Autodesk® MotionBuilder® 2010

Tutorials

Autodesk®

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Contents

MotionBuilder Tutorials

1

This chapter includes a set of nine Autodesk MotionBuilder tutorials that provide a common MotionBuilder workflow and demonstrate how to use the more powerful keyframe and character animation features.

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

NOTE If the Asset Browser window is not available, from the MotionBuilder menu bar, select Window > Asset Browser.

NOTE If the *Tutorials* folder is not displayed in the Asset browser, you need to add a favorite path to display a directory in the Asset Browser.

See also:

- MotionBuilder workflow on page 2

NOTE You can download the tutorial assets (or support files) from: *http://www.autodesk.com/motionbuilder-documentation*.

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.

You can download the latest FBX Plug-ins from: *http://www.autodesk.com/fbx*. For information on the FBX Plug-ins, consult the plug-in documentation.

MotionBuilder workflow

This topic describes a common workflow that introduces the nine tutorials provided to help you familiarize yourself with the MotionBuilder software product. For any steps in the workflow that do not include a dedicated tutorial, you can find additional information in the MotionBuilder Help.

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

The basic workflow for using MotionBuilder can be summarized as follows:

1. Install the required FBX Plug-ins so you can transfer your work from other 3D software packages into and out of MotionBuilder.

   For example, if you are using Maya or 3ds Max for character modelling, you need to install the appropriate Maya or 3ds Max FBX Plug-in to transfer your models into MotionBuilder. See Installing the latest FBX Plug-ins on page 1.

2. Create a character model in your 3D modeling software of choice.

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

   Refer to Guidelines for creating a character model, Bone naming conventions, Open a 3ds Max biped in MotionBuilder on page 126, and Choosing shapes to create in the MotionBuilder Help.

3. Export the character model from your modelling software package.

   When you export your work from a modelling 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.

4. 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.

5. Add a Character asset for 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 on page 5.

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 on page 15.

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 on page 27.

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 on page 39.

   - The seventh tutorial shows you an alternative method for creating a walk cycle using clips in the Story window.
     See Creating a Loop on page 79.

9. Edit and refine your animation.

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

See Editing Character Animation on page 65.

- The eighth tutorial shows you how to combine animations using the Story window.
  See Manipulating Clips on page 95.

10 Retarget your animation between Character models.

Although not a required step for creating animation within MotionBuilder, during animation projects, the Character model you use might change. 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 on page 55.

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.

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*.

13 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 major sections: 3ds Max skeletons on page 109, 3ds Max Bipeds on page 121, 3ds Max Characters on page 130, Animating a 3ds Max Character in MotionBuilder on page 138, and Importing back to 3ds Max on page 149.

Loading and Characterizing Character Models

2

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 out its structure.

The following asset is required for this tutorial:

- *mia_blue.fbx*

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

Prepare the scene

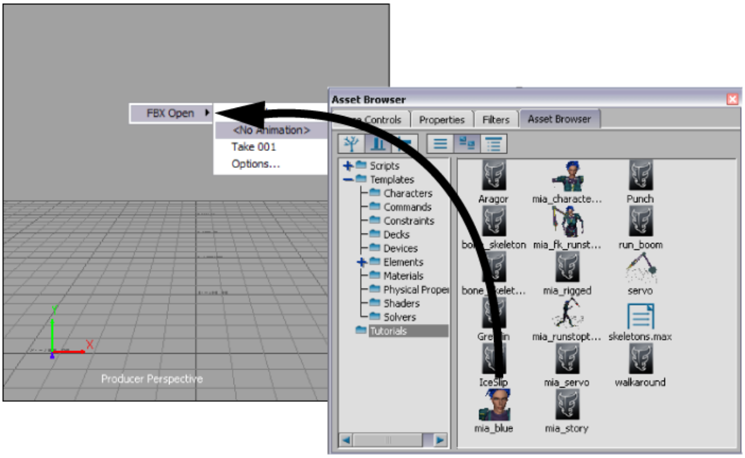
In the following procedure, you prepare the MotionBuilder scene and open the file needed to start this tutorial.

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

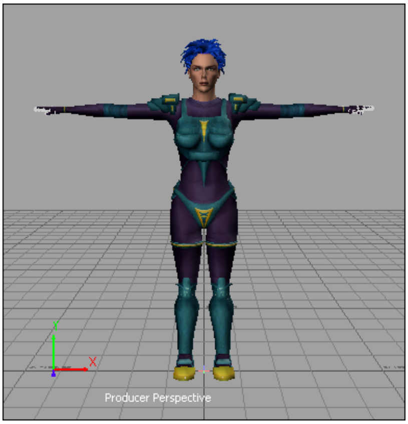
   MotionBuilder displays a new scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

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

3. Drag the *mia_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.



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



Mia shown in the T-stance pose

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

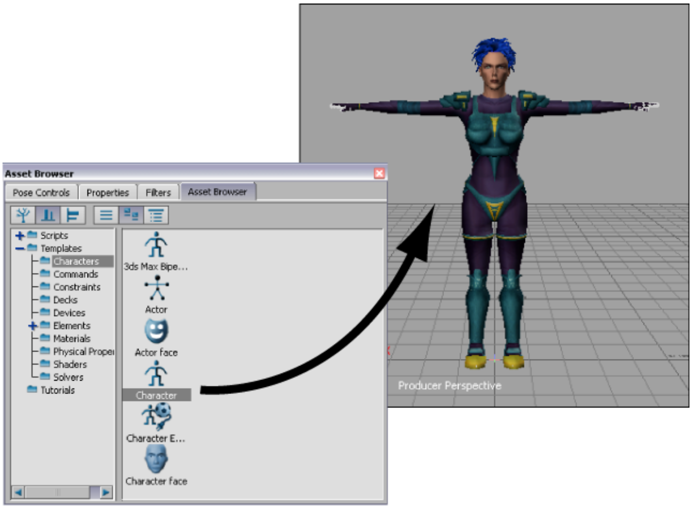
Complete the character map

In the following procedure, you define the structure of your character model for MotionBuilder by completing the required nodes in the Mapping list.

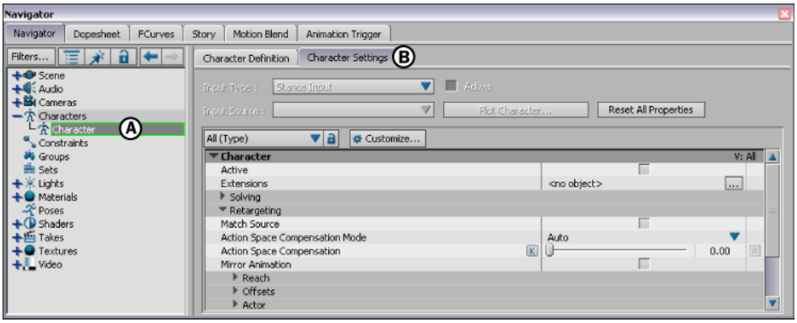
Character mapping describes the character model for MotionBuilder, indicating what are the legs, arms, and so on.

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.

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



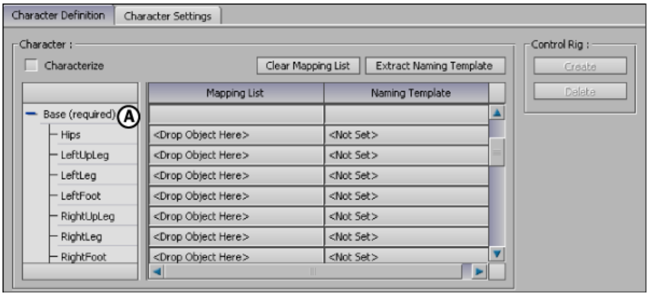
A Character asset is added in the Scene browser (A) and the Character Settings open in the Navigator window (B).



Character
Active □
Extensions <no object>
Match Source □
Action Space Compensation Mode Auto
Action Space Compensation 0.00
Mirror Animation □

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

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



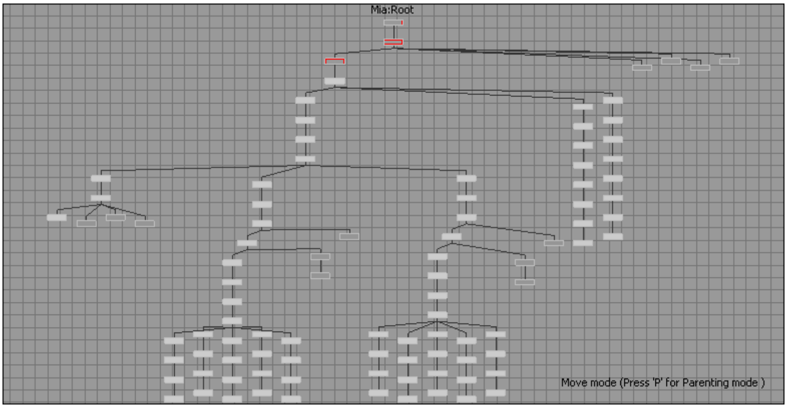
□ Characterize

	Mapping List	Naming Template
– Base (required)		
Hips	<Drop Object Here>	<Not Set>
LeftUpLeg	<Drop Object Here>	<Not Set>
LeftLeg	<Drop Object Here>	<Not Set>
LeftFoot	<Drop Object Here>	<Not Set>
RightUpLeg	<Drop Object Here>	<Not Set>
RightLeg	<Drop Object Here>	<Not Set>
RightFoot	<Drop Object Here>	<Not Set>

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.

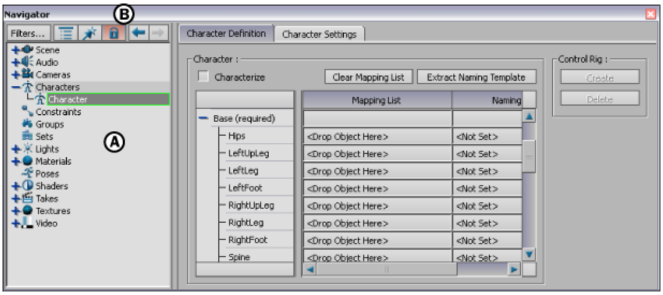


Move mode (Press 'P' for Parenting mode)

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.

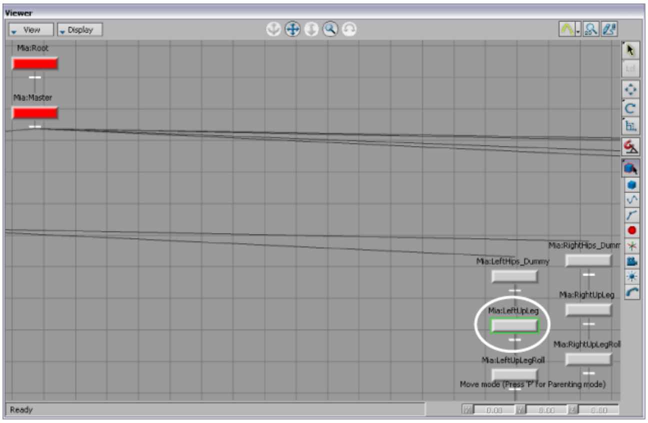


□ Characterize

	Mapping List	Naming
Base (required)		
Hips	<Drop Object Here>	<Not Set>
LeftUpLeg	<Drop Object Here>	<Not Set>
LeftLeg	<Drop Object Here>	<Not Set>
LeftFoot	<Drop Object Here>	<Not Set>
RightUpLeg	<Drop Object Here>	<Not Set>
RightLeg	<Drop Object Here>	<Not Set>
RightFoot	<Drop Object Here>	<Not Set>
Spine	<Drop Object Here>	<Not Set>

Navigator window *A.* **Scene browser** *B.* **Lock option activated**

5 In the Schematic view, zoom in (*Ctrl*-drag) and select the *Mia:LeftUpLeg* node.



Move mode (Press 'P' for Parenting mode)

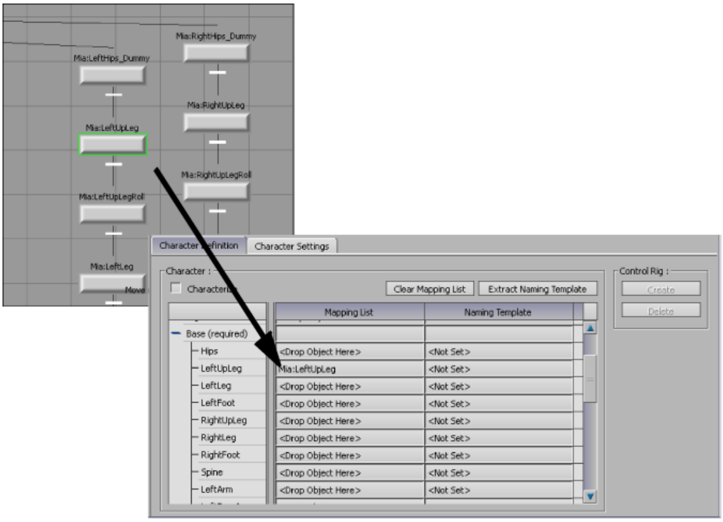
Ready

X 0.00 Y 0.00 Z 0.00

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.



	Mapping List	Naming Template
Base (required)		
Hips	<Drop Object Here>	<Not Set>
LeftUpLeg	Mia:LeftUpLeg	<Not Set>
LeftLeg	<Drop Object Here>	<Not Set>
LeftFoot	<Drop Object Here>	<Not Set>
RightUpLeg	<Drop Object Here>	<Not Set>
RightLeg	<Drop Object Here>	<Not Set>
RightFoot	<Drop Object Here>	<Not Set>
Spine	<Drop Object Here>	<Not Set>
LeftArm	<Drop Object Here>	<Not Set>

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*.

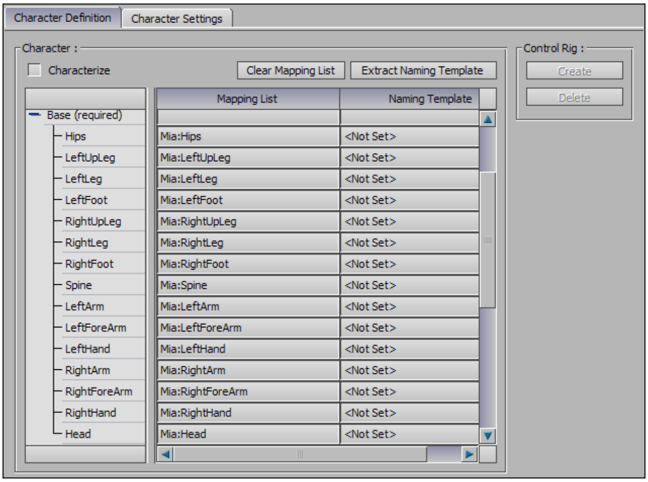
7 Use the following checklist and figure as guides to map the rest of Mia's bones to the *Base (required)* nodes in the Mapping list.

NOTE Although Mia has many bones, you are only required to map the Base group of fifteen 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	

Bone	Slot	Mapped
Mia:Spine	Spine	
Mia:LeftArm	LeftArm	
Mia:LeftForeArm	LeftForeArm	
Mia:LeftHand	LeftHand	
Mia:RightArm	RightArm	
Mia:RightFore-Arm	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.



	Mapping List	Naming Template
− Base (required)		
Hips	Mia:Hips	<Not Set>
LeftUpLeg	Mia:LeftUpLeg	<Not Set>
LeftLeg	Mia:LeftLeg	<Not Set>
LeftFoot	Mia:LeftFoot	<Not Set>
RightUpLeg	Mia:RightUpLeg	<Not Set>
RightLeg	Mia:RightLeg	<Not Set>
RightFoot	Mia:RightFoot	<Not Set>
Spine	Mia:Spine	<Not Set>
LeftArm	Mia:LeftArm	<Not Set>
LeftForeArm	Mia:LeftForeArm	<Not Set>
LeftHand	Mia:LeftHand	<Not Set>
RightArm	Mia:RightArm	<Not Set>
RightForeArm	Mia:RightForeArm	<Not Set>
RightHand	Mia:RightHand	<Not Set>
Head	Mia:Head	<Not Set>

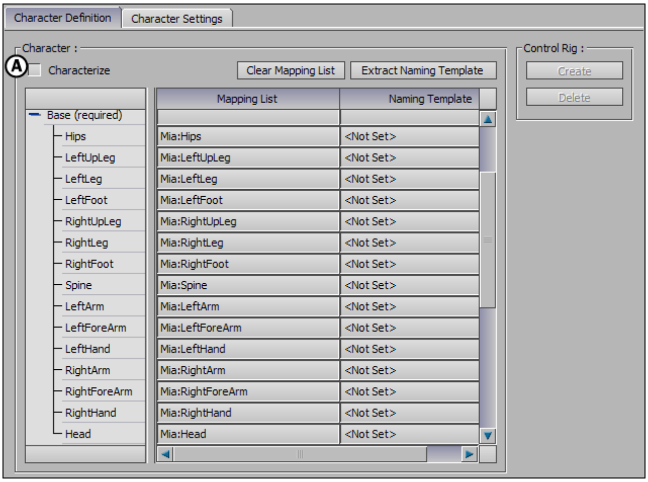
Mia’s base bones mapped to the Base nodes in the Mapping list

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.

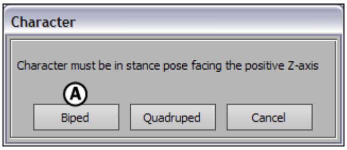
1 In the Character Definition pane, activate the Characterize option (A).



	Mapping List	Naming Template
Base (required)		
Hips	Mia:Hips	<Not Set>
LeftUpLeg	Mia:LeftUpLeg	<Not Set>
LeftLeg	Mia:LeftLeg	<Not Set>
LeftFoot	Mia:LeftFoot	<Not Set>
RightUpLeg	Mia:RightUpLeg	<Not Set>
RightLeg	Mia:RightLeg	<Not Set>
RightFoot	Mia:RightFoot	<Not Set>
Spine	Mia:Spine	<Not Set>
LeftArm	Mia:LeftArm	<Not Set>
LeftForeArm	Mia:LeftForeArm	<Not Set>
LeftHand	Mia:LeftHand	<Not Set>
RightArm	Mia:RightArm	<Not Set>
RightForeArm	Mia:RightForeArm	<Not Set>
RightHand	Mia:RightHand	<Not Set>
Head	Mia:Head	<Not Set>

Character Definition pane *A.* **Characterize option**

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

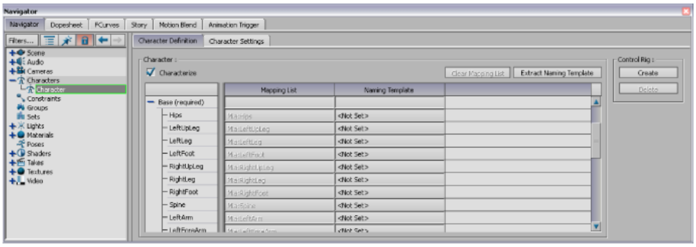


Character must be in stance pose facing the positive Z-axis

Character dialog box *A.* **Click Biped**

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.

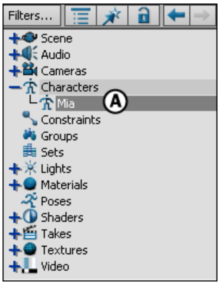


☑ Characterize

	Mapping List	Naming Template
Base (required)		
Hips	Mia:Hips	<Not Set>
LeftUpLeg	Mia:LeftUpLeg	<Not Set>
LeftLeg	Mia:LeftLeg	<Not Set>
LeftFoot	Mia:LeftFoot	<Not Set>
RightUpLeg	Mia:RightUpLeg	<Not Set>
RightLeg	Mia:RightLeg	<Not Set>
RightFoot	Mia:RightFoot	<Not Set>
Spine	Mia:Spine	<Not Set>
LeftArm	Mia:LeftArm	<Not Set>
LeftForeArm	Mia:LeftForeArm	<Not Set>

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 pose.

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 on page 15), you create and customize a Control rig for your characterized character.

Creating and Customizing a Control Rig

3

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.

The following asset is required for this tutorial:

- *mia_characterized.fbx*

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

Prepare the scene

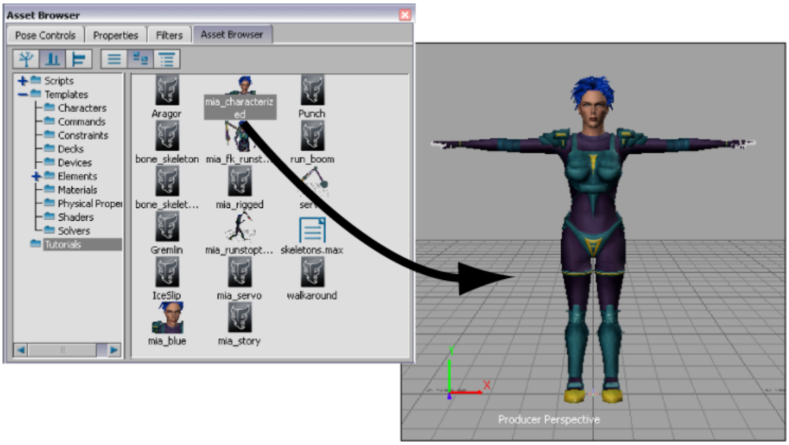
In the following procedure, you prepare the MotionBuilder scene and open the file needed to start this tutorial.

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_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.



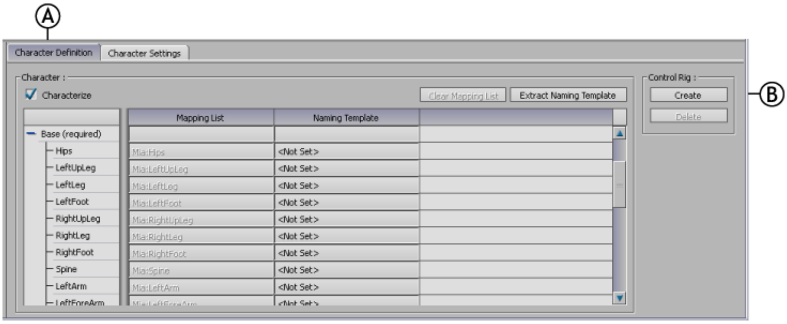
Mia shown in the T-stance pose

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

Create a Control rig

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

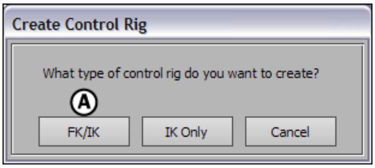
1. Expand the *Characters* branch in the Scene browser and double-click the *Mia* character.
2. Click the Character Definition pane (A) and click Create in the Control Rig area (B).



	Mapping List	Naming Template
Base (required)		
Hips	Mia:Hips	<Not Set>
LeftUpLeg	Mia:LeftUpLeg	<Not Set>
LeftLeg	Mia:LeftLeg	<Not Set>
LeftFoot	Mia:LeftFoot	<Not Set>
RightUpLeg	Mia:RightUpLeg	<Not Set>
RightLeg	Mia:RightLeg	<Not Set>
RightFoot	Mia:RightFoot	<Not Set>
Spine	Mia:Spine	<Not Set>
LeftArm	Mia:LeftArm	<Not Set>
LeftForeArm	Mia:LeftForeArm	<Not Set>

Character Definition *A.* **Settings** *B.* **Control Rig area**

3 In the Create Control Rig dialog box that appears, select FK/IK (A).

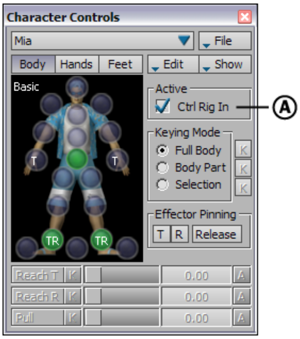

Create Control Rig

What type of control rig do you want to create?

Create Control Rig dialog box *A.* **FK/IK option**

An FK/IK Control rig is created for the Mia Character.

4 In the Character Controls window, activate the Ctrl Rig In option. This makes the Control rig the active motion source for the Mia character.


Character Controls

Mia

Active
☑ Ctrl Rig In

Keying Mode
● Full Body
○ Body Part
○ Selection

Reach T 0.00
Reach R 0.00
Pull 0.00

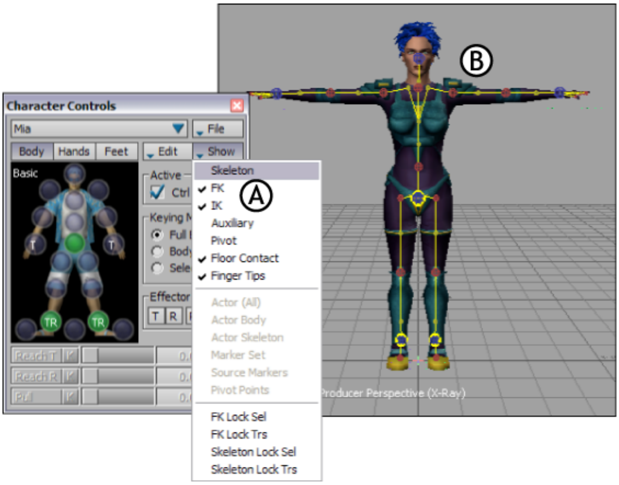
Character Controls *A.* **Ctrl Rig In option activated**

5 Click in the Viewer window, then press *Ctrl-A* until you are in X-Ray display mode.

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.

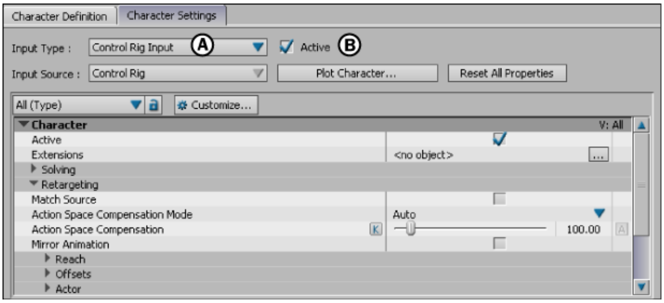
6 In the Character Controls window, open the Show menu (A) and disable the Skeleton option.

This hides the character’s skeleton so you can see the FK and IK Control rig effectors clearly in the Viewer window (B).



A. **Skeleton option disabled** *B.* **Control rig displayed on the Mia character**

7 Switch back to view the Character Settings pane (B).



Input Type : Control Rig Input

☑ Active

Input Source : Control Rig

All (Type)

Character	
Active	☑
Extensions	<no object>
Match Source	□
Action Space Compensation Mode	Auto
Action Space Compensation	100.00
Mirror Animation	□

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).

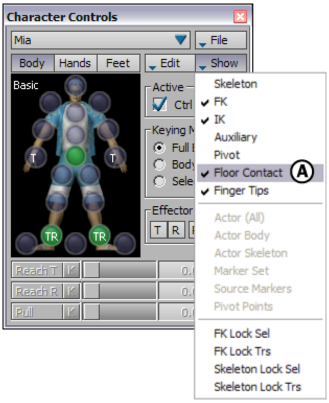
Adjust the foot floor contact markers

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.

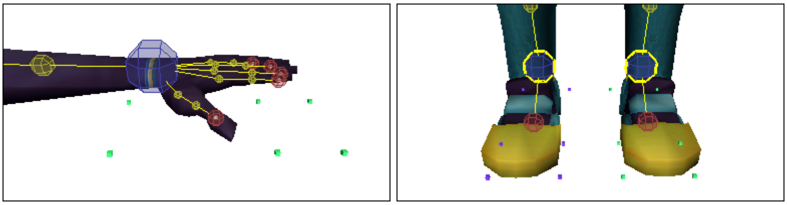
When no floor object is defined in the Mapping list of the Character Definition pane, the MotionBuilder grid is used as the floor. In this tutorial, the floor is not defined.

1 In the Character Controls window, make sure Floor Contact is active in the Show menu (A).



Character Controls *A.* **Floor Contact enabled**

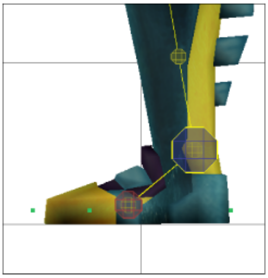
The green and blue floor contact markers display around Mia's hands and feet.



Green and blue floor contact markers displayed around Mia's hands and feet

2 In the Viewer window, click the View menu and select Ortographic > Producer Right (or click *Ctrl-R*) to switch to Producer Right camera view.

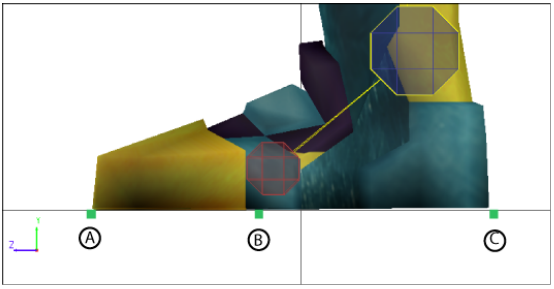
3 Zoom in on Mia's feet as shown in the following figure.



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

5. Select one of the floor contact markers underneath Mia's feet and translate it, using the following guidelines and figure for the marker placement:

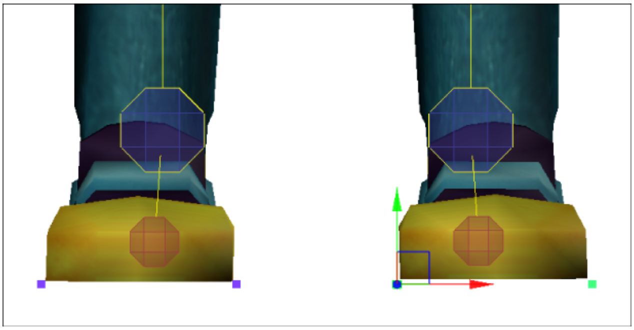
   - Align the middle marker where the toe bone starts (B).
   - Align the front marker with the toe of the model (A).
   - Align the rear marker with the heel of the model (C).



Mia's foot floor contact markers *A.* **Front marker** *B.* **Middle marker** *C.* **Rear marker**

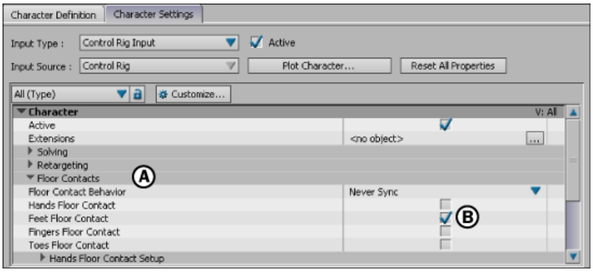
NOTE Moving one foot marker adjusts the other markers accordingly so that as you adjust the green markers on Mia's left foot, the blue markers on the right foot also get adjusted.

6. Switch to 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) to activate the floor contact for the feet.



Input Type : Control Rig Input ☑ Active
Input Source : Control Rig

Character
Active ☑
Extensions <no object>
Solving
Retargeting
Floor Contacts
Floor Contact Behavior Never Sync
Hands Floor Contact □
Feet Floor Contact ☑
Fingers Floor Contact □
Toes Floor Contact □
Hands Floor Contact Setup

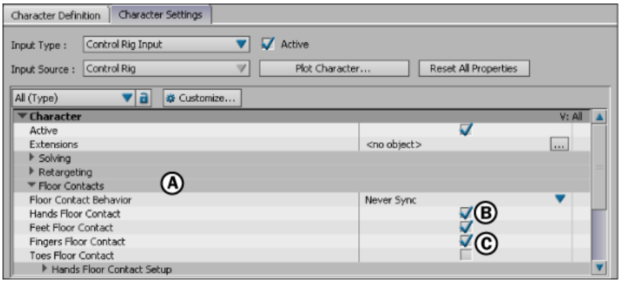
Character Settings pane *A.* Floor Contacts group of properties *B.* Feet Floor Contact option

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.

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.



Input Type : Control Rig Input ☑ Active

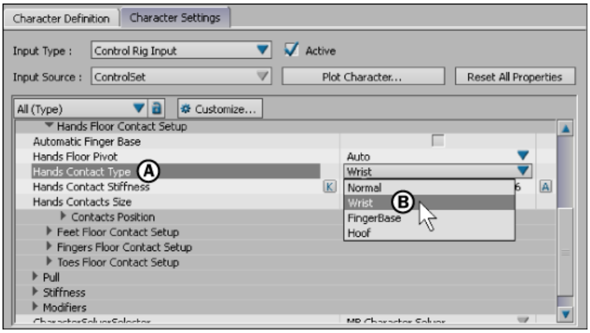
Input Source : Control Rig

Character

Active	☑
Extensions	<no object> ...
Solving	
Retargeting	
Floor Contacts	
Floor Contact Behavior	Never Sync
Hands Floor Contact	☑
Feet Floor Contact	☑
Fingers Floor Contact	☑
Toes Floor Contact	□
Hands Floor Contact Setup	

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*.



Input Type : Control Rig Input ☑ Active

Input Source : ControlSet

Hands Floor Contact Setup

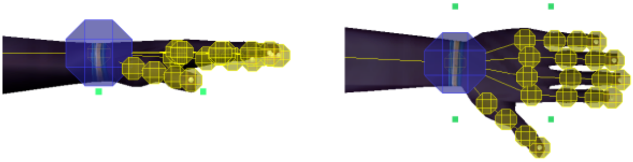
Automatic Finger Base	□
Hands Floor Pivot	Auto
Hands Contact Type	Wrist
Hands Contact Stiffness	
Hands Contacts Size	
Contacts Position	
Feet Floor Contact Setup	
Fingers Floor Contact Setup	
Toes Floor Contact Setup	
Pull	
Stiffness	
Modifiers	
CharacterSolverSelector	MB Character Solver

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.

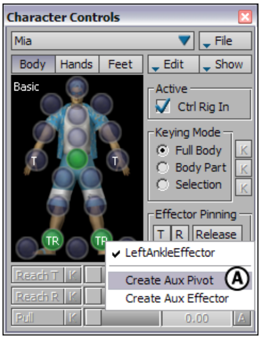
5 Align the rear hand markers with the wrist and the front markers with the base of the fingers (not including the thumb). Also translate the rear markers lower on the Y-axis to align them with the base of the palm as shown in the following figure.



Add Auxiliary pivots

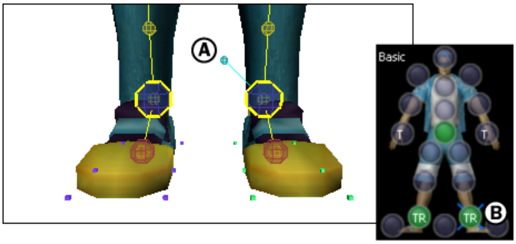
In the following procedure, you create two Auxiliary pivots for additional control over the IK system on Mia's Control rig. These Auxiliary objects can be used to create realistic rotation on Mia's feet as she walks. They also make it easier to rotate Mia's feet while creating keyframe animation.

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



Character Controls *A.* **Left Ankle effector cell contextual menu options**

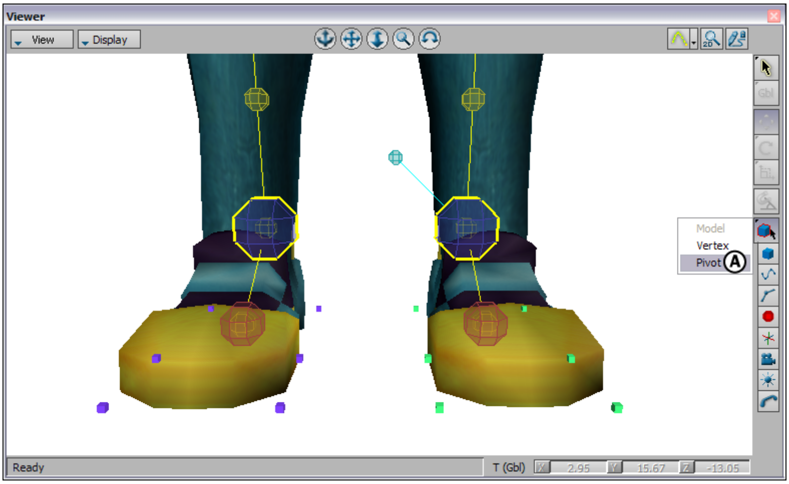
An Auxiliary pivot is created for the left ankle IK effector (A). The Auxiliary pivot displays on the left ankle cell in the Character Controls window as an X (shown in the following figure).



A. **Auxiliary pivot displayed in the Viewer window** *B.* **X represents the Auxiliary pivot**

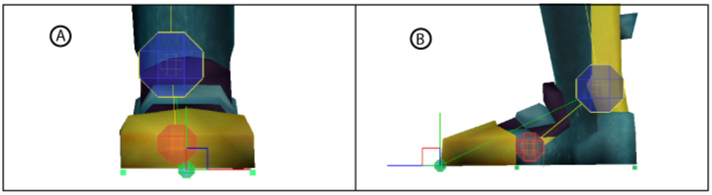
By default, the foot effector is deselected when you create the Auxiliary pivot, and the Auxiliary pivot is selected.

2 In the Viewer window, select *Pivot* from the Selection mode menu to switch to Pivot Selection mode if it is not already selected.



Selection mode menu *A.* **Pivot Selection mode**

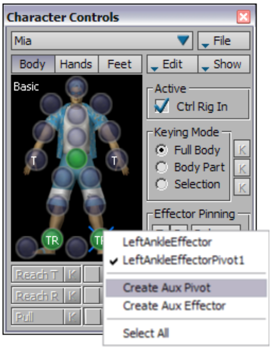
3 Select the Auxiliary pivot you created, if it is not already selected, and translate it until it is placed at the tip of Mia's toes, as shown in the following figure.



Left Ankle Auxiliary pivot *A.* **Front view** *B.* **Side view**

NOTE You can use the Show menu in the Character Controls to hide the Control rig effectors and floor contact markers as you place the Auxiliary pivots.

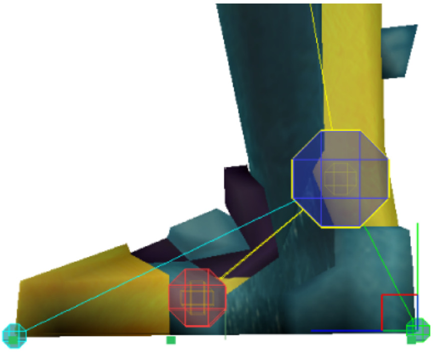
4 Right-click the Left Ankle cell again and select *Create Aux Pivot* from the contextual menu.



Create Aux Pivot on the left ankle

A second Auxiliary pivot displays in the Viewer window.

5 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 on page 27), you add a Character Extension to the Mia character.

Creating a Character Extension

4

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 an additional limb for the Mia character, attach it to Mia using a Character Extension, and define its animation in relation to Mia's body.

The following assets are required for this tutorial:

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

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

Prepare the scene

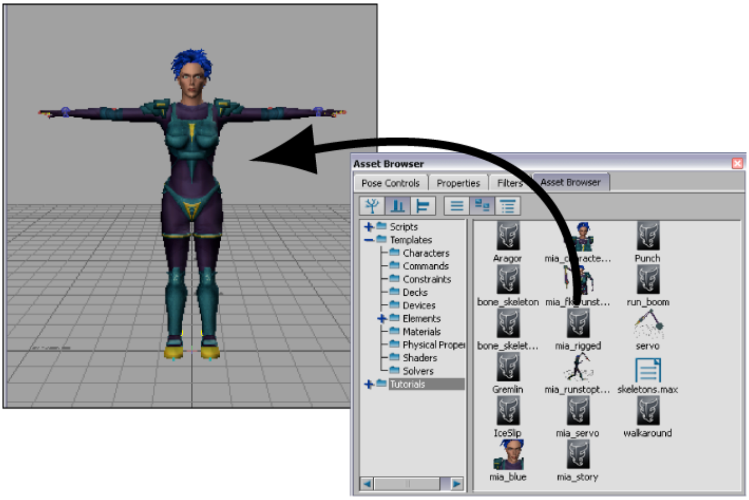
In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

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_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.

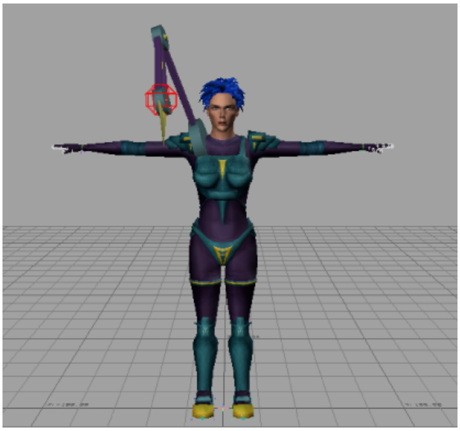


mia_rigged **appears in the Viewer window**

A characterized character named Mia appears in the Viewer window in the T-stance pose.

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 her shoulder. In the next procedure, you attach this arm to Mia as another limb.



Mia and Servo arm loaded into the scene

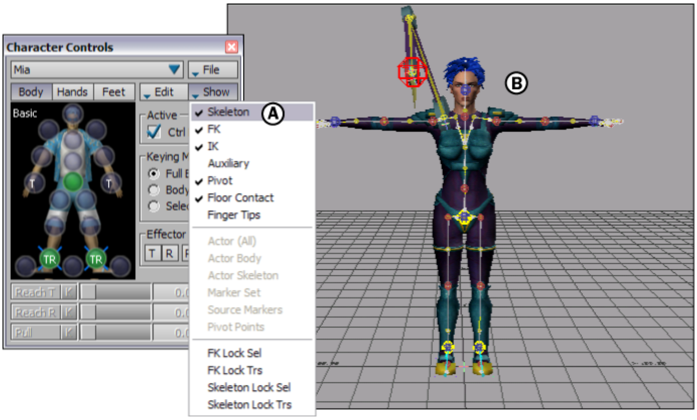
Connect the extra limb to the character

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

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 he keyboard shortcuts *Ctrl-A*.

2 In the Character Controls window, select Mia as the current character and activate the Skeleton option in the Show menu (A). The FK and IK options should also be selected in the Show menu (A) if they are not already.



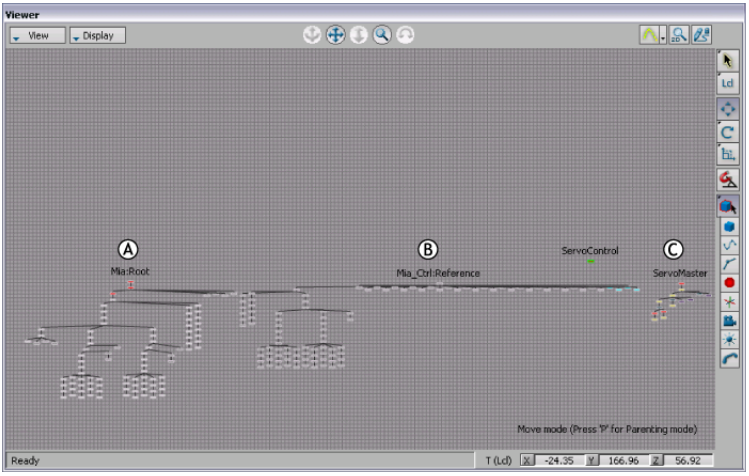
A. **Skeleton activated** *B.* **Skeleton displayed on the Mia character**

The Skeleton display makes it easier to view and select Mia's shoulder bone.

3 Click in the Viewer window then do the following:

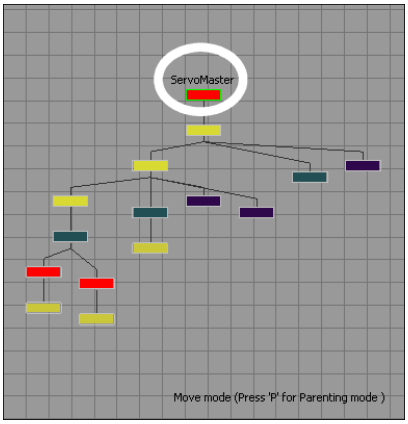
- Press *Ctrl-W* to switch to the Schematic view.
- Right-click in the Schematic view and select Auto-Arrange and then Arrange-All from the contextual menu.
- Press *A* to see all the nodes in the Schematic view.

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).



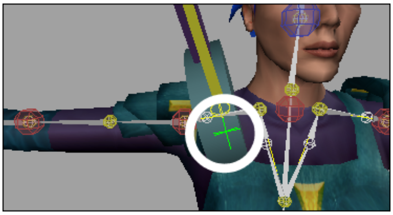
Schematic view of hierarchies in the scene *A.* **Mia's skeleton** *B.* **Mia's Control rig** *C.* **The Servo arm**

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



ServoMaster node selected

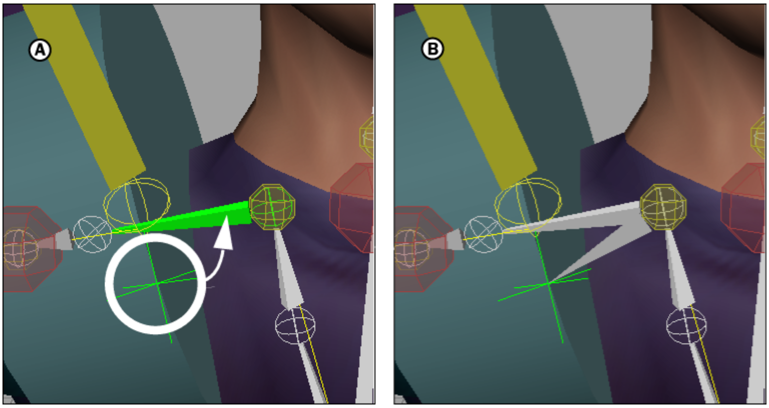
5 Switch back to the Producer camera view (*Ctrl-W*) and zoom in on Mia's right shoulder. The ServoMaster node null is still selected.



The ServoMaster null is selected in the Viewer window

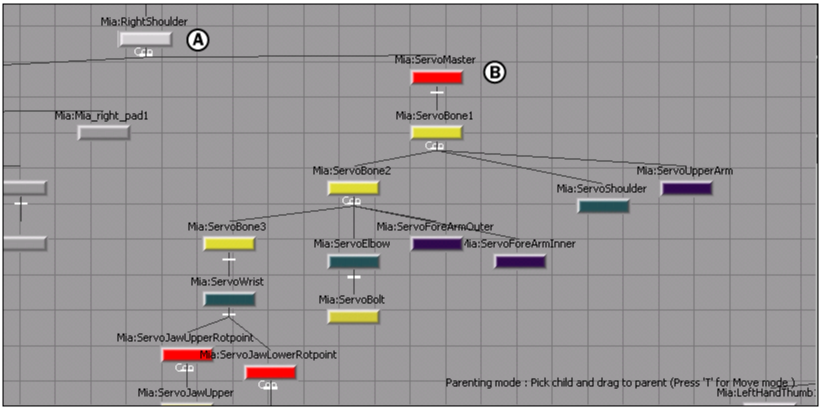
6 Press P to activate Parenting mode, then drag the ServoMaster null to the Mia:RightShoulder bone (A).

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.



Parenting mode : Pick child and drag to parent (Press 'T' for Move mode)

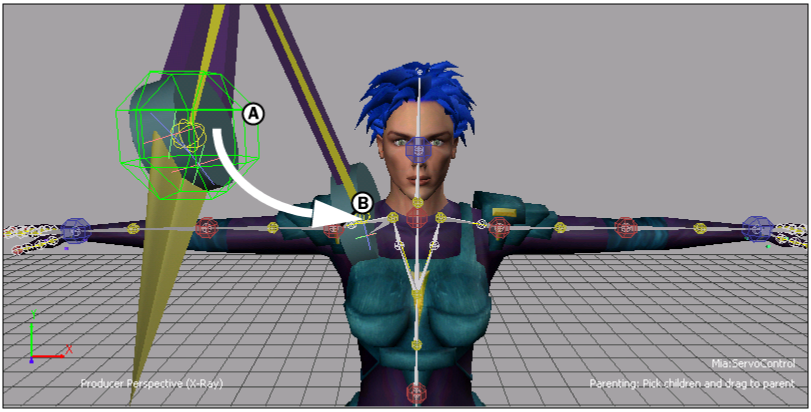
Schematic view showing parenting structure *A.* **Mia:RightShoulder bone** *B.* **Servo arm hierarchy**

NOTE The Mia:RightShoulder node is found on the left side of the Schematic view. 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 Parent mode and parent it onto Mia's right shoulder bone as well.



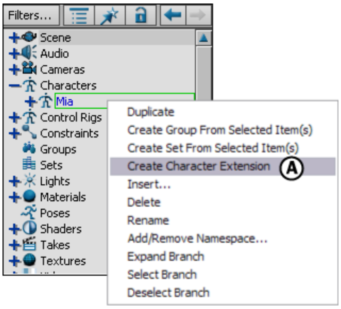
Parenting: Pick children and drag to parent

A. **ServoControl effector** *B.* **Right shoulder bone**

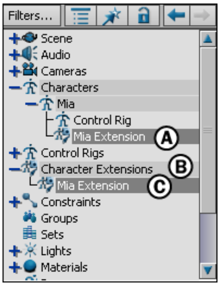
Create a Character Extension

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.

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

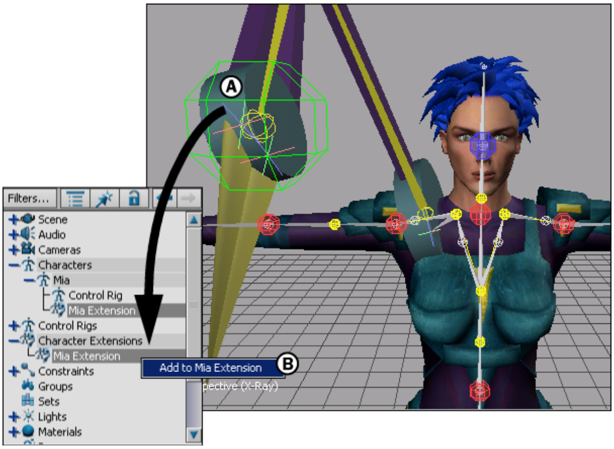


2 Expand the Character Extensions folder in the Scene browser and view the Mia Extension (C).



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 Alt-drag the ServoControl effector from the Viewer window onto the *Mia Extension* and select *Add to Mia Extension* from the contextual menu as shown in the following figure.

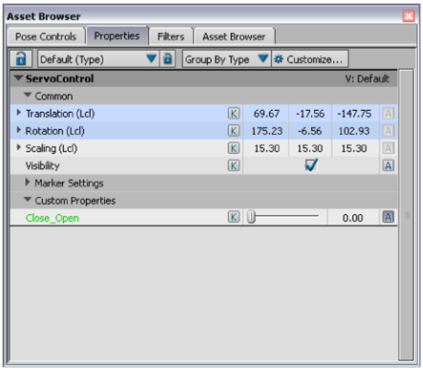


A. **ServoControl effector** *B.* **ServoControl effector added to Mia Extension**

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

4 With the ServoControl effector still selected, open the Asset browser’s Properties window.

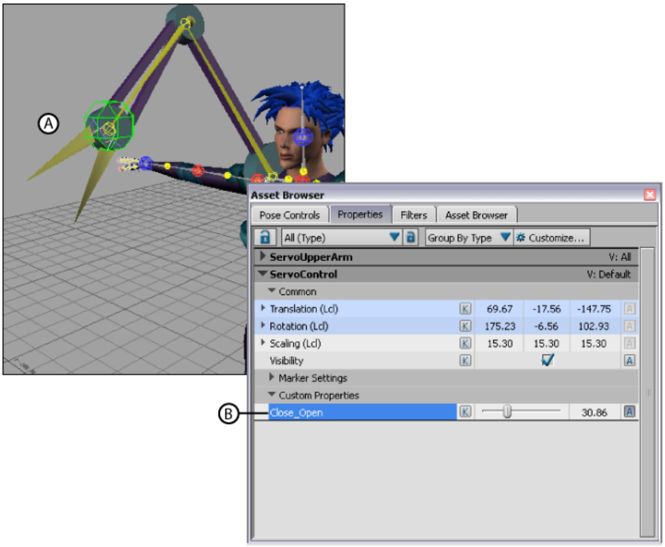
NOTE The Properties window is on the right side of the interface, in one of the Asset browser tabs.



Translation (Lcl)	K	69.67	-17.56	-147.75	A
Rotation (Lcl)	K	175.23	-6.56	102.93	A
Scaling (Lcl)	K	15.30	15.30	15.30	A
Visibility	K		☑		A
Close_Open	K			0.00	A

Properties window

5 Select the custom property *Close_Open* at the bottom of the list, and drag its slider left and right as shown in the following figure.

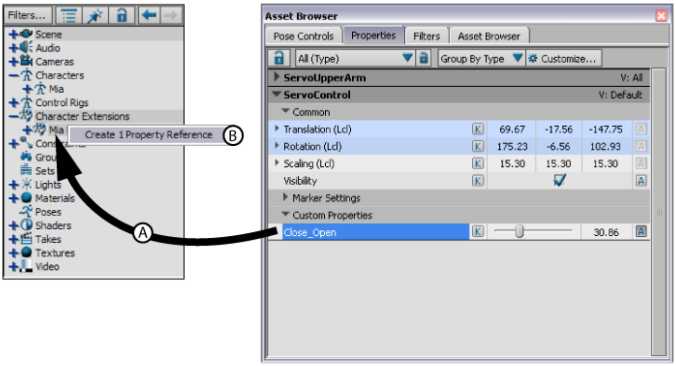


ServoUpperArm				V: All
ServoControl				V: Default
Translation (Lcl)	K	69.67	-17.56	-147.75
Rotation (Lcl)	K	175.23	-6.56	102.93
Scaling (Lcl)	K	15.30	15.30	15.30
Visibility	K		✓	
Close_Open	K			30.86

A. Servo arm opens B. Custom property Close_Open

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

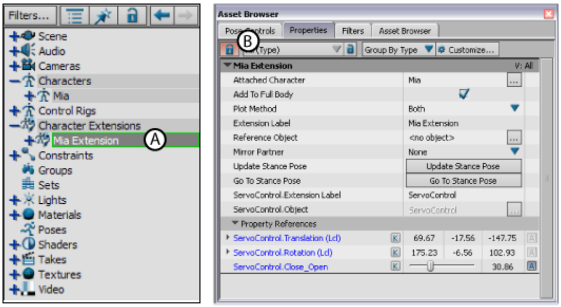
6 Alt-drag the *Close_Open* property over the *Mia Extension* (A) and select *Create 1 Property Reference* from the contextual menu (B).



ServoUpperArm				V: All
ServoControl				V: Default
Translation (Lcl)	K	69.67	-17.56	-147.75
Rotation (Lcl)	K	175.23	-6.56	102.93
Scaling (Lcl)	K	15.30	15.30	15.30
Visibility	K		✓	
Close_Open	K			30.86

A. Close_Open property dragged to Mia Extension B. Select Create 1 Property Reference

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



Mia Extension V: All

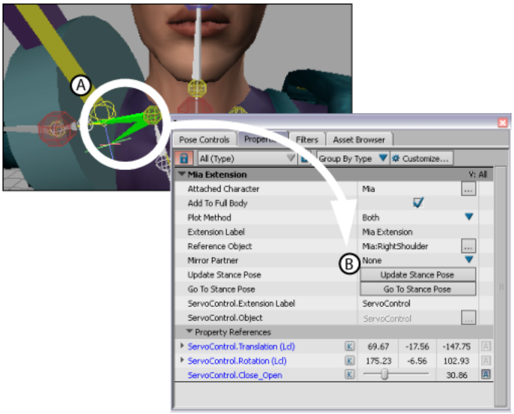
Attached Character	Mia
Add To Full Body	☑
Plot Method	Both
Extension Label	Mia Extension
Reference Object	<no object>
Mirror Partner	None
Update Stance Pose	Update Stance Pose
Go To Stance Pose	Go To Stance Pose
ServoControl.Extension Label	ServoControl
ServoControl.Object	ServoControl

Property References

ServoControl.Translation (Lcl)	K	69.67	-17.56	-147.75
ServoControl.Rotation (Lcl)	K	175.23	-6.56	102.93
ServoControl.Close_Open	K			30.86

A. **Mia Extension selected** *B.* **Lock option activated in the Properties window**

8 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).



Mia Extension V: All

Attached Character	Mia
Add To Full Body	☑
Plot Method	Both
Extension Label	Mia Extension
Reference Object	Mia:RightShoulder
Mirror Partner	None
Update Stance Pose	Update Stance Pose
Go To Stance Pose	Go To Stance Pose
ServoControl.Extension Label	ServoControl
ServoControl.Object	ServoControl

Property References

ServoControl.Translation (Lcl)	K	69.67	-17.56	-147.75
ServoControl.Rotation (Lcl)	K	175.23	-6.56	102.93
ServoControl.Close_Open	K			30.86

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

A Reference Object Change dialog box appears. Click Ok.

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 You can also use the Include Part In Full Body option to define whether you want the Character Extension to be keyed when you set keys in Full Body Keying mode.

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 on page 39), you animate the character and the Character Extension using the Pose Controls.

Creating a Walk Cycle

5

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

The following asset is required for this tutorial:

- *mia_servo.fbx*

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

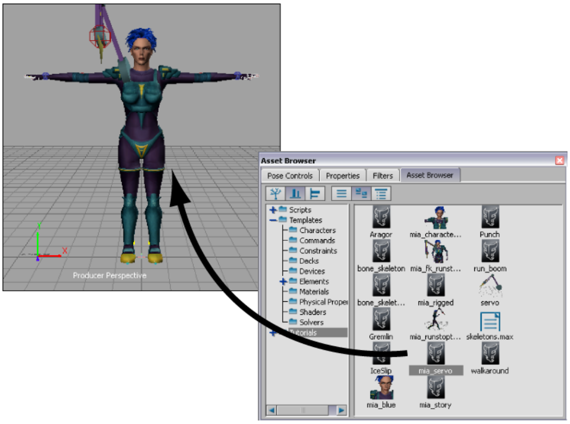
Prepare the scene

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. Select the Tutorials folder in the Asset browser, 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 appears in the Viewer.



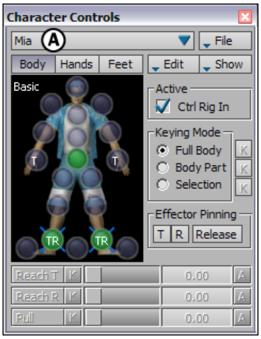
Drag the mia_servo.fbx file into the scene

This character includes an extra “Servo arm” that is parented to the right shoulder bone and added as a Character Extension.

Create poses

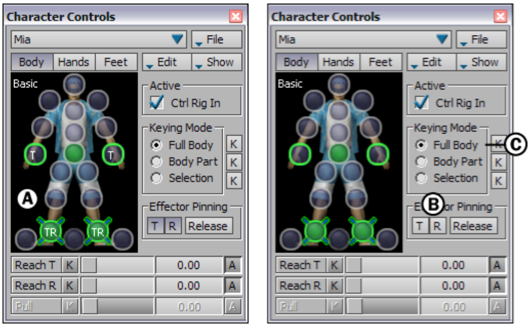
In the following procedure, you create several full body poses on your character, including the Character Extension, to create a walk cycle.

1 In the Character Controls window, if she is not selected already, select Mia in the Current Character menu (A).



Character Controls window
A. **Select Mia from the Current Character menu**

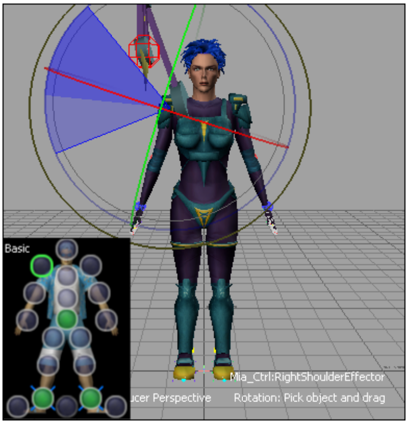
2 Ctrl-click to select the wrist and ankle effectors (A) and turn off all effector pinning by disabling the T and R options in the Effector Pinning area (B).



Character Controls window *A.* **Select the Wrist and Ankle effector cells** *B.* **Disable the T and R pinning on these effectors** *C.* **Full Body Keying mode is active**

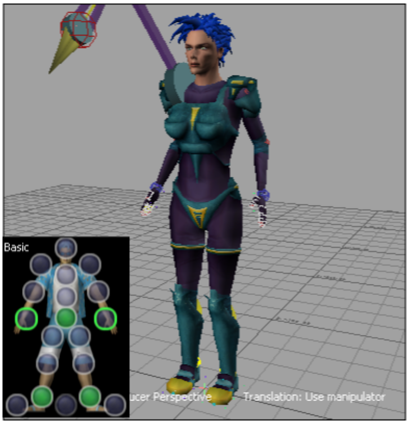
In the following step, Full Body is the default keying mode (C). In Full Body Keying mode, pasted poses are placed onto the character's entire body, and keyframes are placed on all effectors.

3 Select the Left Shoulder effector then press R to rotate the effector until Mia's left arm is in a more natural position at her side. Repeat for the Right Shoulder and right arm.


Basic
Mia_Ctrl:RightShoulderEffector
ıcer Perspective
Rotation: Pick object and drag

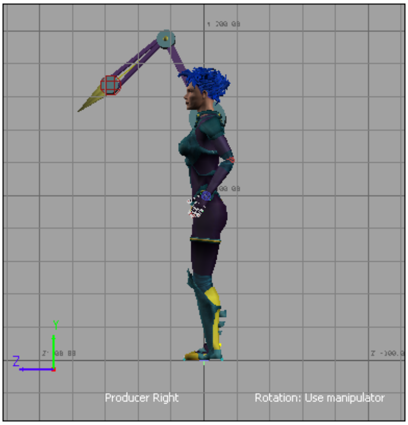
Select the shoulder effectors, then rotate the arms down to Mia's sides

4 Select both wrist effectors and translate them upward on the Y-axis to give the elbows a natural bend.



Select both wrist effectors and translate them upward to create a natural bend in the elbows

5 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.

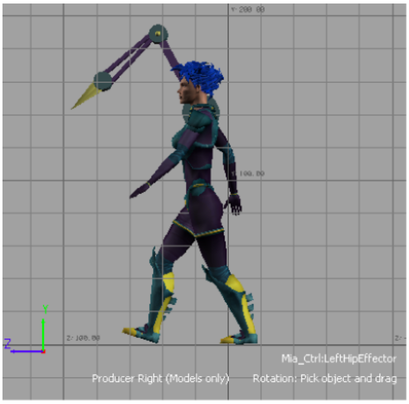


Switch to Producer Right camera view

NOTE As you work through on tutorial and manipulate the character, you can switch the camera view at any time to get a better view.

6 Create the first pose for the walk cycle by doing the following:

- In the Character Controls, select the Right Hip effector then rotate the right leg forward on the Z-axis, as if Mia is stepping forward.
- Select the Left Hip effector and rotate the left leg slightly backward on the Z-axis.
- Select the Right Shoulder effector and rotate the right arm slightly backward, then select the Left Shoulder rotate the left arm forward as if Mia is naturally swinging her arms.
- Select the Auxiliary pivots (*AnkleEffectorPivots*) on Mia's feet and rotate them until her feet are positioned naturally.



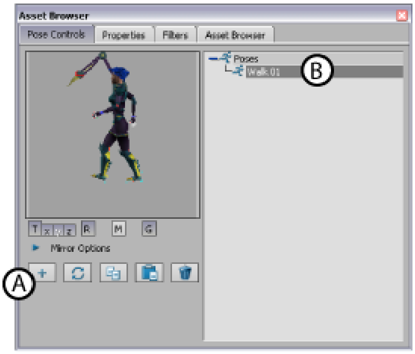
This pose should have Mia with her right leg beginning the forward motion of a step

---

NOTE 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.

---

7 In the Pose Controls window, click Create to add this pose to the Pose browser (A), then right-click and rename the pose "Walk 01" (B). You may need to expand the Poses folder to see the pose.

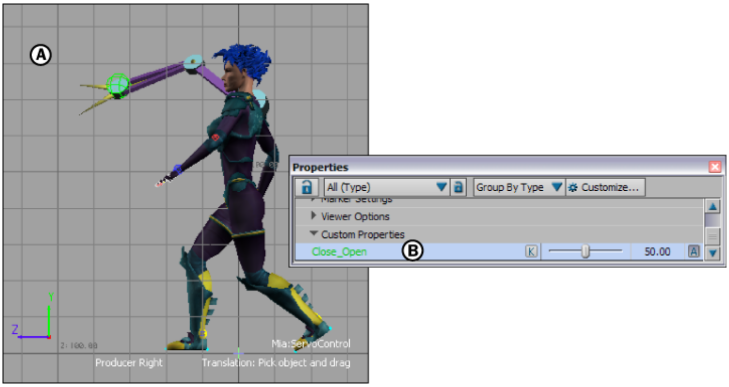


Pose Controls *A.* **Click Create** *B.* **Right-click and rename the Pose "Walk 01"**

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

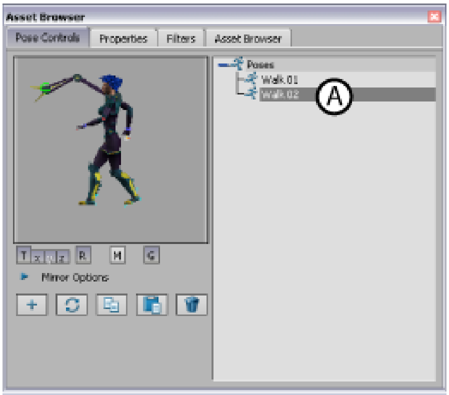
8 Create a second pose for the walk cycle by doing the following:

- Position Mia's legs and arms so that she looks similar to the following figure. The right foot is forward and on the ground, and the left foot is back to provide momentum.
- Select the Mia_Ctrl:ServoControl effector, and translate the Servo arm so it reaches in front of Mia.
- With the Mia_Ctrl:ServoControl effector still selected, open the pincers about half-way using the Close_Open property in the Properties window (B).



A. **The second pose for the walk cycle** *B.* **Adjust the Close_Open property to control the pincers**

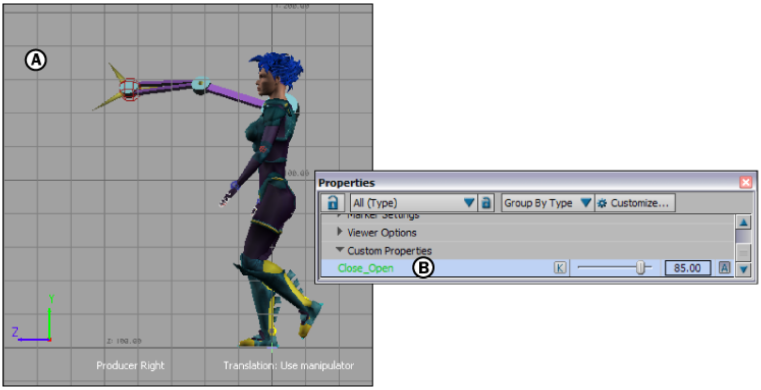
9 In the Pose Controls, click Create. Right-click and rename this pose as Walk 02 (A).



Pose Controls *A.* **Right-click and rename the second pose "Walk 02"**

10 Create the final pose for the walk cycle by doing the following:

- Position Mia's legs and arms so that her step appears similar to the following figure.
- Select the Mia:ServoControl effector and extend the Servo arm to reach even further in front of Mia.
- With the Mia:ServoControl still selected, use the Close_Open property in the Properties window to open the pincers further (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.

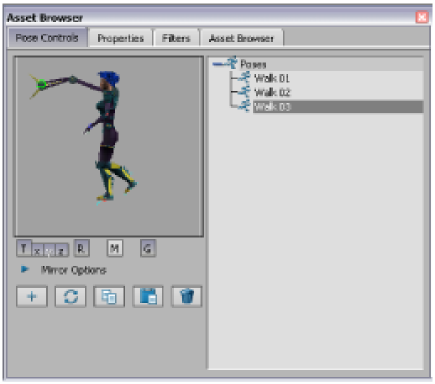


Close_Open 85.00

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

11 In the Pose Controls, click Create. Right-click and rename this pose as Walk 03.

You now have three poses listed in the Scene browser.

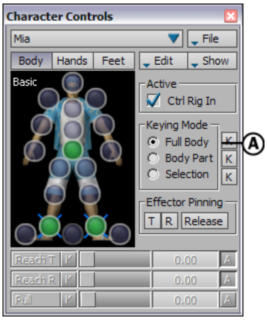


The three poses you created are listed in the Pose browser

Create animation with poses

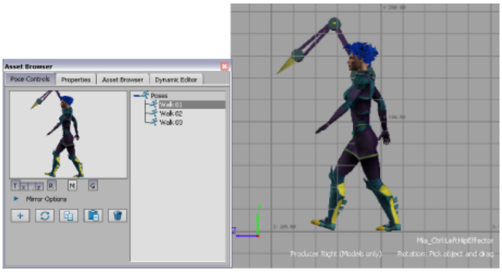
In the following procedure, you use the three poses you created to create one half of a walk cycle. By keyframing these poses at different frames, you create a short walking animation.

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



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

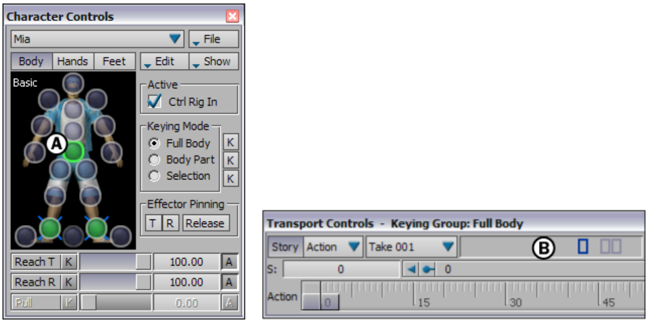
2 In the Pose browser, double-click the Walk 01 pose to paste it on Mia.



Pose Controls *A.* **Double-click the Walk 01 pose** *B.* **The Walk 01 pose is pasted on Mia.**

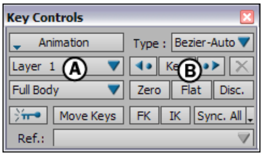
By default, the Gravity, Translation, and Rotation options are active in the Match area. This means that the translation and rotation of the pasted pose match the translation and rotation of the selected effector on the current character. The Gravity option ensures that the feet stay at the original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

3 Select the Hips effector, then go to frame 0 in the Transport Controls.



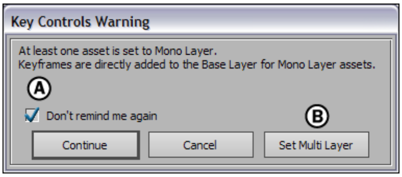
A. **Select the Hips effector** *B.* **Go to frame 0**

4 In the Key Controls window select Layer 1 from the Layer menu (A), then click Flat to set a Flat keyframe (B). You can also press Ctrl-K on the keyboard to set a Flat keyframe. Also select Bezier-Auto from the Type menu if it is not already selected.



Key Controls *A.* **Select Layer 1** *B.* **Click Flat**

5 In the Key Controls Warning dialog box that appears, activate the Don't Remind Me Again option (A), then click Set Multi Layer (B).


Key Controls Warning

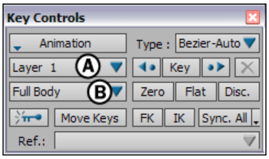
At least one asset is set to Mono Layer.
Keyframes are directly added to the Base Layer for Mono Layer assets.

☑ Don't remind me again

Key Controls Warning dialog box *A.* **Activate Don't remind me again** *B.* **Click Set Multi Layer**

Selecting Set Multi Layer lets you set keyframes on the Mia:ServoControl effector on many different layers, instead of only on the Base Layer.

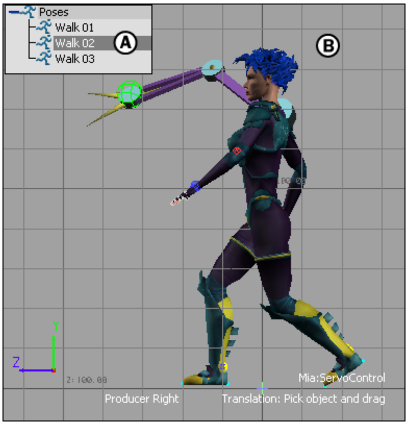
The keyframe is placed on Layer 1 on the full body position of the character, as indicated in the Key Controls window (A and B). The keying mode reflects the selected option in the Keying Mode area of the Character Controls window.



Key Controls *A.* **Layer 1 is selected.** *B.* **Full Body keying mode is selected.**

6 Go to frame 5 and do the following:

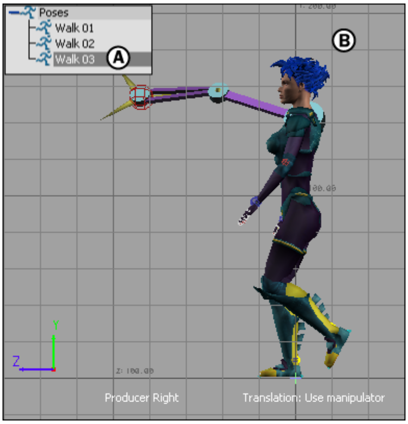
- Double-click the Walk 02 pose to paste it on Mia.
- Press Ctrl-K to set a Flat keyframe.



Frame 5 *A.* **Select the Walk 02 pose.** *B.* **Paste the pose on Mia and set a Flat keyframe.**

7 Go to frame 10 and do the following:

- Double-click the Walk 03 pose to paste it on Mia.
- Press Ctrl-K to set a Flat keyframe.



Frame 10 *A.* **Select the Walk 03 pose.** *B.* **Paste the pose on Mia and set a Flat keyframe.**

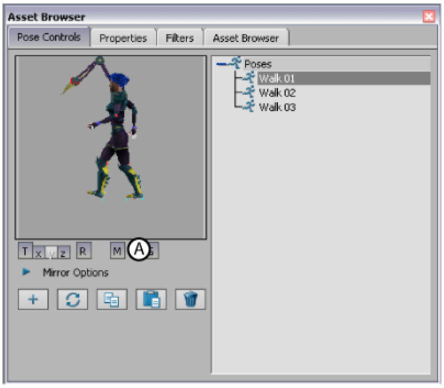
8 Drag the Timeline indicator through the animation to view the step you created.

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 Match area of the Pose Controls window, activate the Mirror option (A).

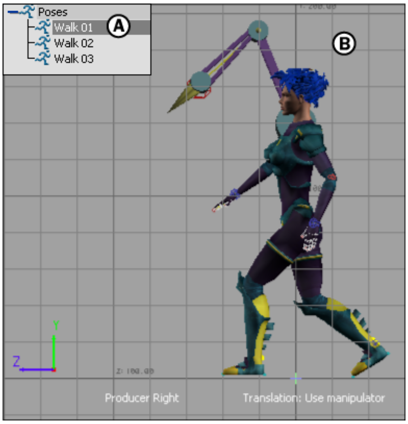


Pose Controls *A.* **Activate the Mirror option**

2 Go to frame 15 and do the following:

- Double-click the Walk 01 pose to mirror-paste it on Mia (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.

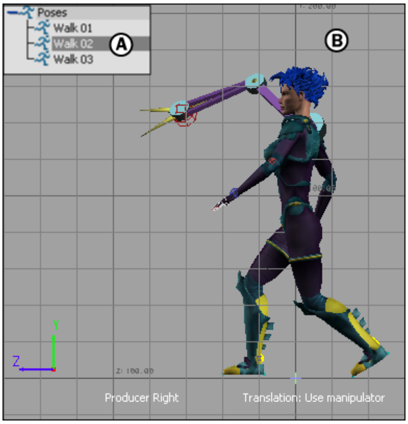


Frame 15 *A.* **Select the Walk 01 pose.** *B.* **Paste it onto Mia and set a Flat keyframe.**

3 Go to frame 20 and do the following:

- Double-click the Walk 02 pose to mirror-paste it (A).

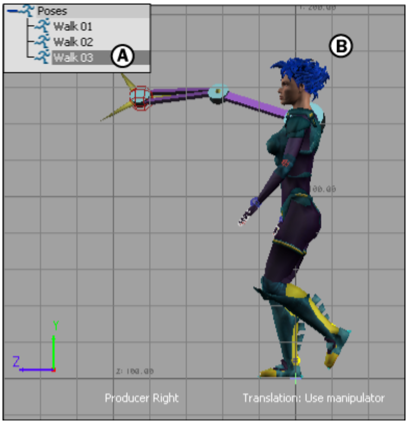
- Press Ctrl-K to set a Flat keyframe.



Frame 20 *A.* **Select the Walk 02 pose.** *B.* **Paste it onto Mia and set a Flat keyframe.**

4 Go to frame 25 and do the following:

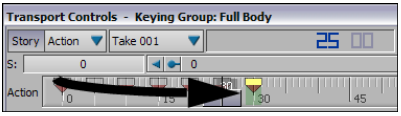
- Double-click the Walk 03 pose to mirror-paste it (A).
- Press Ctrl-K to set a Flat keyframe.



Frame 25 *A.* **Select the Walk 03 pose.** *B.* **Paste it onto Mia and set a Flat keyframe.**

Your animation now consists of six keyframes. The first three keyframes were mirrored onto the left side of the character, 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, copy the keyframe at frame 0 to frame 30 by C-dragging the keyframe from frame 0 to frame 30.

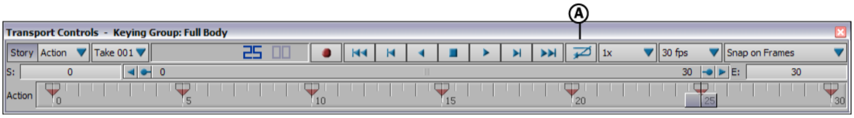


Copy the keyframe at frame 0.

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

Play the animation

1 Click on the Action timeline, then press Ctrl-Shift-A to frame the animation on the Action timeline to its full length of 30 frames.



Press Ctrl-Shift-A to frame the animation you created. *A.* **Loop option**

2 In the Transport Controls window, click Loop (A), then click Play.

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 on page 55, you retarget animation and a Character Extension from one character to another.

Retargeting Character Animation

6

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.

The following assets are required for this tutorial:

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

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

Prepare the scene

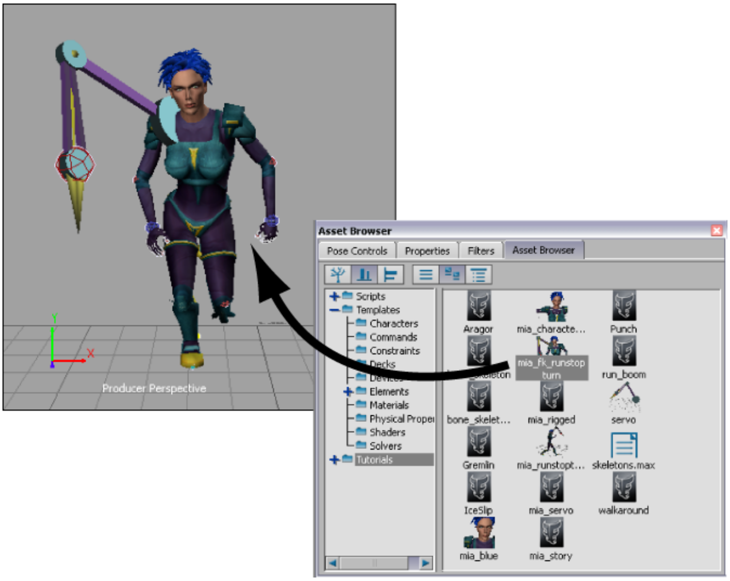
In the following procedure, you prepare the MotionBuilder scene and open the files needed to start this tutorial.

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

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

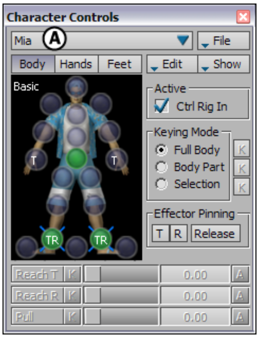
2 Select the Tutorials folder in the Asset browser, drag the *mia_fk_runstopturn* asset (*mia_fk_runstopturn.fbx* file) into the Viewer window as shown in the following figure, then select FBX Open > All takes from the contextual menu that appears.

A model named Mia appears in the Viewer along with her “Servo arm” Character Extension.



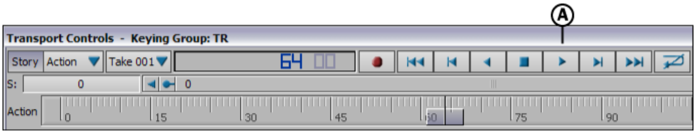
Mia_fk_runstopturn asset dragged into the scene

3 In the Character Controls, select Mia in the Current Character menu (A).



Character Controls ***A.*** **Mia is the Current Character**

4 In the Transport Controls, click Play to view the animation on the Mia character.

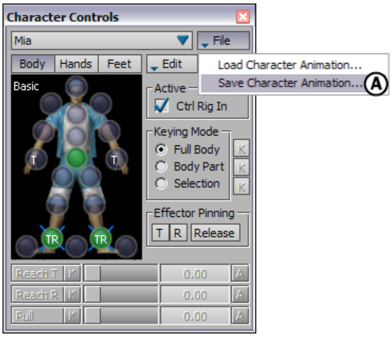


Transport Controls *A.* **Play button**

Save the character animation

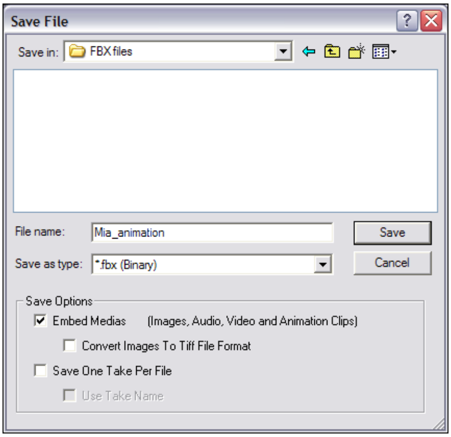
In the following procedure, you save the character animation using the Save Character Animation option. This prepares the animation to be easily loaded using the Load Character Animation option.

1 In the Character Controls window, select Save Character Animation from the File menu (A).



Character Controls *A.* **Save Character Animation option**

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



Save in: FBX files

File name: Mia_animation

Save as type: *.fbx (Binary)

Save Options

☑ Embed Medias (Images, Audio, Video and Animation Clips)

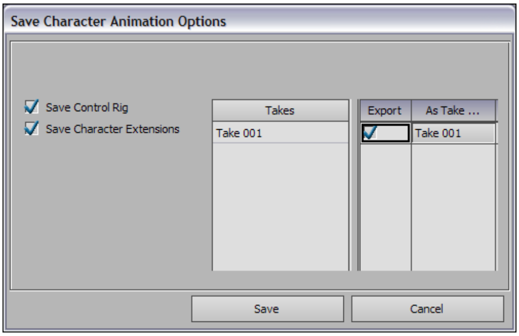
☐ Convert Images To Tiff File Format

☐ Save One Take Per File

☐ Use Take Name

Save File dialog box

3 In the Save Character Animation Options dialog box that appears, make sure that the Save Control Rig and Save Character Extensions options are activated, then click Save.



☑ Save Control Rig

☑ Save Character Extensions

Takes
Take 001

Export	As Take ...
☑	Take 001

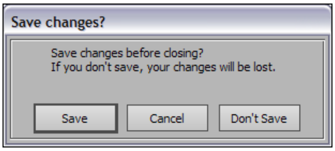
Save Character Animation Options dialog box

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

Create a scene

1 Press *Ctrl-N* to create a scene.

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

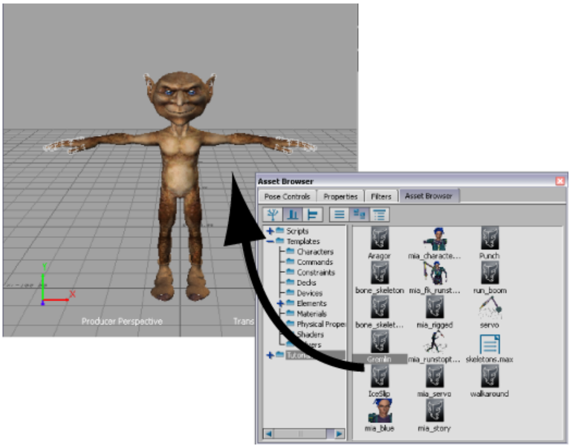


Save changes?

Save changes before closing?
If you don't save, your changes will be lost.

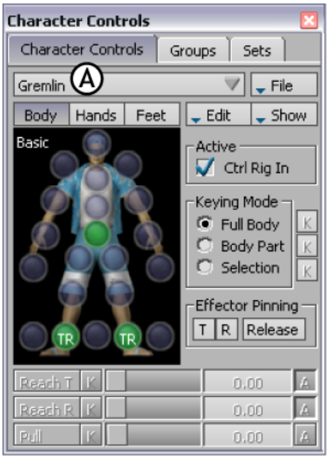
Save changes dialog box

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



Gremlin asset dragged into the scene

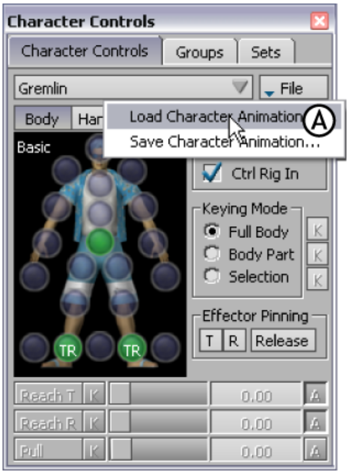
4 In the Character Controls, select Gremlin in the Current Character menu.



Character Controls *A.* **Gremlin is the current character**

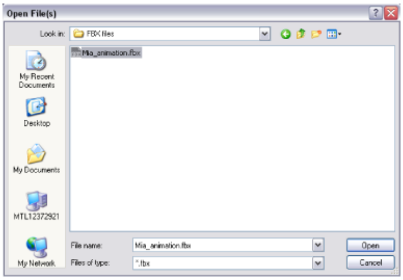
Load character animation

1 In the Character Controls window, from the File menu, select 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.



Look in: FBX files

Mia_animation.fbx

File name: Mia_animation.fbx

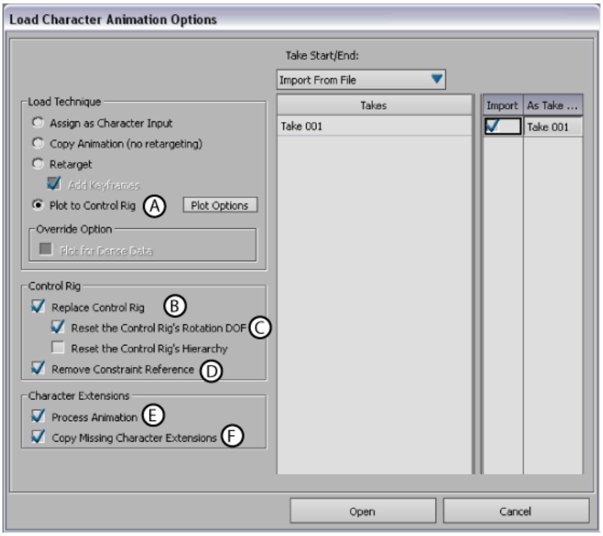
Files of type: *.fbx

Open File(s) dialog box

The Load Character Animation Options dialog box displays.

3 In the Load Character Animation Options dialog box, choose the following settings:

- In the Load Technique area (A), select the Plot to Control Rig option.
- In the Control Rig area, make sure the Replace Control Rig option is activated (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

Take Start/End: Import From File

Load Technique

○ Assign as Character Input

○ Copy Animation (no retargeting)

○ Retarget

☑ Add Keyframes

● Plot to Control Rig (A) Plot Options

Override Option

□ Plot for Dense Data

Control Rig

☑ Replace Control Rig (B)

☑ Reset the Control Rig's Rotation DOF (C)

□ Reset the Control Rig's Hierarchy

☑ Remove Constraint Reference (D)

Character Extensions

☑ Process Animation (E)

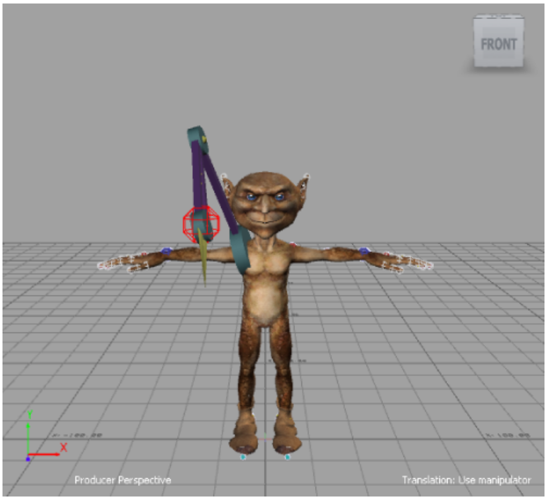
☑ Copy Missing Character Extensions (F)

Takes	Import	As Take ...
Take 001	☑	Take 001

Load Character Animation Options selected settings

- Click Open.

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



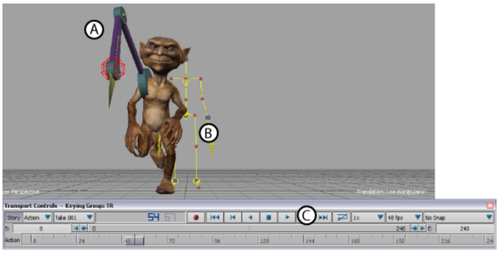
Mia's animation and Control rig loaded onto the Gremlin character

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

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

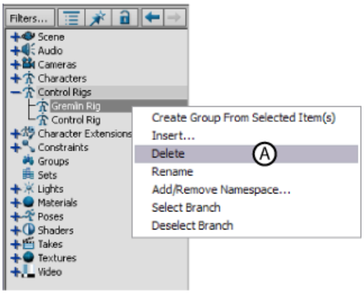
Notice how both the Servo arm and the animation are transferred onto the Gremlin character (A).



A. **Gremlin using Mia's animation** *B.* **Gremlin's Control rig** *C.* **Play button**

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 on page 65), you edit animation on a layer from your original animation, then merge all layers.

Editing Character Animation

7

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

The following asset is required for this tutorial:

- *mia_runstopturn.fbx*

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

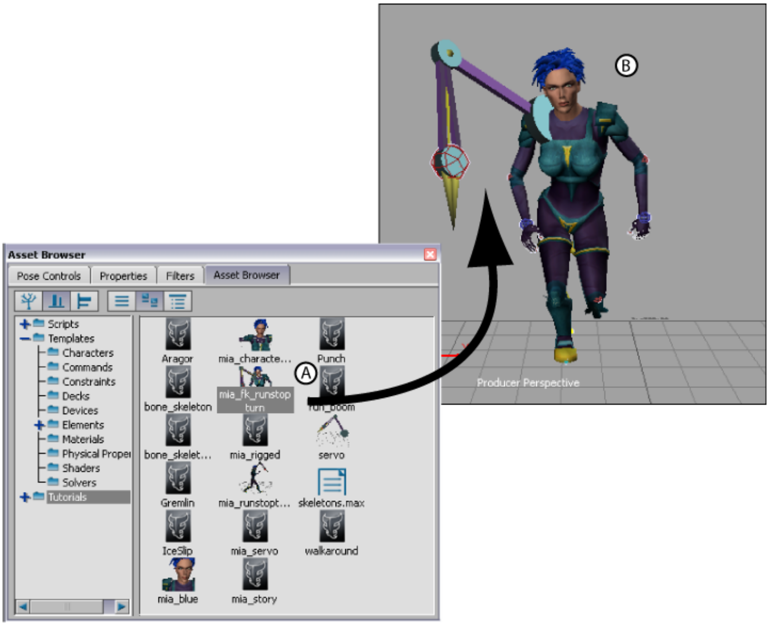
Prepare the scene

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.

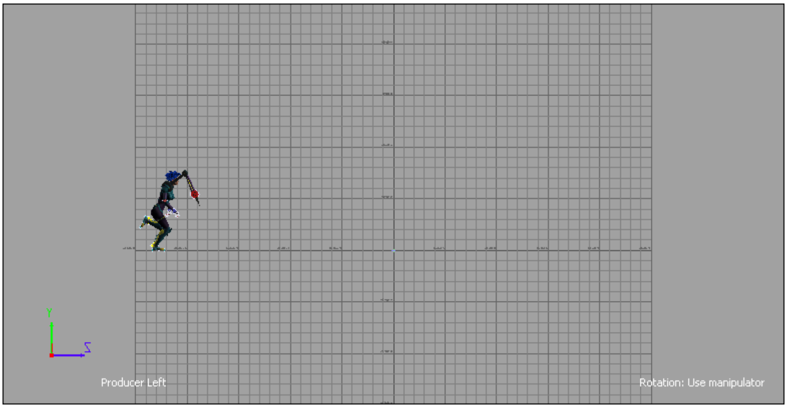
MotionBuilder displays a new scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2 Select the Tutorials folder in the Asset browser, drag the *mia_runstopturn* asset (*mia_runstopturn.fbx* file) into the Viewer window (A), then select FBX Open > All Takes from the contextual menu that appears. A model named Mia appears in the Viewer (B).



A. **Drag the mia_runstopturn.fbx file into the Viewer** *B.* **The Mia character loads**

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



Select the Producer Left camera view and zoom out to view the whole animation

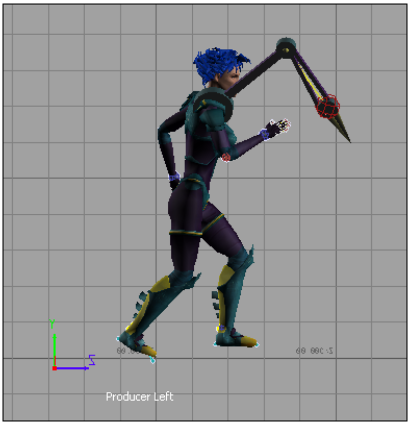
Modify the Character Extension animation

In the following procedure, you create a 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.

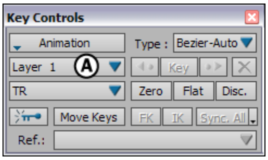
Right now, the Servo arm bounces along in front of Mia, pointing towards the red wire-frame effector. Although this effector is parented to Mia's shoulder, the effector moves enough to cause the Servo arm to jump around while Mia runs.

2 Press Ctrl-Home to go back to the beginning of the take, then play it again to frame 50.



Mia at frame 50

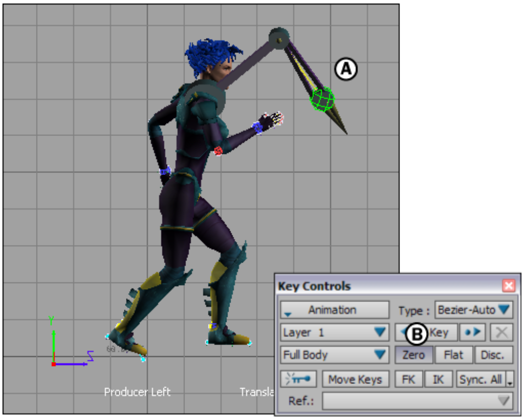
3 In the Key Controls, select Layer 1 from the Layer menu (A).



Key Controls *A.* **Select Layer 1 from the Layer menu**

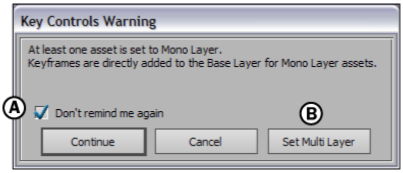
This lets you set keyframes on a separate layer, while preserving the original animation on the Base Layer.

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



A. **Select the Mia:ServoControl effector** *B.* **Set a Zero keyframe**

5 In the Key Controls Warning dialog box that appears, activate the Don't Remind Me Again option (A), then click Set Multi Layer (B).


Key Controls Warning

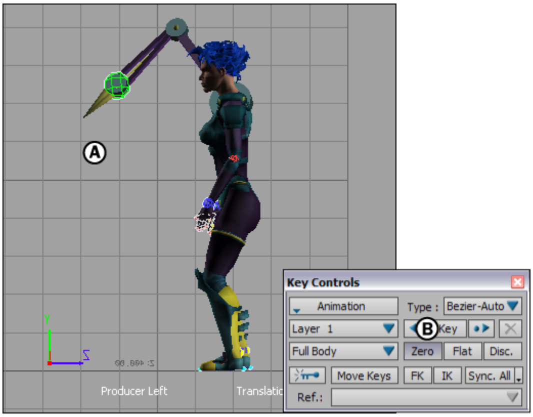
At least one asset is set to Mono Layer.
Keyframes are directly added to the Base Layer for Mono Layer assets.

☑ Don't remind me again

Key Controls Warning dialog box *A.* **Activate Don't remind me again** *B.* **Click Set Multi Layer**

Selecting Set Multi Layer lets you set keyframes on the Mia:ServoControl effector on many different layers, instead of only on the Base Layer.

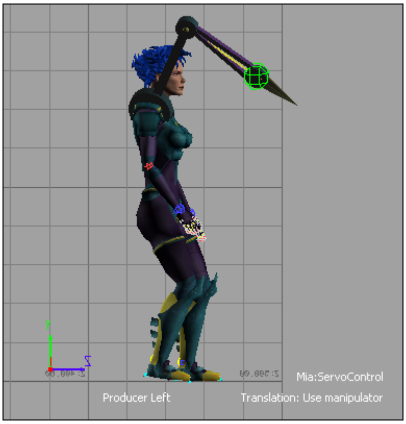
6 With the Mia:ServoControl effector still selected, go to frame 150 and set a Zero keyframe.



Frame 150 *A.* **Mia:ServoControl is still selected** *B.* **Set a Zero keyframe**

7 Go to frame 80.

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

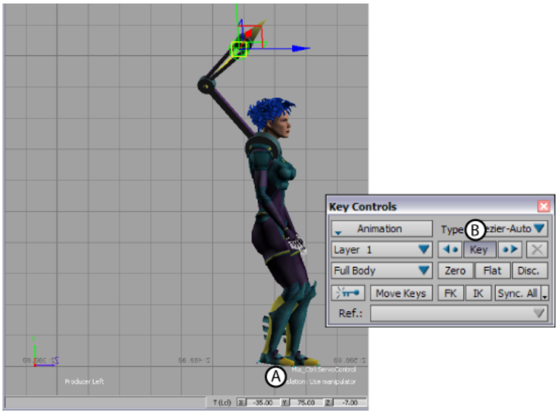


Frame 80

8 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 -35, 75, -7 (A).

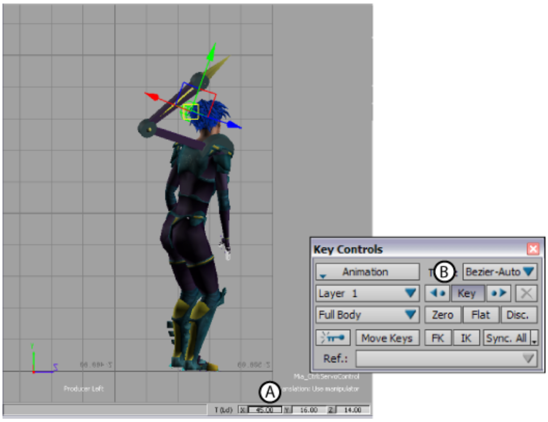
- Set a keyframe (B).



Frame 80 *A.* **Set the Translation values** *B.* **Set a keyframe**

9 Go to frame 120 and do the following:

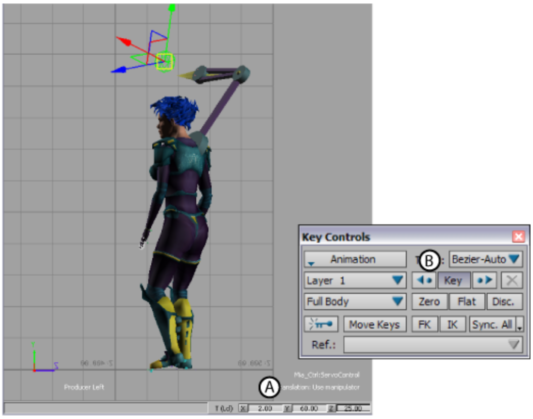
- Set the Mia:ServoControl effector Translation XYZ values to 45, 16, 14 (A).
- Set a keyframe (B).



Frame 120 *A.* **Set the Translation XYZ values** *B.* **Set a keyframe**

10 Go to frame 140 and do the following:

- Set the Translation XYZ values to 2, 60, 25 (A).
- Set a keyframe (B).



Frame 140 *A.* **Set the Translation XYZ values** *B.* **Set a keyframe**

11 Play the animation.

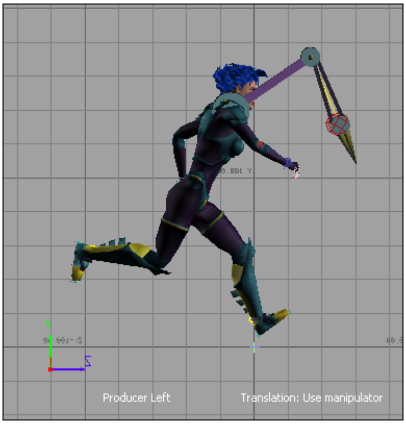
Now, Mia’s Servo arm raises up as she runs.

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.

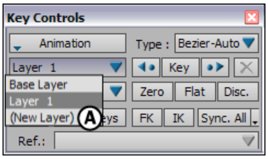
1 Go to frame 30.

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 30

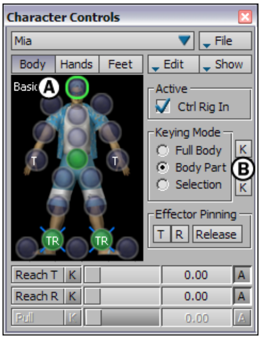
2 In the Key Controls window, select New Layer from the Layer menu (A) to create a layer to modify the head animation.



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

A layer called “Layer 2” is added.

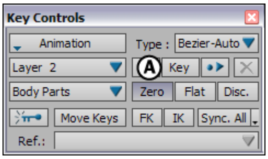
3 In the Character Controls window, select the head effector (A), and switch to Body Part keying mode (B).



Character Controls window
A. **Select the Head effector.**
B. **Switch to Body Part keying mode.**

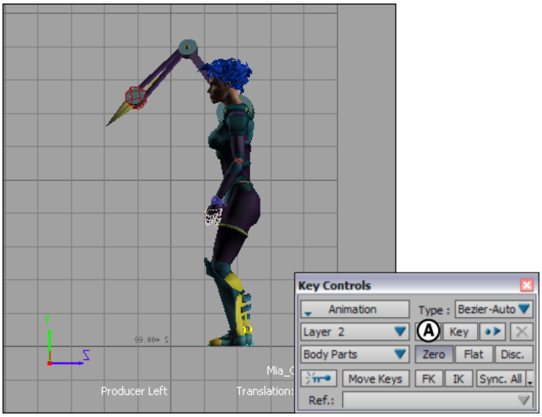
You can use Body Part keying mode as you create animation on this layer, since you only need to set keyframes on the head, not the entire body.

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



Key Controls *A.* **Zero keyframe button**

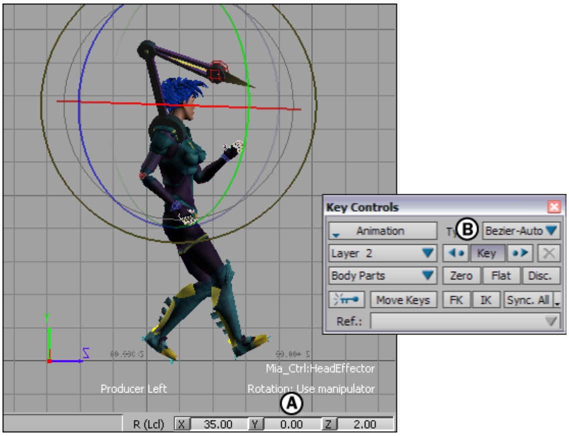
5 Go to frame 150 and set another Zero keyframe.



Frame 150 *A.* **Set a zero keyframe.**

6 Go to frame 60 and do the following:

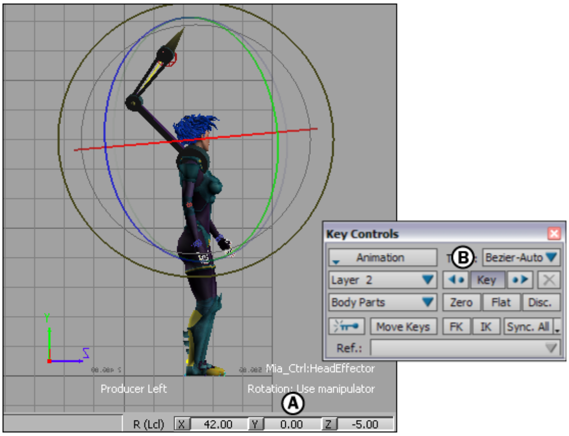
- With the Head effector still selected, activate Rotation mode (click in the Viewer window and press R).
- Change the Rotation XYZ properties at the bottom of the Viewer window to 35, 0, 2 (A).
- Set a keyframe (B).



Frame 60 *A.* **Set the XYZ Rotation properties.** *B.* **Set a keyframe.**

7 Go to frame 90 and do the following:

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

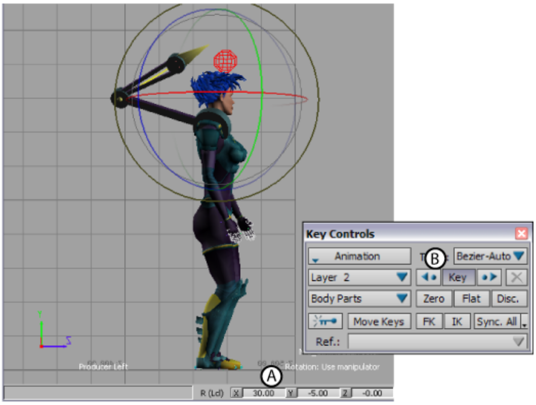


R (Lcl) X 42.00 Y 0.00 Z -5.00

Frame 90 *A.* Adjust the Rotation values. *B.* Set a keyframe.

8 Go to frame 105 and do the following:

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



R (Lcl) X 30.00 Y -5.00 Z -0.00

Frame 105 *A.* Adjust the Rotation values. *B.* Set a keyframe.

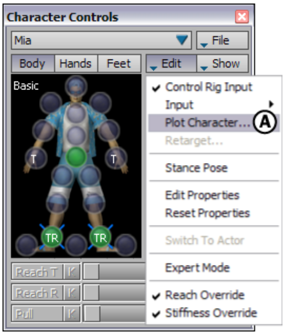
9 Deselect the Head effector, and play your animation.

Mia's head turns as she runs.

Plot the animation

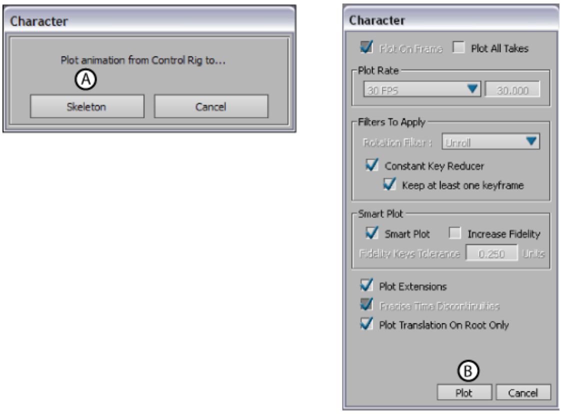
In the following procedure, you plot your animation data to combine the original data with your animations. Plotting merges all of the animation to the Base Layer.

1 From the Edit menu in the Character Controls window, select Plot Character (A). You can also use the Plot Character button in the Character settings.



Character Controls window *A.* **Select Plot Character from the Edit menu.**

2 In the first Character dialog box that appears, click Skeleton (A), then make sure the same options are selected as those in the second Character dialog box that appears and click Plot (B).



☑ Plot On Frame □ Plot All Takes

Plot Rate: 30 FPS 30.000

Filters To Apply

Rotation Filter : Unroll

☑ Constant Key Reducer

☑ Keep at least one keyframe

Smart Plot

☑ Smart Plot □ Increase Fidelity

Fidelity Keys Tolerance 0.250 Units

☑ Plot Extensions

☑ Precise Time Discontinuities

☑ Plot Translation On Root Only

Character plotting dialog boxes *A.* **Click Skeleton.** *B.* **Click Plot.**

All the animation data is transferred from the Control rig to the character's skeleton on the current take. You can see your plotted data in the FCurves window as a series of function curves with numerous keyframes.

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, then merged the animation in one take. In the next tutorial, Creating a Loop on page 79, you learn how to create a walk cycle using the Story window.

Creating a Loop

8

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

The following assets are required for this tutorial:

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

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

Prepare the scene

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

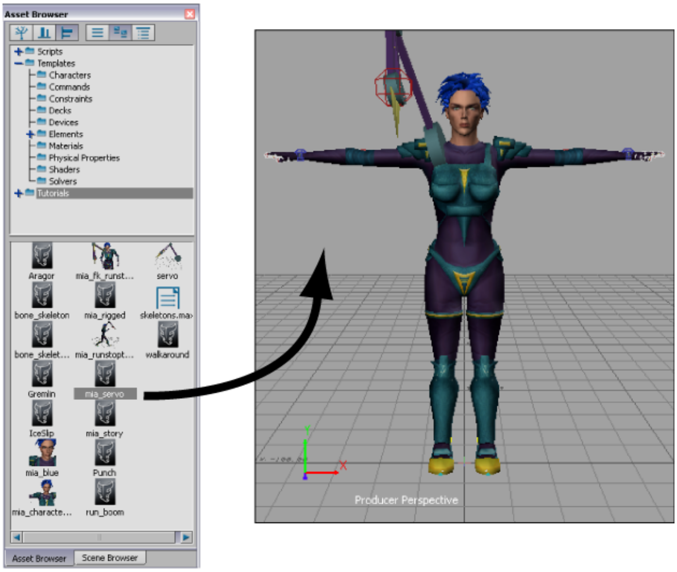
1 From the menu bar, select File > New, then select Layout > Story (or press *Ctrl-Shift-5*).

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 Select the *Tutorials* folder in the Asset browser.

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

A model named Mia appears in a T-stance in the Viewer (B).



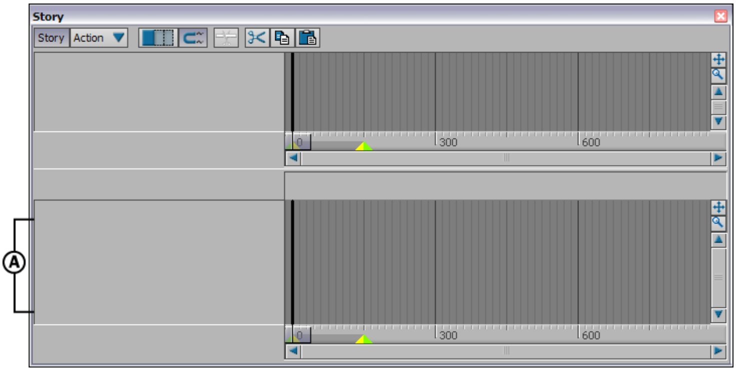
mia_servo **asset shown in T-stance pose**

The *mia_servo* asset appears in the Viewer window, in the T-stance pose.

Create a Character track

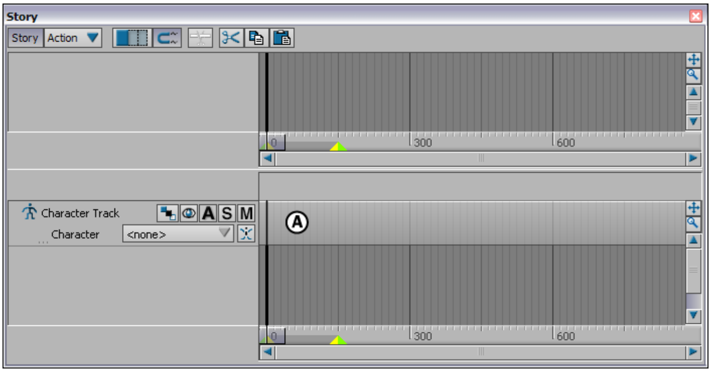
In the following procedure, you create a Character track in the Story window, define the character affected by the track, and add some animation.

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



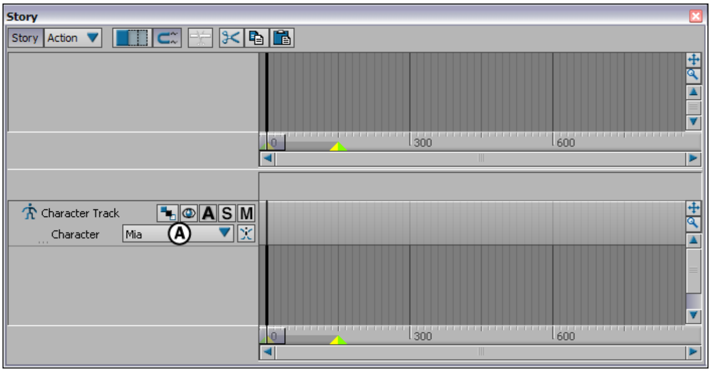
Story window *A.* **Action Track list**

A Character Animation track is added (A).



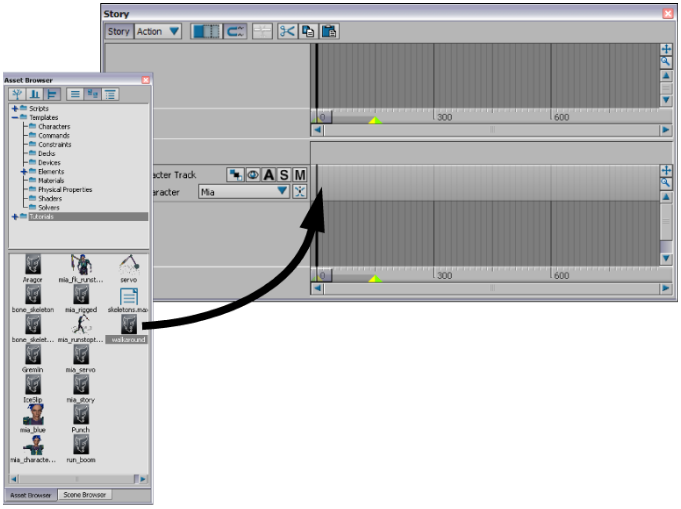
Story window *A.* **Character track**

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



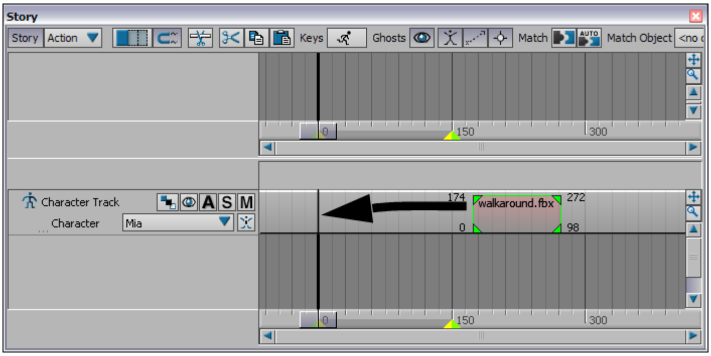
Story window *A.* Select Mia in the Character menu.

3 Drag *walkaround.fbx* from the Asset browser to the Character track.



Drag the walkaround.fbx file into the Character track.

4 Drag the clip so that it begins at frame 0. The clip should end at frame 98.



Drag the clip to frame 0 on the Character track.

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

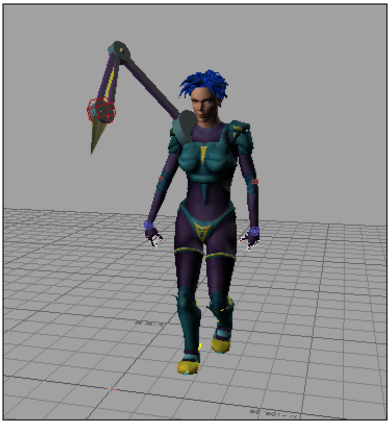
---

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 98, Mia is turning. If you were to loop the animation at this point, there would be a jump in the walk cycle.

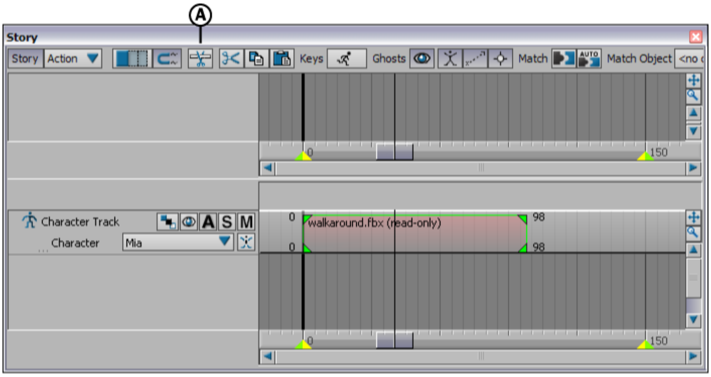
6 Go to frame 40. At this frame, Mia's right foot is flat on the ground and her left foot is slightly lifted.

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



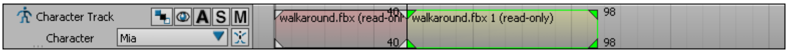
Mia at frame 40.

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



Story window *A.* Razor button

The clip is sliced in two at frame 40.



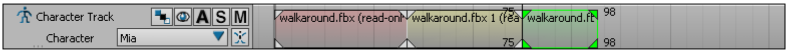
The original clip is sliced in two.

8 Go to frame 75. At this frame, Mia is in almost the same pose as she was at frame 40.

Mia at frame 75.

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

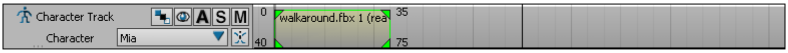
The second clip is sliced at frame 75, and you now have three clips.



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.

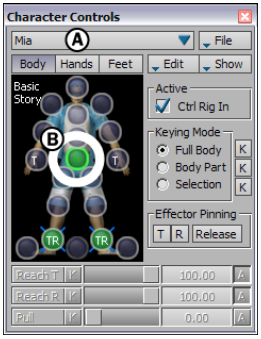


The clip starts at frame 0 and ends at frame 35.

Create poses

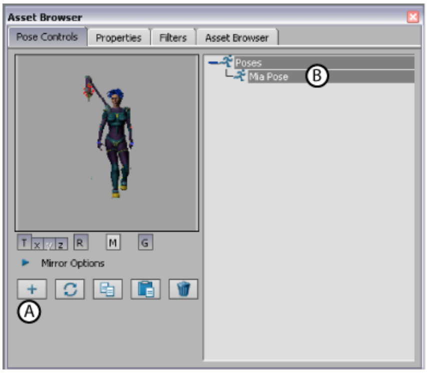
1 Go to frame 0 (Ctrl-Home).

2 In the Character Controls window, if she is not already selected, select Mia from the Current Character menu (A), then select the Hips effector (B).



Character Controls window
***A.* Select Mia from the Current Character menu.**
***B.* Select the Hips effector.**

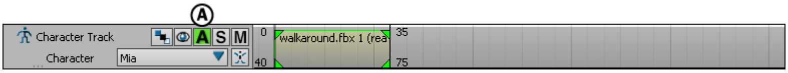
3 Switch to the Pose Controls pane in the Asset browser and click Create (A). Expand the Poses folder to see the pose you created, called “Mia Pose” by default (B).



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

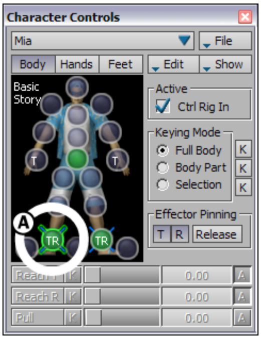
4 Go to frame 35 and do the following:

- 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.



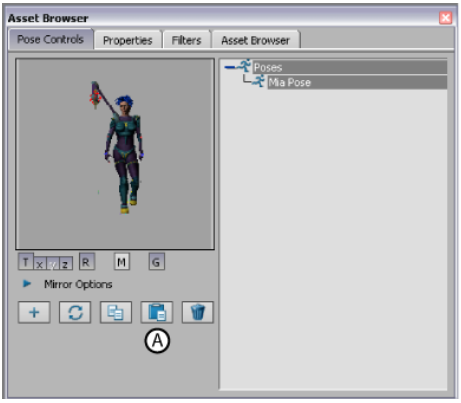
Character track *A.* **Activate the Accept Keys option.**

- Switch back to the Character Controls window, right-click the Right Ankle effector (A) and select RightAnkleEffector from the menu that appears.



Character Controls window
A. **Right Ankle effector**

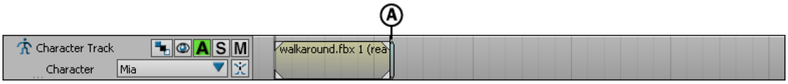
- In the Pose Controls window, click Paste (A).



Pose Controls window *A.* **Paste button**

A one-frame clip appears on the Character track at frame 35.

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 35.**

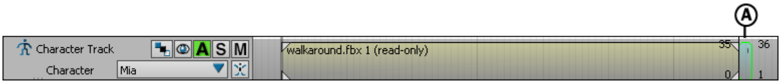
5 Jog (J-drag) or use Ctrl Left Arrow and Ctrl Right Arrow to step frame-by-frame through the animation very slowly. Though the animation begins and ends with the same pose, there is a slight jump between the clips. In the following procedure, you remove the jump.

Match clips

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

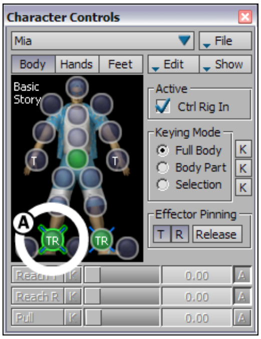
1 Click in an empty space below the track, and press A to zoom in on the clips.

2 Select the second clip.



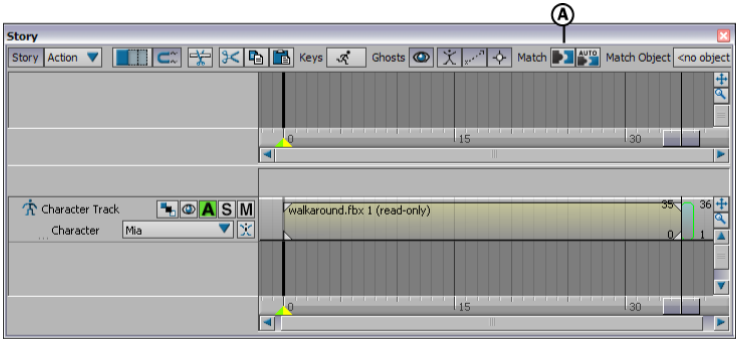
Character track *A.* **Select the second clip.**

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



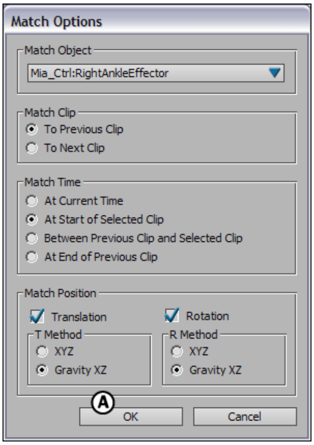
Character Controls window
A. **Right Ankle effector**

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

Match Object

Mia_Ctrl:RightAnkleEffector

Match Clip

● To Previous Clip
○ To Next Clip

Match Time

○ At Current Time
● At Start of Selected Clip
○ Between Previous Clip and Selected Clip
○ At End of Previous Clip

Match Position

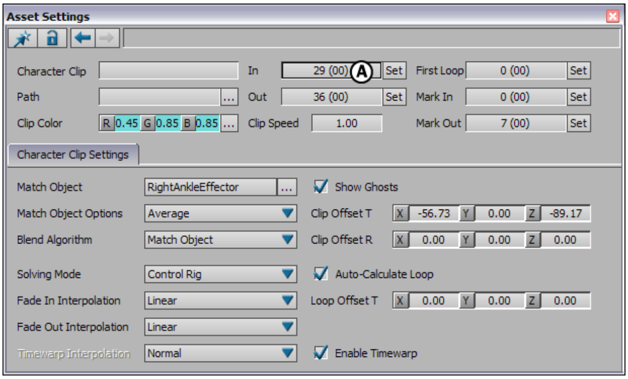
☑ Translation ☑ Rotation

T Method
○ XYZ
● Gravity XZ

R Method
○ XYZ
● Gravity XZ

Match Options dialog box *A.* **OK button**

6 With the second clip still selected, go to the Asset Settings tab in the Asset Settings window. Double-click the second clip to display the setting for the clip and set a value of 29 in the In field (A) in the Asset Settings window.



Character Clip
Path
Clip Color R 0.45 G 0.85 B 0.85
In 29 (00) Set
Out 36 (00) Set
Clip Speed 1.00
First Loop 0 (00) Set
Mark In 0 (00) Set
Mark Out 7 (00) Set

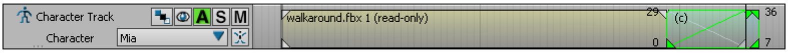
Character Clip Settings

Match Object RightAnkleEffector
Match Object Options Average
Blend Algorithm Match Object
Solving Mode Control Rig
Fade In Interpolation Linear
Fade Out Interpolation Linear
Timewarp Interpolation Normal
☑ Show Ghosts
Clip Offset T X -56.73 Y 0.00 Z -89.17
Clip Offset R X 0.00 Y 0.00 Z 0.00
☑ Auto-Calculate Loop
Loop Offset T X 0.00 Y 0.00 Z 0.00
☑ Enable Timewarp

Asset Settings window *A.* **Set the In point to frame 29.**

7 Enter value of 36 in the Out field in the Asset Settings window.

8 The second clip now starts at frame 29, and cross-blends with the first clip to end at frame 36. This blend creates a slightly smoother transition between the clips.


Character Track
Character Mia

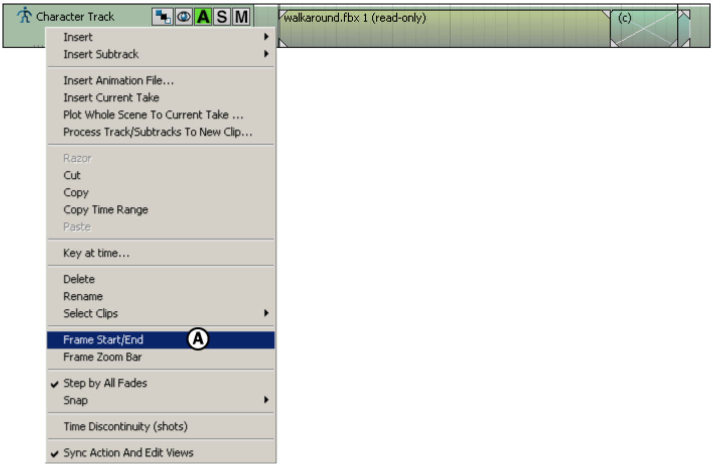
The second clip starts at frame 29 and ends at frame 36.

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

Process the clips

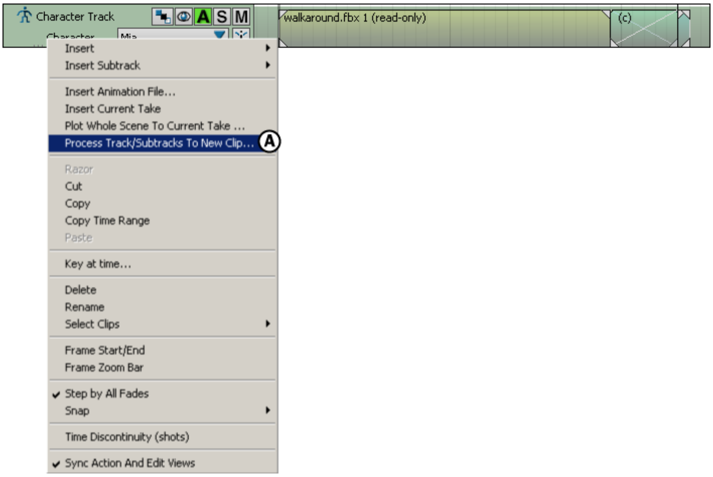
In the following procedure, you process the two clips to save them as a single result clip. Later, you use this new clip to animate a different character.

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.



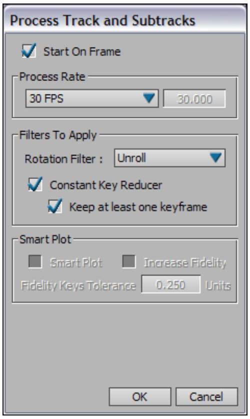
Character track contextual menu *A.* **Select the Frame Start/End option.**

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.* **Select the Process Tracks/Subtracks To New Clip option.**

3 Click OK in the dialog box that appears.



Process Track and Subtracks

☑ Start On Frame

Process Rate: 30 FPS | 30.000

Filters To Apply

Rotation Filter : Unroll

☑ Constant Key Reducer

☑ Keep at least one keyframe

Smart Plot

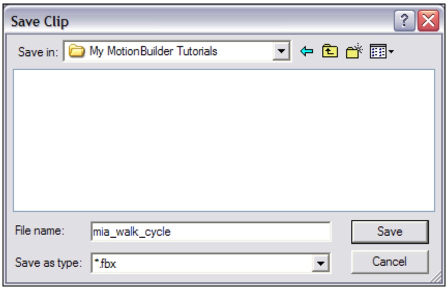
□ Smart Plot □ Increase Fidelity

Fidelity Keys Tolerance 0.250 Units

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

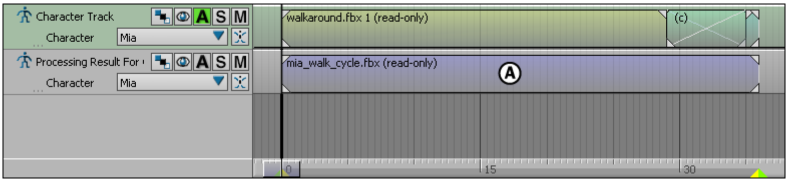
Save in: My MotionBuilder Tutorials

File name: mia_walk_cycle

Save as type: *.fbx

Save Clip dialog box

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

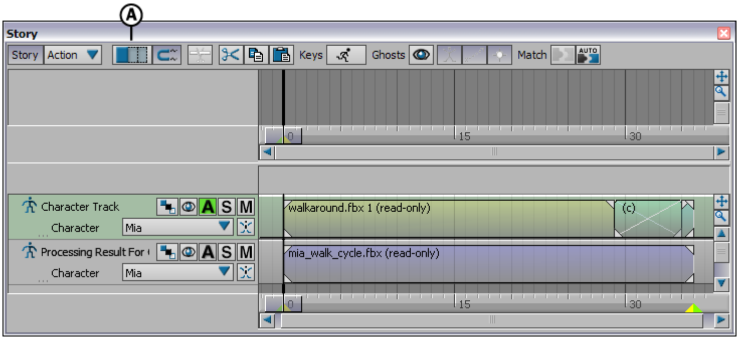


Story window *A.* **New mia_walk_cycle.fbx clip**

Test the walk cycle

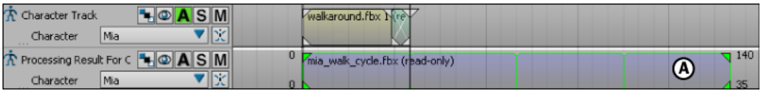
In the following procedure, you test the new walk cycle clip to see if it loops smoothly.

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.**

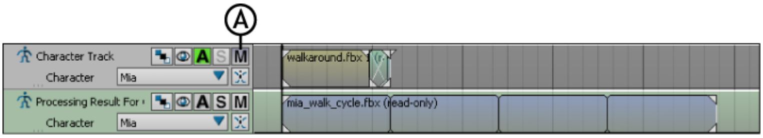
2 Zoom out on the Character tracks, then stretch the end of the mia_walk_cycle clip to frame 140 (A). The clip loops four times.



Character tracks *A.* **Stretch the clip to frame 140.**

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.* **Click Mute.**

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 on page 95, you learn how to edit character animation by modifying clips.

Manipulating Clips

9

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

The following assets are required for this tutorial:

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

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

Prepare the scene

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

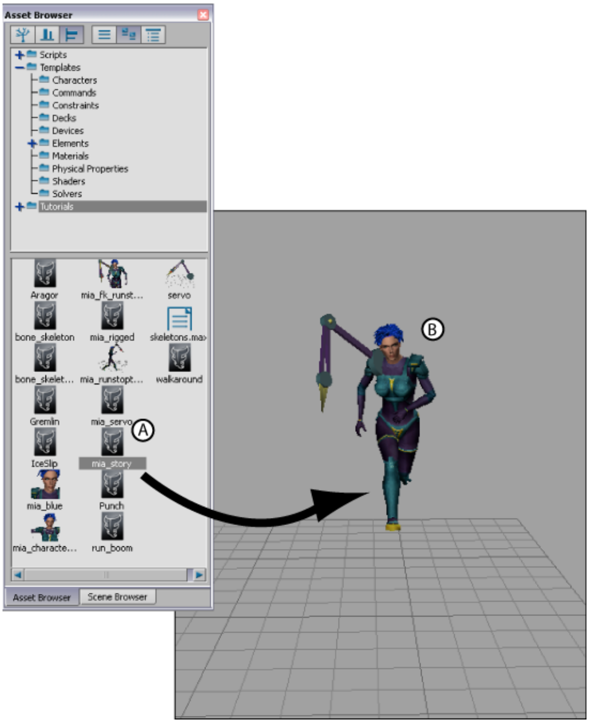
1. From the menu bar, select File > New, then select Layout > Story (or press *Ctrl-Shift-5*).

   MotionBuilder displays a new 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_story* asset (*mia_story.fbx* file) into the Viewer window (A), then select FBX Open > All Takes.

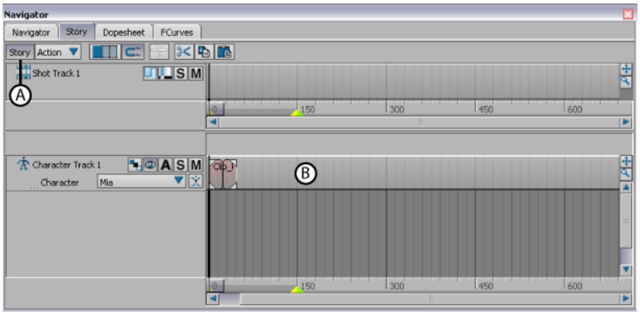
   A model named Mia appears in the Viewer window as shown in the following figure (B).



A. **Asset browser showing selected mia_story.fbx file** *B.* **Scene displaying Mia model**

In the Story window, there is a track with a clip called Clip_Run_Loop. Mia is selected in the track's Character menu.

4 In the Story window, if the Story button (A) is not already turned on, select it and 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**

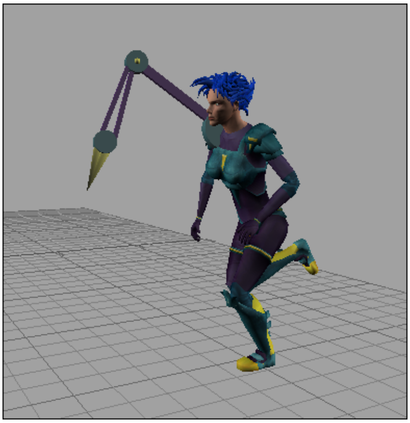
5 Play the animation (*Ctrl-Spacebar*). You may need to zoom out in the Viewer window to see all of the animation.

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.

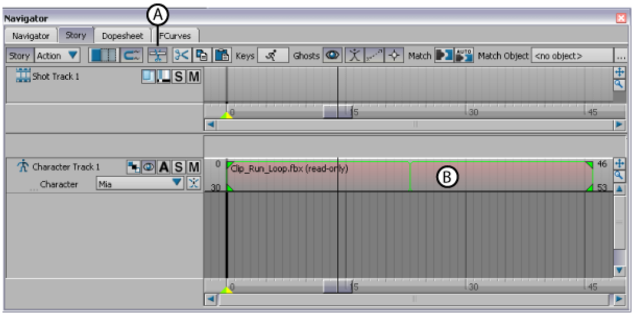
1 Go to frame 14.

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



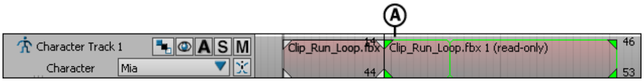
Mia at frame 14.

2 Select the clip (B) and click the Razor button (A) as shown in the following figure.



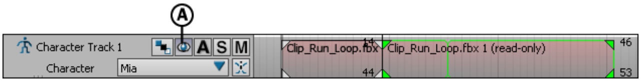
Story window *A.* **Razor button** *B.* **Selected clip**

The clip is sliced into two clips at frame 14 (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 Ghost option in the Character track (A) is activated as shown in the following figure.

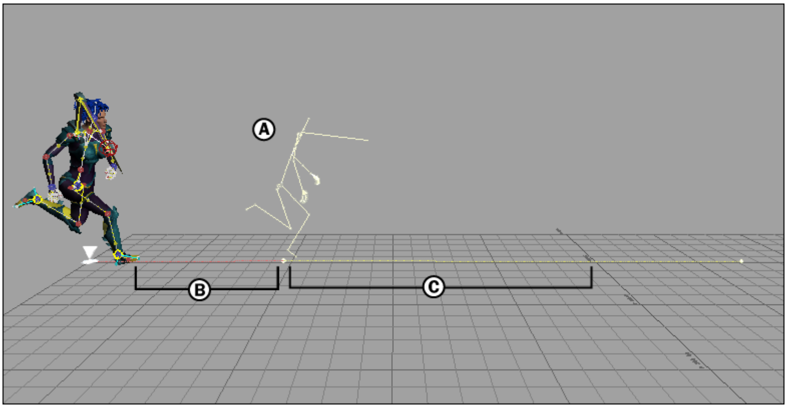


Character track *A.* **Active Ghost option**

4 Go to frame 0 (*Ctrl-Home*).

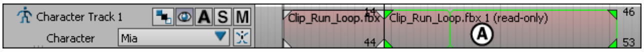
When the Ghost option is active, the ghosts display in the Viewer window as shown in the following figure.

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).



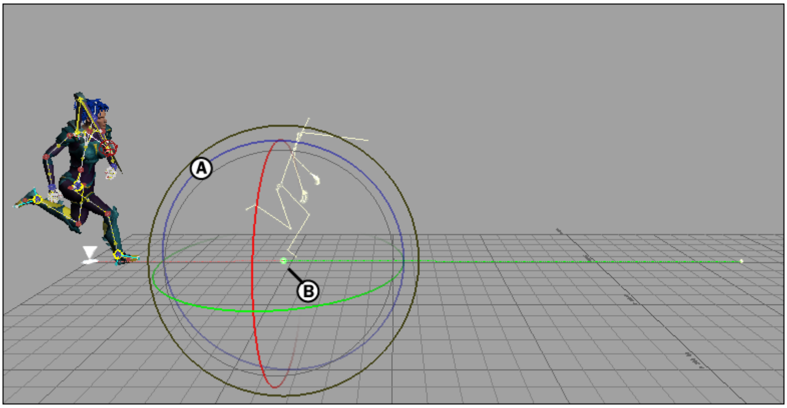
Character track *A.* **The second clip is selected**

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.

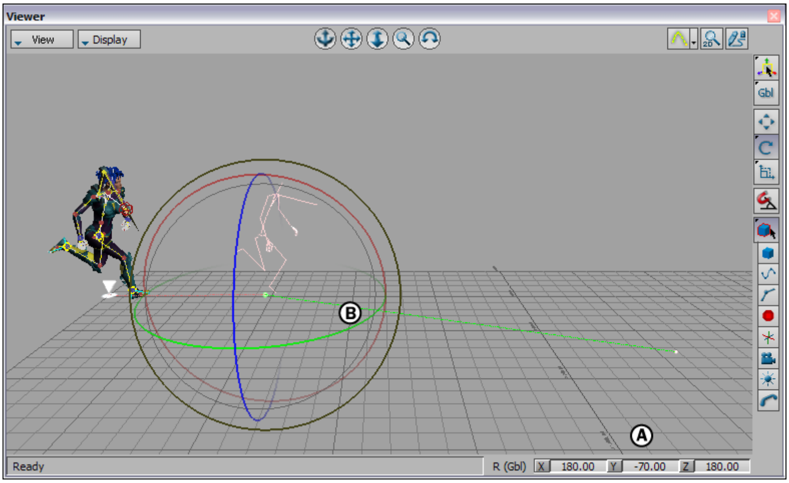


A. **Rotation rings** *B.* **Second ghost clip vector's In point**

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**

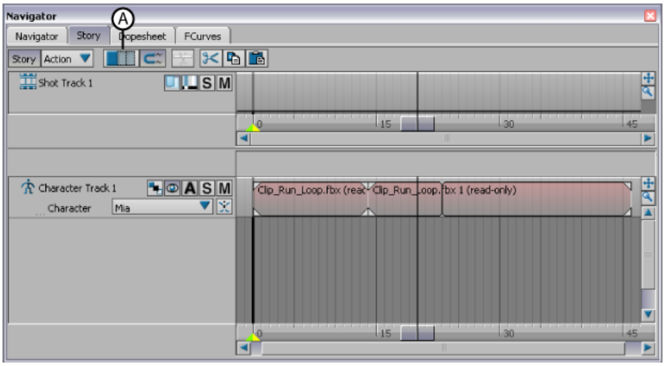
8 *J*-drag in the Viewer window to jog through frames 10 to 20 slowly.

Mia turns as she runs, but her foot jumps slightly at frame 14. 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.

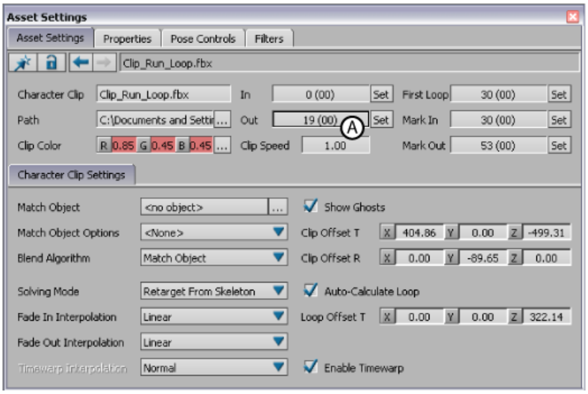
1 Make sure the Loop option (A) is active in the Story window.



Story window *A.* **Loop/Scale option set to Loop**

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

3 Set a value of 19 in the Asset Settings Out field (A).



Clip_Run_Loop.fbx

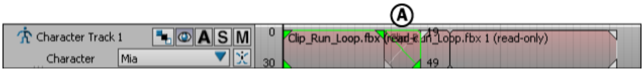
Character Clip: Clip_Run_Loop.fbx
In: 0 (00) Set
First Loop: 30 (00) Set
Path: C:\Documents and Setti ...
Out: 19 (00) Set
Mark In: 30 (00) Set
Clip Color: R 0.85 G 0.45 B 0.45 ...
Clip Speed: 1.00
Mark Out: 53 (00) Set

Character Clip Settings

Match Object: <no object> ...
☑ Show Ghosts
Match Object Options: <None>
Clip Offset T: X 404.86 Y 0.00 Z -499.31
Blend Algorithm: Match Object
Clip Offset R: X 0.00 Y -89.65 Z 0.00
Solving Mode: Retarget From Skeleton
☑ Auto-Calculate Loop
Fade In Interpolation: Linear
Loop Offset T: X 0.00 Y 0.00 Z 322.14
Fade Out Interpolation: Linear
Timewarp Interpolation: Normal
☑ Enable Timewarp

Asset Settings window *A.* **Out field set to 19**

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.

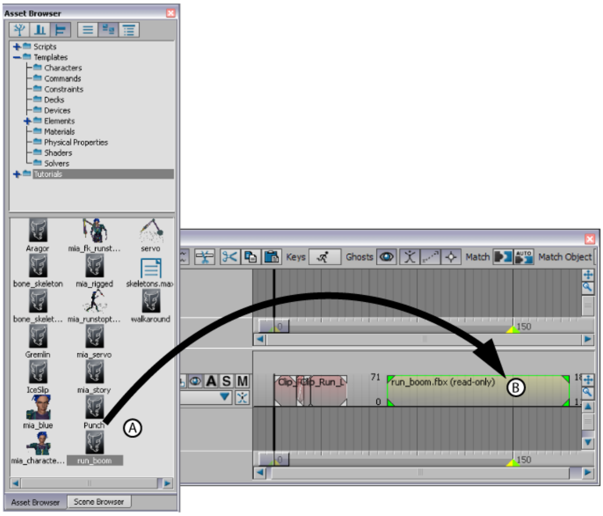
There is no longer a jump at frame 14.

Add a clip

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

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

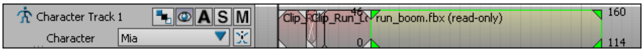
2 From the **Tutorials** folder in the Asset browser, drag the *run_boom.fbx* file onto an empty part of the Character track, to the right of the clips, as shown in the following figure.



run_boom.fbx **clip added to Character track**

3 Drag the clip so that it begins at frame 46.

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



New clip begins at frame 46

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.

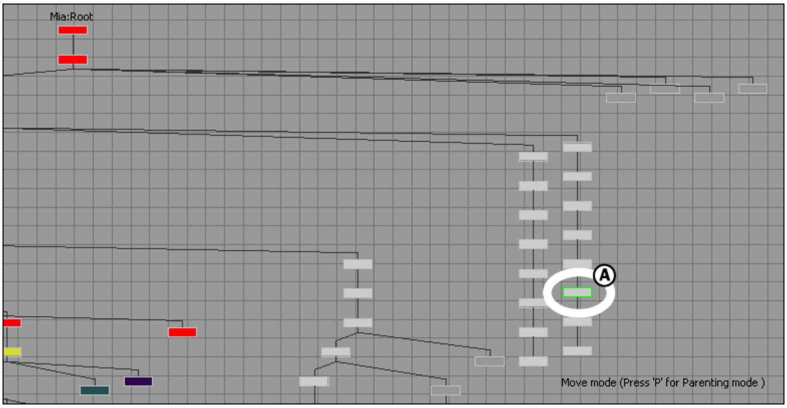
Match clips

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).

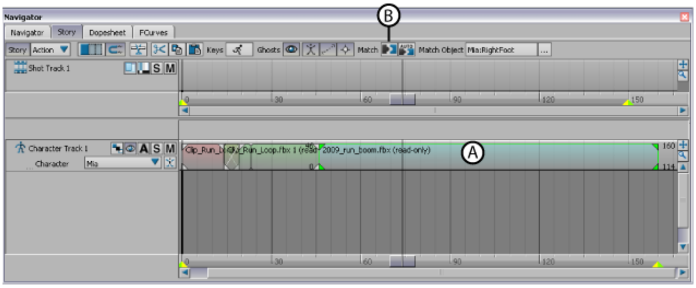
This node represents Mia's right foot toe use as the matching object.



Schematic view *A.* **Mia:RightFoot node selected**

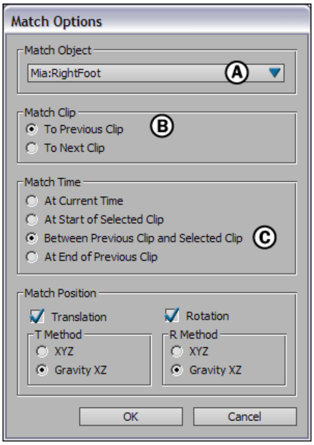
3 Switch back to the Producer Perspective camera view.

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

Match Object

Mia:RightFoot

Match Clip

● To Previous Clip

○ To Next Clip

Match Time

○ At Current Time

○ At Start of Selected Clip

● Between Previous Clip and Selected Clip

○ At End of Previous Clip

Match Position

☑ Translation

T Method

○ XYZ

● Gravity XZ

☑ Rotation

R Method

○ XYZ

● Gravity XZ

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 on page 107), 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

10

This tutorial guides you through the procedures necessary to import a character created in 3ds Max to MotionBuilder, and then export your work back to 3ds Max as a fully-editable animated character.

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

The tutorial covers the following three kinds of animatable skeletons that originate in 3ds Max and 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

This tutorial is comprised of three small tutorials that show the same process for different situations. You can single out the interoperability 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
- Animate the character and prepare it for import to 3ds Max

Preparation for this tutorial

To complete this tutorial, you need the current versions of 3ds Max, MotionBuilder, and the 3ds Max FBX plug-ins 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*.

As for the 3ds Max FBX Plug-ins, you can download the latest version from: *http://www.autodesk.com/fbx*.

NOTE The default installation directory for the FBX Plug-ins is: *C:\Program Files\Autodesk\FBX\FbxPlugins*.

You can choose to either complete the entire tutorial or parts of the tutorial.

Following are the assets 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*
- *Pepe_plotted.FBX*
- *Pepe_plotted.max*

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

3ds Max skeletons

The following 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.

Following is the asset required for this tutorial:

- *skeletons.max*

Following are the result assets for this tutorial:

- *bone_skeleton.FBX*
- *bone_skeleton_characterized.FBX*

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

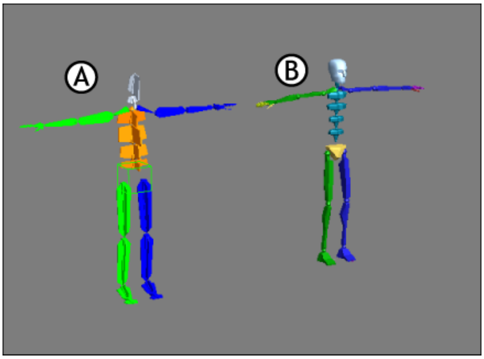
Export a 3ds Max skeleton

In the following procedure, you export conventional 3ds Max bone system skeleton data to FBX format so you can animate it in MotionBuilder.

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 *C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials* directory and open the *skeletons.max* scene file. If the File Load: Units Mismatch dialog appears, select Adopt the File's Unit Scale and click Ok.

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



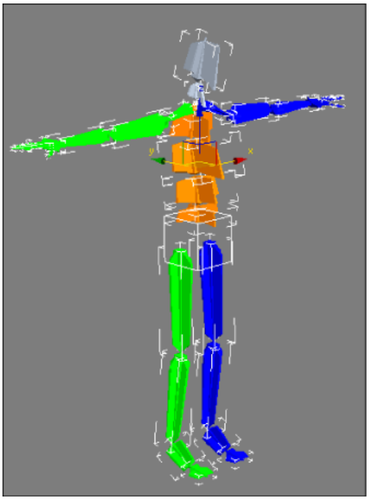
Two skeletons *A.* **Conventional 3ds Max bone system skeleton** *B.* **3ds Max Biped skeleton**

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

NOTE Always place your characters in the “T” stance position before exporting to MotionBuilder. Also, make sure that the skeleton is oriented in the minus Y axis direction. (If you create skeletons with the 3ds Max biped system, they are automatically oriented this way.)

To learn how to export skeletons created with the 3ds Max biped creation option, see Export a 3ds Max biped to MotionBuilder on page 122.

4 Region-select all of skeleton A.



Biped oriented in minus Y direction

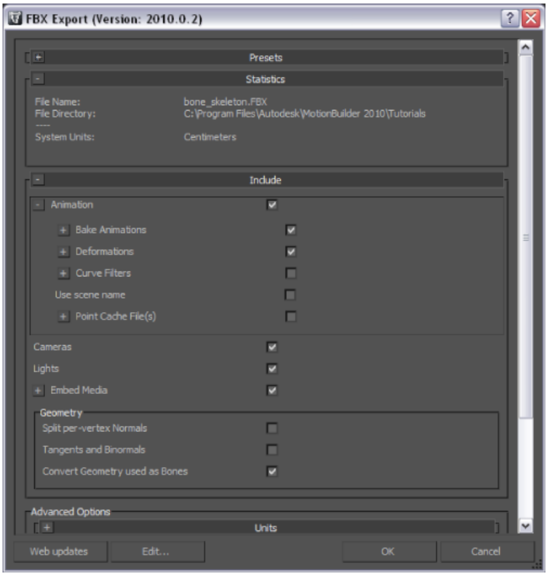
5 From the Application menu, select Export > Export Selected.

TIP You need to hold the mouse over Export without clicking for a moment so that Max displays the Export options menu from which you can choose Export Selected.

6 In the Select File To Export dialog box, navigate to the *C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials* directory, name your file `My_bone_skeleton`, save your file as *Autodesk (*FBX)* 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.

The FBX Exporter opens. This is where you specify how to convert the 3ds Max scene information.


FBX Export (Version: 2010.0.2)

Presets

Statistics

File Name: bone_skeleton.FBX
File Directory: C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials
----
System Units: Centimeters

Include

- Animation ☑
  - Bake Animations ☑
  - Deformations ☑
  - Curve Filters □
  - Use scene name □
  - Point Cache File(s) □
- Cameras ☑
- Lights ☑
- Embed Media ☑

Geometry

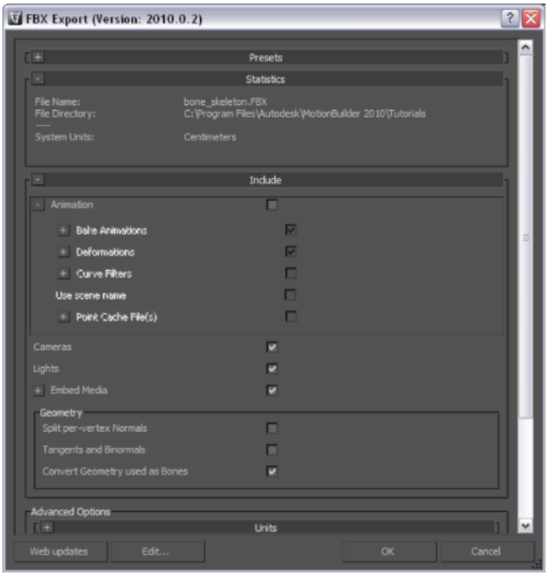
- Split per-vertex Normals □
- Tangents and Binormals □
- Convert Geometry used as Bones ☑

Advanced Options

Units

FBX Export dialog box

7 In the FBX Export dialog box > Include rollout, disable Animation.


FBX Export (Version: 2010.0.2)

Presets

Statistics

File Name: bone_skeleton.FBX
File Directory: C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials
----
System Units: Centimeters

Include

- Animation □
  - Bake Animations ☑
  - Deformations ☑
  - Curve Filters □
  - Use scene name □
  - Point Cache File(s) □
- Cameras ☑
- Lights ☑
- Embed Media ☑

Geometry

- Split per-vertex Normals □
- Tangents and Binormals □
- Convert Geometry used as Bones ☑

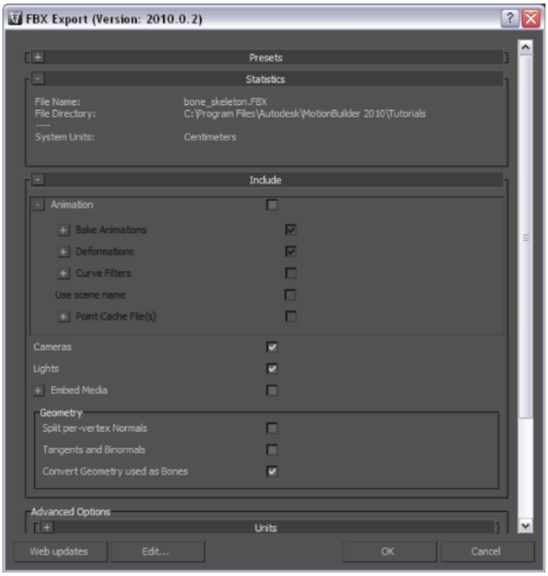
Advanced Options

Units

Animation option in FBX Export shown disabled

Since you are only exporting the skeleton that has no animation, there is no need to export animation.

8 Make sure Embed Media is also disabled. If Embed Media is not disabled, disable it.



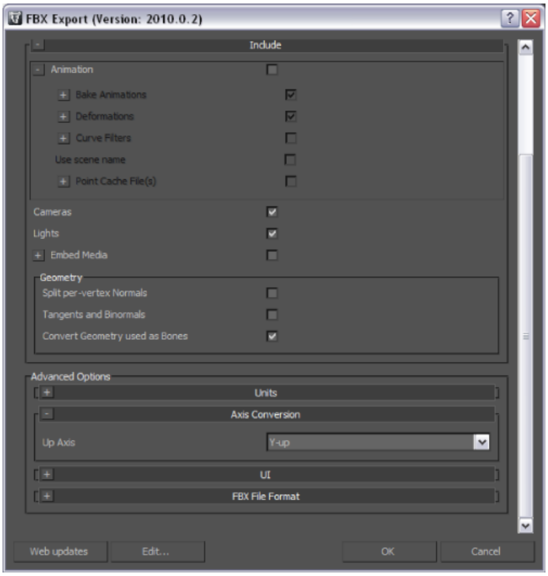
File Name: bone_skeleton.FBX
File Directory: C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials
----
System Units: Centimeters

Animation □
Bake Animations ☑
Deformations ☑
Curve Filters □
Use scene name □
Point Cache File(s) □
Cameras ☑
Lights ☑
Embed Media □
Split per-vertex Normals □
Tangents and Binormals □
Convert Geometry used as Bones ☑

Embed Media option in FBX Export shown disabled

You only need the Embed Media option if you export a mesh with the character. That way, any texture maps associated with the character are saved with the FBX file. In most cases, you would export a mesh, properly skinned onto a skeleton. But in this case, you are only exporting a skeleton, so you do not need this option.

9 Under the Advanced Options, on the Axis Conversion rollout, make sure Up Axis displays the Y-up option as shown in the following figure.



FBX Export (Version: 2010.0.2)

Include

- Animation □
  - Bake Animations ☑
  - Deformations ☑
  - Curve Filters □
  - Use scene name □
  - Point Cache File(s) □
- Cameras ☑
- Lights ☑
- Embed Media □

Geometry

- Split per-vertex Normals □
- Tangents and Binormals □
- Convert Geometry used as Bones ☑

Advanced Options

Units

Axis Conversion

Up Axis: Y-up

UI

FBX File Format

Advanced Options Axis Conversion Y-up Up Axis selected

This setting assigns the exported character a Y-up axis, the orientation used by objects in MotionBuilder. This setting is required since objects created in 3ds Max use a Z-up orientation.

10 Click OK to export skeleton A as an FBX file to your designated folder.

Now that your skeleton is prepared, you can use this FBX file in the next tutorial to import 3ds Max skeletons into MotionBuilder. Once a skeleton is exported to the FBX file format, you can also bring it into other Autodesk software products, such as Autodesk Maya.

Import and characterize a 3ds Max skeleton in MotionBuilder

In the following procedure, you import the skeleton (*My_bone_skeleton.FBX*) you saved in the previous procedure (Export a skeleton on page 109) and then characterize the skeleton so you can animate it in MotionBuilder. Characterization assigns a Control rig to the skeleton bones and is the name MotionBuilder uses for the process of rigging a skeleton.

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

To import a conventional 3ds Max skeleton into MotionBuilder:

1 Launch the MotionBuilder software.

2 From the MotionBuilder main menu, select File > FBX Plug-in Import.

Even though you exported your 3ds Max to the FBX file format, the FBX file is not a native MotionBuilder FBX file you can open via File > Open.

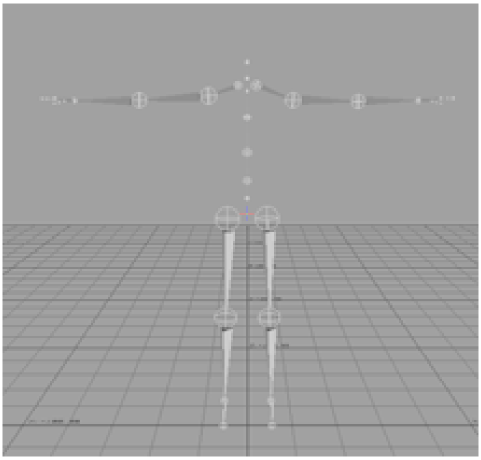
NOTE When you import non-native FBX files into MotionBuilder, always use FBX Plug-in Import.

3 In the Open File window, navigate to the directory where you saved the *My_bone_skeleton.FBX* file and click Open.

NOTE If you did not perform the previous procedure, import (via File > FBX Plug-in Import) the *bone_skeleton.FBX* file located in the *C:\Program Files\Autodesk\MotionBuilder 2010* directory under the *Tutorials* folder.

4 In the FBX Plug-in Import Options dialog, leave the default settings unchanged and click Open.

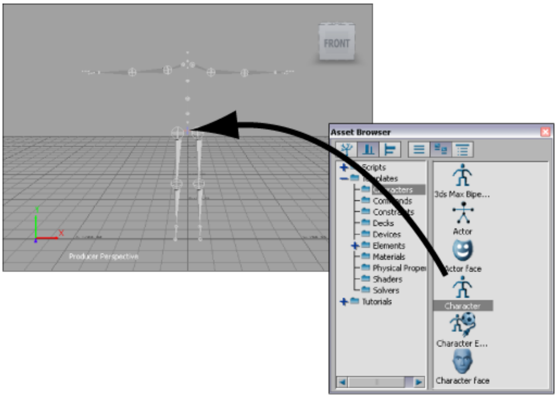
The 3ds Max bone system skeleton loads into MotionBuilder.



3ds Max skeleton displayed in the Viewer window

To characterize your skeleton:

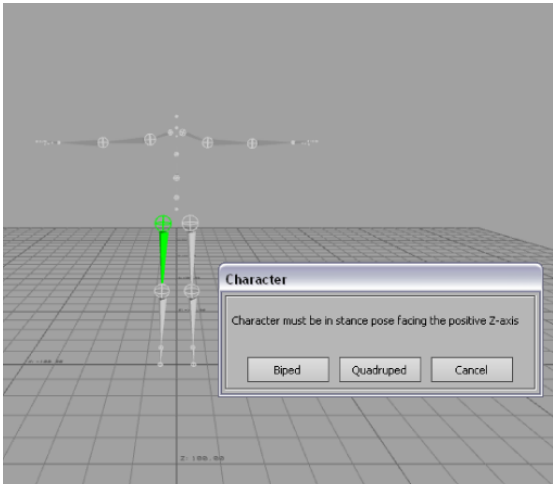
1 In the MotionBuilder Asset browser, expand Templates > Characters and drag a Character asset onto one of the skeleton bones.



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

2 Click Characterize in the dialog box that appears.

The following dialog box reminds you that the character must be in a “T” stance pose 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).


Character

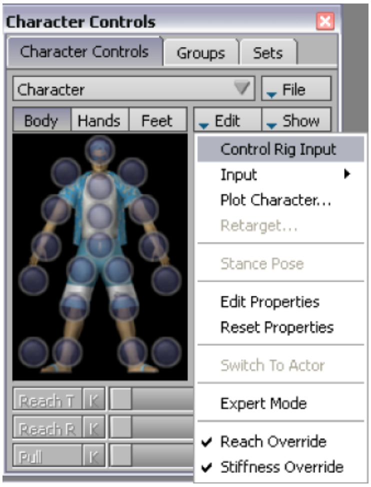
Character must be in stance pose facing the positive Z-axis

Character must be in T stance for characterization

3 Click Biped in the Character dialog box that appears to indicate the type of rigging to apply to the character.

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

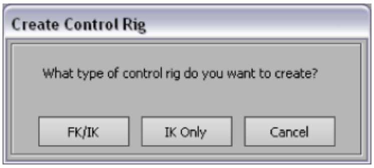
4 From the Character Controls window, select Edit > Control Rig Input.



Character Controls Edit menu

You must use the Control Rig Input setting if you intend to keyframe your character.

The Create Control Rig dialog box appears.

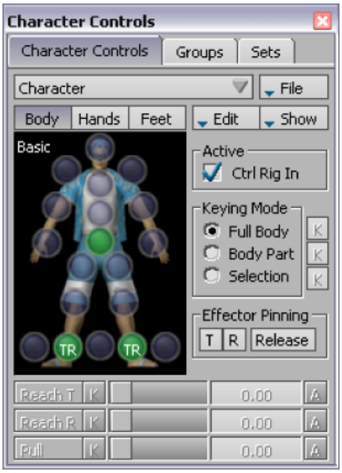


What type of control rig do you want to create?

5 Click FK/IK.

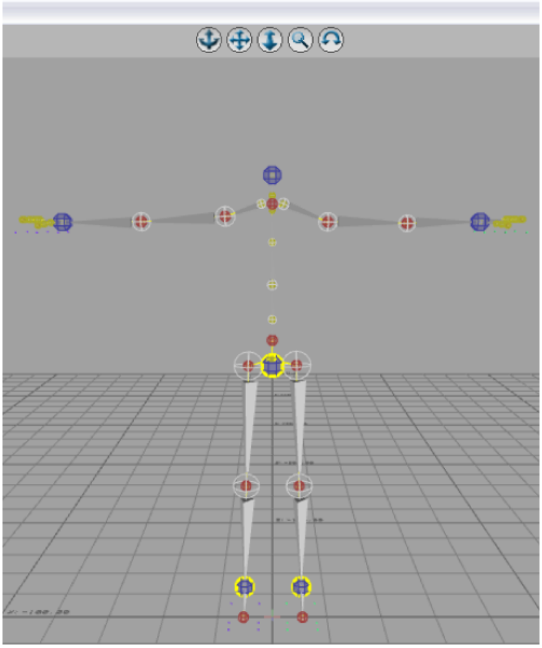
FK/IK is the method commonly used to animate characters.

6 In the Character Controls window Active area, activate Ctrl Rig In option.



Ctrl Rig In option activated

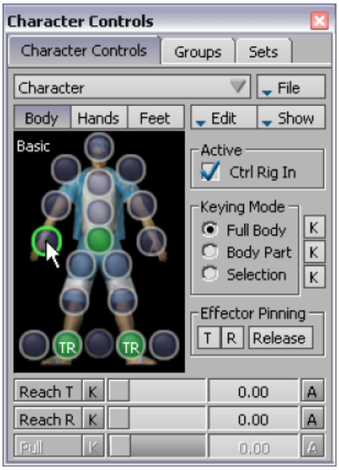
This setting activates the Character Controls Character representation to the left. The Character representation is an image of a human form meant to represent the biped skeleton. It contains all the effectors you need to animate its Control rig, as shown in the following figure.



Your character is now rigged and ready to receive animation.

NOTE Rigging a character in 3ds Max using regular FK/IK constraints would have taken more effort.

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



☑ Ctrl Rig In

● Full Body

○ Body Part

○ Selection

Reach T 0.00

Reach R 0.00

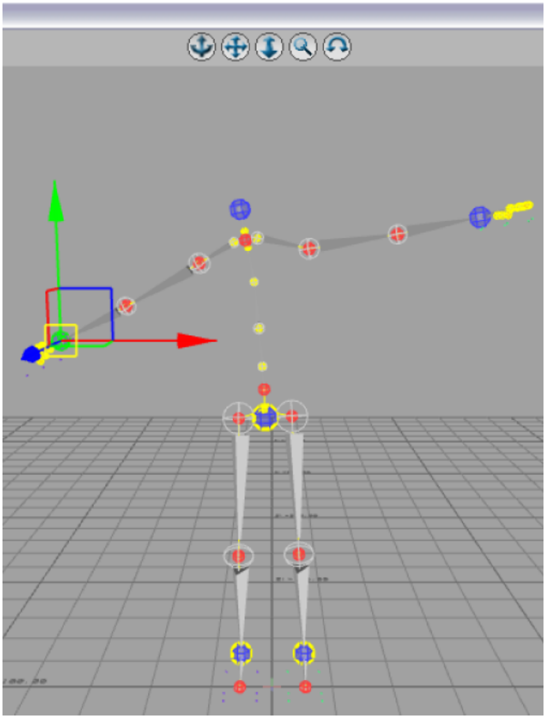
Pull 0.00

Right Wrist effector selected

8. Click in the Viewer window and press *T*.

   The transformation handles are shown.

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 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.

Following is the result asset for this tutorial:

- *biped.FBX*

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

Create and export a 3ds Max biped

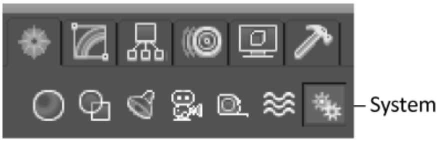
In the following procedure you create a biped in 3ds Max for export to MotionBuilder.

To create a biped in 3ds Max for export to MotionBuilder:

1 Launch the 3ds Max software.

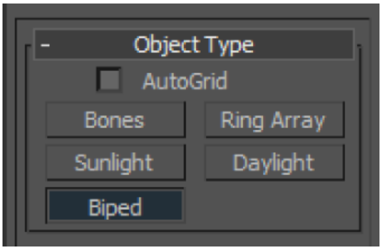
2 In the Application menu, choose Reset to clear the scene/settings.

3 On the Create panel, select Systems.



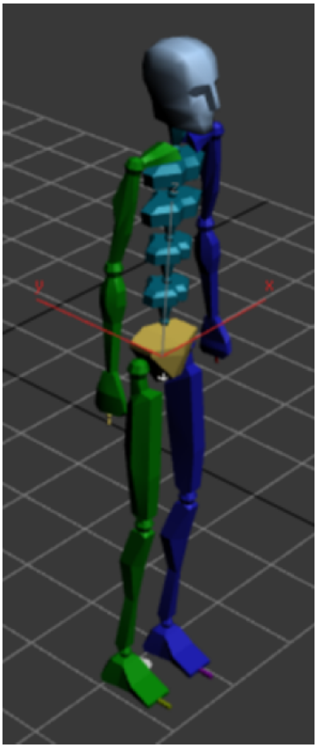
Systems selected in Create panel

4 On the Object Type rollout, click Biped.



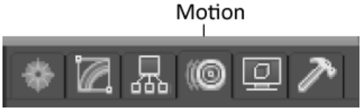
5 In the perspective viewport, click and drag to create a biped object.

NOTE The size of the biped is not important.



3ds Max biped object

6 On the Create panel, select Motion.



7 Select any bone in the biped and then go to the Motion panel > Biped rollout and click Figure Mode.

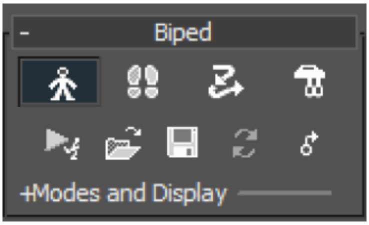
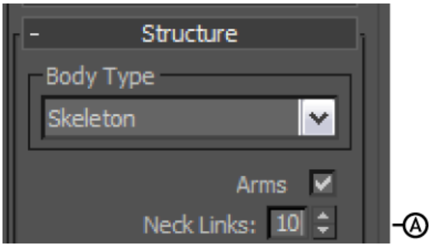


Figure Mode selected

8 In the Structure rollout > Body Type group > Neck Links spinner box, enter `10`.



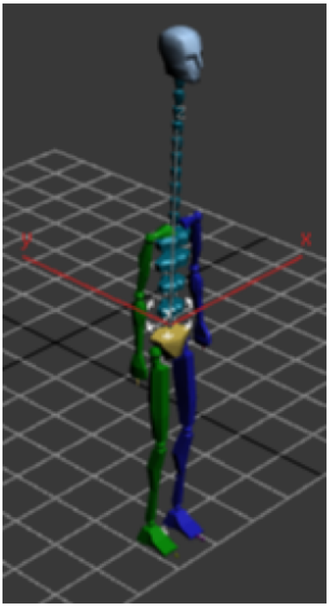
Body Type: Skeleton

Arms ☑

Neck Links: 10

Biped with ten neck links

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



3ds Max biped object with ten neck links

TIP Because MotionBuilder has ten neck link channels, it is good practice to make them available when you create your biped.

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 Export > Export.

12 In the Select File to Export dialog box, navigate to the *C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials* directory, name your file `My_biped`, save your file as *Autodesk (*FBX)* file type, and click Save.

13 In the FBX Export dialog box, click OK.

Now that your biped is saved as an FBX file, you can use it in the next tutorial (Open a 3ds Max biped in MotionBuilder on page 126) to import and characterize in MotionBuilder.

Once you export a biped to the FBX file format, you can bring it into other Autodesk products, such as Autodesk Maya.

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

Import and characterize a 3ds Max biped in MotionBuilder

In the following procedure, you import in MotionBuilder the 3ds Max biped (*My_biped.FBX*) you saved in the previous procedure (Export a 3ds Max biped to MotionBuilder on page 122) so you can animate it. 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, you can use the *biped.FBX* file in the *Tutorials* folder located in the MotionBuilder directory on your system.

To import a 3ds Max biped into MotionBuilder:

1. Launch MotionBuilder.
2. From the MotionBuilder main menu, select File > FBX Plug-in Import.

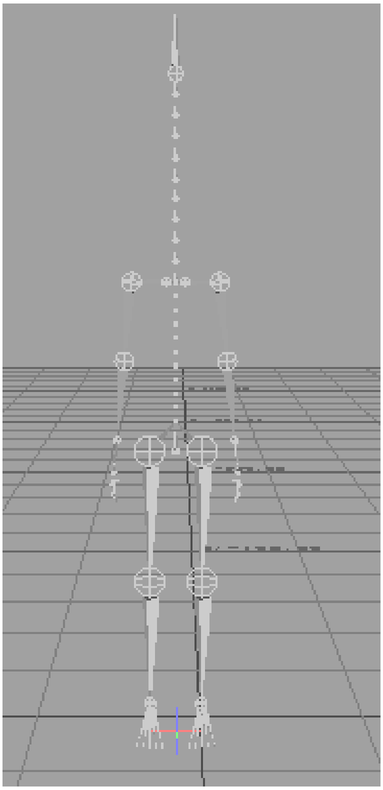
   Even though you exported your 3ds Max to the FBX file format, the FBX file is not a native MotionBuilder FBX file you can open via File > Open.

   NOTE When you import non-native FBX files into MotionBuilder, always use FBX Plug-in Import.

3. In the Open File dialog box, select the *My_biped.FBX* file you created in the previous procedure (Export a 3ds Max biped to MotionBuilder on page 122) and click Open.

   NOTE If you did not perform the previous procedure, import (via File > FBX Plug-in Import) the *biped.FBX* file located in the *C:\Program Files\Autodesk\MotionBuilder 2010* directory under the *Tutorials* folder.

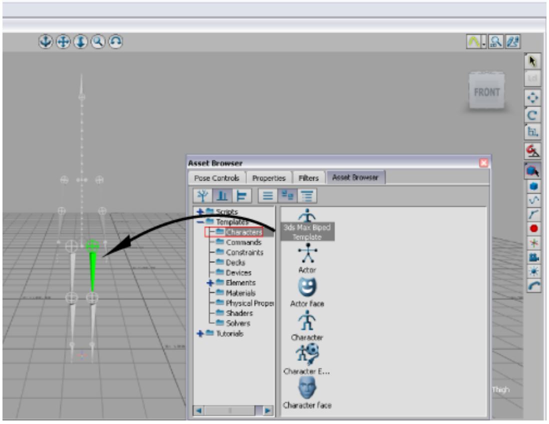
4. In the FBX Plug-in Import Options dialog, click Open.
5. Position your cursor anywhere in the Viewer window and press *A* to frame all of the biped skeleton.



3ds Max biped skeleton imported in MotionBuilder

To characterize your 3ds Max biped:

1. In the Asset browser, expand Templates > Characters and drag the 3ds Max Biped Template on top of the skeleton.



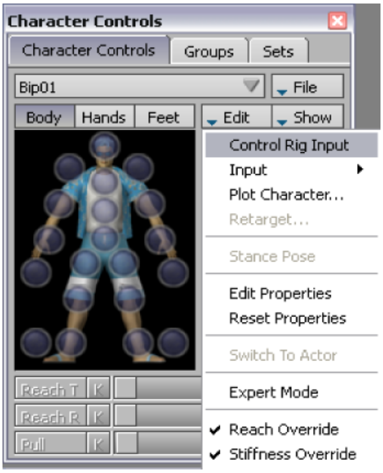
3ds Max Biped Template asset applied to the biped skeleton

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

2 Click Characterize in the dialog box that appears.

The biped skeleton is now characterized. The next step is to add a Control rig so you can animate it.

3 From the Character Controls window, select Edit > Control Rig Input.



Character Controls Edit menu

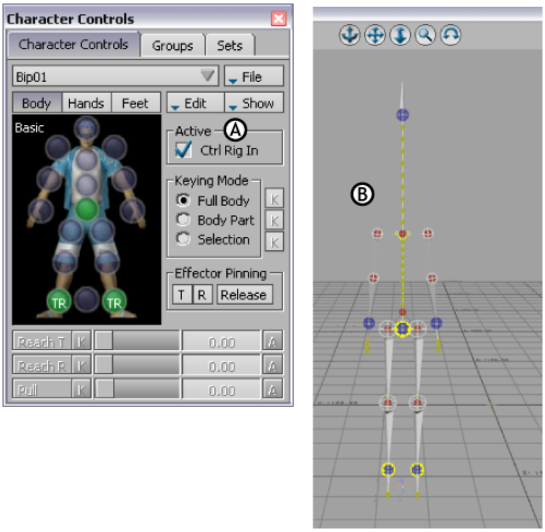
You must use the Control Rig Input setting if you intend to use keyframe animation on your biped.

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

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

5 In the Character Controls window Active area, activate Ctrl Rig In (A).

The Ctrl Rig In setting activates the Character Controls Character representation and displays the effectors of the biped in the Viewer window as shown in the following figure (B).

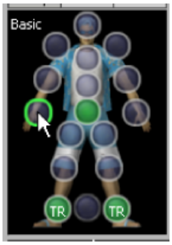


A. **Ctrl Rig In activated** *B.* **Effectors appear on the biped**

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 its Control rig.The biped is now rigged and ready to receive animation.

NOTE Rigging a character in 3ds Max using regular FK/IK constraints would have taken more effort.

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

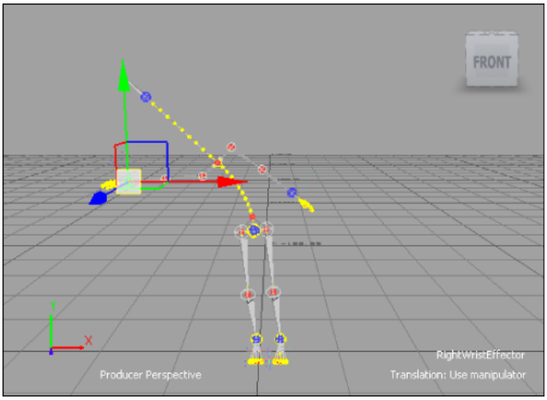


Right Wrist effector selected

7 Click in the Viewer window and press *T*.

The transformation handles are shown.

8 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 3ds Max biped in MotionBuilder.

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.

Following is the asset required for this tutorial:

- *Pepe.max*

Following are the result assets for this tutorial:

- *Pepe.FBX*
- *Pepe_rigged.FBX*

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

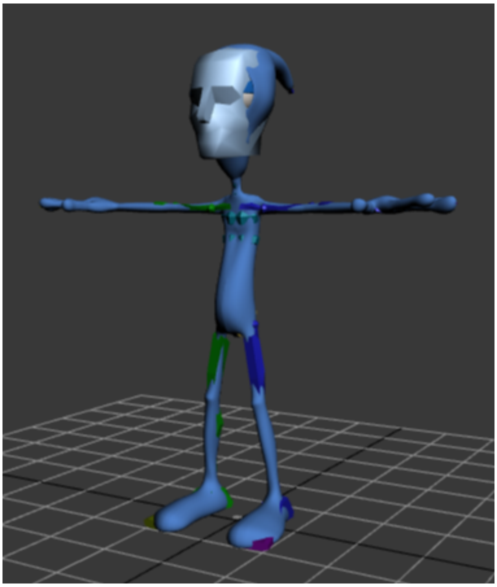
Export a 3ds Max character

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

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 *C:\Program Files\Autodesk\MotionBuilder 2010* 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

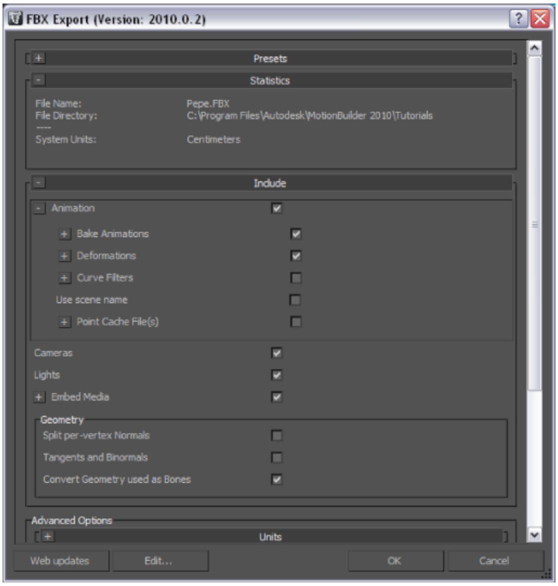
4 From the Application menu, select Export > Export.

5 In the Select File to Export dialog box, navigate to the *C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials* directory, name your file `My_Pepe`, save your file as *Autodesk (*FBX)* 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.

The FBX Export dialog box opens. This is where you specify how to convert the 3ds Max character to an FBX file that MotionBuilder can recognize.

6 In the FBX Export Include area, activate Animation followed by Bake Animations, activate Embed Media option and click OK.



File Name: Pepe.FBX
File Directory: C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials
----
System Units: Centimeters

Animation ☑
Bake Animations ☑
Deformations ☑
Curve Filters □
Use scene name □
Point Cache File(s) □
Cameras ☑
Lights ☑
Embed Media ☑

Geometry
Split per-vertex Normals □
Tangents and Binormals □
Convert Geometry used as Bones ☑

Bake animations and Embed Media activated

Activating these options enables you to export a mesh with the Pepe character and export textures and materials assigned to the Pepe character.

Now that your character is in the FBX file format, you can use this FBX file in the next tutorial to import characters into MotionBuilder or other programs that support the FBX file format.

Import and characterize a 3ds Max Character in MotionBuilder

In the following procedure, you import into MotionBuilder the *My_Pepe.FBX* file you saved in the previous procedure (Export a character on page 131). The Pepe character is a 3ds Max biped, only with a mesh and materials, so some of this procedure is similar to the Open a 3ds Max biped in MotionBuilder on page 126. After importing your Character, you characterize it.

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 import a 3ds Max character into MotionBuilder:

1 Launch the MotionBuilder software.

2 From the MotionBuilder main menu, select File > FBX Plug-in Import.

Even though you exported your 3ds Max to the FBX file format, the FBX file is not a native MotionBuilder FBX file you can open via File > Open.

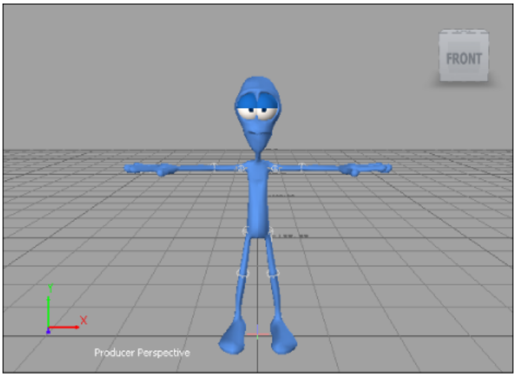
NOTE When you import non-native FBX files into MotionBuilder, always use FBX Plug-in Import.

3 From the Open File dialog box, choose the *My_Pepe.FBX* file you exported in Export a character on page 131, click Open, then click open in the FBX Plug-in Import Options dialog.

NOTE You can also import (via File > FBX Plug-in Import) the *Pepe.FBX* file located in the *C:\Program Files\Autodesk\MotionBuilder 2010* directory under the *Tutorials* folder.

The Pepe character appears in the MotionBuilder Viewer window.

4 Position your cursor anywhere in the Viewer window and press *A* to frame all of the character.



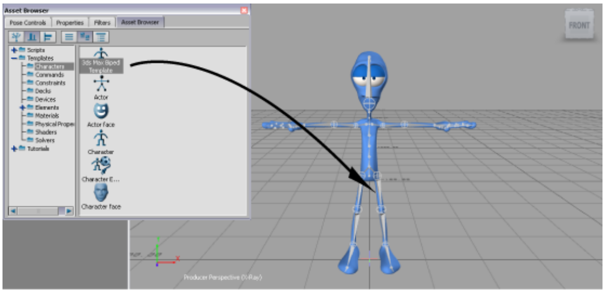
3ds Max Pepe character imported into MotionBuilder

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

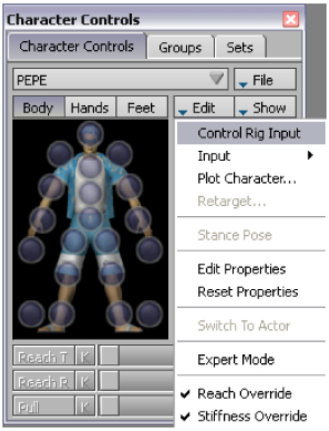


3ds Max Biped Template asset applied to the Pepe Character skeleton

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 dialog box that appears.

4 From the Character Controls window, select Edit > Control Rig Input.



Character Controls Edit menu

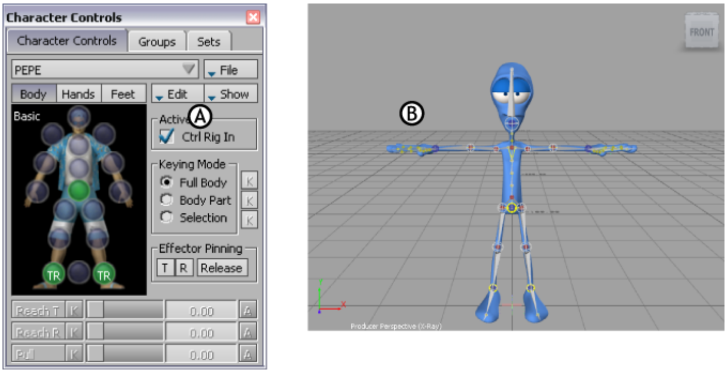
You must use the Control Rig Input setting if you intend use keyframe animation on your biped.

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

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

6 In the Character Controls window Active area, activate Ctrl Rig In.

Effectors appear on the biped as shown in the following figure.

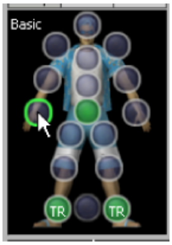


A. **Ctrl Rig In activated** *B.* **Effectors appear on the character**

This setting activates the Character Controls Character representation. The Character representation is an image that shows an image of a human form meant to represent the character skeleton. It contains all the effectors you need to animate its Control rig. The biped is now rigged and ready to receive animation.

NOTE Rigging a character in 3ds Max using regular FK/IK constraints would have taken more effort.

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

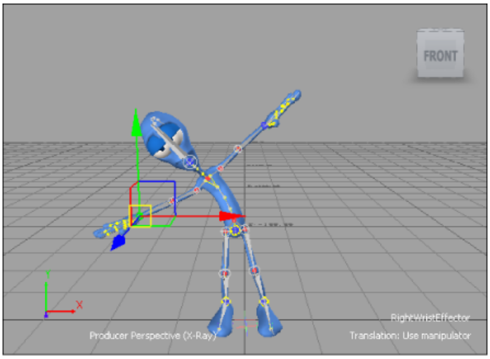


Right Wrist effector selected

8 Click in the Viewer window and press *T*.

The transformation handles are shown.

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 Save your file as *My_Pepe_rigged.FBX* in the *C:\Program Files\Autodesk\MotionBuilder 2010* directory under the *Tutorials* folder.

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 directory on your system.

See Animating a 3ds Max Character in MotionBuilder on page 138.

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 on page 130 section.

NOTE If you did not perform the previous procedures in section Import and characterize a 3ds Max Character in MotionBuilder on page 133, you can use the *Pepe_rigged.FBX* file in the *Tutorials* folder located in the MotionBuilder directory on your system.

In the first of these animation tutorials, Animate a character using motion capture data on page 139, you animate *Pepe* by using one of the motion capture files that ship with MotionBuilder. In the second tutorial, Animate a character by adding keyframes on page 144 you refine the animation using keyframes.

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

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. To do so, from the MotionBuilder menu bar, choose Settings > Keyboard Configuration > 3ds Max. See 3ds Max keyboard shortcuts.

Animate a character using motion capture data

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

If you did not perform the previous procedures in section Import and characterize a 3ds Max Character in MotionBuilder on page 133, you can use the *Pepe_rigged.FBX* file 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:

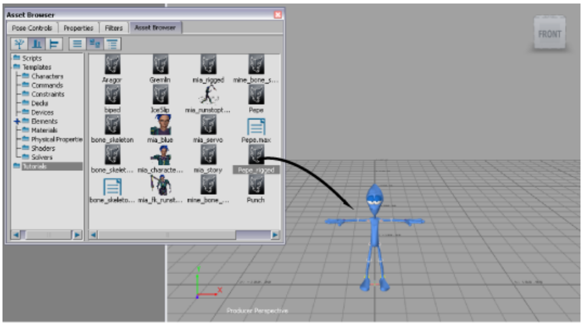
1 Launch the MotionBuilder software.

2 From the Asset browser's *Tutorials* folder, drag into the Viewer window the *My_Pepe_rigged* asset (*My_Pepe_rigged.FBX* file) you saved in the previous procedures in section Import and characterize a 3ds Max Character in MotionBuilder on page 133.

NOTE If you did not perform the previous procedures in section Import and characterize a 3ds Max Character in MotionBuilder on page 133, drag into the Viewer window the *Pepe_rigged* asset (*Pepe_rigged.fbx* file) into the Viewer window

---

3 Select FBX Open > No Animation.

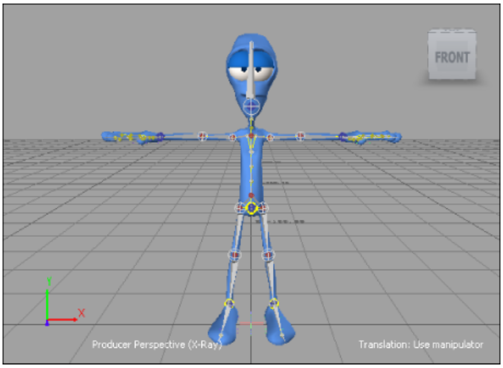


A. **Pepe_rigged asset in Asset browser** *B.* **Pepe loaded in the scene**

The Pepe character appears in the Viewer window.

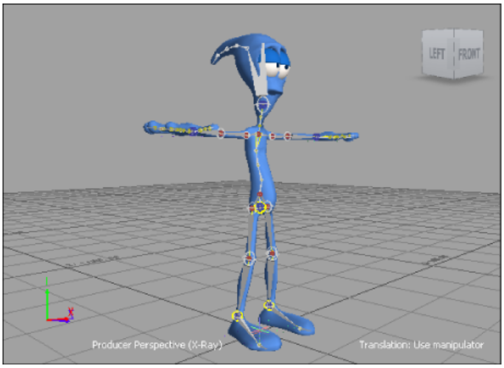
4 Click on an empty area in the Viewer window and press *A* to frame all and zoom in on the *Pepe* character.

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.



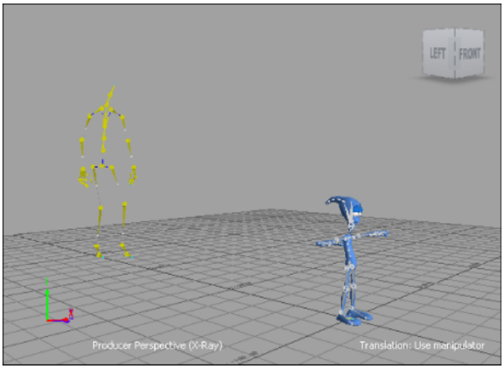
Orbit around Pepe

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.

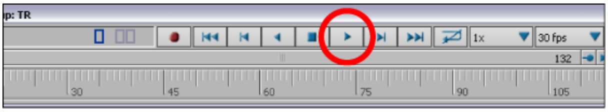
A large yellow skeleton representing the motion capture animation now joins *Pepe* in the scene.

9 Zoom out (*Ctrl*-drag down or left) until you can see the yellow skeleton.



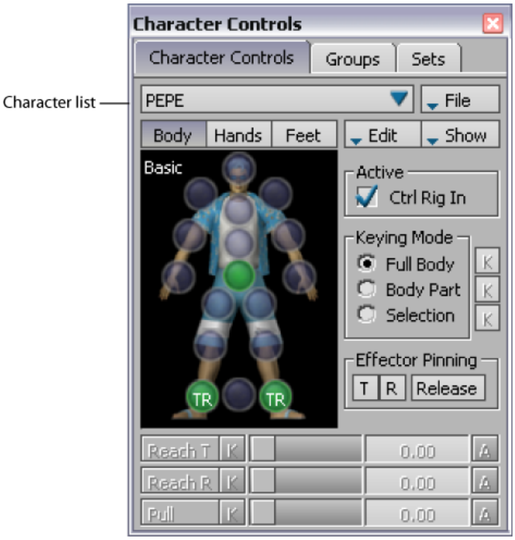
Pepe **with skeleton containing motion capture data**

10 On the Transport Controls, click Play to view the yellow skeleton (*IceSlip* asset) animation.

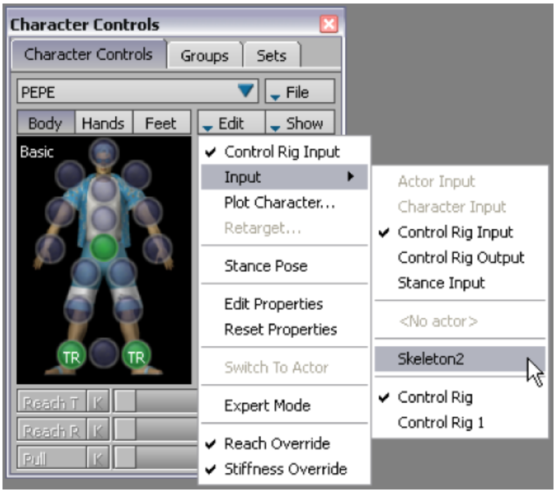


Transport Controls Play button

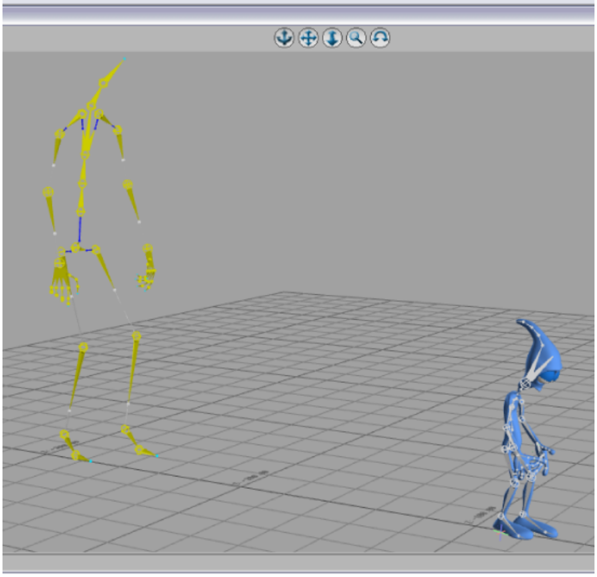
11 On the Character Controls > Current Character menu, make sure PEPE is displayed in the character list.



12 Select Edit > Input > 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.



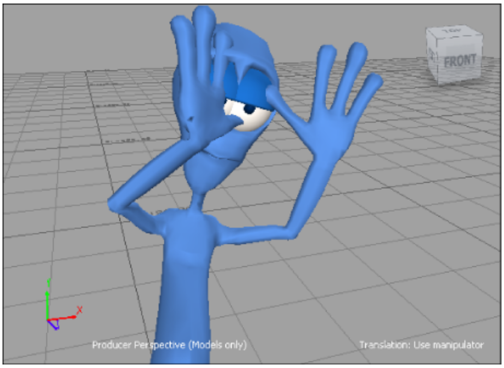
13 Drag the Transport Controls timeline indicator (slider bar) to scrub the animation. You can also hold down the *J* key and drag left or right in the Viewer window.

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.


FRONT
Producer Perspective (Models only)
Translation: Use manipulator

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 part where you add keyframes to correct Pepe's hand movement.

Animate a character by adding keyframes

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.

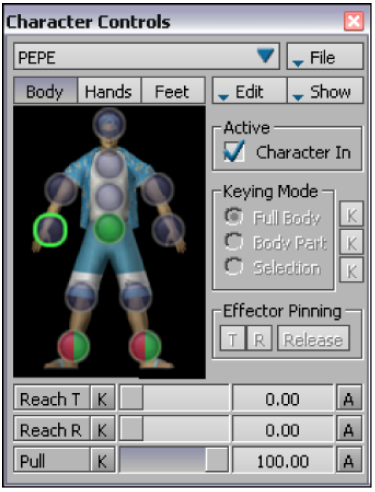
NOTE If you already know how to keyframe characters in MotionBuilder, you can skip the following procedure.

To fine-tune Motion Capture animation with keyframing:

1 Open your result *My_Pepe_Mocap.FBX* file from the previous procedure (Animate a character using motion capture data on page 139) to apply the motion capture data to *Pepe*.

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

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



PEPE

☑ Character In

Reach T	K	0.00
Reach R	K	0.00
Pull	K	100.00

Right Wrist effector selected

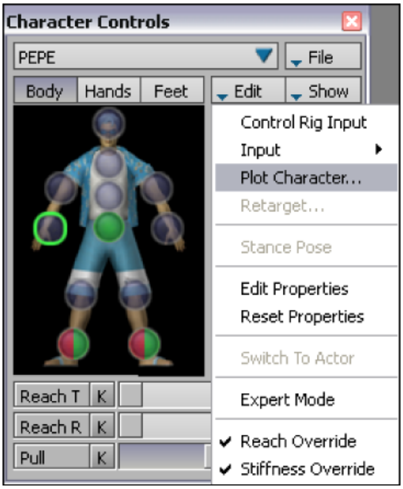
3 Click in the Viewer window and press *T*.

The transformation handles are not displayed.

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.

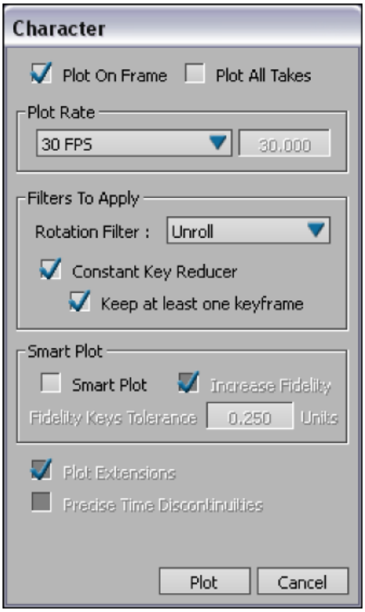
5 In the Character Control window > Edit menu, select Plot Character.



Character Controls' Plot Character Edit menu selected

6 On the Character dialog box, click Control Rig.

The Character dialog box appears.



Character

☑ Plot On Frame □ Plot All Takes

Plot Rate

30 FPS 30.000

Filters To Apply

Rotation Filter : Unroll

☑ Constant Key Reducer

☑ Keep at least one keyframe

Smart Plot

□ Smart Plot ☑ Increase Fidelity

Fidelity Keys Tolerance 0.250 Units

☑ Plot Extensions

□ Precise Time Discontinuities

Character dialog box

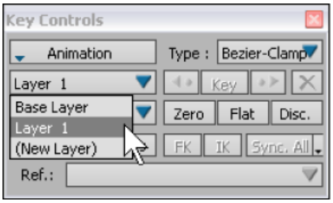
7 Click Plot.

The Plot command creates a key at every frame at the base 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.

Edit the keyframing on another layer than the Base Layer to preserve the original animation on the Base layer.

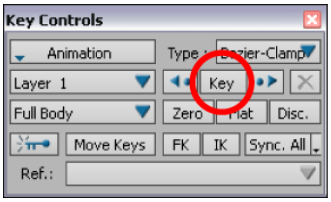
8 On the Key Controls panel, click the Layer menu and select Layer 1.



Layer 1 selected for adding keyframes

The keyframes are hidden on the timeline, clearing your workspace.

9 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 (or press K).



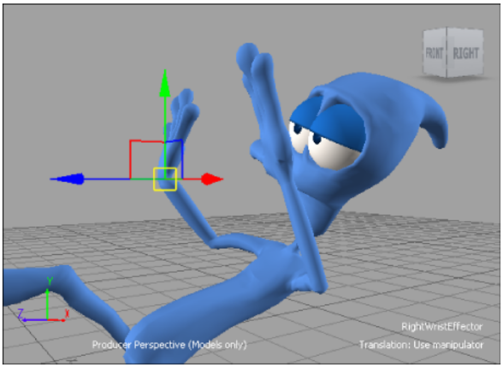
NOTE You can also set a key by placing your cursor anywhere in the Viewer window and pressing *K*.

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

All character movement before the first key and after the second key is unchanged. Only the character movement between frames 80 to 105 are modified.

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

12. 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 and set another key.

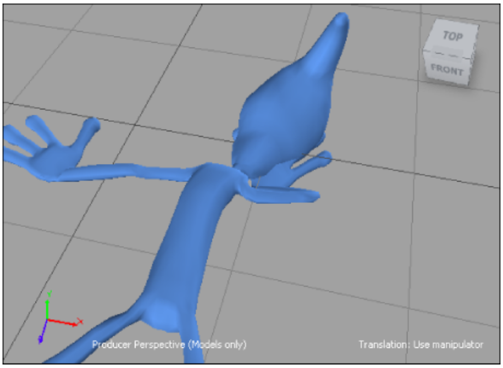

FRNT
RIGHT
Y
Z
X
RightWristEffector
Producer Perspective (Models only)
Translation: Use manipulator

Hand moved away from Pepe's face

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

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

15. Advance to the last frame of the animation and adjust your view until you can see the right side of Pepe's body.

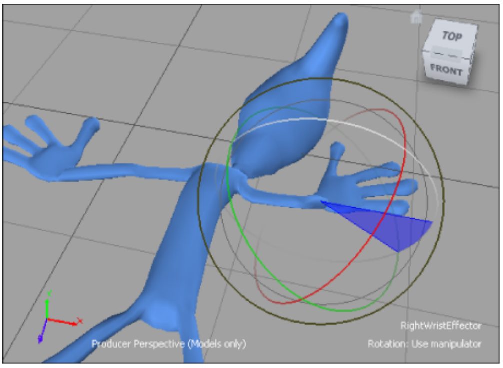

TOP
FRONT
Y
X
Producer Perspective (Models only)
Translation: Use manipulator

Right hand is too close to the character's head

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

17 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 level with the floor.



Rotation rings used to reposition right hand

18 Play back the animation to see the result.

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

If you want to export your FBX file back to 3ds Max, you must bake the animation. See Importing back to 3ds Max on page 149.

Exporting a Character and its animation back to 3ds Max

Because 3ds Max is unable to read the Control rig information that MotionBuilder uses to define character animation in MotionBuilder, you must plot, or "bake", the animation data onto the character skeleton.

The following asset is required for this tutorial:

- *Pepe_keyanim.FBX*

The following assets are the result assets for this tutorial:

- *Pepe_plotted.FBX*

- *Pepe_plotted.max*

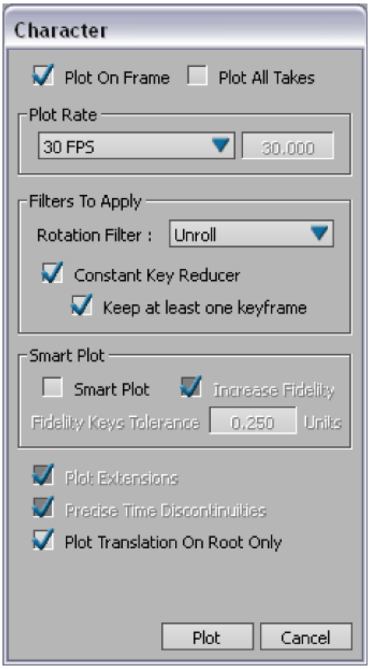
Bake animation for export to 3ds Max

This following procedure shows you how to plot animation on your Character and prepare it for import back to 3ds Max.

To bake animation onto the Pepe character skeleton:

1. Launch MotionBuilder.
2. Open your result *My_Pepe_keyanim.FBX* file from the previous procedure (Animate a character by adding keyframes on page 144).

   If you did not complete the previous procedure, open the *Pepe_keyanim.FBX* file.
3. On the Character Controls Edit menu, select Plot Character.
4. On the Character dialog box, click Skeleton.
5. In the second Character dialog box, leave the default values unchanged as shown in the following figure and click Plot.



☑ Plot On Frame ☐ Plot All Takes

Plot Rate

30 FPS ▼ 30.000

Filters To Apply

Rotation Filter : Unroll ▼

☑ Constant Key Reducer

☑ Keep at least one keyframe

Smart Plot

☐ Smart Plot ☑ Increase Fidelity

Fidelity Keys Tolerance 0.250 Units

☑ Plot Extensions

☑ Precise Time Discontinuities

☑ Plot Translation On Root Only

Character default settings

The character Control rig is deactivated, but the Pepe character retains all animation information.

To edit the character's movement after its animation has been plotted, go back to the Character Control panel > Character Controls tab > Edit menu, and select Plot Character > Control Rig again. When you are done, repeat steps 3 to 5 to bake the animation back onto the character skeleton.

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, but it is not necessary. You can just as easily strip out the skeleton when you import to 3ds Max.

6 From the MotionBuilder main menu, select File > Save As, navigate to the *C:\Program Files\Autodesk\MotionBuilder 2010* directory, save your file `My_Pepe_plotted` under the *Tutorials* folder, and click Save.

Export MotionBuilder scene files to 3ds Max

The FBX Plug-in lets you import the entire contents of scenes saved in MotionBuilder, or update only the elements whose names match those in your 3ds Max scene.

The animation you import from MotionBuilder is now fully editable in 3ds Max.

To import the animated character to 3ds Max:

1 Launch 3ds Max.

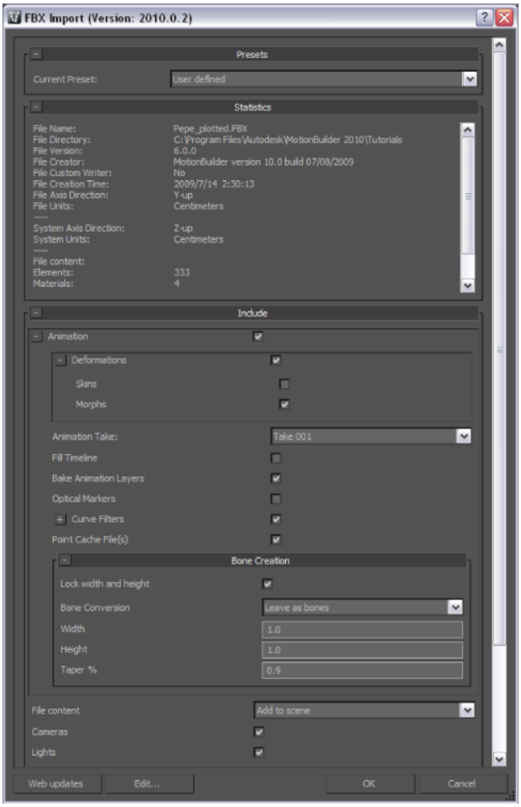
2 In the Application menu, choose Reset to clear the scene/settings.

3 From the Application menu, select Import > Import.

4 On the Select File To Import dialog box, navigate to the *C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials* folder and open your result *My_Pepe_plotted.FBX* file from the previous procedure (Bake animation for Export to 3ds Max on page 150).

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

   The FBX Import dialog appears.



Presets

Current Preset: User defined

Statistics

File Name:	Pepe_plotted.FBX
File Directory:	C:\Program Files\Autodesk\MotionBuilder 2010\Tutorials
File Version:	6.0.0
File Creator:	MotionBuilder version 10.0 build 07/08/2009
File Custom Writer:	No
File Creation Time:	2009/7/14 2:30:13
File Axis Direction:	Y-up
File Units:	Centimeters

System Axis Direction:	Z-up
System Units:	Centimeters

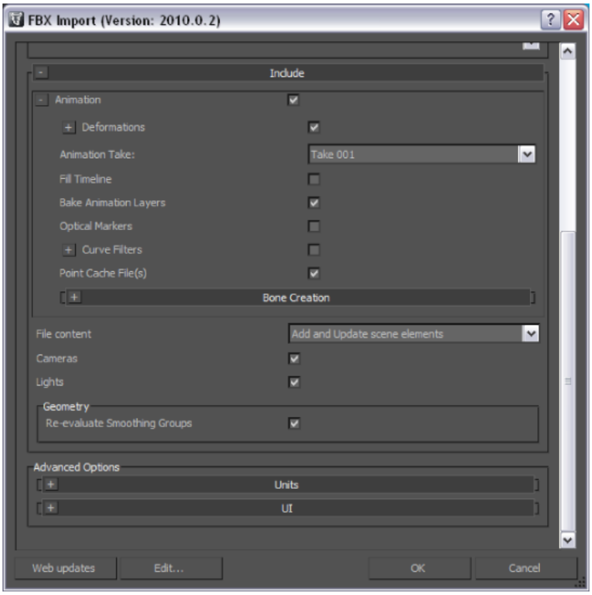
File content:	
Elements:	333
Materials:	4

Include

- Animation ☑
  - Deformations ☑
    - Skins ☐
    - Morphs ☑
  - Animation Take: Take 001
  - Fill Timeline ☐
  - Bake Animation Layers ☑
  - Optical Markers ☐
  - Curve Filters ☑
  - Point Cache File(s) ☑
  - Bone Creation
    - Lock width and height ☑
    - Bone Conversion: Leave as bones
    - Width: 1.0
    - Height: 1.0
    - Taper %: 0.9
- File content: Add to scene
- Cameras ☑
- Lights ☑

FBX Import dialog

5 In the FBX Import window, scroll down to and expand the Include rollout. The File Content list displays Add and Update Scene Elements by default.



FBX Import (Version: 2010.0.2)

Include

- Animation ☑
  - + Deformations ☑
  - Animation Take: Take 001
  - Fill Timeline □
  - Bake Animation Layers ☑
  - Optical Markers □
  - + Curve Filters □
  - Point Cache File(s) ☑
  - + Bone Creation
- File content: Add and Update scene elements
- Cameras ☑
- Lights ☑
- Geometry
  - Re-evaluate Smoothing Groups ☑

Advanced Options

- + Units
- + UI

This default setting imports the Pepe character and the yellow reference skeleton. The option Update Scene elements option updates only the scene elements in 3ds Max that share the same name as those in the imported file.

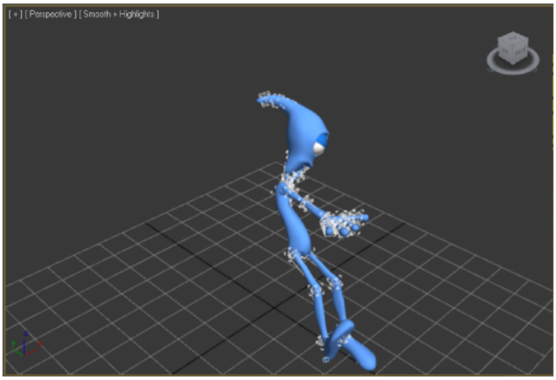
6 Choose instead the Add to scene option to import animation from MotionBuilder to a new 3ds Max scene.

7 Click OK.

8 If a Warnings and Errors dialog appears concerning Skin Modifiers Imports, click OK.

9 Zoom in on Pepe in the Perspective viewport and scrub the timeline to see how the MotionBuilder animation has been baked into the Pepe character bones.

NOTE To clean up the viewport, region select the yellow skeleton and right-click to obtain the quad menu. From the menu select Hide Selection and the skeleton becomes hidden.



MotionBuilder animation imported in 3ds Max

The animation you created in MotionBuilder now works in 3ds Max.

Summary

In this series of tutorials, you took different skeletons created in 3ds Max and exported them to MotionBuilder as an FBX file. In MotionBuilder, you characterized the bones, and animated the character by plotting it to a skeleton.

Then, you baked the animation back to Pepe's control rig, made a few adjustments to perfect the motion, and baked the refined animation back into Pepe's skeleton for export to 3ds Max.

Glossary

The Glossary describes terms specific to the MotionBuilder software product as well as some of the most common computer graphics and software terms used in the 3D world.

The Glossary also includes acronyms used in the MotionBuilder software product and the most common acronyms used in the 2D/3D world.

Acronyms

Following is a list of acronyms used in the MotionBuilder Help.

- BCC on page 173
- BCS on page 174
- BVH on page 176
- FK on page 185
- fps on page 185
- HSB on page 188
- HUD on page 188
- IK on page 188
- NTSC on page 196
- NURBS on page 196
- PAL on page 198
- Qt on page 200
- SMPTE on page 205
- TCB on page 207

- UCS on page 209
- UV on page 210
- VTR on page 211
- WCS on page 211

Terms

Following is a list and description of terms specific to the MotionBuilder software product and of some of the most common computer graphics and software terms used in the 3D world.

List of terms

The following provides a list of terms specific to the MotionBuilder software product as well as some of the most common computer graphics and software terms used in the 3D world.

0-9

- 3D coordinate space on page 170
- 3D matte on page 170

A

- Actor on page 170
- Actor Face on page 170
- aliasing on page 170
- alpha channel on page 171
- alpha-blend on page 171
- animation on page 171
- anti-aliasing on page 171
- artifact on page 171
- asset on page 171

- attribute on page 172
- Auxiliary effector on page 172
- Auxiliary pivot on page 172

B

- back plate on page 172
- Background Color Cancellation (BCC) on page 172
- Background Color Suppression (BCS) on page 173
- Background generator on page 173
- background plane on page 173
- base layer on page 173
- batch on page 173
- Baud rate on page 173
- BCC on page 173
- BCS on page 174
- bind pose on page 174
- Biovision Hierarchical Data (BVH) on page 174
- biped on page 174
- bitplane on page 174
- Black level on page 174
- blending object on page 175
- bone on page 175
- bound model on page 175
- bounding box on page 175
- branch on page 175
- brightness on page 175
- buffer on page 175

- bump map on page 176
- burst on page 176
- BVH on page 176

C

- camera on page 176
- camera interest on page 176
- channel on page 176
- Character on page 177
- character animation on page 177
- Character asset on page 177
- Character Face on page 177
- Character mapping on page 177
- character model on page 177
- child on page 178
- chroma key on page 178
- chrominance on page 178
- clip on page 178
- cluster on page 178
- cluster shapes on page 178
- color burst on page 179
- color timing on page 179
- COM port on page 179
- combiner on page 179
- command clip on page 179
- communications port on page 179
- constrained object on page 180

D

E

F

G

H

- Head-up Display (HUD) on page 188
- hierarchy on page 188
- HSB on page 188
- HUD on page 188
- hue on page 188

I

- IK on page 188
- IK effector on page 189
- IK rig on page 189
- interpolation on page 189
- Inverse Kinematics (IK) on page 189
- IP address on page 189

J

- jogging on page 190
- joint on page 190

K

- key on page 190
- keyframe on page 190
- keyframing on page 190
- keying group on page 190

L

- latency on page 191
- layer on page 191
- Linear key on page 191
- local blend on page 191

- local coordinates on page 191
- local keying group on page 192
- look at point on page 192
- loop on page 192
- luminance on page 192
- luminance key on page 192

M

- magnetic mapping on page 192
- marker on page 193
- Marker set on page 193
- Match pose on page 193
- material on page 193
- Mipmap on page 193
- model on page 194
- moire on page 194
- morph target on page 194
- motion capture on page 194
- motion source on page 194

N

- Namespace on page 194
- naming template on page 195
- National Television System Committee (NTSC) on page 195
- node on page 195
- noise on page 195
- Non Uniform Rational B-splines (NURBS) on page 195
- normal on page 195

- normal map on page 196
- NTSC on page 196
- null on page 196
- NURBS on page 196

O

- object keying group on page 196
- occlusion on page 197
- opacity on page 197
- OpenGL on page 197
- Optical editor on page 197
- optical mapping on page 197
- Optical root on page 197
- origin on page 198

P

- PAL on page 198
- parameter on page 198
- parent on page 198
- parenting on page 198
- partial occlusion on page 199
- patch on page 199
- Phase Alternating Line (PAL) on page 199
- pitch on page 199
- pivot on page 199
- pole vector on page 199
- pose on page 200
- property on page 200

Q

- Qt on page 200
- quadruped on page 200
- quaternion on page 200

R

- reference node on page 201
- Relations on page 201
- relational constraint on page 201
- remote port on page 201
- render on page 201
- rest pose on page 201
- retargeting on page 202
- Rigid body on page 202
- roll on page 202
- rotation on page 202

S

- sample on page 202
- saturation on page 202
- scaling on page 203
- scene on page 203
- scrubbing on page 203
- segment on page 203
- sensor on page 203
- serial port on page 203
- Shadow map on page 204
- shape on page 204

- shape operators on page 204
- shuttling on page 204
- simple constraint on page 204
- skeleton on page 204
- skin on page 204
- SMPTE on page 205
- solving on page 205
- source object on page 205
- Sphere map on page 205
- Spherical map on page 205
- spline on page 205
- stabilizing object on page 206
- stack on page 206
- stance pose on page 206
- SteeringWheels on page 206
- subcarrier on page 206
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Term Definitions

The following provides a description of terms specific to the MotionBuilder software product and of some of the most common computer graphics and software terms used in the 3D world.

0-9

3D coordinate space

The Euclidian/Cartesian environment that defines three dimensions by X-, Y-, and Z-axes, and their corresponding coordinate values.

See also X-axis on page 213, Y-axis on page 213, and Z-axis on page 214.

3D matte

A color signal that is used to fill areas of keys and borders. Unlike a regular matte, a 3D matte has depth and is respected by all other 3D objects in the scene, letting you block out parts of a scene and replace it with video footage.

A

Actor

In MotionBuilder, a humanoid model used to link captured optical or magnetic motion data to a character.

Actor Face

In MotionBuilder, a set of magnetic or optical motion data captured from a performer's face, which can be mapped to a Character Face asset.

aliasing

A defect or distortion in a television picture caused by interference between two frequencies, for example the luminance and chrominance frequencies. Aliasing appears as moire or herringbone patterns, straight lines that become wavy, or rainbow colors.

See also anti-aliasing on page 171.

alpha channel

The portion of each pixel's data reserved for transparency information. 32-bit graphics systems contain four channels: three 8-bit channels for red, green, and blue (RGB) and one 8-bit alpha channel.

alpha-blend

An effect in which you assign pixel values that are solid, invisible, or partially transparent. Alpha-blending is often used in games for special effects such as explosions and weapons discharge. When mapped onto polygons, Alpha-blending simulates semi-transparent objects, such as water and glass.

animation

The process of creating the illusion of moving images by displaying sequential images in rapid succession. In each successive image, two or more values are changed over time, and the items drawn or recorded in the images appear to move.

anti-aliasing

A technique that corrects aliasing by smoothing the edges of diagonal lines on the screen. Without Anti-aliasing, diagonal lines often have a “jaggy” appearance caused by the stair-step effect of the pixels. Anti-aliasing blurs the edges of the lines.

See also aliasing on page 170.

artifact

An undesirable element or defect in motion capture data. These may occur naturally and can be eliminated in order to achieve a better-quality capture.

asset

In MotionBuilder, any element used to create animation, such as models, textures, and shaders.

attribute

See property on page 200.

Auxiliary effector

In MotionBuilder, a supplementary effector in a Control rig that corresponds to an existing IK effector. Auxiliary effectors provide additional IK control for a character's reach, and display as a cube on the corresponding IK effector.

See also effector on page 182.

Auxiliary pivot

In MotionBuilder, a sub-control that lets you translate and rotate an IK Control rig effector from a point other than its current location.

See also pivot on page 199.

B

back plate

A background image, video clip, or video feed to be displayed on the background plane in a scene.

Back plate can also be spelled as one word in other software products.

Background Color Cancellation (BCC)

A chroma key feature that senses the color of the chroma key backing and replaces it with a complementary color. As a result, the two colors cancel each other. This eliminates the halo or fringing effect surrounding the foreground object in the chroma key.

Background Color Suppression (BCS)

A chroma key feature that senses the color of the chroma key backing and replaces it with an adjustable luminance level. This prevents the backing color from appearing in the chroma key.

Background generator

A video generator that produces a solid-color output which can be adjusted for hue, chroma, and luminance.

background plane

A plane in a scene on which images, video clips, or video feeds are projected.

base layer

The default animation layer to which all other layers are merged when you plot an animation.

See also layer on page 191.

batch

The process of automating a frequently performed task by storing commands in a script or “batch file”.

For example, batch load refers to the process of loading or processing more than one file with a single command.

Baud rate

The bits per second (bps) rate at which the information carrying capacity of a communication channel is measured.

BCC

See Background Color Cancellation (BCC) on page 172.

BCS

See Background Color Suppression (BCS) on page 173.

bind pose

In MotionBuilder, the position in which a character is weighted, wherein all of the character’s limbs should be in neutral positions, neither fully extended nor fully contracted.

Biovision Hierarchical Data (BVH)

A character animation file format that contains skeleton hierarchy information and motion data.

BVH, one of the most popular motion capture data file formats, is mainly used as a standard representation of motion capture of humanoid structures.

biped

In MotionBuilder, a humanoid skeleton that stands on two legs, making contact with the floor using only the feet.

bitplane

The memory in a graphic display device that holds a complete one-bit-per-pixel image.

Black level

The lowest transmittable luminance level that can occur during the active picture portion of a video signal. When viewed on a monitor this signal level is seen as black.

blending object

In MotionBuilder, any selection of nodes or sensors with captured data, a part or complete hierarchy of models with plotted data, or a Control rig that can be used to perform a motion blend.

bone

In MotionBuilder, the connecting lines between the joints that compose an Actor skeleton.

bound model

In MotionBuilder, a 3D model that has a rigid skeleton and is covered by a mesh. The mesh contains a texture and body features that give the model a distinct appearance.

bounding box

Rigid bodies that limit the area in which the eyes, eyebrows, and mouth of a face model can move in an Actor Face.

branch

A part of a hierarchy or tree-based data structure where there is only one route between any pair of nodes. A node on a branch has only one parent.

brightness

Along with contrast, a property that determines the luminance of an object.

buffer

An area of memory used for storing messages.

bump map

Textures that contain two direction vectors, and are used to convey relief in a texture.

See also texture on page 207.

burst

See color burst on page 179.

BVH

See Biovision Hierarchical Data (BVH) on page 174.

C

camera

A device for viewing and recording scenes. Each camera sees the scene from a different angle or “vantage point”.

camera interest

Also referred to as a look at point, the focal point of a camera, represented by a null.

channel

A digital effects processing path for video.

A particular signal path.

MotionBuilder uses channels to connect Actor Face assets with Character Face assets to create expressions for 3D models.

Character

See Character asset on page 177.

character animation

The process of animating objects or models to give the illusion of personality, life, and character. In contrast to other types of animation, objects are meant to appear alive and to appear to act on their own accord rather than to move randomly.

Character asset

In MotionBuilder, also referred to as the Character. The link between a motion source on page 194 (such as an Actor on page 170, a Control rig on page 180, or another character) and a character model on page 177.

See also model on page 194.

Character Face

In MotionBuilder, the shapes on a face model which can be driven with live input, recorded motion capture data, devices, and constraints.

See also shape on page 204.

Character mapping

The process of creating a link between a data source and a 3D model with a skeleton.

See also Character asset on page 177.

character model

In MotionBuilder, a 3D object composed of a skinned model with a skeleton.

You can animate a character model by linking it to a motion source via a Character asset.

See also model on page 194, skeleton on page 204, motion source on page 194, and Character asset on page 177.

child

A model or element that is placed below another in a hierarchical structure. For example: Marker2 is parented by Marker1. In the hierarchical structure, Marker2 is the child and Marker1 is the parent.

See also hierarchy on page 188 and parent on page 198.

chroma key

An effect that lets you sample out a colored background, and replace it with something else, such as a video layer.

chrominance

A portion of the video signal that contains color information (hue and saturation). Video picture information contains two components: luminance and chrominance.

See also luminance on page 192.

clip

Each individual instance of animation, audio, commands, constraints, videos, or camera shots in the Story settings.

A portion of data cut off at a defined boundary.

cluster

A collection of vertices that can be linked to objects.

cluster shapes

A shape made of cluster groups by translating, rotating, and scaling the clusters for use in the Shapes Mapping pane.

See also Character Face on page 177and cluster on page 178.

color burst

Also referred to as a burst, a reference for establishing the picture color (hue).

color timing

The synchronization of the color burst phase of two or more video signals. Ensures that no color shifts occur in the picture when the signals are mixed in a switcher or another video device.

COM port

Also referred to as a communications port, a connector for a communications interface.

combiner

A device that controls the way two or more channels work together. It determines the priority of the channels (which picture appears in front and which ones in back) and the types of transitions that can take place between them.

See also channel on page 176.

command clip

A clip that lets you show and hide models at specific frames in your track. You can also use the Command clip to launch an external application.

communications port

See COM port on page 179.

constrained object

An object whose movement is determined by the behavior of another object, using a constraint.

See also constraint on page 180.

constraint

A restriction of the behavior of one object (constrained object) based on the behavior of another object (source object).

See also constrained object on page 180 and source object on page 205.

constraint clip

A clip that lets you select, blend, and fade constraints throughout your track.

contrast

Along with brightness, a property that determines the luminance of an object.

Control rig

A data source that allows you to create and alter character animation using a combination of an IK rig and an FK rig.

cross chrominance

Also referred to as cross color, moire or rainbow effects in encoded video pictures created when the video encoder misinterprets luminance detail as color information. For example, moire effects on pin-striped clothing.

cross color

See cross chrominance on page 180.

current segment

The segment of optical data that is currently selected in the Optical editor. When a segment is selected and active (not set to Done in the Label pane), it is colored green.

See also segment on page 203.

custom keying group

Also referred as custom keying mode. A set of user-defined properties that define a character's effector (or an object) in 3d space which will be captured when a keyframe is created.

A custom keying group can be either: global (can be applied to any character or object in a scene); local (only ever applies to the object(s) that are selected at the time the keying group is created); or object (can be applied to any object in a scene).

cut

A section of a take's animation.

D

deck

A video cassette recorder (VCR).

deformation

A method of modelling object surfaces based on a geometric mesh of control points.

dense data

Animation that displays as many keyframes, such as motion capture data or plotted animation.

device

Any hardware instrument with a specific functionality. In MotionBuilder, you can use input devices such as a mouse, or a MIDI device.

Done state

A possible state of a marker in the optical system. When set to Done, the marker is no longer an active optical marker and cannot be used within the Optical settings. Done optical markers can be filtered and modified in the FCurves window.

dopesheet

A visual representation, similar to a traditional cell-animation timing sheet, that provides you with a way of moving keys, modifying timings, and activating and disabling effects over time.

In MotionBuilder, the Dopesheet window is an exploded view of the Action timeline in the Transport Controls window.

Distribution Factor

A slider that lets you adjust how the gradient is distributed between the Shadow and Highlight colors.

dummy node

A node that contains no geometric data that is used as a parent node.

See also node on page 195.

E

effector

The markers on a Control rig that represent a character's joints. Effectors are visually represented by the cells on the character representation in the

Character settings and can be selected to transform the character's corresponding body parts. There are two types of effectors: FK effectors and IK effectors.

See FK on page 185 and IK on page 188.

See also Auxiliary effector on page 172.

Effects send

A video switcher feature that lets you select a key source to be sent to a digital picture manipulator. The manipulated key and fill video are then returned to the Switcher's keyer for keying ("flying" a key) over background video.

element

A node. All of the objects that make up your scene.

Environment mapping

A form of reflection mapping best suited for situations when you are filming a model from a single point of view.

Expression

A mathematical formula that you use to animate properties and elements.

expressions constraint

Also referred to as Expressions, constraints created using data entered in the Expressions pane.

See also constraint on page 180.

extrapolation

The method of using a mathematical algorithm to estimate how a curve logically continues, based on the currently known values.

F

.fbx

The generic 3D data packager file format. FBX files can be unpacked, read, and used by all major 3D software packages, regardless of which package the data came from, or how it is converted.

FCurve

See function curve on page 186.

fill

In video keying, the video signal that is inserted into the “hole” cut in the background video by a key signal.

filter

A tool used to clean, manipulate, or modify captured motion data. You can use filters and filtering options to manipulate captured data according to your own specifications and to correct noisy or distorted motion capture data.

filtering

The process of cleaning, manipulating, modifying or otherwise tweaking captured motion data.

See also filter on page 184.

First Contact balloon

The interactive graphical tooltip that is displayed when the SteeringWheel is pinned during startup.

FK

See Forward Kinematics (FK) on page 185.

FK effector

See effector on page 182.

See also Forward Kinematics (FK) on page 185.

FK rig

A Forward Kinematics system that lets you control individual pivot points on a model's skeleton.

Forward Kinematics (FK)

A method of moving a hierarchy (such as a limb) in which the lower elements of the hierarchy follow the motion of parent elements. For example, if you rotate the shoulder using forward kinematics, the upper arm, forearm, hands and fingers follow.

See also Inverse Kinematics (IK) on page 189.

fps

Frames per second.

See frame rate on page 186.

frame

A single image at a specific point in time within an animation.

The individual picture image on a strip of film or a complete television picture made up of two fields.

A frame can be used as a unit of measurement.

frame rate

The rate at which sequences of images are captured or displayed. The frame rate is usually measured in frames per second (fps).

function curve

Also referred to as an FCurve, a graphic depiction of an animated value. The time and value of the animated value displays on two axes: the vertical axis representing the value, and the horizontal axis representing the time.

G

gap

The space before, after, or between a marker's segments that does not contain sensor data.

generic channel

A channel that is a preset facial expression.

See also Actor Face on page 170 and channel on page 176.

ghost

A wireframe representation of an unrendered blending object in the Viewer window. Ghosts only display when the Motion Blend or Story windows are open.

See also blending object on page 175.

Ghost curve

A visual representation of the original curve that displays in the FCurves window as you edit the curve.

global coordinates

Values that define a location relative to the origin of a scene, in the format (X, Y, Z).

See also local coordinates on page 191, X-coordinate on page 213, Y-coordinate on page 213, and Z-coordinate on page 214.

global keying group

Also referred to as global keying mode. A custom keying group that can be applied to any character or object in an animated scene. A global keying group describes a set of properties (for example, scale and translation properties) for a character or an object that will be captured when a keyframe is created in an animated scene. Global keying groups can be assigned to any object or character in a scene, but only the keying group's properties that map directly to properties the object or character already has defined for it will be affected.

gobo

A filter placed over a light to make it project patterns.

Guide pose

A representation of a Character pose used in Ragdoll solves when you want the character to attempt to conform to a pose. With a Guide pose, the character does not perform unrealistic contortions to ensure that the pose is assumed. Guide poses appear in the Viewer window as a green stick figure.

A Guide pose is a less-exacting version of the Match pose. See also Match pose on page 193.

H

Hardware FC

Hardware Full Control. A special data transfer protocol that controls the flow of data between specific hardware devices.

Head-up Display (HUD)

See HUD on page 188.

hierarchy

An organization structure that visually describes the relationship between elements. A hierarchy looks like an inverted tree structure, with an element at the top (referred to as a parent) and with several elements below its predecessor (referred to as children).

See also parent on page 198 and child on page 178.

HSB

Three numerical values, where “H” refers to Hue, “S” refers to Saturation, and “B” refers to Brightness.

HUD

Information that is visually relayed to the user without requiring the user to look away from the usual viewpoint.

HUD (Head-up Display) takes its name from the head-up displays used in modern aircraft. The origin of HUD stems from the users being able to view information with their heads “up” and looking forward, instead of angled down looking at lower instruments.

hue

A specific color. For example, you can use the Hue slider in the Color window to set an object’s hue to “green”.

I

IK

See Inverse Kinematics (IK) on page 189.

IK effector

See effector on page 182.

See also Inverse Kinematics (IK) on page 189.

IK rig

An Inverse Kinematics system that lets you transform hierarchies of bones using IK effectors.

See Inverse Kinematics (IK) on page 189.

interpolation

The process in which a computer program automatically fills in the action between keyframes with in-between frames, creating the illusion of smooth, continuous motion when the animation is played.

In MotionBuilder, in the FCurves window, the interpolation is shown by the shape of the function curve drawn between keyframes of an animation.

Inverse Kinematics (IK)

A method of transforming a group of connected joints (such as a limb) where the movement of the end joint influences all the preceding joints in the chain.

For example, when you transform the wrist joint of an arm, the elbow and shoulder joints are also transformed.

See also Forward Kinematics (FK) on page 185.

IP address

The 32-bit host address defined by the Internet Protocol (IP).

J

jogging

The action of smoothly moving forward and backward through time in a take by J-clicking and dragging in the Viewer window.

joint

The points on a skeleton connected by bones.

K

key

The process of setting a keyframe.

keyframe

A reference point, or key point, that marks the position of an important action or change in a scene at a specific point in time.

keyframing

The action of creating keyframe animation by transforming an object in a scene at a specific point in time and setting a keyframe.

keying group

Also referred to as keying mode. A set of properties for a character's effector or for an object recorded when you create keyframes.

L

latency

The time during which the read/write heads wait for data to rotate into position after the controller starts looking for a particular data track.

layer

A level of animation in a scene, on top of the original function curve data. You can have multiple layers in a scene and make changes to one layer without affecting the others.

See also base layer on page 173.

Linear key

A luminance key effect in which the gain of the key is approximately one. This preserves the shaping of the key source edges produced by anti-aliased character generators and digital video effects devices.

See also luminance key on page 192.

local blend

The process of replacing the motion in one track with motion from another track on only part of a hierarchy.

local coordinates

Values that define a location relative to the origin of a selected object, in the format (X, Y, Z).

See also global coordinates on page 187, X-coordinate on page 213, Y-coordinate on page 213, and Z-coordinate on page 214.

local keying group

A custom keying group that describes the set of properties for an object in 3d space that will be captured when a keyframe is created for that object in an animated scene. Local keying groups can only be assigned to the object(s) selected at the time the keying group was created.

look at point

See camera interest on page 176.

loop

The area of a take that is designated to continuously play when you click Play in the Transport Controls.

luminance

The luminous intensity of a video signal. The color picture information contains two components: luminance (brightness and contrast) and chrominance (hue and saturation). Probably should remove reference to luminance within definition.

See also chrominance on page 178.

luminance key

A key effect in which the portions of a key source that are greater in luminance than the clip level cut a hole, or key, in the background video.

M

magnetic mapping

The process of mapping magnetic motion data to an Actor.

marker

Objects used to identify segments. One or more segments, after being labelled or identified, combine to create a marker of continuous data.

In the Optical tool, marker is another term for sensor.

See also sensor on page 203.

Marker set

A set of markers that map objects containing motion data (such as magnetic markers or optical sensors) to an Actor. This association is then used to drive the Actor. In the Viewer window, a Marker set displays as a group of white markers attached to an Actor.

Match pose

A representation of a Character pose used in Ragdoll solves as a goal stance that the Character must assume during a specified time. Match poses appear in the Viewer window as a red stick figure.

A Match pose is more definitive than a Guide pose. See also Guide pose on page 187.

material

A set of properties that describe the surface appearance applied to a model. These properties may include color, shininess, opacity, and reflectivity.

Mipmap

A version of an original texture that has been reduced in size to 1 x 1 pixel. This solves the problem of textures with small objects “flickering” as the viewer gets further away.

See also texture on page 207.

model

The mathematical description of a three dimensional object that is placed in a scene.

moire

A wavy pattern.

morph target

Operators for use with models that have shape animations, also referred to as shape operators.

motion capture

A method of collecting motion data based on the movement of a performer wearing special sensors or markers.

motion source

An asset such as an Actor, character, or Control rig that is linked to a character model through the Character asset to drive the movement of a character model.

N

Namespace

A namespace is a unique path. Each item in a namespace is identified by its own name along with the namespace to which it belongs.

For example, Moon:Alien is a path, but Galaxy:Moon:Alien is a separate path because it does not reference Moon:Alien in the Galaxy but it does increments Moon. Moon:Alien and Galaxy:Moon:Alien are two separate and cooperative elements that do not require renaming.

naming template

An *.fbx* file containing the customized naming conventions used to define a skeleton.

National Television System Committee (NTSC)

See NTSC on page 196.

node

The individual objects (such as joints, bones, or nulls) that are linked to a model's skeleton structure. Nodes allow you to map between a source and a model.

In the Schematic view, the variously colored tiles that visually represent each asset of a hierarchy.

See also reference node on page 201 and dummy node on page 182.

noise

Irregular jumps in a segment of optical data caused by partial occlusion of a sensor on a performer's body during a capture session.

Noticeable distortion in magnetic capture data caused by metallic objects such as aluminium heating ducts interfering with the capture session area.

Non Uniform Rational B-splines (NURBS)

See NURBS on page 196.

normal

A perpendicular or vector that defines the orientation of something.

normal map

Textures that contain three direction vectors: an X, Y and Z. Unlike a bump map's two vectors, the normal map's three vectors convey height and lighting detail with greater precision, providing heightened realism.

See also bump map on page 176 and texture on page 207.

NTSC

Stands for the National Television System Committee (NTSC) as well as for the standard for color television in the United States and other countries established by this Committee.

NTSC is defined by the frame size, a frame rate of 29.97 fps, as well as by the frame aspect ratio and pixel aspect ratio. Although there are various divisions within the NTSC standard format which determine what frame size is used and what pixel and frame aspect ratios are used, the standard frame aspect ratio used by the NTSC standard format is 4:3 (1.333). This format uses a 640 by 480 resolution.

null

An object that you can parent to other objects for additional transformation flexibility. nulls have no specific properties and are simply used to help you build your scene. In the Viewer window, a null is visually represented as a small axis.

NURBS

Non Uniform Rational B-splines. Surfaces and curves that visually represent complex geometric information, used for modelling.

O

object keying group

A custom keying group for objects only (not characters) that describes a user-defined set of properties for object in 3d space in an animated scene when a keyframe is set. Object keying groups can be assigned to any object in a scene (as opposed to “local keying groups” which are restricted to the object(s) selected at the time the local keying group is created.).

occlusion

A problem with optical motion capture, wherein a sensor is hidden from all but three cameras. This may occur when a performer passes by an obstructing object, or when the performer’s body comes between the sensor and the camera.

opacity

The extent to which an object is transparent. If an object’s opacity is set to 100%, the object displays opaque. If the opacity is set to 0%, the object displays transparent.

OpenGL

A software interface for graphics hardware that supports rendering and imaging operations.

Optical editor

An editor that lets you correct optical data, fix poor gap interpolation, switch swapped markers, and perform other optical data reconstruction.

See also noise on page 195, occlusion on page 197, and partial occlusion on page 199.

optical mapping

The process of mapping optical motion data to an Actor.

Optical root

The main reference for imported optical data, represented in the Viewer window by a sphere.

origin

The point at the center of a 3D scene relative to which every location is defined. At the origin of a scene, the X, Y, and Z coordinates have a value of zero.

The center or reference point of a selected 3D object, relative to which the surface of the object is defined. At the origin of an object, all three 3D coordinate values have a value of zero, written as (0,0,0).

See also global coordinates on page 187 and local coordinates on page 191.

P

PAL

Stands for Phase Alternating Line —a standard for color television used in many European, African, and Asian countries.

PAL is defined by the frame size, a frame rate of 25 fps, as well as by the frame aspect ratio and pixel aspect ratio. Although there are various divisions within the PAL standard format which determine what frame size is used and what pixel and frame aspect ratios are used, the standard PAL video signal format sets the video to playback at 25 frames per second which contain 625 lines of pixels in each frame.

parameter

See property on page 200.

parent

A model or element that has been made the parent of another. For example, in the hierarchical structure, Marker1 is the child and Marker2 is the parent.

See also hierarchy on page 188 and child on page 178.

parenting

The act of making one model or element the parent of another.

partial occlusion

A problem with optical motion data that often occurs if a sensor on a performer's body has been placed too close to another sensor, or the sensor becomes partially hidden from one of the cameras during the capture session. The resulting data may display peaks, shifts, or noise.

patch

A type of tesselation, something to do with a model's surface.

Phase Alternating Line (PAL)

See PAL on page 198.

pitch

A rotation based on the movement up or down the Y-axis. For example an airplane banking up or down.

pivot

The point from which a selected object is transformed.

See also Auxiliary pivot on page 172.

pole vector

A part of an IK rotate plane handle that begins at the start joint, and along with the handle vector defines the IK handle's reference plane.

The pole vector changes the orientation of the reference plane, so you can change the orientation of the joint chain directly. This is because the joint chain's degree of orientation, or twist, is defined as the difference in orientation between the reference plane and the joint chain plane.

Also known as "up-vector" in other software packages.

pose

A snapshot in time of a selected character or object's position.

property

Also referred to as an attribute or parameter, a value that quantifies a specific characteristic of an object, and can be animated. For example, the fog intensity of a light is a property.

Q

Qt

A cross-platform application development framework, widely used for the development of GUI programs (in which case it is known as a widget toolkit), and also used for developing non-GUI programs such as console tools and servers.

Qt uses C++ with several non-standard extensions implemented by an additional pre-processor that generates standard C++ code before compilation. Qt runs on all major platforms, and has extensive internationalization support. Non-GUI features include SQL database access, XML parsing, thread management, network support and a unified cross-platform API for file handling.

Qt is most notably used in KDE, Opera, Google Earth, Skype, Qtopia, Photoshop Elements, VirtualBox and OPIE. Qt can also be used in several other programming languages; bindings exist for Ada (QtAda),[3] C# (Qyoto/Kimono),[4] Java (Qt Jambi),[5] Pascal, Perl, PHP (PHP-Qt), Ruby (RubyQt), and Python (PyQt).

quadruped

A four-legged skeleton that makes contact with the floor using all four limbs.

quaternion

A complex number made up of four geometric components.

A quaternion adds a fourth element to the [x, y, z] values that define a three-component-vector. A quaternion represents an axis in 3D space and a rotation around that axis.

R

reference node

A null or joint that acts as the root of an entire model and is the parent of the models' Hips.

Relations

See relational constraint on page 201.

relational constraint

Also referred to as Relations, constraints that perform custom operations on the data of a source object to determine the behavior of the constrained object.

See also constraint on page 180.

remote port

An additional port provided by a serial device where you can physically connect input and output devices.

render

To generate an image file, a sequence of image files, or movie file(s) using the mathematical descriptions of the objects that compose the scene.

rest pose

The default position at which a Character Face asset is at rest.

retargeting

The process of taking the animation data mapped to one character, applying that animation to another character to drive its animation without having the need to plot (or bake) the animation.

Rigid body

Two or more markers grouped to correct occlusion.

roll

A rotation around the X-axis. For example, the rolling of a log.

rotation

The process of changing all the points on an object to reflect the degree of rotation around each of the three axes.

S

sample

The position of a sensor recorded by each camera at each frame. All samples from each camera generate a three-dimensional representation of each sensor's position in time when processed.

See also keyframe on page 190.

saturation

A property that helps determine the chrominance and contrast of the color of an object.

scaling

The process of enlarging an object by moving all the points outward from the object's center, or shrinking it by drawing them all in toward that center.

scene

A representation of a three-dimensional world in which objects are placed and animated using a coordinate system.

See also 3D coordinate space on page 170.

scrubbing

The process of moving through an audio track either forward or backward, while the audio is playing. This process is used to find and hear the audio at a specific frame.

segment

The data captured from an optical motion capture session.

See also current segment on page 181, and motion capture on page 194.

sensor

A reflector or light source attached to a performer’s body. Sensors are tracked by optical cameras during the capture process. Captured data is combined to create segments.

See also motion capture on page 194 and segment on page 203.

serial port

Also referred to as a COM port, a port that uses a special communication protocol to control the flow of data between devices, allowing the transfer to be made at a higher speed.

Shadow map

A *.tiff* image of the shadow created by the shadow map shader, projected onto planes and objects in a scene.

shape

In the Character Face settings, a Character Face modified to portray a particular expression, such as “angry”.

See also Character Face on page 177.

shape operators

Also referred to as morph targets, special operators for use with models that have shape animations.

shuttling

The action of fast-forwarding or rewinding through an audio track while the audio is playing.

simple constraint

Constraints that use a pre-defined list of constrained objects and source objects.

skeleton

A set of points representing the joints, and of connecting lines representing the bones.

skin

The mesh of vertices that envelopes a 3D character, creating its shape.

SMPTE

Refers to the Society of Motion Picture and Television Engineers (SMPTE) founded in 1916 to advance theory and development in the motion imaging field.

solving

The process of calculating the position of both the forward kinematics and inverse kinematics rigs, then applying these results to the linked model while observing the settings in the Character Settings pane.

The results of calculating each rig. For example, IK solving refers to the result of calculating the IK rig.

In MotionBuilder, the result of all calculations, rigs, and settings when using the character engine.

source object

An object on which a constraint is based.

See also constraint on page 180.

Sphere map

A reflection type that causes a 3D object to reflect the contents of its scene from only one point of view.

Spherical map

A reflection type that causes a 3D object to reflect the contents of its scene.

spline

A curve that is defined using control points.

stabilizing object

A sensor, a node from a skeleton, or a model from a hierarchy of models that stabilizes the entire blending object and corrects problems such as foot sliding.

See also blending object on page 175.

stack

A data structure for storing items which are to be accessed in last-in first-out order.

stance pose

The starting or rest pose of a model.

SteeringWheels

Tool set that provides access to 2D and 3D navigation tools.

subcarrier

Also referred to as the SC, in NTSC or PAL video, a continuous sine wave of extremely accurate frequency which constitutes a portion of the video signal. The subcarrier carries picture hue and color saturation information.

swapping

A problem with optical motion capture wherein two markers either cross or pass close to each other, causing the capture system to misinterpret the markers and label the segments incorrectly.

See also motion capture on page 194.

T

take

A snapshot in time of an animation instance.

NOTE Time can be measured in hours, minutes, seconds, and frames, or in frames per second.

tangent handle

The visual representation of the tangent of a keyframe on a function curve. Tangent handles let you change the slope of the curve on either side of the keyframe.

TCB

Tension, Continuity, Bias.

tesselation

A step in the rendering process in which the shapes of an object’s surface mesh are rearranged into triangles.

texture

An asset based on an image file or video clip that can be applied to models, planes, or models to modify their appearance.

timecode

The value that indicates the current position in time of the current take.

Timewarp

A curve that alters the shape of a function curve and changes the timing of an animation.

See also function curve on page 186.

track

A course along which something moves, or a sequence of events through time.

In MotionBuilder, there are two types of tracks. In the Motion Blend window, tracks can contain motion data and let you blend takes into a single result track. In the Story window, tracks can contain motion data, keyframe animation, audio and video, and let you blend specific types of clips along the timeline.

transformation

The process of changing the points on an object by translation, rotation, and scaling.

translation

The process of moving an object on one or all axes. Translation moves an object without changing its orientation.

transparency

The level of visibility of a object, determined by the opacity setting. When the opacity is set to 0%, the object is transparent.

trigger

In the Animation Trigger window, a device, such as a joystick or keyboard, that allows you to execute motion clips to test the transitions you created between them.

triggering group

A collection of motion clips and the triggers that initiate their execution.

T-stance

The neutral pose of a character in which the arms and legs are fully extended, reaching towards their limits.

U

UCS

See User Coordinate System (UCS) on page 210.

See also World Coordinate System (WCS) on page 212.

unlabelled segment

A segment of data that has not yet been labelled to associate it with a marker. This is done during optical cleaning. Unlabelled segments display as blue asterisks.

unweighted tangent

A tangent on a function curve that does not have weight applied to it.

See also function curve on page 186 and weighted tangent on page 212.

up-vector

See pole vector on page 199.

user channels

Custom channels you can create in the Character Face settings.

See also channel on page 176 and Character Face on page 177.

User Coordinate System (UCS)

A user-defined coordinate system that defines the orientation of the X, Y, and Z axes in 3D space. The UCS determines the default placement of geometry in a drawing. See also world coordinate system (WCS).

See also World Coordinate System (WCS) on page 212.

UV

U and V texture coordinates. U and V represent vectors in a 1 x 1 pixel image that connects to places on a 3D mesh. The U and V coordinates let you place the texture on the 3D mesh exactly. This placement attaches the texture to the object's surface, and it is mapped to create a seamless effect.

V

value

A number that defines anything from the position, rotation, or scaling of a model, to a material’s emissive, ambient, or diffuse color values.

See also property on page 200.

vector

A straight line segment.

ViewCube

User interface element that displays the current orientation of a model. You can use it to restore and create a UCS, interactively rotate the view, or restore a preset view.

visual keyframe

Arrowhead-shaped tabs that display on the Action timeline and on the timeline in the Dopesheet window to indicate the location of keyframes that are set.

See also keyframe on page 190.

voice channels

In the Character Face settings, channels that are preset mouth expressions.

See also channel on page 176.

VK ripple

Visual keyframes ripple.

See also visual keyframe on page 211.

VTR

Video Tape Recorder.

W

waveform

A graphical depiction of the continuous fluctuation in the amplitude of a sound over time.

WCS

See World Coordinate System (WCS) on page 212.

See also User Coordinate System (UCS) on page 210.

weighted tangent

A tangent on a function curve that has weight applied, letting you stretch the tangent handle and create special curves that you cannot create with unweighted tangents.

See also function curve on page 186 and unweighted tangent on page 209.

wheel

A reference to one of the individual user interface elements that make up SteeringWheels.

See also SteeringWheels on page 206.

wheel surface

Area of a wheel that is used to organize wedges and other buttons.

wheel wedge

A section on the surface of a wheel that is designated for a specific 2D or 3D navigation tool.

wheels

A reference to more than one of the individual user interface elements that make up SteeringWheels.

See also SteeringWheels on page 206.

wireframe

A manner of displaying objects, such as ghosts.

World Coordinate System (WCS)

A coordinate system used as the basis for defining all objects and other coordinate systems.

See also User Coordinate System (UCS) on page 210.

world coordinates

Coordinates expressed in relation to the World Coordinate System (WCS) on page 212.

X

X-axis

The dimension on which coordinates define the horizontal space of the scene.

See also 3D coordinate space on page 170.

X-coordinate

The value that defines the horizontal space in the scene relative to the origin.

Y

Y-axis

The dimension on which coordinates define the vertical space of the scene.

See also 3D coordinate space on page 170.

Y-coordinate

The value that defines the vertical space in the scene relative to the origin.

yaw

A rotation based on spinning an object using its center as the axis. For example, a record on a turntable.

Z

Z-axis

The dimension on which coordinates define the depth of the scene.

See also 3D coordinate space on page 170.

Z-coordinate

The value that defines depth in the scene, relative to the origin.

Zero keyframe

A keyframe in which the effect of a layer is set to zero at a given time.

A keyframe set to define the start or end of an animation.

See also layer on page 191.

zero point

The stance of an Actor where both translation and rotation are set to zero.