

Chapter 15

Complex Animation

Learning Objectives

After completing this chapter, you will be able to:

- *Create dummy objects.*
- *Create snapshot objects.*
- *Hide objects during animations.*
- *Animate and link cameras.*



TUTORIAL DESCRIPTION

In this tutorial, you will create the animation for a steel manufacturing process. You will create dummy objects to assist in movement during animation. You will link some objects to others to create a parent/child relationship. You will create snapshots of objects so that they can be linked to different parent objects. You will also adjust the track info of objects to hide and unhide them during the animation.

Dummy Objects

Dummy objects are used to control the movement of other objects by linking them, but are not rendered. If several objects are linked to a dummy object, the dummy can be used to move all objects simultaneously. The objects linked to the dummy can also be moved individually without affecting the dummy object or any other object linked to the dummy object.

Download all the files needed for this tutorial from <http://www.cadcim.com> by following the path **Animation > 3ds Max Design > Autodesk 3ds Max Design 2011: A Tutorial Approach**.

1. Select **Open...** from the **Application menu**; the **Open File** dialog box is displayed. Navigate to the *lift.max* file that has been downloaded and pick the **Open** button.

The file *lift.max* is opened.

2. Select **Save As...** from the **Application menu**; the **Save File As** dialog box is displayed. Navigate to the folder of your choice and enter Chapter15 in the **File name** text box. Then, pick the **Save** button to save the file.

The scene is saved as *Chapter15.max* in the folder you specified.

3. Pick the **Time Configuration** button in the lower-right corner of the screen.

The **Time Configuration** dialog box is displayed, **Figure 15-1**.

4. In the **Animation** area, enter 150 in the **Length:** spinner and pick the **OK** button.

This sets the total number of frames in the animation to 150.

5. Pick the **Create** tab in the **Command Panel**. Pick the **Helpers** button. Then, pick the **Dummy** button in the **Object Type** rollout.



6. Activate the Front viewport by right clicking on it.

7. Pick below the Cauldron object and drag the mouse to create a small cube. Then, move the cube in the Left viewport to position it below the Cauldron object.

A dummy object is created, **Figure 15-2**.

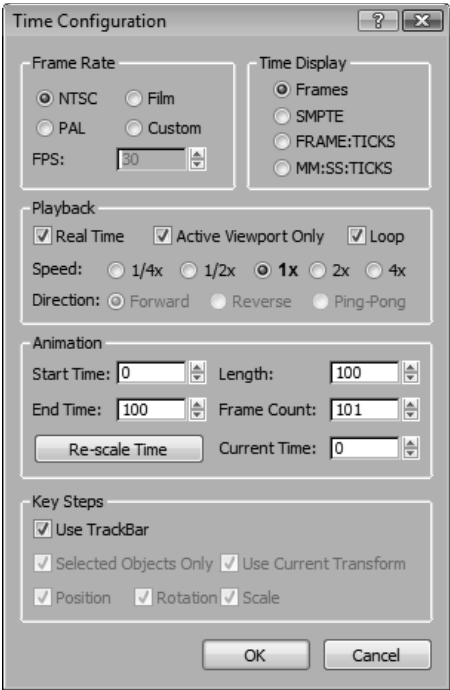


Figure 15-1 The Time Configuration dialog box.

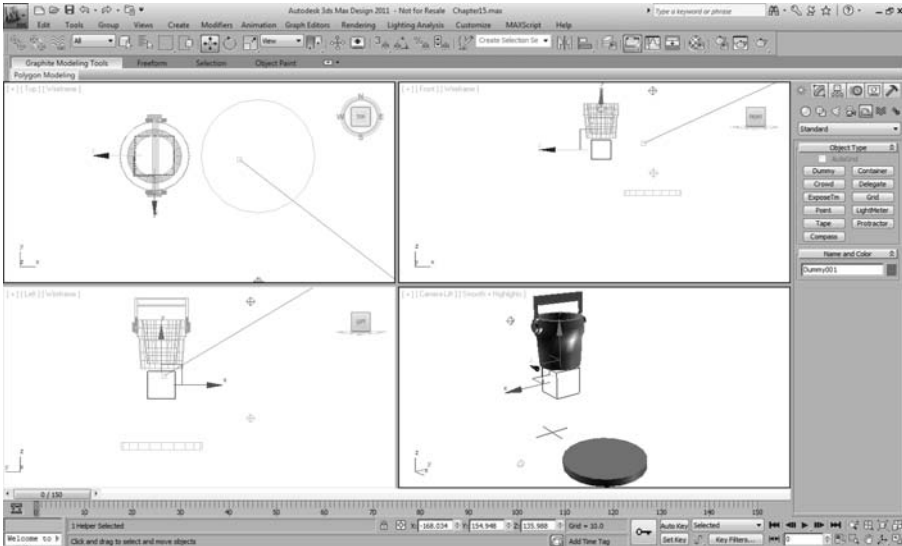


Figure 15-2 A dummy object is created.

The size of the cube does not matter. This cube is the dummy object and will not be visible in the rendered animation. Make the cube of a size that is easy to select, yet not so large that it interferes with the selection of other objects in your scene.

8. Name the dummy object as Cal-Dummy.
9. Pick the **Dummy** button again. In the Front viewport, click below the Base object and drag the mouse to create another small cube. Adjust the position of the cube in the Left viewport to position it below the Base object.
10. Name this dummy object as Base-Dummy.
11. Use the **Align** button in the Top viewport to center the Base-Dummy object with the center of the Base object along the X and Y axes. Also, align the center of the Cal-Dummy object with the center of the Cauldron object along the X and Y axes.



Linking Objects

Linking more than one object to a dummy object simplifies the animation process and allows individual movement later in the animation.

1. Pick the **Select and Link** button in the **Main Toolbar**.
2. Select the Cauldron object, drag the cursor to the Cal-Dummy object, and then release, **Figure 15-3**. Pick the **Select Object** button to end the link command.

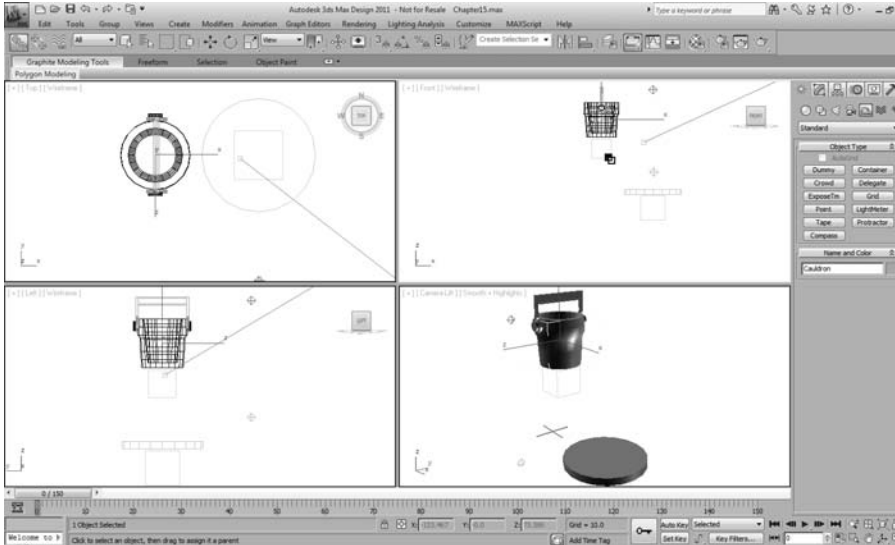


Figure 15-3 The link cursor is displayed.

When the first object is selected, the link cursor appears. On dragging the mouse button and releasing it on the second object, the two objects will be linked. The Cauldron object becomes a child of the Cal-Dummy object and will follow its movement.

3. Pick the **Select and Link** button. Then, select the Hook object, drag the cursor to the Cal-Dummy object, and release. Pick the **Select Object** button to end the link command.

The Hook object becomes a child of the Cal-Dummy object and will follow its movement.

4. Pick the **Select and Link** button. Then, select the Base object, drag the cursor to the Base-Dummy object, and release. Pick the **Select Object** button to end the link command.
5. Save the scene.

Setting Animation Defaults

Continuity controls an object's movement through animation keys, creating the appearance of life-like motion, or creating the appearance of mechanical motion. The objects in this animation should have mechanical motion. A continuity default value can be set before creating animation keys so that each key does not have to be individually adjusted later.

1. Select **Preferences...** from the **Customize** pull-down menu. Then, in the **Preference Settings** dialog box, pick the **Animation** tab.
2. In the **Controller Defaults** area, pick the **Set Defaults...** button.

The **Set Controller Defaults** dialog box is displayed, **Figure 15-4 A**.

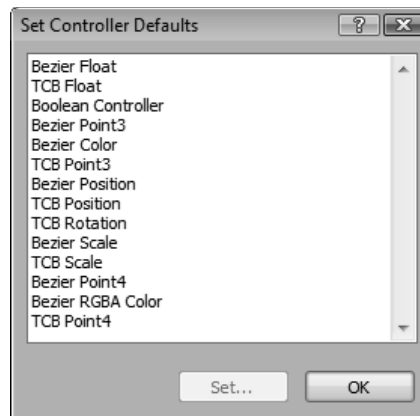


Figure 15-4 A The Set Controller Defaults dialog box.

3. Select **TCB Float** from the list in the **Set Controller Defaults** dialog box and pick the **Set...** button.

The **TCB Default Key Values** dialog box is displayed, **Figure 15-4 B**.

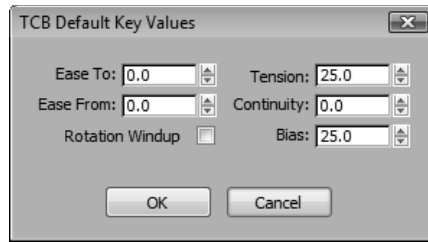


Figure 15-4 B The TCB Default Key Values dialog box.

4. In the **TCB Default Key Values** dialog box, enter 0 in the **Continuity**: spinner and then pick the **OK** button.
5. Pick **OK** in the **Set Controller Defaults** dialog box. Then, pick **OK** in the **Preference Settings** dialog box.

Animating the Hook and Cauldron

To create an animation, a series of keys are defined. Autodesk 3ds Max Design fills in animation between the keys.

1. Select the **Toggle Auto Key Mode** button to turn the animation mode on (red). Auto Key

When the **Toggle Auto Key Mode** button is on (red), any transformation creates an animation key on the current frame. If this button is off, the transformation is applied to frame 0, regardless of the current frame.

2. Drag the **Time Slider** to frame 25. Alternatively, you can enter the value 25 in the spinner at the left side of the **Time Configuration** button.
3. Right-click on the **Select and Move** button.

The **Move Transform Type-In** dialog box is displayed on the screen, **Figure 15-5**. This is a mode less dialog box and can remain open as you select objects.

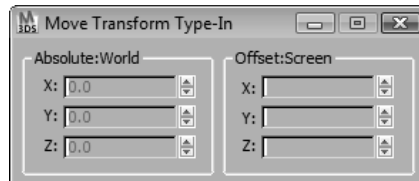


Figure 15-5 The Move Transform Type-In dialog box is displayed.

4. Make the Front viewport active.
5. Select the Cal-Dummy object. Type 300 in the **X**: spinner in the **Offset: Screen** area of the **Move Transform Type-In** dialog box and press the [Enter] key.

The Cauldron is now centered over the circular Base object.

6. Drag the **Time Slider** to frame 50.
7. With the Cal-Dummy object selected, enter -300 units in the **Y:** spinner in the **Offset: Screen** area of the **Move Transform Type-In** dialog box and press the [Enter] key.

This places the Cauldron object on the circular Base object, **Figure 15-6**.

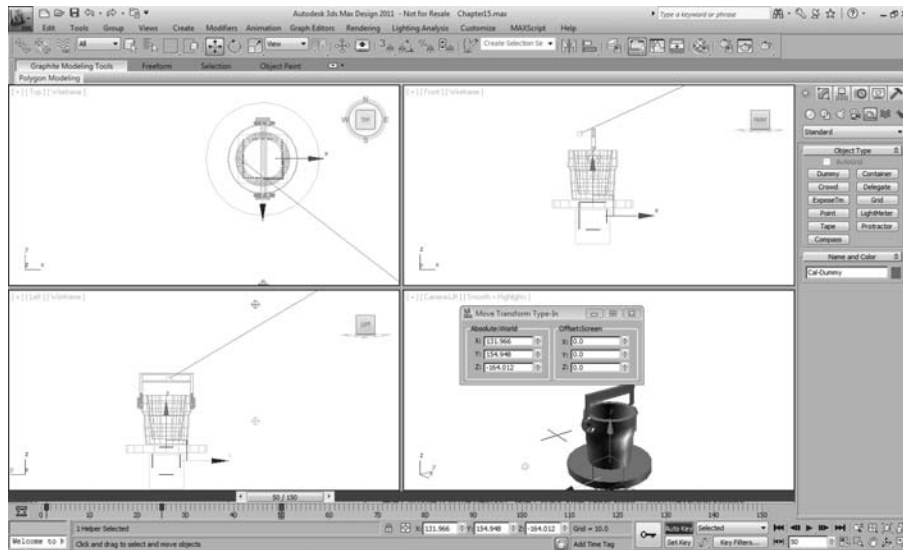


Figure 15-6 The Cauldron is placed on the circular Base object.

8. Close the **Move Transform Type-In** dialog box and exit the animation mode by selecting the **Toggle Auto Key Mode** button.
9. Save the scene.

Adding an Animation Key to a Frame

Currently, if the movement of the Hook object was animated, the movement would begin at frame 0 and would end at whatever frame was current when the Hook was moved. Because of this, the Hook would gradually drift away from its parent object. To prevent this, the Hook needs a position key added at frame 50. The position key locks the Hook's position at frame 50. Any movement applied to the Hook affects only frames between frame 50 and the current frame. **Track View** is used to create the position key.

1. Select all objects in the viewport. Next, select **Track View-Dope Sheet...** from the **Graph Editors** pull-down menu.

The **Track View-Dope Sheet** is displayed.

2. Display the tree for the Hook object. Since it is a child of the Cal-Dummy object, click on the plus sign (+) in a small circle next to Cal-Dummy. Then, expand the tree for the Hook branch and then the **Transform** branch.

Track View-Dope Sheet displays the animation keys for the Hook object. Notice that currently there are no animation keys.

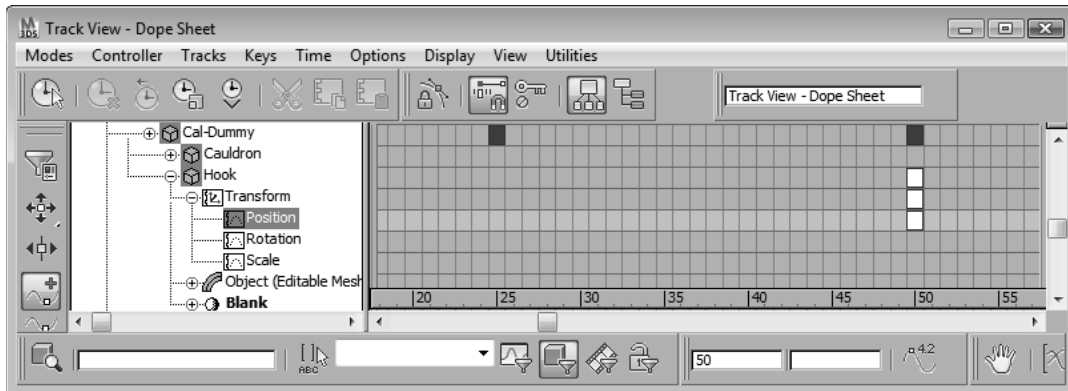
3. Pick the **Add Keys** button on the left side of the **Track View - Dope Sheet**.



4. Click on the **Position** track for the Hook at frame 50.

A position key for the Hook is created on frame 50, **Figure 15-7**.

5. Close **Track View-Dope Sheet**.



*Figure 15-7 The new keys are added to the Hook's **Position** track.*

6. Drag the **Time Slider** to frame 55 and pick the **Toggle Auto Key Mode** button.
7. Select the Hook object.
8. In the Front viewport, move the Hook object -60 units on the X axis and -60 units on the Y axis.

This detaches the Hook from the Cauldron.

9. Drag the **Time Slider** to frame 70.
10. Move the Hook object 300 units on the Y axis.

11. Select **Saved Track Views** from the **Graph Editors** pull-down menu. Then, pick **Track View-Dope Sheet** in the cascading menu.

Track View-Dope Sheet is displayed with the previous settings active.

12. Pick the **Add Keys** button on the left side of the **Track View-Dope Sheet**.
13. Add a key in the **Position** track at frame 90 for the Hook. Then, close **Track View-Dope Sheet**.

The current position of the Hook is recorded in a key on frame 90.

14. Drag the **Time Slider** to frame 105.
15. In the Front viewport, move the Hook object –300 units on the Y axis.
16. Drag the **Time Slider** to frame 110.
17. Move the Hook object 60 units on the X axis and 60 units on the Y axis.

This reattaches the Hook to the Cauldron.

18. Select **Saved Track Views** from the **Graph Editors** pull-down menu. Then, pick **Track View-Dope Sheet** from the cascading menu. Select the Cal-Dummy object in the viewport and expand the **Cal-Dummy** tree and the **Transform** branch.
19. Pick the **Add Keys** button and add a key in the **Position** track at frame 110 for the Cal-Dummy object. Then, close **Track View-Dope Sheet**.

20. Drag the **Time Slider** to frame 130.
21. In the Front viewport, move the Cal-Dummy object 300 units on the Y axis.

The Cal-Dummy, Hook, and Cauldron objects move.

22. Drag the **Time Slider** to frame 150.
23. Move the Cal-Dummy object –300 units on the X axis.
24. Exit the animation mode by clicking on the **Toggle Auto Key Mode** button. Then, drag the **Time Slider** to left and right to replay the animation. Alternatively, click on the **Play Animation** button to see the animation in the viewport.
25. Save the scene.

Creating a Snapshot

The **Snapshot** command duplicates an object in its current state, but unlike the **Copy** command, it does not copy any animation keys associated with the object. The snapshot copy can then be used for complex animation sequences. In this animation, you will be rotating the Cauldron by 45°. A snapshot of the Cauldron will be used to do this.

1. Drag the **Time Slider** to frame 50.
2. Select the Cauldron object.
3. Select **Snapshot...** in the **Tools** pull-down menu.

The **Snapshot** dialog box is displayed, **Figure 15-8**.

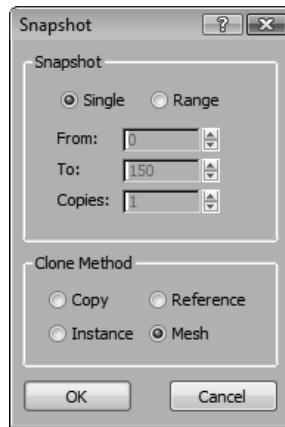


Figure 15-8 The **Snapshot** dialog box.

4. Pick the **Single** radio button in the **Snapshot** area. Also, pick the **Copy** radio button in the **Clone Method** area, and then pick **OK**.

A duplicate copy of the Cauldron object is created at the same location as the original. This is the reason why copy of the Cauldron had to be moved to frame 50. The copy is named as Cauldron001.



Note

The **Snapshot** dialog box allows you to create multiple copies over a range of frames using the **Range** radio button or a single copy using the **Single** radio button.

5. Drag the **Time Slider** to frame 0.

There are now two cauldrons in the scene: the original and the copy located at the original's position at frame 50 when the snapshot was made.

6. Pick the **Select and Link** button on the **Main Toolbar**.

7. Select the Cauldron001 object, drag the cursor to the Base-Dummy object, and release. Pick the **Select Object** button to end the link command.

The Cauldron001 object is now the child of the Base-Dummy object and will follow its movement.

8. Select Base Dummy from the viewport.
9. Select **Saved Track Views** from the **Graph Editors** pull-down menu. Then, pick **Track View-Dope Sheet** in the cascading menu. Expand the **Base-Dummy** tree and the **Transform** branch.
10. Pick the **Add Keys** button and add a key in the Rotation track at frame 70 for the Base-Dummy object. Close **Track View-Dope Sheet**.
11. Drag the **Time Slider** to frame 80. Pick the **Toggle Auto Key Mode** button to enter the animation mode.
12. In the Front viewport, rotate the Base-Dummy object -45° on the Z axis.
13. Drag the **Time Slider** to frame 90.
14. In the Front viewport, rotate the Base-Dummy object 45° on the Z axis.
15. Exit the animation mode by clicking on the **Toggle Auto Key Mode** button. Then, drag the **Time Slider** to left and right to replay the animation.

Hiding an Object During Animation

All parts of the animation are now complete, but there are two cauldrons visible during the animation. You must turn off the visibility, or hide the cauldrons during different segments of the animation. There are two ways to do this. You can use **Track View** or modify the object's properties.

1. Select **Saved Track Views** from the **Graph Editors** pull-down menu. Then, pick **Track View-Dope Sheet** in the cascading menu.
2. Select the Cauldron object in the viewport and select **Cauldron** in the tree so that it is highlighted.
3. Select **Visibility Tracks** from the **Tracks** pull-down menu in the **Track View - Dope Sheet** and then select **Add** from the cascading menu.

A visibility track is added to the tree beneath Cauldron.

4. Pick the **Add Keys** button and add a key in the Visibility track at frame 0 for the Cauldron object, **Figure 15-9**.

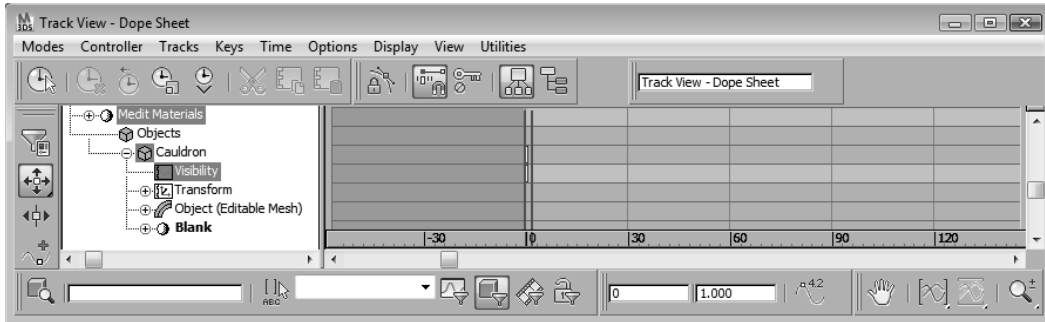


Figure 15-9 A new key has been added in the *Visibility* track at frame 0.

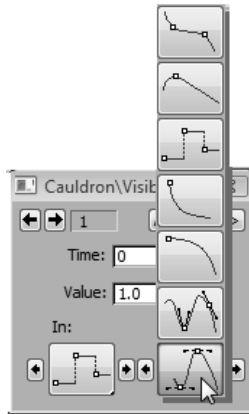


Figure 15-10 The *Cauldron/Visibility* dialog box.

5. Right-click on the new key to open the **Cauldron/Visibility** dialog box. Enter 1.0 in the **Value:** spinner if it is not already set to that. Also, set the **In:** and **Out:** image tiles to the square, mechanical transition, **Figure 15-10**. Leave the **Cauldron/Visibility** dialog box open.

These settings in the key make the Cauldron object fully visible at frame 0.

6. Add a key in the **Visibility** track at frame 50 for the Cauldron object.
7. In the **Cauldron/Visibility** dialog box, enter 0.0 in the **Value:** spinner. Also, set the **In:** and **Out:** image tiles to the square, mechanical transition.

This makes the Cauldron object invisible exactly at frame 50.

8. Add a key in the **Visibility** track at frame 90 for the Cauldron object.
9. Right-click on the new key to open the **Cauldron/Visibility** dialog box, and enter 1.0 in the **Value:** spinner. Also set the **In:** and **Out:** image tiles to the square, mechanical transition.

This makes the Cauldron object fully visible again. Close the **Cauldron/Visibility** dialog box.

10. Close the **Track View-Dope Sheet**. Save the scene.

Hiding the object using Object Properties

1. Drag the **Time Slider** to frame 0.
2. Select the Cauldron001 object in any viewport. Right-click in the viewport and select **Object Properties...** in the lower-right quadrant of the quad menu.

The **Object Properties** dialog box is displayed, **Figure 15-11**.

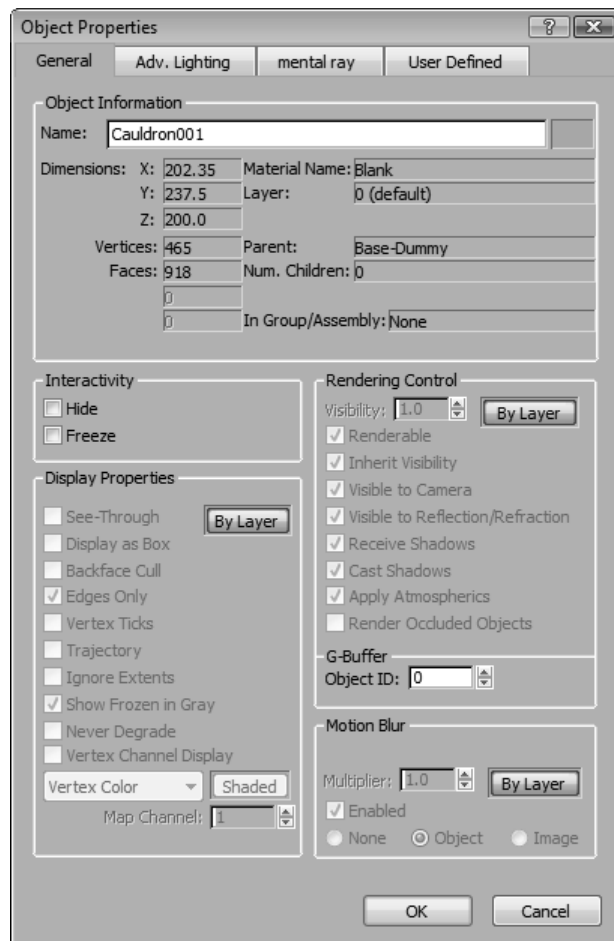


Figure 15-11 The **Object Properties** dialog box.

3. In the **Rendering Control** area, first pick the **By Layer** button so that it becomes the **By Object** button.



The options in this area become active.

4. Enter 0.0 in the **Visibility:** spinner. Pick the **OK** button to close the **Object Properties** dialog box.

The object is invisible at this frame (frame 0). This also adds a visibility track in **Track View**.

5. Drag the **Time Slider** to frame 50. Pick the **Toggle Auto Key Mode** button to enter the animation mode.
6. With the Cauldron001 object selected, right-click in the viewport and select **Object Properties...** from the quad menu.
7. Enter 1.0 in the **Visibility:** spinner of the **Object Properties** dialog box.

You will notice that the corners of the spinner turn red. This indicates that the parameter is animated.

8. Pick the **OK** button to close the **Object Properties** dialog box.

The object becomes visible at frame 50.

9. Drag the **Time Slider** to frame 90. With the Cauldron001 object selected, right-click in the viewport and select **Object Properties...** from the quad menu.
10. Enter 0.0 in the **Visibility:** spinner of the **Object Properties** dialog box. Pick the **OK** button to close the **Object Properties** dialog box.

This makes the object invisible at frame 90.

11. Exit the animation mode by pressing the **Toggle AutoKey Mode** button. Drag the **Time Slider** left and right to replay the animation.

Notice that the Cauldron01 object fades in and out. The transition must be adjusted in **Track View**.

12. Select **Saved Track Views** from the **Graph Editors** pull-down menu. Then, pick **Track View-Dope Sheet** in the cascading menu. Expand the tree for **Cauldron001**, if it is not already expanded.
13. Right-click on the first key in the visibility track. In the **Cauldron/Visibility** dialog box, set the **In:** and **Out:** image tiles to the square, mechanical transition.

14. Repeat this for the visibility keys at frame 50 and frame 90. Close the **Cauldron/Visibility** dialog box and **Track View-Dope Sheet**.
15. Drag the **Time Slider** left and right to preview the animation or pick the **Play Animation** button.

Notice that the Cauldron01 object no longer fades in and out. The visibility changes for both cauldron objects are instantaneous, providing the illusion that there is only one cauldron in the scene.

16. Save the scene.

Previewing the Animation

Now, create a quick preview animation. The preview animation is a low resolution/low color format used to quickly verify that the animation is working correctly.

1. Make sure the Camera-Lift viewport is active.
2. Select **Grab Viewport** from the **Tools** pull-down menu. Then, select **Create Animated Sequence File** from the cascading menu. The **Make Preview** dialog box is displayed, **Figure 15-12**.

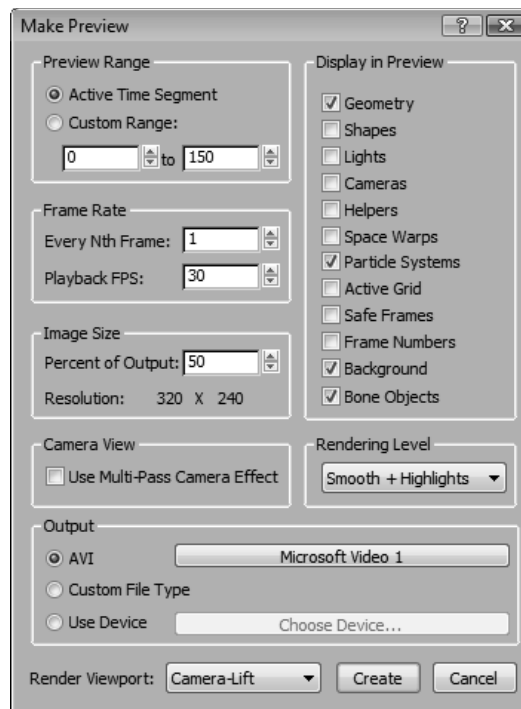


Figure 15-12 The **Make Preview** dialog box.

3. In the **Display in Preview** area, check the **Frame Numbers** check box to activate it.
4. Pick the **Create** button. If the **Video Compression** dialog box appears, pick **OK** to accept the default settings.

When the preview animation is completed, it is played in the Windows Media Player. Notice that the invisible cauldrons appear faintly. This is just a representation in the preview rendering. In the final animation, the cauldrons are completely invisible.

Animating the Camera

The camera can be animated just like any other object in the scene. When a camera is animated, both the camera target and camera body may need to be moved or rotated. In this scene, the camera has been hidden and needs to be turned back on.

1. Pick the **Display** tab in the **Command Panel**.
2. In the **Hide by Category** rollout, uncheck the **Cameras** check box.



The camera named Camera-Lift is no longer hidden.

3. Pick the **Zoom Extents All** button.

The scene is zoomed out in the viewports so that the camera and target fit on the screen.

4. Drag the **Time Slider** to frame 75.
5. Pick the **Select and Move** button. Next, pick the **Toggle Auto Key Mode** button to enter the animation mode.
6. Select the camera in the Top viewport and move it -1300 units on the X axis and 1300 units on the Y axis (to the left and up).
7. Pick the **Display** tab in the **Command Panel**. In the **Display Properties** rollout, check the **Trajectory** check box.

The path that the camera follows is displayed. The dots along the path represent individual frames in the animation. The white boxes represent frames that have animation keys in them for the camera.

8. Drag the **Time Slider** to frame 32.
9. Select the camera in the Top viewport and move it 600 units on the X axis and 600 units on the Y axis (to the right and up). Pick the **Zoom Extents All** button, **Figure 15-13**.

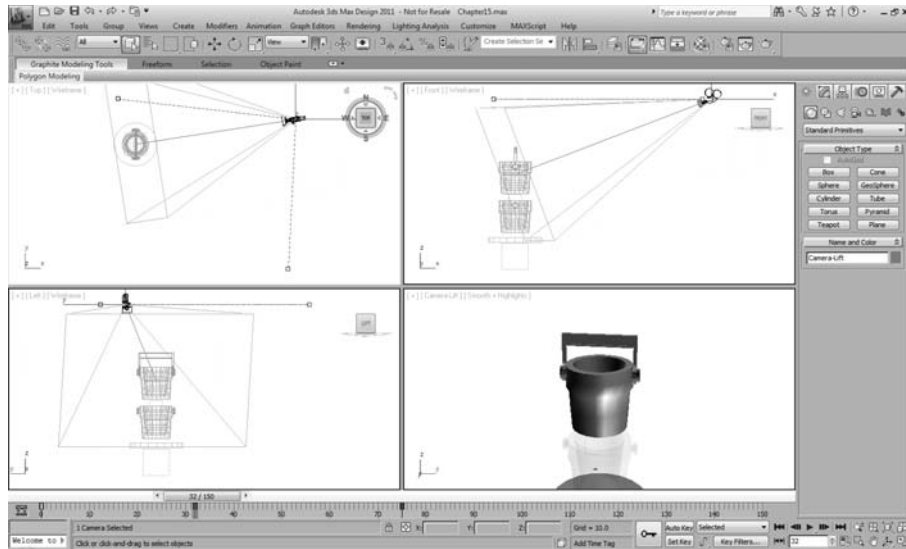


Figure 15-13 The Camera-Lift is displayed in all viewports.

The path bends to fit through the white box keys on the path. More keys can be added and moved to control the shape of the path.

10. Exit the animation mode and save the scene.

Rendering the Preview Animation

Create a quick preview of the updated animation. The preview shows the effect of moving the camera.

1. Make sure the Camera-Lift viewport is current.
2. Select **Make Preview...** from the **Animation** pull-down menu.
3. Pick the **Create** button in the **Make Preview** dialog box.

When the preview animation is completed, it is played in the Windows Media Player.

Animating the Camera Target

The camera target can be animated to follow the movement of an object during animation. A camera target can be linked as a child to the object being followed in the animation to simplify the process.

1. Drag the **Time Slider** to frame 0.
2. Make sure the **Toggle Auto Key Mode** button is off (not red).

Turning the animation mode off moves the selected object in all frames of the animation instead of creating an animation key at the current frame.

3. Pick the **Select and Move** button.
4. Pick the **Zoom Extents All** button.
5. Select the Camera-Lift.target (the camera target) object and drag it to the center of the Cauldron object in the Top and Left viewports, **Figure 15-14**.

The camera target is now centered on the Cauldron object.

6. Pick the **Select and Link** button on the **Main** toolbar.
7. In the Front viewport, pick the Camera-Lift.target object, drag the cursor to the Cal-Dummy object, and then release it. Pick the **Select Object** button to end the link command.

The Camera-Lift.target object is now the child of the Cal-Dummy object and will follow its movement.

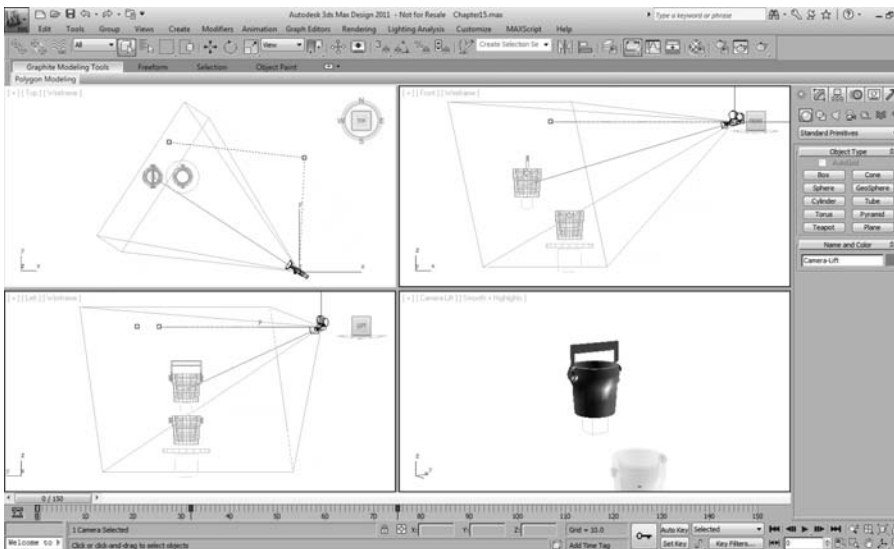


Figure 15-14 The Camera-Lift.target is dragged to the center of the Cauldron object in the Top and Left viewports.



Note

If the camera represents a person walking through a scene, it is better to create a dummy object and link both the camera target and the person to the dummy object. In this way, only the dummy object will be animated.

Previewing the Animation

Create a quick preview of the updated animation to show the effect of moving the camera target.

1. Make sure the Camera-Lift viewport is current.
2. Select **Make Preview...** from the **Animation** pull-down menu.
3. Pick the **Create** button in the **Make Preview** dialog box.

When the preview animation is completed, it is played in the Windows Media Player.

4. Save the scene.

Self-Evaluation Test

Answer the following questions. Then, compare your answers to those given at the end of this chapter.

1. An object can be _____ to a dummy object, and it will then follow the movement of the dummy object.
2. A dummy object will not be visible in _____.
3. The _____ utility can be used to create a position key.
4. The _____ command duplicates an object in its current state, but does not copy any animation keys associated with the object.
5. When adjusting the key information for a key in an object's visibility track, a setting of _____ in the **Value:** spinner will make the object completely visible.
6. An object can be made invisible by creating a visibility track in **Track View**, or by adjusting the object's _____.
7. An object will fade in and out of visibility unless the key transitions are set to square, mechanical transition in the _____ dialog box.
8. When a camera is animated, both _____ and _____ can be moved or rotated.
9. On selecting _____ in the **Display Properties** rollout, camera's path is displayed in the viewport.
10. Frames that have animation keys for the camera are indicated in the trajectory by _____.

Review Questions

Answer the following questions.

1. The _____ objects are used to control the movement of other objects by linking them, but are not rendered.
2. The _____ button is used to link one object with another object.
3. The _____ button is used to add keys in **Track View-Dope Sheet**.
4. The **Snapshot** command is similar to the **Copy** command. (T/F)
5. The _____ option is used to quickly verify that the animation is working correctly.

Exercise**Exercise 1**

Using 3ds Max Design, animate the vise as shown in **Figures 15-15** through **15-18**. You need to download the model file from <http://www.cadcam.com> by following the path **Animation > 3ds Max Design > Autodesk 3ds Max Design 2011: A Tutorial Approach**.

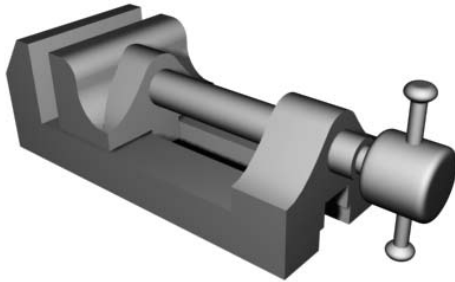


Figure 15-15 Frame 50.

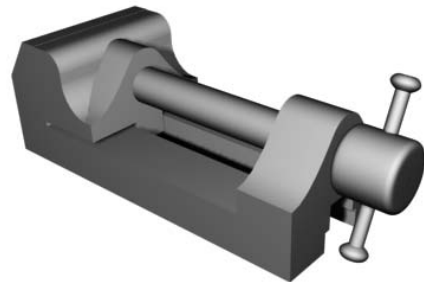


Figure 15-16 Frame 75.

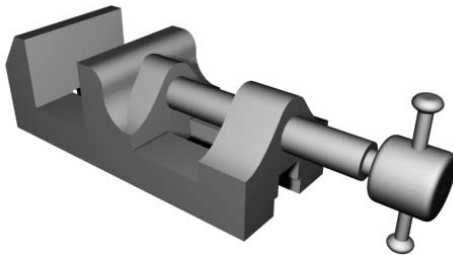


Figure 15-17 Frame 125.

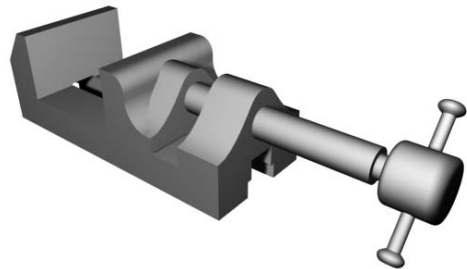


Figure 15-18 Frame 150.

Answers

The following are the answers of Self-Evaluation Test.

1. linked; 2. rendering; 3. **Track View**; 4. **Snapshot**; 5. 1.0; 6. properties; 7. **X/Visibility**;
8. camera, target; 9. **Trajectory**; 10. white boxes