

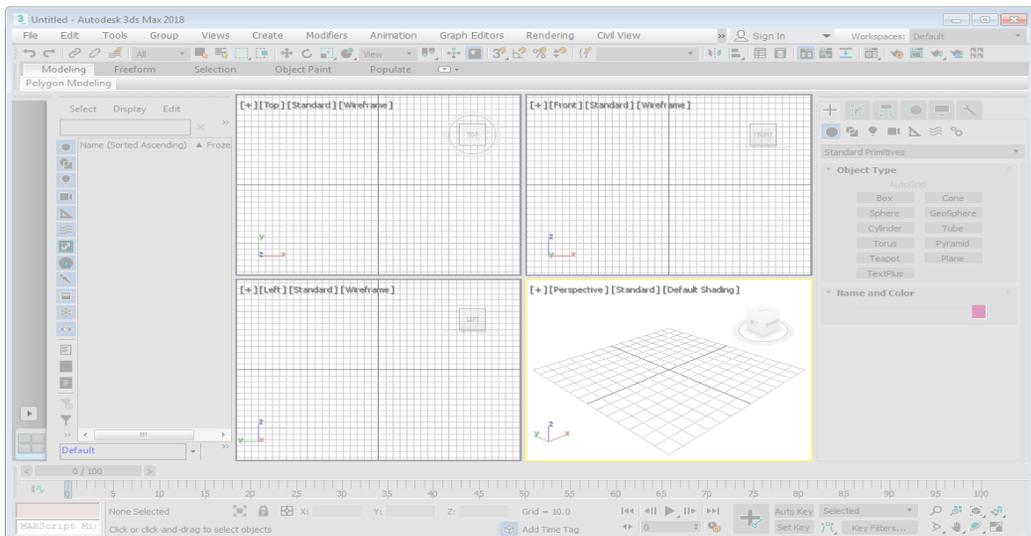
Chapter 1

Introduction to Autodesk 3ds Max 2018

Learning Objectives

After completing this chapter, you will be able to:

- Understand the Autodesk 3ds Max interface components
- Use controls for creating or modifying objects
- Use and customize hotkeys in Autodesk 3ds Max
- Customize the colors of the scene elements



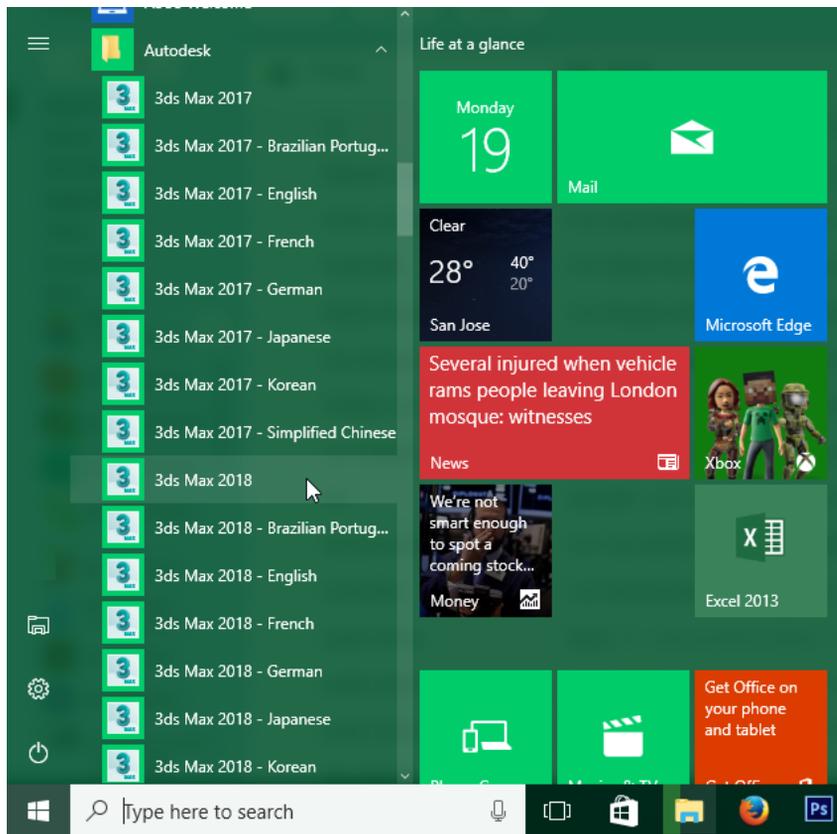


Figure 1-1 Starting Autodesk 3ds Max 2018 from the taskbar

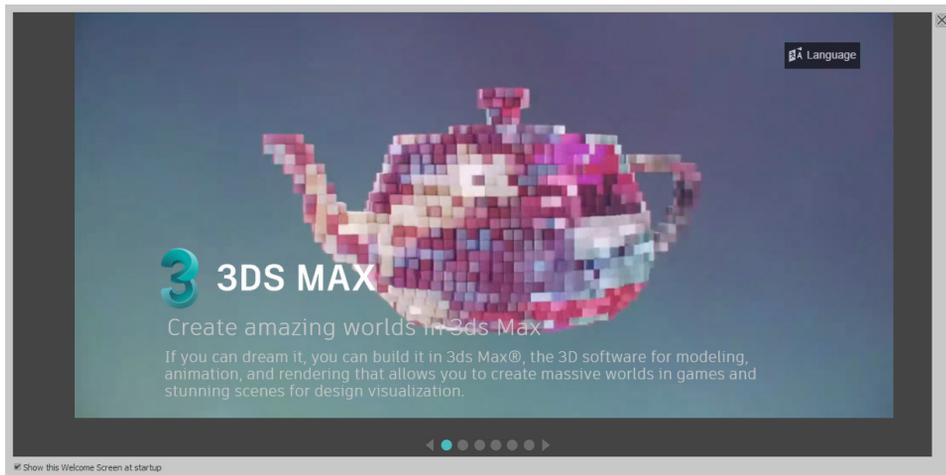


Figure 1-2 The Welcome Screen

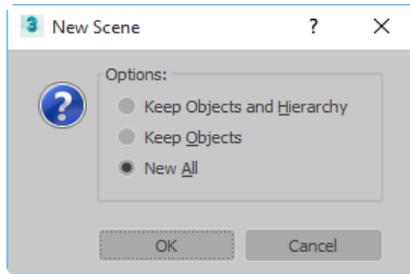


Figure 1-3 The New Scene dialog box

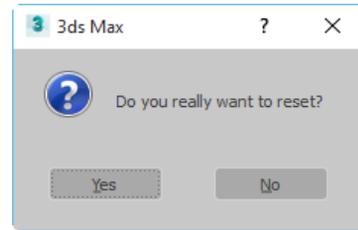


Figure 1-4 The 3ds Max message box

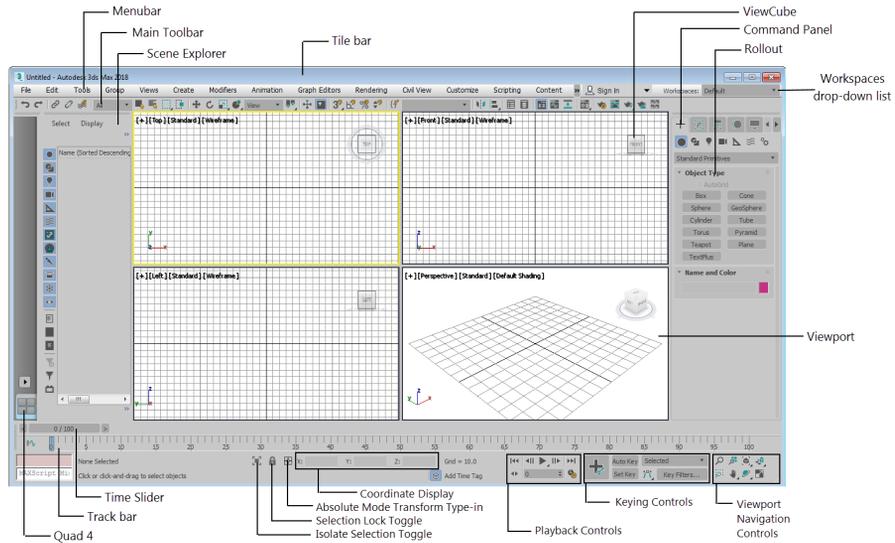


Figure 1-5 Different screen components of Autodesk 3ds Max interface

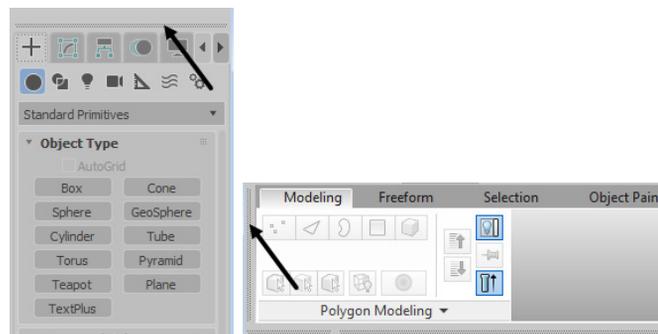
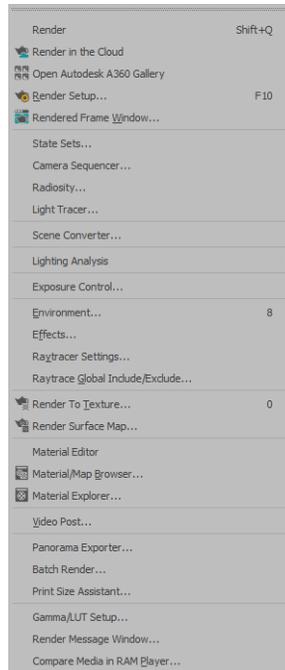


Figure 1-6 The handles marked with arrows



*Figure 1-7 The keyboard shortcuts in the **Rendering** pull-down menu*

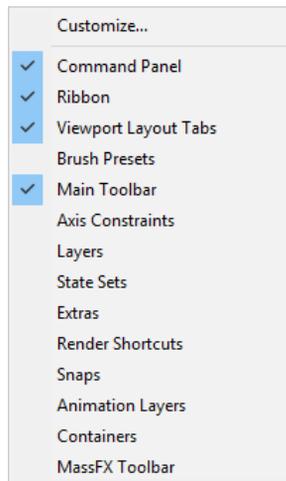
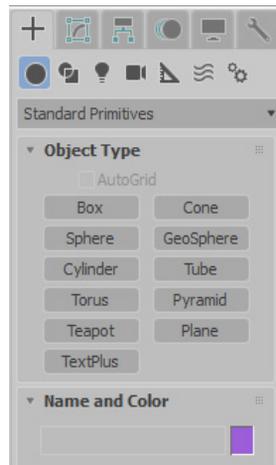


Figure 1-8 The shortcut menu displayed to view the hidden toolbars



*Figure 1-9 The **Command Panel***

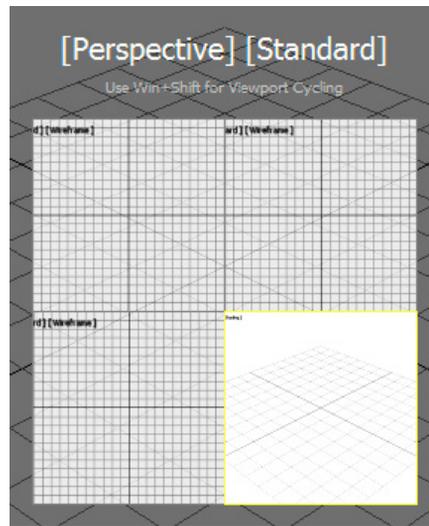


Figure 1-10 Selecting a viewport to make it active

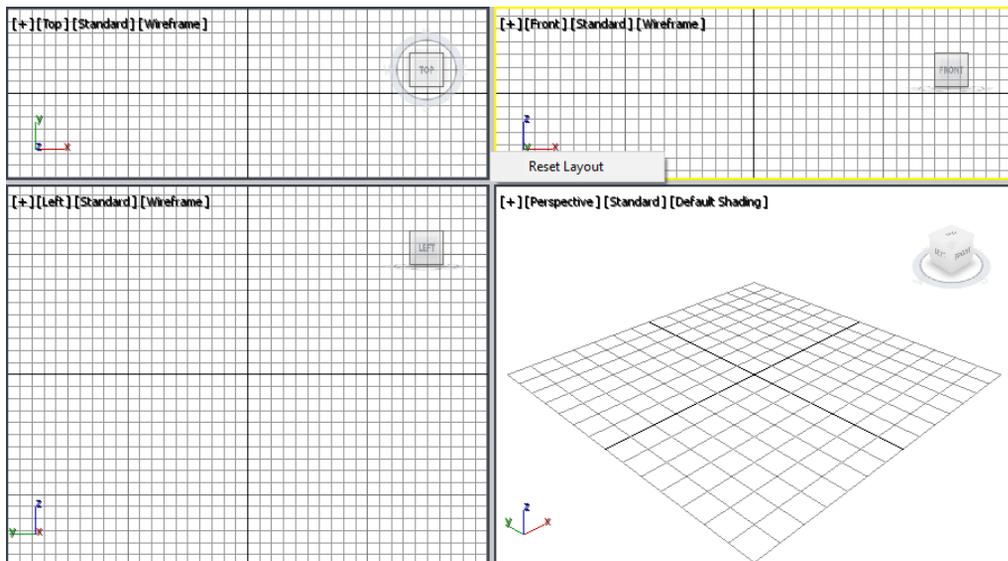


Figure 1-11 The *Reset Layout* option in the shortcut menu

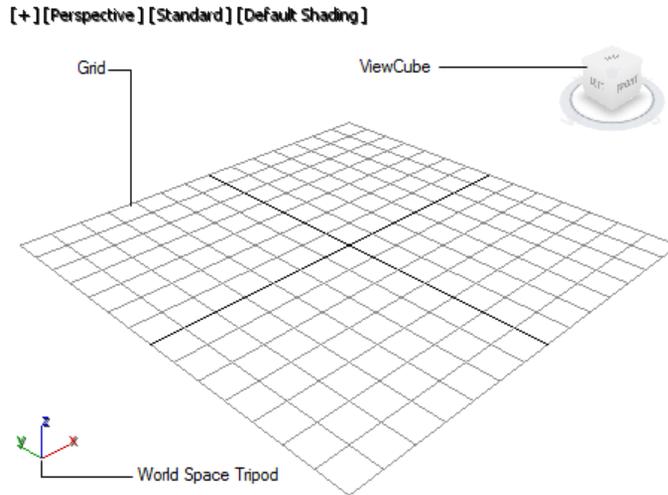


Figure 1-12 The world space tripod, grid, and ViewCube in the Perspective viewport

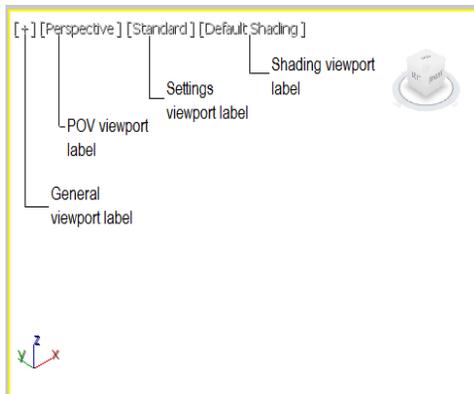


Figure 1-13 The viewport labels in the Front viewport

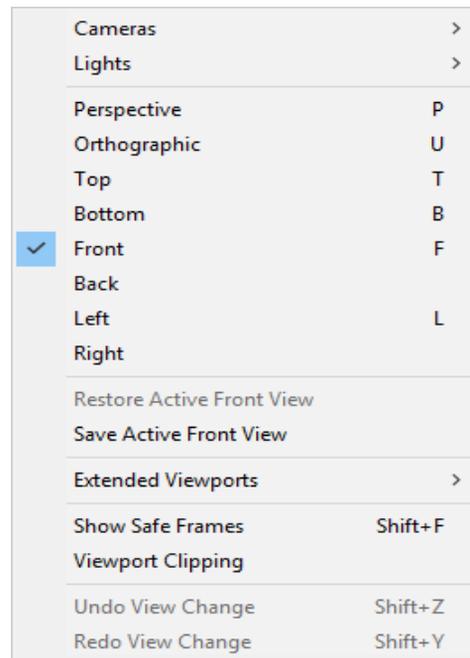


Figure 1-14 The flyout displayed on clicking the POV viewport label

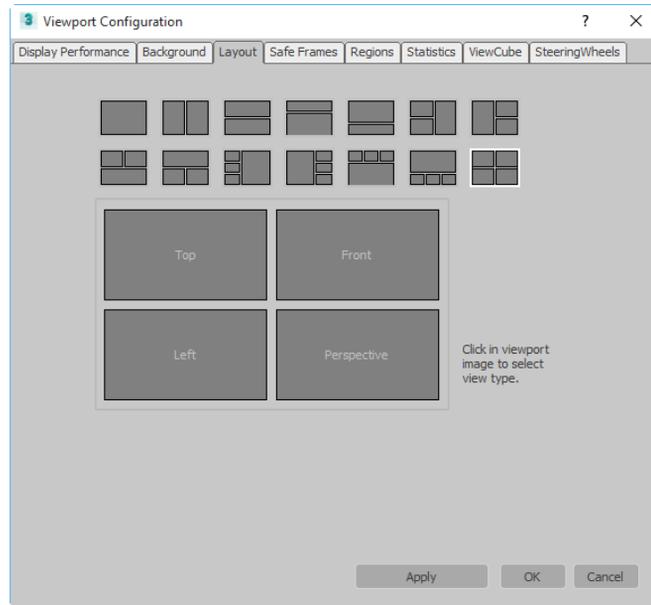


Figure 1-15 The **Layout** tab of the **ViewPort Configuration** dialog box

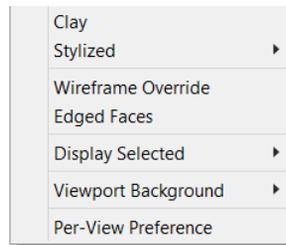


Figure 1-16 The flyout displayed on clicking the **Shading** viewport label



Figure 1-17 The viewport navigation controls



Figure 1-18 The animation playback controls



Figure 1-19 The animation keying controls

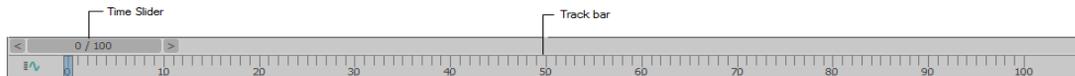


Figure 1-20 The track bar and the time slider

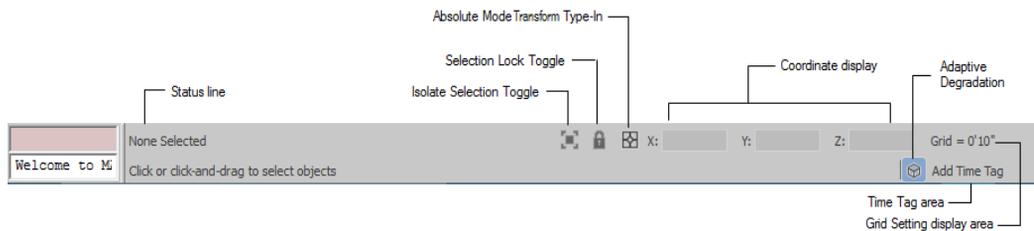


Figure 1-21 The status bar

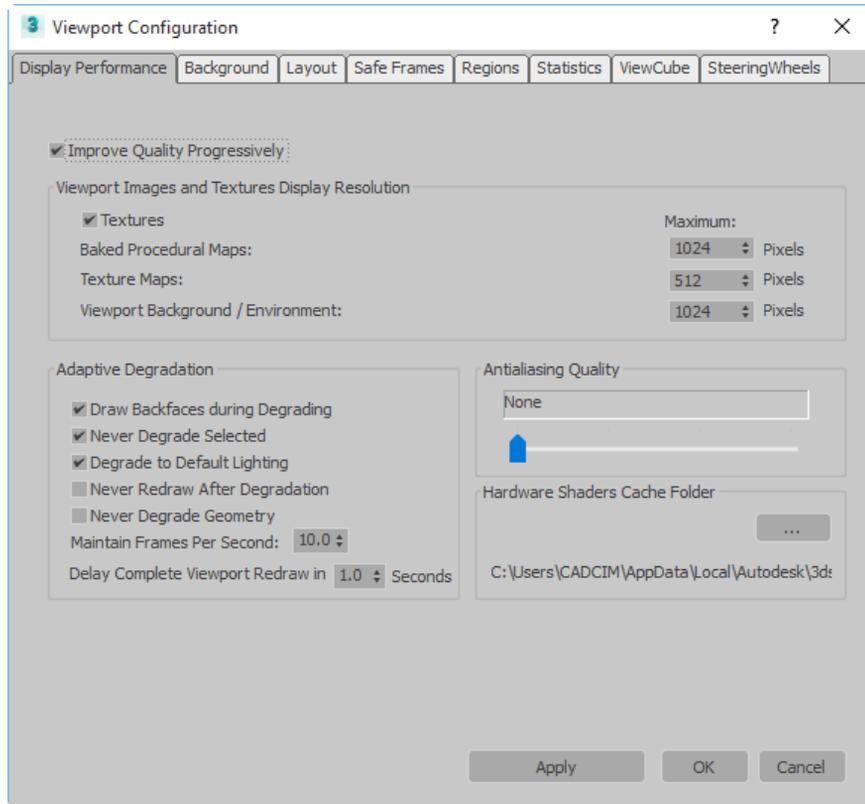


Figure 1-22 The Viewport Configuration dialog box

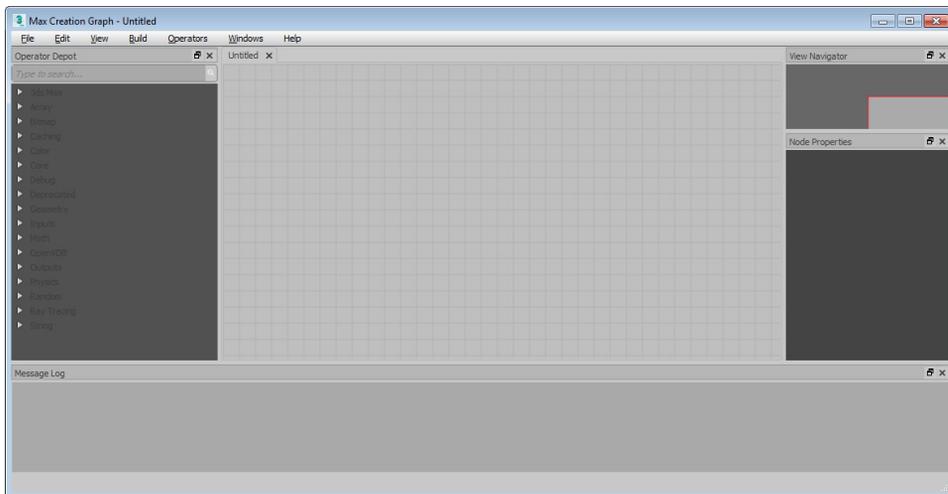


Figure 1-23 The Max Creation Graph - Untitled window

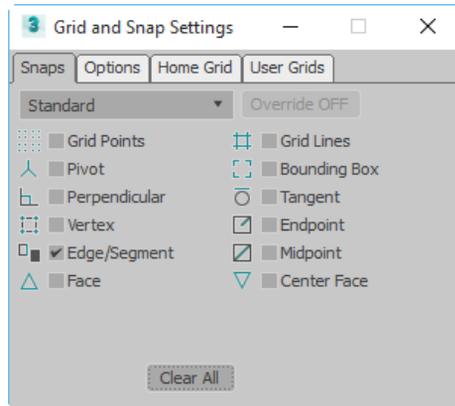


Figure 1-24 The *Grid and Snap Settings* dialog box



Figure 1-25 The *Snaps Toggle* flyout

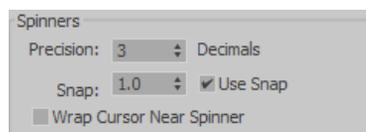


Figure 1-26 The *Spinners* area in the *Preference Settings* dialog box

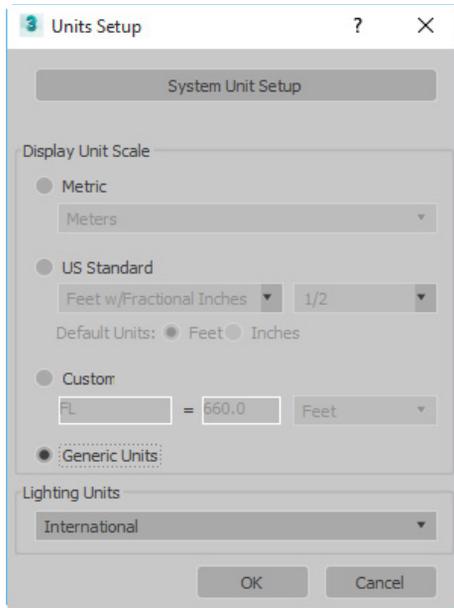


Figure 1-27 The Units Setup dialog box

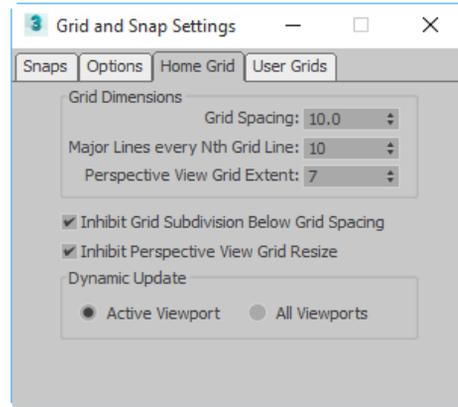


Figure 1-28 The Home Grid tab chosen in the Grid and Snap Settings dialog box

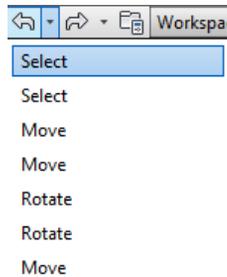


Figure 1-29 The list of actions displayed

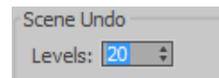


Figure 1-30 The Scene Undo area in the Preference Settings dialog box

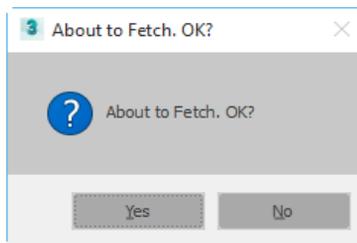


Figure 1-31 The About to Fetch. OK? dialog box

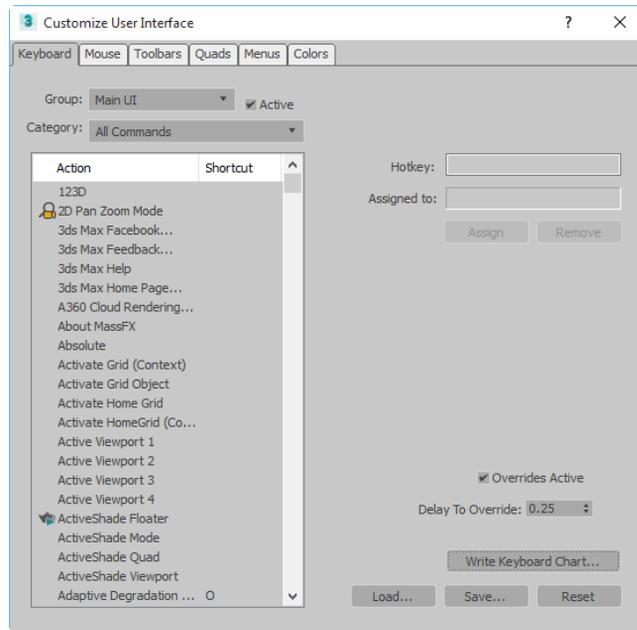


Figure 1-32 The Customize User Interface dialog box

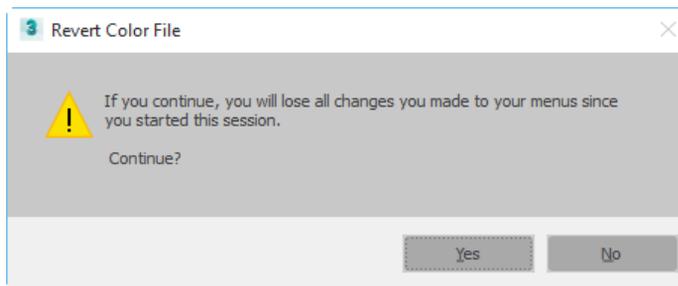


Figure 1-33 The Revert Color File message box

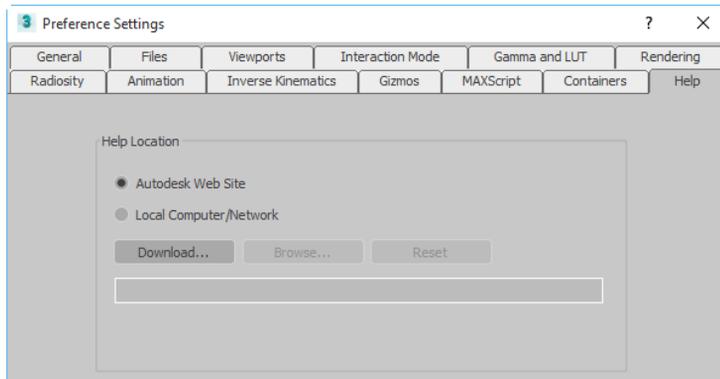


Figure 1-34 The Help tab chosen in the Preference Settings dialog box

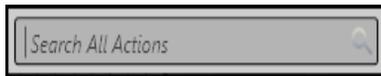


Figure 1-35 The search field

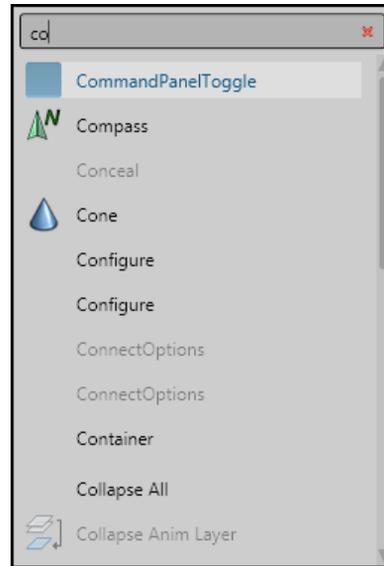


Figure 1-36 List of commands displayed on entering first few characters

2

Standard Primitives

Learning Objectives

After completing this chapter, you will be able to:

- *Understand viewport navigation controls*
- *Understand selection techniques*
- *Understand Scene Explorer/Layer Explorer*
- *Create standard primitives*
- *Render a still image*
- *Change the background color of a scene*



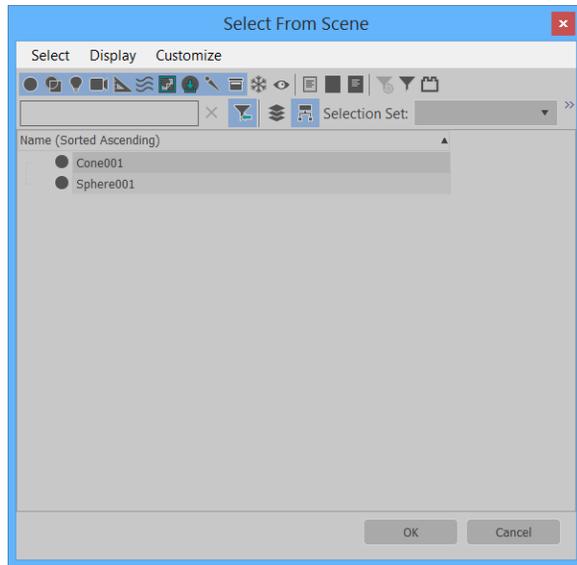


Figure 2-1 The Select From Scene dialog box

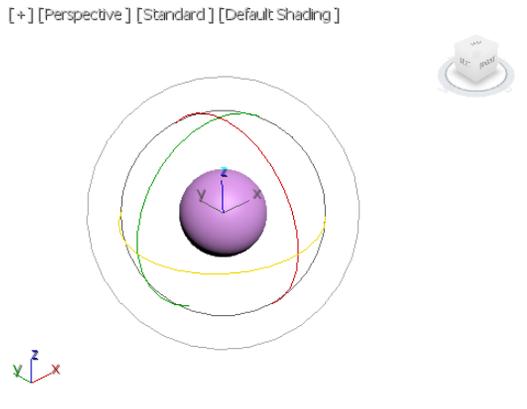


Figure 2-2 The circular gizmo in the Perspective viewport displayed while rotating the object

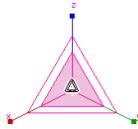


Figure 2-3 The scale gizmo for uniform scaling

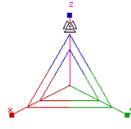


Figure 2-4 Selecting the Z-axis for non-uniform scaling

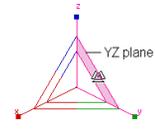


Figure 2-5 Selecting the YZ plane for non-uniform scaling

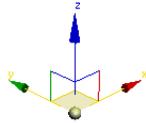


Figure 2-6 The move gizmo

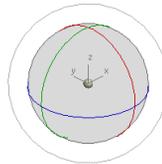


Figure 2-7 The rotate gizmo

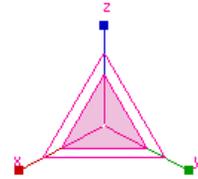


Figure 2-8 The scale gizmo

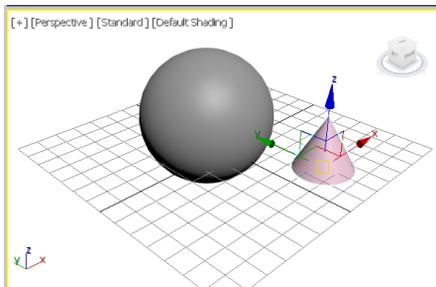


Figure 2-9 The placement of the objects in Perspective viewport

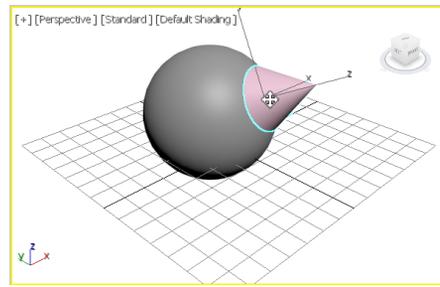


Figure 2-10 The selected object aligned with other object

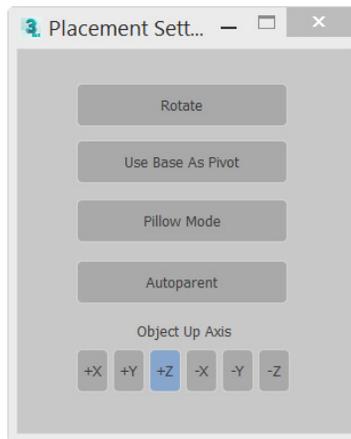


Figure 2-11 The Placement Settings dialog box

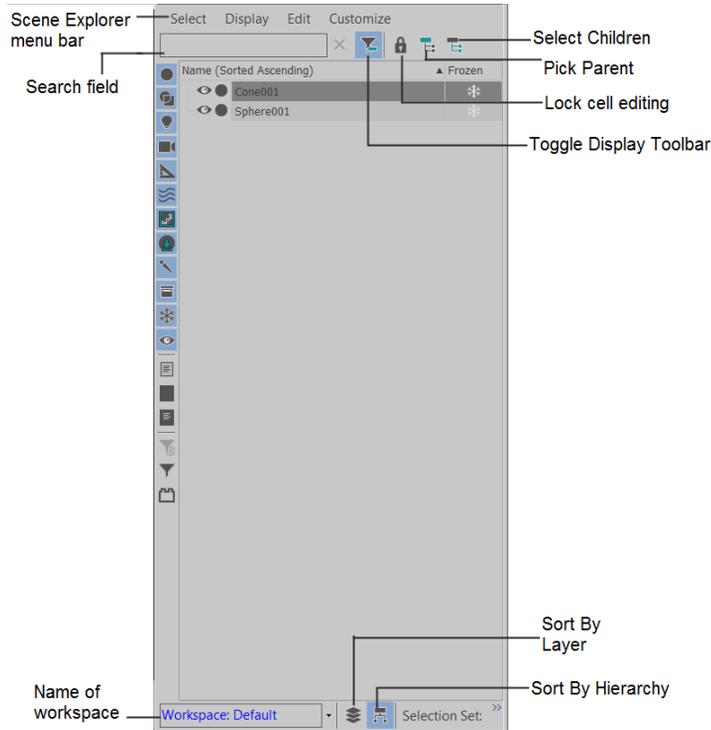


Figure 2-12 *The Scene Explorer*

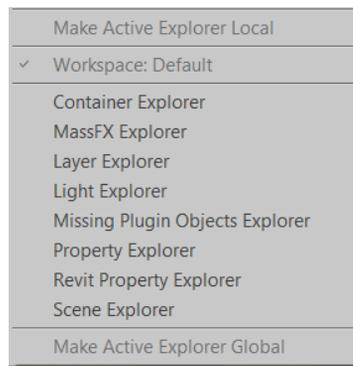


Figure 2-13 *The flyout displayed*

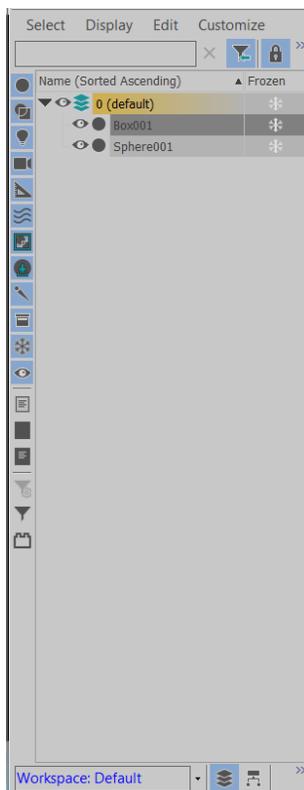


Figure 2-14 The Property Explorer

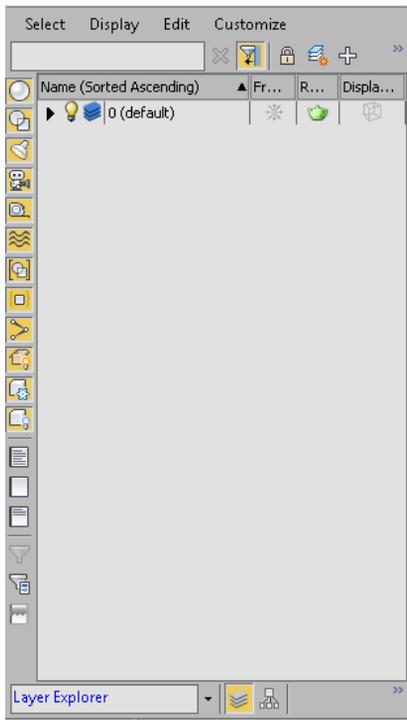


Figure 2-15 The Layer Explorer

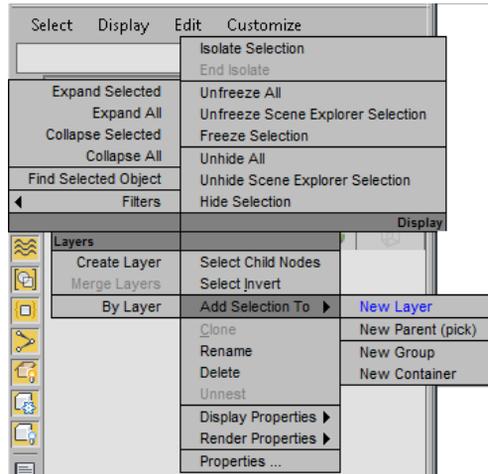


Figure 2-16 The quad menu

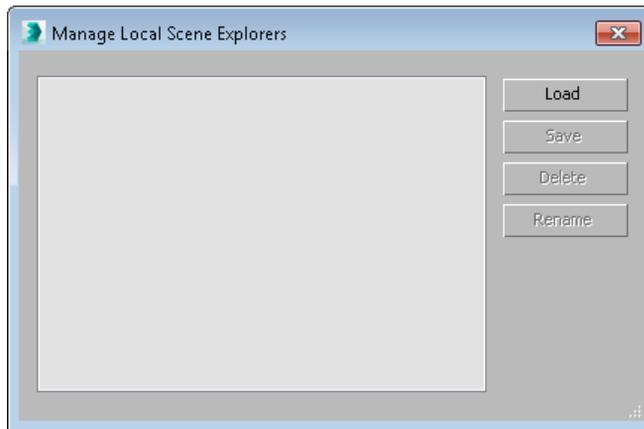


Figure 2-17 The Manage Local Scene Explorers dialog box



Figure 2-18 The Axis Constraints toolbar

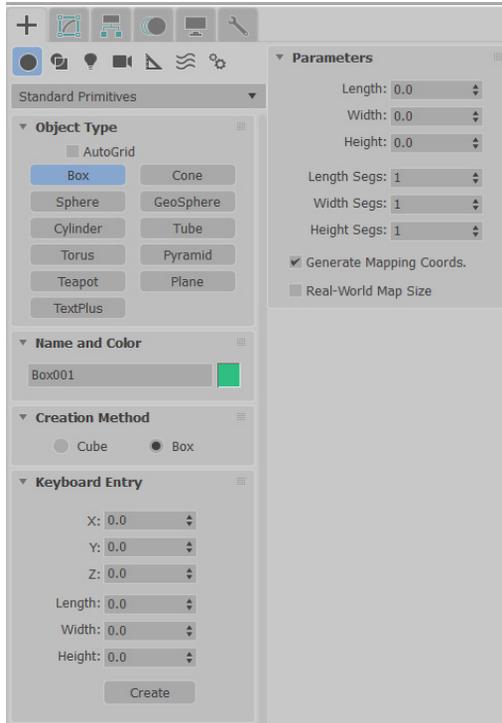


Figure 2-19 Various rollouts to create a box

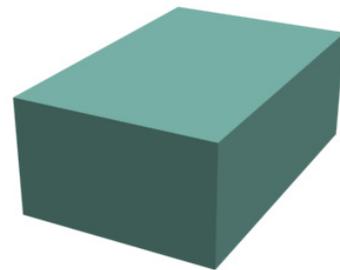


Figure 2-20 A box displayed in the viewport



Figure 2-21 The Object Color dialog box



Figure 2-22 The Color Selector: Add Color dialog box

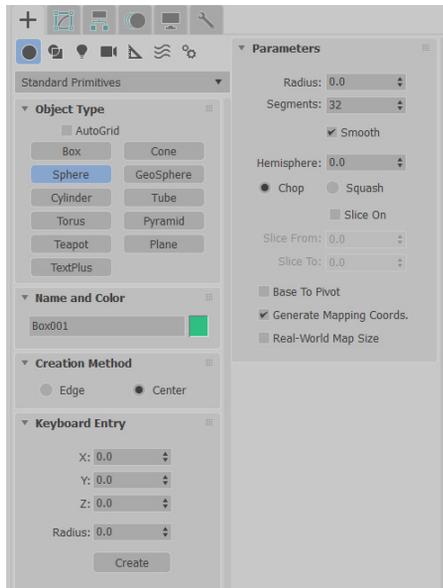


Figure 2-23 Various rollouts to create a sphere

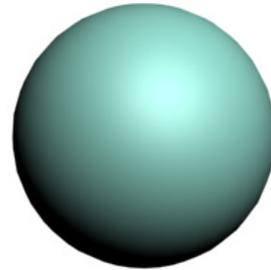


Figure 2-24 A sphere displayed in the viewport

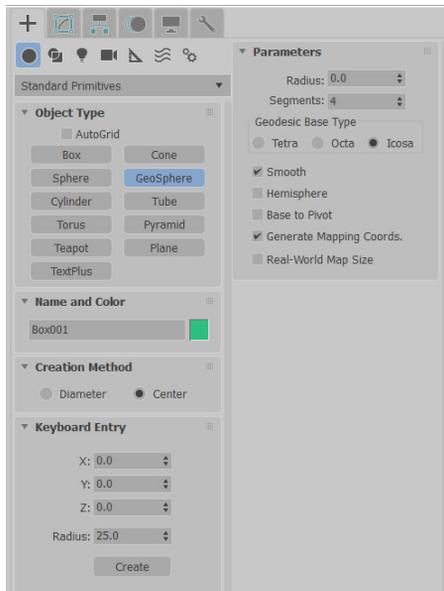


Figure 2-25 Various rollouts to create a geosphere

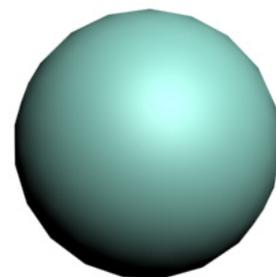


Figure 2-26 A geosphere displayed in the viewport

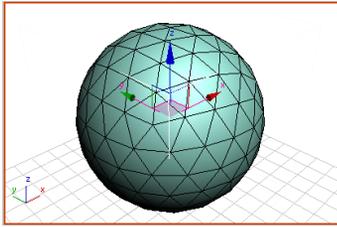


Figure 2-27 The geosphere displayed on selecting the **Icosa** radio button

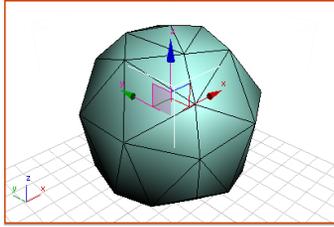


Figure 2-28 The geosphere displayed on selecting the **Tetra** radio button

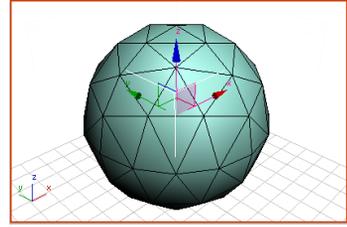


Figure 2-29 The geosphere displayed on selecting the **Octa** radio button

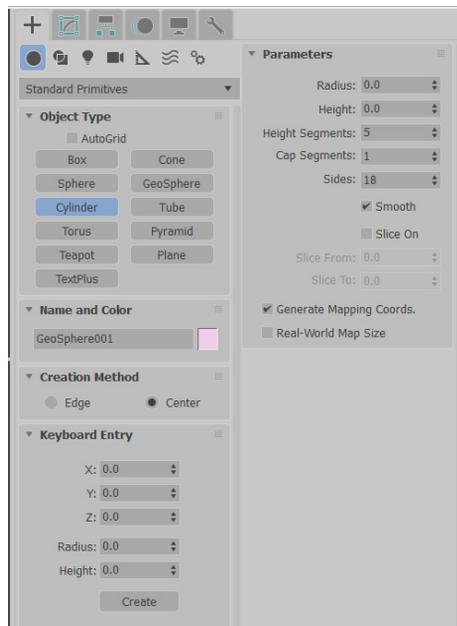


Figure 2-30 Various rollouts to create a cylinder

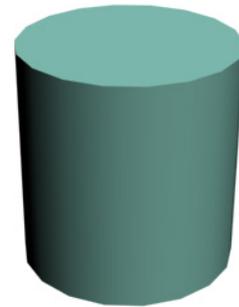


Figure 2-31 A cylinder displayed in the viewport

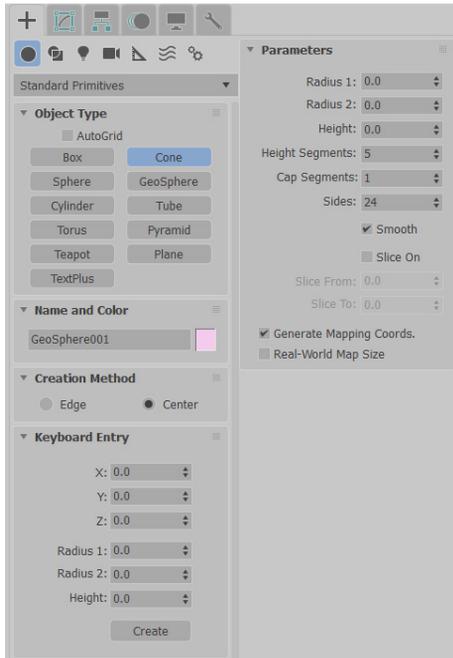


Figure 2-32 Various rollouts to create a cone

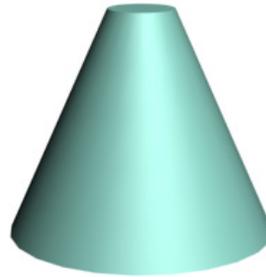


Figure 2-33 A cone displayed in the viewport

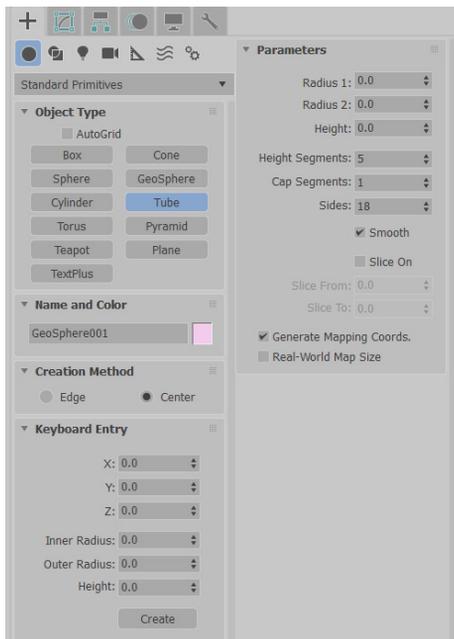


Figure 2-34 Various rollouts to create a tube

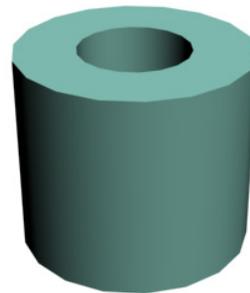


Figure 2-35 A tube displayed in the viewport

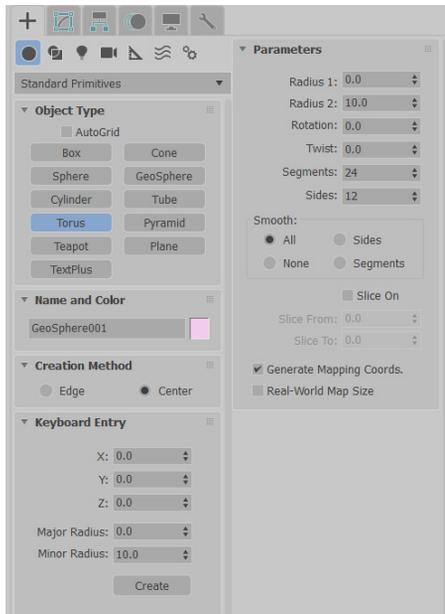


Figure 2-36 Various rollouts to create a torus

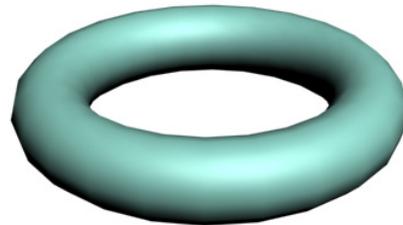


Figure 2-37 A torus displayed in the viewport

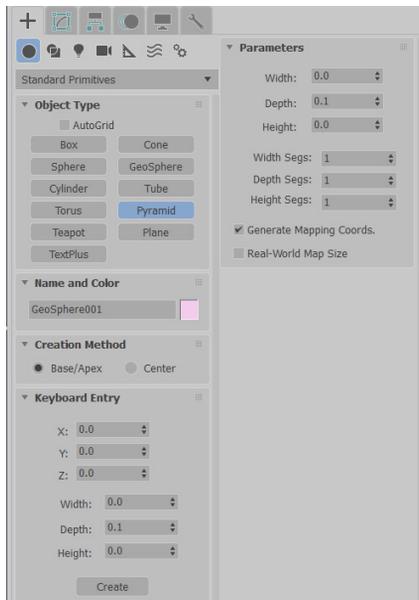


Figure 2-38 Various rollouts to create a pyramid



Figure 2-39 A pyramid displayed in the viewport

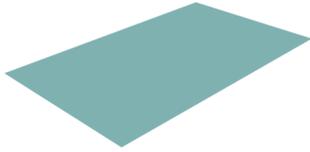


Figure 2-40 A plane displayed in the viewport



Figure 2-41 A teapot displayed in the viewport

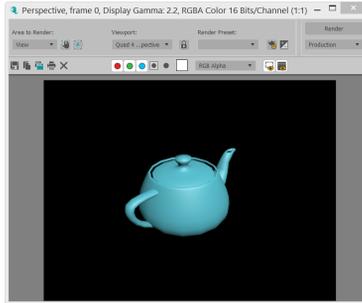


Figure 2-42 The Perspective, frame 0, Display Gamma 2.2, RGBA Color 16 Bits/Channel (1:1) window

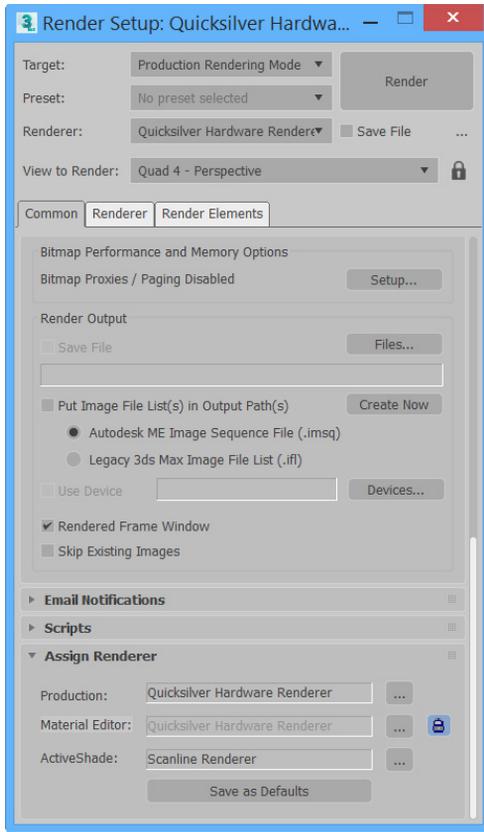


Figure 2-43 The Render Setup: Quicksilver Hardware Renderer dialog box

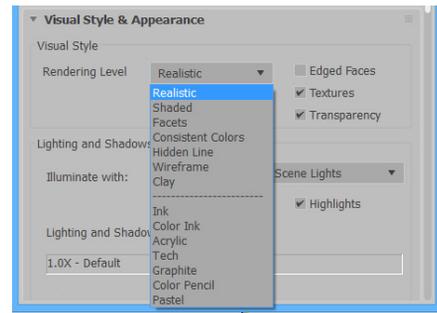


Figure 2-44 The Rendering Level drop-down list

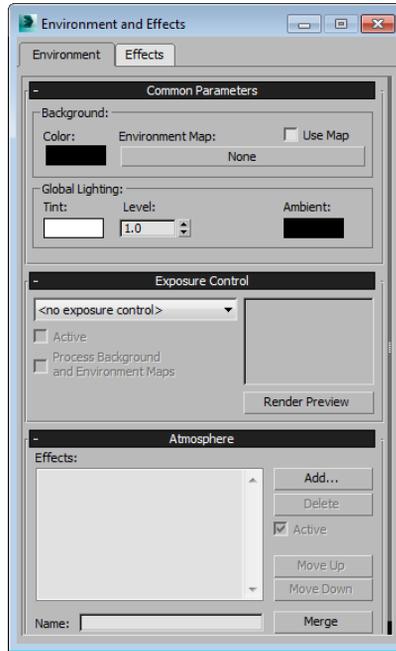


Figure 2-45 The Environment and Effects dialog box



Figure 2-46 The model of coffee table and chairs

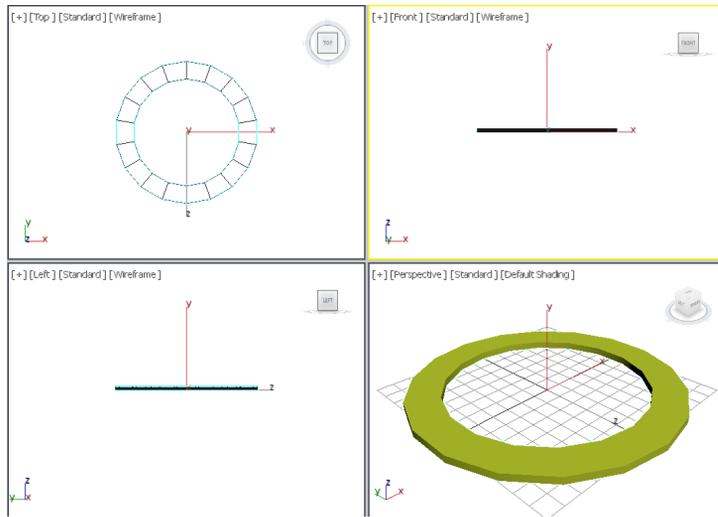


Figure 2-47 The Tube001 displayed in viewports

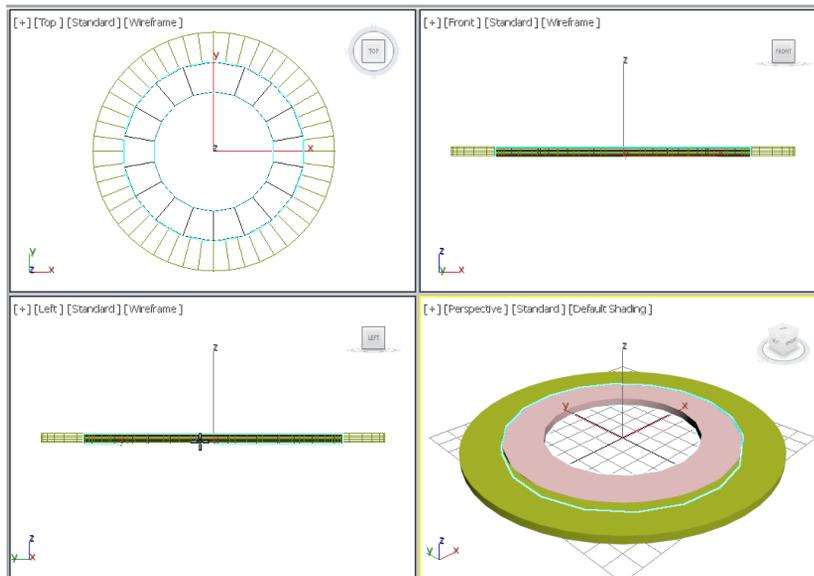


Figure 2-48 The Tube002 displayed in viewports

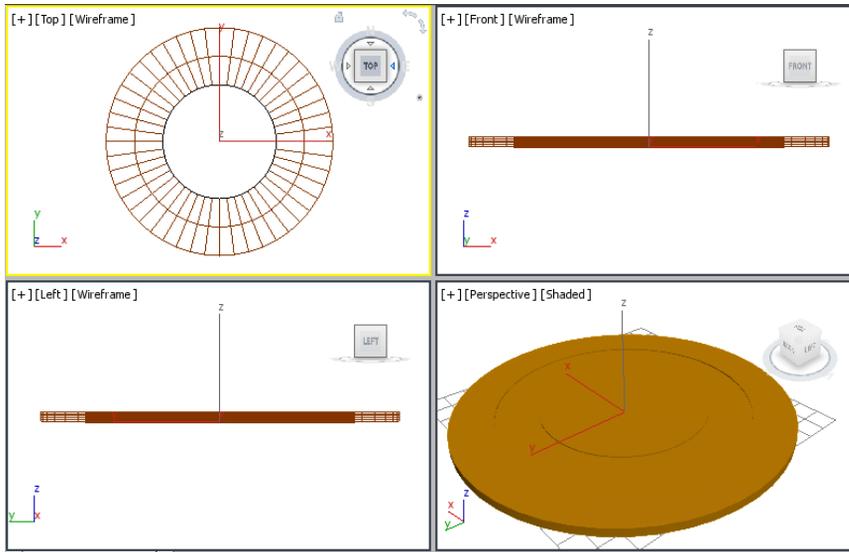


Figure 2-49 The Cylinder001 displayed in the viewports

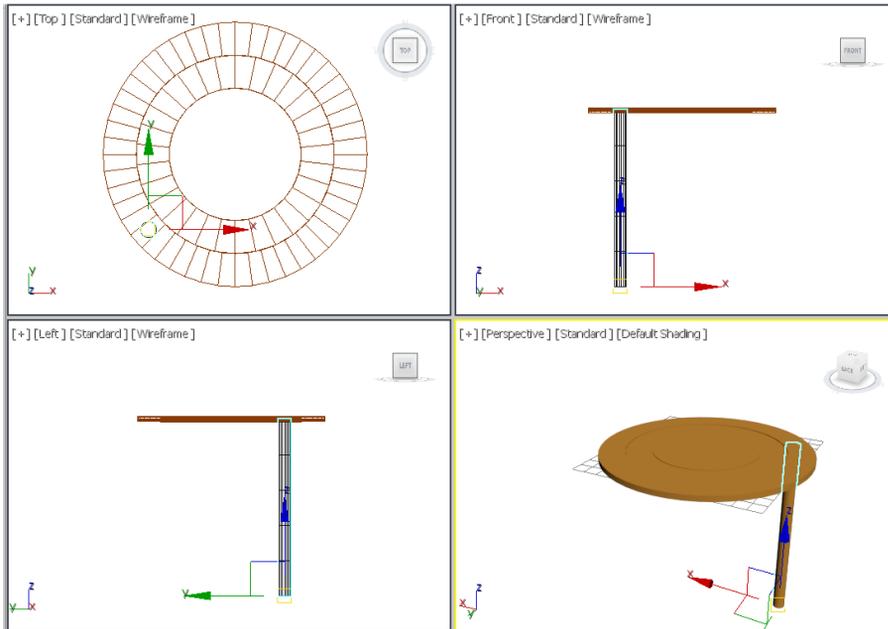


Figure 2-50 The leg001 aligned in viewports

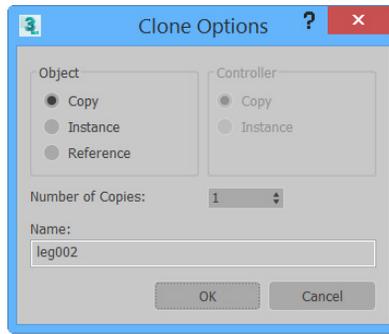


Figure 2-51 The Clone Options dialog box

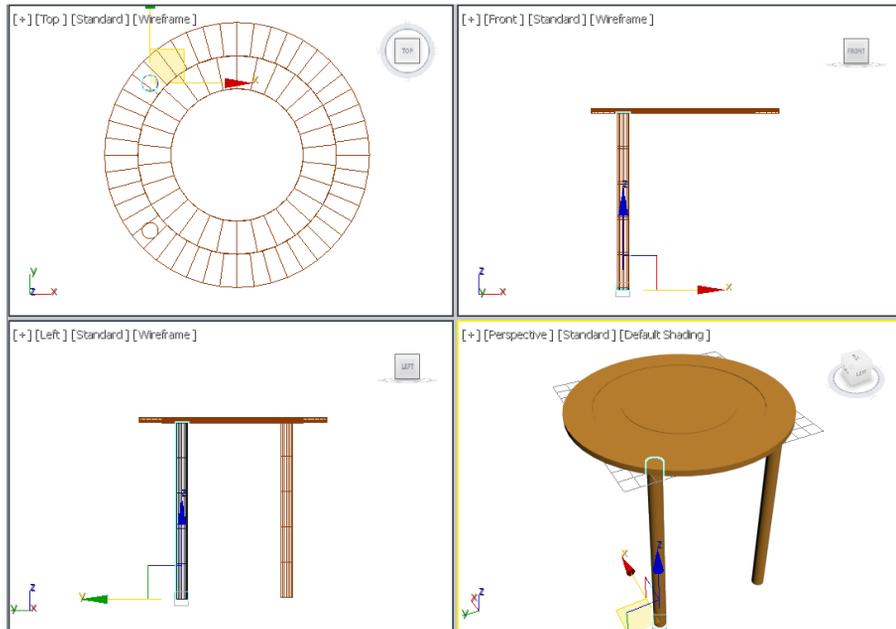


Figure 2-52 The leg002 created after cloning leg001

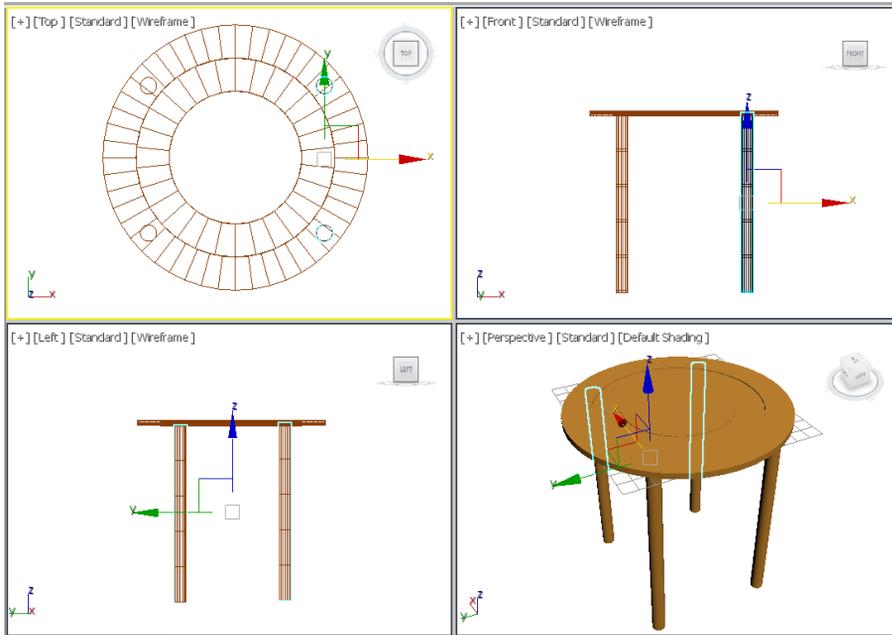


Figure 2-53 The leg003 and leg004 created

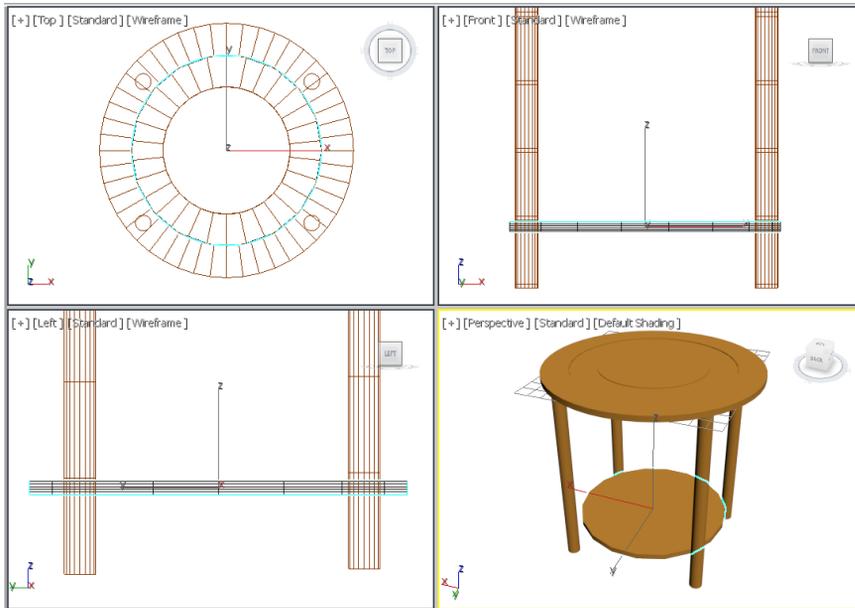


Figure 2-54 The base01 created

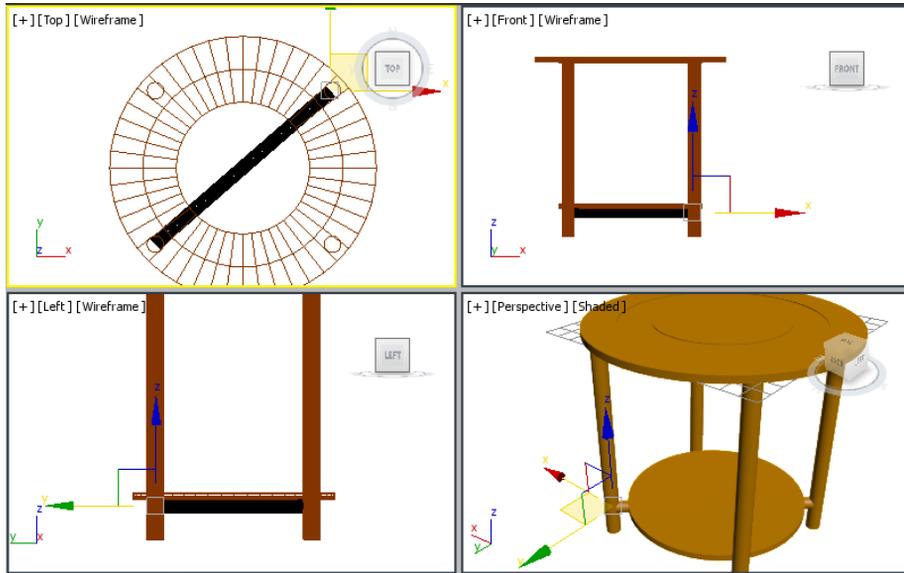


Figure 2-55 Alignment of support01 in viewports

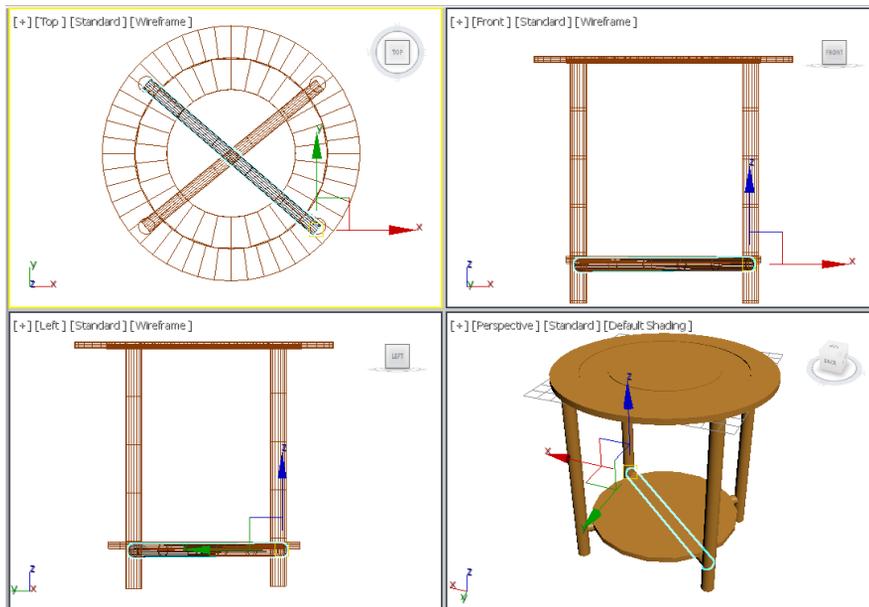


Figure 2-56 Alignment of support002 with base01

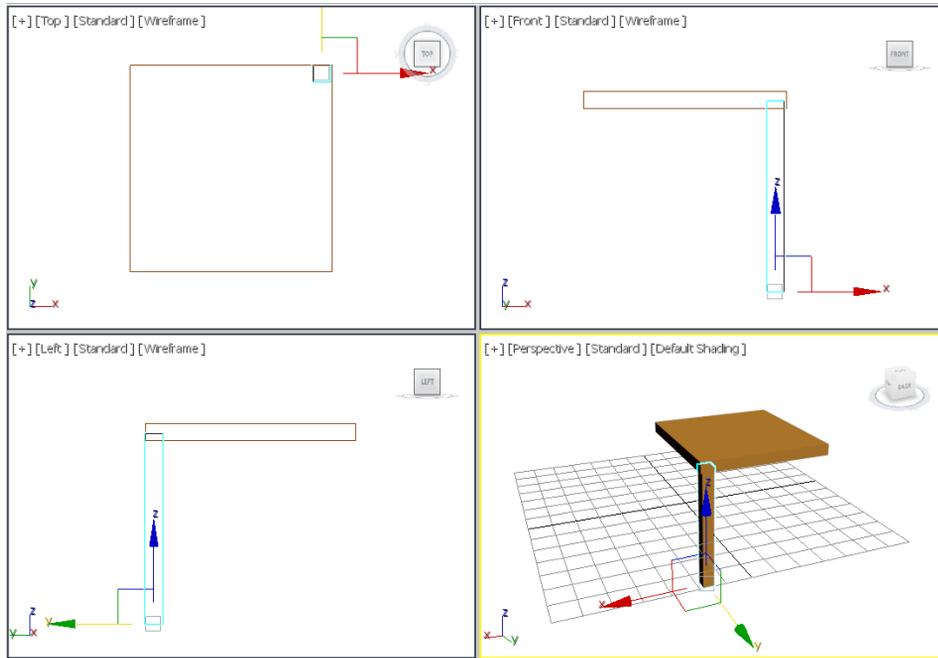


Figure 2-57 Alignment of leg01 with base

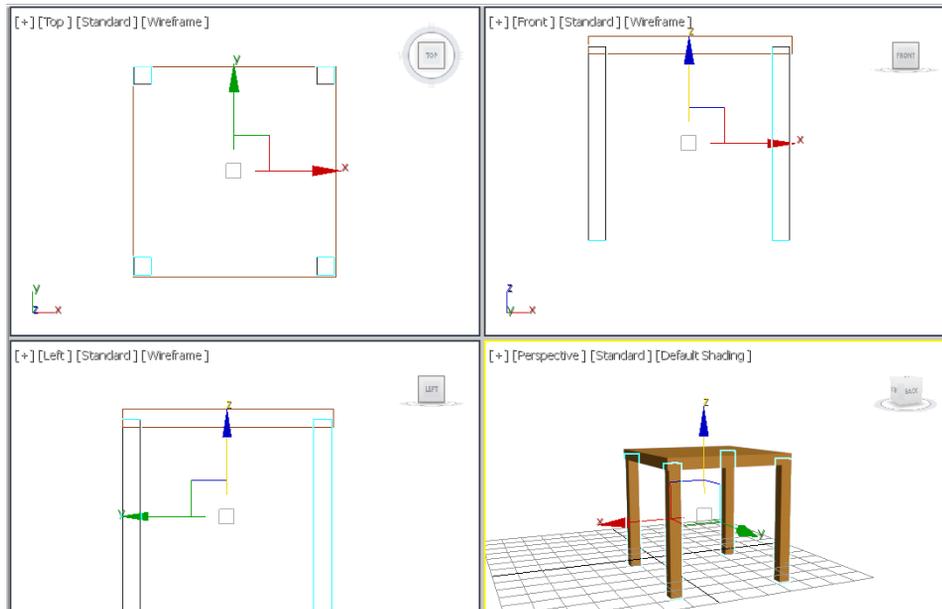


Figure 2-58 Alignment of legs with base

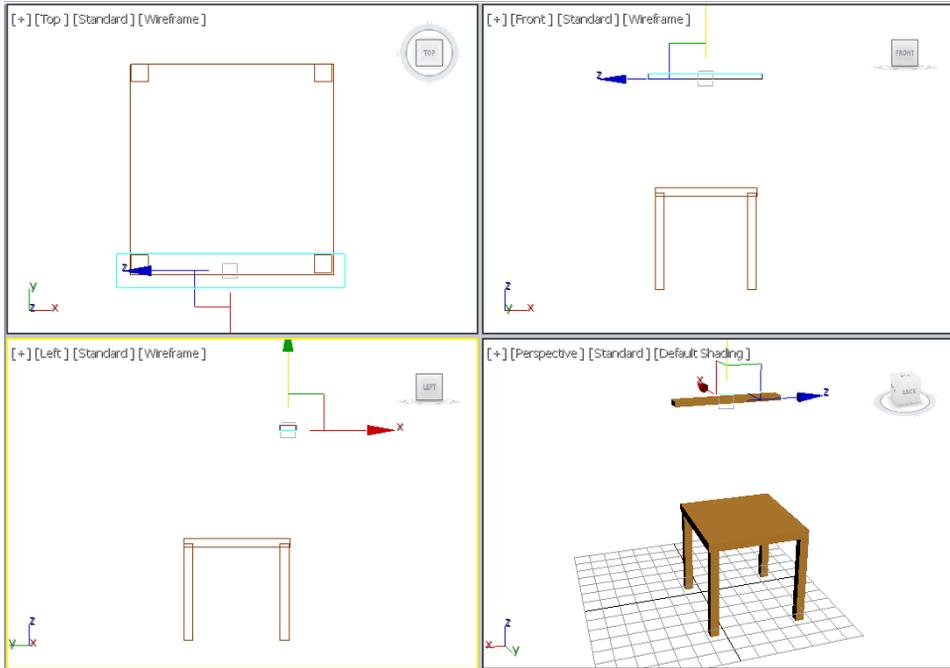


Figure 2-59 Alignment of back1 with base

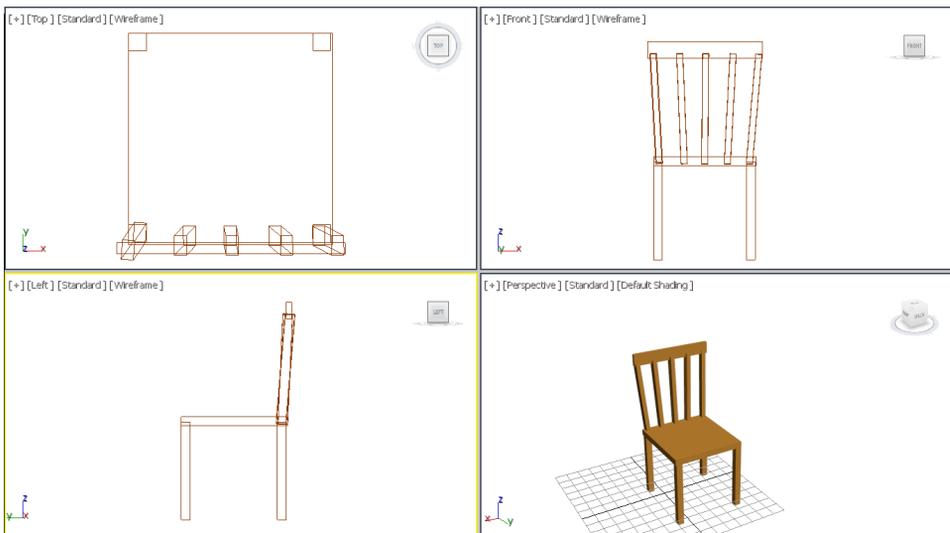


Figure 2-60 Alignment of back2 and its copies

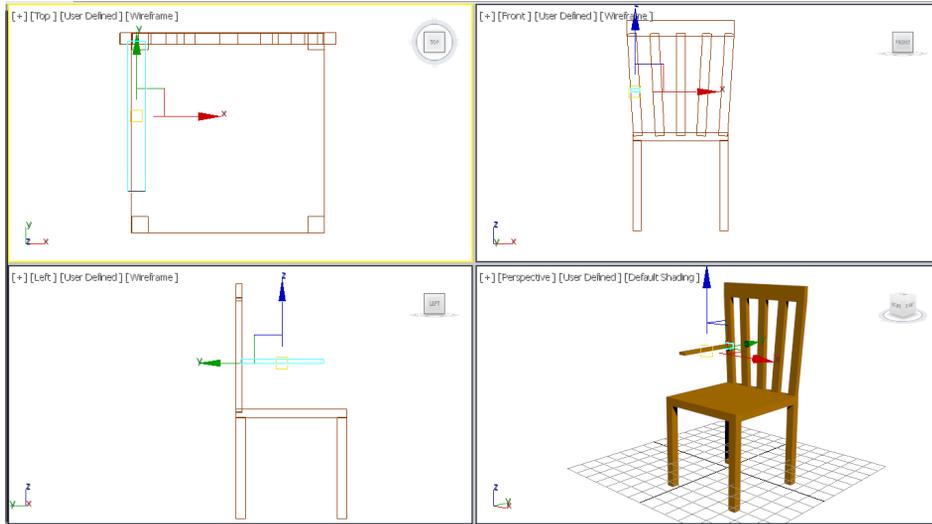


Figure 2-61 Alignment of box with back2

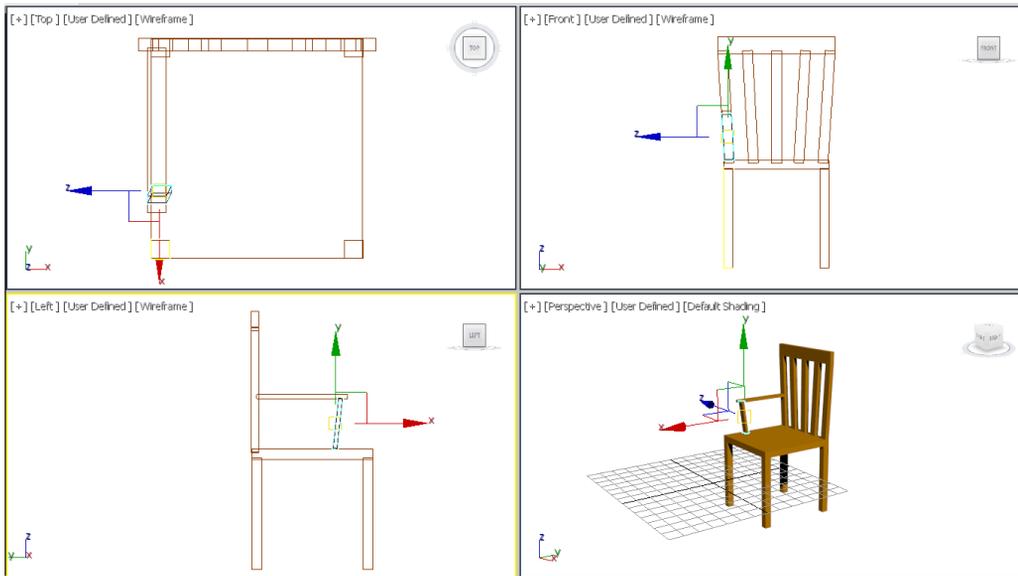


Figure 2-62 Alignment of box in the viewports

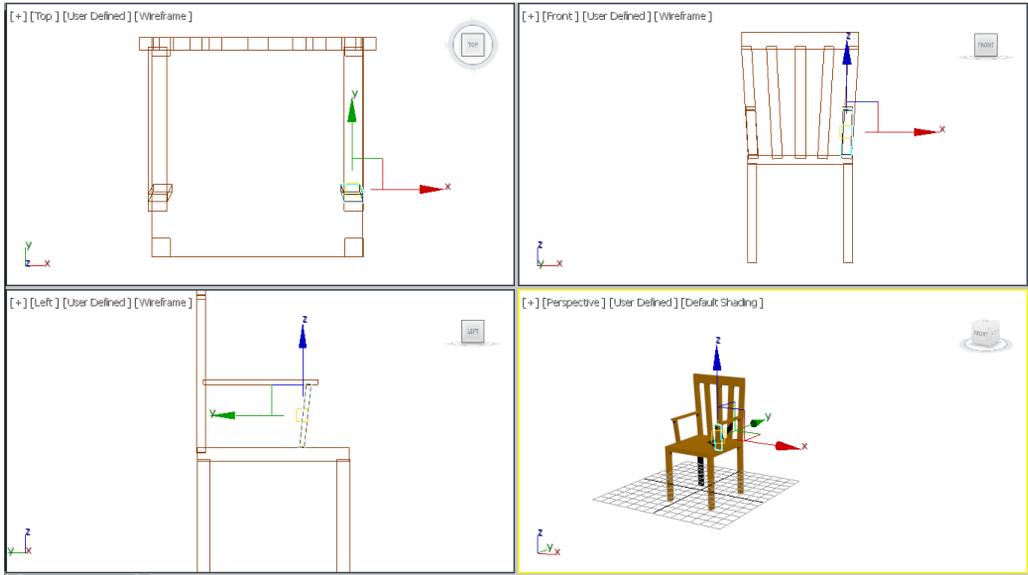


Figure 2-63 Alignment of boxes in the viewports



Figure 2-64 The final output after rendering



Figure 2-65 The model of a park bench

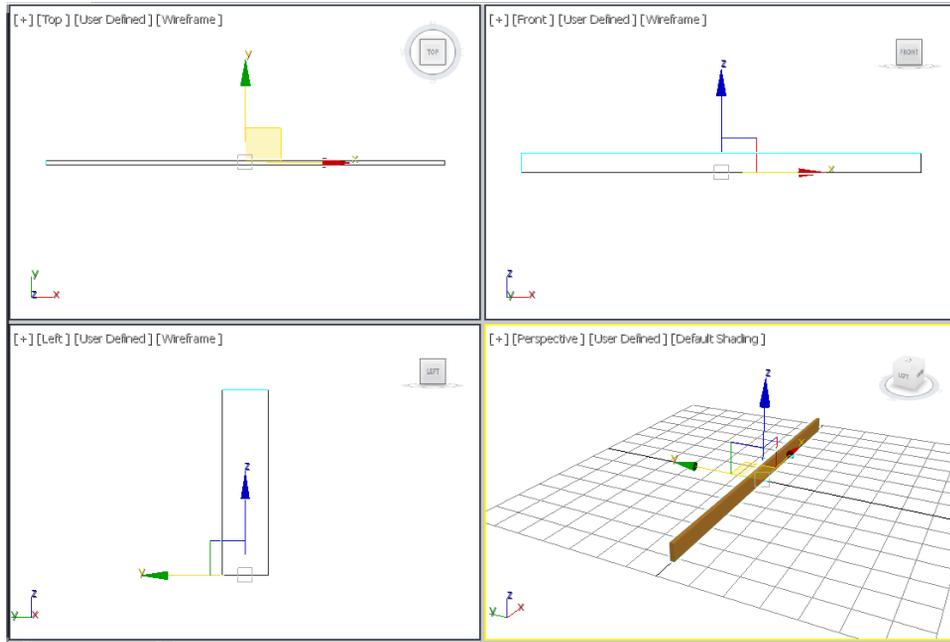


Figure 2-66 A box created

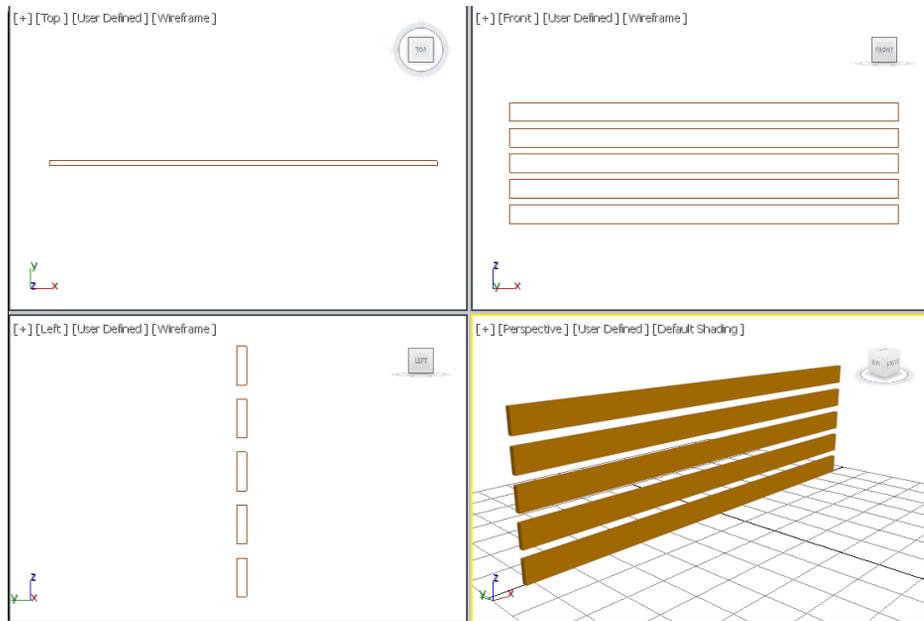


Figure 2-67 Horizontal back supports displayed in viewports

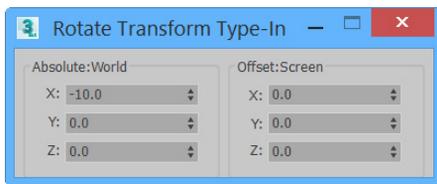


Figure 2-68 The Rotate Transform Type-In dialog box

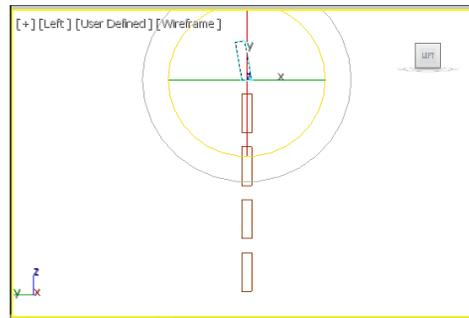


Figure 2-69 The horizontal back support005 geometry after being rotated in the Left viewport

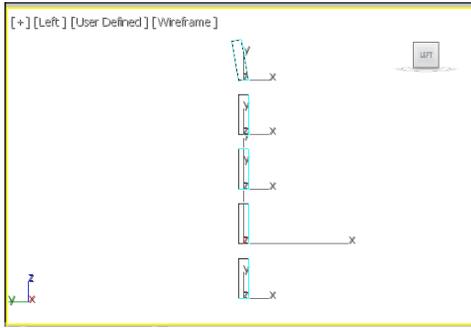


Figure 2-70 All horizontal back supports selected simultaneously

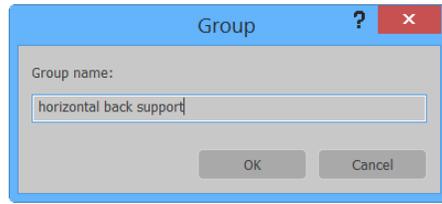


Figure 2-71 The **Group** dialog box

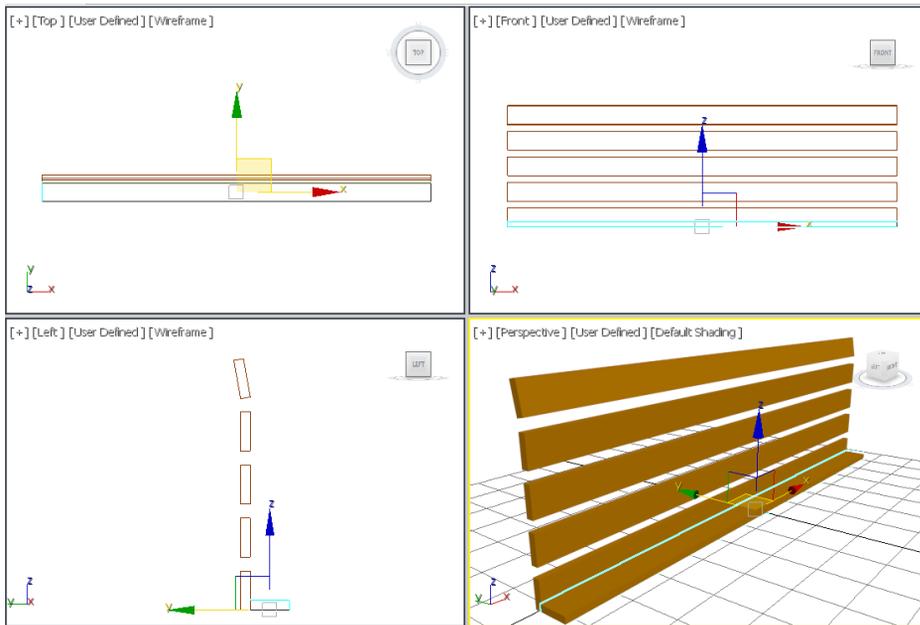


Figure 2-72 Alignment of horizontal seat support001 in viewports

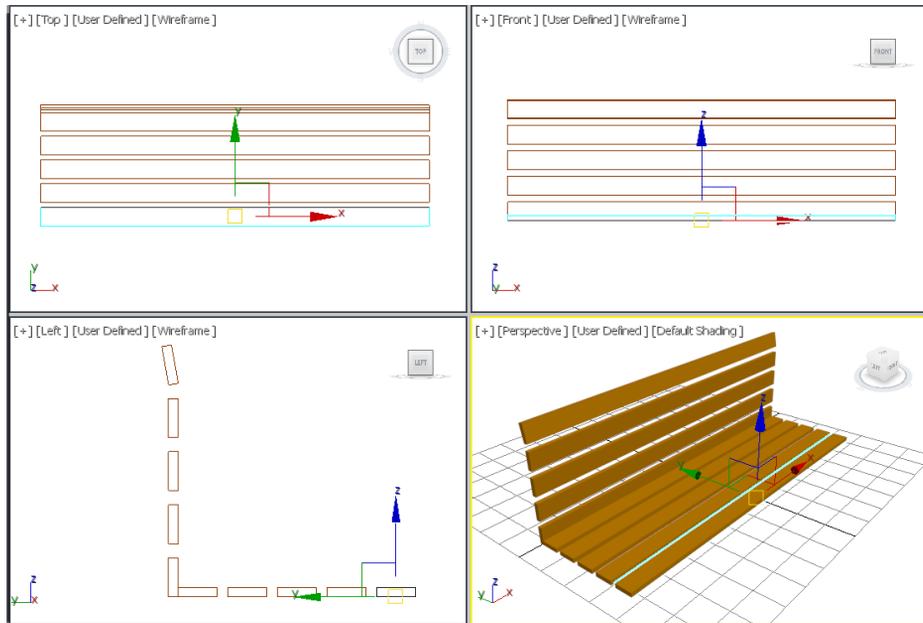


Figure 2-73 Horizontal seat supports displayed in the viewports

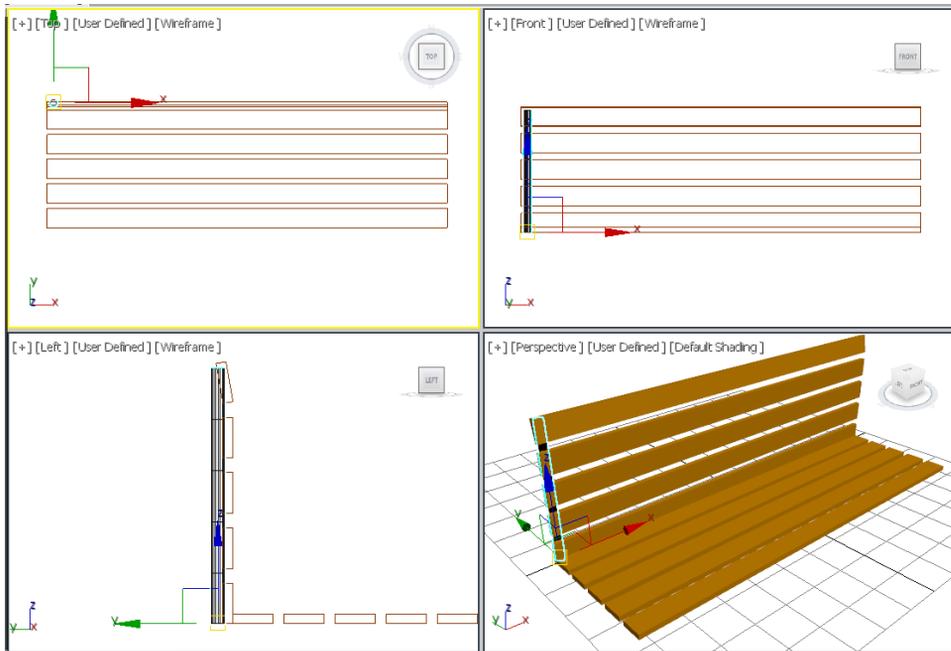


Figure 2-74 The vertical back support001 geometry in viewports

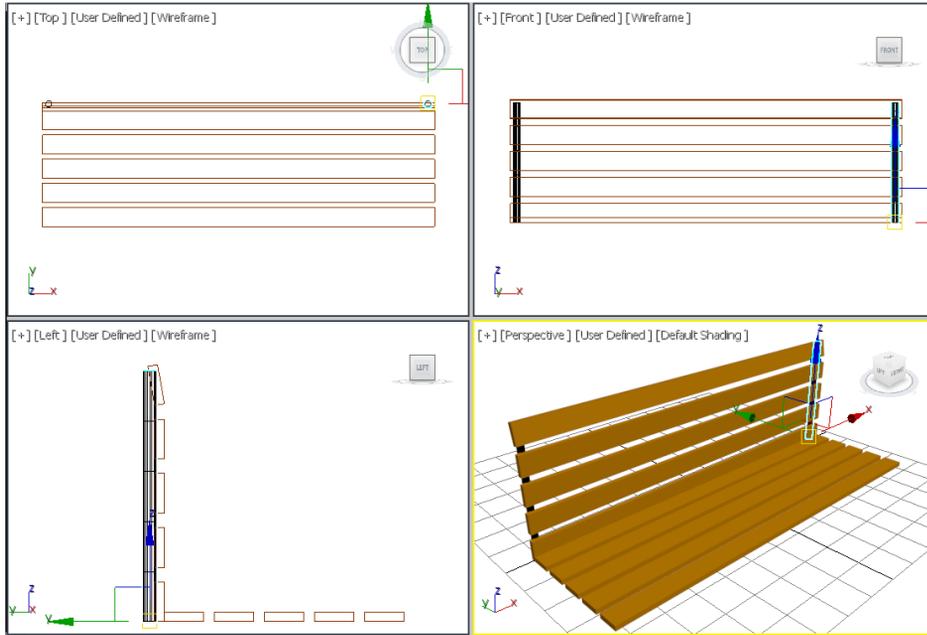


Figure 2-75 The vertical back support002 in viewports

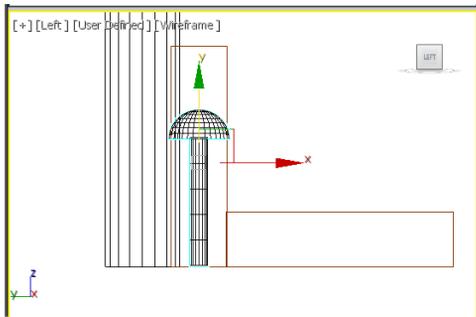


Figure 2-76 Alignment of cap and body

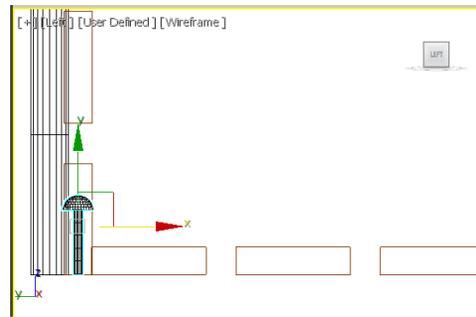


Figure 2-77 The rivet001 group in the Left viewport

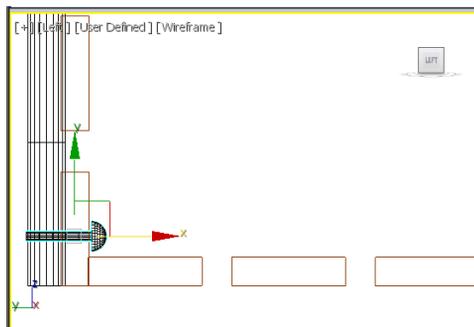


Figure 2-78 Rotating rivet001 in the Left viewport

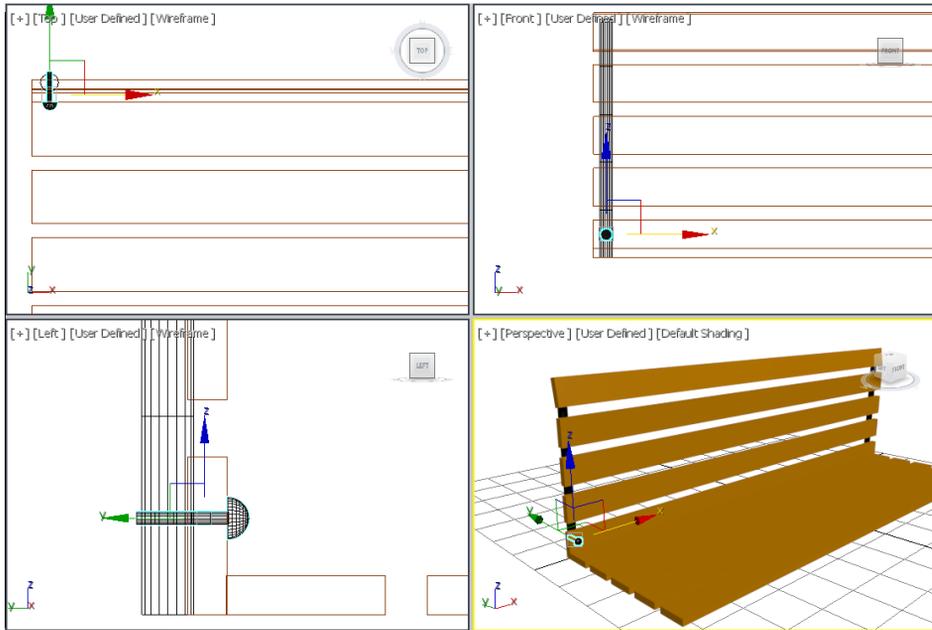


Figure 2-79 Alignment of rivet001 with horizontal back support

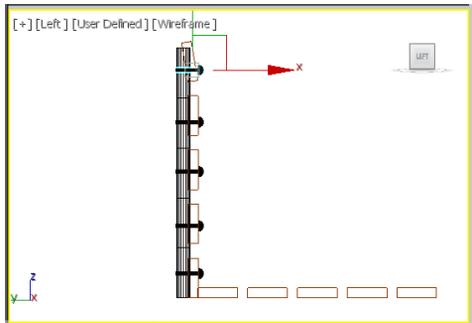


Figure 2-80 Alignment of rivets in the Left viewport

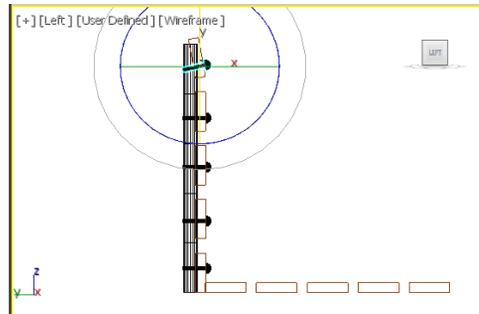


Figure 2-81 Rotating uppermost rivet

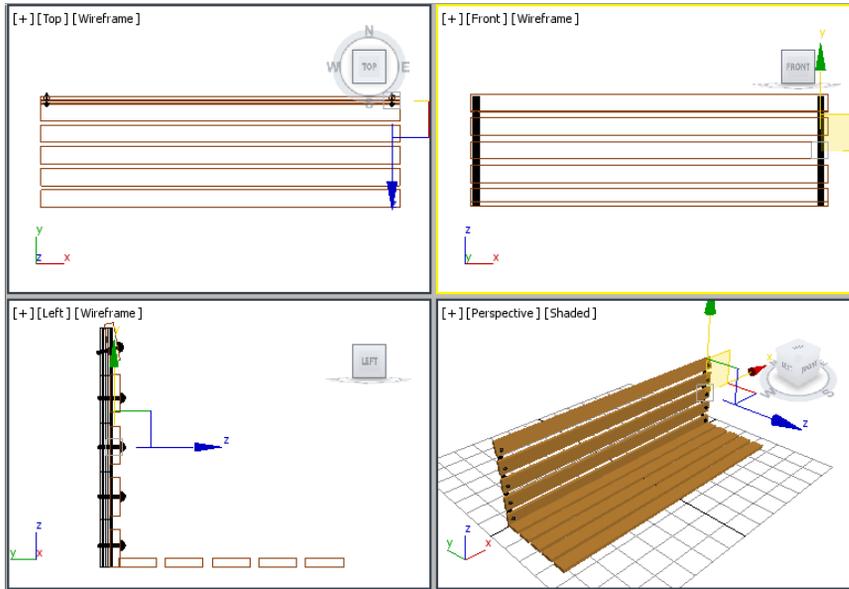


Figure 2-82 The right side rivets group displayed in viewports

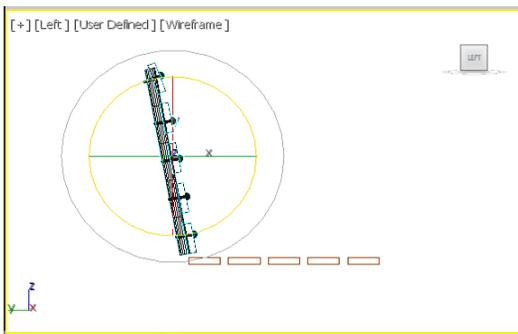


Figure 2-83 The back support after being rotated in the Left viewport

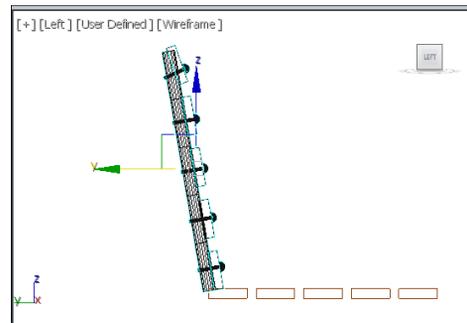


Figure 2-84 Alignment of back support in the Left viewport

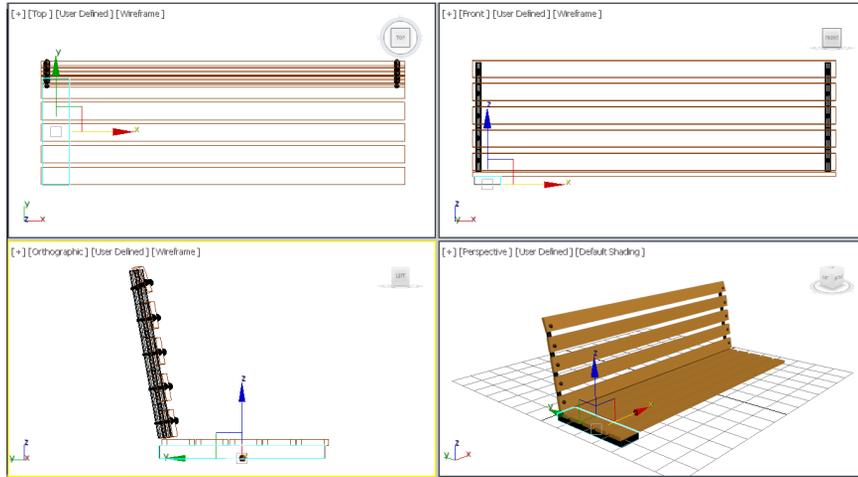


Figure 2-85 Alignment of leg support001 with horizontal seat support

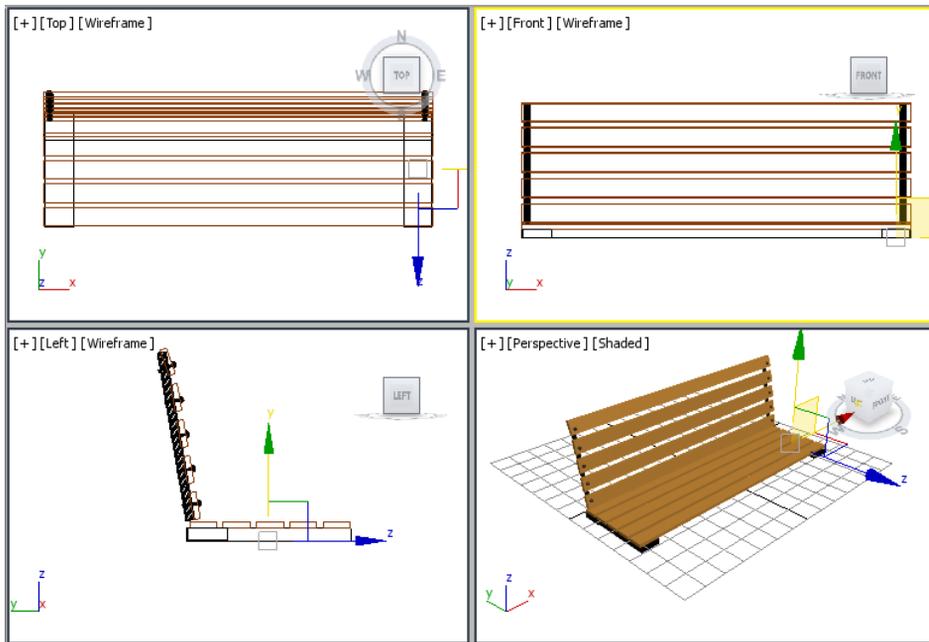


Figure 2-86 Alignment of leg support002 with horizontal seat support

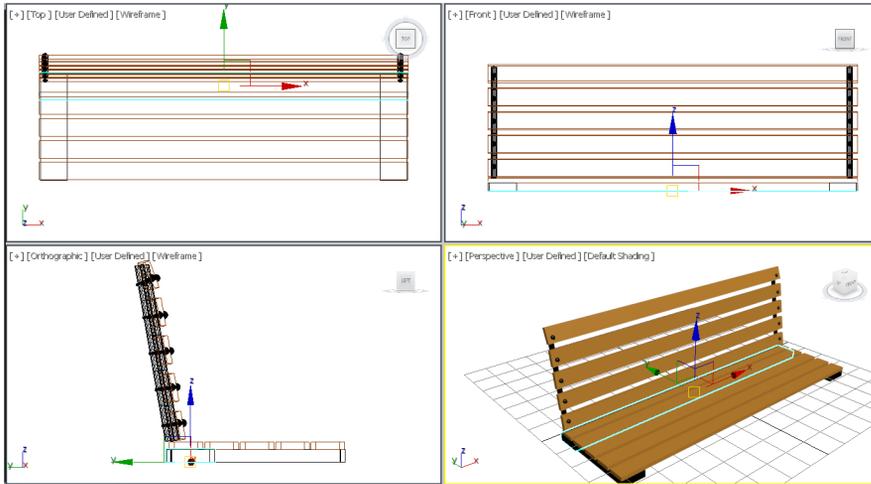


Figure 2-87 Alignment of leg support003 with horizontal seat support in the viewports

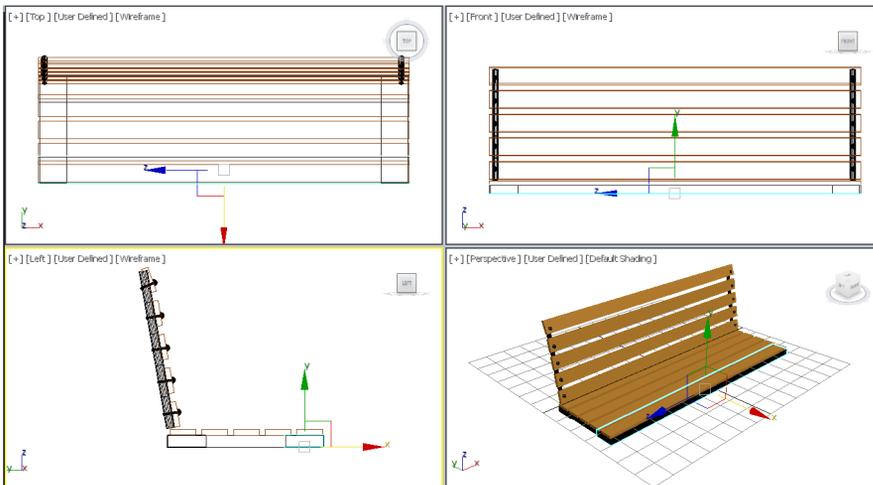


Figure 2-88 Alignment of leg support004 in viewports

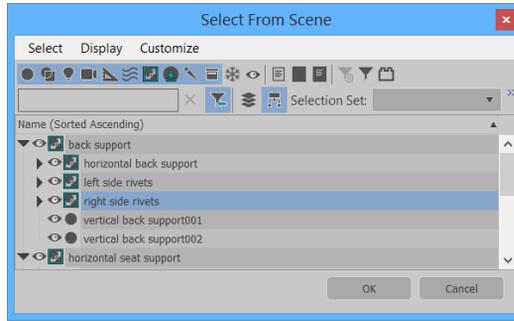


Figure 2-89 The right side rivets group selected in the **Select From Scene** dialog box

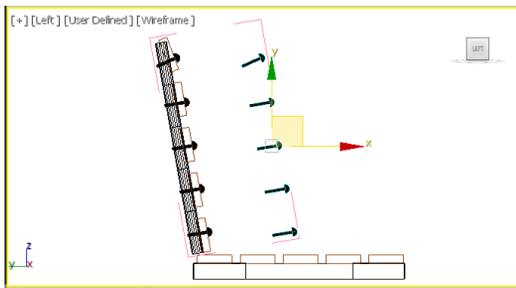


Figure 2-90 The right side seat rivets group in the **Left** viewport

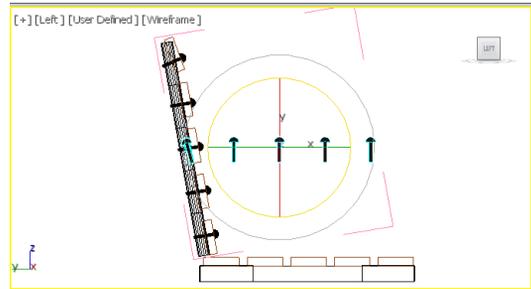


Figure 2-91 Rotating the right side seat rivets group in the **Left** viewport

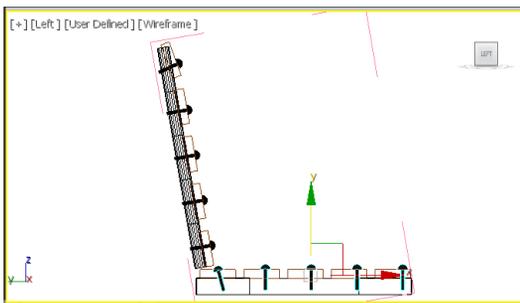


Figure 2-92 Alignment of right side seat rivets in the **Left** viewport

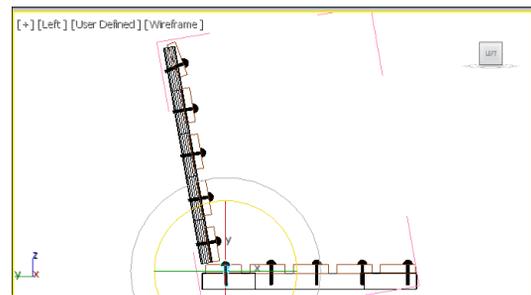


Figure 2-93 Rotating rivet in the **Left** viewport

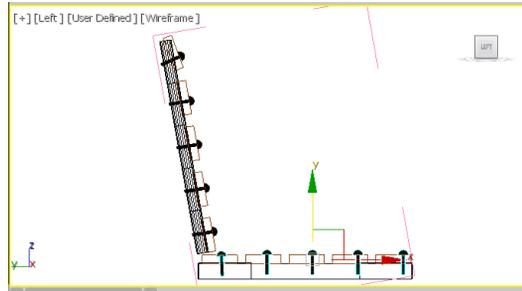


Figure 2-94 Alignment of right side seat rivets in the Left viewport

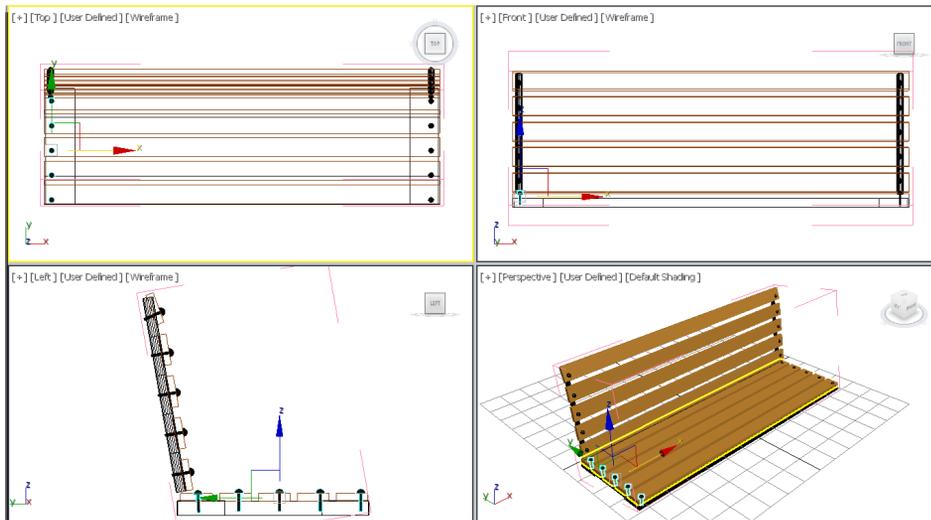


Figure 2-95 Alignment of left side seat rivets in viewports

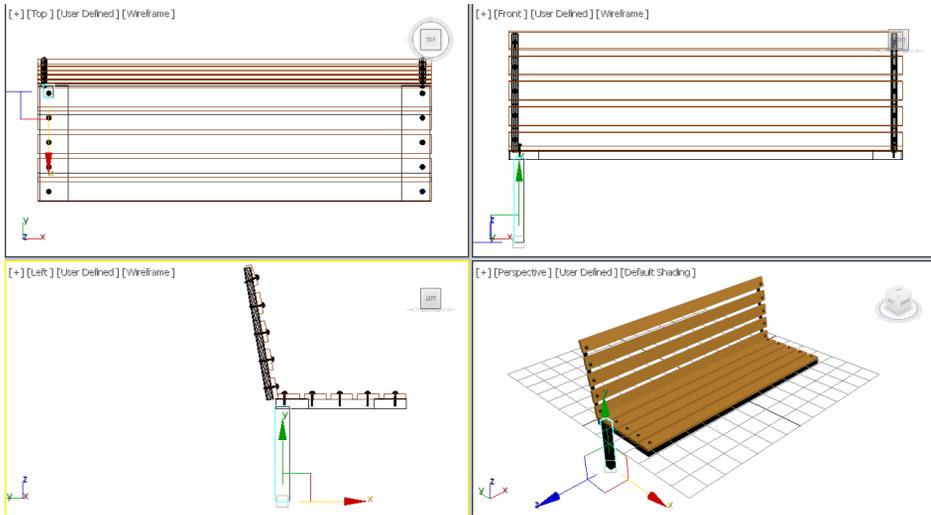


Figure 2-96 Alignment of leg001 in viewports

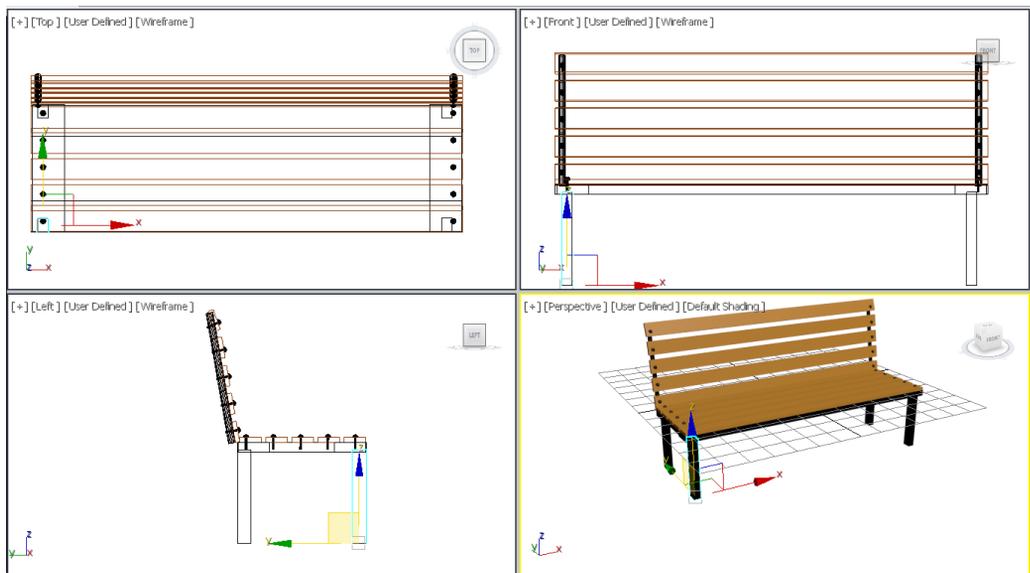


Figure 2-97 Alignment of legs in viewports



Figure 2-98 The final output after rendering



Figure 2-99 The model to be created in Exercise 1

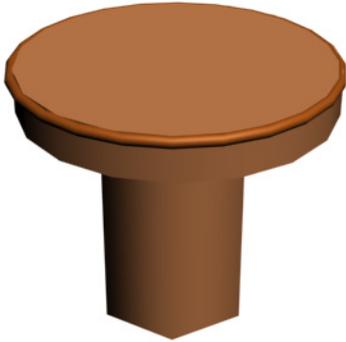


Figure 2-100 The model of a nut (view 1)

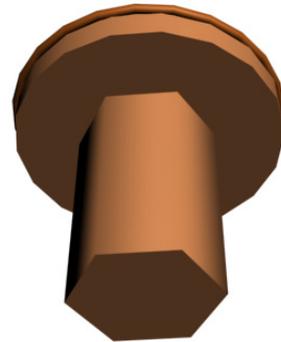


Figure 2-101 The model of a nut (view 2)



Figure 2-102 The model of a table



Figure 2-103 The model of a table

Extended Primitives

Learning Objectives

After completing this chapter, you will be able to:

- *Understand Bend modifier*
- *Understand Taper modifier*
- *Create and edit extended primitives*



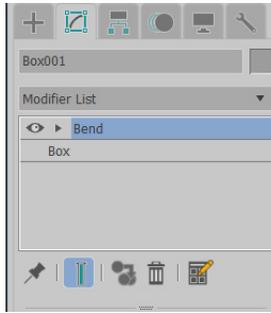


Figure 3-1 The **Bend** modifier displayed in the modifier stack

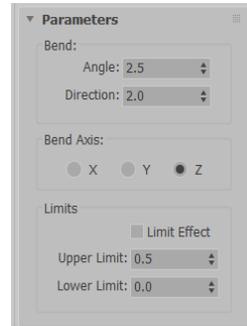


Figure 3-2 The **Parameters** rollout of the **Bend** modifier

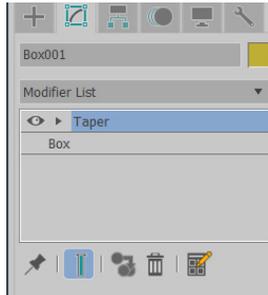


Figure 3-3 The **Taper** modifier in the modifier stack

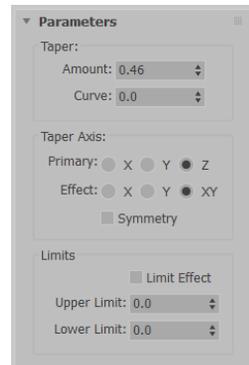


Figure 3-4 The **Parameters** rollout of the **Taper** modifier

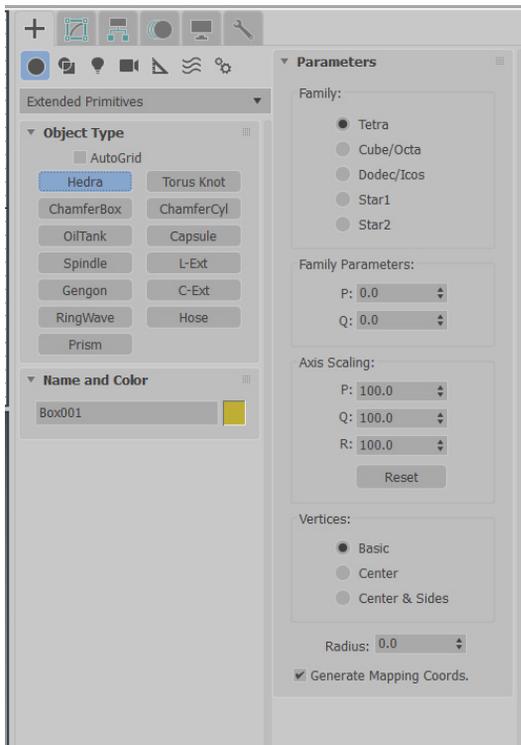


Figure 3-5 Various rollouts to create a hedra



Figure 3-6 A hedra displayed in the viewport

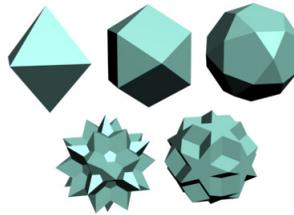


Figure 3-7 Five basic shapes of hedra



Figure 3-8 Various rollouts to create a chamfer box

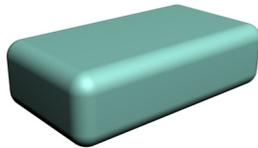


Figure 3-9 A chamfer box with rounded edges

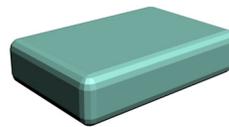


Figure 3-10 A chamfer box with beveled edges



Figure 3-11 A chamfer cylinder displayed in the viewport



Figure 3-12 A chamfer cylinder with beveled edges



Figure 3-13 A capsule displayed in the viewport



Figure 3-14 A spindle displayed in the viewport

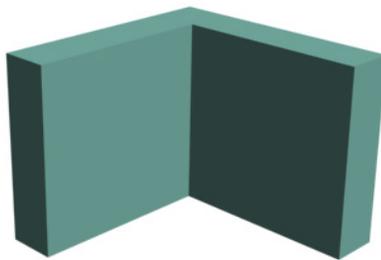


Figure 3-15 An L-Ext displayed in the viewport

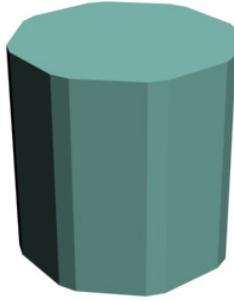


Figure 3-16 A gencon displayed in the viewport



Figure 3-17 A ringwave displayed in the viewport

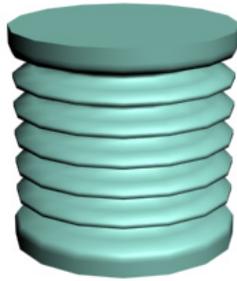


Figure 3-18 A hose displayed in the viewport



Figure 3-19 The model of a couch

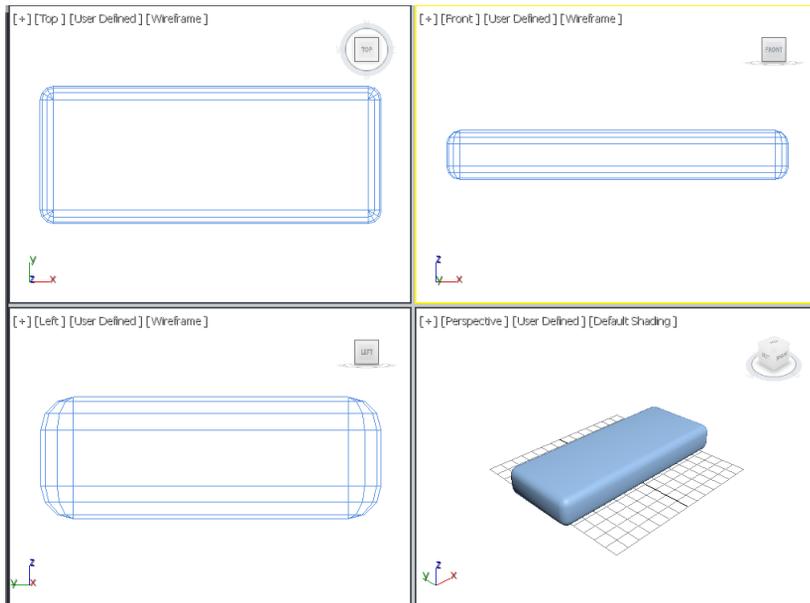


Figure 3-20 A chamfer box created for seat support

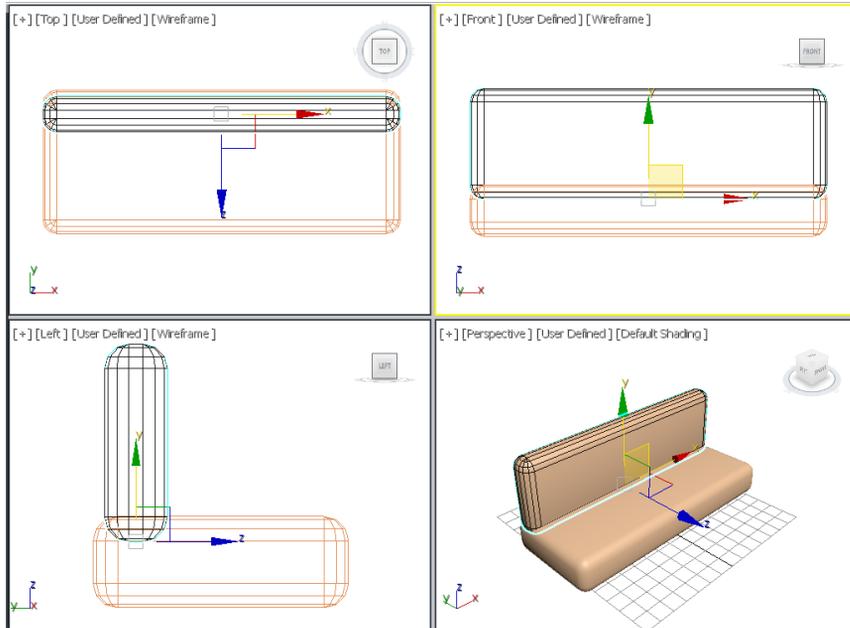


Figure 3-21 Alignment of back support with seat support

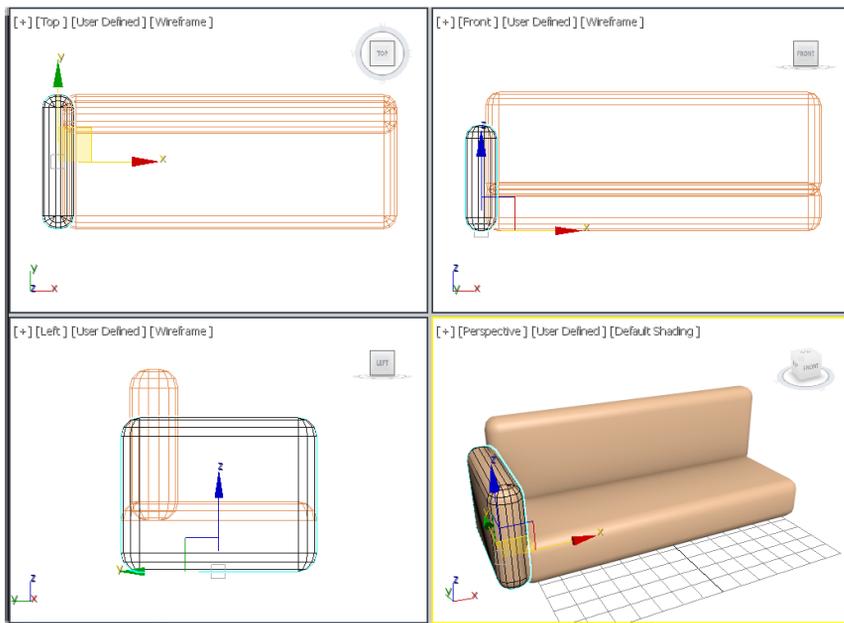


Figure 3-22 The another chamfer box displayed in the viewports

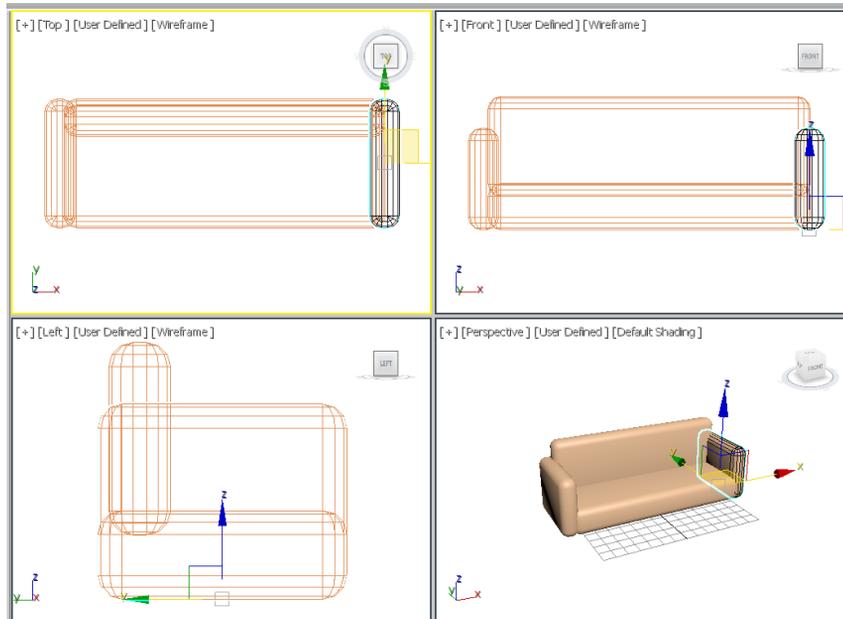


Figure 3-23 The right side geometry displayed in the viewports

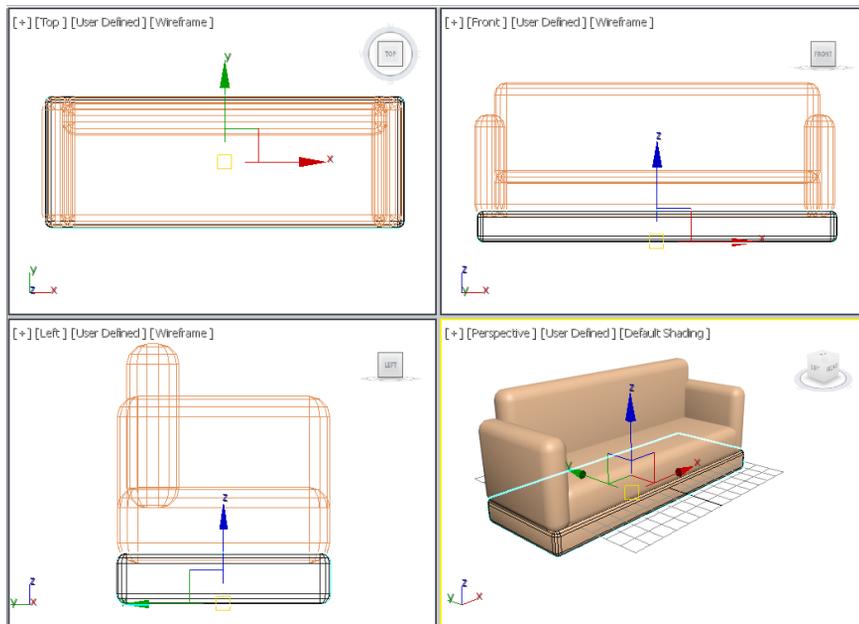


Figure 3-24 The base geometry displayed in the viewports

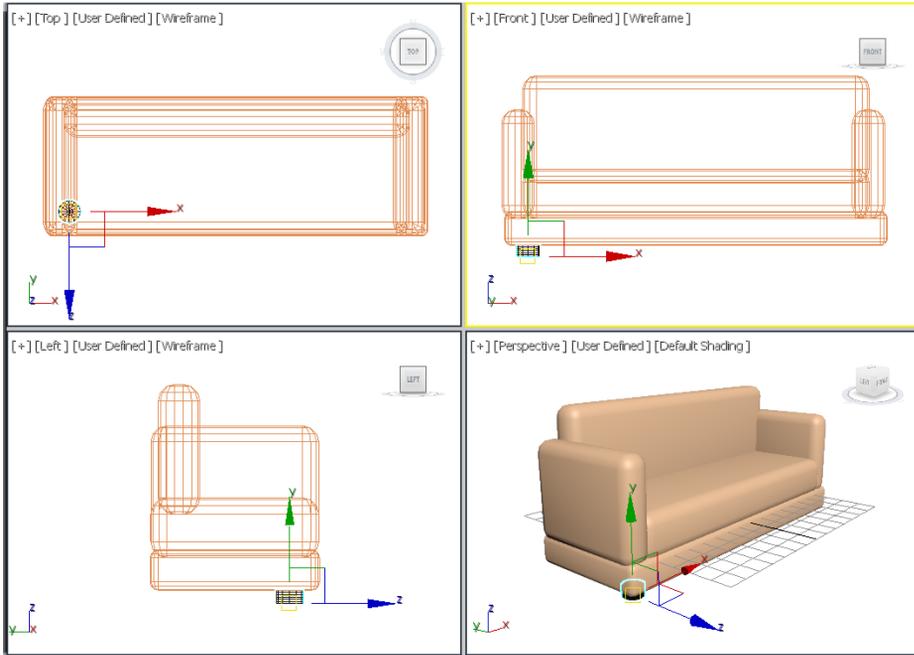


Figure 3-25 The support1 geometry aligned in the viewports

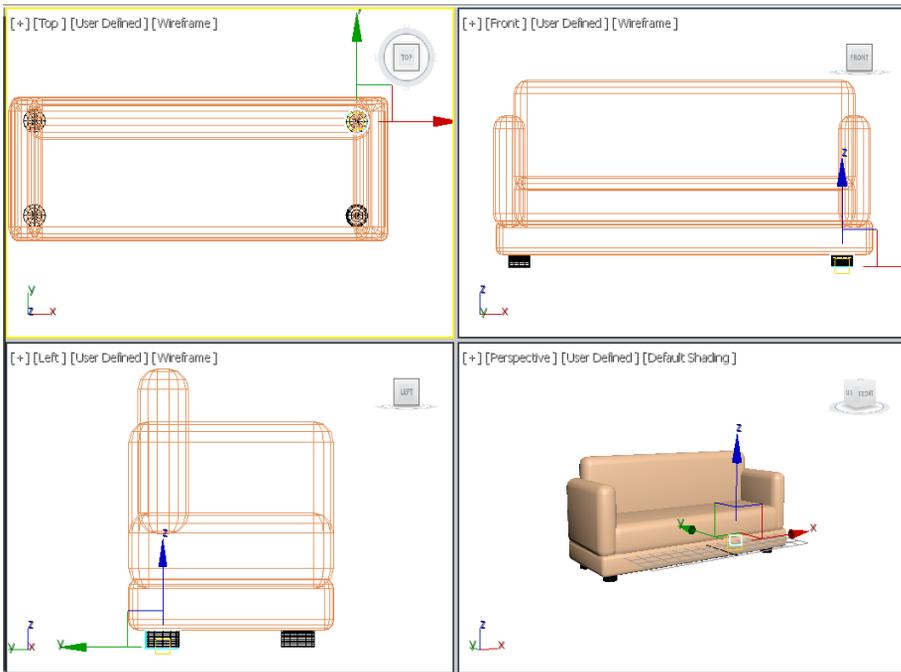


Figure 3-26 All supports aligned in viewports



Figure 3-27 The final output after rendering



Figure 3-28 The model of a chair

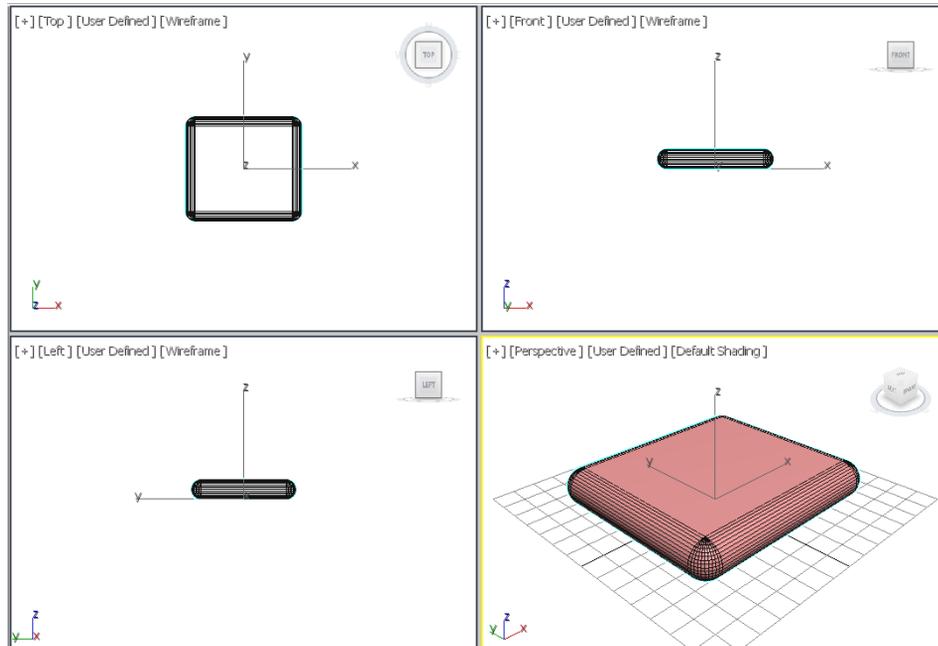


Figure 3-29 The chamfer box created for seat support of the chair

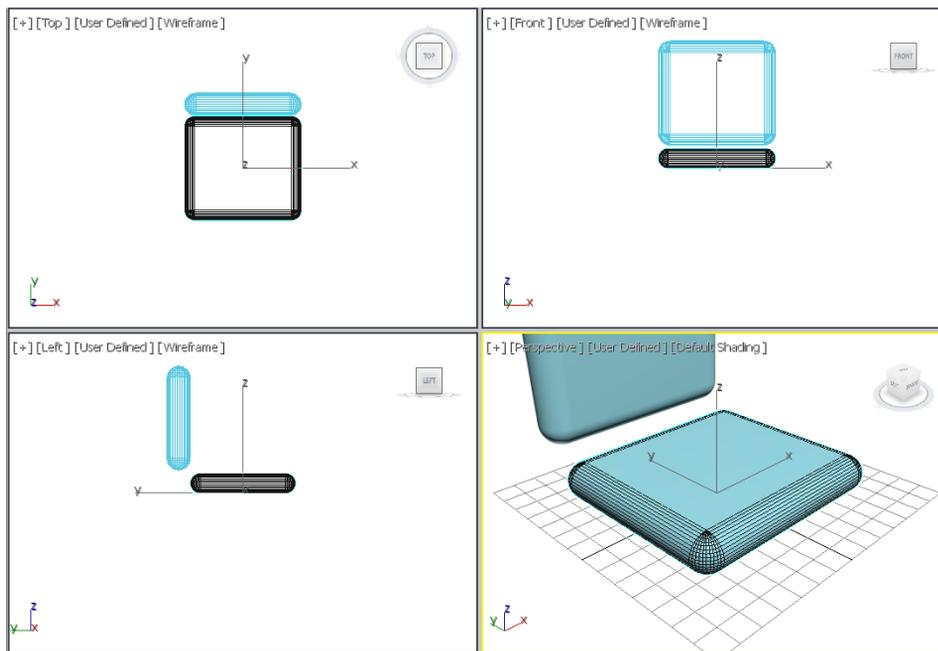


Figure 3-30 The back support geometry in viewports

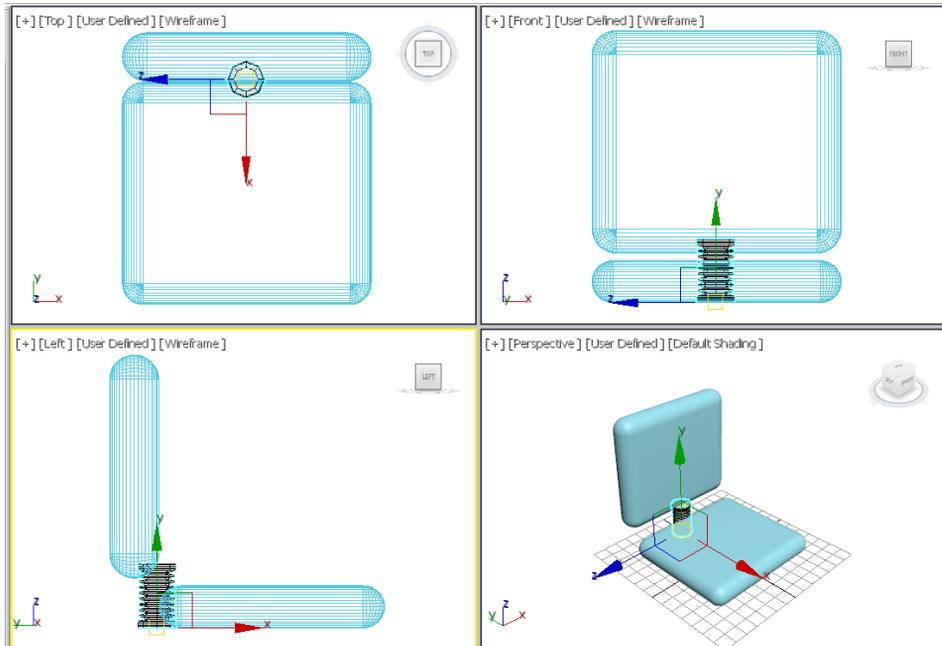


Figure 3-31 The spring support geometry in viewports

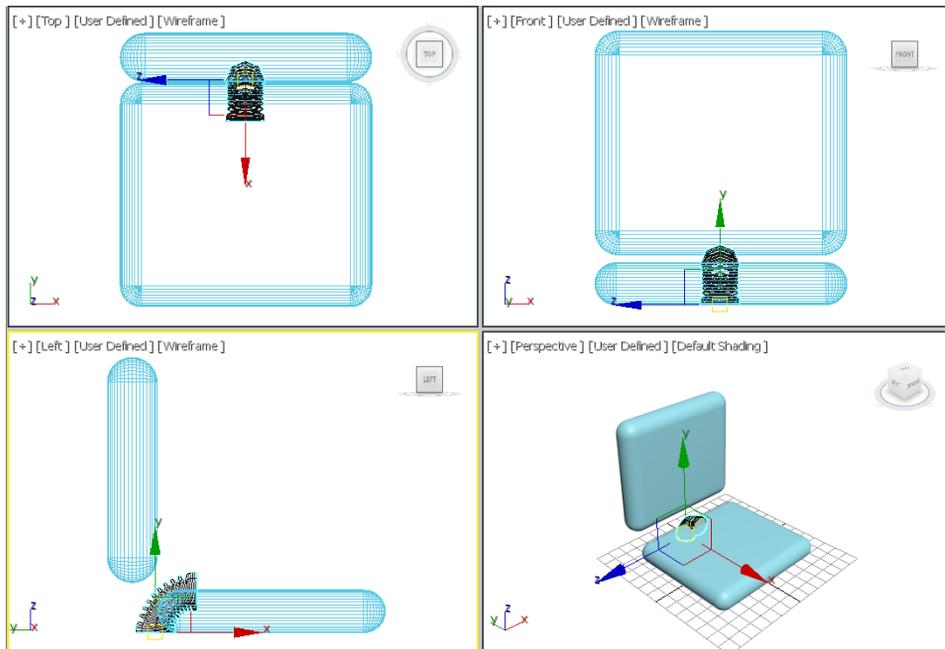


Figure 3-32 The spring support geometry after applying the **Bend** modifier

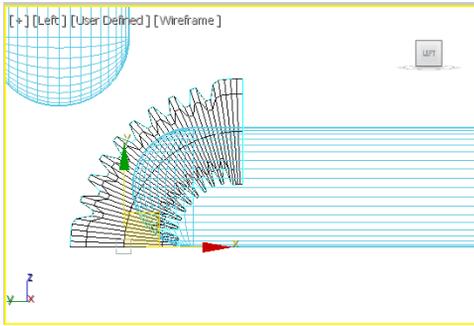


Figure 3-33 The spring support geometry zoomed in the Left viewport

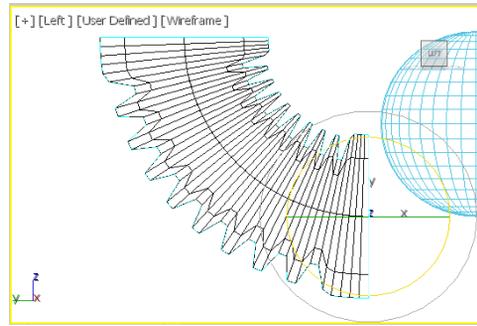


Figure 3-34 The spring support geometry rotated in the Left viewport

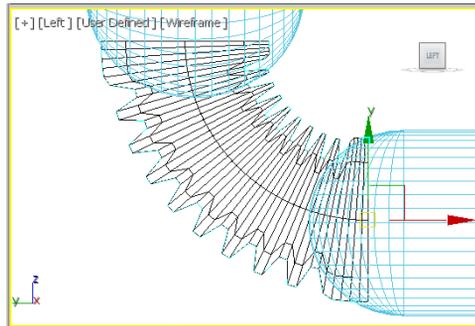


Figure 3-35 Alignment of spring support in the Left viewport

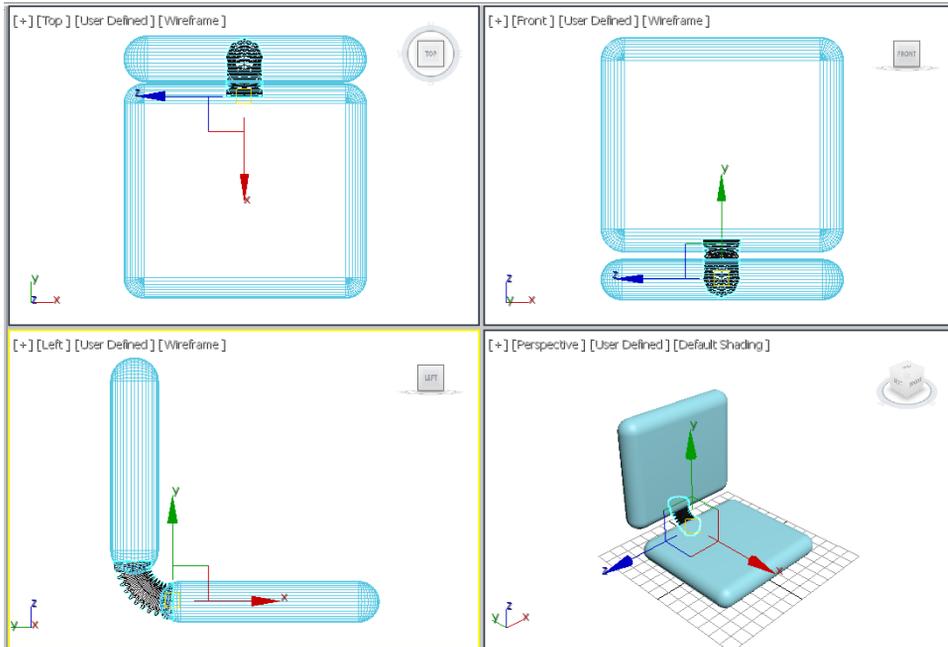


Figure 3-36 Alignment of spring support in the viewports

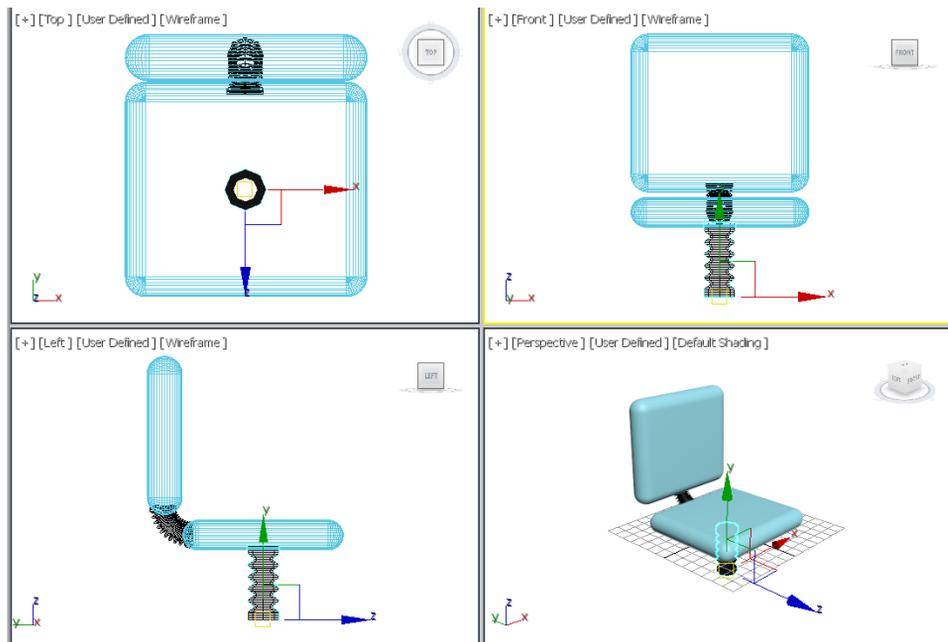


Figure 3-37 Alignment of leg support in the viewports

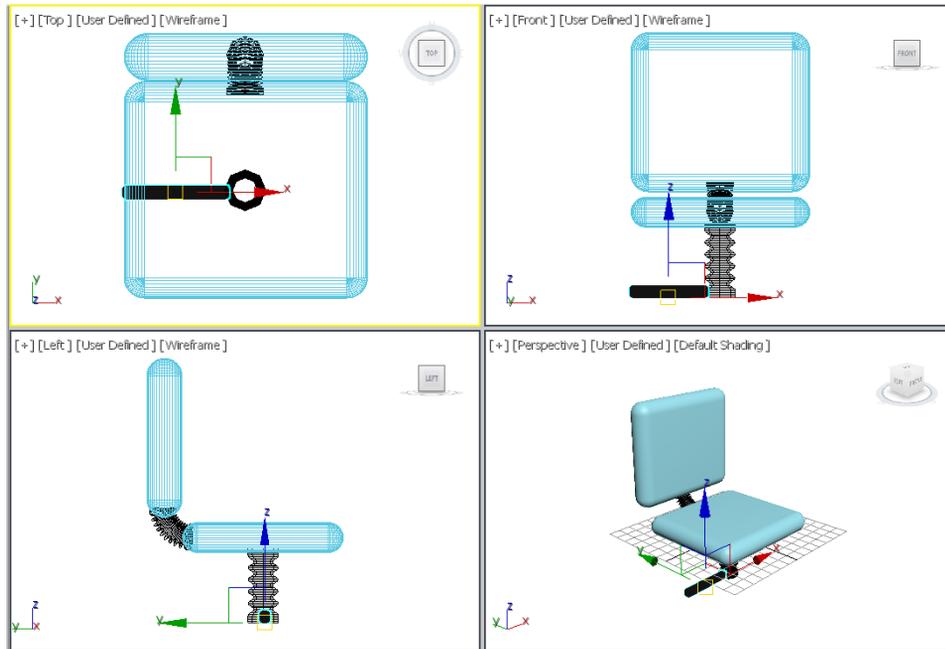


Figure 3-38 Alignment of leg01 in the viewports

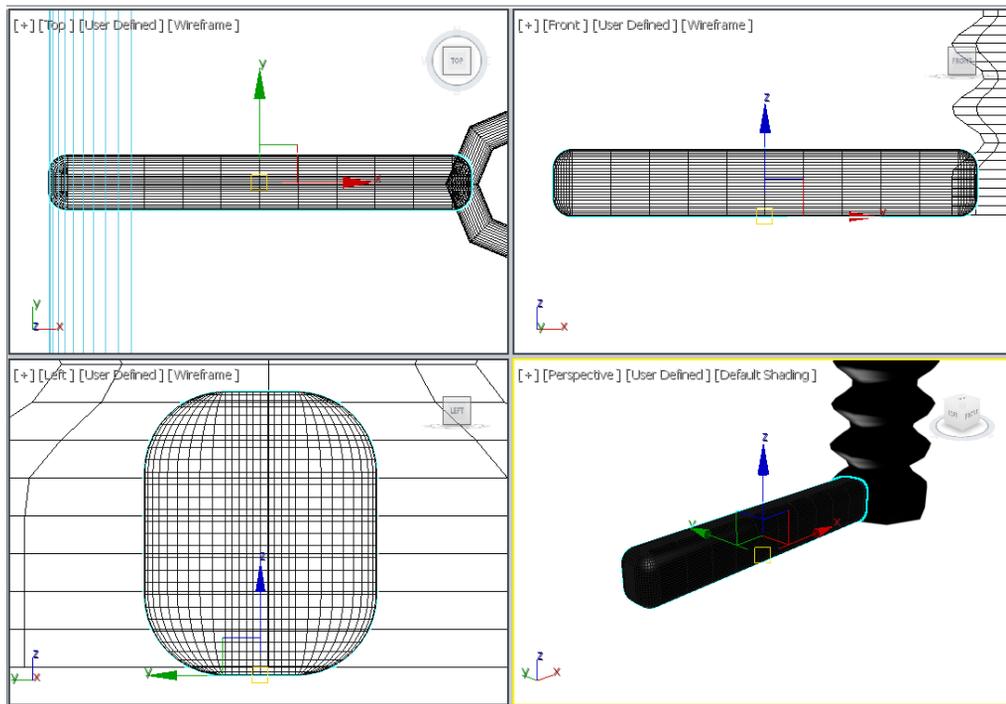


Figure 3-39 The leg01 geometry after invoking the Zoom Extents All Selected tool

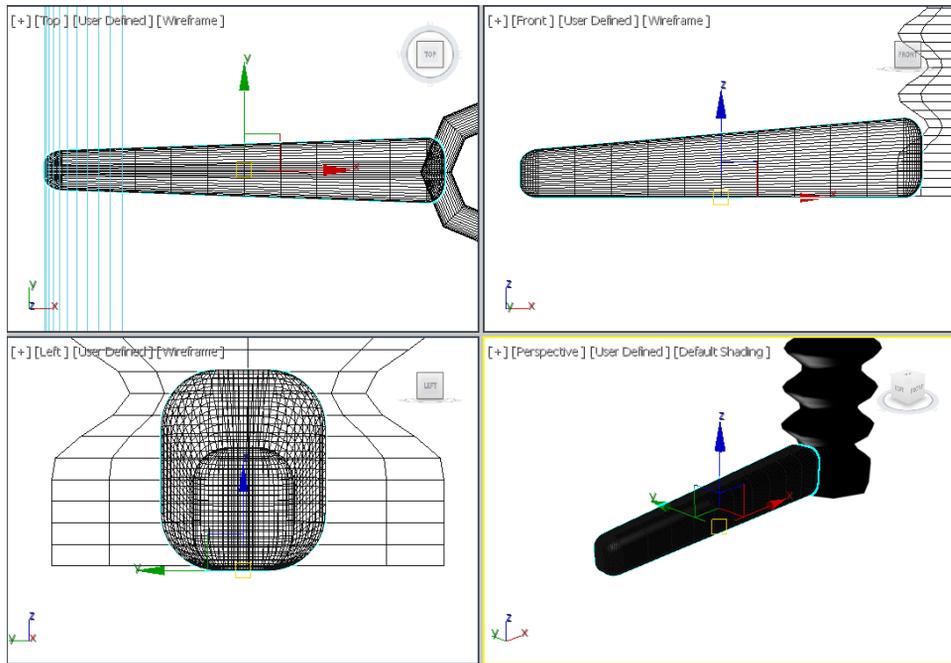


Figure 3-40 The leg01 geometry displayed in viewports after applying the **Taper** modifier

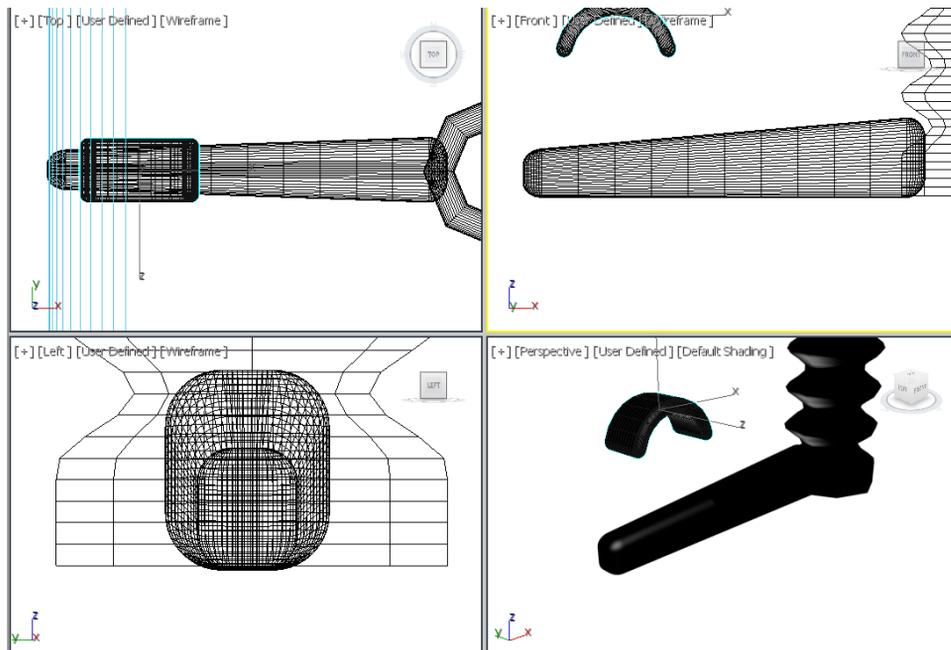


Figure 3-41 The box01 geometry displayed in viewports after applying the **Bend** modifier

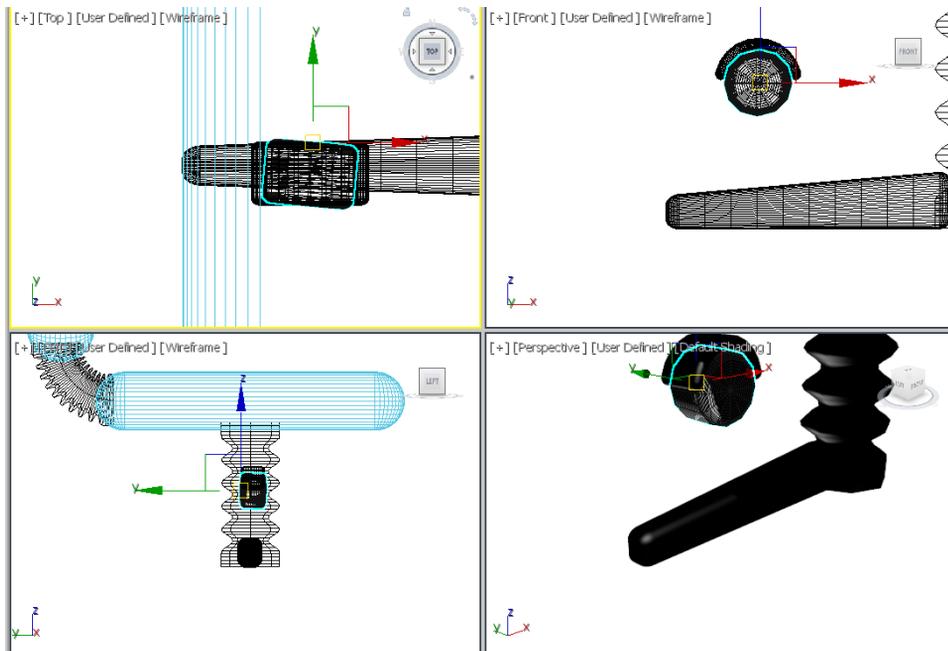


Figure 3-42 Alignment of cylinder01 with box01 in viewports

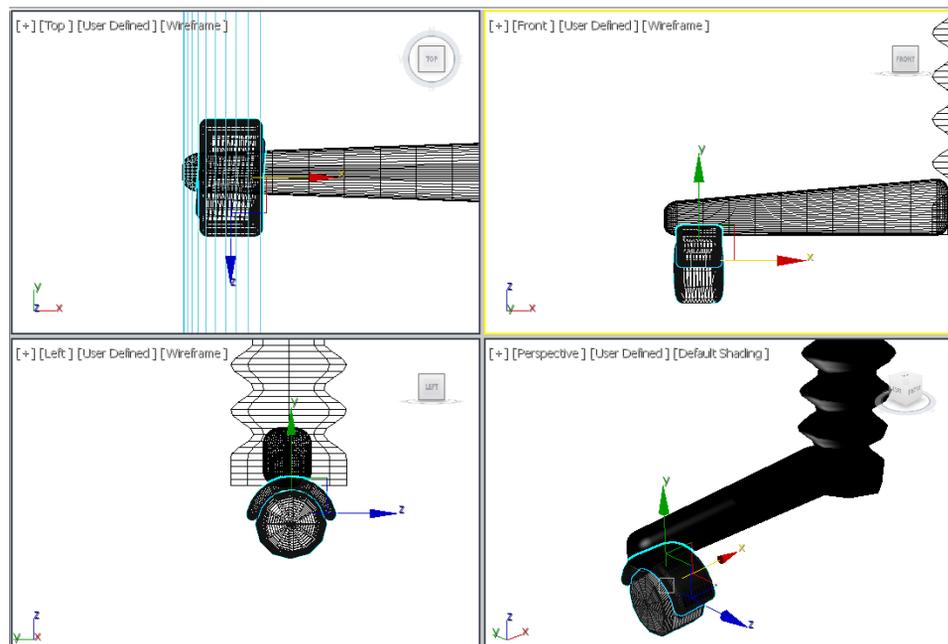


Figure 3-43 Alignment of roller01 with leg01 in viewports

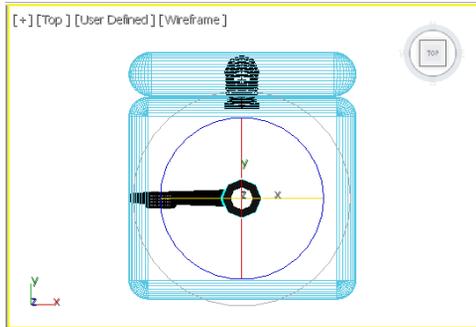


Figure 3-44 A circular gizmo displayed at the location of the working pivot point

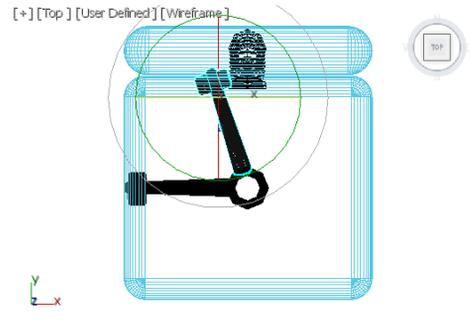


Figure 3-45 The *f_leg01* group rotated about -72 degrees with respect to the working pivot point

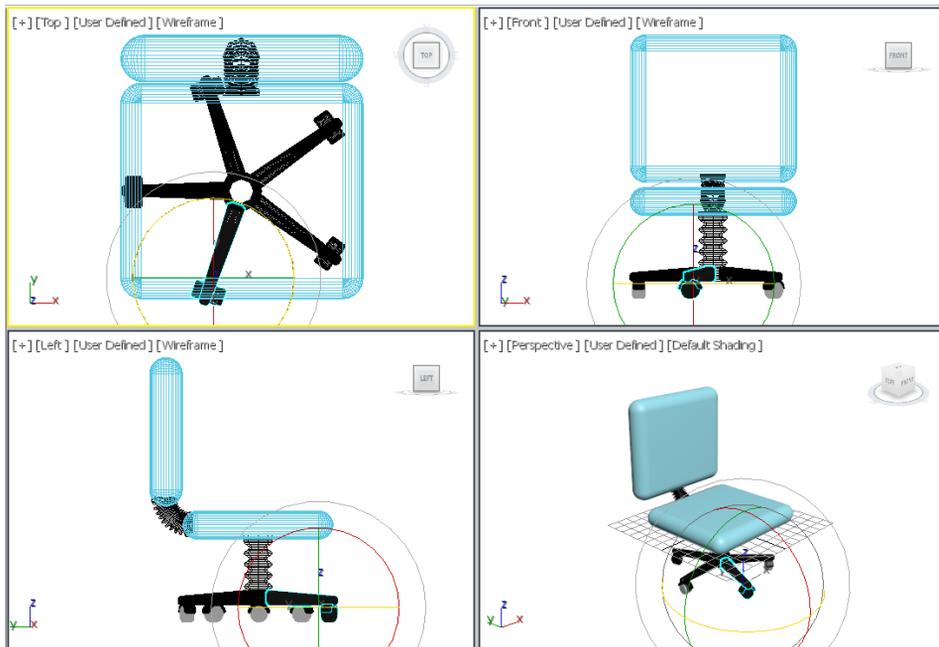


Figure 3-46 The *f_leg002*, *f_leg003*, *f_leg004*, and *f_leg005* in viewports

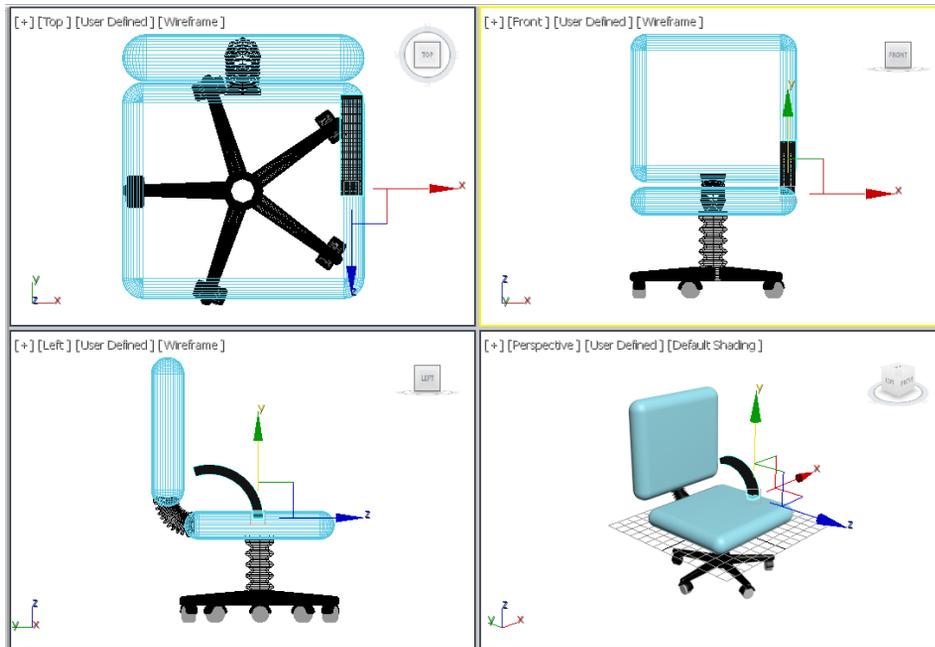


Figure 3-47 Alignment of right hand support01 in viewports

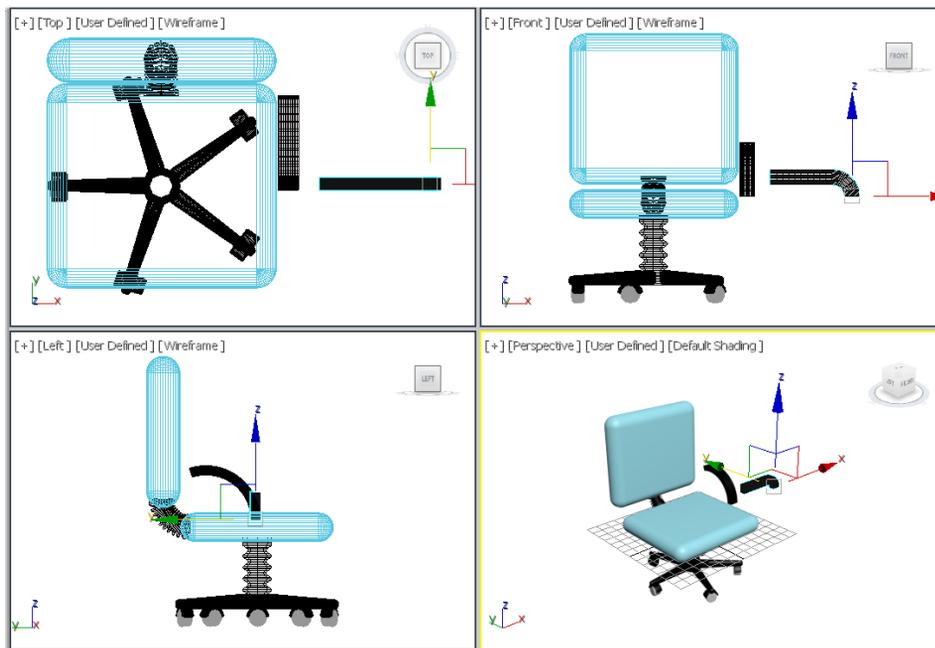


Figure 3-48 The right hand support002 geometry after modifying the values of the **Bend** modifier

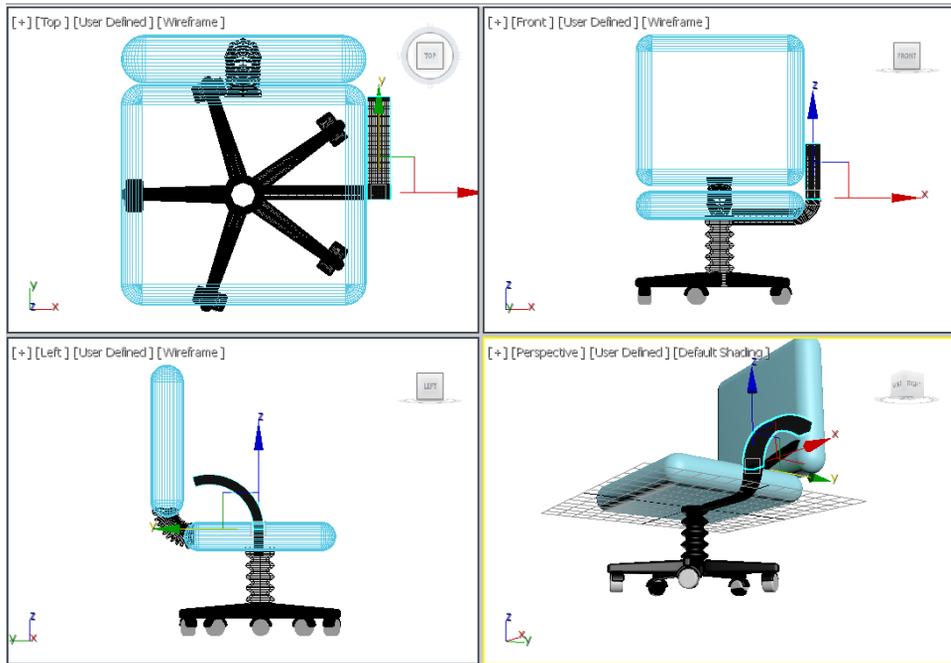


Figure 3-49 Alignment of right hand support002 in viewports

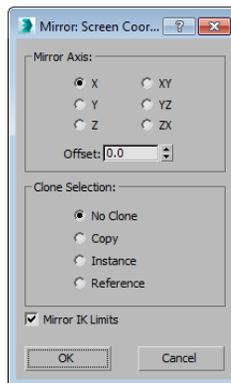


Figure 3-50 The Mirror: Screen Coordinates dialog box

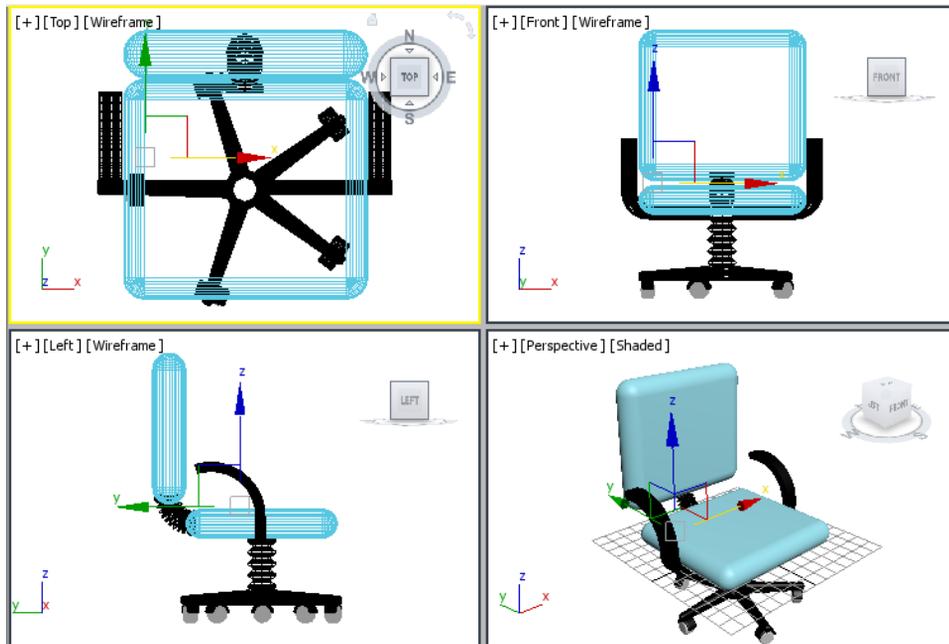


Figure 3-51 The left hand support geometry in viewports



Figure 3-52 The final rendered output



Figure 3-53 The model of a stool



Figure 3-54 The model of a table



Figure 3-55 The model of a chair

4

Working with Architectural Objects

Learning Objectives

After completing this chapter, you will be able to:

- *Use the Mirror and Align tools*
- *Create AEC extended objects*
- *Create doors and windows*



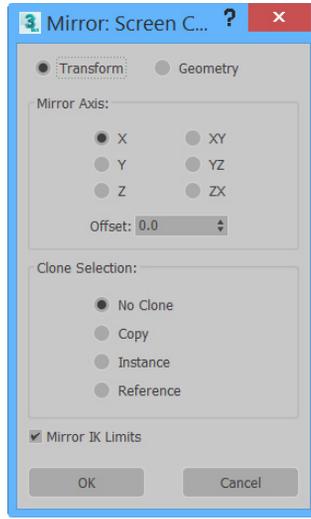


Figure 4-1 The *Mirror* dialog box

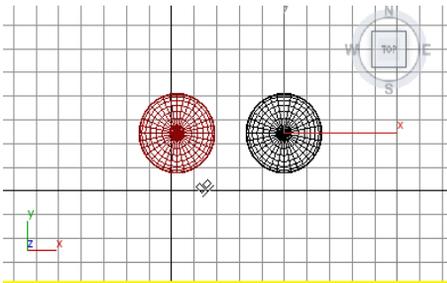


Figure 4-2 The align cursor in the *Top* viewport

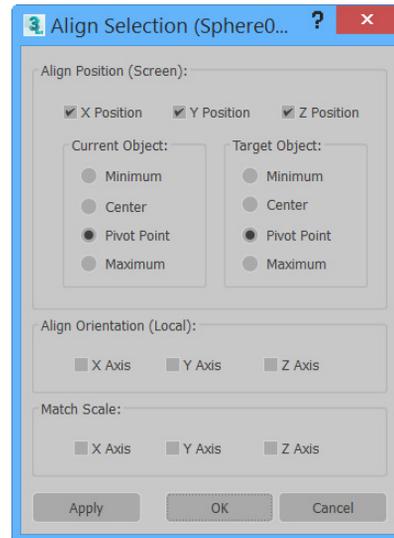


Figure 4-3 The *Align Selection (Sphere002)* dialog box



Figure 4-4 Various rollouts to create a tree

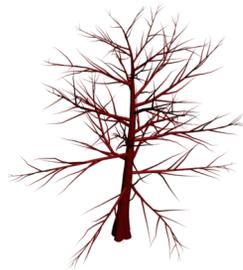


Figure 4-5 A tree created using the **Foliage** tool

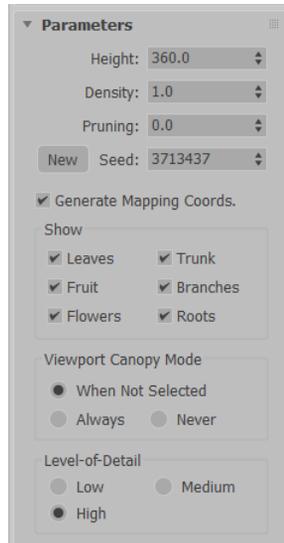


Figure 4-6 *The Parameters rollout*



Figure 4-7 *A tree with the 0 value in the Pruning spinner*



Figure 4-8 *A tree with the 0.5 value in the Pruning spinner*



Figure 4-9 The tree with low level of detail at rendering



Figure 4-10 The tree with medium level of detail at rendering



Figure 4-11 The tree with high level of detail at rendering

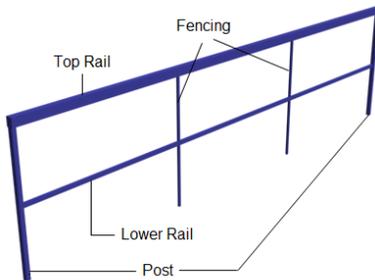


Figure 4-12 The railing with different parts labeled

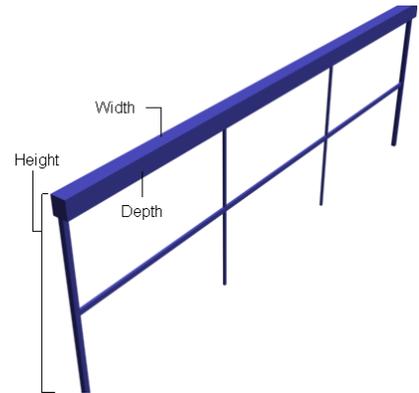


Figure 4-13 The railing with different dimensions

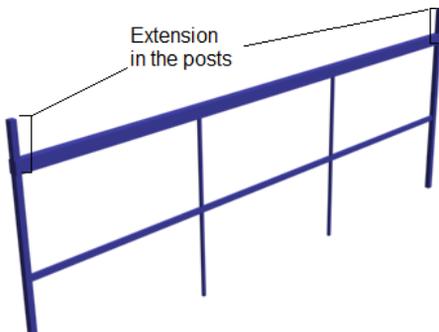


Figure 4-14 The railing with the extension in the posts

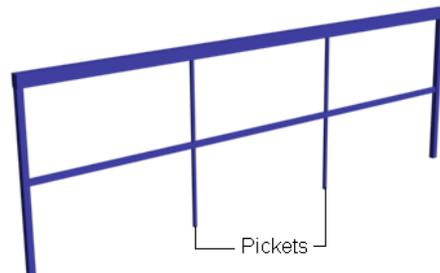


Figure 4-15 The railing with the picket type of fencing

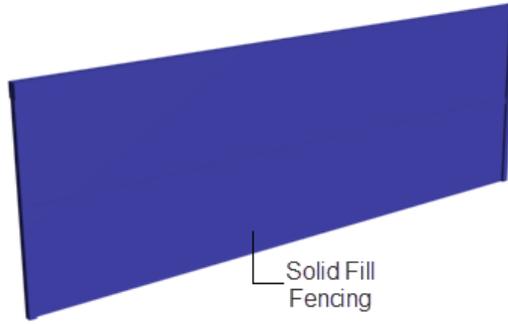


Figure 4-16 The railing with the solid fill type of fencing

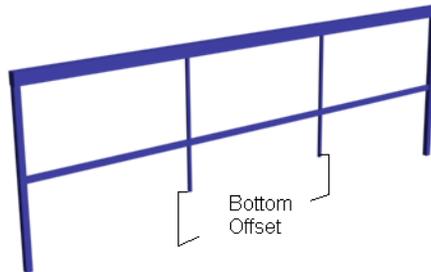


Figure 4-17 The bottom offset in the picket fencing

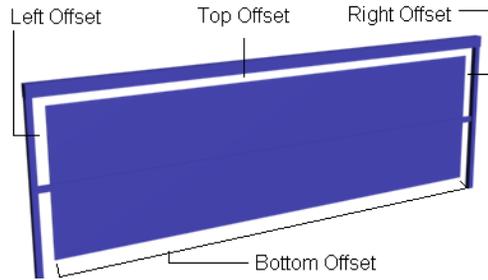


Figure 4-18 Various offsets in the solid fill fencing

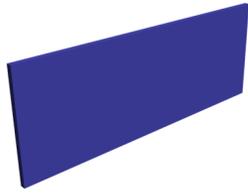


Figure 4-19 *The wall segment displayed*

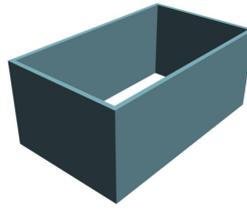


Figure 4-20 *A closed wall displayed*



Figure 4-21 *The pivot door created in the viewport*

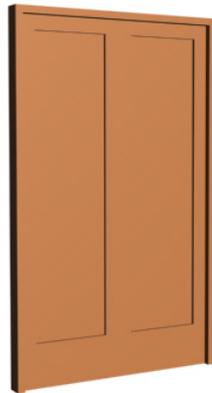


Figure 4-22 *A double pivot door*

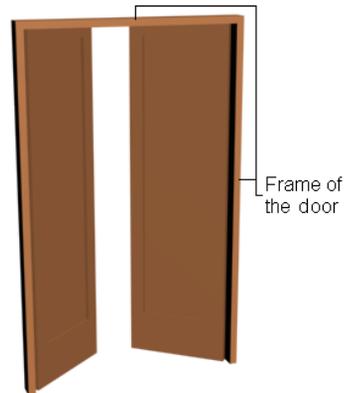


Figure 4-23 *An opened double door*

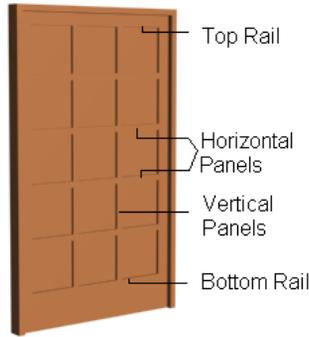


Figure 4-24 *The modified door leaf*



Figure 4-25 *A door with the beveled panels*

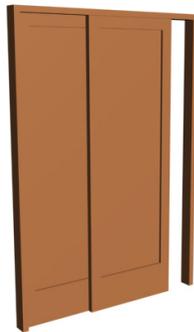


Figure 4-26 *A sliding door*



Figure 4-27 A bifold door

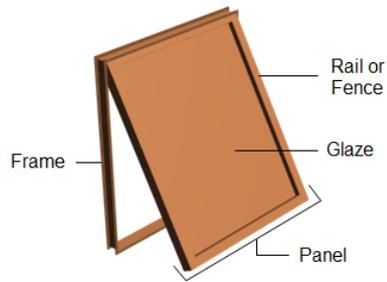


Figure 4-28 An awning window



Figure 4-29 An awning window with two panels



Figure 4-30 *A casement window*



Figure 4-31 *A casement window with two panels*



Figure 4-32 *A fixed window*



Figure 4-33 *A fixed window with horizontal and vertical divisions*

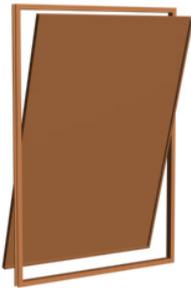


Figure 4-34 *A pivoted window rotated around the horizontal axis*

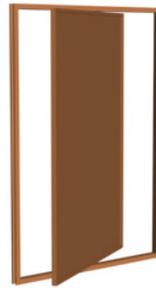


Figure 4-35 *A pivoted window rotated around the vertical axis*

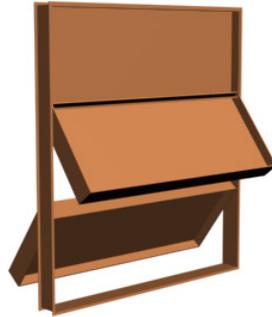


Figure 4-36 *A projected window*



Figure 4-37 *The sliding window*



Figure 4-38 *The sliding window with two horizontal and vertical chamfered divisions*



Figure 4-39 *The sliding window with the horizontal sliding*

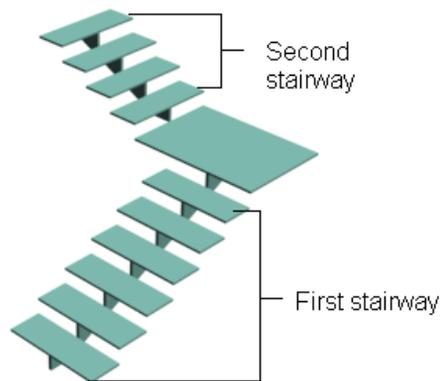


Figure 4-40 *The L-type open stairs created*

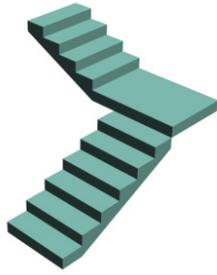


Figure 4-41 The L-type closed stairs

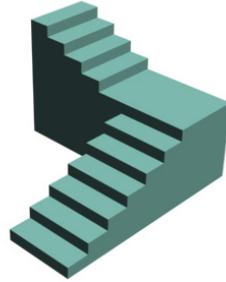


Figure 4-42 The L-type box stairs

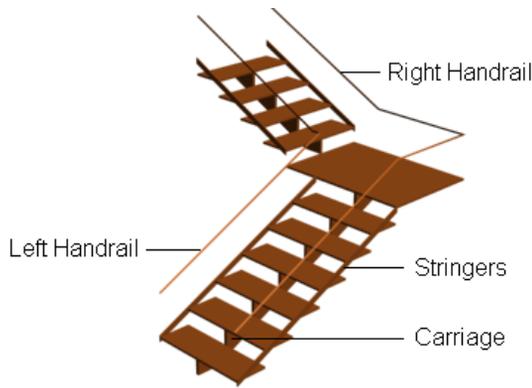


Figure 4-43 The L-Type stairs with handrails, carriage, and stringers

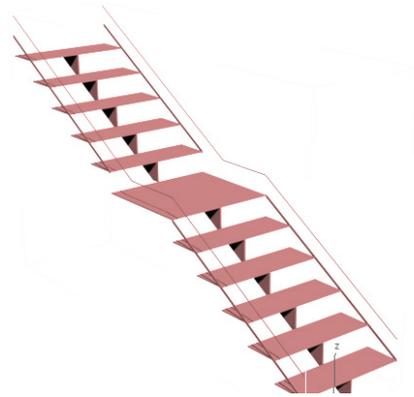


Figure 4-44 The L-Type stairs with Angle value set to zero



Figure 4-45 The spiral stairs

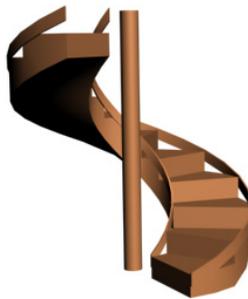


Figure 4-46 The closed spiral stairs

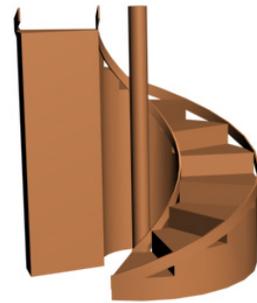


Figure 4-47 The spiral box stairs

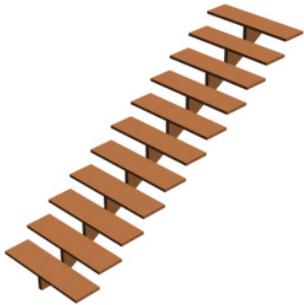


Figure 4-48 *The straight stairs*



Figure 4-49 *The straight closed stairs*

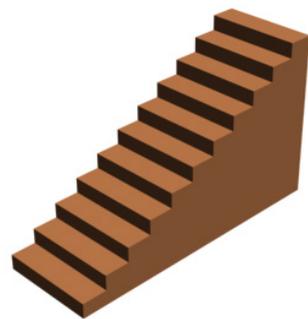


Figure 4-50 *The straight box stairs*

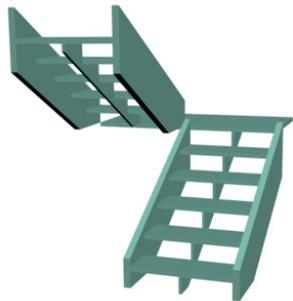


Figure 4-51 *The U-type stairs*

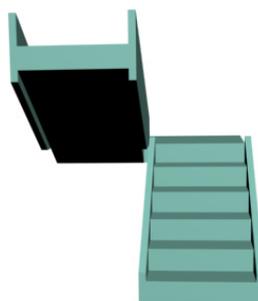


Figure 4-52 *The U-type closed stairs*

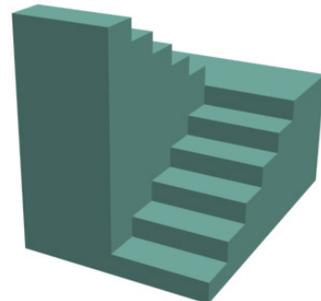


Figure 4-53 *The U-type box stairs*

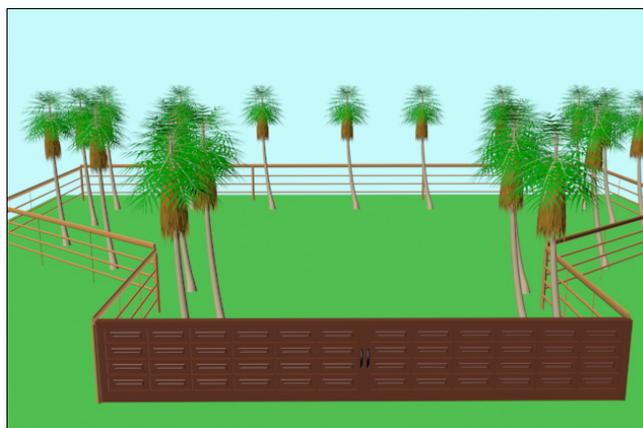


Figure 4-54 *The nature scene*

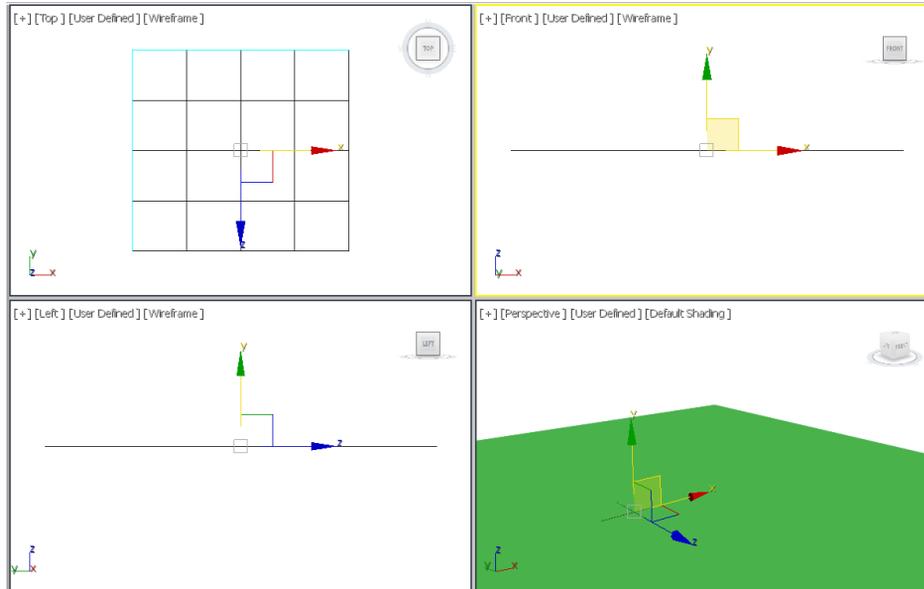


Figure 4-55 The floor geometry after using the Zoom and Orbit tools

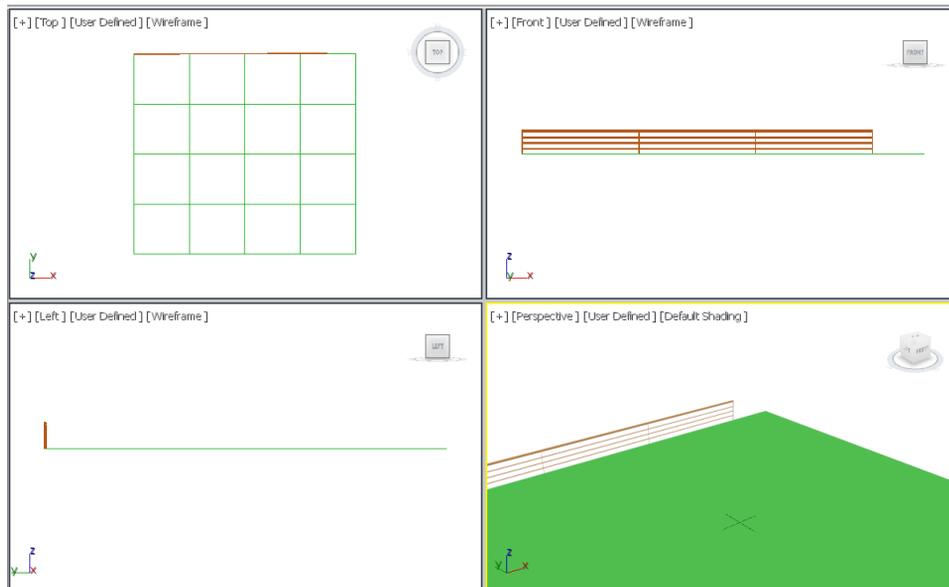


Figure 4-56 The railing01 displayed in viewports

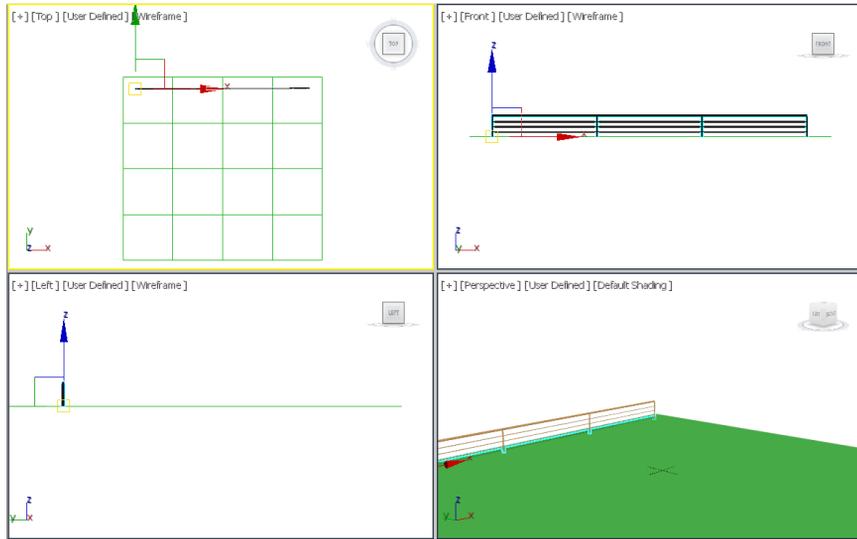


Figure 4-57 The railing01 geometry in viewports after aligning it in the Top viewport

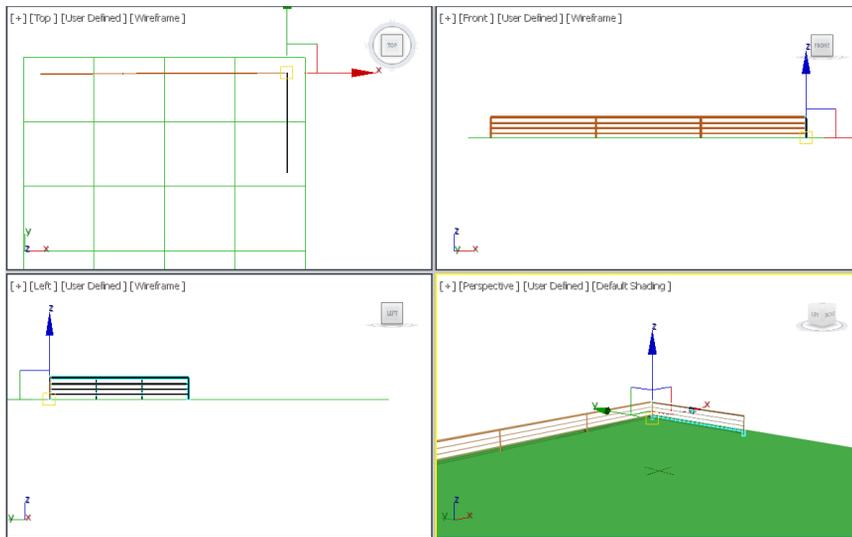


Figure 4-58 The railing02 geometry in viewports after alignment

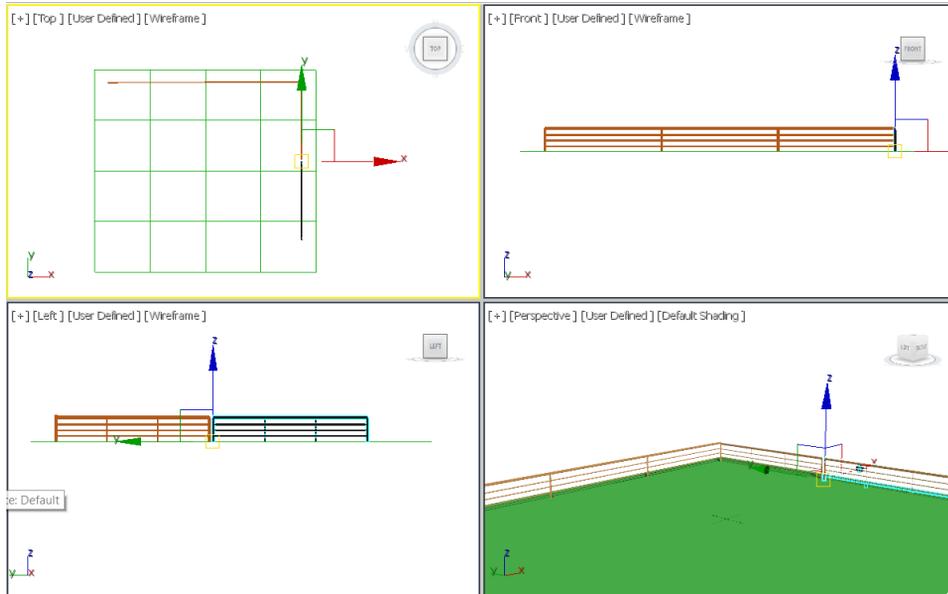


Figure 4-59 The railing03 geometry after alignment

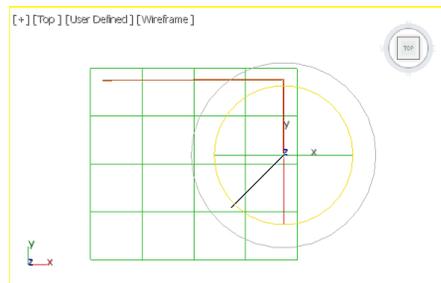


Figure 4-60 The railing03 geometry rotated in the Top viewport

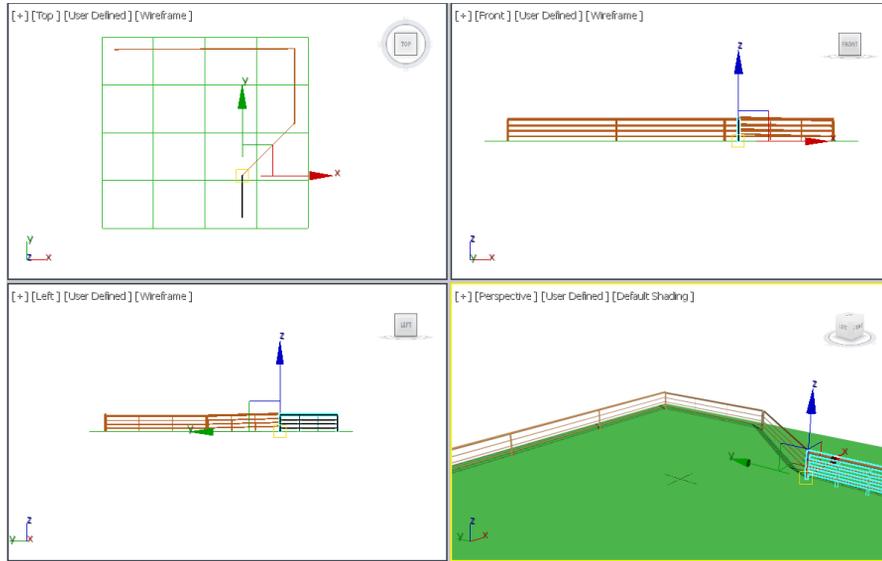


Figure 4-61 The railing04 geometry aligned in viewports

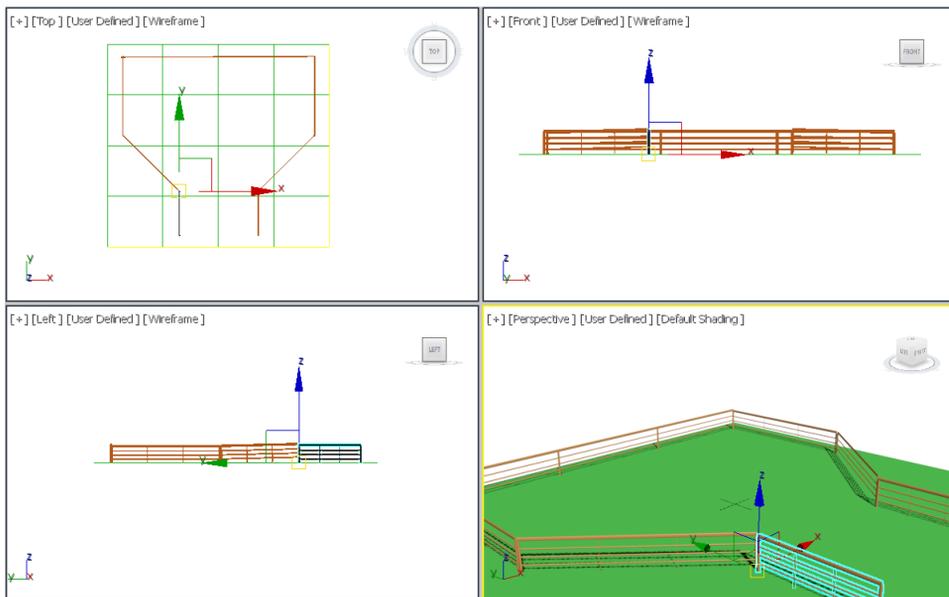


Figure 4-62 The railings geometry displayed in viewports

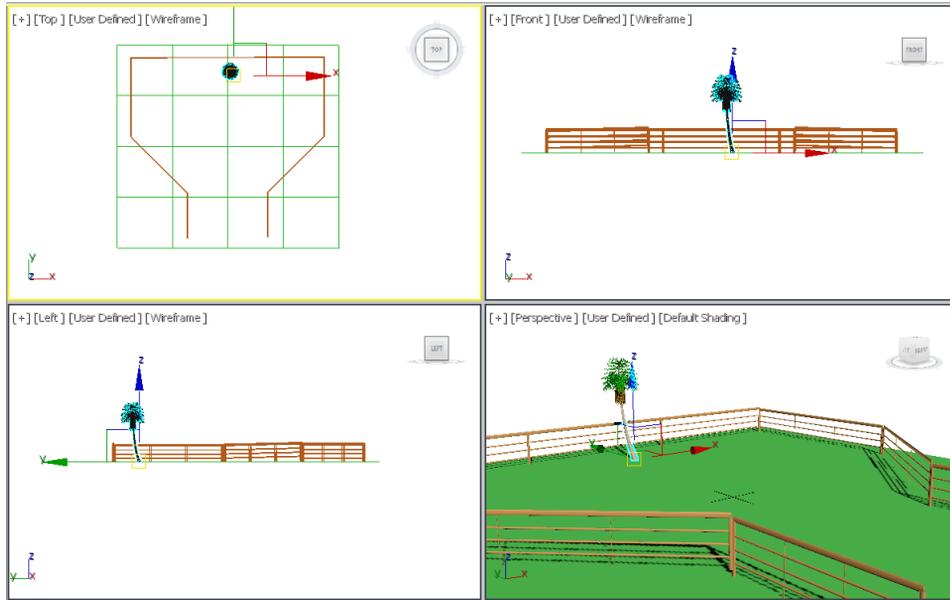


Figure 4-63 Alignment of tree01 in viewports

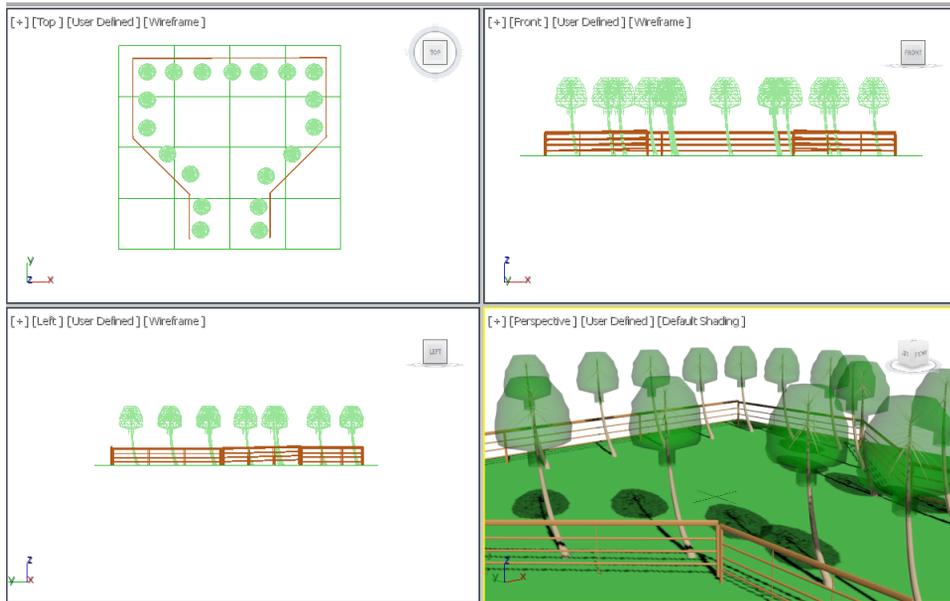


Figure 4-64 Multiple copies of tree01 created and aligned in viewports

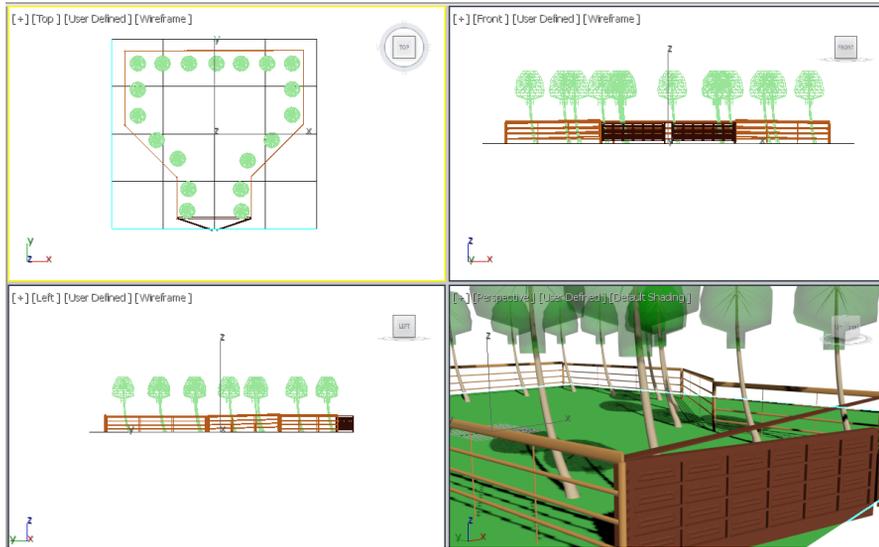


Figure 4-65 The gate geometry aligned in viewports

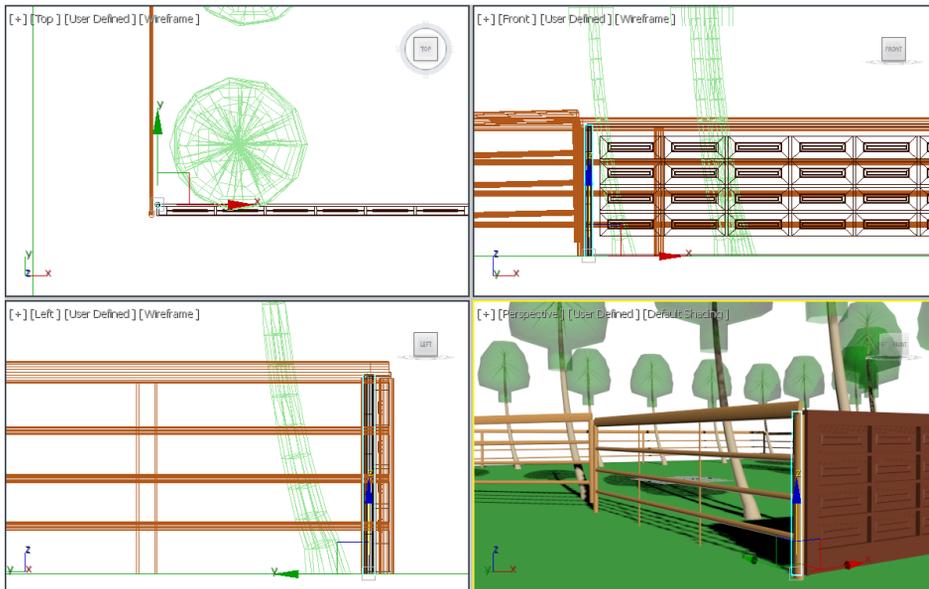


Figure 4-66 The rod1 geometry aligned in viewports

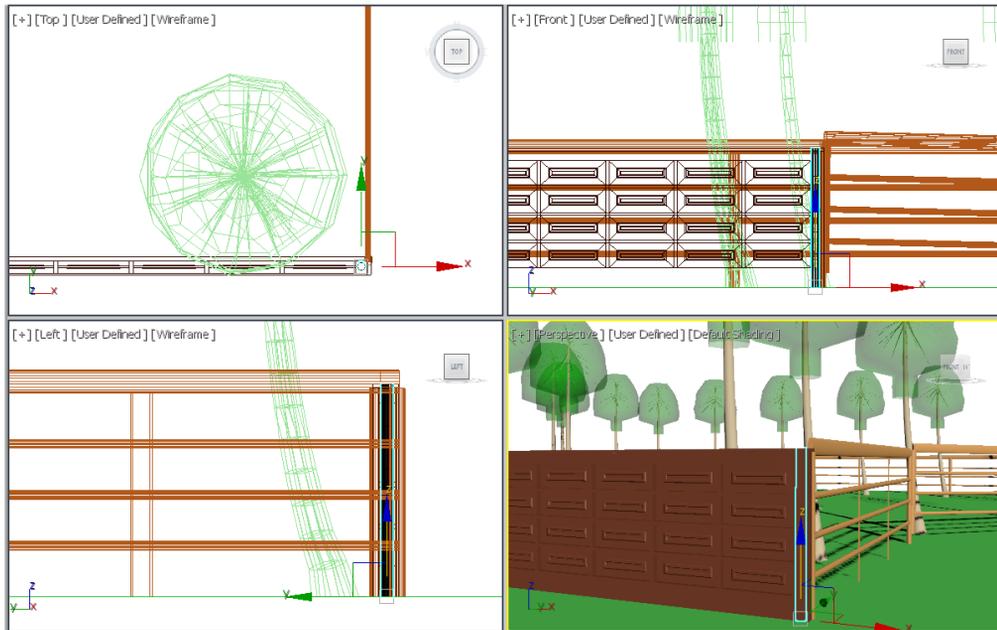


Figure 4-67 The rod2 geometry aligned in viewports

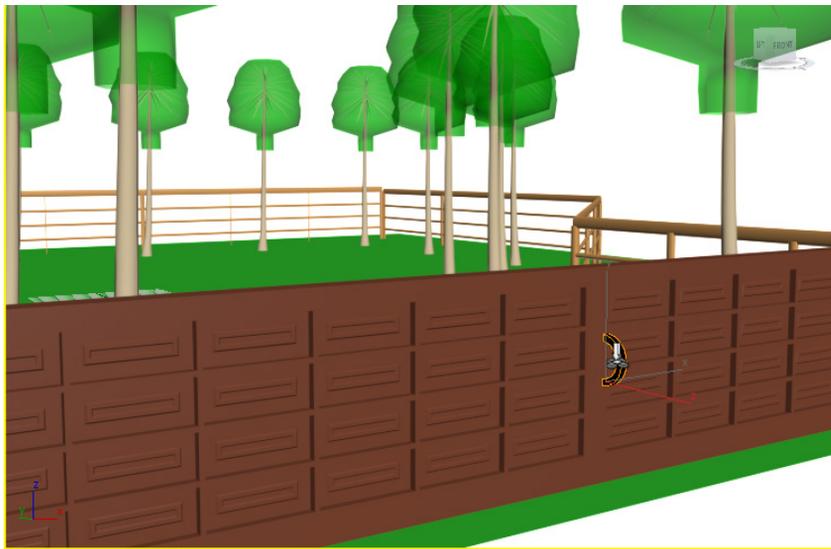


Figure 4-68 The handle1 geometry aligned

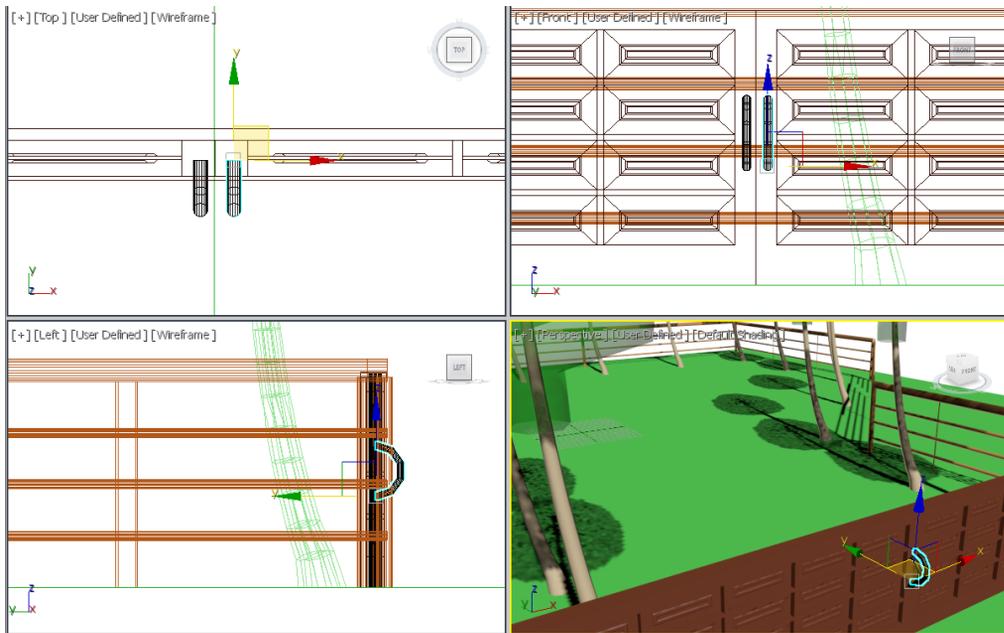


Figure 4-69 The copy of handle1 aligned

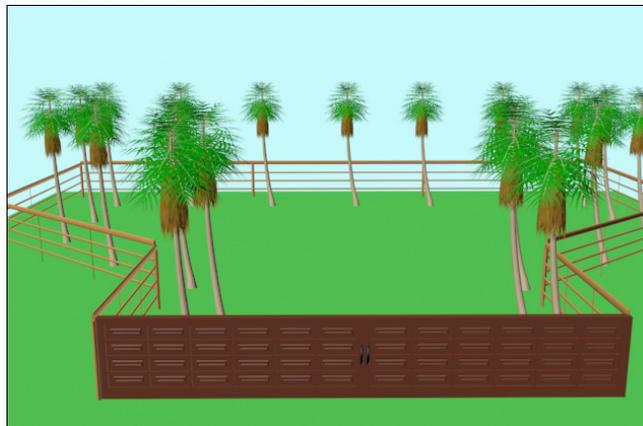


Figure 4-70 The final output after rendering



Figure 4-71 The room model

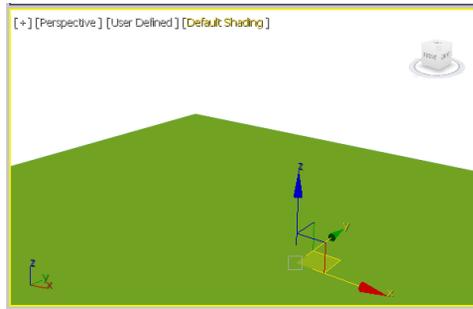


Figure 4-72 The floor geometry in the Perspective viewport

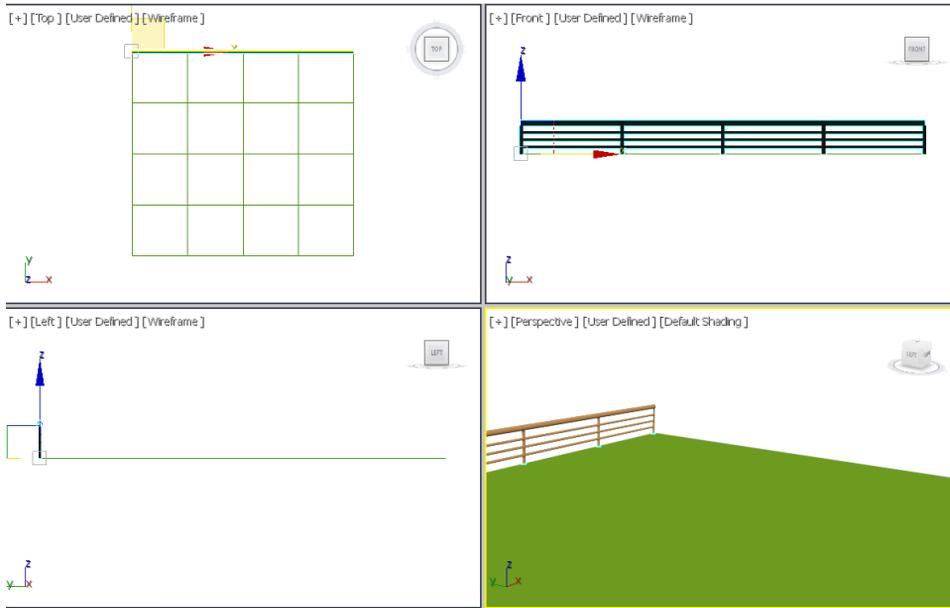


Figure 4-73 The railing01 geometry in viewports after alignment

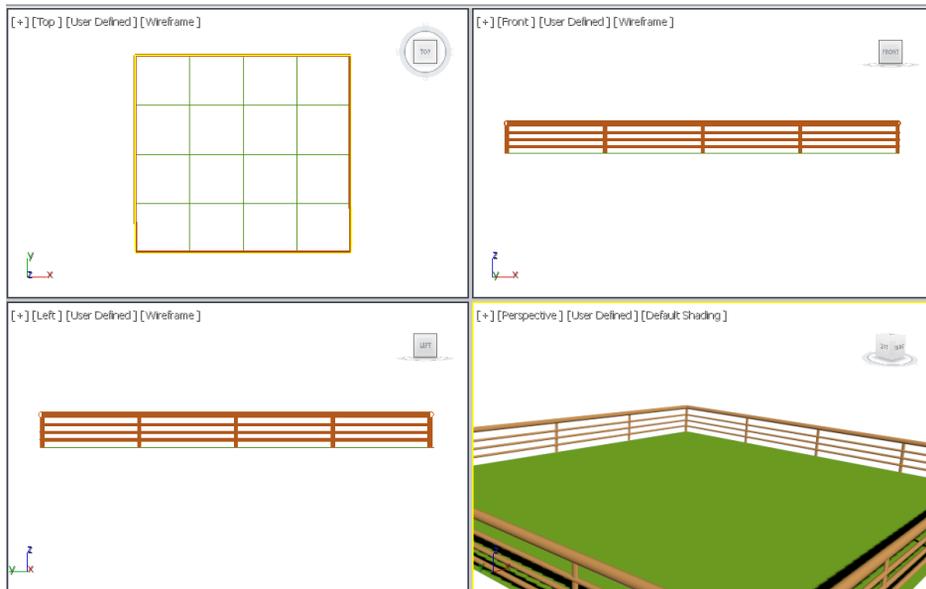


Figure 4-74 The railings geometry displayed in viewports

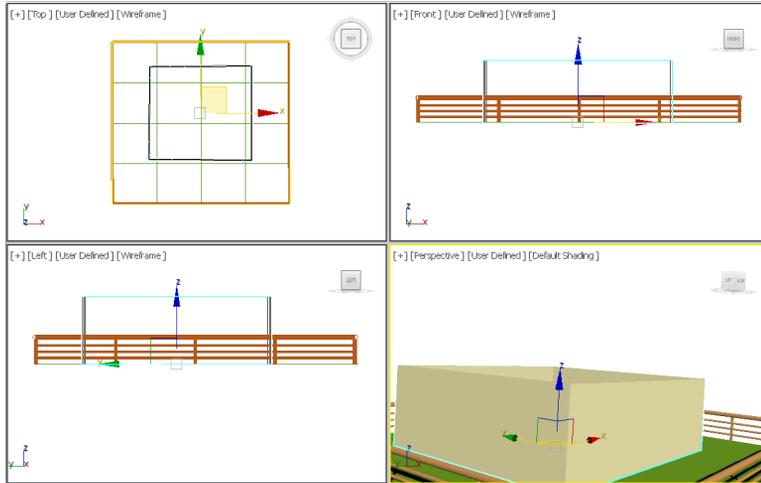


Figure 4-75 The wall geometry displayed in viewports

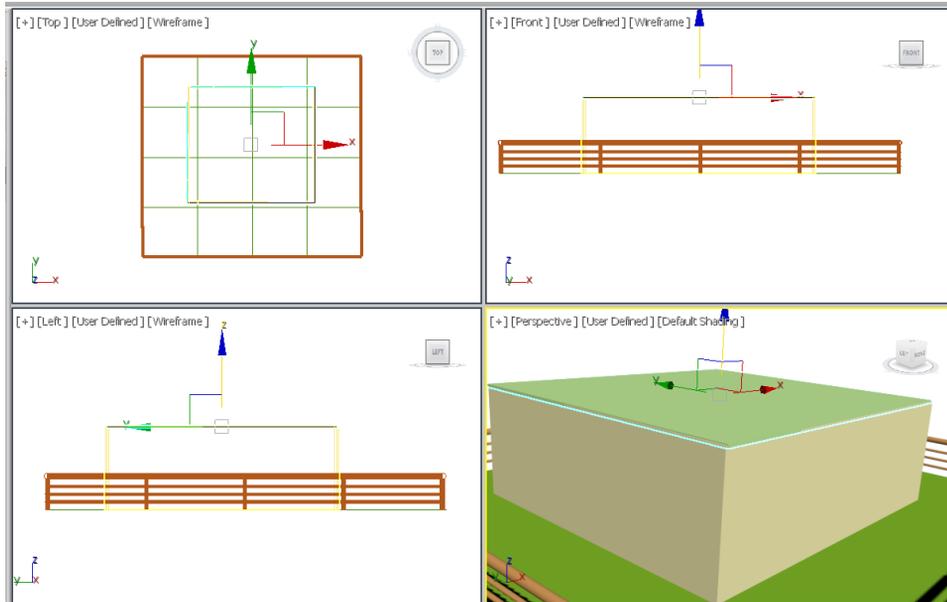


Figure 4-76 The roof geometry in viewports after alignment

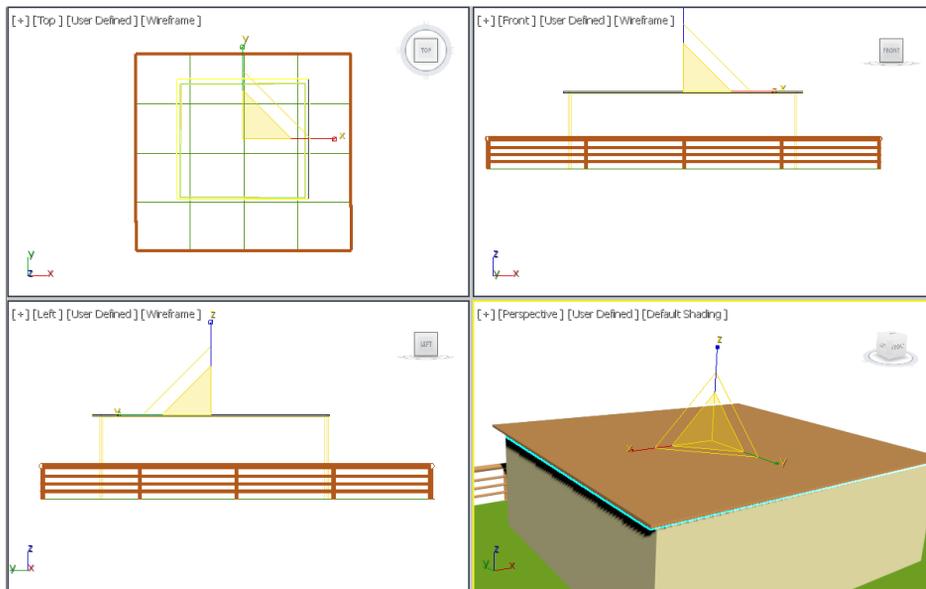


Figure 4-77 The roof fencing geometry after scaling in the Front viewport

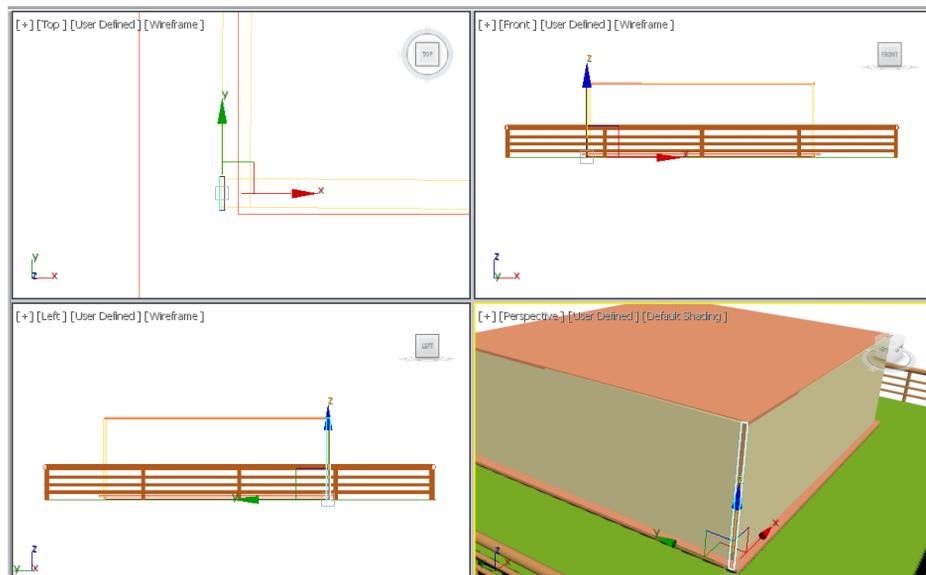


Figure 4-78 The fc01 geometry in the Top viewport after alignment

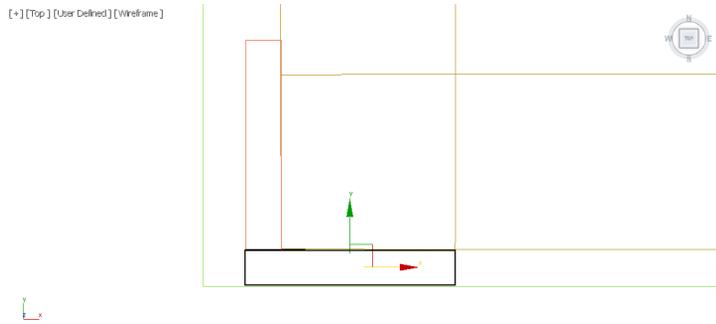


Figure 4-79 The fc002 geometry in the Top viewport after alignment

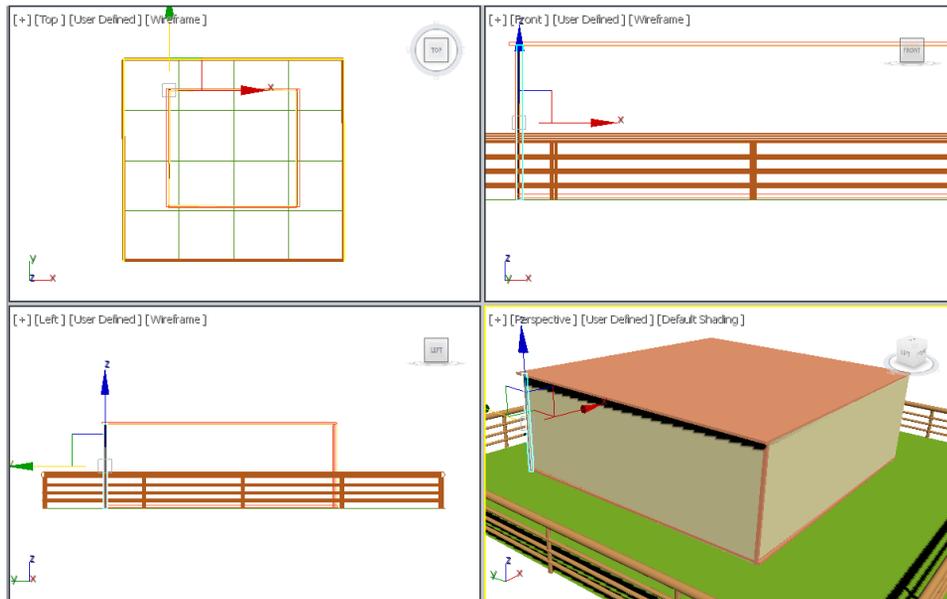


Figure 4-80 The fencing geometry at the four corners of wall in viewports

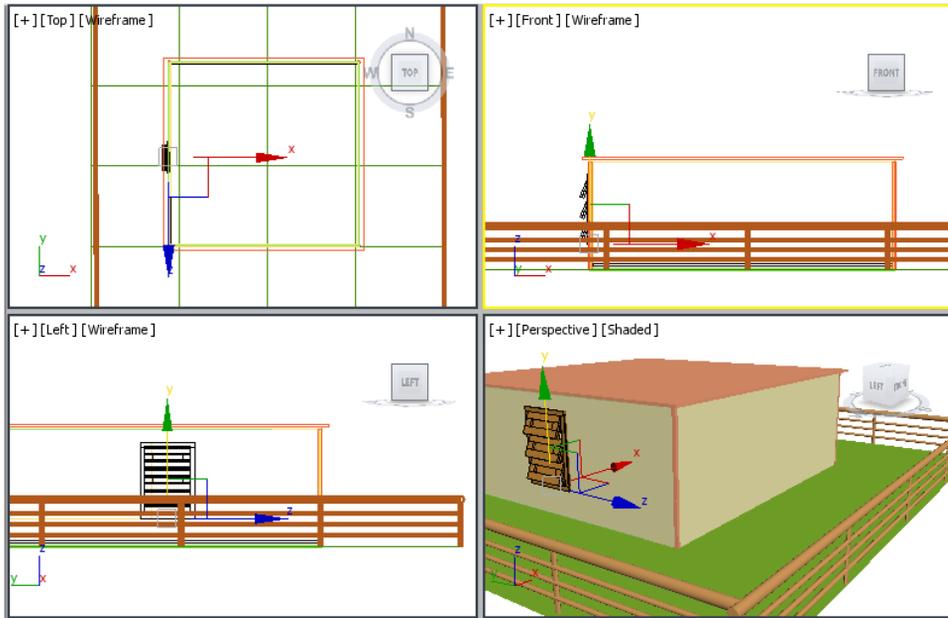


Figure 4-81 The window geometry in viewports after alignment

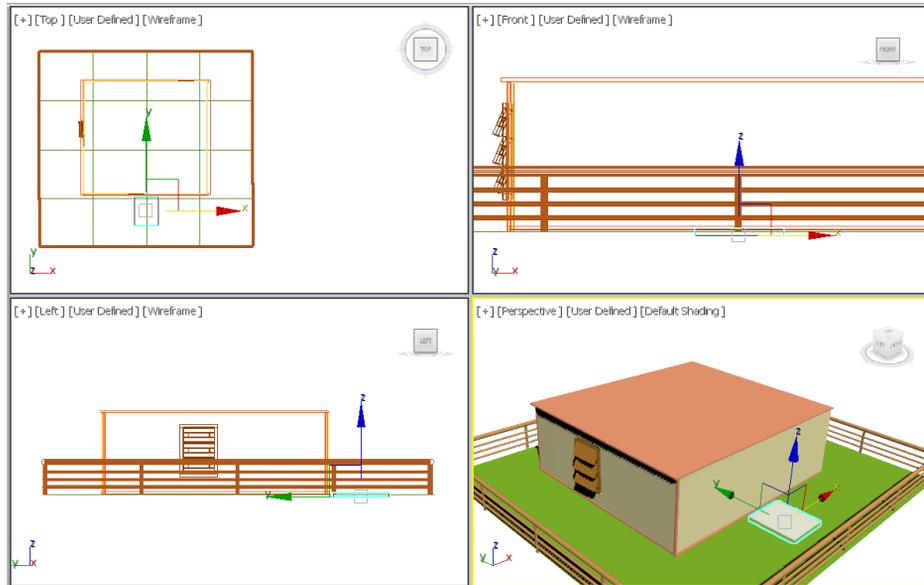


Figure 4-82 The foot support geometry in viewports after the alignment

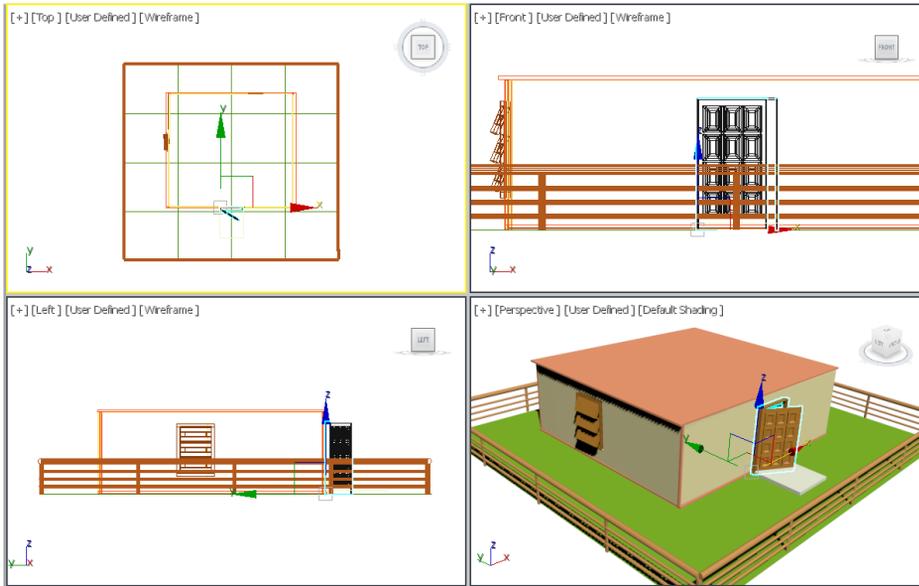


Figure 4-83 The door geometry in viewports after alignment

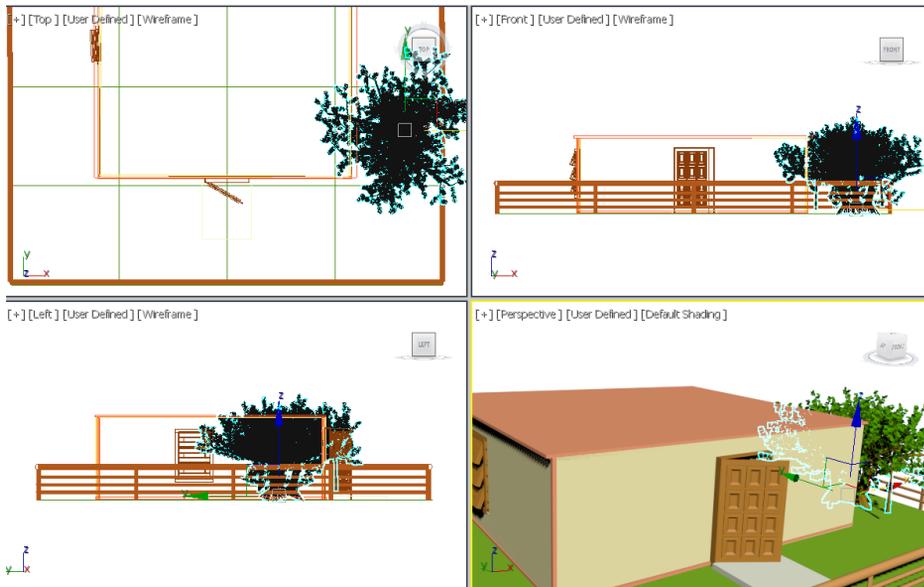


Figure 4-84 The tree01 geometry displayed in viewports after alignment

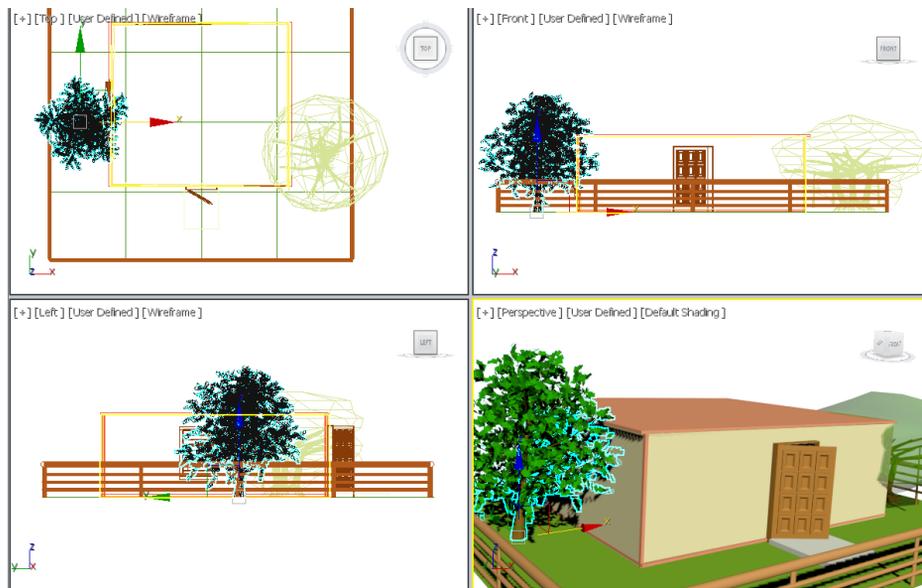


Figure 4-85 The tree02 geometry in viewports after the alignment



Figure 4-86 The final output of the scene at rendering



Figure 4-87 The model for Exercise 1

5

Splines and Extended Splines

Learning Objectives

After completing this chapter, you will be able to:

- *Use the AutoGrid option*
- *Create splines*
- *Create extended splines*



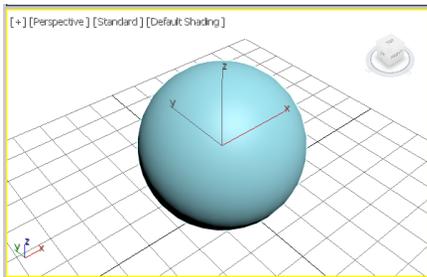


Figure 5-1 The sphere created

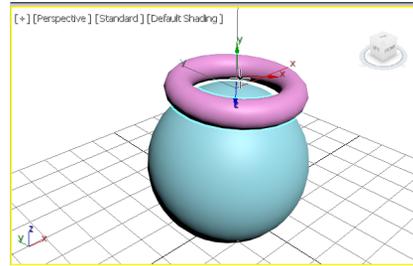


Figure 5-2 The torus created after selecting the **AutoGrid** check box

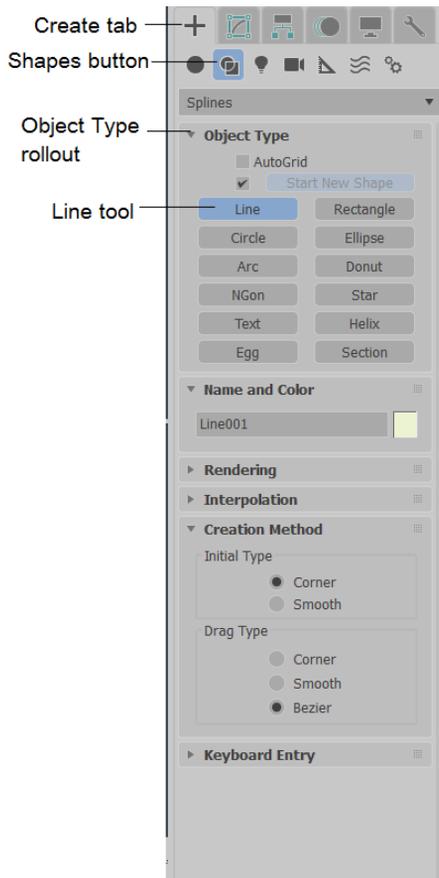


Figure 5-3 Various rollouts displayed to create and modify a line spline

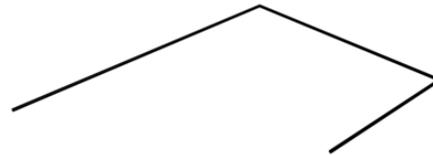


Figure 5-4 An open line spline created

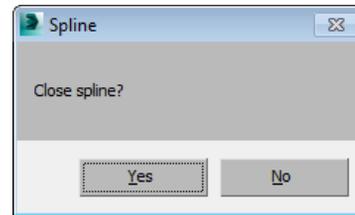


Figure 5-5 The **Spline** message box

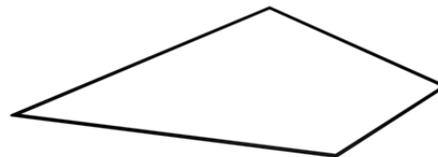


Figure 5-6 A closed line spline

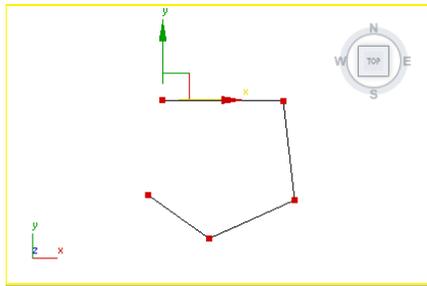


Figure 5-7 A line with corner vertices

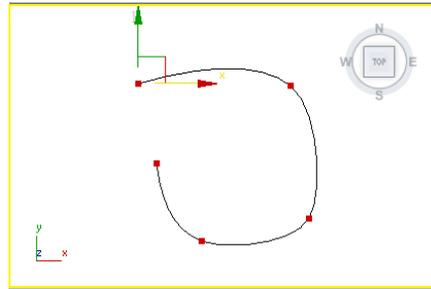


Figure 5-8 A line spline with bezier vertex and smooth curve

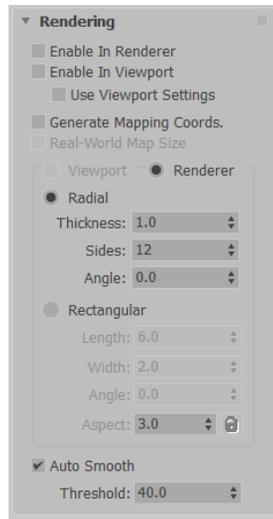


Figure 5-9 The Rendering rollout

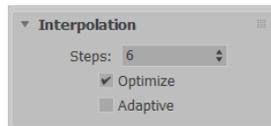


Figure 5-10 The Interpolation rollout

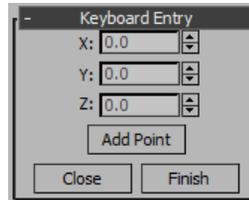


Figure 5-11 The Keyboard Entry rollout

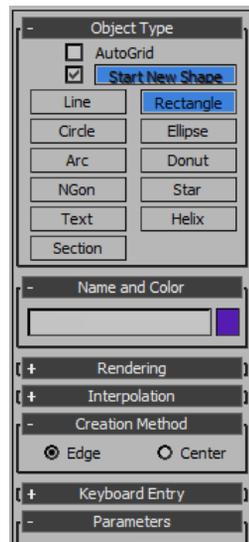


Figure 5-12 Various rollouts to create and modify a rectangular spline



Figure 5-13 A rectangular spline

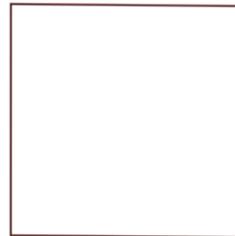


Figure 5-14 A square spline



Figure 5-15 A rectangle with corner radius

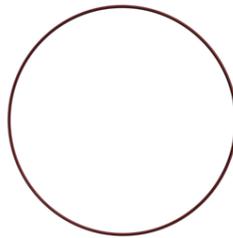


Figure 5-16 A circular spline

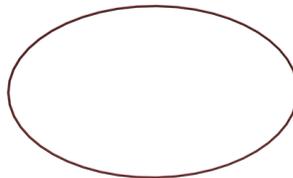


Figure 5-17 An elliptical spline



Figure 5-18 Creating an arc using the End-End-Middle method (step-1)

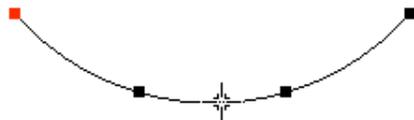


Figure 5-19 Creating an arc using the End-End-Middle method (step-2)

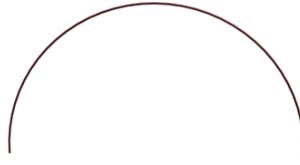


Figure 5-20 An arc spline

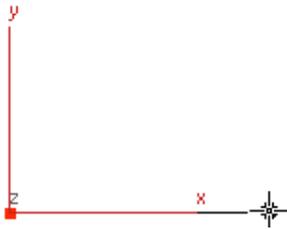


Figure 5-21 Creating an arc using the Center-End-End method (step-1)

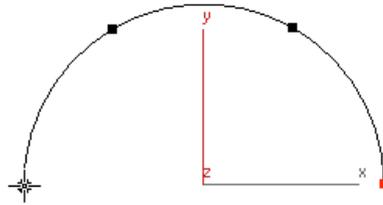
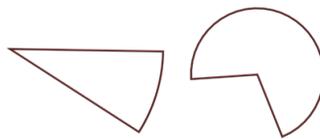


Figure 5-22 Creating an arc using the Center-End-End method (step-2)



*Figure 5-23 The arcs created on selecting the **Pie Slice** check box*



Figure 5-24 A donut spline

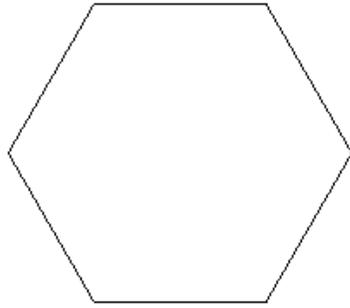


Figure 5-25 An NGon spline

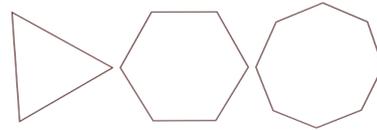


Figure 5-26 The NGons with 3, 6, and 8 number of sides

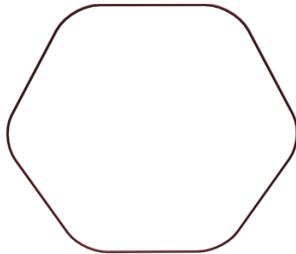
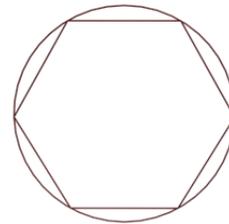
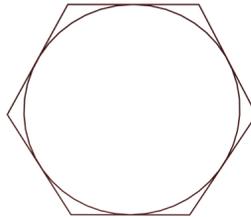


Figure 5-27 The NGon with round corners



*Figure 5-28 An NGon after selecting the **Inscribed** radio button*



*Figure 5-29 An NGon after selecting the **Circumscribed** radio button*

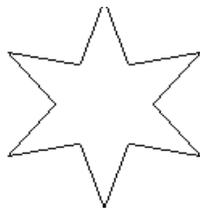


Figure 5-30 A star spline

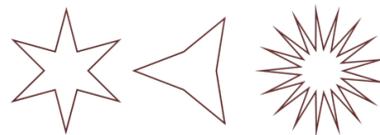


Figure 5-31 The star splines with different number of points

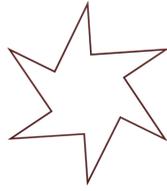


Figure 5-32 A star after setting the value in the **Distortion** spinner

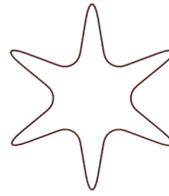


Figure 5-33 A star after setting the values in the **Fillet Radius 1** and **Fillet Radius 2** spinners



Figure 5-34 The text in the viewport



Figure 5-35 Alignment buttons



Figure 5-36 A helix spline



Figure 5-37 The helix spline with three turns and zero value in the **Bias** spinner



Figure 5-38 The helix spline with three turns and +1 value in the **Bias** spinner



Figure 5-39 The helix spline with three turns and -1 value in the **Bias** spinner

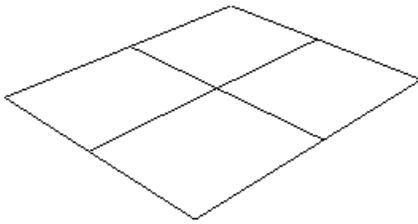


Figure 5-40 A section spline

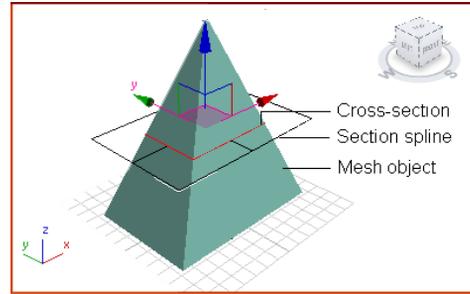


Figure 5-41 The cross-section of the section spline according to the object

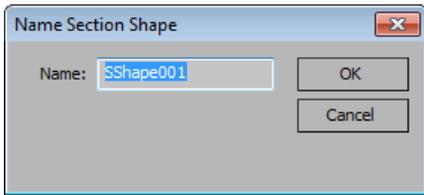


Figure 5-42 The Name Section Shape dialog box

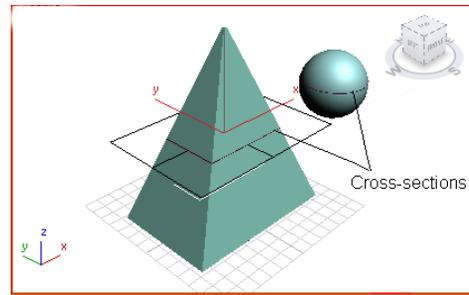


Figure 5-43 The cross-sections generated in both the objects in their planes on selecting the Infinite radio button

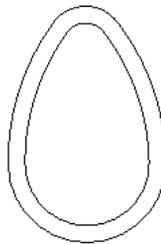


Figure 5-44 An egg spline

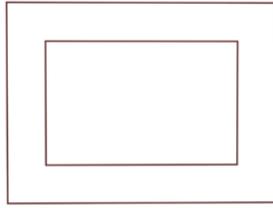


Figure 5-45 A WRectangle spline

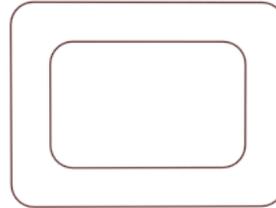


Figure 5-46 The WRectangle spline with corner radius

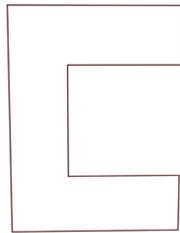


Figure 5-47 A channel spline

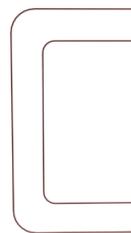


Figure 5-48 The channel spline with corner radius

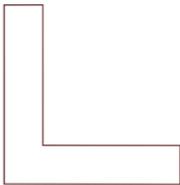


Figure 5-49 An angle spline

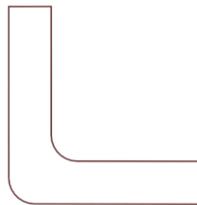


Figure 5-50 The angle spline with corner radius

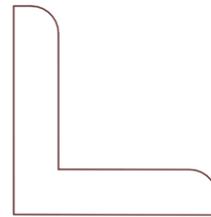


Figure 5-51 An angle spline with edge radii

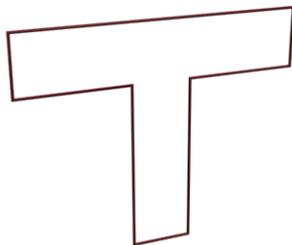


Figure 5-52 A T-shaped tee spline

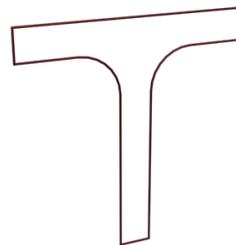


Figure 5-53 A tee spline with corner radius

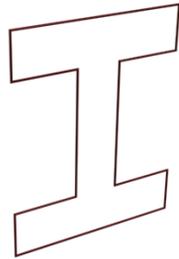


Figure 5-54 An I-shaped wide flange spline



Figure 5-55 The wide flange spline with corner radius

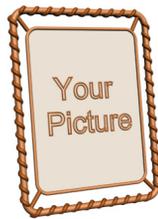


Figure 5-56 The model of a photo frame

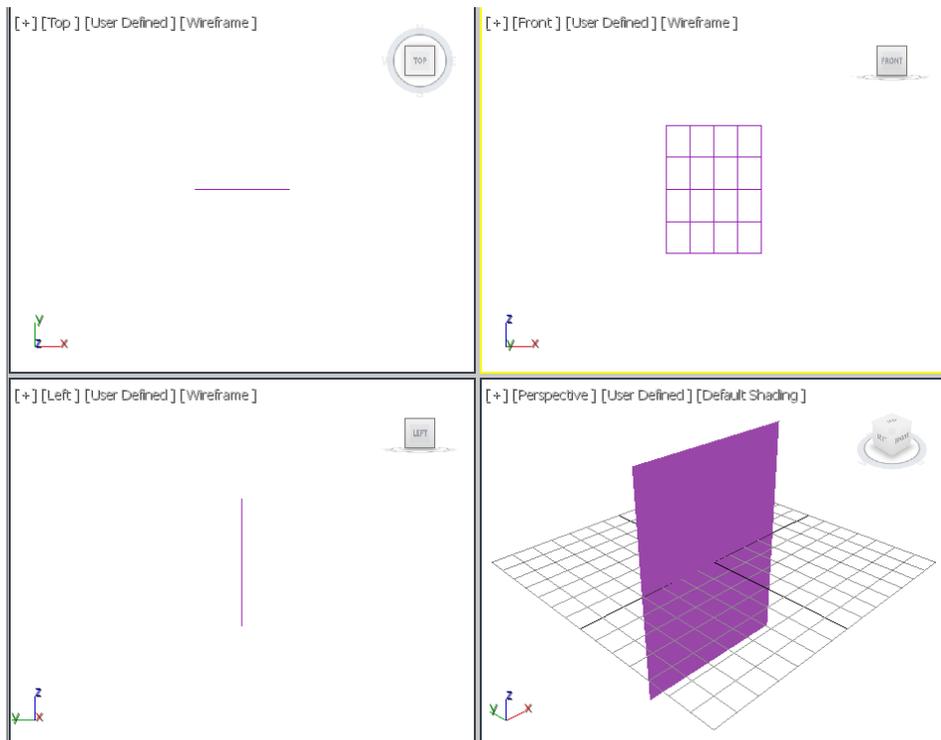


Figure 5-57 The plane created in viewports

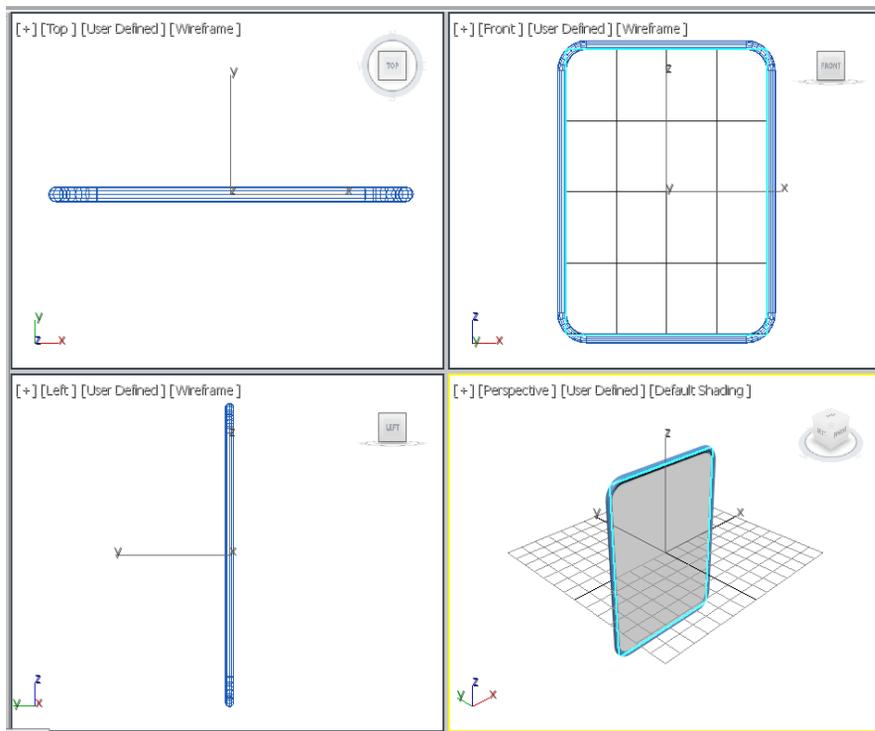


Figure 5-58 The rectangle displayed in the viewports

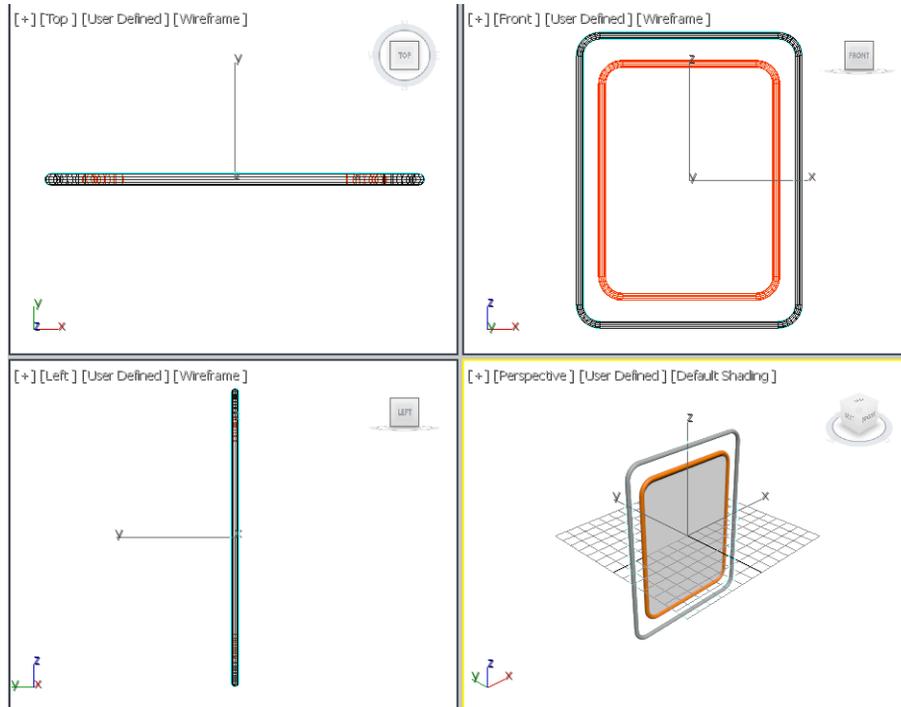


Figure 5-59 The rectangle displayed in the viewports

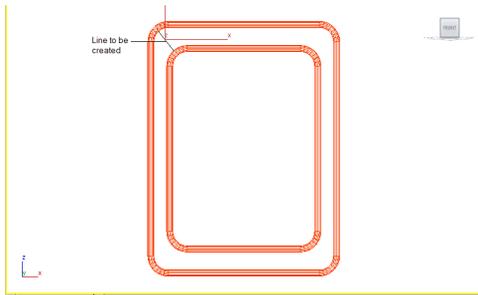


Figure 5-60 The line to be created in the Front Viewport

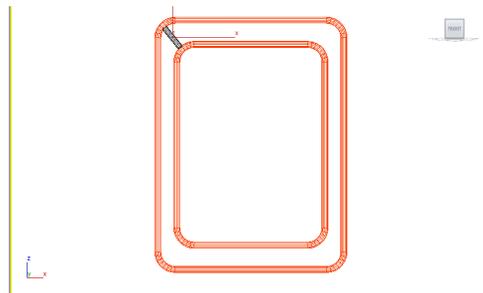


Figure 5-61 The joint1 geometry in the Front Viewport

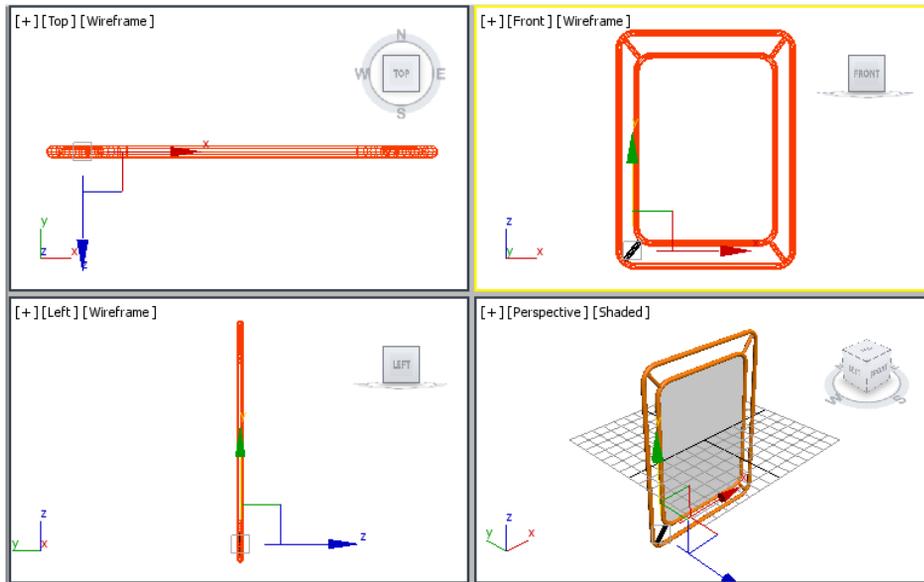


Figure 5-62 All joints aligned in the viewports

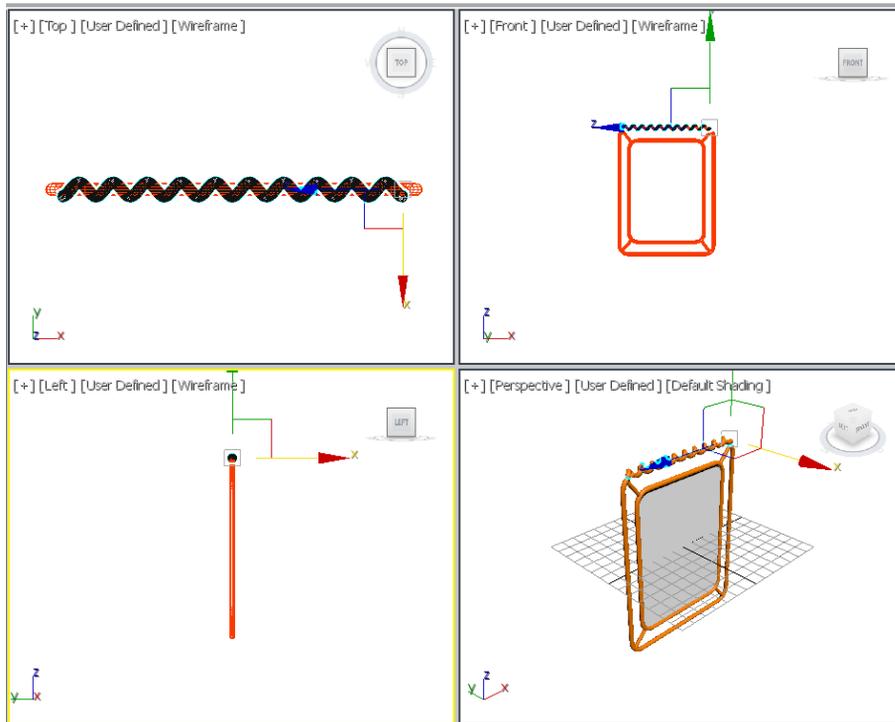


Figure 5-63 The design1 geometry aligned in the viewports

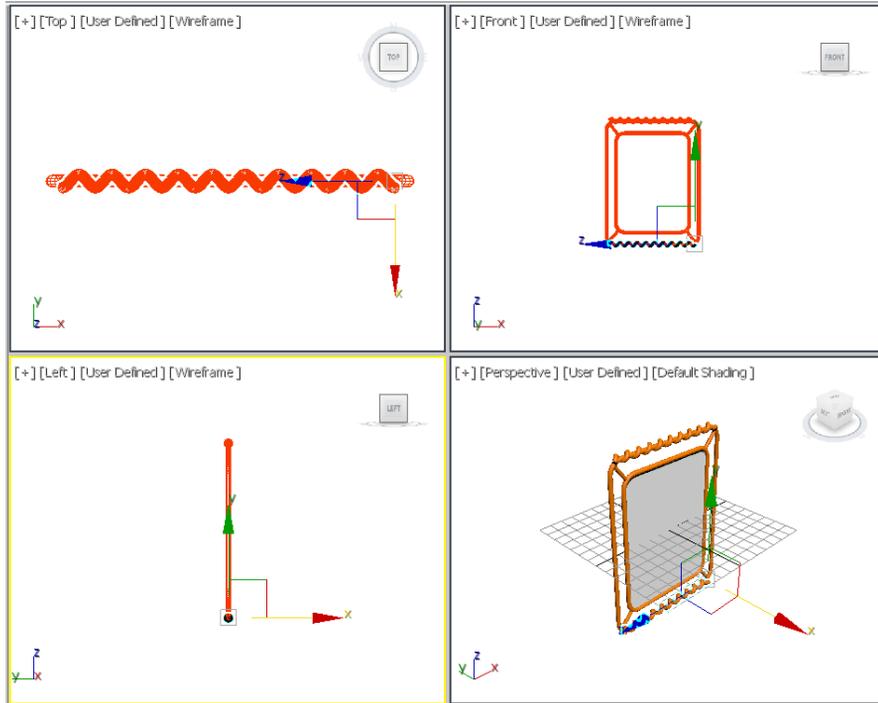


Figure 5-64 The copy of design1 aligned in the viewports

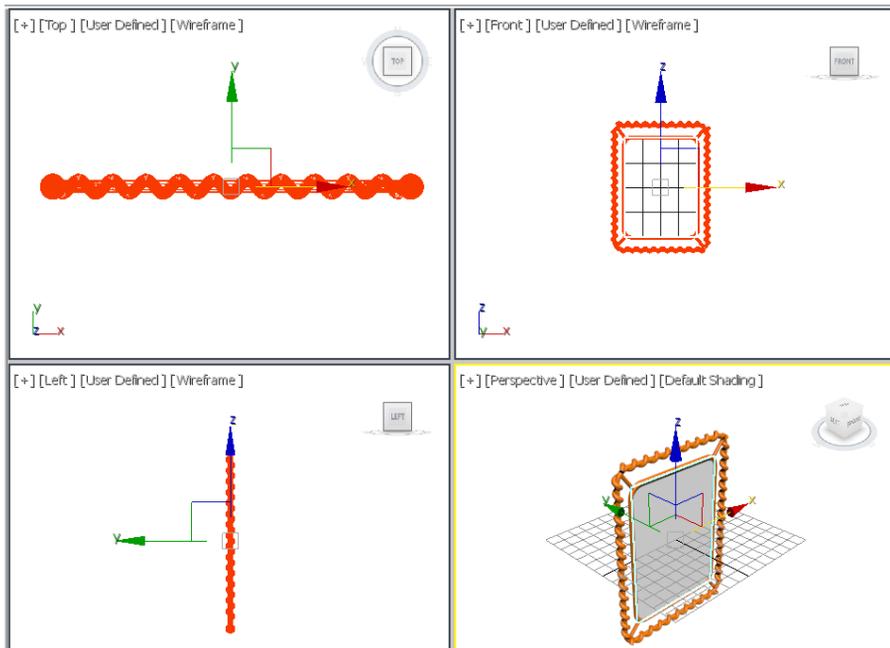


Figure 5-65 The design3 geometry aligned in the viewports

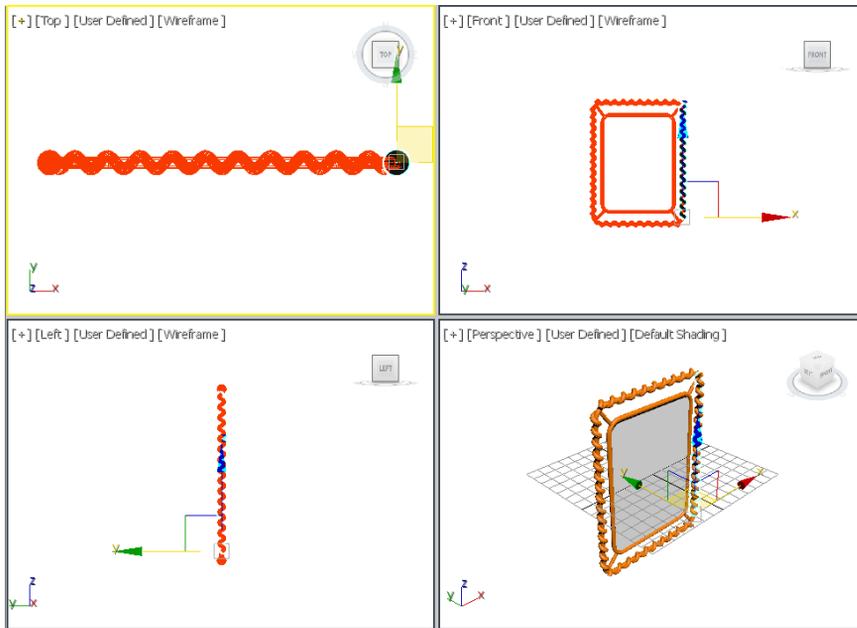


Figure 5-66 The copy of design3 geometry aligned in the viewports

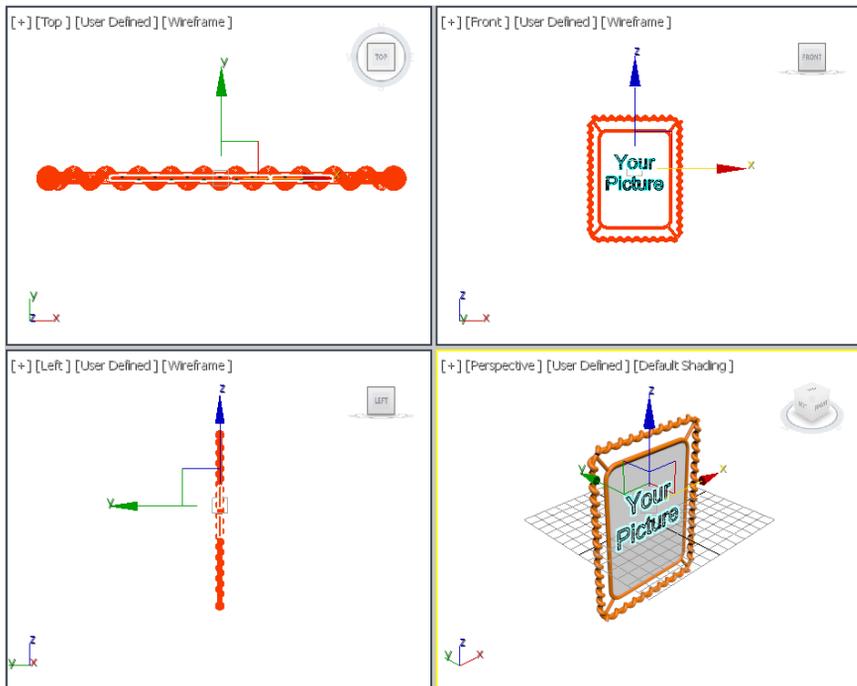


Figure 5-67 Text001 aligned in the viewports

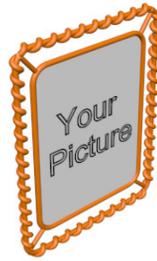


Figure 5-68 The final output after rendering

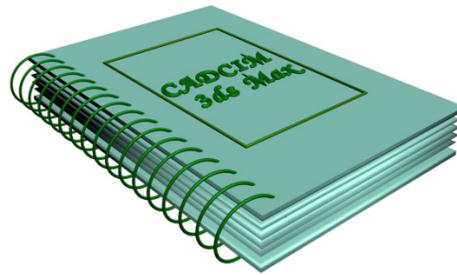


Figure 5-69 The model of a book

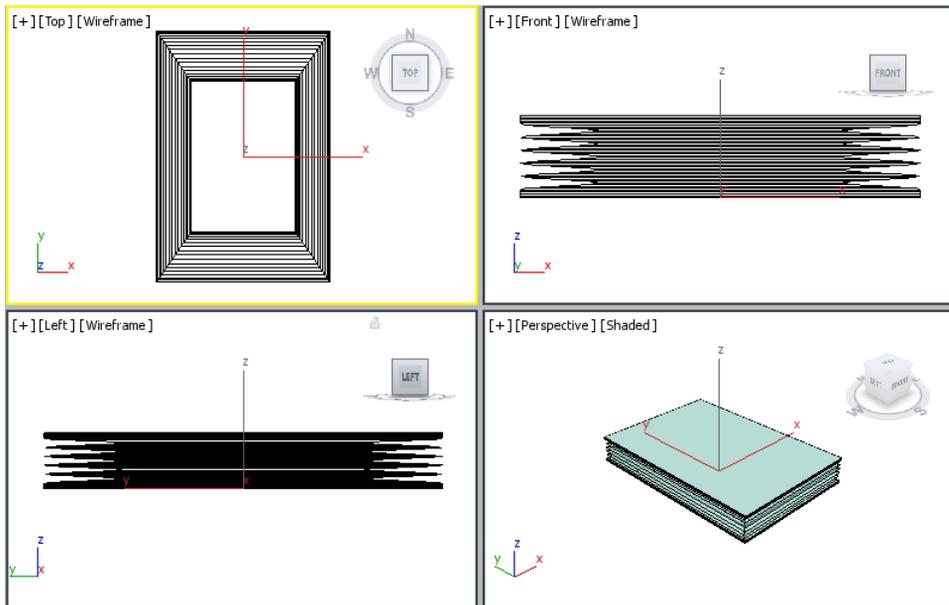


Figure 5-70 The book geometry after invoking the **Zoom Extents All** tool

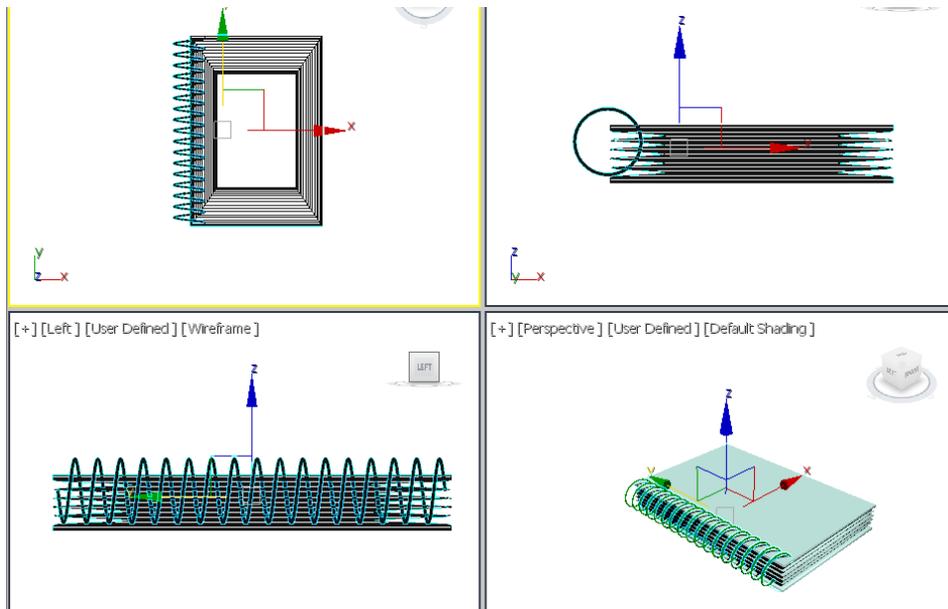


Figure 5-71 Alignment of spiral binding with book in the viewports

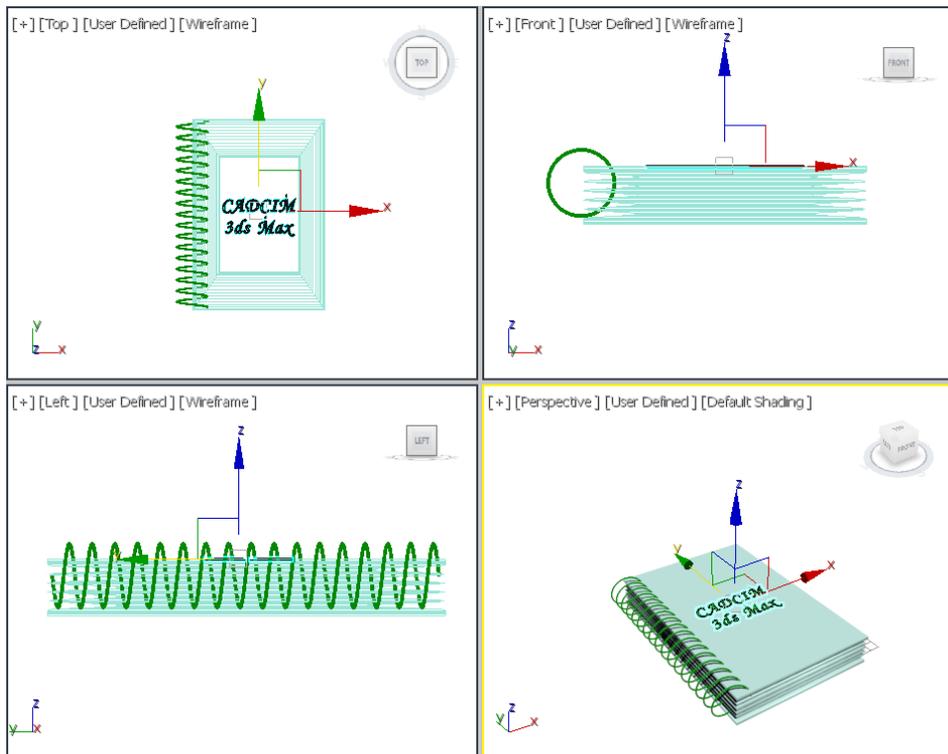


Figure 5-72 Alignment of text01 on book in viewports

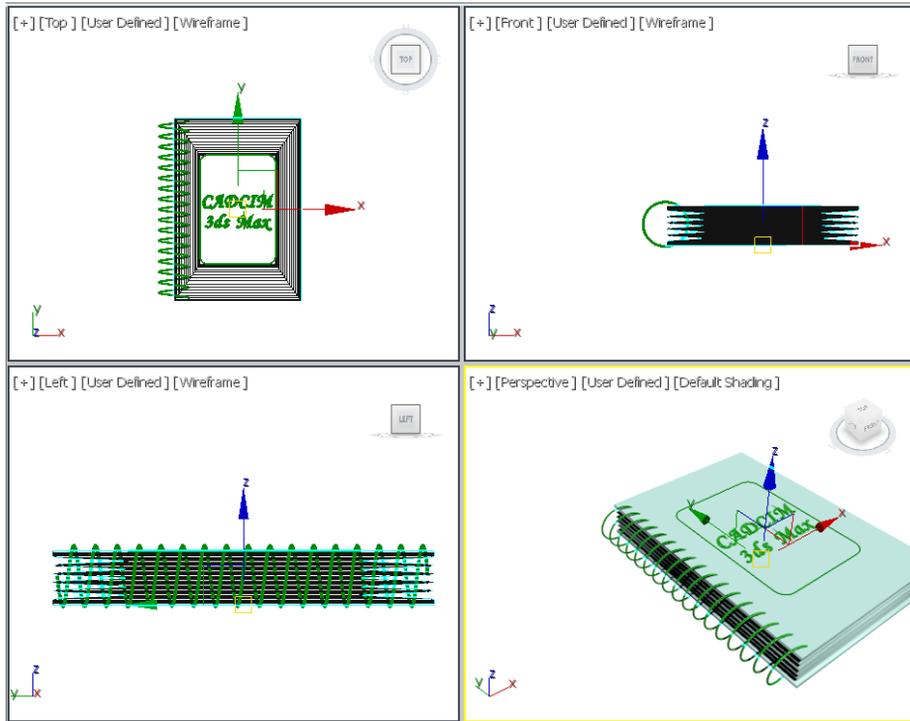


Figure 5-73 Alignment of rectangular design in the viewports



Figure 5-74 The final output after rendering



Figure 5-75 The model of a grid



Figure 5-76 The Christmas tree model

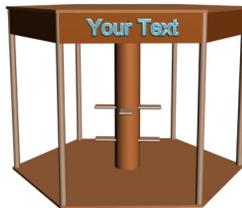


Figure 5-77 The model of an entrance

6

Modifying Splines

Learning Objectives

After completing this chapter, you will be able to:

- *Adjust the pivot point of an object*
- *Use the Lathe modifier to modify objects*
- *Modify shapes*
- *Use editable spline objects*



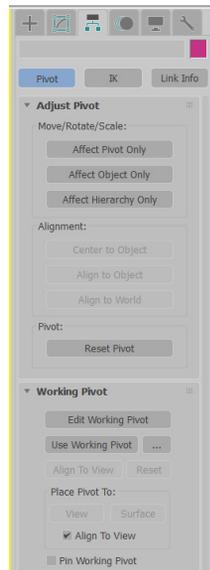


Figure 6-1 The *Pivot* tab chosen in the *Hierarchy* tab

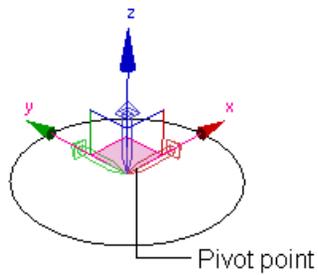


Figure 6-2 The pivot point of a circle

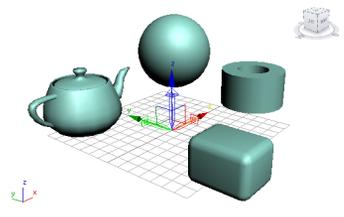


Figure 6-3 The working pivot along with the gizmo in the scene

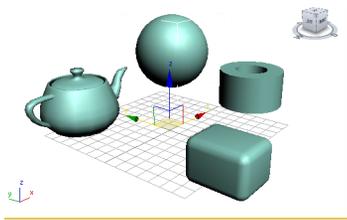


Figure 6-4 The move transform gizmo displayed

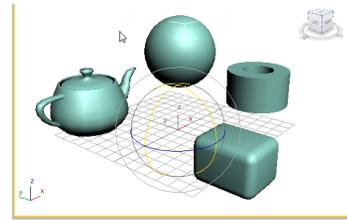


Figure 6-5 The rotate transform gizmo displayed

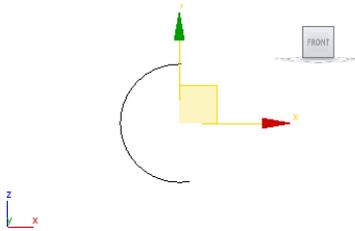


Figure 6-6 An arc displayed in the Front viewport

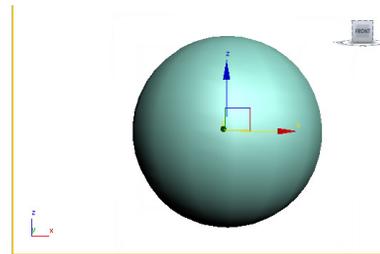


Figure 6-7 The arc converted into a 3D object after applying the **Lathe** modifier

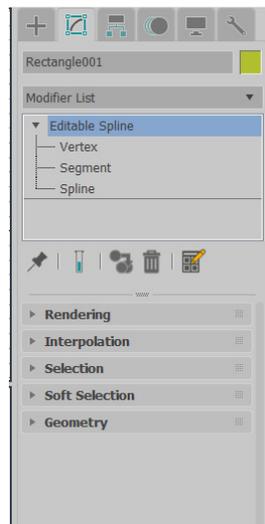


Figure 6-8 The sub-object levels and rollouts displayed

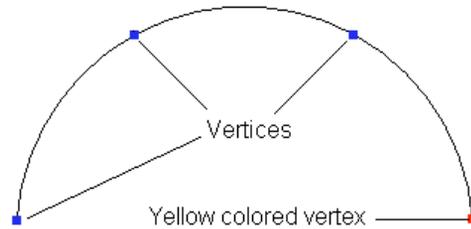


Figure 6-9 The vertices of an arc spline displayed after selecting the **Vertex** sub-object level

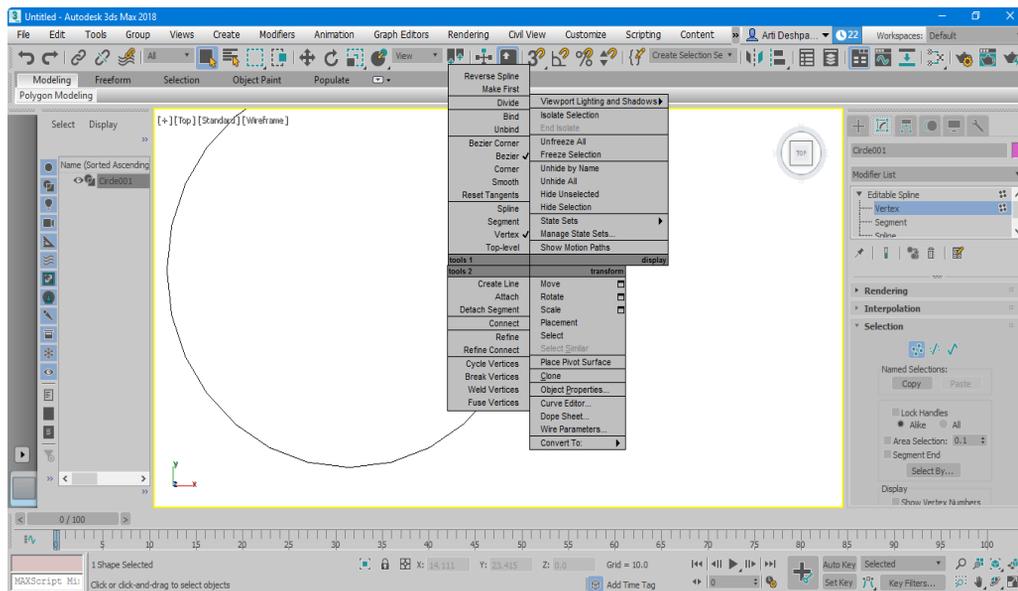


Figure 6-10 Various types of vertices in a quad menu

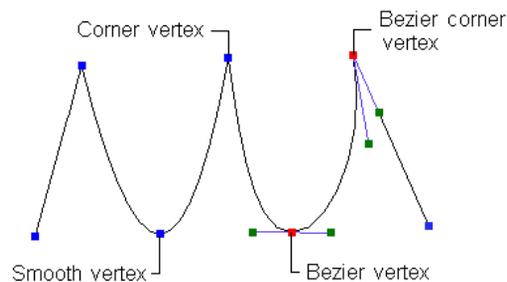


Figure 6-11 Various types of vertices in a line spline

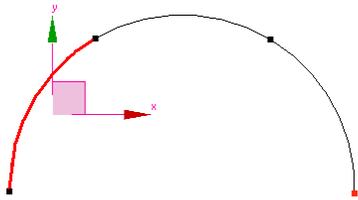


Figure 6-12 The curved segment selected in an arc spline

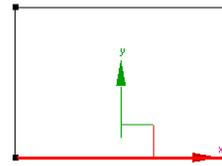


Figure 6-13 The line segment selected in a rectangular spline

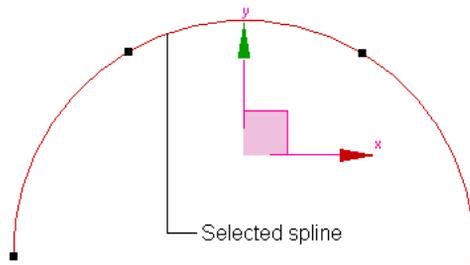


Figure 6-14 The spline selected in an arc

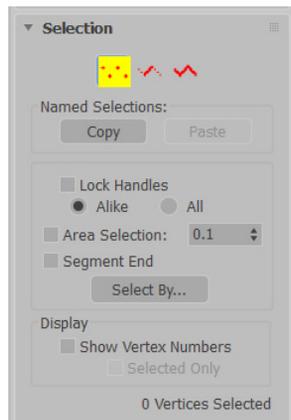


Figure 6-15 The **Selection** rollout

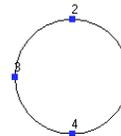


Figure 6-16 The vertex numbers displayed on selecting the **Show Vertex Numbers** check box

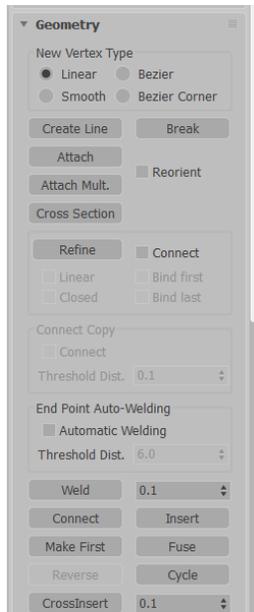


Figure 6-17 Partial view of the **Geometry** rollout

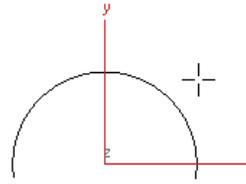


Figure 6-18 The cursor displayed in the viewport on choosing the **Create Line** button

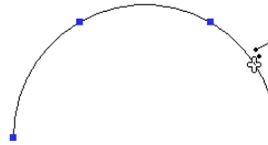


Figure 6-19 The cursor displayed after choosing the **Insert** button

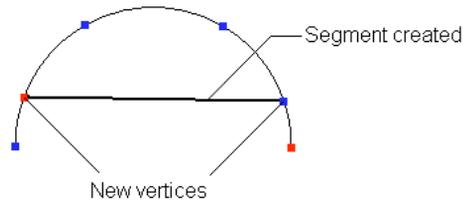


Figure 6-20 The new vertices and the segment created using the **Refine** button and the **Connect** check box

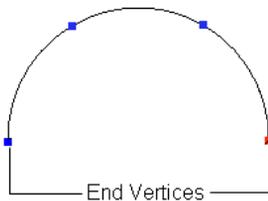


Figure 6-21 The end vertices in an arc spline

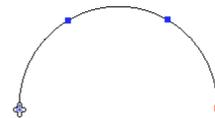


Figure 6-22 The cursor over one of the end vertices

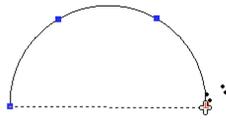


Figure 6-23 The cursor over another end vertex and the dotted line displayed

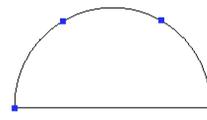


Figure 6-24 The end vertices connected with a segment

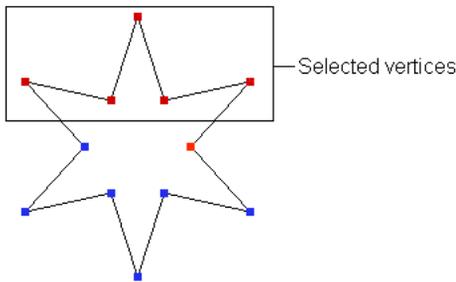


Figure 6-25 The selected vertices inside the rectangular area

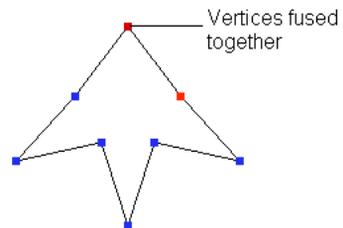


Figure 6-26 The selected vertices fused at their average center

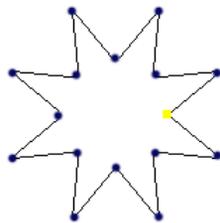


Figure 6-27 The star spline

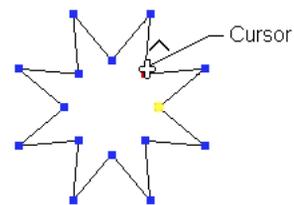


Figure 6-28 The changed shape of cursor displayed after moving the cursor over the selected vertex

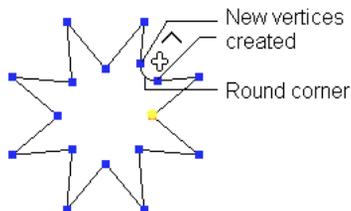


Figure 6-29 The two new vertices and the round corner displayed

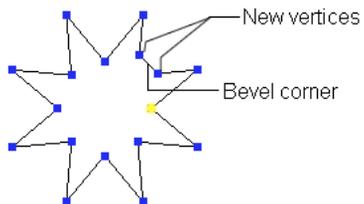


Figure 6-30 The new vertices with a beveled corner

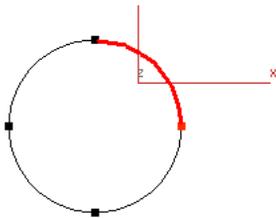


Figure 6-31 A segment selected in the circle spline

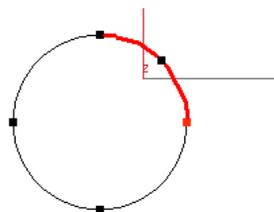


Figure 6-32 The selected segment sub-divided after using the **Divide** button

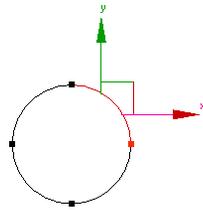


Figure 6-33 A segment sub-object selected in the circle spline

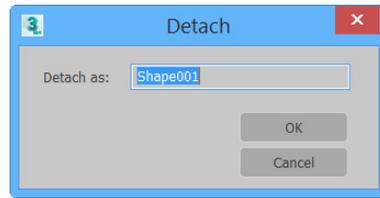


Figure 6-34 The **Detach** dialog box

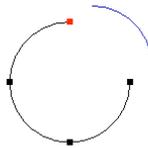


Figure 6-35 The detached segment as a new independent shape

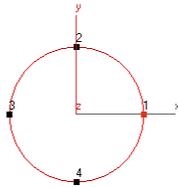


Figure 6-36 The spline selected in a circle

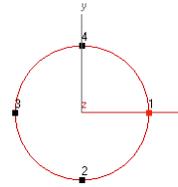


Figure 6-37 The reversed direction of the selected spline after choosing the **Reverse** button

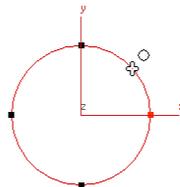


Figure 6-38 The shape of the cursor changed after choosing the **Outline** button

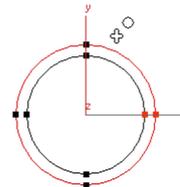


Figure 6-39 A copy of the spline created as an outline of the selected spline

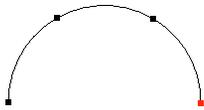


Figure 6-40 An open arc spline

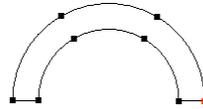


Figure 6-41 The closed spline after using the **Outline** button on the open spline

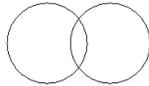


Figure 6-42 The two attached splines overlapping each other

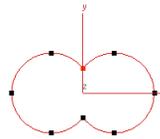


Figure 6-43 The union boolean final output

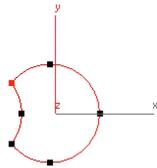


Figure 6-44 The subtraction boolean final output

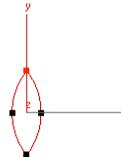


Figure 6-45 The intersection boolean final output

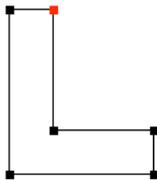


Figure 6-46 The angle extended spline created to mirror

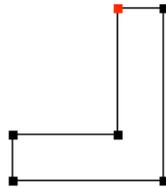


Figure 6-47 The spline mirrored horizontally

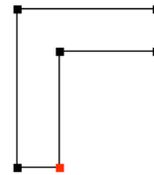


Figure 6-48 The spline mirrored vertically

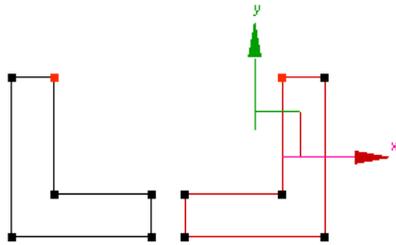


Figure 6-49 The spline mirrored horizontally after selecting the **Copy** check box

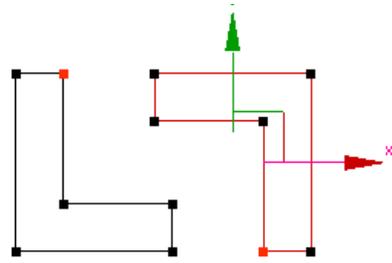


Figure 6-50 The spline mirrored on both the sides after selecting the **Copy** check box

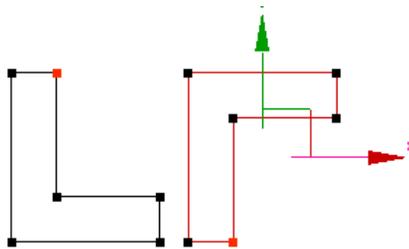


Figure 6-51 The spline mirrored vertically after selecting the **Copy** check box

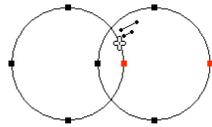


Figure 6-52 The two attached splines and the cursor over the overlapping segments

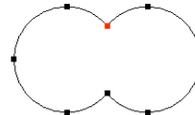


Figure 6-53 The splines after using the **Trim** button

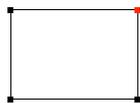


Figure 6-54 The rectangular spline for explosion

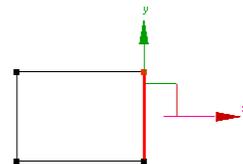


Figure 6-55 One of the broken splines selected after using the **Explode** button

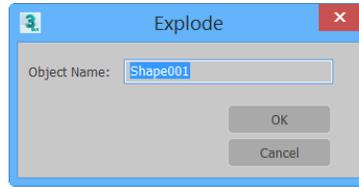


Figure 6-56 The Explode dialog box



Figure 6-57 The model of a street lamp

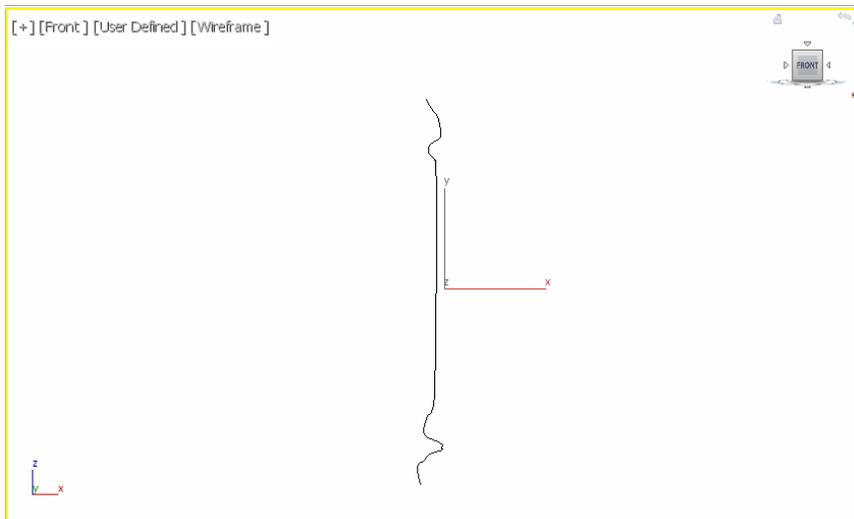


Figure 6-58 The line spline created for glass

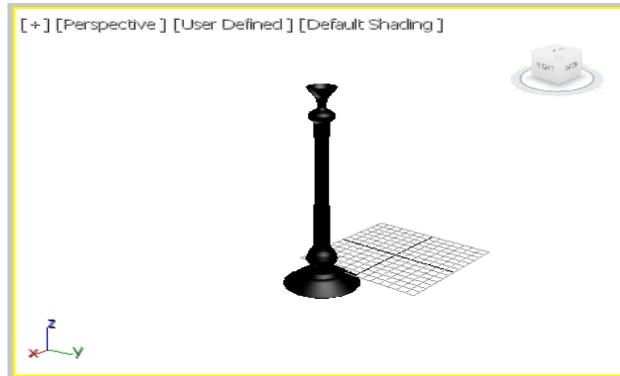


Figure 6-59 The pole displayed in the Perspective viewport

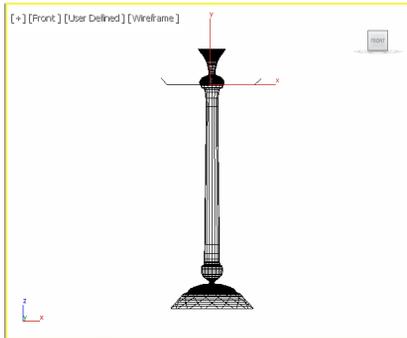


Figure 6-60 The line created

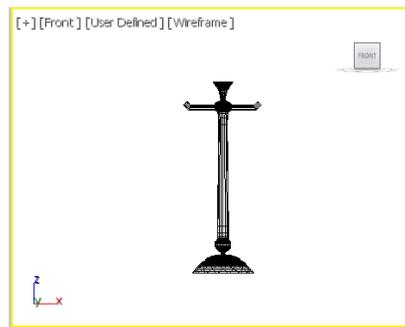


Figure 6-61 The line modified

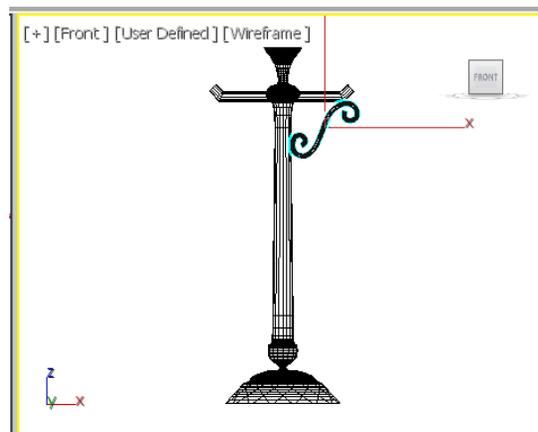


Figure 6-62 The design01 in the Front viewport

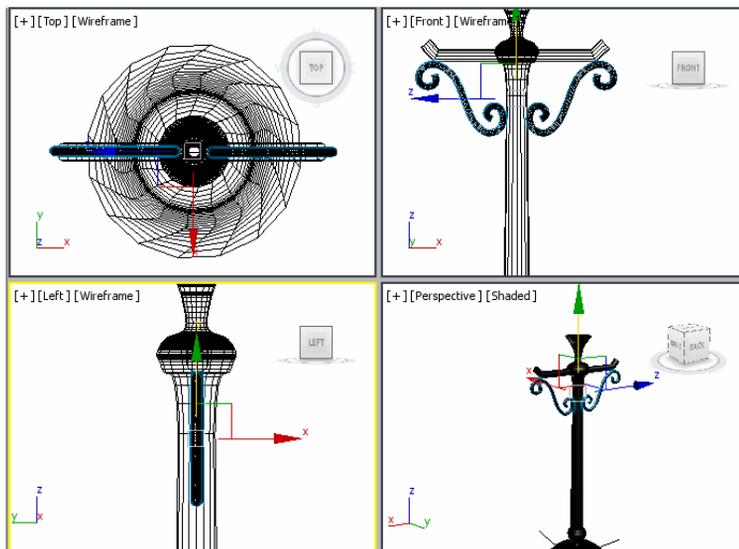


Figure 6-63 The design01 and design02 aligned

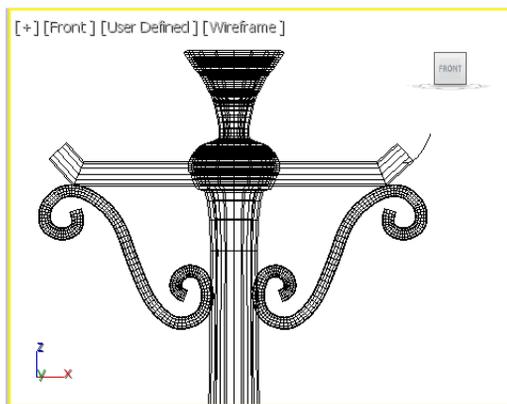


Figure 6-64 New line created

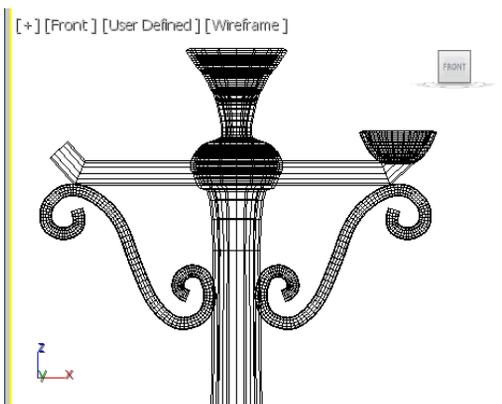


Figure 6-65 The base01 in the Front viewport

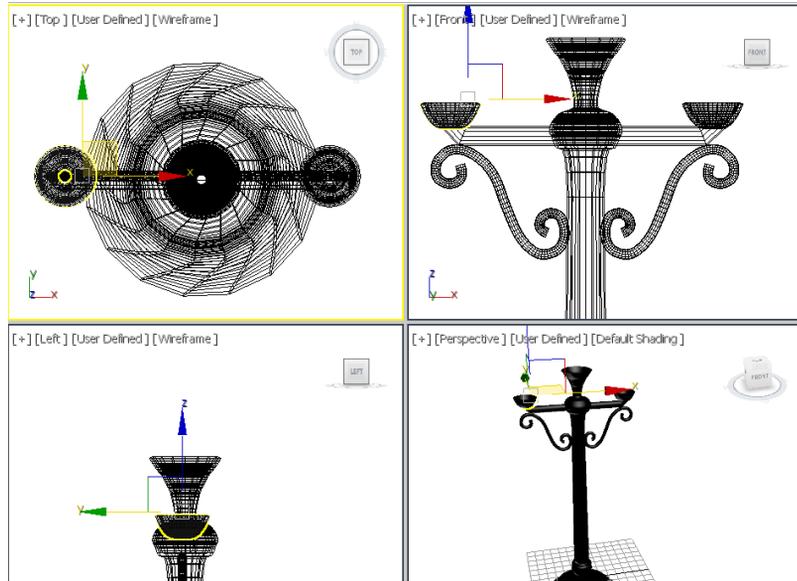


Figure 6-66 The base02 aligned in the viewports

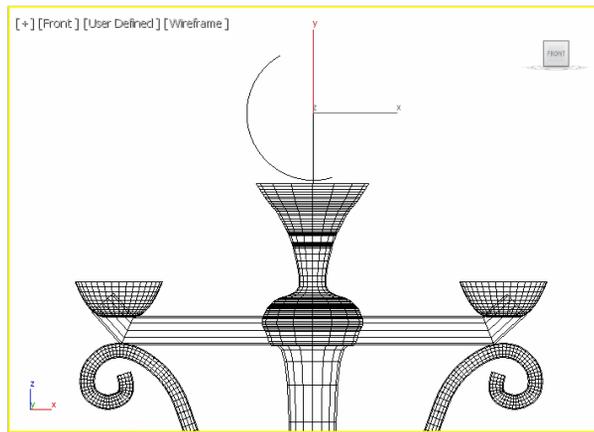


Figure 6-67 An arc created

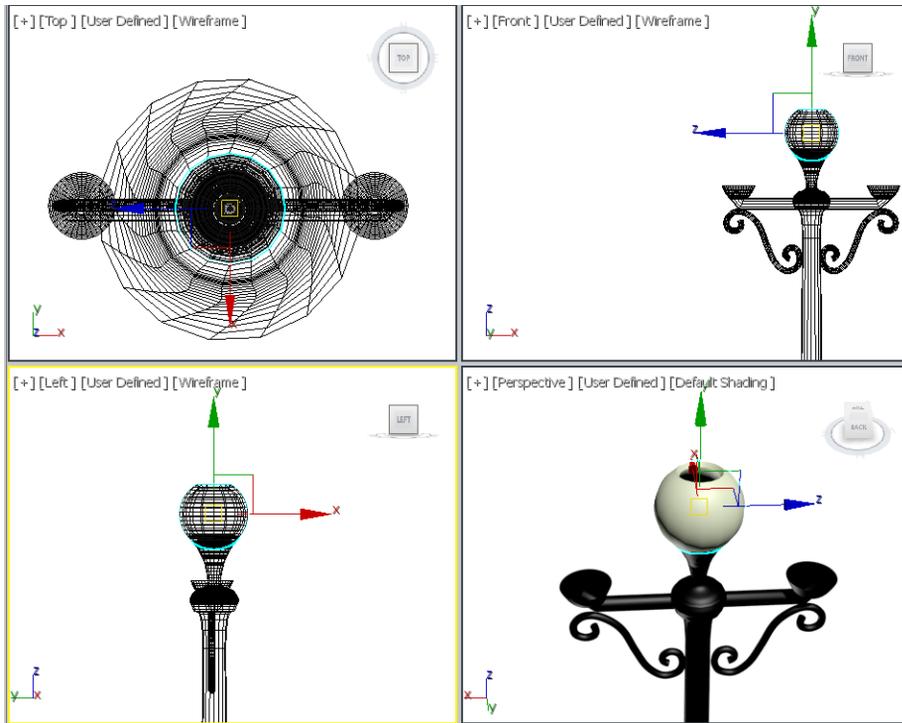


Figure 6-68 The dome01 aligned in the viewports

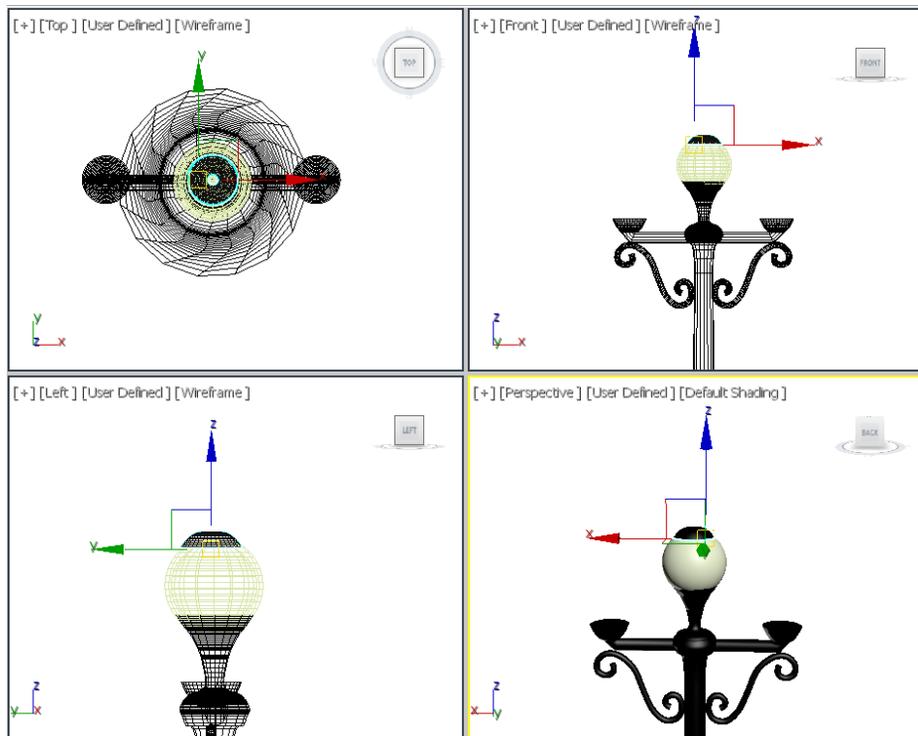


Figure 6-69 The top01 aligned in the viewports

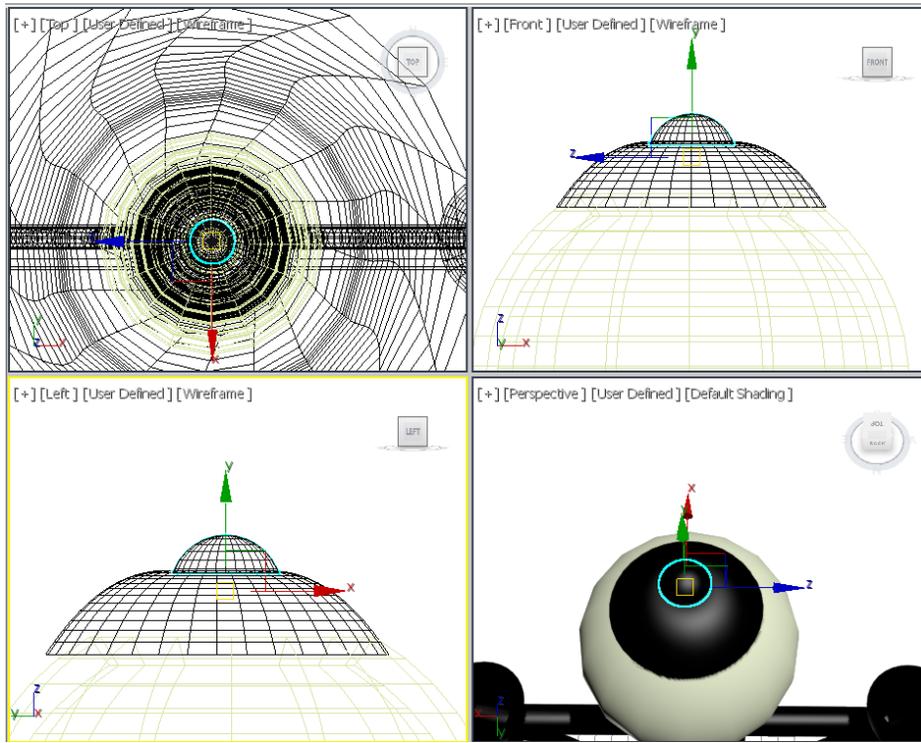


Figure 6-70 The top02 aligned in the viewports

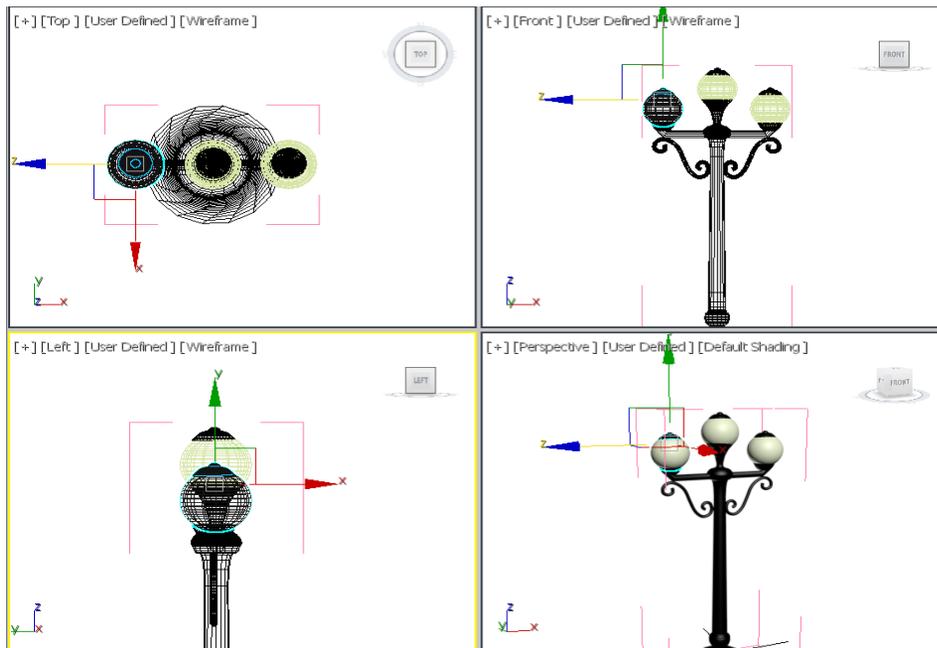


Figure 6-71 The lamp02 and lamp03 aligned in the viewports



Figure 6-72 Final output of the street lamp after rendering



Figure 6-73 The model of a vase with flower plant

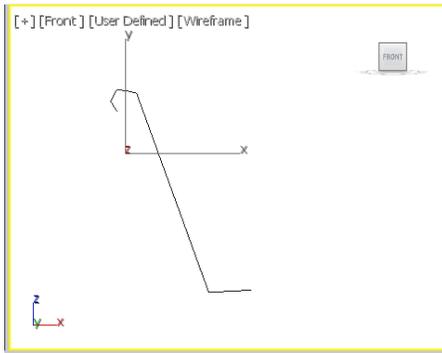


Figure 6-74 A line spline created for the vase

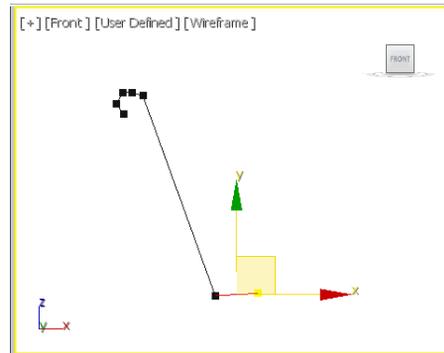


Figure 6-75 The first vertex of the line spline selected in the Front viewport

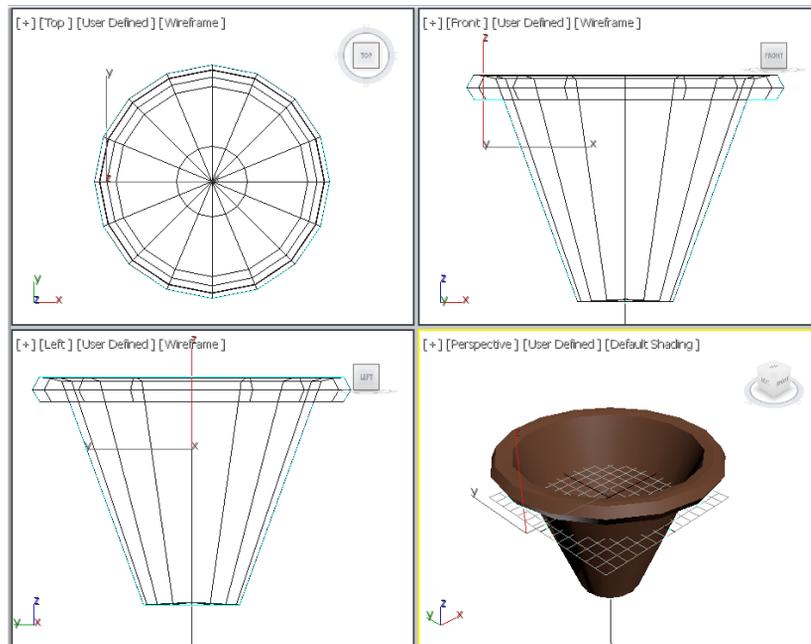


Figure 6-76 The vase geometry after applying the **Lathe** modifier

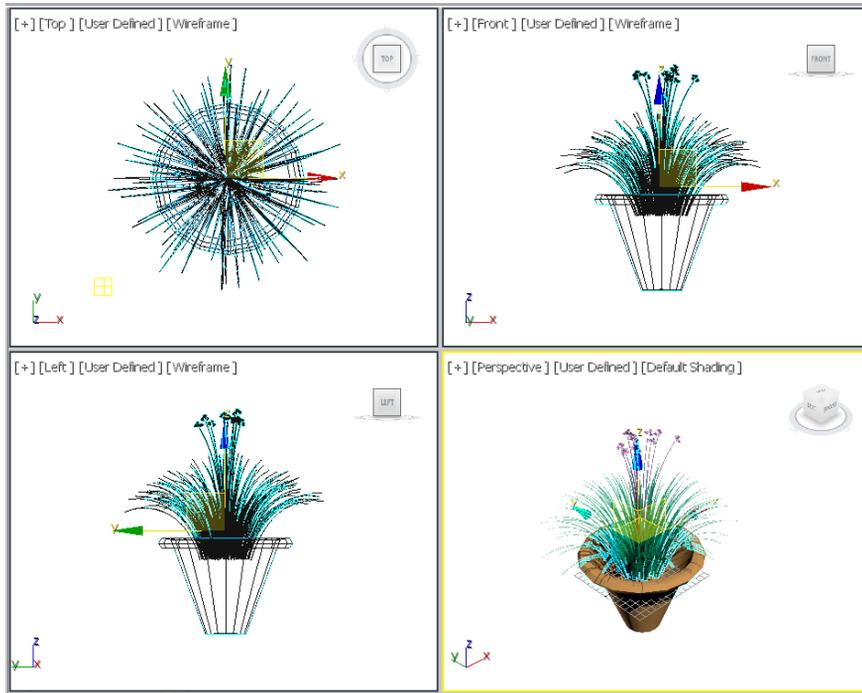


Figure 6-77 Alignment of plant with vase in viewports

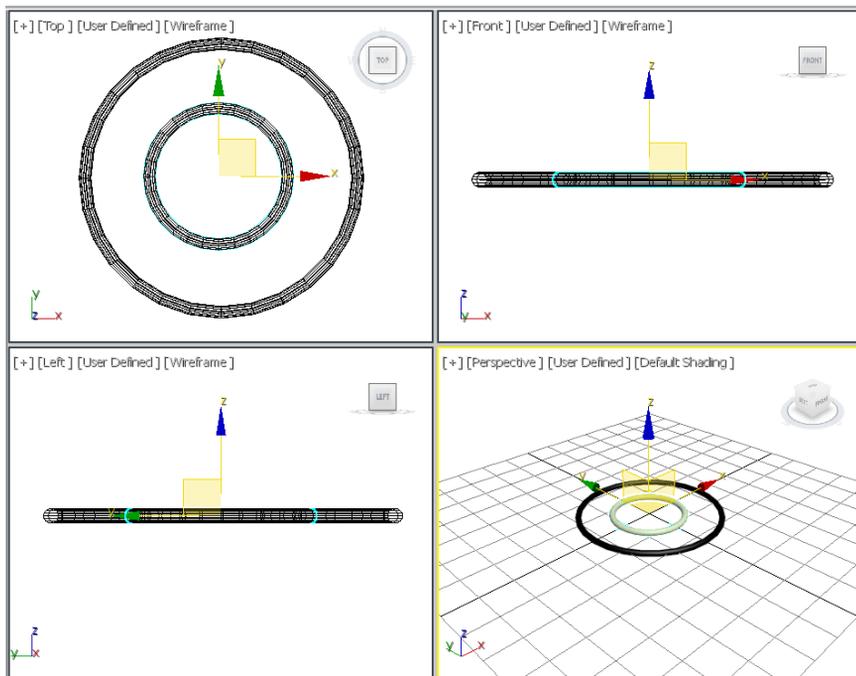


Figure 6-78 Alignment of the circles in viewports

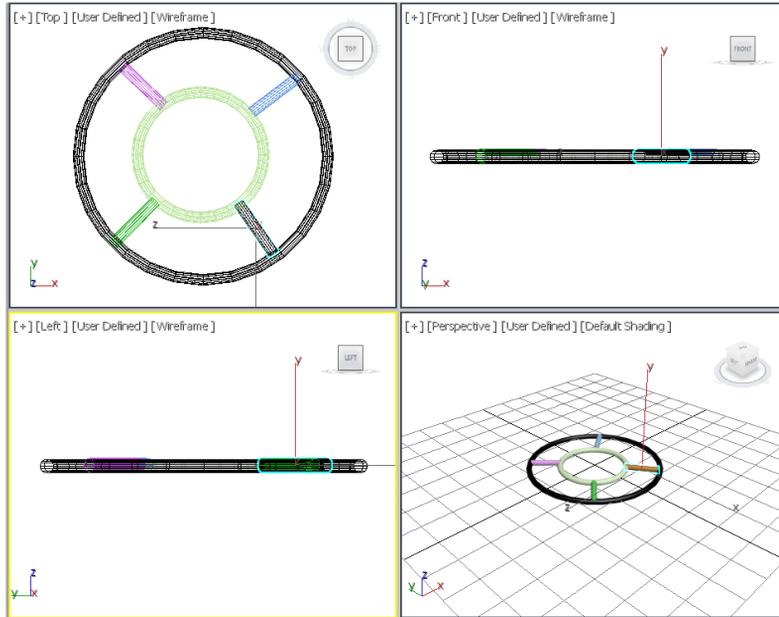


Figure 6-79 The line splines created to join both the circles

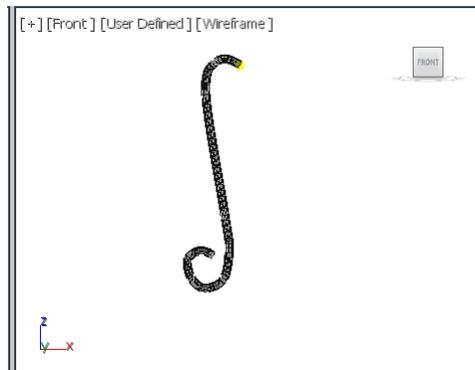


Figure 6-80 The line spline for the leg of stand

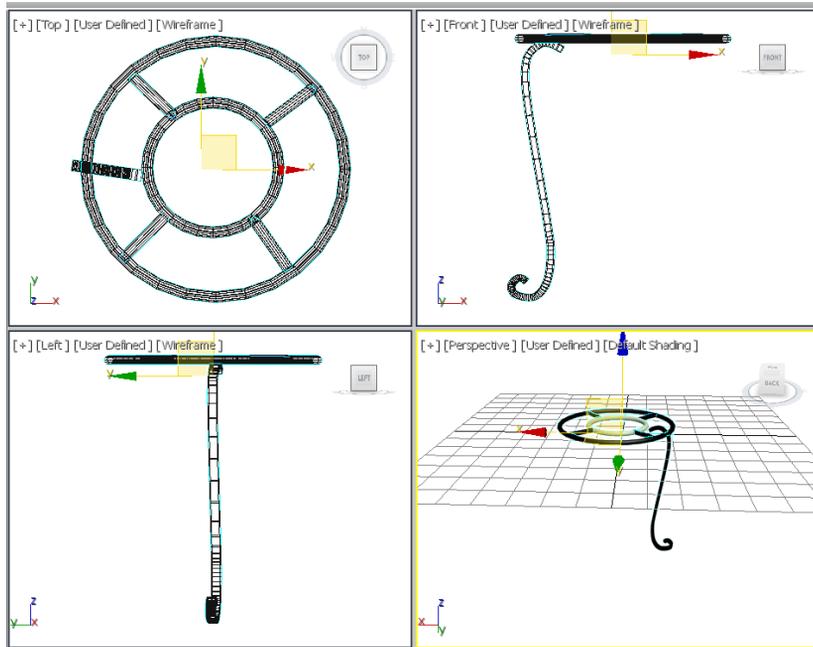


Figure 6-81 Alignment of upper portion and leg01 in viewports

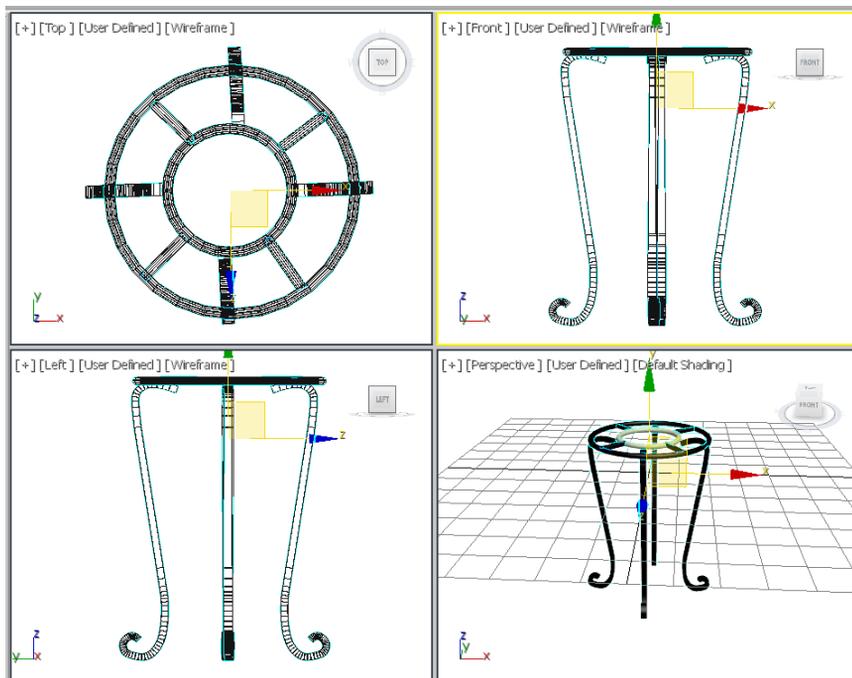


Figure 6-82 Alignment of leg01, leg002, leg003, and leg004 in viewports

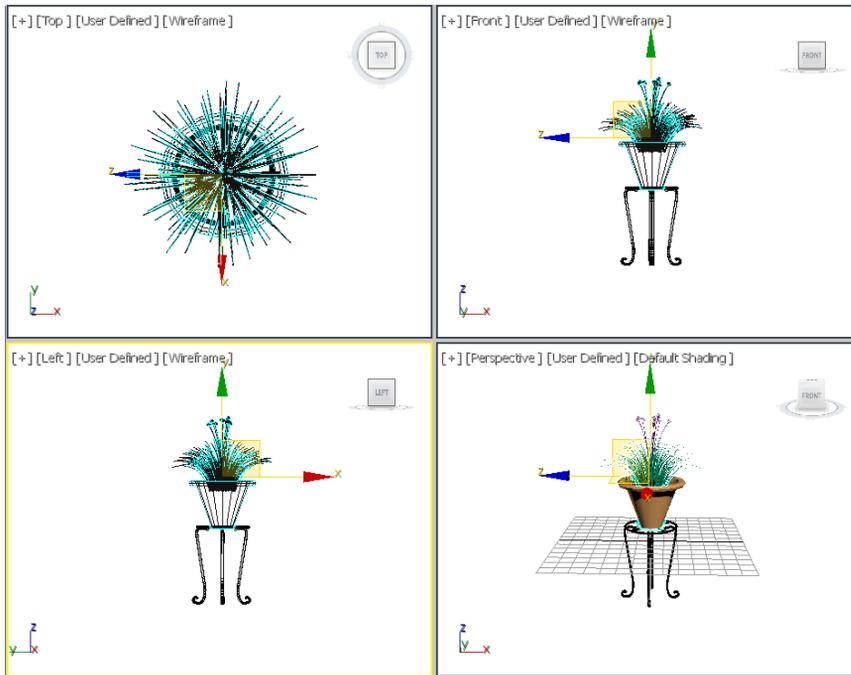


Figure 6-83 Alignment of flower vase and vase stand in viewports



Figure 6-84 The pair of cocktail glasses



Figure 6-85 Set of vases



Figure 6-86 A candle stand

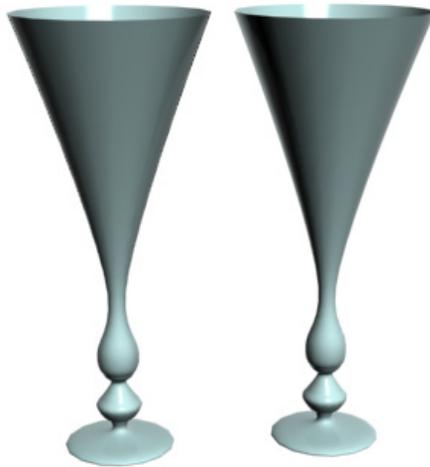


Figure 6-87 The pair of glasses



Figure 6-88 The pair of glasses

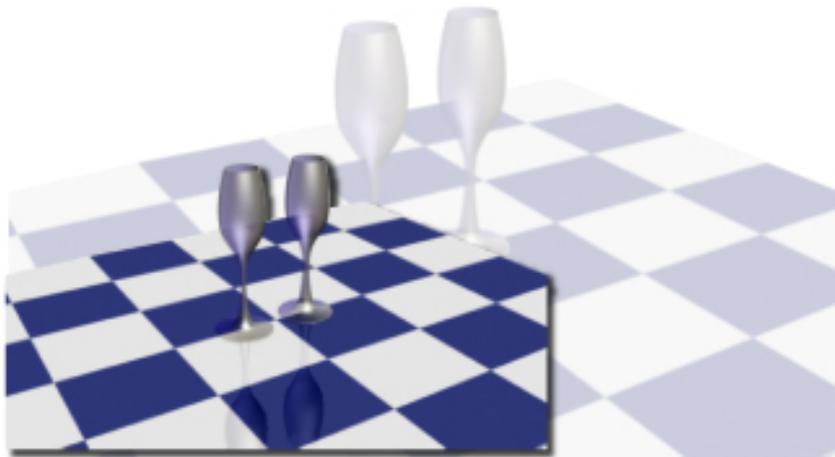
7

Materials and Maps

Learning Objectives

After completing this chapter, you will be able to:

- *Use the Material Editor dialog box*
- *Understand the types of materials and maps*
- *Create materials and maps*
- *Assign materials to objects*



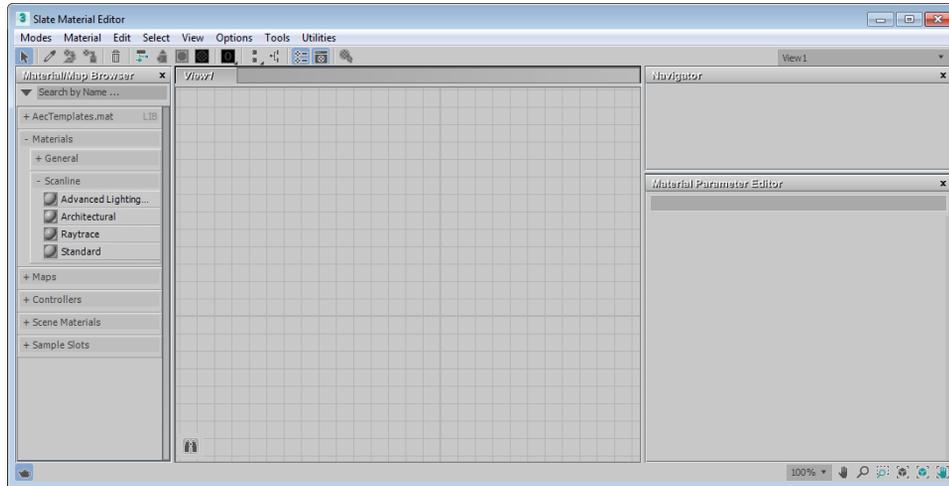


Figure 7-1 The Slate Material Editor dialog box

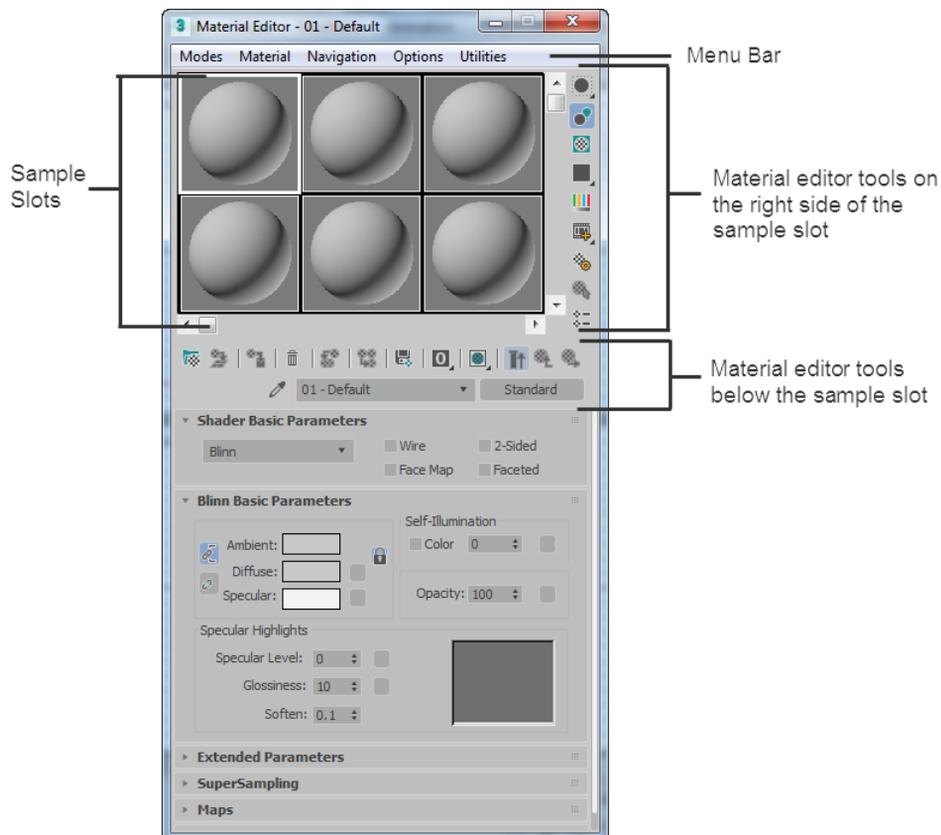


Figure 7-2 The Material Editor dialog box

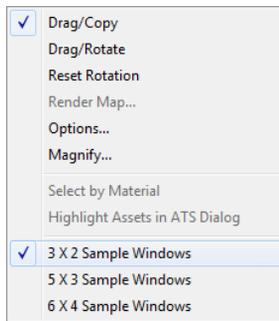


Figure 7-3 The shortcut menu displayed

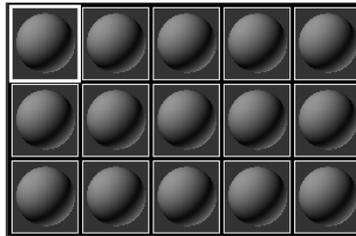


Figure 7-4 The sample slots after choosing the 5x3 Sample Windows option

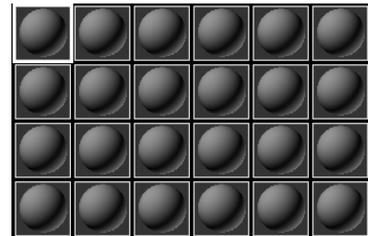


Figure 7-5 The sample slots after choosing the 6x4 Sample Windows option

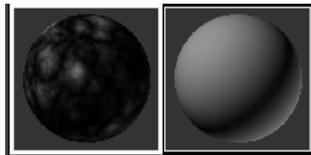


Figure 7-6 Two sample slots in the Material Editor dialog box

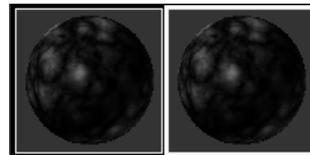


Figure 7-7 The map/material of one sample slot copied to the other

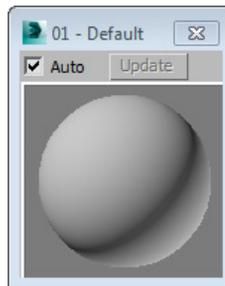


Figure 7-8 The sample slot displayed in a separate window

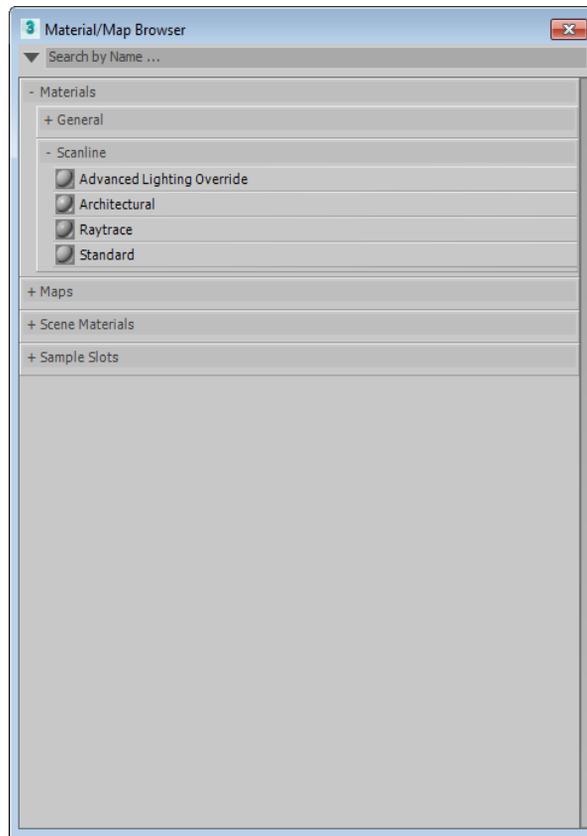


Figure 7-9 Partial view of the rollouts in the **Material/Map Browser** dialog box

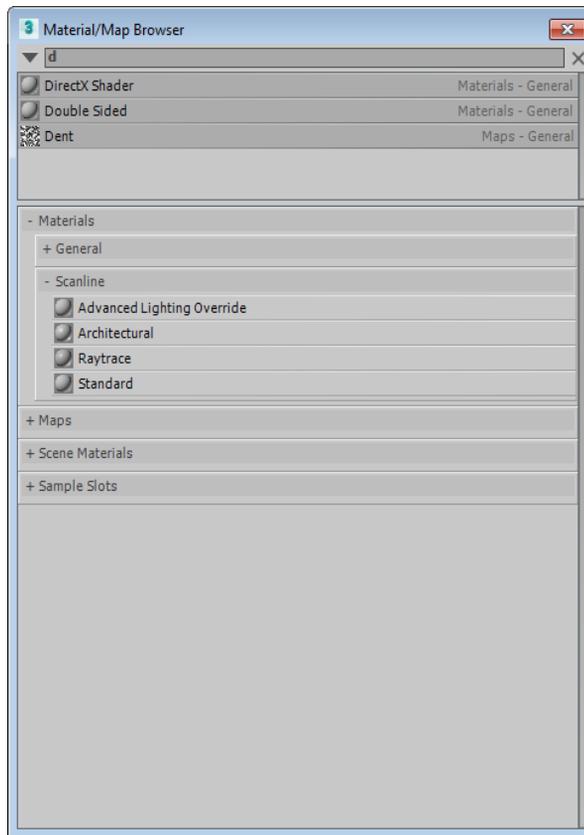


Figure 7-10 The drop-down list displayed after entering the alphabet *d* in the text box

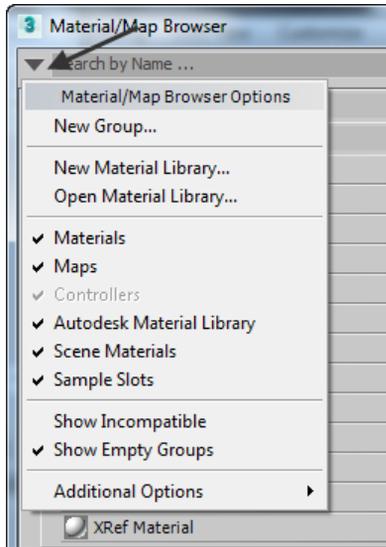


Figure 7-11 The flyout displayed after choosing the **Material/Map Browser Options** button

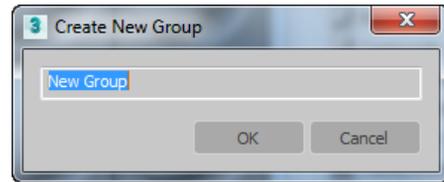


Figure 7-12 The **Create New Group** dialog box

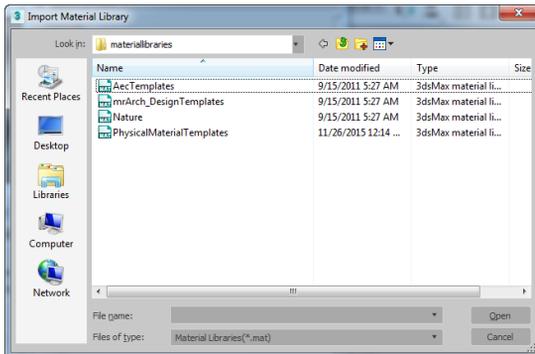


Figure 7-13 The **Import Material Library** dialog box

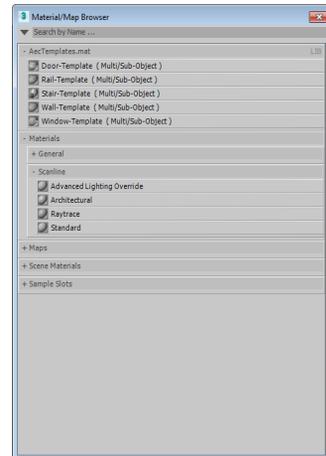


Figure 7-14 The materials of the selected library displayed in the **Material/Map Browser** dialog box

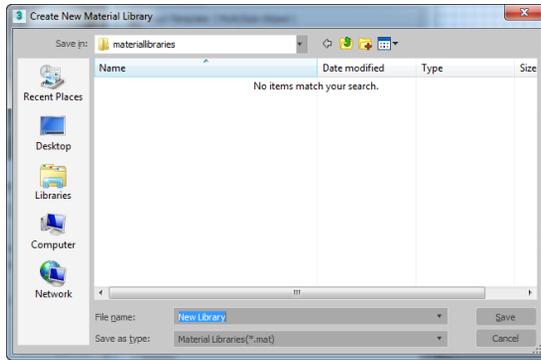


Figure 7-15 The *Create New Material Library* dialog box

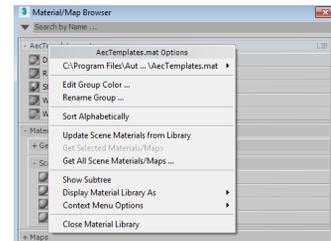


Figure 7-16 The shortcut menu displayed

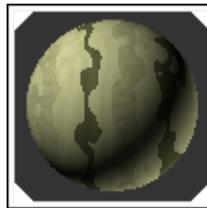


Figure 7-17 The triangles displayed on a sample slot

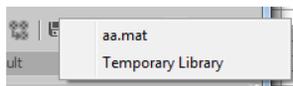


Figure 7-18a The flyout displayed

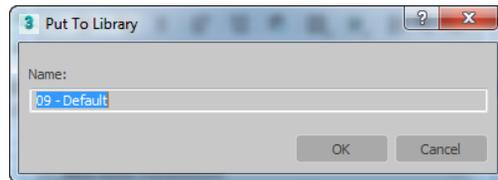


Figure 7-18b The *Put to Library* dialog box

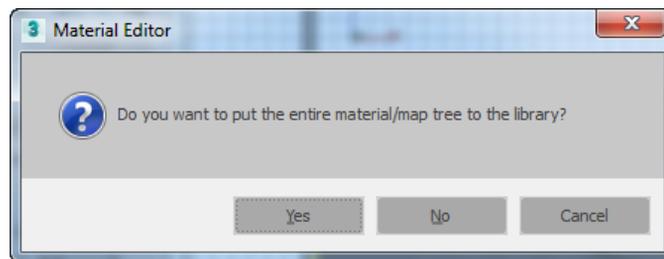


Figure 7-19 The *Material Editor* message box



Figure 7-20 The effect of the **Backlight** tool in the sample slot



Figure 7-21 The sample slot without the backlight effect

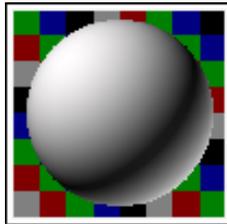


Figure 7-22 The sample slot with the **Background** tool invoked

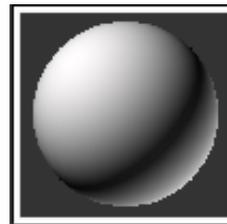


Figure 7-23 The sample slot without invoking the **Background** tool

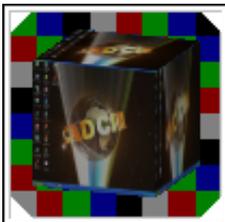


Figure 7-24 The 1x1 sample UV tiling in a cube sample slot

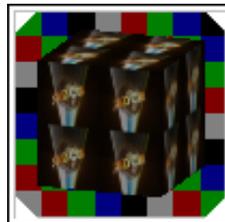


Figure 7-25 The 2x2 sample UV tiling in a cube sample slot

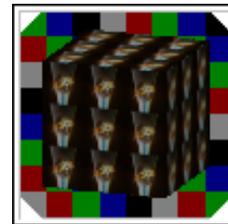


Figure 7-26 The 3x3 sample UV tiling in a cube sample slot

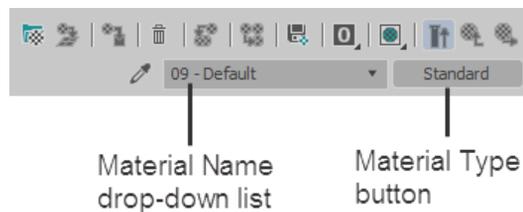


Figure 7-27 The **Material Name** drop-down list and the **Material Type** button

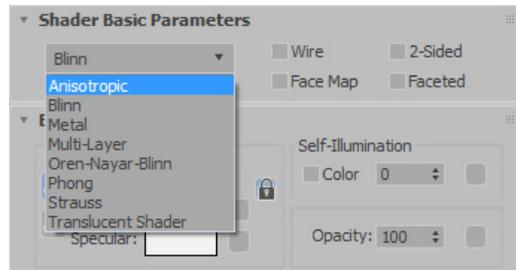


Figure 7-28 The Shader Basic Parameters rollout with eight shaders displayed in the drop-down list

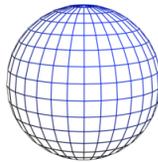


Figure 7-29 The sphere geometry with the Wire check box selected



Figure 7-30 The sphere geometry with the Face Map check box selected

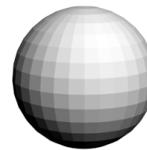


Figure 7-31 The sphere geometry with the Faceted check box selected

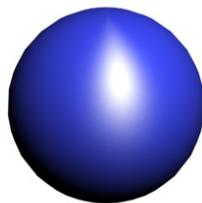


Figure 7-32 The sphere geometry with Anisotropic shader

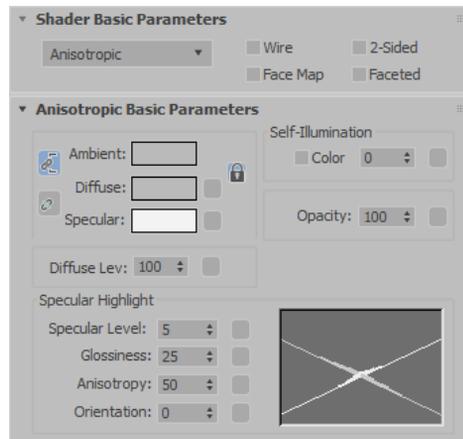


Figure 7-33 The Anisotropic Basic Parameters rollout

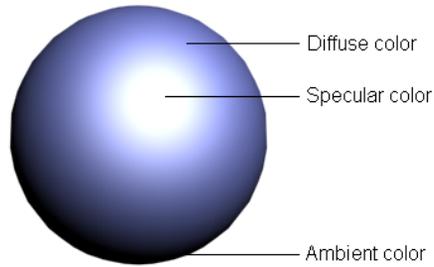


Figure 7-34 The ambient, diffuse, and specular colors in a sphere

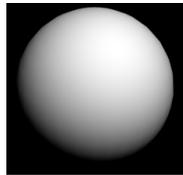


Figure 7-35 A sphere geometry without self-illumination

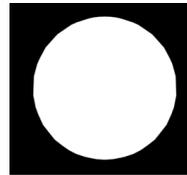


Figure 7-36 A sphere geometry with self-illumination



Figure 7-37 A teapot geometry within a transparent box



Figure 7-38 The torus knot geometry with the default value in the **Diffuse Lev** spinner



Figure 7-39 The torus knot geometry with the value 150 in the **Diffuse Lev** spinner

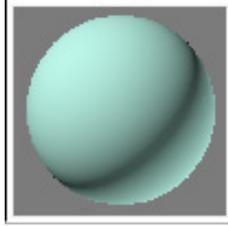


Figure 7-40 The sphere geometry with the value 0 in the **Specular Level** spinner

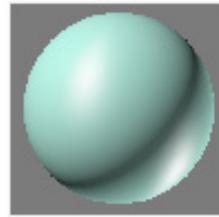


Figure 7-41 The sphere geometry with the value 66 in the **Specular Level** spinner

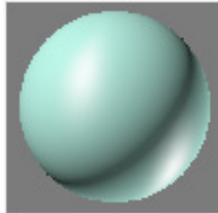


Figure 7-42 The sphere geometry with less value in the **Glossiness** spinner

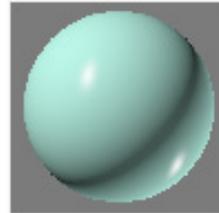


Figure 7-43 The sphere geometry with more value in the **Glossiness** spinner



Figure 7-44 The teapot geometry with less value in the **Anisotropy** spinner



Figure 7-45 The teapot geometry with more value in the **Anisotropy** spinner



Figure 7-46 The teapot geometry with the value 0 in the **Orientation** spinner



Figure 7-47 The teapot geometry with the value 45 in the **Orientation** spinner

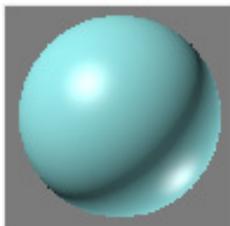


Figure 7-48 The sphere geometry with the **Blinn** shader



Figure 7-49 The teapot geometry with the **Metal** shader

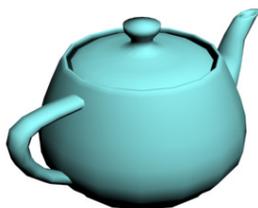


Figure 7-50 The teapot with less value in the **Roughness** spinner



Figure 7-51 The teapot with more value in the **Roughness** spinner



Figure 7-52 The teapot with the **Multi-Layer** shader



Figure 7-53 The teapot geometry with the **Oren-Nayar-Blinn** shader

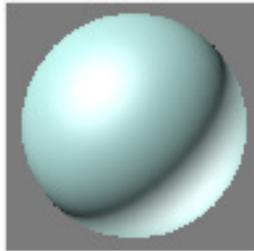


Figure 7-54 The sphere geometry with the **Phong** shader



Figure 7-55 The teapot geometry with the **Strauss** shader

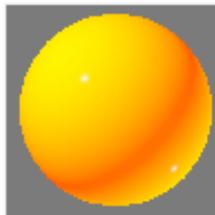


Figure 7-56 The sphere geometry with the **Translucent** shader

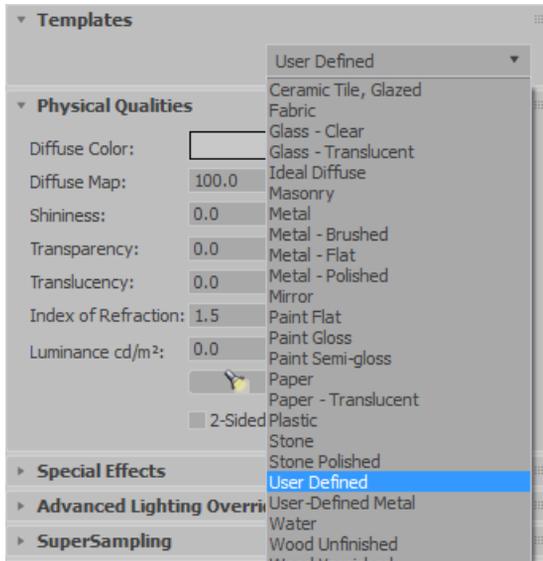


Figure 7-57 The preset materials in the drop-down list in the **Templates** rollouts



Figure 7-58 The teapot geometry with the **Masonry** preset material applied



Figure 7-59 The teapot geometry with the **Raytrace** material applied

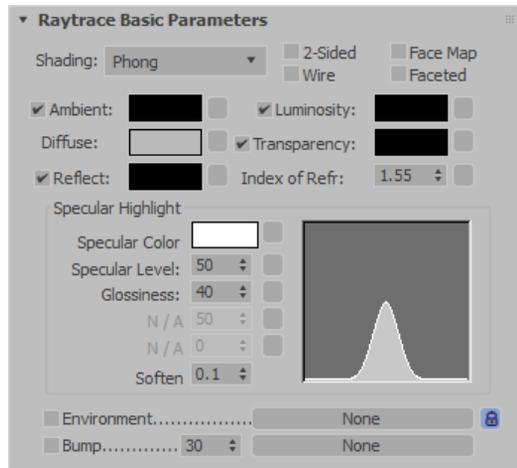
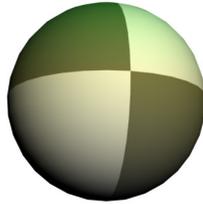
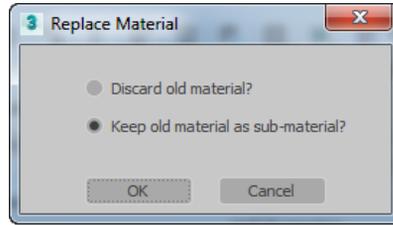


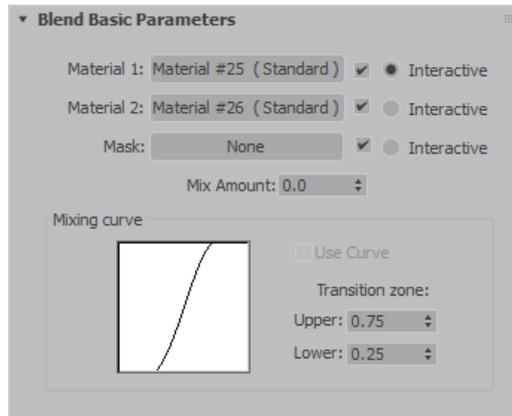
Figure 7-60 The **Raytrace Basic Parameters** rollout



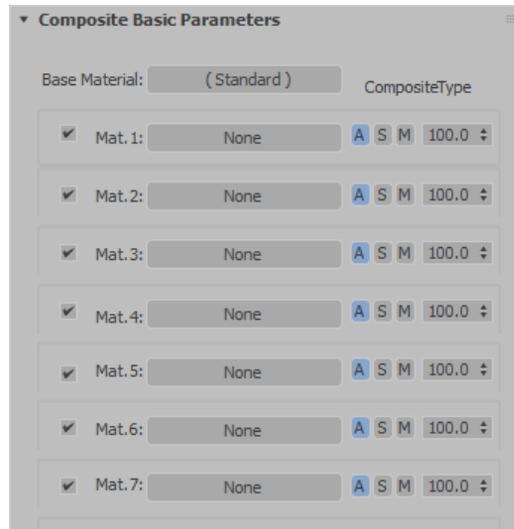
*Figure 7-61 The sphere geometry with the **Blend** material applied*



*Figure 7-62 The **Replace Material** message box*



*Figure 7-63 The **Blend Basic Parameters** rollout*



*Figure 7-64 The **Composite Basic Parameters** rollout*



Figure 7-65 The object with the **Standard** material



Figure 7-66 The object with the **Double Sided** material



Figure 7-67 The **Double Sided Basic Parameters** rollout



Figure 7-68 The object with the **Multi/Sub-Object** material

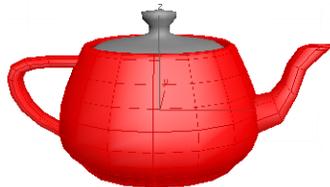


Figure 7-69 The object with group of polygons selected



Figure 7-70 The object with remaining polygons selected

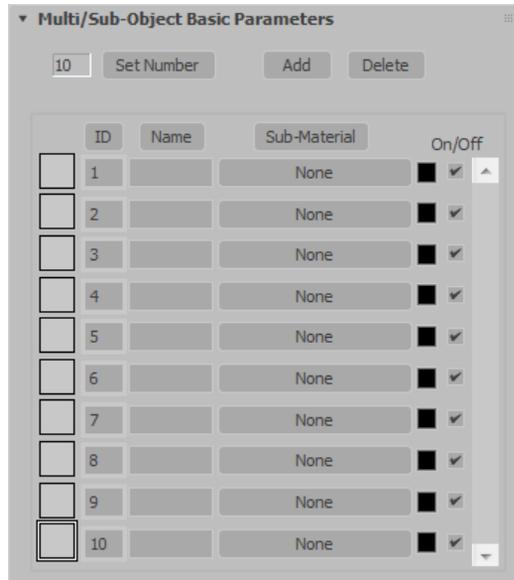


Figure 7-71 The Multi/Sub-Object Basic Parameters rollout



Figure 7-72 The object with the Top/Bottom material applied

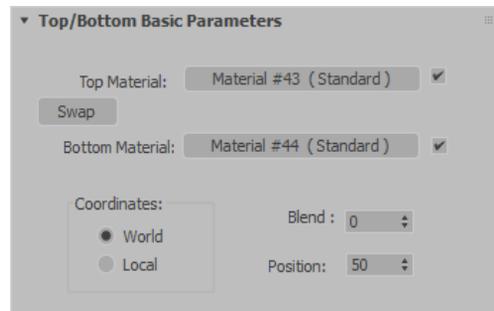


Figure 7-73 The Top/Bottom Basic Parameters rollout

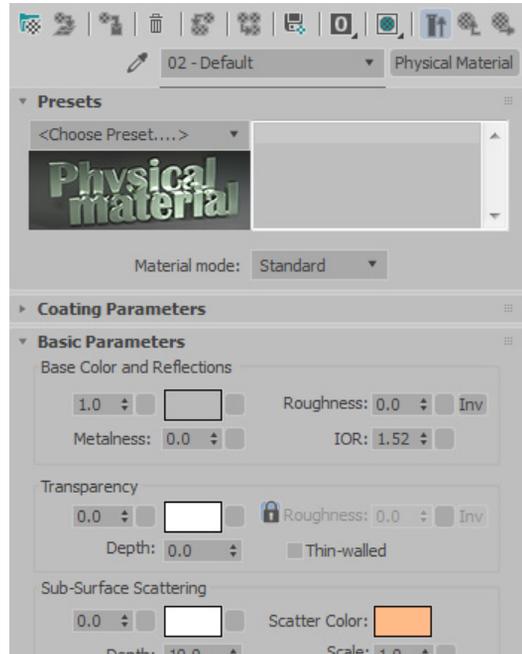


Figure 7-74 The Presets rollout

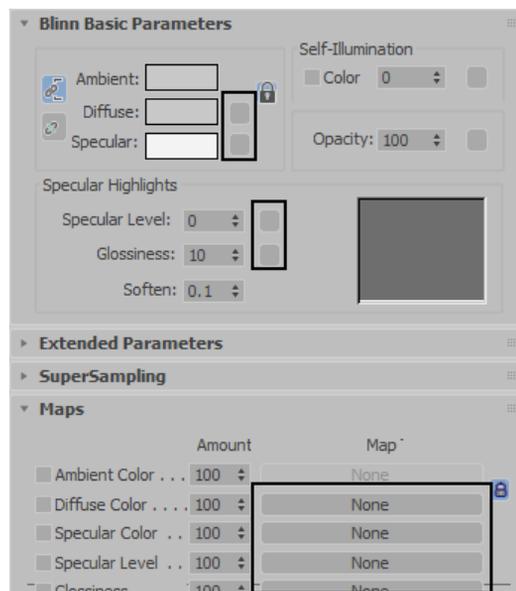


Figure 7-75 The square buttons highlighted for inserting maps



Figure 7-76 A sphere with the Bitmap map applied

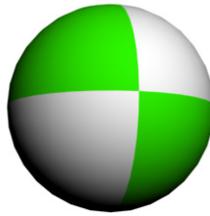


Figure 7-77 A sphere with the Checker map applied



Figure 7-78 An object with the Gradient map applied

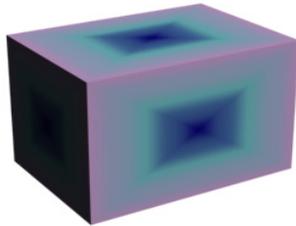


Figure 7-79 A box with the Gradient Ramp map applied

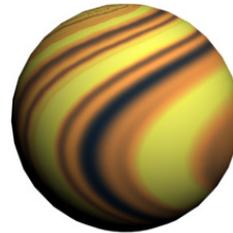


Figure 7-80 A sphere with the Swirl map applied

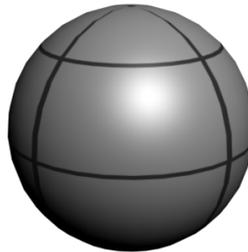


Figure 7-81 A sphere with the Tiles map applied



Figure 7-82 The Parameters rollout of the Map Output Selector map

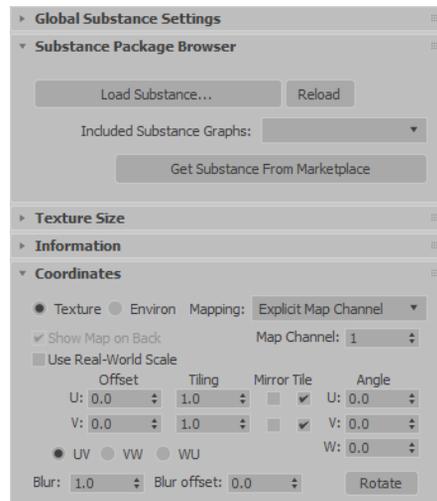


Figure 7-83 The rollouts displayed on selecting the Substance map

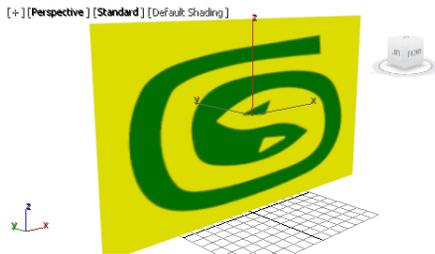


Figure 7-84 The default shape displayed in the viewport

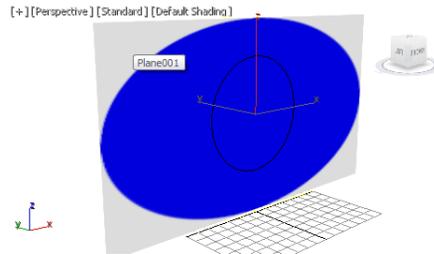


Figure 7-85 The spline texture shown in the viewport

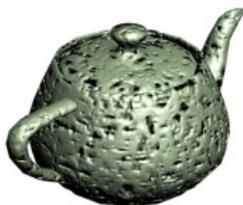


Figure 7-86 A teapot with the Dent map applied



Figure 7-87 An object with the Cellular map applied



Figure 7-88 A sphere with the Noise map applied

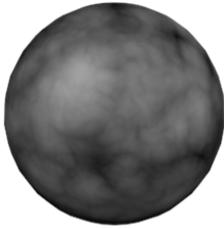


Figure 7-89 A sphere with the **Smoke** map applied

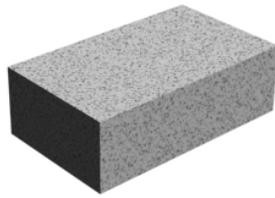


Figure 7-90 A box with the **Speckle** map applied

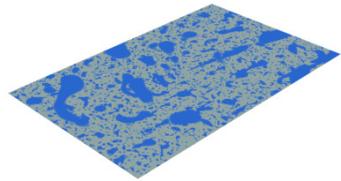


Figure 7-91 A box with the **Splat** map applied

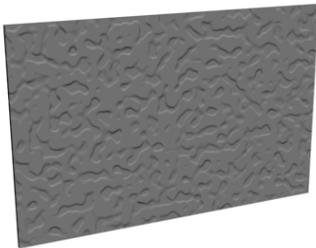


Figure 7-92 A wall with the **Stucco** map applied

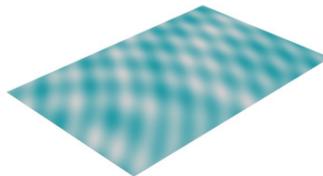


Figure 7-93 A plane with the **Waves** map applied



Figure 7-94 A box with the **Wood** map applied

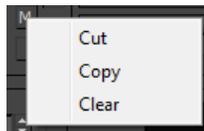


Figure 7-95 The shortcut menu displayed on right-clicking on the **M** button



Figure 7-96 The model of LCD monitor

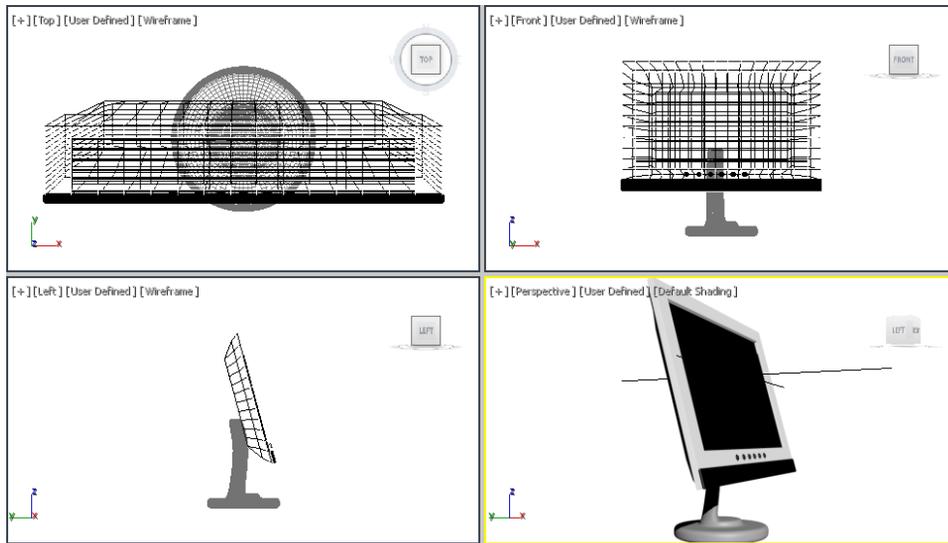


Figure 7-97 The LCD computer in viewports



Figure 7-98 The final output after rendering (view 1)



Figure 7-99 The final output after rendering (view 2)



Figure 7-100 The textured scene

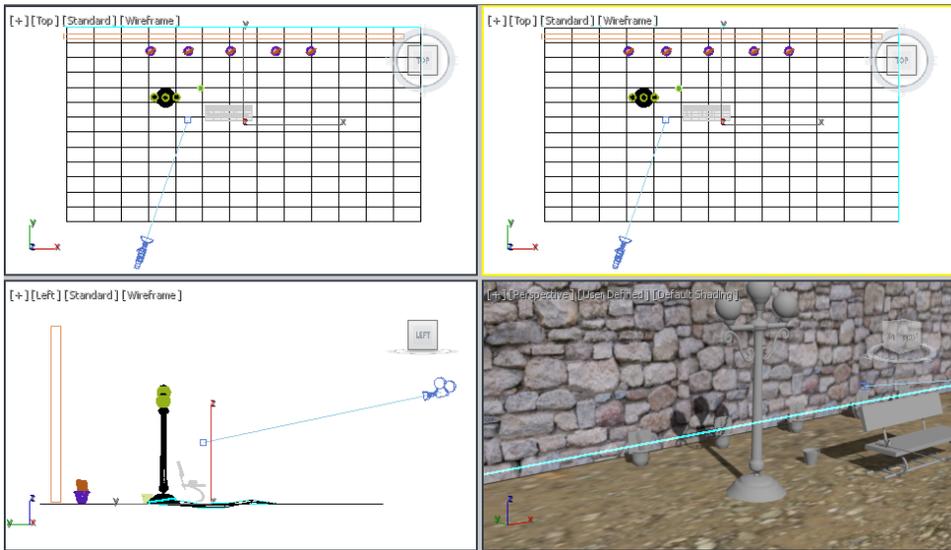


Figure 7-101 The file displayed

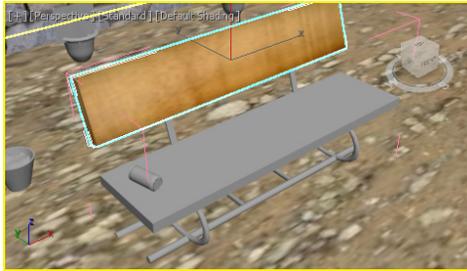


Figure 7-102 The wood material assigned to back

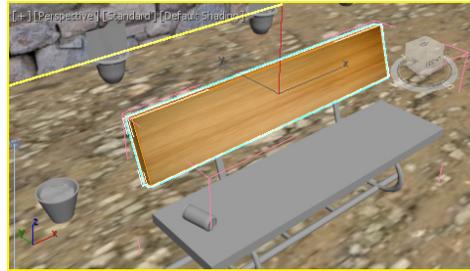


Figure 7-103 The wood material displayed after using the **UVW Map** modifier

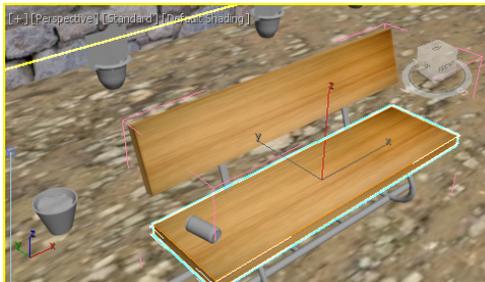


Figure 7-104 The wood material displayed after using the **UVW Map** modifier



Figure 7-105 The rendered image



Figure 7-106 The rendered image

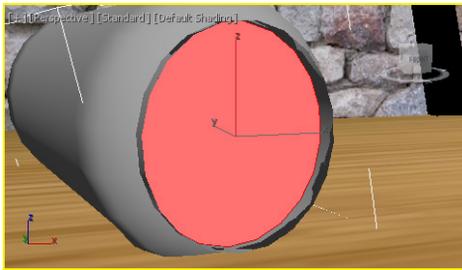


Figure 7-107 Selected polygon of can

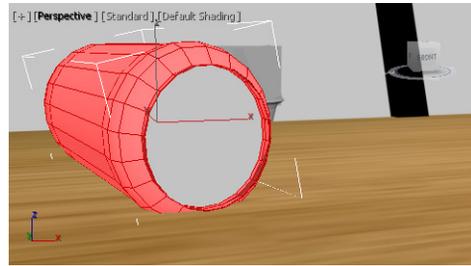


Figure 7-108 Rest of the polygons selected

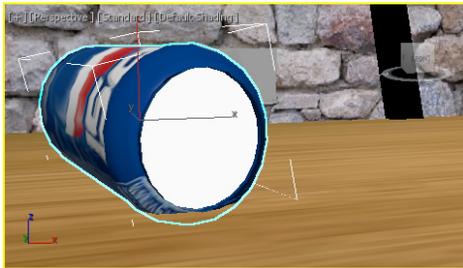


Figure 7-109 The canmat material displayed

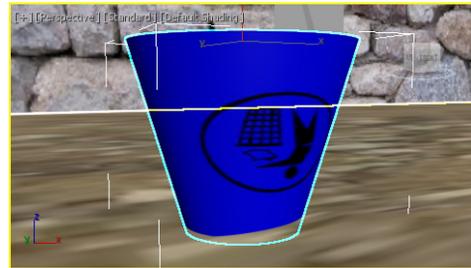


Figure 7-110 The dustbinmat material displayed



Figure 7-111 The garbagemat material applied



Figure 7-112 The plant material applied



Figure 7-113 The clay material applied to soil



Figure 7-114 The final output of the scene



Figure 7-115 The model of a flower pot



Figure 7-116 The flower pot geometry with a plant



Figure 7-117 The brass material displayed in the sample slot



Figure 7-118 The model of cups and glasses



Figure 7-119 The model of a room

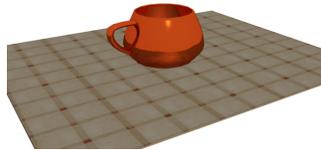


Figure 7-120 The model of a tea cup

8

Modifying 3D Mesh Objects

Learning Objectives

After completing this chapter, you will be able to:

- *Convert objects into editable mesh*
- *Use sub-object levels*
- *Convert objects into editable poly*
- *Modify editable mesh and editable poly objects*



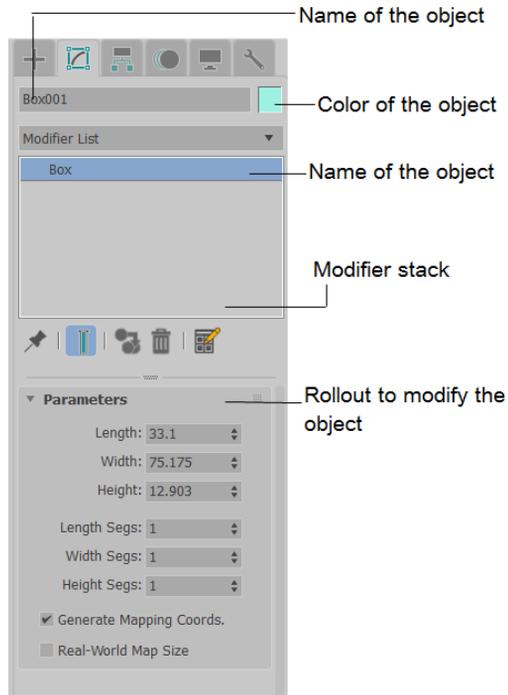
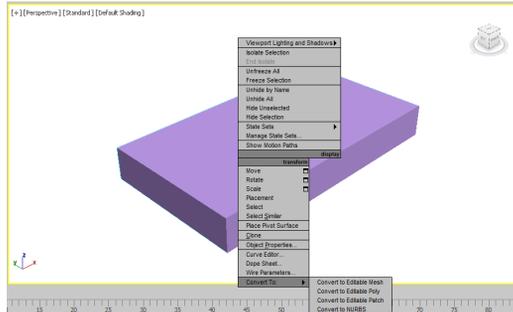


Figure 8-1 The Modify panel



*Figure 8-2 The cascading menu displayed on choosing the **Convert To** option*

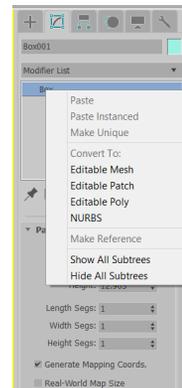


Figure 8-3 The shortcut menu displayed

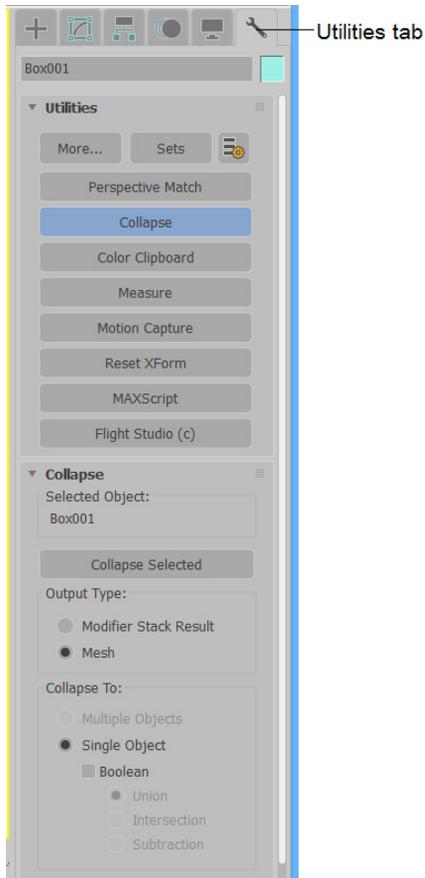


Figure 8-4 The Utilities rollout displayed after choosing the Utilities tab

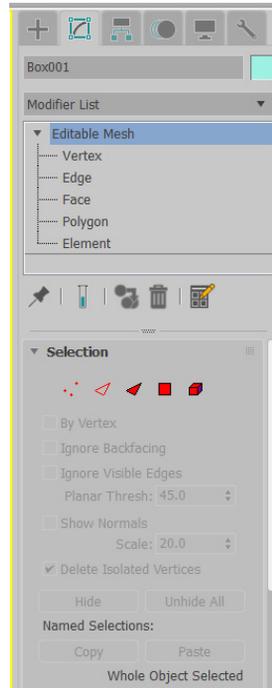


Figure 8-5 The sub-object levels of an object displayed

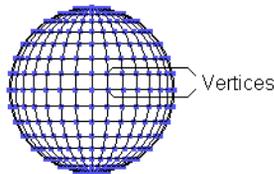


Figure 8-6 Displaying the vertices of the sphere

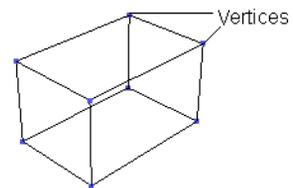


Figure 8-7 Displaying the vertices of the box

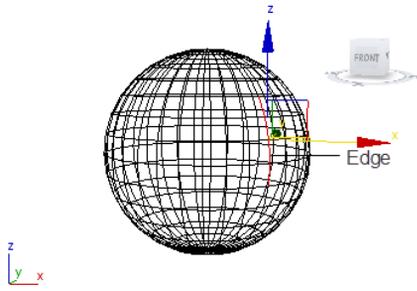


Figure 8-8 Selecting the edges of the sphere

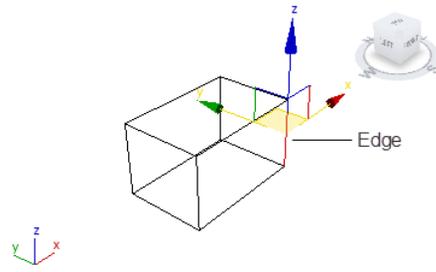


Figure 8-9 Selecting the edge of the box

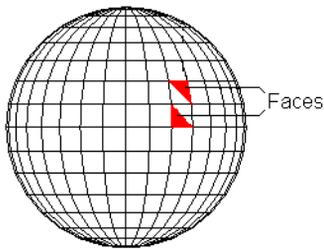


Figure 8-10 The Face sub-object level

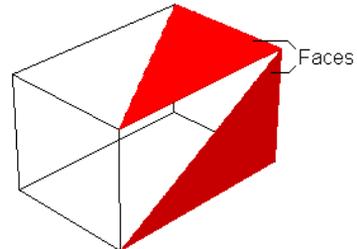


Figure 8-11 A box with the faces selected

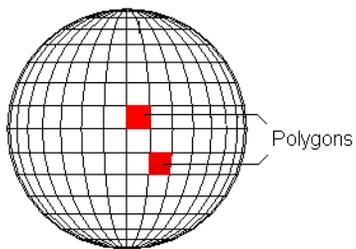


Figure 8-12 The Polygon sub-object level

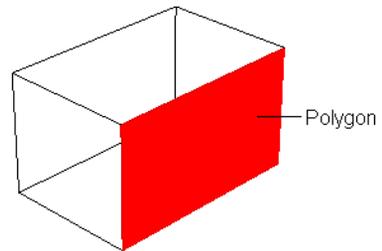


Figure 8-13 The polygon of a box selected

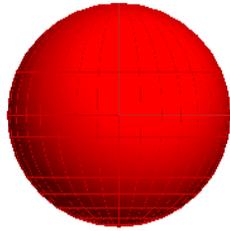


Figure 8-14 The Element sub-object level

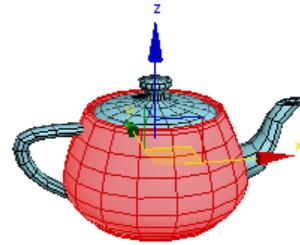


Figure 8-15 The element of the box selected

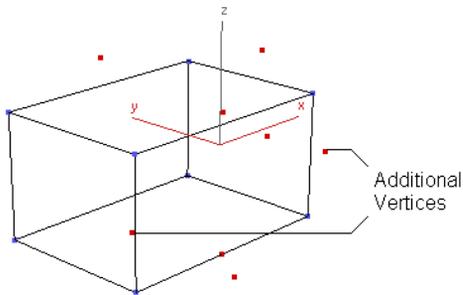


Figure 8-17 Additional vertices created in a box using the **Create** button

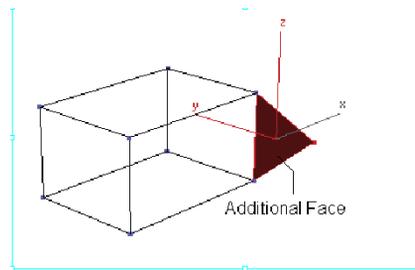


Figure 8-18 A new face added to a box using the **Create** button

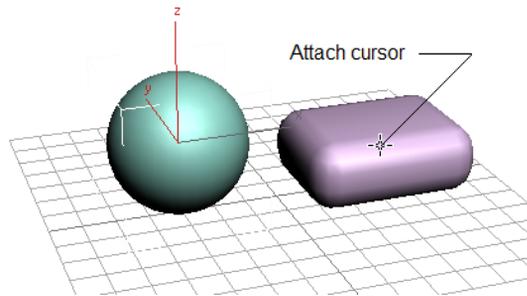


Figure 8-19 The attach cursor after choosing the **Attach** button

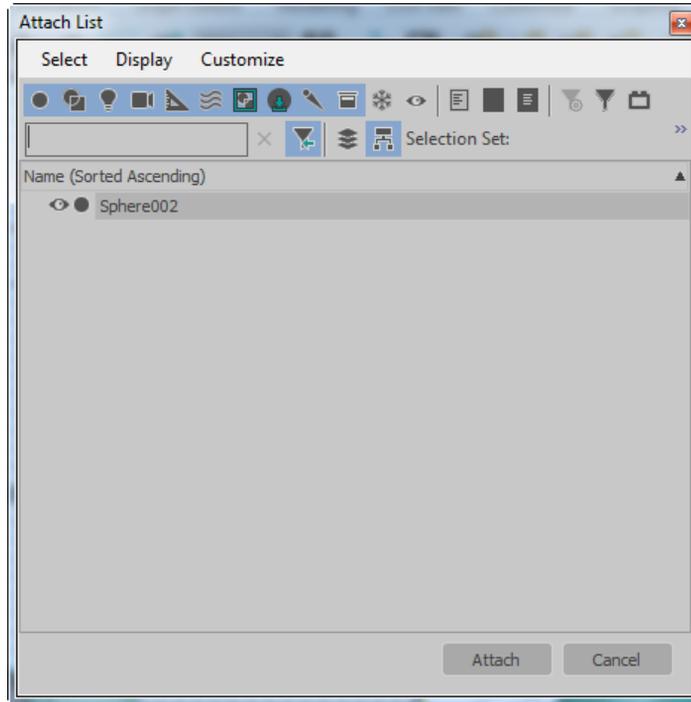


Figure 8-20 The Attach List dialog box

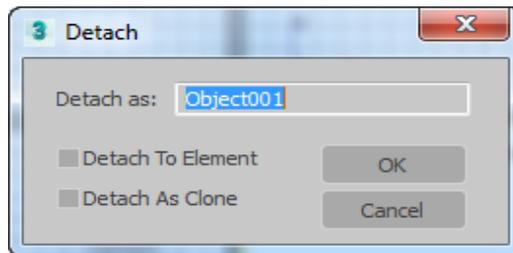


Figure 8-21 The Detach dialog box

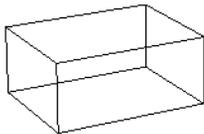


Figure 8-22 The box before choosing the Turn button

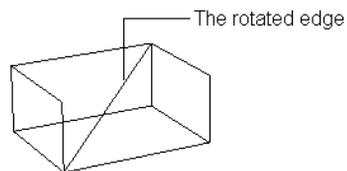


Figure 8-23 The rotated edge of the box after choosing the Turn button

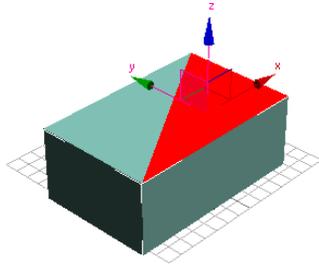


Figure 8-24 The face before choosing the **Divide** button

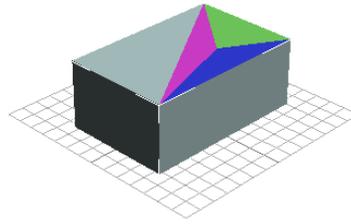


Figure 8-25 The face divided after using the **Divide** button

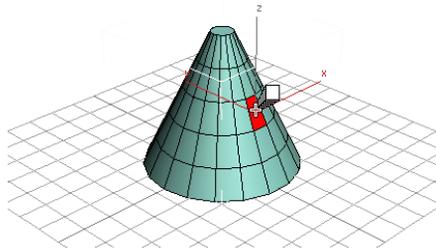


Figure 8-26 The extrude cursor displayed over the selected polygon

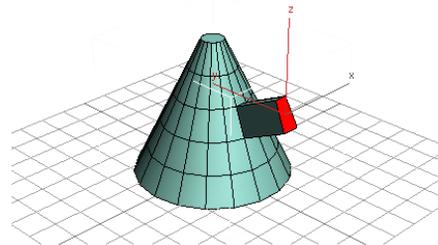


Figure 8-27 The selected polygon sub-object after extrusion

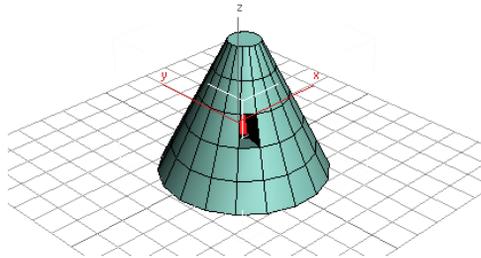


Figure 8-28 The selected polygon after negative extrusion

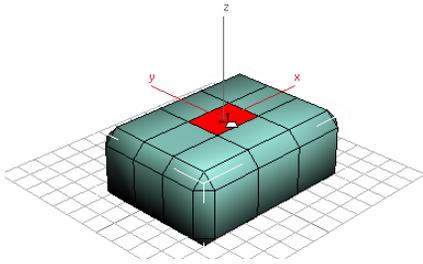


Figure 8-29 The bevel cursor displayed over the selected polygon

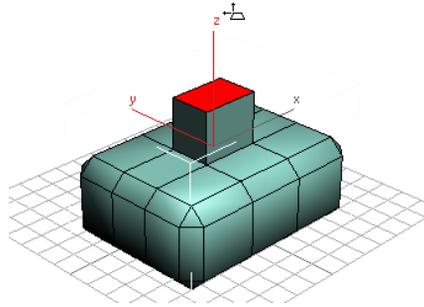


Figure 8-30 The polygon extruded

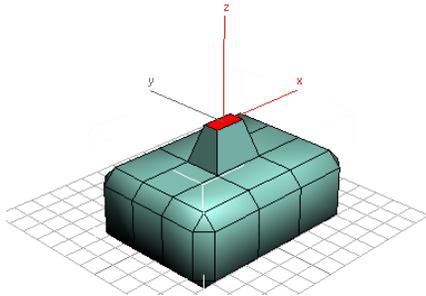


Figure 8-31 The size of the extruded polygon reduced using the **Bevel** button

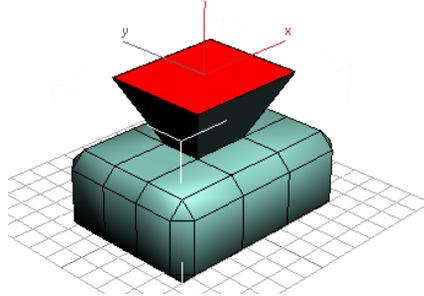


Figure 8-32 The size of the extruded polygon increased using the **Bevel** button

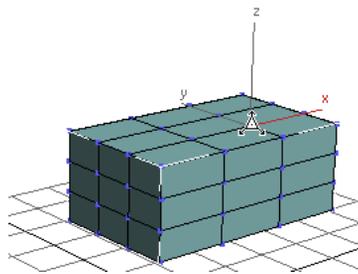


Figure 8-33 The chamfer cursor displayed over the selected vertex

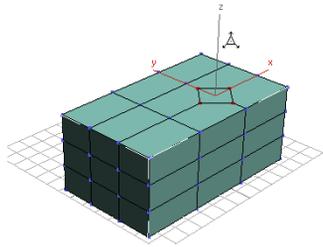


Figure 8-34 The vertex sub-object chamfered using the **Chamfer** button

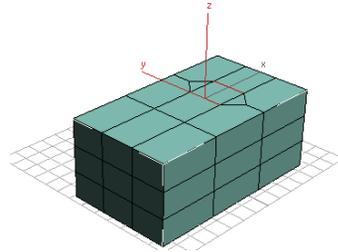


Figure 8-35 The edge sub-object chamfered using the **Chamfer** button

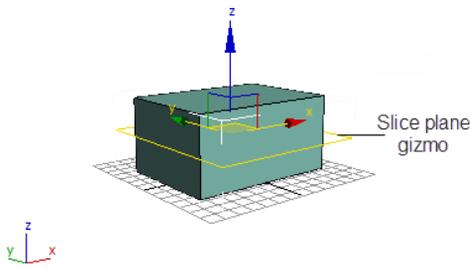


Figure 8-36 The slice plane gizmo displayed in the selected object

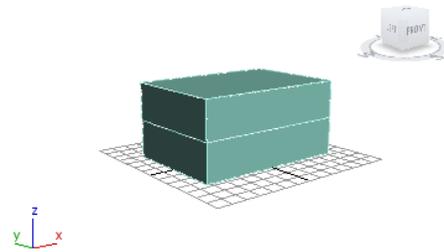


Figure 8-37 The selected object sliced after choosing the **Slice** button

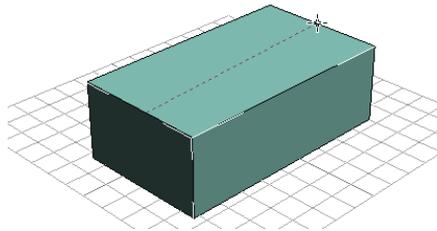


Figure 8-38 The dotted lines

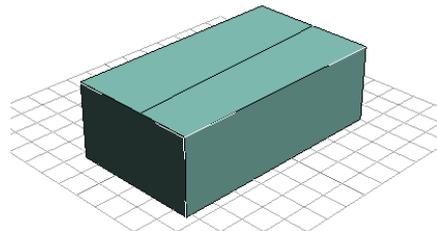


Figure 8-39 The cut on the object after using the **Cut** button

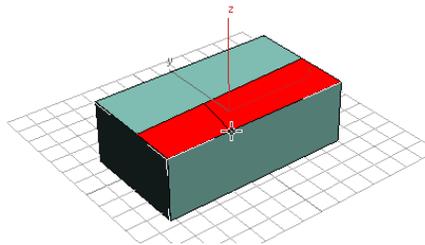


Figure 8-40 The cut on the selected polygon

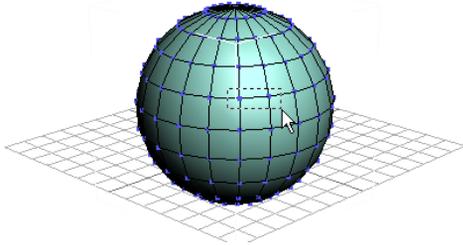


Figure 8-41 The selection box around the vertices to be welded

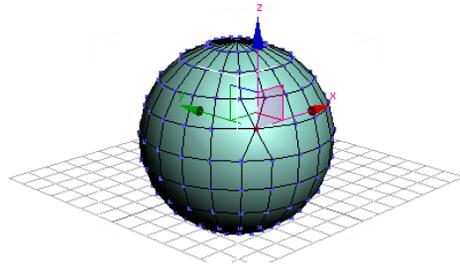


Figure 8-42 The vertices welded together

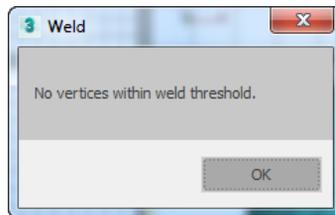


Figure 8-43 The Weld message box

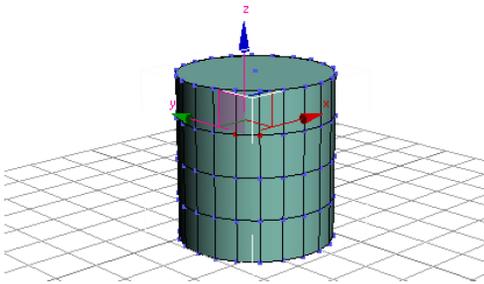


Figure 8-44 The vertices selected for welding

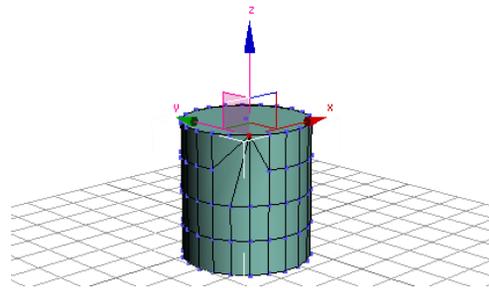


Figure 8-45 The selected vertices welded to the target vertex

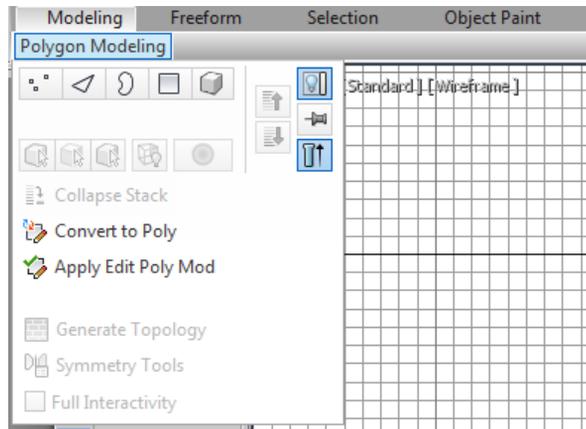


Figure 8-46 Flyout displayed after moving the cursor over the **Polygon Modeling** panel

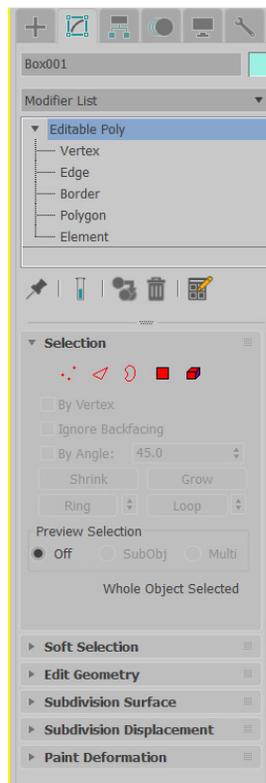


Figure 8-47 Various rollouts displayed

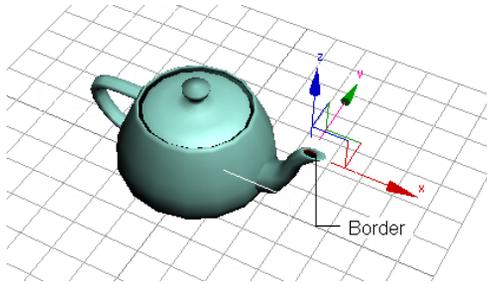


Figure 8-48 Border selected around the hole of the spout of a teapot

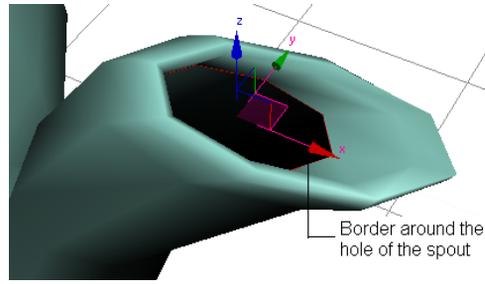


Figure 8-49 Maximized view of the border selected around the hole of the spout of a teapot

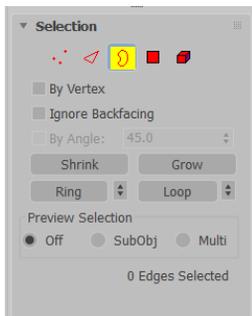


Figure 8-50 The **Selection** rollout with the **Border** sub-object level selected

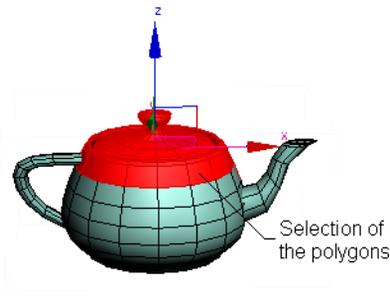


Figure 8-51 The selection area in the teapot

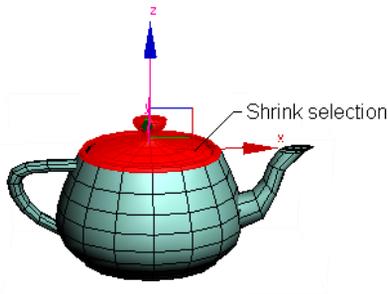


Figure 8-52 The selection area in the teapot decreases after choosing the **Shrink** button

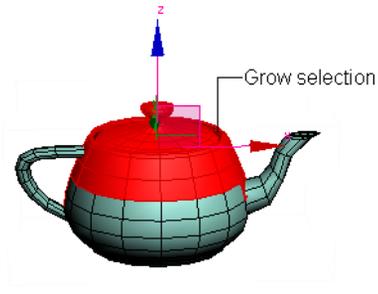


Figure 8-53 The selection area in the teapot increases after choosing the **Grow** button

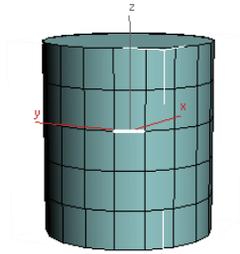


Figure 8-54 An edge selected in a cylinder

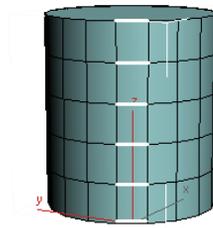


Figure 8-55 The parallel edges selected after choosing the **Ring** button

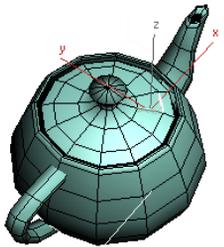


Figure 8-56 The selected edge of the teapot

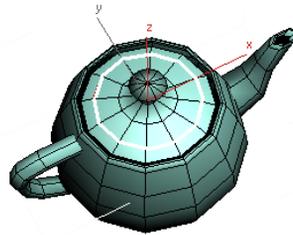


Figure 8-57 The edges selected after choosing the **Loop** button

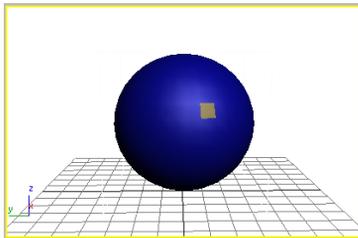


Figure 8-58 The selected sub-object level highlighted

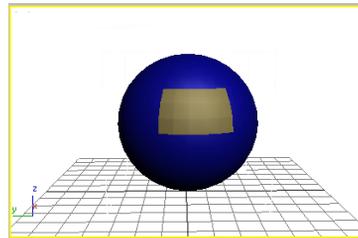


Figure 8-59 More than one polygon highlighted

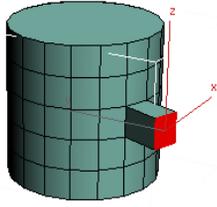


Figure 8-60 The extruded polygon in a cylinder

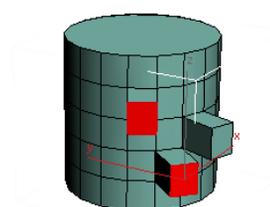


Figure 8-61 The same extrusion on other polygons after choosing the **Repeat Last** button

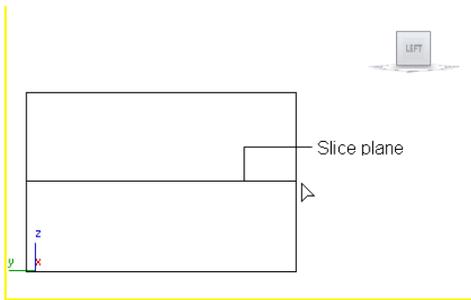


Figure 8-62 The quick slice cursor and slice plane displayed

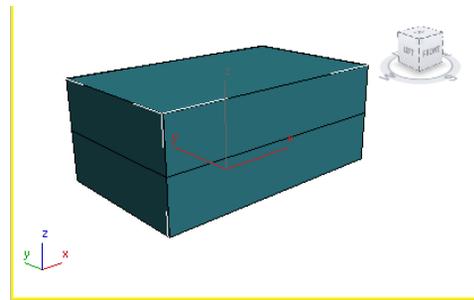


Figure 8-63 The box sliced in the Perspective viewport

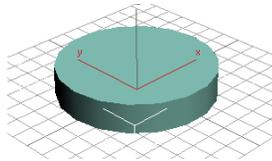


Figure 8-64 Selecting the cylinder in the viewport

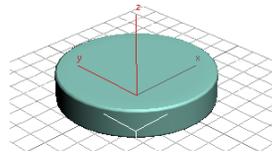


Figure 8-65 The cylinder smoothed after choosing the **MSmooth** button

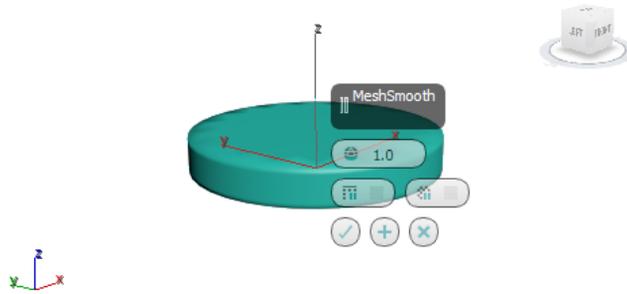


Figure 8-66 The MeshSmooth Selection caddy control

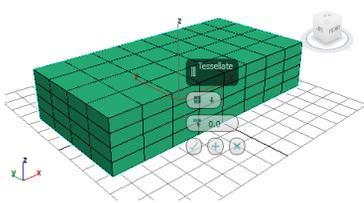


Figure 8-67 The Tessellate caddy control

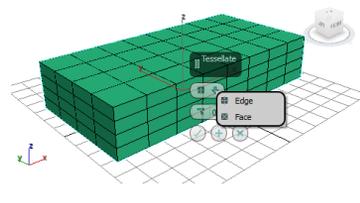


Figure 8-68 The drop-down list displayed after clicking on the arrow

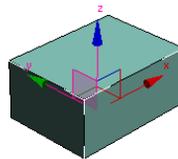


Figure 8-69 A box

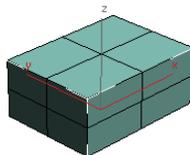


Figure 8-70 The box after selecting the Edge radio button

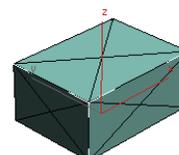


Figure 8-71 The box after selecting the Face radio button

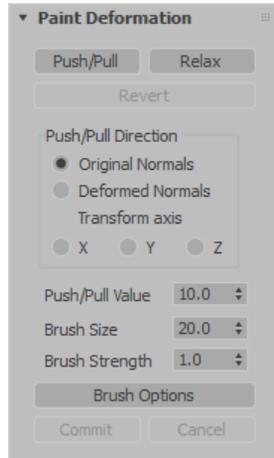


Figure 8-72 The *Paint Deformation* rollout

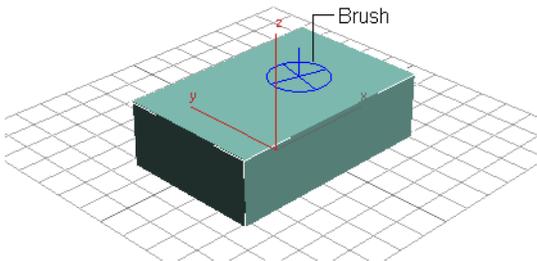


Figure 8-73 The brush displayed on choosing the *Push/Pull* button

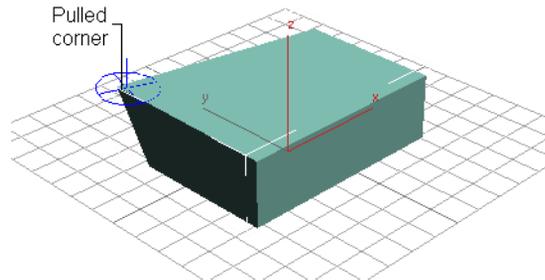


Figure 8-74 The object deformed at the corner vertex

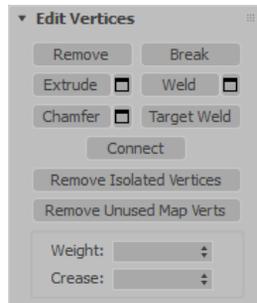


Figure 8-75 The *Edit Vertices* rollout

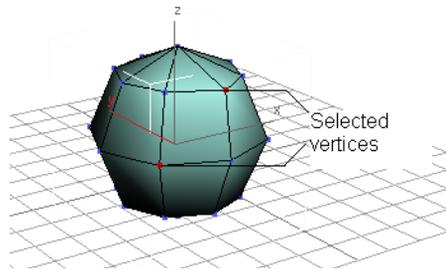


Figure 8-76 The vertices selected in the object

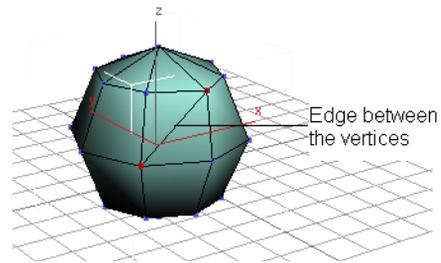


Figure 8-77 The edge created between the vertices selected

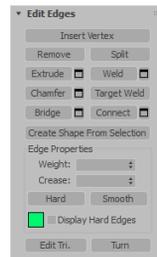


Figure 8-78 The Edit Edges rollout

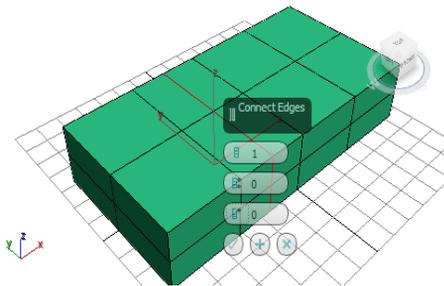


Figure 8-79 The Connect Edges caddy control in the viewport

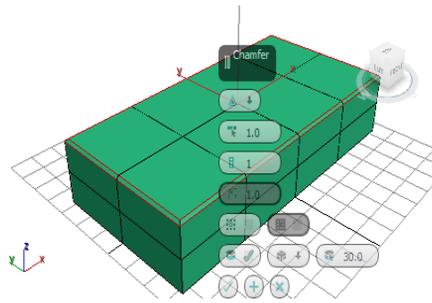


Figure 8-80 The Chamfer caddy control in the viewport

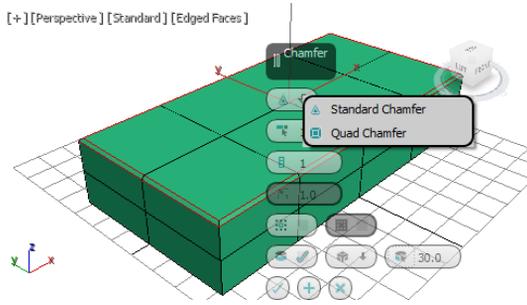


Figure 8-81 The Chamfer Type flyout

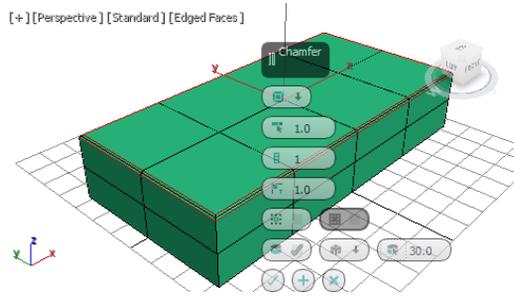


Figure 8-82 The Chamfer caddy control on choosing Quad Chamfer from the flyout

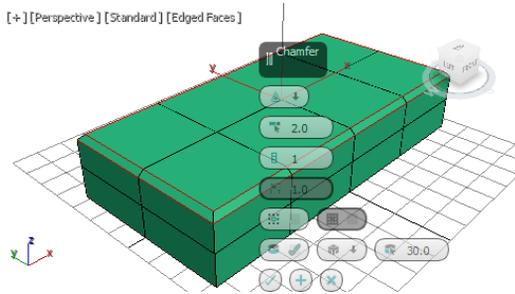


Figure 8-83 Chamfering with the Standard Chamfer type and Edge Chamfer Amount spinner = 2

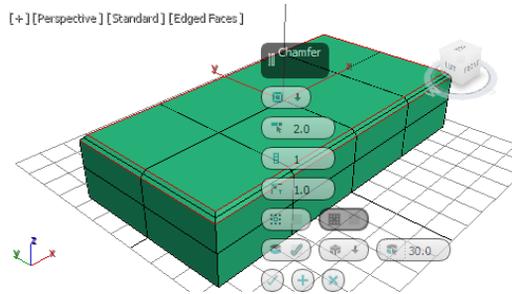


Figure 8-84 Chamfering with the Quad Chamfer type and Edge Chamfer Amount spinner = 2

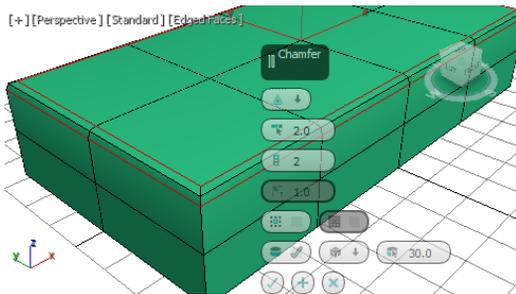


Figure 8-85 Chamfering with the Standard Chamfer type and the Connect Edge Segments spinner = 2

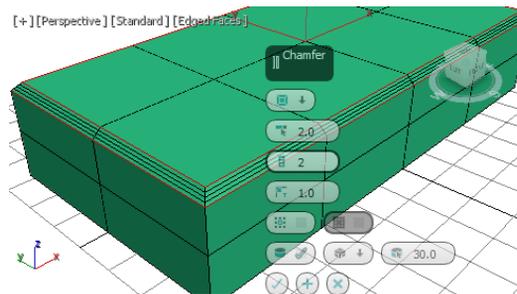


Figure 8-86 Chamfering with the Quad Chamfer type and the Connect Edge Segments spinner = 2

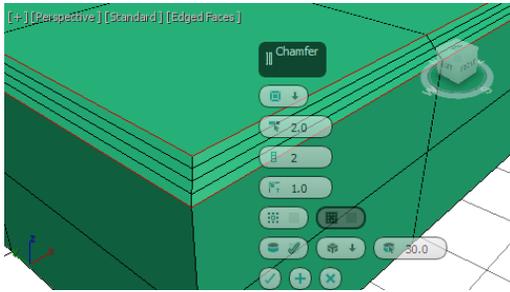


Figure 8-87 Chamfering with the *Edge Tension* spinner = 1

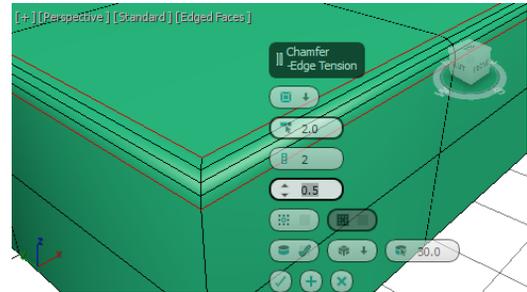


Figure 8-88 Chamfering with the *Edge Tension* spinner = 0.5

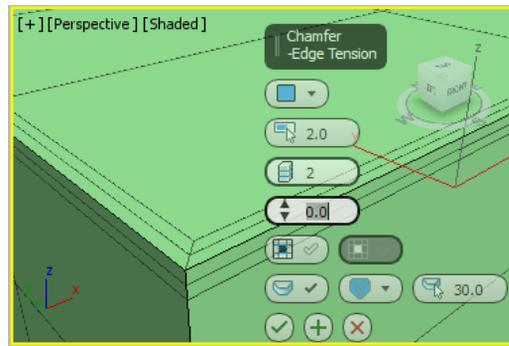


Figure 8-89 Chamfering with the *Edge Tension* spinner = 0

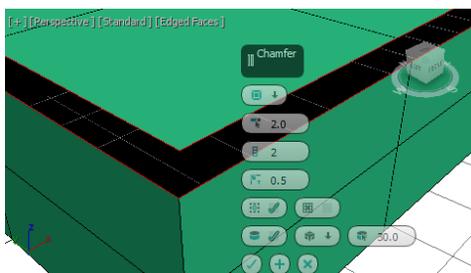


Figure 8-90 The deleted polygons

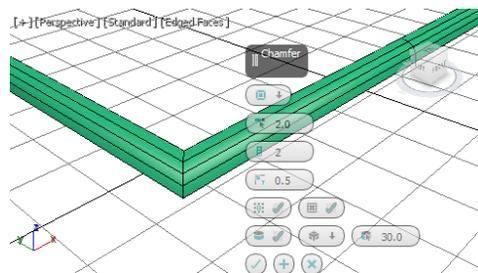


Figure 8-91 The remaining polygons after selecting the *Invert Open* check box

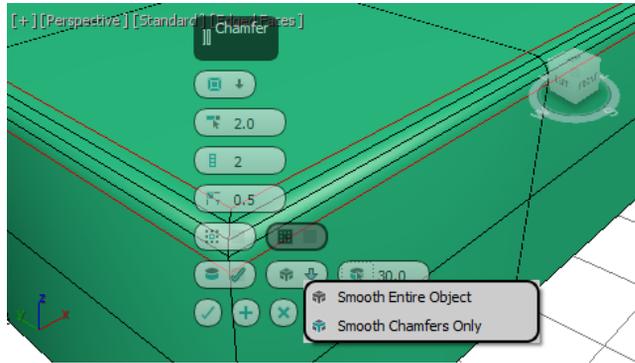


Figure 8-92 The flyout displayed

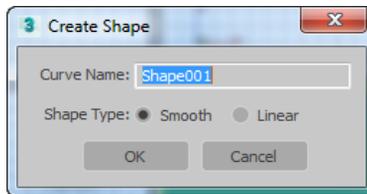


Figure 8-93 The Create Shape dialog box

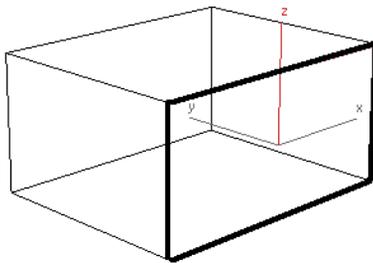


Figure 8-94 The edges selected in the box

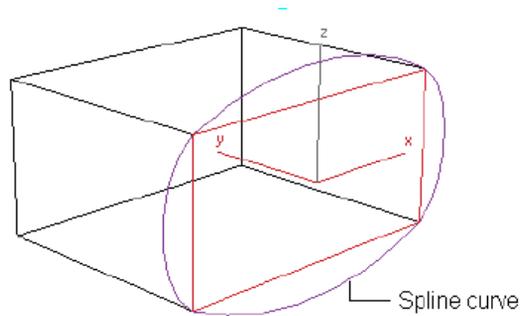


Figure 8-95 The spline created after using the Create Shape From Selection button

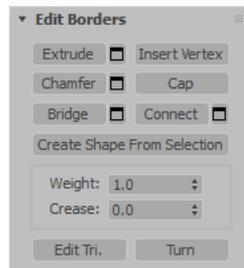


Figure 8-96 The Edit Borders rollout

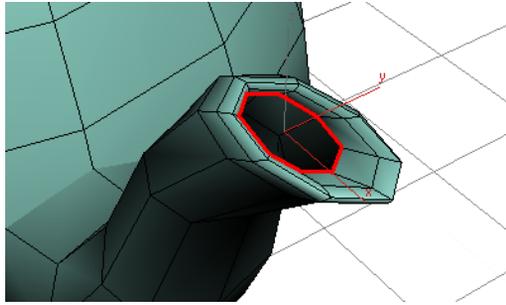


Figure 8-97 The selected border of the spout of a teapot

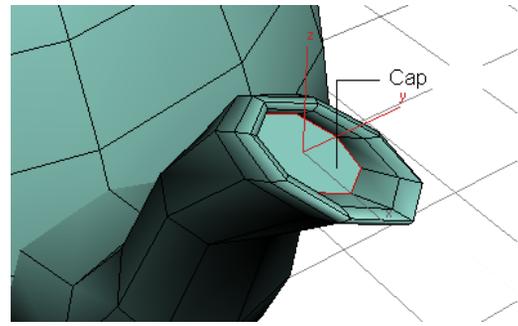


Figure 8-98 The cap after choosing the **Cap** button

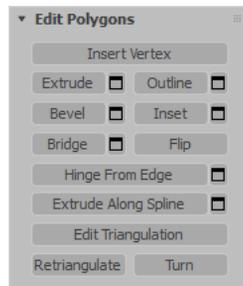


Figure 8-99 The **Edit Polygons** rollout

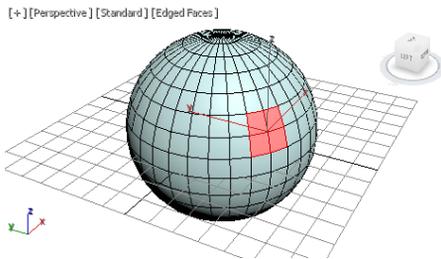


Figure 8-100 The selected polygons in a sphere

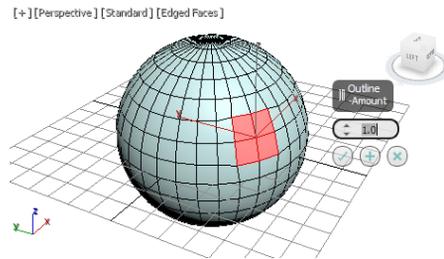


Figure 8-101 The selected polygons after choosing the **Outline** button

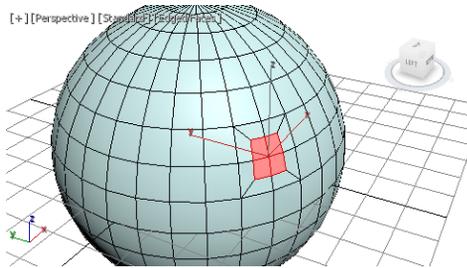


Figure 8-102 The group of polygons inset on selecting the **Group** option

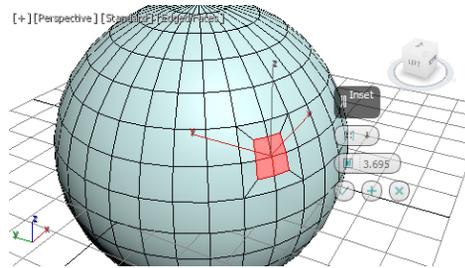


Figure 8-103 The **Inset** caddy control displayed

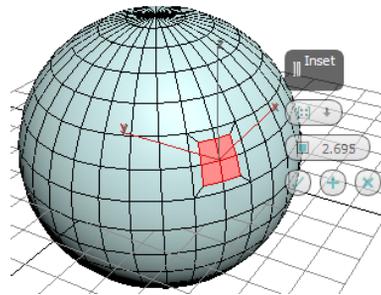


Figure 8-104 The drop-down list displayed in the **Inset** caddy control

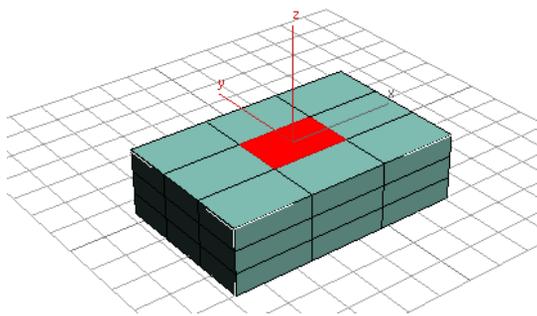


Figure 8-105 The polygon selected in the box

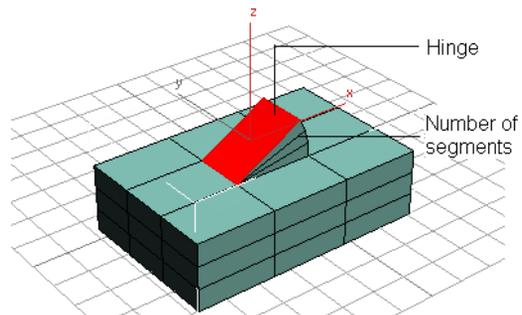


Figure 8-106 The hinge created on choosing the **Hinge From Edge** button

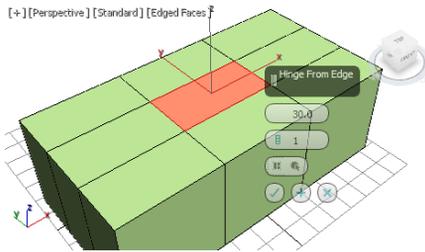


Figure 8-107 *The Hinge From Edge caddy control*

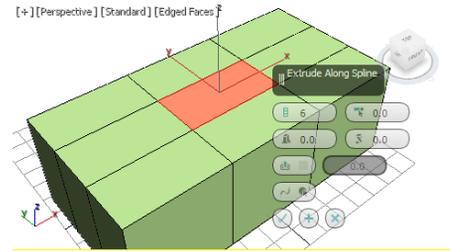


Figure 8-108 *The Extrude Along Spline caddy control*

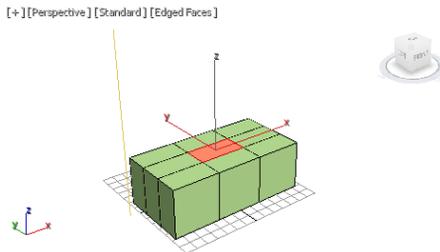


Figure 8-109 *The polygon selected in the plane and the spline*

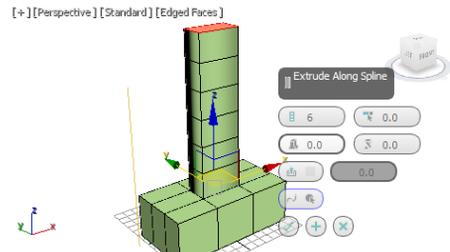


Figure 8-110 *The selected polygon extruded along the spline*



Figure 8-111 *A golf ball model*

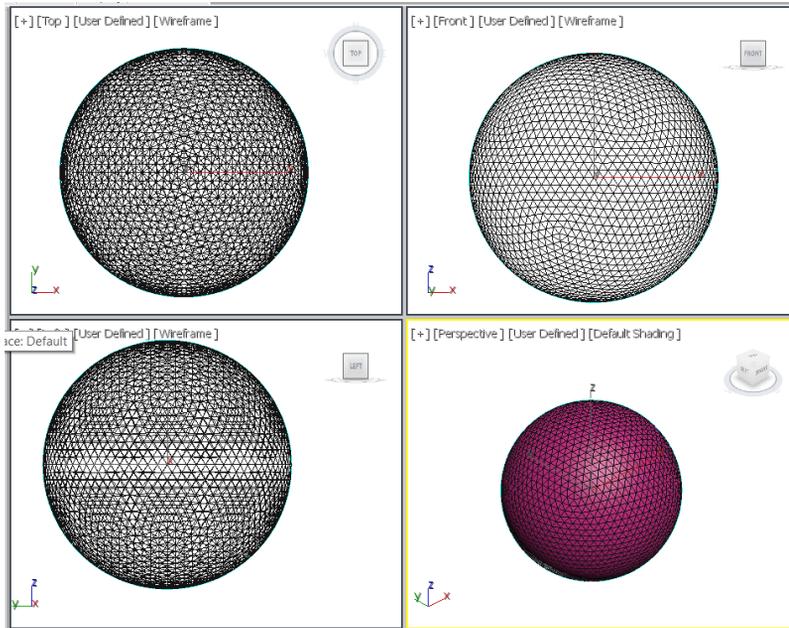


Figure 8-112 The geosphere displayed in viewports

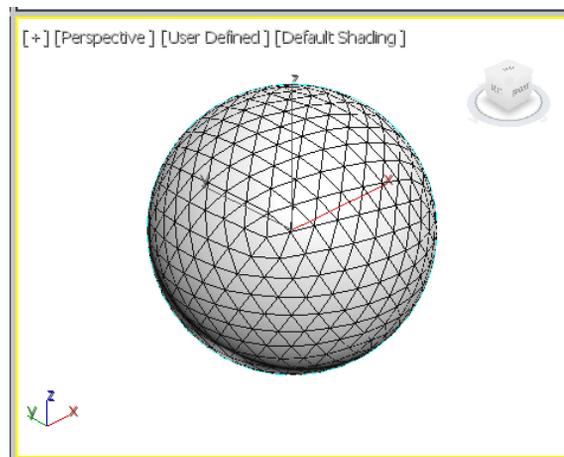


Figure 8-113 The golf ball geometry zoomed in the Perspective viewport

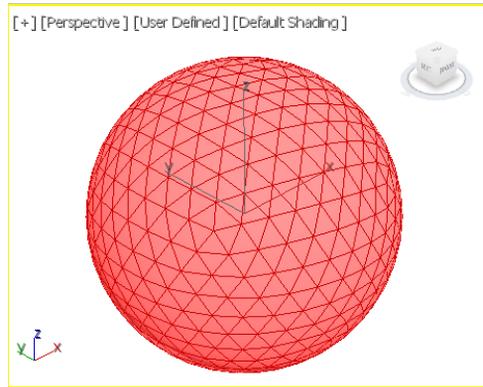


Figure 8-114 All polygons in the golf ball selected

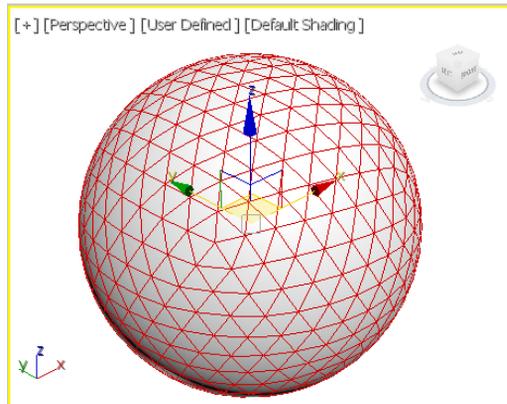


Figure 8-115 All edges of golf ball selected

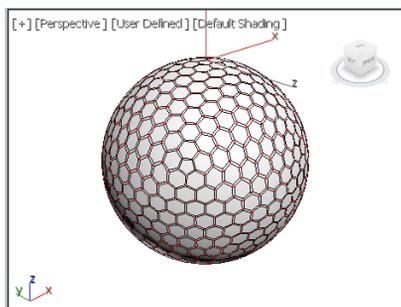


Figure 8-116 All edges of golf ball chamfered

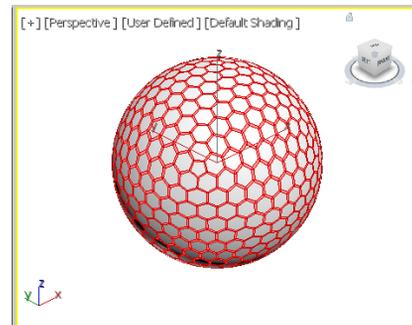


Figure 8-117 All polygons in golf ball, except new hexagonal polygons selected

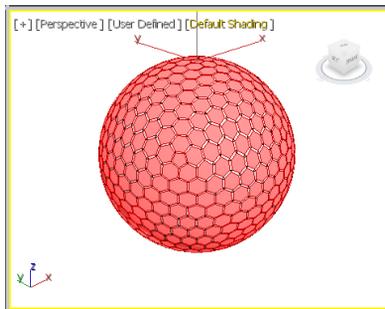


Figure 8-118 All hexagonal polygons of golf ball selected in the viewport

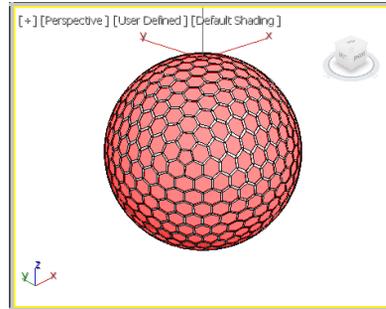


Figure 8-119 Hexagonal polygons displayed after negative extrusion



Figure 8-120 The golf ball geometry after applying the Mesh Smooth modifier

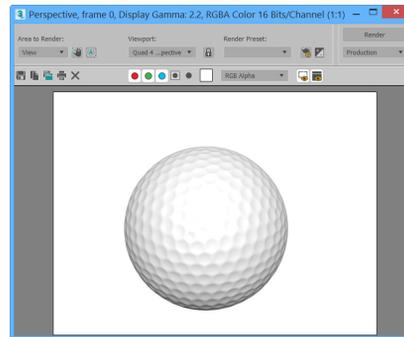


Figure 8-121 The final output after rendering



Figure 8-122 The model of an LCD monitor (view 1)



Figure 8-123 The model of an LCD monitor (view 2)

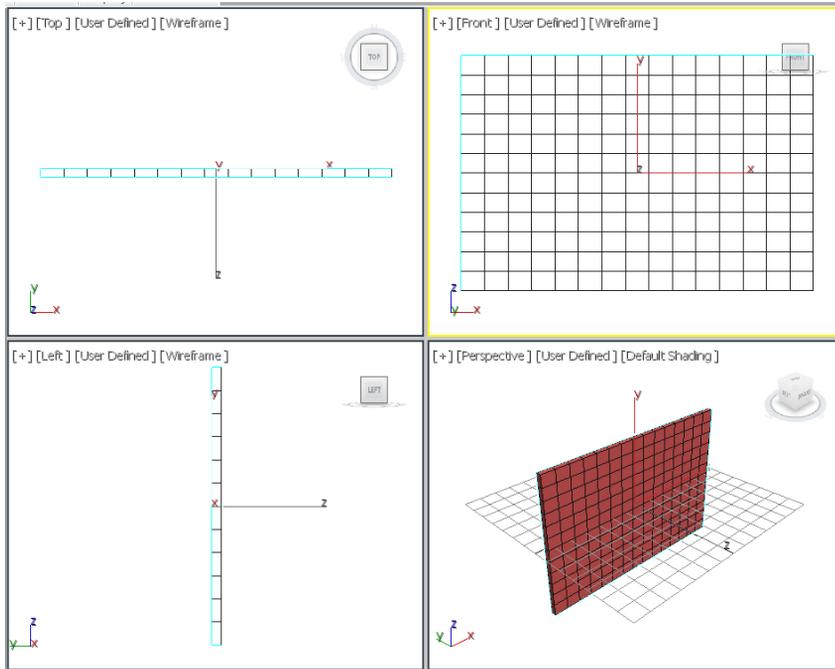


Figure 8-124 The box for the front portion of the monitor displayed in viewports

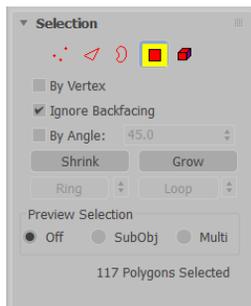


Figure 8-125 The Ignore Backfacing check box selected

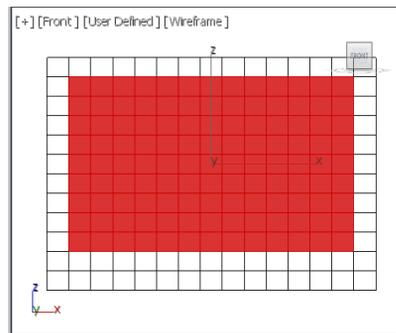


Figure 8-126 All polygons selected in the Front viewport

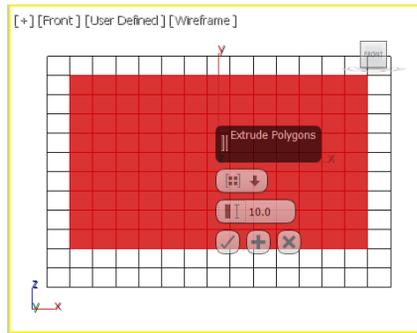


Figure 8-127 The *Extrude Polygons* caddy control

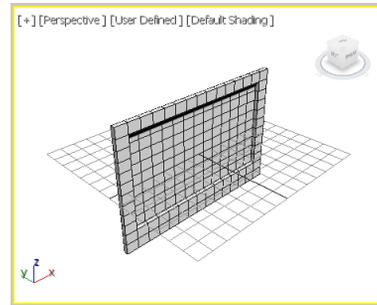


Figure 8-128 The extrusion effect displayed in the *Perspective* viewport

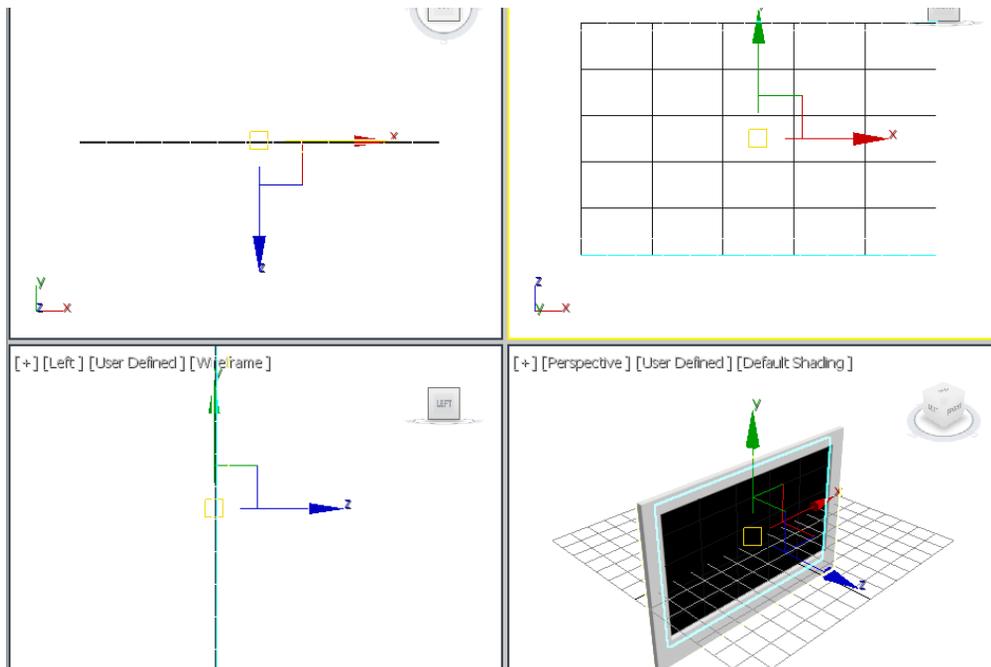


Figure 8-129 The screen geometry in the viewports

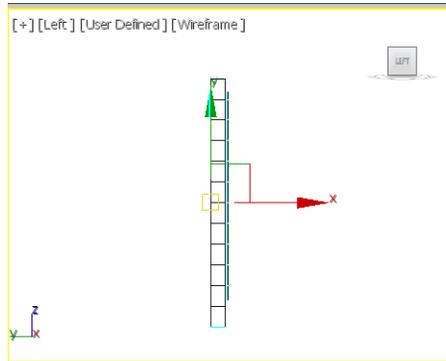


Figure 8-130 Alignment of the back portion with the front part in the Left viewport

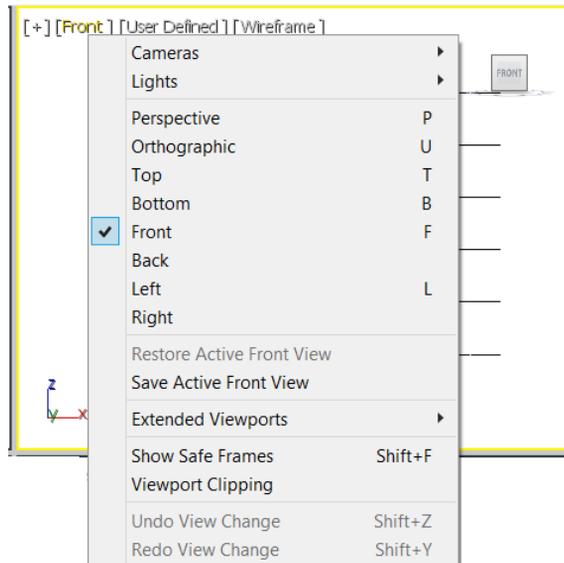


Figure 8-131 A flyout showing various options to display views

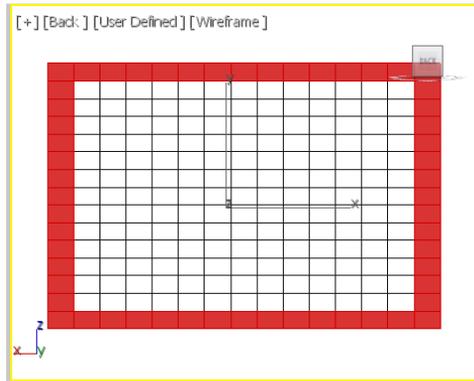


Figure 8-132 The outer polygons selected in back portion

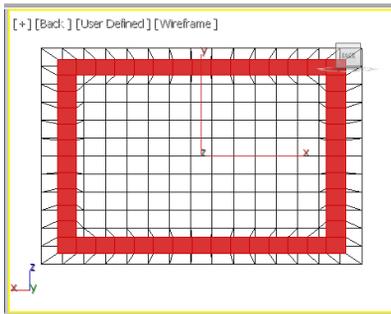


Figure 8-133 The selected polygons uniformly scaled in back portion

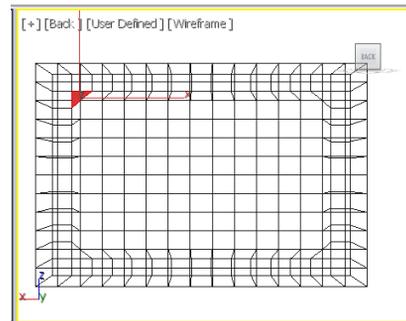


Figure 8-134 Selecting the inner polygons in back portion

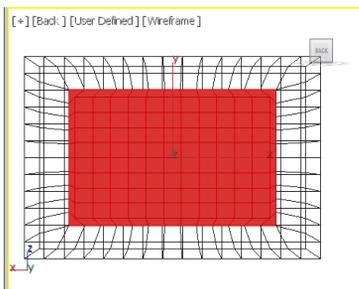


Figure 8-135 The selected polygons uniformly scaled to 90 percent

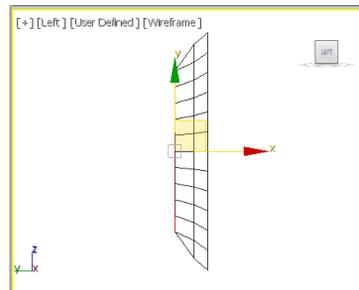


Figure 8-136 Selected polygons dragged horizontally

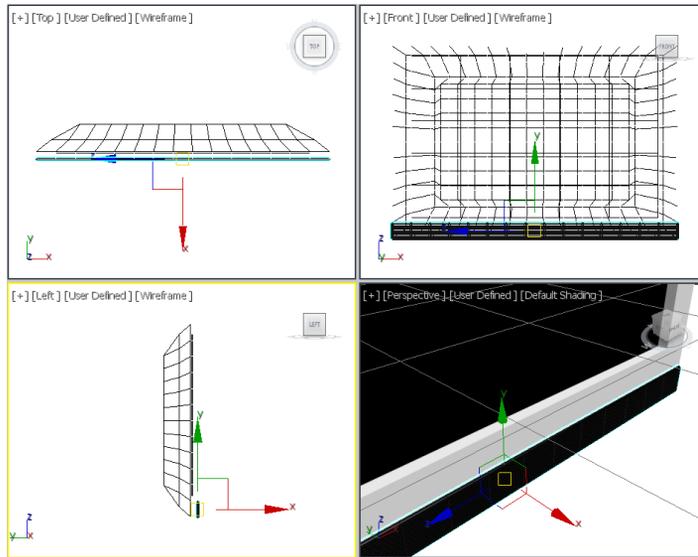


Figure 8-137 Alignment of the speaker with the monitor in viewports

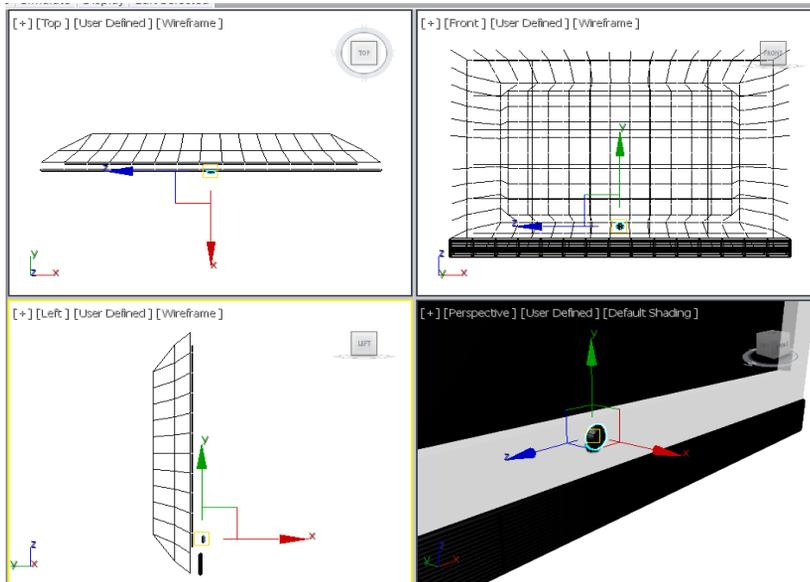


Figure 8-138 Alignment of b01 with front portion in viewports

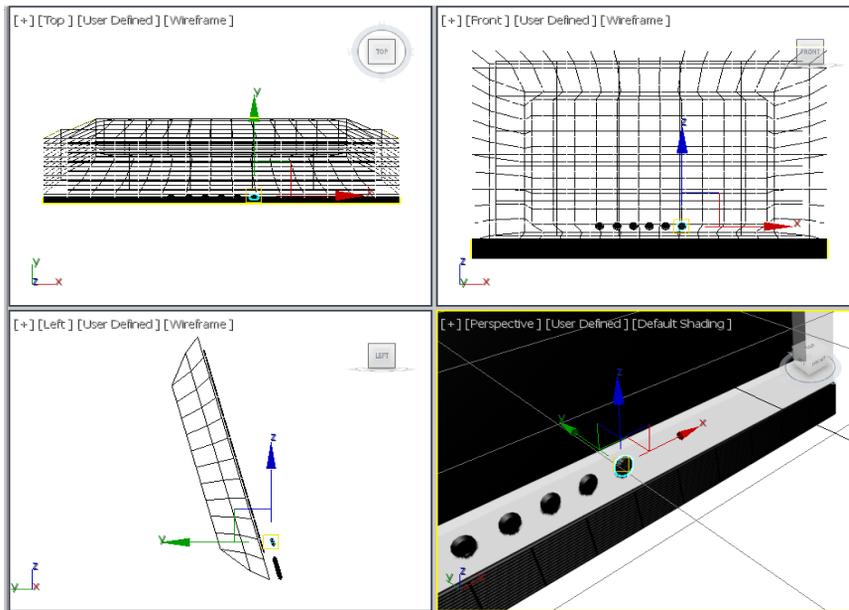


Figure 8-139 Alignment of *b002*, *b003*, *b004*, *b005*, and *b006* in viewports

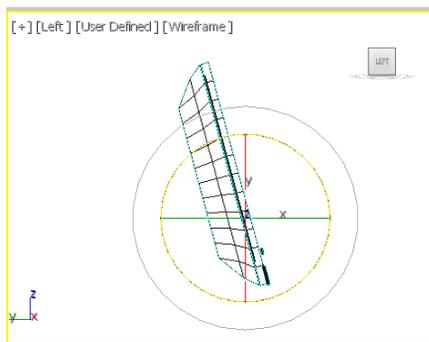


Figure 8-140 The LCD monitor group displayed after being rotated it in the Left viewport

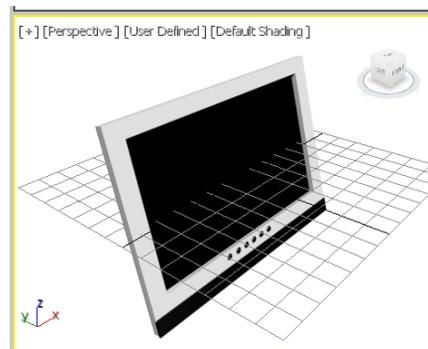


Figure 8-141 The LCD monitor group displayed in the Perspective viewport

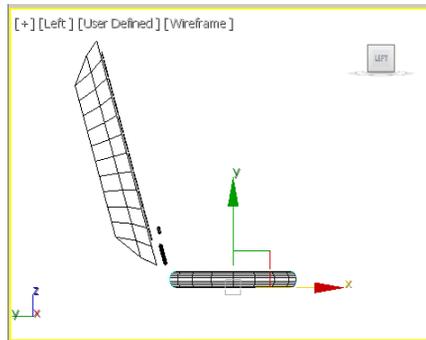


Figure 8-142 The support geometry moved in the Left viewport

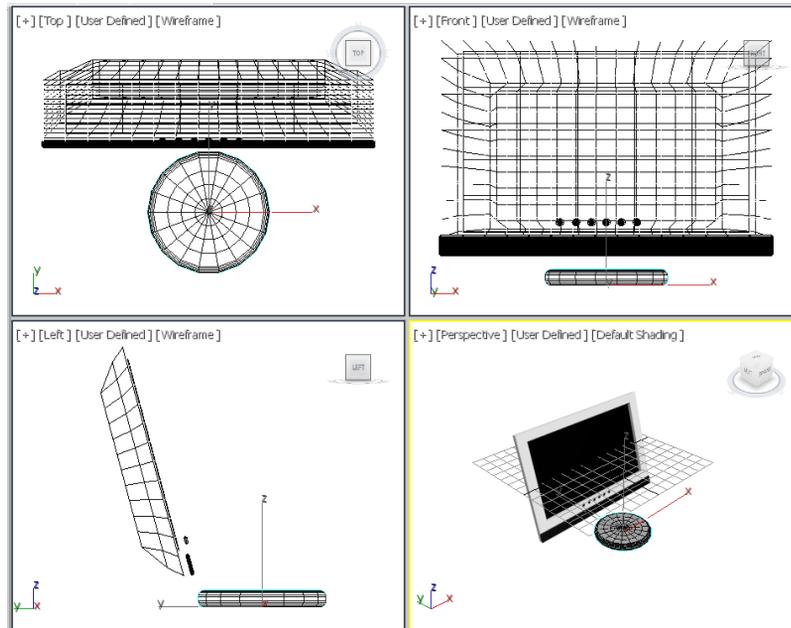


Figure 8-143 The support geometry zoomed in viewports

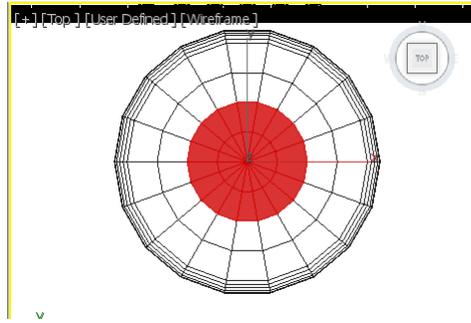


Figure 8-144 The inner polygons of support selected

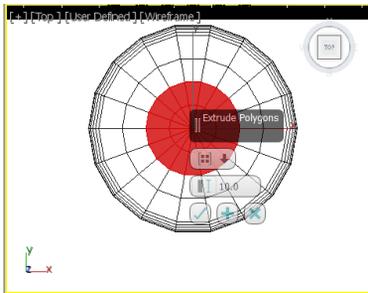


Figure 8-145 The **Extrude Polygons** caddy control

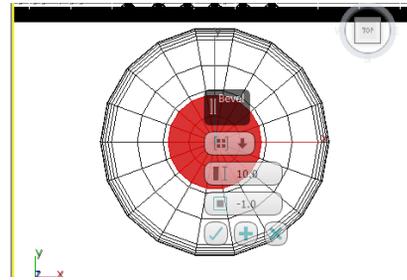


Figure 8-146 The value set in the **Height** spinner of the **Bevel** caddy control

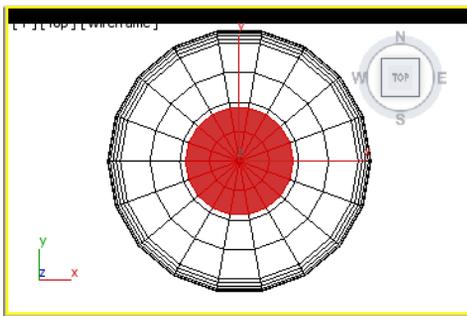


Figure 8-147 The selected polygons in the **Top** viewport after extruding and beveling

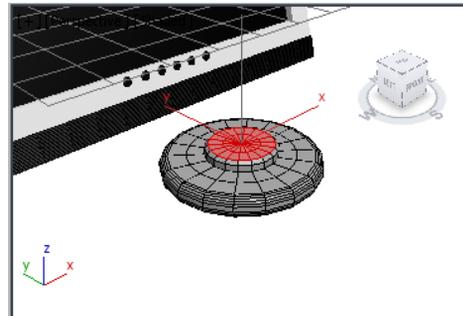


Figure 8-148 The selected polygons in the **Perspective** viewport after extruding and beveling

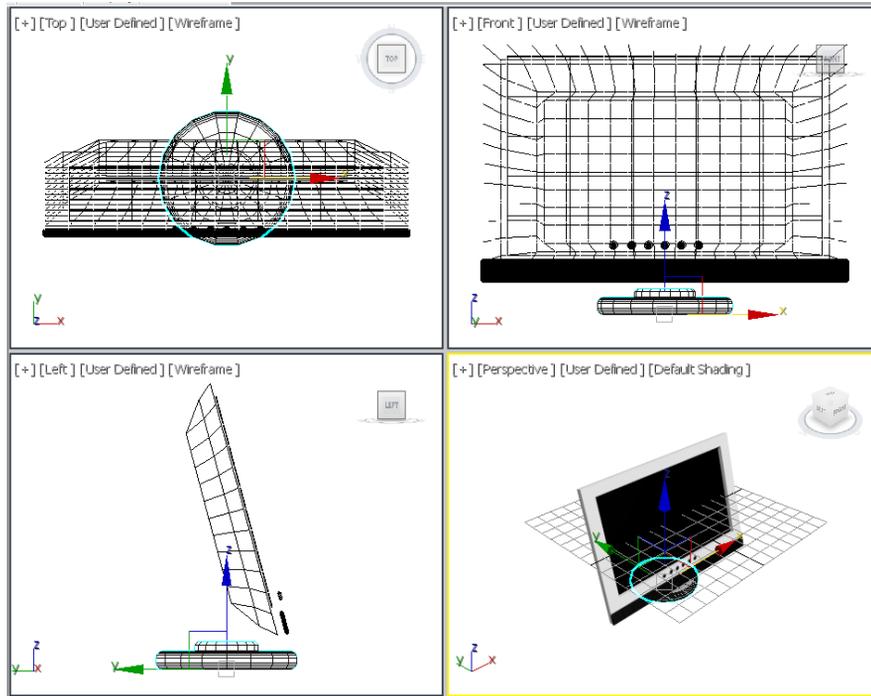
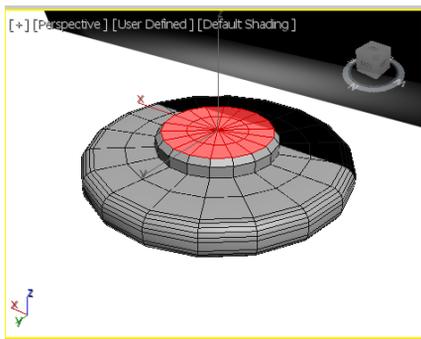


Figure 8-149 Alignment of support in viewports



*Figure 8-150 The view of the Perspective viewport after using the **Z**oom and **O**rbit tools*

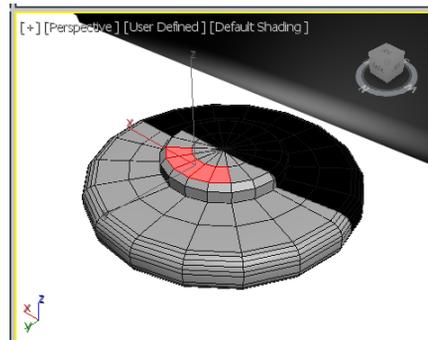


Figure 8-151 The polygons selected in the Perspective viewport

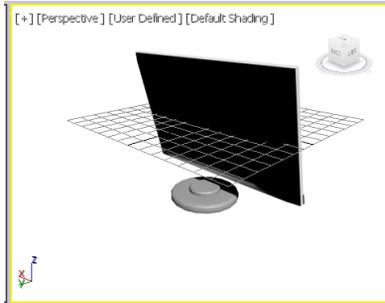


Figure 8-152 The back side geometry of LCD monitor in the Perspective viewport

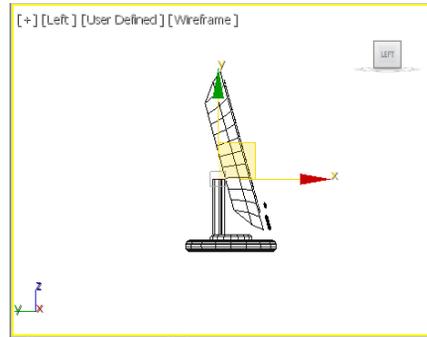


Figure 8-153 The selected polygons extruded in the Left viewport

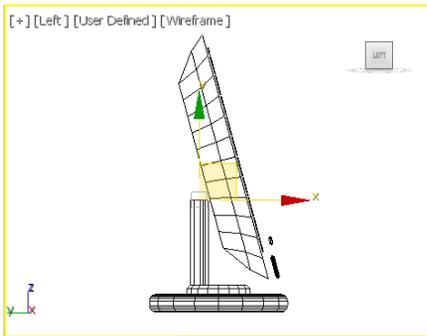


Figure 8-154 The support geometry in the Left viewport after moving it horizontally

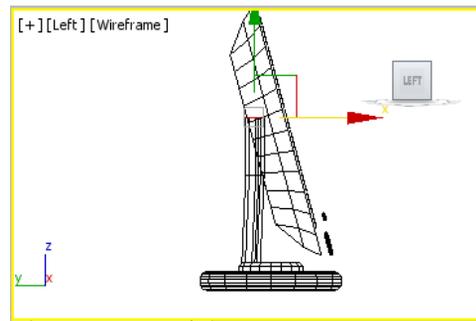


Figure 8-155 The support geometry in the Left viewport after extrusion

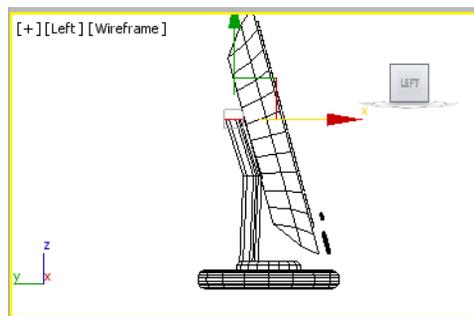


Figure 8-156 The selected polygons of support in the Left viewport



Figure 8-157 The model of a bed

9

Graphite Modeling Technique

Learning Objectives

After completing this chapter, you will be able to:

- *Customize the graphite modeling toolset interface*
- *Work with panels in the graphite modeling toolset*



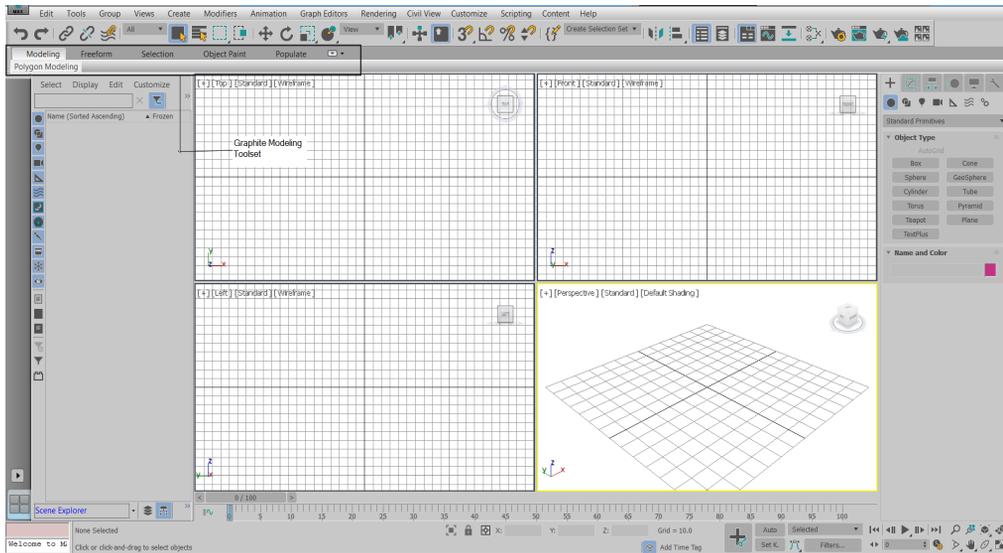


Figure 9-1 The graphite modeling toolset

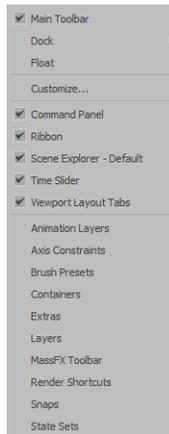


Figure 9-2 The shortcut menu displayed on right-clicking the Main Toolbar

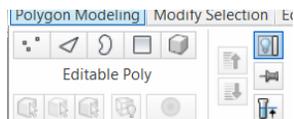


Figure 9-3 The Polygon Modeling panel

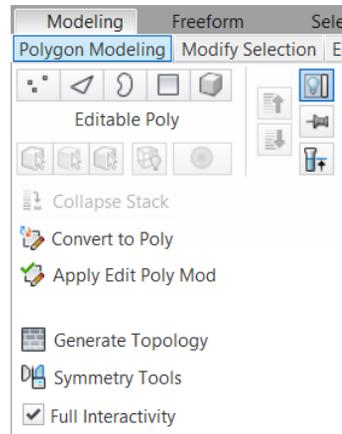


Figure 9-4 The Polygon Modeling panel expanded

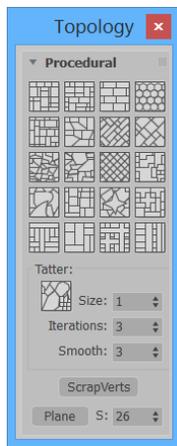


Figure 9-5 The Topology dialog box

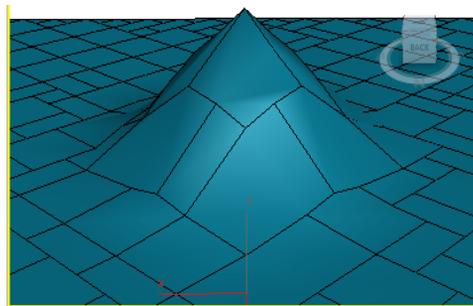


Figure 9-6 The Floor2 topology pattern displayed on the polygonal object

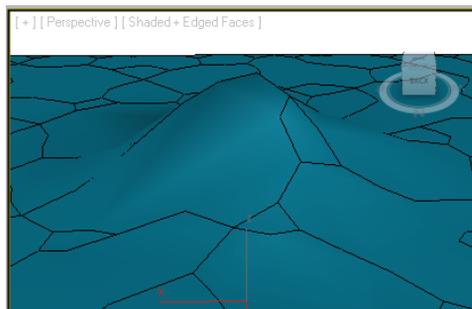


Figure 9-7 The Smoothstar topology pattern

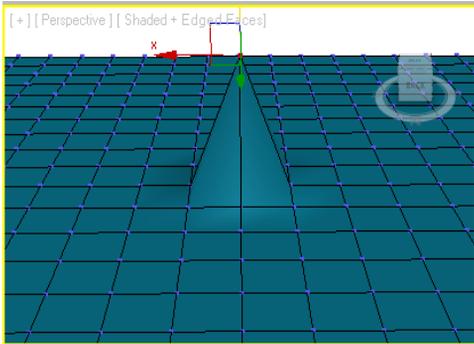


Figure 9-8 Vertex moved without choosing the *Use Soft Selection* tool

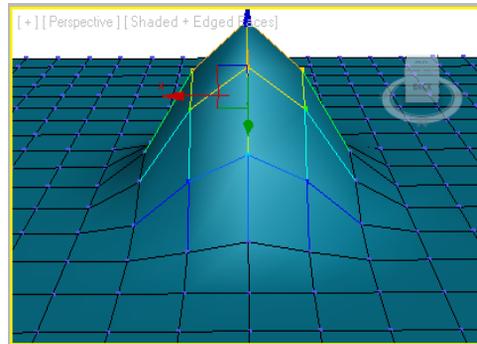


Figure 9-9 Vertex moved after choosing the *Use Soft Selection* tool

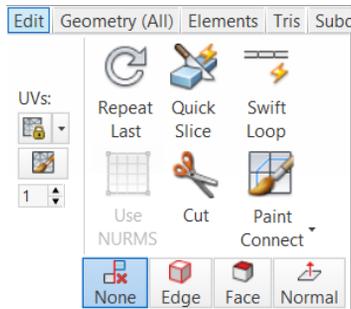


Figure 9-10 The *Edit* panel

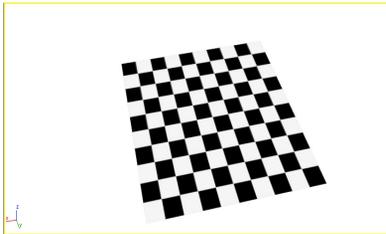


Figure 9-11 Checker map applied to an object

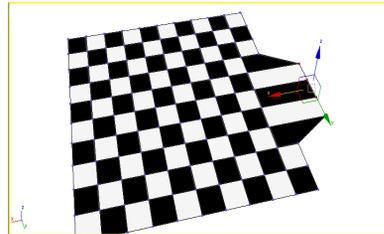


Figure 9-12 Checker map distorted before choosing the *Preserve UVs* tool

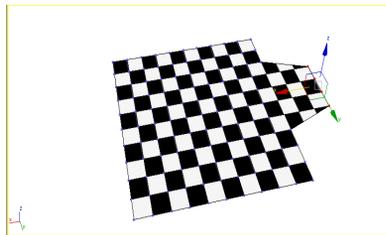


Figure 9-13 The checker map after choosing the *Preserve UVs* tool

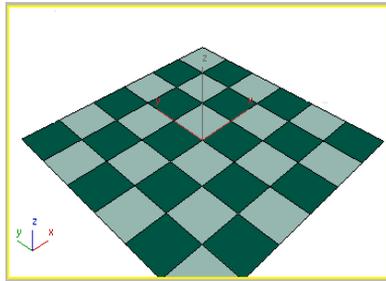


Figure 9-14 Checker map applied to an object

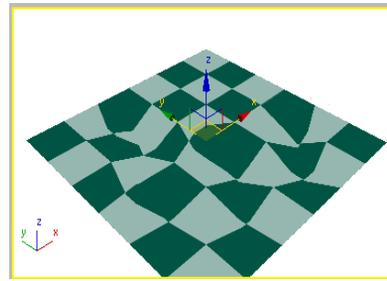


Figure 9-15 Checker map tweaked using the **Tweak** tool

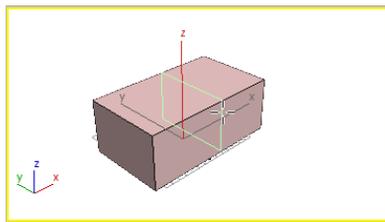


Figure 9-16 A green colored gizmo displayed on the object

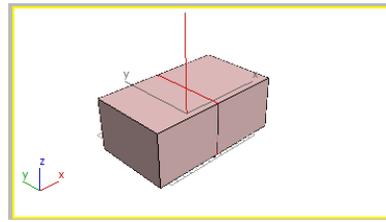


Figure 9-17 A new edge loop created using the **SwiftLoop** tool

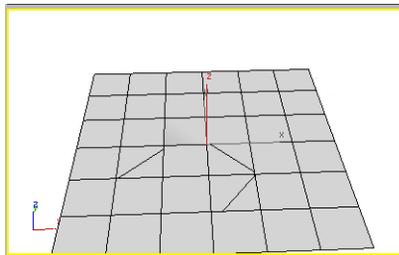


Figure 9-18 New segments created on an object using the **Paint Connect** tool

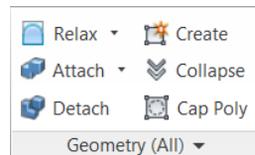


Figure 9-19 The **Geometry (All)** panel

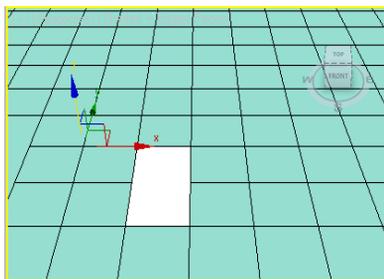


Figure 9-20 An object with a hole

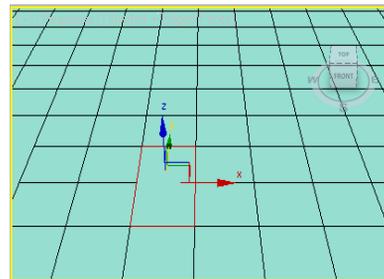


Figure 9-21 The hole covered after choosing the **Cap Poly** tool

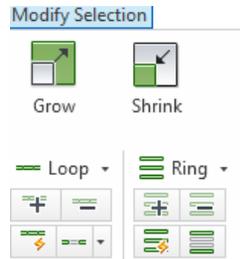


Figure 9-22 The tools in the upper part of the **Modify Selection** panel

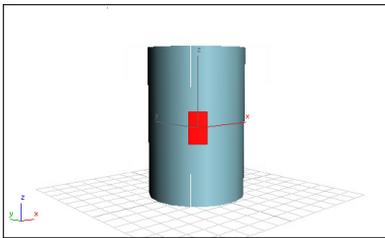


Figure 9-23 A polygon selected to create a loop selection

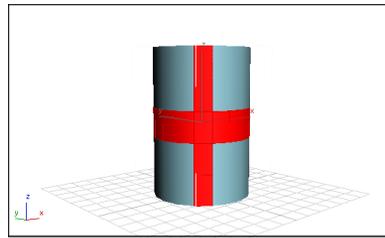


Figure 9-24 The polygons selected after choosing the **Loop** tool

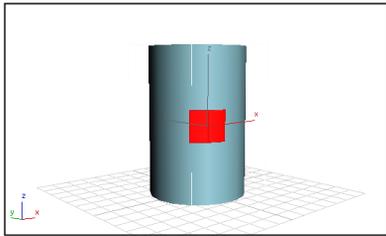


Figure 9-25 Two polygons selected to create a loop

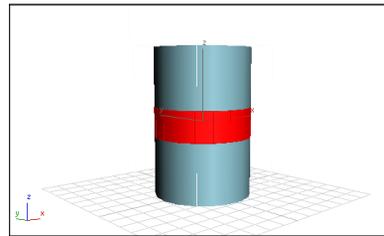


Figure 9-26 The loop created after choosing the **Loop** tool

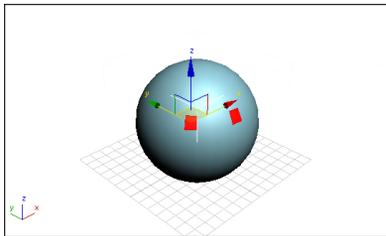


Figure 9-27 The polygons selected on a sphere

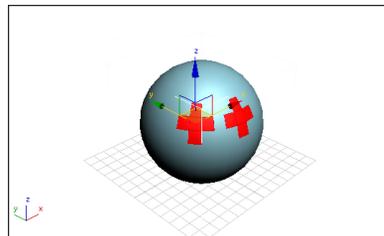


Figure 9-28 The polygons selected after choosing the **Grow Loop** tool

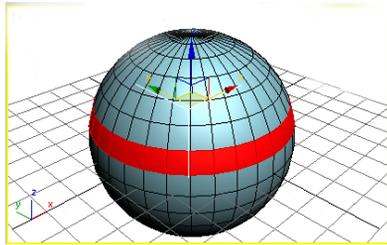
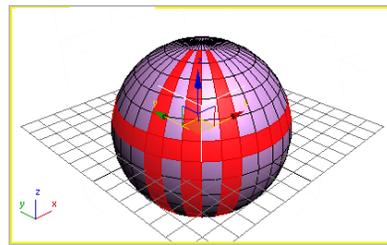


Figure 9-29 The loop selection



*Figure 9-30 The selected polygons after choosing the **Loop Mode** tool*

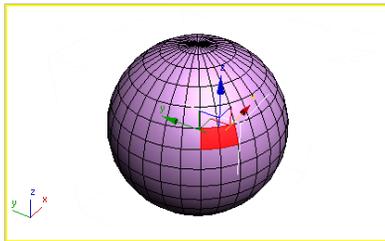
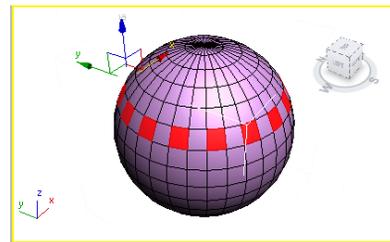


Figure 9-31 Two adjacent polygons selected



*Figure 9-32 The selection loop on choosing the **Dot Loop** tool*

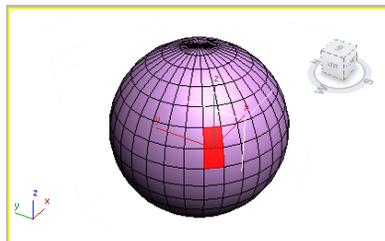


Figure 9-33 Two adjacent polygons selected

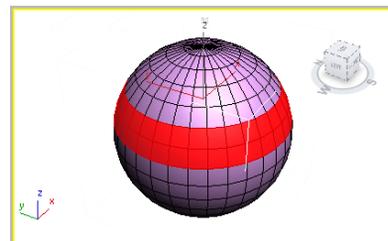


Figure 9-34 The sub-objects selected in the form of a ring

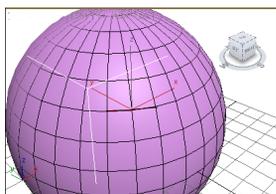


Figure 9-35 The edges selected



*Figure 9-36 The tools in the bottom part of the **Modify Selection** panel*

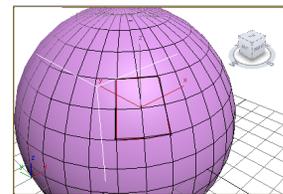


Figure 9-37 An outline created around the selected edges

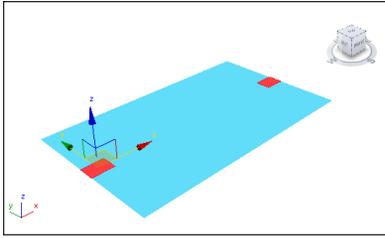


Figure 9-38 Two polygons selected

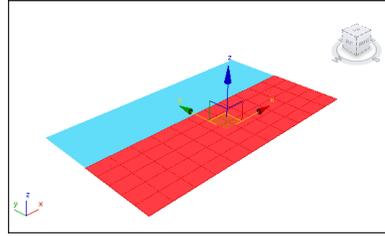


Figure 9-39 All sub-objects selected between the two selected polygons

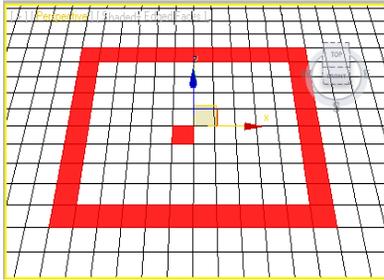


Figure 9-40 The sub-objects selected to create a boundary

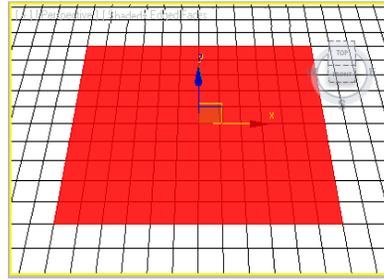


Figure 9-41 All sub-objects selected to fill the defined boundary

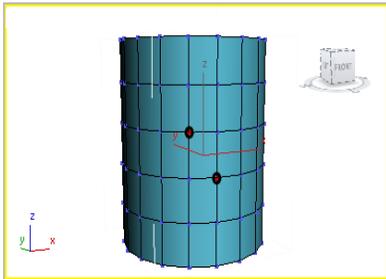


Figure 9-42 The two vertices selected

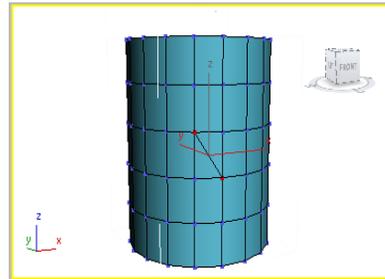


Figure 9-43 A new edge created between the two selected vertices

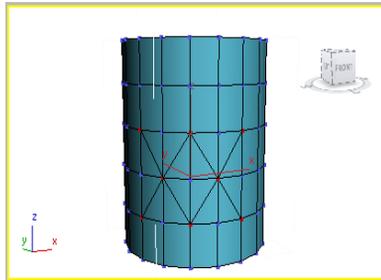


Figure 9-44 Multiple vertices connected on choosing the **Connect** tool

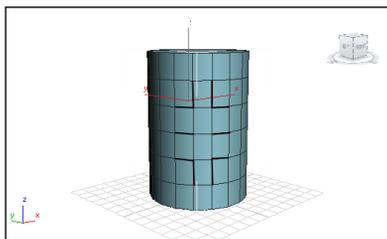


Figure 9-45 The edges selected

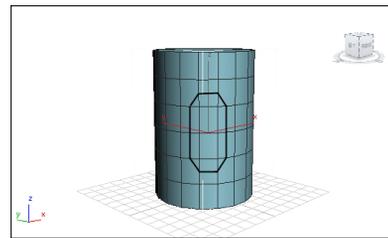


Figure 9-46 The selected edges connected by new edges

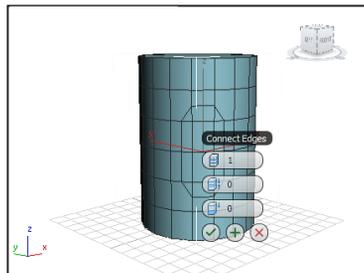


Figure 9-47 The **Connect Edges** caddy control

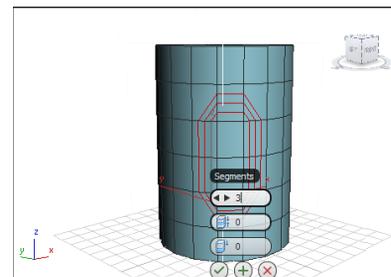


Figure 9-48 Multiple edges created between the selected edges

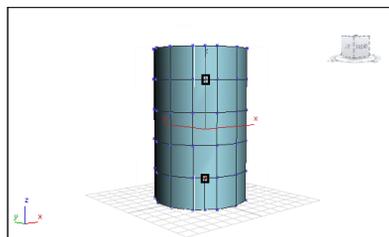


Figure 9-49 Two vertices selected

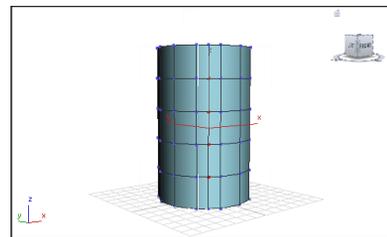


Figure 9-50 Connection created between the selected vertices

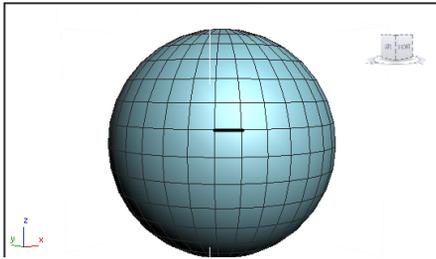


Figure 9-51 An edge selected on the sphere

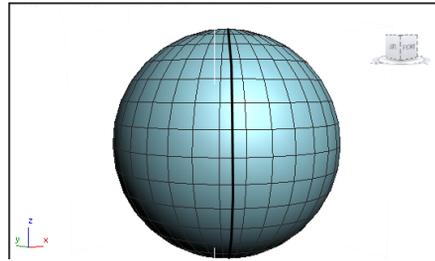


Figure 9-52 The complete edge loop of the selected edge

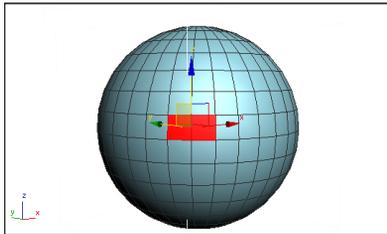


Figure 9-53 The polygons selected on an object

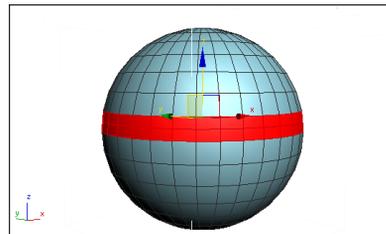


Figure 9-54 An edge loop created along the selected polygons using the **Insert Loop** tool

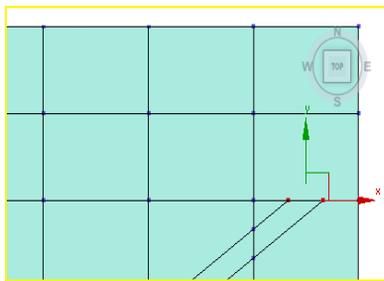


Figure 9-55 The two vertices selected

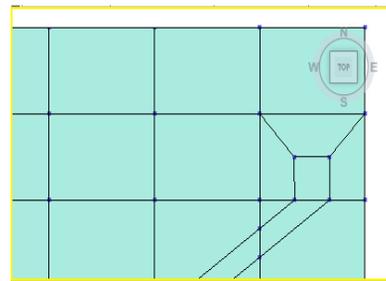


Figure 9-56 A quad built at the ends of the two selected vertices

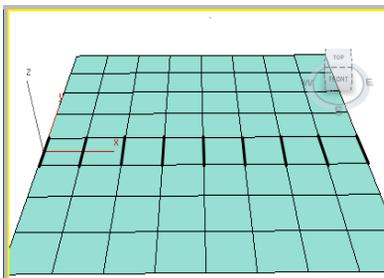


Figure 9-57 The edges selected

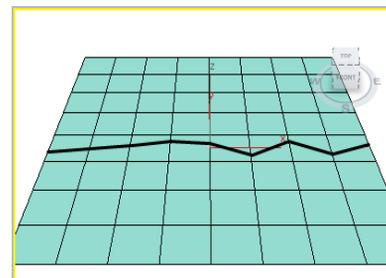


Figure 9-58 Randomly connected edges



Figure 9-59 The model of a computer table

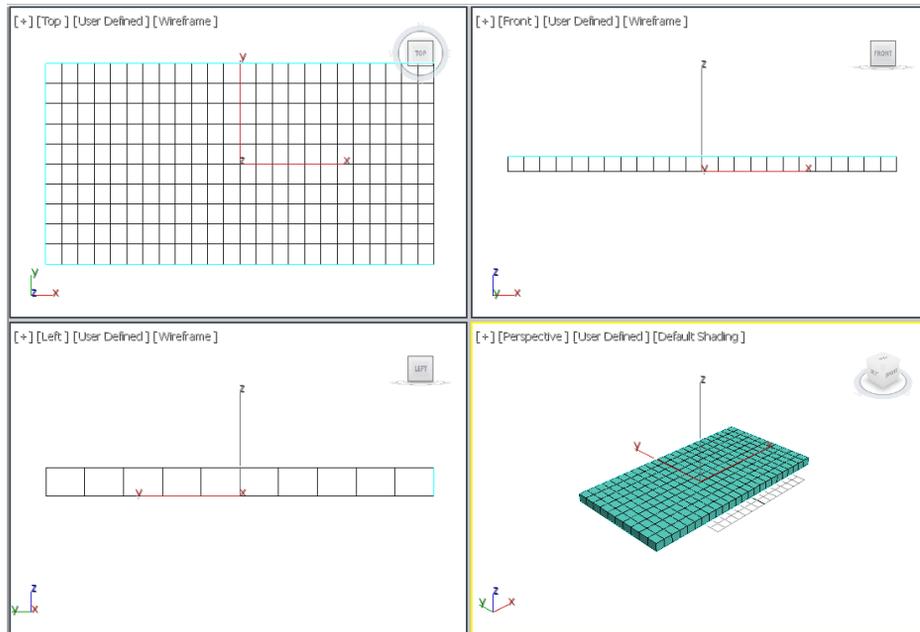


Figure 9-60 The computer table geometry displayed in the viewports

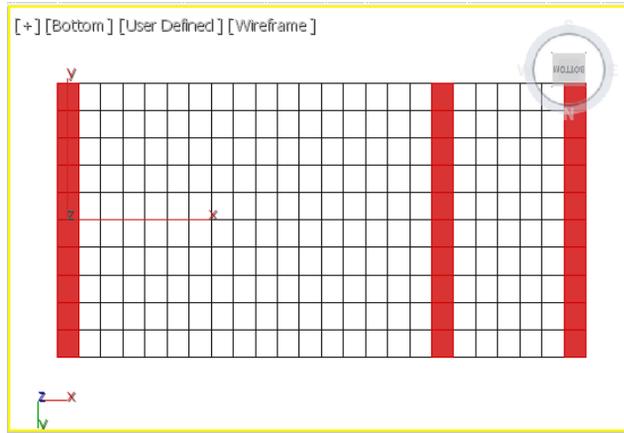


Figure 9-61 Selected polygons of computer table

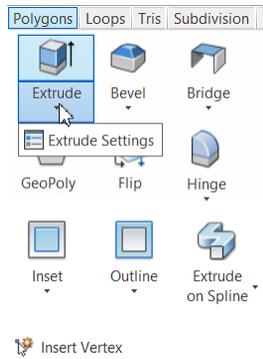


Figure 9-62 Choosing *Extrude Settings* from the *Extrude* drop-down

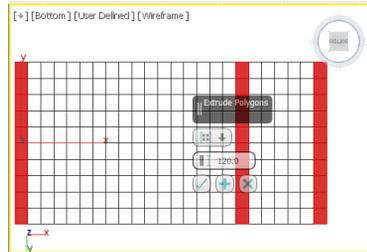


Figure 9-63 The *Extrude Polygons* caddy control

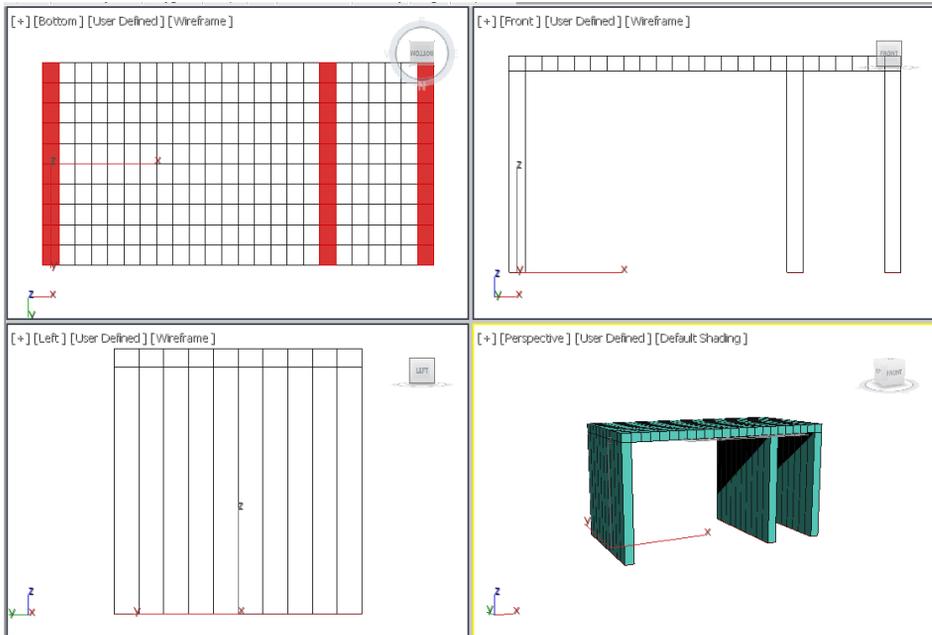


Figure 9-64 The selected polygons extruded

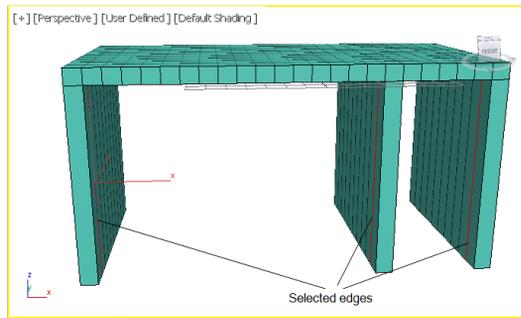


Figure 9-65 Selected edges of computer table

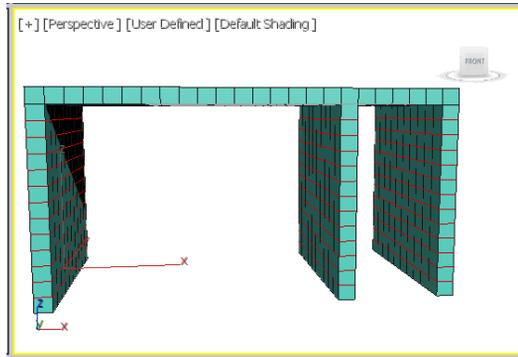


Figure 9-66 Edges added to the computer table

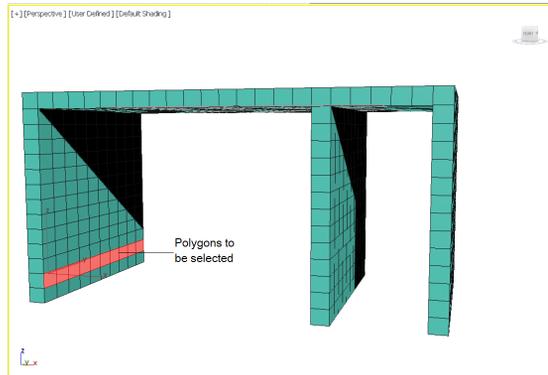


Figure 9-67 The selected polygons of computer table

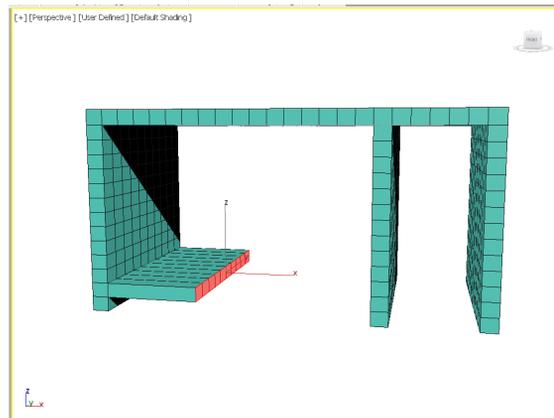


Figure 9-68 The extruded polygons of computer table

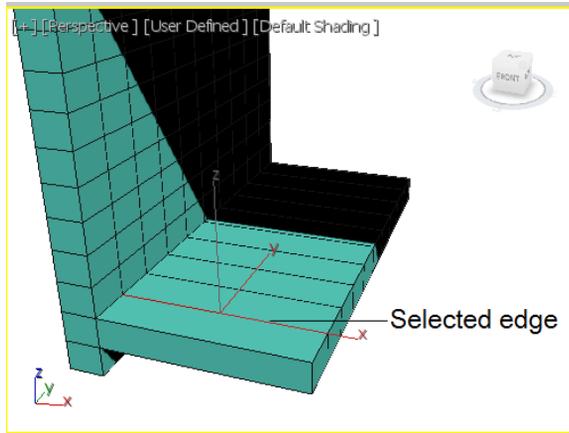


Figure 9-69 The selected edge of computer table

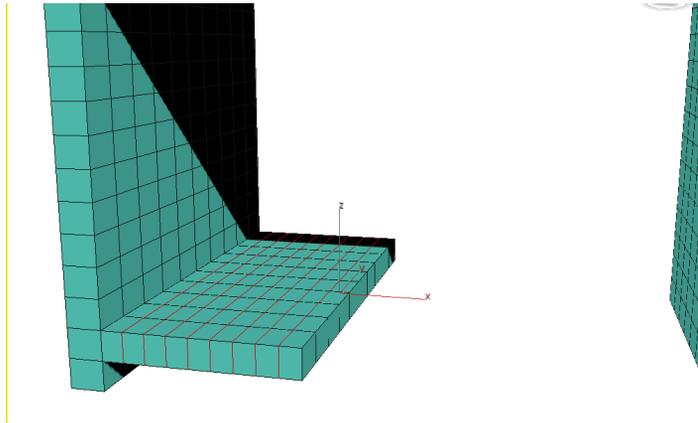


Figure 9-70 Edges added to the computer table

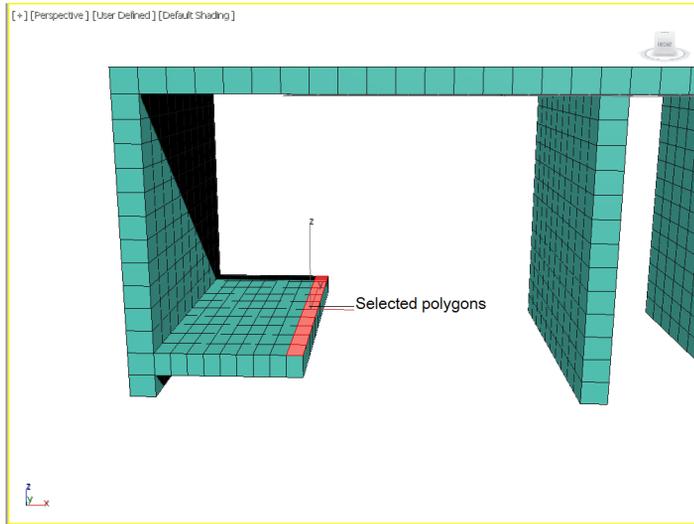


Figure 9-71 Selected polygons of computer table

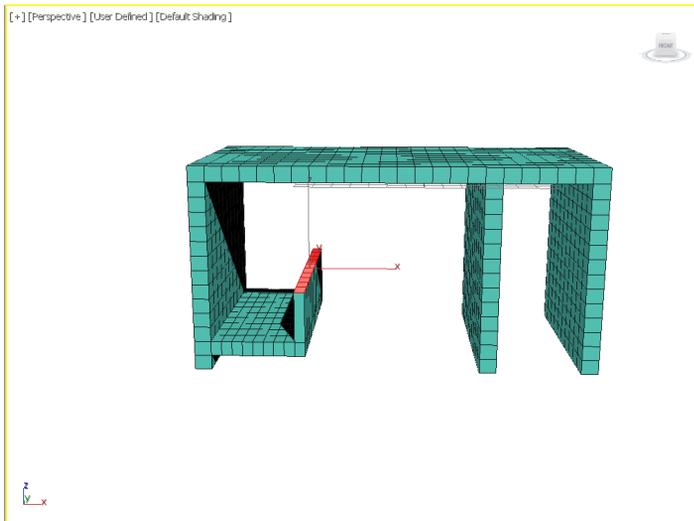


Figure 9-72 Extruded polygons of computer table

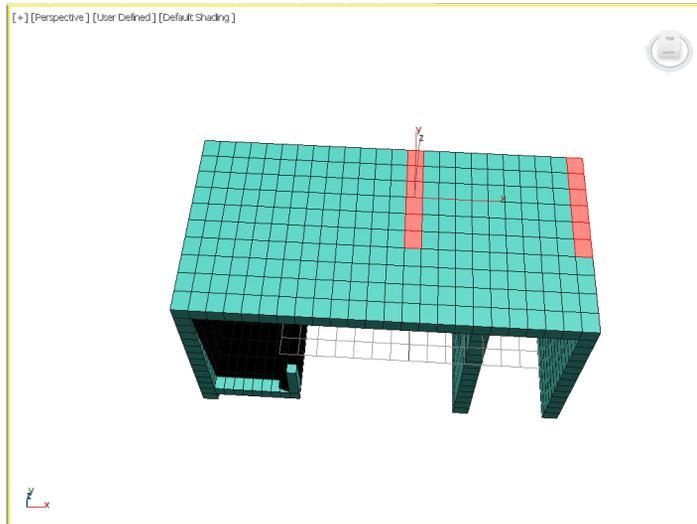


Figure 9-73 Selected polygons of computer table

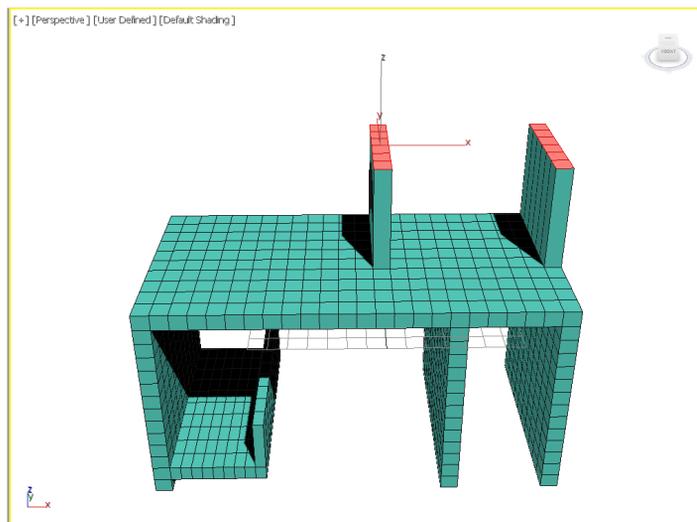


Figure 9-74 Extruded polygons of computer table

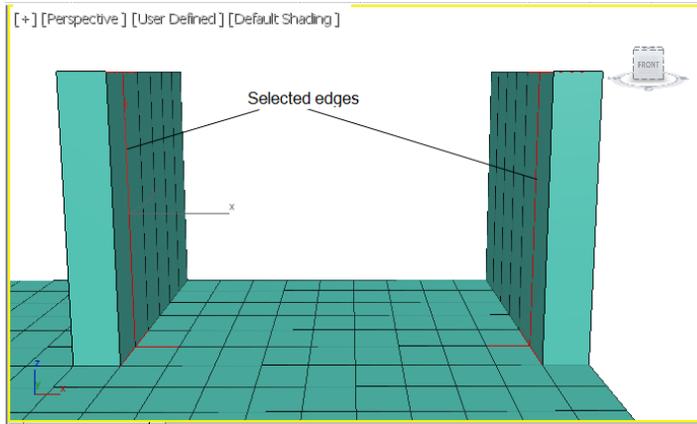


Figure 9-75 Selected edges of the extruded part

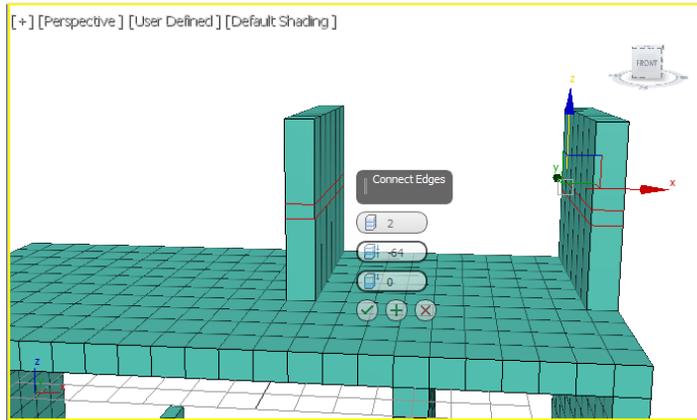


Figure 9-76 Added edges at the center of the extruded part

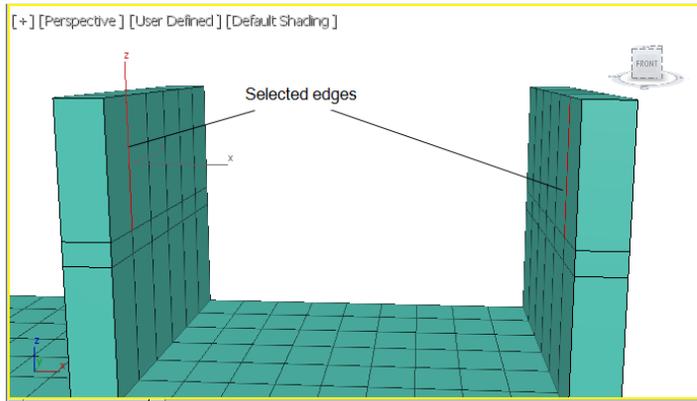


Figure 9-77 Selected edges from the upper portion of extruded part

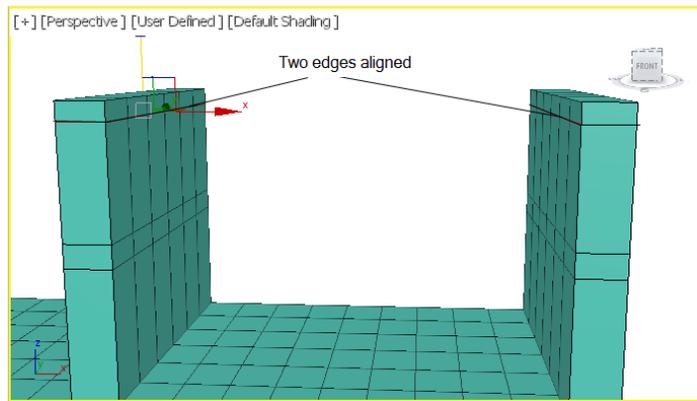


Figure 9-78 Two edges aligned

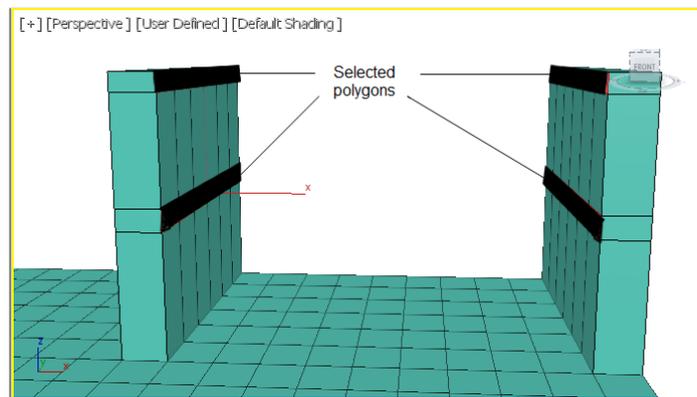


Figure 9-79 Selected polygons of the extruded part

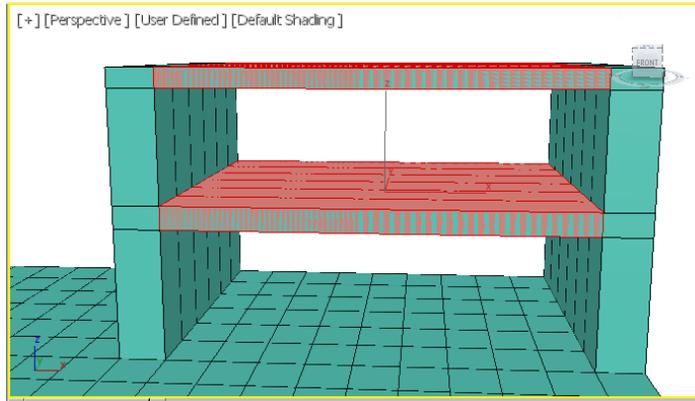


Figure 9-80 Selected polygons connected by bridges

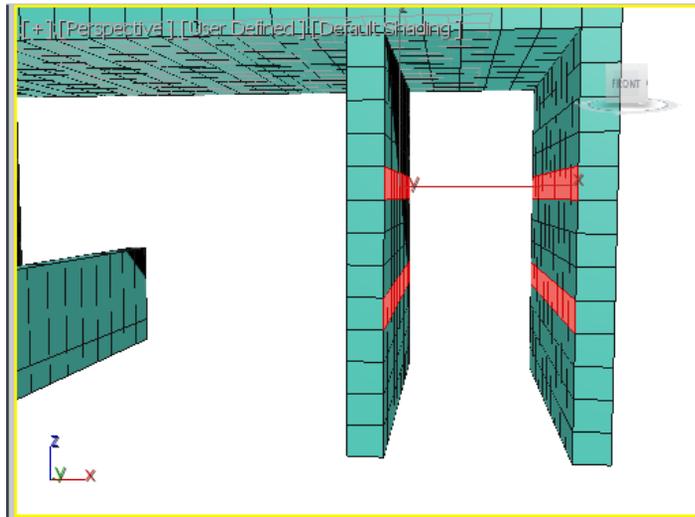


Figure 9-81 Selected polygons of the lower parts

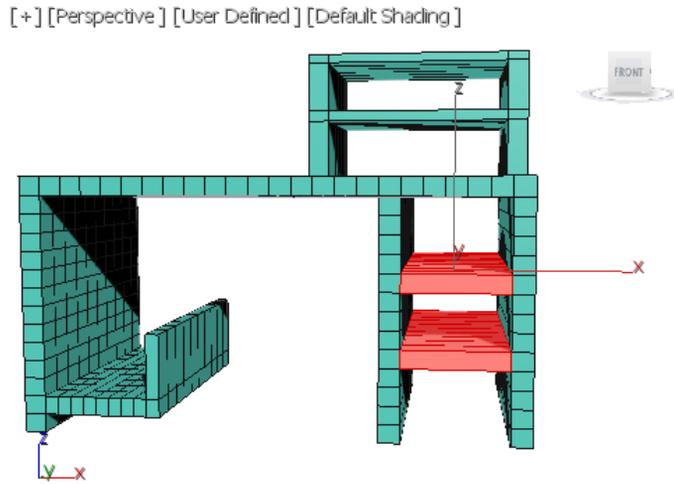


Figure 9-82 Selected polygons connected by bridge

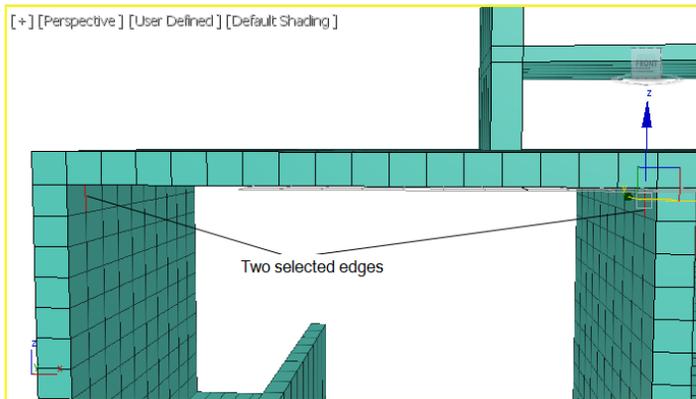


Figure 9-83 Two edges selected from the lower left part

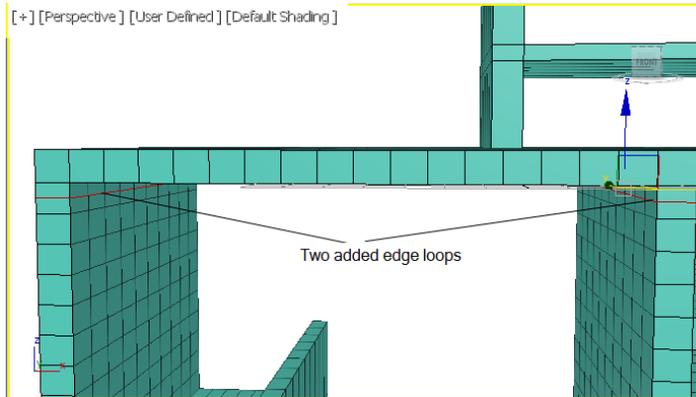


Figure 9-84 Two added edge loops

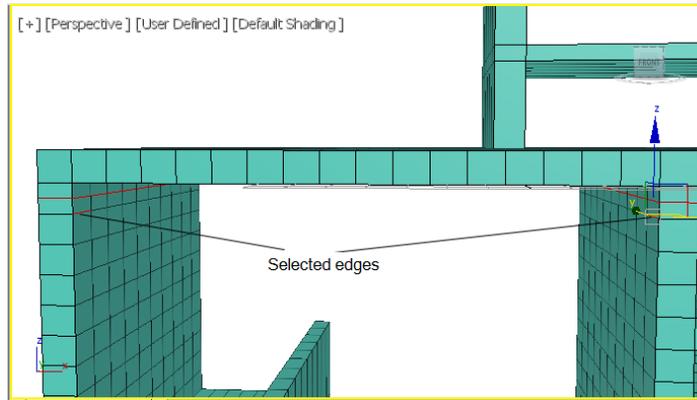


Figure 9-85 Two edges selected

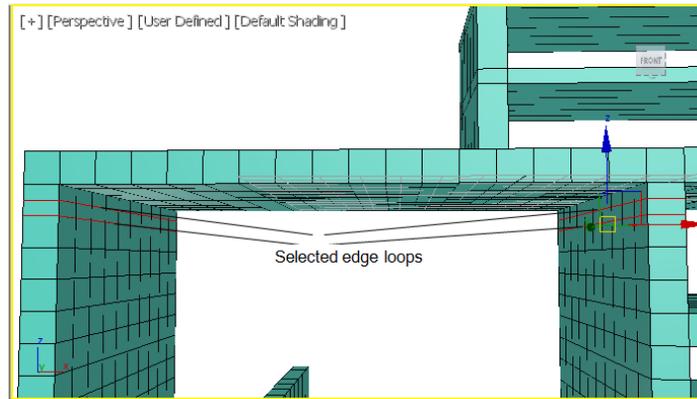


Figure 9-86 Selected edge loops

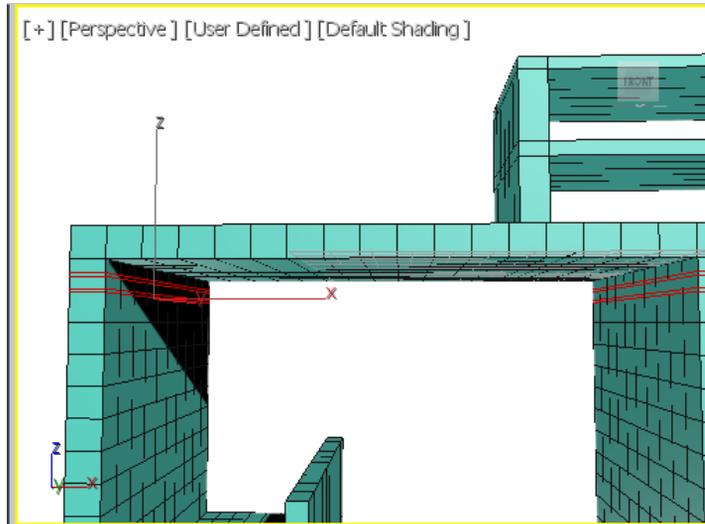


Figure 9-87 Two edge loops chamfered

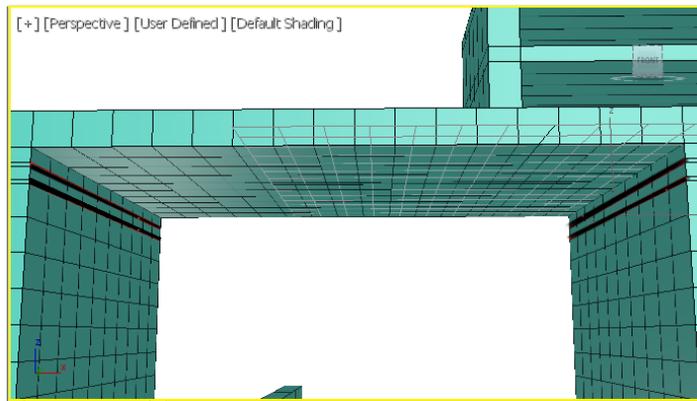


Figure 9-88 Selected polygons between the chamfered edges

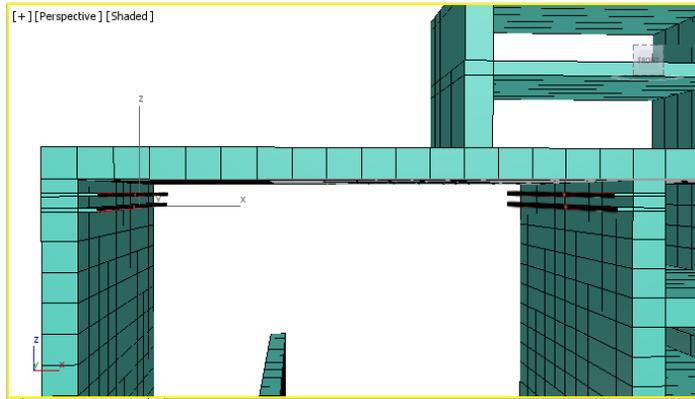


Figure 9-89 Selected polygons extruded

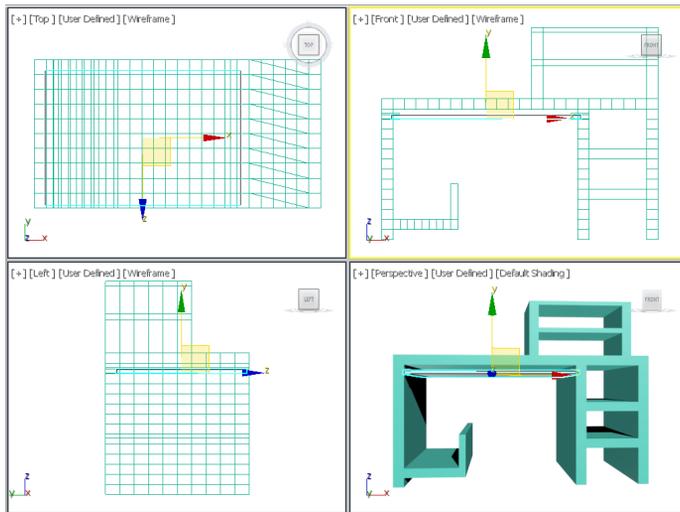


Figure 9-90 The Keyboard support geometry aligned in the viewports



Figure 9-91 The rendered model of computer table



Figure 9-92 The model of the guitar

10

NURBS Modeling

Learning Objectives

After completing this chapter, you will be able to:

- *Create NURBS curves*
- *Create NURBS surfaces*
- *Convert splines into NURBS curves*
- *Convert splines and extended splines into NURBS surfaces*
- *Convert primitives into NURBS surfaces*
- *Create NURBS models*
- *Understand NURBS sub-objects*



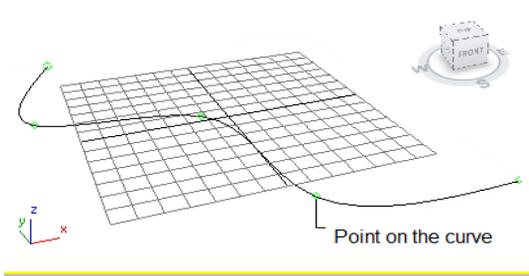


Figure 10-1 A point curve

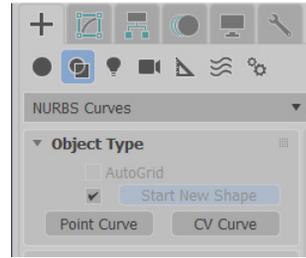


Figure 10-2 The tools for creating NURBS curves

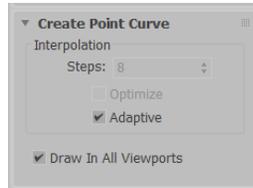


Figure 10-3 The Create Point Curve rollout

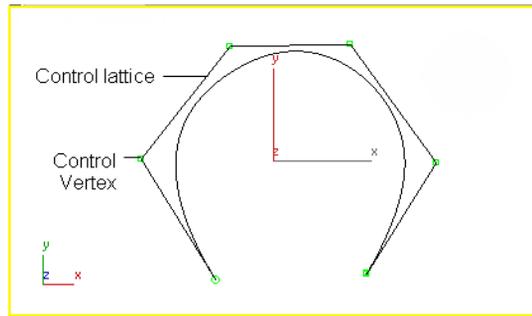


Figure 10-4 A CV curve

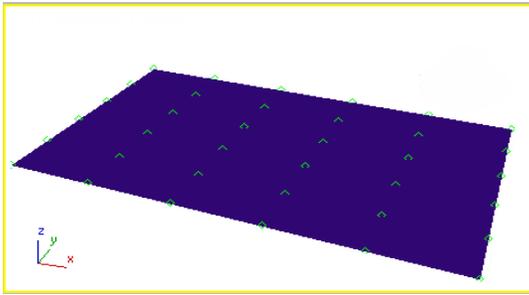


Figure 10-5 A point surface

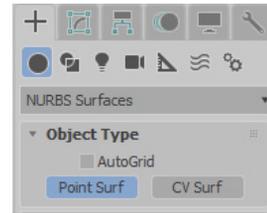


Figure 10-6 The tools displayed to create NURBS surfaces

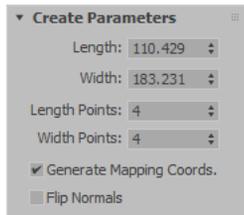


Figure 10-7 The Create Parameters rollout

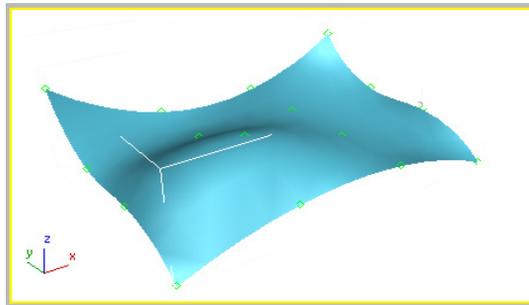


Figure 10-8 The points in the point surface moved

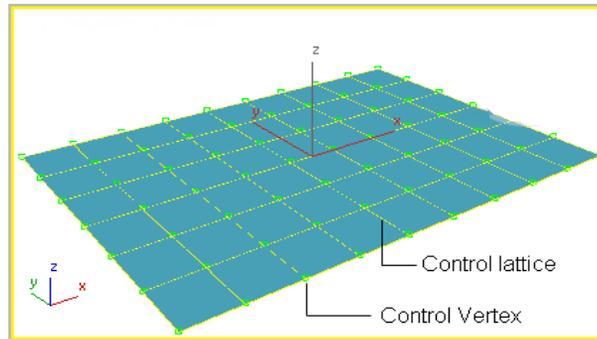


Figure 10-9 A CV surface

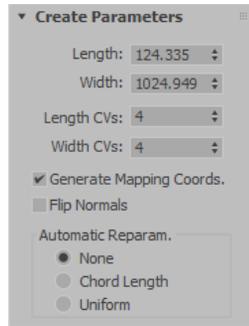


Figure 10-10 *The Create Parameters rollout*

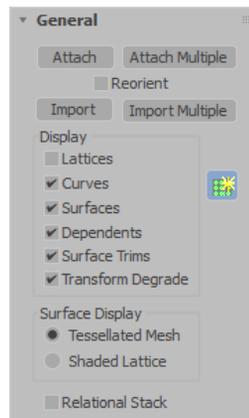


Figure 10-11 *The General rollout*

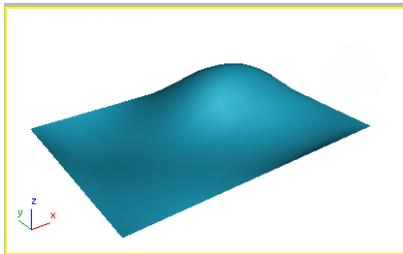


Figure 10-12 *The NURBS surface object displayed as a mesh object*

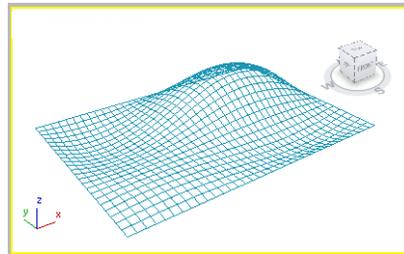


Figure 10-13 *The NURBS surface object displayed as iso lines*

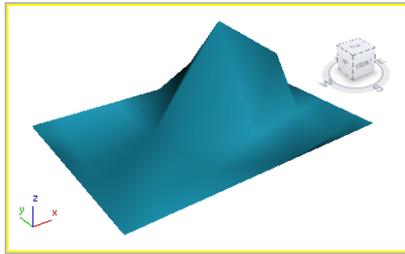


Figure 10-14 The NURBS surface object displayed as shaded lattices

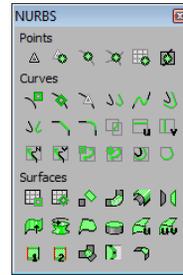


Figure 10-15 The NURBS toolbox

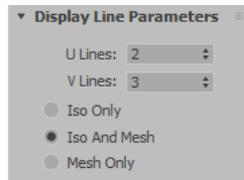


Figure 10-16 The *Display Line Parameters* rollout

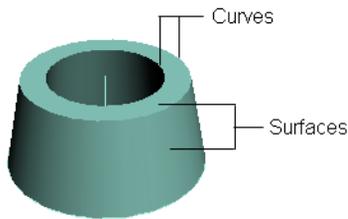


Figure 10-17 The dependent and independent sub-objects in a loft object

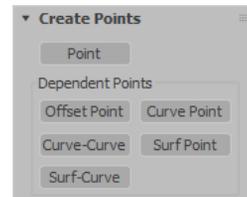


Figure 10-18 The *Create Points* rollout

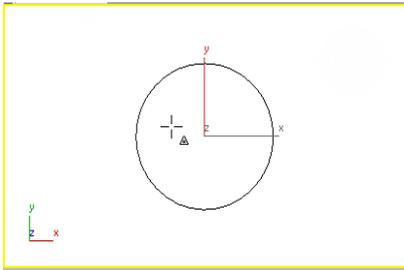


Figure 10-19 The cursor displayed to create independent points

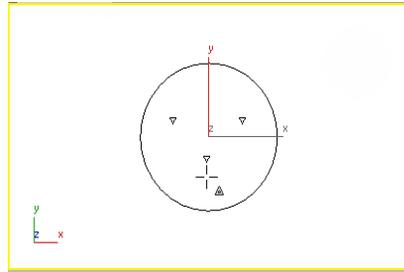


Figure 10-20 The independent points created in the viewport

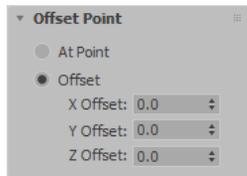


Figure 10-21 The **Offset Point** rollout

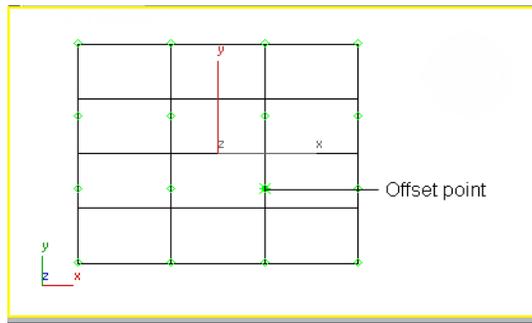


Figure 10-22 The offset point displayed

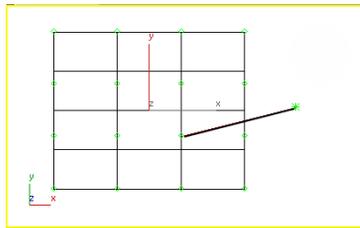


Figure 10-23 The red line displayed between the parent point and the offset point

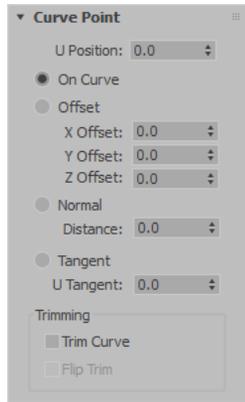


Figure 10-24 The *Curve Point* rollout

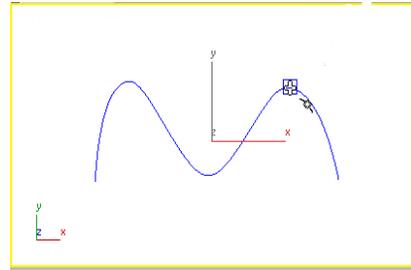


Figure 10-25 A blue box displayed along with the cursor

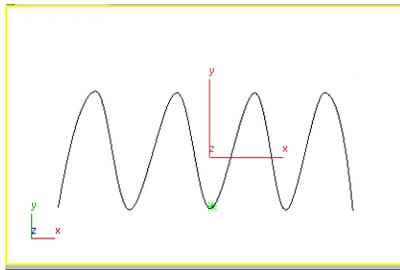


Figure 10-26 A curve point placed on the curve

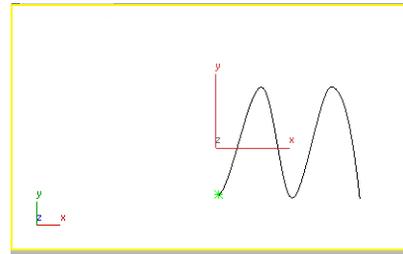


Figure 10-27 The curve after selecting the *Trim Curve* check box

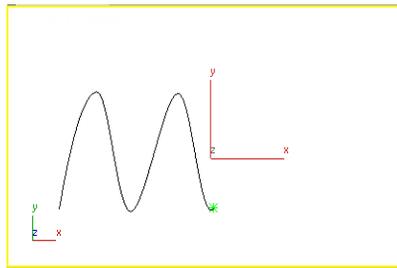


Figure 10-28 The curve after selecting the *Flip Trim* check box

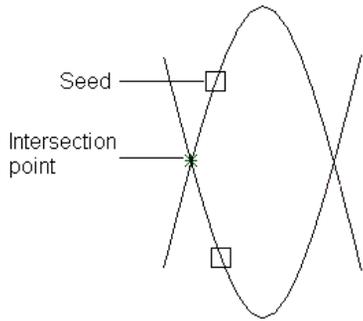


Figure 10-29 The intersection point created

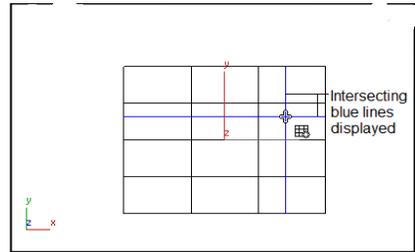


Figure 10-30 The blue lines displayed

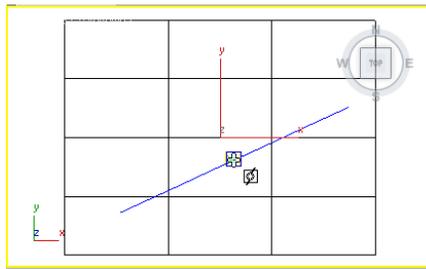


Figure 10-31 A seed created on the NURBS curve

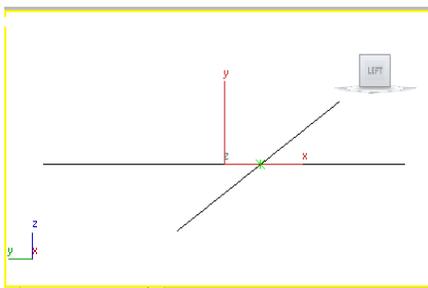


Figure 10-32 A surface curve intersection point created in the Left viewport

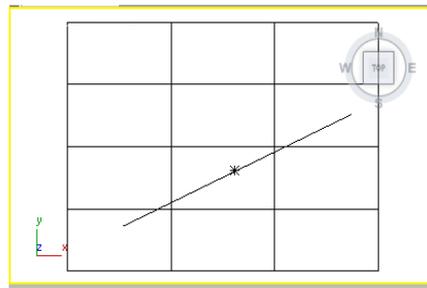


Figure 10-33 A surface curve intersection point created in the Top viewport

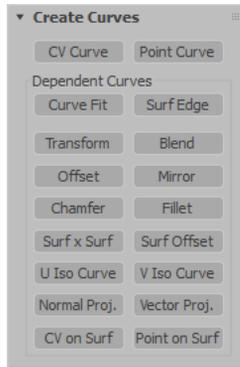


Figure 10-34 The Create Curves rollout

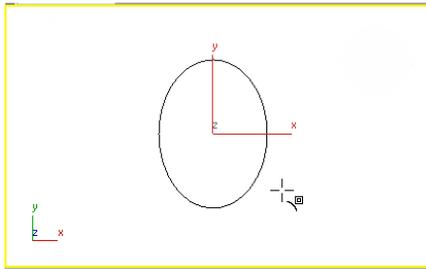


Figure 10-35 The changed shape of the cursor

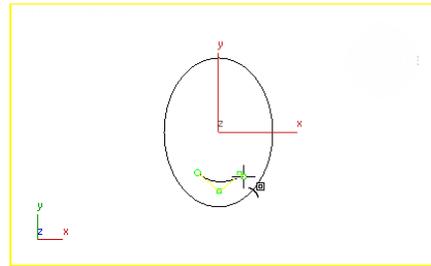


Figure 10-36 The new CV curve created

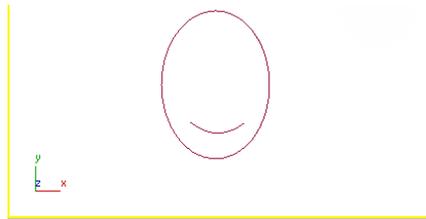


Figure 10-37 The new CV curve attached to the NURBS object

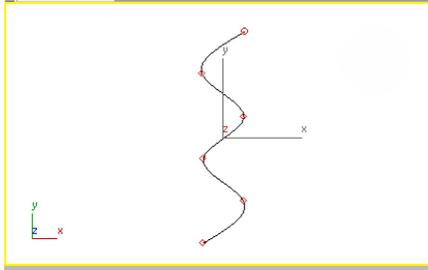


Figure 10-38 A NURBS curve object

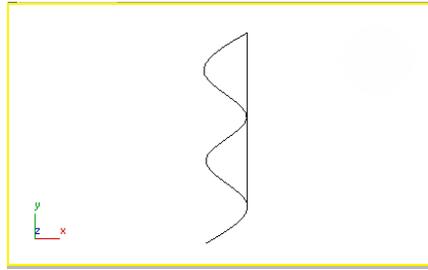


Figure 10-39 A fit curve created between the points in a NURBS curve object

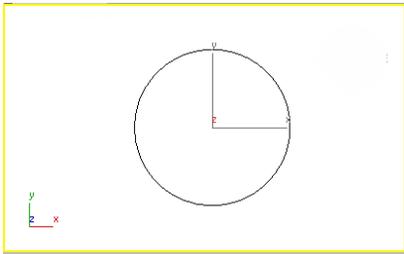


Figure 10-40 A NURBS curve object

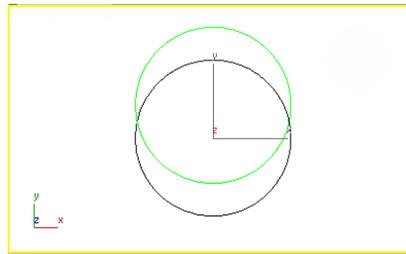


Figure 10-41 A transform curve created

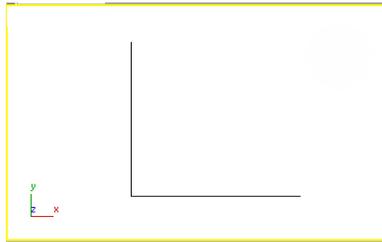


Figure 10-42 A NURBS curve to create a chamfer curve

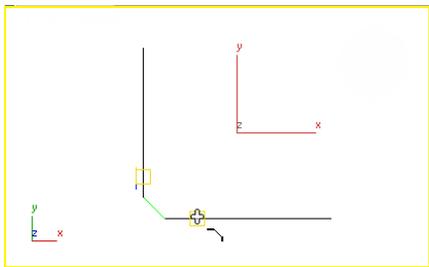


Figure 10-43 The seeds placed on the curves

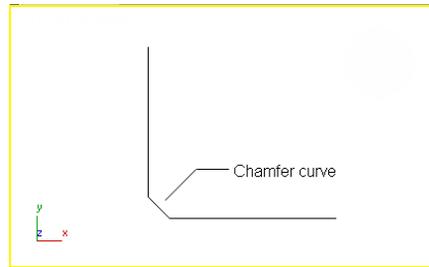


Figure 10-44 A chamfer curve created

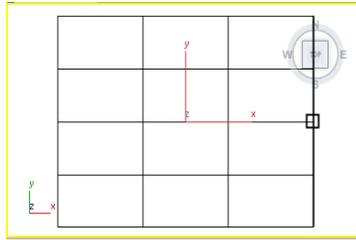


Figure 10-45 A surface edge curve created



Figure 10-46 The Create Surfaces rollout

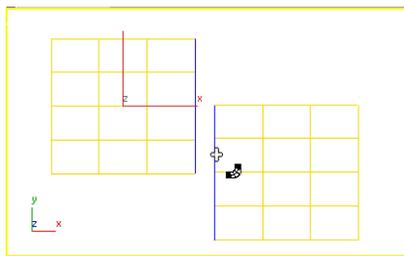


Figure 10-47 The cursor placed over another edge

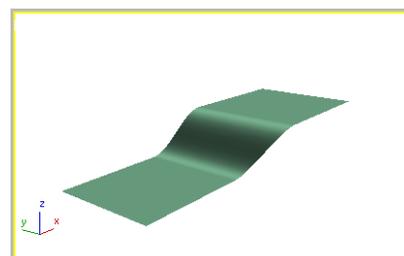


Figure 10-48 A blend surface created

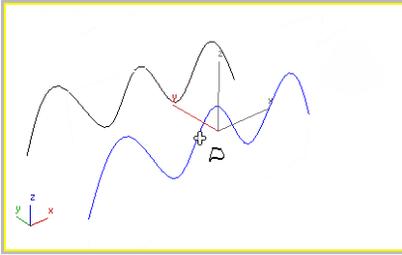


Figure 10-49 The cursor displayed to create the ruled surface

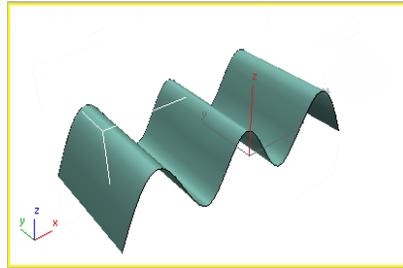


Figure 10-50 A ruled surface created

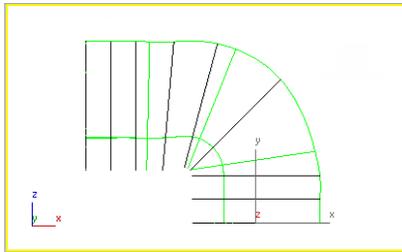


Figure 10-51 The green iso lines of the U loft surface displayed

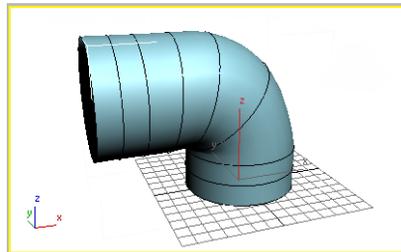


Figure 10-52 A U loft surface created

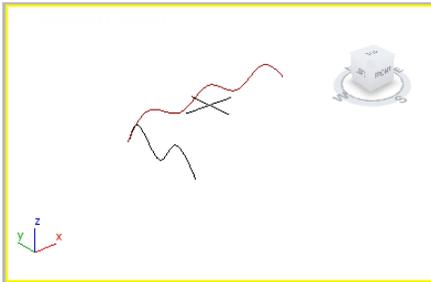


Figure 10-53 The curves to create 1-rail surface

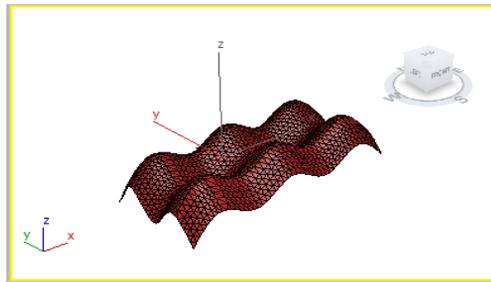


Figure 10-54 The 1-rail surface created

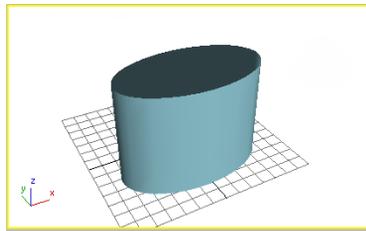


Figure 10-55 An open ended closed surface

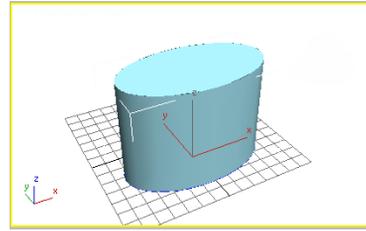


Figure 10-56 A cap created to cap the open end of the closed surface

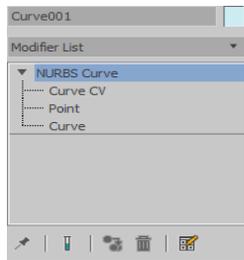


Figure 10-57 The sub-object levels displayed in the modifier stack

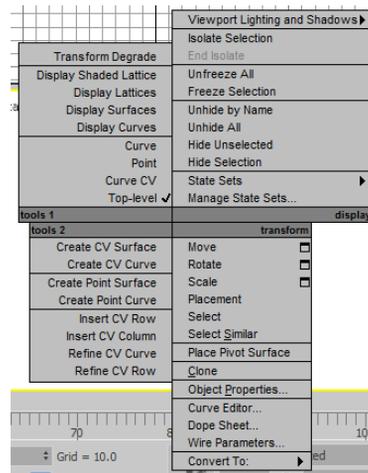


Figure 10-58 The quad menu displayed



Figure 10-59 The model of a washbasin

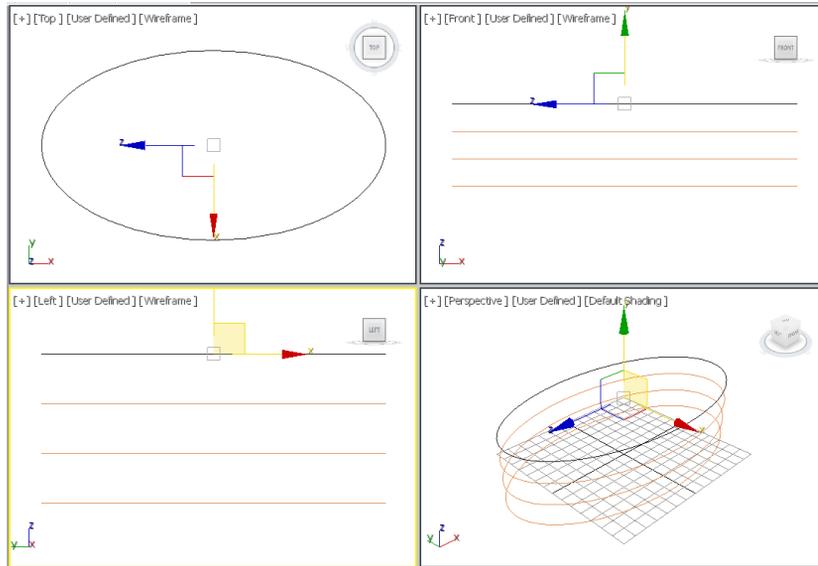


Figure 10-60 All ellipses displayed in viewports

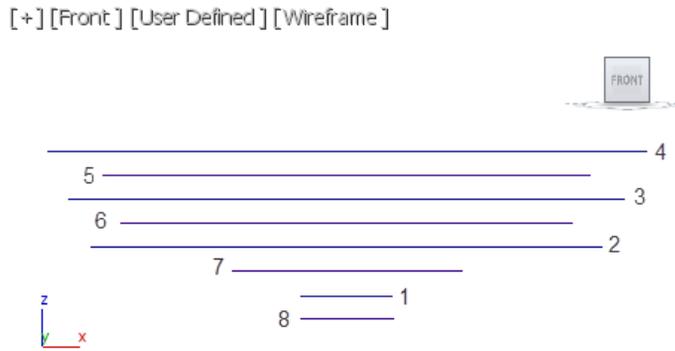


Figure 10-61 All NURBS curves scaled in the Front viewport

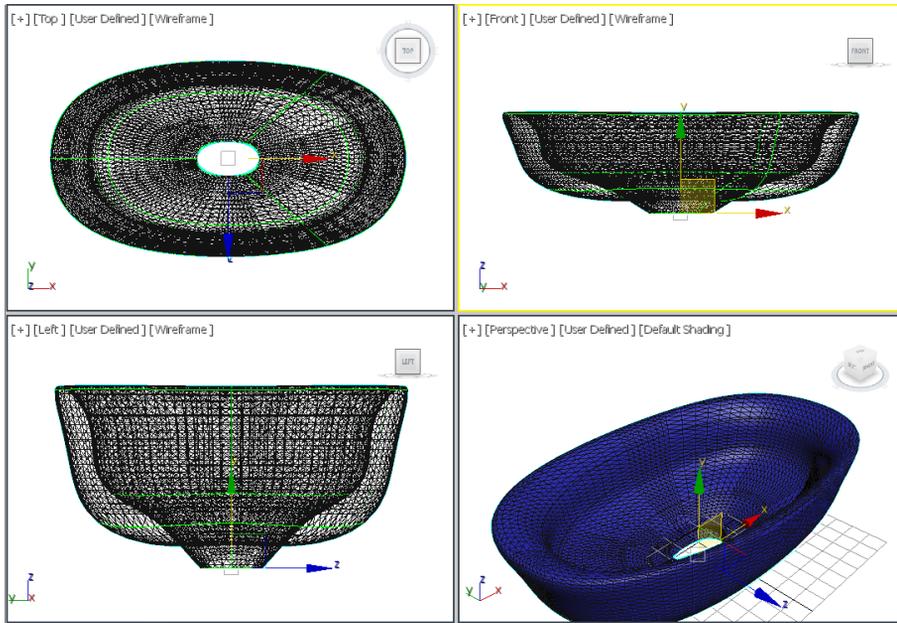


Figure 10-62 A NURBS surface created in viewports

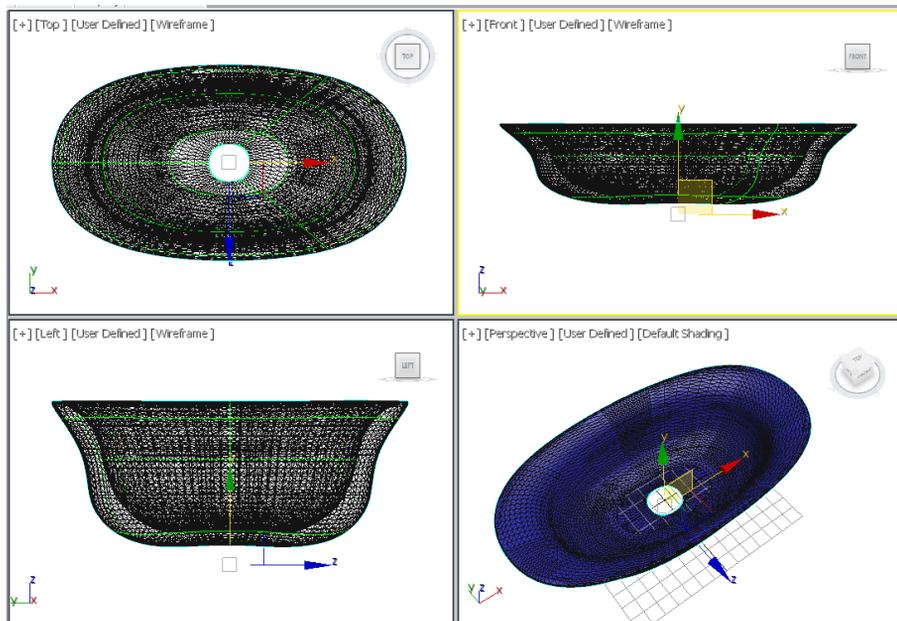


Figure 10-63 The washbasin modified at the Curve sub-object level

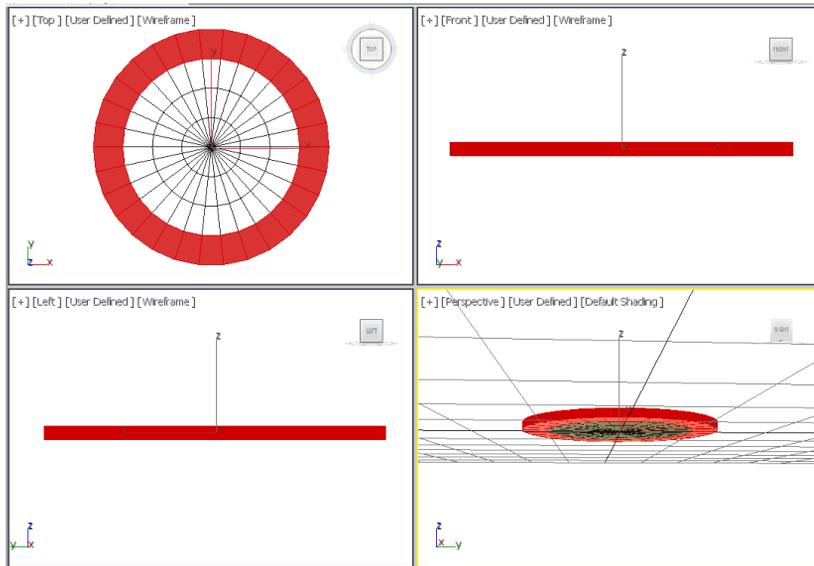


Figure 10-64 Selected polygons of sieve

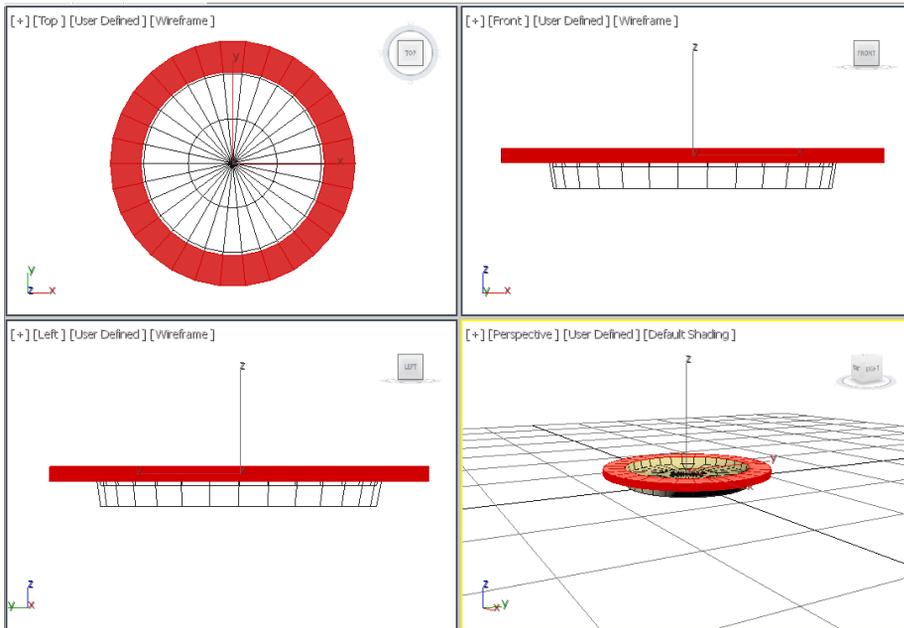


Figure 10-65 The selected polygons moved and scaled

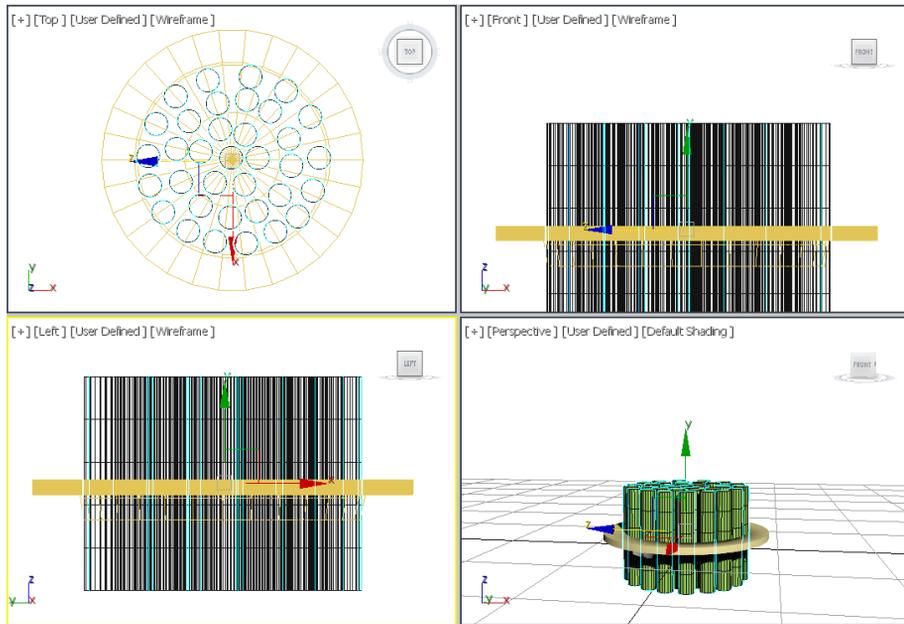


Figure 10-66 Cylinders created and aligned

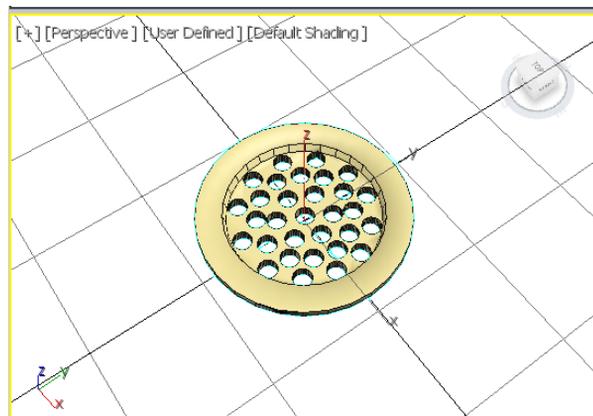


Figure 10-67 A sieve created in the Perspective viewport

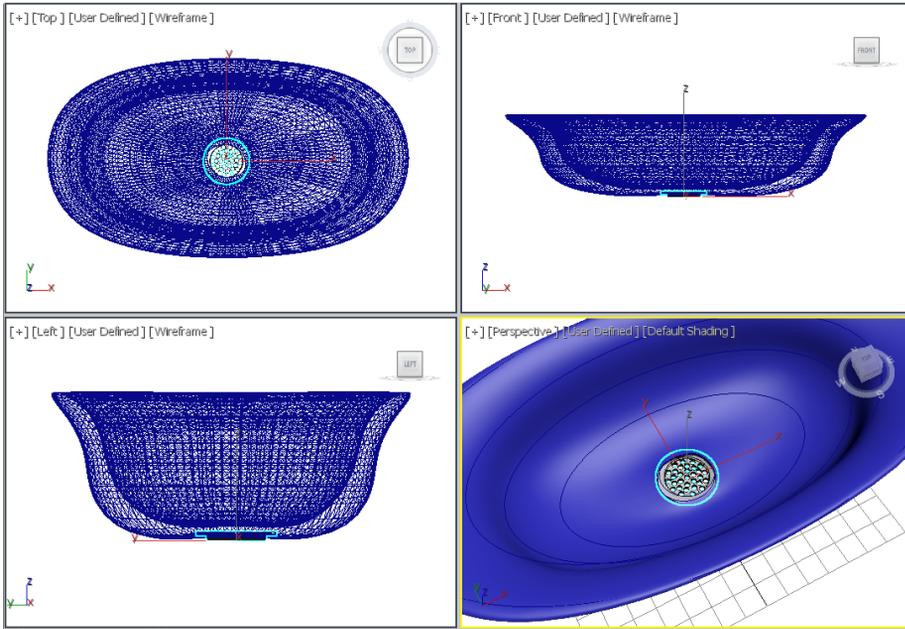


Figure 10-68 A sieve created and aligned in viewports

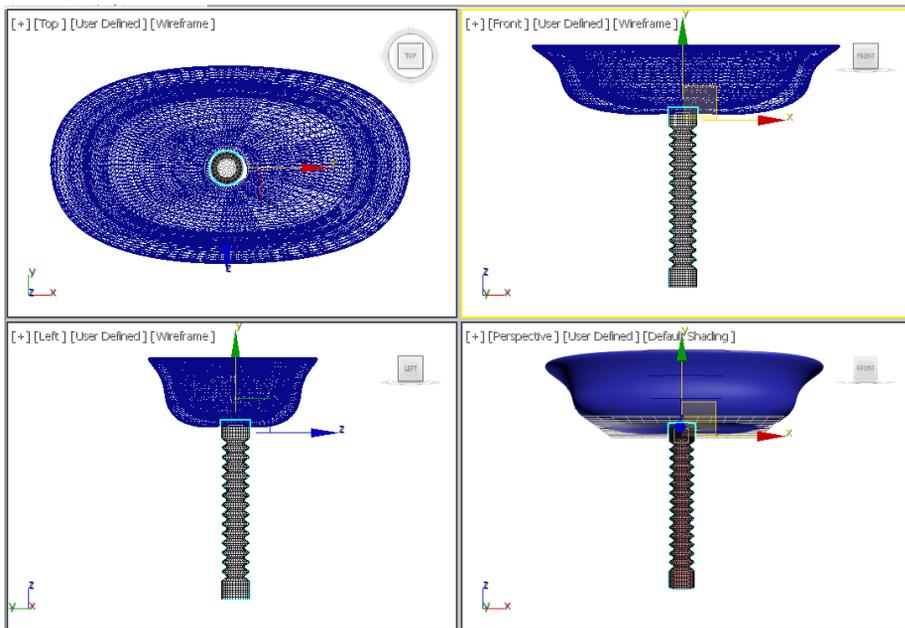


Figure 10-69 A duct created and aligned in viewports

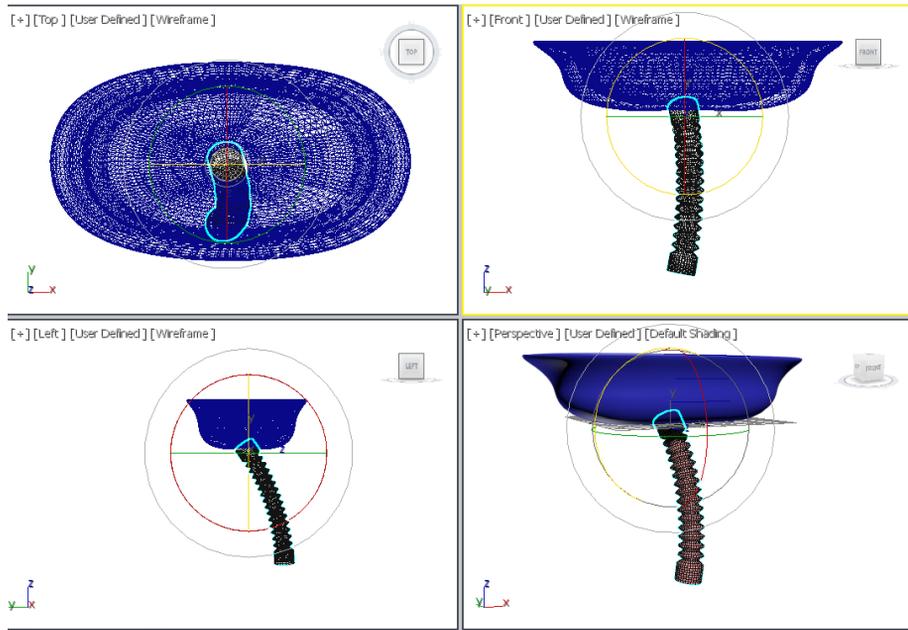


Figure 10-70 The duct geometry rotated and aligned in viewports

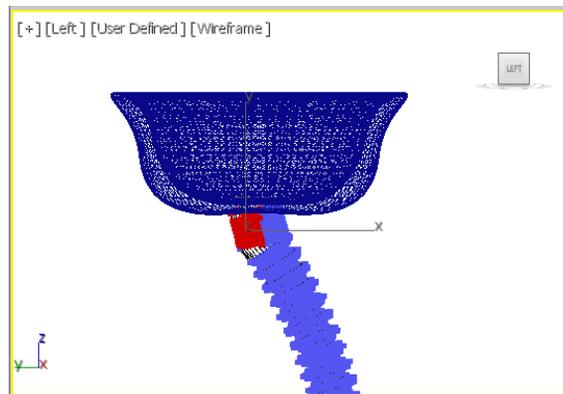


Figure 10-71 The vertices of duct aligned in the Left viewport

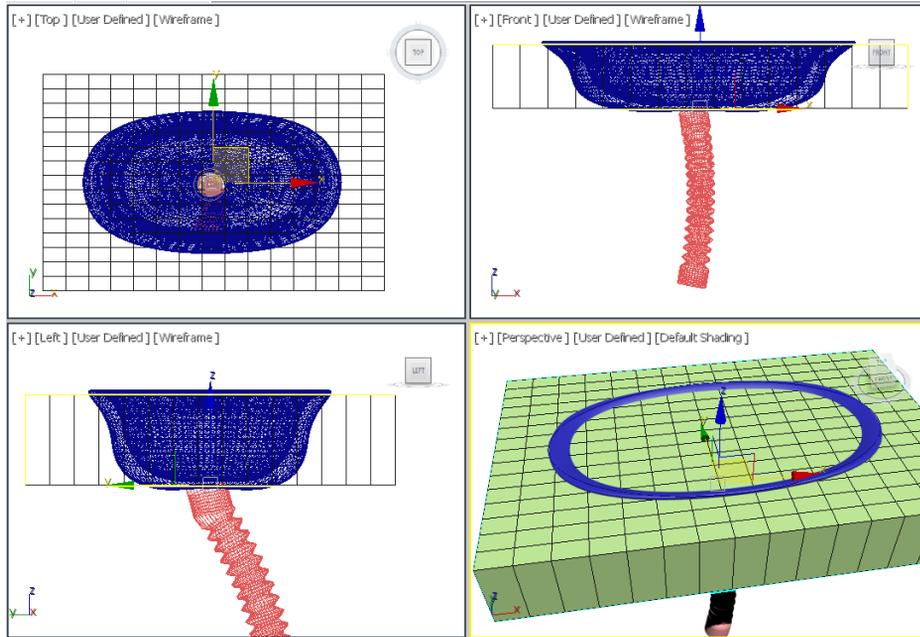


Figure 10-72 The washbasin slab created and aligned in viewports

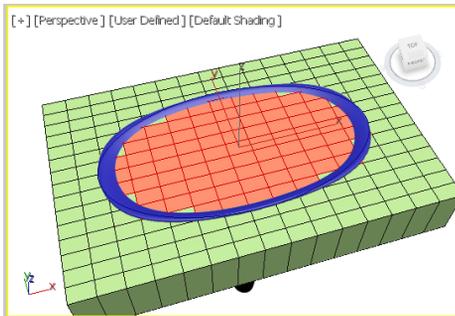


Figure 10-73 The inner polygons selected to be deleted

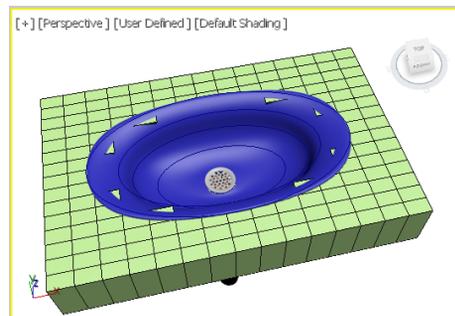


Figure 10-74 The washbasin slab after deleting the polygons

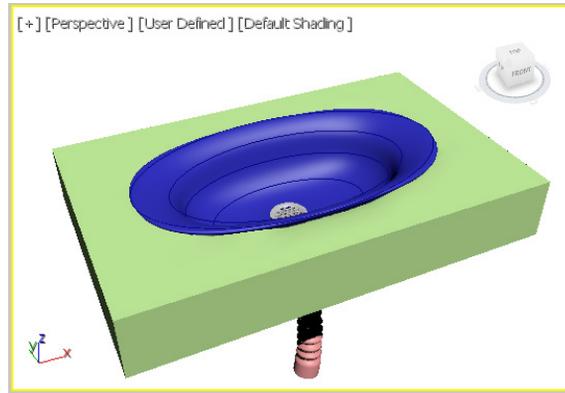


Figure 10-75 The vertices moved to view the inner portion of washbasin

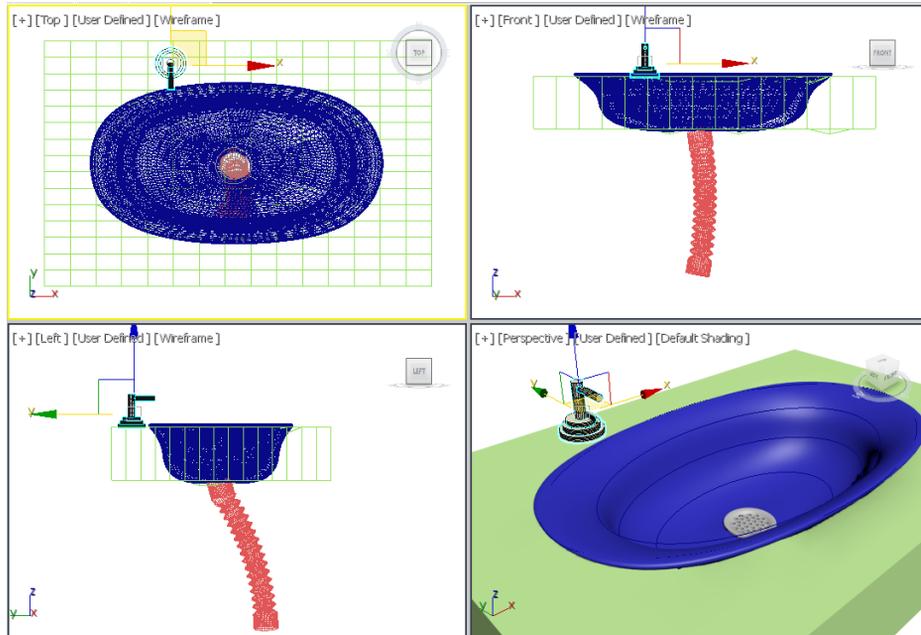


Figure 10-76 The tap01 geometry created and aligned in viewports

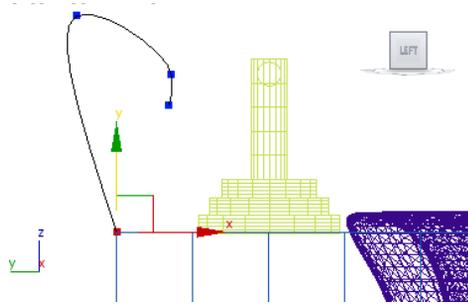


Figure 10-77 The line spline created in the Left viewport



Figure 10-78 Alignment of upper tap and base

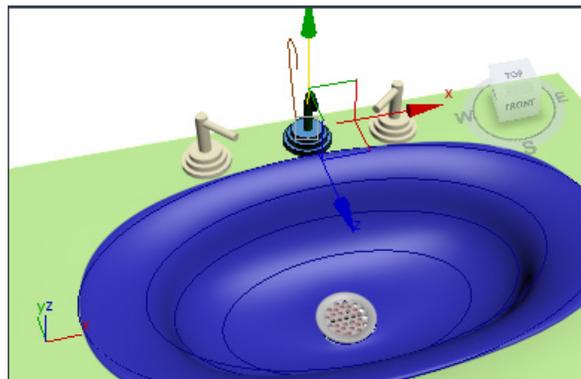


Figure 10-79 Alignment of the main tap in viewports



Figure 10-80 The model of hat (view 1)



Figure 10-81 The model of hat (view 2)

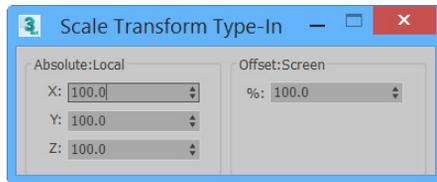


Figure 10-82 The Scale Transform Type-In dialog box

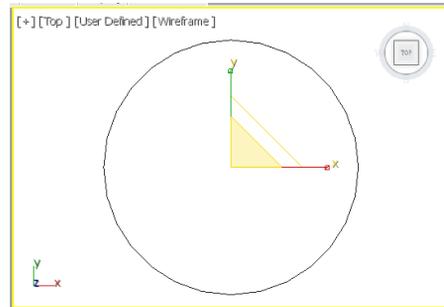


Figure 10-83 The Circle001 spline scaled along the X-axis

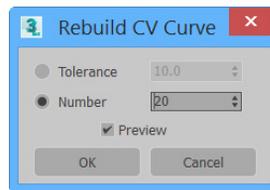


Figure 10-84 The Rebuild CV Curve dialog box

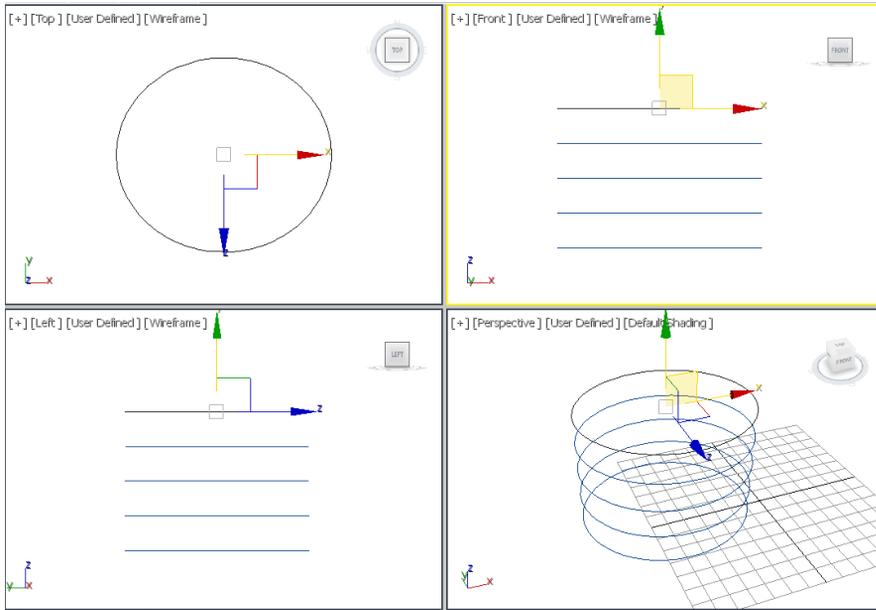


Figure 10-85 The circular NURBS curves displayed in viewports



Figure 10-86 The Circle001 spline moved vertically

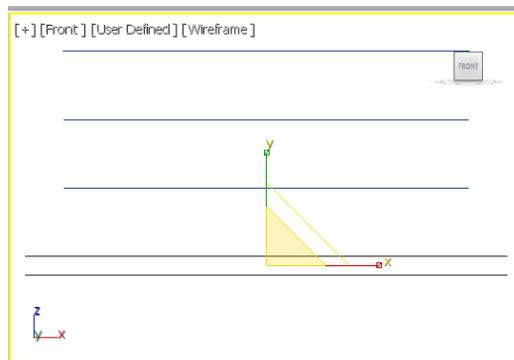


Figure 10-87 The Circle001 and Circle002 splines scaled vertically

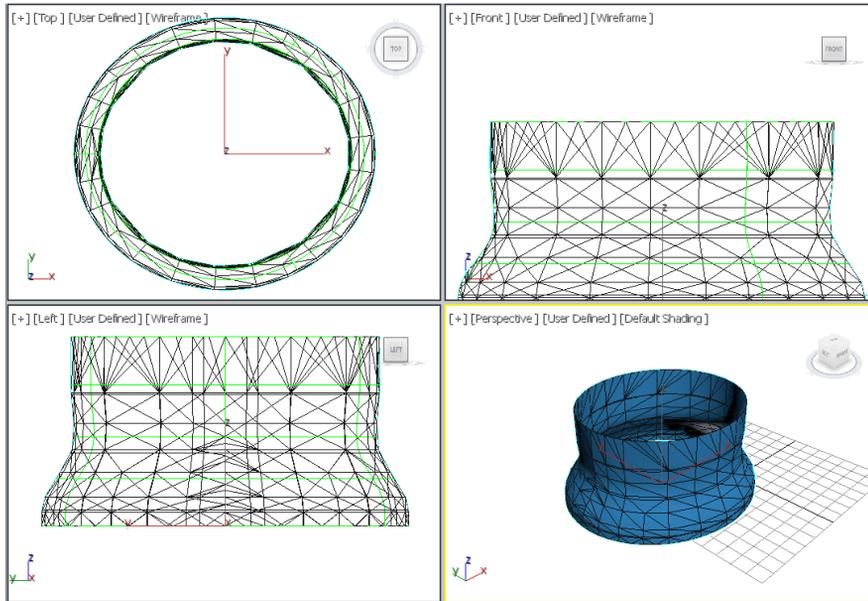


Figure 10-88 A NURBS surface created

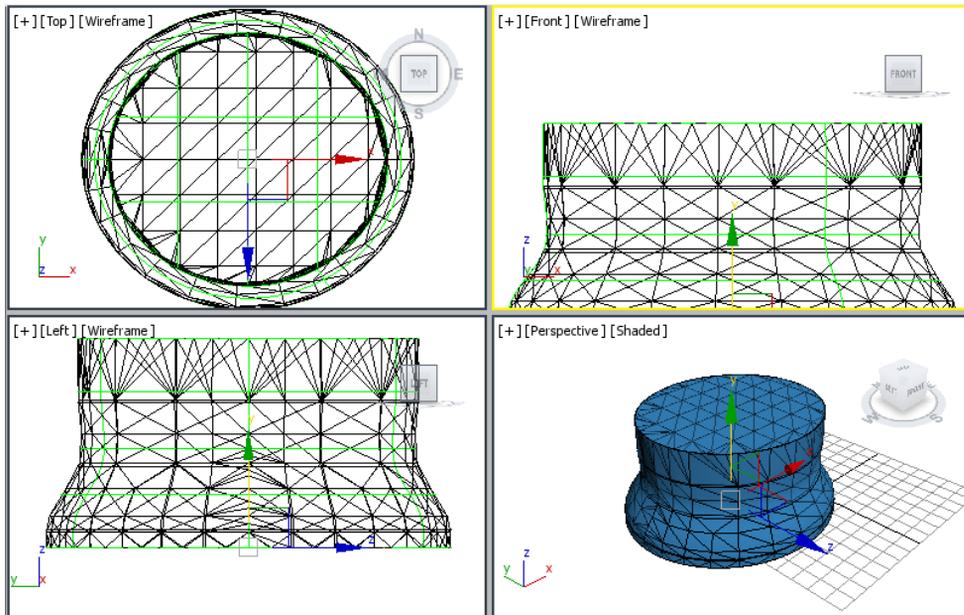


Figure 10-89 The NURBS surface capped at one end

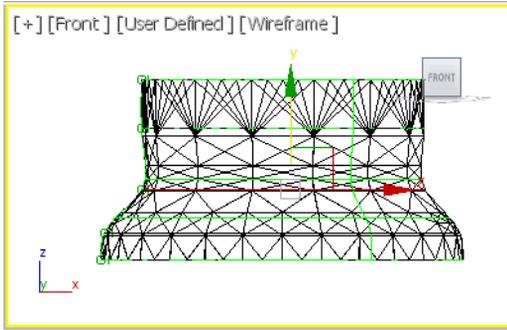


Figure 10-90 The NURBS curves modified in the Front viewport

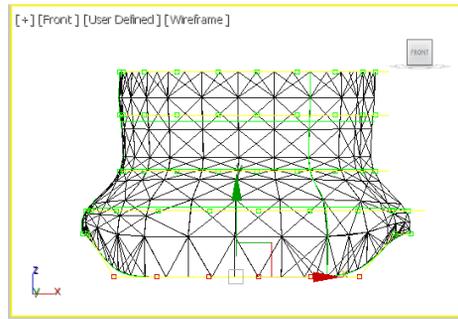


Figure 10-91 The outer control vertices moved vertically

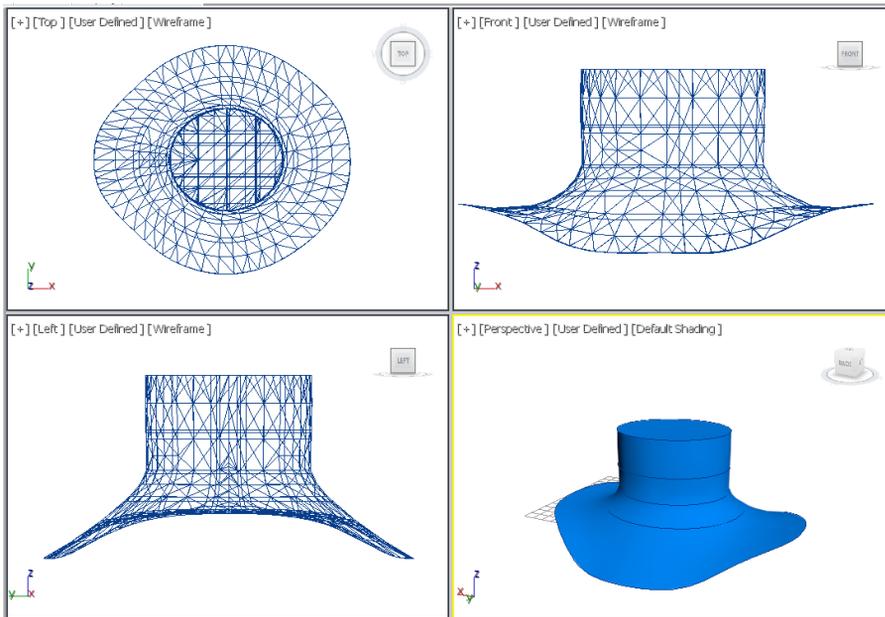


Figure 10-92 The surface modified at the sub-object level



Figure 10-93 The final output after rendering

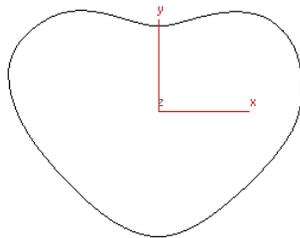


Figure 10-94 The NURBS curve to create the model of heart



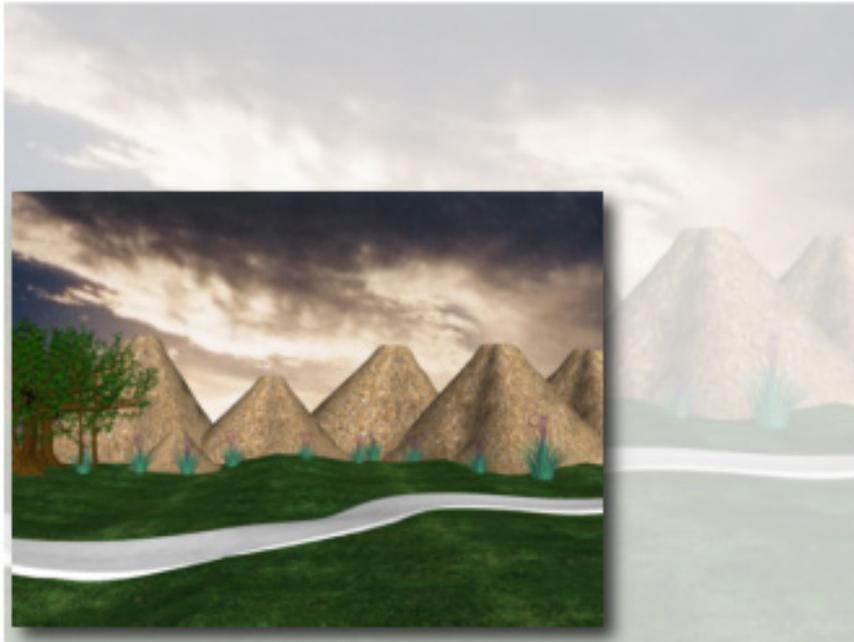
Figure 10-95 The model of heart

Compound Objects

Learning Objectives

After completing this chapter, you will be able to:

- *Create compound objects*
- *Modify compound objects*



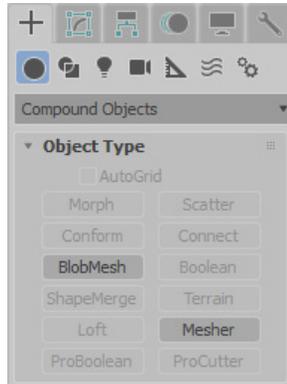


Figure 11-1 The tools for creating compound objects displayed in the rollout

[+] [Perspective] [Standard] [Edged Faces]

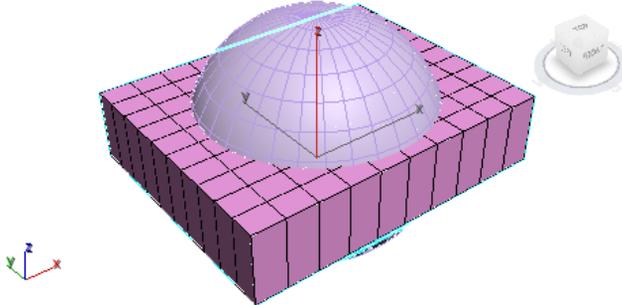


Figure 11-2 Two overlapping objects created in the viewport



Figure 11-3 Partial view of the rollouts displayed on choosing the **Boolean** tool



Figure 11-4 The **Operand** list

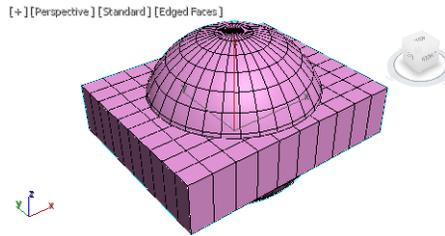


Figure 11-5 The result of the **Union** operation

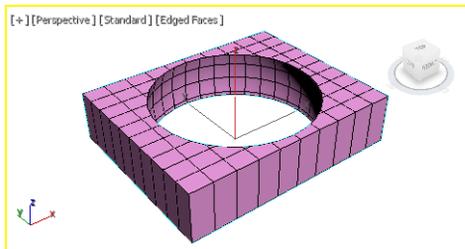


Figure 11-6 The result of the **Subtraction** operation

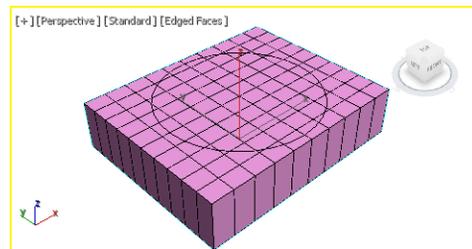


Figure 11-7 The result after selecting the **Imprint** check box

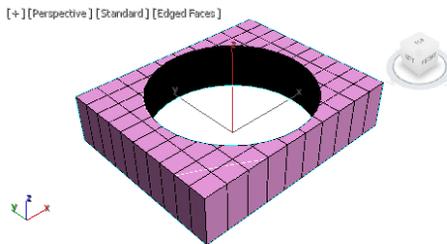


Figure 11-8 The result after selecting the **Cookie** check box

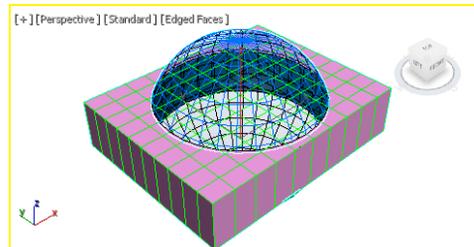


Figure 11-9 The result after selecting the **Operands** radio button

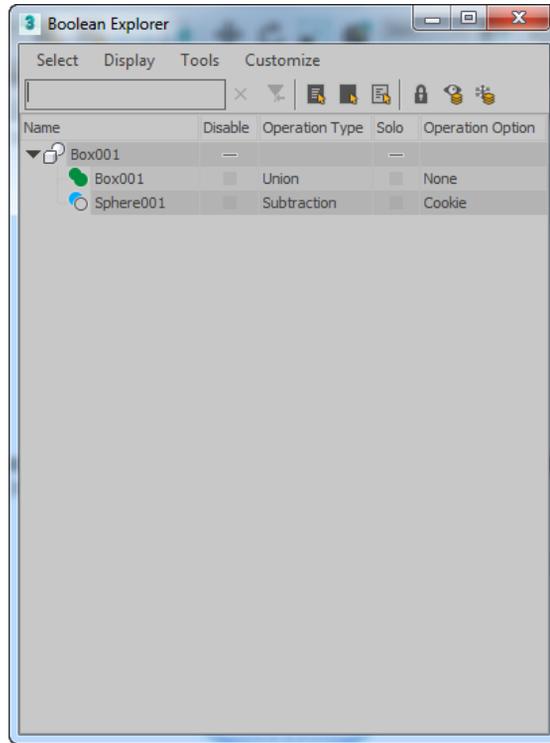


Figure 11-10 The *Boolean Explorer* dialog box

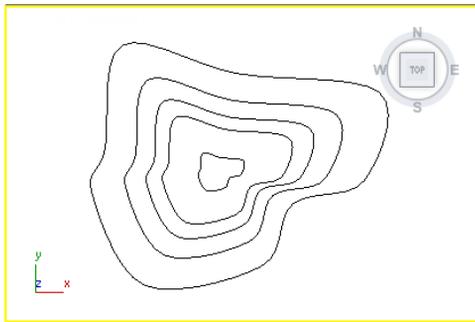


Figure 11-11 The contour lines created for the terrain object in the *Top* viewport

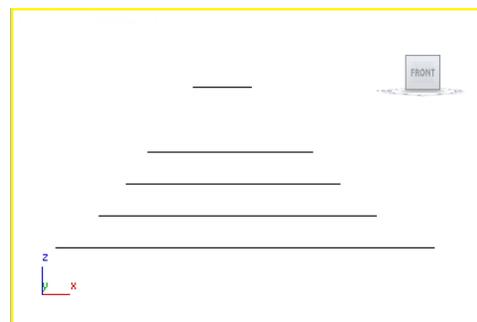


Figure 11-12 The contour lines aligned for the terrain object in the *Front* viewport

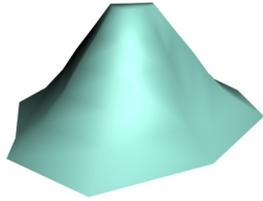


Figure 11-13 The terrain object created from the contour lines



Figure 11-14 The **Pick Operand** rollout



Figure 11-15 List of operands in the **Operands** area

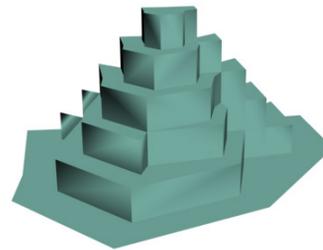


Figure 11-16 The terrain object with the **Layered Solid** radio button selected

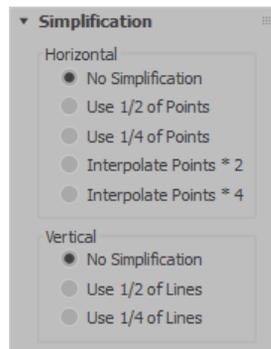


Figure 11-17 Different areas in the **Simplification** rollout

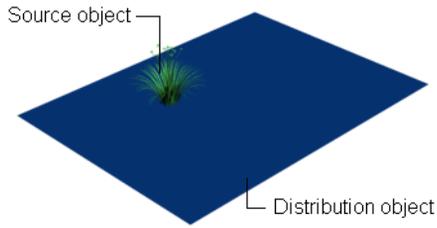


Figure 11-18 The distribution and source objects

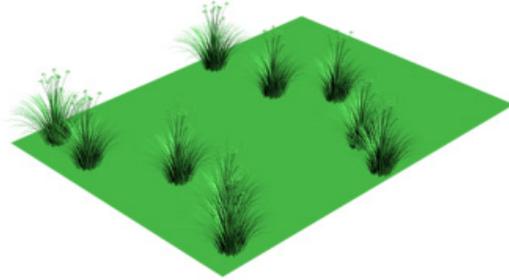


Figure 11-19 The duplicates of the source object distributed over the distribution object



Figure 11-20 The *Pick Distribution Object* rollout



Figure 11-21 The *Objects* area

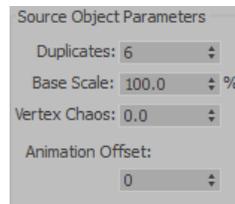


Figure 11-22 The *Source Object Parameters* area

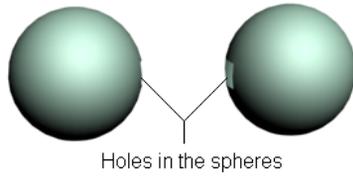


Figure 11-23 Two spheres with holes on their surfaces

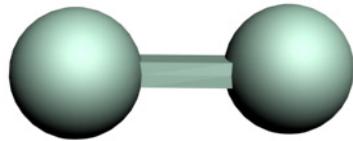


Figure 11-24 The spheres after performing the **Connect** operation



Figure 11-25 The rollouts displayed after choosing the **Connect** tool

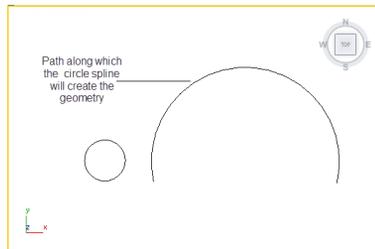


Figure 11-26 Two splines to create a loft object

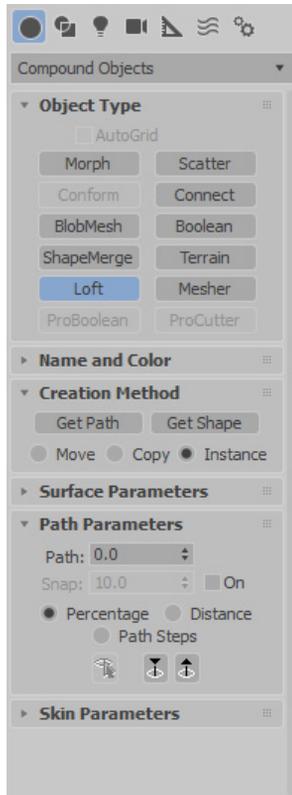


Figure 11-27 Partial view of the rollouts displayed after invoking the **Loft** tool



Figure 11-28 The loft object created



Figure 11-29 The **Deformations** rollout

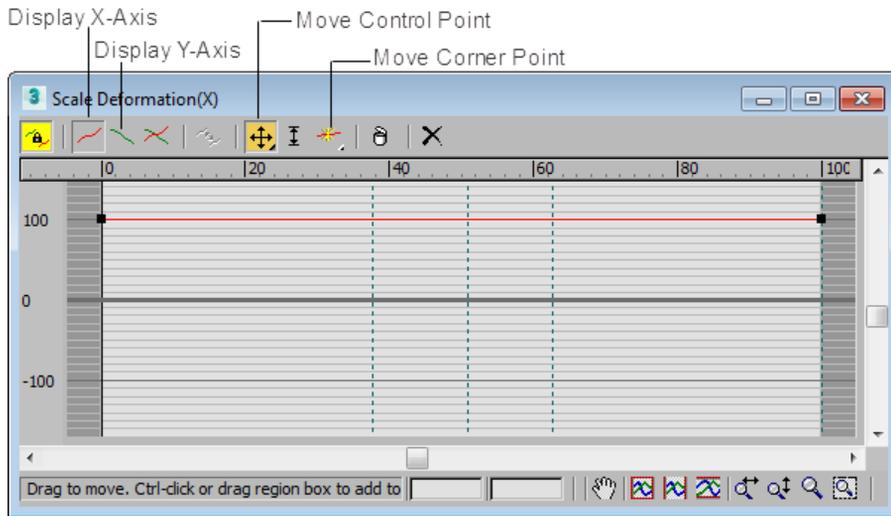
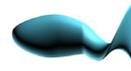


Figure 11-30 The Scale Deformation(X) dialog box



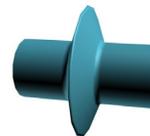
*Figure 11-31 The loft object modified using the **Scale** tool*



*Figure 11-32 The loft object modified using the **Twist** tool*



*Figure 11-33 The loft object modified using the **Fit** tool*



*Figure 11-34 The loft object modified using the **Bevel** tool*



*Figure 11-35 The loft object modified using the **Teeter** tool*

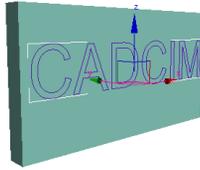


Figure 11-36 Alignment of the shape with the mesh object



Figure 11-37 The shape embedded in the mesh object



Figure 11-38 The shape subtracted from the mesh object

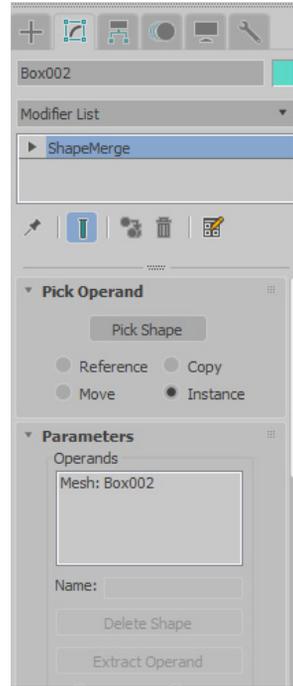


Figure 11-39 Partial view of the rollouts displayed after invoking the **ShapeMerge** tool



Figure 11-40 The road (Wrapper object) fitted over a hilly area (Wrap-To object) before using the **Conform** tool



Figure 11-41 The road (Wrapper object) fitted over a hilly area (Wrap-To object) after using the **Conform** tool

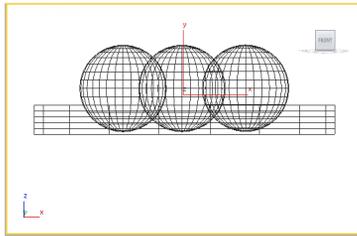


Figure 11-42 The objects to perform the proboolean operation in the Front viewport

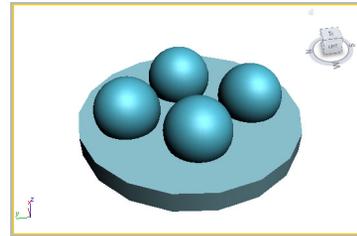


Figure 11-43 The objects to perform the proboolean operation in the Perspective viewport

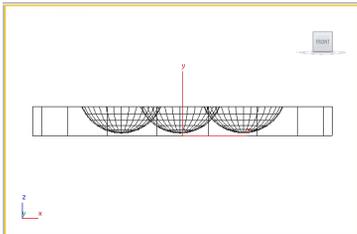


Figure 11-44 The objects after performing the proboolean operation in the Front viewport

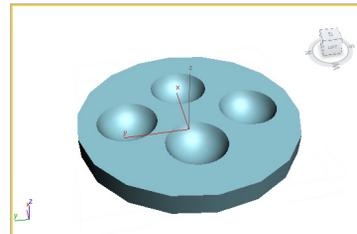


Figure 11-45 The objects after performing the proboolean operation in the Perspective viewport

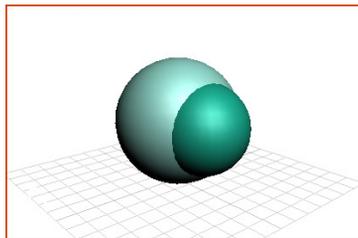


Figure 11-46 The two spheres intersecting each other to perform the boolean operation

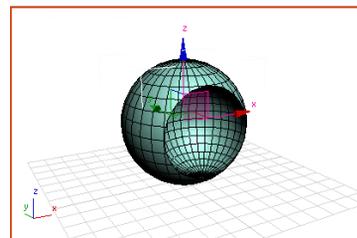


Figure 11-47 The proboolean object after performing the boolean operation

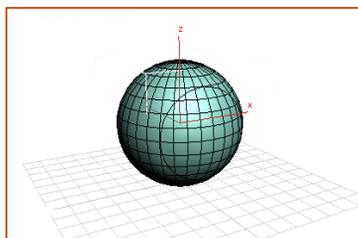


Figure 11-48 The proboolean object after selecting the **Imprint** check box

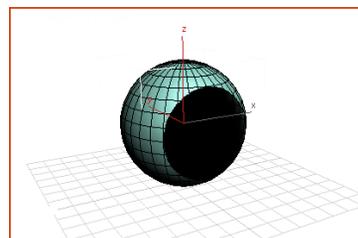


Figure 11-49 The proboolean object after selecting the **Cookie** check box

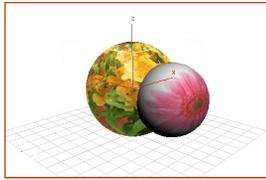


Figure 11-50 The two spheres with materials applied on them

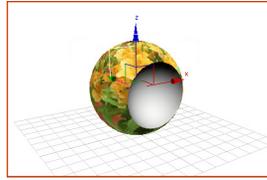


Figure 11-51 The proboolean object after selecting the **Apply Operand Material** radio button

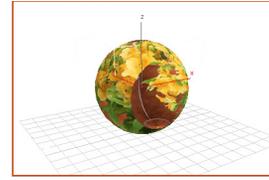


Figure 11-52 The proboolean object after selecting the **Retain Original Material** radio button

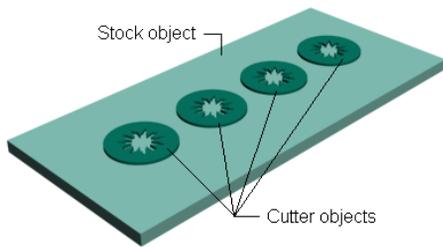


Figure 11-53 The cutter and stock objects aligned for the procutter operation

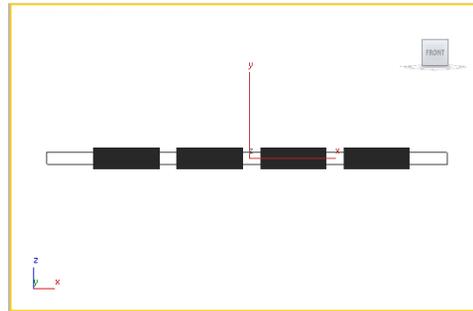


Figure 11-54 The cutter and stock objects before performing the procutter operation in the Front viewport

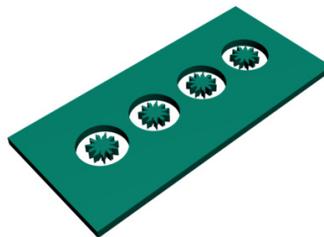


Figure 11-55 The cutter and stock objects after performing the procutter operation



Figure 11-56 The cutter and stock objects after selecting the **Stock Inside Cutter** check box



Figure 11-57 The cutter and stock objects after selecting the **Cutter Outside Stock** check box



Figure 11-58 The model of a toothpaste tube

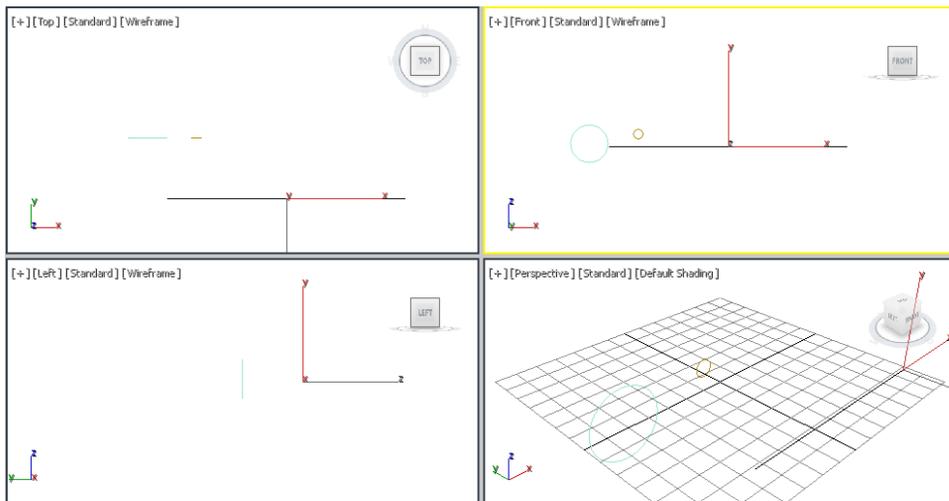


Figure 11-59 The Circle001, Circle002, and Line001 splines in viewports

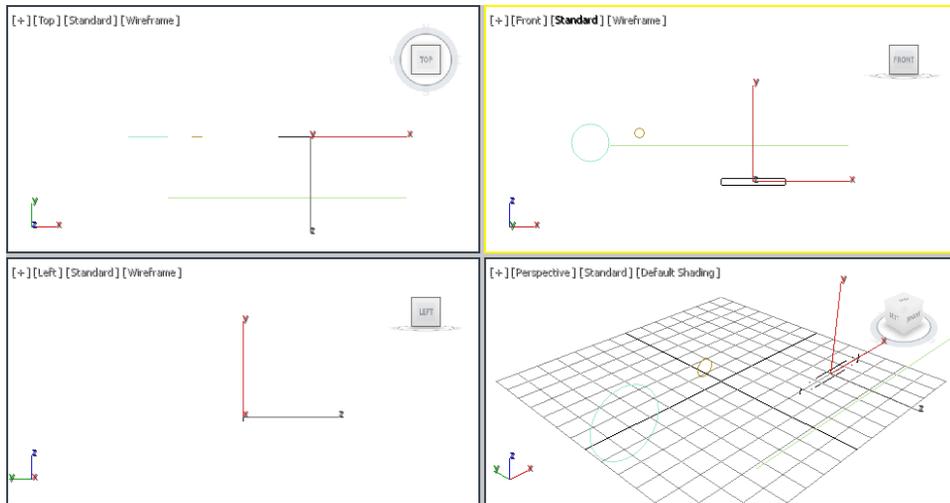


Figure 11-60 The Rectangle001 displayed in viewports

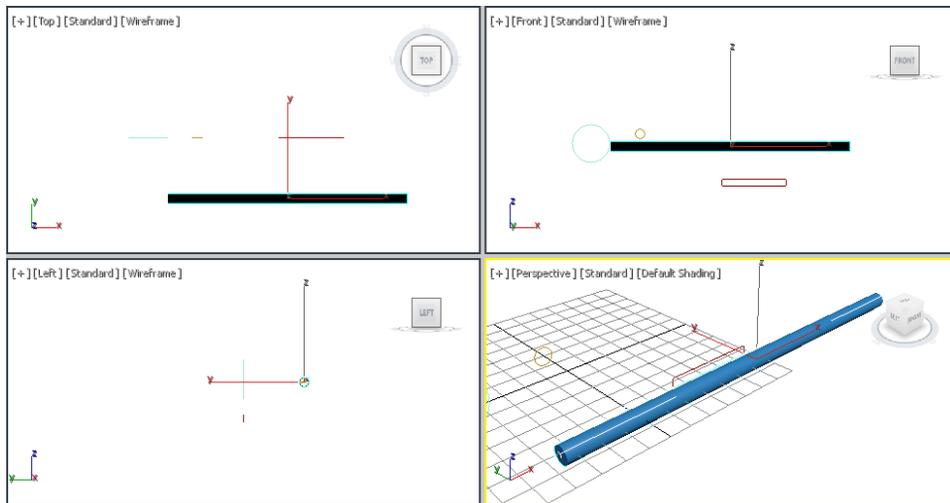


Figure 11-61 A shape created along the path spline (Line001)

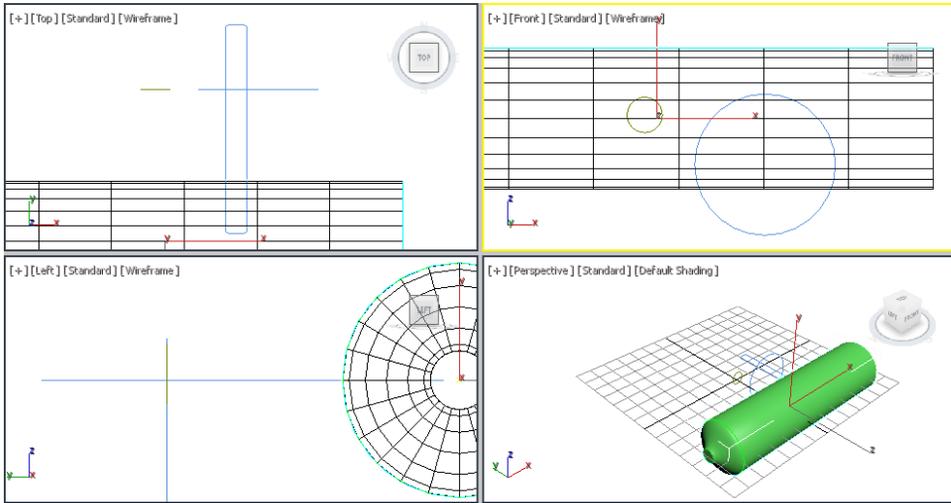


Figure 11-62 The shape of the tube created along the path spline

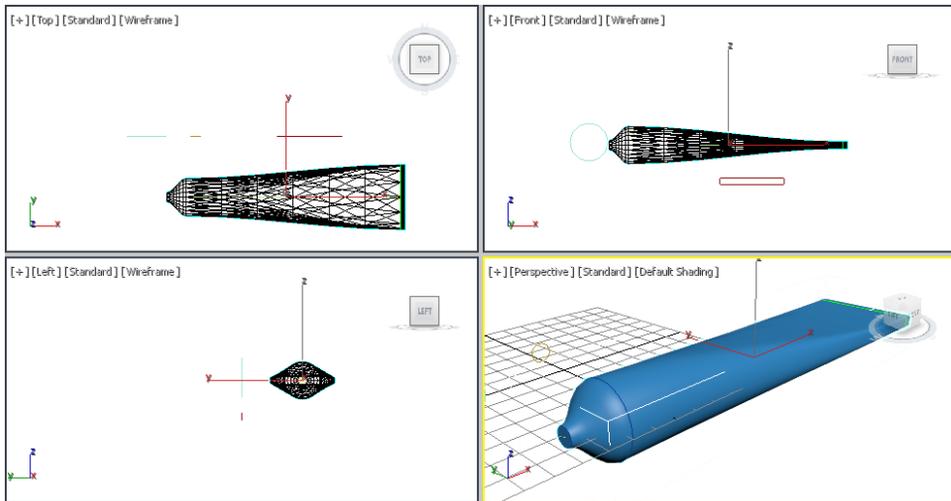


Figure 11-63 The shape of tube created in viewports

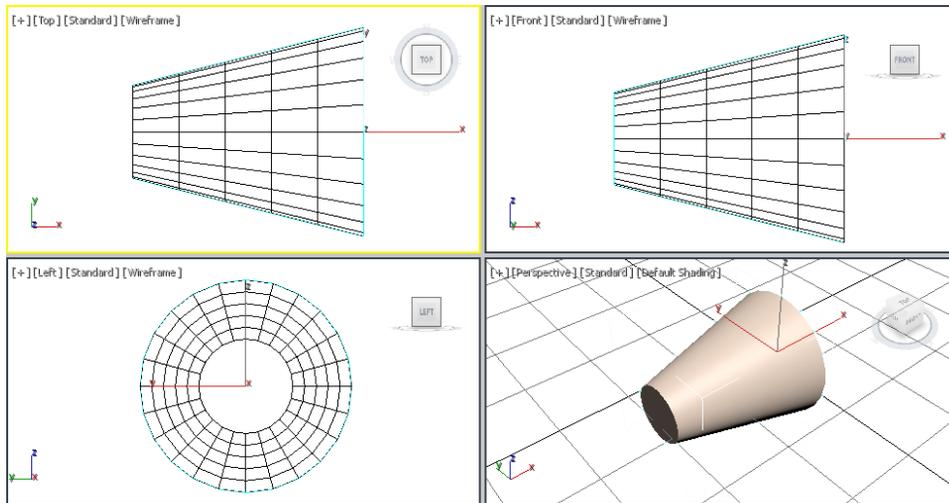


Figure 11-64 The cap01 geometry zoomed in viewports

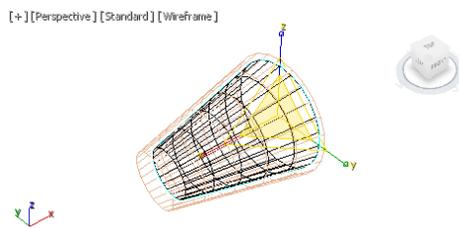


Figure 11-65 The cap002 geometry displayed

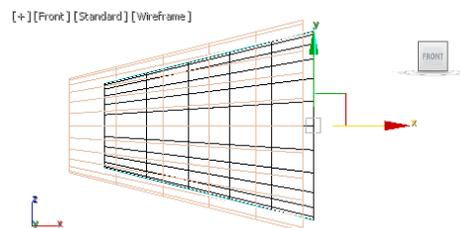


Figure 11-66 The cap002 geometry after the alignment

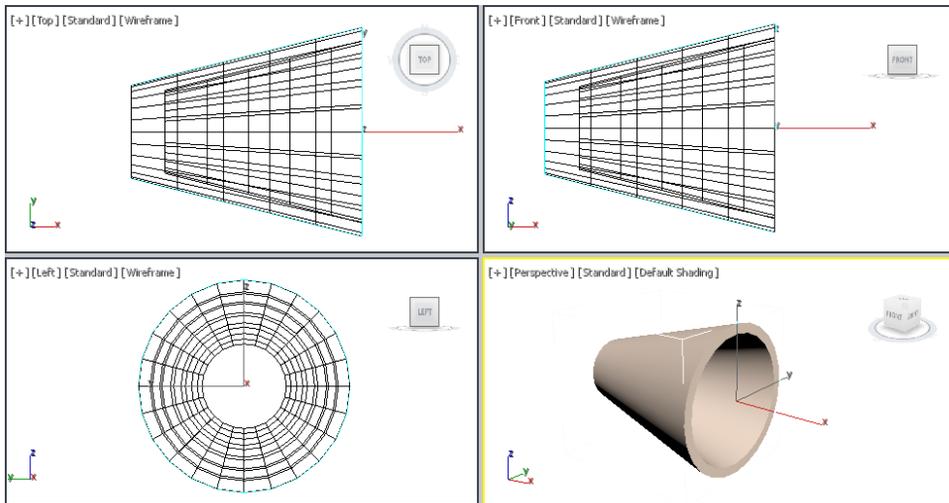


Figure 11-67 The cap01 after performing the Subtraction(A-B) boolean operation in viewports

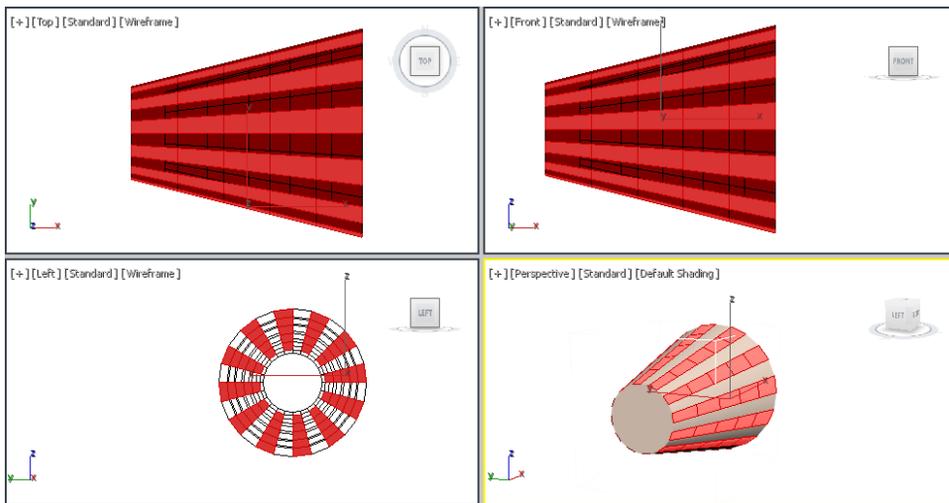


Figure 11-68 The selected polygons of cap01

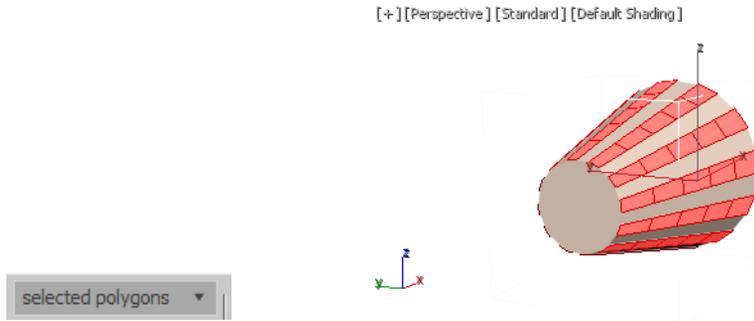


Figure 11-69 *The Named Selection Sets drop-down list*

Figure 11-70 *The extruded polygons in the Perspective viewport*

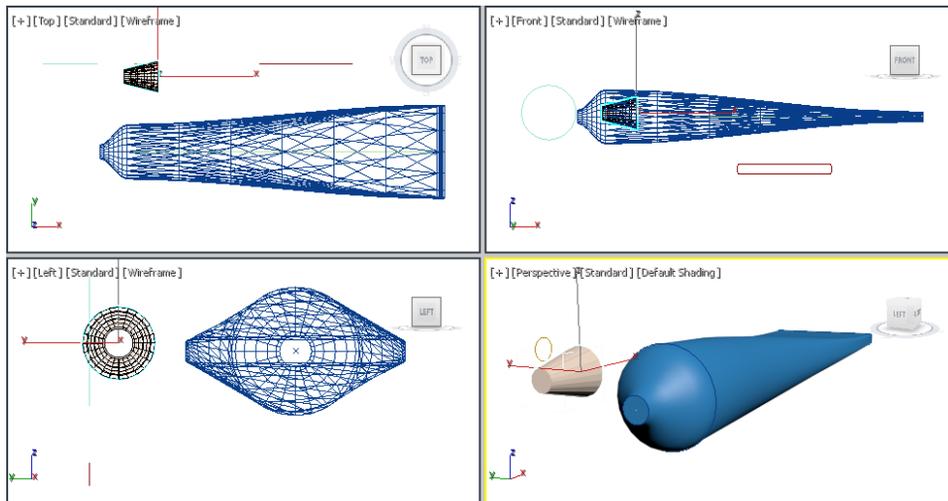


Figure 11-71 *The objects in the viewports*

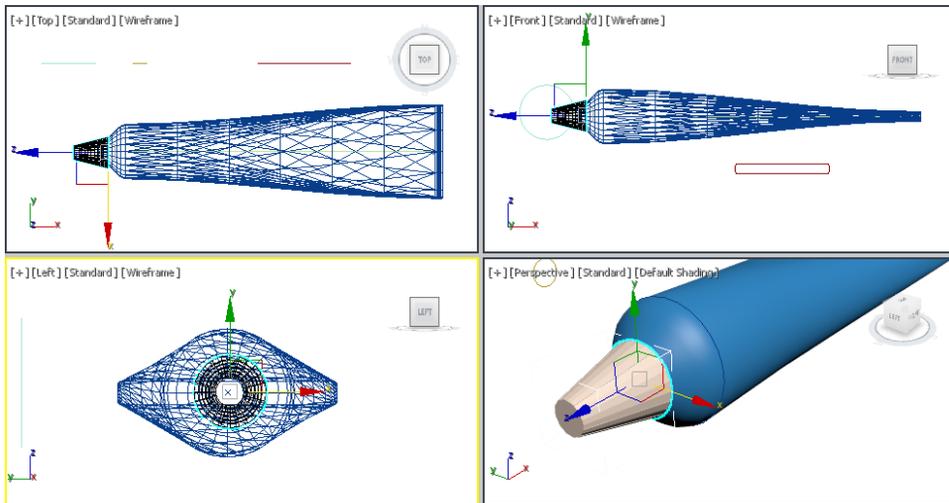


Figure 11-72 The cap01 geometry in the viewports after being aligned with toothpaste tube

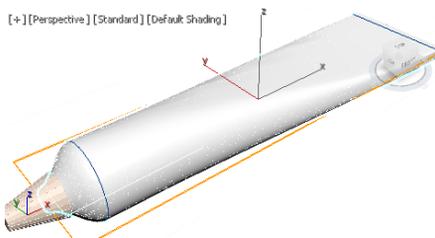


Figure 11-73 The map on the toothpaste tube

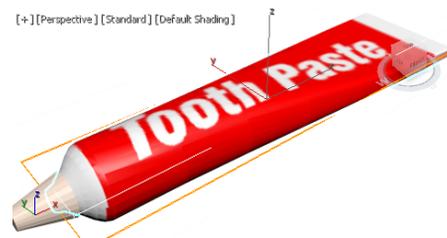


Figure 11-74 The map on the toothpaste tube after applying the UVW Map modifier



Figure 11-75 The toothpaste tube after the map assigned

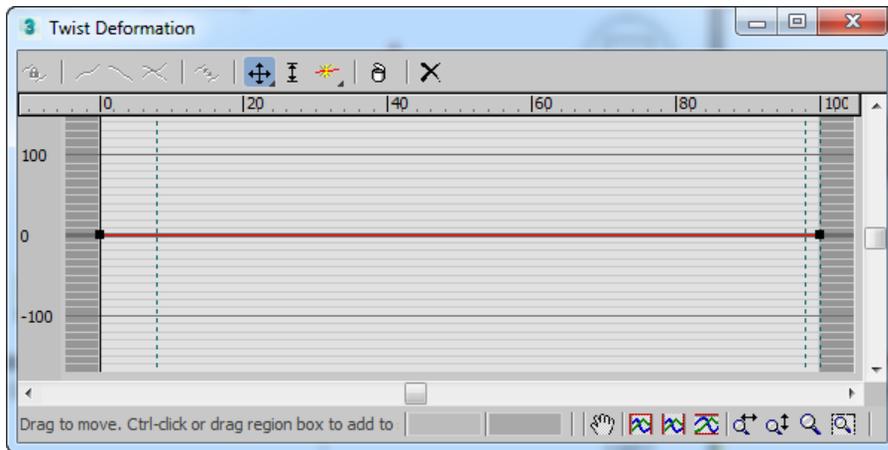


Figure 11-76 The Twist Deformation dialog box

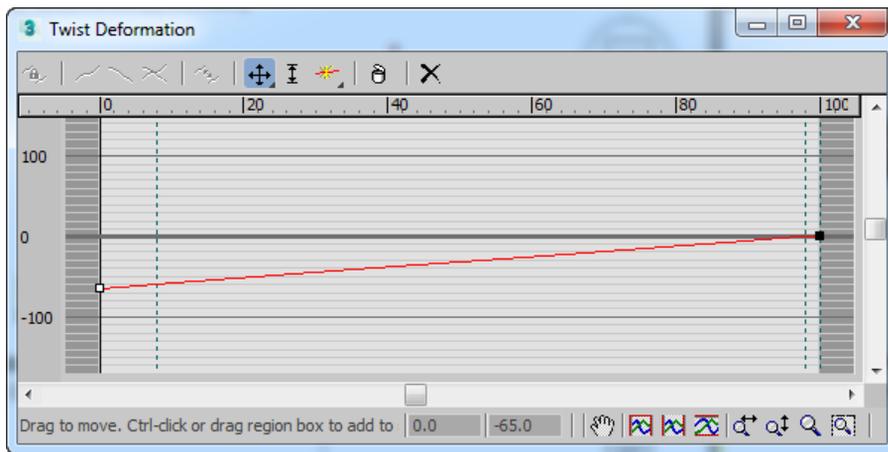


Figure 11-77 The first vertex point moved in the Twist Deformation dialog box

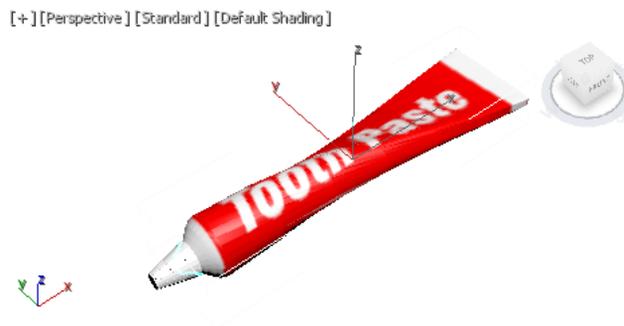


Figure 11-78 Twisted toothpaste tube

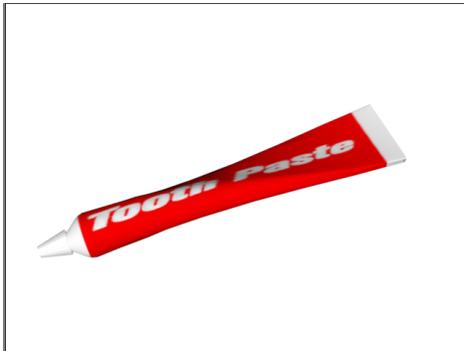


Figure 11-79 The final output after rendering (view 1)



Figure 11-80 The final output after rendering (view 2)



Figure 11-81 Scene for Tutorial 2

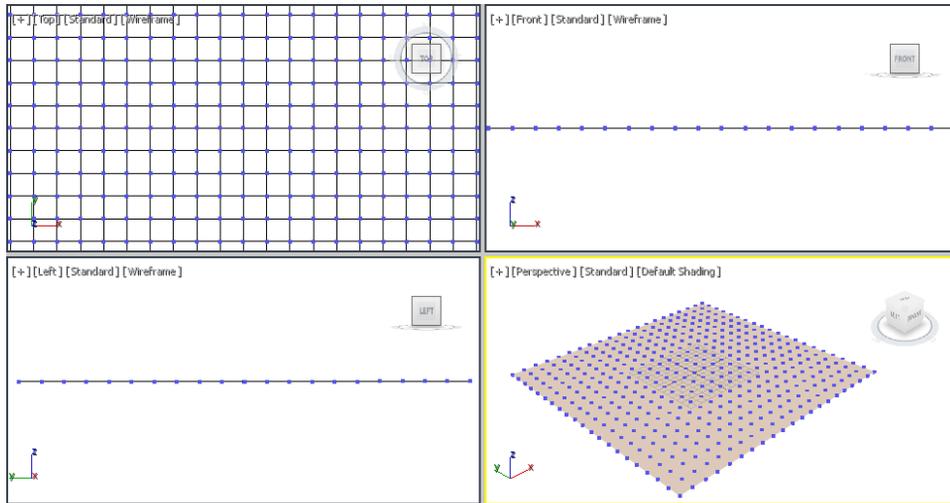


Figure 11-82 All vertices displayed in viewports

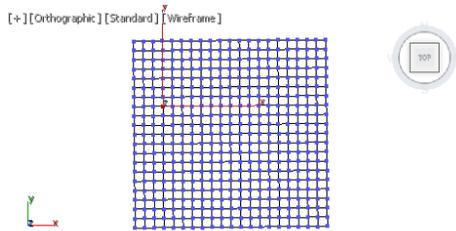
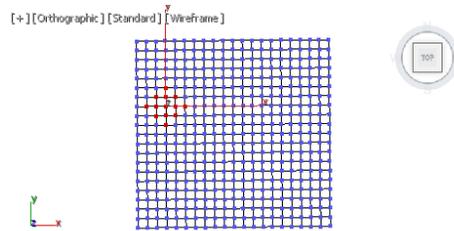


Figure 11-83 A vertex selected in the Top viewport



*Figure 11-84 The vertices selected after choosing the **Grow** button*

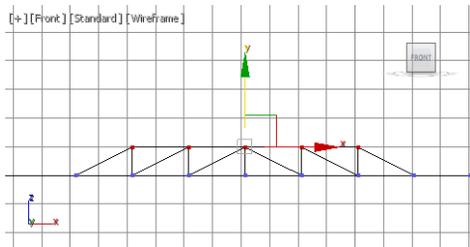


Figure 11-85 The selected vertices dragged up in the Front viewport

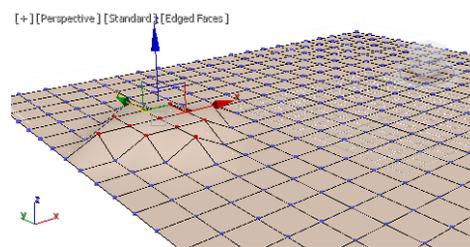


Figure 11-86 The selected vertices dragged up in the Perspective viewport

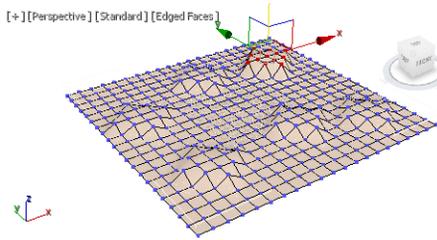


Figure 11-87 The hilly surface created using the vertices of the plane

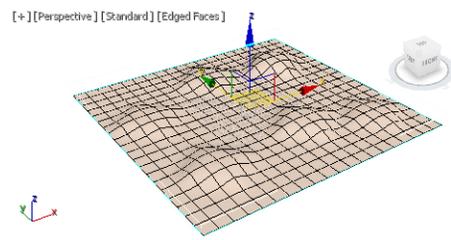


Figure 11-88 The hilly surface after applying the MeshSmooth modifier

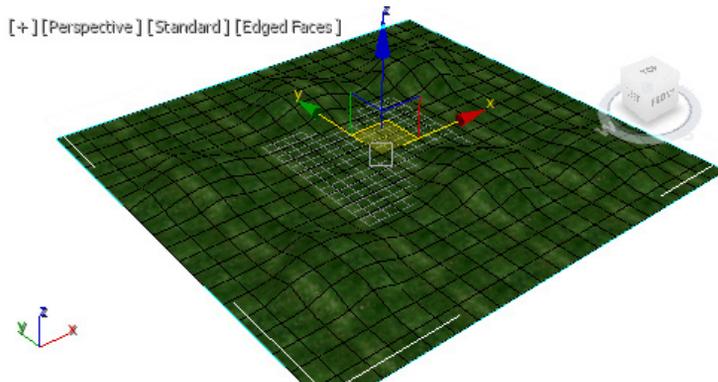


Figure 11-89 The plane with the map assigned in the perspective viewport

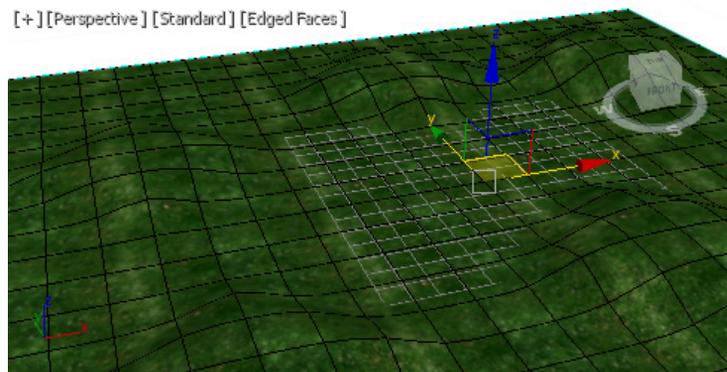


Figure 11-90 The plane after using the viewport navigation tools

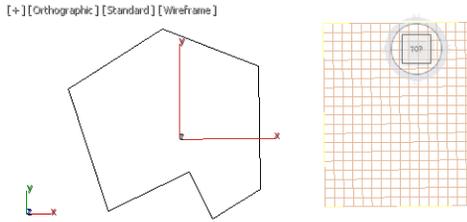


Figure 11-91 A close line spline created in the Top viewport

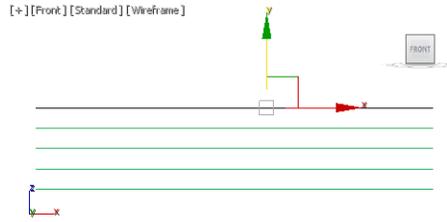


Figure 11-92 Four copies of the line spline created in the Front viewport

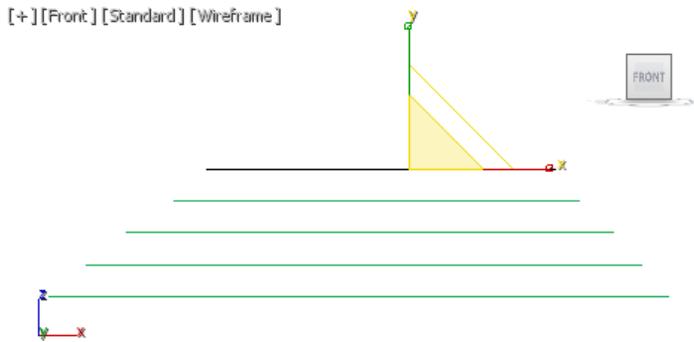


Figure 11-93 The scaled lines after using the Select and Uniform Scale tool

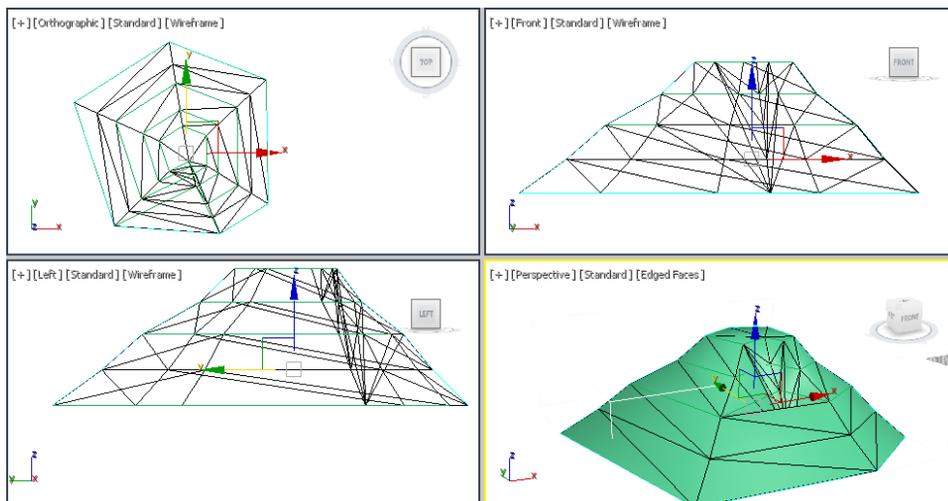


Figure 11-94 The terrain object created in viewports

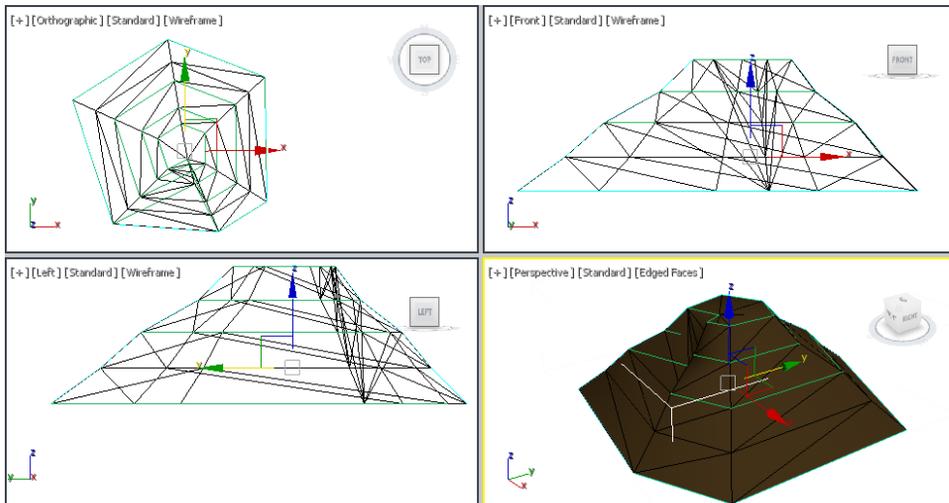


Figure 11-95 The map assigned to hill01

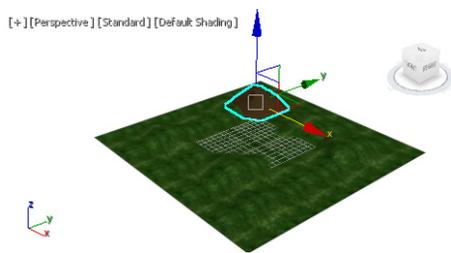


Figure 11-96 The hill01 after scaling and aligning with the ground

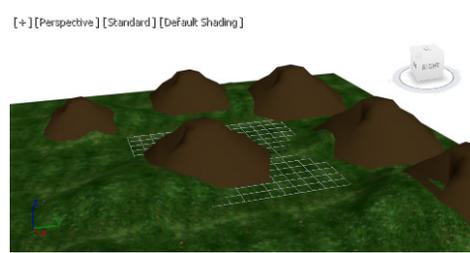


Figure 11-97 The hills displayed after scaling and alignment

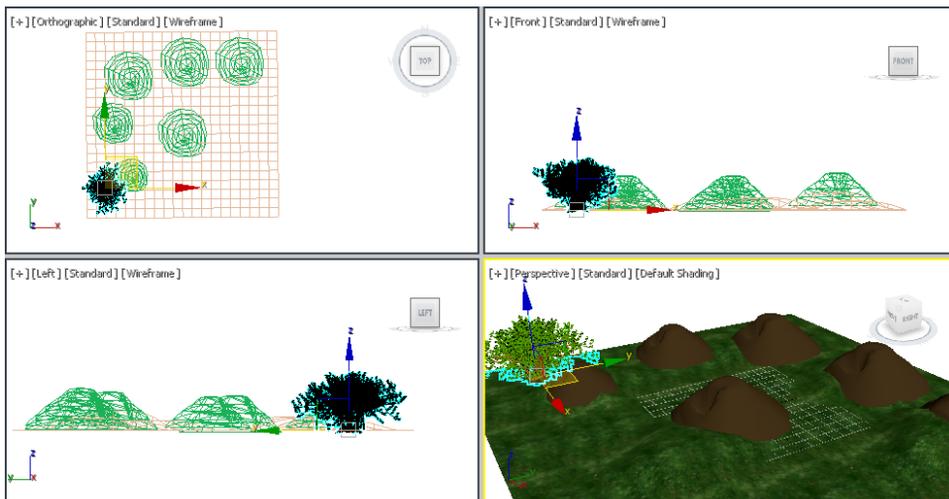


Figure 11-98 Alignment of the tree01 in viewports

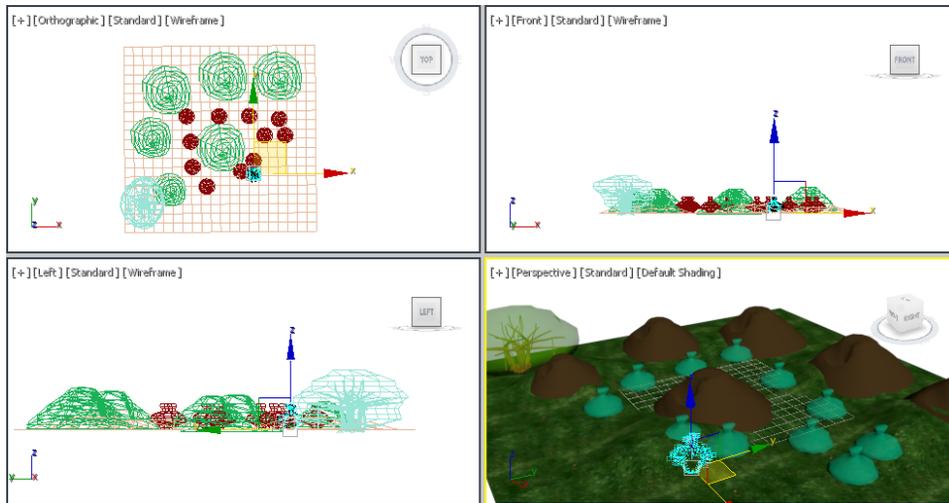


Figure 11-99 Alignment of trees in viewports

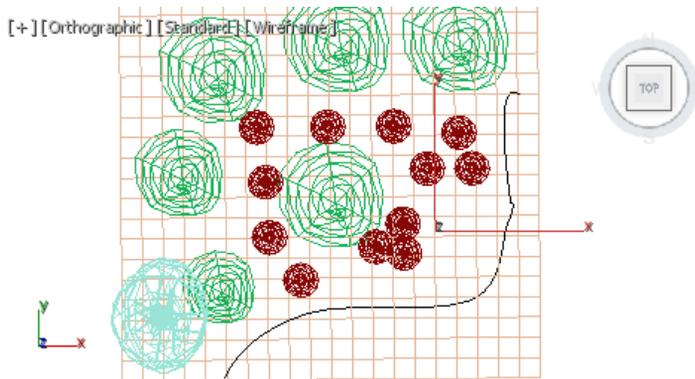


Figure 11-100 The line created in the Top viewport

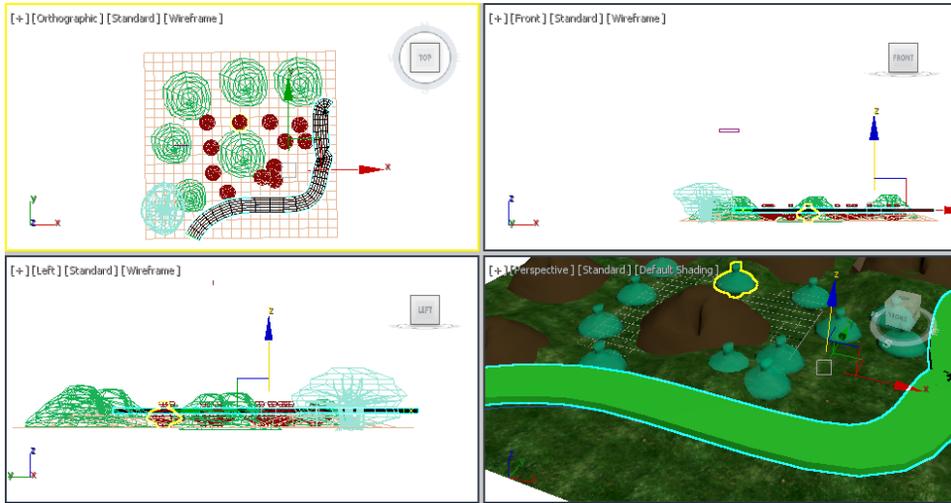


Figure 11-101 The road geometry aligned with ground



Figure 11-102 The road after assigning map to it

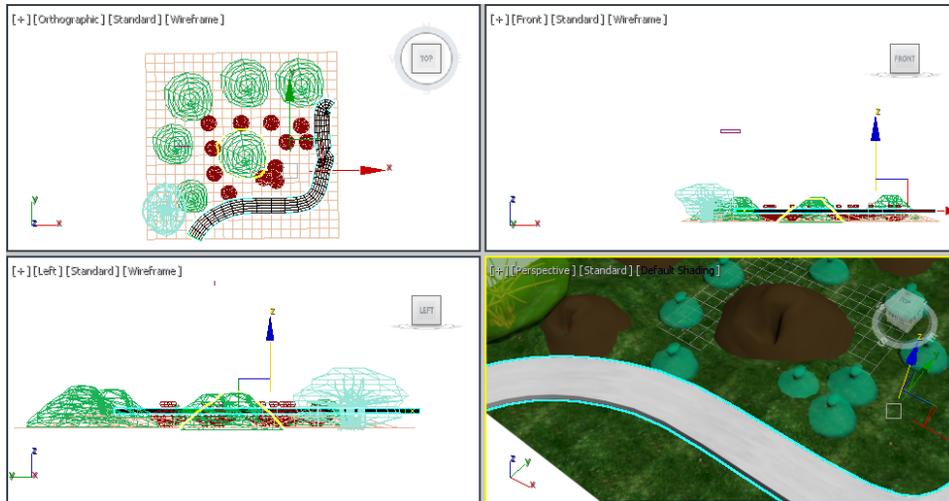


Figure 11-103 The scene after using the **Conform** tool



Figure 11-104 Model to be created in Exercise 1

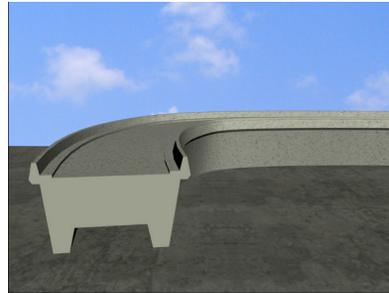


Figure 11-105 Model to be created in Exercise 2

12

Modifiers

Learning Objectives

After completing this chapter, you will be able to:

- *Use modifiers*
- *Understand the types of modifiers*
- *Create complex objects using modifiers*



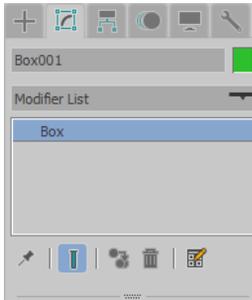


Figure 12-1 The Modifier List drop-down list

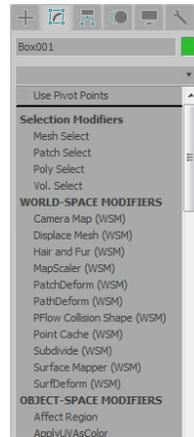


Figure 12-2 Partial view of the Modifier List drop-down list

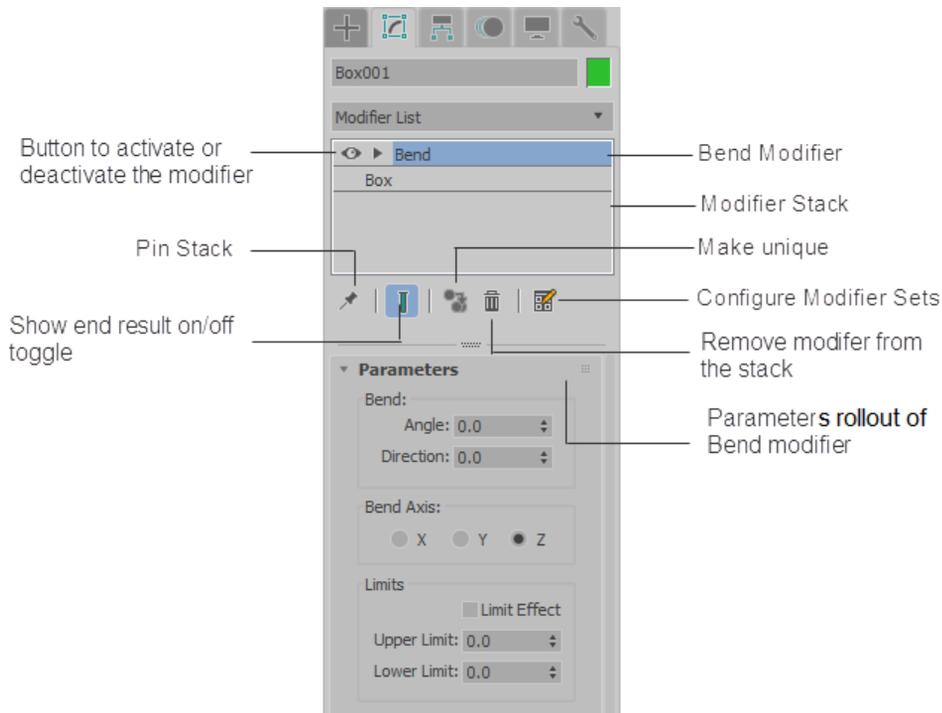


Figure 12-3 The modifier stack

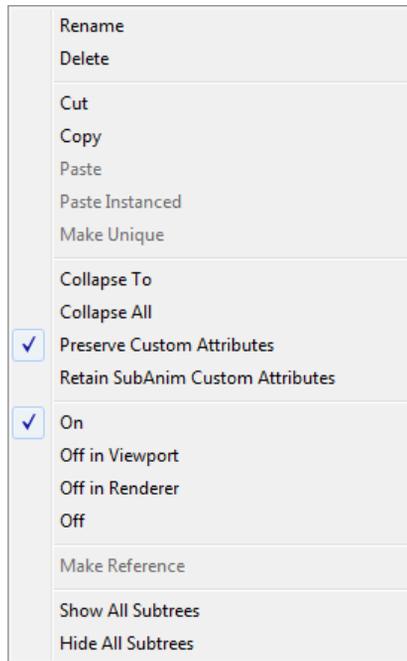


Figure 12-4 The shortcut menu displayed on right-clicking on the modifier in the modifier stack

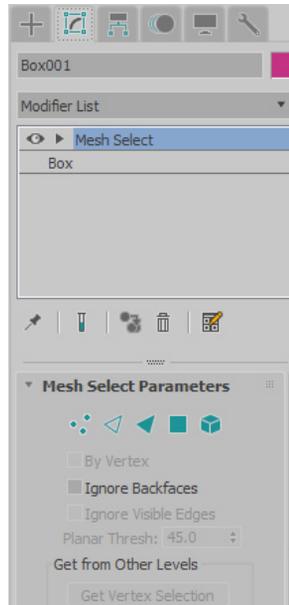


Figure 12-5 Partial view of the rollouts displayed on selecting the **Mesh Select** modifier

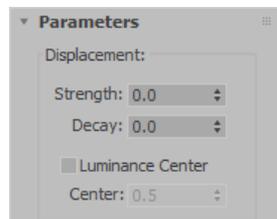


Figure 12-6 The **Displacement** area in the **Parameters** rollout

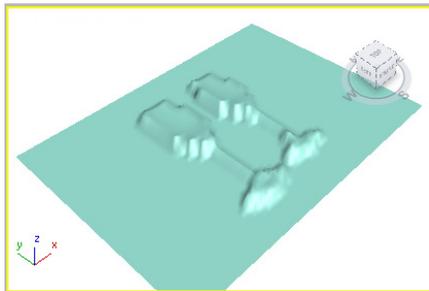


Figure 12-7 The plane after using the bitmap image in the **Displace** modifier



Figure 12-8 The bitmap image that has been used for displacement in Figure 12-7



Figure 12-9 The plane after using the map image in the **Displace** modifier



Figure 12-10 The map image that has been used for displacement in Figure 12-9

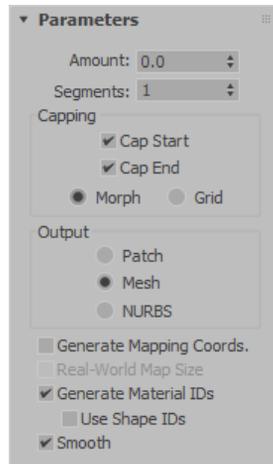


Figure 12-11 The **Parameters** rollout

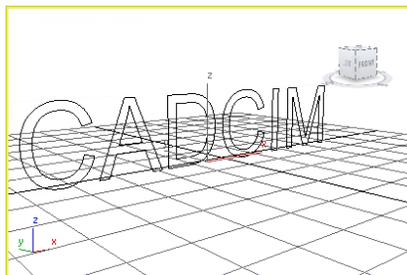


Figure 12-12 The text spline before applying the **Extrude** modifier



Figure 12-13 The text spline after applying the **Extrude** modifier



Figure 12-14 The Parameters rollout

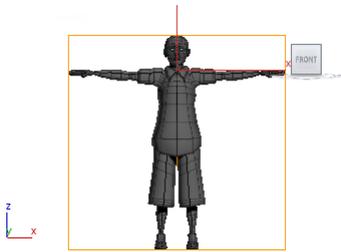


Figure 12-15 The object before applying the Melt modifier

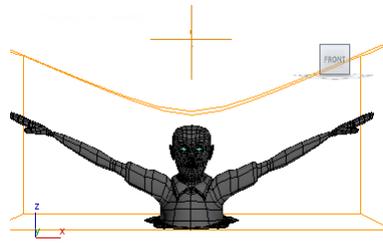


Figure 12-16 The object after applying the Melt modifier

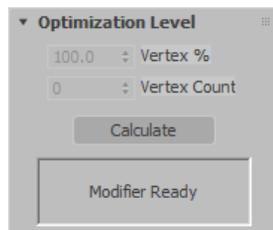


Figure 12-17 The Optimization Level rollout

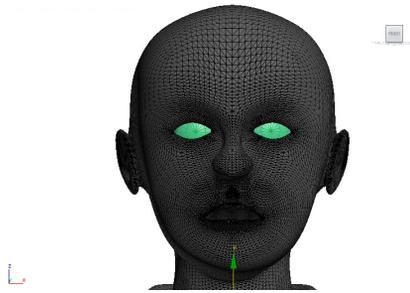


Figure 12-18 The object before applying the ProOptimizer modifier

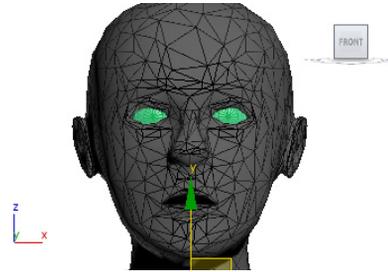


Figure 12-19 The object after applying the ProOptimizer modifier

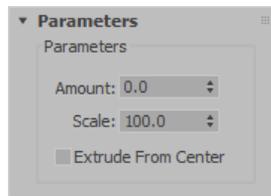


Figure 12-20 The Parameters rollout

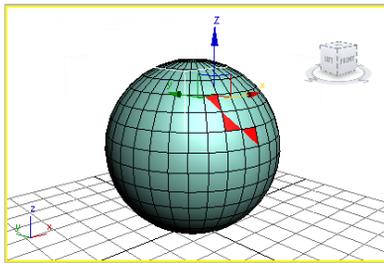


Figure 12-21 The faces selected to be extruded in a sphere

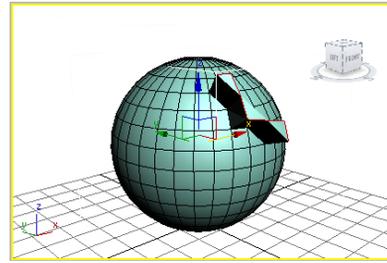


Figure 12-22 The selected faces extruded

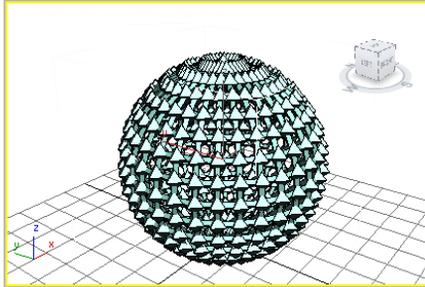


Figure 12-23 The sphere after applying the *Lattice* modifier

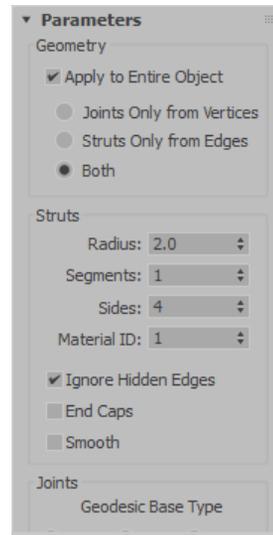


Figure 12-24 Partial view of the *Parameters* rollout

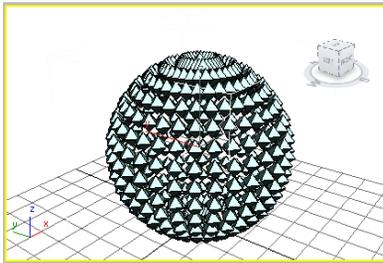


Figure 12-25 The sphere after selecting the *Joints Only from Vertices* radio button

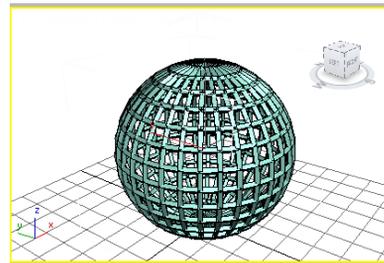


Figure 12-26 The sphere after selecting the *Struts Only from Edges* radio button

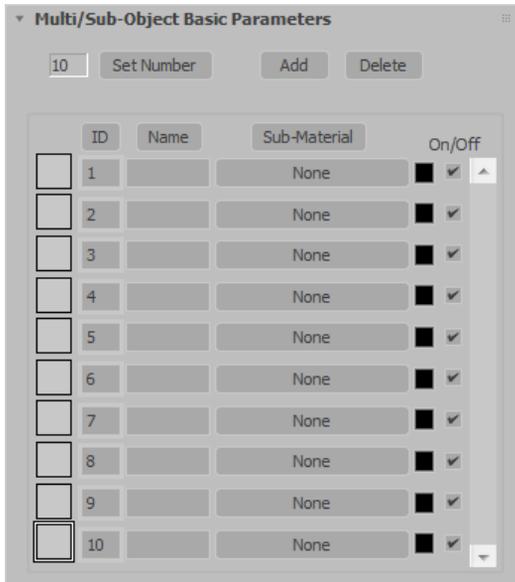


Figure 12-27 Partial view of the **Multi/Sub-Object Basic Parameters** rollout in the **Material Editor** dialog box

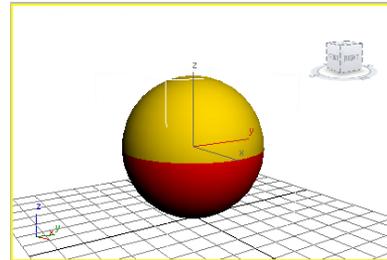


Figure 12-28 The object displayed in two different colors after applying the **Material** modifier

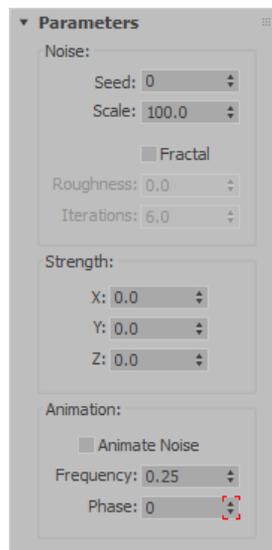


Figure 12-29 The **Parameters** rollout

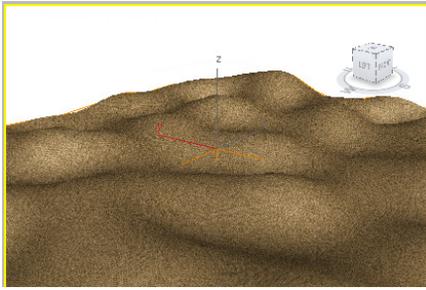


Figure 12-30 The plane with the Noise modifier applied

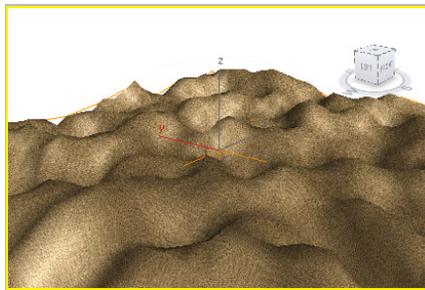


Figure 12-31 The plane with the Fractal checkbox selected

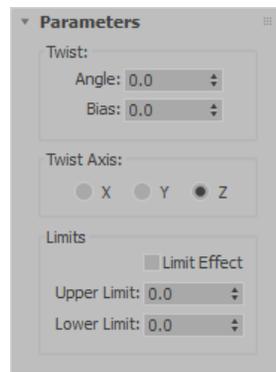


Figure 12-32 The Parameters rollout

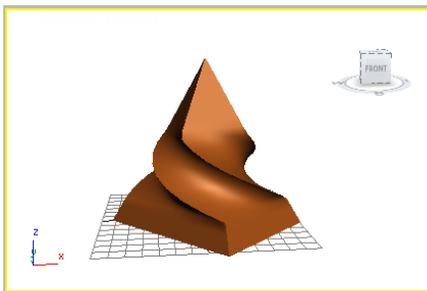


Figure 12-33 The Twist modifier applied to the pyramid object

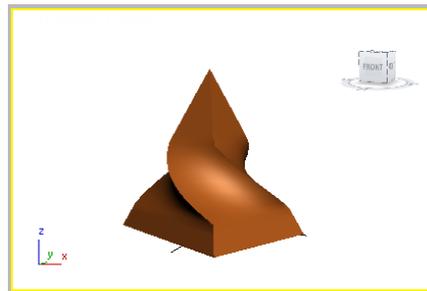


Figure 12-34 The Twist modifier applied to a portion of the pyramid object using the options in the Limits area

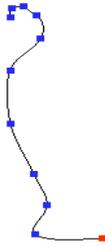


Figure 12-35 The *Line* spline



Figure 12-36 The *Line* spline after applying the *Lathe* modifier

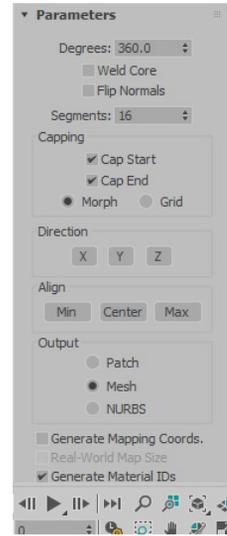


Figure 12-37 Partial view of the *Parameters* rollout

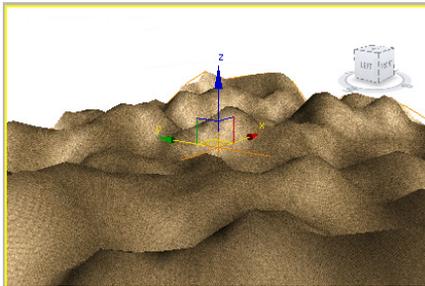


Figure 12-38 The surface before applying the *MeshSmooth* modifier

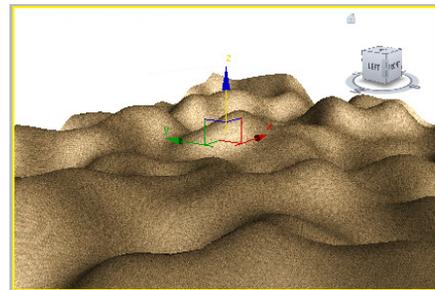


Figure 12-39 The surface after applying the *MeshSmooth* modifier

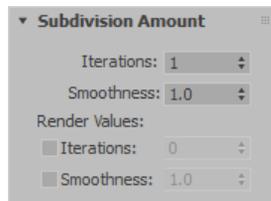


Figure 12-40 The *Subdivision Amount* rollout

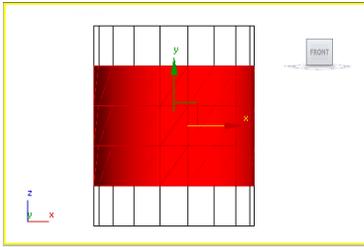


Figure 12-41 The sub-objects selected in an object to apply the **Tessellate** modifier

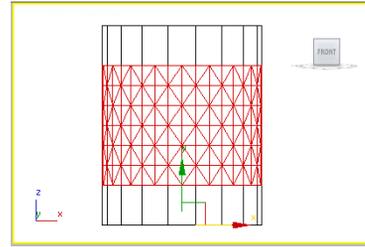


Figure 12-42 The selected sub-objects converted into triangular faces after applying the **Tessellate** modifier

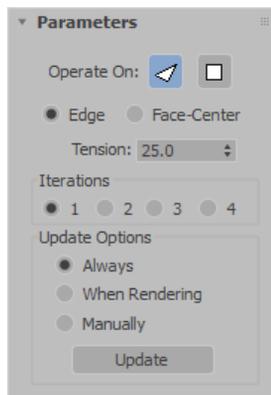


Figure 12-43 The **Parameters** rollout

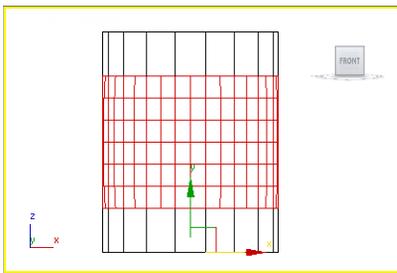


Figure 12-44 The selected sub-objects converted into polygonal faces after choosing the **Polygons** button

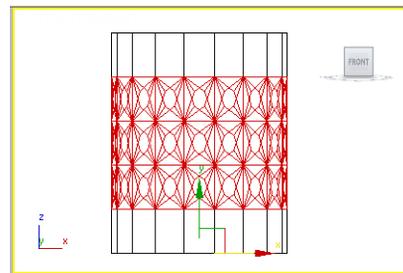


Figure 12-45 The selected sub-objects converted into triangular faces after choosing the **Face-Center** radio button



Figure 12-46 The Parameters rollout

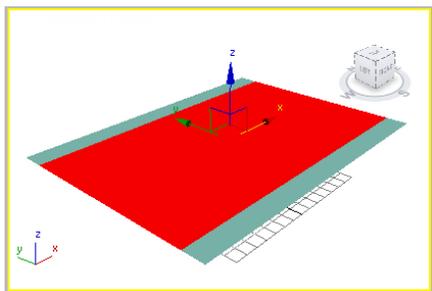


Figure 12-47 The selected sub-objects of a plane before applying the Push modifier

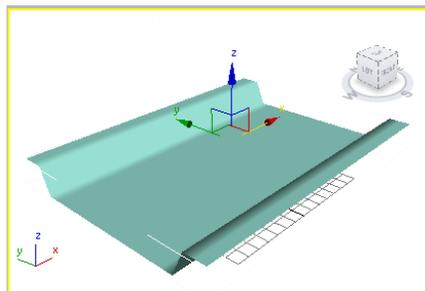


Figure 12-48 The plane after applying the Push modifier

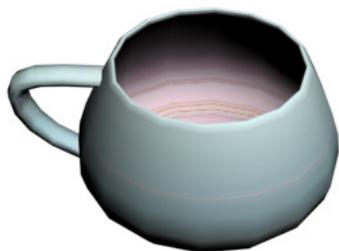


Figure 12-49 The object with two different materials on the inner and outer sides



Figure 12-50 The inner and outer materials interchanged after applying the Normal modifier

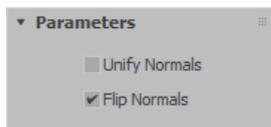


Figure 12-51 The Parameters rollout

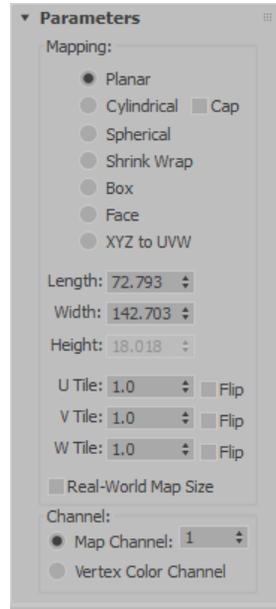


Figure 12-52 Partial view of the **Parameters** rollout



Figure 12-53 A box with the Planar mapping coordinate



Figure 12-54 A cylinder with the Cylindrical mapping coordinates



Figure 12-55 The Cylindrical mapping coordinates applied to a cylinder and its cap



Figure 12-56 *The Spherical mapping coordinates applied to a sphere*

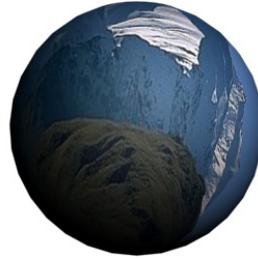


Figure 12-57 *The Shrink Wrap mapping coordinates applied to a sphere*



Figure 12-58 *The Box mapping coordinates applied to a box*

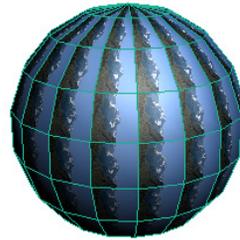


Figure 12-59 *The Face mapping coordinates applied to a sphere*

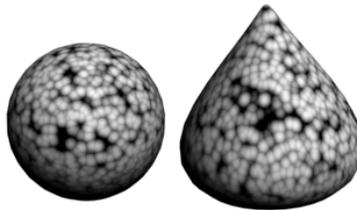


Figure 12-60 *Coordinates of the object adjusted to match the new shape*

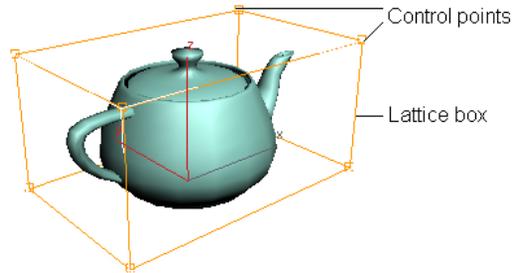


Figure 12-61 The **FFD 2x2x2** modifier applied to an object

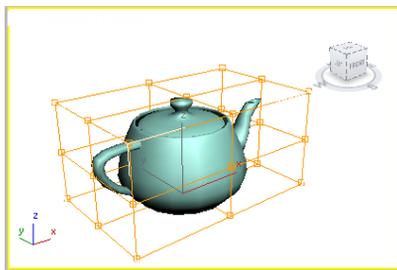


Figure 12-62 The **FFD 3x3x3** modifier applied to an object

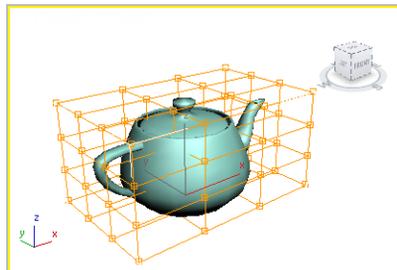


Figure 12-63 The **FFD 4x4x4** modifier applied to an object

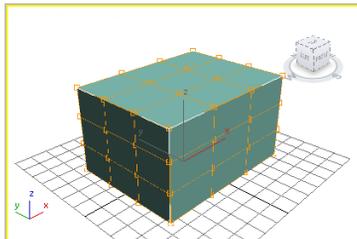


Figure 12-64 A box object with the **FFD(box)** modifier applied

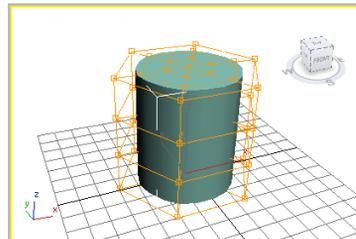


Figure 12-65 A cylindrical object with the **FFD(cyl)** modifier applied

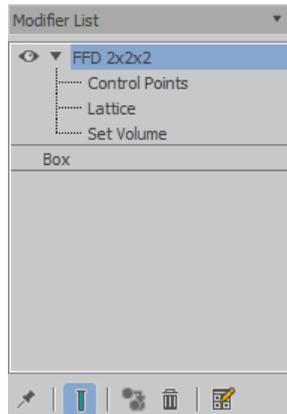


Figure 12-66 The sub-object levels in the modifier stack

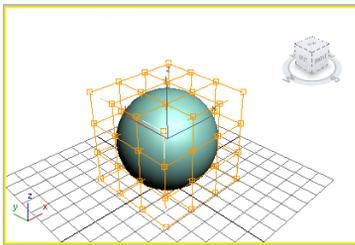


Figure 12-67 The FFD modifier applied to the objects

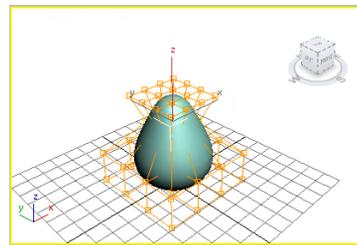


Figure 12-68 The shape of the object modified after transforming the control points

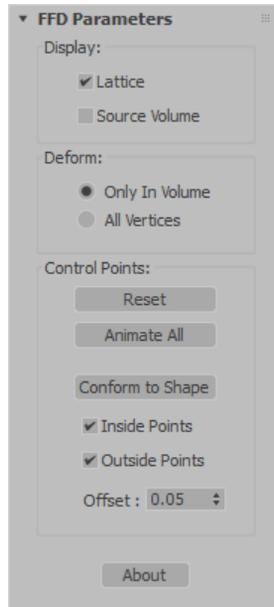


Figure 12-69 Partial view of the **FFD Parameters** rollout

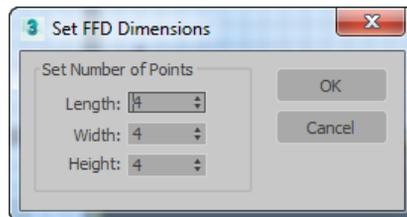


Figure 12-70 The **Set FFD Dimensions** dialog box

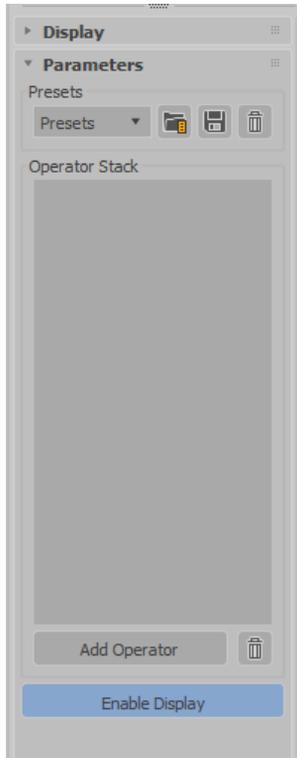


Figure 12-71 The Add Operator button in the Parameters rollout

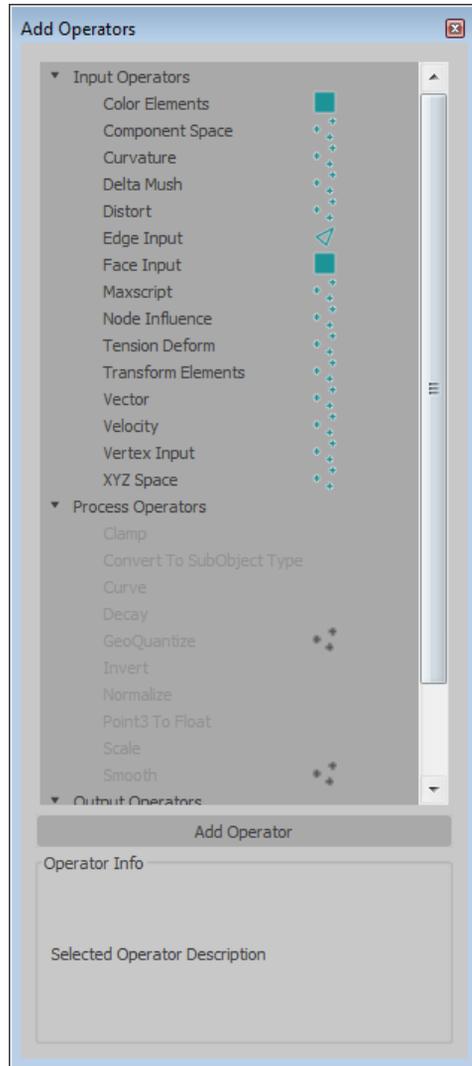


Figure 12-72 Operators to be added in the Operator Stack

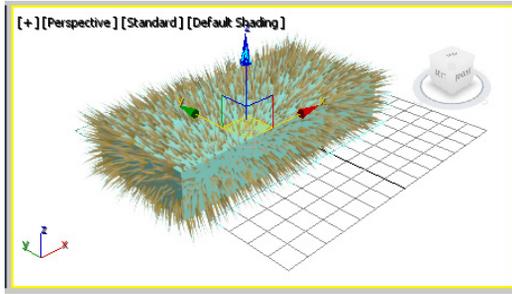


Figure 12-73 Strands grown on the selected mesh object



Figure 12-74 Strands grown on the extruded circle



Figure 12-75 A tennis racket model

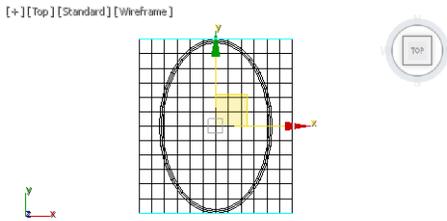


Figure 12-76 The plane created in the Top viewport

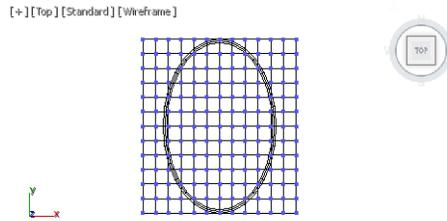


Figure 12-77 The vertices of the stringed area displayed in the Top viewport

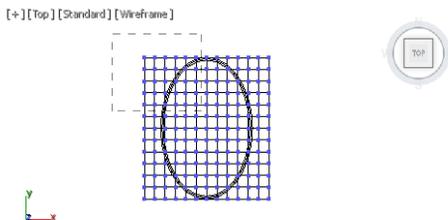


Figure 12-78 A selection box dragged around the vertices using the **Zoom Region** tool

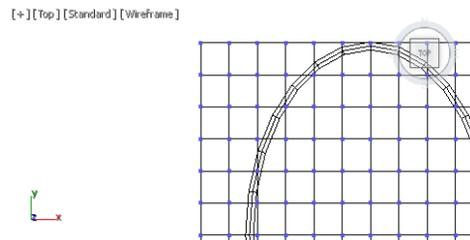


Figure 12-79 The selected area zoomed in

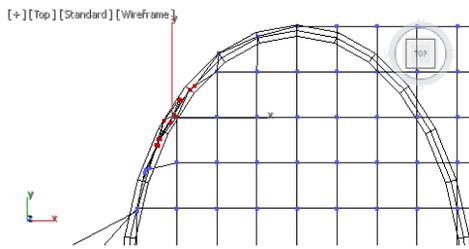


Figure 12-80 The vertices arranged to form the shape of the head

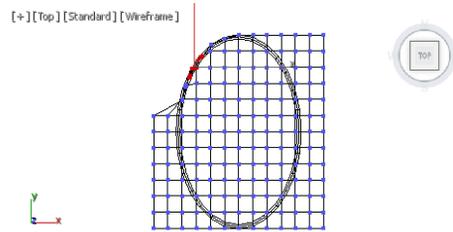


Figure 12-81 The objects after invoking the **Zoom Extents** tool

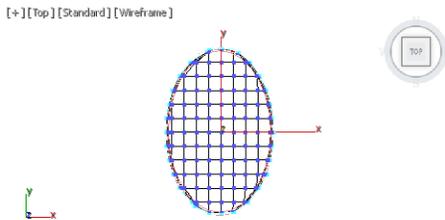


Figure 12-82 All outer vertices arranged to form the shape of the head

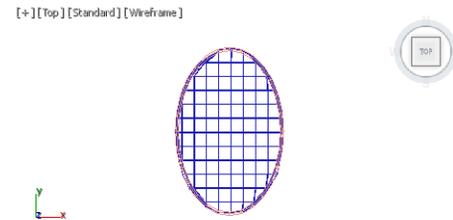


Figure 12-83 The stringed area after applying the **Lattice** modifier

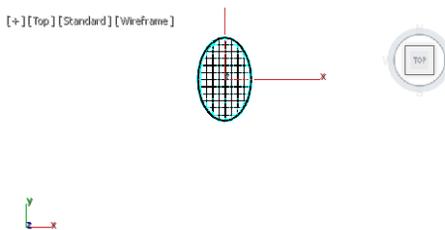


Figure 12-84 The racket head in the Top viewport



Figure 12-85 A line created around the racket head

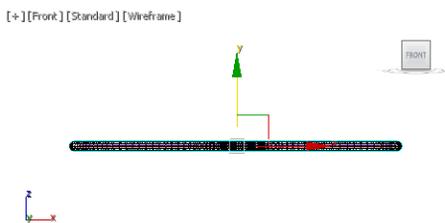


Figure 12-86 Alignment of the shaft01 at the bottom of the racket head

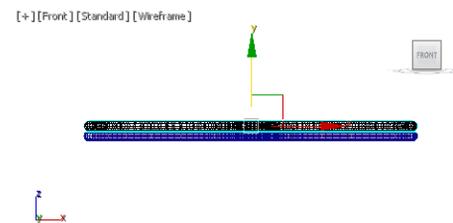


Figure 12-87 Alignment of the shaft002 at the top of the racket head

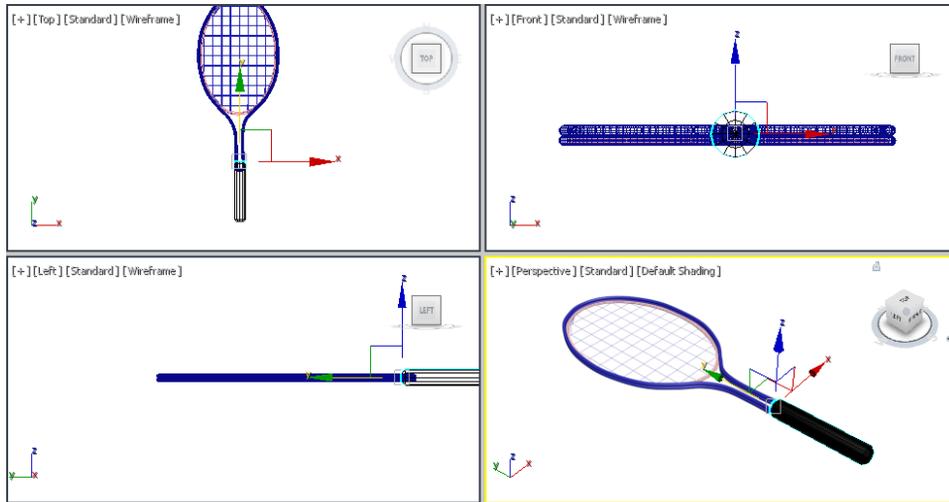


Figure 12-88 Alignment of handle in viewports

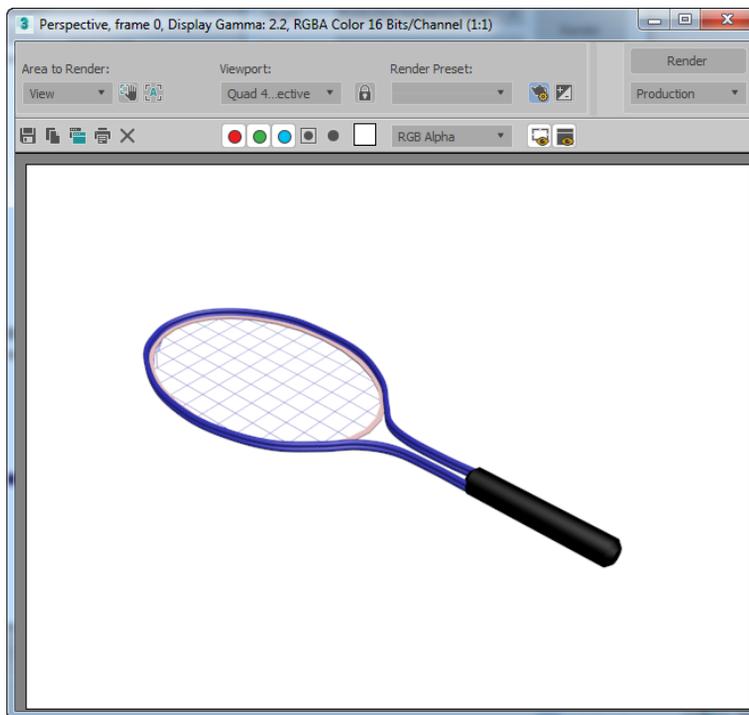


Figure 12-89 The final output



Figure 12-90 The water surface

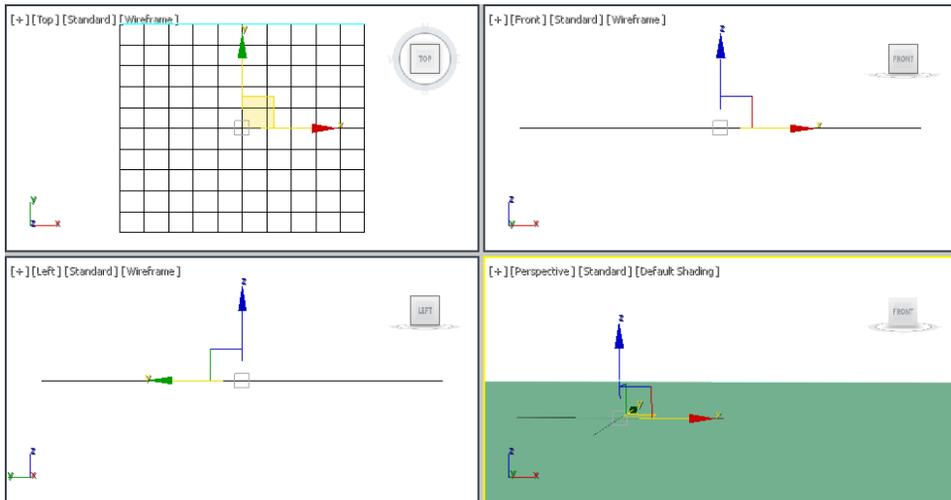


Figure 12-91 The water surface in viewports

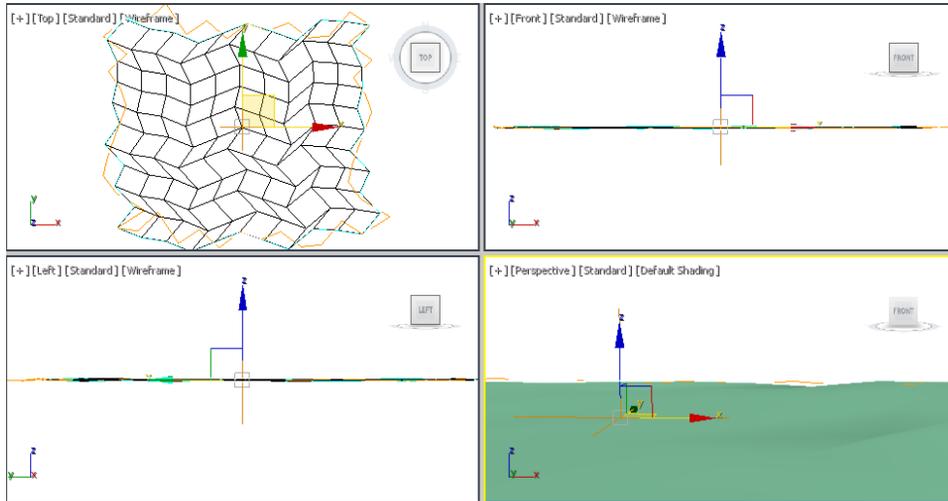


Figure 12-92 The water surface displayed after entering the values in the *Parameters* rollout of the *Noise* modifier

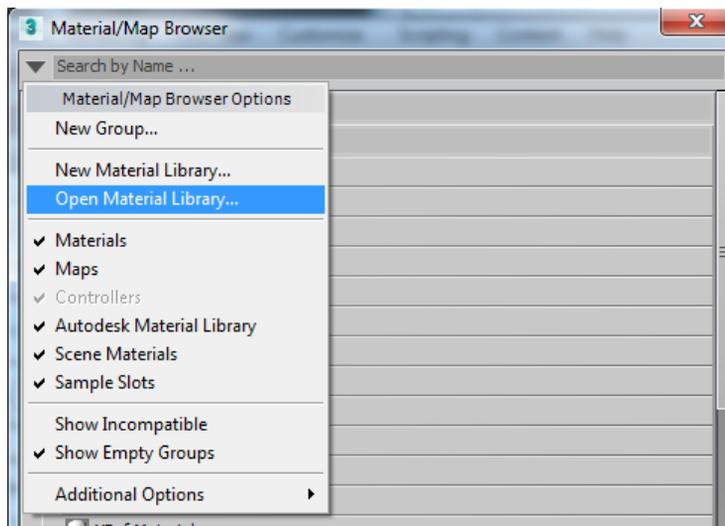


Figure 12-93 Choosing the *Open Material Library* option from the flyout

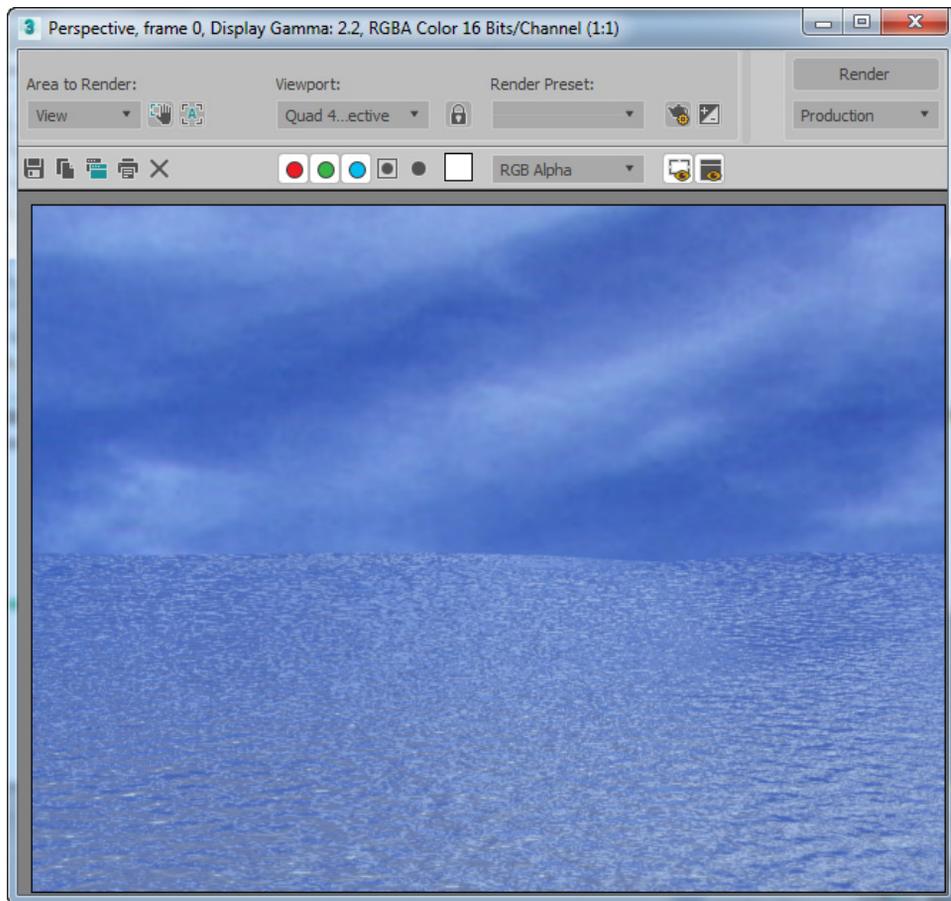


Figure 12-94 The final output of the scene after rendering



Figure 12-95 The model of a basket

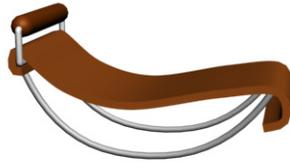


Figure 12-96 The model of a chair



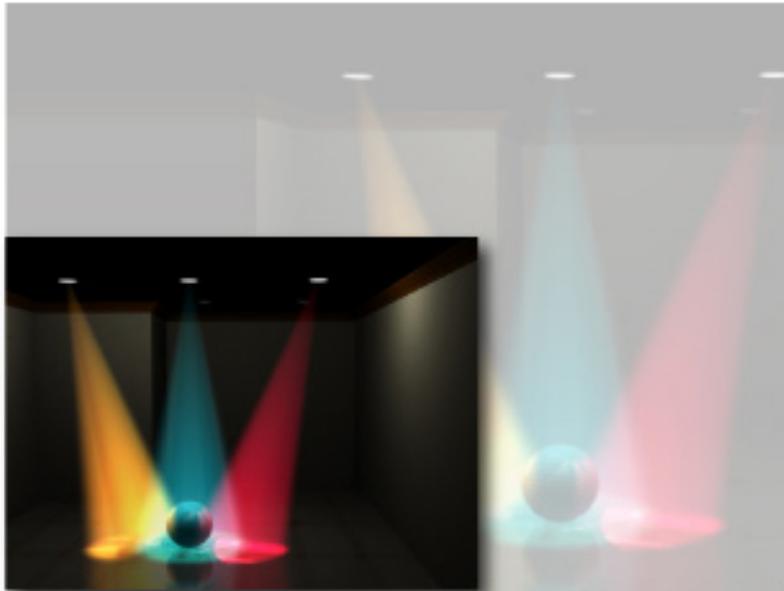
Figure 12-97 The model of a bowl

Lights and Rendering

Learning Objectives

After completing this chapter, you will be able to:

- *Work with standard lights*
- *Work with photometric lights*
- *Use the Place Highlight tool*
- *Work with Camera tools*
- *Understand camera viewport controls*
- *Work with the Align Camera tool*
- *Work with the Arnold renderer*



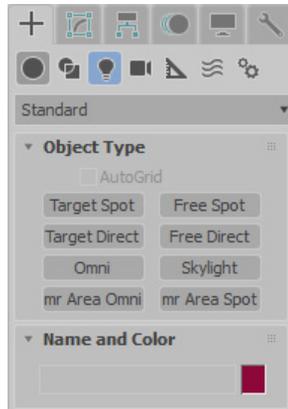


Figure 13-1 The tools to create standard lights in the **Object Type** rollout



Figure 13-2 The **General Parameters** rollout

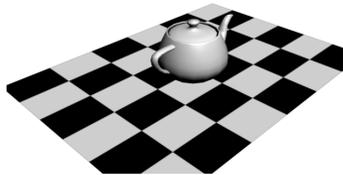


Figure 13-3 The scene without any light



Figure 13-4 The scene with the omni lights applied

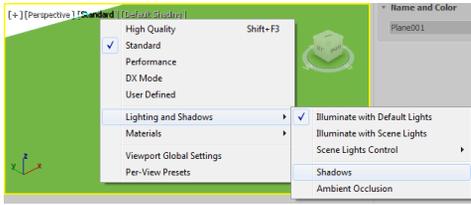


Figure 13-5 The cascading menu displayed in the viewport



Figure 13-6 The shadows displayed in the viewport

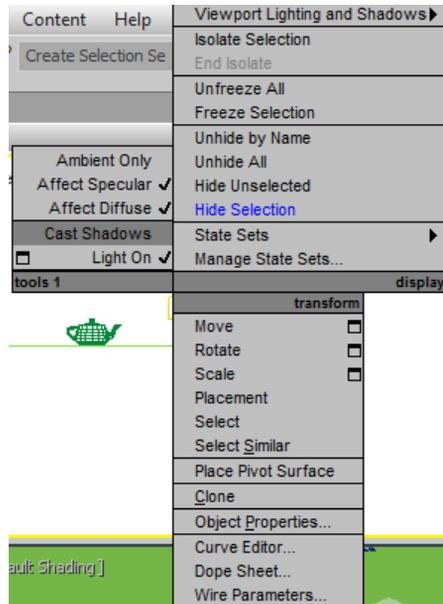


Figure 13-7 The quad menu displayed in the viewport

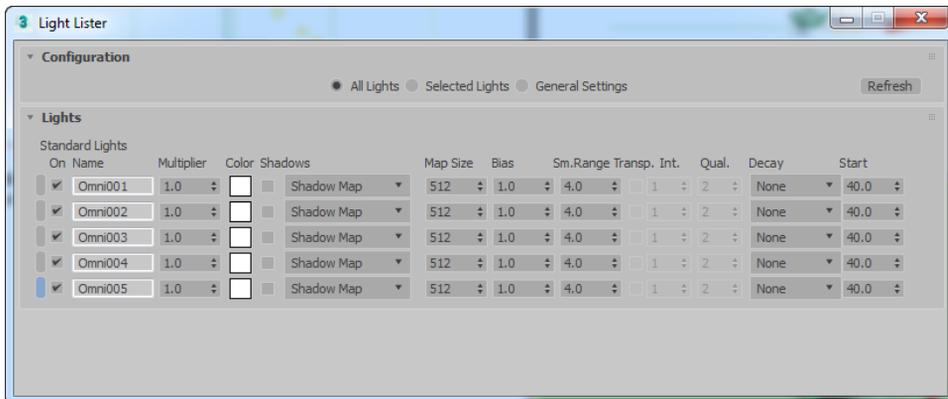


Figure 13-8 The Light Lister window

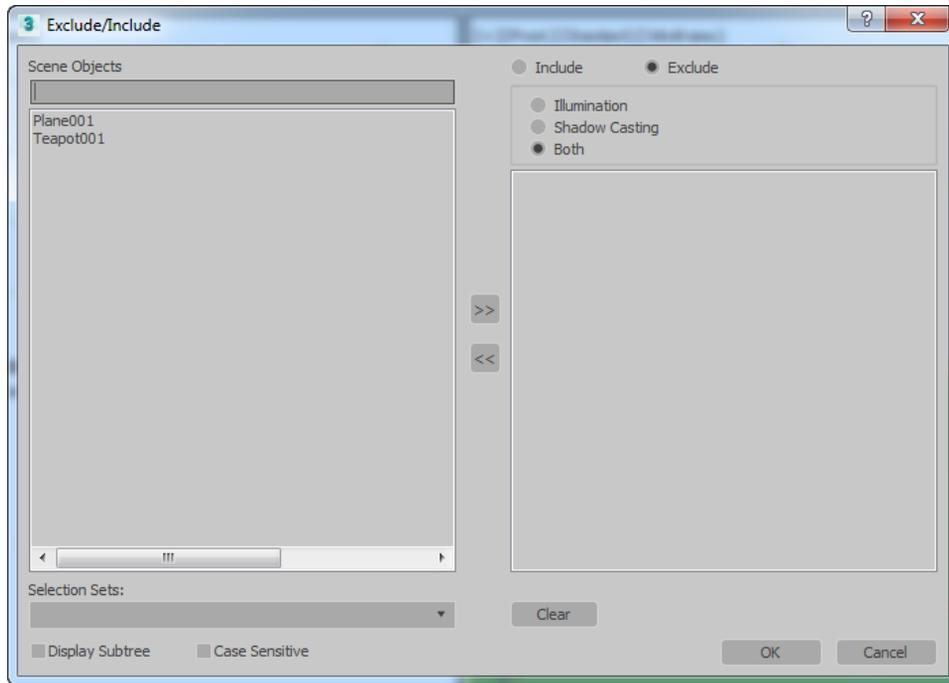


Figure 13-9 The Exclude/Include dialog box

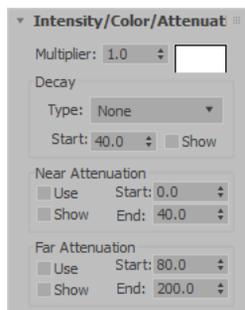


Figure 13-10 The Intensity/Color/Attenuation rollout



Figure 13-11 The effect of light on selecting the None option



Figure 13-12 The effect of light on selecting the Inverse option

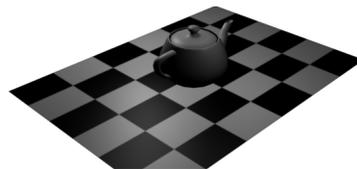


Figure 13-13 The effect of light on selecting the Inverse Square option

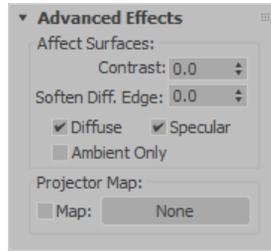


Figure 13-14 The Advanced Effects rollout

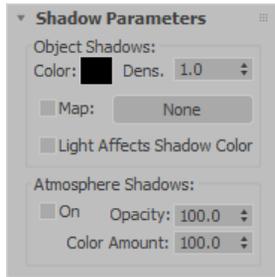


Figure 13-15 The Shadow Parameters rollout



Figure 13-16 A dent map used as a shadow map



Figure 13-17 The Atmospheres & Effects rollout



Figure 13-18 The lens effect applied to the omni light

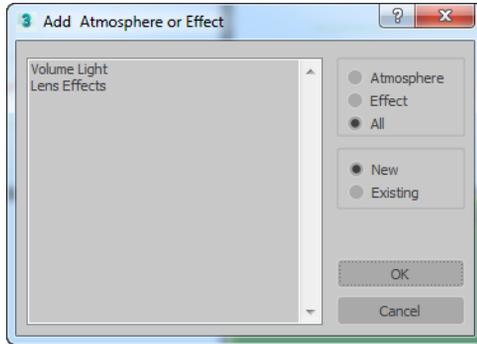


Figure 13-19 The Add Atmosphere or Effect dialog box

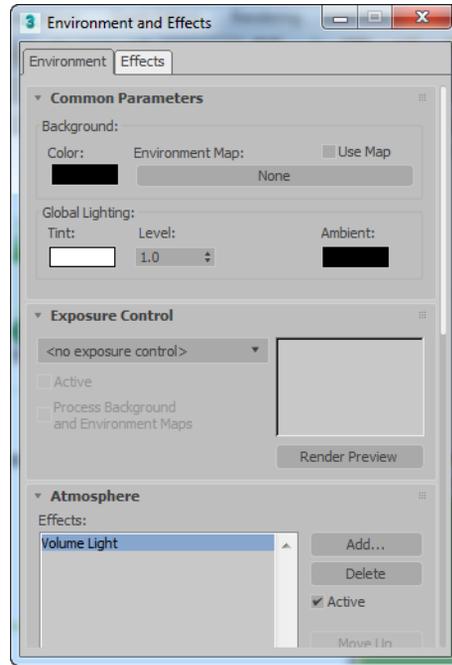


Figure 13-20 The Environment and Effects dialog box

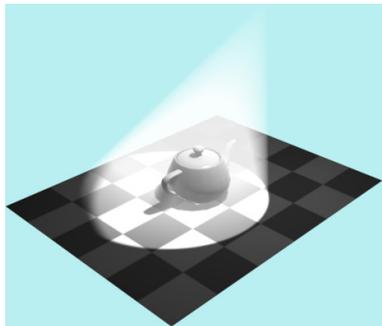


Figure 13-21 The effect of the target spot light with the Volume Light effect

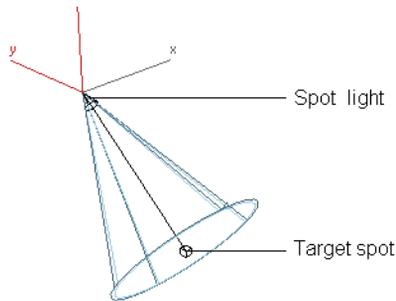


Figure 13-22 The target spot light

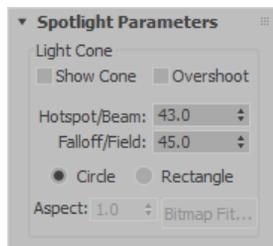


Figure 13-23 The Spotlight Parameters rollout

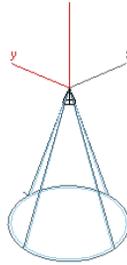


Figure 13-24 *The free spot light*

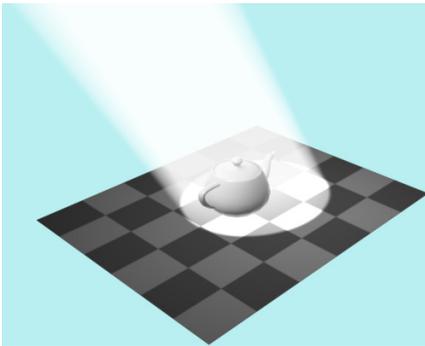


Figure 13-25 *The effect of the target direct light*

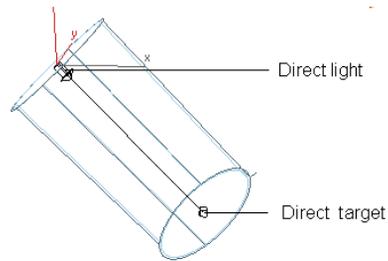


Figure 13-26 *The target direct light*

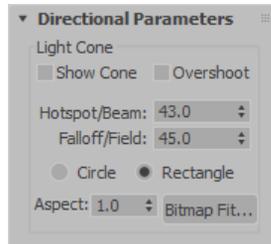


Figure 13-27 *The Directional Parameters rollout*

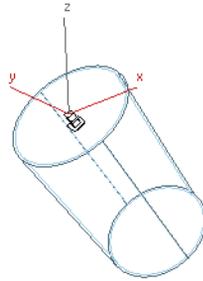


Figure 13-28 The free direct light



Figure 13-29 The skylight

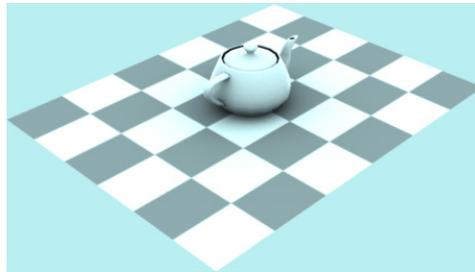


Figure 13-30 The effect of the skylight

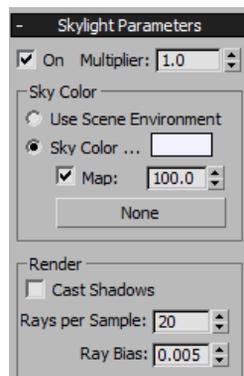


Figure 13-31 The Skylight Parameters rollout

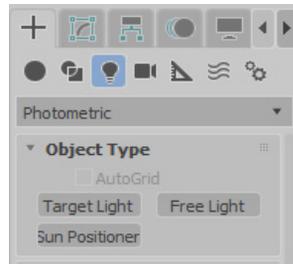


Figure 13-32 Various tools to create *Photometric* lights

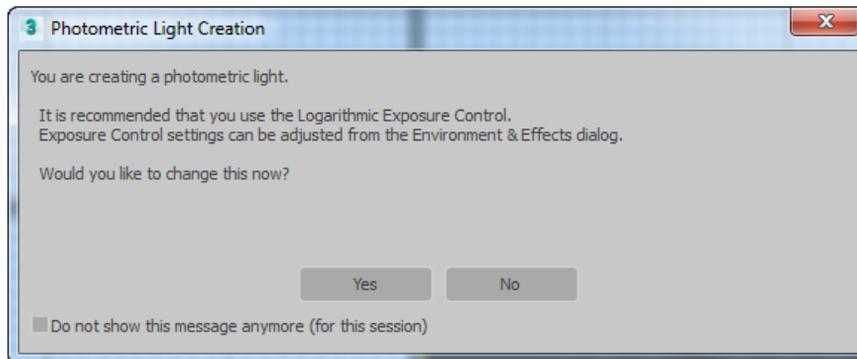


Figure 13-33 The *Photometric Light Creation* message box

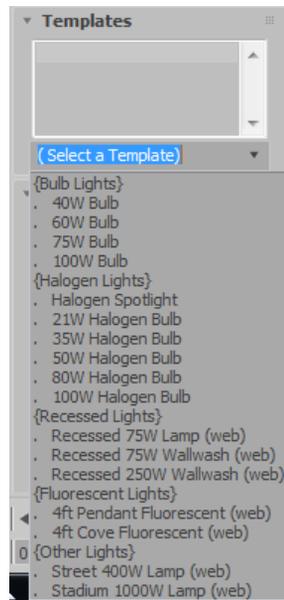


Figure 13-34 The Templates rollout and the drop-down list displayed to select the type of light

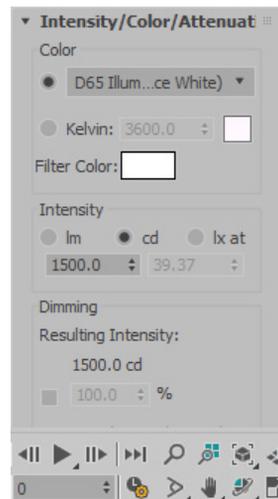


Figure 13-35 The Intensity/Color/Attenuation rollout

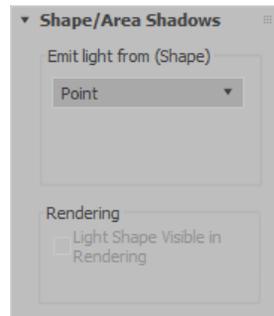


Figure 13-36 The Shape/Area Shadows rollout

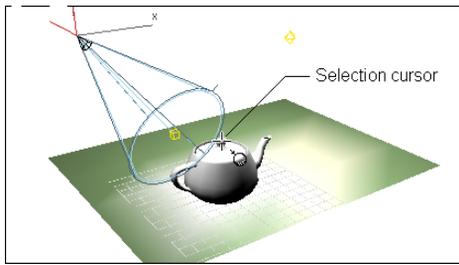


Figure 13-37 The selection cursor displayed after invoking the **Place Highlight** tool

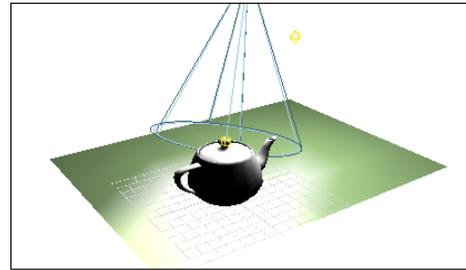


Figure 13-38 The light aligned as per the selection of the face of the object

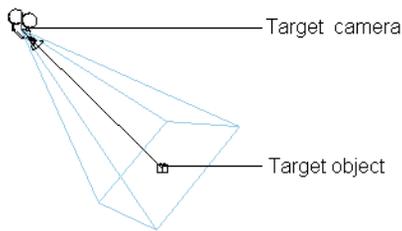


Figure 13-39 The target camera

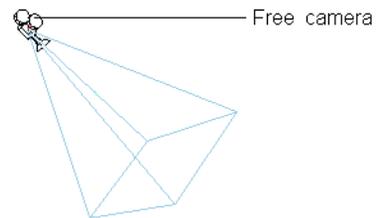


Figure 13-40 The free camera

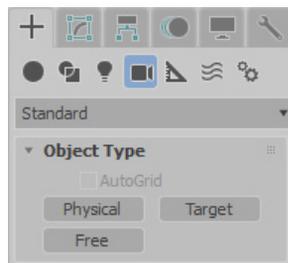


Figure 13-41 The **Object Type** rollout with tools to create cameras

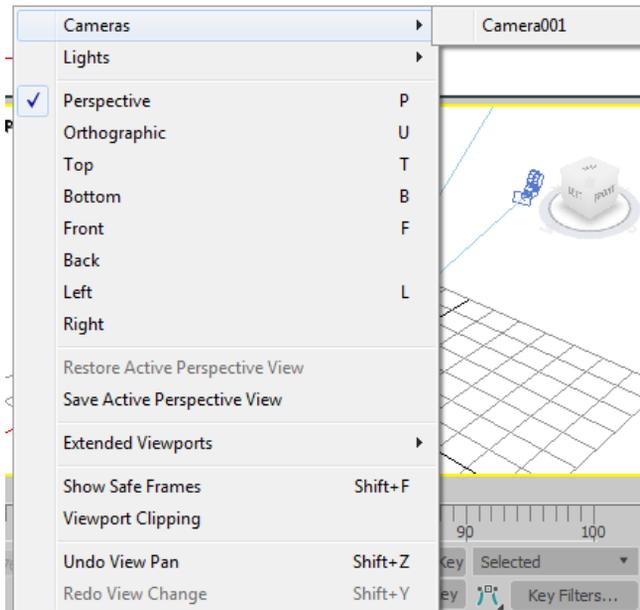


Figure 13-42 The cascading menu displayed on choosing the **Cameras** option

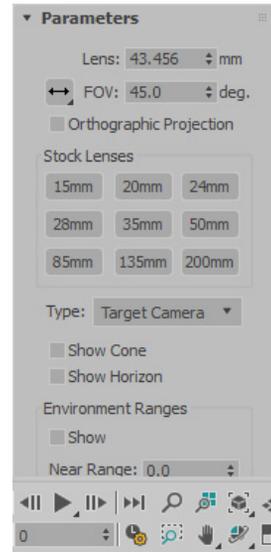


Figure 13-43 Partial view of the **Parameters** rollout

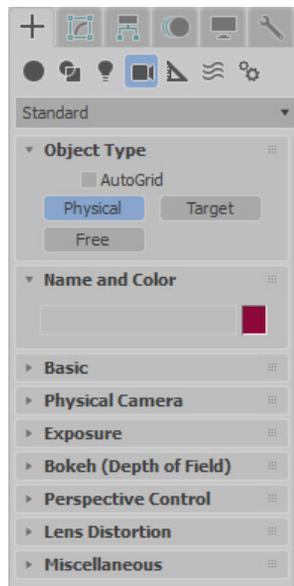


Figure 13-44 Various rollouts to create a physical camera

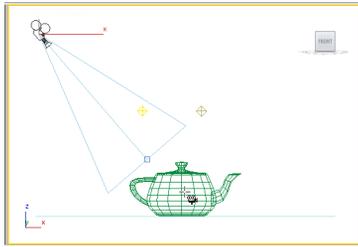


Figure 13-45 The cursor displayed on the object to get the proper alignment

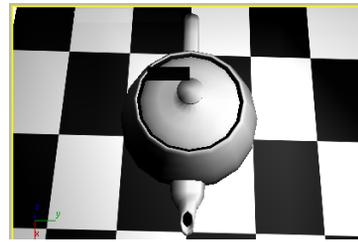
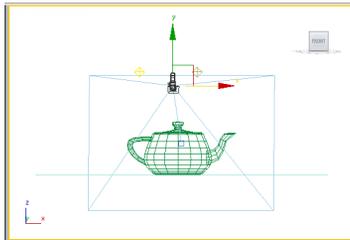


Figure 13-46 The Camera viewport before alignment



*Figure 13-47 The new position of the camera after using the **Align Camera** tool*



*Figure 13-48 The Camera viewport after using the **Align Camera** tool*

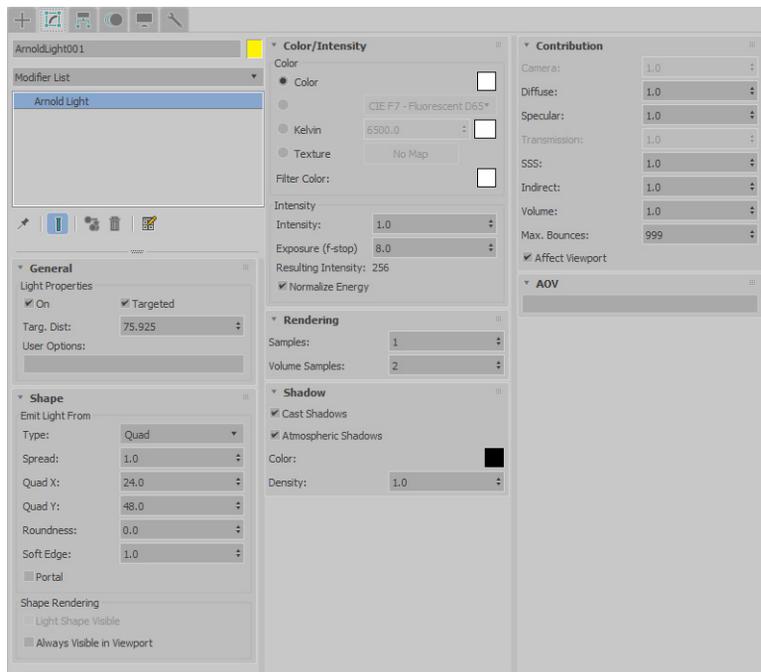


Figure 13-49 The rollouts for the Arnold light



Figure 13-50 The scene to be created

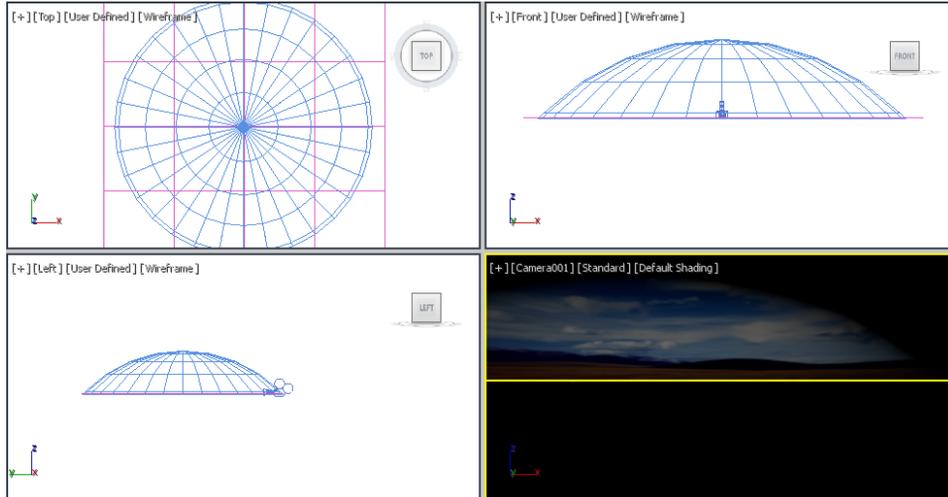


Figure 13-51 The c13_tut1_start.max file

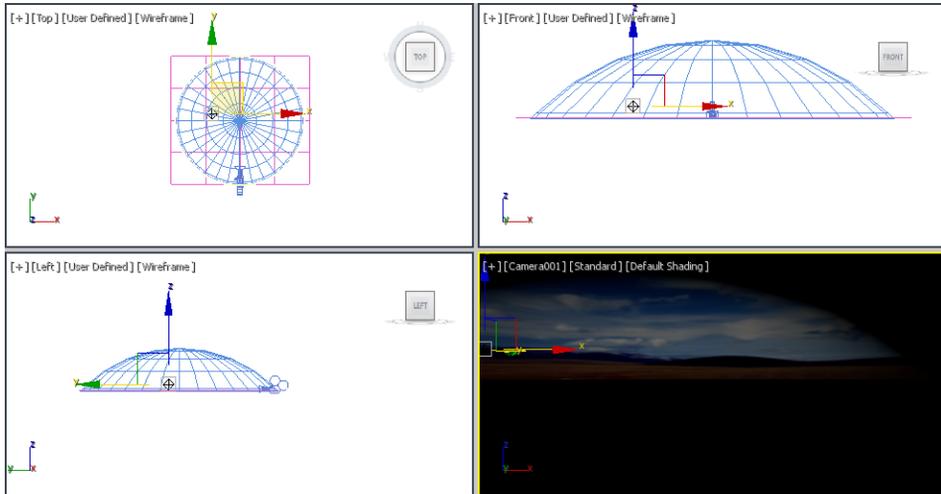


Figure 13-52 Alignment of Omni001 in the viewports

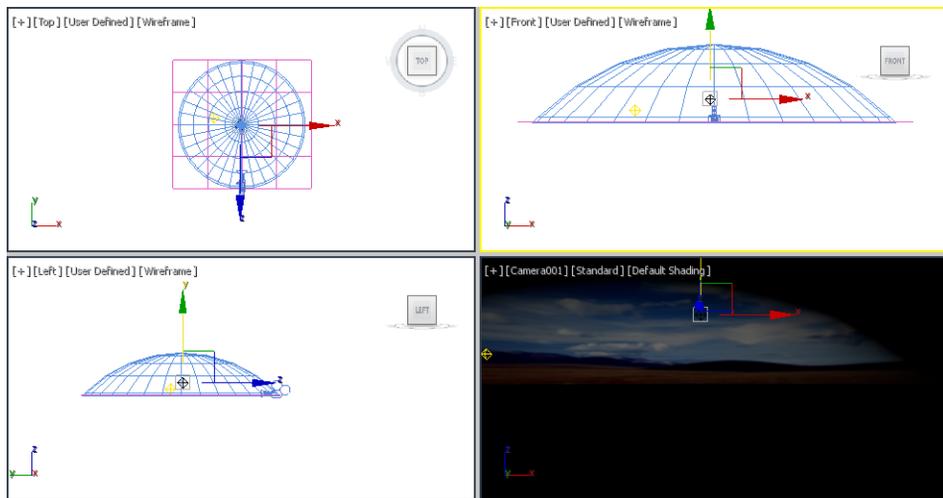


Figure 13-53 Alignment of Omni002 in the viewports



Figure 13-54 The Lens Effects Parameters rollout

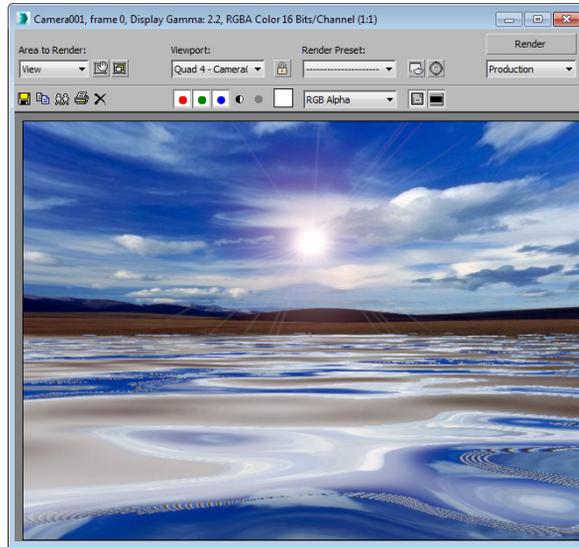


Figure 13-55 The final output of the scene

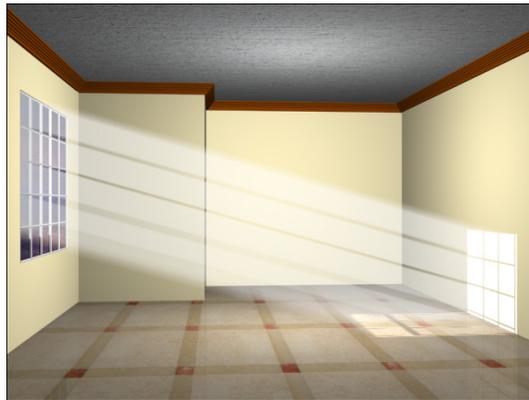


Figure 13-56 The illuminated room

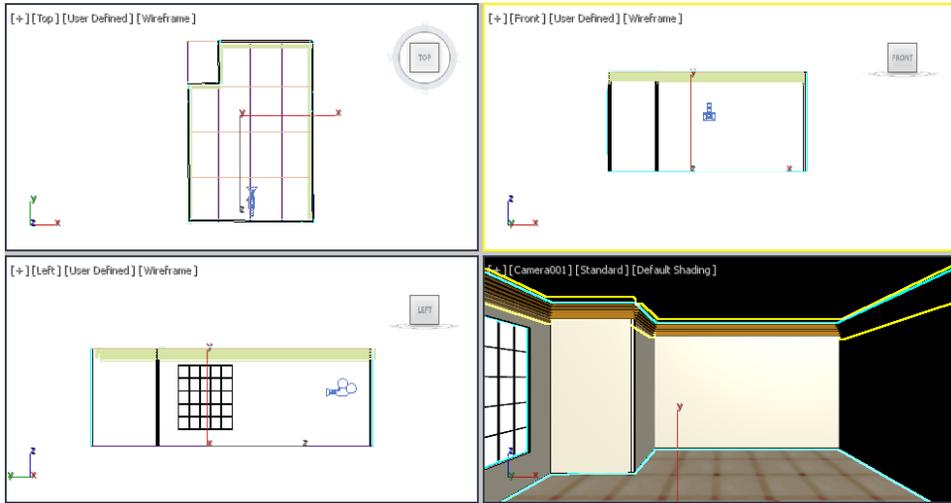


Figure 13-57 The c13_tut2_start.max file

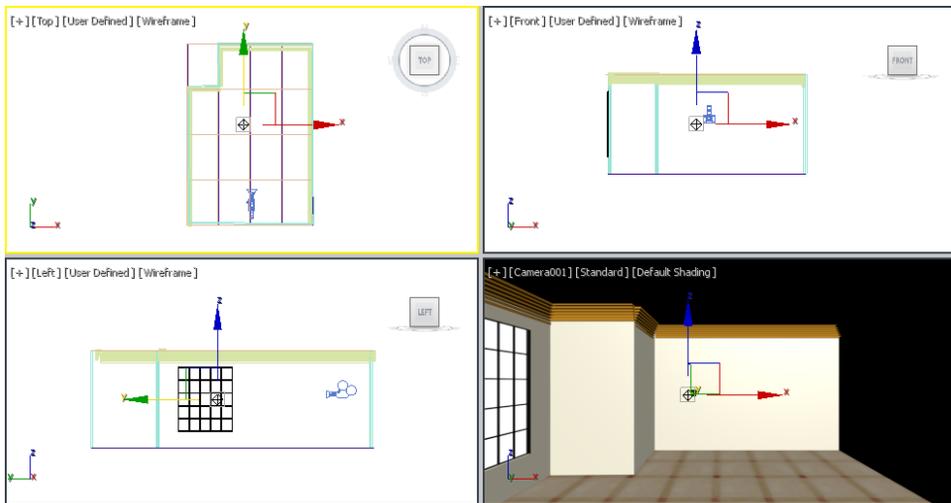


Figure 13-58 The Omni001 light in viewports

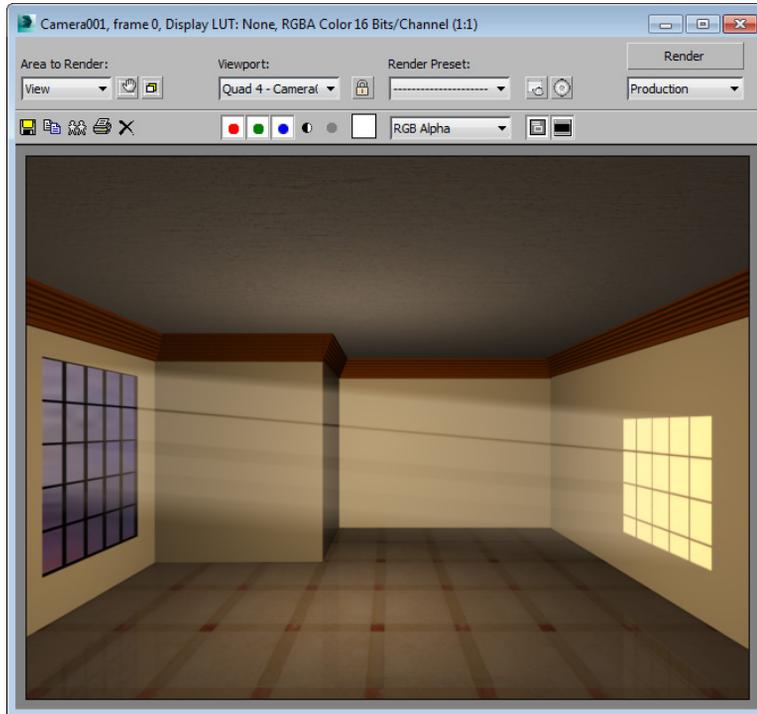


Figure 13-59 The final output after rendering



Figure 13-60 The illuminated night scene of a room

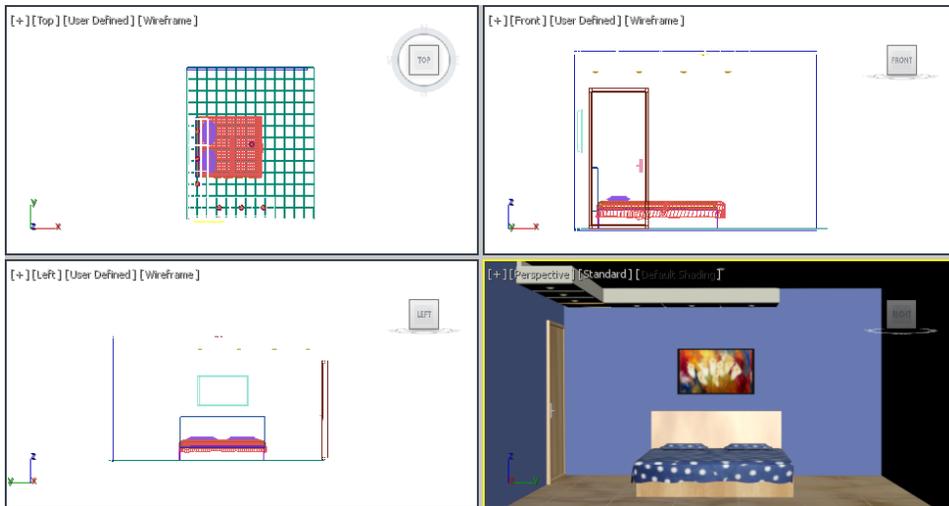


Figure 13-61 The *c13_tut3_start.max* file

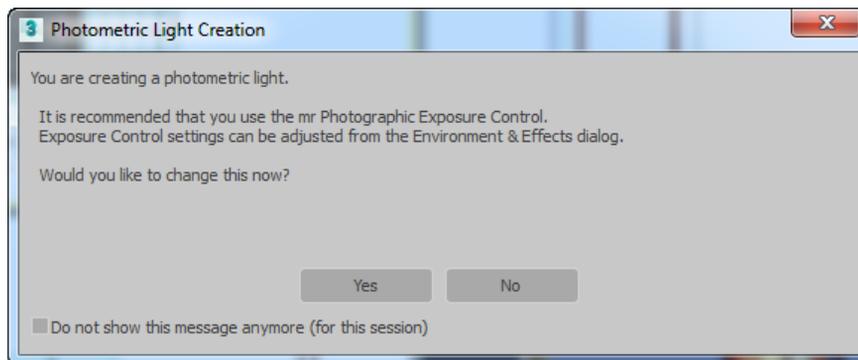


Figure 13-62 The *Photometric Light Creation* message box

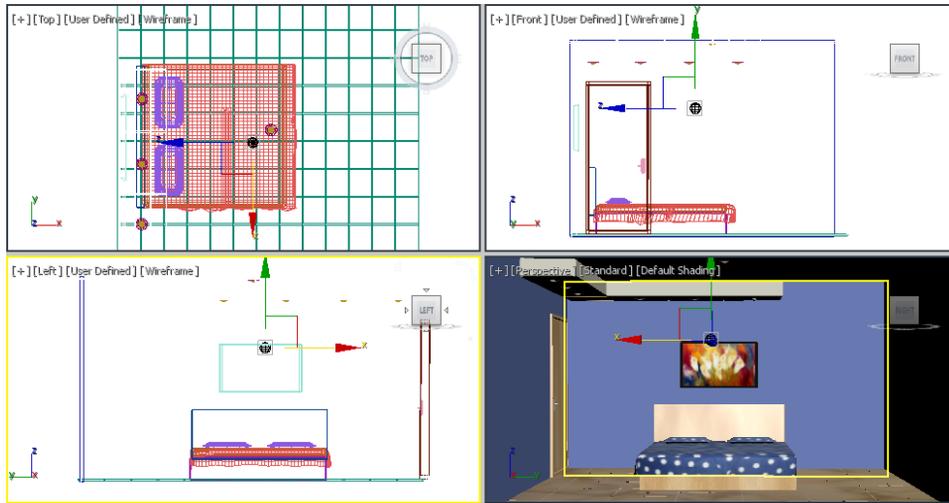


Figure 13-63 The rooflight1 aligned in the viewports



Figure 13-64 The rendered image

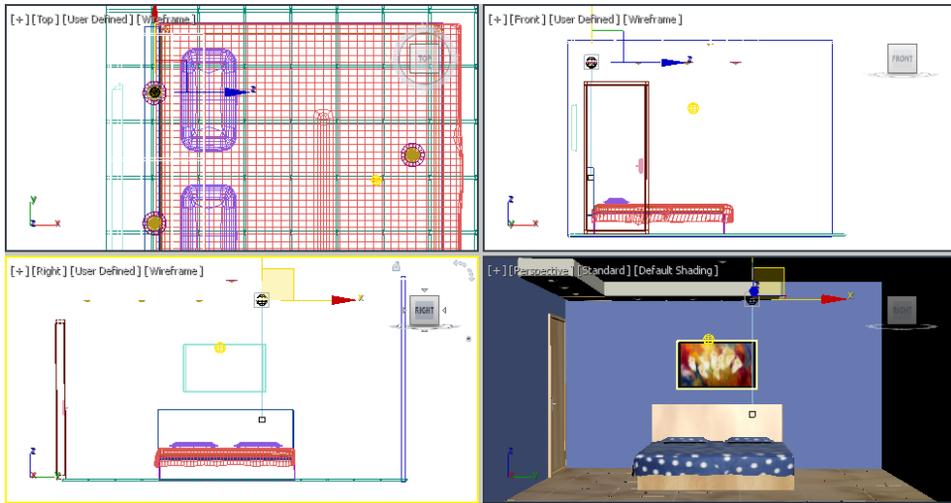


Figure 13-65 The spot light1 and spot light1.Target aligned in the viewports

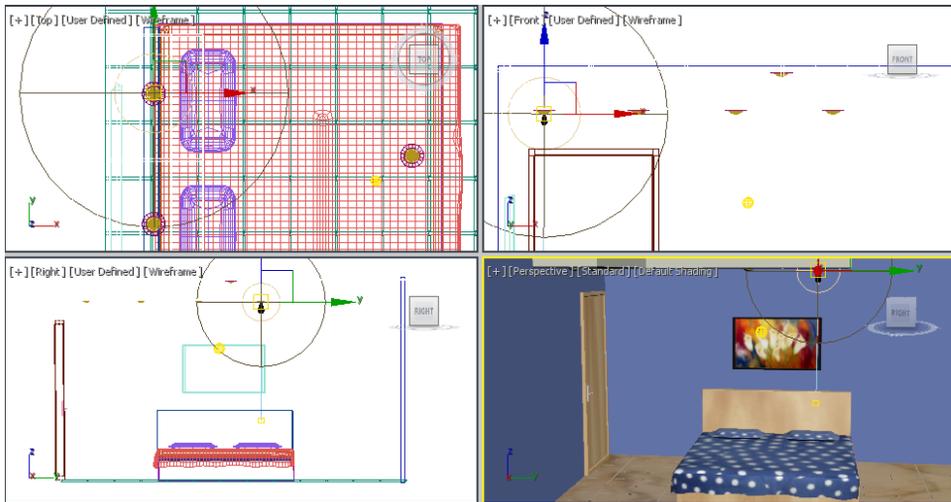


Figure 13-66 The spot light1 rotated



Figure 13-67 The rendered image

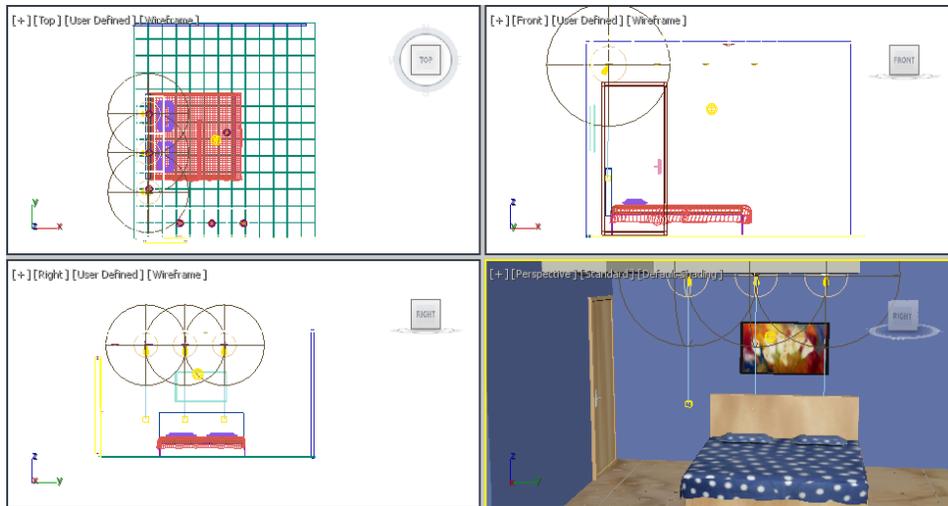


Figure 13-68 Copies of spot light1 and spot light1. Target aligned in the viewports



Figure 13-69 The rendered image



Figure 13-70 The daylight exterior scene



Figure 13-71 The c13_tut4_start.max file



Figure 13-72 The rendered image



Figure 13-73 The rendered image



Figure 13-74 The Daylight cone adjusted



Figure 13-75 The Daylight cone adjusted



Figure 13-76 The rendered image



Figure 13-77 The final output



Figure 13-78 The final render

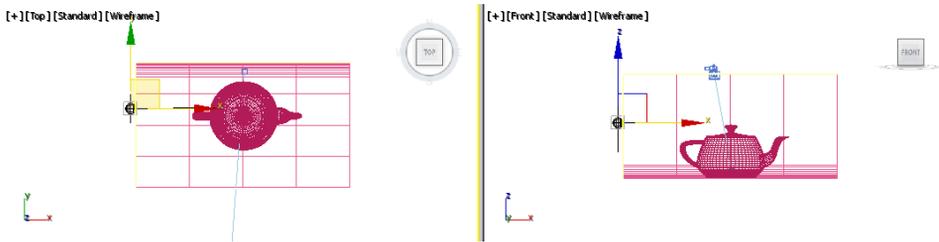


Figure 13-79 The leftLight aligned



Figure 13-80 The scene render

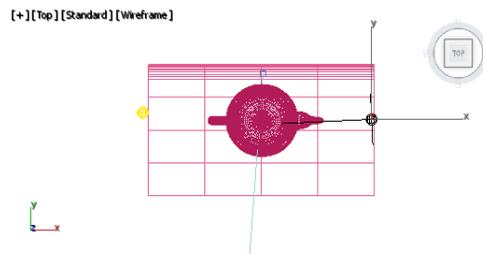


Figure 13-81 The rightLight aligned



Figure 13-82 The scene render



Figure 13-83 The scene render

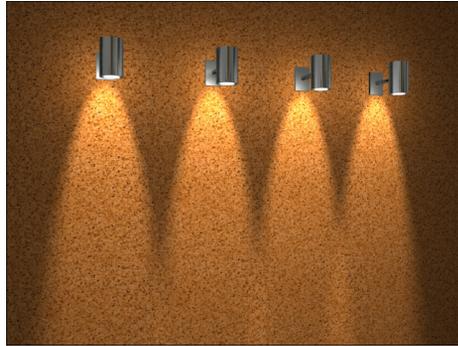


Figure 13-84 The target spot lights illuminating the wall

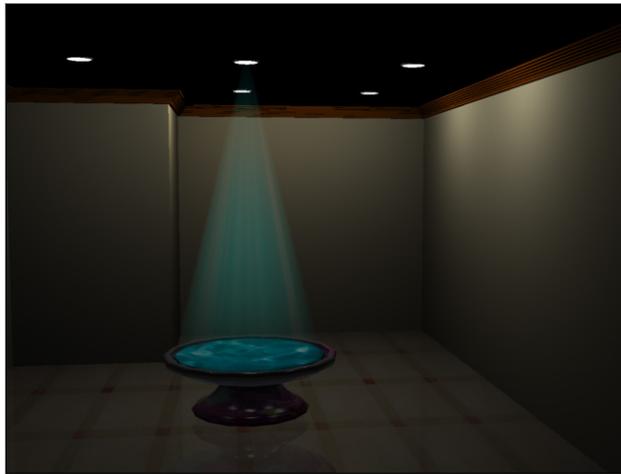


Figure 13-85 Various lights illuminating the room

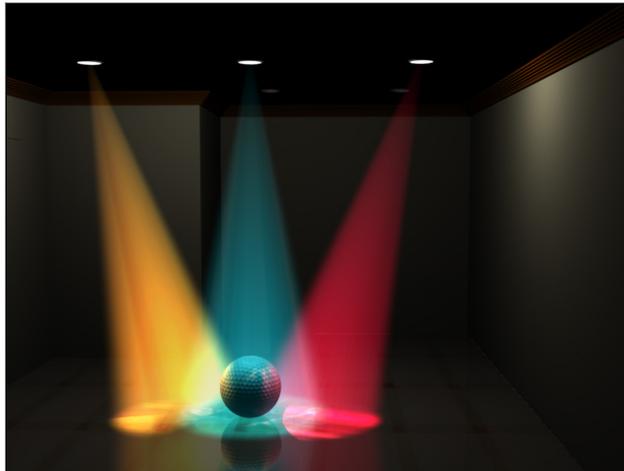


Figure 13-86 The scene illuminated by the spot lights

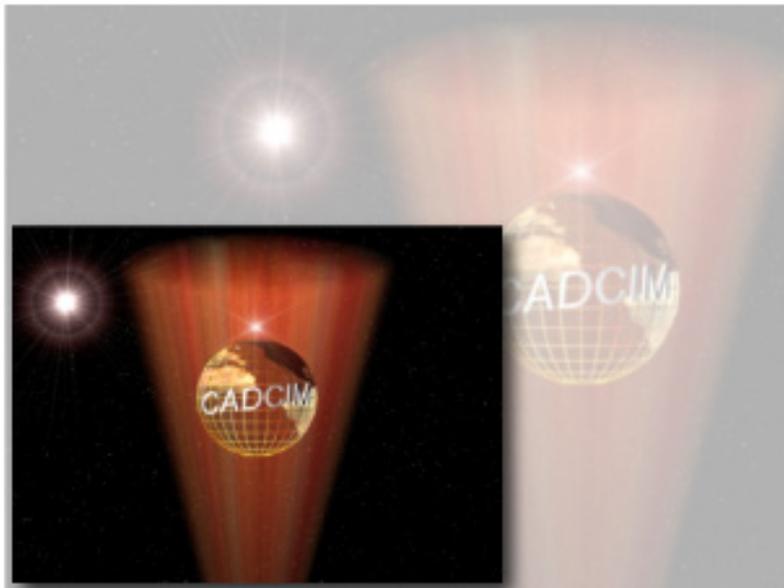
14

Animation Basics

Learning Objectives

After completing this chapter, you will be able to:

- *Work with the time slider*
- *Use animation playback controls*
- *Use animation and time controls*
- *Morph compound object*
- *Render and preview an animation*
- *Apply various rendering effects to a scene*



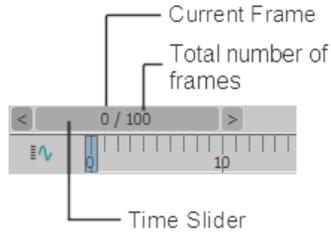


Figure 14-1 The time slider

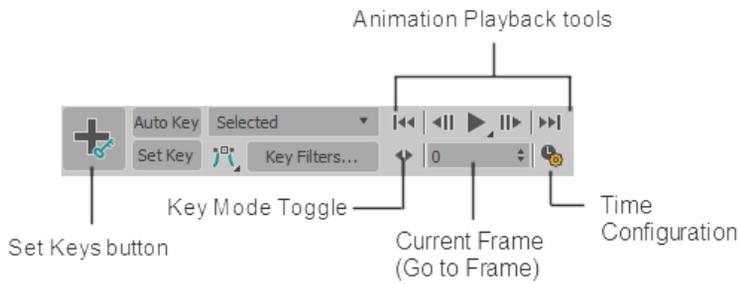


Figure 14-2 The time control tools

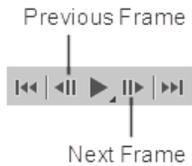


Figure 14-3 Animation playback controls before choosing the **Key Mode Toggle** button



Figure 14-4 Animation playback controls after choosing the **Key Mode Toggle** button

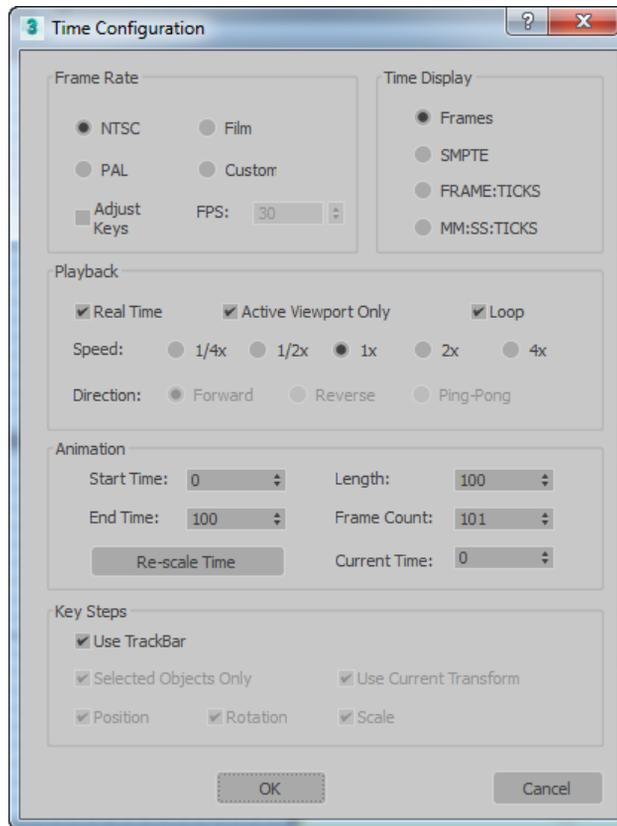


Figure 14-5 The Time Configuration dialog box

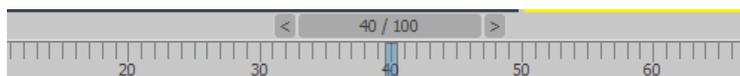


Figure 14-6 Partial view of the track bar

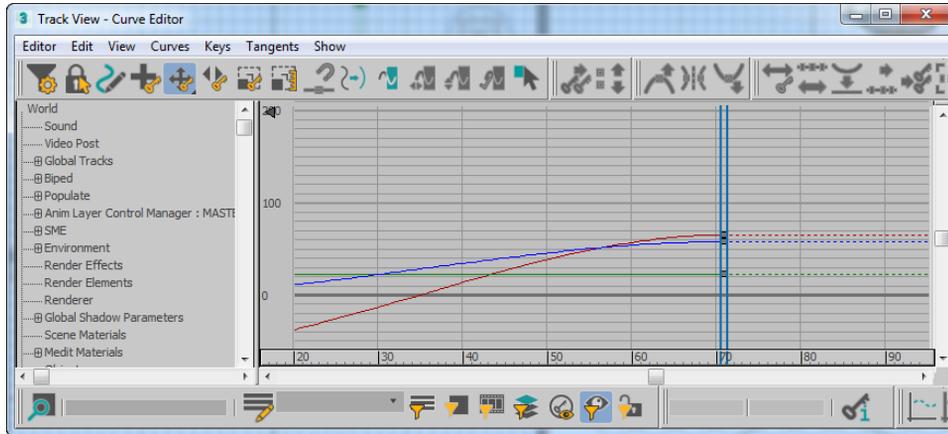


Figure 14-7 The Track View - Curve Editor window

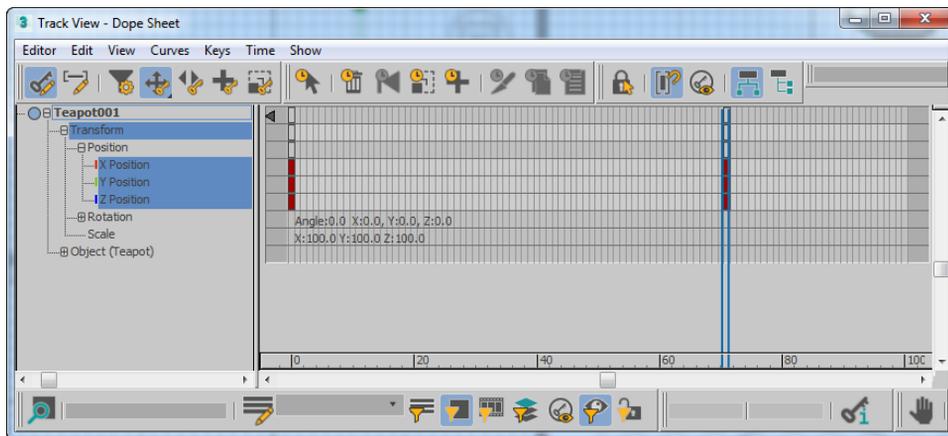


Figure 14-8 The Track View - Dope Sheet window

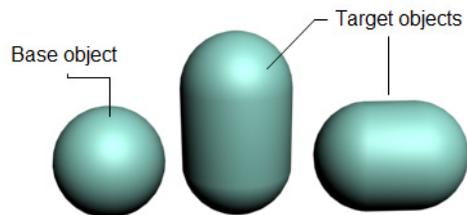


Figure 14-9 The base and target objects for morphing

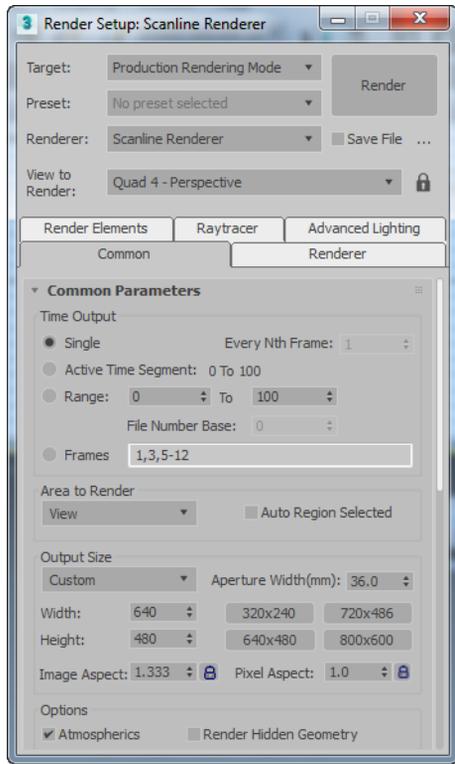


Figure 14-10 The **Render Setup: Scanline Renderer** dialog box

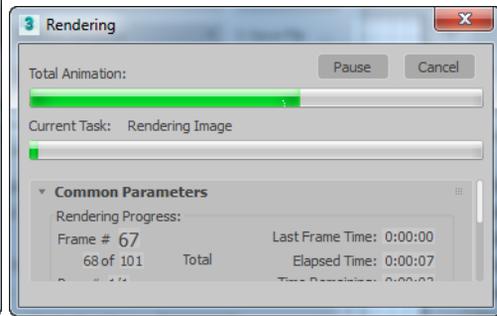


Figure 14-11 The **Rendering** dialog box

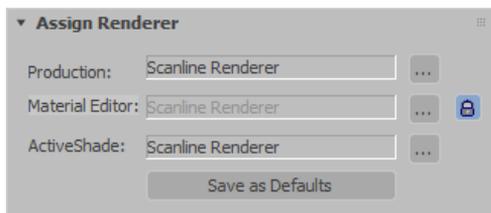


Figure 14-12 The **Assign Renderer** rollout

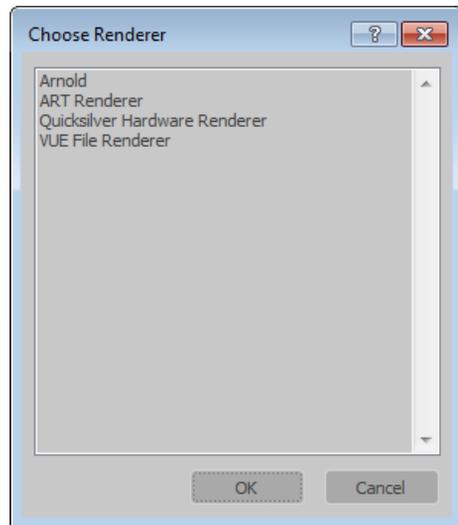


Figure 14-13 The **Choose Renderer** dialog box

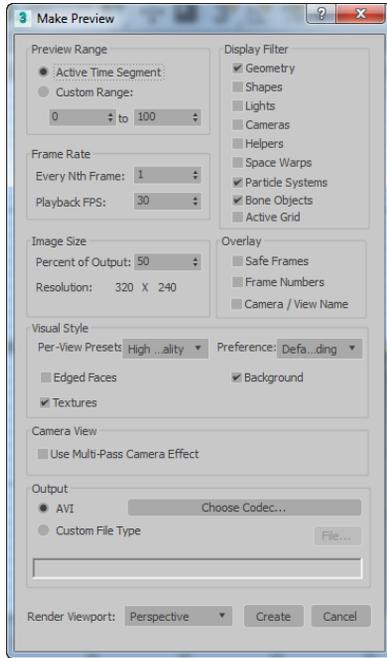


Figure 14-14 The *Make Preview* dialog box

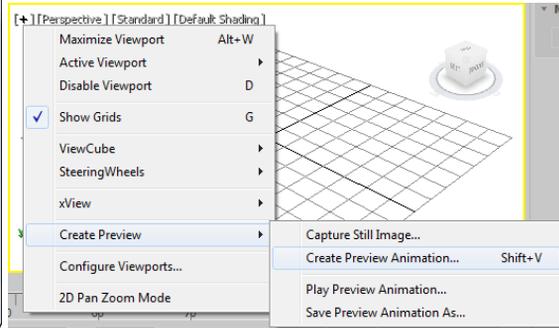


Figure 14-15 The flyout and the cascading menu of the *General viewport label*

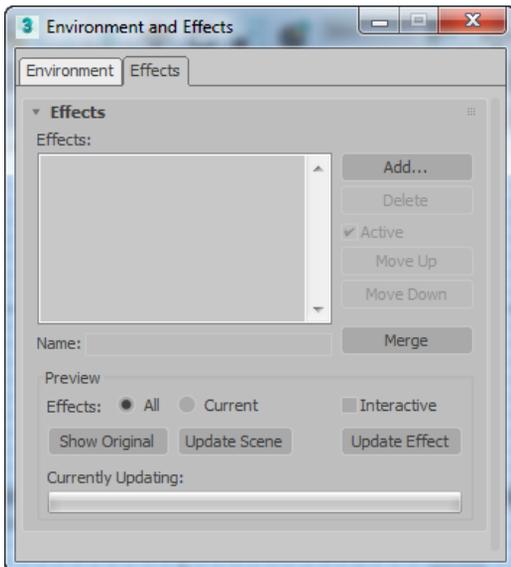


Figure 14-16 The *Environment and Effects* dialog box

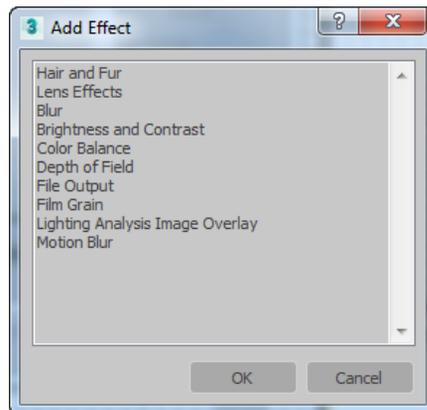


Figure 14-17 The *Add Effect* dialog box

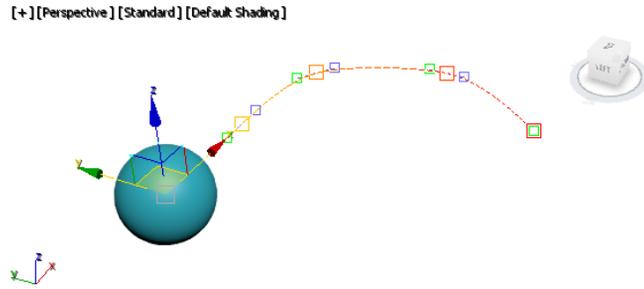


Figure 14-18 The motion path displayed

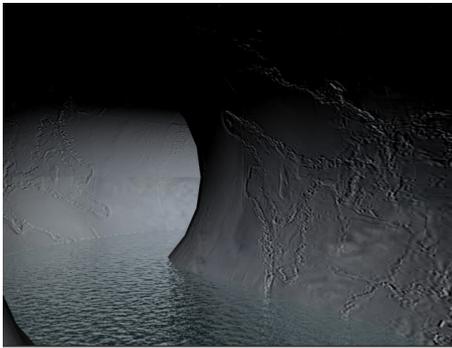


Figure 14-19 Animated scene for tunnel at frame 600



Figure 14-20 Animated scene for tunnel at frame 920

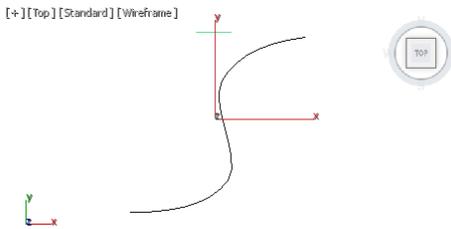


Figure 14-21 A line created for the tunnel

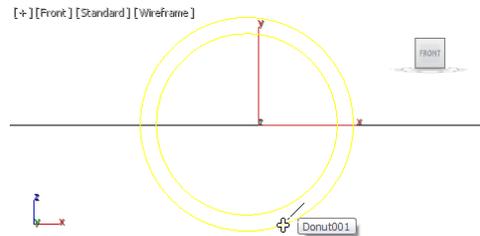


Figure 14-22 The cursor displayed after moving it over Donut001

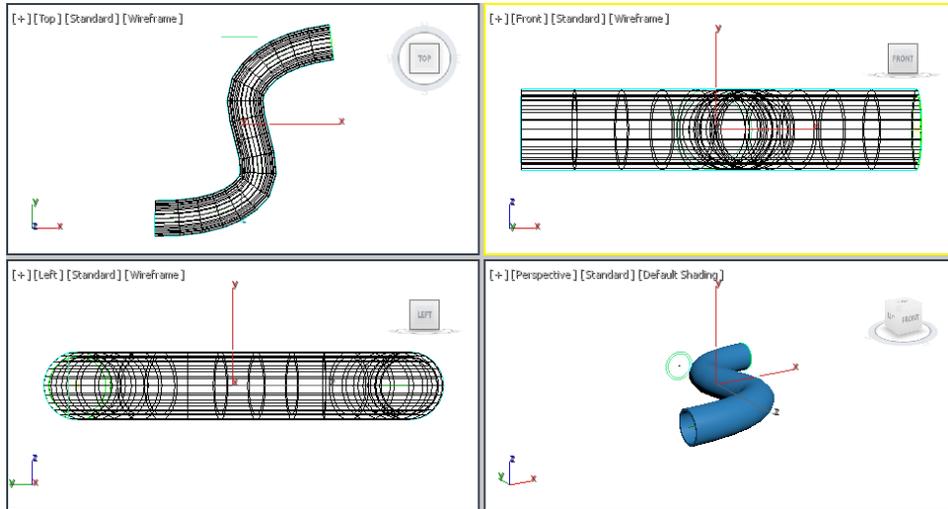


Figure 14-23 The shape of the tunnel created in the viewports using the Loft tool

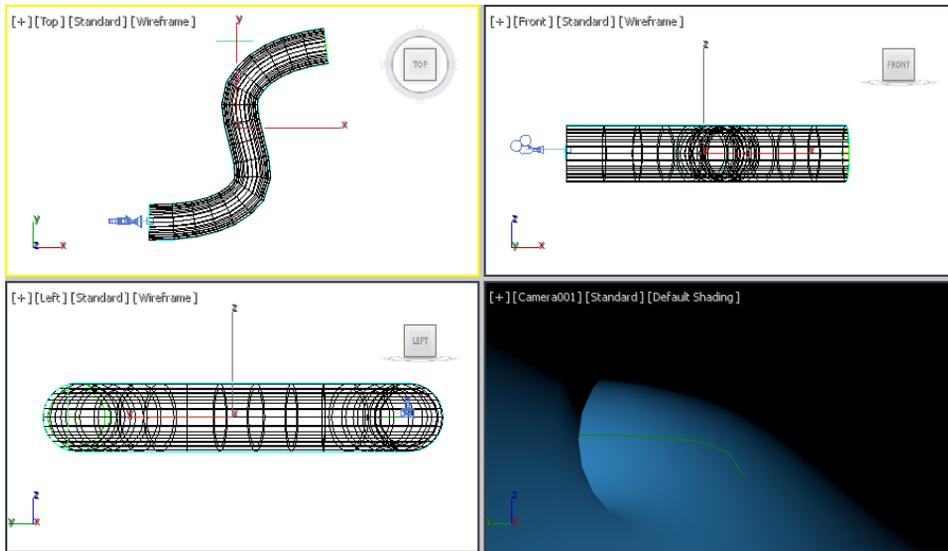


Figure 14-24 Alignment of Camera001 in viewports

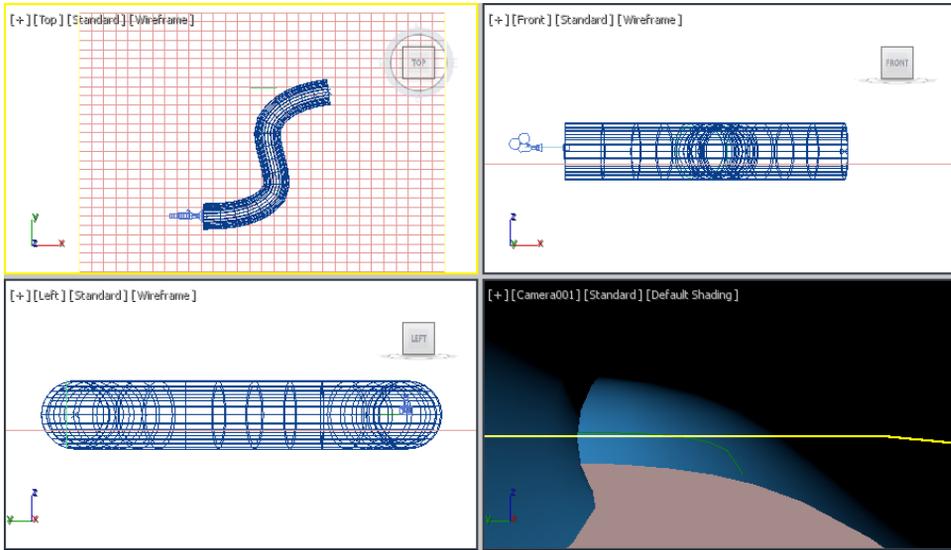


Figure 14-25 The water surface created and aligned in viewports

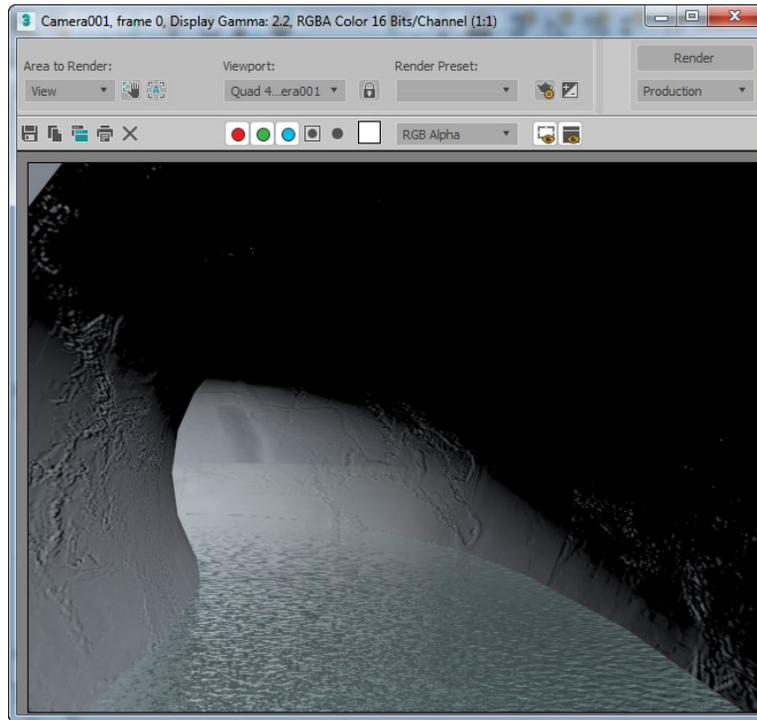


Figure 14-26 The scene after assigning the materials

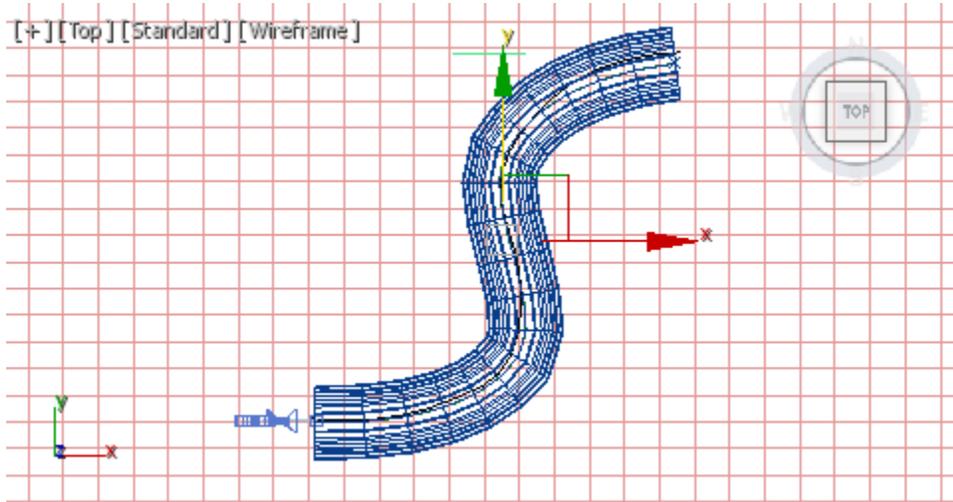


Figure 14-27 A line created for the path

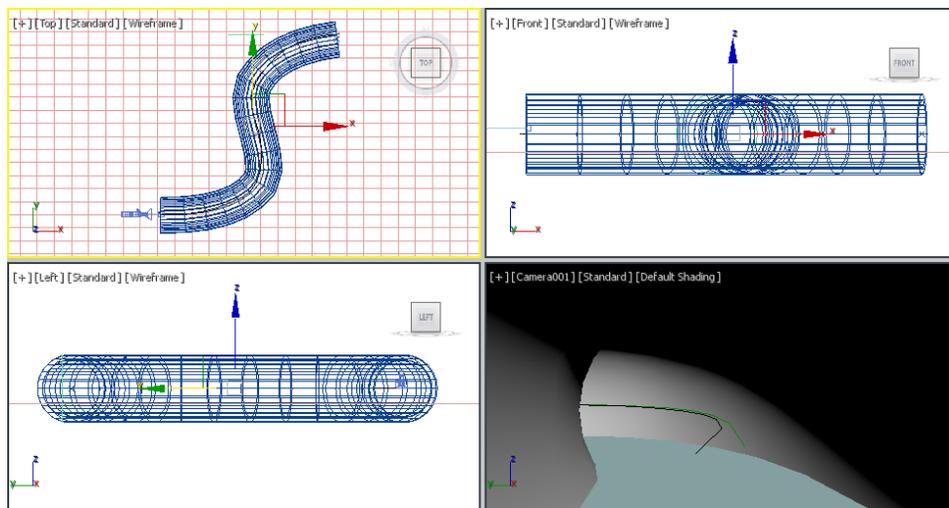


Figure 14-28 The path aligned in viewports

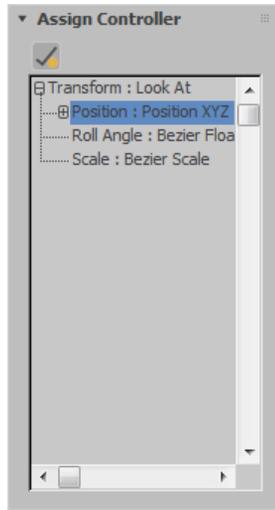


Figure 14-29 The Assign Controller rollout

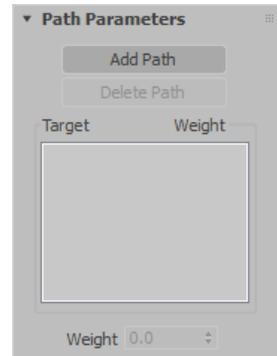


Figure 14-30 Partial view of the Path Parameters rollout

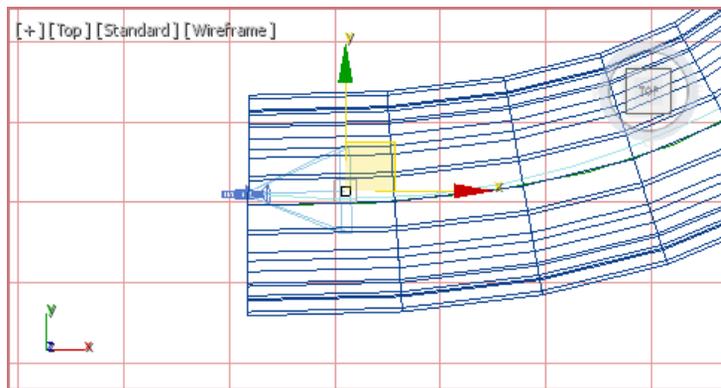


Figure 14-31 The camera and its target at frame 0

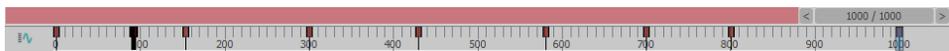


Figure 14-32 The track bar after creating the animation



Figure 14-33 The animated scene

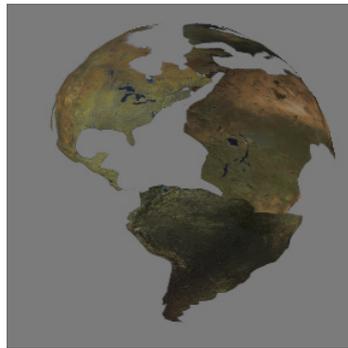


Figure 14-34 The earth map in the sample slot



Figure 14-35 The earth map applied to the earth sphere after rendering

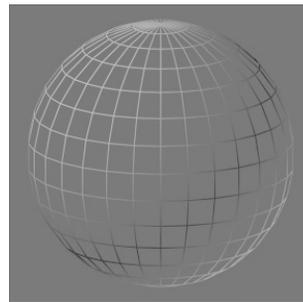


Figure 14-36 Wireframes displayed in the sample slot

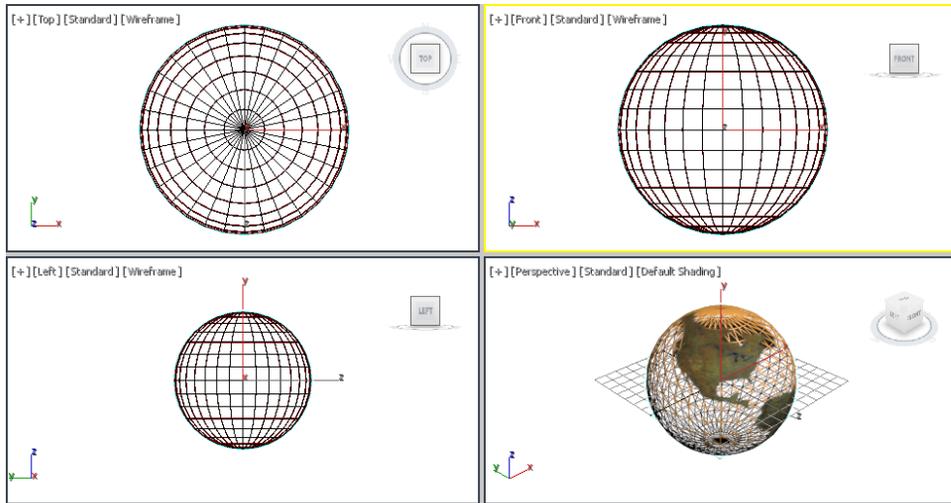


Figure 14-37 Alignment of the wireframe and the earth sphere in viewports



Figure 14-38 The sphere at rendering

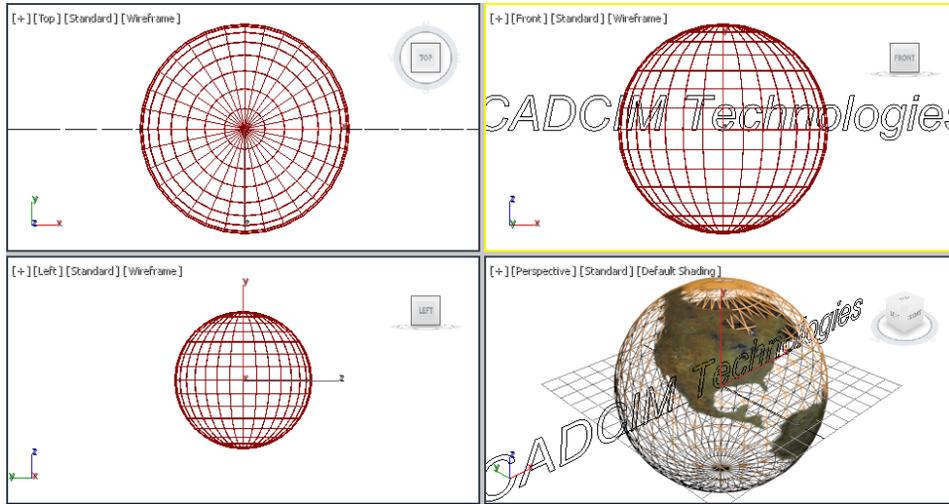


Figure 14-39 Alignment of Text001 in viewports

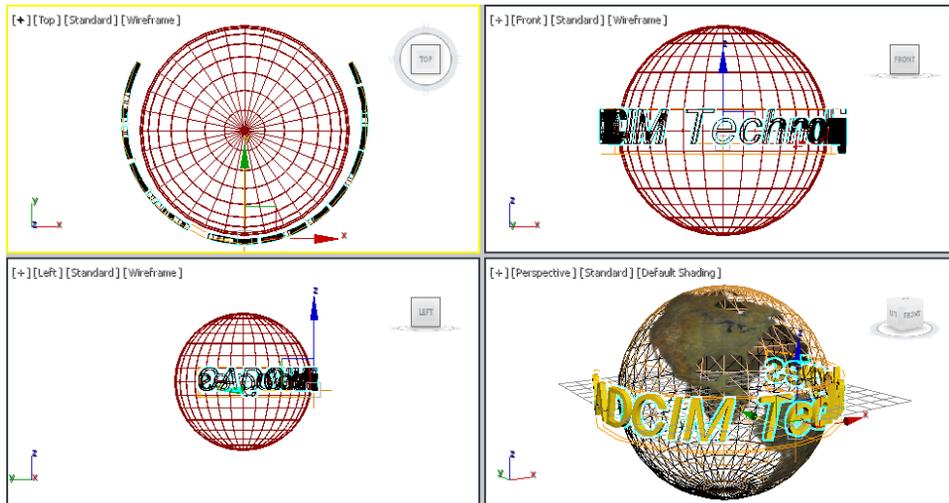


Figure 14-40 The Text001 aligned in viewports after applying the **Extrude** and **Bend** modifiers

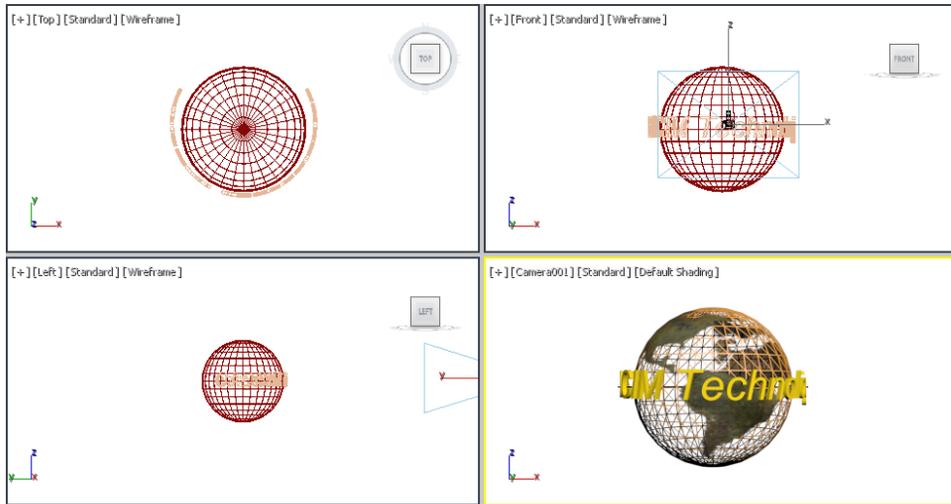


Figure 14-41 The Camera001 aligned in viewports

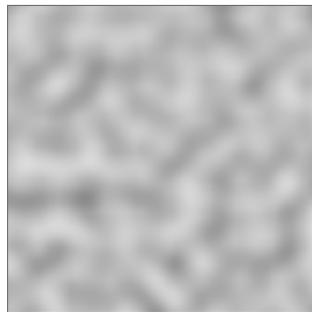


Figure 14-42 The sample slot with the Noise environment



Figure 14-43 The scene with the space environment map

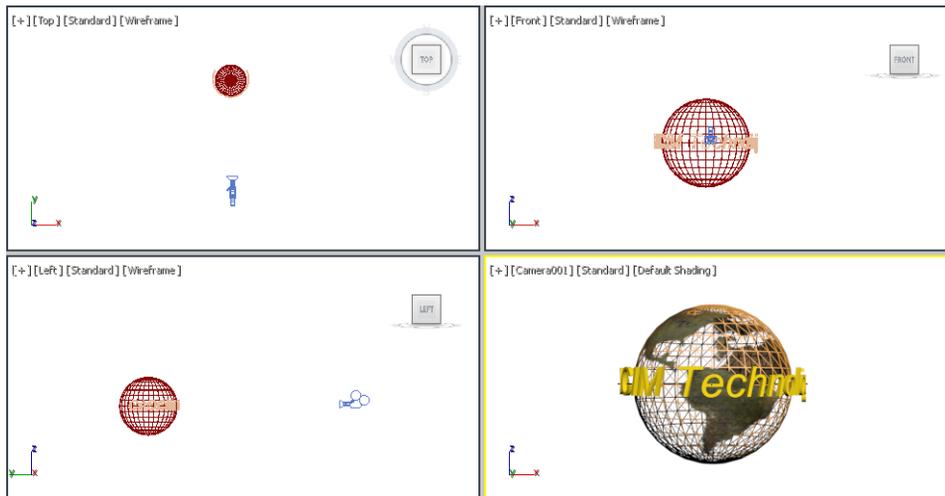


Figure 14-44 The wireframe earth sphere zoomed out

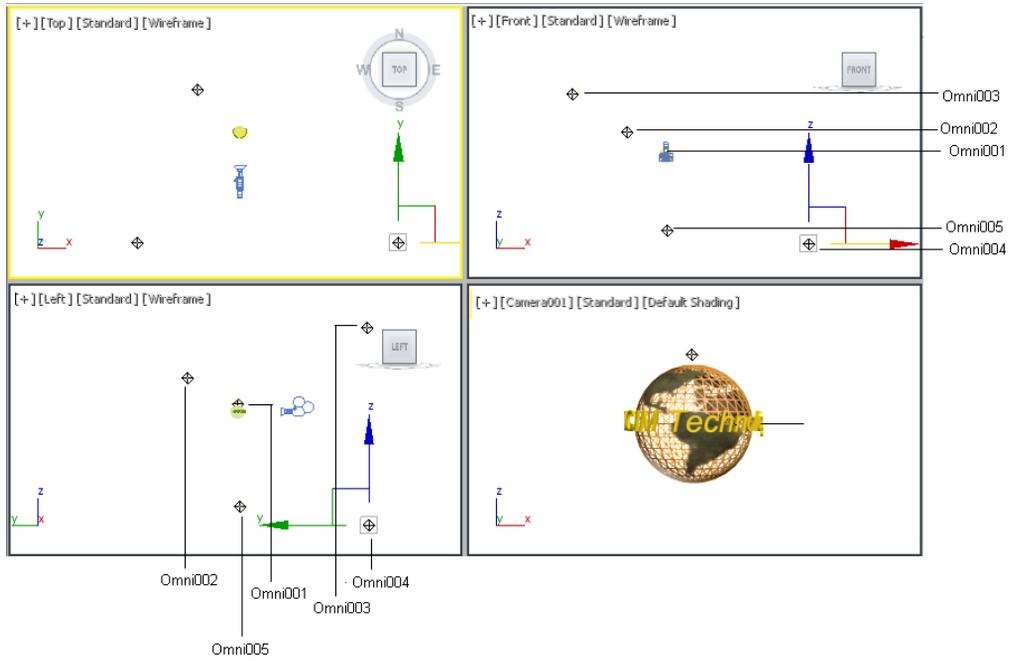


Figure 14-45 Omni lights aligned in viewports

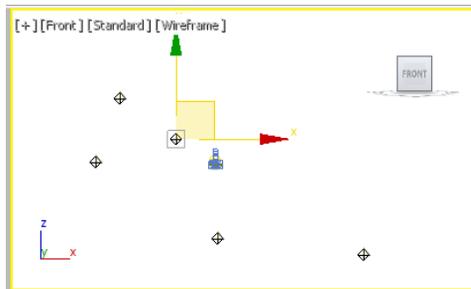


Figure 14-46 Omni light selected to add the advance effects



Figure 14-47 The effect of the omni light displayed at rendering

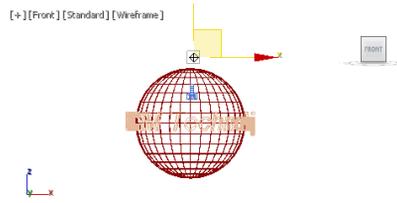


Figure 14-48 The omni light aligned with the top of the wireframe earth sphere



Figure 14-49 The omni light with lens effect displayed

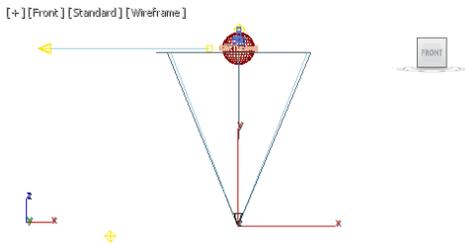


Figure 14-50 Spot light created in the Front viewport



Figure 14-51 Spot light created in the Top viewport



Figure 14-52 The scene at rendering after applying the **Volume Light** effect in the **Spot001** light

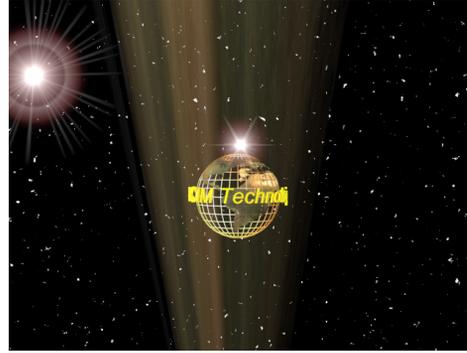


Figure 14-53 The scene at rendering after assigning a map to **Projector Map**



Figure 14-54 The scene displayed at rendering after setting the parameters in the **Far Attenuation** area

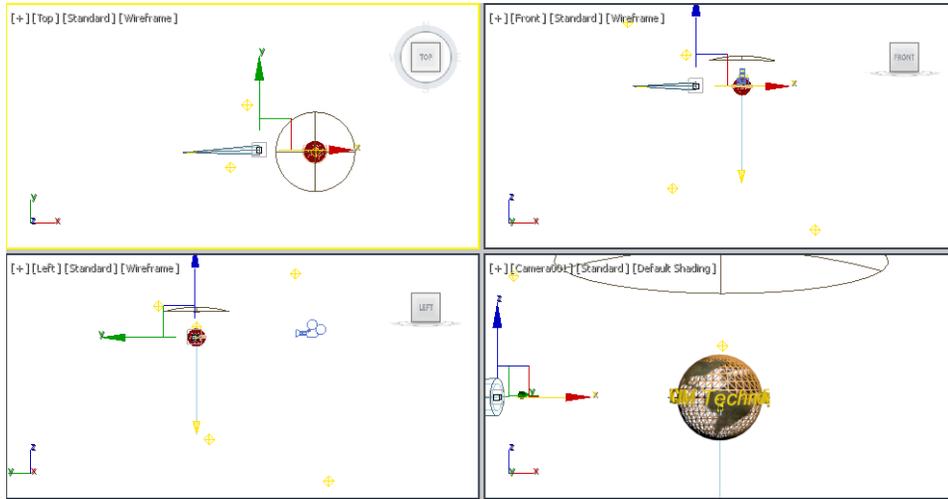


Figure 14-55 The Spot002 and Spot002.Target light aligned in viewports

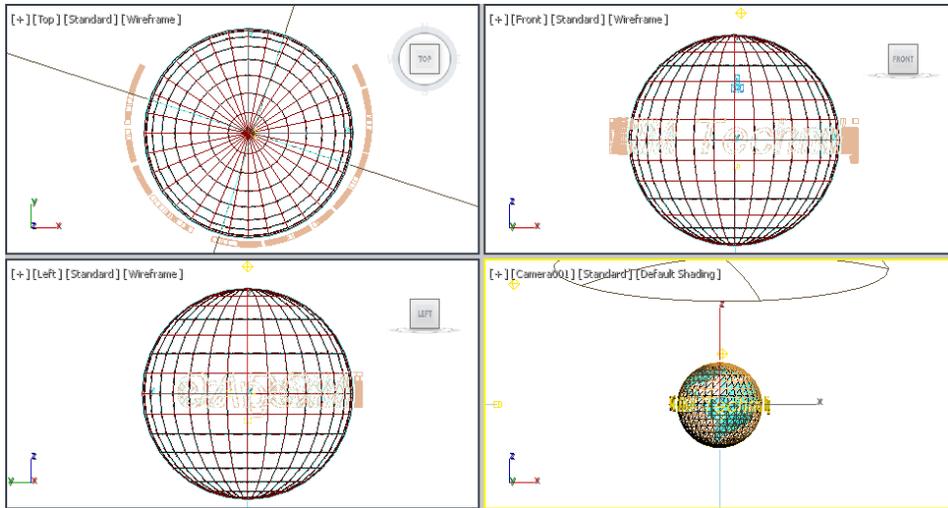


Figure 14-56 The wireframe earth sphere zoomed in viewports

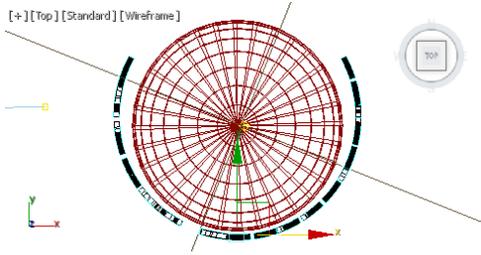


Figure 14-57 The pivot point of the Text001 displayed in the Top viewport

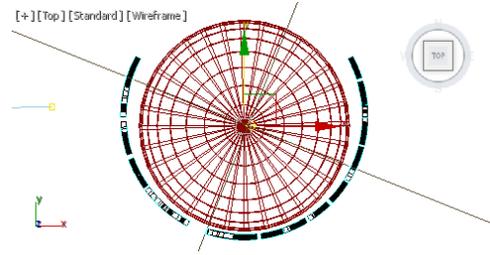


Figure 14-58 The pivot point of the Text001 aligned in the Top viewport

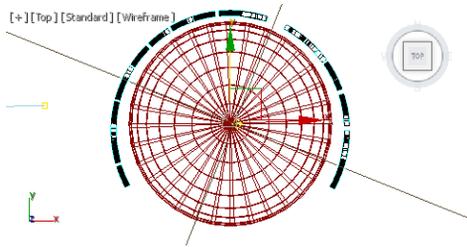


Figure 14-59 The Text001 rotated in the Top viewport

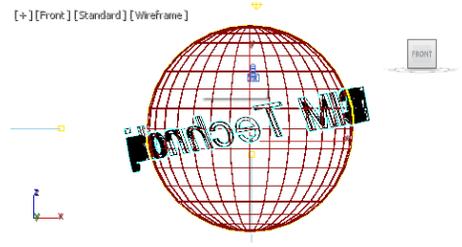


Figure 14-60 The Text001 rotated in the Front viewport



Figure 14-61 The final walkthrough at frame 70

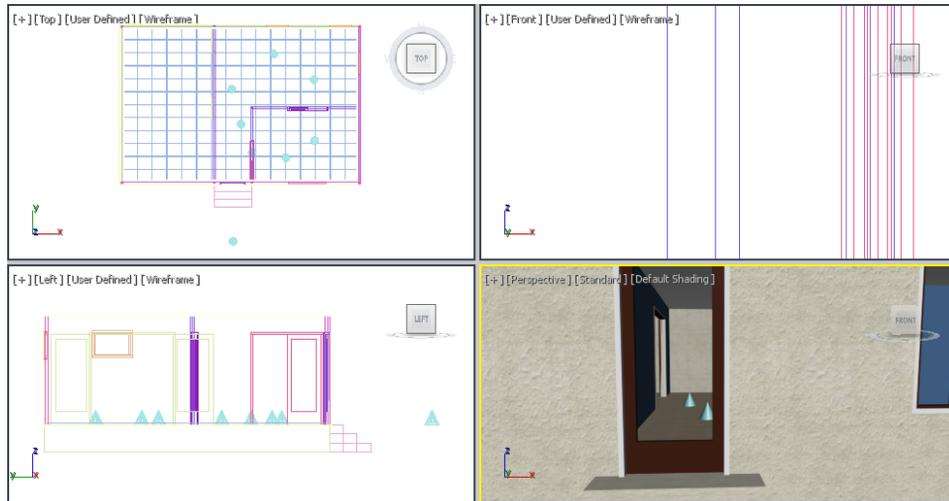


Figure 14-62 The c14_tut3_start file

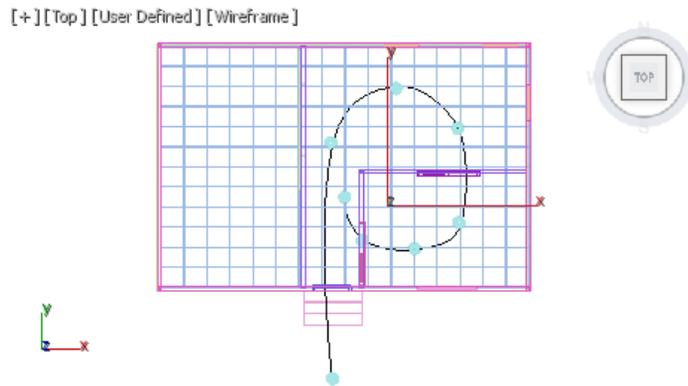


Figure 14-63 A line created to be used as a path

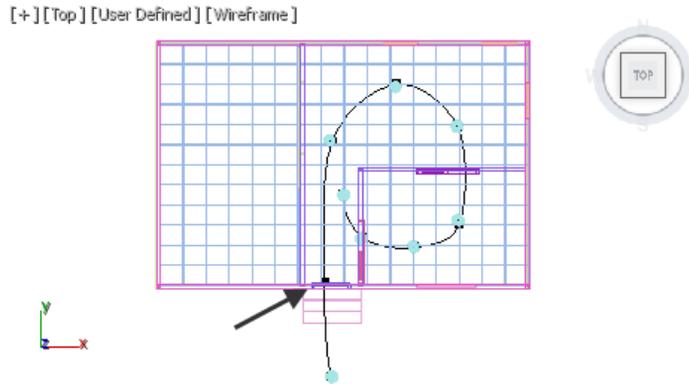


Figure 14-64 A new vertex added to the path

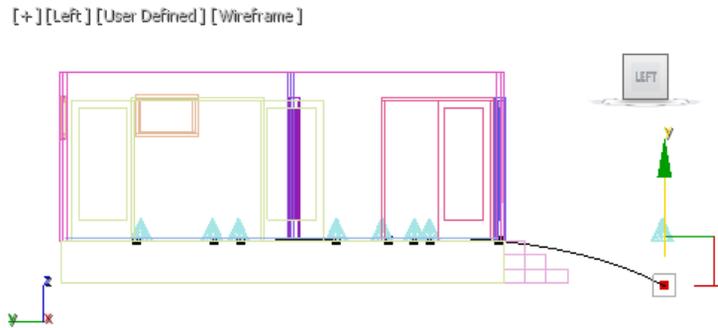


Figure 14-65 The first vertex moved down

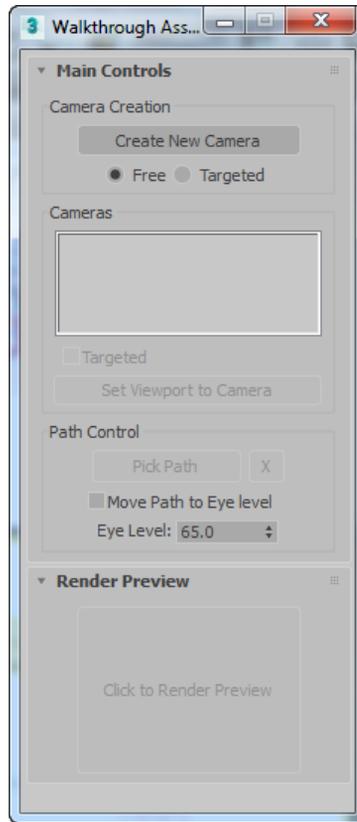


Figure 14-66 The Walkthrough Assistant dialog box

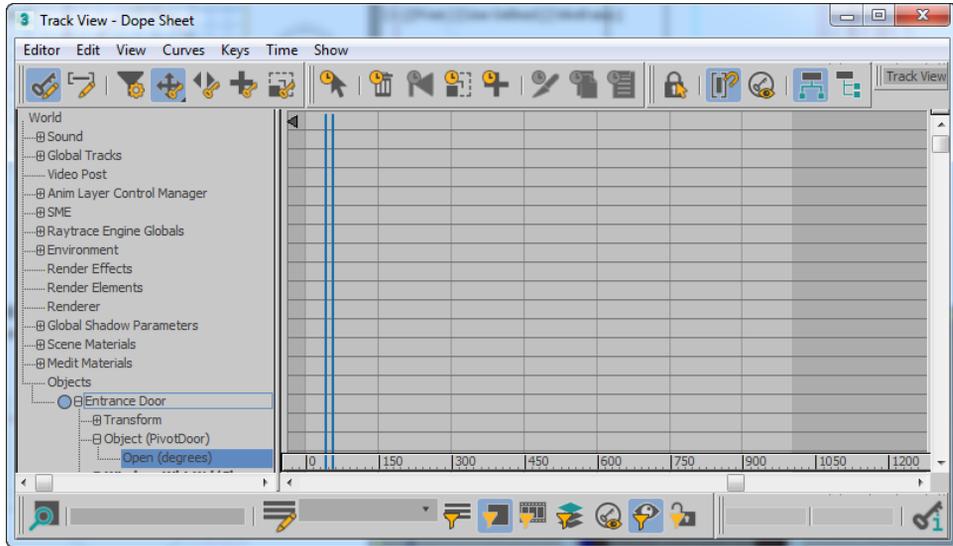


Figure 14-67 The Track View - Dope Sheet window

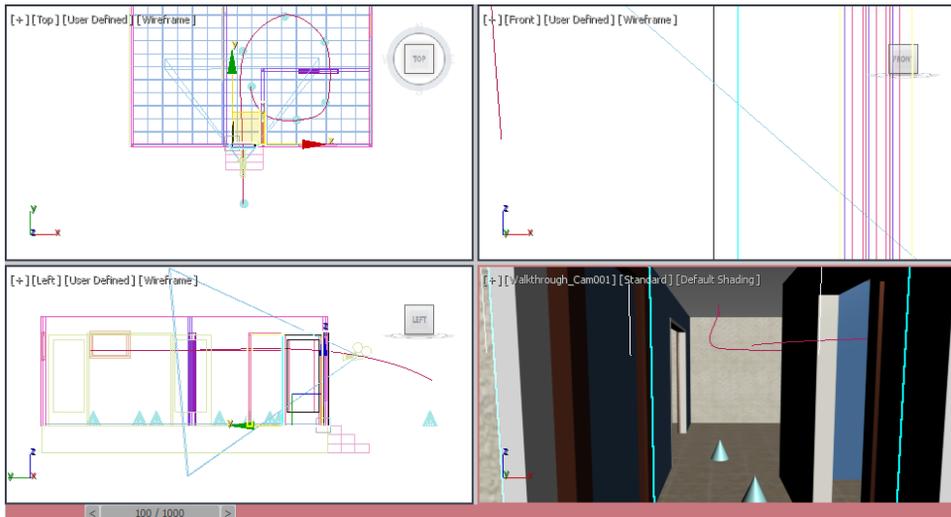


Figure 14-68 The Entrance Door is opened 90 degrees at frame 100

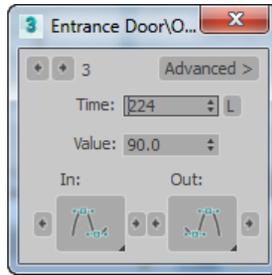


Figure 14-69 The Entrance Door\Open (degrees) dialog box



Figure 14-70 The morning scene

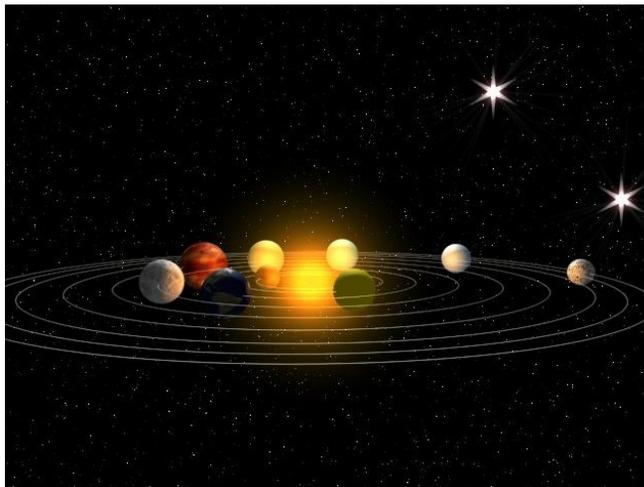


Figure 14-71 The solar system



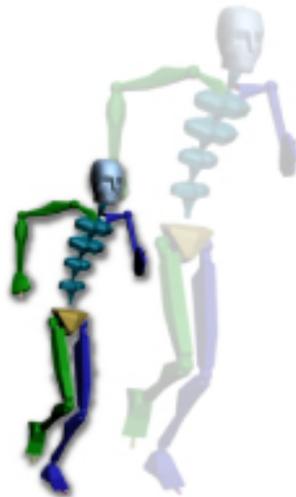
Figure 14-72 Walkthrough for the lobby

Systems, Hierarchy, and Kinematics

Learning Objectives

After completing this chapter, you will be able to:

- *Create a Ring Array system*
- *Create a Sunlight system*
- *Create a Daylight system*
- *Understand hierarchy and kinematics*
- *Create a bone system*
- *Understand IK solver, interactive IK, and applied IK*
- *Create a biped system*



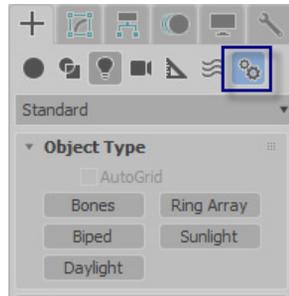


Figure 15-1 *The Systems in the Command Panel*

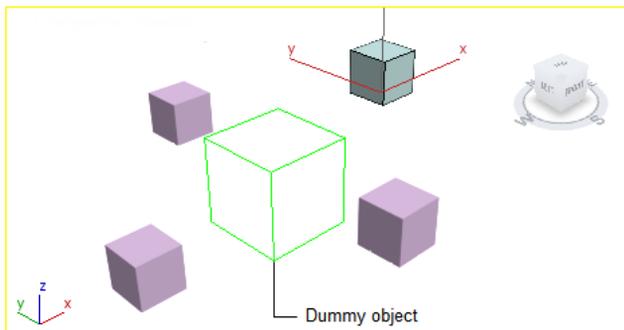


Figure 15-2 *The Ring Array system*

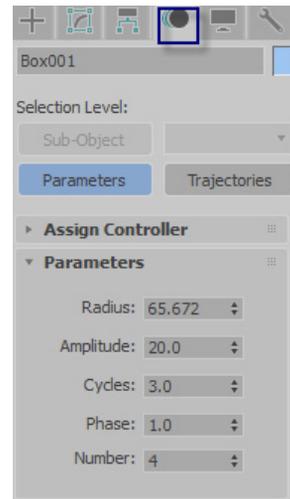


Figure 15-3 *The Parameters rollout in the Motion tab*

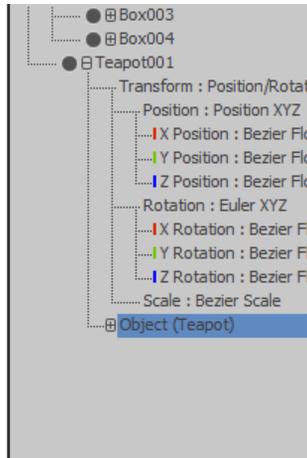


Figure 15-4 The object selected in the hierarchy tree to replace the boxes of the Ring Array system

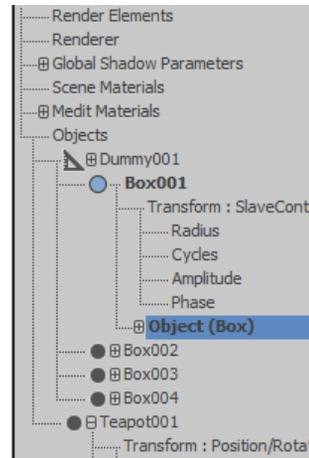


Figure 15-5 The box selected in the hierarchy tree to be replaced with the object

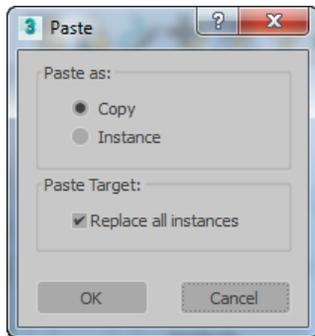


Figure 15-6 The Paste dialog box

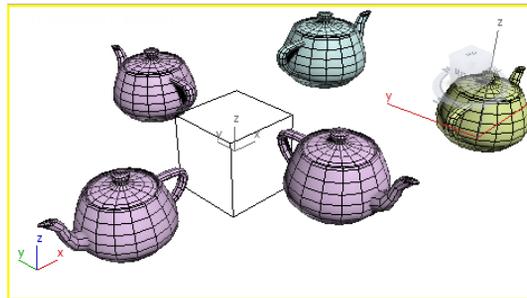


Figure 15-7 The boxes of the Ring Array system replaced with the object (teapot)



Figure 15-8 The scene after creating the Sunlight system

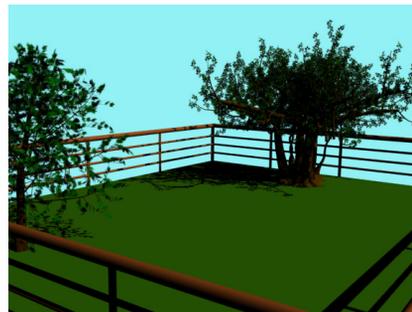


Figure 15-9 The scene after changing the position of the sun

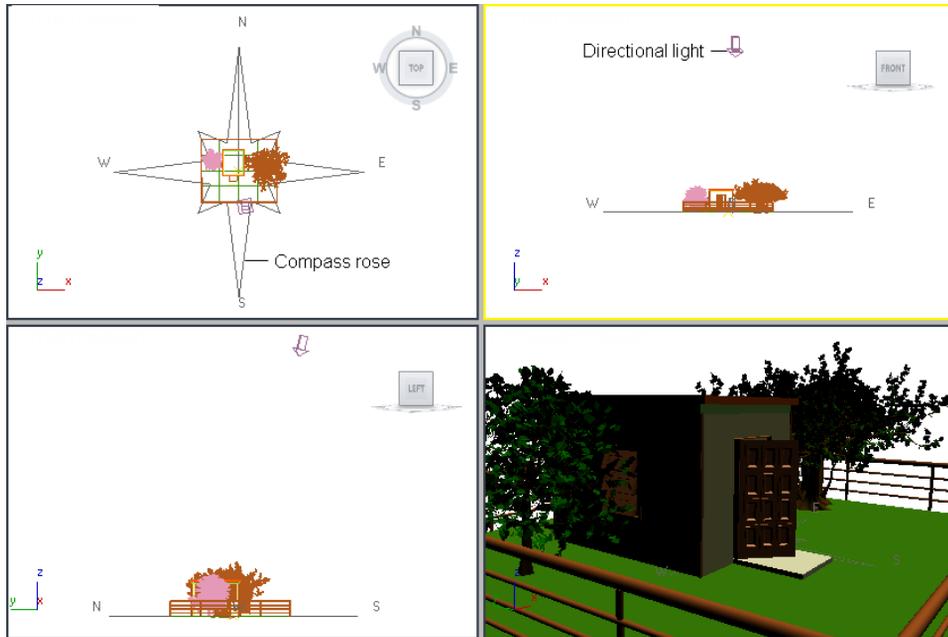


Figure 15-10 The Sunlight system in all viewports

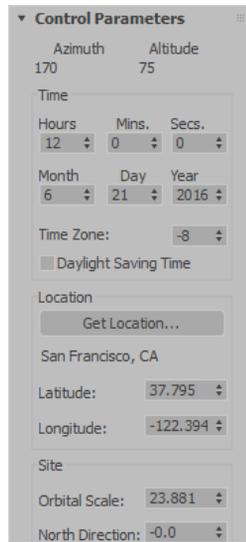


Figure 15-11 The Control Parameters rollout

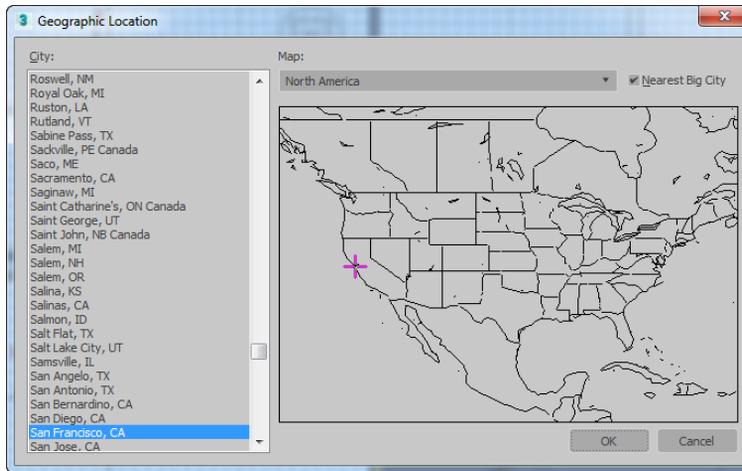


Figure 15-12 The Geographic Location dialog box



Figure 15-13 The Parameters rollout

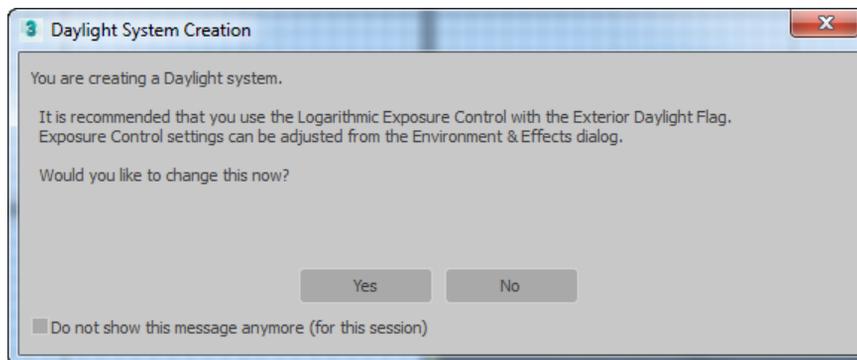


Figure 15-14 The Daylight System Creation message box

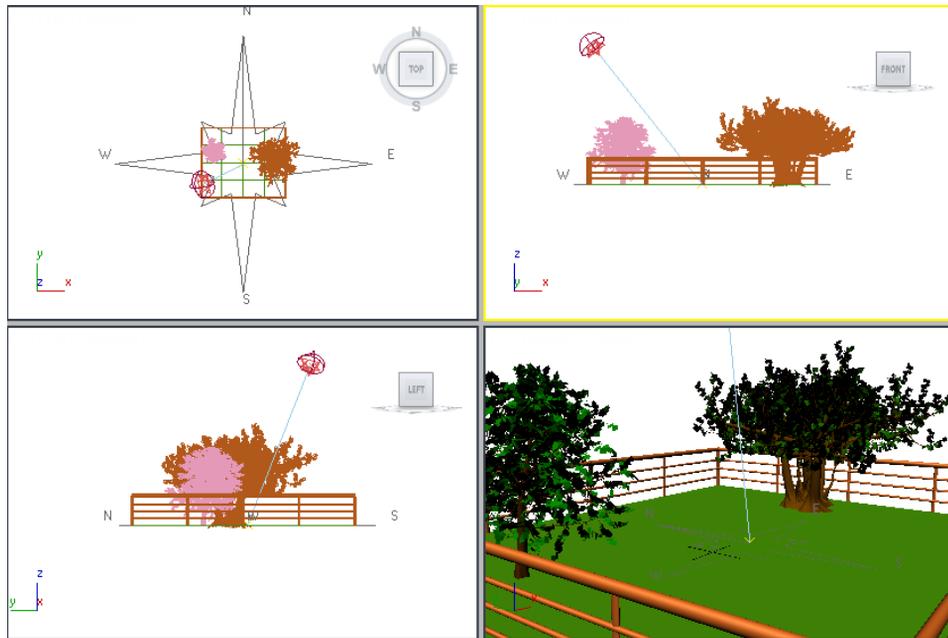


Figure 15-15 The Daylight system created in viewports

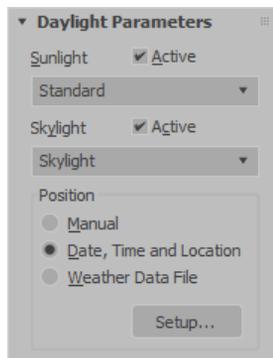


Figure 15-16 The Daylight Parameters rollout

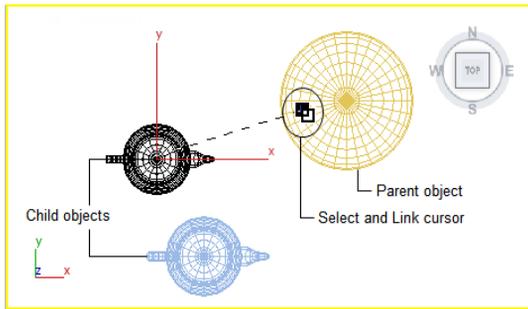


Figure 15-17 The child object linked to the parent object using the **Select and Link** tool

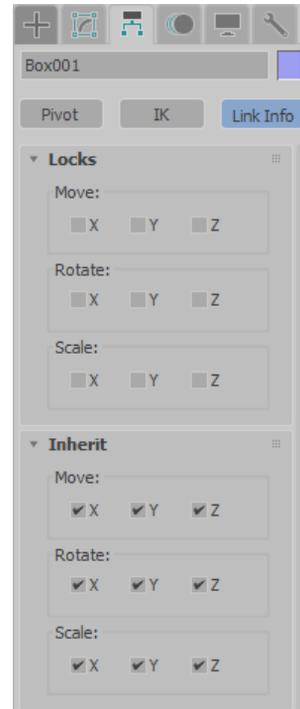


Figure 15-18 The **Link Info** button chosen in the **Hierarchy** tab

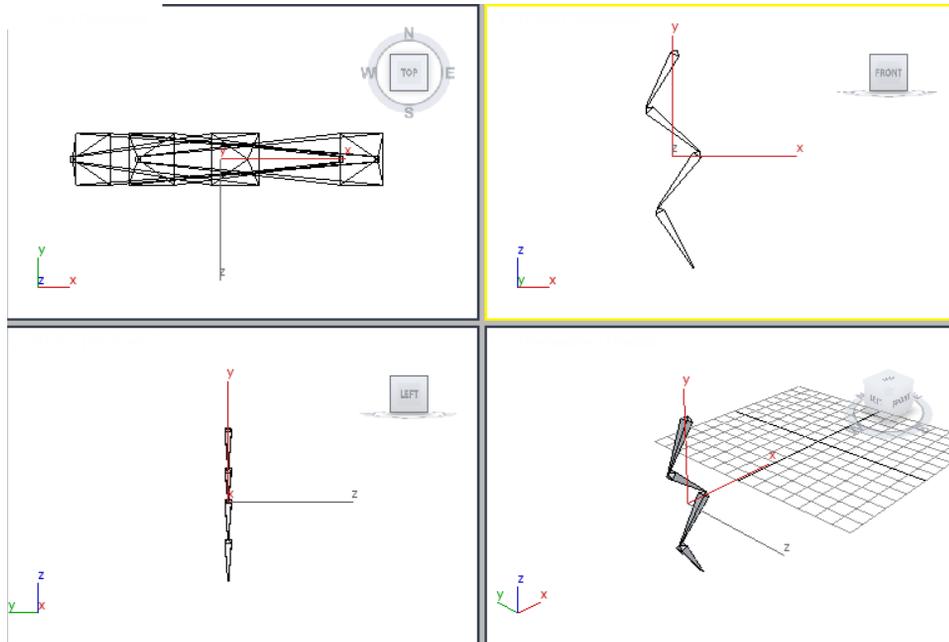


Figure 15-19 The hierarchy of bones created

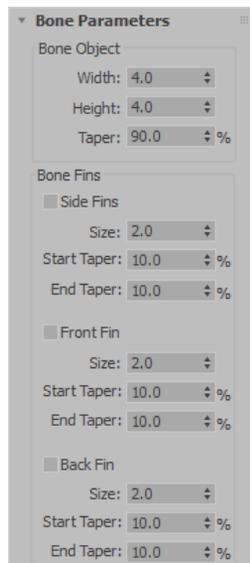


Figure 15-20 The Bones Parameters rollout

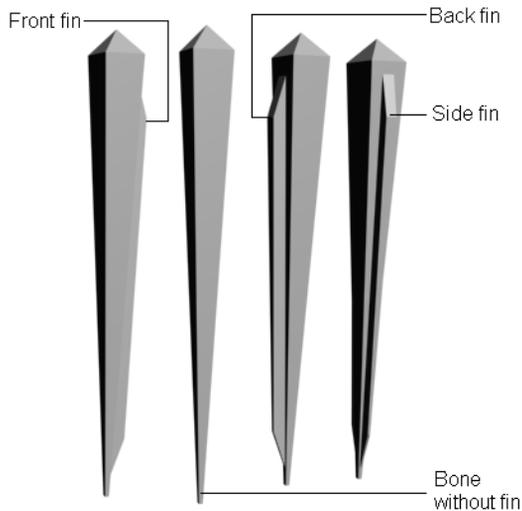


Figure 15-21 The bones with the fins added to them

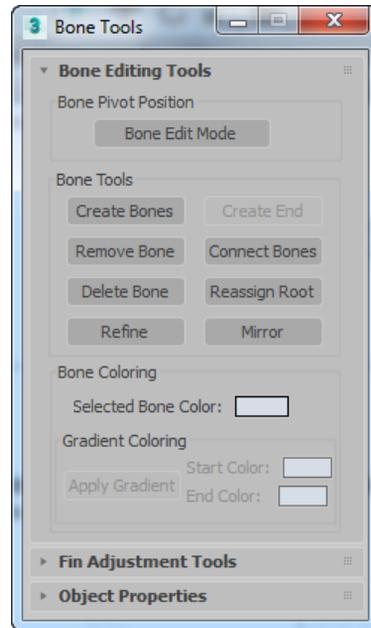


Figure 15-22 The **Bone Tools** dialog box

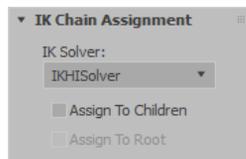


Figure 15-23 The **IK Chain Assignment** rollout

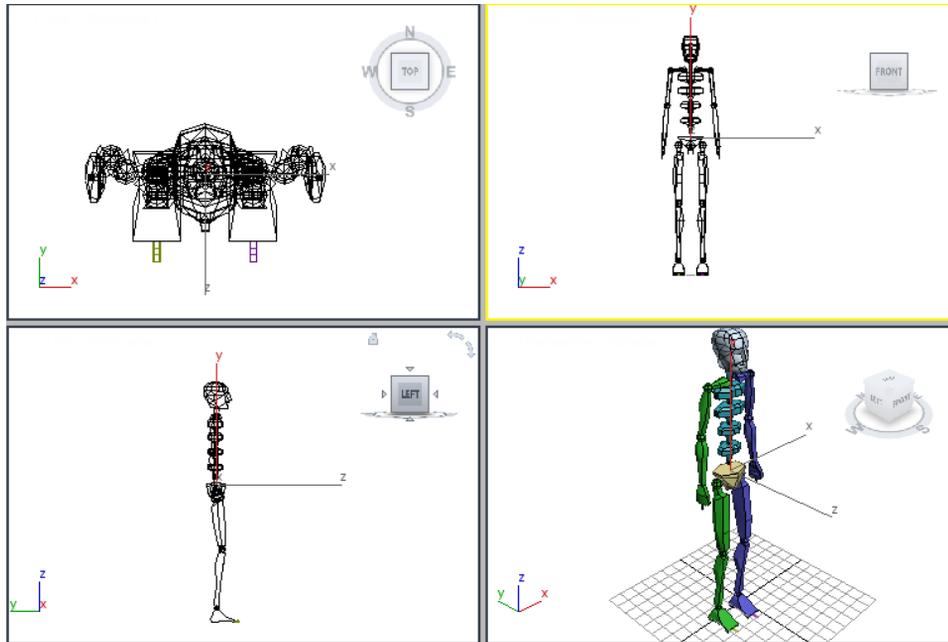


Figure 15-24 The biped model displayed in viewports

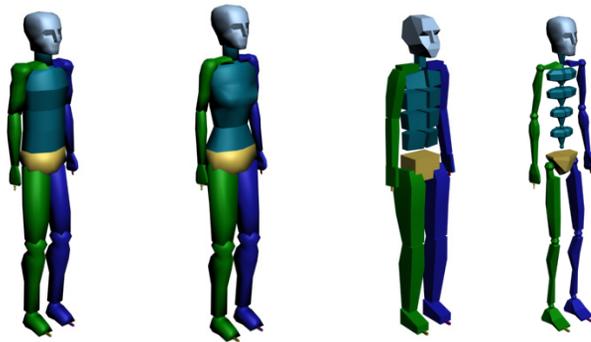


Figure 15-25 The male, female, classic, and skeleton type biped models



Figure 15-26 The shadow pattern in the scene

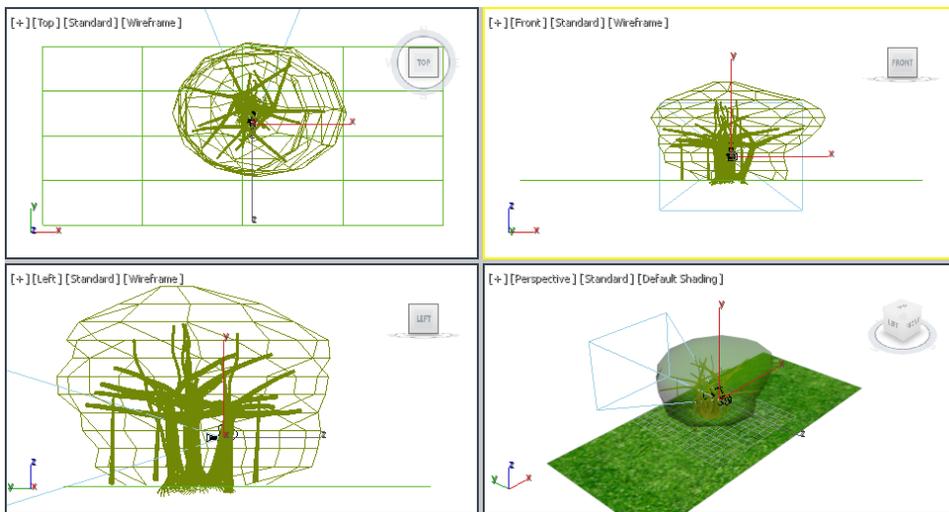


Figure 15-27 Alignment of the Camera001 in viewports

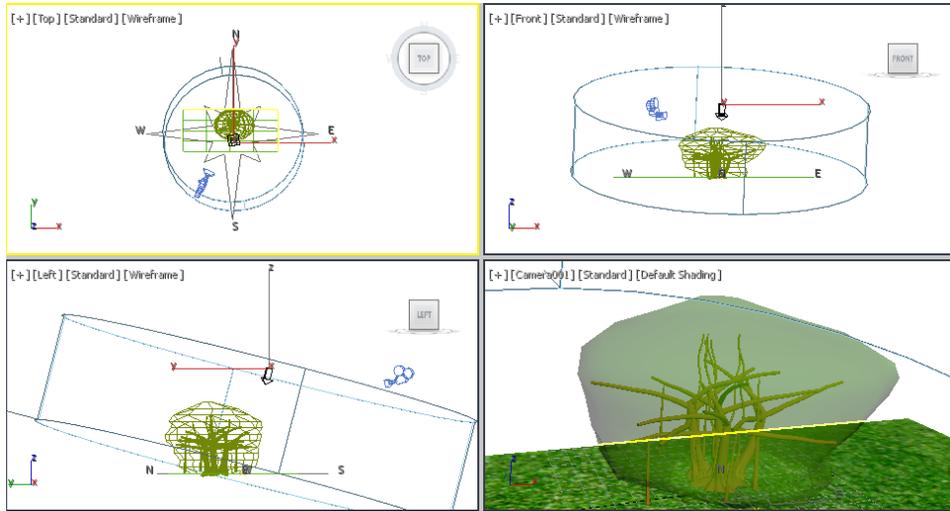


Figure 15-28 The Sunlight system created in viewports

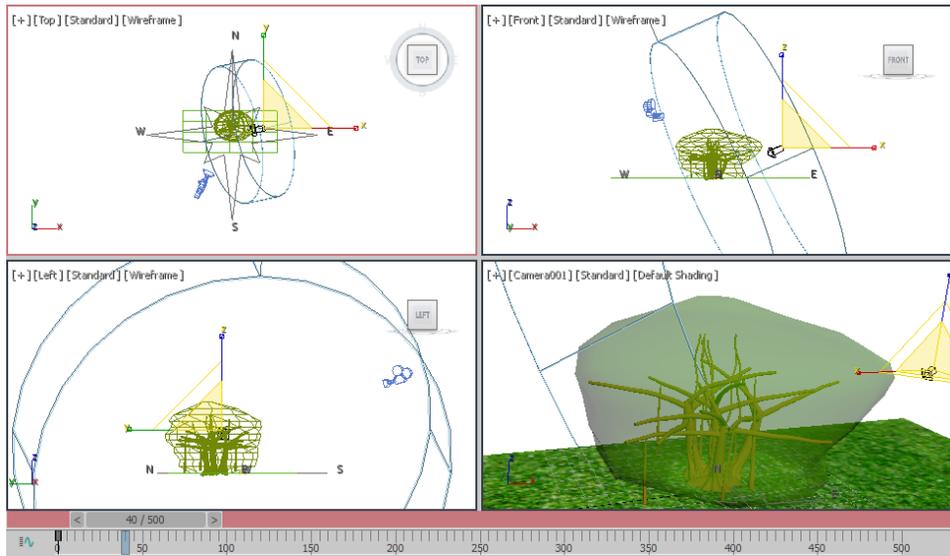


Figure 15-29 The time slider at frame 40



Figure 15-30 The biped model animation

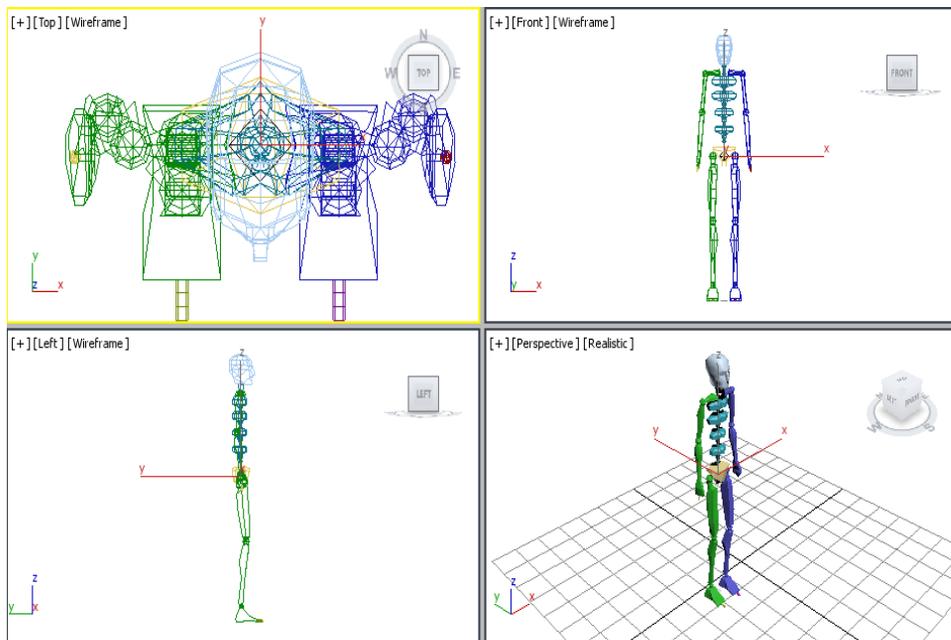


Figure 15-31 The biped model displayed in viewports

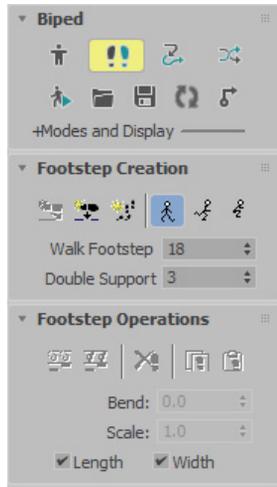


Figure 15-32 The rollouts displayed after choosing the **Footstep Mode** button

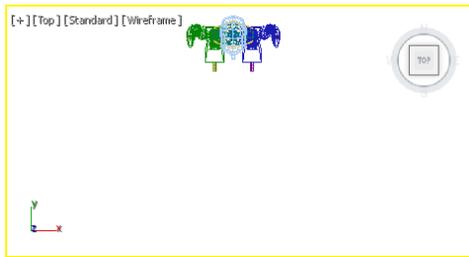


Figure 15-33 The Top viewport after using the **Zoom** and **Pan** tools

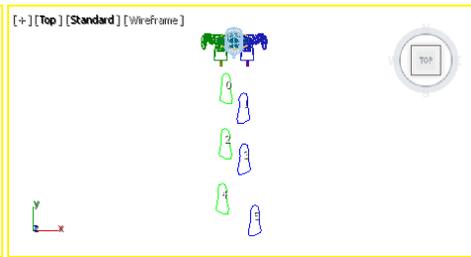


Figure 15-34 The footsteps created in the Top viewport

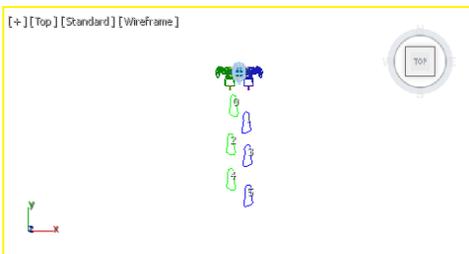


Figure 15-35 The footsteps aligned using the **Select and Move** tool

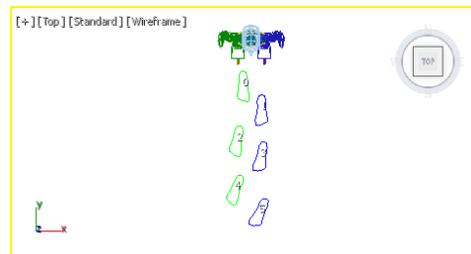
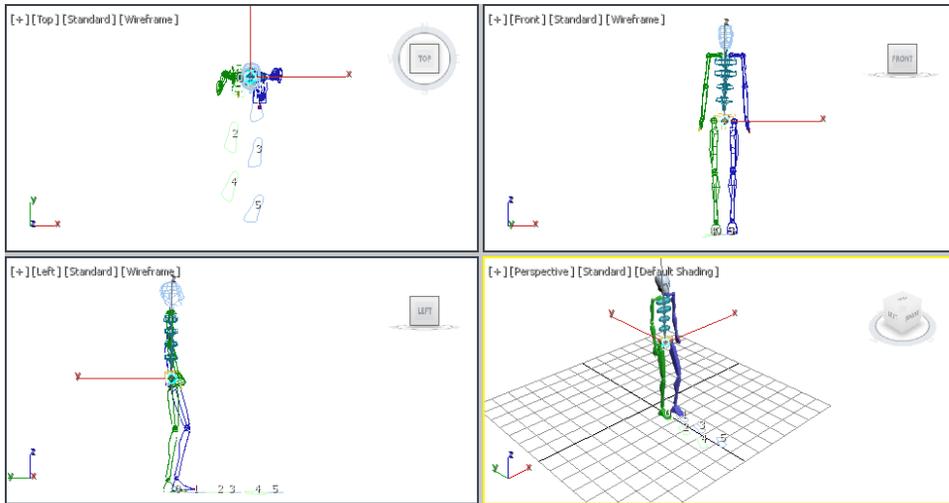
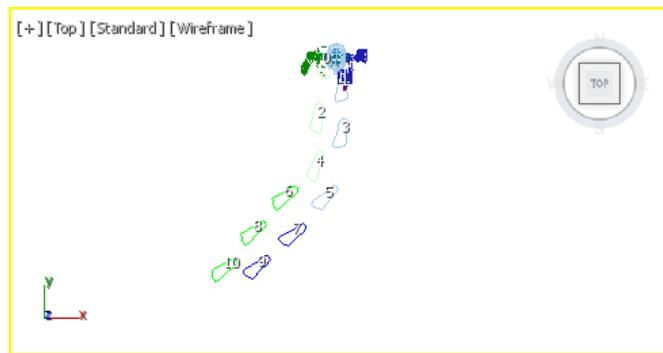


Figure 15-36 The footsteps after rotating them in the Top viewport



*Figure 15-37 The biped model moving after choosing the **Play Animation** button*



*Figure 15-38 New footsteps created in the **Top** viewport*

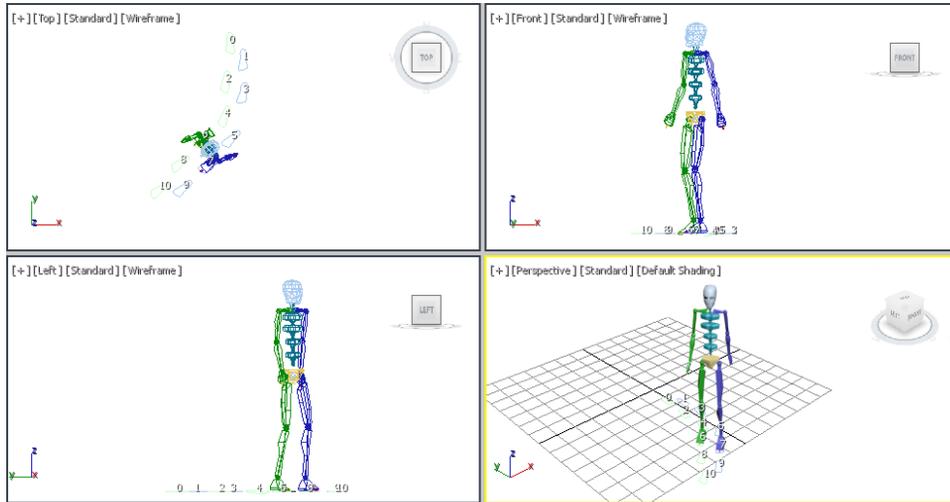


Figure 15-39 The biped model moving according to the newly created footsteps

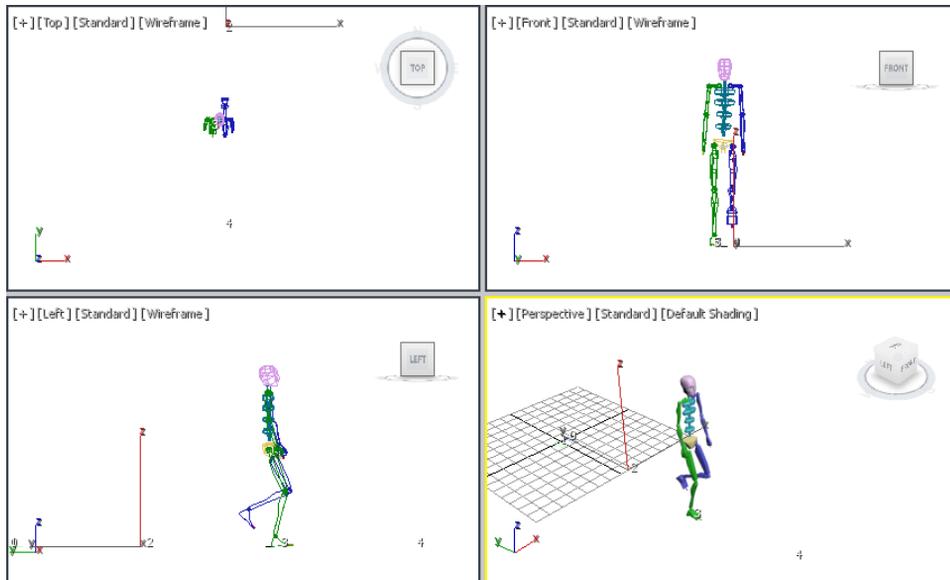


Figure 15-40 The running biped model in viewports

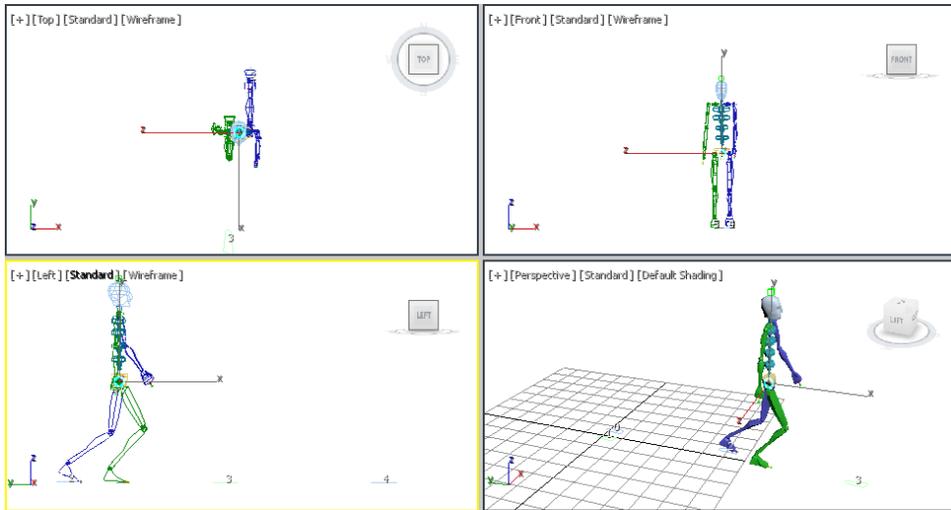


Figure 15-41 The Bip001 in running position after loading the Run.bip file

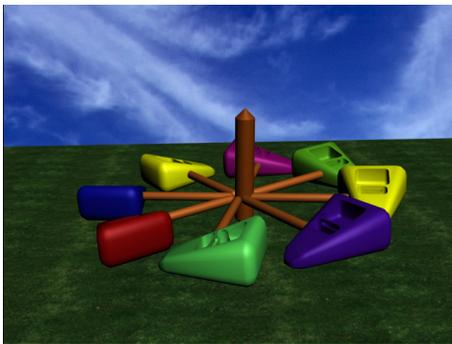


Figure 15-42 Model to be created in Exercise 1 (view 1)

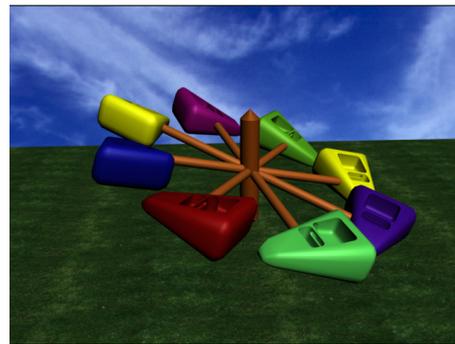


Figure 15-43 Model to be created in Exercise 1 (view 2)

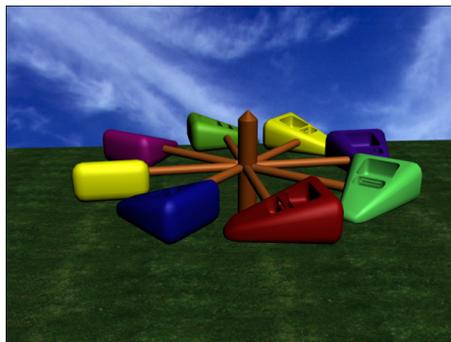


Figure 15-44 Model to be created in Exercise 1 (view 3)

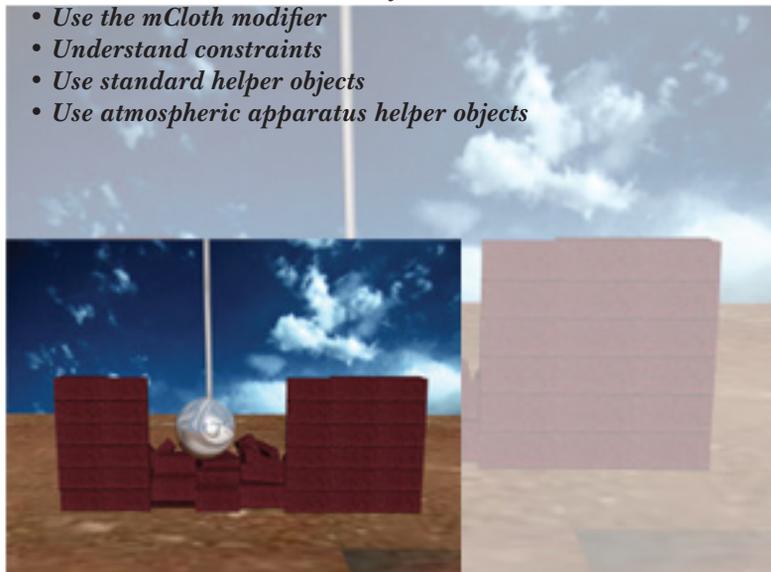
16

Rigid Body Dynamics and Helpers

Learning Objectives

After completing this chapter, you will be able to:

- Create static, dynamic, and kinematic rigid bodies
- Understand the MassFX interface
- Use the mCloth modifier
- Understand constraints
- Use standard helper objects
- Use atmospheric apparatus helper objects



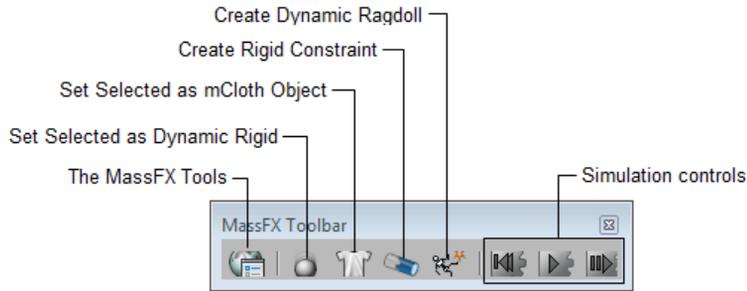


Figure 16-1 *The MassFX Toolbar*

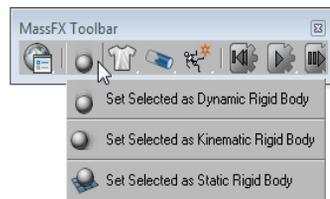


Figure 16-2 *Various options displayed in the flyout*

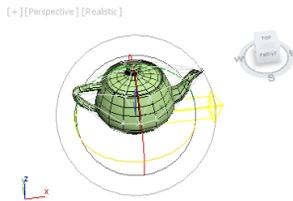


Figure 16-3 *The rigid body with the Initial Velocity sub-object level selected*

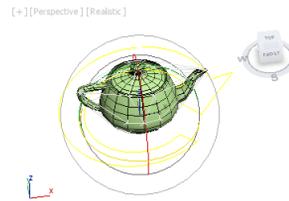


Figure 16-4 *The rigid body with the Initial Spin sub-object level selected*

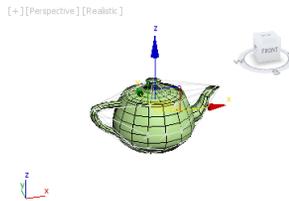


Figure 16-5 *The rigid body with the Center of Mass sub-object level selected*

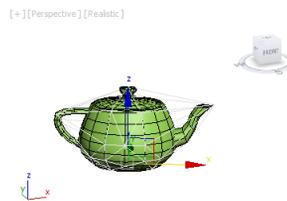


Figure 16-6 *The rigid body with the Mesh Transform sub-object level selected*

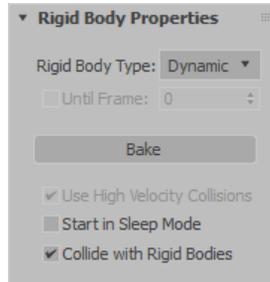


Figure 16-7 The Rigid Body Properties rollout

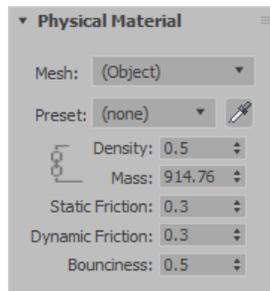


Figure 16-8 The Physical Material rollout

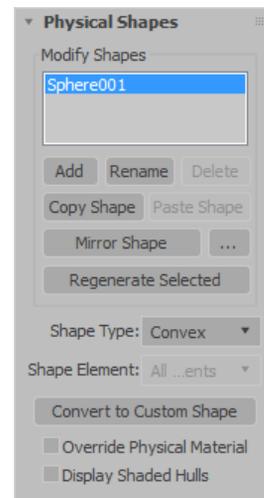


Figure 16-9 The Physical Shapes rollout

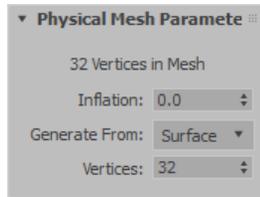


Figure 16-10 The Physical Mesh Parameters rollout for the Convex mesh type

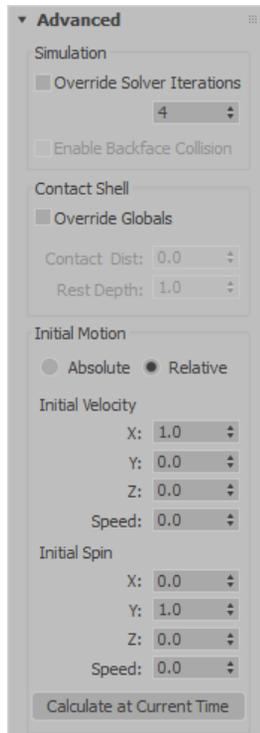


Figure 16-11 The Advanced rollout

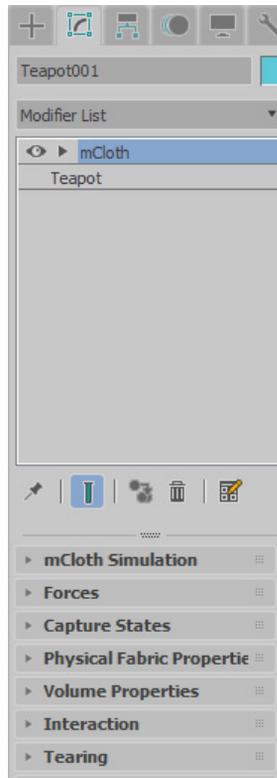


Figure 16-12 The *mCloth* modifier in the Modify panel

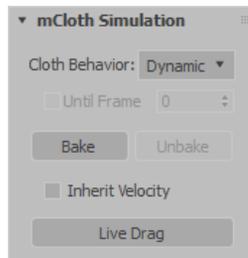


Figure 16-13 The *mCloth Simulation* rollout

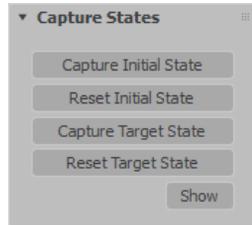


Figure 16-14 The Capture States rollout

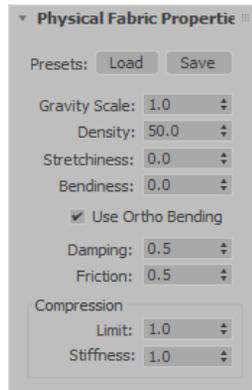


Figure 16-15 The Physical Fabric Properties rollout

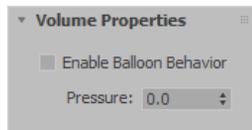


Figure 16-16 The Volume Properties rollout

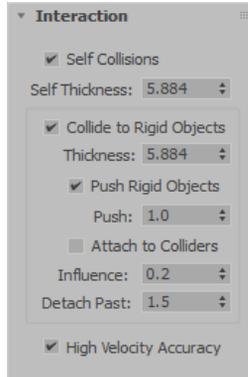


Figure 16-17 The Interaction rollout

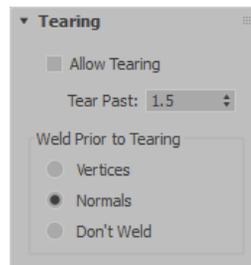


Figure 16-18 The Tearing rollout

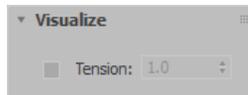


Figure 16-19 The Visualize rollout



Figure 16-20 The Advanced rollout

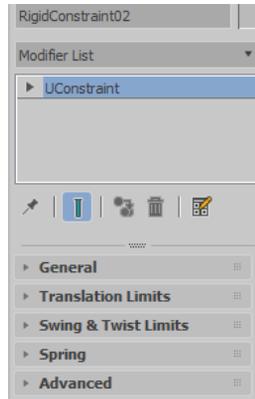


Figure 16-21 The rollouts of rigid constraint in the Modify panel

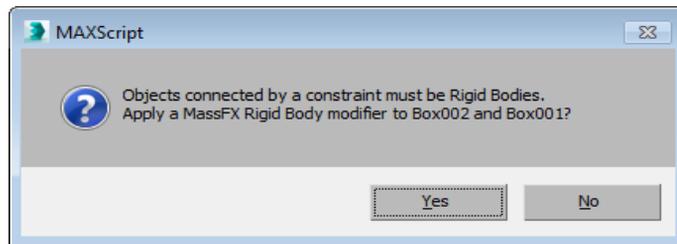


Figure 16-22 The MAXScript message box

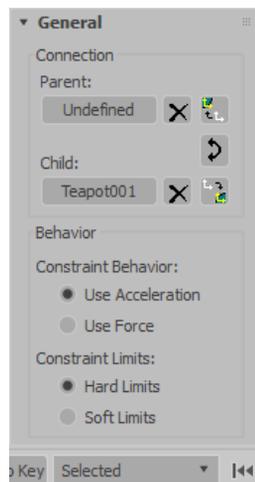


Figure 16-23 The General rollout

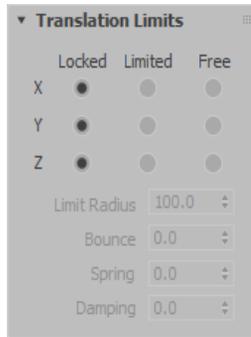


Figure 16-24 The Translation Limits rollout

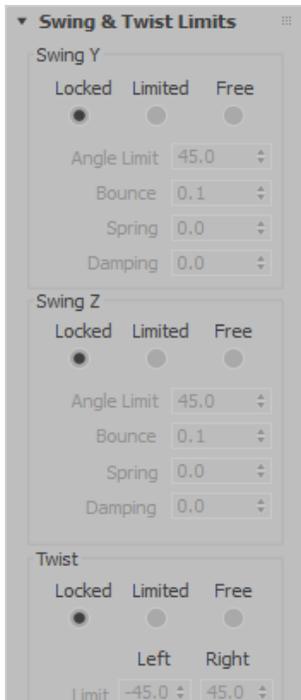


Figure 16-25 The Swing & Twist Limits rollout

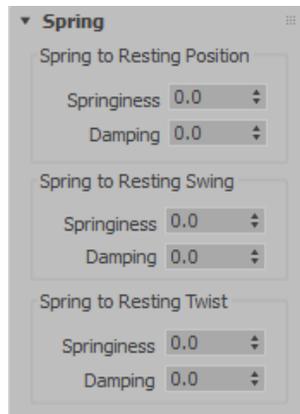


Figure 16-26 The Spring rollout

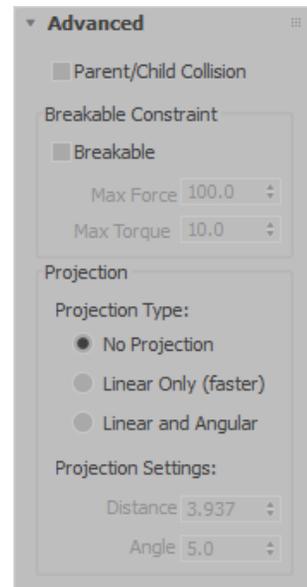


Figure 16-27 The Advanced rollout



Figure 16-28 Various options in the flyout

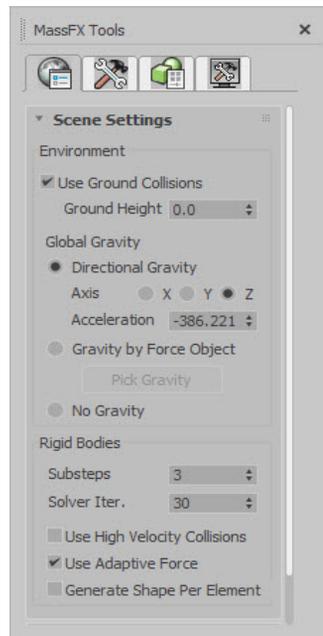


Figure 16-29 Partial view of the *MassFX Tools* dialog box



Figure 16-30 The Simulation, Simulation Settings, and Utilities rollouts in the Simulation Tools tab

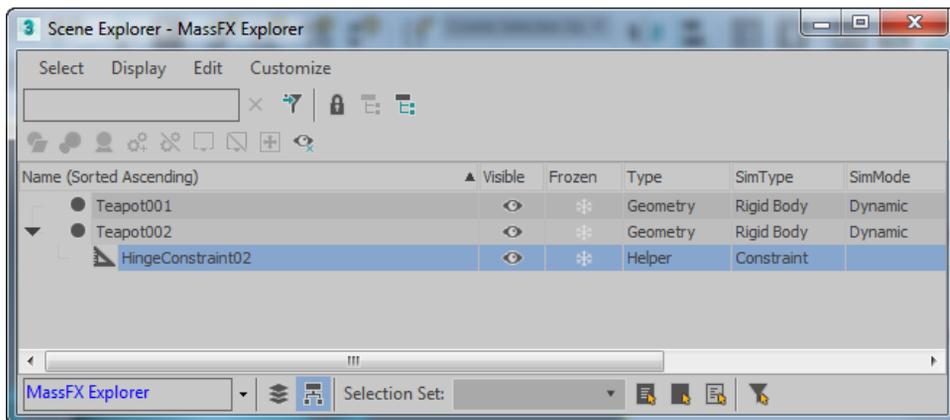


Figure 16-31 The Scene Explorer - MassFX Explorer window

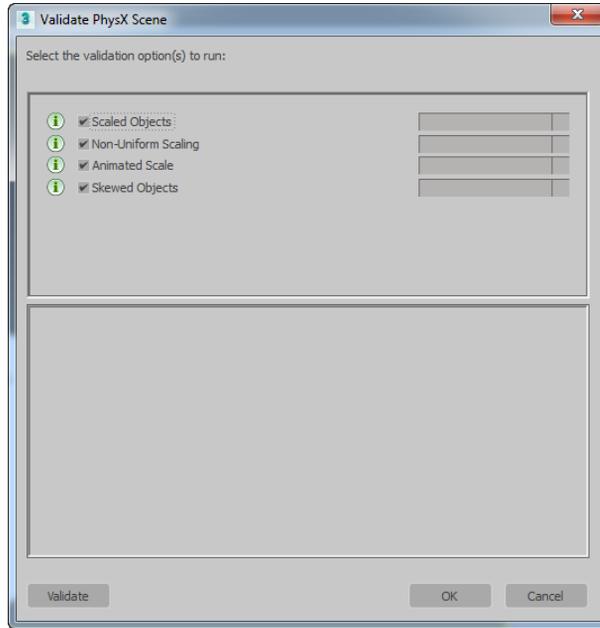


Figure 16-32 The Validate PhysX Scene dialog box

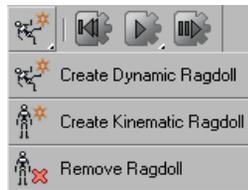


Figure 16-33 Various options displayed in the Ragdoll flyout

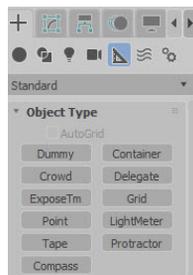


Figure 16-34 The Helpers button chosen in the Command Panel

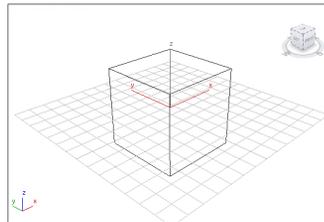


Figure 16-35 A dummy helper object in the Perspective viewport

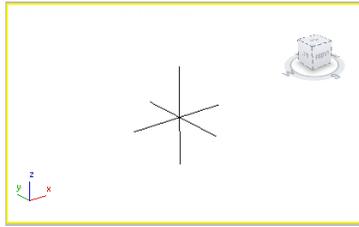


Figure 16-36 A point helper object

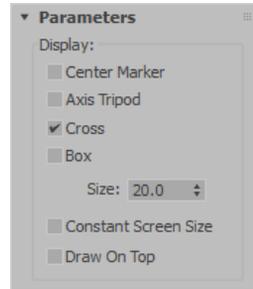


Figure 16-37 The *Parameters* rollout

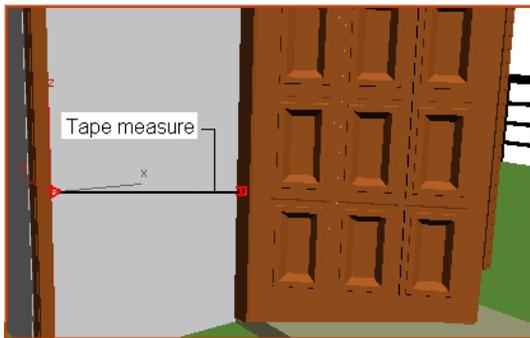


Figure 16-38 A tape measure created in a scene

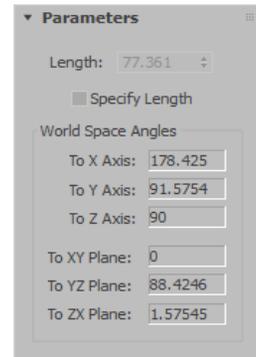


Figure 16-39 The *Parameters* rollout

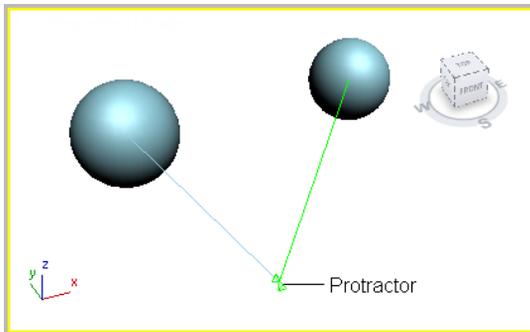


Figure 16-40 A protractor helper object

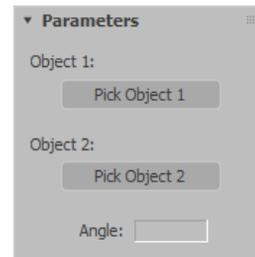


Figure 16-41 The *Parameters* rollout

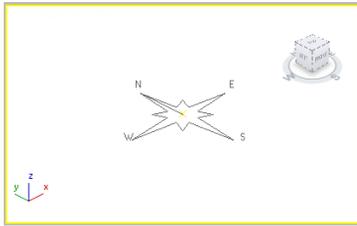


Figure 16-42 A compass rose



Figure 16-43 The *Parameters* rollout

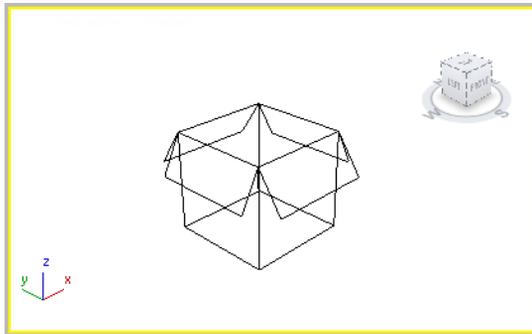


Figure 16-44 A container helper

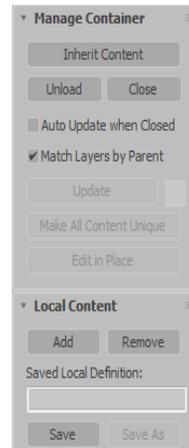


Figure 16-45 Partial view of various rollouts displayed for the container helper

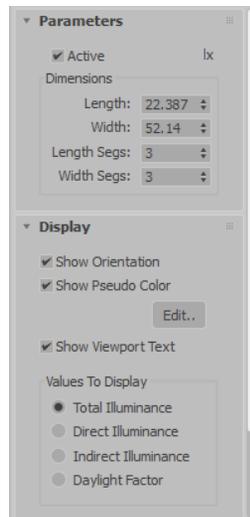


Figure 16-46 The *Parameters* and *Display* rollouts

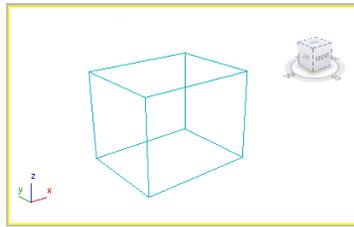


Figure 16-47 A BoxGizmo helper

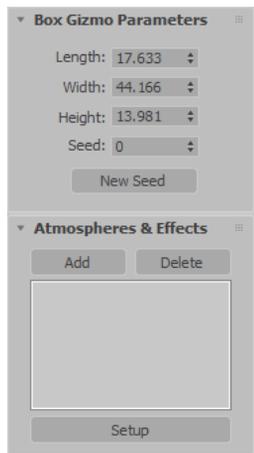


Figure 16-48 The rollouts for modifying the BoxGizmo helper in the Modify panel

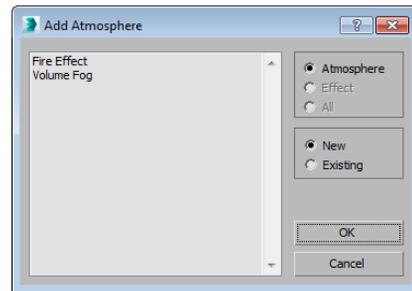


Figure 16-49 The Add Atmosphere dialog box

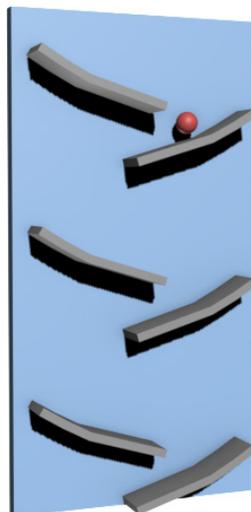


Figure 16-50 The ball falling on sliders at frame 42

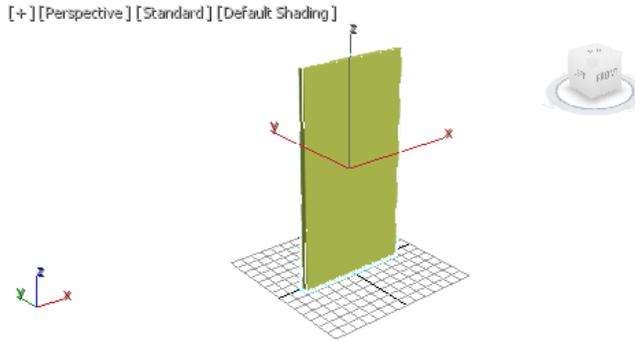


Figure 16-51 Alignment of back support with the grid

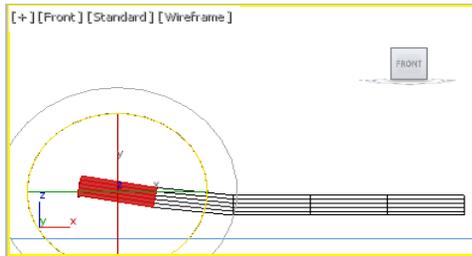


Figure 16-52 The slider1 geometry after aligning the polygons

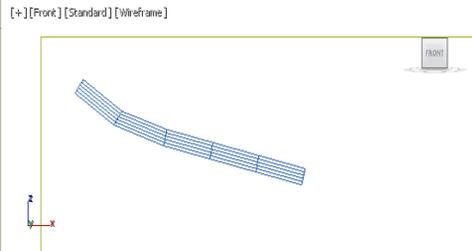


Figure 16-53 Alignment of the slider1 in the Front viewport

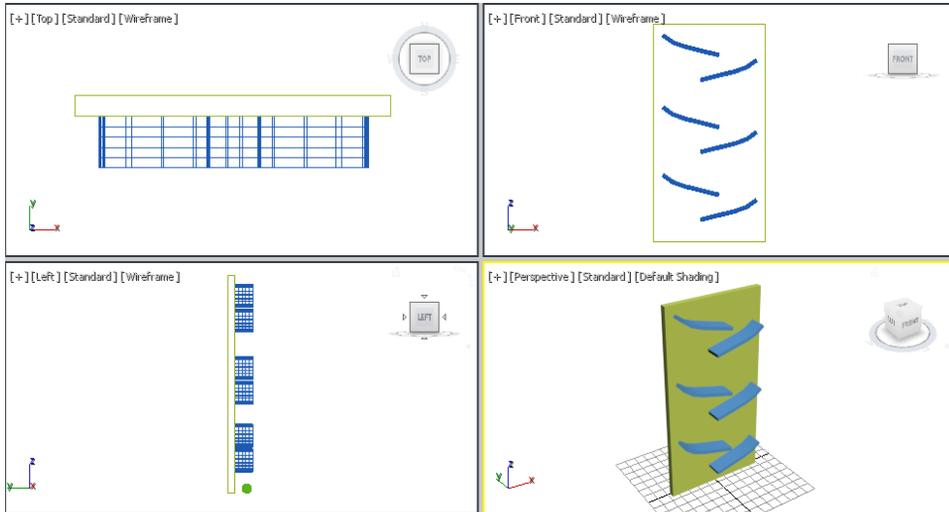


Figure 16-54 Alignment of ball in viewports



Figure 16-55 Key animation of ball baked

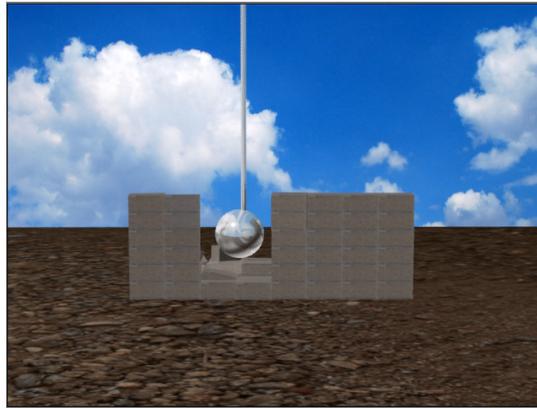


Figure 16-56 The scene for Tutorial 2

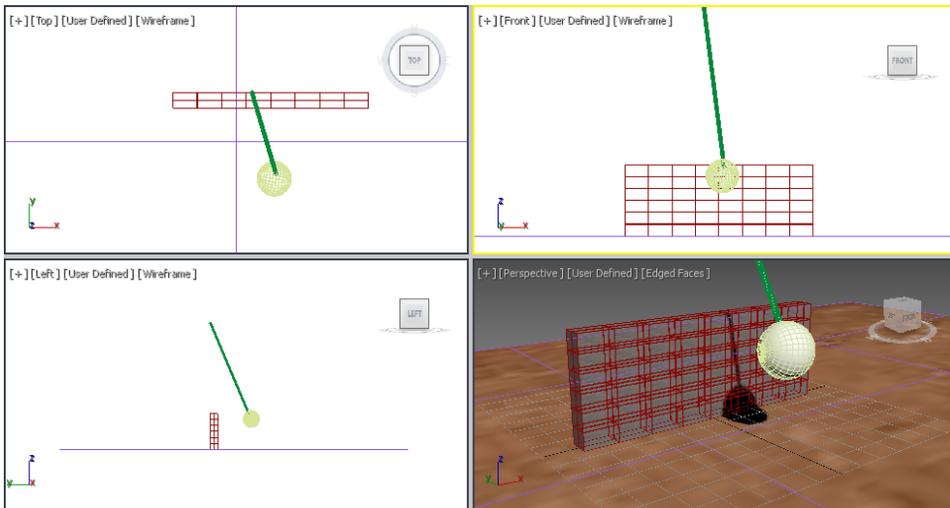


Figure 16-57 The brick wall with a metal ball and metal rod in viewports

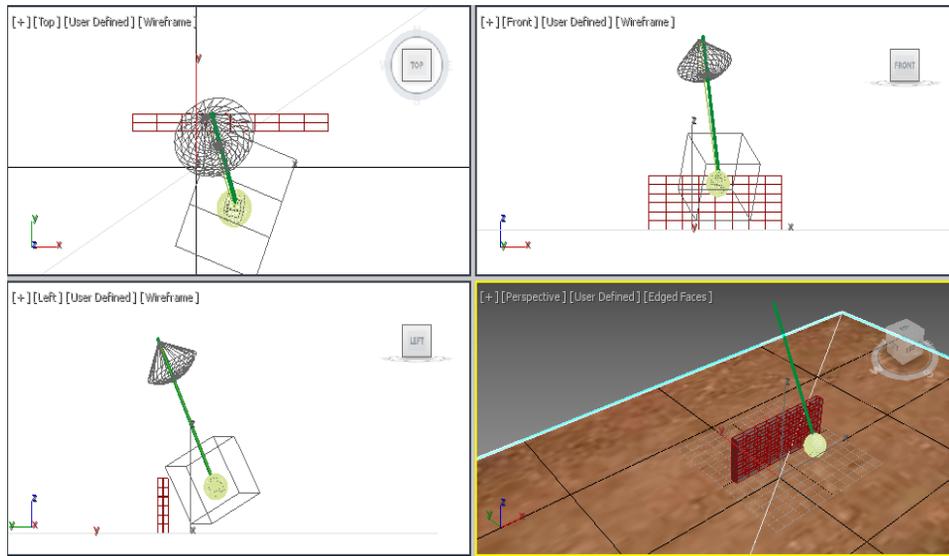


Figure 16-58 Universal constraint aligned in viewports



Figure 16-59 Scene for Exercise 1

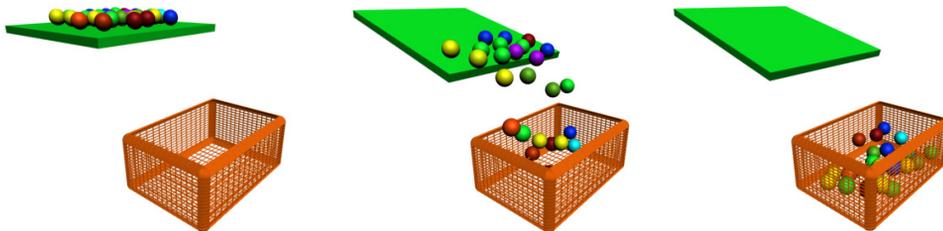


Figure 16-60 Simulation of falling balls at different frames