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MotionBuilder®
2013

Tutorials

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Autodesk® Motionbuilder® 2013

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Contents

Tutorials

<div style="text-align: right; font-size: 4em; font-weight: bold;">1</div>

Introduction

This book includes a set of nine Autodesk MotionBuilder tutorials—some of which provide two types of workflows—and demonstrate how to use the more powerful keyframe and character animation features.

IMPORTANT The tutorials were written and updated using the Autodesk MotionBuilder version 2013, Autodesk Maya® version 2013, and Autodesk 3ds Max® version 2013. If you do the tutorials using a version other than version 2013, the results may differ.

NOTE The tutorial *Importing 3ds Max Files into MotionBuilder* use the **Send To** single-step interoperability features. If you are using an earlier version than version 2012 of the software products, refer to the Note under each topic that directs you to the appropriate topic in the MotionBuilder Help for legacy workflows so you can successfully perform the tutorial procedures.

You can find the tutorial assets in the Autodesk MotionBuilder Asset browser's *Tutorials* folder as well as in the *Tutorials* folder located in the Autodesk MotionBuilder directory on your system.

BEST PRACTICE Go to *http://www.autodesk.com/motionbuilder2013-documentation* to download the latest version of the tutorials and tutorial assets (or support files).

To add a directory to be displayed in the Asset browser:

■ Refer to "Adding a favorite path" topic in the MotionBuilder Help under "User's Guide | MotionBuilder Interface | Asset browser topic.

This book includes the following tutorials:

See also:

MotionBuilder Workflows

There are two workflows you can use for completing the tutorials: the Autodesk interoperability workflow and the generic workflow. The workflows enable you to become familiar with the MotionBuilder software product and guide you in choosing the most efficient workflow for your projects.

Use the Autodesk interoperability workflow when you are working on a project that includes interoperability with MotionBuilder and Maya or MotionBuilder and 3ds Max to streamline your process.

Use the generic workflow when you are using pre-2012 versions of Autodesk 3ds Max and Autodesk Maya, or when you are using another 3D software package with MotionBuilder. See Generic workflow (page 5).

Although these tutorials assume you are using MotionBuilder for a character animation project, the workflows can be easily adapted to any animation project where MotionBuilder is used in conjunction with other 3D modeling or rendering software.

Autodesk interoperability workflow

MotionBuilder has the Single-step interoperability feature that enables you to send your model to Maya or 3ds Max via the **File > Send To Maya** and **File > Send To 3ds Max** menu options.

Maya and 3ds Max both have the Single-step interoperability feature that enables you to send your model to MotionBuilder via the **File > Send to MotionBuilder** menu option.

IMPORTANT The Single-step interoperability features are not available in the Autodesk software versions prior to version 2012.

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1 **Create a character model in Maya or 3ds Max.**

   Before you start your animation project using MotionBuilder, there are a few things you can do when modeling to facilitate your work in MotionBuilder.

   Refer to "Guidelines for creating a character model", "Bone naming conventions", "Import and characterize a 3ds Max biped in MotionBuilder", and "Choosing shapes to create" in the MotionBuilder Help.

2 **Export the character model from Maya or 3ds Max via File > Send to MotionBuilder.**.

   If MotionBuilder2013 is installed, it launches and loads your character model.

3 **Once the model loads into MotionBuilder, set it up for animation by dragging the 3ds Max or MotionBuilder Character asset on top of it.**

   The Character asset helps you map the structure of your character model so that it can be animated in MotionBuilder. Once you complete this mapping process, you 'activate' the character model by characterizing it. Characterizing lets MotionBuilder know that this character model is ready to be animated. The first tutorial shows you how to import character models into MotionBuilder and prepare them for animation.

   See Characterize the character model (page 16).

4 **Add a Control rig and customize it to fit your character animation needs.**

   Control rigs are an animation tool that make it easy to control and position your character model.

   The second tutorial shows you how to customize a Control rig and add character animation features such as floor contacts and Auxiliary pivots.

   See Creating and Customizing a Control Rig (page 19).

5 **Add Character Extensions to support props or non-human body parts.**

The third tutorial shows you how to augment your character with an extra limb, in this case a "Servo arm" with giant pincers attached to the character's right shoulder.

See Creating a Character Extension (page 34).

6 **Create your animation using keyframing and character animation features.**

■ One efficient method of creating animation involves creating a set of poses that can be pasted onto your character at various points over time.

The fourth tutorial shows you how to use the Control rig and the Pose Controls to create a walk cycle.

See Creating a Walk Cycle (page 45).

■ The seventh tutorial shows you an alternative method for creating a walk cycle using clips in the Story window.

See Creating a Loop (page 90).

7 **Edit and refine your animation.**

■ The sixth tutorial shows you how to use layers to edit animation.

See Editing Character Animation (page 77).

■ The eighth tutorial shows you how to combine animations using the Story window.

See Manipulating Clips (page 108).

8 **Retarget your animation between Character models.**

During animation projects, the Character model you use might change. Although not a required step for creating animation within MotionBuilder, instead of re-creating the animation on a new model, you can simply apply the same animation to the desired model(s).

The fifth tutorial shows you how to transfer animation and Character Extensions between character models.

See Retargeting Character Animation (page 65).

9 **If you want to animate 3ds Max characters in MotionBuilder, and then use that animation in 3ds Max, you need to import your 3ds Max scene into MotionBuilder, animate in MotionBuilder, then import your animation in 3ds Max.**

This last tutorial shows you the major steps for importing animation into MotionBuilder, animating in MotionBuilder, and exporting the animation from MotionBuilder and importing it to 3ds Max.

See the following topics: 3ds Max skeletons (page 121), 3ds Max Bipeds (page 133), 3ds Max Characters (page 146), and Animating a 3ds Max Character in MotionBuilder (page 153).

Generic workflow

Maya and 3ds Max 2012 both have one-step interoperability features that brings your model into MotionBuilder automatically. If you do not have the 2012 versions of these packages, you need to install the appropriate Maya or 3ds Max FBX Plug-in to transfer your models into MotionBuilder. Download the free FBX plug-in *http://www.autodesk.com/fbx*.

If you are using another 3D software package, you can convert your file to FBX using the free FBX Converter that you can download from *http://www.autodesk.com/fbx*.

1 **Create a character model in your 3D software**.

Before you start your animation project using MotionBuilder, there are a few things you can do when modeling to facilitate your work in MotionBuilder.

Refer to "Guidelines for creating a character model", "Bone naming conventions", "Import and characterize a 3ds Max biped in MotionBuilder", and "Choosing shapes to create" in the MotionBuilder Help.

2 **Export the character model from your modeling software package.**

When you export your work from a modeling software package, the FBX Plug-in you installed lets you save your character model in the *.fbx* file format. This format enables you to load your models in MotionBuilder.

3 **Start MotionBuilder and load your character model.**

Once you load a model into MotionBuilder, you can set it up to animate it using the MotionBuilder Character asset.

4 **Once the model loads into MotionBuilder, set it up for animation by dragging the 3ds Max or MotionBuilder Character asset on top of it.**

The Character asset helps you map the structure of your character model so that it can be animated in MotionBuilder. Once you complete this mapping process, you 'activate' the character model by characterizing it. Characterizing lets MotionBuilder know that this character model is ready to be animated.

5 **Add a Character asset to your character model and characterize it.**

The Character asset helps you map the structure of your character model so that it can be animated in MotionBuilder. Once you complete this mapping process, you 'activate' the character model by characterizing it. Characterizing lets MotionBuilder know that this character model is ready to be animated. All major character animation features in MotionBuilder, including Control rigs and animating in the Story window, require a characterized character.

The first tutorial shows you how to create a Character asset and use it to map out your character model's structure.

See Loading and Characterizing Character Models (page 8).

6 **Add a Control rig and customize it to fit your character animation needs.**

Control rigs are an animation tool that make it easy to control and position your character model.

The second tutorial shows you how to customize a Control rig and add character animation features such as floor contacts and Auxiliary pivots.

See Creating and Customizing a Control Rig (page 19).

7 **Add Character Extensions to support props or non-human body parts.**

The third tutorial shows you how to augment your character with an extra limb, in this case a "Servo arm" with giant pincers attached to the character's right shoulder.

See Creating a Character Extension (page 34).

8 **Create your animation using different keyframing and character animation features.**

■ One efficient method of creating animation involves creating a set of poses that can be pasted onto your character at various points over time.

The fourth tutorial shows you how to use the Control rig and the Pose Controls to create a walk cycle.

See Creating a Walk Cycle (page 45).

■ The seventh tutorial shows you an alternative method for creating a walk cycle using clips in the Story window.

See Creating a Loop (page 90).

9 **Edit and refine your animation.**

■ The sixth tutorial shows you how to use layers to edit animation.

See Editing Character Animation (page 77).

■ The eighth tutorial shows you how to combine animations using the Story window.

See Manipulating Clips (page 108).

10 **Retarget your animation between Character models.**

During animation projects, the Character model you use might change. Although not a required step for creating animation within MotionBuilder, instead of re-creating the animation on a new model, you can simply apply the same animation to the desired model(s).

The fifth tutorial shows you how to transfer animation and Character Extensions between character models.

See Retargeting Character Animation (page 65).

11 **Plot your finished animation to your model's skeleton.**

Depending on the animation features you are using to create your character animation, plotting may consist of plotting from your Control rig to your character model skeleton, or plotting the tracks in the Story window to a single take.

Whatever method you use to animate, the finished result must be plotted to the skeleton of your character model before you export it.

See "The plotting process" topic in the MotionBuilder Help "Plotting Animation" chapter.

12 **Save your plotted model as an *.fbx* file**.

Your finished animations can also be exported for rendering in the software of your choice using the appropriate FBX Plug-In.

You can download the latest FBX Plug-ins from: *http://www.autodesk.com/fbx*.

See also:

Installing the latest FBX Plug-ins

The Autodesk® FBX® technology is one of the most widely used and supported platform-independent 3D data interchange solutions around. Universal 3D asset exchange via Autodesk FBX helps to remove data compatibility barriers and gives you the freedom to build an efficient pipeline for your projects.

Autodesk FBX fosters interoperability between several Autodesk products. The MotionBuilder software product supports FBX natively, while the Autodesk Maya and Autodesk 3ds Max software products include FBX plug-ins. In addition, the Autodesk® Softimage® software product can read and write FBX through the Autodesk® Crosswalk software initiative. Autodesk ® Mudbox ™ 2010 software is the first Mudbox release to support FBX, streamlining common workflows between Mudbox, Maya, 3ds Max, and MotionBuilder.

You can download the latest FBX Plug-ins and FBX Plug-ins documentation from: *http://www.autodesk.com/fbx*.

Loading and Characterizing Character Models

This tutorial guides you through the procedures necessary to bring your character models into MotionBuilder and get them ready for animation.

Each character model brought into MotionBuilder has to be characterized before you can create a Control rig, create poses, and use other animation tools. To characterize a character model, you need to map its structure.

This tutorial shows you how to:

■ Prepare the scene (page 9)

■ Complete the character map (page 11)

■ Characterize the character model (page 16)

The following asset is required for this tutorial:

■ *mia_blue.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the file needed to start this tutorial.

To prepare the scene:

1 From the menu bar, select File > New, then select Layout > Editing.

   MotionBuilder displays a new 3D scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2 Click the *Tutorials* folder in the Asset browser.

3 Drag the *mia_blue* asset *(mia_blue.fbx* file) from the Asset browser into the Viewer window, then select FBX Open > <No Animation> as shown in the following figure.
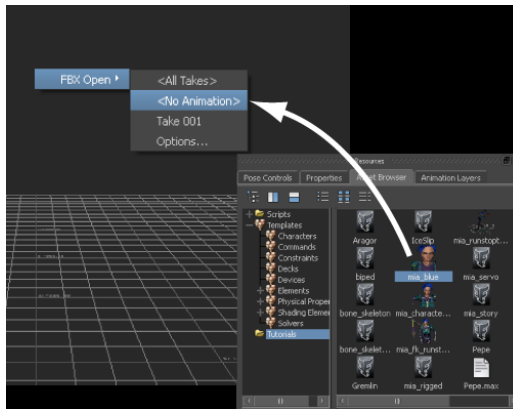
   In the Viewer window, a model named Mia appears in the T-stance.
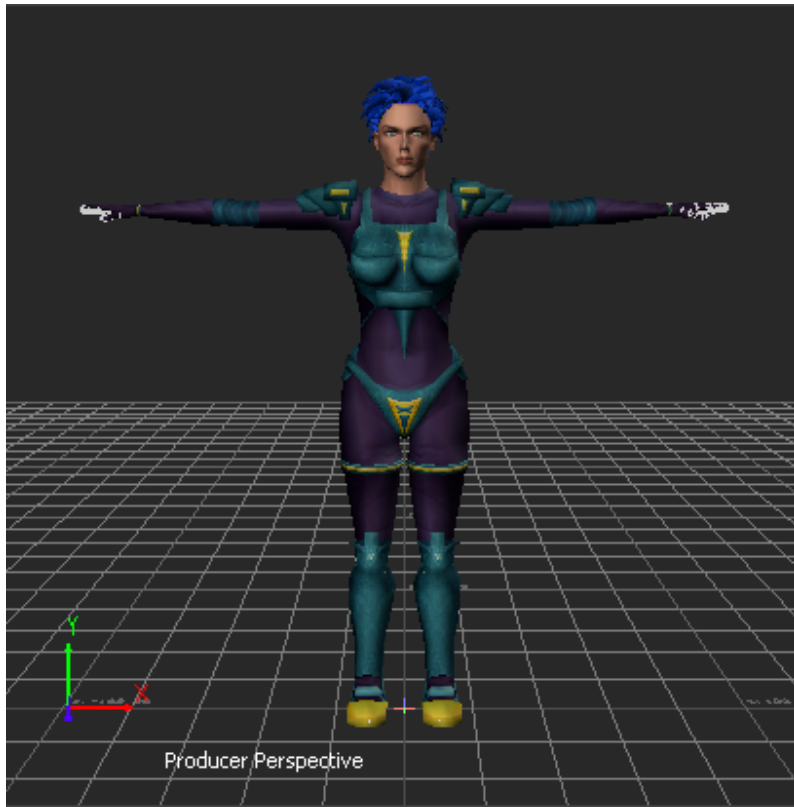
Mia in the T-stance

NOTE This model was created in Maya, and the bones were named according to the naming conventions in the MotionBuilder Mapping list.

4 Choose File > Save As.

The Save File window appears.

5 Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

The Save Options dialog box appears.

6 Click Save.

Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.

Complete the character map

In the following procedure, you define the structure of your character model for MotionBuilder by mapping the required nodes in the Mapping list. Character mapping describes the character model for MotionBuilder, indicating what are the legs, arms, and so on.

Although you can automatically map and characterize a character by dragging the Character asset directly onto a character model, for the purpose of this tutorial, you manually map out Mia's structure.
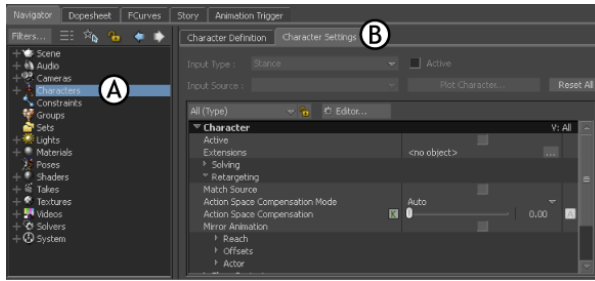
To complete the character map:

1   From the *Templates* > *Characters* folder of the Asset browser, drag the *Character* asset into an empty area of the scene.
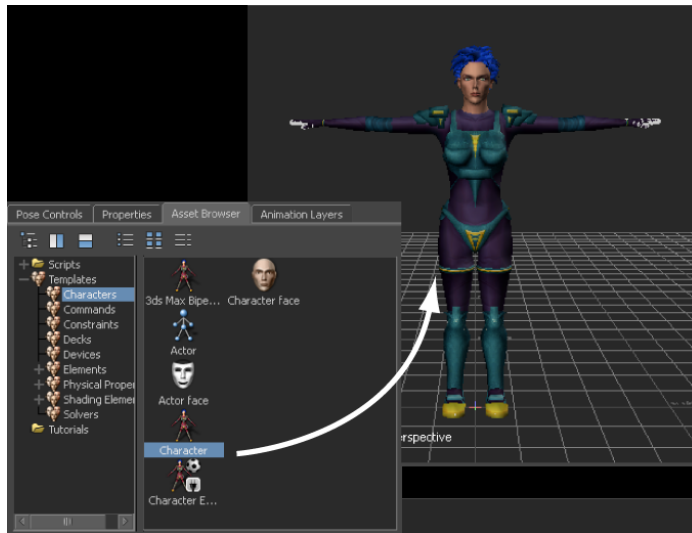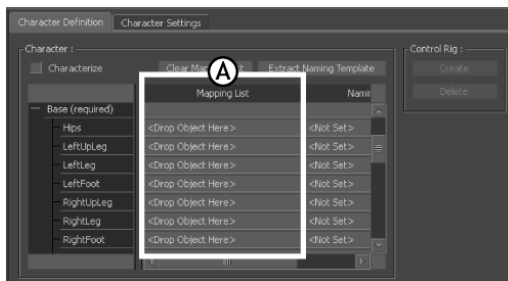

Drag the Character asset into the scene

A Character asset is added in the Scene browser (A) and the Character Settings are displayed in the Navigator window (B).

Navigator window: *A.* **Character in the Scene browser** *B.* **Character Settings**

2 Switch to the Character Definition pane in the Character Settings and expand the *Base (required)* group of nodes in the Mapping list (A).

Character Definition pane: *A.* **Base nodes**

This group of nodes is required for MotionBuilder to recognize the structure of your character model. If you had automatically characterized this character, the Mapping list would be populated with the character's bone names.

3 In the Viewer window, switch to the Schematic view (Ctrl-W) and press A to frame the hierarchy.
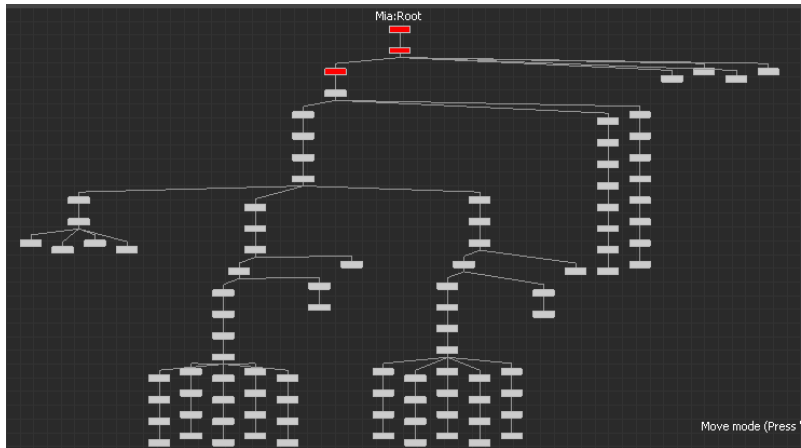
Schematic view of Mia's structure

The Schematic view makes it easier to select bones from the model's hierarchy because each bone is represented as a rectangular node.

4 In the Scene browser, activate the Lock option to lock the view of the Character Definition pane.
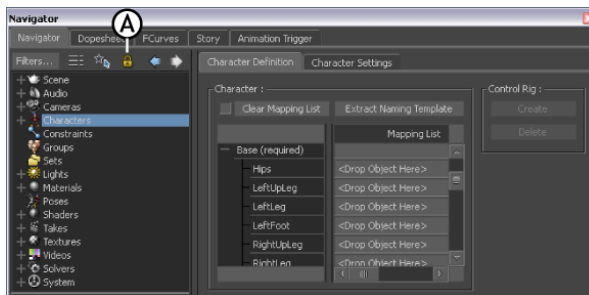
Navigator window: _A._ Scene browser Lock option activated

5 In the Schematic view, zoom in, pan to locate the *Mia:LeftUpLeg* node, and select the node.
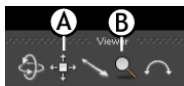
Viewer Navigation buttons: _A._ Travelling button _B._ Zoom button

TIP You can use the keyboard shortcut `Ctrl`-drag to zoom in and the keyboard shortcut `Shift`-drag to travel (or pan) in the Viewer window.

Mia:LeftUpLeg node selected

NOTE When you know the name of the node you are looking for, you can press `Shift-N` to open the Find Model by Name dialog box and do a quick search.
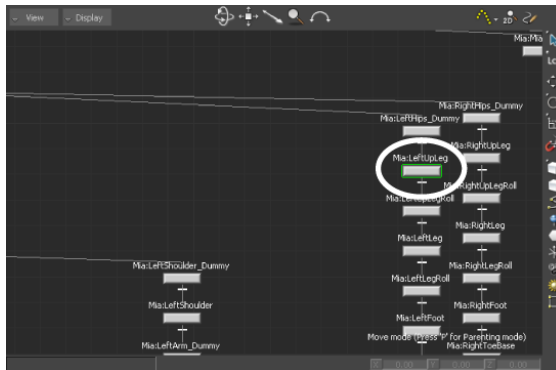
6   `Alt`-drag the *Mia:LeftUpLeg* node into the *Base (required)LeftUpLeg* Mapping List slot.
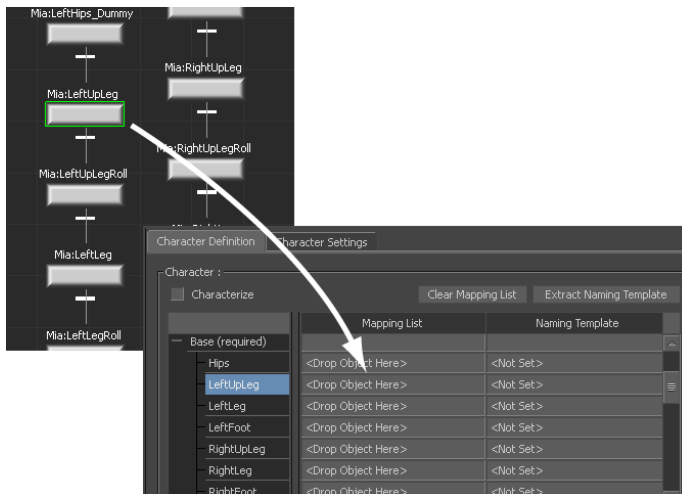
Mia's *LeftUpLeg* node mapped to MotionBuilder *LeftUpLeg*

When you characterize this character, MotionBuilder recognizes that for this skeleton the *LeftUpLeg* node is called *Mia:LeftUpLeg*.

7 Use the following checklist and figure as guides to map the rest of Mia's bones to the *Base (required)* nodes in the Mapping list.

NOTE Although Mia has many bones, you are only required to map the Base group of 15 for MotionBuilder characterization.

Bone	Slot	Mapped
Mia:Hips	Hips	
Mia:LeftUpLeg	LeftUpLeg	x
Mia:LeftLeg	LeftLeg	
Mia:LeftFoot	LeftFoot	
Mia:RightUpLeg	RightUpLeg	
Mia:RightLeg	RightLeg	
Mia:RightFoot	RightFoot	
Mia:Spine	Spine	
Mia:LeftArm	LeftArm	
Mia:LeftForeArm	LeftForeArm	
Mia:LeftHand	LeftHand	
Mia:RightArm	RightArm	
Mia:RightForeArm	RightForeArm	
Mia:RightHand	RightHand	
Mia:Head	Head	

After completing the character mapping process for the Base group, the Mapping list resembles the Mapping List shown in the following figure.
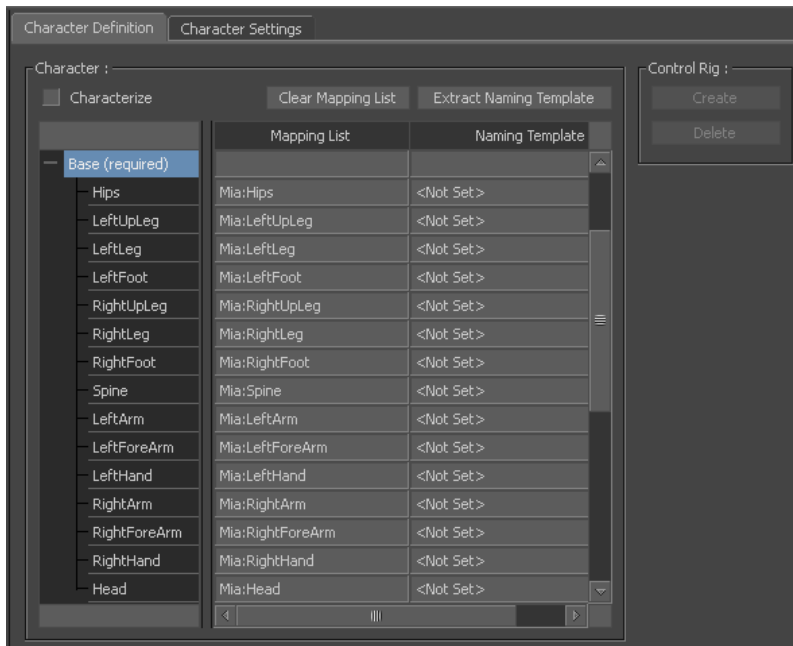
Mia's base bones mapped to the Base nodes in the Mapping list

The Character mapping is now complete.

Characterize the character model

The following procedure shows you how to characterize a model. The moment you characterize a character model, MotionBuilder reads the structure you have outlined in the Mapping list, taking the model's current pose as the base for all future poses and movement.

To characterize the character model:

1 In the Character Definition pane, activate the Characterize option (A).
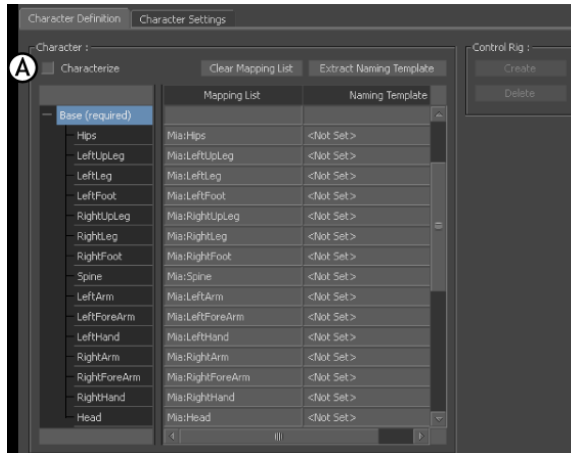
Character Definition pane *A*. Characterize option

2 In the Character dialog box that appears, click Biped, since the Mia skeleton stands on two legs and makes contact with the floor using only the feet.
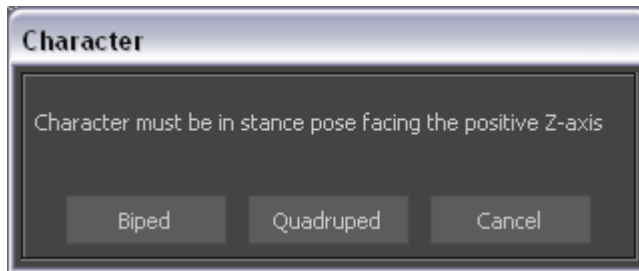
Biped option in the Character dialog box

Generic offsets are calculated so that the character is compatible with any source, the character is characterized, and MotionBuilder recognizes its structure.

The nodes in the Mapping list are gray and cannot be edited.

NOTE If you want to add more bones or edit the Mapping list later, you can temporarily disable the Characterize option when your character is in the T-stance.
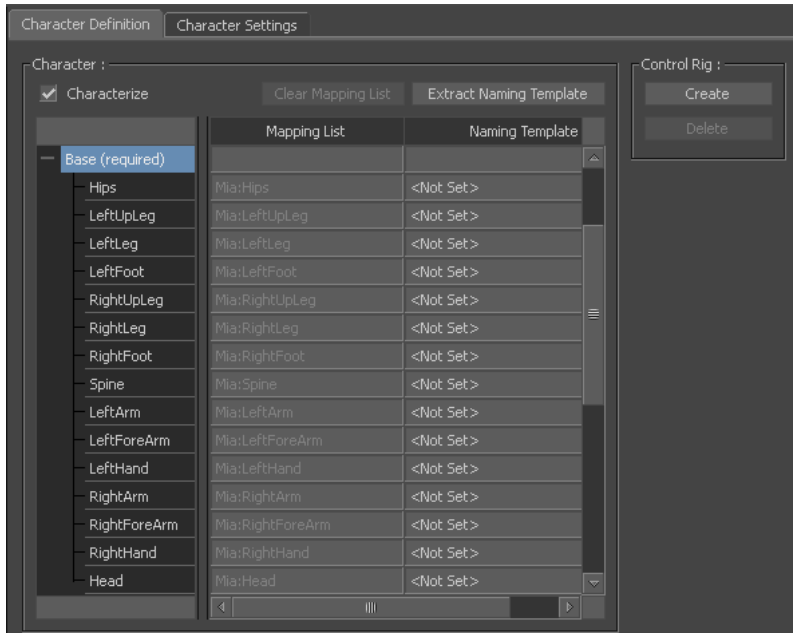
3 In the Scene browser, expand the *Characters* branch, right-click the Character asset, select Rename from the contextual menu, and name the character "Mia" (A).
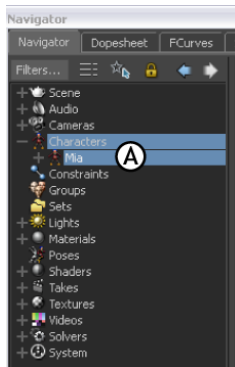
Scene browser *A*. Character asset named Mia

Your character is now fully characterized and ready to be animated.

Summary

In this tutorial, you loaded a character model, mapped out its structure, and characterized it.

In the next tutorial, (Creating and Customizing a Control Rig (page 19)), you create and customize a Control rig for your characterized character.

Creating and Customizing a Control Rig

This tutorial guides you through the procedures necessary to create a Control rig and customize the Control rig to create animation in subsequent tutorials.

Control rigs are an animation tool that make it easy to control and position your character model. You can re-purpose Control rigs for other models.

This tutorial shows you how to:

- Prepare the scene (page 20)
- Create a Control rig (page 21)
- Adjust the foot floor contact markers (page 25)
- Adjust the hand floor contact markers (page 28)
- Add Auxiliary pivots (page 29)

The following asset is required for this tutorial:

- *mia_characterized.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.


Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the file needed to start this tutorial.

To prepare the scene:

1 From the menu bar, select File > New, then select Layout > Editing.

   MotionBuilder displays a new 3D scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2 Click the *Tutorials* folder in the Asset browser.

3 Drag the *mia_characterized* asset (*mia_characterized.fbx* file) from the Asset browser into the Viewer window as shown in the following figure, then select FBX Open > <No Animation>.

   A model named Mia appears in the Viewer window, in the T-stance.
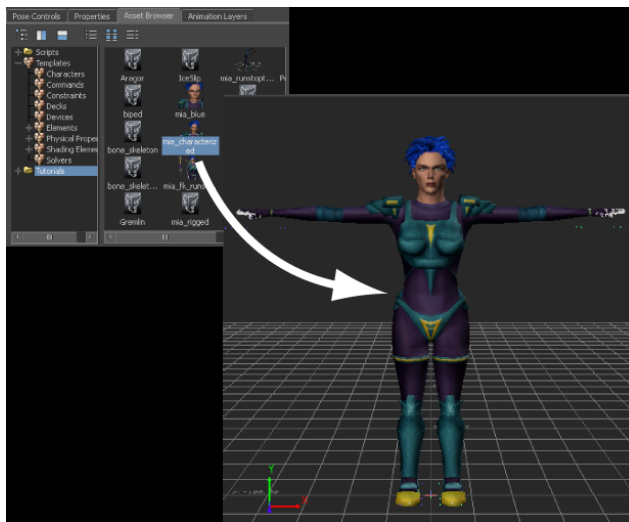
Mia shown in the T-stance

4 Choose File > Save As.

   The Save File window appears.

5 Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

   The Save Options dialog box appears.

6 Click Save.

Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.
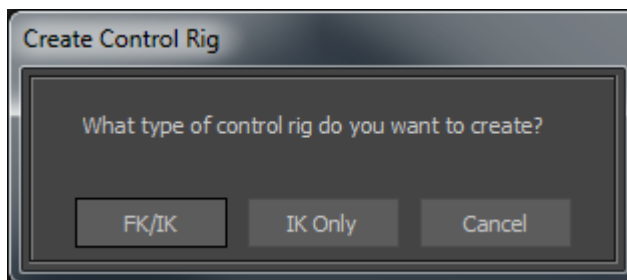
Create a Control rig

In the following procedure, you create and prepare a Control rig for the Mia character.

To create a Control rig:

1   In the Scene browser, expand the *Characters* branch and double-click the *Mia* character to access the Character Definition pane.

2   In the Navigator window, click the Character Definition pane and in the Control Rig area, click Create.
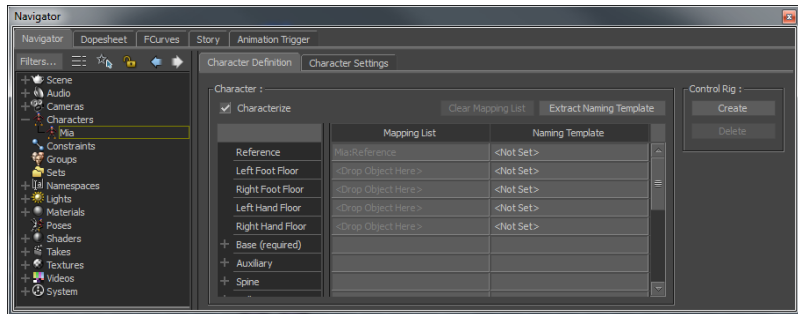
The Create Control Rig dialog box appears.
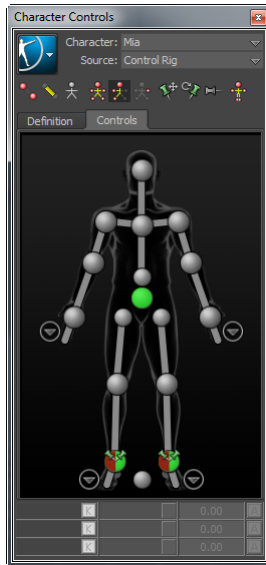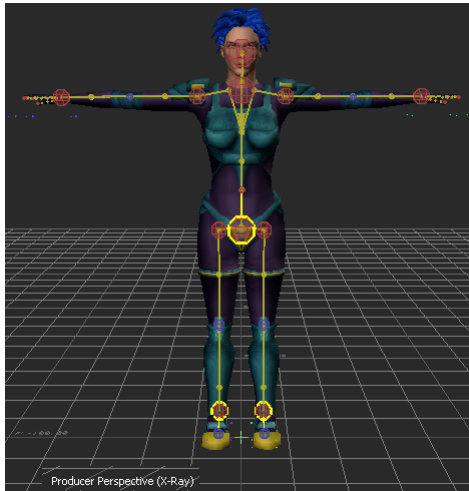

3   Click FK/IK.

An FK/IK Control rig is created for the Mia Character and is shown in the Character Controls window as the (motion) source for the Mia character in the Controls tab.

**4** Click in the Viewer window and press `Ctrl-A` until you are in X-Ray display mode.

NOTE The display mode is shown at the bottom left of the Viewer window.

Producer Perspective (X-Ray)

In X-Ray display mode, you can see the FK and IK effectors that make up the Control rig.

■ The blue and red IK effectors let you intuitively manipulate the character using a setup that simulates how the human body moves.

■ The yellow FK effectors let you selectively fine-tune individual body parts. If you plan to do any fine-tuning with your characters, create Control rigs with both FK and IK effectors.

5 In the Navigator window, switch back to view the Character Settings pane.
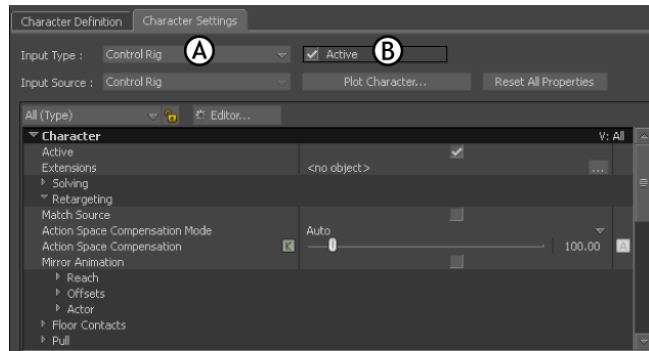
Character Settings pane *A.* **Input Type menu** *B.* **Active option shown enabled**

The Control rig is also shown as the active motion source by the Input Type menu and the Active option in the Character Settings pane (A and B).

Adjust the foot floor contact markers

In the following procedure, you adjust how the character's feet touch the floor using the floor contact markers.

The floor contact markers are the blue and green markers that appear around the character's hands and feet when you characterize your character model. These markers create an invisible grid that determines where the character's feet come in contact with the floor.
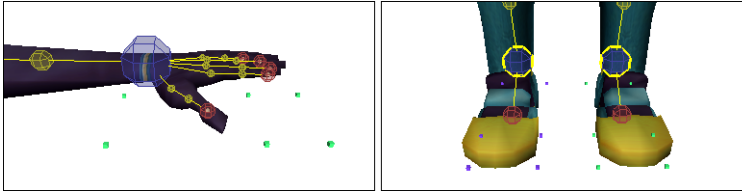
Green and blue floor contact markers displayed around Mia's hands and feet

NOTE When no floor object is defined in the Mapping list of the Character Definition pane, the MotionBuilder grid is used as the floor. In this tutorial, the floor is not defined.

To adjust the foot floor contact markers:

1   In the Viewer window, click the View menu and select Orthographic > Producer Right (or click in the Viewer and press Ctrl-R) to switch to Producer Right camera view.

2   Zoom in on Mia's feet as shown in the following figure.
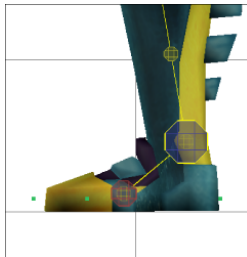
3   Click one of the floor contact markers underneath Mia's feet.

4   Click the Translate button in the Viewer toolbar (or press T) to activate the Translate mode.

5   Translate the floor contact marker using the following guidelines and figure for the marker placement:

   ■   Align the middle marker where the toe bone starts (B).

   ■   Align the front marker with the toe of the model (A).

   ■   Align the rear marker with the heel of the model (C).
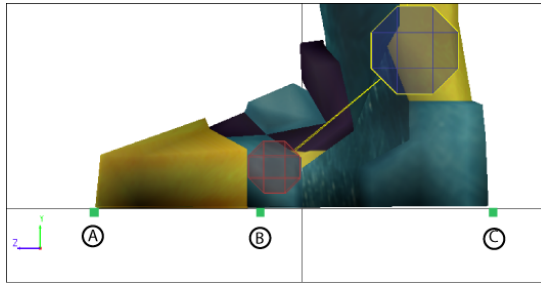
Mia's foot floor contact markers *A.* **Front marker** *B.* **Middle marker** *C.* **Rear marker**

> **NOTE** Moving one foot marker adjusts the other markers accordingly so that as you adjust the green markers on Mia's left foot, the blue markers on the right foot are also adjusted.

6 Switch to Orthographic Producer Front view (Ctrl-F), zoom in on the feet (Ctrl-drag), and translate the foot markers right or left to position them at the edges of the feet as shown in the following figure.
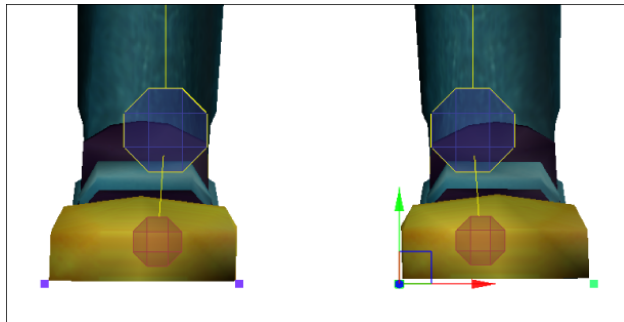
Left and right position of the markers

7 In the Character Settings pane, expand *Floor Contacts* (A) and activate the *Feet Floor Contact* option (B).

Creating and Customizing a Control Rig | **27**
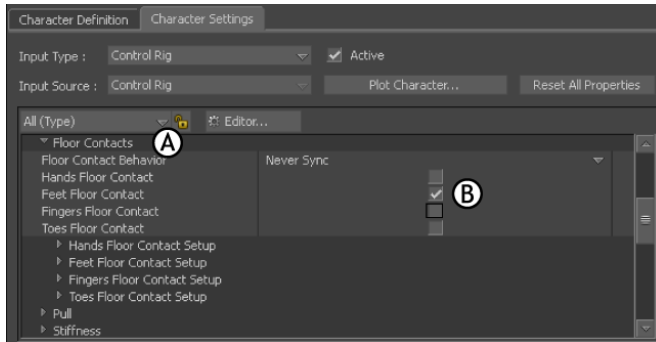
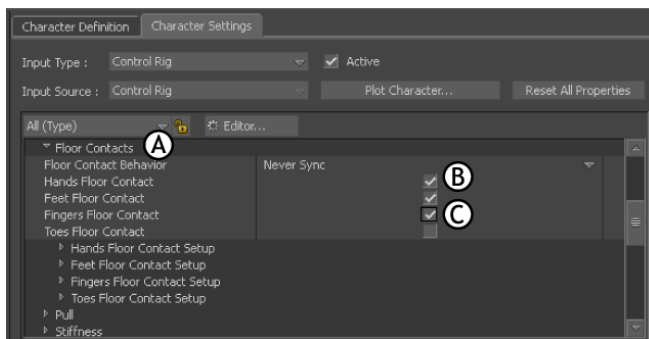**Character Settings pane** *A.* **Floor Contacts group of properties** *B.* **Feet Floor Contact option**

Adjust the hand floor contact markers

In the following procedure, you define the floor contact for the hands so that when Mia's hands touch the floor, it produces a realistic result.

To adjust the hand floor contact markers:

1   In the Scene browser, double-click the *Mia* character and click the Character Settings pane to display the Character Settings.

2   In the Character Settings pane, expand *Floor Contacts* (A) if it is not already expanded, and activate the *Hands Floor Contact* (B) and the *Fingers Floor Contact* (C) options to activate the floor contact for the hands and fingers.

Character Settings pane *A.* **Floor Contacts** *B.* **Hands Floor Contact** *C.* **Fingers Floor Contact**

3 Expand the *Hands Floor Contact Setup* option, click the *Hands Contact Type* menu (A) and select *Wrist.*
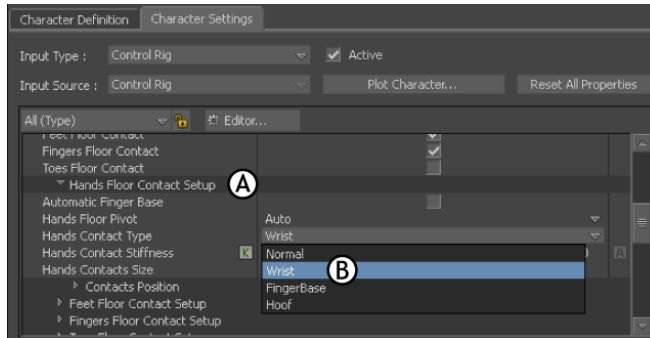
Character Settings pane: *A.* **Hands Contact Type** *B.* **Wrist Hands Contact Type**

By default, the *Hands Contact Type* is set to *Normal*, which gives Mia six hand floor contact markers. Changing this option to *Wrist* gives each hand four floor contact markers for basic control.

4 Zoom in on one of Mia's hands in the Viewer window using various camera views.

5 Align the rear hand markers with the wrist and the front markers with the base of the fingers (not including the thumb). Also translate the rear markers lower on the Y-axis to align them with the base of the palm as shown in the following figure.
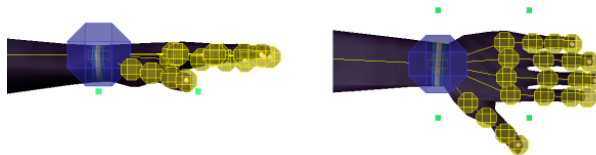
Add Auxiliary pivots

In the following procedure, you create two Auxiliary pivots for additional control over the IK system on Mia's Control rig. These Auxiliary objects can be used to create realistic rotation on Mia's feet as she walks. They also make it easier to rotate Mia's feet while creating keyframe animation.

To add Auxiliary pivots:

1   In the Character Controls window, right-click the Left Ankle cell and select *Create Aux Pivot* from the contextual menu.

An Auxiliary pivot is created for the left ankle IK effector (A). The Auxiliary pivot displays on the left ankle cell in the Character Controls window as an X (B).
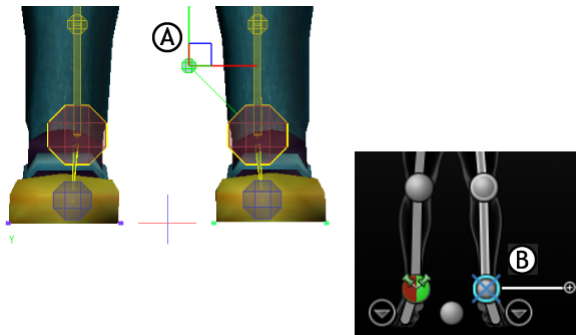
A. Auxiliary pivot displayed in the Viewer window B. X represents the Auxiliary pivot

By default, the foot effector is deselected when you create the Auxiliary pivot, and the Auxiliary pivot is selected. In the Viewer window, the Pivot Selection mode is automatically selected.
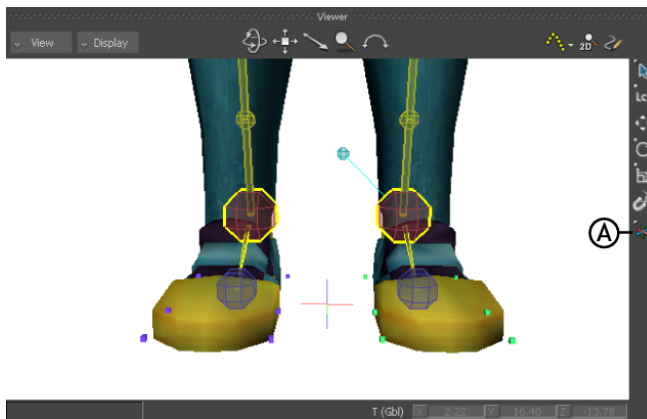
Viewer window A. Pivot Selection mode

2 Select the Auxiliary pivot you created, if it is not already selected, and translate it until it is placed at the tip of Mia's toes, as shown in the following figure.
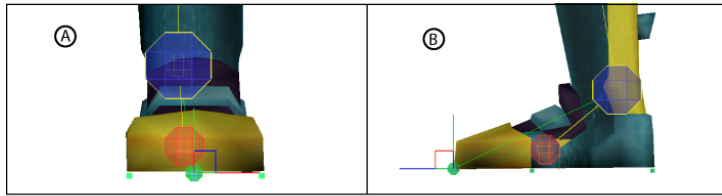
Left Ankle Auxiliary pivot *A.* **Front view** *B.* **Side view**

NOTE You can use the [icon] > Show/Hide menu in the Character Controls window to hide the Floor Contact markers as you place the Auxiliary pivots.

3 Right-click the Left Ankle cell again and select *Create Aux Pivot* from the contextual menu.

A second Auxiliary pivot displays in the Viewer window.

4 Translate the second Auxiliary pivot to display at the heel of the foot, as shown in the following figure.
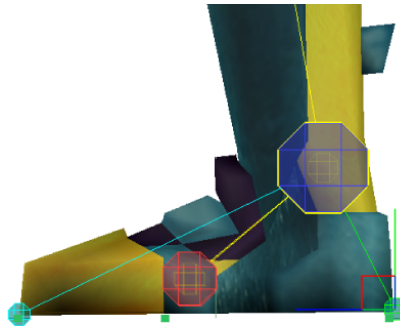
Summary

In this tutorial, you created a Control rig, arranged the floor contact markers on the character's feet, then created two Auxiliary pivots to control the rotation of the foot.

In the next tutorial, (Creating a Character Extension (page 34)), you add a Character Extension to the Mia character.

Creating a Character Extension

This tutorial guides you through the procedures necessary to create a Character Extension that enables you to control extra appendages for a character.

In this tutorial, you load a limb for the Mia character, attach it to Mia using a Character Extension, and define its animation in relation to Mia's body.

This tutorial shows you how to:

- Prepare the scene (page 34)
- Connect the extra limb to the character (page 36)
- Create a Character Extension (page 40)

The following assets are required for this tutorial:

- *mia_rigged.fbx*
- *servo.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.


Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the file needed to start this tutorial.

To prepare the scene:

1 From the menu bar, select File > New, then select Layout > Editing.

   MotionBuilder displays a new 3D scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2 Click the *Tutorials* folder in the Asset browser.

3 Drag the *mia_rigged* asset (*mia_rigged.fbx* file) from the Asset browser into the Viewer window, then select FBX Open > <No Animation> from the contextual menu as shown in the following figure.
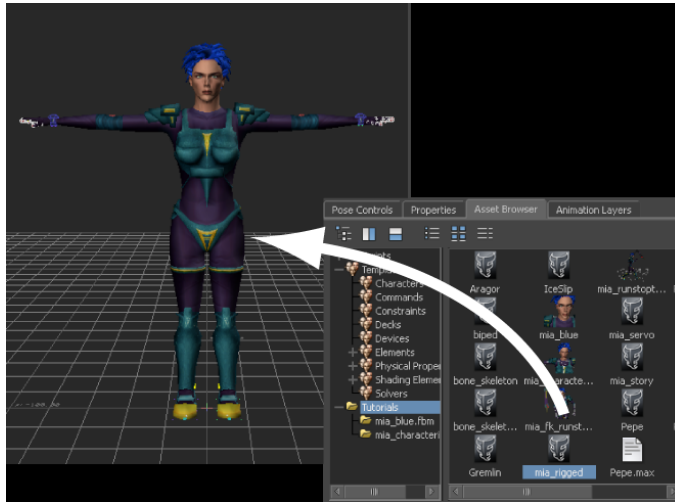
Characterized Mia appears in the Viewer window

The characterized Mia appears in the Viewer window in the T-stance.

4 From the Asset browser drag the *servo* asset (*servo.fbx* file) into the scene and select FBX Merge > <No animation> from the contextual menu.

A Servo arm is loaded into the scene, positioned over Mia's shoulder. In the next procedure, you attach this arm to Mia as another limb.

Mia and Servo arm loaded into the scene

5 Choose File > Save As.

The Save File window appears.

6 Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

The Save Options dialog box appears.

7 Click Save.

Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.

# Connect the extra limb to the character

In the following procedure, you create a Parent-Child relationship between the Servo arm and Mia's shoulder.

To connect the extra limb to the character:

1 Switch to X-Ray display mode (Ctrl-A) in the Viewer window.

NOTE Toggle between Normal mode, Models Only mode, and X-Ray mode using the keyboard shortcuts Ctrl-A.

2 In the Character Controls window, make sure Mia is selected as the current character.

3 Click in the Viewer window then do the following:

■ Press Ctrl-W to switch to the Schematic view.

■ Right-click in the Schematic view and select Auto-Arrange and then Arrange-All from the contextual menu.

■ Press A to see all the nodes in the Schematic view.

The Schematic view displays a hierarchy for Mia's skeleton (A), Mia's Control rig (B), and a third hierarchy for the Servo arm ("ServoMaster", C).
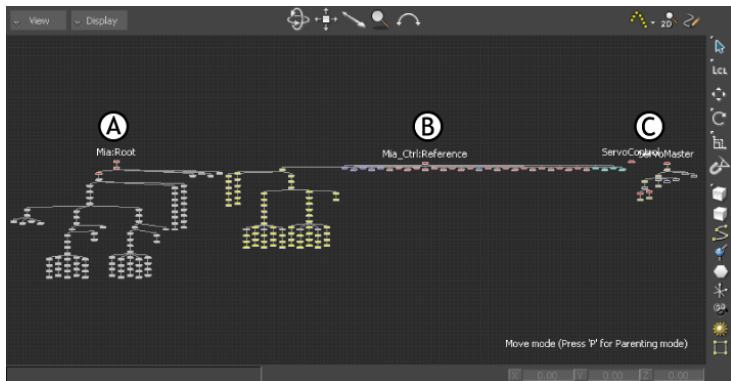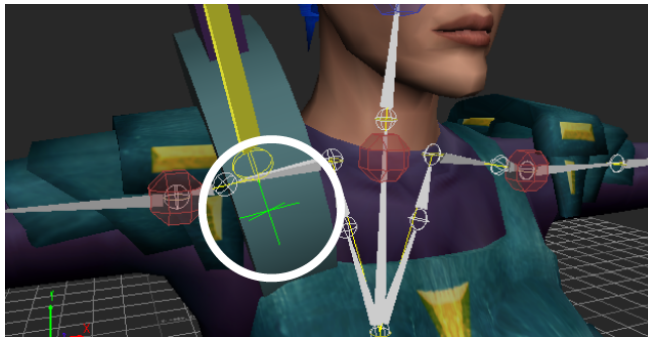

Schematic view of hierarchies in the scene *A.* Mia's skeleton *B.* Mia's Control rig *C.* The Servo arm

4 Zoom in on the Servo arm (ServoMaster) hierarchy at the right of the view (C) and select the ServoMaster node.
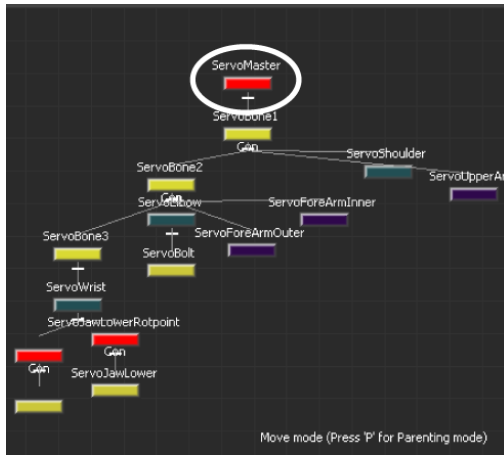
ServoMaster node selected

5 Switch back to the Producer camera view (Ctrl-W) and zoom in on Mia's right shoulder. The ServoMaster node null is still selected.


The ServoMaster null is selected in the Viewer window

6 Press the P keyboard shortcut to activate Parenting mode, then drag the ServoMaster null to the Mia:RightShoulder bone (A).

The bone is highlighted green as you parent the Servo arm. This parents the Servo arm to the right shoulder bone (B).
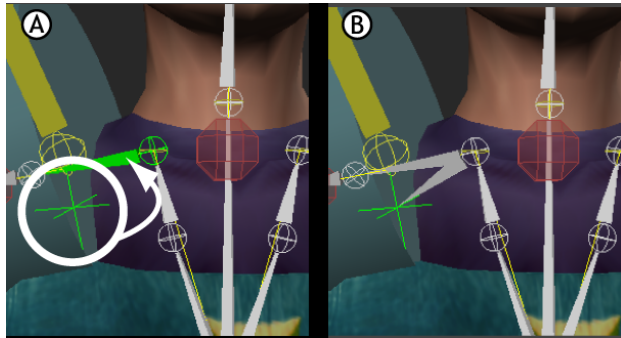
***A.** Parenting the ServoMaster null to Mia's right shoulder bone **B.** After parenting*
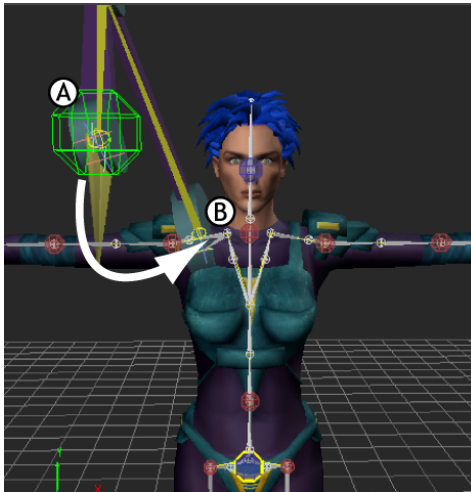
7 Switch to the Schematic view to verify that the Servo arm is a child of the Mia:RightShoulder bone.
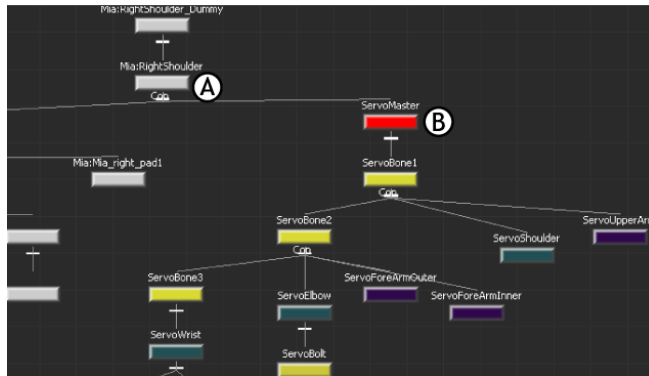
Schematic view showing parenting structure *A.* Mia:RightShoulder bone *B.* Servo arm hierarchy

**NOTE** The Mia:RightShoulder node is found on the left side of the Schematic view. If you have not already done so, right-click and select Auto arrange to clean up the hierarchy.

8 Switch back to the Producer Perspective view.

9 Select the ServoControl effector at the end of Mia's Servo arm (A), make sure you are back in Parenting mode, and parent it to Mia's right shoulder bone as well.

A. ServoControl effector *B.* Right shoulder bone

10 Switch to the Schematic view to verify that the ServoControl effector is a child of the Mia:RightShoulder bone.
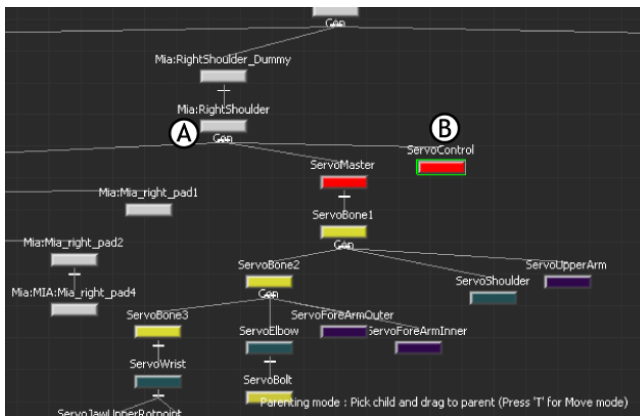

Schematic view showing parenting structure *A.* Mia:RightShoulder bone *B.* ServoControl effector

Create a Character Extension

In the following procedure, you create a Character Extension to connect the Servo arm to the Mia character so that they can be controlled and keyframed together.
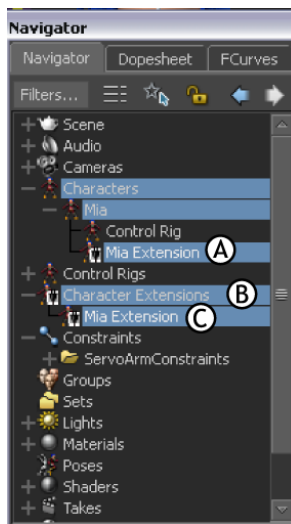
To create a character extension:

1 In the Scene browser, expand Characters, right-click Mia, and select Create Character Extension from the contextual menu (A).
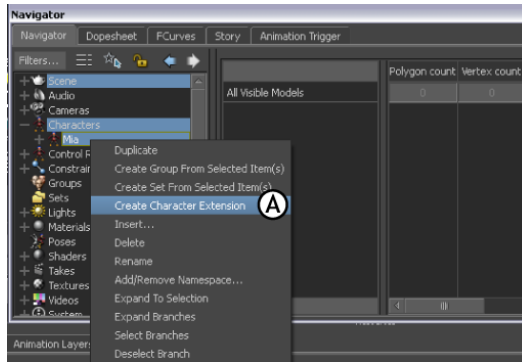
Scene browser *A.* **Create Character Extension option**

2 Expand the Character Extensions folder in the Scene browser to see the Mia Extension (C).

Scene browser *A.* **Character Extension added to Mia character** *B.* **Character Extensions heading added to the Scene browser** *C.* **Character Extension named for the Mia character**

3 Switch back to the Producer Perspective view.

4 `Alt`-drag the ServoControl effector from the Viewer window onto the *Mia Extension* in the scene browser and select *Add to Mia Extension* from the contextual menu as shown in the following figure.
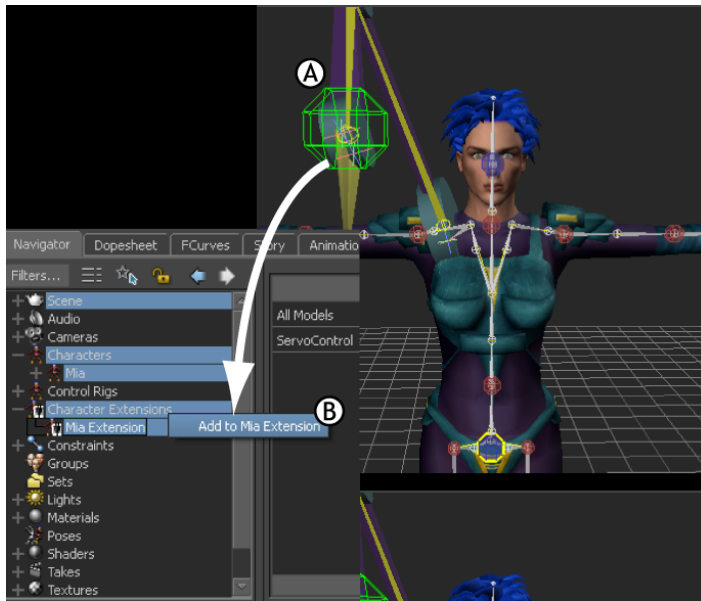
A. ServoControl effector B. ServoControl effector added to Mia Extension

The Servo arm is defined as a Character Extension of Mia, and is considered as a new "body part" of the Mia character.

5 With the ServoControl effector still selected, open the Properties window.

NOTE The Properties window is a tab in the Resources pane, on the right side of the interface. Alternatively, from the menu bar, click Window > Add Property View to display the window.
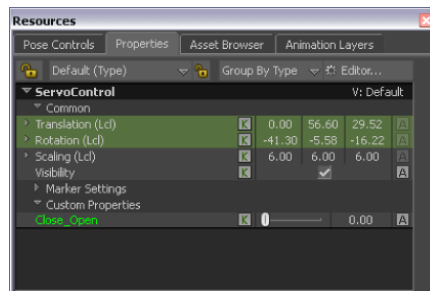
Properties window

6 Select the green custom property *Close_Open* and drag its slider left and right as shown in the following figure.
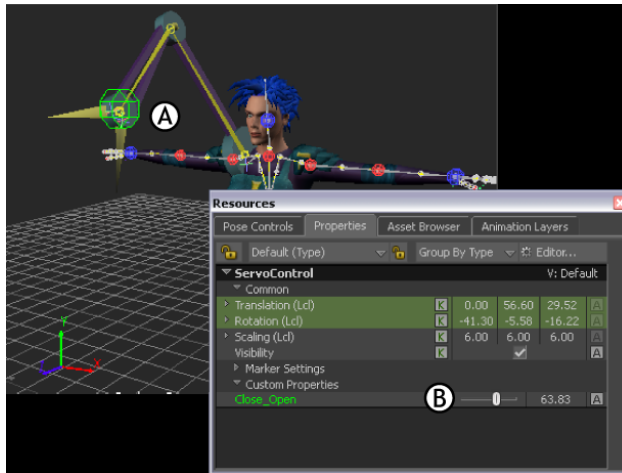

A. Servo arm opens **B.** Custom property Close_Open

In the Viewer window, the pincer moves on the Servo arm.

7 `Alt`-drag the *Close_Open* property over the *Mia Extension* (A) and select *Create 1 Property Reference* from the contextual menu (B).
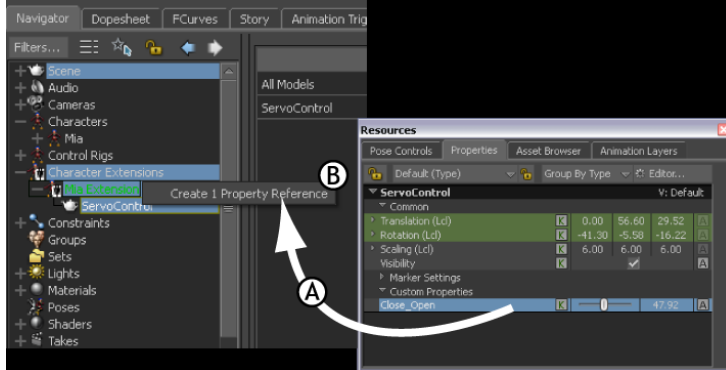
A. Close_Open property dragged to Mia Extension **B.** Select Create 1 Property Reference

8 Select the *Mia Extension* in the Scene browser (A), then activate the Lock option in the Properties window (B) so that the *Mia Extension* properties stay open no matter what you select.
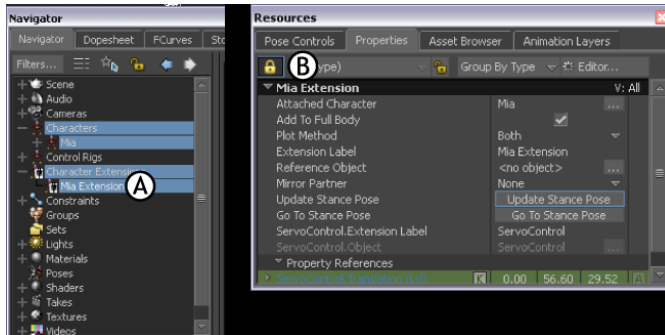
A. **Mia Extension selected** *B.* **Lock option activated in the Properties window**

9 Define Mia's right shoulder bone as the Reference object for the Character Extension by `Alt`-dragging the Mia:RightShoulder bone (A) into the Reference Object field in the Properties window (B).
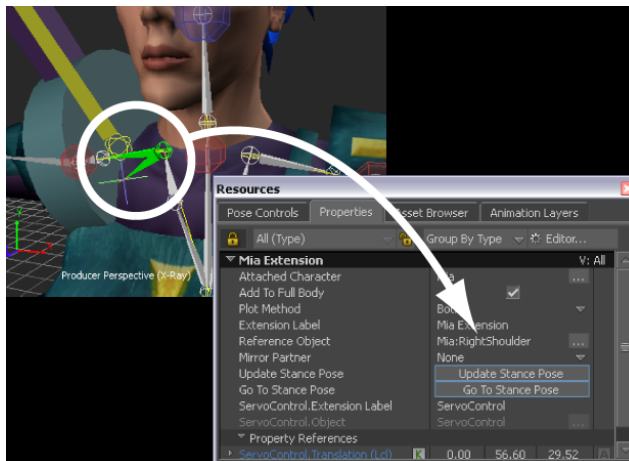

A. **Mia:RightShoulder** *B.* **Mia:RightShoulder Reference Object**

10 Click OK in the Reference Object Change dialog box that appears.

The Reference object for your Character Extension is used to calculate all future positioning of the Extension, for example when the Character Extension is included in a pose.

NOTE The **Add To Full Body** option in the Properties window is turned on to define whether you want the Character Extension to be keyed when you set keys in Full Body Keying mode.

See MotionBuilder Help > Animating Characters > Character setup > Character Extensions > Character Extension properties.

Summary

In this tutorial you added a limb to the Mia character by creating a Character Extension.

In the next tutorial (Creating a Walk Cycle (page 45)), you animate the character and the Character Extension using the Pose Controls.

Creating a Walk Cycle

This tutorial guides you through the procedures necessary for using poses to create a walk cycle.

This tutorial shows you how to:

■ Prepare the scene (page 46)
■ Create poses (page 48)
■ Create animation with poses (page 57)
■ Mirror poses (page 61)
■ Play the animation (page 64)

The following asset is required for this tutorial:

■ *mia_servo.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.


BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

1 From the menu bar, select File > New, then select Layout > Editing.

   MotionBuilder displays a new 3D scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2 Click the *Tutorials* folder in the Asset browser.

3 Drag the *mia_servo* asset (*mia_servo.fbx* file) into the Viewer window, then select FBX Open > <No Animation> from the contextual menu that appears.

   A model named Mia (*mia_servo* asset) appears in the Viewer window as shown in the following figure. This character includes a "Servo arm" that is parented to the right shoulder bone and added as a Character Extension.
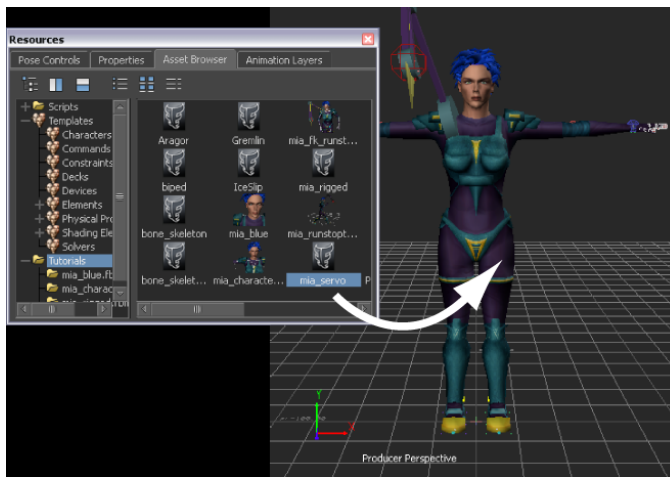
   In the Character Controls window, Mia is shown by default as the current character in the Character menu (A).
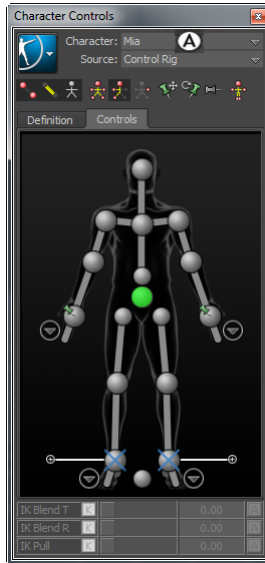
A. **Character Controls' Character menu**

4 Choose File > Save As.

The Save File window appears.

5 Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

The Save Options dialog box appears.

6 Click Save.

Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.

Create poses

In the following procedures, you create several full body poses on your character, including the Character Extension, to create a walk cycle.

Position the character:

1 In the Character Controls window, click the plus sign (+) above each ankle effector to expand both auxiliary pivots. This way you can see Mia's ankles are pinned in Translation (T) and Rotation (R).
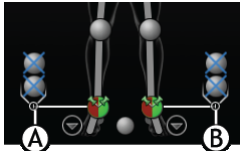
Click the plus signs to expand the Ankle effectors (A, B)

2 Ctrl-click to select the wrist and ankle effectors.

Effectors *A* **Wrist effectors** *B.* **Ankle effectors**

3 Disable the T and R Effector pinning options.

Effector Pinning options A**. T and R Effector pinning disabled**

NOTE You may have to toggle R (Rotation pinning) on and off once more to ensure that rotation is disabled.

Make sure that there are no more T or Rs in any of the effectors on the Character Representation.

4 Ensure the Full Body keying mode ( ) in the Character Controls toolbar is enabled.

In the Full Body keying mode, pasted poses are placed onto the character's entire body, and keyframes are placed on all effectors.

5 In the Character Controls window, select the Left Shoulder effector.

6 Move the cursor over the Viewer window, press R, and rotate the effector until Mia's left arm is in a more natural position at her side.
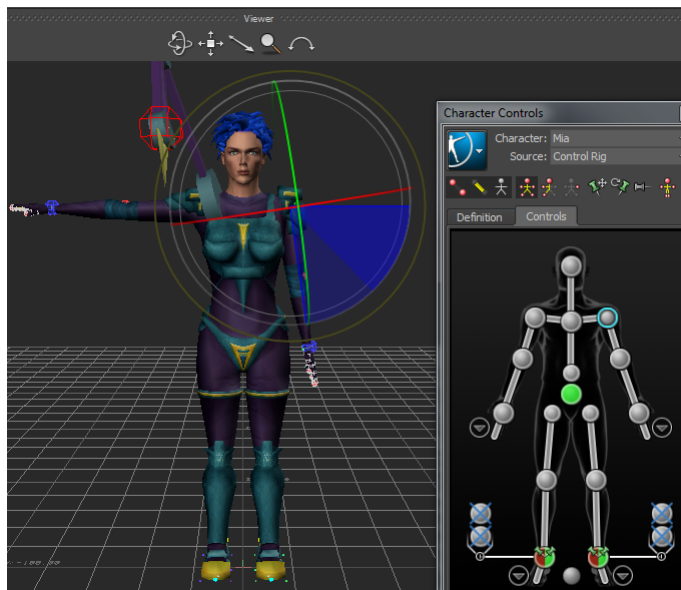

7 Do the same for the Right Shoulder effector.

8 Ctrl+click both wrist effectors and translate them upward on the Y-axis to give the elbows a natural bend.

Wrists translated upward in Y-axis using the wrist effectors

9 Click on an empty area of the Viewer window to deselect the wrist effectors and choose a camera view that lets you see a side view of the character. For example you can press `Ctrl-R` to switch to the Producer Right camera view.
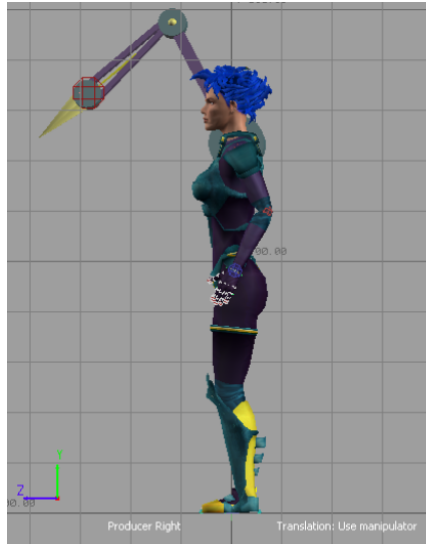
Producer Right camera view

NOTE You can switch the camera view at any time during the tutorial to get a better view.

To create the first pose for the walk cycle:

1 In the Character controls window, select the right ankle effector and move the foot forward (on the Z-axis) and upward slightly, so that the knee bends.

2 Select the left ankle effector and slide it backward until Mia's feet are apart and both knees are bent as if she is walking.

NOTE You can select the Ankle effector pivots to flex her foot.

3 Select the Right Shoulder effector and rotate the right arm slightly backward, then select the Left Shoulder and rotate the left arm forward as if Mia is naturally swinging her arms.

4 Select the Hips effector and translate Mia's body up or down so that she appears to be in mid-stride. If your transformations cause Mia to float above the floor, select the Hips effector and translate Mia downward at

any time. The default floor contact makes Mia's feet interact naturally with the default floor.

This pose should have Mia with her right leg beginning the forward motion of a step, as shown in the following figure.
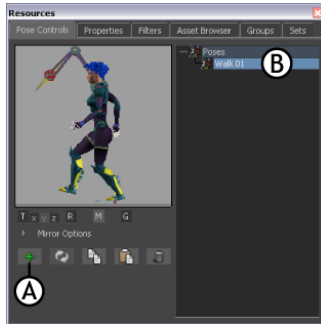

First pose ready to create

5 In the Resources window, click the Pose Controls tab and click Create ➕ .

A pose is added to the Pose browser.

The position of the Character Extension is included with the position of Mia's body in this pose.

6 Expand the *Poses* folder in the Pose browser to see the pose.

7 Right-click the pose created and rename the pose "Walk 01" (B).

**Pose Controls *A.* Create pose *B.* "Walk 01"pose in Pose browser**

Create the second pose for the walk cycle:

1 Position Mia's legs and arms so that she looks similar to the following figure.

- Select the right ankle effector and slide it back and down until her foot is flat on the ground.

- Then select the left ankle effector and slide it back until it is behind her, to provide momentum.

- Adjust the hips effector to bend her knees believably.

2 Select the Mia:ServoControl effector, and translate the Servo arm so it reaches in front of Mia.

3 With the Mia:ServoControl effector still selected, click the Asset browser Properties tab and use the Close_Open property (B) to open the pincers about half-way as shown in the following figure.
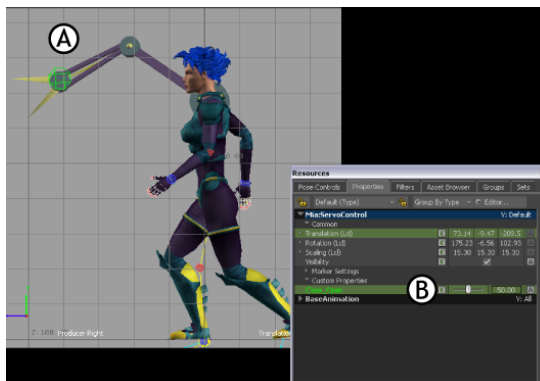
***A.* Second pose for the walk cycle *B.* Close_Open property to control the pincers**
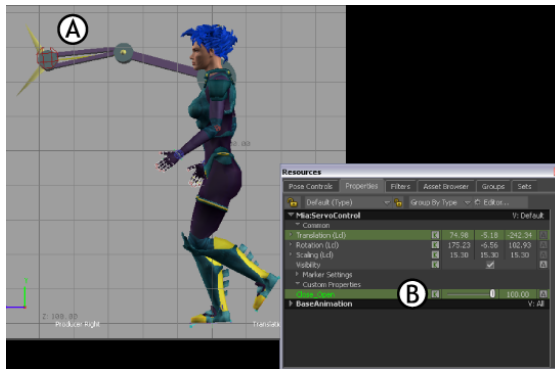
4 In the Pose Controls, click Create and rename this pose as "Walk 02" (A).
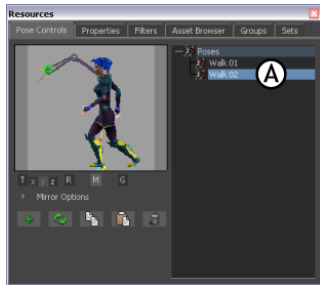
Pose Controls *A*. Second pose renamed "Walk 02"

**Create the third and final pose for the walk cycle:**

1 Position Mia's legs and arms so that her step appears similar to the following figure.

2 Select the Mia:ServoControl effector and extend the Servo arm to reach even further in front of Mia.

3 With the Mia:ServoControl still selected, open the pincers further using the Close_Open property in the Properties window (B).

In this pose, the left leg goes back, and the Servo arm goes forward, completing one step for the first half of the walk cycle.

***A*. Third pose for the walk cycle *B*. The Close_Open property**

4 In the Pose Controls, click Create and then rename this pose "Walk 03".

You now have three poses in the scene. The three poses are listed in the Pose browser.
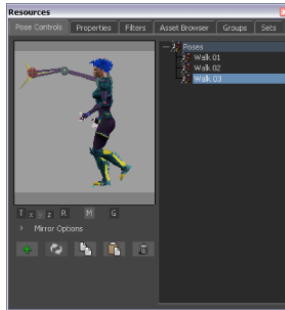
**Three poses created for the walk cycle**

Create animation with poses

In the following procedure, you use the three poses you created to create one half of a walk cycle. By keyframing these poses at different frames, you create a short walking animation.

1 In the Character Controls window, deselect any effectors that may be still selected and ensure that Full Body keying mode is selected (A).

**Character Controls** *A.* **Full Body Keying mode selected**

2 In the Pose browser, double-click the "Walk 01" pose to paste it on Mia.
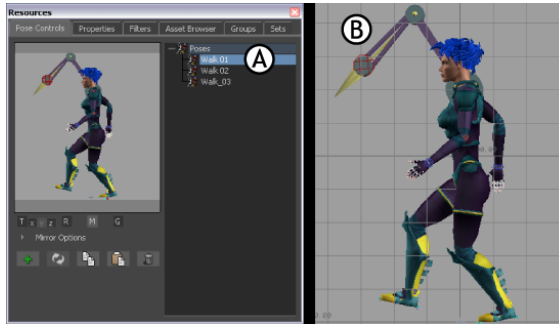
Pose Controls: *A.* **First pose for the walk cycle** *B.* **"Walk 01" pose pasted on Mia**

By default, the Gravity, Translation, and Rotation options are active in the Pose Controls window. This means that the translation and rotation of the pasted pose match the translation and rotation of the selected effector on the current character. The Gravity option ensures that the feet stay at the original level of the pasted pose (normally floor level).

3 Select the Hips effector, then go to frame 0 in the Transport Controls.
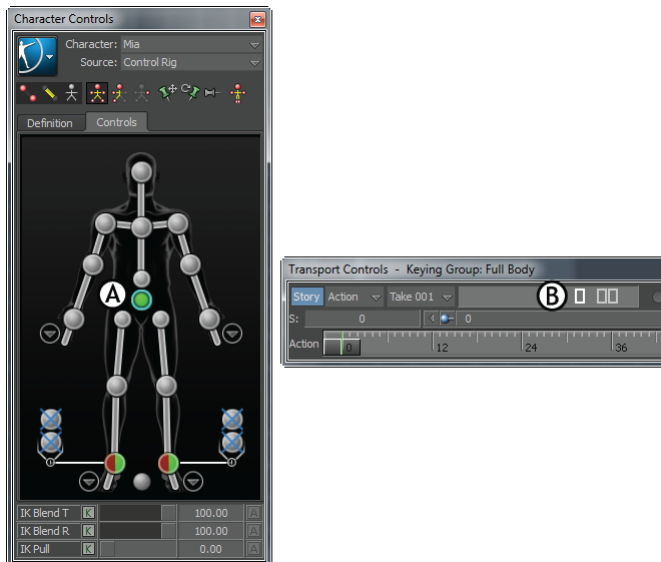
*A.* **Hips effector selected** *B.* **Current frame is 0**

4 In the Key Controls window, select Auto in the Type menu.

5 Select AnimLayer1 from the Layer menu (A), then click Flat to set a Flat keyframe (B).

NOTE You can also press Ctrl-K to set a Flat keyframe.

Key Controls *A.* **AnimLayer1 selected** *B.* **Flat key**

6 Go to frame 4 and do the following:
  ■ Double-click the Walk 02 pose to paste it on Mia.
  ■ Press Ctrl-K to set a (Flat) keyframe.
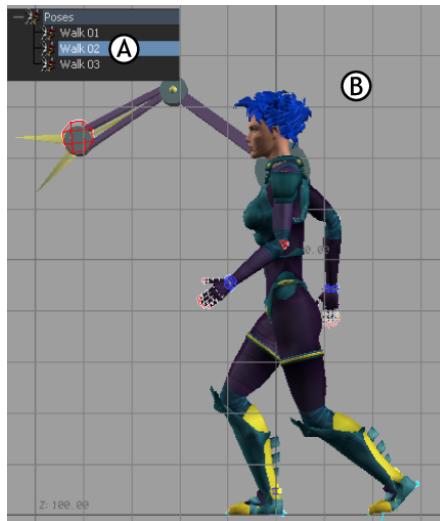
Frame 4: *A.* **Second pose for the walk cycle** *B.* **"Walk 02" pose pasted on Mia**

7 Go to frame 8 and do the following:
  ■ Double-click the Walk 03 pose to paste it on Mia.
  ■ Press Ctrl-K to set a (Flat) keyframe.

**Frame 8:** *A.*Third pose for the walk cycle *B.* "Walk 03" pose pasted on Mia

8 Drag the Timeline indicator through the animation to view the step you created.

The interpolation between the three keyframes creates the movement for one step.

Mirror poses

In the following procedure, you mirror the three poses from the Pose browser to create the second half of the walk cycle. By keyframing these mirrored poses after the original poses, you complete the short walking animation.

1 In the Pose Controls window, activate the M (Mirror) button (A) .
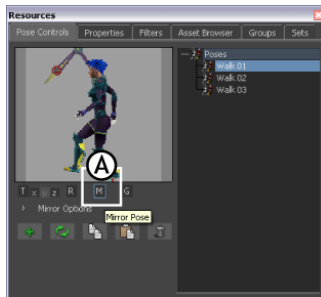
Pose Controls *A.* Mirror activated

2 Go to frame 12 and do the following:
- ■ Double-click the "Walk 01" pose (A).

  The "Walk 01" pose is pasted and mirrored onto the character (B). Because you mirror-pasted the pose, the left leg is now forward, and the right leg is behind to continue the walk cycle on the other side.
- ■ Press Ctrl-K to set a (Flat) keyframe.

Frame 12 *A*. First pose for the second half of the walk cycle *B*. "Walk 01" pose pasted on Mia

3 Go to frame 16 and do the following:
- ■ Double-click the "Walk 02" pose (A).

  The "Walk 02" pose is pasted and mirrored onto the character (B).
- ■ Press Ctrl-K to set a (Flat) keyframe.

Frame 16 *A*. Second pose for the second half of the walk cycle *B*. "Walk 02" pose pasted on Mia

4 Go to frame 20 and do the following:

- Double-click the "Walk 03" pose (A).

   The "Walk 03" pose is pasted and mirrored onto the character (B).

- Press Ctrl-K to set a (Flat) keyframe.
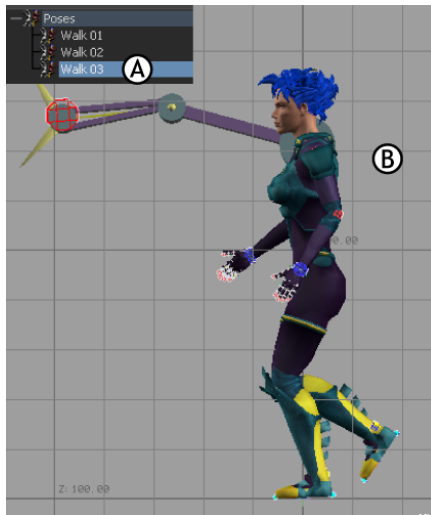
Frame 20 *A*. Third pose for the second half of the walk cycle *B*."Walk 03" pose pasted on Mia

Your animation now consists of six keyframes. The first three keyframes were mirrored onto the left side of the character for the last three keyframes, creating a complete walking movement. To complete a full animation cycle, your take should begin and end with the same position.

5   On the Action timeline in the Transport controls, select the keyframe at frame 0 and C-drag the keyframe to frame 24.

The keyframe at frame 0 is copied to frame 24.

The animation now begins and ends on the same position, creating a complete cycle.

Play the animation

1   in the Transport Controls window, click on the Action timeline and then press Ctrl-Shift-A to frame the animation on the Action timeline to its full length of 24 frames.

2   Click Loop (A), then click Play.

Animation framed *A*. Loop option

As the animation plays, each loop shows a full walk cycle.

In your animation, the movement may be a bit choppy, and the feet may slide on the floor. You can smooth your movement by adjusting the animation's function curves in the FCurves window.

Summary

In this tutorial, you created poses on a character, set keyframes of these poses at different points, and created a walk cycle.

NOTE You can also create a loop if you want to create a walk cycle using the Story window.

In the next tutorial, Retargeting Character Animation (page 65), you retarget animation and a Character Extension from one character to another.

Retargeting Character Animation

This tutorial guides you through the procedures necessary to retarget animation from one characterized character to another. Since the source character includes a Character Extension and the target character does not, you must also retarget the Character Extension.

This tutorial shows you how to:

- Prepare the scene (page 66)
- Save the character animation (page 67)
- Create a scene (page 70)
- Load character animation (page 71)
- Play the animation (page 75)

The following assets are required for this tutorial:

- *mia_fk_runstopturn.fbx*
- *Gremlin.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.


BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

1 From the menu bar, select File > New, then select Layout > Editing.

MotionBuilder displays a new 3D scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2 Click the *Tutorials* folder in the Asset browser.

3 Drag the *mia_fk_runstopturn* asset (*mia_fk_runstopturn.fbx* file) into the Viewer window as shown in the following figure, then select FBX Open > All takes from the contextual menu that appears.

A model named Mia appears in the Viewer along with her "Servo arm" Character Extension.
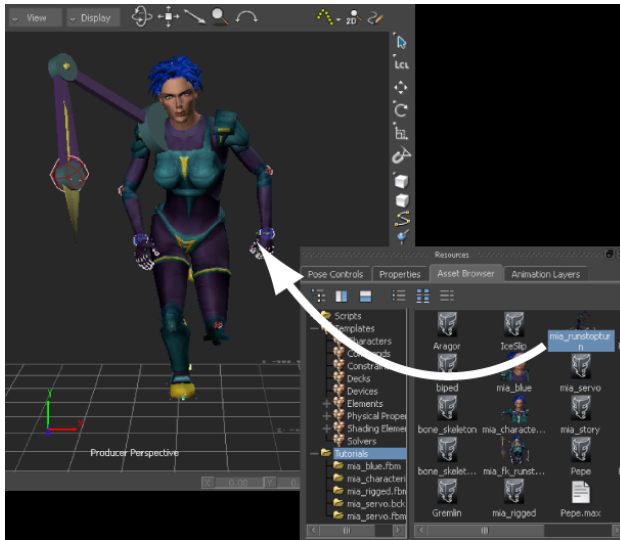
Mia_fk_runstopturn asset dragged into the scene

4 Choose File > Save As.

The Save File window appears.

5 Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

The Save Options dialog box appears.

6 Click Save.

Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.

**7** In the Transport Controls, click Play (A) to view the animation on the Mia character.
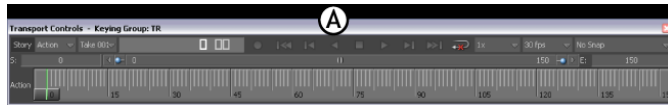
**Transport Controls** *A.* **Play button**

Save the character animation

In the following procedure, you save the character animation using the Save Character Animation option. This lets you import Mia's animation to another character using the Load Character Animation option.

1 From the Character Controls menu button, select File > Save Character Animation.
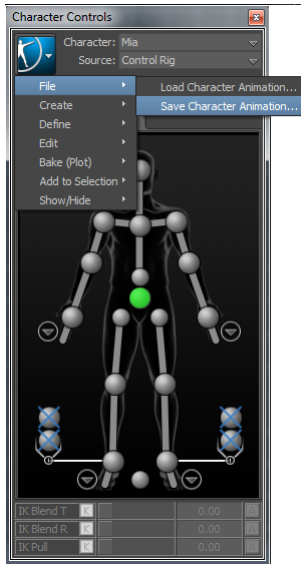
Character Controls menu *A*. Save Character Animation option

2 Navigate to where you want to save the character animation, enter a file name, and click Save.
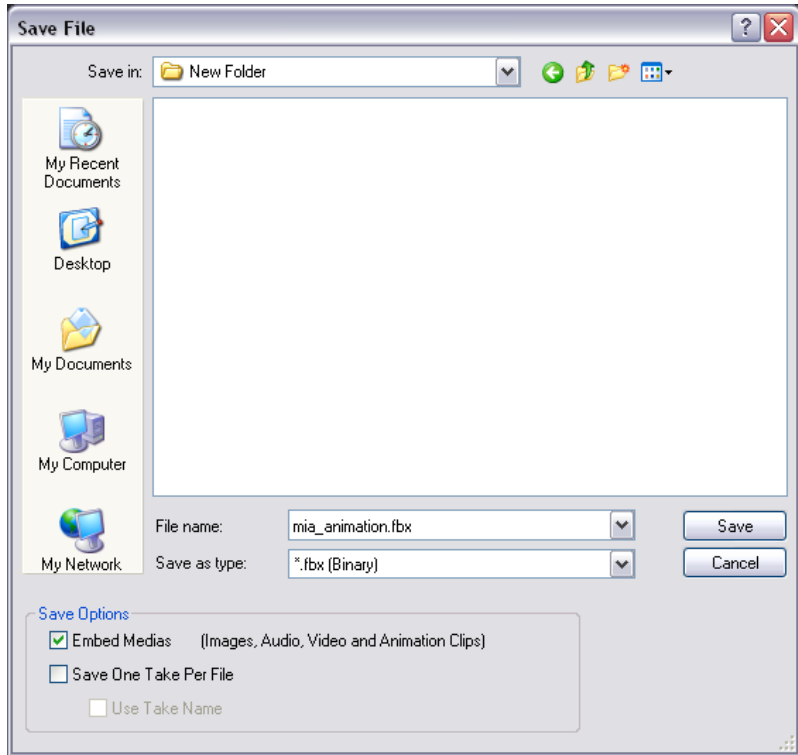
Save File dialog box

3 In the Save Character Animation Options dialog box that appears, activate the Save Control Rig option and the Save Character Extensions option, then click Save.
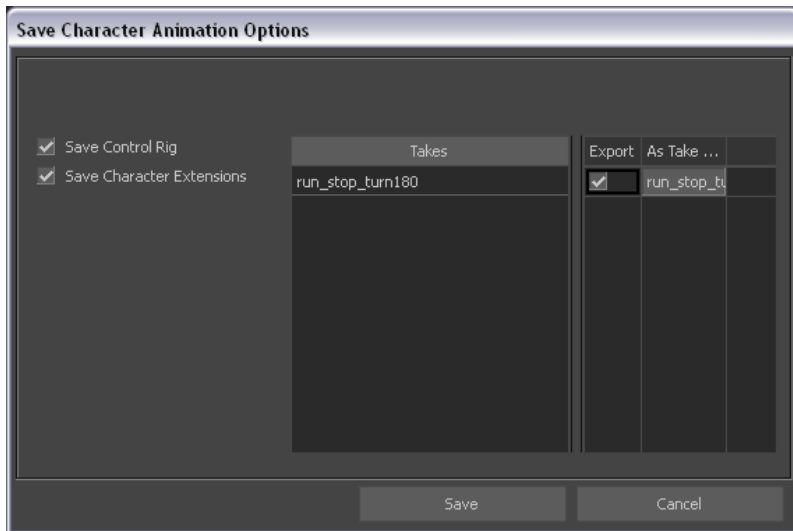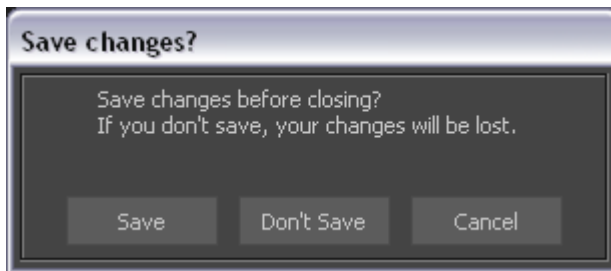
Save Character Animation Options dialog box

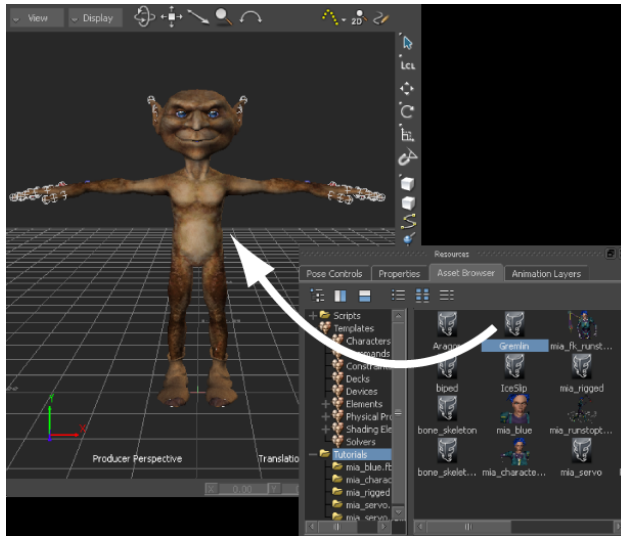The animation and Character Extension are saved as an *.fbx* file.

Create a scene

In the following procedure, you create a scene.

1. Press Ctrl-N to create a scene.

2. In the Save changes dialog box appears, click Don't Save.

Save changes dialog box

3. From the Asset browser, drag the *Gremlin* asset into the scene, and select
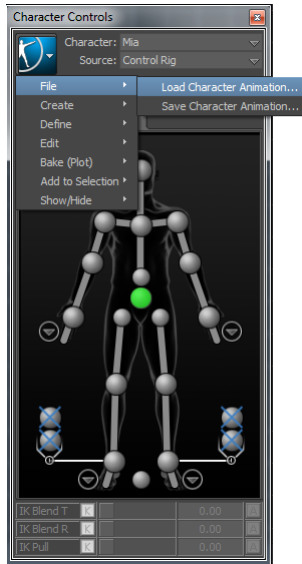   FBX Open > <No animation>.

Gremlin asset dragged into the scene

Load character animation

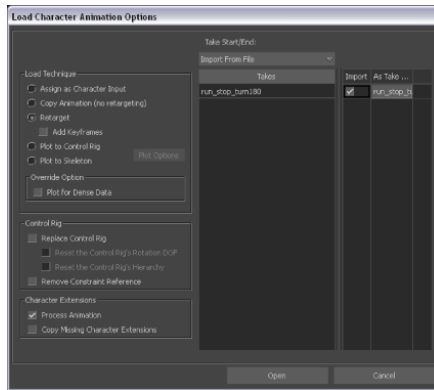In the following procedure, you load the character animation you saved earlier.

   1 In the Character Controls window, select File > Load Character
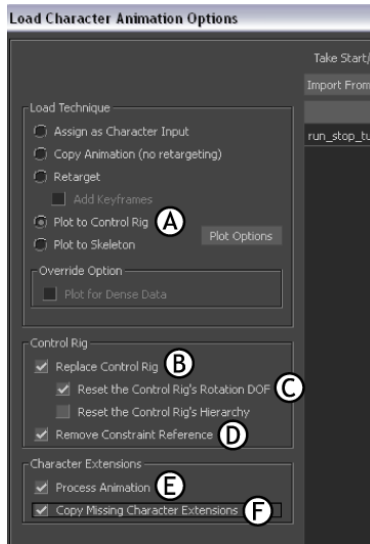Animation.

Character Controls A. Load Character Animation option

2 Navigate to select the *.fbx* file you saved earlier in this tutorial and click Open.

The Load Character Animation Options dialog box appears.

3 Choose the following settings:

- In the Load Technique area (A), select the Plot to Control Rig option.

- In the Control Rig area, activate the Replace Control Rig option (B).

- In the Control Rig area, activate the Reset Control Rig's Rotation DOF option (C).

- In the Control Rig area, make sure the Remove Constraint Reference option is activated (D).

- In the Character Extensions area, activate the Process Animation option (E).

- In the Character Extensions area, activate the Copy Missing Character Extensions option (F).

Load Character Animation Options settings

4 Click Open.

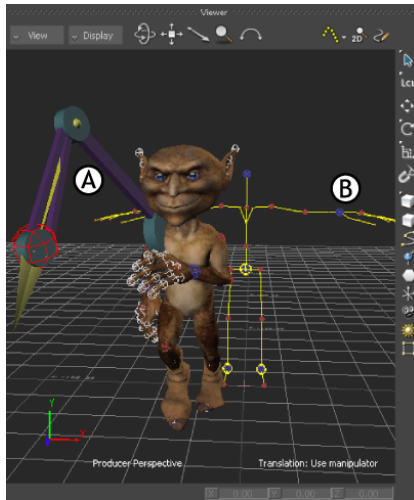Mia's animation, Control rig, and character extension are loaded onto the Gremlin character.
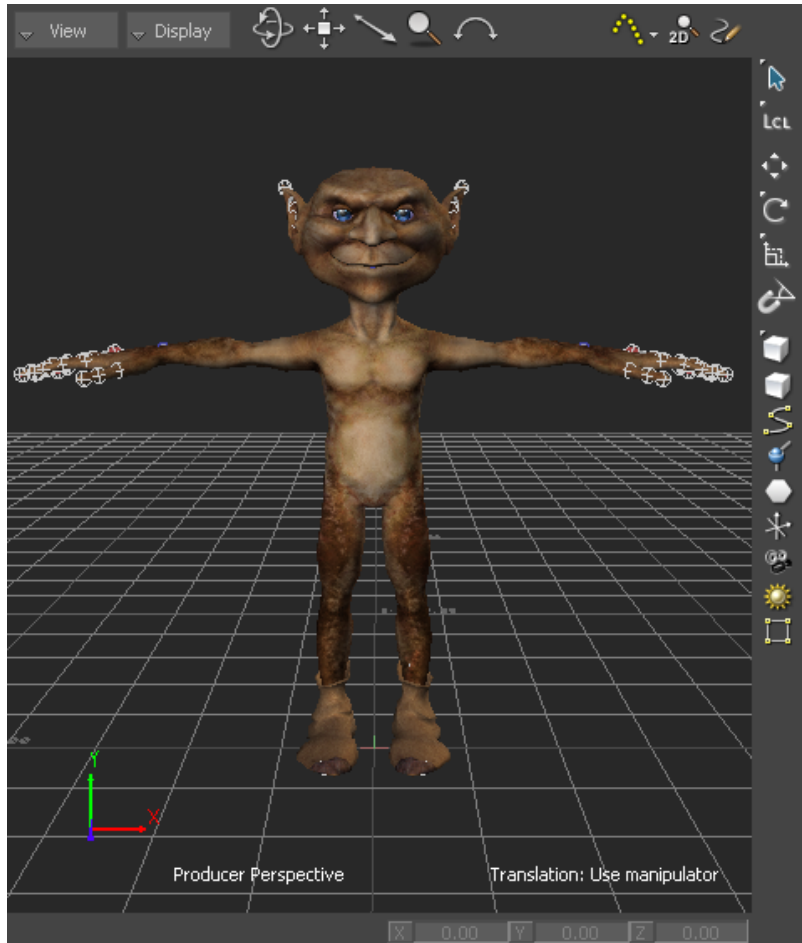
Mia's animation and Control rig loaded onto the Gremlin character

Because Mia's Servo arm is parented to her right shoulder FK effector, the Servo arm is attached in the same way to the Gremlin character.

Play the animation

Play the result animation.

1 Click Play in the Transport Controls (A) to play the animation.

A. Gremlin using Mia's animation B. Gremlin's Control rig

Notice how both the Servo arm and the animation are transferred onto the Gremlin character (A). The Gremlin's original Control rig is left in the middle of the scene (B). This happens because you selected Replace Control Rig in the Load Character Animation Options dialog box. Gremlin's Control rig has been replaced by Mia's.

2 In the Scene browser, expand Control Rigs and right-click Gremlin Rig (Gremlin's original Control rig) and select Delete to clean up the scene.
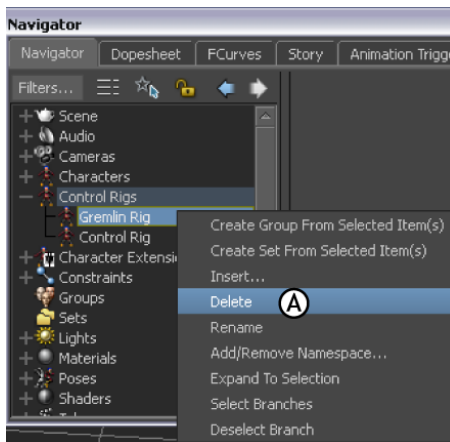
Scene browser: A. Contextual menu Delete option

Summary

In this tutorial you retargeted animation from one characterized character to another and you transferred the Character Extension from the source character to the target character.

In the next tutorial, (Editing Character Animation (page 77)), you edit animation on a layer from your original animation, then merge all layers.

Editing Character Animation

This tutorial guides you through the procedures necessary to modify animation by creating animation layers. You modify the animation plotted to the character's Control rig on two layers, then combine the original animation and your modified animation.

This tutorial shows you how to:

- Prepare the scene (page 78)
- Modify the Character Extension animation (page 79)
- Modify the head animation (page 84)
- Play the resulting take (page 89)

The following asset is required for this tutorial:

- *mia_runstopturn.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.


BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

1   From the menu bar, select File > New, then select Layout > Editing.

    MotionBuilder displays a new 3D scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2   Click the *Tutorials* folder in the Asset browser.

3   Drag the *mia_runstopturn* asset (*mia_runstopturn.fbx* file) into the Viewer window (A), then select FBX Open > run_stop_turn180 from the contextual menu that appears.

    A model named Mia appears in the Viewer (B).
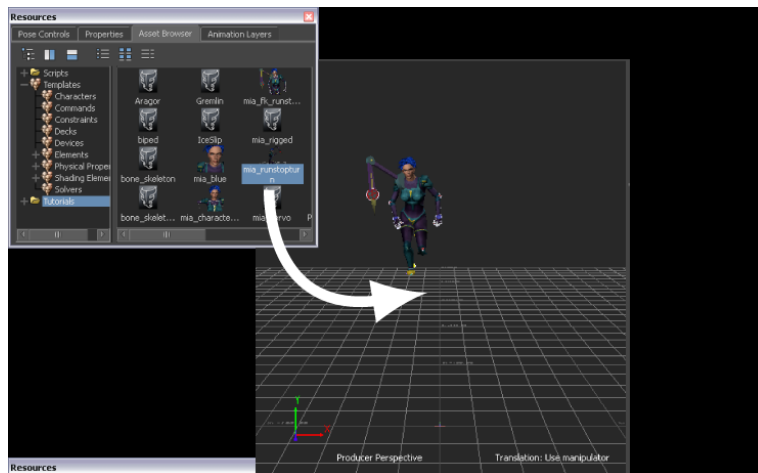
A. mia_runstopturn asset *B.* Mia character loaded in scene

4   Choose File > Save As.

    The Save File window appears.

5   Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

    The Save Options dialog box appears.

6   Click Save.

    Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.

7 Click in the Viewer window, then press `Ctrl-R` twice to switch to Producer Left camera. Zoom out to view the entire grid.
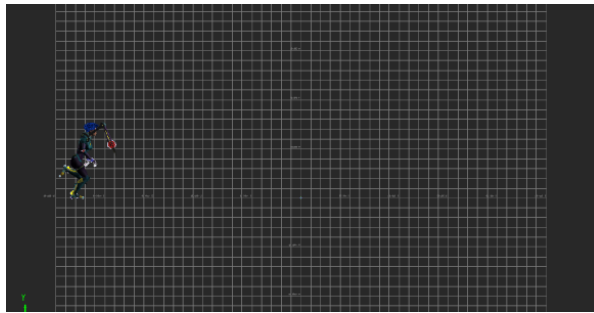
Producer Left camera view

Modify the Character Extension animation

In the following procedure, you create an animation layer and modify the animation of the Servo arm Character Extension.

**1** Play the entire take (`Ctrl-Spacebar`) to view all the motion, paying special attention to the Servo arm.

Right now, the Servo arm bounces along in front of Mia, pointing towards the red wire-frame effector. Although this effector is parented to Mia's shoulder, the effector moves enough to cause the Servo arm to jump around while Mia runs.

2 Press `Ctrl-Home` to go back to the beginning of the take, then play it again to frame 40.
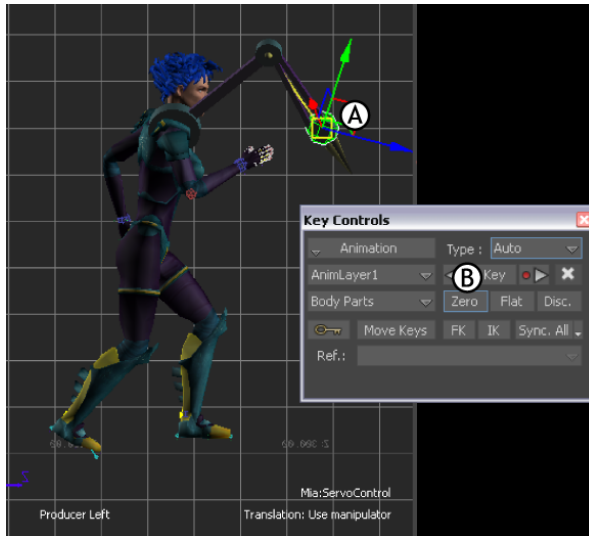
Mia at frame 40

3 In the Key Controls, select AnimLayer1 from the Layer menu (A).
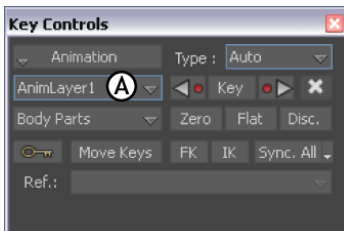

Key Controls *A.* **AnimLayer1 selected**

This lets you set keyframes on an animation layer while preserving the original animation on the BaseAnimation layer.

4 Select the Mia:ServoControl effector (A) then click Zero in the Key Controls to set a Zero keyframe (B) at frame 40.

Frame 40 *A.* Mia:ServoControl effector *B.* Zero keyframe button

5   With the Mia:ServoControl effector still selected, go to frame 120 and set a Zero keyframe.
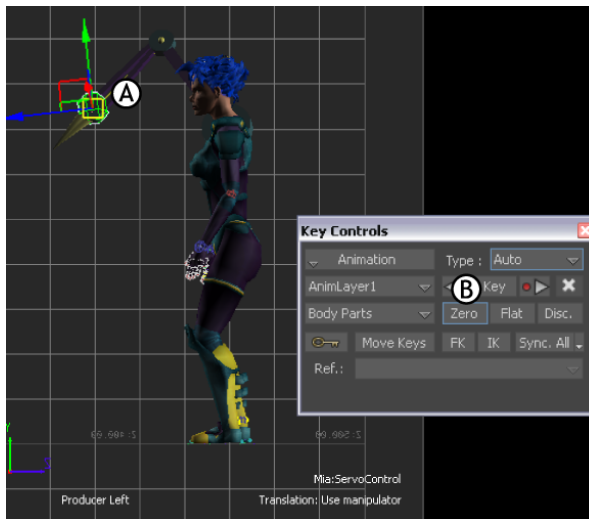
Frame 120 *A.* Mia:ServoControl is selected *B.* Zero keyframe button

6   Go to frame 64.

At this frame, you are going to start modifying the animation so that Mia raises her Servo arm.
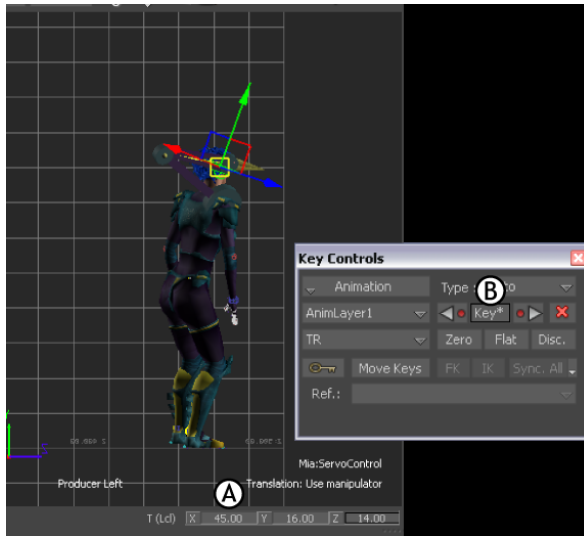
Frame 64

7   Do the following:

■ Click in the Viewer window and press T to activate Translation mode.

■ At the bottom of the Viewer window, set the Translation XYZ values to 200, -30, 10 (A).

■ Set a keyframe (B).
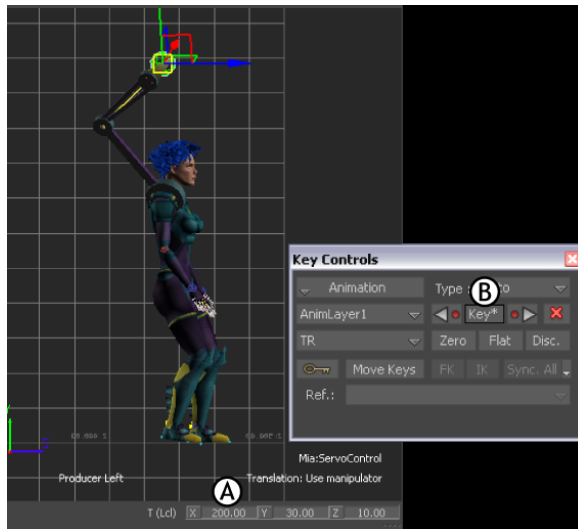
Frame 64 *A.* Translation XYZ values set *B.* Key button

8   Go to frame 96 and do the following:

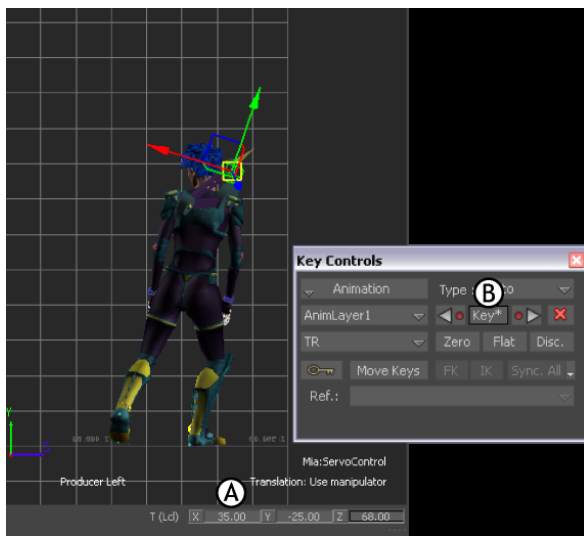■ Set the Mia:ServoControl effector Translation XYZ values to 45, 16, 14 (A).

■ Set a keyframe (B).

Frame 96 *A.* **Translation XYZ Values set** *B.* **Key button**

9 Go to frame 104 and do the following:

■ Set the Translation XYZ values to 35, -25, 68 (A).

■ Set a keyframe (B).

Frame 104 *A.* **Translation XYZ Values set** *B.* **Key button**

10 Play the animation.

Now, Mia's Servo arm raises up as she slows and turns.

Modify the head animation

In the following procedure, you use another layer to improve the animation by making Mia turn her head as she runs, when she stops, and again just before she turns around.
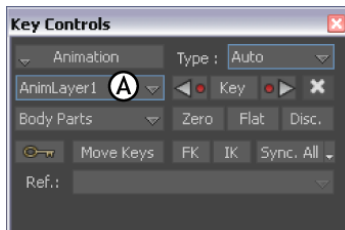
1 Go to frame 24.

At this frame, Mia's head is pointed straight ahead in the direction she is running. You need to modify the motion so that Mia turns her head.
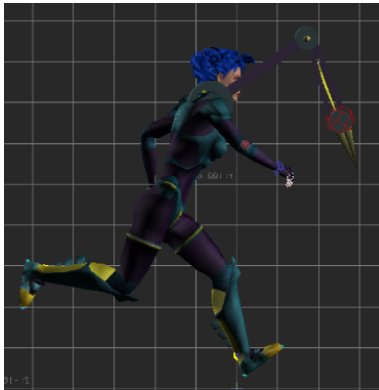
Mia at frame 24

2 In the Key Controls window, select New Layer from the Layer menu (A) to create a layer to modify the head animation.

Key Controls window *A*. Layer menu > New Layer option

A layer called "AnimLayer2" is added.

3 In the Character Controls window, select the head effector (A), and switch to Body Part keying mode (B).

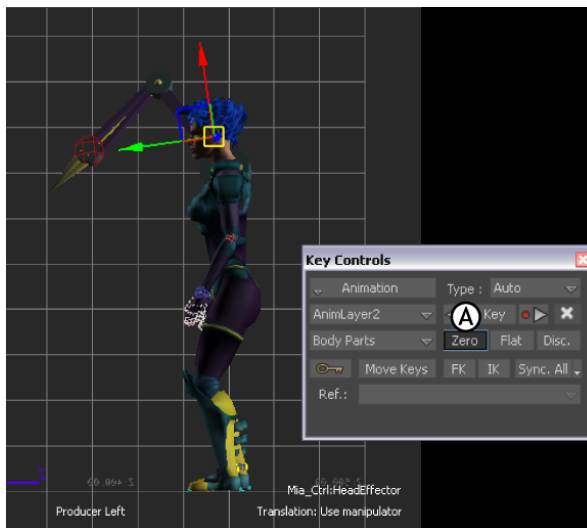**Character Controls window** *A.* **Head effector selected** *B.* **Body Part keying mode selected**

You can use Body Part keying mode as you create animation on this layer, since you only need to set keyframes on the head, not the entire body.

4   In the Key Controls, click Zero to set a zero keyframe (A).
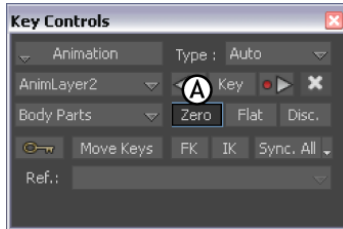
Key Controls *A.* Zero keyframe button

5   Go to frame 120 and set another Zero keyframe.


Frame 120*A.* Zero keyframe button

6   Go to frame 48 and do the following:
   ■   With the Head effector still selected, activate Rotation mode (click in the Viewer window and press R).

   ■   Change the Rotation XYZ properties at the bottom of the Viewer window to 35, 0, 2 (A).
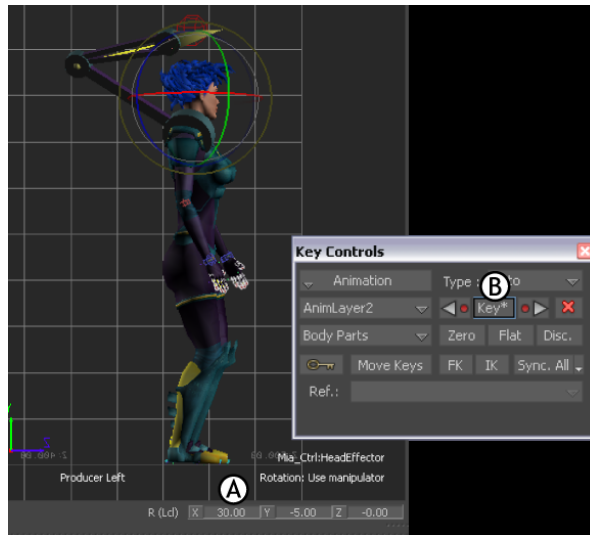
   ■   Set a keyframe (B).
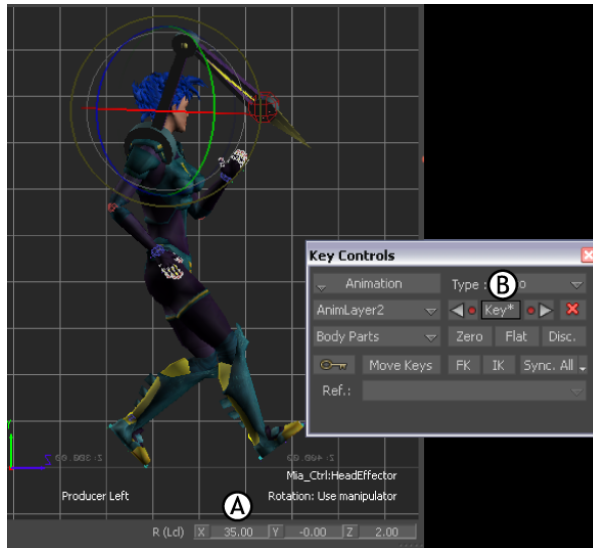
Frame 48 *A*. Rotation XYZ values set *B*. Key button

7 Go to frame 72 and do the following:

- Set the Rotation XYZ values to 42, 0, -5 (A).

- Set a keyframe (B).
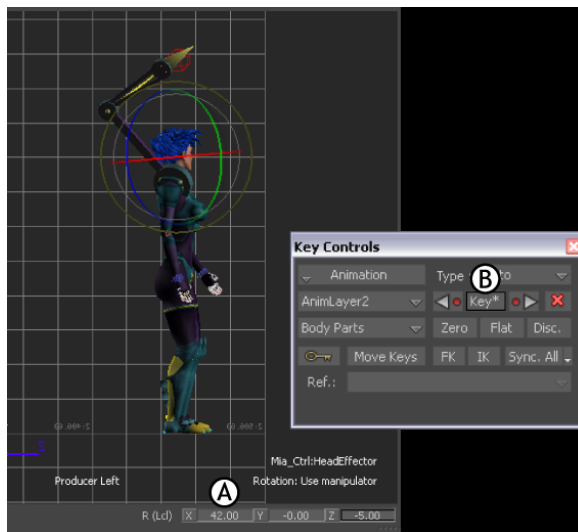
Frame 72 *A*. Rotation XYZ values set *B*. Key button

8 Go to frame 84 and do the following:

- Set the Rotation XYZ values to 30, -5, 0 (A).

- Set a keyframe (B).

Frame 84 *A.* **Rotation XYZ values set** *B.* **Key button**

9 Deselect the Head effector, and play your animation.

Mia's head turns as she runs.

Play the resulting take

Play the take and observe your animation.

The animation of the Servo arm rising up and the head turning are merged with the original animation of Mia running and turning around.

Summary

In this tutorial, you modified original animation by setting keyframes on two layers. In the next tutorial, , you learn how to create a walk cycle using the Story window.

Creating a Loop

This tutorial guides you through the procedures necessary to animate a character and create a walk cycle using the Story window.

This tutorial shows you how to:

- Prepare the scene (page 90)
- Create a Character track (page 91)
- Create poses (page 96)
- Match clips (page 100)
- Process the clips (page 104)
- Test the walk cycle (page 107)

The following assets are required for this tutorial:

- *mia_servo.fbx*
- *walkaround.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.


Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

1 From the menu bar, select File > New, then select Layout > Story (or press Ctrl-Shift-5).

MotionBuilder displays a new 3D scene using the Story layout. This layout displays all the windows you need for your work in this tutorial.

2   Click the *Tutorials* folder in the Asset browser.

3   Drag the *mia_servo* asset (*mia_servo.fbx* file) into the Viewer window then select FBX Open > No Animation.

The *mia_servo* asset appears in the Viewer window, in the T-stance.
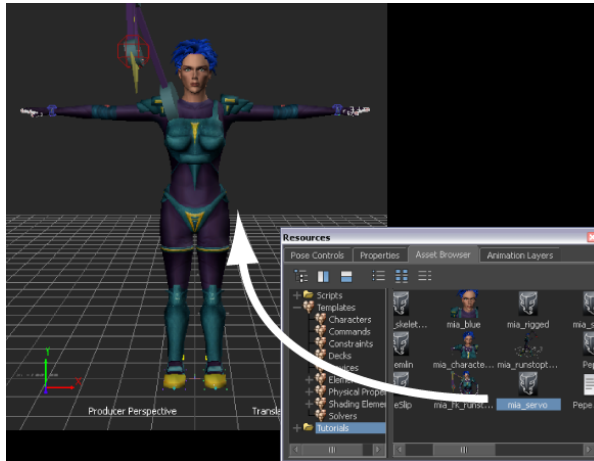
Mia with servo shown in the T-stance

4   Choose File > Save As.

The Save File window appears.

5   Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

The Save Options dialog box appears.

6   Click Save.

Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.
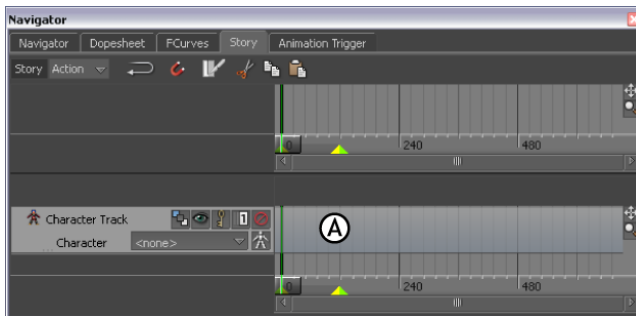
Create a Character track

In the following procedure, you create a Character track in the Story window, define the character affected by the track, and add some animation.

1   In the Story window, right-click in the Action Track list (A) and select Insert > Character Animation Track from the contextual menu.
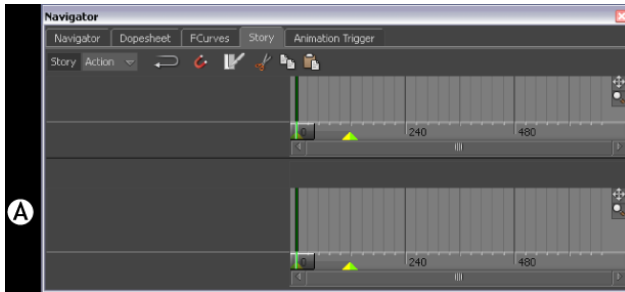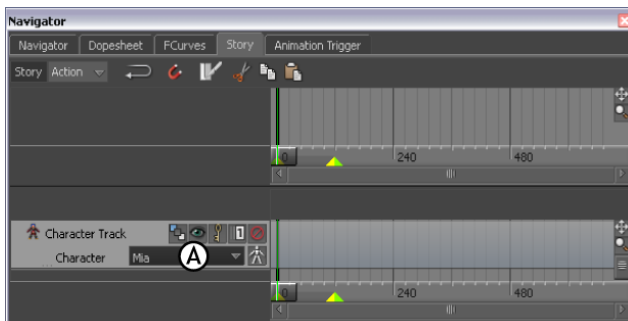
Story window _A_. Action Track list
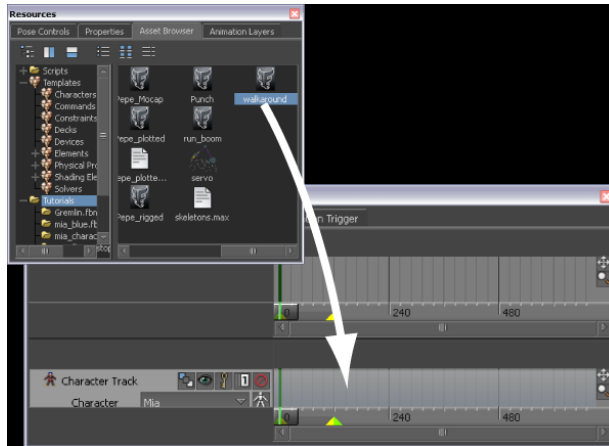
A Character Animation track is added (A).

Story window _A_. Character track

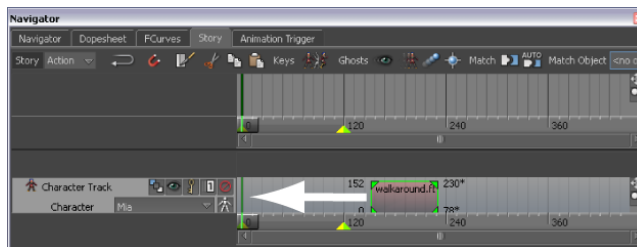**2** Select Mia in the track's Character menu (A).

Story window _A_. Mia selected in the Character menu.

3 Drag _walkaround.fbx_ from the Asset browser to the Character track.

walkaround.fbx asset being dragged into the Character track.

4 Drag the clip so that it begins at frame 0. The clip should end at frame 78.


**Clip dragged to frame 0 on the Character track .**

NOTE

You can Ctrl-drag to zoom and Shift-drag to pan in the Character track.

5 Play the animation (Ctrl-Spacebar).

At frame 0, the character's right foot is in front and the left foot is in back. At frame 78, Mia is turning. If you were to loop the animation at this point, there would be a jump in the walk cycle.

6 Go to frame 32. At this frame, Mia's right foot is flat on the ground and her left foot is slightly lifted.

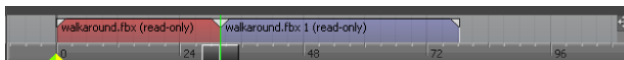Change your camera view so you can see Mia from the front.
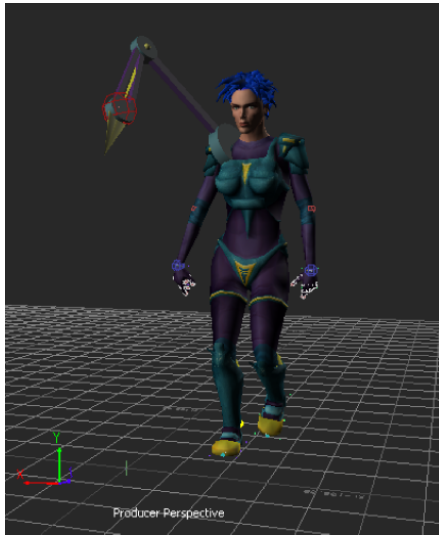
Mia at frame 32.

7 With the clip still selected, click the Razor button (A).
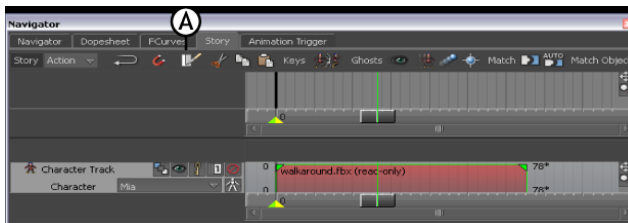
Story window A. Razor button

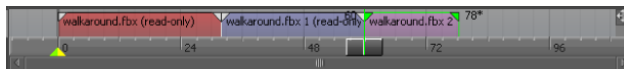The clip is sliced in two at frame 32.

The original clip is sliced in two.

8 Go to frame 60. At this frame, Mia is in almost the same pose as she was at frame 32.
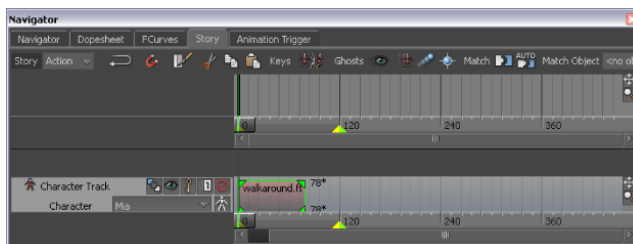
Mia at frame 60.

9 Select the second clip if it is not already selected, then click the Razor button.

The second clip is sliced at frame 60, and you now have three clips.

Three clips in the Character track

10 Ctrl-click the first clip, so that the first and third clips are selected, then press Delete, as you only need the middle clip.

11 Drag the remaining clip to start at frame 0.

The clip starts at frame 0 and ends at frame 28.

Create poses

1 Go to frame 0 (Ctrl-Home).

2 In the Character Controls window, make sure Mia is selected in the Current Character menu (A), then select the Hips effector (B).
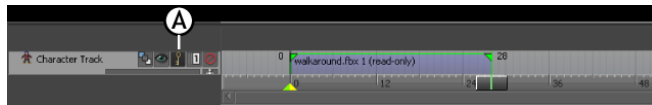
Character Controls window *A*. Hips effector selected

3 In the Asset Settings window, click the Pose Controls tab.

4 In the Pose Controls, click Create (A), then expand the Poses folder to see the pose you created, called "Mia Pose" by default (B).
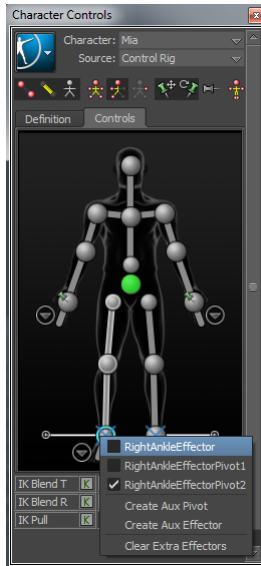

Pose Controls window *A.* **Create button** *B.* **Mia Pose**

5 Go to frame 28 and do the following:

- In the Story window, activate the Accept keys option (A) in the Character track. You can only paste poses on a track when the Animate option is active.
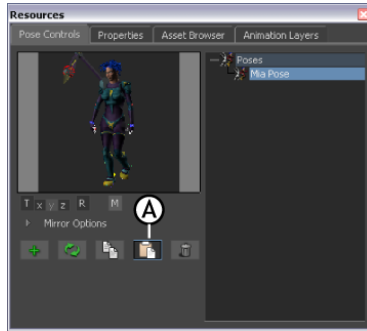

Character track *A.* **Animate option activated.**

- In the Character Controls window, right-click the Right Ankle effector (A) and select RightAnkleEffector from the menu that appears.
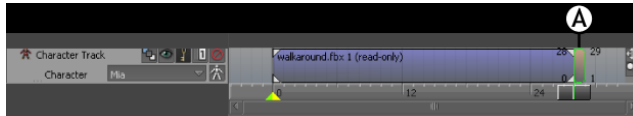
■ In the Pose Controls window, click Paste (A).

Pose Controls window _A_. Paste button

A one-frame clip appears on the Character track at frame 28.

This clip contains the data of the pose you pasted. Now Mia starts and stops walking with exactly the same pose.


Character track _A_. New clip at frame 28.

6   Jog (J-drag) or use Ctrl-Left Arrow and Ctrl-Right Arrow to step frame-by-frame through the animation very slowly. Though the animation begins and ends with the same pose, there is a slight jump between the clips. In the following procedure, you remove the jump.

Match clips

In the following procedure, you match and blend the two clips to remove the jump in the animation.

1   Click in an empty space below the track, and press A to zoom in on the clips.

2   Select the second clip.
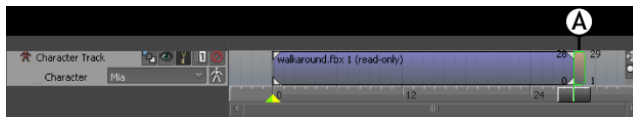
Character track _A_. Second clip selected.

3 Make sure the Right Ankle effector is still selected in the Character Controls window (A).
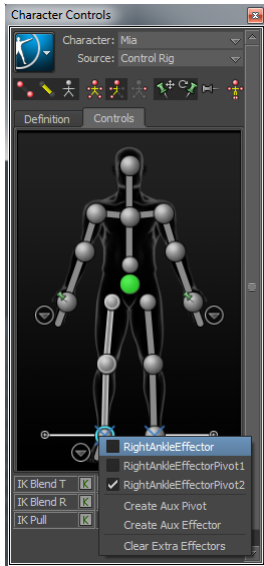
Character Controls window *A*. Right Ankle effector

4   In the Story window, click the Match Options button (A).

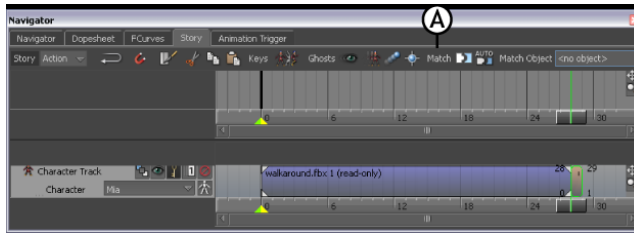**Story window *A*. Match Options button**

5 In the Match Options dialog box that appears, click OK (A).
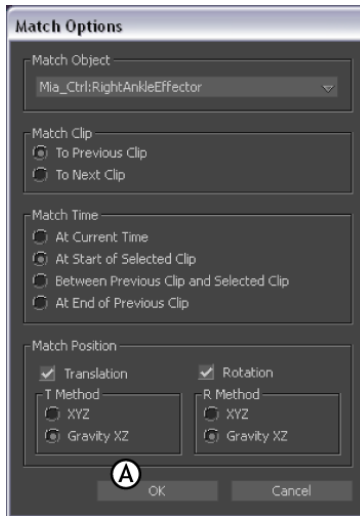
Match Options dialog box *A*. OK button

6 Select Window > Asset Settings from the MotionBuilder menu bar, then double-click the second clip in the Story window to display its settings.

7 In the Asset Settings, set a value of 23 in the In field (A).

Asset Settings window *A*. In point set to frame *29*.

8 Enter value of 29 in the Out field in the Asset Settings window.

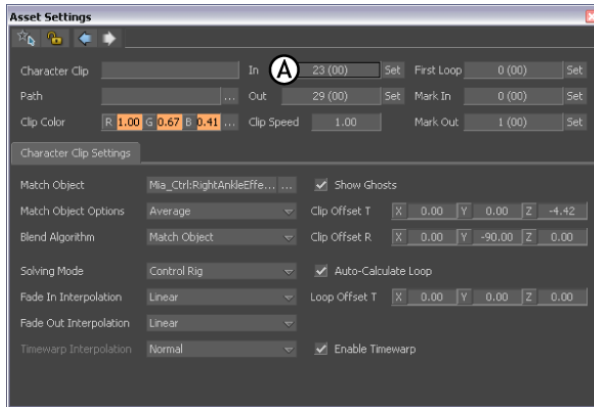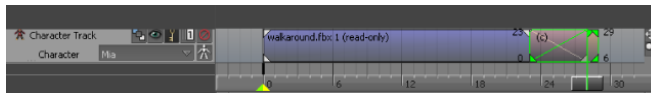**9** The second clip now starts at frame 23, and cross-blends with the first clip to end at frame 29. This blend creates a slightly smoother transition between the clips.

The second clip starts at frame 23 and ends at frame *29*.

10 Play the animation. Mia walks, starting and ending with the same pose.

Process the clips

In the following procedure, you process the two clips to save them as a single result clip. Later, you use this new clip to animate a different character.

1 Right-click on the Character track near the Character name and select Frame Start/End from the contextual menu (A). The time range is resized to fit the length of the clips.
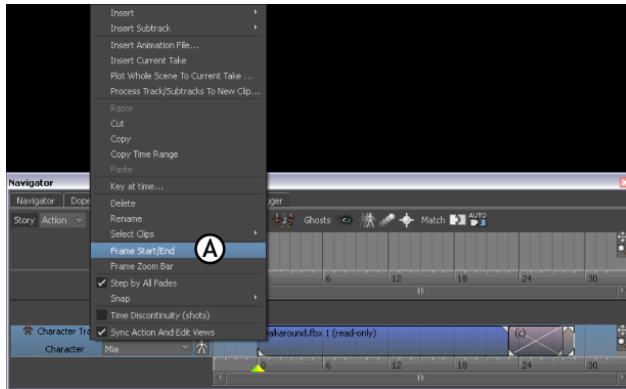
Character track contextual menu *A.* Frame Start/End option selected.

2 Right-click the Character track again and select Process Track/Subtracks To New Clip from the contextual menu (A).
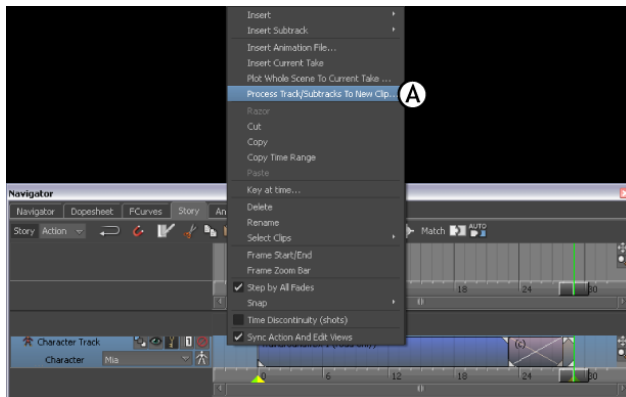
Character track Contextual menu *A.* Process Tracks/Subtracks To New Clip option

3 In the Process Track and Subtrack dialog that appears, change the Process Rate to 24 FPS. Click OK.
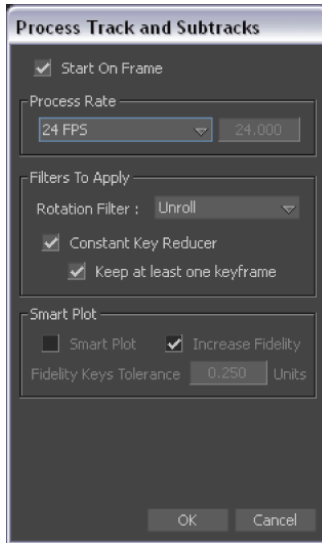
Process Track and Subtracks dialog box

4 In the Save Clip dialog box that appears, save your new clip as
mia_walk_cycle.fbx.

You need the saved clip to complete this tutorial.
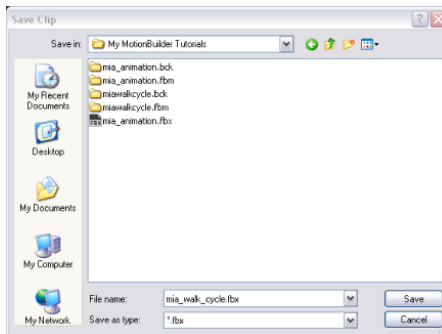
Save Clip dialog box

In the Story window, a second Character track appears containing the
new *mia_walk_cycle.fbx* clip (A).
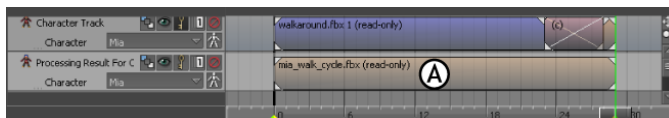
Story window A. New mia_walk_cycle.fbx clip

Test the walk cycle

In the following procedure, you test the new walk cycle clip to see if it loops smoothly.

1   Make sure that the Loop/Scale option is set to Loop, as shown in (A).
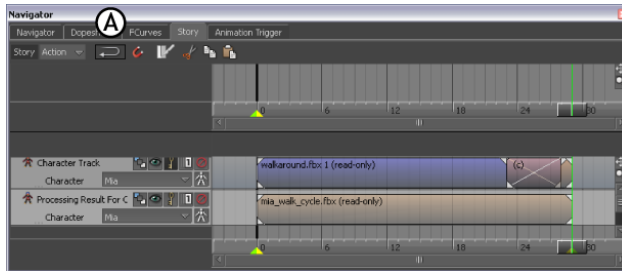
Story window *A*. Loop/Scale option is set to Loop.

2   Zoom out on the Character tracks, then stretch the end of the mia_walk_cycle clip to frame 116 (A). The clip loops four times.
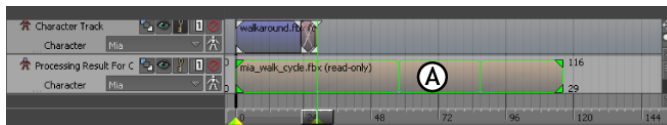
Character tracks *A*. Clip stretched to frame 116.

3   Right-click any Character track and select Frame Start/End from the contextual menu.

4   Click the first Character track's Mute button (A) to disable the track.
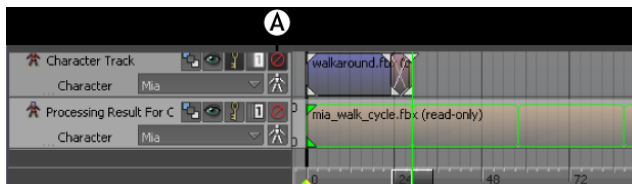
Character tracks *A*. Mute selected

5   Play the animation. Mia walks smoothly for 140 frames.

Summary

In this tutorial, you took a short clip of animation and turned it into a looping walk cycle. In the next tutorial, Manipulating Clips (page 108), you learn how to edit character animation by modifying clips.

Manipulating Clips

This tutorial guides you through the procedures necessary to modify character animation by manipulating clips.

This tutorial shows you how to:

- Prepare the scene (page 109)
- Create a turn (page 110)
- Blend two clips (page 114)
- Add a clip (page 115)
- Match clips (page 116)

The following assets are required for this tutorial:

- *mia_story.fbx*
- *run_boom.fbx*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

Prepare the scene

In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

1   From the menu bar, select File > New, then select Layout > Editing (or press `Ctrl-Shift-3`).

   MotionBuilder displays a new scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2   Click the *Tutorials* folder in the Asset browser.

3   Drag the *mia_story* asset (*mia_story.fbx* file) into the Viewer window (A), then select FBX Open > All Takes.

   A model named Mia appears in the Viewer window (B) and Mia is selected in the track's Character menu.

   NOTE You may need to zoom out in the Viewer window to see Mia at the far end of the grid.
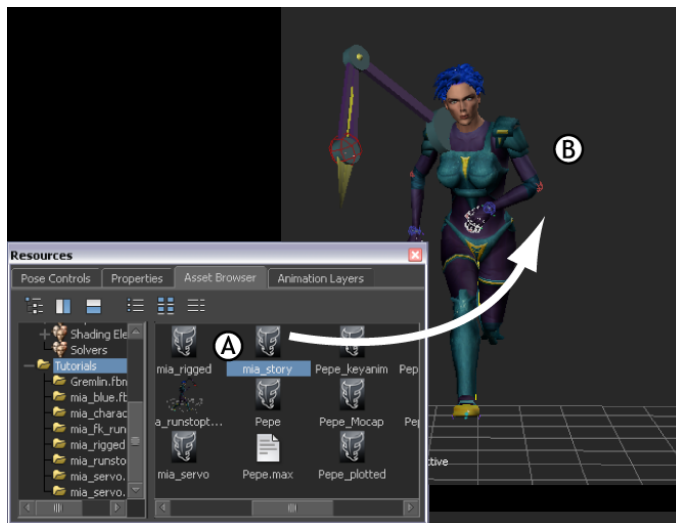
A. **mia_story asset** *B.* **Mia model loaded in scene**

   In the Story window, there is a track with a clip called Clip_Run_Loop.

4   Choose File > Save As.

   The Save File window appears.

5   Navigate to a directory other than the default MotionBuilder*Tutorials* directory where you want to save the file and click Save.

The Save Options dialog box appears.

6   Click Save.

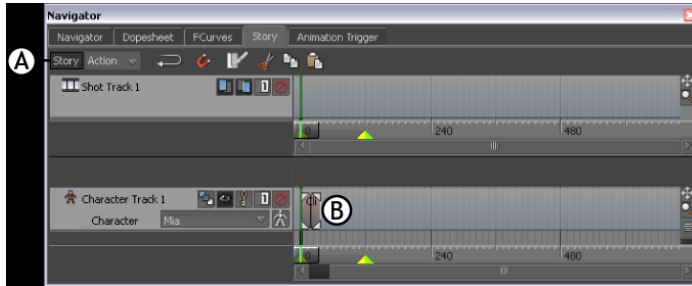Choosing to save the file to a directory other than the default MotionBuilder*Tutorials* directory ensures you do not overwrite the original *.fbx* file.

7   In the Story window, activate the Story button (A) if it is not already turned on, then click on the Character track (B) and press A to frame the clip.

Story window *A.* Story button selected *B.* Character track showing one clip

8   Play the animation (Ctrl-Spacebar). You may need to zoom out in the Viewer window to see all of the animation.

Create a turn

In the following procedure, you slice a clip in two, then rotate a ghost clip vector to make Mia turn as she runs.

1   Go to frame 11.

At this frame, Mia's left foot is flat on the ground as shown in the following figure.
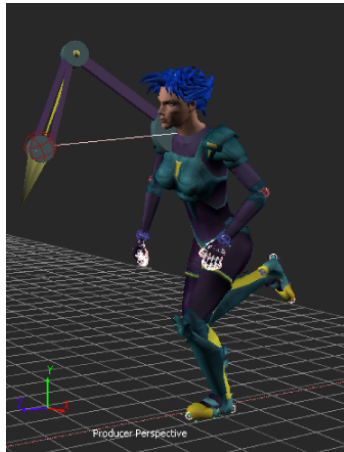
Mia at frame 11.

2 In the Story window, select the clip (B), and click the Razor button (A) as shown in the following figure.
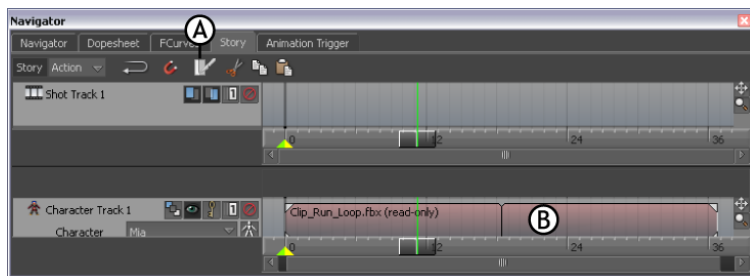
Story window *A*. Razor button *B*. Selected clip

The clip is sliced into two clips at frame 11(A).
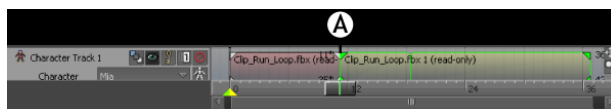
Character track *A*. Clip sliced in two at the current time

3 Switch to the X-Ray display mode in the Viewer window, then make sure the Show/Hide Ghost option in the Character track (A) is activated as shown in the following figure.

Manipulating Clips | **111**

Character track *A.* **Show/Hide Ghost option**

4 Go to frame 0 (Ctrl-Home).

When the Show/Hide Ghost option is active, the ghosts display in the Viewer window as shown in the following figure.

The clip vector ghosts represent the start and end of each clip. For each clip, there is one clip vector ghost that you can select and manipulate (B and C).
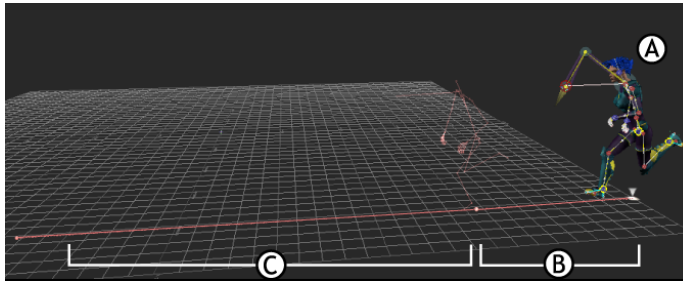
Mia model at frame 0 *A.* **Model ghost** *B.* **First clip's ghost clip vector** *C.* **Second clip's ghost clip vector**

5 In the Story window, select the second clip if it is not still selected (A).
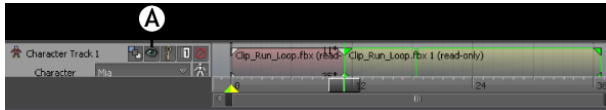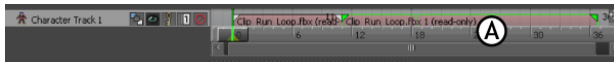

Character track *A.* **The second clip is selected**

The ghost clip vector of the selected clip is also selected in the Viewer window.

6 Click in the Viewer window and press the keyboard shortcut R.

Rotation rings appear at one end of the selected clip vector ghost, as shown in the following figure.

If the rings do not appear at the same point of the clip vector, double-click the clip vector's In point as shown to select it.
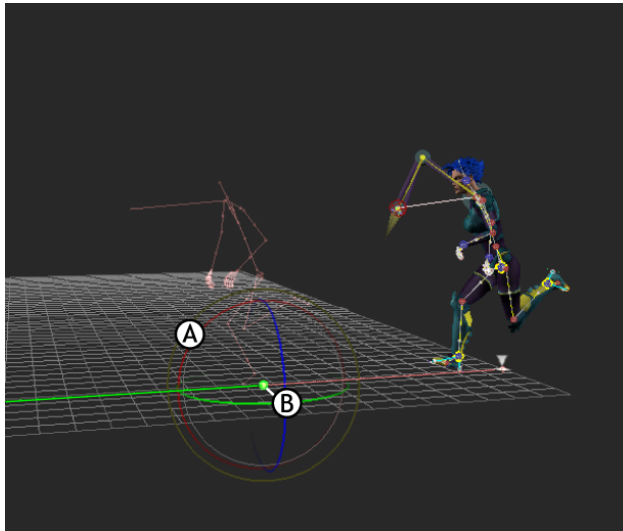
A. Rotation rings *B.* Second ghost clip vector's In point

7 In the Viewer window, enter a value of -70 in the Rotation Y-axis field as shown in the following figure (A).

The clip vector turns to Mia's right (B).

TIP

You can manually rotate the clip vector by dragging the green rotation ring.
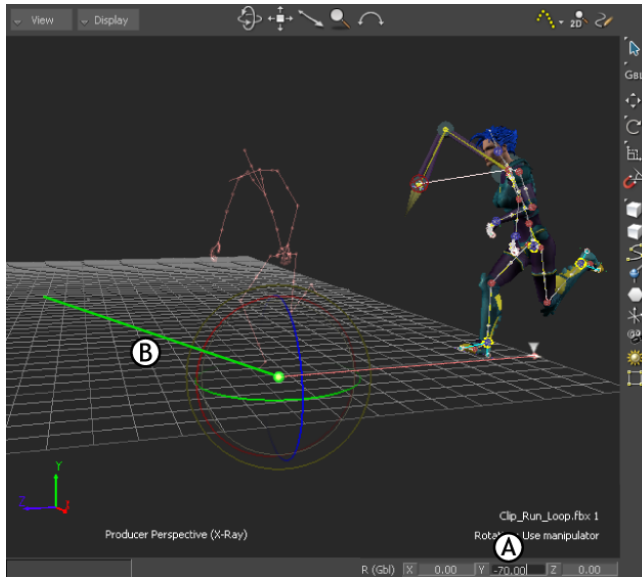
A. Rotation Y-axis field **B.** Ghost clip vector is rotated

8 J-drag in the Viewer window to jog through frames 8 to 16 slowly.

Mia turns as she runs, but her foot jumps slightly at frame 11. You need to blend the clips to remove the jump.

Blend two clips

In the following procedure, you blend two clips to remove a jump in animation that occurs when Mia turns.

1 Make sure the Loop option (A) is active in the Story window.
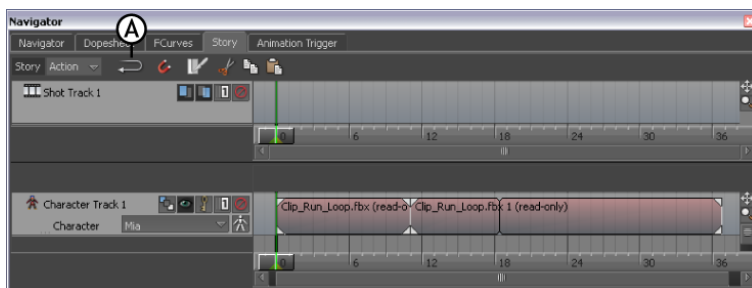
Story window A. Loop/Scale option set to Loop

2 Double-click the first clip to display its settings in the Asset Settings window located at the bottom right of the user interface.

3 In the Asset Settings, set a value of 15 in the Out field (A).
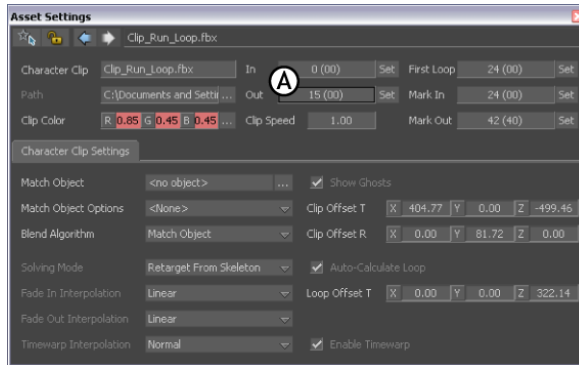
Asset Settings window A. Out field set to 15

The first clip overlaps the second clip, creating a cross-blend as shown in the following figure (A).
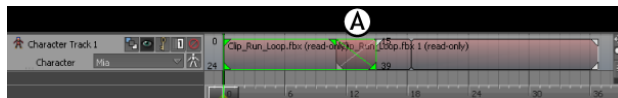
Character track A. Clip cross-blend

4 Play the animation.

There is no longer a jump at frame 11.

Add a clip

In the following procedure, you add a clip to the Character track in the Story window.

1 Ctrl-drag and Shift-drag in an empty space beneath the Character track to zoom out and make room next to the clips.

2 From the **Tutorials** folder in the Asset browser, drag the *run_boom.fbx* file onto an empty part of the Character track, to the right of the clips, as shown in the following figure.
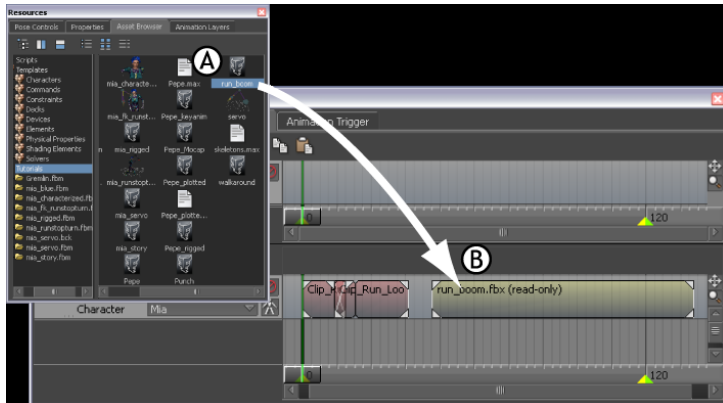
run_boom.fbx **clip added to Character track**

3 Drag the clip so that it begins at frame 36.

NOTE

It should rest against the end of the second clip, as shown in the
following figure.

New clip begins at frame 36

4 Deselect the new clip, then right-click the Character track and select
Frame Start/End from the contextual menu.

5 Play the animation (Ctrl-Spacebar).

Mia runs, turns, there is a jump in the animation, then Mia is thrown
forward as if propelled by an explosion.

Match clips

In the following procedure, you match the last clip to the previous clip to
remove the jump in the animation.

1 Go to frame 0.

2 In the Viewer window, switch to the Schematic view and select the
Mia:RightFoot node (A).

This node represents Mia's right foot and will be used as the matching
object.
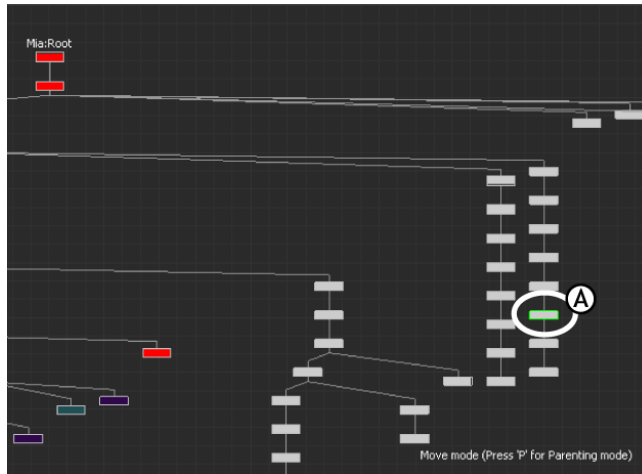
Schematic view *A.* Mia:RightFoot node selected

3 Switch back to the Producer Perspective camera view.

4 In the Story window, select the third clip (A), then click the Match Options button (B).
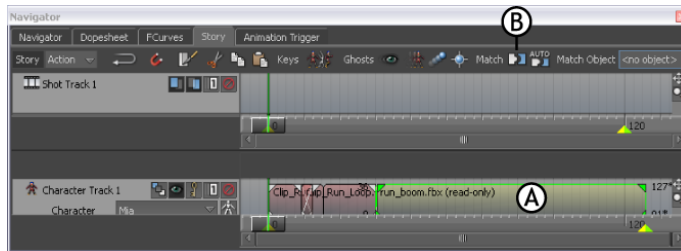
Story window *A.* Third clip selected *B.* Match Options button

5 In the Match Options dialog box that appears, if not selected, select the Mia:RightFoot in the Match Object menu (A), and select To Previous Clip (B) and Between Previous Clip and Selected Clip (C) as shown in the following figure.
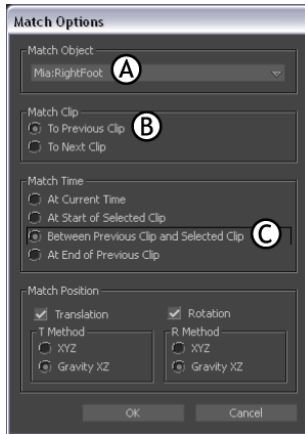
Match Options dialog box *A.* **Match Object** *B.* **Match Clip** *C.* **Match Time**

The Translation and Rotation options are already selected.

6 Click OK.

The last clip vector moves to match the previous clip.

7 Deselect Mia:RightFoot (Shift-D).

8 Play the animation.

Mia runs, turns, then is thrown forward. The jump in the animation is gone.

Summary

In this tutorial, you sliced a clip of running animation in two and rotated one clip vector ghost to make the character turn while running. Then you added another clip with different animation and blended all three clips together in one seamless animation sequence.

In the next tutorial, (Importing 3ds Max Files into MotionBuilder (page 119)), you export 3ds Max skeletons and a 3ds Max character into MotionBuilder, add a Control rig, characterize the skeletons and Character, and animate the character in MotionBuilder, and then export a Character and animation back to 3ds Max.

Importing 3ds Max Files into MotionBuilder

This tutorial shows you how to export a character created in 3ds Max, import it to MotionBuilder, and then to export it back to 3ds Max as a fully-editable animated character.

NOTE This tutorial was written using the latest version of 3ds Max, MotionBuilder, and 3ds Max FBX plug-ins software products available at the time.

The tutorial covers the following three kinds of animatable skeletons that originate in 3ds Max. The tutorial also shows you how to bring these skeletons into MotionBuilder for animation using the FBX format.

■ Conventional 3ds Max bone system skeletons

■ Biped system skeletons

■ Skinned characters with skeletons

You can single out the Send to 3ds Max procedure that addresses your needs or complete the whole tutorial to get a well-rounded view of the interaction between MotionBuilder and 3ds Max.

This set of tutorials shows you how to:

■ Export two kinds of 3ds Max skeletons and a 3ds Max character into MotionBuilder

■ Add a Control rig and characterize the skeletons and character in MotionBuilder

■ Animate the character in MotionBuilder and prepare it for import to 3ds Max

Following are the major topics in this tutorial:

NOTE Although the procedures in this tutorial use the MotionBuilder keyboard shortcuts, you can use 3ds Max keyboard shortcuts in MotionBuilder if you select Settings > Keyboard Configuration > 3ds Max from the MotionBuilder menu bar. See the MotionBuilder 3ds Max keyboard shortcuts in the Keyboard Shortcuts chapter of the MotionBuilder Help.

NOTE MotionBuilder adopts the native frame rate used in files imported from other software. In this tutorial, you import a skeleton from 3ds Max, and MotionBuilder changes its default frame rate of 24 frames per second (FPS) to match the frame rate of the 3ds Max file (30 FPS). When you finish this tutorial, MotionBuilder will retain this new frame rate (30 FPS) as the default unless you restore it to its native frame rate of 24 FPS.

For example, if you create a 90-frame animation for video, using an NTSC frame rate of 30 frames per second, the result will be three seconds of animation. If you later need to output to PAL video (at 25 frames per second), you can switch to the PAL frame rate. The 90 frames are converted to 75, and produce the same total animation time with a different number of frames. You can later switch back to NTSC frame rate to restore the original 90 frames of animation.

You can change the frame rate for your MotionBuilder output at any time, outputting the correct number of frames to maintain the correct playback speed for your animation, without losing animation data.

Requirements

To complete this tutorial, you need the current versions of 3ds Max, and MotionBuilder installed on your system.

If you do not have the current version of 3ds Max, you can download a trial version of the software product from the Autodesk web site at: *http://www.autodesk.com/3dsmax*.

The following assets are required for this tutorial:

■ *skeletons.max*

■ *bone_skeleton.FBX*

■ *bone_skeleton_characterized.FBX*

■ *biped.FBX*

■ *Pepe.max*

- *Pepe.FBX*
- *Pepe_rigged.FBX*
- *IceSlip.fbx*
- *Pepe_Mocap.FBX*
- *Pepe_keyanim.FBX*

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

3ds Max skeletons

This tutorial shows you how to export a conventional 3ds Max bone system skeleton data to FBX format, import to MotionBuilder, and then characterize it so you can animate it.

The following assets are required for this tutorial:

- *skeletons.max*
- *bone_skeleton.FBX*
- *bone_skeleton_characterized.FBX*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

## Export and characterize a 3ds Max skeleton in Motion-Builder

In the following procedure, you export a conventional 3ds Max bone system skeleton and use the 3ds Max Send To feature to open it in MotionBuilder for animation.

NOTE This tutorial uses the MotionBuilder and 3ds Max single-step interoperability workflows, using the **Send to 3ds Max** menu option. For legacy workflow, refer to the topic *Exporting 3ds Max skeletons to MotionBuilder* in the MotionBuilder Help.

To export a skeleton in FBX format:

1 Launch 3ds Max.

2 From the Application menu, select Open > Open.

3 In the Open File dialog box, navigate to the MotionBuilder root directory and in the *Tutorials* folder, open the *skeletons.max* scene file.

NOTE If the File Load: Gamma & LUT Settings Mismatch dialog appears, select Adopt the File's Gamma and LUT Settings and click OK.
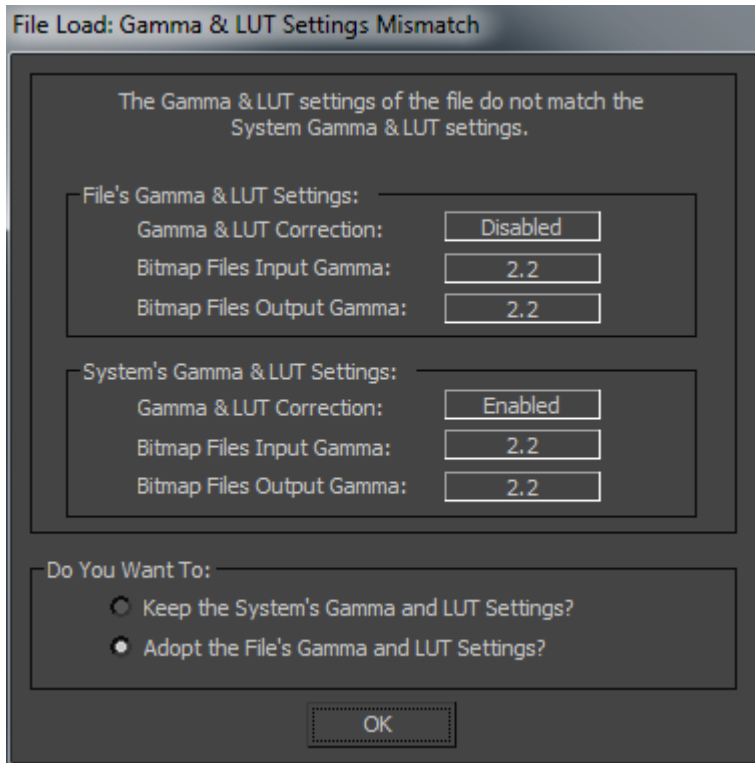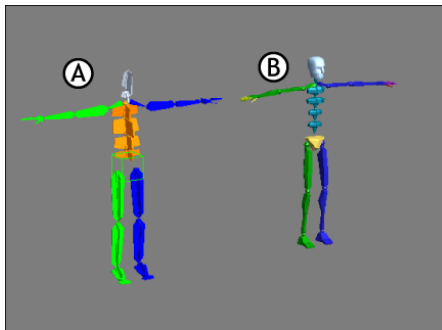

File Load: Gamma & LUT Settings Mismatch

NOTE If the File Load: Units Mismatch dialog appears, select Adopt the File's Unit Scale and click OK.
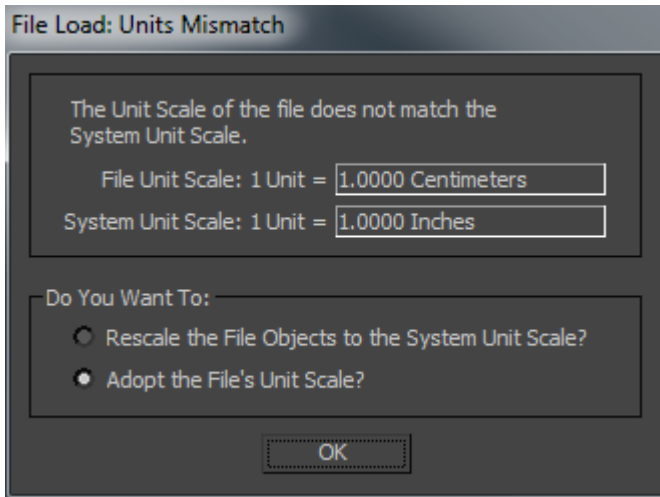
File Load: Units Mistmatch

The *skeletons.max* file opens, displaying two skeletons. Skeleton A is created with the conventional 3ds Max bone system, and skeleton B is created with the 3ds Max Biped creation option.


Two 3ds Max skeletons *A.* Conventional 3ds Max bone system skeleton *B.* 3ds Max Biped skeleton

The skeletons are positioned in a "T" stance, the pose used by animators for skinning.

NOTE Always place your characters in the "T" stance before exporting to MotionBuilder.

To learn how to export skeletons created with the 3ds Max biped creation option, see Create and export a 3ds Max biped (page 133).

4 Drag across all of Skeleton A to region-select it.
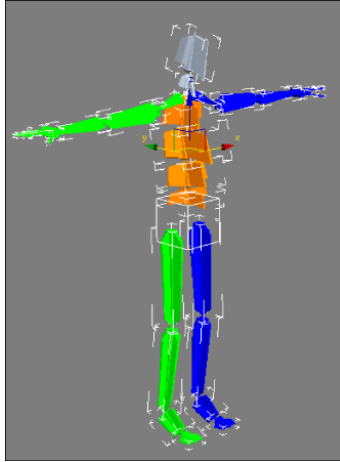

Biped oriented in a T-stance

The skeleton will characterize perfectly because its bones are named according to MotionBuilder conventions, and is in a T-stance.

See MotionBuilder Help > Animating Characters > Character setup > Skeletons > Bone naming conventions section.

5 From the Application menu, select Send to > Send to MotionBuilder > Send as New Scene. MotionBuilder launches.

NOTE If you have a version earlier than version 2012 of MotionBuilder and 3ds Max, you do not have access to the Send to option. Refer to the MotionBuilder Help.

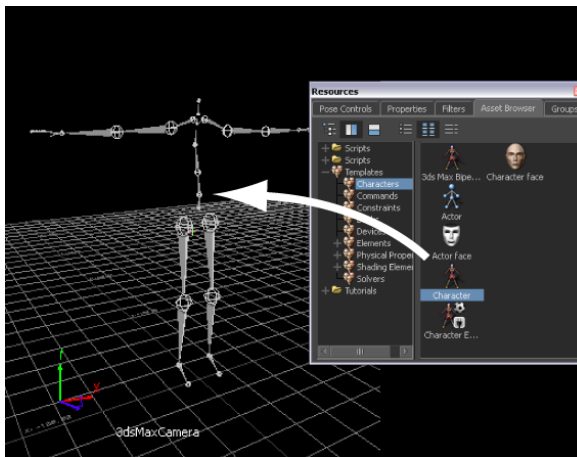The 3ds Max bone system skeleton loads into MotionBuilder.
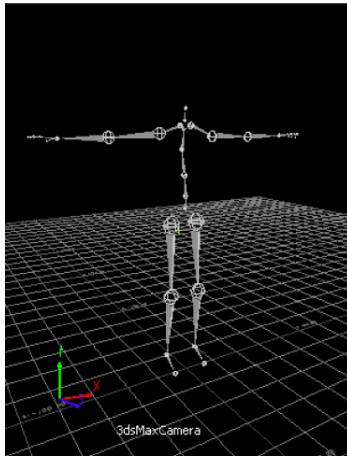
**3ds Max skeleton displayed in the Viewer window**

To characterize your skeleton:

1 In the MotionBuilder Asset browser, expand Templates > Characters and drag the Character asset onto one of the skeleton bones.


The bone lights up when the asset makes contact with it.

2 Click Characterize in the menu that appears.

The following dialog box reminds you that the character must be in a "T" stance and face in the positive Z axis (the equivalent of the negative Y axis that you converted when exporting the *.max* file into the FBX file format).
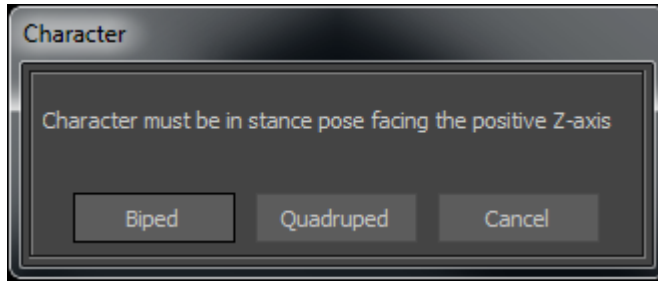
3 Click Biped in the Character dialog box that appears to indicate the type of rigging to apply to the character.
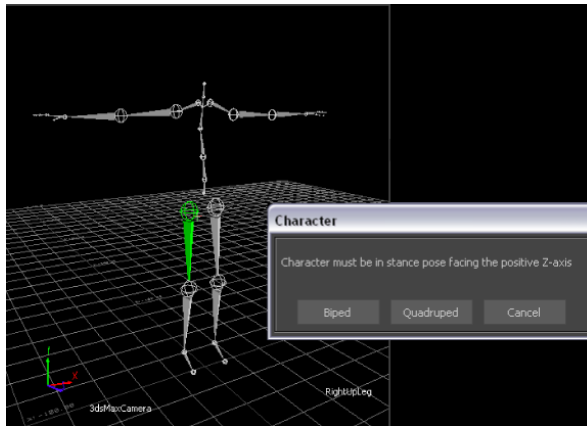
Character stance dialog box

The skeleton is now characterized, which means that it is ready to accept a Control rig you can animate.

4 ![Updated] From the Character Controls window > Character menu, select Character.

5 From the Character Controls window > Source menu, select Control Rig.

(You can also select ![icon] > Create > Control rig, but setting the rig as a Source makes the skeleton an active character in the scene.)

Character Controls Source menu

You must use the Control Rig Input setting if you intend to keyframe your character.
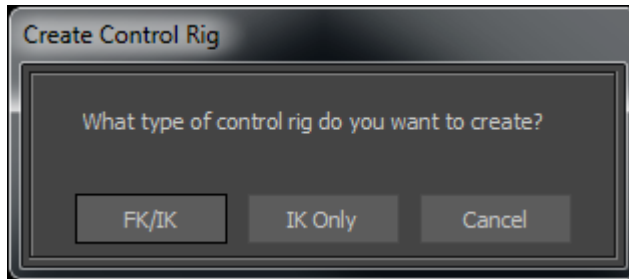
The Create Control Rig dialog box appears.

6 Click FK/IK.

FK/IK is the method commonly used to animate characters.

This setting activates the Control rig and the Character Controls Character representation. The Character representation is an image of a human form meant to represent the biped skeleton. It contains all the effectors you need to animate the Control rig, as shown in the following figure.
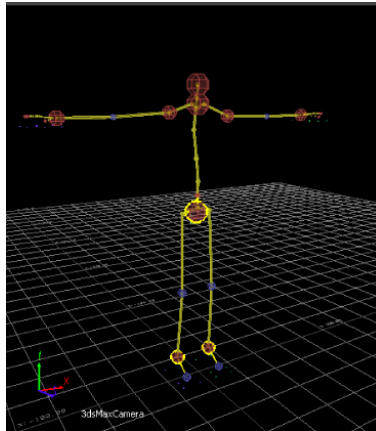
Skeleton with FK/IK Control rig

Your character is now rigged and ready to receive animation.

7 In the Character Controls toolbar, click the Full Body icon.
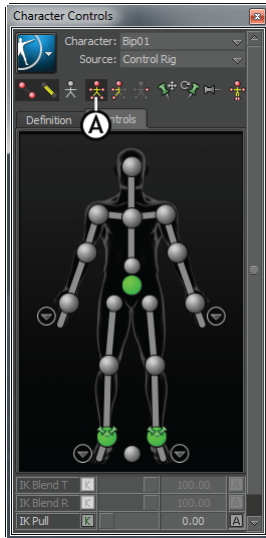
Character controls *A*. Full Body icon

This lets you move the body using the entire Control rig.

8 On the Character representation, select the Right Wrist effector.
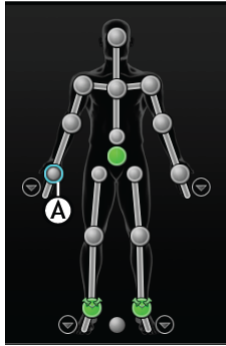
Character representation A. Right Wrist effector selected

9 Click in the Viewer window and press T.

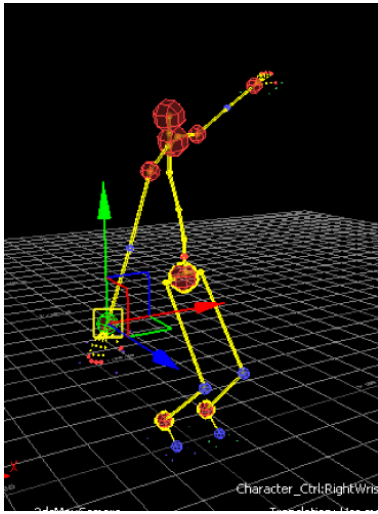The transformation handles appear.

10 Translate (or move) the hand down as shown in the following figure.

Notice as you move the hand, the arm extends and the rest of the body follows in a natural movement. You can now transform the characterized skeleton.

NOTE If you wish to see the result of this procedure, open the *bone_skeleton_characterized.FBX* file.

3ds Max Bipeds

This tutorial shows you how to create and export biped skeletons created with the 3ds Max Biped system to MotionBuilder for animation.

The following is the result asset for this tutorial:

■ *biped.FBX*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

Create and export a 3ds Max biped

In the following procedure you create a biped in 3ds Max for export to MotionBuilder.

NOTE This tutorial uses the MotionBuilder and 3ds Max single-step interoperability workflows, using the **Send to 3ds Max** menu option. For legacy workflow, refer to the *Exporting 3ds Max bipeds to MotionBuilder* topic in the MotionBuilder Help.

To create a biped in 3ds Max for export to MotionBuilder:
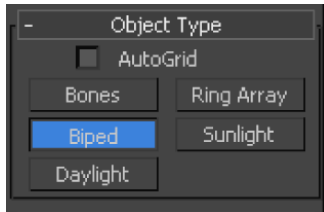
1   Launch the 3ds Max software.
2   In the Application menu, choose Reset to clear the scene/settings.

3 On the Create panel, select Systems.

Systems selected in Create panel

4 On the Object Type rollout, click Biped.

5 In the perspective viewport, click and drag to create a biped object.

   NOTE The size of the biped is not important.
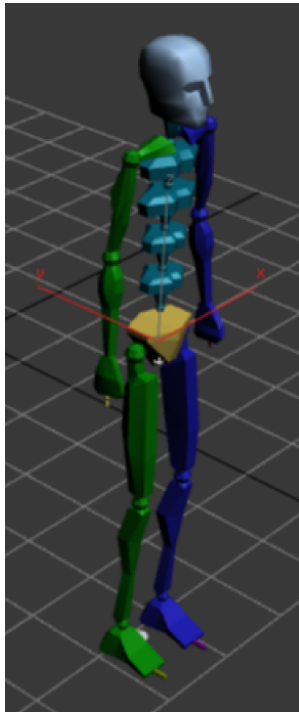
3ds Max biped object

6 Open the Motion command panel.

7 With Bip001 still selected, go to the Motion panel > Biped rollout and click Figure Mode.

Figure Mode selected

8 In the Structure rollout > Body Type group > Neck Links spinner box, enter 4.

Biped with ten neck links

The 3ds Max biped object now has four neck links as shown in the following figure.

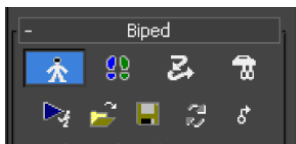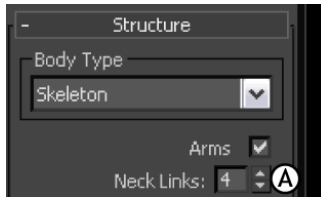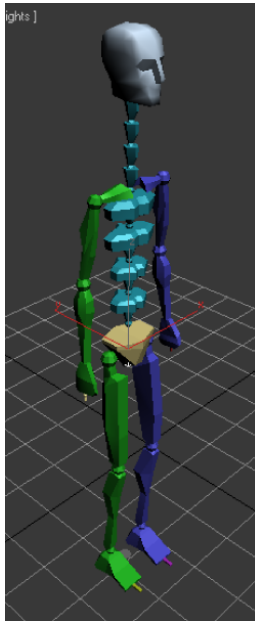**3ds Max biped object with four neck links**

9 In the Spine links spinner box, enter 10, in the Fingers spinner box, enter 5, in the Finger Links spinner box, enter 3, in the Toes spinner box, enter 5 and in the Toe Links spinner box, enter 3.

10 Go to the Motion panel > Biped rollout and click Figure Mode again to exit the input mode.

11 From the Application menu, select Send to > Send to MotionBuilder > Send as New Scene. MotionBuilder launches.

12 In MotionBuilder, position your cursor anywhere in the Viewer window and press A to frame all of the biped skeleton.
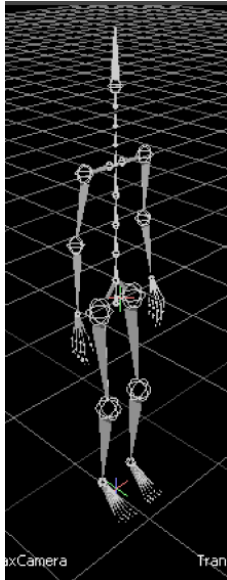
3ds Max biped skeleton imported in MotionBuilder

13 In the Select File To Export dialog box, navigate to a directory other than
the default MotionBuilder*Tutorials* directory where you want to save the
file and name your file `My_biped`. Choose *Autodesk (*FBX)* as the file type,
and click Save.

NOTE

If you do not specify a location, the file is automatically saved in the
FBX file format to the 3ds Max Export folder.

Now that your biped is saved as an FBX file, you can use it in the next tutorial
(Characterize a 3ds Max biped in MotionBuilder (page 137)) to characterize it
in MotionBuilder.

NOTE If you wish to see the result of this procedure, open the *biped.FBX* file.

Characterize a 3ds Max biped in MotionBuilder

In the following procedure, you characterize in MotionBuilder the 3ds Max
biped (*My_biped.FBX*) you saved in the previous procedure (Create and export
a 3ds Max biped (page 133)). Characterization assigns a Control rig to the biped

bones and is the name MotionBuilder uses for the process of rigging a biped skeleton.

NOTE If you did not perform the previous procedure, use the *biped.FBX* file in the *Tutorials* folder located in the MotionBuilder directory on your system.

To characterize your 3ds Max biped:

1 Select the a shoulder (Upperarm) node on the skeleton, press R to enter Rotation mode and rotate the skeleton's arm until it is parallel with the grid. Do the same with the other shoulder.
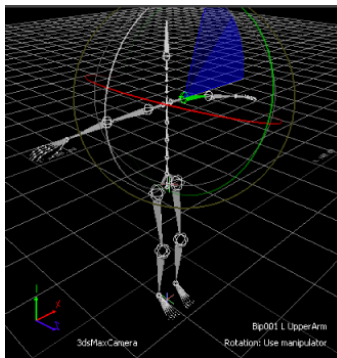
Rotate the skeleton's shoulders into a T-stance.

The skeleton is now in a T-stance.

2 In the Asset browser, expand Templates > Characters and drag the 3ds Max Biped Template on top of the skeleton.
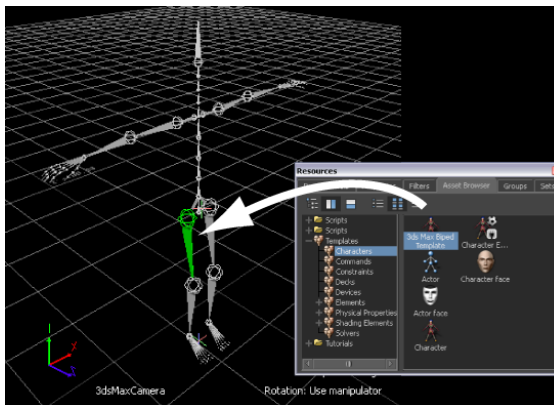
Applying the 3ds Max Biped Template asset to the biped skeleton

The 3ds Max Biped template is specially designed for bipeds created in 3ds Max as they have a naming structure that MotionBuilder does not recognize.

3 Click Characterize in the menu that appears.

The biped skeleton is now characterized.

4 **Updated** In the Character Controls window, click the Definition tab.
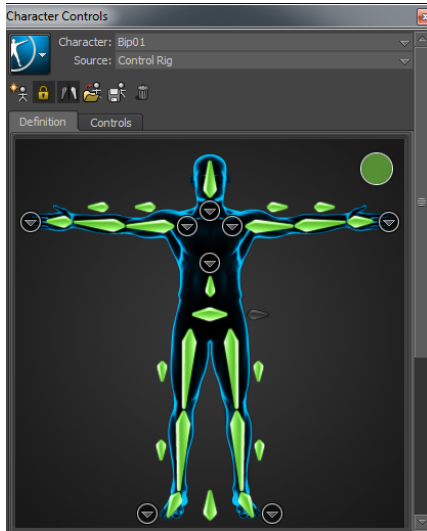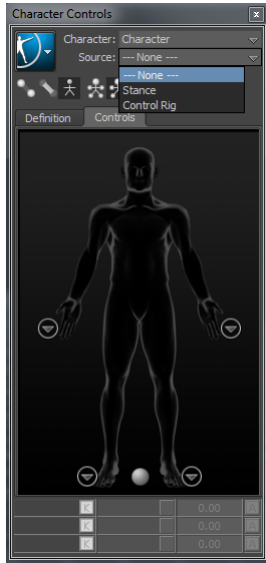
Character representation shows that the characterization is correct

The Character representation displays green if the characterization is correct, yellow if potential problems are detected, and red if there is an element of the skeleton matching that is incorrect.

The next step is to add a Control rig so you can animate it.

5 **Updated** From the Character Controls window > Source menu, select Control Rig.

Character Controls Source menu

The Create Contril Rig dialog box appears.

6 In the Create Control Rig dialog box, click FK/IK.
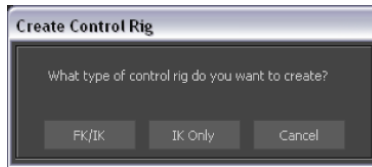
FK/IK is the method commonly used to animate characters.

The Control Rig setting activates the Character representation and displays the Control rig effectors on the biped in the Viewer window (B).
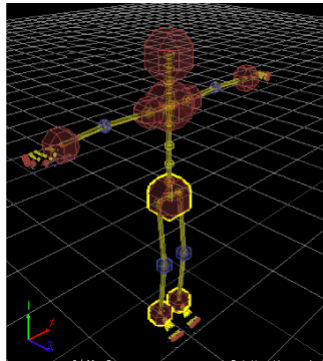
The Character representation is an image of a human form that represents the biped skeleton. It contains all the effectors you need to animate its Control rig. The biped is now rigged and ready to receive animation.

7 In the Character Controls toolbar, click the Full Body icon. This lets you move the body using the entire Control rig.

Character controls *A*.Full Body icon

8 On the Character representation, select the Right Wrist effector.

Character representation *A*.Right Wrist effector selected

9 Click in the Viewer window and press T.

The transformation handles appear.

10 Translate (or move) the hand down as shown in the following figure.
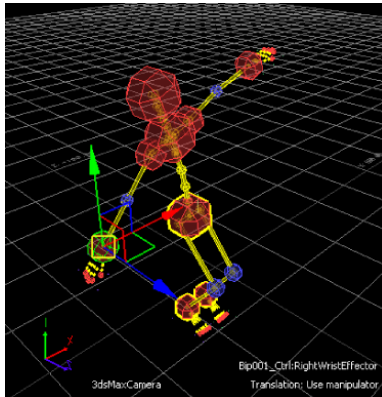
Notice as you move the hand, the arm extends and the rest of the body follows in a natural movement.

You can now transform and animate the characterized 3ds Max biped in MotionBuilder. See Animating a 3ds Max Character in MotionBuilder (page 153).

3ds Max Characters

The following tutorial shows you how to export a character with a skeleton created and skinned in 3ds Max to the FBX file format, import to MotionBuilder, and then characterize it so you can animate it.

Since a character is a skeleton with skin and textures, the procedure is similar to the procedure shown in the tutorials for exporting 3ds Max skeletons and biped skeletons.

The following asset is required for this tutorial:

■ *Pepe.max*

The following assets are the result assets for this tutorial:

■ *Pepe.FBX*
■ *Pepe_rigged.FBX*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.


Export a 3ds Max character

The following procedure shows you how to export a 3ds Max character to MotionBuilder.

NOTE This tutorial uses the MotionBuilder and 3ds Max single-step interoperability workflows, using the *Send to 3ds Max* menu option. For the legacy workflow, refer to the *Export a 3ds Max character* topic in the MotionBuilder Help.

To export the 3ds Max Pepe character:

1 Launch the 3ds Max software.

2 In the Application menu, choose Reset to clear the scene/settings.

3 Select Open and open the *Pepe.max* scene file located in the MotionBuilder root directory under the *Tutorials* folder.

The *Pepe.max* scene file opens, displaying a biped skeleton inside a mesh.
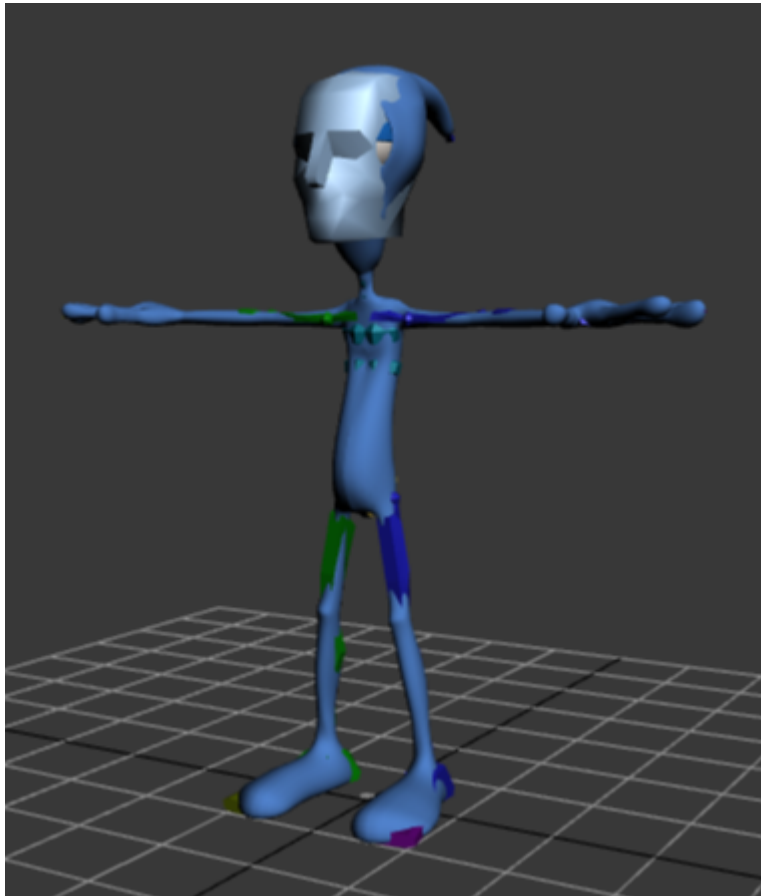
3ds Max biped skeleton inside a mesh

4 From the Application menu, select Send to > Send to MotionBuilder > Send as New Scene.

NOTE If you have a pre-2012 version of MotionBuilder and 3ds Max, you do not have access to the Send to option. Refer to the MotionBuilder documentation.

5 MotionBuilder launches and the Pepe character appears in the Viewer window.

6 Position your cursor anywhere in the Viewer window and press A to frame all of the character.
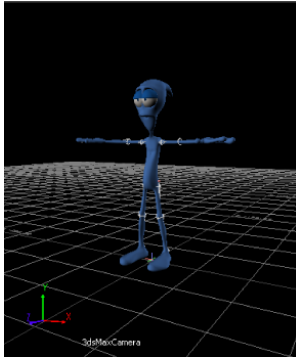
3ds Max Pepe character imported into MotionBuilder

7 Navigate to a directory other than the default MotionBuilder*Tutorials* directory and save the file as My_Pepe.

Characterize a 3ds Max Character in MotionBuilder

In the following procedure, you characterize the *My_Pepe.FBX* file you saved in the previous procedure (Export a 3ds Max character (page 146)). The Pepe character is a 3ds Max biped, with only a mesh and materials.

NOTE If you did not perform the previous procedure, you can use the *Pepe.FBX* file in the *Tutorials* folder located in the MotionBuilder directory on your system.

To characterize your Character:

1 In the Viewer window, press Ctrl-A until you are in X-Ray mode.

X-Ray mode lets you see through the character skin to the skeleton underneath.

2 In the Asset browser, expand Templates > Characters and drag the 3ds Max Biped Template asset on top of the Pepe Character skeleton.
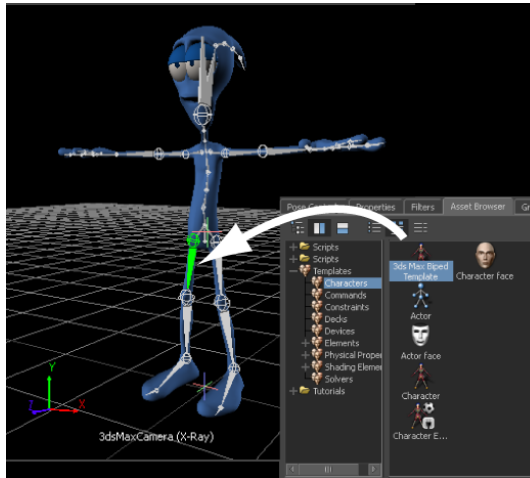
3ds Max Biped Template asset applied to the Pepe Character skeleton

The 3ds Max Biped template is specially designed for bipeds created in 3ds Max as they have a different naming structure that the MotionBuilder Character does not recognize automatically.

3 Click Characterize in the menu that appears.

4 **Updated** From the Character Controls window > Source menu, select Control Rig.

You must use the Control Rig Input setting if you intend use keyframe animation on your biped.

5 In the Create Control Rig dialog box, click FK/IK.

Click FK/IK

FK/IK is the method commonly used to animate characters.

This setting activates the Control rig and the Character representation. The Character representation is an image of a human form, meant to represent the character's skeleton. It contains all the effectors you need to animate its Control rig. The biped is now rigged and ready to receive animation.
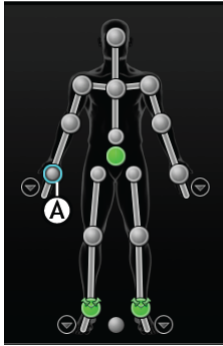
The Control Rig effectors appear on the biped as shown in the following figure.
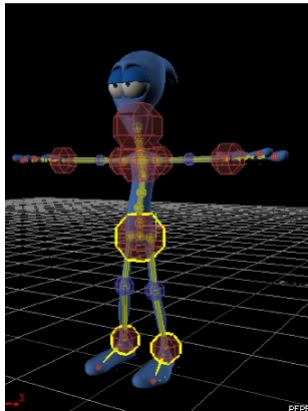
6 Make sure that the Full Body mode ( ) is selected in the Character Controls toolbar.
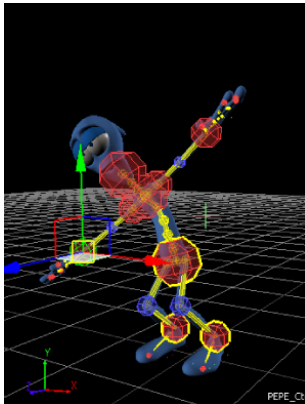
Activating Full Body mode lets you control the entire rig, not a body part.

7 On the Character representation, select the Right Wrist effector.

Right Wrist effector selected

8 Click in the Viewer window and press T.

The transformation handles display.

9 Translate (or move) the hand down as shown in the following figure.

Notice as you move the hand, the arm extends and the rest of the body follows in a natural movement.

You can now animate your character with motion capture and key frame animation.

10 Navigate to a directory other than the default MotionBuilder*Tutorials* directory and save the file as My_Pepe_rigged

NOTE You can use this file for the next tutorial or you can use the *Pepe_rigged.FBX* file in the *Tutorials* folder located in the MotionBuilder root directory on your system.

See Animating a 3ds Max Character in MotionBuilder (page 153).

Animating a 3ds Max Character in MotionBuilder

You can animate characters in MotionBuilder two ways: by setting keyframes manually, or using motion capture data. The following tutorials show you how to animate the 3ds Max *Pepe* character you imported in the 3ds Max Characters (page 146) section.

If you did not perform the previous procedures in section Import and characterize a 3ds Max Character in MotionBuilder (page 148), you can use the *Pepe_rigged.FBX* file in the *Tutorials* folder located in the MotionBuilder root directory on your system.

In the first of these animation tutorials, Animate a character using motion capture data (page 154), you animate *Pepe* by using one of the motion capture files that ship with MotionBuilder. In the second tutorial, Modify character animation with keyframes and export it to 3ds Max (page 160) you refine the animation using keyframes and bring your edited animation back into 3ds Max.

NOTE If you already know how to animate characters in MotionBuilder, you can skip this section.

Following are the assets required for this tutorial:

- *Pepe_rigged.FBX*
- *Iceslip.fbx*

Following are the result assets for this tutorial:

- *Pepe_Mocap.FBX*
- *Pepe_keyanim.FBX*

NOTE The tutorial assets can be found in the Asset Browser under the *Tutorials* folder and in the MotionBuilder directory on your system.

BEST PRACTICE To use the latest update of the tutorials and tutorial assets, go to *http://www.autodesk.com/motionbuilder2013-documentation* and download the tutorials and tutorial support files to your system. If you download the tutorial support files to a location other than theMotionBuilder default location, remember to add this location in the Asset browser so you can access the assets via the Asset browser. See *Adding a favorite path* topic in the Help under *MotionBuilder Interface | Asset browser*.

If you are new to MotionBuilder, take a moment to try a few MotionBuilder navigation techniques using the MotionBuilder keyboard shortcuts:

■ Press Ctrl-Shift and drag to orbit around the scene.

■ Ctrl-drag to zoom in and out of the scene.

■ Shift-drag to pan the scene.

Although the procedures in this tutorial use the MotionBuilder keyboard shortcuts, you can elect to use the 3ds Max keyboard shortcuts.

See the *3ds Max keyboard shortcuts* topic in the *Keyboard Shortcuts* chapter of the MotionBuilder Help for a list of all the 3ds Max keyboard shortcuts.

Animate a character using motion capture data

The following procedure shows you how to use keyframe animation techniques in MotionBuilder to refine the motion capture animation.

If you did not perform the previous procedures in section Characterize a 3ds Max Character in MotionBuilder (page 148), you can use the *Pepe_rigged*.*FBX* file in the MotionBuilder root directory in the *Tutorials* folder on your system or the *Pepe_rigged* asset in the MotionBuilder Asset browser's *Tutorials* folder.

**To animate the Pepe character using motion capture data:**

1 Launch the MotionBuilder software.

2 From the Asset browser's *Tutorials* folder, drag the *My_Pepe_rigged* asset (*My_Pepe_rigged*.*FBX* file) you saved in the previous procedures in section Characterize a 3ds Max Character in MotionBuilder (page 148) into the Viewer window .

NOTE If you did not perform the previous procedures in section Characterize a 3ds Max Character in MotionBuilder (page 148), drag into the Viewer window the *Pepe_rigged* asset (*Pepe_rigged*.*fbx* file) into the Viewer window.
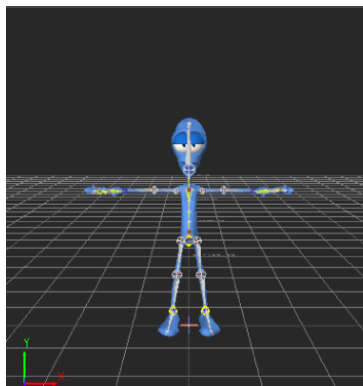
3 Select FBX Open > No Animation.

The Pepe character appears in the Viewer window.
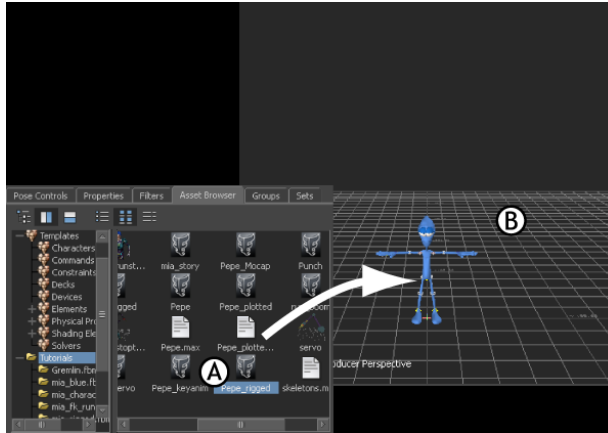
Loading the file *A*. Pepe_rigged asset in Asset browser *B*. Pepe loaded in the scene

4 Click on an empty area in the Viewer window and press A to frame all and zoom in on the *Pepe* character.

5 Press Ctrl-A until you are in X-ray mode and can see Pepe's skeleton and Control rig.

**Pepe's Control rig shown in X-Ray mode**

6 Press `Ctrl-Shift` and drag to orbit until you can see the right side of the *Pepe* character. Use the following image as a guideline.
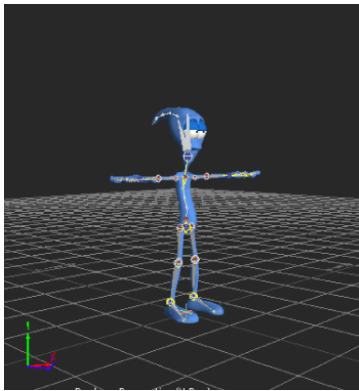

Orbit around Pepe

7 From the Asset Browser's *Tutorials* folder, select the *IceSlip* asset (*IceSlip.fbx* file) and drag it into an empty area of the Viewer window.

8 Select FBX Merge > IceSlip.

A large yellow skeleton representing the motion capture animation now joins *Pepe* in the scene.

9 Zoom out (`Ctrl`-drag down or left) until you can see the yellow skeleton.
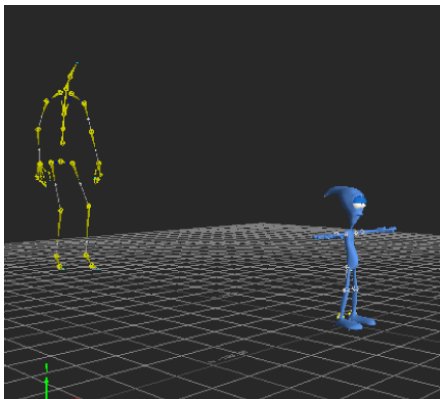
Pepe **with skeleton containing motion capture data**

10 Choose 30 fps from the drop down menu (B) on the right side of the Transport Controls.

11 In the Transport Controls, click Play (A) to view the yellow skeleton's *IceSlip* animation.
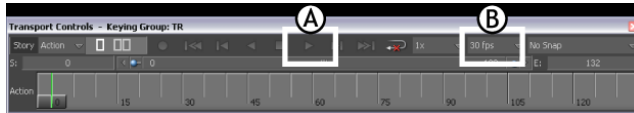
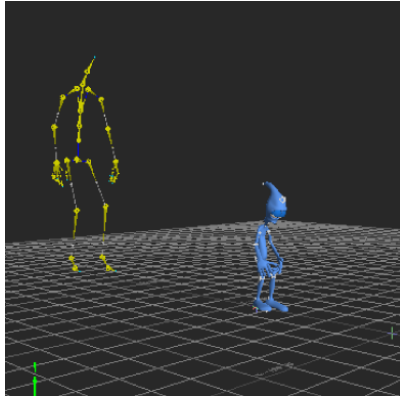**Transport Controls A. Play button B. 30 fps selected**

12 **Updated** In the Character Controls, make sure PEPE is displayed in the character list. From the Character Controls window > Source menu, select Skeleton2, which is the name of the yellow skeleton that contains the motion capture animation.

*Pepe* assumes the skeleton's stance as shown in the following figure.

13 In the Transport Controls, drag the Timeline indicator (slider bar) to scrub the animation. You can also hold down the J key and drag left or right in the Viewer window.

The skeleton's animation now drives the *Pepe* character.

14 Press Ctrl-A until only Pepe is visible, then go to frame 92 and zoom in on the *Pepe* character.

15 Press Ctrl-Shift and drag to orbit *Pepe*.

If you look carefully, you will notice that one of Pepe's hands passes though his face.
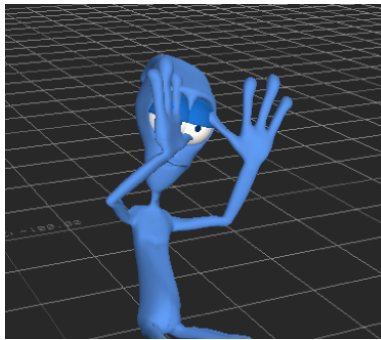
Unwanted hand movement from the motion capture

16 Scrub the animation a few times if you cannot see the problem.

The animation that drives Pepe's bone movement is based on a skeleton that has a very different physiology. For example, Pepe's head, hands, and feet are much larger than the skeleton, while Pepe's shoulders are much smaller than the skeleton's shoulder.

17 Save the file as *My_Pepe_Mocap.FBX*.

You can use this file for the next tutorial where you add keyframes to correct Pepe's hand movement.

The next tutorial also shows you how to export the modified character back to 3ds Max.

Modify character animation with keyframes and export it to 3ds Max

In MotionBuilder, you can animate characters by setting keyframes manually. This is useful for creating original animation or making changes to motion capture animation.

In the following procedure, you use key frame animation to refine motion capture animation and then export your edited animation and the character back to 3ds Max.

If you already know how to keyframe characters in MotionBuilder, you can skip to step 21 and export your character to 3ds Max.

NOTE This tutorial uses the MotionBuilder and 3ds Max single-step interoperability workflows, using the **Send to 3ds Max** menu option. If you do not have the 2012 or 2013 versions of these products, refer to the MotionBuilder Help.

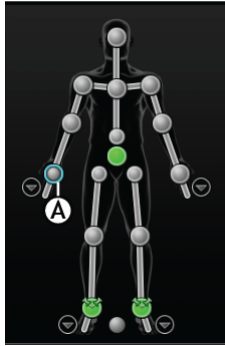**To fine-tune Motion Capture animation with keyframing:**

1 In MotionBuilder, open your result *My_Pepe_Mocap.FBX* file from the previous procedure (Animate a character using motion capture data (page 154)) to apply the motion capture data to *Pepe*.

NOTE If you did not complete the previous procedure, open the *Pepe_Mocap.FBX* file.

NOTE Remember to navigate to save the file to a directory other than the default MotionBuilder*Tutorials* directory, so that you do not override the original *.fbx* file.

Press Ctrl-A until only Pepe is visible.

**2** On the Character Representation of the Character Controls, click the Right Wrist effector.

Right Wrist effector selected

3 Click in the Viewer window and press T.

The transformation handles do not display.

4 Try to move Pepe's hand.

Nothing happens because Pepe's animation is controlled by the skeleton, not the Control rig. Before you can keyframe Pepe's motion capture animation, you must plot (or bake) the skeleton animation onto the Pepe character Control rig.

5 From the Character Controls menu button, select Bake (Plot) > Bake (plot) To Control Rig.
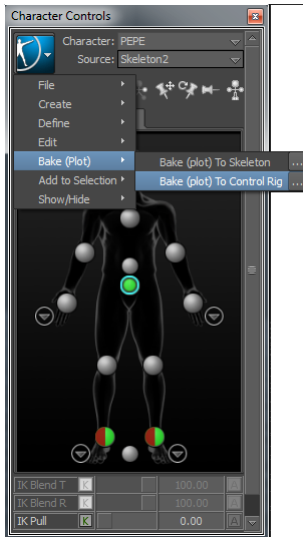
The Bake (plot) to Control Rig command creates a key at every frame at
the base layer (or *BaseAnimation layer*) of the animation track, making

edits difficult. (You can see these keyframes in the Transport controls if you select *Pepe*'s wrist effector.)

You can now edit the *Pepe* character using *Pepe*'s Control rig.

6   In the Key Controls, click the Layer menu and select AnimLayer1.
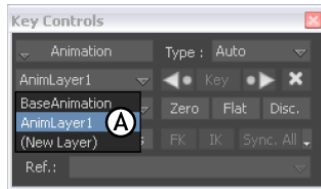
AnimLayer1 selected for adding keyframes

Selecting another layer lets you edit the animation while preserving the original animation on the BaseAnimation layer. When you select AnimaLayer1, the timeline hides the keyframes on the BaseAnimation layer and shows the keyframes set on AnimLayer1 (there are none at the moment).

7   Go to frame 80, which is the start of the problematic right hand movement. On the Character Controls window Character Representation, click the Right Wrist effector, then in the Key Controls, click Key.


NOTE You can also set a key by pressing K.

8   Go to frame 105, the end of the problem hand movement, and set another key.

As you take the following steps, all character movement before the first key and after the second key will remain unchanged. Only the character movement between frames 80 to 105 will be modified.

9   Go to frame 94, the mid point between the two keyframes you set.

10 In the Viewer window, press T, move the hand away from Pepe's face on its X and Z axes as shown in the following figure, then set another key.
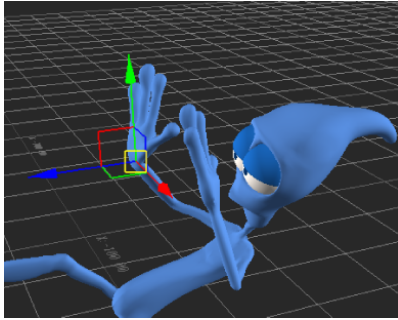
Hand moved away from Pepe's face

11 Press J, then drag back and forth to see how the hand reacts to the keys you just created.

12 Make any further adjustments to the hand movement as required. Make sure to create a key after each adjustment.

13 Advance to the last frame of the animation and adjust your view until you can see the right side of Pepe's body.
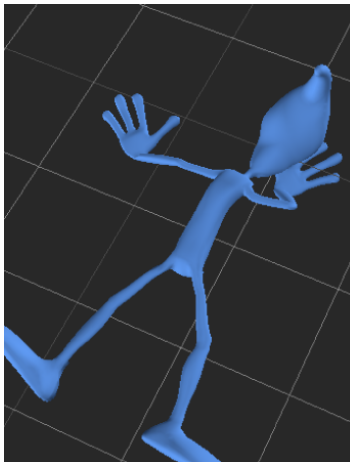
Right hand is too close to the character's head

14 Move Pepe's hand away from his body and set a key.

15 Press R to use the key rotation rings to modify the hand's position until it rests flat on the ground, then set another key.

NOTE You may need to change your view so you can see if Pepe's hand is flat on the ground.
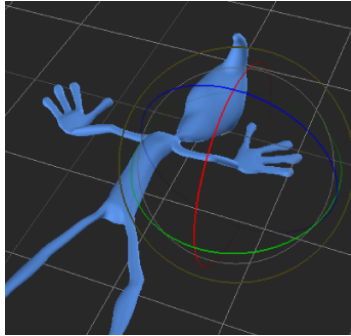
Rotation rings used to reposition right hand

16 Play back the animation to see the result.

17 Make any further adjustments to the character body position and save your file as *My_Pepe_keyanim.FBX*.

   NOTE When you save your file, the animated Pepe character in your scene is saved, but so is the yellow reference skeleton. If you want, you can delete the skeleton from the scene, or select the Pepe character and save it to another file for import to 3ds Max.

18 Drag across the Pepe character to select him. This way you can exclude the yellow skeleton when you export him to 3ds Max.

19 From the MotionBuilder main menu, select File > Send To 3ds Max > Send as New Scene.
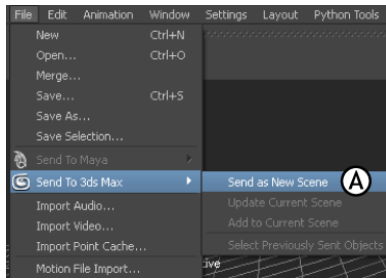
File >Send to 3ds Max > Send as New Scene

   3ds Max launches and the animated Pepe Character loads in the Viewport.

20 Click Play in the 3ds Max Animation Controls to view the edited MotionBuilder animation.
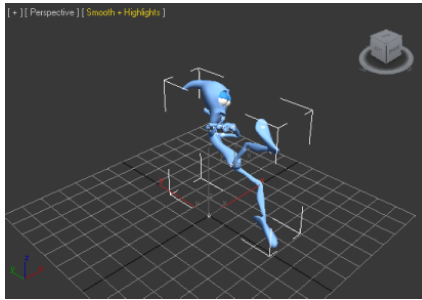
Pepe's animation played back in 3ds Max

Summary

In this series of tutorials, you took different skeletons created in 3ds Max and exported them to MotionBuilder. In MotionBuilder, you characterized the bones, and animated the character.

Then, you made a few adjustments to perfect the motion, and exported the Pepe character back to 3ds Max.

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