Xfrog | Tutorial

Simple Flower

greenworks
organic-software

Credits

Bernd Lintermann	senior software architect
Shane Cooper	interface architect and software architect
Andreas Kratky	interface design and graphic design
Cosima Striepe	tree library design
Marco Bubke	tree library design
Stewart McSherry	project manager
Orio Menoni	modeler and librarian

License

To fully use Xfrog you need to purchase a license key.
There are several ways to do this, and if you have additional questions about licensing for educational or multiple platform use, please contact us directly.

1) http://www.greenworks.de/license.html
2) fax, +49 721 8100 1509
3) email root@greenworks.de
4) write: ZKM | bildmedien
Lintermann und Deussen Gbr (greenworks)
attn: Stewart McSherry
Lorenzstr. 19
D-76135 Karlsruhe
Germany
+49 721 8100 1553 phone

Copyright

Author

This Tutorial was written in Feb 2001 by A. Kratky, (rev. 1b, feb 18)

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 refererence 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.

Simple Flower

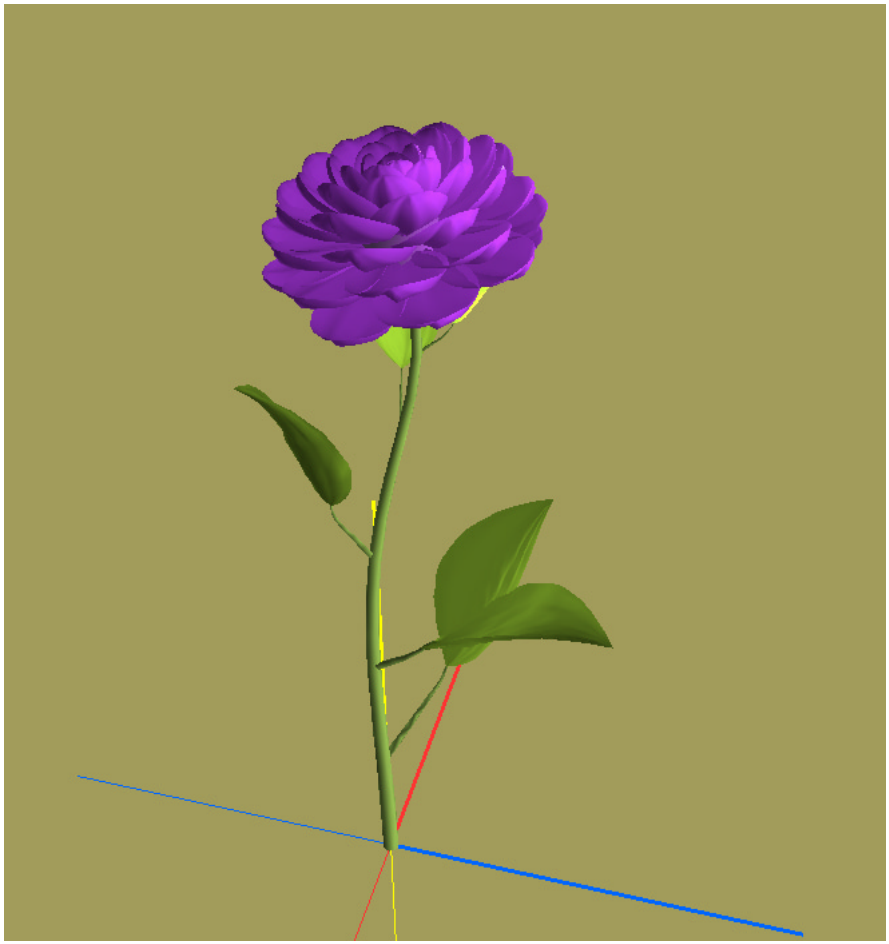
This tutorial explains how to build the model of a simple flower and how to animate the growth of the flower. The aim of the tutorial is not in the first line the achievement of botanical accuracy but to give you a hands on description how to use Xfrog for the modeling of many different structures. Starting from this description you can go ahead making your own flowers following precise natural examples.
The flower model described in this tutorial is one of the plant models shipped with Xfrog. You can find the Xfrog model and the required textures in the subdirectory “Models/Xfrog Plant Models/SimpleFlower.xfr.
The animated version of this plant can be found in Models/Xfrog Animation Models/Flower blossom.xfr (the description of the animation is in a separate tutorial called “Flower Blossom”).

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.

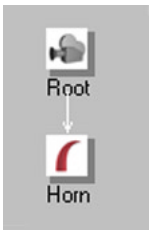
Step 1

First analyse the plant you are going to build:
The basic architecture of the flower consists of one main stem with a few twigs and leaves coming out of it and, on the top, a central arrangement of leaves forming the blossom.

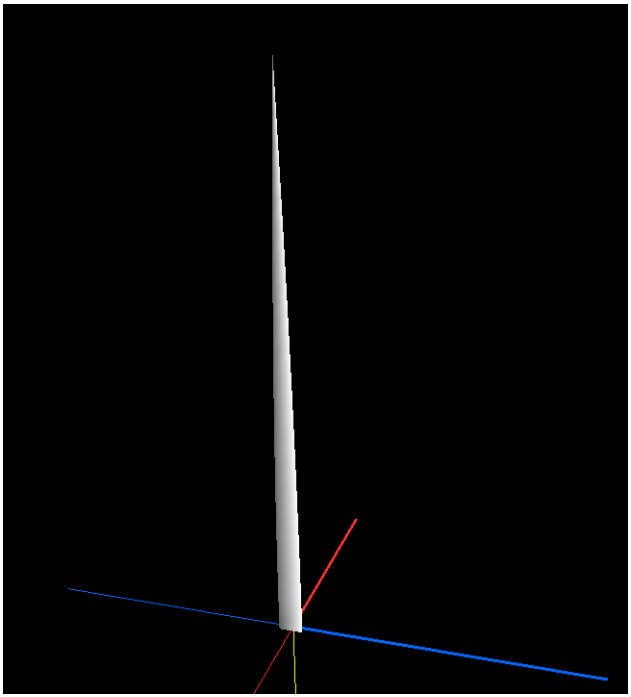


Step 2

To produce the main stem create a “Horn” component by double-clicking the “Horn” icon in the in the “Components” tab of the “Libraries” window. You will see a “Horn” component appearing in the “Hierarchy Editor” window. By default the “Camera” icon in the “Hierarchy Editor” window is selected (displayed in a grey color) and the new component is automatically linked to it. If this is not the case (when the “Camera” component was not selected before creating the new component) the “Horn” component will appear next to the “Camera” icon and you will have to link it to the camera manually. To do this drag the icon of the “Horn” component onto the “Camera” icon.



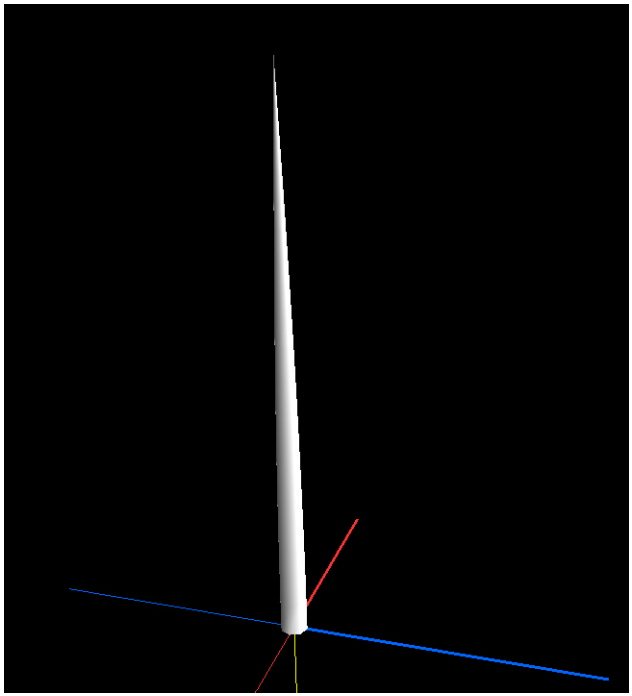
Component constellation in the “Hierarchy Editor” window



Result in the “Model View” window

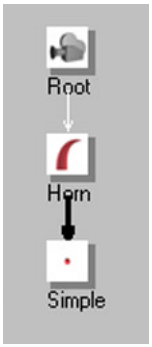
Step 3

By default the resolution of the “Horn” component is as low as possible to keep the complexity of the model low. The “Horn” component comes with a preset primitive of the type “Tube” and the lowest value with this primitive corresponds to a primitive-resolution of three vertex-points. Below three points now visible geometry is created. In most cases this low resolution is sufficient but, in our case it would be nice to have a round stem for the flower instead of a triangular one.
To increase the primitive resolution of the “Horn” component go to the “Primitive” tab of the “Parameter Editor” window and increase the value of the “Points” parameter.



Step 4

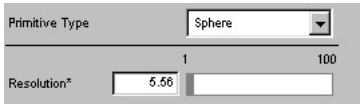
To build the blossom you start with a sphere being the centre of the blossom and forming the bud. Create a “Simple” component and link it to the hierarchy (drag it onto the “Horn” component). Make the link connecting the “Horn” and the “Simple” components a simple-link. By deafult the link-type of components connected to a “Horn” component will be a multiple-link. The “Horn” component has the capability to multiply components linked to it. This capability can be activated by connecting the component to be multiplied with a multiple link and, it can be deactivated by connecting the new component with a simple-link. The “Horn” component multiplies successor components (and the primitives assigned to the “Horn” component) in a row along it’s shape. When the multiplying-capability is deactivated, the successor component is added at the end - the top - of the horn.
To change the link type select the link (click it) connecting the “Horn” and the “Simple” components and choose the “simple” from the “Link” pull-down menu at the bottom of the “Hierarchy Editor”.
As the “Simple” component produces no preset geometry, no changes are visible in the “Model View” window.

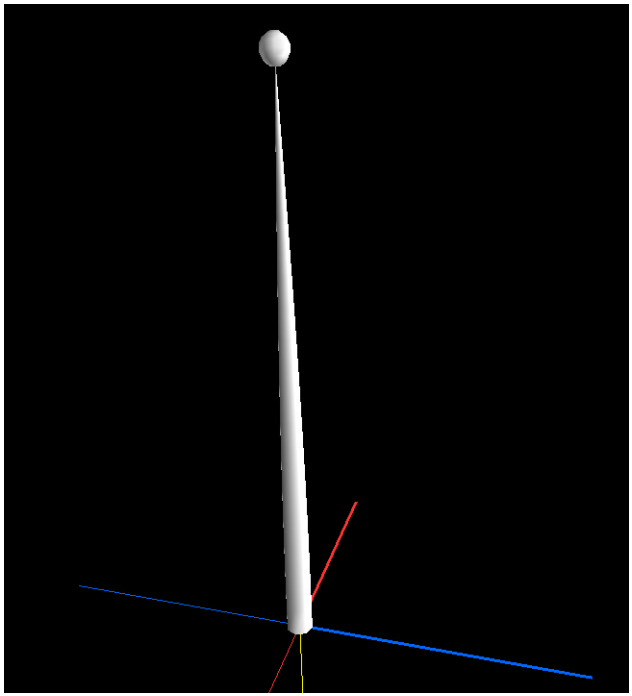


The link connecting the “Horn” and the “Simple” components is selected

Step 5

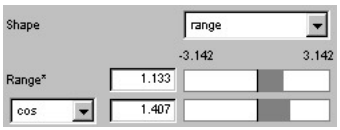
To produce a visible result in the “Model View” window you have to assign a primitive to the “Simple” component. Go to the “Primitive” tab of the “Parameter Editor” window and choose “Sphere” from the “Primitive Type” pull-down menu. You will see a sphere appearing on top of the horn. Again the resolution of the sphere-primitive is preset to a low value. To produce a nicely rounded sphere you should increase the “Resolution” parameter.

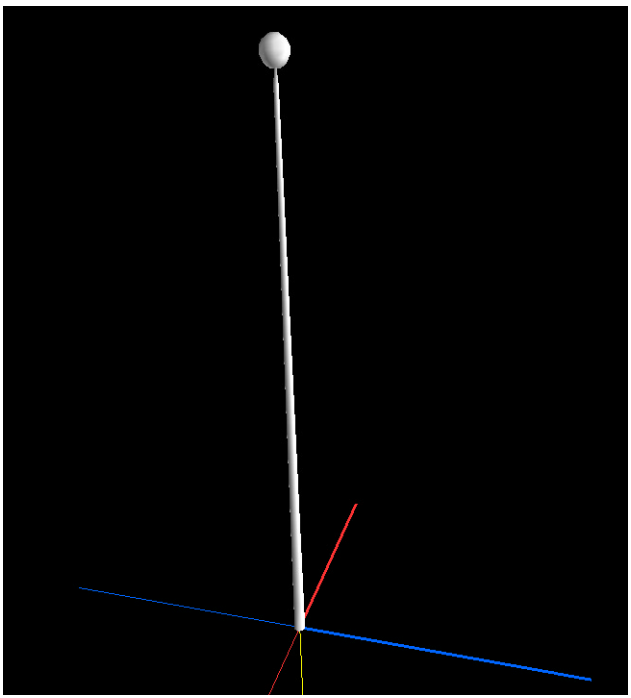




Step 6

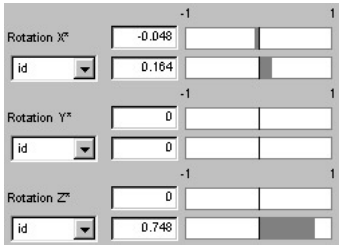
Now adjust the shape of the stem. It seems to be too conical and too solid for a fragile flower. The shape of the horn is defined in the “Shape” parameter in the “Parameter Editor” window. The default definition is a “range” definition which is characteristic to the horn’s multiplyer capabilities. It specifies one value for for the first instance of the multiplied components and one for the last instance. The values inbetween are interpolated. The shape of the horn is produced by multiplying tube-primitives that are scaled according to the preset values in this range-definition. To make the shape of the flower’s stem a bit finer, you should adjust the values as shown in the following image.

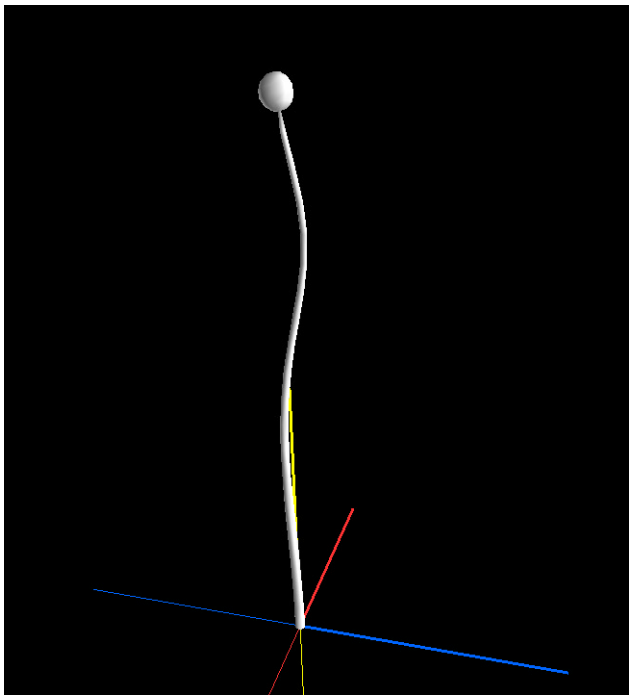




Step 7

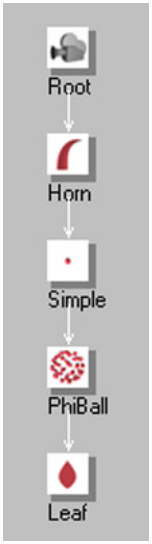
Adjust the curvature of the stem to achieve a more naturally looking result. The curvature is again defined by a “range” definition specifying values for the first and the last instance of the multiplied primitives and components. These values are specified for the rotation in each axis independently. Play around with the values until you find a curvature that meets your ideas.





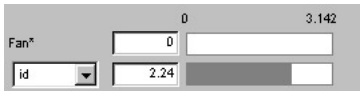
Step 8

To add the leaves of the blossom create a “PhiBall” component which produces the central arrangement of the leaves. The “PhiBall” component is also a multiplier component like the “Horn” but it does not have a preset primitive and thus generates no geometry when created.
Create a “Leaf” component (which by default creates geometry) and link it to the “PhiBall” component. The “PhiBall” component multiplies the leaf and arranges the multiplied instances around the sphere.

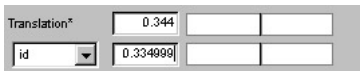


Step 9

By default the “PhiBall” component produces an even distribution of the multiplied geometry on a sphere. But as the blossom of your flower should not be round we have to define a limitation for the angle of the leaves’ distribution. This is done with the “Fan” parameter of the “PhiBall” parameters. The fan is defined by a “range” definition which can remain on 0 for the first value and for the second value should be around 2.2.



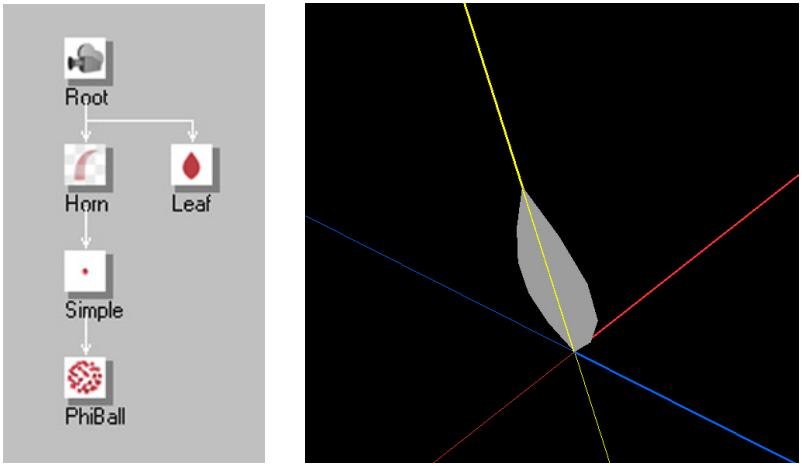
To inforce the effect of this operation you can also specify a translation for the leaves pushing them to the upper part of the central sphere so that they are slightly excentrical.



Step 10

Before you work on the connection of the leaves and the stem in detail, first define the shape of the leaves. In order to have a better overview about what you are doing you can disconnect the “Leaf” component from it’s original place and link it directly to the “Camera” icon while working on the leaf.
Then select the “Horn” component and click the “Hide” button at the bottom of the “Hierarchy Editor” window. This makes the entire model except one leaf disappear from the “Model View” window. The leaf that is left is the model for all other leaves that will be multiplied by the “PhiBall” component when you rearrange the hierarchy as it was before. To work at ease, you can navigate the perspective displayed in the “Model View” window as it is best for you.

Tip:
If you want to return to the perspective you had before, you select “Store View (To Current Key)” from the “Camera” item in the “Model View” window menu before changing the perspective. When you want to return to the saved perspective, select “Recall View (From Current Key)” from the same menu.

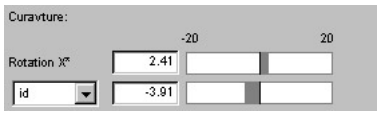


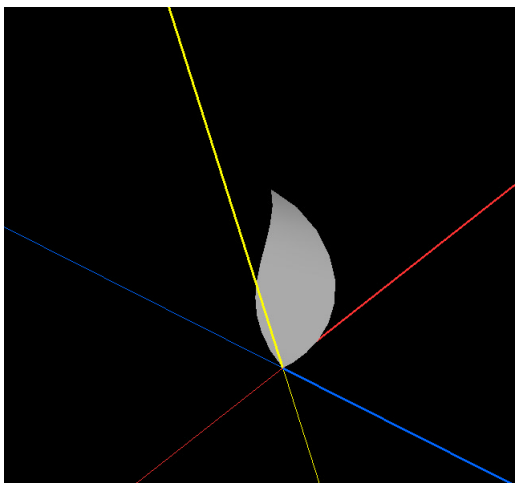
Hidden hierarchy and the “Leaf” component linked to the camera.

Step 11

To get rid of the jerky shape of the leaf go to the “Segments” parameter of the leaf’s parameters and increase the segment-resolution of the leaf.

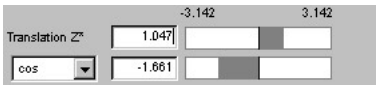
Then go to the “Curvature” definition and specify a rotation around the X-axis.

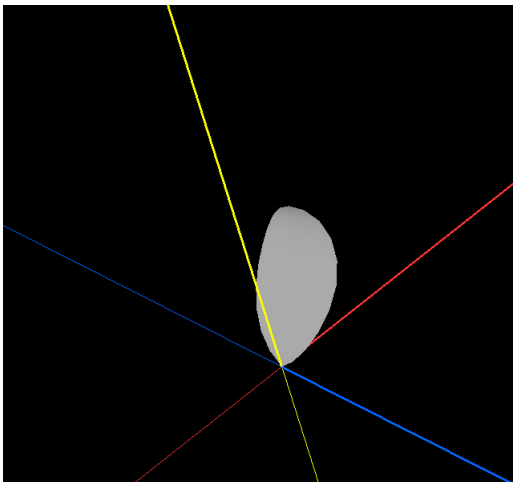




Step 12

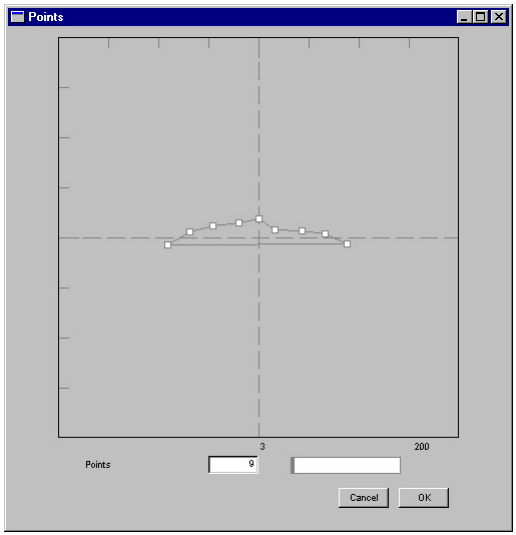
For a rounded top of the leaf go to the “Translation Z” parameter of the leaf’s parameters and decrease the second value of the range definition. This assigns a translation of the vertex-points of the leaf’s primtive. As you just changed the last value, the pointed end is moved into the leaf.





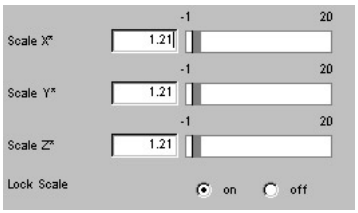
Step 13

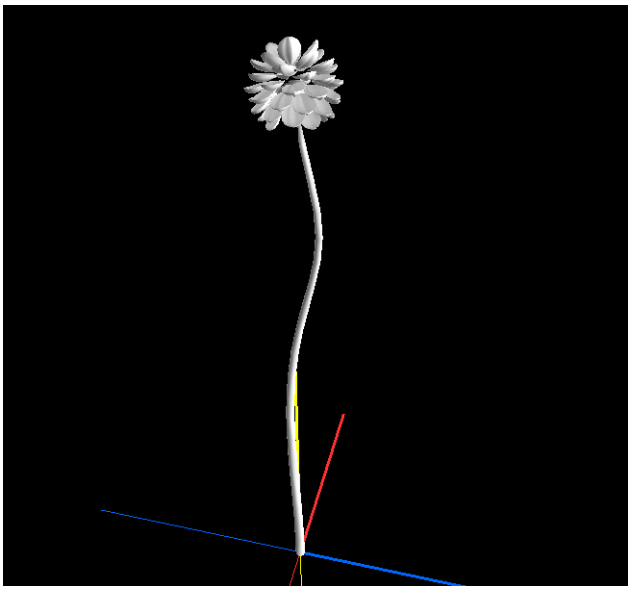
With the default primitive of the “Leaf” component (which is the “Area” primitive) it is possible to apply a three dimensional profile to the leaf. This option is not available when the primitive of the “Leaf” component is set to another primitive. To access the parameters of the leaf’s primtive you change to the “Primitive” tab in the “Parameter Editor” window. Go to the “Profile” parameter and set it to “on”. Below the “on” radio button you see an “Edit” button appearing. Click this button to invoke an editor window where you can edit the points of the profile.
With the “Points” slider at the bottom of this window you can increase the amount of points. The settings of this slider correspond directly with those of the “Points” slider in the “Parameter Editor” window.
The points can be edited by draging them. Shift-clicking the points allows for multiple selections. It is only possible to insert new points or to remove existing points by using the slider or the numerical field.



Step 14

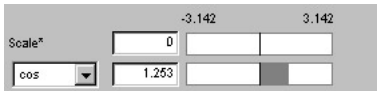
Link the “Leaf” component again to the “PhiBall” component and make the hierarchy to visible in the “Model View” window. Select the “Horn” component (which is for the moment displayed with a checker board overlay to indicate it’s hidden state) and click the “Unhide” button at the bottom of the “Hierarchy Editor” window.
You may now find that the leaves are to small compared to the rest of the plant. To make them bigger go again to the “Primitive” tab of the “Leaf” component. At the bottom of this editor you find the “Scale” parameters. In order to scale the leaf proportionally in all directions first switch the “Lock Scale” radio button to “on”. When you now move any of the three “Scale” sliders you will see that the other two sliders will follow.



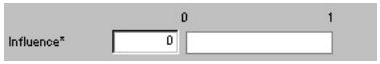


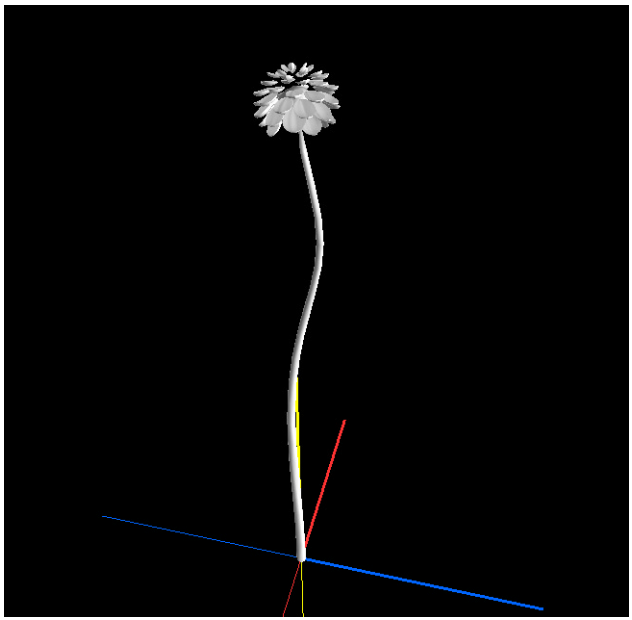
Step 15

Normally the leaves of a flower grow out of the middle of the blossom. Thus the outer leaves are older and bigger than the inner ones. To achieve this, select the “PhiBall” component and go to the “PhiBall” tab in the “Parameter Editor” window. Increase the second value of the “Scale” parameter (again a range definition). This parameter defines a scaling value for the objects multiplied by the “PhiBall” component.



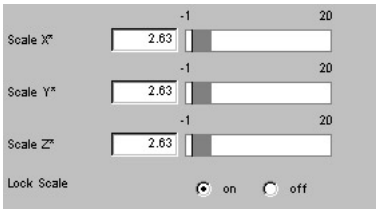
The result of this action are smaller leaves in the middle of the blossom and bigger ones at the edge. As the inner leaves are smaller, the empty space between them is bigger now and the overall distribution of the leaves appears to be uneven. The eveness can be reestablished by decreasing the value of the “Influence” parameter. This parameter defines up to which degree the size of the multiplied objects influences their distribution.

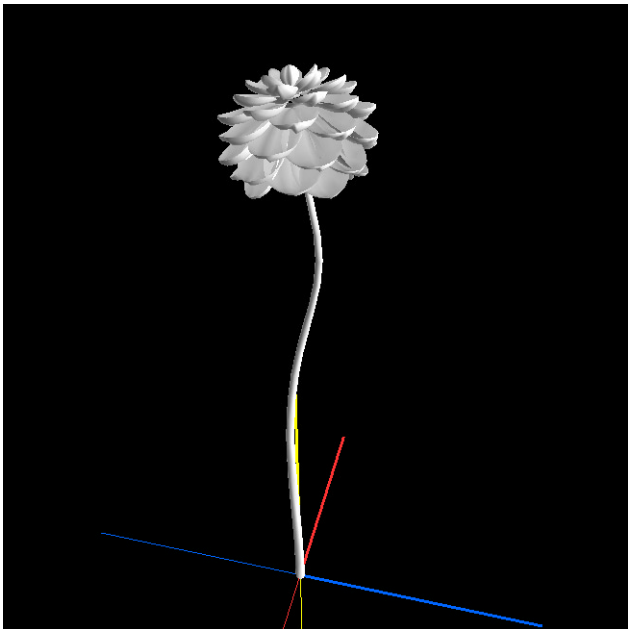




Step 16

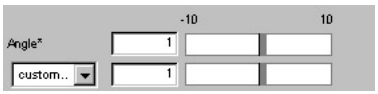
As the leaves are still too small you could again go to the “Primtive” tab of the “Leaf” component and enlarge the primtive. But there is also another way of doing this: You can use the basic scaling in the component’s parameters. This parameter is independent from the primitive and belongs to the component. It can be transmitted from one component to it’s successors whereas the primtive scaling only affects the primtives and is not transmitted. In the current constellation both ways have the same effect as there are no successors that could receive the scaling information from the “Leaf” component.
The basic scaling can be found in the “Basic” tab in the “Parameter Editor” window. Again set the “Lock Scale” radio button to “on” and then increase the “Scale” values.

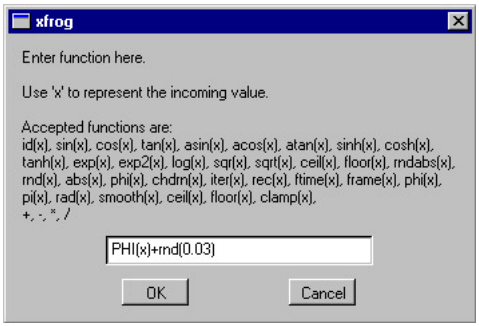




Step 17

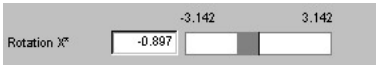
The “PhiBall” component produces by default a completely even distribution of the multiplied objects according to the golden section. Nature normally does not have this mathematical prescision and all plants have a certain randomness or irregularity in their growth. To add this to your plant you can use the random function. In all range definitions it is possible to specify a mathematical function that is used to calculate the intermediate values of the range definition.
Select the “PhiBall” component and go to the “Angle” parameter in the “PhiBall” tab. By default the distribution produced by the “PhiBall” uses the “phi” function (golden section). This is indicated in the pull-down menu below the word “Angle”. From this pull-down menu you can select a number of predefined mathematical functions or “custom” to define your own functions. When you choose “custom”, a window shows up, explaining how to define functions. Here you write the following function:
phi(x) + rnd(0.03)
The first part of the function (phi(x)) makes sure that the distribution will still be according to the golden section. The second part just adds a random number. The range of the number is specified by the number in brackets (0 to 0.03). The addition off the small random number creates slight irregularity in the distribution of the leaves.

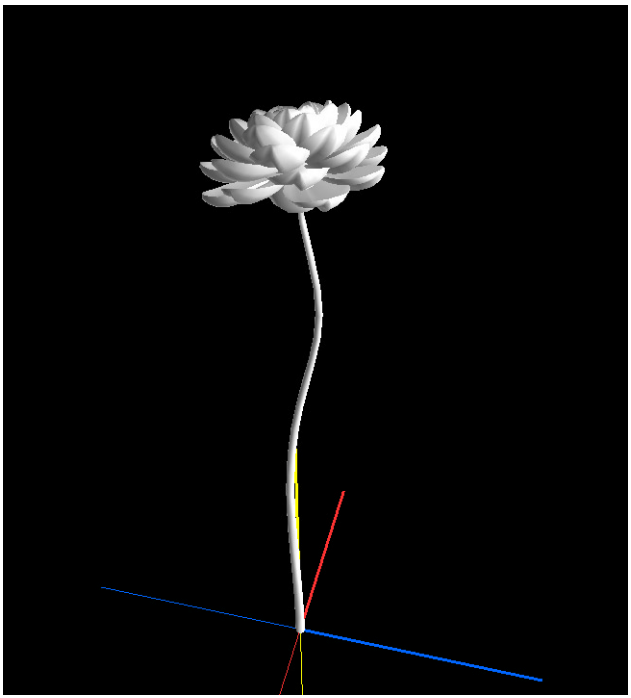




Step 18

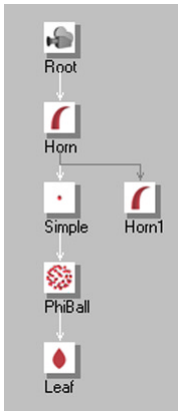
The blossom is already quite beautiful but the leaves are slightly hanging down. As your flower should be a fresh and vivid one, you should orient the leaves upwards. Select the “Leaf” component and go to the “Basic” tab. Set the “Rotation X” parameter to a negative value. This will rotate all multiplied leaves upwards.

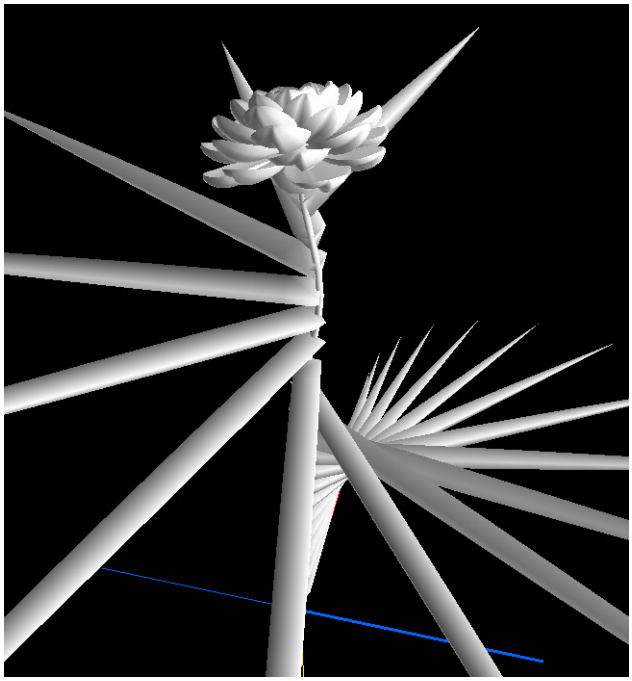




Step 19

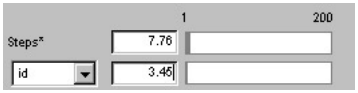
Now it is time to care about the twigs and the leaves connected to them. Create a new “Horn” component (which will be called “Horn1”) and link it to the first “Horn” component. Make sure that the link between them is a multiple-link.

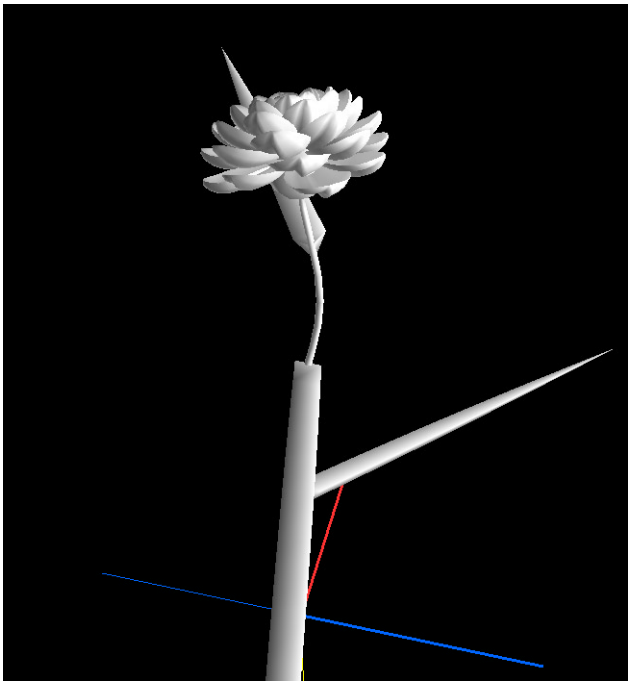




Step 20

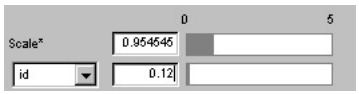
As the “Horn1” component is connected with a multiple-link, it is multiplied by the “Horn” component. The default settings produce by far too many twigs so you should reduce the amount. Select the “Horn” component because this is the multiplying component and thus defines how many instances of the successor component are produced. Go to the “Horn” tab of the “Parameter Editor” window and find the “Steps” parameter in the lower part of the window. This parameter is part of a number of parameters that influence the multiplied objects (the successor component) and not the selected component itself.
The “Horn” component produces a number of origins and normally when a second “Horn” component is linked, in every origin a new horn is created. To skip some of the origins and thus reduce the number of multiplied horns, you can use the “Step” parameter. It defines intervalls between the origins by means of a range definition.



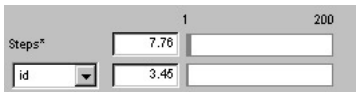


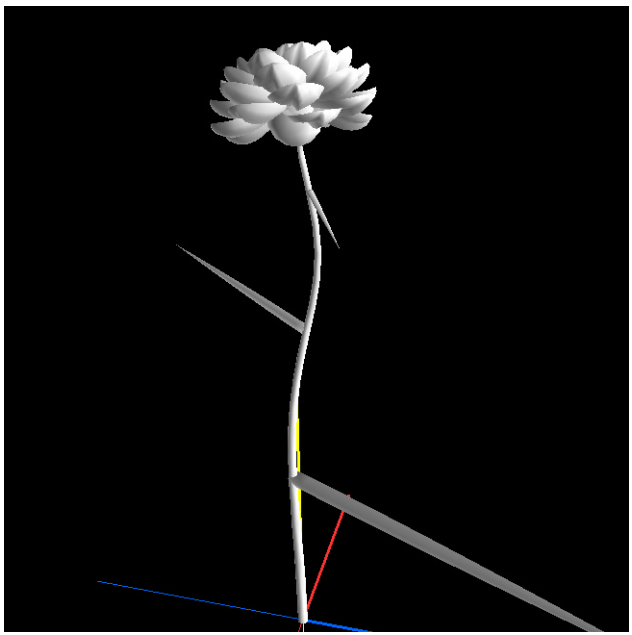
Step 21

The future twigs do not at all fit to the stem because the “Horn” component does not pass any scaling factor to it’s successors that would allow to adapt the size of the multiplied objets to their parent component. This has to be done manually. Go to the “Scale” parameter of the “Horn” component and decrease the two values of the range definition until the twigs fit to the stem. The “Scale” parameter defines a scaling factor for the first multiplied instance and one for the last mulltiplied instance. The intermediate values are interpolated.



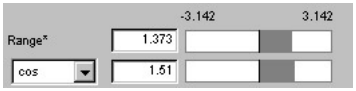
Then go to the “Screw” parameter and adjust the two values. The “Screw” parameter defines a rotation of the multiplied objects around the multiplying component - thus a rotation of the twigs arounf the stem. Play with the values until you find a satisfying position.



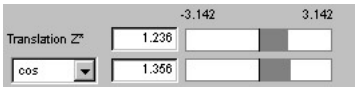


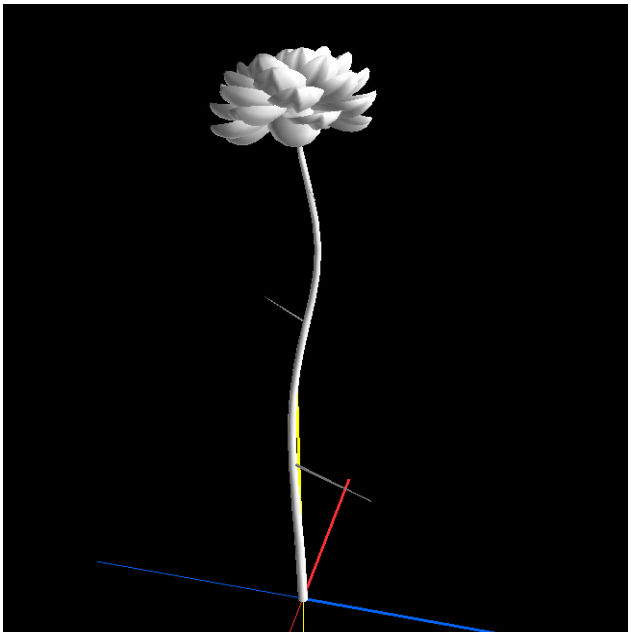
Step 22

Select the “Horn1” component and go to the “Horn” tab of the “Parameter Editor” window. Increase the first value of the “Shape” parameter’s range definition. This parameter defines a general scaling of the horn’s segments (primtives) and is not influenced by the preceding component. The effect of this parameter is the same for all instances (twigs).



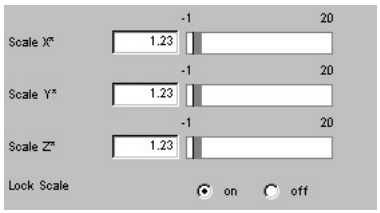
As the twigs are still extremely long you should shorten them. Therefore increase the “Translation Z” parameter. As the default function that is applied to this parameter is “cos” the increased values will produce shorter twigs.



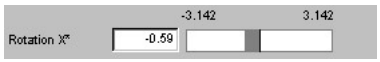


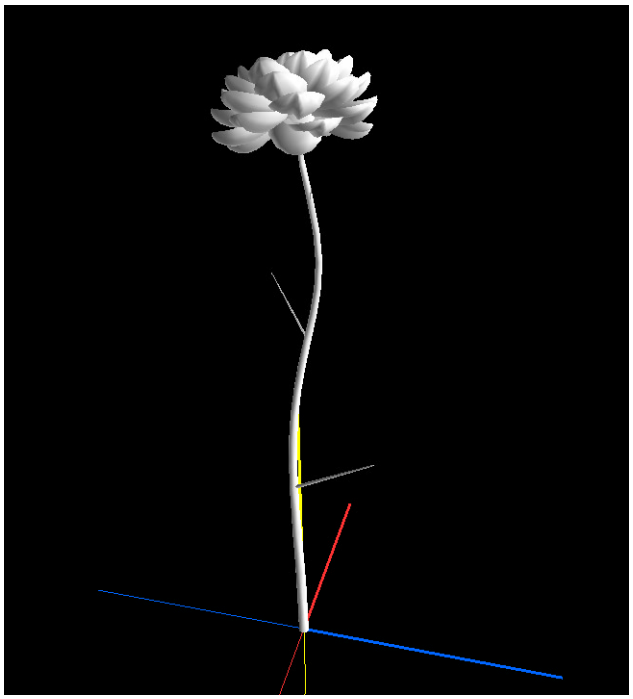
Step 23

The twigs appear now to be a bit too fine but as we want to connect big leaves to them in one of the next steps, we can apply basic scaling to the “Horn1” component that will afterwards be passed on to the leaves. Select the “Horn1” component and go to the “Basic” tab. Switch the “Lock Scale” check-box to “on” and increase the “Scale” values.



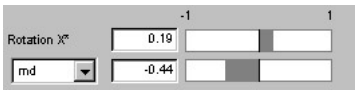
To make the twigs come out of the stem in a more natural way, bend them upwards. In the “Basic” tab assign a negative value to the “Rotation X” parameter.

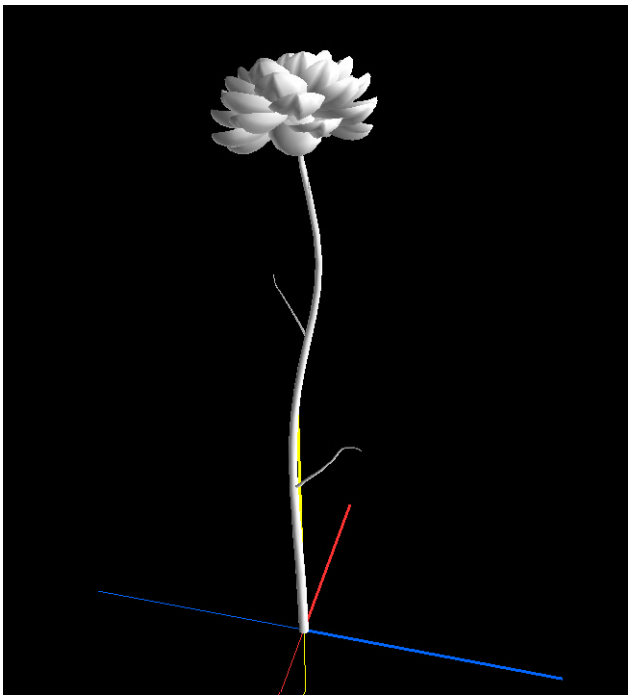




Step 24

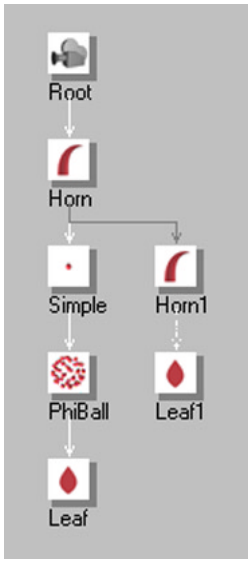
To make the twigs less straight you should add some irregularities. The “Horn1” component selected go to the “Horn” tab in the “Parameter Editor” window and assign a rotation in X-direction to bend the twigs. By assigning the random (rnd) function in the pull-down menu below the word “Rotation X” you can add these irregularities. The range of the random number is defined by the values you assign in the two sliders - thus you can assign a different random range for the first and the last segment of the horn.

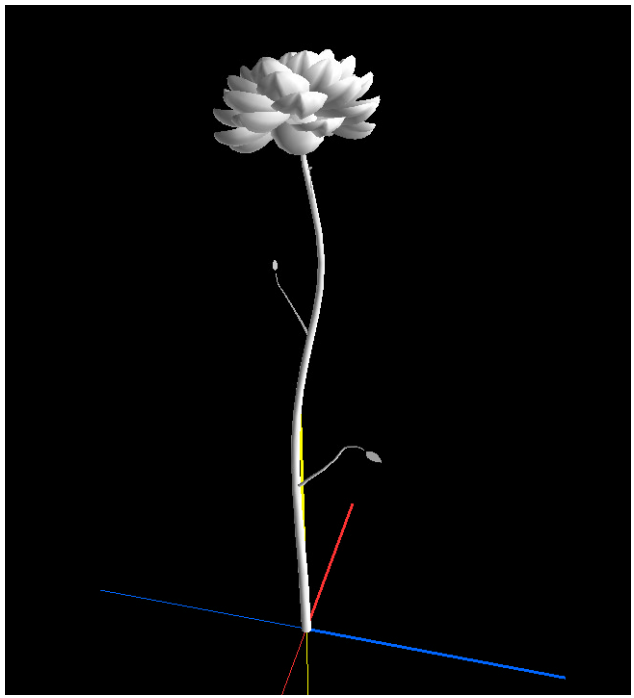




Step 25

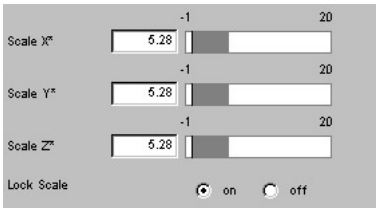
Create a new “Leaf” component and link it to the “Horn1” component. Make sure that the link between them is a simple link, producing only one leaf at the end of each twig. In order to keep the complexity of the model as low as possible, you can also make this link a “ReUse” link. This kind of link produces the geometry of the linked part of the hierarchy only once and copies it to all instances. This reduces the complexity but avoids the recalculation of the geometry for the different instances and thus all instances are exactly the same. In combination with a “Reuse” link e.g. a random function would not have any effect as the instances cannot be randomly different.
To make a link a “ReUse” link you have to select the link and then check the “ReUse” check-box at the bottom of the “Hierarchy Editor” (or use the context or main menu).

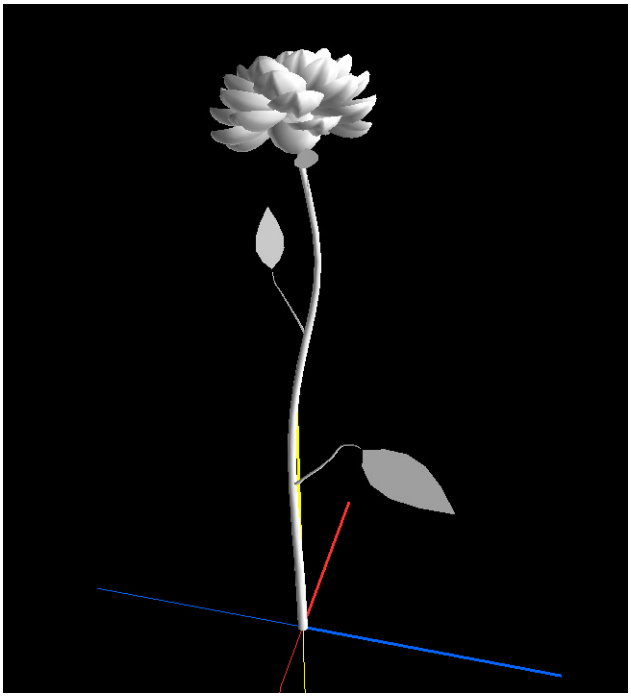




Step 26

The leaves are still too small. To make them bigger select the “Leaf1” component and go to the “Basic” tab of the “Parameter Editor” window. Set the “Lock Scale” radio button to “on” and increase the “Scale” values.

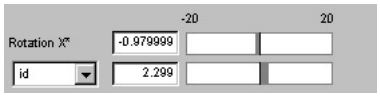


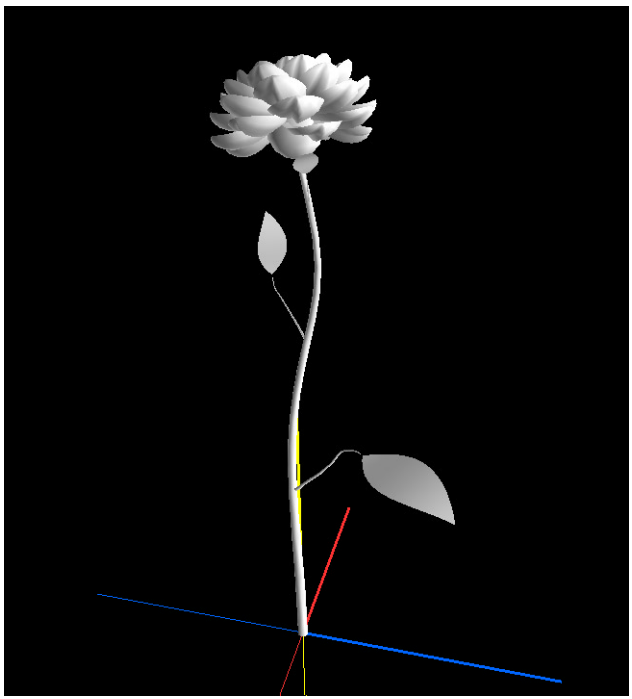


Step 27

To adjust the shape of the leaves go to the “Leaf” tab and first increase the amount of segments in the “Segments” parameter. This allows a smoothly bended shape.

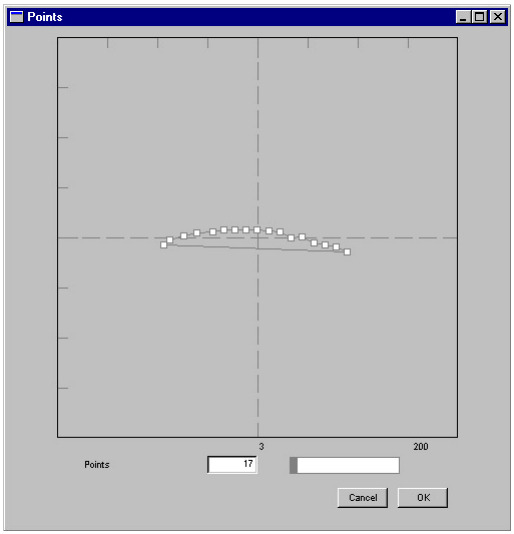
Then bend the leaves with the “Rotation X” parameter.

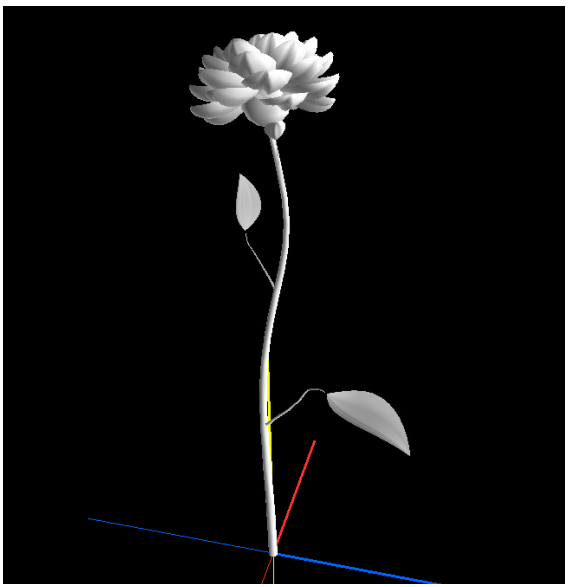




Step 28

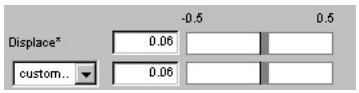
To assign a three dimensional profile to the leaves go to the “Primitive” tab and switch the “Profile” radio button to “on”. Then click on the “Edit” button that appeared to open the point-editor window.
Increase the number of points with the “Points” slider and arrange the points in the shape you want the profile to be.



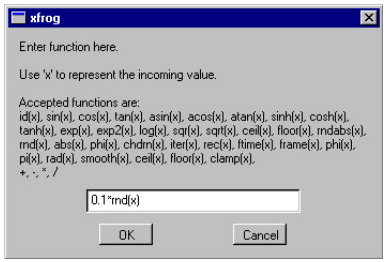


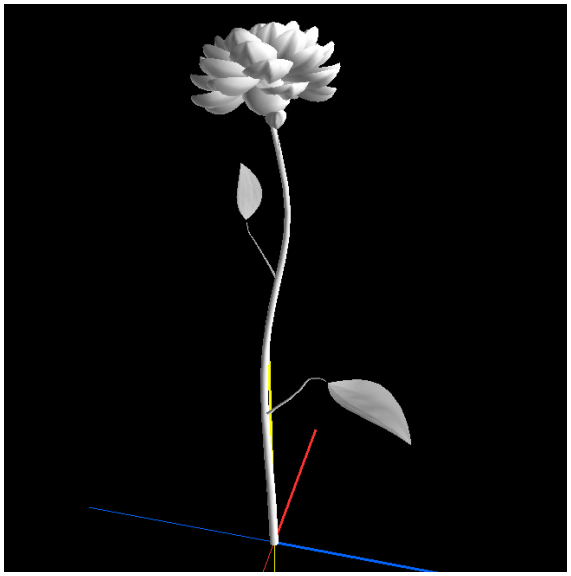
Step 29

You can also add irregularities to the surface of the leaves. This can be done with an option of the primtive. The “Leaf1” component selected go to the “Primitive” tab of the “Parameter Editor” window and find the “Displacement” parameter. This parameter produces a random (the default setting) offset for the points of the “Area” primitive. Slightly increase the two values of the range defintion - you see that the effect is very strong and for our example even too strong.



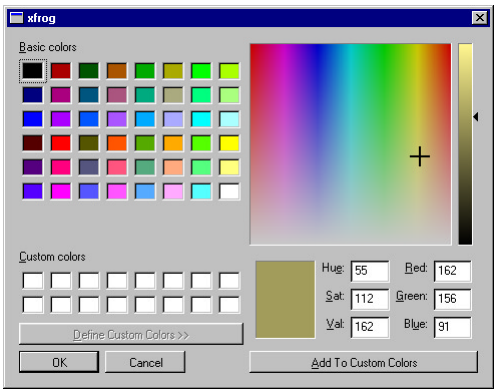
You can reduce the effect by using a custom function instead of the preset “rnd”. You just have to multiply the “rnd” value with a small number like e.g. 0.1 which would have as result the following formula: 0.1 * rnd(x)

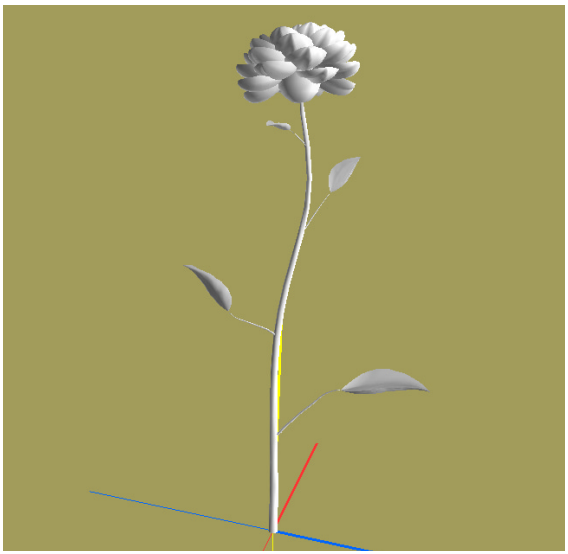




Step 30

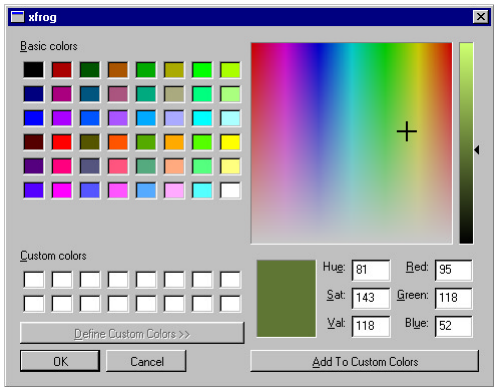
You can always play with all parameters to optimize the result. Sometimes different parameters interfere with each other (e.g. the different ways of scaling etc.) and you might feel that you have to react on changes produced by an alteration of a certain parameter.
Despite that, we would propose to work on the colors now. To define a color for the background you have to select “Edit Background Color” from the “Background” menu in the “Model View” window. This opens a color editor where you can specify a color. When you click the “OK” button this color is applied to the background of the “Model View” window.





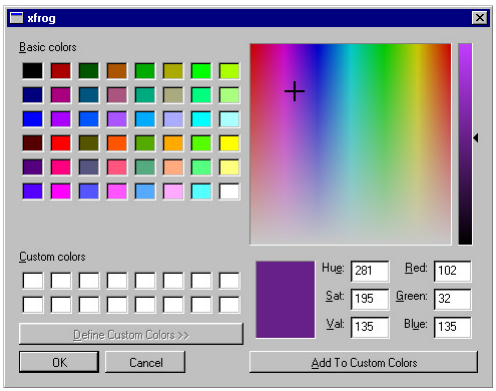
Step 31

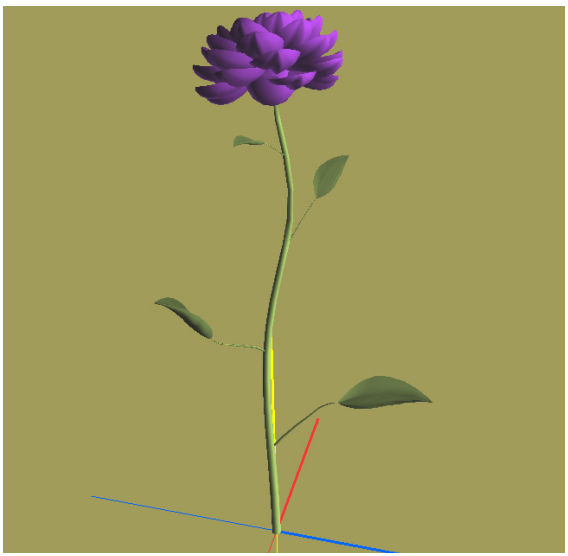
To specify a color for the model select the “Horn” component and go to the “Material” tab of the “Parameter Editor” window. Set the radio button of the “Color” parameter to “set” and you will see several color fields and parameters appearing. Click on the “Edit” button of the “Diffuse” parameter. A color editor is opened, where you can specify a green color for the stem and the leaves. Click “OK” and the color is applied to your flower.



Step 32

For the moment the entire flower is green. The color information is passed from the first “Horn” component to all successors. As the blossom should have another color, select the “Simple” component and go to the “Material” tab. By switching the “Color” parameter to “set” the inheritance of the color from a preceding component is stopped and you can define a new color. Click the “Edit” button of the “Diffuse” parameter and define a color. This color is passed on to the “PhiBall” and the “Leaf” component, while the green is still existing in the second branch of the hierarchy where the iheritance of the color is intact.





Overview

What you learned in this tutorial:

- Creating and linking components to the model hierarchy
- Assigning primitives to components
- Manipulating components and primtives
- Making components visible and invisible in the “Model View”
- Specifying colors and color inheritance
- Using 3D profiles
- Assigning mathematical functions to range value definitions
- Using custom functions
- Using multiplier components
- Using “Simple”, “Multiple” and “ReUse” links