

CINEMA 4D

MODELING • ANIMATION • RENDERING

Motion Sequencing

Mini Tutorial

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Tutorial Author Dirk Beichert

Layout Jörn Gollob

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MAXON Computer GmbH, Max-Planck-Str. 20, 61381 Friedrichsdorf, Germany

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Motion Sequencing

In this tutorial you will learn about possible problems with Motion Sequencing and Motion Capture data and how to handle them.

What is Motion Sequencing anyway?

It is the possibility to combine a set of motions (Position, Rotation or Scale) by mixing or by fading them into each other. An example: You have two motions, recorded by a Motion Capture system. Now these motions need to be lined up one after another without any visible transition. The following example is going to show this using two motions from the PowerMoves package of LifeForms Studio. This motion data was exported as Biovision data (.bvh) in the first step. The corresponding files are in the same folder as this text.

CINEMA 4D automatically creates a Bone skeleton when importing Biovision data. Press the play button and you'll see the skeleton move – doing either a kick or a box punch. Maybe you'll notice already that these motions each have a similar start and end position.

At this point let us take a look at the limitations you have to consider – this avoids a lot of frustration and work later on. Generally, with Motion Sequencing you can mix any motion, but you should take care that the start and end positions fit together as best as possible. Mixing a running person and one who lies down will not produce a reasonable result. It is also necessary that both skeletons have identical hierarchies. Both requirements are fulfilled by our example files.

The basic procedure with Motion Sequencing is to group the existing sequences and keys in a Motion Group.

Although it is displayed in one single sequence for the whole object hierarchy, a Motion Group still contains all the raw data.

Load the files "Kick.bvh" and "Box.bvh" into a new scene. You may unfold the hierarchies of the skeletons and have a look at all those keys (menu "Objects / Unfold All"). This load of keys is always created by Motion Capturing – for each object and frame a key is created. Don't let this confuse you – let's clean things up with Motion Groups instead.

In the Time Line, activate the first skeleton's "hips" and create a Motion Group (menu "Sequences / Group Motion"). Important note: You can only create a Motion Group if the active object contains a position, scale or rotation track itself. Motion Grouping only works with these animation types, other tracks remain untouched. Do the same for the second skeleton. Everything should look a bit clearer now, only two sequences remain.

These can now be renamed by opening the additional info by clicking the little "+" sign. Double click the empty area below the sequence to open the name dialog window.

To line up both animations you need a little more space in the Time Line. Go to "Edit / Project Settings..." and type in a total length of 100 frames for your animation. Drag the Power Slider to the very right of the Time Line to view the whole animation length.

Now Drag&Drop the kicking skeleton animation to the other one by clicking, dragging and dropping the sequence below the “Box” sequence. If it looks like in illustration 01, you’ve done it alright.

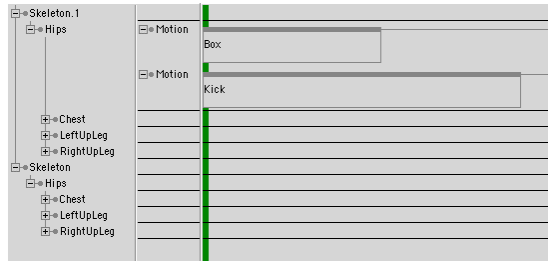


Illustration 01

Now hide the motionless skeleton in the Object Manager, it’s not needed anymore.

If your skeleton looks strange in the view window this is a precursor of the problems of Motion Sequencing and Motion Capture data mentioned above.

Nevertheless, finish this part. Move the “Kick” sequence to the right until both motions overlap just a little bit.

Next, create keys for the sequences like in illustration 02.

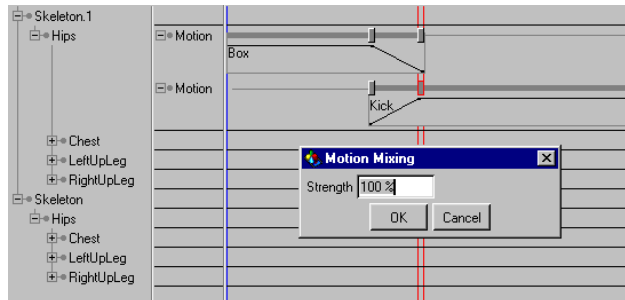


Illustration 02

When moving the time slider to the transition you will see the skeleton doing some strange contortions.

Why does this happen?

The problem emerges several steps before CINEMA 4D, it is created by the Motion Capture systems. Those apparently decide just like the weather, if e.g. a leg has an angle of 0 or 360 degrees (in fact this is of course no weather problem, but a mathematical one). When playing such an animation it makes no difference, the (optical) position of the leg is the same in both cases.

But for Motion Sequencing, CINEMA 4D calculates the median value of two overlaying keys. If a rotational key of 0 degrees is balanced with another key of 0 degrees, the result is 0 degrees – alright. If, however, a key of 0 degrees is balanced with a key of 360 degrees, the mathematical result is a median value of 180 degrees, looking at it medically – a double shin fracture.

What can be done to prevent this? In the first place you have to have a good eye to manually correct the problematic areas.

Throw away the scene you just created, it only helped us to demonstrate the problem.

Again, open one of the original files, e.g. "Box.bvh" and unfold the complete hierarchy in the Time Line. Go to "Window / Space Curves" and select the rotation track of the "Head". Use "View / Frame All" to show all three curves. As you can already see, the curves for the Y and Z rotations are near the zero line, the red curve for the X rotation, however, is at about 360 degrees. This is exactly the problem, because in the second file, "Kick", the X rotation is near the zero line.

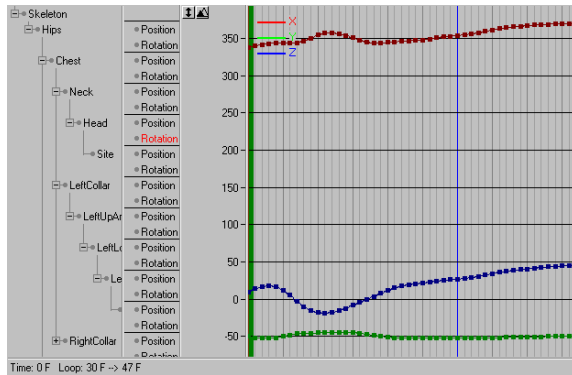


Illustration 03

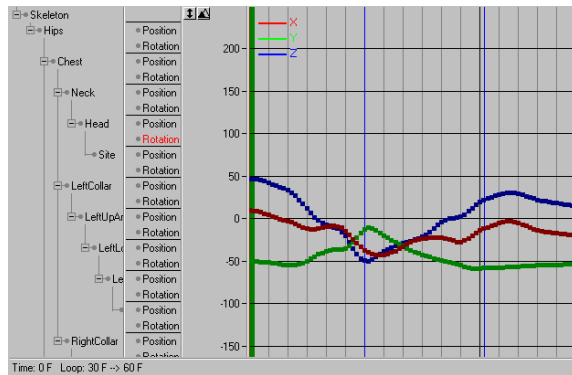


Illustration 04

We have to bring some system into all this to have all curves run in the same range of values. First, we will divide the Space Curve diagram into three ranges (see illustration 05). Green is the main range (from about -180 to $+180$ degrees), most curves should be in this range. Yellow is the tolerance range (about 70 degrees above and below the main range). Curves can be here, too, but there is a risk to run into trouble later on.

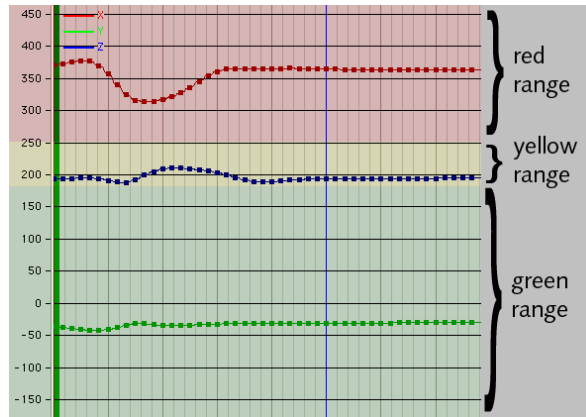


Abbildung 05

However, this depends on the project and you can't make a general decision if curves have to be moved out of here or not. Red is the *danger* zone (starting from 250 degrees below or above the zero line.) A curve is not allowed to stay here, push it off right away.

And this is how you do it: Right after having loaded the Biovision files, switch to Space Curves mode and clean all rotation tracks of the skeleton, following the principles described above.

As for illustration 05, you would select the red curve (e.g. by drawing a rectangle, or by hiding the other curves and choosing "Edit / Select All"). With "Curves / Move" you can move down the whole curve at once (put -360 into the "Data" field). You should keep an eye on the blue curve. The green curve, however, will not cause any trouble.

This sounds like a never-ending task, but with some practice this should be done in a few minutes. Sehr hilfreich ist es hierbei, sich eine kleine Befehlspalette mit Text-Icons in die Zeileiste zu legen, die die oft benötigten Befehle enthält (siehe Abbildung 06) – das beschleunigt das Arbeiten enorm.

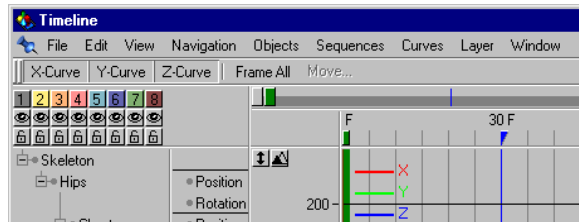


Illustration 06

A special case can occur if the Motion Capture system produces rotational jumps or 180 or 360 degrees. It then looks like in illustration 07, but can be easily solved with the same means as already explained above – only applied to a selected part of the curve. Fortunately this is not the case for our example files.

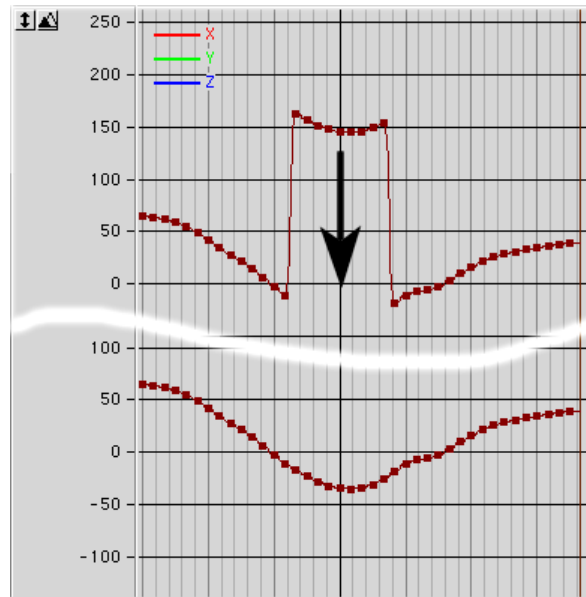


Illustration 07

You can try the whole procedure on the examples yourself, or use the prepared file "Kick_Box_cleanedup.c4d". Now create two overlapping Motion Sequences, like you've learned it at the beginning of this tutorial – et voilà.