Chapter 5: Arranging Objects

You arrange a scene in the Assemble room, scaling and positioning objects in relation to the global universe and to each other. This chapter describes the Assemble room workspace and the techniques you use to arrange objects in your scene.

The Assemble Room

The Assemble room is where you arrange objects, cameras, and lights to form a scene. Like the Modeling windows, the Assemble room provides up to four separate panes, each containing a different view of your scene.

You can change views using the view layout controls. For information on using these controls, refer to Changing Views.

The 3D workspace of the Assemble room is called the universe. The universe is where all objects are displayed, assembled, and manipulated. By default, Carrara opens new scenes with one distant light and one conical camera.

Carrara uses a coordinate system called the Cartesian coordinate system to reference positions in the universe. A trio of unique coordinates (X, Y, and Z) is associated with each position in the universe.

The maximum volume of the universe is a 3.32 kilometer cube. On the other end of the scale, the minimum dimension of an object is 0.006 millimeters. You can create objects of any size in the measurement units of your choice as long as they stay within that range.

The Assemble room contains many features to view your scene.

The Working Box

Think of the working box as a 3D ruler that helps you bring objects together more easily and accurately. The grids of the working box are a visual reference for the dimensions and orientation of the universe. By default, the working box floor is centered on the origin of the universe (0, 0, 0) and aligned with the axes of the universe. The ground plane, lying on the XY plane, is positioned at Z = 0.

The working box planes show projections, like shadows, for the objects in the scene. These projections help you see which objects are farther away, higher, or tilted, and help you move the objects into the positions and orientation you want. For information on projections, refer to Bounding Boxes and
Projections.

Projections appear on the planes of the Working Box.

The working box is moveable and scalable, so you can set it at different angles, change its size, and move it away from the origin.

**The Active Plane**

The active plane is the plane of reference used when you drag objects in the Assemble room and perform other positioning operations.

You can change the active plane to control positioning operations.

To change the active plane:

- Click the plane you want to be active in the Working Box control.

**Changing the Working Box**

You can change the working box in several ways to facilitate the assembly of your scenes:

- Change plane colors to suit your personal preferences. For more information, refer to Color Pickers.
- Change the size of the working box to simulate the real-world size of your scene.
- Send the working box to an object or group. This aligns and repositions the working box around a selection, which is useful for creating large scenes where you would otherwise run out of grid. It is also useful for creating an object or a motion path that is set at an angle to the overall orientation of the scene.
- Center the working box in the global universe. This is useful for positioning objects in your scene.

By using real-world units of measure and centering your scene at the universe's 0,0,0 coordinates, you always have an idea of where your objects are in relation to the overall scene.

**Note**: Changing the working box does not affect your existing objects. The orientation of the working box applies only to subsequent arrangement operations.

You'll find that changing the working box facilitates many useful operations, such as aligning objects to each other. After each operation, you'll need to move or reorient the working box for the next task.

To send the working box to an object or group:
1. Select an object or group.
2. Choose **View menu > Send Working Box to Object**. Carrara sets the working box planes parallel to the bounding box planes of the selected object or group bounding box. The coordinate systems of the working box and the object (or group) are aligned.

Sending the working box to an object.

The working box planes are parallel to the bounding box planes of the object.

For information on bounding boxes, refer to Bounding Boxes and Projections.

**Previewing Objects**

You can preview objects in the Assemble room at seven different levels of quality:

- Bounding Box
- Wireframe
- Lit Wireframe
- Flat
- Gouraud
- Textured (Phong)
- Sketch

Higher preview modes take longer to redraw, so it's a good idea to use a Wireframe or Flat mode when you're arranging objects. Switch to the higher modes only as specific shading detail becomes more important.

Use the Test Render tool whenever possible, to preview your work.

In all preview modes, objects create projections on the working box planes, and selected objects display their bounding boxes.

The Assemble room displays projections of objects in the form of bounding boxes.

To change the preview quality:

- Choose the Preview Quality tool you want:

Click one of the Preview Quality icons to change the preview quality of the objects in the Assemble room. Click on the arrow to open the interactive renderer preferences dialog and to have more options.

- **Bounding Box** mode displays only the objects' bounding boxes. For information on bounding boxes, refer to Bounding Boxes and Projections.
Bounding Box preview mode.

- **Wireframe** mode displays objects as a mesh of wires.

Wireframe preview mode.

- **Lit Wireframe** mode displays objects as an illuminated mesh of wires.

Lit Wireframe preview mode.

- **Flat** mode displays objects with low faceting and colored surfaces.

Flat preview mode.

- **Gouraud** mode shows objects with shading at a low level of detail.

Gouraud preview mode.

- **Textured (Phong)** mode shows objects with shading, texture maps, and paint regions in detail.

Textured (Phong) preview mode.

- **Sketch** mode shows objects with bright outlines and fewer facets.

Sketch preview mode.

To hide or show an object:

1. Select the object.
2. Choose **Edit menu > Hide/Show in 3D View**.

## Arranging Objects

Arranging is the process of positioning, scaling, and orienting objects. The most significant part of an object's arrangement is its position relative to other objects; its absolute arrangement (relative to the universe) is generally important only for orientation.

For example, it is important to position a glass of wine on a tabletop rather than embedding it in the
table or making it appear to float. However, you should use the glass's absolute arrangement to establish an upright orientation, so that the full glass wouldn't appear to hang upside down without spilling a drop.

Arranging one object in relation to another may require a series of positioning, orientation, scaling, and alignment operations. Many of these commands operate under the constraints of the working box. Setting the working box appropriately before starting an operation greatly simplifies the procedure.

Note: Except where noted, all of the positioning, orienting, aligning, and scaling commands work with either simple or grouped objects. For information on grouping objects, refer to Building a Hierarchical Structure.

**Bounding Boxes and Projections**

The *bounding box* is the smallest box that encloses an object or group of objects. Bounding boxes appear around objects that are selected.

The bounding boxes of all objects, including cameras and lights, cast 2D profiles called *projections* on the planes of the working box. These projections show the object's position and orientation in relation to each of the three planes. You can drag the projection to scale, move, or rotate the object in the plane of the projection.

**The Hot Point**

The hot point is the single point of an object or group that identifies its center of rotation.

The hot point of selected objects and groups appears in the Assemble room as a black point that casts 2D projections.

Hot point and projections.

By default, an object's or group's hot point is at the center of its bounding box, but you can move the hot point anywhere in the scene.

Where you put the hot point depends on the type of arrangement operation you are planning. For example, with the hot point at the center of an object, the Rotate tool spins the object in place. However, with the hot point placed some distance away, the object rotates around its hot point like a planet orbiting around its sun.

To move a hot point by dragging:

1. Choose the Selection tool.
2. Select the object or group whose hot point you want to move.
3. Turn on Caps Lock on your keyboard to unlock the object and its hot point. If you drag the hot point when Caps Lock is off, the object moves with it.
4. Drag the hot point in 3D or drag one of its 2D projections. The hot point moves parallel to the active plane.
Hold down Command/Ctrl to drag the hot point perpendicular to the active plane.

To move a hot point numerically:

1. Select the object or group.
2. Enter the Hot Point values you want on the Properties tray: Motion tab: Transform panel. For more information on these settings, refer to Setting Object Properties.

To send the hot point to the center of the object:

1. Select the object or group.
2. Choose Edit menu> Center hot point. Carrara moves the hot point to the center of the object or group bounding box.

Selecting Objects

Carrara provides several ways to select objects:

- Use the Selection tool to click the object preview or one of the projections.
- Click an item or drag a marquee over one or several items in the Hierarchy section of the Sequencer or in the Instances tab of the properties.
- Select the object from the Find list in the Properties tray: General tab.

A selected object displays its bounding box. The projections of the selected object on the working box planes are highlighted. The object's name in the Hierarchy is also highlighted.

To select objects with the Selection tool:

1. Choose the Selection tool.
2. Click the preview or one of the object's projections.
3. Hold down the Shift key and click other objects to add to the selection. Shift+click an object that's already selected to subtract it from the selection.

Selecting multiple objects.

1. If a number of objects overlap, position the cursor over the object or projection and hold the mouse button down. A pop-up menu appears, listing all of the objects beneath the cursor at that point. Select the object you want.

To select objects in the Hierarchy:

- Click the object's name in the Hierarchy.
- You can also drag a marquee around the objects to select several.
- Hold down the Shift key and click other objects (or drag another marquee) to add to the selection. Shift+drag over items that are already selected to subtract them from the selection.

For complete information on working with the Hierarchy, refer to Building a Scene

To find and select an object:
In the Properties tray, click the arrow next to the Find box and choose the object you want from the list.

**Using the Counter**

The counter tracks the complexity of the objects and geometry in the scene. The counter displays:

- The selected object
- The number of objects in the scene
- The number of modeled facets

This information may be useful if you intend to export the scene for use in another program. The number of triangles has a direct correlation to file size in the exported document.

To view the counter:

- Choose *Edit menu > Counter*.

The counter keeps track of the number of objects in the scene and their complexity.

**Setting Object Properties**

You can use the options in the *Properties tray: Motion tab: Transform panel* to perform most of the basic arranging operations discussed in this chapter. You can set properties for an object or for a group. The Properties tray lets you make numerical adjustments— as opposed to dragging or nudging—for moving, positioning, scaling, and rotating an object.

Use the *Properties tray: Motion tab: Transform panel* to manipulate objects numerically.

By default, numerical changes use the units of measurement currently specified in the general preferences (*File menu > Preferences: Units*). For more information on setting general preferences, refer to Setting Application Preferences.

To arrange objects numerically:

1. Select the object or group.
2. Display the *Properties tray: Motion tab: Transform panel*.
3. Select the CoordinateSystem you want to use.
   - **World** lets you specify the object's arrangement relative to the universe. Use this for absolute positioning, scaling, and rotating operations.
   - **Local** lets you specify the object's arrangement relative to the center of the object or group bounding box. For instance, you can move the hot point out from the center on a specific axis.
4. Enable Lock Center and Hot Point to make the object move when you change either the Center or Hot Point value.
5. Enter new values for the object property you want to change.
• **Center** repositions the object.
• **Hot Point** repositions the hot point. For more information on the hot point, refer to The Hot Point.
• **Rotation** reorients the object. For details on orientation, refer to Orienting Objects.
• **Size** sets the dimensions (height, width, and depth) of the object's bounding box. For more information on bounding boxes, refer to Bounding Boxes and Projections.
• **Scaling** sets the scaling percentages on each axis. One hundred percent is the scale at which the object was created.

**Naming Objects**

By default, new objects are named *Type n*, where *Type* is the object description (Spline, Sphere, Text, etc.) and *n* is the number of similar objects in the order created—Spline 1, Spline 2, and so forth.

You can change the names of objects and groups. Giving objects and groups descriptive names can make them easier to locate and select.

To change the name of an object or group:

1. Select the object or group.
2. On the Properties tray: **General tab: General panel**, enter any name you like in the Name box.

**Dragging Objects**

The easiest way to move an object is to drag it with the Selection tool.

Dragging operations use the working box planes as the dimensional reference. Remember that you can orient the working box to a particular attitude before dragging an object. For information on moving and orienting the working box, refer to Changing the Working Box.

Remember also that the planes of the working box extend throughout the universe. The visible grid is merely a reference of the orientation of those planes and does not restrict you to the visible space.

**Using the Ghost Menu**

You can also move objects using the Ghost menu. The Ghost menu is a set of interactive commands that appear whenever you right-click (Win) or Control-click (Mac) anywhere in the 3D view. The menu remains visible as long as you press the mouse button. You select commands by rolling over them and then releasing the mouse button.

To learn more about the Ghost menu, see The Ghost Menu.

Select **Move** from the Ghost menu to move the desired object.

To move an object along a specific plane:
1. Choose the Selection tool, or choose Move from the Ghost menu.
2. Drag the object's projection in that plane.

To move an object parallel to the active plane:

1. Choose the Selection tool, or choose Move from the Ghost menu.
2. Drag the object. Hold down the Shift key to constrain the drag angle to increments of the Rotation Angle.

Drag an object to move it parallel to the active plane.

To move an object perpendicular to the active plane:

1. Choose the Selection tool, or choose Move from the Ghost menu.
2. Hold down the Command/Ctrl key and drag the object.

Hold down the Command/Ctrl key to drag an object perpendicular to active plane.

Using the Manipulators to Move

When an object is selected with the Selection tool, three colored arrows let you move the object along the global X, Y, and Z directions. As you move the mouse cursor near one of them, the cursor changes to a cross. You can then click and move the cursor in the direction of the arrow. This constrains the movement of the object to the direction indicated by the selected arrow.

The Move Manipulator.

To use the keyboard to nudge an object:

Press and hold the Command/Ctrl key, and then press the arrow keys to move the object in the active plane.

If you press the Option/Alt key at the same time, the object moves in the direction perpendicular to the active plane.

If you press the Shift key at the same time, the object moves with smaller steps.

Collision Detection

Collision Detection instructs objects to “respect each other's space.” With Collision Detection enabled, you can drag one object toward another, and the object stops when its surface contacts the other object. If you continue to drag, the object snaps through to the other side, but you can't leave it embedded.

Collision Detection is a great feature for bringing the surfaces of two objects together—for example,
putting plates and silverware on a dinner table. Without Collision Detection, you might accidentally leave a knife floating just above the table or embed it in the table itself.

To enable or disable Collision Detection:

Choose View menu> Use Collision Detection or click on the Collision Detection icon on the right of the 3DView window.

| Note | Collision Detection is effective only when you reposition objects by dragging. Nudging and numerical repositioning are not affected by Collision Detection. |

Collision Detection ON and OFF.

**Centering Objects in the Universe**

You can send an object or group to the center of the universe. The object maintains its orientation, and its center (not its hot point) is placed at 0,0,0.

To center an object in the universe:

1. Select the object.
2. Choose Edit menu> Send To Origin.

**Scaling Objects**

When you create an object in a modeler, you model it at a particular size. In the scene in the Assembly room, you can scale the object to new dimensions.

Because Carrara allows you to work with real-world units (inches, feet, centimeters, meters, etc.), many artists scale objects equivalent to their size in the real world. For example, you could create life-size models of several boxes—one at 12 x 12 x 15 inches, one at 13 x 18 x 12 inches, and one at 14 x 20 x 14 inches—and a life-size model of a hand truck at 48 inches. When you put all the objects together in the same scene, the objects have the correct size relationship.

Carrara allows you to work with real world units to maintain true size relationships between objects.

Scaling in the scene does not change the size of the original object; if you reopen it in a modeler, it will be the same size as when you created it.

You can scale an object or group several ways:

- Use the Scale tool to drag its bounding box. This is useful if you want to scale one object “by sight” and then apply the same scaling factor to other objects.
The Scale tool.

- Use the Size and Scaling controls (numerical scaling) in the **Properties tray: Motion tab: Transform panel**. For details, refer to Setting Object Properties.
- Use the Scale command in the Ghost menu. For details, refer to The Ghost Menu.

Scale from the Ghost menu.

In all cases, you can scale an object proportionately or disproportionately.

Remember, in the rendered scene an object’s apparent size is determined not only by its dimensions, but by its distance from the point of view. This is just like the real world: a car right in front of you appears larger than it does when it's parked down the block. In Carrara, the point of view is the camera, so if you want to make objects appear larger in the scene, either move the camera closer or increase its focal length. For more information on moving the camera, refer to Camera Navigation.

To scale an object or group by dragging:

1. Select an object or group.
2. Choose the Scale tool, or choose Scale from the Ghost menu.
3. Depending on how you want to scale, drag one of the following on the object's bounding box or projection:
   - **Corner** This maintains the object's proportions; it is scaled along all three axes.
   - **Edge** This scales the object on two of its axes.
   - **Side** This scales the object on one of its axes.

Drag the corner of an object's bounding box or projection to maintain proportions when you scale it.

Drag the edge of an object's bounding box or projection to scale the object on two axes.

Drag the side of an object's bounding box or projection to scale it on one axis.

The reference—which remains anchored in place—is the corner opposite to the one you drag.

To use the hot point as the reference, hold the Command/Ctrl key while you drag. The hot point stays in place, and all eight corners of the bounding box move to scale the object.

1. When you are satisfied with the object's new size, release the mouse. The object's Scaling factors change as you scale the object. You can use this information to scale other objects by the same amount.

---

**Note** Collision Detection is effective only when you reposition objects by dragging. Nudging and numerical repositioning are not affected by Collision Detection.
Using the Manipulators to Scale

When an object is selected with the scale tool, three colored cubes let you scale the object along its local X, Y, and Z directions. As you move the mouse cursor near one of them, the cursor changes to a cross. You can then click and move the cursor in the direction of the line under the cube. This constrains the scaling of the object to that line. If you press the Shift key at the same time, the scaling is uniform (the same in each direction).

The Scale Manipulator.

You can still use the bounding box of the object to scale it.

To use the keyboard to nudge the scale of an object:

- Press and hold the Command/Ctrl key, and use the arrow keys to nudge the object.
- If you press the Shift key at the same time, the object scales with smaller steps.

Orienting Objects

Most real-world objects have a logical upright position and some have a logical front. For example, airplanes and automobiles have both. In simple terms, think of an object's orientation as the direction it faces.

Carrara interprets the native upright position and front of objects by the way they are modeled.

Note Orientation applies to objects and groups, as well as to lights and cameras.

Carrara allows you to change an object's orientation in several ways: with the Rotate tool (free rotation), using Rotate from the Ghost menu, and numerically. You can also choose whether to rotate an object around its center or its hot point. See The Ghost Menu to learn more about the Ghost menu.

To choose an object's center of rotation:

- In the Properties tray: Motion tab: Transform panel: Around list, select Object Center or Hot Point.

To free-rotate an object:

1. If desired, position the object's hot point. For information on positioning an object's or group's hot point, refer to The Hot Point.
2. Select the object or group.
3. Choose the Rotate tool, or choose Rotate from the Ghost menu.

The Rotate tool.

1. Drag the object in a circle.
To constrain rotation to a particular plane:

1. Orient the working box and position the object's hot point. This allows you to control the plane and axis of rotation.

For information on aligning the working box to a group or object, refer to Changing the Working Box. For information on positioning an object's or group's hot point, refer to The Hot Point.

1. Choose the Rotate tool.
2. Drag one of the object's projections in a circle to rotate the object parallel to that plane. Hold down the Shift key while you drag to constrain rotation to increments of the Rotation Angle.

To orient an object or group numerically:

1. Select the object or group.
2. Enter the X,Y,Z rotation values you want on the Properties tray: Motion tab: Transform panel. For more information on these settings, refer to Setting Object Properties.

**Using the Manipulators to Rotate**

You can use the manipulators to rotate objects.

The Rotate Manipulator.

To rotate an object using the manipulators:

- Select an object with the rotate tool.
- Three colored arcs let you rotate the object around its local X, Y and Z directions. A ring encompasses the three arcs and makes the object rotate around the direction of the camera. As you move the mouse cursor near one of the arcs or the ring, the cursor changes to a cross. You can then click and move the cursor along the arc. This constrains the rotation of the object. To rotate freely in all directions, click inside the ring (without clicking on one of the arcs) and move the mouse.

To use the keyboard to nudge the rotation of an object:

- Press and hold the Command/Ctrl key, and use the arrow keys to nudge the object.
- If you press the Shift key at the same time, the object rotates with smaller steps.

Changing the size of the manipulators:

To easily manipulate big or small objects, the size of the manipulators depends on the size of the 3D View.

To make the manipulators bigger or smaller:

1. Choose **File menu> Preferences**.
2. Choose 3D View in the pop-up menu.
3. Adjust the 3D View Controls Size slider.
Mirroring an Object's Orientation

You can automatically mirror an object or group's orientation across the ground plane.

To mirror an object or group's orientation:

1. Select an object or group.
2. Position the hot point to describe the location you want for the mirror plane.
3. In the Properties tray: **Motion tab: Transform panel**, enable the Mirror option.

Arranging Objects with Constraints

By default, when an object has a position constraint, dragging it respects the constraint. For example if the constraint is a ball joint, the object can only be rotated and cannot be moved. This Use Constraints mode can be toggled on and off by using the **View menu > Use Constraints** command, or by clicking on the Use Constraints icon on the side of the 3DView window.

When the Use constraints mode is off, the objects can be moved and rotated freely, even if they have a constraint.

Use Constraints ON and OFF.

See Applying Constraint Properties.

Arranging Objects Without Modifying its Children

Lock Children ON and OFF

When you move, scale or rotate an object, its children follow the movement. But if you want to adjust an object in a hierarchy without affecting the children: you have to move the parent and then move back the children to their previous position.

The **Lock Children** mode simplifies that: enable it and you will be able to move, rotate or scale an object without changing its children. This can be useful in a lot of cases, for instance, to adjust the joints of a skeleton.

**Note**

Be careful when using this mode on animated objects. This mode is only for adjusting, you should avoid using it in the middle of an animation as it may modify the movement of the children of the object you are modifying.

Aiming Cameras and Lights

All of the positioning and orientation commands work on cameras and lights as well as simple objects.
Note Because the current camera is not visible as an object, manipulation by dragging isn't possible.

The Point At command directs the light beam or camera view toward an object you specify.

To point a camera or light at an object:

1. Select the camera or light and the object you want to point at. You may select multiple cameras and lights, but only one object or group. If you don't select a camera or light, Carrara points the current camera.
2. Choose Edit menu> Point At. The light or camera points at the hot point of the selected object or group.

Aligning Objects

Carrara's relative alignment feature lets you arrange objects with respect to each other. You align objects on each axis separately. The selected axis is called the axis of constraint.

When aligning many objects, you may want to start by aligning only two of them. Once the two objects are aligned, group them, then align a third object to the group. Continue to group and align objects until all are aligned.

To align objects relative to each other:

1. Orient the working box to set the axes of constraint you want to use. For information on orienting the working box, refer to Changing the Working Box.
2. Select two or more objects. The first object you select becomes the anchor object.

The Align dialog.

1. Click to choose the axis or axes of constraint. To choose more than one axis, Shift+click additional axes. If you choose all three axes, the second object will be embedded in the anchor object.
2. Select the alignment command you want for this axis. You'll often use a different command on each axis.
   - **Align** sets the reference point of each object co-linear with the reference point of the anchor object along the axis of constraint.
   - **Contact** brings the Max of each object into contact with the Min of the next object along the axis of constraint.
   - **Space** puts the specified distance between the reference points of each object along the axis of constraint. Enter a spacing value.
   - **Distribute** aligns three or more objects at an equal distance from each other along the axis of constraint. By default, the first two objects you select serve as anchors, while the third and subsequent objects are the ones that move.
3. Select the reference point on the objects. Object reference points that are grayed out are unavailable for the selected alignment command.
   - **Hot Point** specifies each object's hot point.
Align with Hot Point as reference.

- **Min** specifies the side of each object's bounding box with the lower coordinate value along the axis of constraint.

Align with Min as the reference

- **Center** specifies the center of each object's bounding box.

Distribute with Center as the reference.

- **Max** specifies the side of each object's bounding box with the higher coordinate value along the axis of constraint.

Space with Max as the reference.

- **Sides** specifies the sides of the object's bounding box.

Contact with Sides as the reference.

1. If you want to add a buffer around the distribution of the objects, enter a value for the buffer in the Space field.
2. Click OK.
3. When you have achieved the alignment you want in one constraint axis, move on to the next one. (Return to step 3.)

**Alignment: Tutorial**

The following section is a step-by-step tutorial that shows you how to align three objects.

To align the hot points of three objects:

1. Use the object primitives pop-up menu to drag three simple objects into your scene.

Three objects in the working box.

1. Select all three objects by holding down the Shift key while clicking each object. The first object you select becomes the anchor object.
2. Choose **Edit menu > Align**. The Align dialog appears.
3. Click to choose both the X and Y axes.
From the Alignment pop-up menu, select Align.
5. From the Reference pop-up menu, select the Hot Point.

The Align dialog with the specified settings.

1. Click OK. The objects are aligned along the X and Y axes.

The objects are aligned.

**Duplicating Objects**

Duplication creates a new object with the position, orientation, and scale attributes of the original object. Duplication is an efficient way of working and has a number of practical applications.

For example, you could use this feature to build a DNA strand:

1. Create the first base and place it between two helixes.

Select the object.

1. Then duplicate the base, raise the duplicate to the level where the next base would be located, and rotate it an appropriate amount.

Duplicate and position the new object.

1. Choose duplicate again and again until you have built a DNA strand.

Replicate (repeat 1 and 2).

Duplicated objects are multiple instances of a single master object. For more information, refer to Working with Master Objects.

To duplicate an object:

1. Select one object.
2. Choose *Edit menu*> **Duplicate**. The duplicate occupies the same space as the original. Pull the duplicate away by dragging it or moving it numerically.
3. Perform any number of position, orientation, and scale operations without deselecting the object.
4. Choose Duplicate again.

Each time you duplicate, the new copy receives the positioning, orientation, and scaling of the last duplicated object.
Replicators

Duplicating objects can sometimes be a very long process for scenes like a city or a forest, especially when you don’t want your objects to be exactly the same. To help you duplicate objects in very little time and using little memory, Carrara 6 provides two tools: the Replicator and the Surface Replicator. They do almost the same thing, replicating your objects, but in different ways.

Surface Replicator example

To replicate objects

1. Insert one type of replicator in your scene by the method you choose:
   - Insert menu> Replicator or Insert menu> Surface Replicator.
   - Drag one of these tools to the scene window.

1. Insert the objects to generate as sons of the generator:
   - In the hierarchy move the object or the group you want to generate on the replicator, or;
   - In the replicator properties use the button Add.

If you want to randomly generate different types of objects, such as different types of trees or buildings, reiterate step 2 above. For example, if you want to create a forest with 75% pine trees and 25% maple trees, insert three pine trees and one maple tree as sons of the generator.

1. Choose the generating point on each object: objects are generated from their hot point. For trees you will want to generate them from their base, so move the hot points to the bases of the trees.
2. Edit the generator properties by:
   - Double clicking on the generator, or;
   - Selecting the generator and the switching to the Model Room.

1. In the Assemble Room you can adjust the display of the generated objects. This setting won’t affect the final render but lets you work with a clean scene.
2. If you are happy with your replication, you can create instances for real to work with it using the Create button in the modeling room. But in most cases you should not do this because:
   - The properties of the generators won’t be accessible
   - Carrara might be slower because of all these objects especially the 3D View

The Replicator

The Replicator duplicates objects along basic shapes: grid, rectangle, circles, etc. It can be used to create armies, walls or cities. Once you have created the replicator and set the objects you want to replicate, choose the settings in the Replicator modeler.

- The Grid Cell determines different things according to the replication method, but basically it is the distance between two neighboring objects.
The Autogrid replication method will set the grid cell to biggest bounding box of the replicated objects.

The Random Transform lets you create objects that are not positioned uniformly by changing rotation, scale or position randomly on each object. The settings are the amplitude of the error on each parameter.

The Seamless option can only be used with the Autogrid replication method and switches the orientation of one of two replicated objects. For example, if you set a terrain as the duplicated object, this will result as a large, continuous terrain.

The Surface Replicator

The Surface Replicator duplicates objects randomly on the surface of another object. You could use this to quickly generate forests, vegetation or rocks on terrain, or hair on a character. Once you have created the replicator and set the objects you want to replicate, choose the settings in the Surface Replicator modeler.

- The surface used to generate objects is the surface of the Source Object that can be a plane or a terrain, for example. Use the choose button to select it from the scene. The replicated objects will be linked to the source object: if you modify the source object, the generated objects will move; if you delete it, the generated objects will disappear.
- The number of objects you can choose is only an approximative number as there may not be enough space on the surface to place all the objects. If this is the case, you will see a warning at the bottom of the dialog.
- The Random Transform lets you create objects that are not all the same by changing rotation or scale randomly on each object. The settings are the amplitude of the error on each parameter.
- Align object to normal determines whether the objects should be orientated like the original object or be orientated like the surface they lay on, using the local normal. To generate a forest you will prefer to uncheck this, where as for hairs it is better to have it checked.

The distribution of the objects can be automatic, but you can also choose globally where you want to put your objects.

- If the source object has several shading domains, you can limit the distribution of replicated objects to a shading domain.
- Use shader sets the distribution of objects to follow the shader of the generator. The generator will try to place objects on bright areas first and black areas won't get any objects.
- If your objects should not overlap (as is the case most of the time) you can set a \textbf{Minimum distance between objects}.
- If you want to make thickets of trees or other clustered objects, you can use Objects try to cluster. Specify the \textbf{average distance} objects should have in clusters and apply a \textbf{Strictness}. High strictness will tend to leave no object by itself.

Changing an Object's Symmetry

Many real-world objects exhibit symmetry. Airplanes, automobiles, and the human body are a few examples. To help you build complex symmetrical objects, Carrara 6 provides the Flip and Duplicate with Symmetry commands.
The Symmetry Plane

The symmetry commands let you choose the plane across which objects are reflected or flipped.

The attitude of the working box and the Local universe's Z coordinate are important for a successful Flip or Duplicate with Symmetry operation. Flip repositions or reorients the object, while Duplicate with Symmetry makes a second copy in a symmetrical attitude.

- To flip an object in place, position the center of the object at Z=0 in the working box's coordinate system.
- To create a mirrored duplicate precisely alongside the original, set the ground plane of the working box parallel to the plane that will be the center of the symmetrical object. (This will be parallel to one side of the object's bounding box). Move the working box to put working box Z=0 in contact with that side of the object's bounding box.

To flip an object:

1. Orient and position the working box to put the plane of symmetry where you want it.
2. Select the object you want to flip.

The Flip dialog.

1. Click to select the plane axis along which you want to flip the object.
2. If you want to offset the plane along which the object flips, enter a value in the Plane Offset field.
3. Click OK. Carrara flips the object across the plane of symmetry.

To duplicate with symmetry:

1. Orient and position the working box to put the plane of symmetry where you want it.
2. Select the object.
3. Choose Edit menu> Duplicate with Symmetry. The Duplicate with Symmetry dialog appears.

The Duplicate with Symmetry dialog.

1. Click to select the plane axis along which you want to duplicate the object.
2. If you want to offset the plane along which the object duplicates, enter a value in the Plane Offset field.
3. Click OK. Carrara 6 duplicates the object across the plane of symmetry.

Duplicating an image with symmetry.
Shadow Casting

By default, all objects that are not transparent cast shadows. There may be an instance where you don't want an object to cast shadows. Carrara 6 allows you to turn Shadow Casting on and off for individual objects.

To set shadow casting for the selected object:

- In the Properties tray: General tab: General panel, enable the Casts shadows option.

Splitting Objects

You can split objects into their component pieces. For example, you can split a line of text into individual letters or you can break a vertex object into polymeshes.

To split an object:

1. Select the object you want to split.
2. Choose Edit menu> Split Object. The object splits into its component pieces.