

# Chapter 2

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## *Working with Splines*

### **Learning Objectives**

**After completing this chapter, you will be able to:**

- *Work with spline primitives*
- *Understand NURBS modeling techniques*

## INTRODUCTION

In computer graphics, a spline is a line formed by connecting a sequence of vertices lying in 3D space. Although, it is formed in 3D space, it has no depth. A spline is not visible on rendering.

In CINEMA 4D, you can create complete parametric spline primitives (with pre-defined shapes) as well as empty splines whose shapes can be defined interactively in the viewport.

## TUTORIALS

Before you start tutorials of this chapter, you need to download the *c02\_cinema4d\_r14\_tut.zip* file from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and Visual Effects > MAXON CINEMA 4D > MAXON CINEMA 4D R14 Studio: A Tutorial Approach*

Next, you need to extract the contents of the zip file. To do so, navigate to the *Documents* folder and create a new folder in it with the name *c4dprojects* and then extract the contents of the zip file to *|Documents|c4dprojects*.

### Tutorial 1

In this tutorial, you will create the 3D model of a door lock system with the help of spline primitive tools. The final output of the model is shown in Figure 2-1.

(Expected time: 35 min)



*Figure 2-1 The model of door lock system*

The following steps are required to complete this tutorial:

- a. Set the viewport background.
- b. Create the base of the door lock system.
- c. Create the key hole.
- d. Create the handle.
- e. Change the background color of the scene.
- f. Save and render the scene.

Setting the Viewport Background

In this section, you will set the background image in the Front viewport.

- 1. Choose **File > New** from the main menu; a new scene is displayed.
- 2. Press the middle mouse button in the Perspective viewport; all viewports are displayed. Click in the Front viewport to activate it and then press the middle mouse button to maximize it. Alternatively, choose **Cameras > Front** from the Menu in editor view, as shown in Figure 2-2; the Front viewport is maximized.
- 3. Choose **Options > Configure** from the Menu in editor view, as shown in Figure 2-3; the **Viewport [Front]** settings are displayed in the Attribute Manager. In the Attribute Manager, choose the **Back** button; the **Back** area is displayed. In this area, choose the browse button next to the **Image** text box, as shown in Figure 2-4; the **Open File** dialog box is displayed. Browse to `|Documents|c4dprojects|c02|keyhole.jpg`. Next, choose the **Open** button; the `keyhole.jpg` is opened as the background image of the Front viewport.

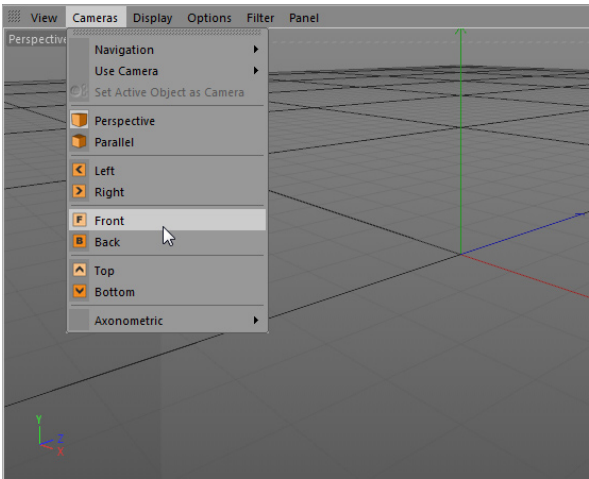


Figure 2-2 Choosing the **Front** option from the **Cameras** menu

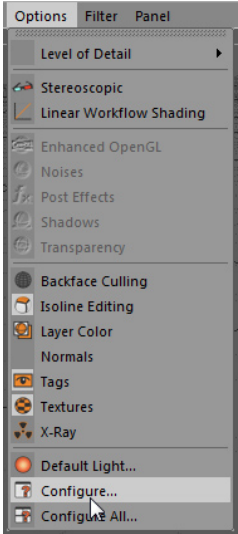


Figure 2-3 Choosing the **Configure** option from the **Options** menu

- 4. In the **Back** area, clear the **Keep Aspect Ratio** check box and then set the parameters as follows:

Offset X: 122

Size X: 445

Offset Y: 2

Size Y: 500

The **Configure** option in the **Options** menu is used to edit the settings of the respective viewport. It applies to all viewports. The options in the **Back** area are used to place the reference image at the desired location as the viewport background. The **Image** text box displays the location of the loaded file. Any image with a recognizable format can be loaded in CINEMA 4D.

The **Offset X** option is used to move the reference image horizontally.

The **Offset Y** option is used to move the reference image vertically. The **Size X** and **Size Y** options are used to scale the reference image.

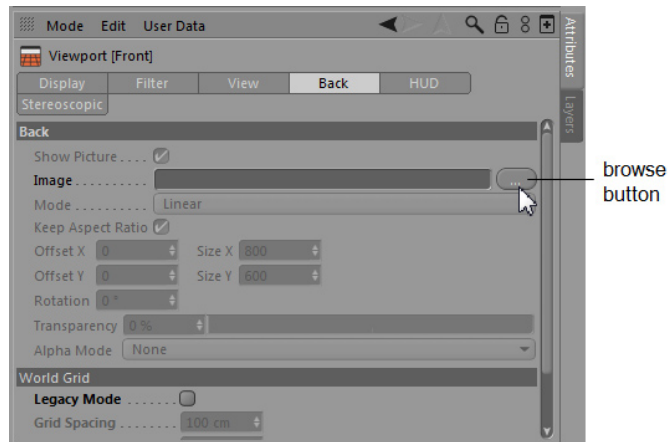


Figure 2-4 Choosing the browse button next to the **Image** text box

## Creating the Base of the Door Lock System

In this section, you will create the base of the door lock system using the **Rectangle** tool.

1. Press F1; the Perspective viewport is maximized. Alternatively, choose **Cameras > Perspective** from the Menu in editor view, refer to Figure 2-2; the Front viewport is maximized. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Next, choose **Rectangle** from it, as shown in Figure 2-5; a rectangle is created in the Perspective viewport. Also, *Rectangle* is added to the Object Manager.



### Note

*The spline primitives are parametric in nature as their attributes such as height, radius, and so on can be altered in the Attribute Manager.*

2. Make sure that *Rectangle* is selected in the Object Manager. In the Attribute Manager, make sure the **Object** button is chosen and then enter **121** and **465** in the **Width** and **Height** spinners, respectively of the **Object Properties** area, refer to Figure 2-6.

By default, the value of these parameters is set to 400. As a result, a square is created in the viewport.

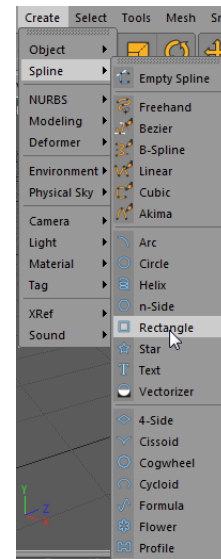
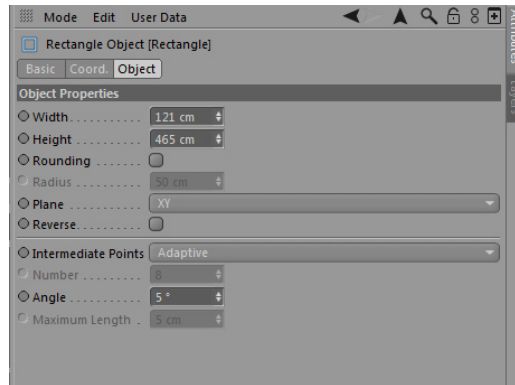


Figure 2-5 Choosing **Rectangle** from the **Create** menu

**Note**

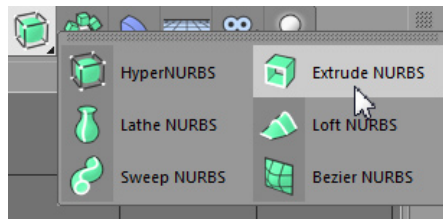
You can change the units of parametric objects. To do so, choose **Mode > Project** in the Attribute Manager; the **Project** area is displayed in the Attribute Manager. Choose the **Project Settings** button in this area; the **Project Settings** area is displayed. In this area, by default **Centimeters** is selected in the drop-down list located next to the **Project Scale** spinner. You can select any other unit from the drop-down list as per your requirement.



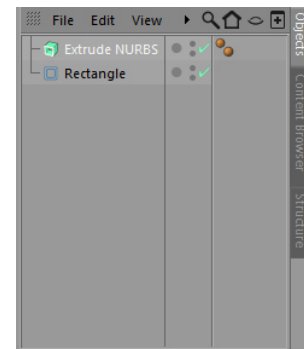
**Figure 2-6** Setting the width and height of the rectangle

Next, you will extrude the rectangle.

- Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Next, choose the **Extrude NURBS** tool from it, as shown in Figure 2-7; *Extrude NURBS* is added to the Object Manager; refer to Figure 2-8.



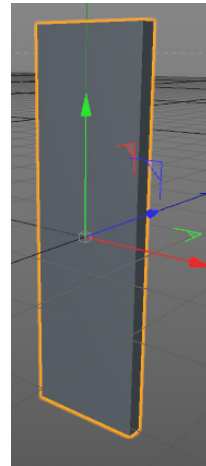
**Figure 2-7** Choosing *Extrude NURBS* from the flyout



**Figure 2-8** *Extrude NURBS* added to the Object Manager

- Make sure that *Rectangle* is selected in the Object Manager. Press and hold the left mouse button on *Rectangle* and drag the cursor to *Extrude NURBS* in the Object Manager; the *Rectangle* is connected to *Extrude NURBS* in the Object Manager. Also, *Rectangle* is extruded in the Perspective viewport, as shown in Figure 2-9.

On choosing **HyperNURBS**, a flyout is displayed with various tools that are used to create complex models with relatively less number of control points. Models created using these tools can be converted into polygons. The **Extrude NURBS** tool is used to extrude the spline in any direction. The effect of this tool is only visible when the spline is connected to Extrude NURBS object.

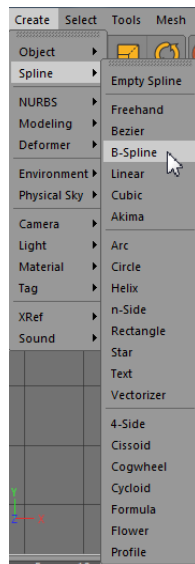


*Figure 2-9 Rectangle extruded in the Perspective viewport*

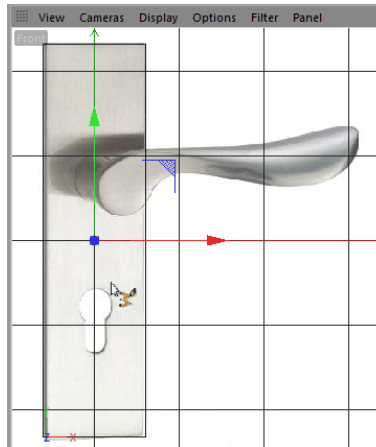
## Creating the Keyhole

In this section, you will create a keyhole using the **B-Spline** tool.

1. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Now, choose **B-Spline** from it, as shown in Figure 2-10. Alternatively, press and hold the left mouse button on the **Freehand** tool in the Command Palette; a flyout is displayed. Choose **B-Spline** from the flyout; the shape of the cursor is changed, as shown in Figure 2-11.

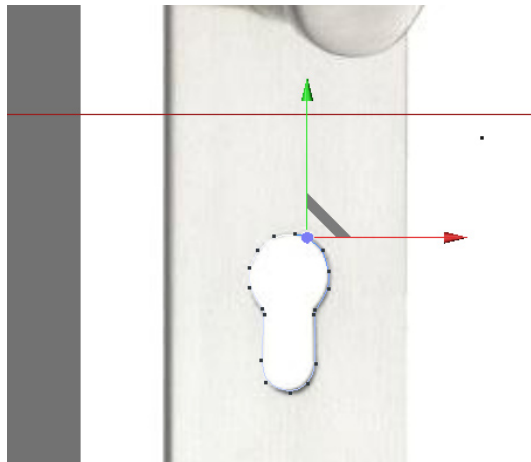


*Figure 2-10 Choosing B-Spline from the main menu*



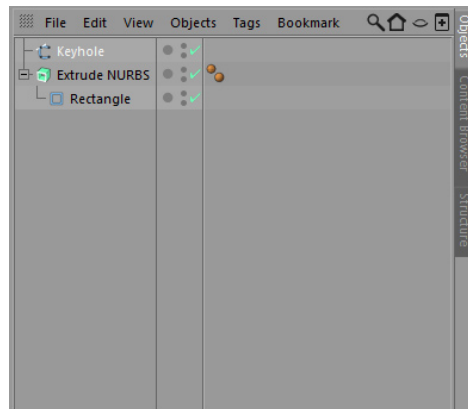
*Figure 2-11 The changed shape of the cursor*

2. Press F4; the Front viewport is maximized. In the Front view, draw the shape of the keyhole on the reference image, as shown in Figure 2-12. You will notice that *Spline* is also added to the Object Manager.
3. Invoke the **Move** tool from the Command Palette and select the points of *Spline*. Next, edit the shape of *Spline* to give it the shape of a keyhole, as shown in the reference image, refer to Figure 2-12.



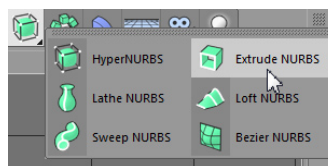
*Figure 2-12 Shape of the keyhole*

4. Make sure *Spline* is selected in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, select the **Close Spline** check box to close the spline. Next, choose the **Basic** button; the **Basic Properties** area is displayed. In this area, enter **keyhole** in the **Name** text box; *Spline* is renamed as *keyhole* in the Object Manager, as shown in Figure 2-13.



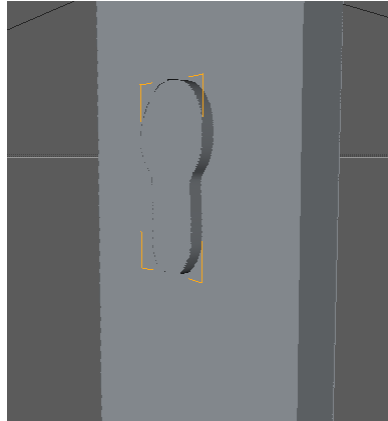
*Figure 2-13 Spline renamed as keyhole*

5. Press F1; the Perspective viewport is maximized. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Next, choose **Extrude NURBS** from it, as shown in Figure 2-14; *Extrude NURBS.1* is added to the Object Manager. Next, drag *keyhole* on *Extrude NURBS.1* in the Object Manager; *keyhole* is connected to *Extrude NURBS.1*.



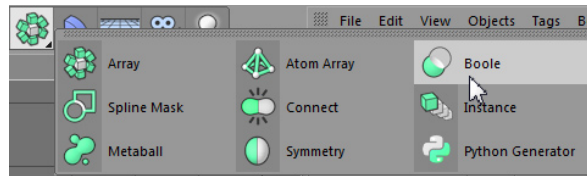
*Figure 2-14 Choosing Extrude NURBS from the flyout*

6. Select *Extrude NURBS.1* in the Object Manager. Next, choose the **Object** button in the Attribute Manager; the **Object Properties** area is displayed. In this area, enter **40** in the Z spinner of the **Movement** parameter; the *keyhole* is extruded.
7. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, enter **-5.409** in the **P . Z** spinner. Figure 2-15 displays *keyhole* extruded in the Perspective viewport.



*Figure 2-15 keyhole extruded in the viewport*

8. Press and hold the left mouse button on the **Array** tool in the Command Palette; a flyout is displayed. Next, choose **Boole** from the flyout, as shown in Figure 2-16; *Boole* is added to the Object Manager. Now, select *Extrude NURBS.1* and drag the cursor to *Boole*; *Extrude NURBS.1* is connected to *Boole*.



*Figure 2-16 Choosing Boole from the flyout*

9. In the Object Manager, select *Extrude NURBS* and press and hold the left mouse button; the shape of the cursor is changed. Next, drag *Extrude NURBS* on *Boole*; *Extrude NURBS* is connected to *Boole*, as shown in Figure 2-17. Also, *keyhole* is subtracted from *Extrude NURBS* and a hole is created in the Perspective viewport, as shown in Figure 2-18.



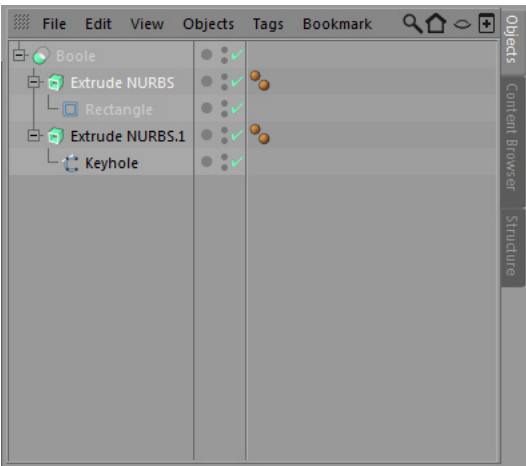


Figure 2-17 Extrude NURBS connected to Boole

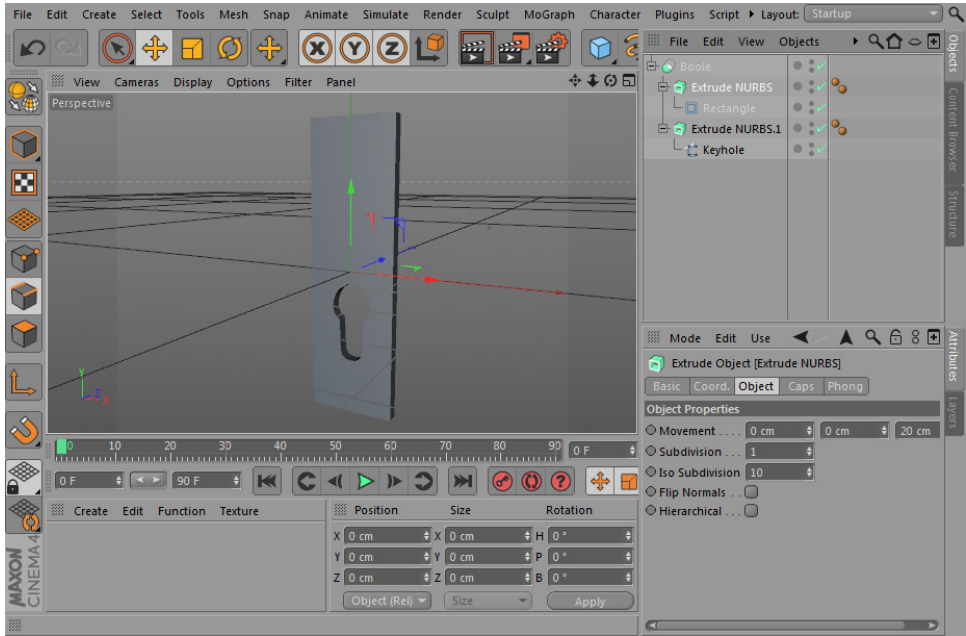


Figure 2-18 The hole created in the Perspective viewport

The **Array** tool is used to create duplicates of the selected NURBS or polygon object at uniform interval. The **Boole** tool is used to subtract two or more objects to create a hole in the object. Mostly it is used to preform operations on NURBS primitives and polygons.

## Creating the Handle

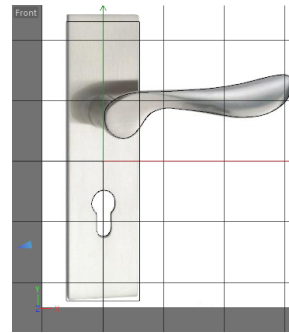
In this section, you will create the handle of the door using the **B-Spline** tool.

1. Press F4; the Front viewport is maximized. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **B-Spline** from it; the shape of the cursor is changed. Alternatively, press and hold the left mouse button on the **Freehand** tool in the Command Palette; a flyout is displayed. Choose **B-Spline** from the flyout; the shape of the cursor is changed.

The **Freehand** tool is used to draw free hand curves or splines in the viewport. The **B-Spline** tool is used to create smooth curves.

2. In the Front viewport, draw the shape of the door handle on the reference image and press ENTER to complete the shape. You will notice that *Spline* is added to the Object Manager. Make sure that **Close Spline** check box is selected in the **Object Properties** area in the Attribute Manager.
3. In the Attribute Manager, choose the **Basic** button; the **Basic Properties** area is displayed. In this area, type **Handle** in the **Name** text box; the name of *Spline* changes to *Handle* in the Object Manager.

Figure 2-19 displays *Handle* placed in the Front viewport.



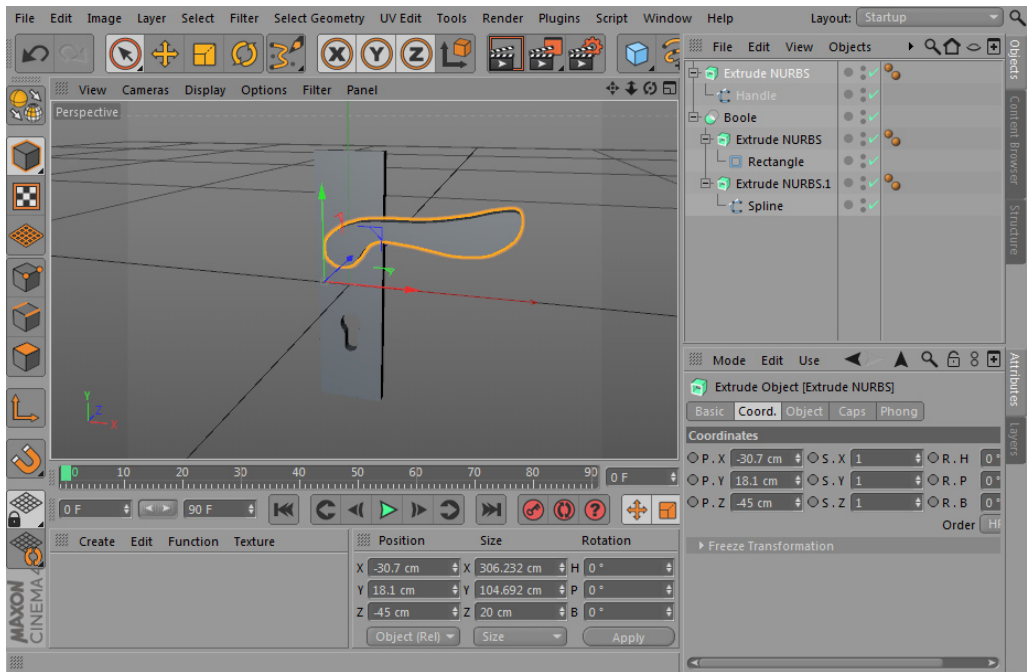
4. Press F1; the Perspective viewport is maximized. Next, press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Next, choose **Extrude NURBS** from it; *Extrude NURBS* is added to the Object Manager. Now, select *Handle* in the Object Manager and drag *Handle* to *Extrude NURBS*; the *Handle* is connected to *Extrude NURBS* and it is extruded in the Perspective viewport, as shown in Figure 2-20.

5. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

P . X: -30.7      P . Y: 18.1      P . Z: -45

**P . X**, **P . Y**, and **P . Z** parameters are used to specify the position values of X, Y, and Z axes. The **S . X**, **S . Y**, and **S . Z** parameters are used to specify the scale values of X, Y, and Z axes. Similarly, the **R . X**, **R . Y**, and **R . Z** parameters are used to specify the rotational values of X, Y, and Z axes.

**Figure 2-19** *Handle placed in the viewport*



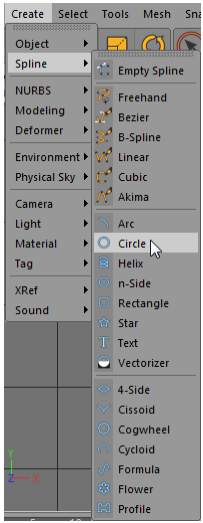
**Figure 2-20** Handle extruded in the Perspective viewport

Next, you will create the joint behind the handle and the base of the door.

6. Press F2; the Top viewport is maximized. In the Top viewport, choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Circle** from it, as shown in Figure 2-21; a circle is created in the Top viewport and *Circle* is added to the Object Manager.
7. Make sure that *Circle* is selected in the Object Manager. Next, in the Attribute Manager, choose the **Basic** button. In the **Basic Properties** area, type **Joint** in the **Name** text box; *Circle* is renamed as *Joint* in the Attribute Manager. Next, choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

P . Y: 81.591                      R . P: 90

8. Choose the **Object** button in the Attribute Manager; the **Object Properties** area is displayed. In this area, enter **20** in the **Radius** spinner.
9. Press F1; the Perspective viewport is maximized. Make sure that *Joint* is selected in the Object Manager. Now, create a copy of *Joint* by pressing both the CTRL key and the left mouse button. Now, drag the cursor and release the left mouse button; a copy of *Joint* is created in the Object Manager with the name *Joint.1*.

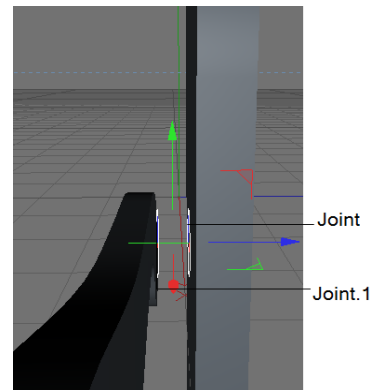


**Figure 2-21** Choosing *Circle* from the main menu

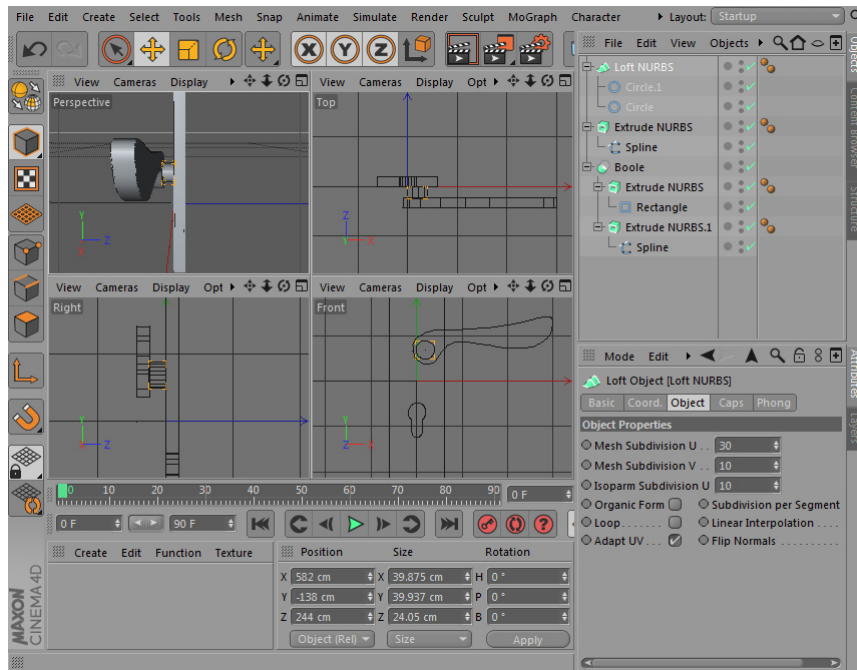
10. Make sure that *Joint.1* is selected in the Object Manager. In the Attribute Manager, make sure that the **Coordinates** area is displayed. In this area, enter **-24.05** in the **P . Z** spinner. Figure 2-22 shows the position of *Joint* and *Joint.1* in the Perspective viewport.

Next, you will create the surface of the joints.

11. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Next, choose the **Loft NURBS** tool from it; *Loft NURBS* is added to the Object Manager.
12. Press F5; all viewports are displayed. Select *Joint* and *Joint.1* in the Object Manager by using the SHIFT key and then press and hold the left mouse button and drag the cursor on *Loft NURBS*; the *Joint* and *Joint.1* are connected to the *Loft NURBS* in the Object Manager. Also, a surface is created. Figure 2-23 displays the surface in all viewports.



**Figure 2-22** The position of *Joint* and *Joint.1* displayed in the Perspective viewport



**Figure 2-23** *Joint* and *Joint.1* lofted to create a surface

Next, you will group the surfaces together.

13. In the Object Manager, select *Boole*, *Extrude NURBS*, and *Loft NURBS* by using the SHIFT key. Next, choose **Objects > Group Objects** from **Objects** menu in the Object Manager, as shown in Figure 2-24; all selected objects are grouped and *Null* is added to the Object Manager. Rename the **Null** as **Door Lock** in the **Name** text box in the Attribute Manager.

## Changing the Background Color of the Scene

In this section, you will set the background color of the scene.

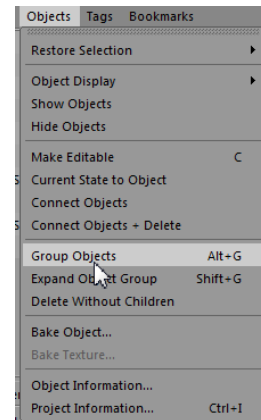
1. Choose **Create > Environment** from the main menu; a cascading menu is displayed, as shown in Figure 2-25. Choose the **Background** option from it; *Background* is added to the Object Manager.

The **Background** option is used to change the background with the color or image which is only visible in the render view.

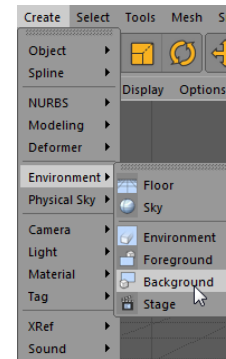
Next, you will change the background color to white.

2. Make sure *Background* is selected in the Object Manager, as shown in Figure 2-26. In the Attribute Manager, choose the **Basic** button; the **Basic Properties** area is displayed. In this area, select **On** from the **Use Color** drop-down list. On doing so, the **Display Color** parameter is activated, as shown in Figure 2-27. By default, the white color is selected in this spinner. As a result, the background color changes to white.

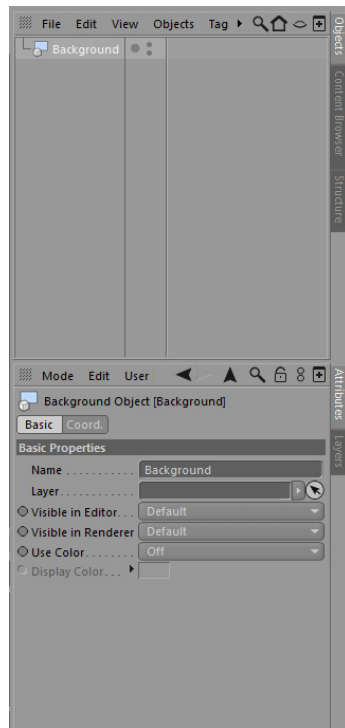
The options in the **Use Color** drop-down list are used to determine whether the selected objects in the viewport use the color assigned to them or not. You need to select the **On** option from the **Use Color** drop-down list to ensure that the display color is used even if the materials are applied to it.



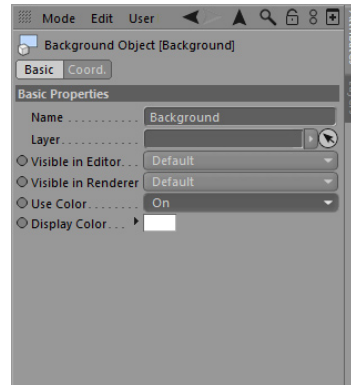
**Figure 2-24** Choosing **Group Objects** from the flyout



**Figure 2-25** Choosing the **Background** option from the main menu



**Figure 2-26** The **Background Object** selected in the **Object Manager**



**Figure 2-27** The **Display Color** parameter displayed

## Saving and Rendering the Scene

In this section, you will save and render the scene. You can also view the final render of the scene by downloading the file *c02\_cinema4d\_r14\_rndr.zip* from [www.cadcim.com](http://www.cadcim.com). The path of the file is mentioned at the beginning of the chapter.

1. Choose **File > Save** from the main menu; the **Save File** dialog box is displayed. In this dialog box, browse to the location `|Documents|c4dprojects|c02`.
2. Enter **c02tut1** in the **File name** text box and then choose the **Save** button.
3. In the Perspective viewport, set the camera angle using the Viewport Navigation Tools located at the top right of the Perspective viewport. Next, choose the **Render to Picture Viewer** tool from the Command Palette. Alternatively, press **SHIFT+R**; the **Picture Viewer** window is displayed, as shown in Figure 2-28.

The **Render to Picture Viewer** tool is used to render the scene in the **Picture Viewer** window. The **Picture Viewer** window is also known as the output window in CINEMA 4D. It is used to view the output of the scene as well as to save it.

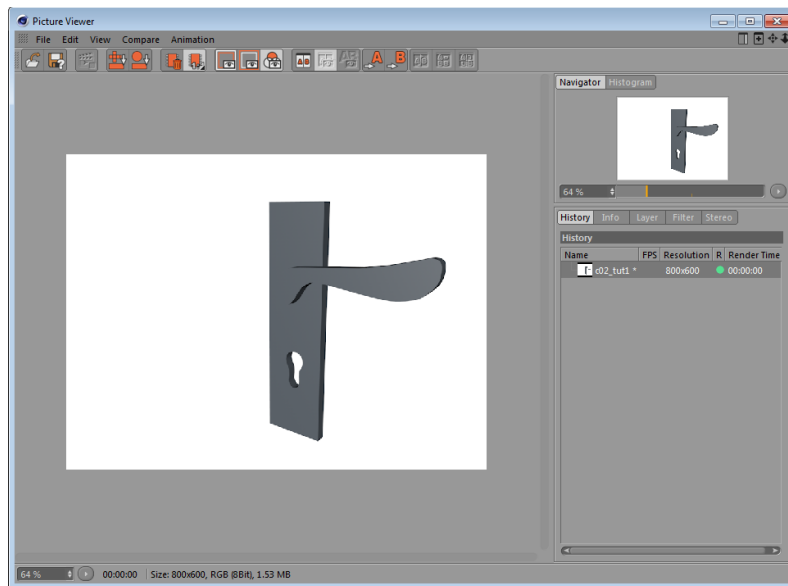


Figure 2-28 The *Picture Viewer* window

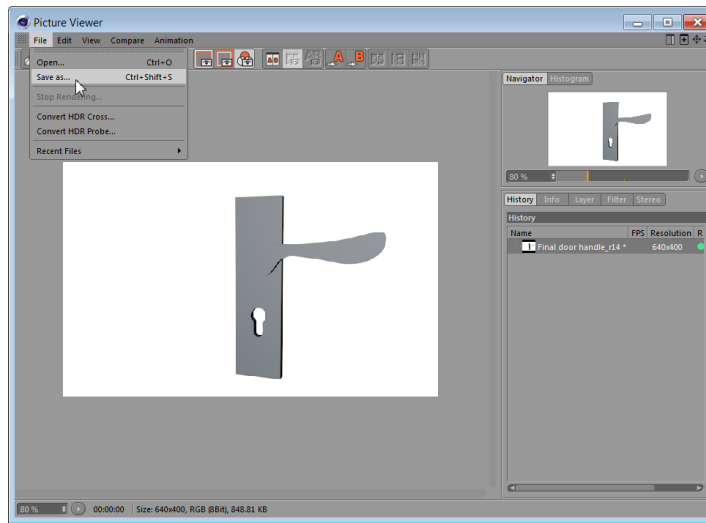
Next, you will save the rendered image.

4. In the **Picture Viewer** window, choose **File > Save as**, as shown in Figure 2-29; the **Save** dialog box is displayed, as shown in Figure 2-30.

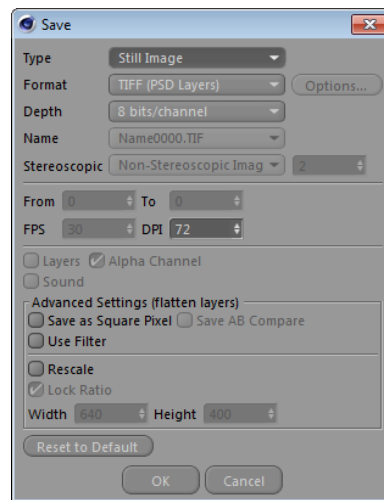
The **Save as** option is used to save a scene or an image sequence in the format based on your requirement. The **Save** dialog box is displayed with specific parameters which helps you in saving the still image or image sequence in an uncompressed format.

5. In the **Save** dialog box, choose the **OK** button; the **Save Dialog** dialog box is displayed. Next, browse to `|Documents|c4dprojects|c02`. In the **File Name** text box, type `c02_tut1_rndr`. Next, choose the **Save** button; the rendered image is saved at the desired location.

The output of the model is shown in Figure 2-1.



*Figure 2-29 Choosing the Save as option from the File menu*



*Figure 2-30 The Save dialog box*

## Tutorial 2

In this tutorial, you will create a guitar with the help of the spline and NURBS tools. The final output of the model is shown in Figure 2-31. **(Expected time: 40 min)**

The following steps are required to complete this tutorial:

- Set the viewport background.
- Create the body of the guitar.
- Create the neck of the guitar.
- Create the sound hole of the guitar.



- e. Create the strings of the guitar.
- f. Create the tuning keys of the guitar.
- g. Change the background color of the scene.
- h. Save and render the scene.

### Setting the Viewport Background

In this section, you will set a background image in the Front viewport.

1. Press F4; the Front viewport is maximized.
2. In the Front viewport, choose **Options > Configure** from the Menu in editor view; the **Viewport [Front]** settings are displayed in the Attribute Manager. In the Attribute Manager, choose the **Back** button; the **Back** area is displayed. In this area, choose the browse button next to the **Image** text box; the **Open File** dialog box is displayed. Browse to `|Documents|c4dprojects|c02|Front guitar.jpg`. Next, choose the **Open** button; the *Front guitar.jpg* is placed as the background image in the Front viewport.

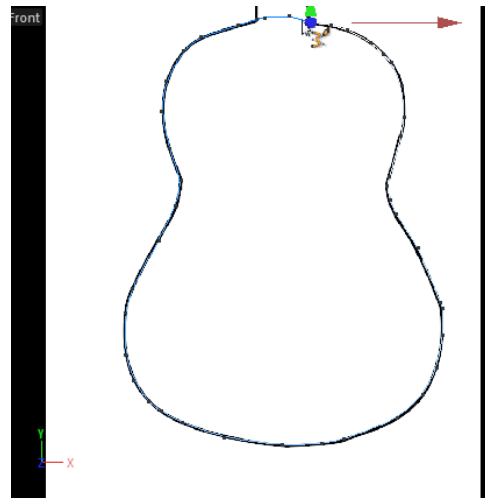


**Figure 2-31** The model of guitar

### Creating the Body of the Guitar

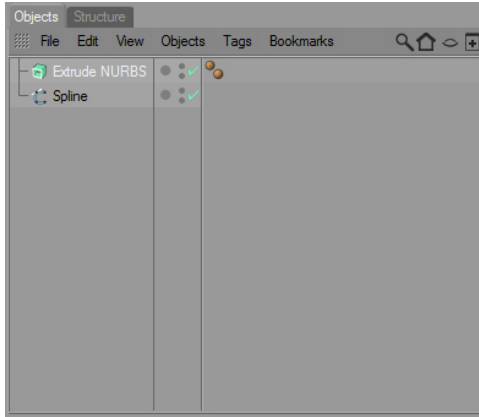
In this section, you will create the body of the guitar by using the **B-Spline** tool.

1. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **B-Spline** from the cascading menu.
2. Draw the body of the guitar in the Front viewport. Figure 2-32 displays the complete shape of the guitar. In the Attribute Manager, make sure the **Object** button is chosen. In the **Object Properties** area, select the **Close Spline** check box. Next, press SPACEBAR to exit the **B-Spline** tool.
3. In the Front viewport, select the points of *Spline* using the **Live Selection** tool to edit the shape of the guitar.
4. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Choose **Extrude NURBS** from it; *Extrude NURBS* is added to the Object Manager, as shown in Figure 2-33.

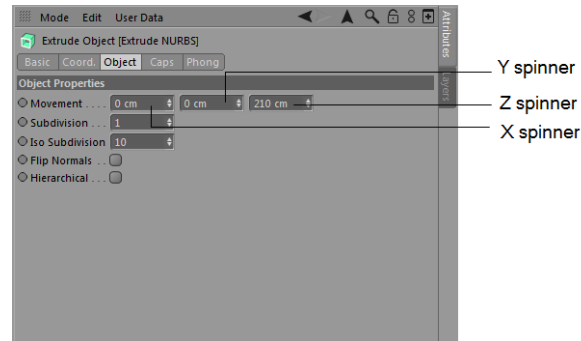


**Figure 2-32** The body of guitar

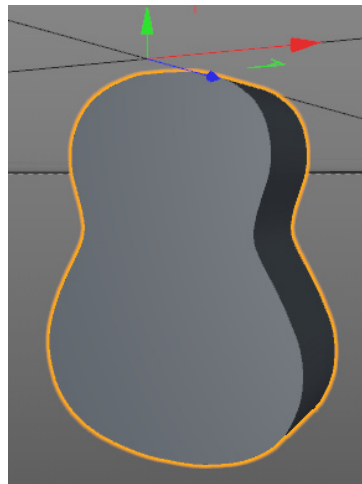
5. Press F1; the Perspective viewport is maximized. In the Object Manager, select *Spline* and drag it to *Extrude NURBS* and release the left mouse button; *Spline* is connected to *Extrude NURBS* and it is extruded in the Perspective viewport.
6. Select *Extrude NURBS* in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, enter **210** in the Z spinner of the **Movement** parameter; refer to Figure 2-34. The body of the guitar is extruded and is visible in the Perspective viewport, as shown in Figure 2-35.



**Figure 2-33** *Extrude NURBS added to the Object Manager*



**Figure 2-34** *The Z spinner of the Movement parameter*



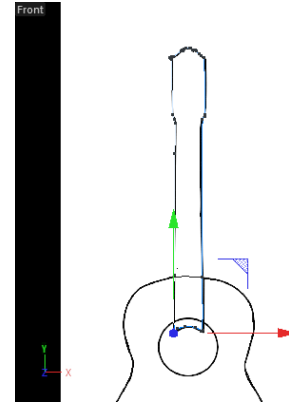
**Figure 2-35** *The extruded body of the guitar*

The X, Y, and Z spinners in the **Movement** parameter are used to define the amount of extrusion along the **X**, **Y**, and **Z** axes, respectively.

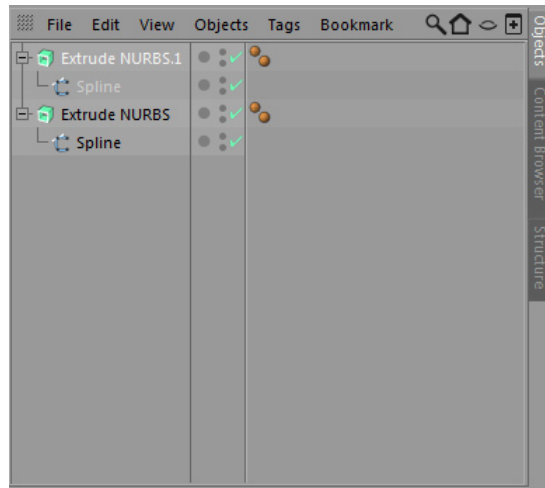
## Creating the Neck of the Guitar

In this section, you will model the neck of the guitar using the **B-Spline** tool.

1. Press F4; the Front viewport is maximized. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose the **B-Spline** tool from the cascading menu and then draw the neck of the guitar, as shown in Figure 2-36. In the Attribute Manager, make sure that the **Close Spline** check box is selected in the **Object Properties** area. Select **Natural** option from the **Intermediate Points** drop-down list. Next, press SPACEBAR to exit the tool.
2. Press and hold the left mouse button on the **HyperNURBS** tool; a flyout is displayed. Choose **Extrude NURBS** from it; *Extrude NURBS.1* is added to the Object Manager. Next, select *Spline* of the neck.
3. Press and hold the left mouse button and drag *Spline* on *Extrude NURBS.1* and release the left mouse button; *Spline* is connected to *Extrude NURBS.1* in the Object Manager, as shown in Figure 2-37.



**Figure 2-36** Spline for the neck of the guitar in the Front viewport



**Figure 2-37** Spline connected to *Extrude NURBS.1* in the Object Manager

4. Press F1; the Perspective viewport is maximized. Select *Extrude NURBS.1* in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, enter **38** in the Z spinner corresponding to the **Movement** parameter; *Spline* is extruded and is visible in the Perspective viewport.
5. Choose the **Coord** button in the Attribute Manager; the **Coordinates** area is displayed. In this area, enter **-28.95** in the **P . Z** spinner.

## Creating the Sound Hole of the Guitar

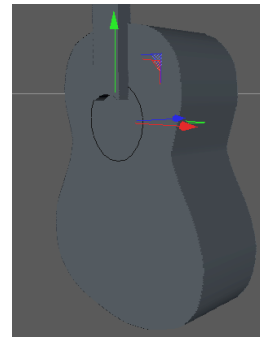
In this section, you will create a sound hole of the guitar using the **Boole** tool.

1. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Circle** from it; a circle is created in the Front viewport and *Circle* is added to the Object Manager.
2. Make sure that *Circle* is selected in the Object Manager. In the Attribute Manager, choose the **Object** button; the **Object Properties** area is displayed. In this area, enter **100** in the **Radius** spinner.
3. Choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

P . X: **35.33**

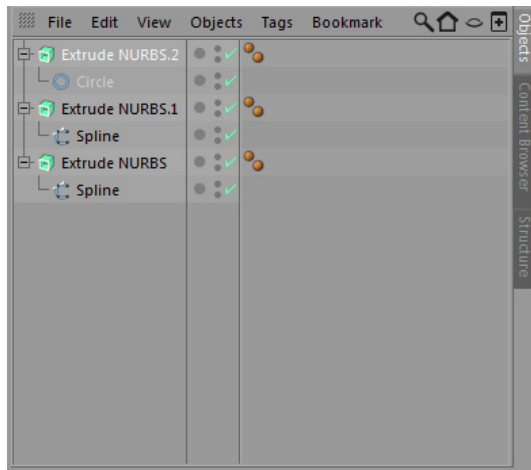
P . Y: **-272.89**

Press F1; the Perspective viewport is displayed. Figure 2-38 displays *Circle* placed on the guitar.

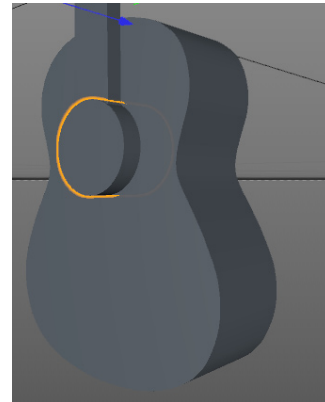


**Figure 2-38** The *Circle* placed on the guitar in the Perspective viewport

4. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Choose **Extrude NURBS** from the flyout; *Extrude NURBS.2* is added to the Object Manager, as shown in Figure 2-39. Select *Circle* in the Object Manager and then drag it to *Extrude NURBS.2* and release the left mouse button; *Circle* is connected to *Extrude NURBS.2* in the Object Manager.
5. Select *Extrude NURBS.2* in the Object Manager. Next, in the Attribute Manager, choose the **Object** button; the **Object Properties** area is displayed. In this area, enter **150** in the Z spinner corresponding to the **Movement** parameter; *Circle* is extruded in the Perspective viewport, refer to Figure 2-40.
6. Choose the **Coord** button; the **Coordinates** area is displayed. In this area, enter **-30.93** in the **P . Z** spinner; *Circle* is positioned in the Perspective viewport, as shown in Figure 2-40.



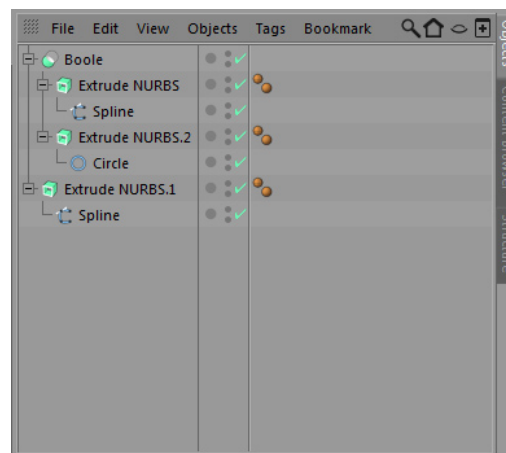
**Figure 2-39** *Extrude NURBS.2 added in the Object Manager*



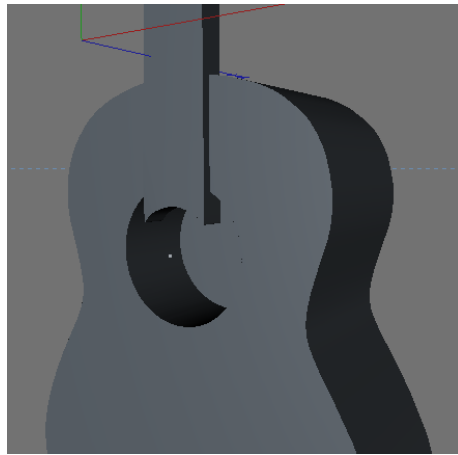
**Figure 2-40** *The extruded circle positioned in the Perspective viewport*

Next, you will create a hole in the guitar using the **Boole** tool.

7. Press and hold the left mouse button on the **Array** tool in the Command Palette; a flyout is displayed. Choose the **Boole** tool from the flyout; *Boole* is added to the Object Manager.
8. In the Object Manager, drag *Extrude NURBS.2* to *Boole*; *Extrude NURBS.2* is connected to *Boole*. Next, drag *Extrude NURBS* to *Boole*; *Extrude NURBS* is connected to *Boole*, refer to Figure 2-41. You will notice that a hole is created in the body of guitar, as shown in Figure 2-42.



**Figure 2-41** *Extrude NURBS and Extrude NURBS.2 connected to Boole in the Object Manager*



*Figure 2-42 The hole created in the body of guitar*

Next, you will create a rectangle on the body of the guitar.

9. Press F4; the Front viewport is maximized. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Rectangle** from the cascading menu, as shown in Figure 2-43; a rectangle is created in the Front viewport and *Rectangle* is added to the Object Manager.
10. Press F1; the Perspective viewport is maximized. Make sure that *Rectangle* is selected in the Object Manager. In the Attribute Manager, choose the **Object** button; the **Object Properties** area is displayed. In this area, set the values of parameters as follows:

Width: **298**

Height: **58**

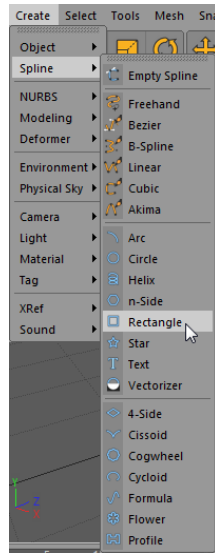
11. Choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

P . X: **42.12**

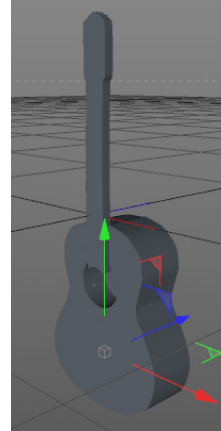
P . Y: **-569.62**

P . Z: **18**

After entering the values, the rectangle is created and positioned in the Perspective viewport, as shown in Figure 2-44.



**Figure 2-43** Choosing *Rectangle* from the cascading menu



**Figure 2-44** The rectangle positioned in the Perspective viewport

12. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Next, choose **Extrude NURBS** from it; *Extrude NURBS* is added to the Object Manager. Next, drag *Rectangle* to *Extrude NURBS*; *Rectangle* is connected to *Extrude NURBS* in the Object Manager.
13. Select *Extrude NURBS* in the Object Manager. In the Attribute Manager, choose the **Object** button; the **Object Properties** area is displayed. In this area, enter **-54** in the Z spinner corresponding to the **Movement** parameter; the *Rectangle* is extruded and it becomes visible in the Perspective viewport.

## Creating the Strings of the Guitar

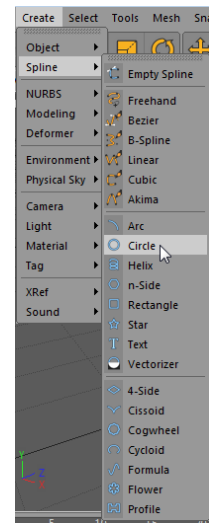
In this section, you will create the strings of the guitar.

1. Press F2; the Top viewport is maximized. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Circle** from it, as shown in Figure 2-45; a circle is created in the Top viewport and *Circle* is added to the Object Manager.
2. Make sure that *Circle* is selected in the Object Manager. In the Attribute Manager, choose the **Object** button; the **Object Properties** area is displayed. In this area, enter **1** in the **Radius** spinner and then place it on the guitar.
3. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Choose **Extrude NURBS** from the flyout; *Extrude NURBS.2* is added to the Object Manager.
4. Double-click on *Extrude NURBS.2*; a text box is displayed. Enter **String1** in the text box; *Extrude NURBS.2* is renamed as *String1*.

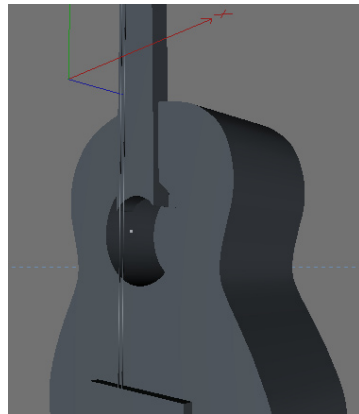
5. Select *Circle* in the Object Manager. Next, drag *Circle* to *String1*; *Circle* is connected to *String1*.
6. Press F1; the Perspective viewport is maximized. Select *String1* in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, enter **1125** in the Y spinner corresponding to the **Movement** parameter. Align *String1* with the guitar using the **Move** and **Rotate** tools in the Perspective viewport, refer to Figure 2-46.

Next, you will create copies of the string.

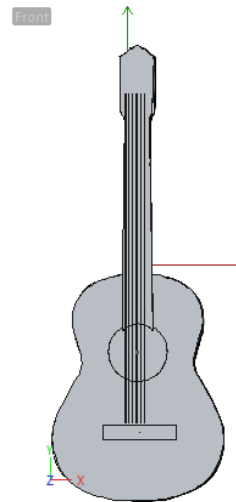
7. In the Perspective viewport, make sure that *String1* is selected. Press and hold the left mouse button and the CTRL key and move the first string along the X axis to the right; the first copy is created, as shown in Figure 2-46.
8. Press F4; the Front viewport is maximized. In the Front viewport, create six more copies of *String1*, as shown in Figure 2-47.



**Figure 2-45** Choosing *Circle* from the *Create* menu



**Figure 2-46** *String1* positioned in the Perspective viewport



**Figure 2-47** The copies of string created

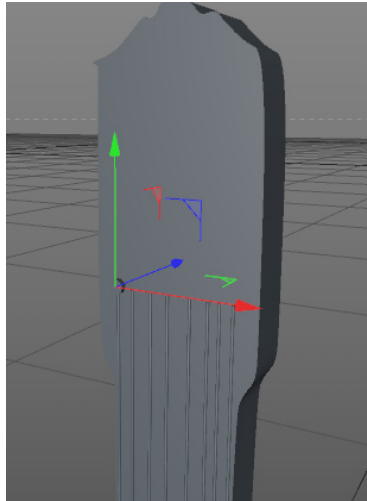
## Creating the Tuning Keys of the Guitar

In this section, you will create the tuning keys of the guitar.

1. Make sure that the Front viewport is maximized. Then, choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Circle** from it; a circle is created in the Front viewport and *Circle* is added to the Object Manager.



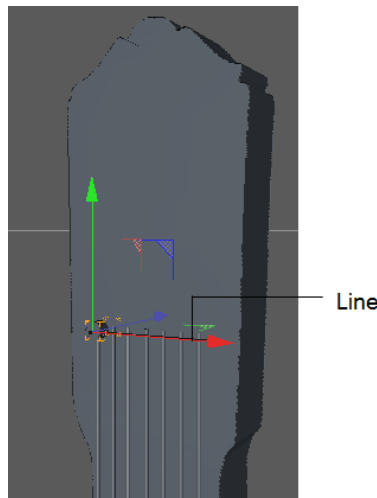
2. Make sure that *Circle* is selected in the Object Manager. Next, make sure the **Object** button is chosen. In the **Object Properties** area, enter **5** in the **Radius** spinner. Next, place *Circle* on guitar at the top of *String1*, refer to Figure 2-48.
3. Choose **HyperNURBS** tool from the Command Palette; a flyout is displayed. Choose **Extrude NURBS** from it; *Extrude NURBS.2* is added to the Object Manager.
4. In the Object Manager, select *Circle* and drag it to *Extrude NURBS.2*; *Circle* is connected to *Extrude NURBS.2*. Rename *Extrude NURBS.2* as *Key1*.
5. Select *Key1* in the Object Manager. In the Attribute Manager, make sure the **Object** button is chosen. In the **Object Properties** area, enter **7** in the Z spinner corresponding to the **Movement** parameter. Press F1; the Perspective viewport is maximized. Now, position *Circle* on *String1* of guitar, as shown in Figure 2-48.



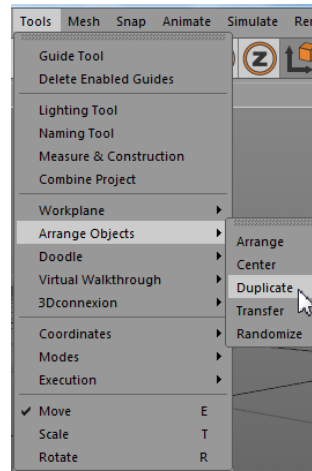
**Figure 2-48** The Circle positioned on String1

Next, you will create duplicate copies of *Key1* using the **Duplicate** tool.

6. Press F2; the Top viewport is maximized. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Linear** from it. Next, click on *Key1* and then create a straight line using the SHIFT key in the Top viewport. Next, press SPACEBAR to exit the tool.
7. Press F1; the Perspective viewport is maximized. Make sure that the spline is selected in the Object Manager. Next, place the spline on the neck of the guitar by using the **Move** tool, as shown in Figure 2-49.
8. Select *Key1* in the Object Manager. Choose **Tools > Arrange Objects** from the main menu; a cascading menu is displayed. Choose **Duplicate** from it, as shown in Figure 2-50; the settings corresponding to **Duplicate** option are displayed in the Attribute Manager.

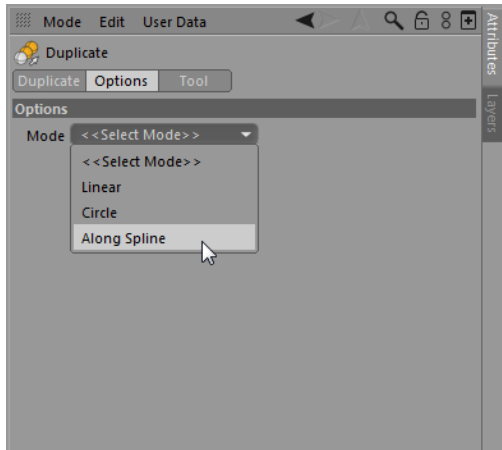


**Figure 2-49** The spline positioned on String1

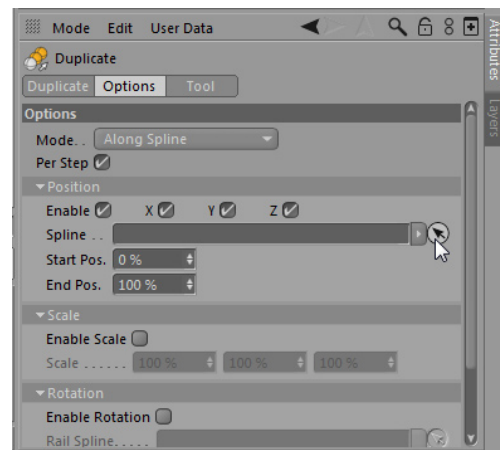


**Figure 2-50** Choosing **Duplicate** from the cascading menu

9. In the Attribute Manager, choose the **Options** button; the **Options** area is displayed. In this area, select the **Along Spline** option from the **Mode** drop-down list, as shown in Figure 2-51. Next, choose the arrow button located on the right of the **Spline** text box, as shown in Figure 2-52; the shape of the cursor is changed, as shown in Figure 2-53. Next, select **Spline** in the Object Manager; **Spline** is added to the **Spline** text box. Now, enter **8** and **91** in the **Start Pos.** and **End Pos.** spinners, respectively. Choose the **Duplicate** button and enter **7** in the **Copies** spinner; **Key1\_copies** is created in the viewport.



**Figure 2-51** Selecting the **Along Spline** option from the **Mode** drop-down list



**Figure 2-52** Choosing the arrow button on the right of the **Spline** text box

The **Copies** option in the **Duplicate** area is used to specify the number of duplicate copies to be created. By default, they are grouped together.

Using the **Move** tool, position the *Key1\_copies* in the Perspective viewport, as shown in Figure 2-54.

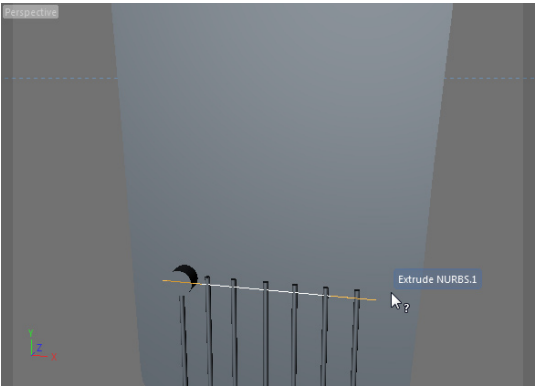


Figure 2-53 The changed shape of the cursor

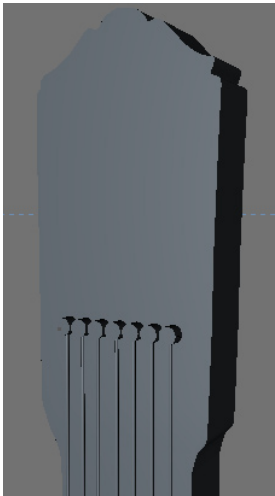


Figure 2-54 The tuning keys positioned

### Changing the Background Color of the Scene

In this section, you will set the background color.

1. Choose **Create > Environment** from the main menu; a cascading menu is displayed. Choose the **Background** option from the menu, refer to Figure 2-55; *Background* is added to the Object Manager.

Next, you will change the background color to white.

2. Make sure that *Background* is selected in the Object Manager; the **Background Object [Background]** settings are displayed in the Attribute Manager. Choose the **Basic** button; the **Basic Properties** area is displayed. In this area, select the **On** option from the **Use Color** drop-down list; the **Display Color** parameter is activated.

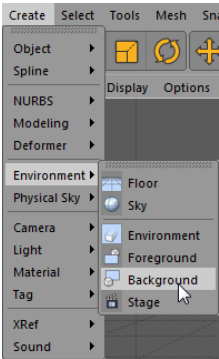


Figure 2-55 Choosing *Background* from the cascading menu

### Saving and Rendering the Scene

In this section, you will save and render the scene. You can also view the final render of the scene by downloading the file *c02\_cinema4d\_r14\_rndr.zip* from [www.cadcim.com](http://www.cadcim.com). The path of the file is mentioned at the beginning of the chapter.

1. Choose **File > Save** from the main menu; the **Save File** dialog box is displayed. In this dialog box, browse to the location `|Documents|c4dprojects|c02`.
2. Enter **c02tut2** in the **File name** text box and then choose the **Save** button.

3. In the Perspective viewport, set the camera angle using the Viewport Navigation Tools located on the top right corner of the Perspective viewport. Next, choose the **Render to Picture Viewer** tool from the Command Palette. Alternatively, press SHIFT+R; the **Picture Viewer** window is displayed, as shown in Figure 2-56.

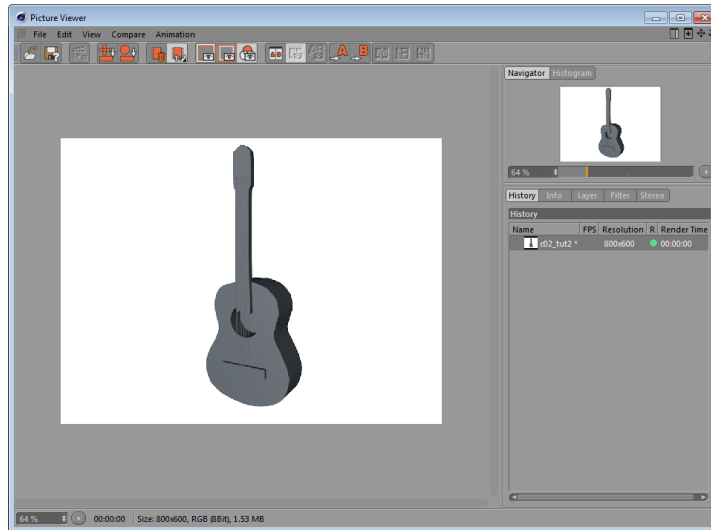


Figure 2-56 The **Picture Viewer** window

4. In the **Picture Viewer** window, choose **File > Save as**, as shown in Figure 2-57; the **Save** dialog box is displayed.

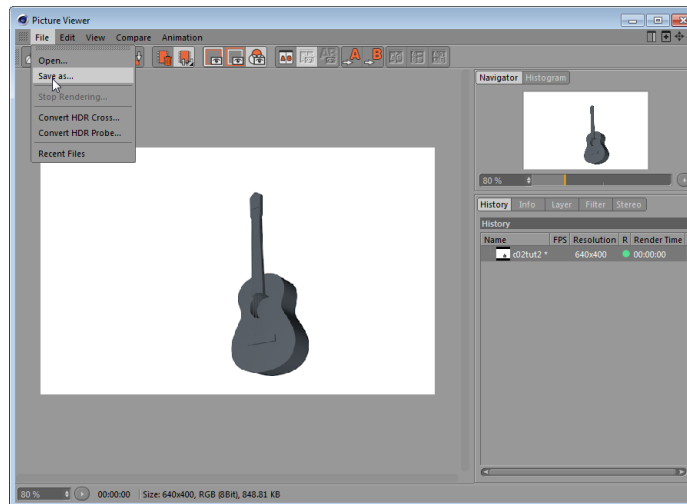


Figure 2-57 Choosing the **Save as** option from the **File** menu

5. In the **Save** dialog box, choose the **OK** button; the **Save Dialog** dialog box is displayed. Next, browse to the `|Documents|c4dprojects|c02`. In the **File Name** text box, type `c02_tut2_rndr`. Next, choose the **Save** button; the rendered image is saved at the desired location. The output of the model is shown in Figure 2-31.

In this tutorial, you will create a hand bag with the help of Splines and NURBS tools. The final output of the model is shown in Figure 2-58. **(Expected time: 25 min)**

**(Expected time: 25 min)**

- 

**Figure 2-58** Model of a hand bag

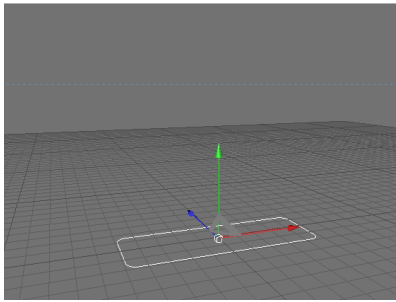
1. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Rectangle** from the menu, as shown in Figure 2-59; a rectangle is created in the Perspective viewport and *Rectangle* is added to the Object Manager.

- 
- The screenshot shows the SolidWorks 'Create' menu with 'Spline' selected. The 'Spline' submenu is open, listing various spline types. The 'Rectangle' option is highlighted with a mouse cursor. The background shows a 3D model of a mechanical part in the SolidWorks environment.

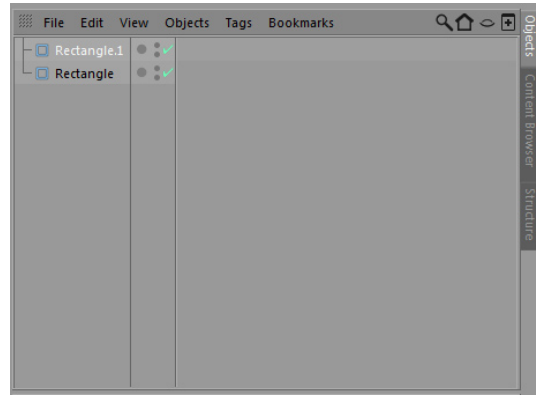
P . Z: -4

After entering the values, *Rectangle* is placed in the Perspective viewport, as shown in Figure 2-60.

5. Make sure that *Rectangle* is selected in the Object Manager. Press and hold the left mouse button and the CTRL key and then drag and drop the cursor in the empty space above it; the copy of *Rectangle* is created in the Perspective viewport and added to the Object Manager with the name *Rectangle.1*, as shown in Figure 2-61.



**Figure 2-60** *Rectangle placed in the Perspective viewport*



**Figure 2-61** *Rectangle.1 added to the Object Manager*

6. Make sure that *Rectangle.1* is selected in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, set the parameters as follows:

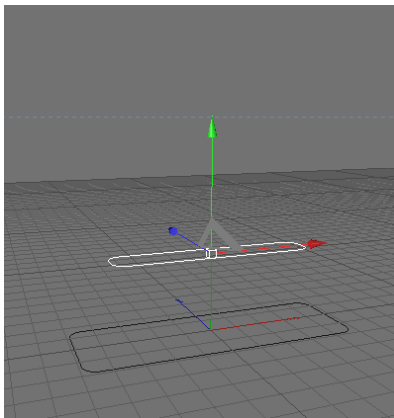
Width: **730**

Height: **129**

Make sure that the **Rounding** check box is selected. Next, enter **55** in the **Radius** spinner.

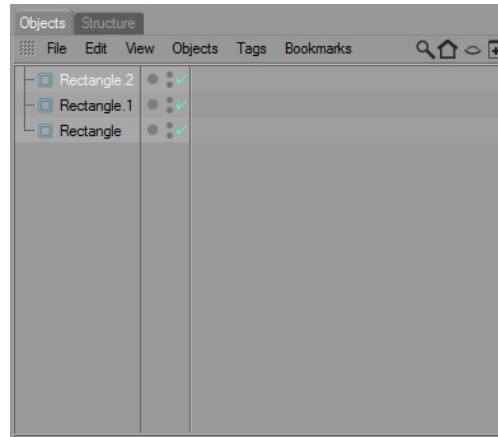
7. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, enter **286.8** in the **P . Y** spinner.

After entering the values, *Rectangle.1* is placed in the Perspective viewport, as shown in Figure 2-62.



**Figure 2-62** *Rectangle.1 placed in the Perspective viewport*

8. Make sure that *Rectangle.1* is selected in the Object Manager. Press and hold the left mouse button and the CTRL key and then drag and drop the cursor in the empty space; the copy of the *Rectangle.1* is created and added to the Object Manager with the name *Rectangle.2*, as shown in Figure 2-63.



**Figure 2-63** *Rectangle.2* added to the Object Manager

9. Make sure that *Rectangle.2* is selected in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, set the parameters as follows:

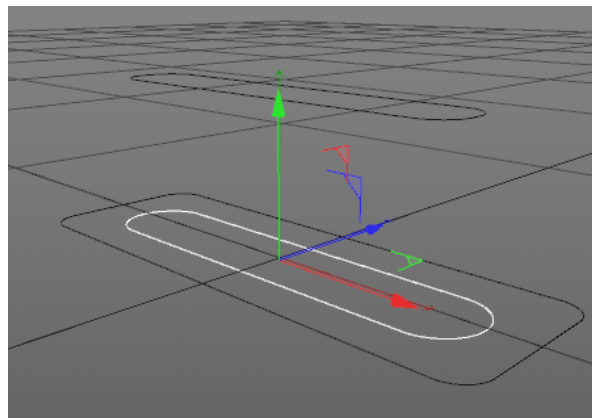
Width: **815**

Height: **165**

Make sure that the **Rounding** check box is selected and enter **82.5** in **Radius** spinner.

10. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, enter **-3.66** in the **P . Y** spinner.

After entering the values, *Rectangle.2* is placed in the Perspective viewport, as shown in Figure 2-64.



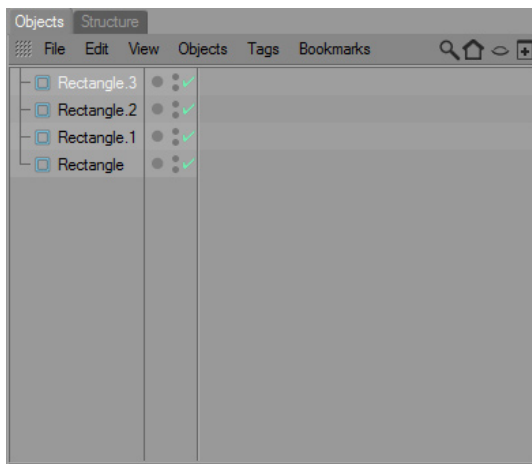
**Figure 2-64** *Rectangle.2* placed in the Perspective viewport

11. Make sure that *Rectangle.2* is selected in the Object Manager. Next, press and hold the left mouse button and the CTRL key and drag and drop the cursor in the empty space; the copy of *Rectangle.2* is created and added to the Object Manager with the name *Rectangle.3*, as shown in Figure 2-65.
12. Make sure that *Rectangle.3* is selected in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, set the parameters as follows:  
  
 Width: **527**                      Height: **55**  
  
 Make sure that the **Rounding** check box is selected and enter **0** in the **Radius** spinner.
13. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

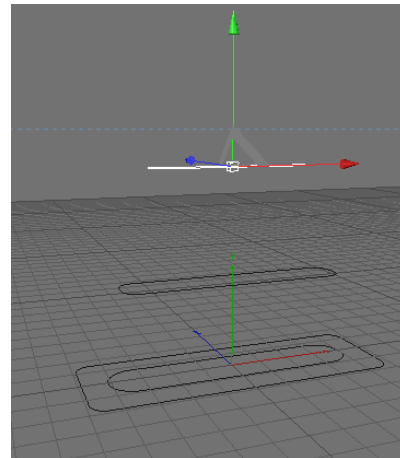
P . X: **-1.9**

P . Y: **647.4**

After entering the values, *Rectangle.3* is placed in the Perspective viewport, as shown in Figure 2-66.

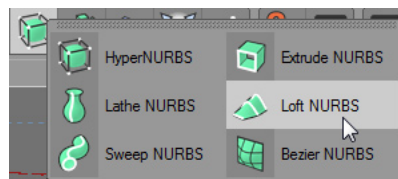


**Figure 2-65** *Rectangle.3* added to the Object Manager



**Figure 2-66** *Rectangle.3* placed in the Perspective viewport

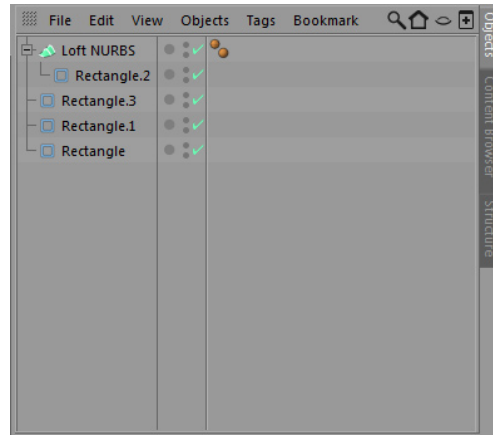
14. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Choose the **Loft NURBS** tool from the flyout, as shown in Figure 2-67; *Loft NURBS* is added to the Object Manager.



**Figure 2-67** Choosing **Loft NURBS** from the flyout

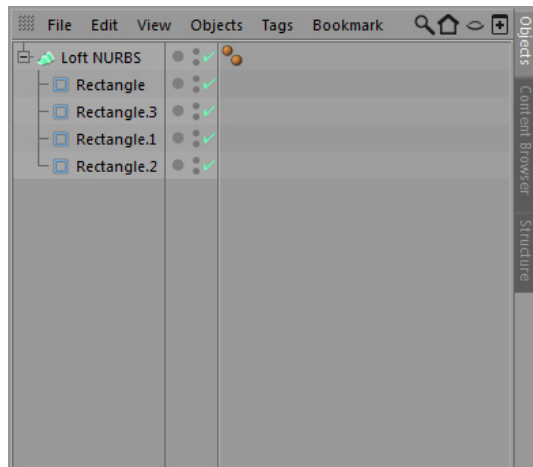


15. In the Object Manager, select *Rectangle.2*. Next, drag and drop *Rectangle.2* on *Loft NURBS*; *Rectangle.2* is connected to *Loft NURBS*, as shown in Figure 2-68. Also, *Rectangle.2* is lofted with a surface in the Perspective viewport.

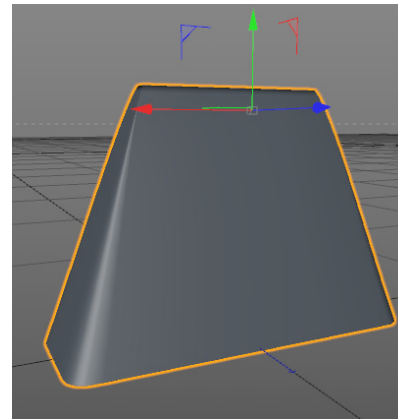


**Figure 2-68** *Loft NURBS connected to Rectangle.2 in the Object Manager*

16. Connect *Rectangle.1*, *Rectangle.3*, and *Rectangle* to *Loft NURBS* in the Object Manager, as shown in Figure 2-69. On doing so, a lofted surface resembling the shape of a hand bag is created in the Perspective viewport, as shown in Figure 2-70.



**Figure 2-69** *Rectangle, Rectangle.1, and Rectangle.3 connected to Loft NURBS*



**Figure 2-70** *All the Rectangles lofted in the Perspective viewport*

## Creating the Handles of the Hand Bag

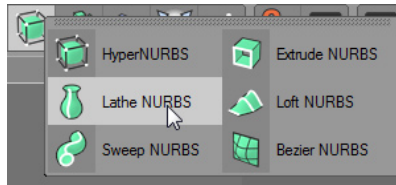
In this section, you will create the handles of the bag using the **Lathe** tool.

1. Choose **Create > Spline** from the main menu; a cascading menu is displayed. Choose **Circle** from it; a circle is created in the Perspective viewport and *Circle* is added to the Object Manager.

2. Make sure *Circle* is selected in the Object Manager. In the Attributes Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, enter **8** in the **Radius** spinner. Also, make sure that the **XY** option is selected in the **Plane** drop-down list. Next, choose the **Coord** button; the **Coordinates** area is displayed. In the **Coordinates** area, set the parameters as follows:

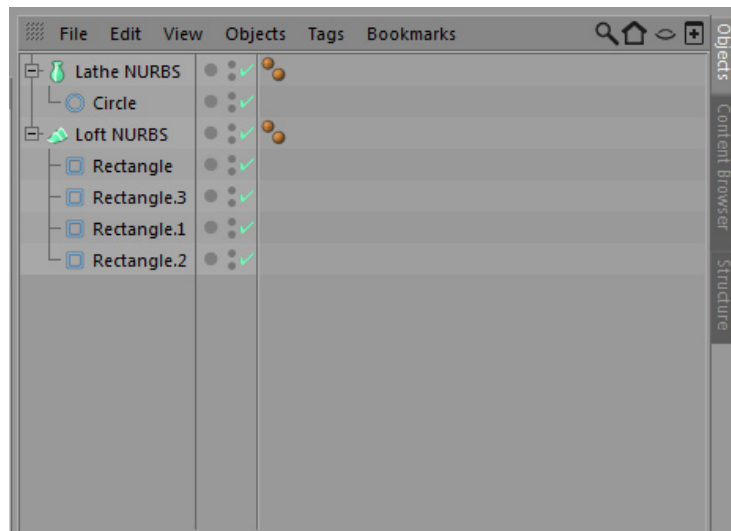
P . X: **242.63**P . Y: **293.5**P . Z: **-110.8**

3. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Choose the **Lathe NURBS** tool from the flyout, as shown in Figure 2-71; *Lathe NURBS* is added to the Object Manager, refer to Figure 2-72.



**Figure 2-71** Choosing *Lathe NURBS* from the flyout

4. In the Object Manager, drag *Circle* and drop it on *Lathe NURBS*; *Circle* is connected to *Lathe NURBS*, as shown in Figure 2-72.



**Figure 2-72** *Circle* connected to *Lathe NURBS* in the Object Manager

The **Lathe NURBS** tool is used to rotate the profile curve on the Y-axis of the local axis system of NURBS object. It is used to generate a revolved surface.

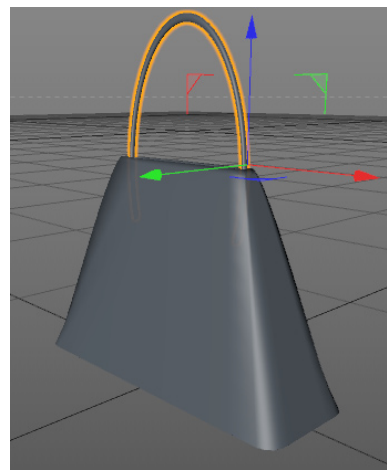
5. Select *Lathe NURBS* in the Object Manager. In the Attribute Manager, choose the **Object** button; the **Object Properties** area is displayed. In this area, enter **75** in the **Subdivision** spinner and **227** in the **Angle** spinner.

- Choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

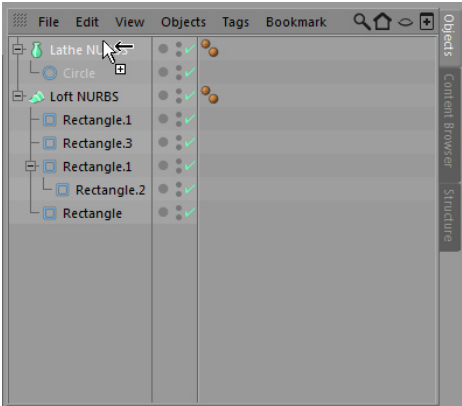
P . X: <b>5.715</b>	P . Y: <b>634.142</b>	P . Z: <b>291.176</b>
S . X: <b>0.87</b>	S . Z: <b>1.62</b>	R . H: <b>90</b>
R . P: <b>90</b>	R . B: <b>-90</b>	

Figure 2-73 displays the hand bag with its handle. Next, you will create a copy of the handle.

- Select *Lathe NURBS* in the Object Manager. Press and hold the left mouse button along with the CTRL key; the shape of the cursor is changed, as shown in Figure 2-74. Next, drag *Lathe NURBS* in the empty space above it and then release the left mouse button; a copy of *Lathe NURBS* is added with the name *Lathe NURBS.1* to the Object Manager.



**Figure 2-73** The handle of the hand bag created



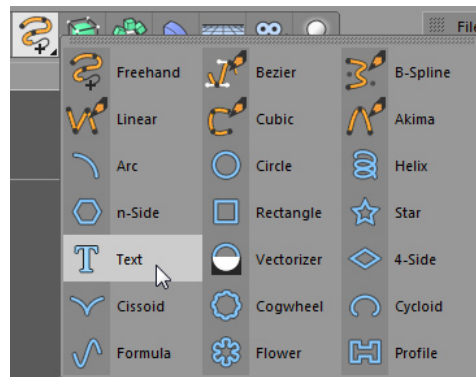
**Figure 2-74** The changed shape of the cursor in the Object Manager

- Make sure that *Lathe NURBS.1* is selected in the Object Manager. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, enter **282.25** in the **P . Z** spinner.

### Creating Text on the Hand Bag

In this section, you will create text on the hand bag using the **Extrude NURBS** tool.

- Press and hold the left mouse button on the **Freehand** tool in the Command Palette; a flyout is displayed. Choose the **Text** tool from the flyout, as shown in Figure 2-75; *Text* is created in the Perspective viewport and added to the Object Manager.



**Figure 2-75** Choosing the *Text* tool from the flyout

2. Make sure that *Text* is selected in the Object Manager. In the Attribute Manager, make sure that the **Object** button is chosen. In the **Object Properties** area, set the parameters as follows:

Text: **S&S**

Height: **274**

Horizontal Spacing: **5**

Vertical Spacing: **11**

The **Text** edit box in the **Object Properties** area is used to write the text in the viewport. You can also type multiple lines. The **Height** parameter is used to determine the height of the text written in the viewport. The **Horizontal Spacing** parameter is used to determine the horizontal spaces or gaps between the characters. The **Vertical Spacing** parameter is used to determine the vertical spaces or gaps between the characters.

3. In the Attribute Manager, choose the **Coord** button; the **Coordinates** area is displayed. In this area, set the parameters as follows:

P . X: **-1.085**

P . Y: **322.761**

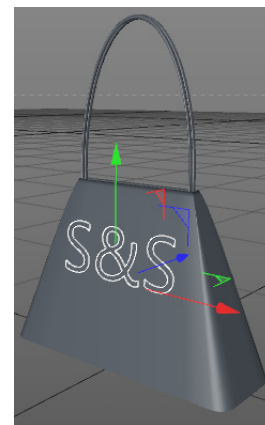
P . Z: **-116.243**

R . P: **-12**

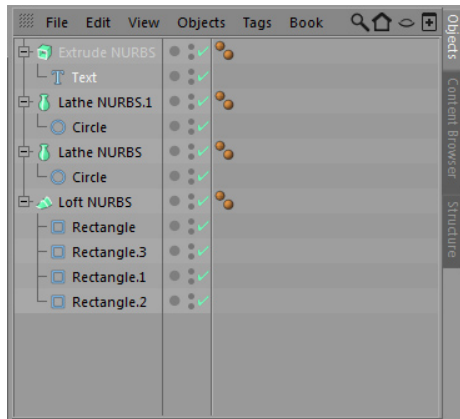
The text is placed in the Perspective viewport, as shown in Figure 2-76.

Next, you will extrude the text.

4. Press and hold the left mouse button on the **HyperNURBS** tool in the Command Palette; a flyout is displayed. Choose the **Extrude NURBS** tool from it; *Extrude NURBS* is added to the Object Manager.
5. In the Object Manager, drag *Text* and drop it on *Extrude NURBS*; *Text* is connected to *Extrude NURBS*, as shown in Figure 2-77. Also, *Text* is extruded in the Perspective viewport, refer to Figure 2-78.



**Figure 2-76** The text placed in the Perspective viewport



**Figure 2-77** Text connected to Extrude NURBS in the Object Manager



**Figure 2-78** The extruded text on the hand bag

## Changing the Background Color of the Scene

To change the background color of the scene to white in the final output, follow the steps given in Tutorial 1 of Chapter 2.

## Saving and Rendering the Scene

In this section, you will save and render the scene. You can also view the final render of the scene by downloading the file *c02\_cinema4d\_r14\_rndr.zip* from [www.cadcim.com](http://www.cadcim.com). The path of the file is mentioned at the beginning of the chapter.

1. Choose **File > Save** from the main menu; the **Save File** dialog box is displayed. In this dialog box, browse to the location `|Documents|c4dprojects|c02`.
2. Enter **c02tut3** in the **File name** text box and then choose the **Save** button.
3. In the Perspective viewport, set the camera angle using the Viewport Navigation Tools located on the extreme top right of the Perspective viewport. Next, you need to render the scene. For rendering, refer to Tutorial 1.

Figure 2-58 displays the final output.

## Self-Evaluation Test

Answer the following questions and then compare them to those given at the end of this chapter:

1. Which of the following tools is used to create complex models using relatively less number of control points?
 

(a) <b>Freehand</b>	(b) <b>Hyper NURBS</b>
(c) <b>Move</b>	(d) None of these
2. Which of the following tools is used to extrude a spline object or curve?
 

(a) <b>Freehand</b>	(b) <b>Loft NURBS</b>
(c) <b>Extrude NURBS</b>	(d) All of these
3. Which of the following combinations of shortcut keys is used to render a scene?
 

(a) ALT+Q	(b) CTRL+D
(c) SHIFT+R	(d) None of these
4. The \_\_\_\_\_ tool in the Command Palette is used to subtract two or more objects from an object to create a hole in the object.
5. The \_\_\_\_\_ option in the **Options** menu is used to edit the settings of the respective viewport.
6. The **Angle** parameter in the \_\_\_\_\_ area of the Attribute Manager is used to define the angle of rotation of the spline.
7. The Viewport Navigation Tools are located at the right corner of the viewport. (T/F)
8. The three spinners corresponding to the **Movement** parameter are used to specify the extrusion taking place along the **X**, **Y**, or **Z** axis. (T/F)
9. The **Background** tool is used to change the foreground with the color or the image which is visible only in the render view. (T/F)
10. The **R . P** parameter in the Attribute Manager is used to determine the rotational values of the X axis. (T/F)

## Review Questions

Answer the following questions:

- Which of the following tools is used to revolve a profile curve about the Y axis of the local axis system of the NURBS object?  
(a) **Lathe** (b) **Hyper NURBS**  
(c) **B-Spline** (d) None of these
- Which of the following tools is used to create text in the viewport in CINEMA 4D?  
(a) **Lathe** (b) **Text**  
(c) **Freehand** (d) **Render to Picture Viewer**
- The options in the \_\_\_\_\_ drop-down list are used to determine whether the selected objects in the viewport use the background color assigned to them.
- By default, the height of a rectangle spline primitive is set to \_\_\_\_\_.
- In CINEMA 4D, \_\_\_\_\_ in the **Duplicate** area is used to specify the number of duplicate copies to be created.
- The \_\_\_\_\_ dialog box consists of specific parameters which help you in saving a still image or image sequence in an uncompressed format.
- CINEMA 4D consists of default predefined curves known as spline primitives. (T/F)
- The **Render to Picture Viewer** tool is used to render a scene or model in the picture viewer. (T/F)
- The **Picture Viewer** window is also known as the output window in CINEMA 4D. (T/F)

## Exercises

### Exercise 1

Using various NURBS and spline modeling tools, create the model of a chair, as shown in Figure 2-79. You can view the final rendered image of this model by downloading the file *c02\_cinema4d\_r14\_exr.zip* from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and Visual Effects > MAXON CINEMA 4D > MAXON CINEMA 4D R14 Studio: A Tutorial Approach* (Expected time: 25 min)



*Figure 2-79 The model of a chair*

## Exercise 2

Using various NURBS and spline modeling tools, create the model of a table watch, as shown in Figure 2-80. You can view the final rendered image of this model by downloading the file *c02\_cinema4d\_r14\_exr.zip* from [www.cadcam.com](http://www.cadcam.com). The path of the file is mentioned in Exercise 1. **(Expected time: 45 min)**



*Figure 2-80 The model of a table watch*

## Answers to Self-Evaluation Test

1. b, 2. c, 3. c, 4. Boole, 5. Configure, 6. Object Properties, 7. T, 8. T, 9. F, 10. T