ToeTap : Rigging

Copyright and Terms of Use
Please leave all references to FridgeMonsters intact in the documentation and code examples.

1. Except as otherwise provided, the contents of these notes shall not be reproduced, republished, uploaded, posted, transmitted or distributed electronically or non-electronically in any way, without FridgeMonsters prior written permission.

2. Modification of any of the contents or use of the contents for any other purpose will be a violation of FridgeMonsters copyright and other intellectual property rights. Graphics and images in these notes are protected by copyright and may not be reproduced or appropriated in any manner without written permission of FridgeMonsters.

3. FridgeMonsters reserves all rights to deny or restrict access to these notes to any particular person or persons, or to block access from a particular Internet address to the FridgeMonsters.com Web Site, at any time, without ascribing any reasons whatsoever.

4. These Terms of Use shall be governed and construed in accordance with laws of the Republic of Singapore.

For full details, please view the Terms of Use document at :

http://www.FridgeMonsters.com/administration/terms.asp

Introduction

In this tutorial you will create and rig a simple leg with custom Attributes to allow more efficient animating. You will then create a copy of the leg, and rig it and create another set of custom Attributes.

Learning Outcome

The objective of this tutorial is to introduce you to the following :

1. Create a Joint Chain to Rig a leg.
2. Create IK handles for the Joint Chain.
3. Create a Control Object.
4. Organise the IK handles into Groups.
5. Parent the IK handles Groups to the Control Object.
6. Adjust the IK handles Group local axis.
7. Create custom Attributes for the Control Object.
8. Connect the custom Attributes to the IK handle Groups.
9. Mirror the Joint Chain to create a second leg.
10. Rigging the second leg.

Setting the Project

The Project folder contains all the sub-folders for your project. It allows your scene to source for all the appropriate files and references in an organised manner.
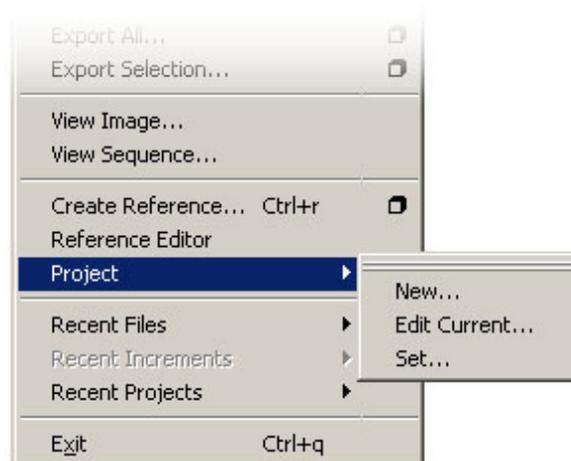
New Project
File > Project > New
1. Name the Project
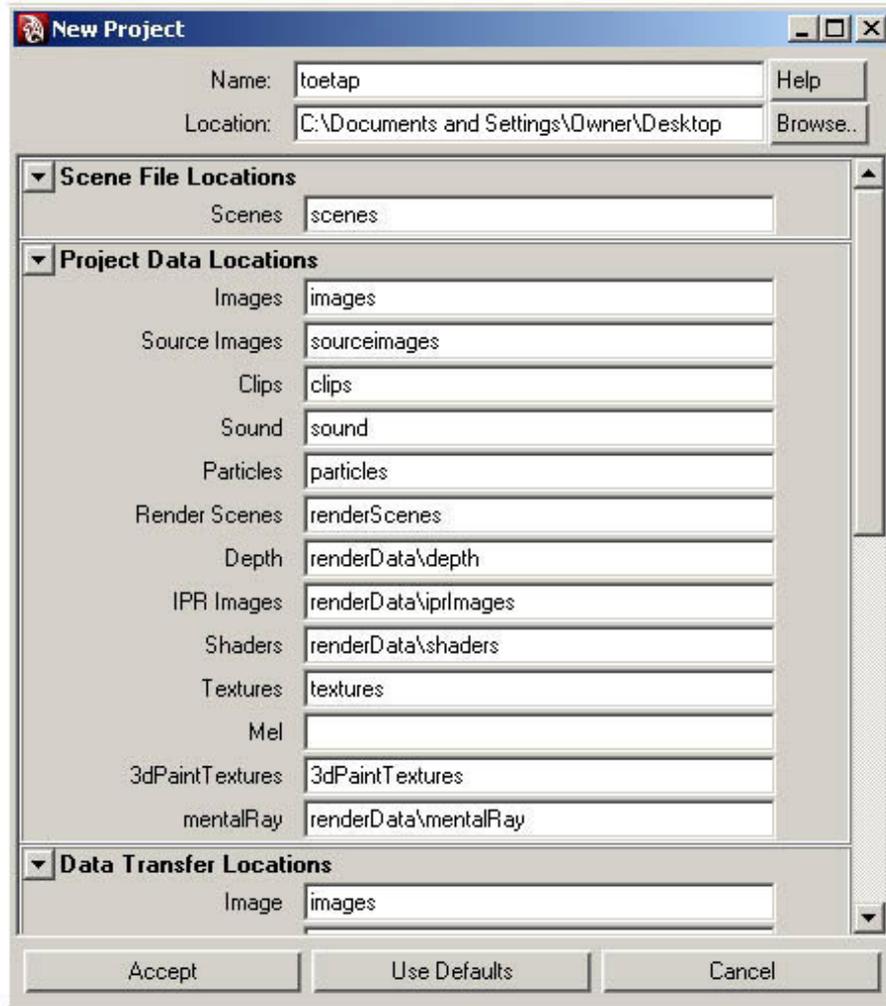2. Location to Save the Project
3. Set Folder Names

Name the Project : lower case character, obvious names with no spaces
Location of Project : The default location is set to Documents Folder, but if you are not working on your own computer it's better to save it to the Desktop. Copy this Project folder to your portable device when you have finished this tutorial.

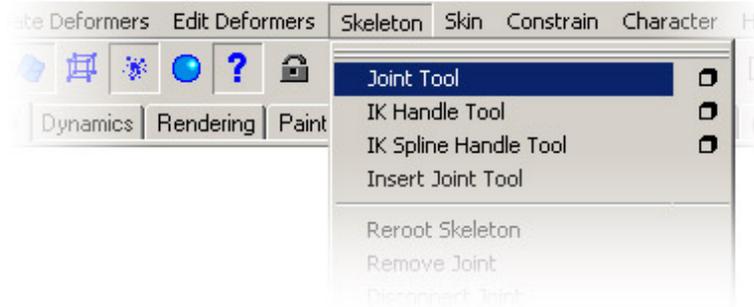Do not save your project to a portable drive (thumb drive) or the performance will lag.

Export All...			
Export Selection...			
View Image...			
View Sequence...			
Create Reference... Ctrl+r			
Reference Editor			
Project	►	New...	
		Edit Current...	
Recent Files	►	Set...	
Recent Increments	►		
Recent Projects	►		
Exit	Ctrl+q		

Name your project : toetap. Click the **Use Defaults** button to set the Project Data Locations. Then click **Accept**.

New Project

Name: toetap   Help

Location: C:\Documents and Settings\Owner\Desktop   Browse..

Scene File Locations

Scenes: scenes

Project Data Locations

Images: images

Source Images: sourceimages

Clips: clips

Sound: sound

Particles: particles

Render Scenes: renderScenes

Depth: renderData\depth

IPR Images: renderData\iprImages

Shaders: renderData\shaders

Textures: textures

Mel:

3dPaintTextures: 3dPaintTextures

mentalRay: renderData\mentalRay

Data Transfer Locations

Image: images

Accept   Use Defaults   Cancel

Open the **Joint Tool** options.

Animation > Skeleton > Joint Tool > Options

Reset the settings by clicking the **Reset Tool** button.
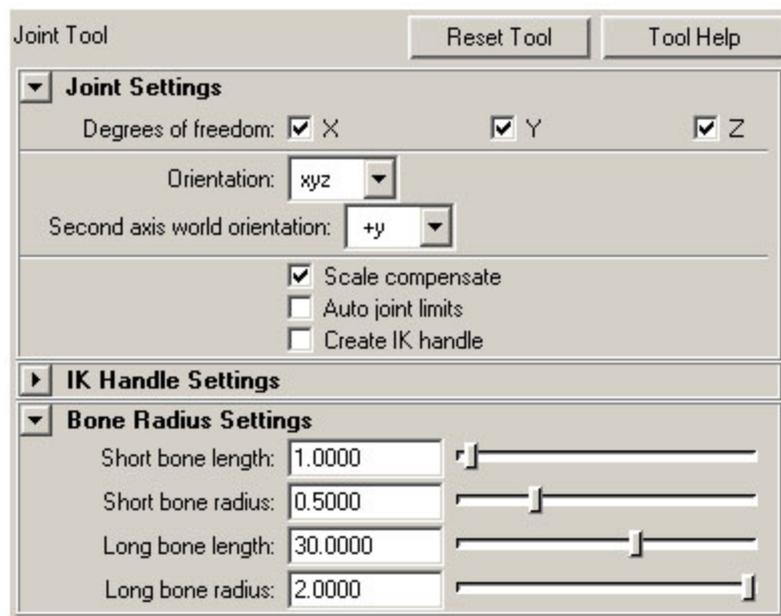
Close the Joint Tool settings by clicking **Ctrl + A**.

Maximise the **Front** viewport (SPACE BAR in Front viewport). Click and create Joints for the Hip, Knee, Ankle, Foot and Toes (see diagram below).

Note : Remember to create the foot joint half along the foot (depending on your model). Holding the SHIFT key down will lock the position of the Joint horizontally or vertically as you click. This is useful for creating the last Joint for the Toes.

front
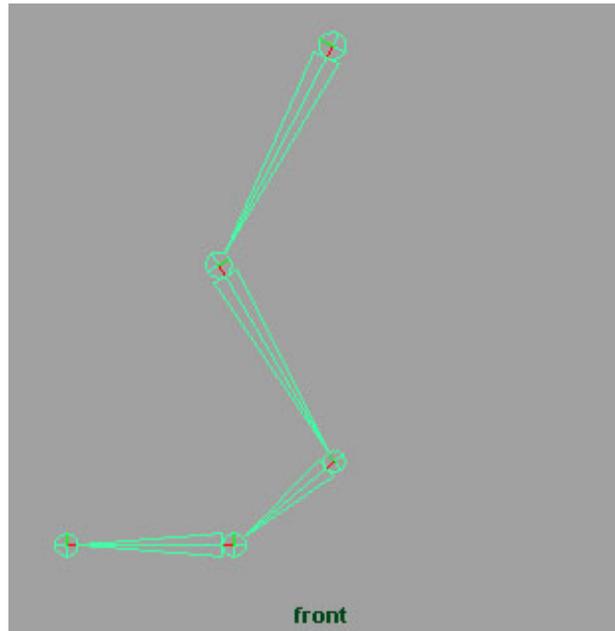
Press **Enter** to finish drawing the Joint Chain.

Open the **Outliner** and name the Joints as listed below. Follow this naming convention : ***joint_side_character*** *(eg. knee_l_robot01)*

Note : Do not use any spaces or capital letters in the names.
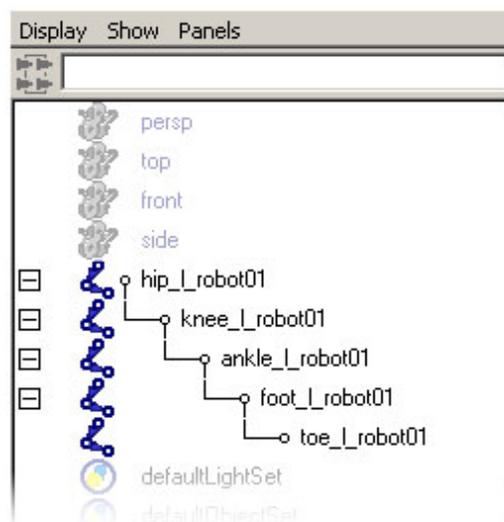
Adjust the Joints positions using the **local axis** (Mac=Home : PC=Insert). When create a Joints Chain for your character, you should use your Model as a template (Put the Model on separate Layer and Template it). Check the position of the Joints in the Perspective viewport.

After you have adjusted the Joints the local axis are no longer aligned to the Joint Chain. When you are confident the Joints are in position, select the Hip Joint (hip_l_robot01) and re-align the axis to the Joints.

Animation > Skeleton > Orient Joint > Options
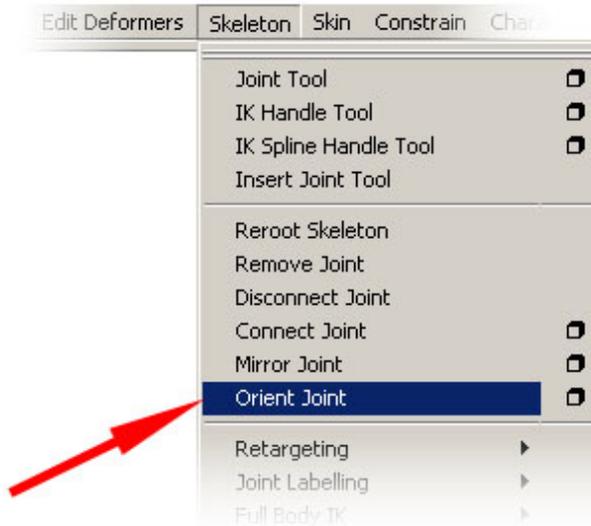
Reset the Orient Joint Options.

> Edit > Reset

In this tutorial, the Joint Chain is created facing along the negative X axis. Therefore, the local X axis should be aligned along the Joints Chain. The local Y axis should define the "up" direction and the local Z axis should be the major axis for rotating the Joints.

Under the Orientation setting, the order of axis defines alignment, up, rotation. In this tutorial you should select XYZ.
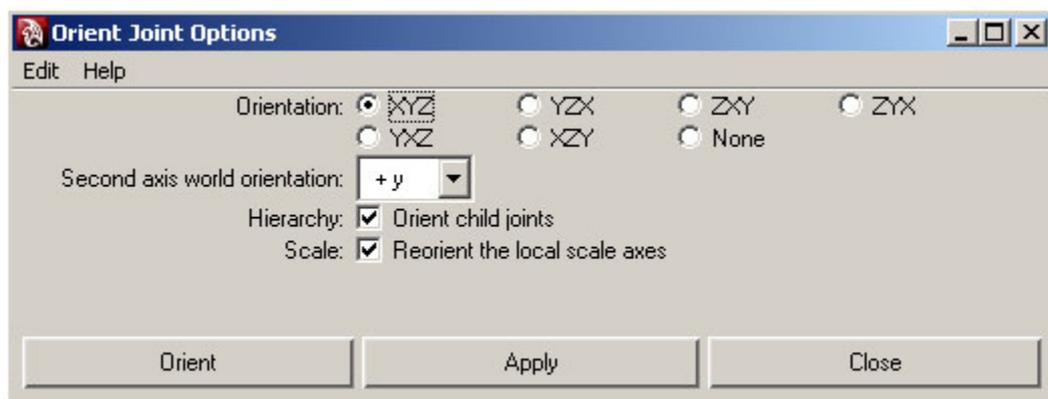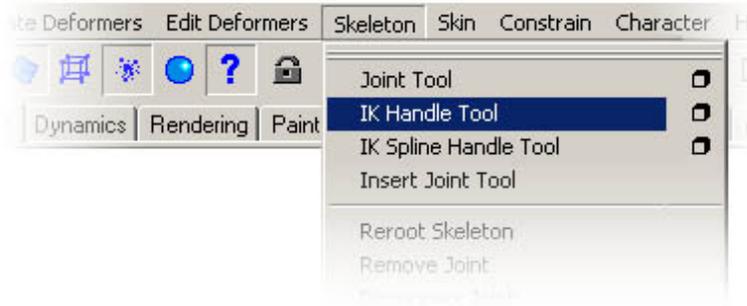

Note : If you forget to Orient the Joints, they will rotate around arbitrary axis and make posing your character during animation a nightmare.

Click **Orient**.

The next task is to create the IK Handles for the Rig.

Open the **IK Handle Tool** options.

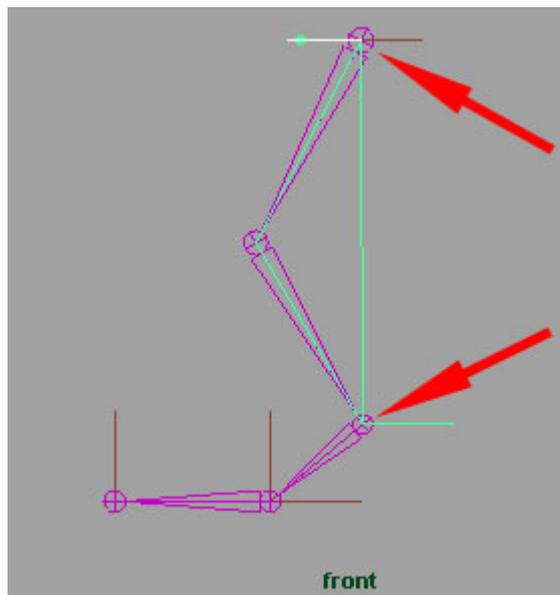> Animation > Skeleton > IK Handle Tool > Options

Reset the settings by clicking the **Reset Tool** button.
From IK Handle Settings, select **ikRPsolver** as the Current Solver.
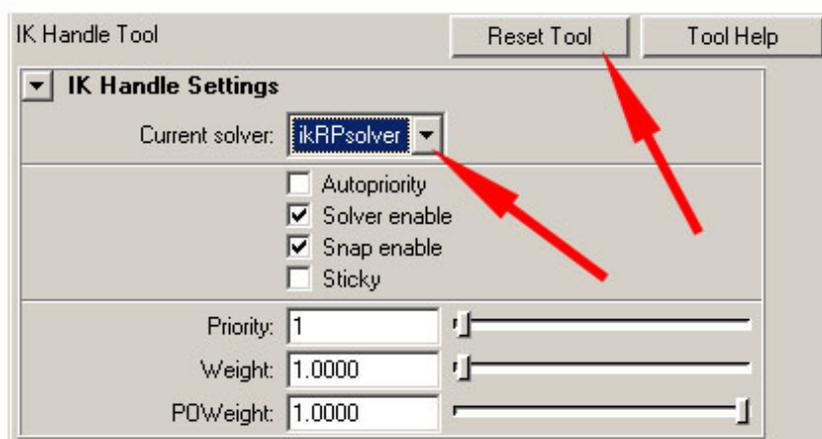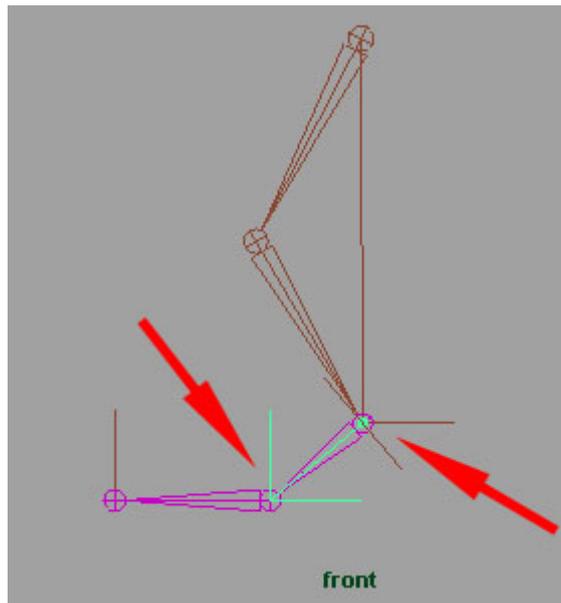

Close the Joint Tool settings by clicking **Ctrl + A**.
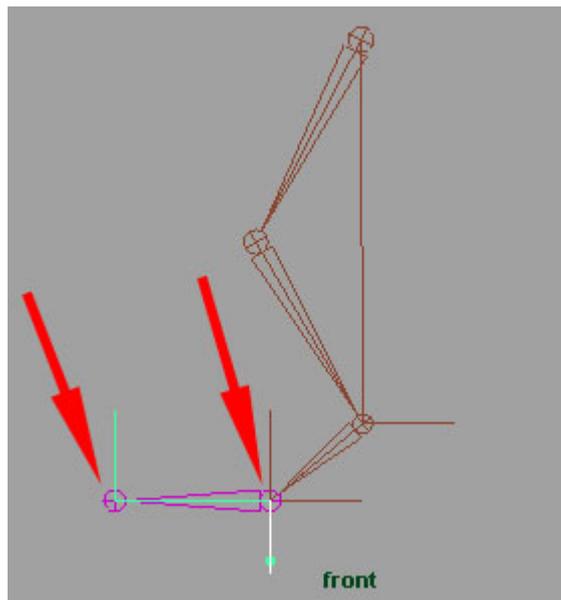
Note : Remember to select **ikRPsolver**..!!

Create 3 IK chains (see diagram below). The first starts at **hip_l_robot01** and ends at **ankle_l_robot01**.

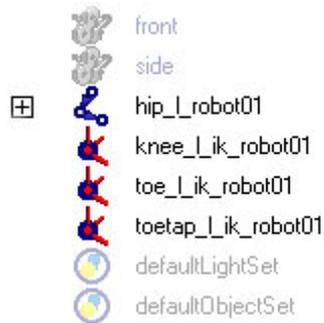The second starts at **ankle_l_robot01** and ends at **foot_l_robot01**.

front

The third starts at **foot_l_robot01** and ends at **toe_l_robot01**.

front

Open the **Outliner** and name the IK Handles as listed below. Follow this naming convention : ***name_side_ik_character***

Note : Do not use any spaces or capital letters in the names.

The pivot point of an IK Handle is always located at the end of the IK chain. By Grouping each IK Handle you can then adjust the local axis (pivot point) of the Group and therefore create an IK Chain with pivot points where we need them.

Select each of the IK Handles separately and **Group** them (Ctrl +G).
Open the **Outliner** and name the Groups as listed below. Follow this naming convention : ***name_side_group***
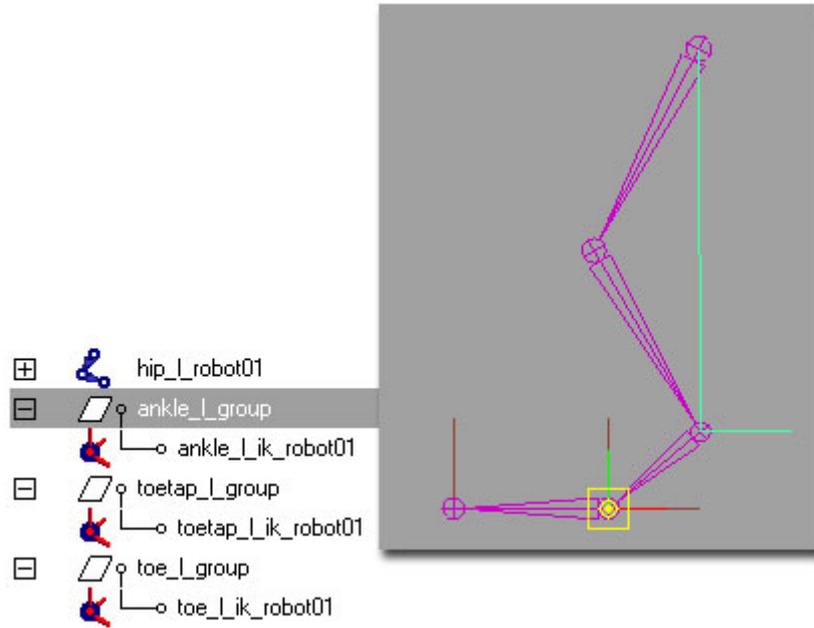
Note : Do not use any spaces or capital letters in the names.
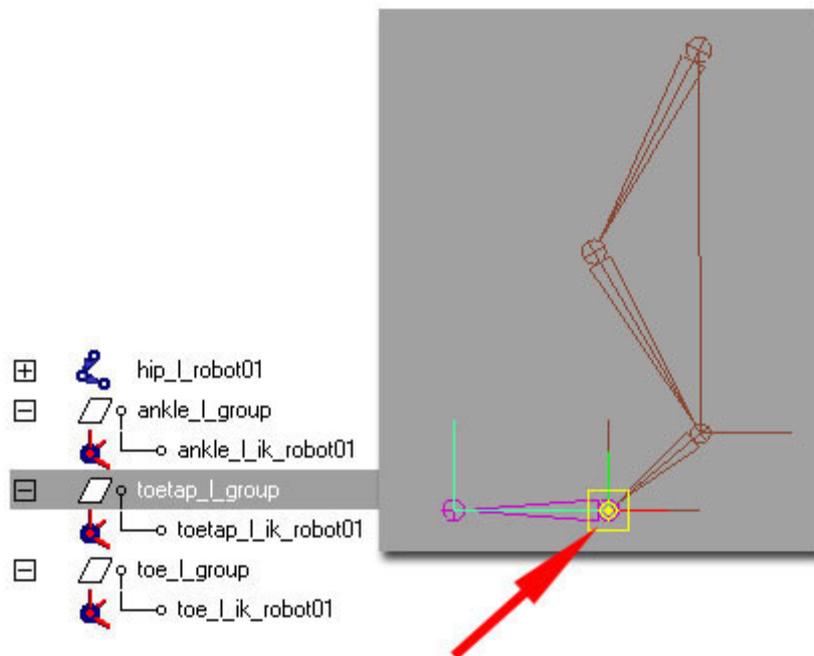
Adjust the Joints positions using the **local axis** (Mac=Home : PC=Insert). You can save a lot of time by pressing the **V key to snap** the local axis to the Joints.

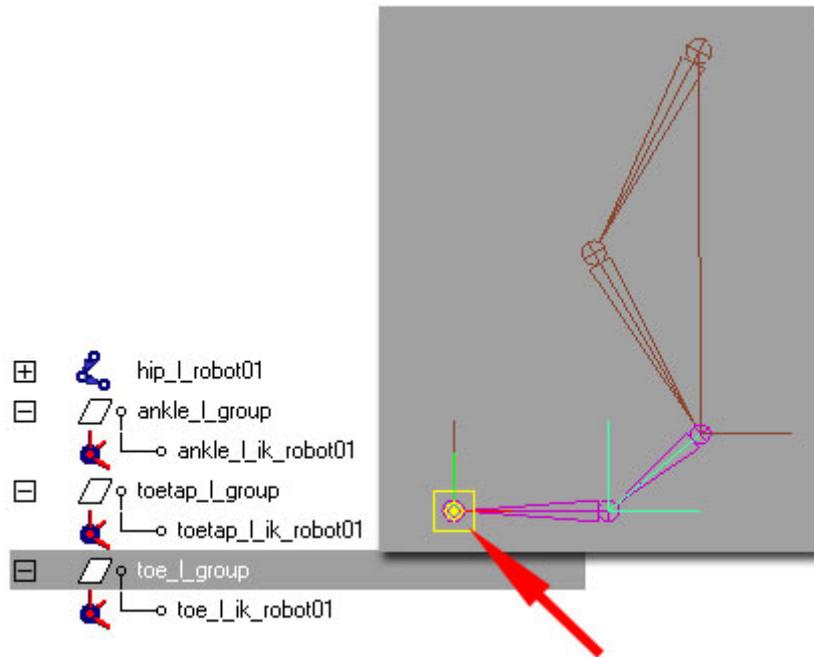W key (translate) > Mac=Home : PC=Insert > V key

ankle_l_group
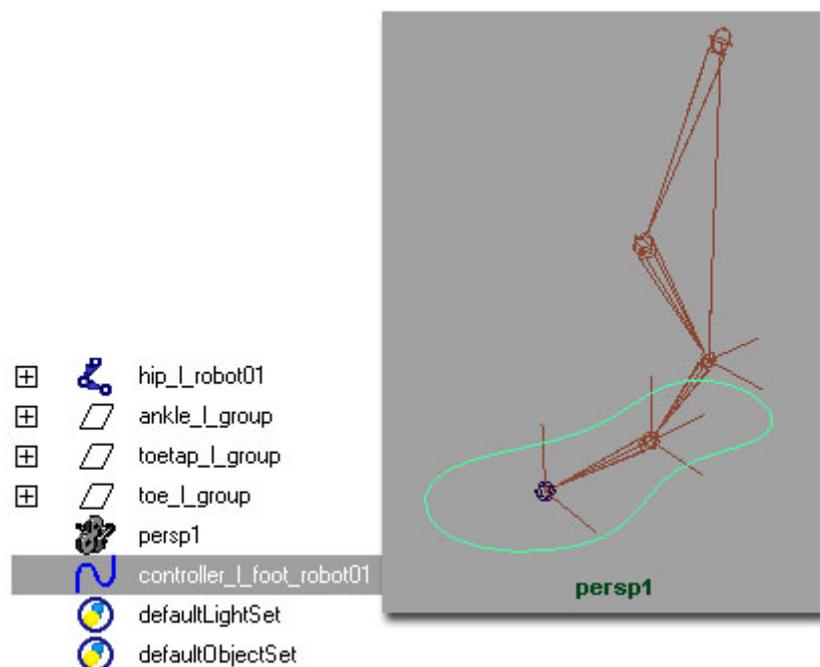

toetap_l_group

toe_l_group

Note : Remember to toggle the local axis mode off by pressing Mac=Home : PC=Insert again.

Create Control Object using a **NURBS Circle**.

      Create > Primitives > NURBS > Circle

Then modify the **Control Vertices** to create a simple foot shape. Move it into place over the Joints Chain.

Name the NURBS Circle **controller_l_foot_robot01**.

Delete the History and Freeze the Transformation. This is very important as in the future you'll be able to reset your Characters Rig by setting all the Control Objects values to 0 (zero).
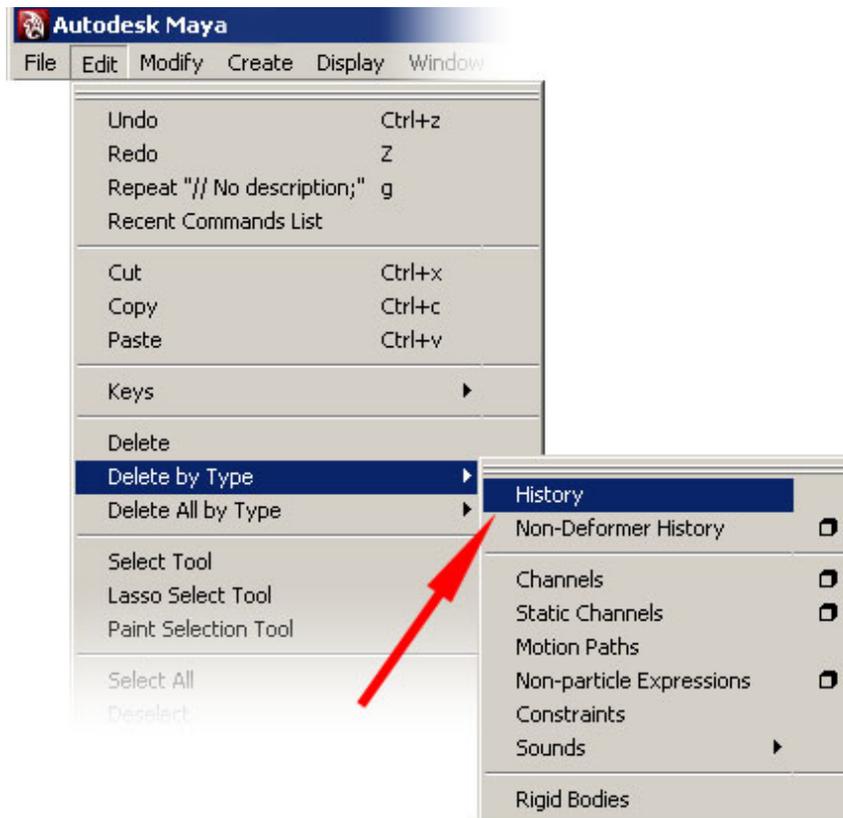

Note : Don't forget to do this..!!

Follow the steps below to create a Hierarchy with the Control Object and 3 Groups.

1. Select **toe_l_group** and SHIFT + select **controller_l_group**. Press **P**.
2. Select **ankle_l_group** and SHIFT + select **controller_l_group**. Press **P**.
3. Select **toetap_l_group** and SHIFT + select **controller_l_group**. Press **P**.
4. Open the **Outliner**. Make ankle_l_group a Child object of toe_l_group by **MMB** on **ankle_l_group** and **drag** it on top of **toe_l_group**.

Check the **Outliner** against the diagram below.
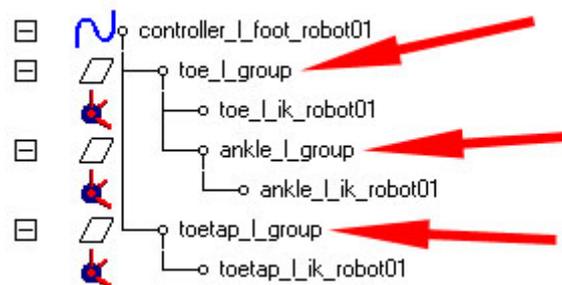
Summary : You created a Joint Chain, adjusted it and re-oriented the local axis. You then added 3 IK Handles to the Joints Chain. The local axis of the IK Handles were in the wrong position. To solve this problem, you Grouped each IK Handle and then adjusted the local axis. You then created a Control Object using a NURBS Circle. You then Parented the 3 Groups to the Control Object. You finally adjusted the Hierarchy as shown in the diagram above.

The Control Object(controller_l_foot_robot01) is therefore the Root of the hierarchy and the 3 Groups. Translating, Rotating and Scaling the Control Object now effects the 3 Groups. The 3 Groups contain the IK Handles and the these effect the Joints Chain.

Note : Read the summary above again and make sure you understand what you have done so far and why. When you are ready, proceed with the tutorial.

The objective now is to create a set of custom Attributes (sliders) for the Control Object to control the 3 Groups.

Note : See the Appendix at the end of this document to see how each custom Attribute will effect the 3 Groups.

Select the **Control Object**(controller_l_foot_robot01). Open the **Channel Window** (right of the screen) and display the **Attribute** list.
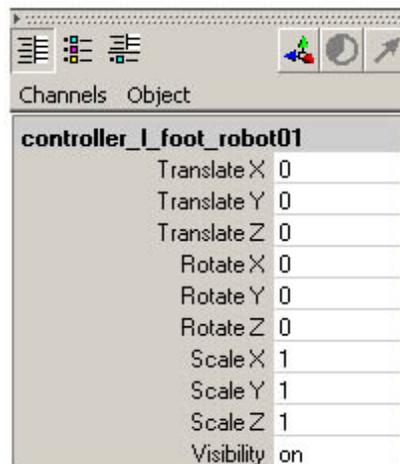
RMB on the list of Attributes and select **Add Attribute**. Follow the steps below to add a custom Attribute to the Control Object.

1. Enter the Attribute Name : **Toe_Tap**
2. Set the Data Type to **Float**
3. Enter a **Minimum** value of **-10**
4. Enter a **Maximum** value of **30**
5. Enter a **Default** value of **0**
6. Click **Add**.
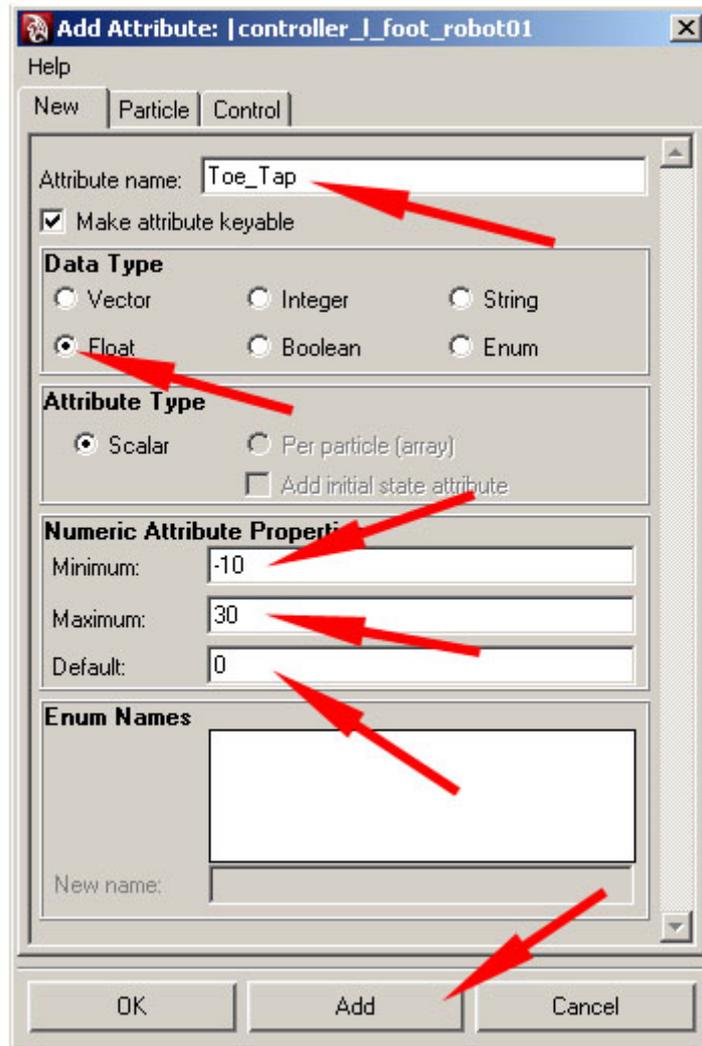
Following the table below, add a total of 6 new Attributes to **Control Object**(controller_l_foot_robot01).

Attribute Name	Min Value	Max Value	Default Value
Toe_Tap	-10	30	0
Tip_Toe	0	45	0
Foot_Bend	0	45	0
Heal_Roll	-45	45	0
Heal_Twist	-30	30	0
Heal_Tap	-45	45	0

When you have finished, check the Attribute list against the diagram below (the order of the list may differ).
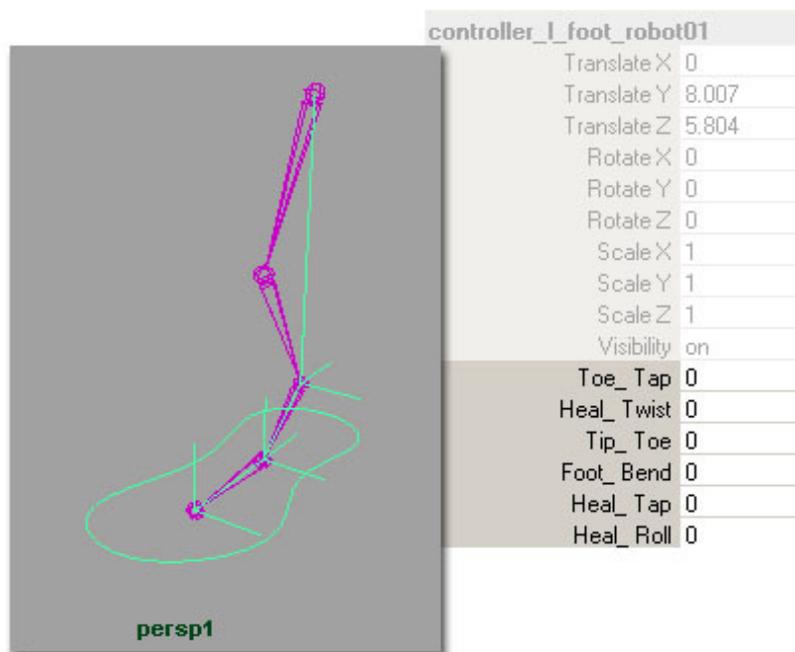

You have now created 6 custom Attributes. They are in effect 6 empty sliders. The objective now is to connect each of the sliders to the Hierarchy created earlier.

Each Attribute will have a 3 values Set on it. A Minimum, Maximum and Default value as defined in the table above.

OK, let's start by setting the first 3 values for the Toe_Tap Attribute. Open the **Set Driven Key** options.

Animation > Animate > Set Driven Key > Set
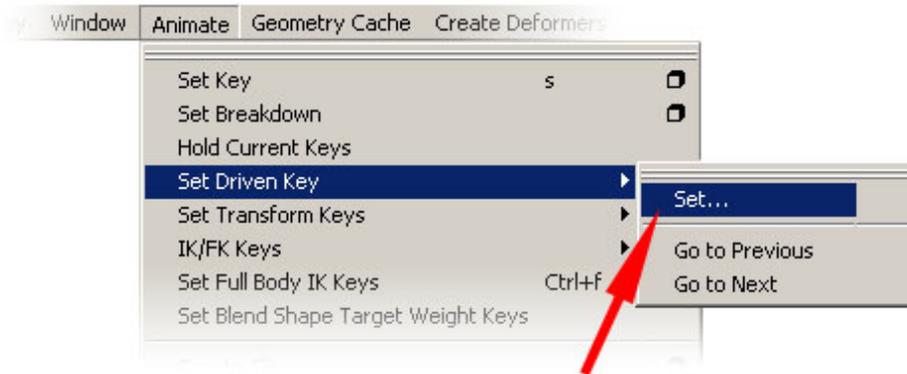
Create a **Driven Key** by following the steps below...

1. Select the **Driver** object from the Outliner (controller_l_foot_robot01).
2. Click **Load Driver**
3. Select the Attribute (**Toe_Tap**) from the list.
4. Set the value in the Attribute list (**0**).
5. Select the **Driven** object from the Outliner (**toe_l_group**).
6. Click **Load Driven**
7. Select the Attribute (**rotateZ**) from the list.
8. Set the value in the Attribute list (**0**).
9. Click **Key**.
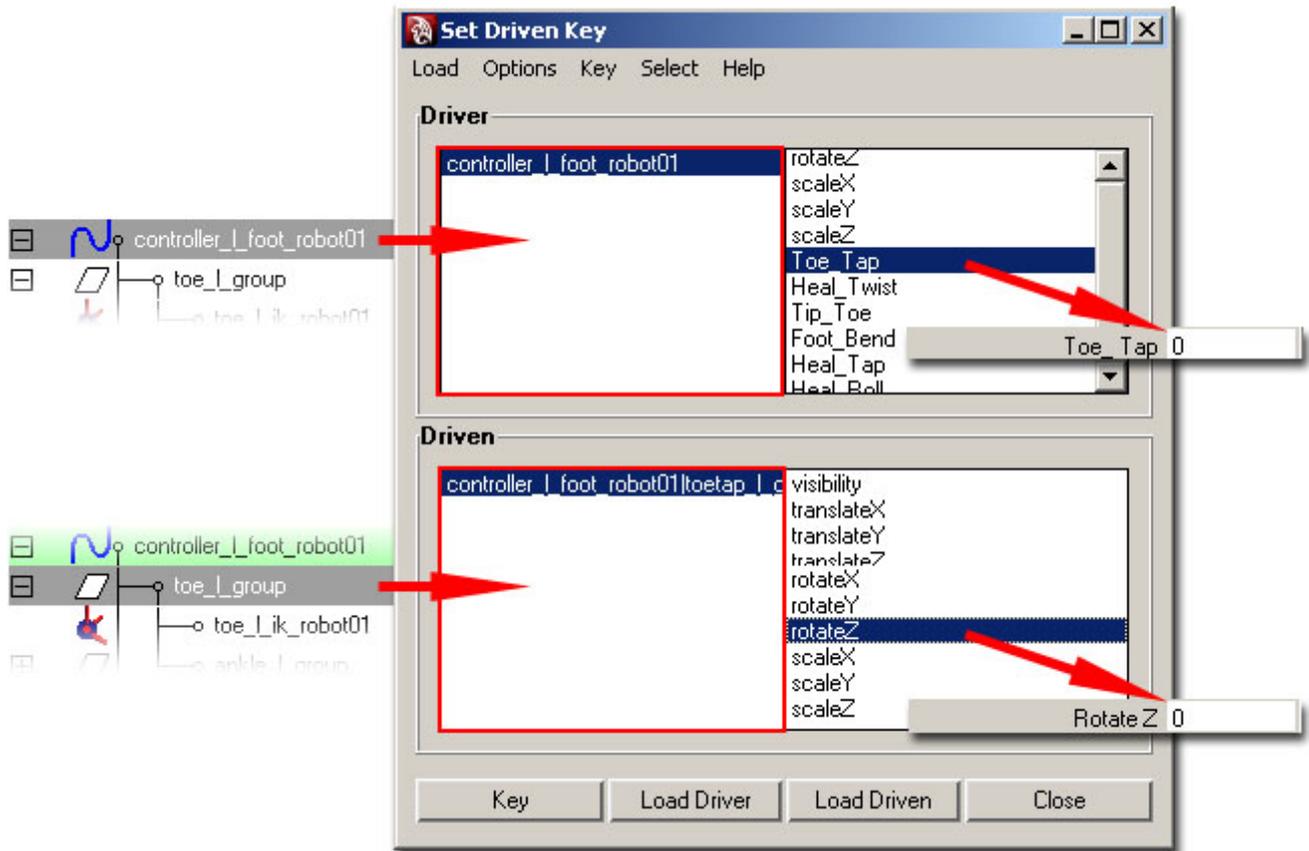
This will have Keyed a value of 0 on the Toe_Tap Attribute to 0 for the Z rotation of toe_l_group.

Now repeat the steps to create the Minimum value.

1. The **Driver** is already loaded (controller_l_foot_robot01).
2. Attribute (**Toe_Tap**) is already selected.
3. Set the value in the Attribute list (**-10**).
4. The **Driven** object is already loaded (**toe_l_group**).
5. The Driven Attribute (**rotateZ**) is already selected.
6. Set the value in the Attribute list (**-10**).
7. Click **Key**.

Now repeat the steps again to create the Maximum value.

8. The **Driver** is already loaded (controller_l_foot_robot01).
9. Attribute (**Toe_Tap**) is already selected.
10. Set the value in the Attribute list (**30**).
11. The **Driven** object is already loaded (**toe_l_group**).
12. The Driven Attribute (**rotateZ**) is already selected.
13. Set the value in the Attribute list (**-30**).
14. Click **Key**.

Done..!! You've now created a Set of 3 Driven Keys. To see the result select the Control Object(controller_l_foot_robot01). Reset the **Toe_Tap** value back to **0** and the **toe_l_group** return to the default rotation.
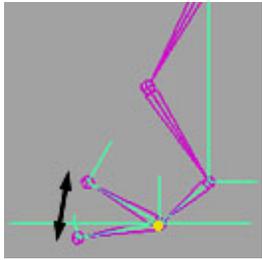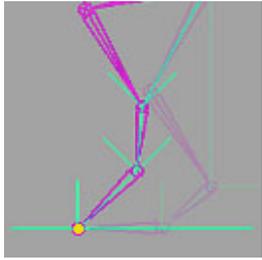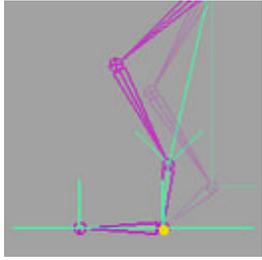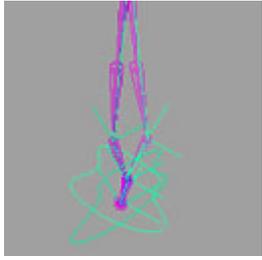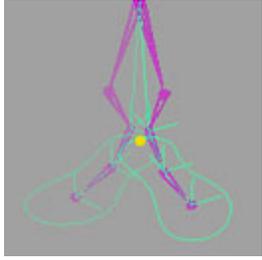
Now select the Attribute label (not the value) in the Attribute window. MMB button in the viewport and drag the mouse left and right to
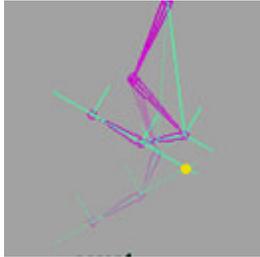
Follow the table below and create a Set of 3 (Default, Min and Max)Driven keys for each of the 6 Attributes.

Note : Remember you need to **Load** a different **Driven** for each Set of 3 Keys.

Attribute Name	Driver	Driven	Min Value	Max Value	Default Value
Toe_Tap	controller_l_foot_robot01	toetap_l_group rotation Z	-10	30	0
Tip_Toe	controller_l_foot_robot01	toe_l_group rotation Z	0	45	0
Foot_Bend	controller_l_foot_robot01	ankle_l_group rotation Z	0	45	0
Heal_Roll	controller_l_foot_robot01	controller_l_foot_robot01 rotation X	-45	45	0
Heal_Twist	controller_l_foot_robot01	controller_l_foot_robot01 rotation Y	-30	30	0
Heal_Tap	controller_l_foot_robot01	controller_l_foot_robot01 rotation Z	-45	45	0

Appendix : Yellow Dot indicates pivot point (axis)

Attribute Name	Image	Driven	Min Value	Max Value	Default Value
Toe_Tap		toetap_l_group rotation Z	-10	30	0
Tip_Toe		toe_l_group rotation Z	0	45	0
Foot_Bend		ankle_l_group rotation Z	0	45	0
Heal_Roll		controller_l_foot_robot01 rotation X	-45	45	0
Heal_Twist		controller_l_foot_robot01 rotation Y	-30	30	0

Heal_Tap		controller_l_foot_robot01 rotation Z	-45	45	0