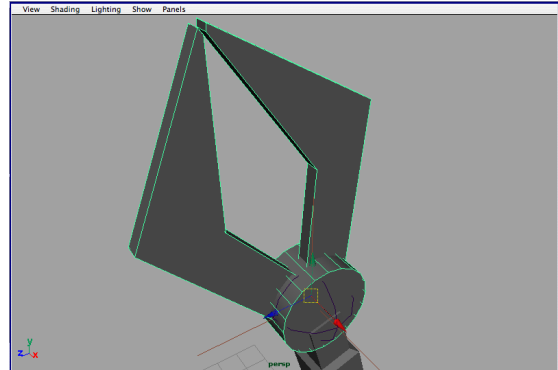


Maya Complete 4.5

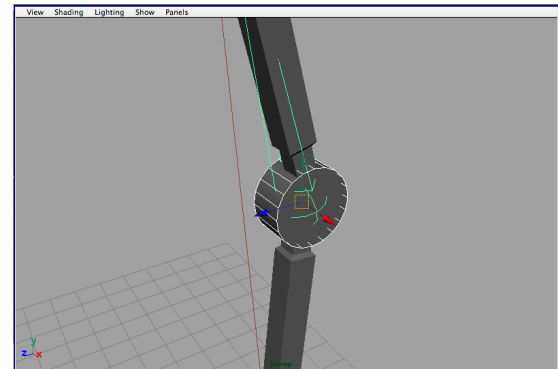
Animation - Inverse & Forward Kinematics

To finish the exercise we'll need to Parent the components outside the skeleton so that everything moves with it. When parenting objects the selection order is important, which ever is selected first is the Child and the second selected object is the Parent.

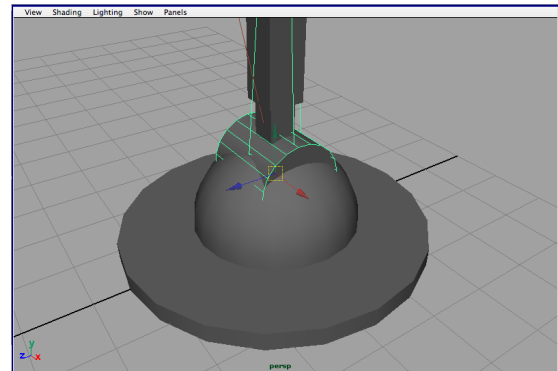
Select the both claws first, then the Cylinder beneath them. Go to Menu Bar>Edit>Parent (or Press P). Then select the same Cylinder and the joint inside (not the IK Handle), press P.



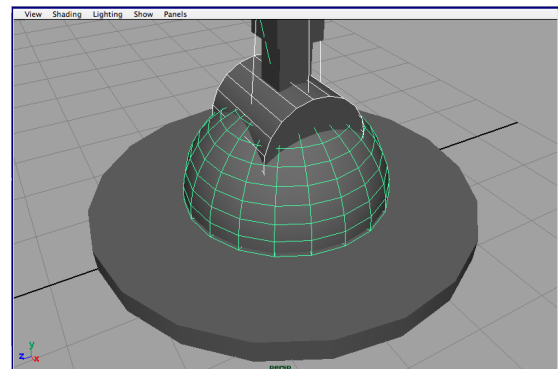
Select the Cylinder between the arms then the joint inside, press P.



Select the Cylinder at the bottom then the joint inside it (go to Wireframe if necessary), press P.



Select the Joint inside the Cylinder then the dome, press P. This will enable you to rotate the whole armature. If you want Parent the dome to the Cylinder base so it can be moved all together.



This completes the exercise and you should now have a working model with both IK and FK functionality. These techniques, particularly Set Driven Keys, are commonly used functions in Maya.