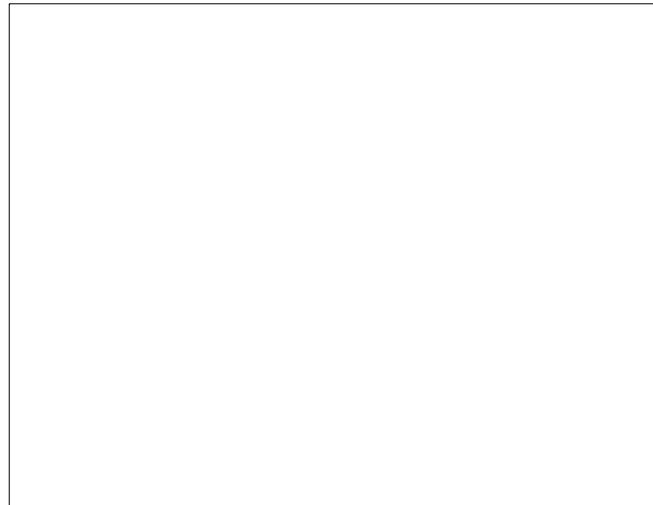


- ▼ **FACT-BVH tutorial**
- ▼ **Other Techniques**
- ▼ **File Formats Supported**
- ▼ **Known Limitations**
- ▼ **General Concepts**
  - How ElectricImage applies Imported motion
  - Fitting the Motion to the Model
  - Why Pivot Points are Important
  - Why Hierarchy is Important



## **Using Life Forms Motions for ElectricImage Projects**

Character Animation is one of the most rewarding albeit challenging type of animation you can undertake as a 3D artist. In Life Forms, however, you have an interface that allows you to forget the technical issues, and focus on creating dynamic motion for jointed models either by keyframing or by editing motion capture data. Now, you can bring in Life Forms animations into an ElectricImage project.

This tutorial describes how we set up the project "Sundancer-alive!". Sundancer Alive was created with models and animations from Life Forms 3.0. You can use the same technique to add motion into your ElectricImage projects.

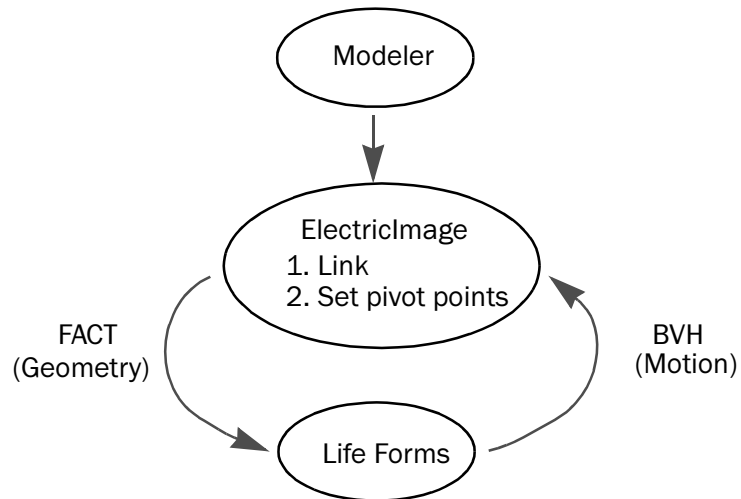
You will need **Life Forms Studio 3.0** and ElectricImage **2.8Q**. If you are using Life Forms 2.1, please ensure that you have the latest BVH and FACT plug-ins from the Credo website at <http://www.credo-interactive.com>.

# *Tutorial:* **FACT-BVH Approach: Animating Sundancer**

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## Objective

The objective of this tutorial is to animate the model Sundancer for an EI (ElectricImage) project. The illustration below summarizes how data moves between the modeler, ElectricImage and Life Forms.



## *Summary*

In this tutorial, we will import a DXF model and link it in ElectricImage. The resulting FACT model is brought into Life Forms and animated. The animation is then exported as BVH data back to ElectricImage. For other methods of transferring data to ElectricImage see [OBM-DXF technique](#).

### **Important. Please note the following:**

- 1 If you have Life Forms Classic 3.0 you will need to upgrade to the Studio version to use Life Forms with ElectricImage.
- 2 If you have Life Forms 2.1.4, please make sure that you have the latest plug-ins by downloading them from <http://www.credo-interactive.com>.
- 3 The latest plug-ins have special export options for exporting to ElectricImage. Please also note that the changes in R patch version of ElectricImage 2.8 cannot be used in this tutorial. Please use an earlier release, for example ElectricImage 2.7.5Q or 2.8P.

## Conventions and Files used

At the end of each step, the name of the resulting file is given. You can find all files used in this tutorial in the Life Forms & ElectricImage folder that you downloaded.

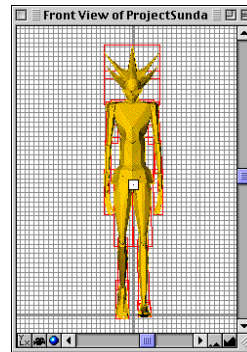
We will be working in ElectricImage and Life Forms. To make it clear which application is being used at each step is marked in the right margin.

### Step 1

ElectricImage

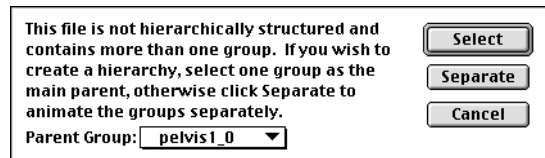
## Importing Sundancer

Sundancer was built so that it imports into EI facing forward, and standing upright in the Front view window.

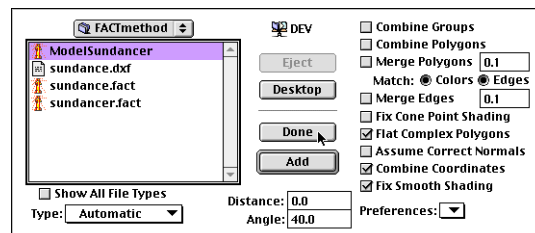


Import Sundancer.dxf into a new EI project by choosing File menu > Add model > FACT. The dialog box for converting a model to FACT format appears. Click Add. You will then be asked to name the converted FACT file.

In the dialog box that appears, select pelvis\_0 as the *Parent Group*. Click Select. In the Model conversion dialog box click Done.



*Select a Parent Group*



*Click Done to close the dialog box*

## Step 2

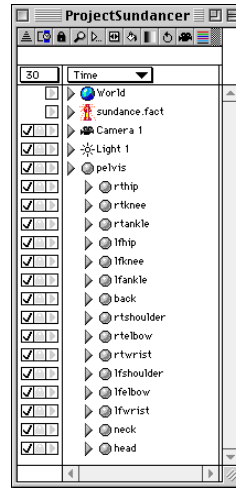
ElectricImage

Result: ProjectSundancer

### Linking Sundancer

The next step is to link Sundancer.

In the Project window, you'll see all of Sundancer's joints. Each joint is a separate object that needs to be linked together in a hierarchy.

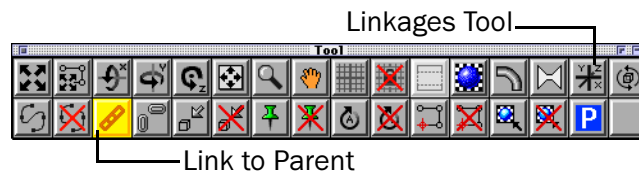


Project window

Think of a hierarchy as several chains of joints that eventually meet at the root joint or *Parent group*. For human models, the Parent group is almost always the Pelvis or hip.

It's easiest to begin at the extremities, for example the foot, and work towards the pelvis.

Select the right foot by clicking on its joint name, *rtankle*, in the

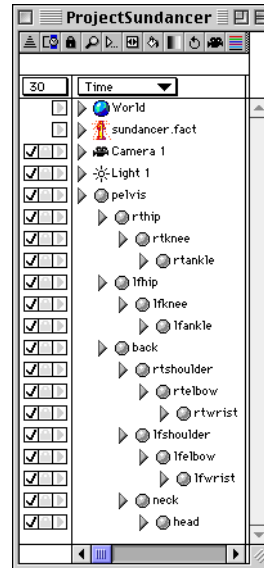


Tool Palette

Project window. Now click on the Link to Parent tool in the Tool Palette. Next click on *rtknee*, which is the right lower leg. You have just linked the ankle to the model's lower leg.

Notice that the *rtankle* is now indented under *rtknee*. Repeat the process by linking the *rtknee* to *rthip*, and *rthip* to the *pelvis*. Then, link each chain of joints until all joints are linked.

The finished hierarchy will look like this:



*Result:* 1\_ProjectSundancer

### Step 3

### Setting Pivot Points

ElectricImage

The next step in setting up the model is to set the pivot points of each joint or object.

In the Project window, click on a joint name to select it. Click on the Linkages Tool in the Tool Palette. This opens the Group Link window. Check that the Link type is Free and inherit Position,



position of the pivot point.

*Result:* 2\_ProjectSundancer\_linked

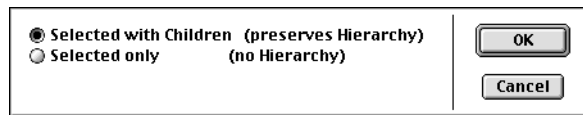
## Step 4

ElectricImage

### Exporting the Model

We are now ready to export the model to Life Forms.

In the EI Project window, select the Pelvis (Parent Group) of Sundancer. Export the model using File > Model > Fact. A dialog box will appear, asking if you want to preserve the hierarchy. Yes we do. Click OK.



*Result:* 4\_ModelSundancer (a Fact model)

## Step 5

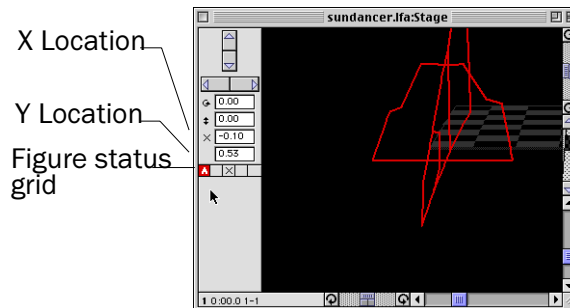
Life Forms

### Importing the Model

In Life Forms, open a new animation by choosing File menu > New Animation.

Now import the ModelSundancer into Life Forms, choose Import Figure command.

Because Life Forms converts Granger units from ElectricImage to Meters, Fact models are very large when imported into Life Forms. You will need to resize the models in Life Forms.



*Life Forms Stage window showing model's foot*

## Step 6

Life Forms

### Scaling the Model

Select the model by clicking on it in the Stage window. If you cannot find it in the Stage window, you can select it by clicking on the letter A in the Figure Status grid. This is the figure's shortname.

To scale the model choose Figure menu > Height and Scale. Scale the model to a manageable size, for example 1.7 meters.

Step 7  
Life Forms

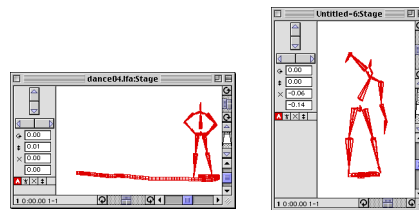
You may have to reset the location on the stage to 0,0, so that the model is centered on the stage. Enter 0 in the X and Y Location fields in the Stage window.

*Result:* 6\_Sundancer.If

### Applying Mocap

You can animate the model in Life Forms by pasting keyframed animation from PowerMoves I, by pasting motion capture data to the model from PowerMoves II, or by creating new keyframed animations from scratch. Note: PowerMoves I and II come with Life Forms Studio v3.0.

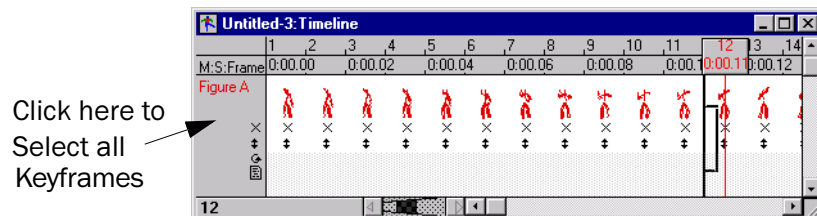
Here, we will use two mocap sequences that come with Life Forms: Dance.bvh, and Dance4.bvh.



*Two mocap sequences in Life Forms with paths displayed*

First, open Dance.bvh.

Next, in the Timeline window of this animation, click the grey panel to the left of the figure's animation. This selects all the keyframes in the animation.



Copy the keyframes from the Timeline of Dance.bvh to Sundancer by choosing Edit menu > Copy. Position the insertion point in the first frame of Sundancer's Timeline by clicking on Frame One. Then choose Edit menu > Paste.

The Joint Map editor will open to allow you to map the BioVision Stick figure to Sundancer. Map the mocap data to Sundancer by

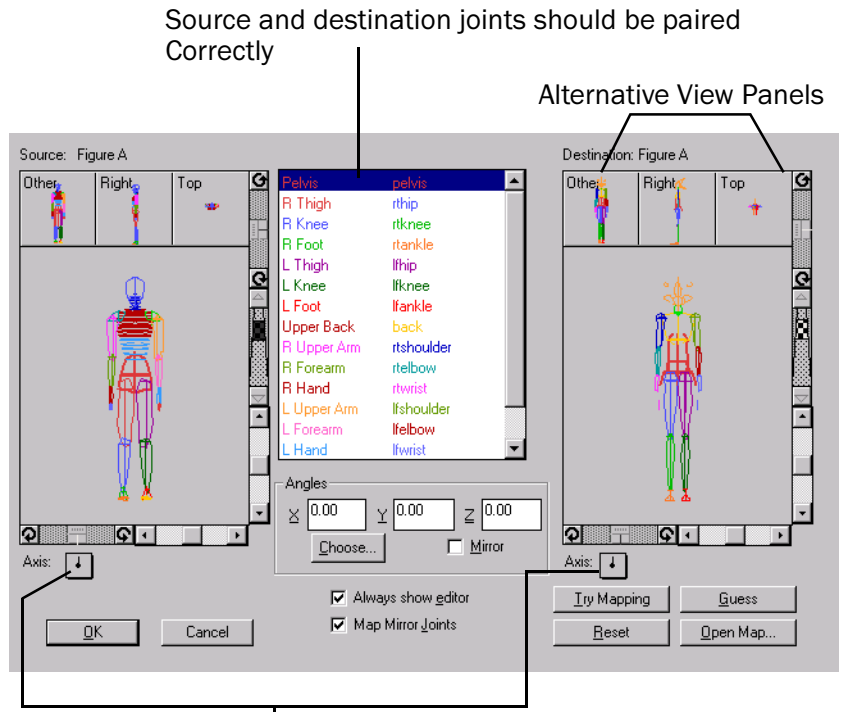
- Matching up the joints of the two models, and make sure that ori-



entation of Sundancer's joint axes are correct.

- Checking that the joint axis of the source and destination models lie along the joint, and point in the direction the joint is pointing. Use the Axis indicator to do this. You may have to change views by clicking on the alternative view panels.

Then, click OK



Source and destination joints should be paired Correctly

Alternative View Panels

Axis indicator for joints should point in the direction of the joint.

*Result:* 7\_Sundancing.lfa

Note Detailed information about mapping motion capture data to models is given in the Life Forms 3.0 User Guide.

Step 8  
Life Forms

### Adding More Mocap

Now, to append the second mocap sequence to Dance.bvh.

First, open Dance4.bvh.

In the Timeline window, click the grey panel to the left of its keyframes.

Then, choose Edit menu > Copy. Now, position the insertion point after the last keyframe in Timeline of Sundancer by clicking on the frame.

Step 9  
Life Forms

You can now paste the mocap sequence by choosing Edit menu > Paste. We added a few empty frames between the sequence to slow down the transition.

Voila! Sundancer is now dancing!

Now that we have the animation we want, how do we get it into ProjectSundancer?

### Exporting Motion

You need to export the animation in BVH file format. Choose File menu > Export. Select BVH from the Export Format list.

Be sure to check the following export options:

- Scale to Original Size
- Export in Meters
- Use Left Hand Coordinate System

*Result:* 8\_Sundancing.bvh

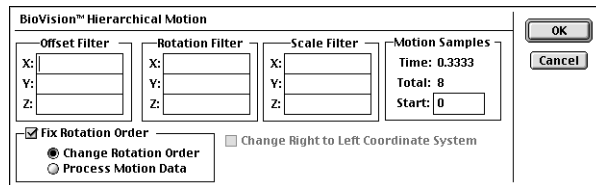
Step 9  
ElectricImage

### Importing Motion

Now to import the BVH motion data in to ProjectSundancer.

In EI, choose File menu> Add> Motion > BVH. Find sundancing.bvh – the file we just exported.

A dialog box appears. The option Change Right to Left Coordinates is greyed out. Do not select this option. We have already corrected this problem by exporting the BVH in the Left Hand coordinate system.



The Fix Rotation Order option may also be greyed out. This option is unavailable when there is a perfect match in the rotation order of each joint and the rotation order of the motion data in the BVH file.

If the rotation order needs to be fixed, the option is available and is selected by default. When Fix Rotation Order is selected, ElectricImage will the change the rotation order of all the joints to match the motion data. This is desirable. Click OK.

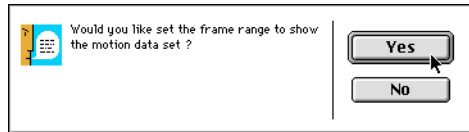
ElectricImage imports motion data as Custom keyframes. Its motion path cannot be manipulated by editing the splines using the Function curve editor.

## Step 11

ElectricImage

### Setting Frames to Show

Another dialog box appears, asking if you want to set frame range to display the motion data. Click Yes.



## Step 12

Now the moment of truth. Will the motion data work in ElectricImage? Have no fear:

The animation from the BVH file maps to the model automatically. Sundancer is poised to dance.

*Result:* 9\_ProjectSundancer\_Finish

Congratulations! You have successfully completed the tutorial. You now know how to bring exciting Life Forms animation data into ElectricImage.

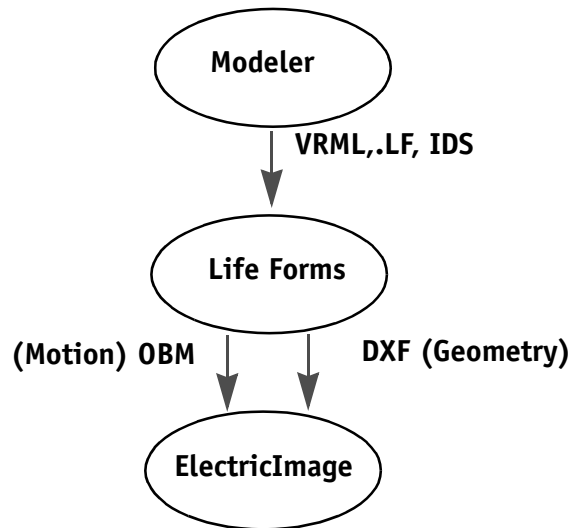
You are now ready to set up your lights and cameras, add props, apply textures and colors and render your animation using ElectricImage's quality rendering engine.

## Other Techniques

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### OBM-DXF technique

Aside from the FACT-BVH method, you can also use the DXF-OBM method. The illustration below summarizes how data moves between Life Forms, ElectricImage, and the modeler



This technique allows you to work with models that you can't bring into ElectricImage but are already in Life Forms. This is a direct way of exporting animation and models to ElectricImage.

There is one limitation, however, the animation imported is defined as custom keyframes in absolute values for separate objects and is not easy to reposition in ElectricImage. You can work around this limitation by:

- Animating all your models in Life Forms, setting up the interaction in Life Forms before exporting the OBM motion data.
- Merging separate project files with imported animation and models into a single file. Use a parent world effector when merging, then reposition and scale the parent effector of each merged project, as needed, once all the ElectricImage projects are merged into a single project. This approach enables you to create multi-figure animations, and still retain the interaction of the animated models.

To export model and geometry to ElectricImage from Life Forms, simply export a DXF(model) and OBM (motion) file for the animation. To export choose File menu > Export.

When exporting DXF files, check the following options:

- Default Shape Only
- Append Figure Index to Joint names

When exporting OBM files, check the following options:

- Append Index to Joint names
- Fix Center Points

# File Formats Supported

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## Model geometry

### DXF

The DXF file format allows you to export model geometry from Life Forms to ElectricImage. This file format exports the surface shape or geometry for each of the model's joints. However, it does not export important information such as hierarchy, and pivot points. DXF models can be animated in ElectricImage by applying absolute motion but not relative data.

**Note** ElectricImage converts DXF files to a FACT file, and then reads the model from the FACT file.

### FACT

Life Forms imports models from FACT files exported by ElectricImage. You can use FACT files to import models from ElectricImage into Life Forms. When a FACT model is imported into Life Forms, it will have the same joint names, pivot points, hierarchy and orientation as the model in ElectricImage.

## Animation data

Animation data can be keyframed Life Forms data, motion capture data modified in Life Forms, procedurally generated walk sequence data or any combination of these.

All motion data file formats below store motion of each joint as separate streams of information. BVH, OBM and BVA have similar formats for recording motion data: they list the joint name, and under it, they list the position of the joint at each frame in rotation angles.

Motion data for each joint can be stored as either a relative or absolute rotation. Relative means that the position of a joint is described relative to its parent's axes, where as Absolute means that the position of a joint over time is described relative to a constant global axis. The benefit of motion data that is stored in absolute rotations is that it can be applied to models that are not linked.

ElectricImage imports motion data in the following file formats as custom keyframes. Custom keyframes differ from normal keyframes in that their motion paths cannot be manipulated as splines in ElectricImage.

### **BVH**

The BVH (BioVision Hierarchical Motion Data) file format is a text file format that stores motion data. BVH stores motion data as relative rotations. BVH files stores descriptive information such as joint names, hierarchy information (relationship between joints), and the position of the joint's pivot points relative to its parent joint (joint offset). This means that BVH will only apply correctly to models which have the same hierarchy and pivot points.

### **BVA**

The BVA file format is the same as the BVH file format, except that motion data is stored as absolute data, that is the rotation angles are given relative to a global axes. Like BVH, it also stores the joint names, hierarchy information, and pivot points of each joint relative to its parent. This format is used by applications that support deformation based on absolute rotations, for example Pixel Putty.

### **OBM**

The ElectricImage OBM file format stores animation data as absolute rotations. This means that OBM data can be applied to models that are not hierarchically linked.

## **Known Limitations**

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### 1 ElectricImage 2.8R

The technique of transferring animation to ElectricImage using FACT for geometry and BVH for motion data works for versions of ElectricImage released before 2.8R, for example, v2.7.5Q, v2.8P and v2.8Q. The FACT-BVH technique does not work in 2.8R because FACT files it exports causes pivot points to be shifted to incorrect positions in Life Forms.

### 2 Custom Keyframes

ElectricImage treats imported BVH and OBM motion data as Custom keyframes. One of the limitations of Custom keyframes is that they cannot be edited using the Function Curve editor - a new feature in v2.8.

### 3 Bones

In version 2.8, ElectricImage introduced support for bones-driven animation. Unfortunately, the implementation is not complete enough to allow you to use motion capture data to animate a complex character. Thus, the most reliable way of getting motion data into ElectricImage is still to apply motion data as Joint motion to jointed models.

# General Concepts

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## How ElectricImage applies Imported motion

The key thing to remember, is that the model and motion data must *match*. What do we mean by *match*?

Life Forms exports animation in the BVH and OBM file formats which store motion data on a joint by joint basis. When these files are imported into ElectricImage, EI automatically applies the motion data by comparing the **joint names** with the same information in the model in the EI project. It may also compare **pivot points and hierarchy** in the motion file.

If there is a discrepancy in the joint names, an error message will appear, and the motion data for those joints will not be applied.

If there is a discrepancy in the pivot points or hierarchy, the data may not be applied to the geometry or may be applied but the resulting animation will be incorrect.

## Fitting the Motion to the Model

Another aspect of matching motion to models in EI, is the *fit*. How well will the motion fit the model? The main factors that affect the fit are the:

- Position of the joints pivot points, and
- Hierarchy of the model.
- Size of the model and motion

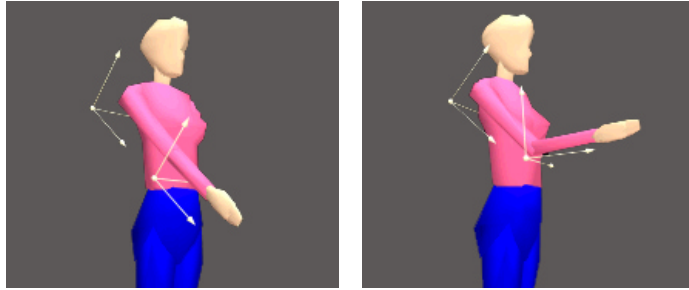
## Why Pivot Points are Important

To understand how pivot points affect the motion applied to the model, you have to understand how motion data is described. The position of a joint is described as the angle of rotation around the joint's pivot point. When motion data is applied it rotates the joint around the pivot point defined in ElectricImage. Thus, when the pivot points of the model are wrong, the motion data will rotate the joint incorrectly. It may cause the joints to over or under rotate, or it may cause joints to break off from adjacent joints.

## Why Hierarchy is Important

The axis of each joint is relative to the position of the joint. Another way of expressing this concept is that each joint has its own local axis. The axes of a joint changes depending on the position of its

parent joint that comes before it (e.g. the upper arm is the parent of the lower arm). Consider the illustration below.



Some motion data file formats store relative instead of absolute rotation angles, for example BioVision BVH format. Relative rotation angles are the angles of rotation given relative to the parent joint's local axes. When motion data is recorded in this way, the model that the data will be applied to must have the same hierarchy as the data in the motion file.

### *Summary*

To keep things really simple, we recommend that you generate the motion data using the exact same as you will be applying the motion to in your EI project. This way the model and motion data will have the same:

- Joint names
- Same pivot points
- Hierarchy