

## Creating Scenes and Characters for Virtools in OpenFX

### Scenes

Scenes are straightforward: In Virtools use the *Resources->Import File As->Scene* menu command and select the .MFX (OpenFX model) file containing the scene. The scene will appear as a single 3D Object in the Level Manager.

### Characters (and character animations.)

Characters can be imported in two ways, as a collection of morphs from different .MFX model files. Or as a Skinned Skeleton with Bones and joints. Both of these approaches provide a single character and a collection of animations that apply to the character.

To use the character importation option use *Resources->Import File As->Character* menu command in Virtools. Once the *load as character* option has been selected, the file open dialog will show all available .MFX files and all files with the extension .SEQ. The .SEQ files are used to define a morphed character animation. Alternatively, selecting an ordinary .MFX file to load as a character will imply that a special OpenFX animation script is available containing details of the animation of a figure with bones and joints (see the details below.)

### Morph Characters

To import a morph character select the .SEQ file containing information about the .MFX files making up the various animations pertaining to the imported character. A typical .SEQ file will look like this:

```
RedPerl
3 2.0 Walk
0.0
c:\programs\vr\virtools\mfxmorph\m0.mfx
1.0
c:\programs\vr\virtools\mfxmorph\m2.mfx
2.0
c:\programs\vr\virtools\mfxmorph\m0.mfx
3 2.0 Run
0.0
c:\programs\vr\virtools\mfxmorph\m0.mfx
1.0
c:\programs\vr\virtools\mfxmorph\m1.mfx
2.0
c:\programs\vr\virtools\mfxmorph\m0.mfx
3 2.0 Step
0.0
c:\programs\vr\virtools\mfxmorph\m3.mfx
1.0
c:\programs\vr\virtools\mfxmorph\m1.mfx
2.0
c:\programs\vr\virtools\mfxmorph\m3.mfx
0 0.0 END
```

In the example above three animations for a character called *RedPerl* are defined. They are called Walk, Run and Step respectively. The first, called Walk, consists of 3 steps (3 models) with the sequence lasting for 2 seconds. This is defined on the line: `3 2.0 Walk`

On the next line, the time of the morph model is given (0.0 in this case), immediately following that, is the name (including full absolute path) of the .MFX file defining the first model in the sequence. (All textures, material and maps are loaded from this file.)

Following on from this are two additional set of time instant and morph file.

Once the 3 sequences have been loaded this animation is complete and the next animation begins.

When all the animations are completed a value of 0 is used for the number of animations in the sequence.

Going back to the example file, following the Walk animation, a 3 sequence animation called Run is provided. And after that, a 3 sequence animation called Step.

The process is brought to an end by the line. 0 0.0 END (The first 0 tells the importer that there are no further morphs.)

It is important to note that **every** OpenFX module used to define the animations for a character **must** have the same number of vertices.

### Skeleton Characters (Robots in OpenFX)

In OpenFX the most suitable actor to use to create Virtools characters is the *Robot*. A menu command in OpenFX's animation module (*Fille->Export->Robot Key Frames*) will create a special script .SCR file from the animation or one or more Robot actors in an .OFX file. This script will be requested by the *Virtools importer* after selecting the Robot's .MFX model file. (A folder with files containing details of the character poses will also be created. – This folder and .SCR file can be deleted after importation.)

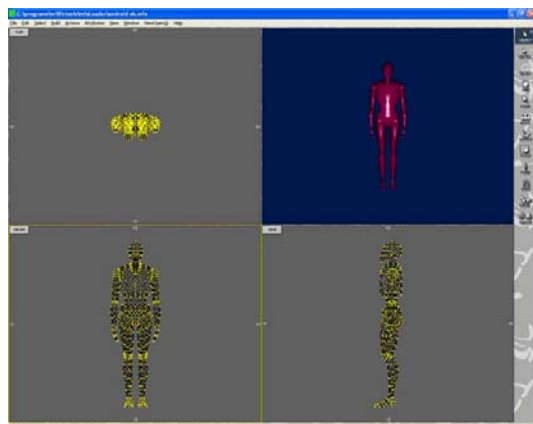
There are many ways in which one could consider making all the necessary animations for a particular character, but the protocol that we feel offers the easiest solution is as follows:

- In the Designer module, make a model of the character, including textures, maps and material. Add an appropriate skeleton, assign the model's vertices to a specific bone in the skeleton, save the model in a .MFX file.  
**Note: When modelling, make sure the Root node of the Skeleton is placed exactly at the origin of the coordinate system. Do NOT assign any vertices in the Skin mesh to the root node.**  
**The forward direction is along the Y axis (front) axis. Set up a coordinate system than gives the character size (e.g height) in Virtools Units (m) Thus make humanoid figures approx 2 OpenFX units high.)**
- Move to the Animation module. Create a *Robot* actor, using the model made in the Designer. Name the *Actor* according to the animated sequence it is to represent. E.g. Walk, Run, Wait, Step etc. etc.
- Make the animation as long as it will take to play out the action, at 25 frames per second
- Make as many keyframes on the Costume timeline as is necessary to represent the action.
- To make other animations for this character add additional Robot actors (all using the same .MFX model) give them appropriate names and set-up their keyframe poses.

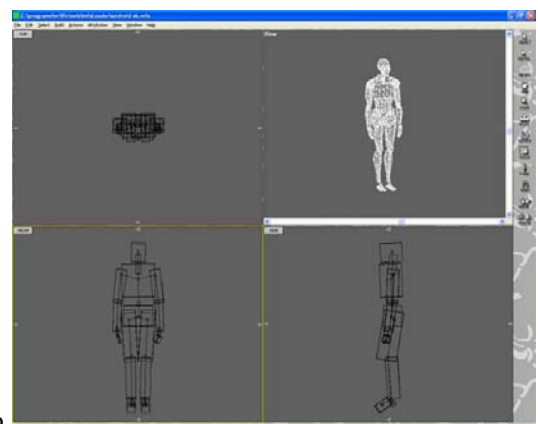
Once all the actors are in place write the special script file. (*Fille->Export->Robot Key Frames*). Now that you have the .MFX file and the script .SCR file, the character is ready to be imported to Virtools.

In Virtools, execute the *Resources->Import File As->Character* menu command. Select the .MFX file, you will be then asked for the .SCR file, choose the one you exported from the OpenFX animation module.

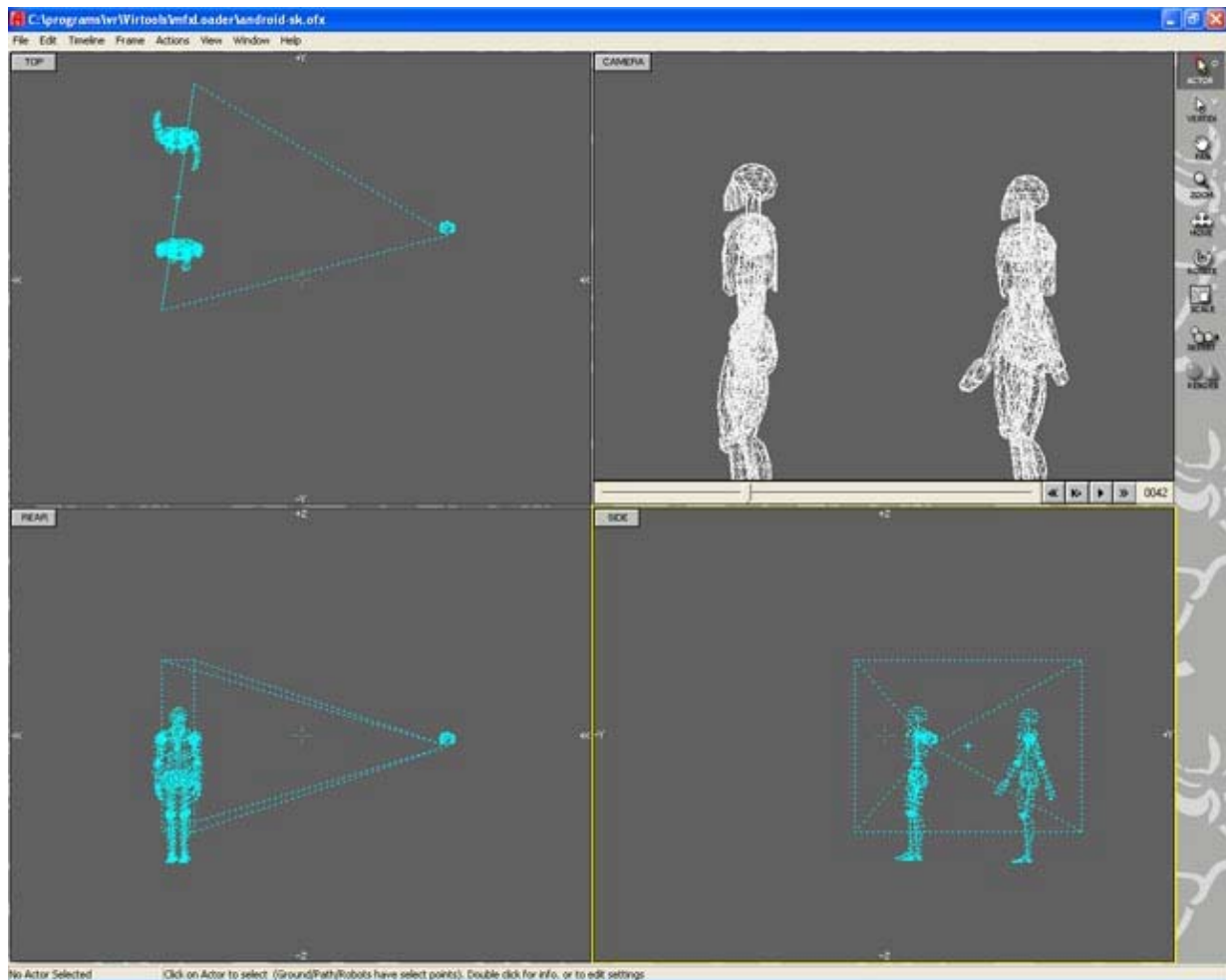
For example suppose you built this android model in OpenFX's designer module:



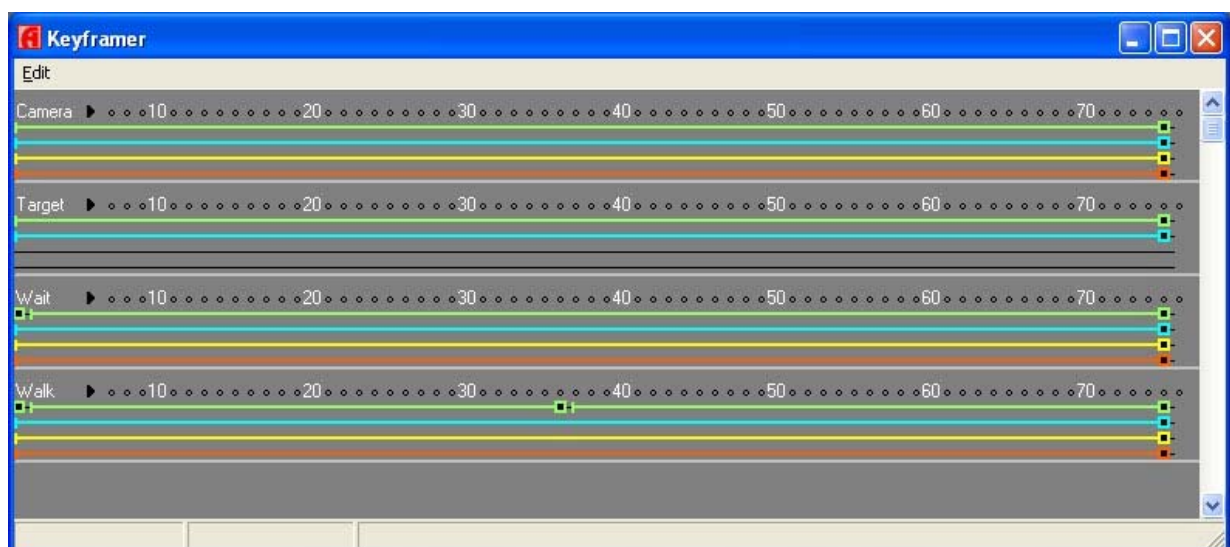
with a Skeleton



In the Animation module, the same .MFX model is loaded for two Robot Actors (they can be placed anywhere in the scene that is convenient. It is their *keyframe poses* that are important. In the example below, two Robot actors named Walk and Wait have been created. The animation length has been set to 3 sec (75 frames). This means that in Virtools the character animation will cycle through its steps every 3 seconds.



The Keyframer shows the timelines for the actors.

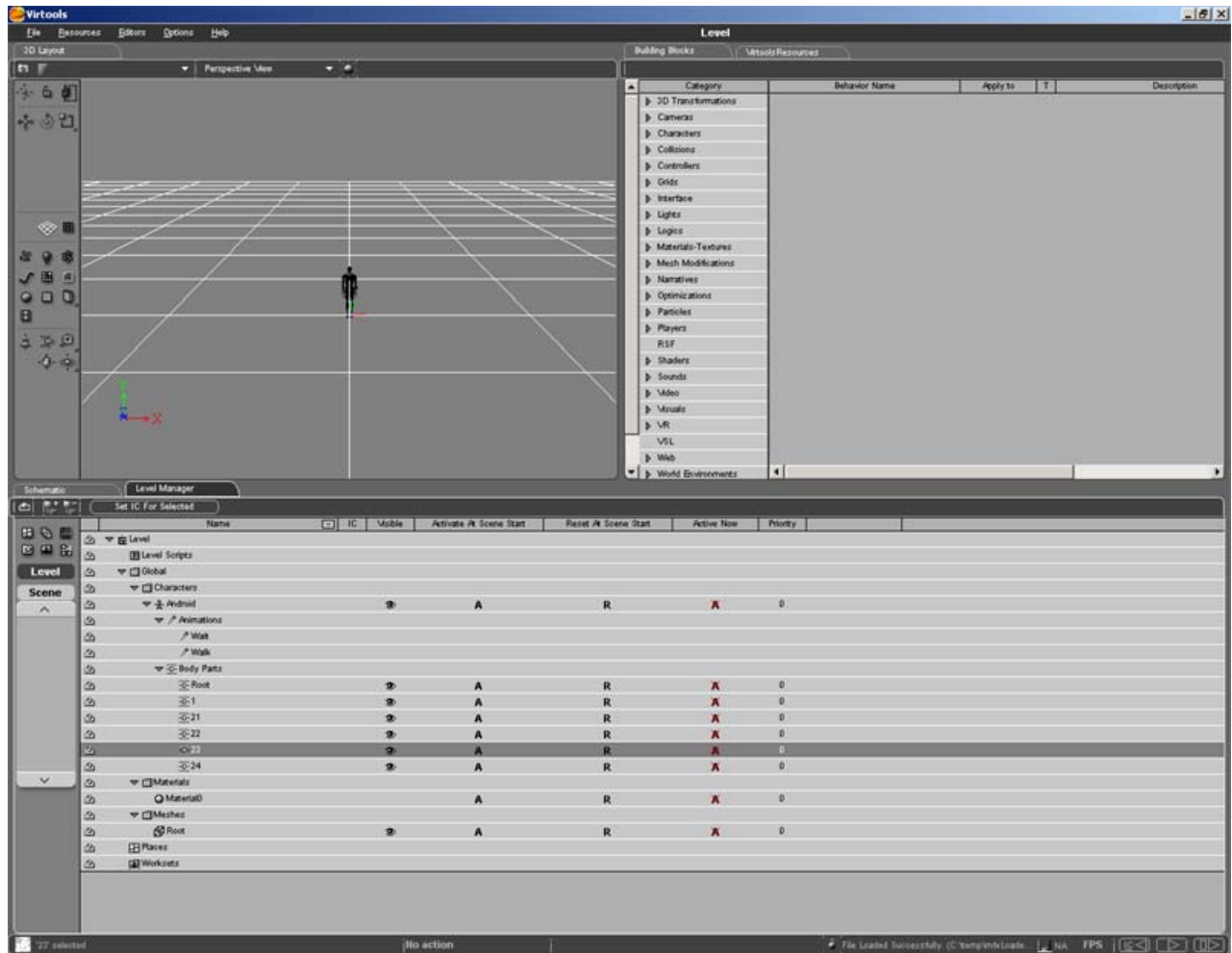


Robot actors *Walk* and *Wait* appear after the *Camera* and *Target*. The camera and Target will be ignored when the script is created.

Looking at the timelines for the Wait actor one can see that it is made up from two poses, one at frame 1 and the other in frame 75. The Walk actor has three key poses at frame 0, 36 and 75.

(If an animation requires fewer than 75 frames, just drag the last keyframe back to the appropriate frame.)

Once this script and model data file are imported into Virtools they will appear as a single character named after the Script file. The body parts will be named after the skeleton bones, and two animations named after the Robot Actors.



For information, the special script file looks like:

```

2 20 (No of anims, Max no of Keys)
Android (Name of character)
Wait (Name of Anim)
2.960000 0.0 (Seq time and forward motion offset)
2 (No of Keys in this anim)
0.000000 c:\temp\mfxLoader\Android.skd\1.0 (Time of Key and file)
2.960000 c:\temp\mfxLoader\Android.skd\75.0
Walk 2.960000
3
0.000000 c:\temp\mfxLoader\Android.skd\1.1
1.400000 c:\temp\mfxLoader\Android.skd\36.1
2.960000 c:\temp\mfxLoader\Android.skd\75.1

```

This data could be 'tweaked' using a text editor if required, e.g. to change the timings, it has a similar form to the script for the morph characters.

The process described above (for Skeletons) will produce character animations that *play-out* in situ. The figures they apply to will not move automatically (e.g. in a walking animation the legs will move but the character will not advance forward.)

For many Virtools applications this will be acceptable behaviour because the movement will be implemented with Translation and Rotation BBs. When using other BBs – e.g. character curve follower, or Character Controller it will be necessary to build in a step-size-offset to match the rest of the motion.

### **Characters with offset motion.**

Building a character animation with an offset can be accomplished in the OFX animation by using the position-time line. Set an additional Position keyframe in frame 1 of the animation. (There will already be a Position keyframe in the final frame of the sequence.)

Once the motion of the animation sequence is designed, move to the time of the last keyframe and position the character so that it moves forward (along Y) by an amount that matches the movement of the animation.

For example, if a 2m tall character steps forward by 0.5m during each repeated step (over a time period of 1s), position the Robot actor at (0.0,0) in frame 1 and at (0,0.5,0) in frame 30.) After importation into Virtools the character will move forward at a rate of 0.5m/s.