3ds Max Animation with Biped
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Table of Contents | Index

Overview

3ds Max is a leader in 3D animation for game development, design visualization, and visual effects and enables users to outperform the competition when it comes to high-volume visual effects production. From 3D storyboards and digital matte paintings to realistic digital environments, believable characters, and impressive crowds, this all-in-one software is professional and fast! The powerful Biped module in 3ds Max 8, with pre-linked and realistically constrained skeletons and its suite of motion tools, dramatically speeds up the animation process. In this book and accompanying CD, author and award-winning animators Michele Bousquet and Michael McCarthy look at the Biped, Physique, Crowd, and Motion Mixer tools and demonstrate how to animate character models quickly. They start with the basics of Biped, and then move on to footstep animation, freeform animation and the use of crowd behavior simulation tools. Readers will also learn how to use all the new tools of Motion Mixer for mixing motion files, and the Workbench for adjusting biped function curves, and learn specific animation techniques, including how to adjust physique for perfect deformation, fit a biped to any character model, create realistic motions, combine motions on any character, create crowd scenes automatically, and more!

Table of Contents | Index

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3ds Max Animation with Biped

Michele Bousquet and Michael McCarthy

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Introduction

Welcome to the world of 3ds Max and Biped!

Biped is a subject with many facets. If you are new to this software, understanding a little of its history and usage will help you use the software more effectively. Biped, along with Physique, was a component of

Character Studio, which has now been incorporated into 3ds Max.
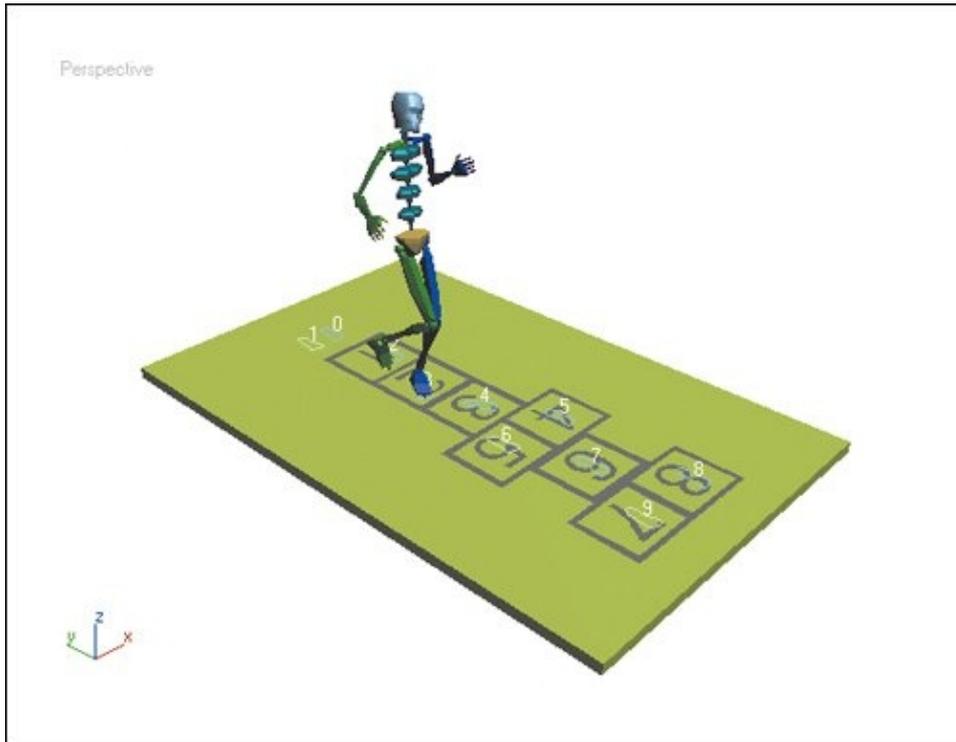
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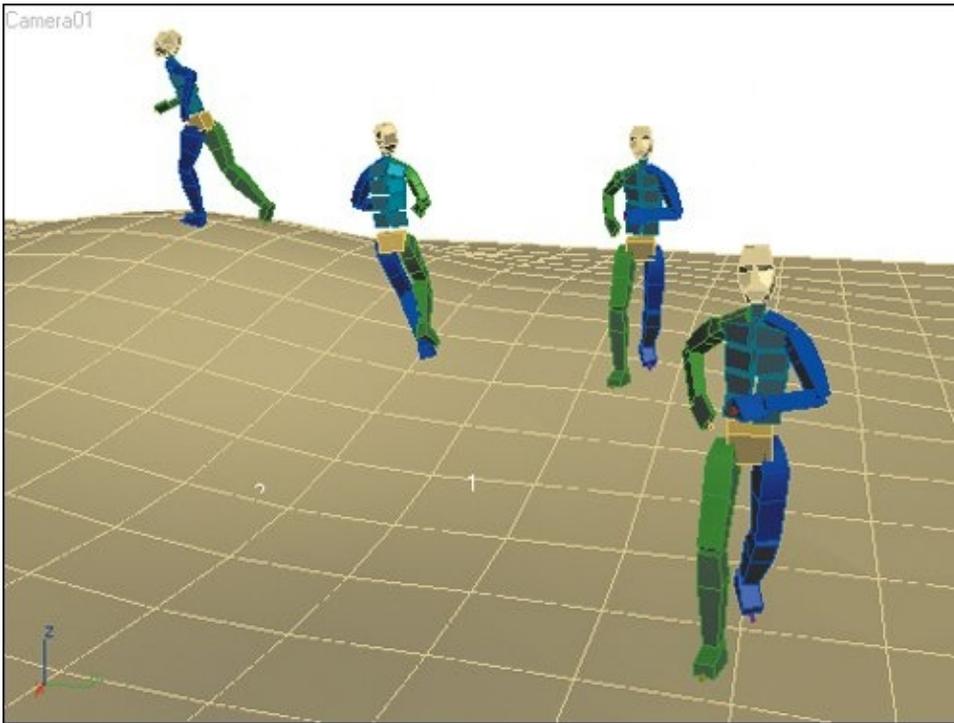
A Brief History of Character Animation

Character animation with 3D software is a relatively new art form. In 3D, animating a character is quite different from animating a bouncing ball or a car rolling down the street. A living creature has limbs that move in various ways. When it walks or runs, at least one body part (such as the left or right foot) reacts with the ground at any given time.

Throughout the 1990s, three different approaches were developed to make 3D character animation possible: jointed characters, model controls, and skeletons.

Jointed Characters

The first approach was to create jointed characters, similar to a marionette. The parts were linked together in a hierarchy; moving the torso would move the entire character in space. Then the arms and legs could be rotated separately.

This solution is still in use for many types of animation, but it has limitations. The joints are nearly always visible, or become visible as soon as the character starts to move. Animators can get around this problem by fitting the character with certain types of clothing or armor, or by animating the character very carefully (and tediously). Because of the joints' visibility, this type of animation is currently used only with action figures wearing armor, and with characters that are supposed to look like marionettes.

Another limitation of jointed animation is the hierarchy itself. As soon as the torso moves, the feet move. This makes it hard to pin the feet to the ground when the character is walking or moving around. Some tools were developed in the 1990s for pinning the feet down, but these were often awkward and hard to use.

Model Controls

To get around the problems of joints, another approach was developed for one-piece character models. An animator could place controls at key points on a character's body and use the controls to push and pull parts of the mesh.
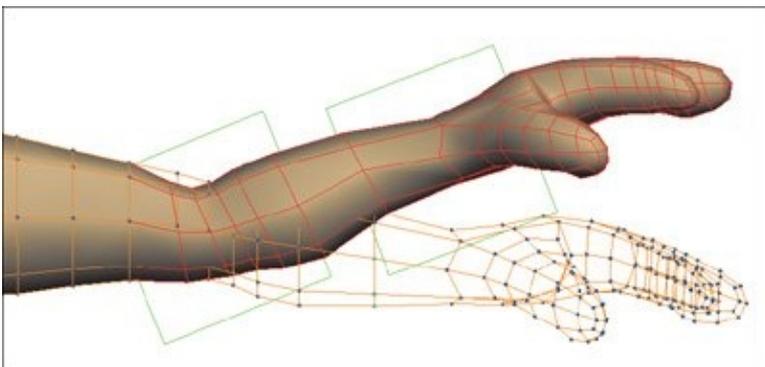
Although this technique makes it possible to animate a character smoothly, it is also tedious and difficult. A great number of controls is necessary to make the character deform correctly; and when animated the character can seem to be made of rubber or clay. Also, with model controls it takes a very long time to do just a few seconds of animation.

Animators have always been inventive in their use of jointed characters and model controls. With extensive controls and scripting, it was (and still is) possible for an animator to create a custom tool set that speeds up

the animation process and gets better results. However, not everyone has the time or the means to learn scripting and write their own tools.

Skeletons and Skinning

A third approach was developed that mirrors real life more closely. A skeletal structure is placed inside the character model. When the skeleton is animated, it acts like bones inside a body and causes the character model to deform accordingly.

This technique requires tools to make the skeleton affect the character model appropriately. For example, the skeleton's upper arm bone must affect just the character's upper arm and no other body part.

As skeleton tools developed, new terminology was introduced. The objects that make up the skeleton are often called bones. The association of a skeleton with a character model is called skinning. If an animator is going to "skin a character," the animator is going to create a skeleton and associate the skeleton with the character model.

In the 1990s, new objects called Bones were introduced in 3ds Max. These objects were automatically linked together as they were created, making it easier to create a skeleton. In addition, plug-ins became available for skinning characters in 3ds Max.
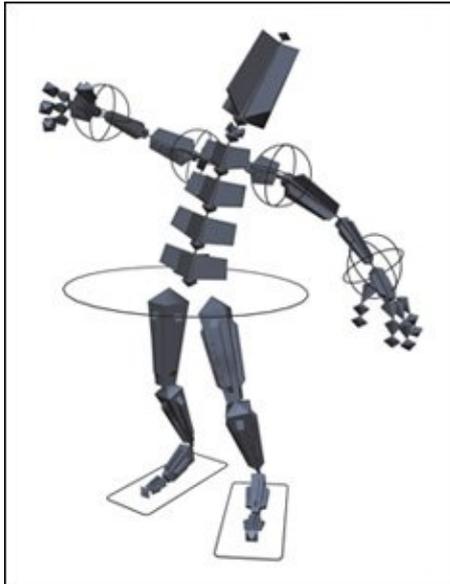
Even with improved tools, the animator still had to construct the skeleton manually with Bones or other 3ds Max objects, and also had to create his or her own controls for animating the skeleton. Designing such controls is time consuming and can be daunting for the new animator.

To solve all these problems, Character Studio was introduced.

Tip

To learn how to animate with Bones rather than a biped, see the "Resources" appendix.

Character Studio

In 1995, the first version of Character Studio was released as a plug-in for 3ds Max. The software was revolutionary in that it provided all the elements an animator needed to do character animation quickly and easily:

- A full humanoid skeleton that can easily be posed to fit most types of characters
- Tools for skinning a character
- Animation tools for the skeleton
- Easy methods for making the feet stick to the ground when necessary
- Methods for reusing animation that has already been created
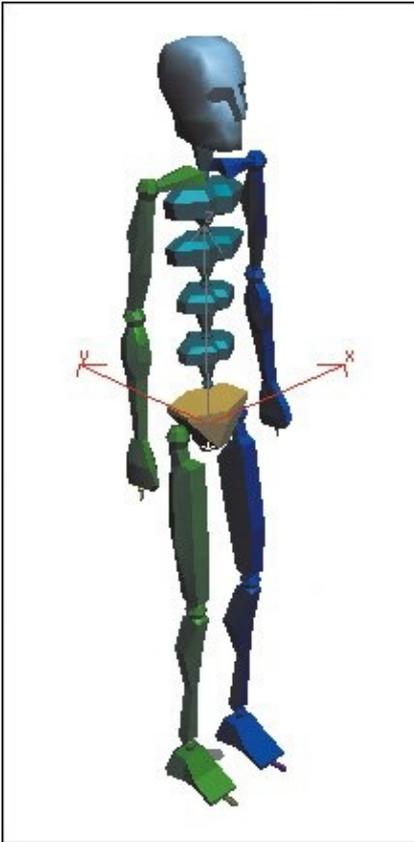
Of these, the last two elements are perhaps the most important. With Character Studio, an animator can take a character model and make it walk around in a matter of minutes rather than hours or days. An animator no longer has to be an expert at scripting to get good results with character animation. Once the motions are created, they can be reused for other animation sequences.

The Character Studio skeleton is called a biped, which means "two-footed."

Biped Today

Character Studio has been included with 3ds Max versions 7 and later instead of being available only as a plug-in. Its name no longer appears in the 3ds Max software itself, although you might find "Character Studio" in the 3ds Max documentation.

The key feature of Character Studio is its Biped module. This part of the software deals exclusively with the creation and animation of the biped skeleton. Most of this book is devoted to Biped tools and techniques. Because it gives results so quickly, the Biped module and its animation techniques are very popular with game developers and film/TV animators.

The Physique modifier is also part of Character Studio. This modifier skins a character with any skeleton, regardless of whether it is a biped or a custom skeleton made of 3ds Max objects.

Nowadays, the Skin modifier is included with 3ds Max. Like Physique, the Skin modifier skins a character. In 3ds Max 5 and later, Skin has been improved to the degree that it is superior to Physique. In general, animators use Physique rather than Skin only when they have a need for features specific to Physique, such as automatic muscle bulges.

When we refer to Character Studio in this book, we are referring to the Biped module and Physique modifier that are included with 3ds Max.

Biped Basics

There are a few concepts you should understand before you get started with 3ds Max Animation with Biped.

Terminology

When you see the term Biped with a capital B, this refers to the Biped module and its tools. The term biped with a lowercase b refers to the biped skeleton itself.

In any software package, the term rig refers to a set of controls for animating a character. A rig consists of a skeleton and the controls for animating the skeleton. A biped skeleton includes a complete rig.

Choosing a Mesh

Before working with the Biped software, you need a mesh to work with. Character Studio does not create meshes, nor does it have any tools for doing so. There are a number of ways to find a character mesh suitable for animation with Biped, and you'll find a few ideas in the "Resources" appendix.

Quicklist: Character Mesh Setup

- Pose the character with its head facing forward and its arms outstretched, palms facing down.
- If necessary, scale the character to fit the scene before starting to work on it.
- Rotate the mesh so it's facing the Front viewport.
- Move the mesh so it's standing on the construction plane.
- Create a named selection set for the mesh.

Another option is creating your own character from scratch, but keep in mind that learning how to do this takes time. Even when you become adept at creating characters, it can take days or weeks to create an appealing, believable character that will animate well. Common methods for character creation are box modeling and surface modeling with the Surface modifier. (See the "" appendix for some recommended books on modeling.)

When you first start working with character design and animation, it's a good idea to use meshes from another source. After you learn more about how characters are animated, it will be easier for you to make usable character meshes.

Setting Up the Mesh

For a character mesh to work well with Biped, a few setup actions are needed. The mesh must be properly positioned and scaled before you can associate it with your biped.

To begin working with a character, you load it into 3ds Max. You can also have other objects in your scene, such as an environment to work in.

The character mesh should be positioned with its head facing forward, arms outstretched, and palms facing down. The legs should have a little distance between them. If your mesh isn't in this position, you will have to move and rotate vertices until it is. All of the meshes that come with 3ds Max are in this pose.

The mesh doesn't have to be all in one piece. Biped will work equally well with one- and multiple-piece characters. You'll find out how this works later in the book.

Before using the character, you might need to scale it to fit the environment. Attempting to scale a character after manipulating it with Biped can have unpredictable results. You won't have to perform this scaling step in any of the exercises in this book, but you should be aware of its necessity in some situations.

It will be easier to work with the biped if you first rotate the mesh so it's facing the Front viewport. It's also a good idea to move the mesh so that it's standing on the construction plane, if this suits your environment. Once the mesh is placed, freeze it so that you won't accidentally select it when working with the biped.

Your work will be made much easier if you create a named selection set for the mesh. This will enable you to easily and quickly select the mesh later on.

Production Workflow

The list of steps included here will give you an idea of how Character Studio works. You can also use it as a reference as you go through this book, and afterward when working on your own animation.

1. Create or obtain a mesh. Create a character mesh, or retrieve one from the Internet or some other source.
2. Create a biped. This is a quick stepjust a click and a drag to make the biped skeleton.
3. Change biped parameters. Set up the biped with the appropriate number of fingers and toes, spine links, and so on.
4. Fit biped to mesh. Move, rotate, and scale the biped until it fits inside the mesh like a real skeleton.
5. Associate biped and mesh. Use the Skin modifier or Physique modifier to associate the biped with the mesh.
6. Make preliminary skinning adjustments. The default settings for both Skin and Physique usually require adjustments to make the biped affect the mesh correctly. You can make some preliminary adjustments at this point, even before you animate the biped.
7. Create a test animation for the biped. You can create a quick footstep animation, a more customized animation using the freeform method, or some combination of the two.
8. Watch the animation to see the deformation. Some parts of the mesh won't behave as expected when the biped moves, indicating that more adjustments are needed in the Skin or Physique modifier.
9. Create the final animation. Create the actual animation that you want the biped to perform. This could include crowd scenes, or mixing motions to create a complex animation.
10. Render the animation. Hide the biped and render the mesh in its environment.

In this book you'll learn how to do all these steps, plus a few other tricks that Biped has to offer.

Using This Book

Each section of 3ds Max Animation with Biped covers a different technique for working with the Biped software: Skinning, Footsteps, Freeform Animation, and Combining Motions. The chapters cover various tasks you can accomplish with those techniques, and exercises will walk you through the process of using the associated tools.

The exercises are meant to be performed using 3ds Max version 8, but some may also work in earlier versions. However, the Max files on the accompanying CD were all saved in version 8 and will not open in earlier versions.

Word to the wise: If you're using 3ds Max 8, be sure to get the Service Pack 1 update, which fixes a number of bugs.

Section I: Getting Started

Character Studio has a wide variety of features for making characters walk, run, jump, climb, fight, and do most anything. Before you jump in and play with its features, use this section to learn the overall workflow and get some results right away.

In this section, you'll make a character walk around with a minimum of clicks, and find out how Character Studio sets its keys for such an animation. You'll also learn how to manipulate the Character Studio skeleton (called the biped), and how to associate it with a character mesh.
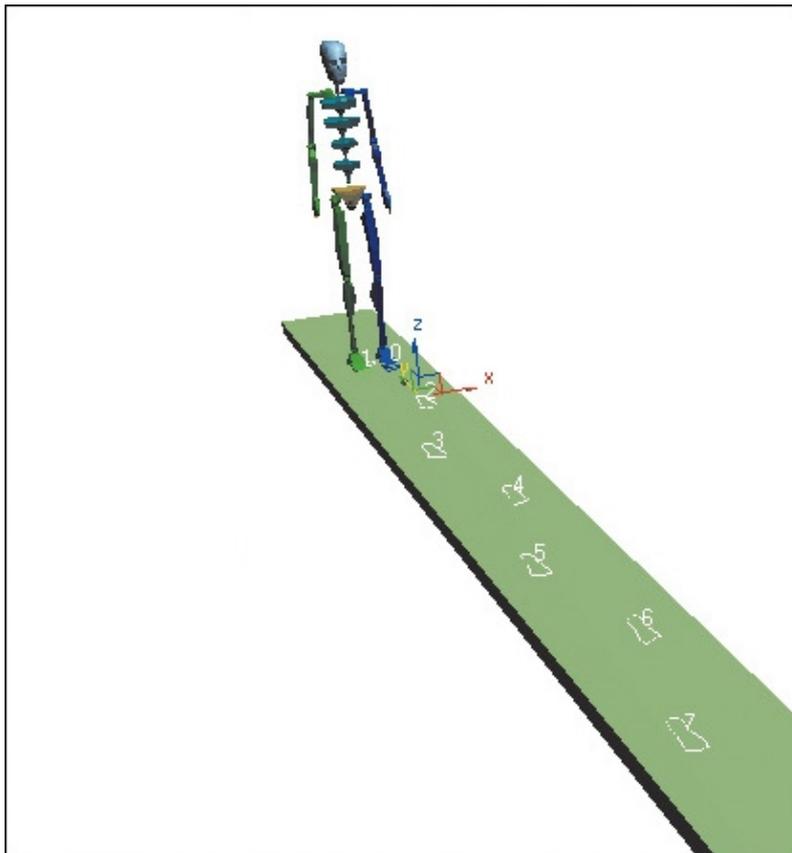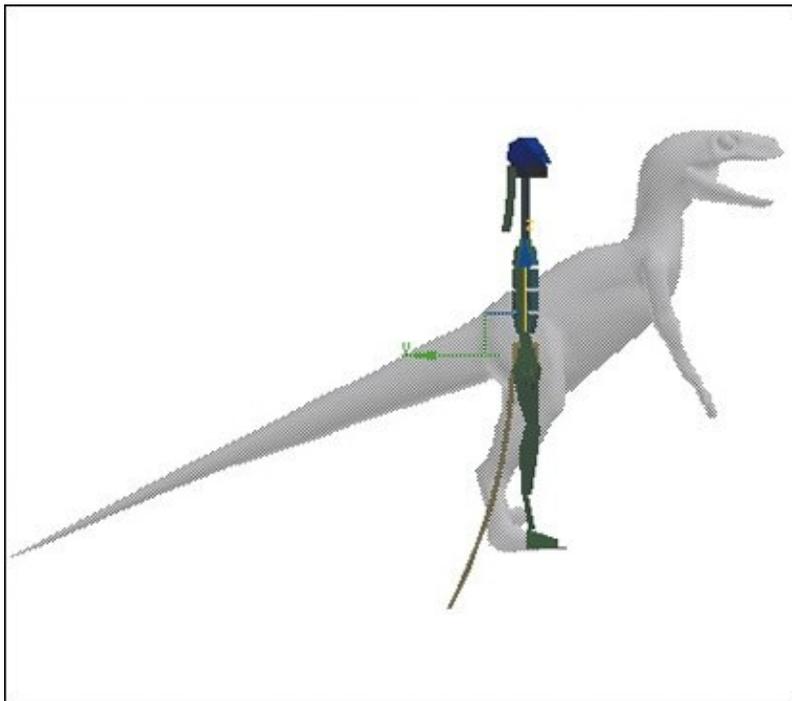
Chapter 1. Character Studio Basics

In this chapter, you'll get a character to walk around with just a few steps. Then you'll learn how Character Studio creates this animation. You'll also learn the basic workflow for working with Character Studio's many features.
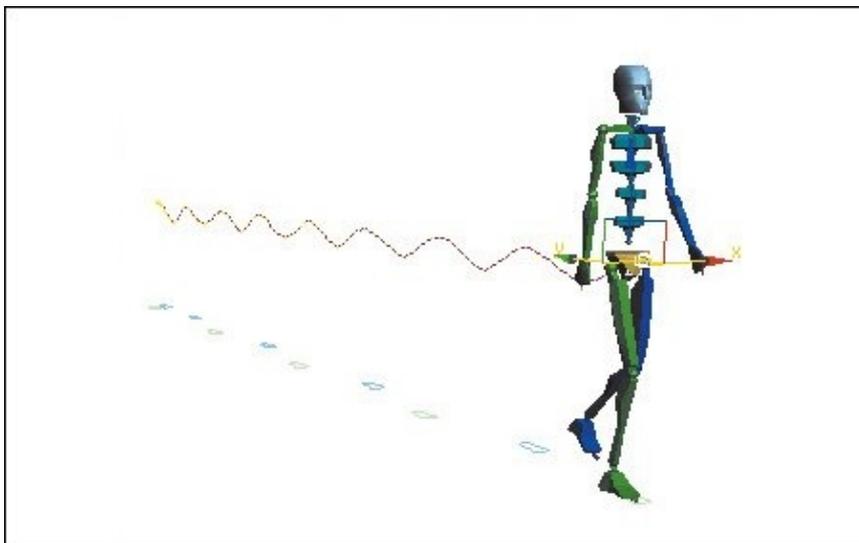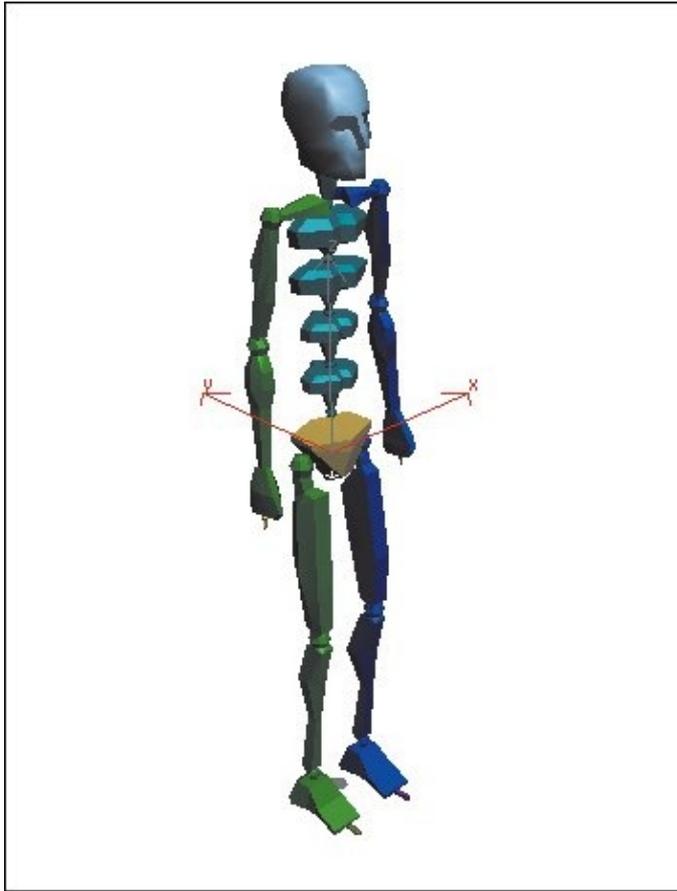
Quick Start

Want to get started right away? You can follow this quick set of steps to get some action with Character Studio in just a few minutes.
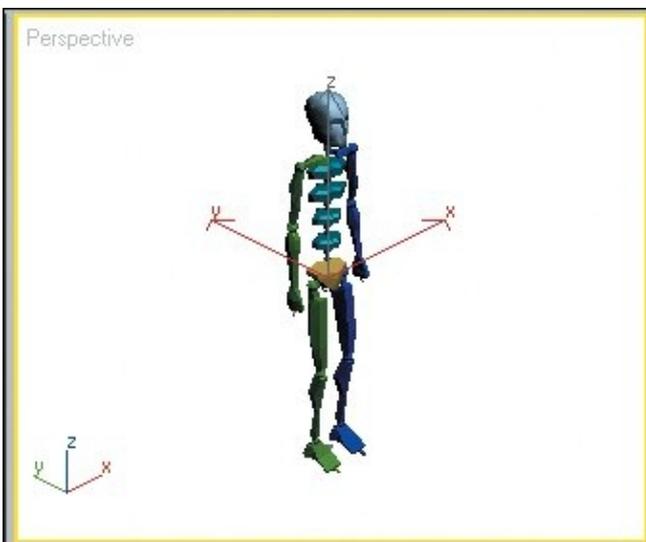
1. Create a biped. On the ⬚ Create panel go to ✳ Systems > Biped, then drag out a biped in the Perspective viewport.

2. Go to the ◉ Motion panel. As long as any part of the biped is still selected, you will see the Biped rollout.

3. On the Biped rollout click [footstep icon] Footstep Mode.

The Footstep Creation rollout appears.

4. Click   Create Multiple Footsteps. In the Create Multiple Footsteps: Walk dialog click OK.

This creates footstep icons in the scene. If you click Play Animation, nothing happens. That's because you have to create keys for the footsteps.

5. To see the footsteps better, turn off the axis tripod display. To do this, choose Views menu > Show Transform Gizmo.

6. Click   Create Keys for Inactive Footsteps.
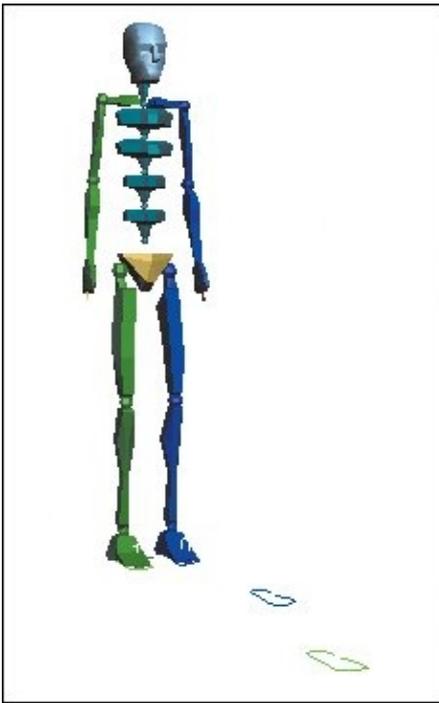
7. Click ▶ Play Animation to watch the biped walk.
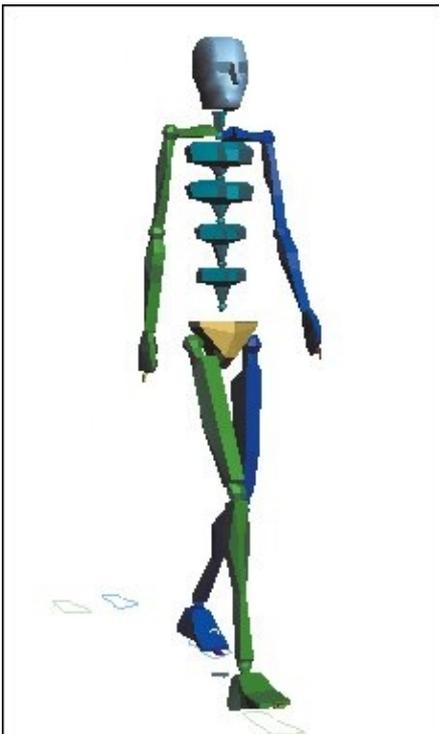
Biped Basics

A biped is a set of linked objects that you can use as a skeleton for a character. The default skeleton contains humanoid body parts such as a head, spine, arms, and legs.

Tip