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**Introduction**

To give you an idea of how modeling in Xfrog works, the software is delivered with a number of demo models. By analyzing these models you can gain an insight into the basic modeling strategies. We also provide tutorials giving a step by step explanation of how to realize some of the models shipped with Xfrog. You may use them as a first approach to become familiar with the program and develop your own models.

If you have any questions on the installation of the software, the interface and the different elements of the program please refer to the reference manual. The reference manual also explains the components, their parameters and their effect on the model.

Before you start building a new model you should have a short look on the structure of the object your are going to build. This helps you planning and setting up the model hierarchy. The model hierarchy reflects the architectural structure of the object you are building.

**Flower Blossom**

The aim of the “Flower Blossom” tutorial is to familiarize you with the animation possibilities of Xfrog. Here we will show you how to animate the growth of the plant that you already know from the “Simple Flower” tutorial. The animation in Xfrog works with keyframes. Every keyframe contains a description of the entire model. The keyframes are arranged on a timeline and the different model descriptions become states of the same model at different times. The intermediate values between the keyframes are automatically interpolated by Xfrog. In this way you can produce seamless morphings, growth animation, moving organic shapes etc.

The animation “Flower blossom” can be found in the directory Models/Xfrog Animation Models/Flower blossom.xfr. The flower model on which this animation is based can be found in the subdirectory “Models/Xfrog Plant Models/SimpleFlower.xfr.

**Launching Xfrog**

Go to the “Start” menu and select “Xfrog” from the “Greenworks” directory. The program is started and shows an empty “Hierarchy Editor” where you can start building your model.
Step 1

Open the model “Simple Flower” that you already may have created in the tutorial “Simple Flower”. Select “Open” from the “File” menu in the main menu to invoke a file-open dialogbox. Here you go either to the model you already built or to C/Program Files/Greenworks/Xfrog 3.21/Models/Xfrog Plant Models/SimpleFlower.xfr (this path is the default of the Xfrog-Installer, if you have specified another location to install Xfrog, the pathname may be different). When the file is opened you see already the entire hierarchy in the “Hierarchy Editor” window.

Looking at the “Animation Editor” window you see the timeline with two keys, the first key at the beginning of the timeline and the last key at the end. These two keys are always existing and cannot be deleted. They are defining the initial state of the model and the last state. Between them you can insert as many keys as you want to create intermediate states. The keys contain descriptions of the model in certain states (a specific parameter constellations). The model hierarchy is the same in all keys whereas the parameters of the different components, the hierarchy consists of, can vary. Thus changes to the model hierarchy affect every key in the timeline and changes to the parameters only affect the active key.

By default the first key is active and the “Model View” window displays the initial state of the model. All parameter changes made to an active key are automatically stored in this key.

When you start building a model all the parameter settings you make are only stored in the first key, the last key will contain the same model hierarchy as the first one but with the default parameters of the components. When you are using the flower you built in the “Flower Simple” tutorial you will find, after hitting the “Play” button in the “Animation Control” window, that you already created some kind of animation: An interpolation between the flower you built and the model with the default parameters.
To make the two keys equal you have to copy the first key and replace the last key with this copy.
The first key selected click the “Cpy” button in the “Animation Control” window to copy the first key. A second key appears in the timeline next to the first one.

![First key is selected…](image1)

…and after copying a second key appears.

Then select the last key and move it to the left (back in time). Then drag the copy of the first key to the end of the timeline.

![Move the last key…](image2)

…and replace it with the copy.

Then select the second last key (the one you moved back in time) and click the “Del” button in the “Animation Control” window to delete the key. Now the two keys are the same and when you again click the “Play” button you will see no changes anymore throughout the animation.

*Tip:*
*When you are using the “SimpleFlower” model that is shipped with Xfrog, the two keys are already the same.*
Step 2

As you are animating the growth of the flower the current state should be the last state. The begin of the animation should be a small flower just breaking through the earth and starting to grow. Thus you have to change the parameters of the first key in order to make the flower small. Select the first key in the “Animation Editor” window and then select the “Horn” component in the “Hierarchy Editor” window. In the “Horn” tab of the “Parameter Editor” window go to the “Length” parameter and reduce the length of the stem.

The “Length” parameter is not passed on in the hierarchy so the other components are not scaled or adapted to it in any way. The result is that the blossom is now lying on the ground.
Step 3

To adjust the size of the blossom you have to select the “Simple” component in the “Hierarchy Editor” window and then go to the “Basic” tab of the “Parameter Editor” window. Switch the “Lock Scale” radio button at the bottom of the window to “on” to allow for proportional scaling in all directions. Then decrease the “Scale” values.

In this case the scaling information of the “Simple” component is passed on to the successor components. This is a characteristic of the basic scaling that is available with every component in the “Basic” tab. But the scaling information is only passed on to the successors of the “Simple” component, the second branch of the hierarchy is untouched.
Step 4

Reduce also the size of the second branch of the hierarchy by selecting the “Horn1” component and going to the “Horn” tab in the “Parameter Editor” window. To make the twigs grow, they should be very short in the beginning and then grow throughout the animation. To achieve this, decrease the “Length” parameter as you already did with the “Horn” component.

Again this parameter is not passed on in the hierarchy and the leaves are still big.
Step 5

Select the “Leaf1” component and go to the “Leaf” tab in the “Parameter Editor” window. First decrease the “Length” parameter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>0.001</td>
</tr>
</tbody>
</table>

The leaves are now short but still a big, flat thing. To prevent this, reduce also the “Scale X” and the “Scale Y” parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale X</td>
<td>0.33</td>
</tr>
<tr>
<td>Scale Y</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Now click the “Play” button in the “Animation Control” window to view the animation you created. The result is a continuous interpolation between a very small flower and a big one. This is pretty nice but has nothing to do with natural growth. This result could have been achieved much easier by only inserting a “Simple” component as the first component in the hierarchy and applying a basic scaling to it.

In nature the first step of a growing flower is a tiny shoot that comes out of the earth. The shoot grows and small leaves are coming out of it. The leaves grow and after a certain while a bud is produced. The bud grows and the first petals are becoming visible. Then in a next step the petals grow until the blossom comes into full flower.

To simulate a natural growth process you have to work in detail on the successive development of the different parts of the flower.
Step 7

To realize different steps in the animation you have to create new keyframes. The easiest way to create new keyframes is to double-click the timeline at the position where you want to have a new keyframe. You can also click the “New” button in the “Animation Control” window or select “New Key” from the context menu of the “Animation Editor” window (available with the right mouse button).

The parameters contained in the new keyframe are automatically interpolated according to the position of the keyframe in the existing animation.

Tip:
The possible positions where you can create keyframes are defined by the number of frames your animation consists of. This value is displayed in the “Frms” field in the “Animation Control” window. The default setting is 100 frames which allows for a flexible positioning of the keyframes. If the animation contained only four frames there would be only two possible positions for intermediate keyframes. These positions are indicated by tickmarks on the grey line above the timeline. The same limitations apply when you want to move keyframes forward or backward.
Step 8

Now you divided the timeline into two steps. The first part will describe the development of the shoot and the bud and the second part the blossoming. For the first step only the bud, the sphere assigned to the “Simple” component, should be visible and, afterwards the leaf arrangement can develop. Thus select in the “Animation Editor” window the first keyframe and then select in the “Hierarchy Editor” window the “PhiBall” component, the component producing the arrangement, to reduce the size of the blossom. Go to the “Basic” tab in the “Parameter Editor” window, switch the “Lock Scale” radio button to “on” and reduce the value of the “Scale” parameters. After that select the second keyframe and repeat the same procedure.
Step 9

The second keyframe still selected, select the “Simple” component. In the “Basic” tab in the “Parameter Editor” window increase the “Scale” parameters a little bit. Like this you can accelerate the growth of the bud in the first part of the animation and relatively slow it down in the second part. This accentuates the two steps of the plant development.
Step 10

In the current animation the petals are coming out of the bud in an even spherical distribution. This corresponds to the late state of the blossom but seems unnatural for the opening bud. Normally the bud opens at its top and the petals unfold slowly to the broad blossom.

You can achieve this effect by adjusting the “Fan” parameter of the “PhiBall” component. The second keyframe still active, select the “PhiBall” component and go to the “PhiBall” tab in the “Parameter Editor” window. Reduce the second value of the “Fan” parameter’s range definition.

As the petals are not yet produced at this state of the animation, you will not see any changes in the “Model View” window. Just hit “Play” and you will see a magnificent blossoming.
Step 11

The blossoming is already quite convincing but the leaves of the twigs are still coming too early. Select the “Leaf1” component and go to the “Basic” tab in the “Parameter Editor” window and reduce the “Scale” parameters. The same settings have to be applied to the first keyframe as well as to the second keyframe.

![Image showing parameter editor settings]

![Image showing perspective view of a flower with leaves adjusted]

Xfrog Tutorial-Flower Blossom
Step 12

If you now find that the twigs are produced too early select the second keyframe and the “Horn1” component. Go to the “Horn” tab of the “Parameter Editor” window and reduce the “Length” parameter. Like this you can go ahead adding more and more detail (like the petals changing their shape during their growing process etc.) and more and more keyframes for a subtle animation and high botanical correctness of your flower.
Step 13

At the end of this tutorial click again the “Play” button in the “Animation Control” window to see what you accomplished.
Overview

What you learned in this tutorial:

- Manipulating the parameters of components
- The purpose of keyframes
- Handling keys in the timeline
- Controlling animations in the “Animation Control” window
- The parameter inheritance within the model hierarchy
- The Definition of the number of frames in an animation