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# General Forces

“Forces” are scene objects that can be used to push, pull, gnarl, twist, curl, or obstruct parts of the tree.

## Overview

Forces are powerful modeling tools that can manipulate spine growth in ways that would be impossible without them. There are many types of forces, each with different capabilities. Since forces are world-space objects and not bound to the tree hierarchy, they can be transformed (moved, rotated, or scaled) with manipulators in the 'Tree Window'. Use the toolbar icons to change the manipulation mode.

## Adding Forces

To add a force to the scene, right-click in the tree window or use the “+” toolbar button and select “Add force”. Forces can also be added from the Generation Editor's “Forces” icon. If one or more generators or nodes are selected before the force is added, the added force will be automatically enabled on the selection (see “Allowing forces” below).

Deleting forces is as easy as selecting it and pressing the delete key.

## Allowing Forces

After a force has been added to the scene, it must be 'Enabled' on either a generator or node level to have an effect on them. This is set in the “Forces” group in the 'Property Editor', which has a checkbox for every force currently in the scene. For instance, to have one force act on the trunk (e.g., pull the tree left) and a different force act only on its child branches (e.g., pull the child nodes

right).

There is also an over-arching Allow forces property that will toggle on or off all forces collectively for the selected generators or nodes.

## Disabling Forces

Forces themselves may be enabled or disabled independently of whether they are “allowed” or not. This is accomplished with the 'Enabled' property on the force object itself. Disabled forces are shown as dark gray.

## Renaming Forces

Same type are present, new names are enumerated (e.g. “Magnet 1”). To make it easier to tell them apart, forces can be manually renamed. Select a force so the force properties appear and press “F2” to rename the force.

## Localizing the Area of Influence

Since forces are world-space objects, they can be freely moved around in the scene. By enabling Attenuation on the force object's properties, the area of affect will be limited to a radius around the force object. This lets you have a force only affect a very specific part of the tree, such as only branches over the negative 'XY' quadrant.

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## Force Types

There are several types of forces available, each having their own unique affect on the tree shape. Any force can have its type changed by selecting a different type on the force's properties. The available types are:



### Direction

Spines grow in the direction that the arrow points.



### Magnet

Spines converge on a single point at the center of the force.



### Gnarl

Spines twist around a world-space vector that is determined by the force's rotation.



### Twist

Spines twist along their local up vectors and are altered by the force's rotation.



### **Curl**

Spines curl inward on themselves in a direction determined by the force's rotation.



### **Planar**

Spines grow along a 2D plane determined by the force's rotation.



### **Mesh**

Spines grow toward or around an arbitrary mesh object. See the mesh forces section below for more details.



### **Return**

Standard and subdivision branches will return to their original growth direction. Use this to keep wildly disturbed, jinked, twisted, curled, or gnarled branches under some control.



### **Season light**

Leaves change season sooner based on the how much they are growing toward the position of this force object. Fine tune the behavior with the leaf generator's 'Anatomical sensitivity' property.

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