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Official Press

Randi L. Derakhshani
Dariush Derakhshani

Autodesk® 3ds Max® 2014 ESSENTIALS

SYBEX
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Cover Image: Randi L. Derakhshani

Published simultaneously in Canada
ISBN: 978-1-118-57514-7
ISBN: 978-1-118-72366-1 (ebk.)
ISBN: 978-1-118-75025-4 (ebk.)
ISBN: 978-1-1187-2364-7 (ebk.)

Library of Congress Control Number: 2013933624

10 9 8 7 6 5 4 3 2 1

Dear Reader,

Thank you for choosing *Autodesk® 3ds Max® 2014 Essentials*. This book is part of a family of premium-quality Sybex books, all of which are written by outstanding authors who combine practical experience with a gift for teaching.

Sybex was founded in 1976. More than 30 years later, we're still committed to producing consistently exceptional books. With each of our titles, we're working hard to set a new standard for the industry. From the paper we print on, to the authors we work with, our goal is to bring you the best books available.

I hope you see all that reflected in these pages. I'd be very interested to hear your comments and get your feedback on how we're doing. Feel free to let me know what you think about this or any other Sybex book by sending me an email at `nedde@wiley.com`. If you think you've found a technical error in this book, please visit `http://sybex.custhelp.com`. Customer feedback is critical to our efforts at Sybex.

Best regards,

Neil Edde
Vice President and Publisher
Sybex, an Imprint of Wiley

To Max Henry

Acknowledgments

We are thrilled to be a part of the team working to publish *Autodesk® 3ds Max® 2014 Essentials*, a complete update and style change to our previous *Introducing Autodesk® 3ds Max®* series. Education is an all-important goal in life and should always be approached with eagerness and earnestness. We would like to show appreciation to the teachers who inspired us; you can always remember the teachers who touched your life, and to them we say thanks. We would also like to thank all of our students, who taught us a lot during the course of our many combined academic years.

Special thanks go to Mariann Barsolo, Thomas Cirtin, Rachel Gunn, and Pete Gaughan, our editors at Sybex who have been professional, courteous, and ever patient. Our appreciation also goes to technical editor Jon McFarland, who worked hard to make sure this book is of the utmost quality. We could not have done this revision without their help.

In addition, thanks to Dariush's mother and brother for their love and support, not to mention the life-saving babysitting services.

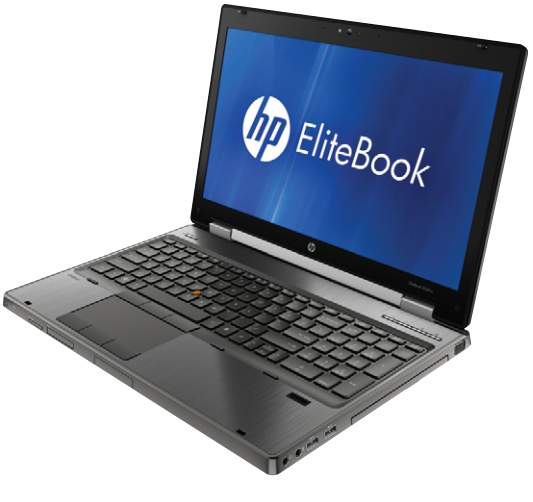
Writing on the HP EliteBook

Having a good computer system is important with this type of work, so a special thank you goes to HP for keeping us on the cutting edge of workstation hardware by providing us with a fully decked-out EliteBook 8760w, which was our primary computer in writing this book. What struck us about the laptop was that it was not only portable, making it easy for a writing team to collaborate; it was also powerful enough to run truly demanding tasks. It takes a special machine to run graphics-intensive applications, such as Autodesk 3ds Max, and we were thrilled to write this book on the HP EliteBook.

Running an Intel i7 CPU alongside 16 GB of RAM and an Nvidia Quadro 5010M (with a whopping 6 GB of memory) gave us the muscle we needed to run multiple applications alongside 3ds Max splendidly. Dual 320 GB hard drives gave us plenty of space for Windows 7 Professional and its applications and still left lots of room for renders. We opted out of the RAID option to mirror the drives (you can also stripe them for performance), but that doesn't mean we neglected our backup duties with this machine! The 8760w was easily integrated into a Gigabit network in the home office, and on fast Wi-Fi everywhere else, so we had constant access to the home network and the hundreds upon hundreds of files necessary to write this book (and all their backups!).

And since we are so very image conscious (as in the screen!), we wondered if the images we created and captured for this book would be done justice on "just a laptop screen." The EliteBook has a stunning 17″ 30-bit IPS display panel that put those questions to rest very quickly! The HP EliteBook screen is no less than professionally accurate and calibrated for optimum image clarity and correct color. Barely a handful of high-end mobile workstations could even come close to meeting the demands image professionals put on their gear. But this notebook HP DreamColor display is remarkable—there's just no other way to put it—going as far as besting any of our desktop screens in color and vibrancy.

With performance at such a high level, and in a nice portable form, we were easily convinced that we should perform all of our intensive work for this book on the EliteBook. Going back to a desk-bound tower quickly became a non-option. Thanks, HP!



About the Authors

Randi L. Derakhshani is an Autodesk Certified Instructor and a staff instructor with The Art Institute of California–Los Angeles. She began working with computer graphics in 1992 and was hired by her instructor to work at Sony Pictures Imageworks, where she developed her skills with the Autodesk 3ds Max program and Nuke, among many other programs. A teacher since 1999, Randi enjoys sharing her wisdom with young talent and watching them develop at The Art Institute. Currently, she teaches a wide range of classes, from Autodesk® 3ds Max®, Autodesk® Maya®, and ZBrush to compositing with The Foundry's Nuke. Juggling her teaching activities with caring for a little boy makes Randi a pretty busy lady.

Dariush Derakhshani is an Autodesk Certified Instructor and Certified Evaluator, a visual-effects supervisor, a writer, and an educator in Los Angeles, California, as well as Randi's husband. Dariush used Autodesk® AutoCAD® software in his architectural days and migrated to using 3D programs when his firm's principal architects needed to visualize architectural designs in 3D on the computer. Dariush started using Alias PowerAnimator version 6 when he enrolled in USC Film School's animation program, and he has been using Alias/Autodesk animation software for the past 14 years. He received an MFA in Film, Video, and Computer Animation from the USC Film School in 1997. He also holds a BA in Architecture and Theater from Lehigh University in Pennsylvania. He worked at a New Jersey architectural firm before moving to Los Angeles for film school. He has worked on feature films, music videos, and countless commercials as a 3D animator, as a CG/VFX supervisor, and sometimes as a compositor. Dariush also serves as an editor and is on the advisory board of *HDRI 3D*, a professional computer graphics magazine from DMG Publishing.

Contents at a Glance

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Introduction

Welcome to Autodesk® 3ds Max® 2014 Essentials. The world of computer-generated (CG) imagery is fun and ever changing. Whether you are new to CG in general or are a CG veteran new to 3ds Max designing, you'll find this book the perfect primer. It introduces you to the Autodesk 3ds Max software and shows how you can work with the program to create your art, whether it is animated or static in design.

This book exposes you to all facets of 3ds Max by introducing and plainly explaining its tools and functions to help you understand how the program operates—but it does not stop there. This book also explains the use of the tools and the ever-critical concepts behind the tools. You'll find hands-on examples and tutorials that give you firsthand experience with the toolsets. Working through them will develop your skills and the conceptual knowledge that will carry you to further study with confidence. These tutorials expose you to various ways to accomplish tasks with this intricate and comprehensive artistic tool. These chapters should give you the confidence you need to venture deeper into the feature set in 3ds Max, either on your own or by using any of the software's other learning tools and books as a guide.

Learning to use a powerful tool can be frustrating. You need to remember to pace yourself. The major complaints CG book readers have are that the pace is too fast and that the steps are too complicated or overwhelming. Addressing those complaints is a tough nut to crack, to be sure. No two readers are the same. However, this book offers the opportunity to run things at your own pace. The exercises and steps may seem confusing at times, but keep in mind that the more you try and the more you fail at some attempts, the more you will learn how to operate the 3ds Max engine. Experience is king when learning the workflow necessary for *any* software program, and with experience come failure and aggravation. But try and try again. You will find that further attempts will always be easier and more fruitful.

Above all, however, this book aims to inspire you to use the 3ds Max program as a creative tool to achieve and explore your own artistic vision.

Who Should Read This Book

Anyone who is interested in learning to use the 3ds Max tools should start with this book.

If you are an educator, you will find a solid foundation on which to build a new course. You can also treat the book as a source of raw materials that you can adapt to fit an existing curriculum. Written in an open-ended style, *Autodesk 3ds Max 2014 Essentials* contains several self-help tutorials for home study as well as plenty of material to fit into any class.

What You Will Learn

You will learn how to work in CG with Autodesk 3ds Max 2014. The important thing to keep in mind, however, is that this book is merely the beginning of your CG education. With the confidence you will gain from the exercises in this book, and the peace of mind you can have by using this book as a reference, you can go on to create your own increasingly complex CG projects.

What You Need

Hardware changes constantly and evolves faster than publications can keep up. Having a good solid machine is important to a production, although simple home computers will be able to run the 3ds Max software quite well. Any laptop (with discrete graphics; not a netbook) or desktop PC running Windows XP Professional, Windows 7, or Windows 8 (32- or 64-bit) with at least 2 GB of RAM and an Intel Pentium Core 2 Duo/Quad or AMD Phenom or higher processor will work. Of course, having a good video card will help; you can use any hardware-accelerated OpenGL or Direct3D video card. Your computer system should have at least a 2.4 GHz Core 2 or i5/i7 processor with 2 GB of RAM, a few GBs of hard-drive space available, and a GeForce FX or ATI Radeon video card. Professionals may want to opt for workstation graphics cards, such as the ATI FirePro or the Quadro FX series of cards. The following systems would be good ones to use:

- Intel i7, 4 GB RAM, Quadro FX 2000, 400 GB 7200 RPM hard disk
- AMD Phenom II, 4 GB RAM, ATI FirePro V5700, 400 GB hard disk

You can check the list of system requirements at the following website: `www.autodesk.com/3dsmax`.

Free Autodesk Software for Students and Educators

The Autodesk® Education Community is an online resource with more than five million members that enables educators and students to download—for free (see website for terms and conditions)—the same software used by professionals worldwide. You can also access additional tools and materials to help you design, visualize, and simulate ideas. Connect with other learners to stay current with the latest industry trends and get the most out of your designs. Get started today at `www.autodesk.com/joinedu`.

What Is Covered in This Book

Autodesk® 3ds Max® 2014 Essentials is organized to provide you with a quick and essential experience with 3ds Max to allow you to begin a fruitful education in the world of computer graphics.

Chapter 1, "The 3ds Max Interface," begins with an introduction to the interface for 3ds Max 2014 to get you up and running quickly.

Chapter 2, "Your First 3ds Max Project," is an introduction to modeling concepts and workflows in general. It shows you how to model using 3ds Max tools with polygonal meshes and modifiers to create a retro alarm clock.

Chapter 3, "Modeling in 3ds Max: Architectural Model Part I," takes your modeling lesson from Chapter 2 a step further by showing you how to use some of the Architecture Engineering and Construction (AEC) tools to build an interior space using a room from an image.

Chapter 4, "Modeling in 3ds Max: Architectural Model Part II," continues with the interior space from Chapter 3 by adding some furniture. The main focus of this chapter is the Graphite Modeling Tools tab and its many tools.

Chapter 5, "Introduction to Animation," teaches you the basics of 3ds Max animation techniques and workflow by animating a bouncing ball. You will also learn how to use the Track View–Curve Editor to time, edit, and finesse your animation.

Chapter 6, "Animation Principles," rounds out your animation experience by showing the animation concepts of weight, follow-through, and anticipation when you animate a knife thrown at a target.

Chapter 7, "Character Poly Modeling: Part I," introduces you to the first of three chapters on creating a low-polygon mesh character model of a soldier. In this chapter, you begin by blocking out the primary parts of the body.

Chapter 8, "Character Poly Modeling: Part II," continues the soldier model, focusing on using the Editable Poly toolset. You will finish the body and add hands and boots.

Chapter 9, "Character Poly Modeling: Part III," finishes the model of the soldier started in Chapter 7. You will create the head and merge in elements such as goggles and a face mask and integrate them into the scene.

Chapter 10, "Introduction to Materials: Interiors and Furniture," shows you how to assign textures and materials to your models. You will learn to texture the couch, chair, and window from Chapter 4 as you learn the basics of working with 3ds Max materials and UVW mapping.

Chapter 11, "Textures and UV Workflow: The Soldier," furthers your understanding of materials and textures and introduces UV workflows in preparing and texturing the soldier.

Chapter 12, "Character Studio: Rigging," covers the basics of Character Studio in creating a biped system and associating the biped rig to the soldier model.

Chapter 13, "Character Studio: Animation," expands on Chapter 12 to show you how to use Character Studio to create and edit a walk cycle using the soldier model.

Chapter 14, "Introduction to Lighting: Interior Lighting," begins by showing you how to light a 3D scene with the three-point lighting system. It then shows you how to use the tools to create and edit 3ds Max lights for illumination, shadows, and special lighting effects. You will light the furniture to which you added materials in Chapter 10.

Chapter 15, "3ds Max Rendering," explains how to create image files from your 3ds Max scene and how to achieve the best look for your animation by using proper cameras and rendering settings when you render the interior scene.

Chapter 16, "mental ray and HDRI," shows you how to render with mental ray. Using Final Gather, you will learn how to use indirect lighting.

The companion web page to this book at www.sybex.com/go/3dsmax2014essentials provides all the sample images, movies, and files that you will need to work through the projects in *Autodesk 3ds Max 2014 Essentials*.

Note

This book is a great primer for Autodesk 3ds Max. If you're interested in taking the Autodesk Certification exams for 3ds Max, go to www.autodesk.com/certification for information and resources.

The Essentials Series

The Essentials series from Sybex provides outstanding instruction for readers who are just beginning to develop their professional skills. Every Essentials book includes these features:

- Skill-based instruction with chapters organized around projects rather than abstract concepts or subjects
- Suggestions for additional exercises at the end of each chapter, where you can practice and extend your skills
- Digital files (via download) so you can work through the project tutorials yourself. Please check the book's web page at www.sybex.com/go/3dsmax2014essentials for these companion downloads.

You can contact the authors through Wiley or on Facebook at www.facebook.com/3dsMaxEssentials.

CHAPTER 1

The 3ds Max Interface

The Autodesk 3ds Max® software interface is where you view and work with your scene. This chapter explains its basic operations and tools. You can use this chapter as a reference as you work through the rest of this book, although the following chapters and their exercises will orient you to the 3ds Max user interface (UI) quickly. It's important to be in front of your computer when you read this chapter so you can try out techniques as we discuss them in the book.

This chapter includes the following topics:

- **The workspace**
- **Transforming objects using gizmos**
- **Graphite Modeling Tools set**
- **Command panel**
- **Time slider and track bar**
- **File management**

The Workspace

The following sections present a brief rundown of what you need to know about the UI and how to navigate in the 3D workspace.

In this version of 3ds Max they have rolled out a new Enhanced Menus workspace that defines the look of interface. When you first open the program, you will see the Default Workspace. Throughout this book, however, we have opted to use the Enhanced Menus workspace instead. The differences between the two are seen mainly in the menus and the ribbon. We believe the Enhanced Menu workspace is a smoother workflow for new users to the

program. To use the Enhanced Menu workspace, go to the Quick Access toolbar located at the top of the interface, and in the Workspaces drop-down list, choose the Enhanced Menus workspace, as shown here.

User-Interface Elements

Figure 1.1 shows the 3ds Max UI. (See Table 1.1 for explanations of the UI elements.) At the very top left of the application window is an icon ( ) called the Application button; clicking it opens the Application menu, which provides access to many file operations. Also running along the top is the Quick Access toolbar, which provides access to common commands, and the InfoCenter, which offers to access many product-related information sources. Some of the most important commands in the Quick Access toolbar are file management commands such as Save File and Open File. If you do something and then wish you hadn't, you can click the Undo Scene Operation button ( ) or press Ctrl+Z. To redo a command or action that you just undid, click the Redo Scene Operation button ( ) or press Ctrl+Y.

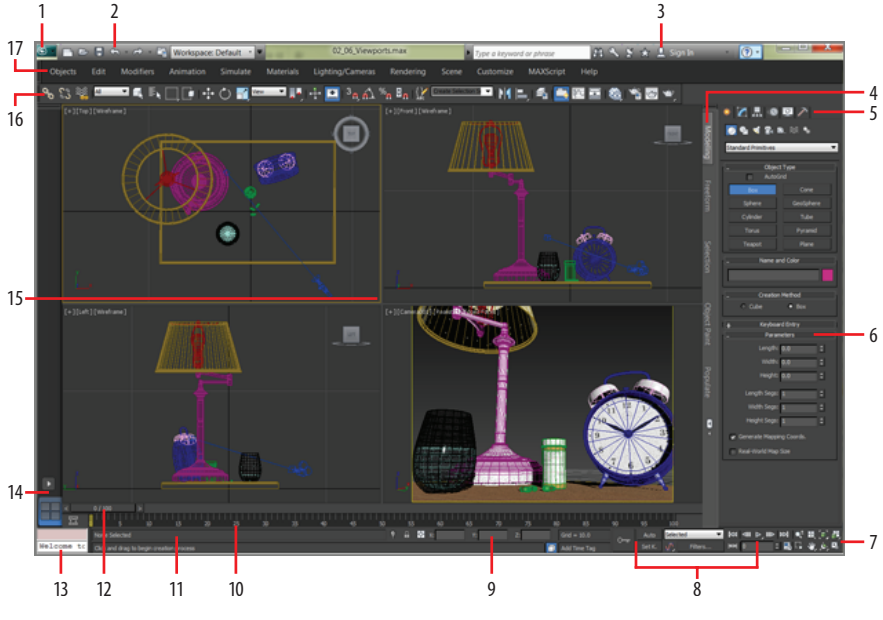

FIGURE 1.1 The 3ds Max interface elements

TABLE 1.1 The 3ds Max interface elements*

	Element	Function
1	Application button	Opens the Application menu, which provides file management commands.
2	Quick Access toolbar	Provides some of the most commonly used file management commands as well as Undo Scene Operation and Redo Scene Operation.
3	InfoCenter	Provides access to 3ds Max product-related information.
4	The ribbon	Provides access to a wide range of tools to make building and editing models in 3ds Max fast and easy. In Figure 1.1, the ribbon is shown in a vertical orientation.
5	Command panel tabs	Where all the editing of parameters occurs; provides access to many functions and creation options; divided into tabs that access different panels, such as Create panel, Modify panel, etc.
6	Rollout	A section of the command panel that can expand to show a listing of parameters or collapse to just its heading name.
7	Viewport navigation controls	Icons that control the display and navigation of the viewports; icons may change depending on the active viewport.
8	Animation Time/ Keying controls	Controls for animation keyframing and animation playback controls.
9	Coordinate display area	Allows you to enter transformation values.
10	Track bar	Provides a timeline showing the frame numbers; select an object to view its animation keys on the track bar.
11	Prompt line and status bar controls	Prompt and status information about your scene and the active command.
12	Time slider	Shows the current frame and allows for changing the current frame by moving (or scrubbing) the time bar.
13	MAXScript Mini Listener	A command prompt window for the MAXScript language. The window is useful for performing interactive work and developing small code fragments.
14	Viewport Layout tab bar	This is an easy access tab for quickly changing viewport layouts. Preset layouts can be added to the menu on the tab bar.

(Continues)

TABLE 1.1 *(Continued)*

	Element	Function
15	Viewports	You can choose different views to display in these four viewports as well as different layouts from the viewport label menus.
16	Main toolbar	Provides quick access to tools and dialog boxes for many of the most common tasks.
17	Menu bar	Provides access to commands grouped by category.

*The numerals in the first column refer to labels in Figure 1.1.

Just below the Quick Access toolbar is the menu bar, which runs across the top of the interface. The menus give you access to a ton of commands—from basic scene operations, such as Duplicate and Group under the Edit menu, to advanced tools such as those found under the Modifiers menu. Immediately below the menu bar is the main toolbar. It contains several icons for functions, such as the three transform tools: Select And Move, Select And Rotate, and Select And Uniform Scale ().

When you first open 3ds Max, the workspace has many UI elements. Each is designed to help you work with your models, access tools, and edit object parameters.

Viewports

You'll be doing most of your work in the viewports. These windows represent 3D space using a system based on Cartesian coordinates. That is a fancy way of saying "space on X, Y, and Z axes."

You can visualize X as left-right, Y as in-out (into and out of the screen from the Top viewport), and Z as up-down within the Perspective and Camera viewports. In the orthographic viewports, you visualize Y as up-down and Z as in-out. The coordinates are expressed as a set of three numbers, such as (0, 3, –7). These coordinates represent a point that is at 0 on the X-axis, 3 units up on the Y-axis, and 7 units back on the Z-axis.

Four-Viewport Layout Tab Bar

The viewports in 3ds Max are the windows into your scene. By default, there are four views: Front, Top, Left, and Perspective. The first three—Front, Top, and Left—are called orthographic views. They are also referred to as modeling windows. These windows are good for expressing exact dimensions and size

relationships, so they are good tools for sizing up your scene objects and fine-tuning their layout. The default viewport layout has the four views, but this can be changed. The Viewport Layout tab bar, which is located at the lower-left corner of the interface, is a tab bar that allows you to switch between many different viewport layout configurations with a single click. When you click the arrow button on the tab bar, the Standard Viewport Layouts menu gives you access to choose a layout. It will then be added to the tab bar for easy access, as shown in Figure 1.2.

The General viewport label menus ([+]) in the upper-left corner of each viewport provide options for overall viewport display or activation, as shown in Figure 1.3. It also gives you access to the Viewport Configuration dialog box.

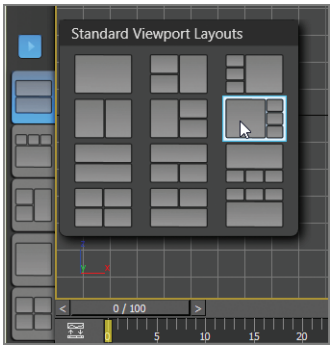

FIGURE 1.2 Viewport Layout tab bar

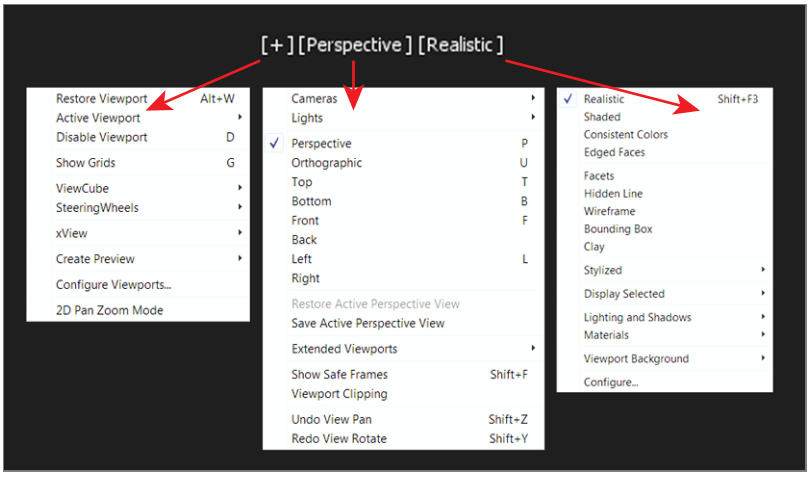

FIGURE 1.3 Viewport label menus showing the General Viewport, Point-of-View, and Shading Viewport menus.

The Perspective viewport displays objects in 3D space using perspective. Notice in Figure 1.1 how the distant objects seem to get smaller in the Perspective viewport. In actuality, they are the same size, as you can see in the orthographic viewports. The Perspective viewport gives you the best representation of what your output will be.

To make a viewport active, click in a blank part of the viewport (not on an object). If you do have something selected, it will be deselected when you click in the blank space.

When active, the view will have a mustard-yellow highlight around it. If you right-click in an already active viewport, you will get a pop-up context menu called the quad menu. You can use the quad menu to access some basic commands for a faster workflow. We will cover this topic in the section "Quad Menus" later in this chapter.

You can also right-click anywhere in an inactive viewport to activate it without selecting or deselecting anything.

ViewCube

The ViewCube® 3D navigation control, shown in Figure 1.4, provides visual feedback of the current orientation of a viewport; it lets you adjust the view orientation and allows you to switch between standard and isometric views.

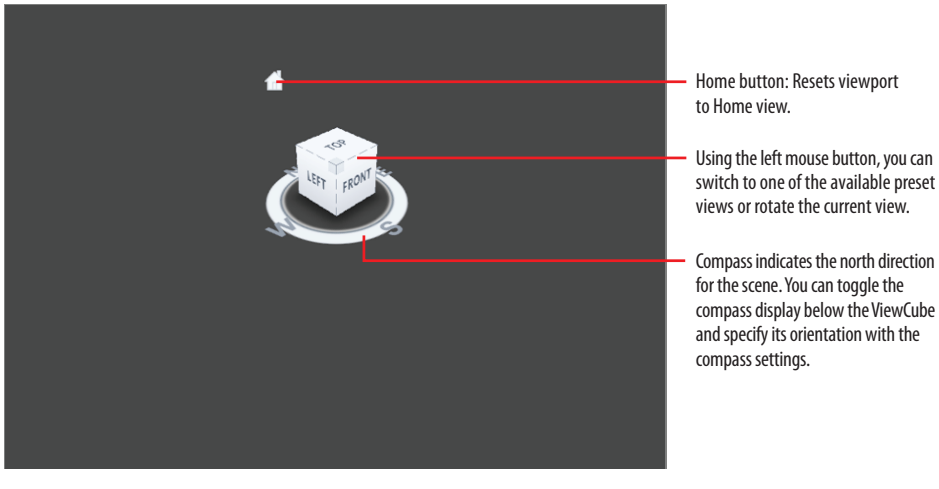

FIGURE 1.4 ViewCube navigation tool

The ViewCube is displayed by default in the upper-right corner of the active viewport; it is superimposed over the scene in an inactive state to show the orientation of the scene. It does not appear in camera or light views. When you position your cursor over the ViewCube, it becomes active. Using the left mouse button, you can switch to one of the available preset views, rotate the current view, or change to the Home view of the model. Right-clicking over the ViewCube opens a context menu with additional options.

Mouse Buttons

Each of the three buttons on your mouse plays a slightly different role when manipulating viewports in the workspace. When used with modifiers such as the Alt key, they are used to navigate your scene, as shown in Figure 1.5.

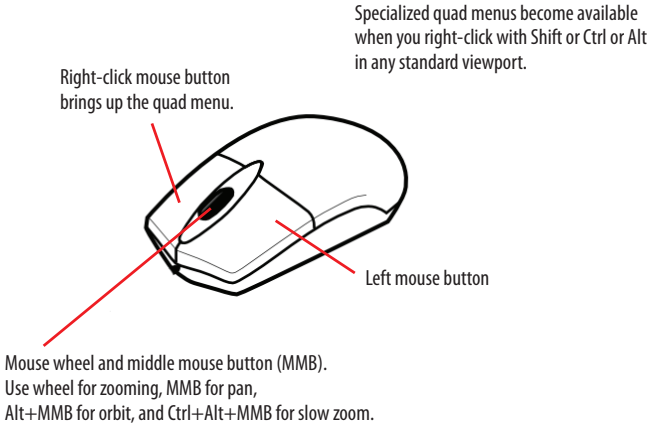

FIGURE 1.5 **Breakdown of the three mouse buttons**

Quad Menus

When you click the right mouse button anywhere in an active viewport, except on the viewport labels and the ViewCube, a quad menu is displayed at the location of the mouse cursor, as shown in Figure 1.6. The quad menu can display up to four quadrant areas with various commands without your having to travel back and forth between the viewport and rollouts on the command panel (the area of the interface to the right—more on this later in the section "Command Panel").

The right quadrant of the default quad menu displays generic commands, which are shared between all objects. The left quadrant contains context-specific commands, such as mesh tools and light commands. You can also repeat your last quad menu command by clicking the title of the quadrant.

The quad menu contents depend on what is selected. The menus are set up to display only the commands that are available for the current selection; therefore, selecting different types of objects displays different commands in the quadrants. Consequently, if no object is selected, all of the object-specific commands will be hidden. If all of the commands for one quadrant are hidden, the quadrant will not be displayed.

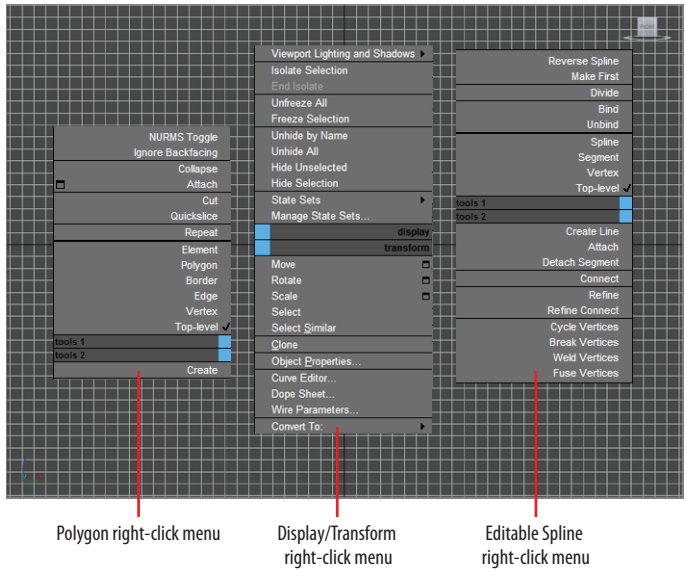

FIGURE 1.6 Quad menus

Some of the selections in the quad menu have a small icon next to them. Clicking this icon opens a dialog box where you can set parameters for the command.

Cascading menus display submenus in the same manner as a right-click menu. The menu item that contains submenus is highlighted when expanded. The submenus are highlighted when you move the mouse cursor over them.

To close the menu, right-click anywhere on the screen or move the mouse cursor away from the menu and click the left mouse button. To reselect the last-selected command, click in the title of the quadrant of the last menu item. The last menu item selected is highlighted when the quadrant is displayed.

Display of Objects in a Viewport

Viewports can display your scene objects in a few ways. If you click the viewport's name, you can switch that panel to any other viewport angle or point of view. If you click the Shading Viewport label, a menu appears to allow you to change the display driver. The display driver names differ depending on the graphics drive mode you selected when you first start 3ds Max. This book uses the default display mode Nitrous.

Wireframe mode Wireframe mode displays the edges of the object, as shown on the left in Figure 1.7. It is the fastest to use because it requires less computation on your video card.

Realistic mode The Realistic mode is a shaded view in which the objects in the scene appear solid. It shows realistic textures with shading and lighting, as shown in the middle in Figure 1.7.