In Unit A, you learned that multimedia titles incorporate text, graphics, sound, animation, and video. In this unit and Unit C, you will learn more about these elements, including how they are best used when developing a multimedia title. The way in which the elements are used depends on the intended audience and the objectives of the title. As you study these elements, keep in mind that the decision of what elements to use is often a trade-off between cost, time, or effect. This unit focuses on the appropriate use of text and graphics as well as a discussion of software for working with text and graphics to create special multimedia effects. In addition, you will learn about ways to decrease the size of graphic images so that they can be used efficiently on the Web. Finally, you will look at copyright issues and your responsibility as a multimedia user and developer.
Using text in multimedia applications

Text is perhaps the easiest of all multimedia elements to manipulate. Most computer users have had experience with word processing and are therefore familiar with the processes of entering and editing text and working with fonts and font sizes. This lesson takes a closer look at some considerations and guidelines to keep in mind when working with text.

**DETAILS**

—you Be concise. Reading volumes of text on a computer screen is difficult and tiring. Moreover, it may not be the best way to communicate an idea, concept, or even a fact. The saying “A picture is worth a thousand words” (and perhaps more when sounds, simulations, and animations are added) is as true in multimedia as it is for the printed page. In some titles, where text dominates, such as reference works like encyclopedias, combining other elements with text can often reduce the amount of text needed to convey a concept. From a design standpoint, text should fill less than half of the screen.

—you Use appropriate fonts. Text can be boring unless you enliven it by selecting fonts (which are analogous to typefaces in a print environment) and type sizes that are appropriate for the audience. Fonts help focus attention on certain text on the screen, enhance readability, set a tone (serious, lighthearted), and project an image (progressive, conservative). Fonts can be characterized as serif, sans serif, and decorative. Figure B-1 shows an example of each type of font.

—Figure B-2 shows Critter and ComicsCarToon, two fonts that may appeal to a younger audience because of their whimsical looks. It also shows Regency Script, a font that is appropriate for a formal look.

—you Make the text readable. Perhaps the overriding concern with text is readability. For body text, a serif font is preferred because the serifs create a line at the top and bottom of a text line and guide the eye across the page. Sans serif text, however, does not have that line, so the eye has difficulty reading along the text line: it wants instead to leave the text line and wander through the body of the text. Research has shown that comprehension of text blocks with serifs is 75%–80%, whereas comprehension of text blocks set in sans serif fonts is 20%–30%.

—Fonts are measured in point sizes. There are 72 points per inch. Ten and 12 points are common point sizes for type displayed on the screen. The point size often depends on how the font is used—that is, as a title, as body text, and so on. Text that appears as a title at the top of a screen may be relatively large, whereas text that is used on a button might be quite small. Some guidelines follow:

<table>
<thead>
<tr>
<th>Use</th>
<th>Point Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headings</td>
<td>14–48</td>
</tr>
<tr>
<td>Subheadings</td>
<td>Half the heading size, with a minimum that is not smaller than the text block</td>
</tr>
<tr>
<td>Text block</td>
<td>10–12</td>
</tr>
</tbody>
</table>

Headings and subheadings are used to attract attention and provide the user with quick identification of the screen content, while text blocks provide the substance. Subheadings must never be smaller than the text block.

—you Consider using font formats and font colors. Three common font formats are bold, italic, and underline. These formats are often used for emphasis in print materials. In multimedia applications, however, they are more often used to indicate that clicking on the word will hyperlink (jump to another part of the program), to display additional text (such as a definition), or to cause some action (such as playing a sound or animation).

—you Use restraint and be consistent. While it may be tempting and certainly easy to use a variety of fonts, sizes, and styles, it is important to exercise restraint. Avoid too many font sizes and styles on one screen. In addition, try to maintain consistency. For example, if several screens have a similar heading, use the same font, size, and style for all of the headings.
Sans Serif: The French word sans means “without,” so a sans serif font is one without extensions. Sans serif fonts are best used for titles.

Serif: A serif is a line or curve extension from the end of a letter. Serif fonts are best used for body text.

Decorative: Decorative fonts, such as script type, are more stylish and formal. They are best used for emphasis.

Bodoni

Avant Garde

Arnold Boecklin

Sans Serif: The French word sans means “without,” so a sans serif font is one without extensions. Sans serif fonts are best used for titles.

Serif: A serif is a line or curve extension from the end of a letter. Serif fonts are best used for body text.

Decorative: Decorative fonts, such as script type, are more stylish and formal. They are best used for emphasis.

Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field, as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.
Using text on the Web

Research has shown that first-time visitors to a Web site spend less than 53 seconds on a Web page. If the Web page does not capture the visitor’s attention in that time, then chances are good that he or she will leave the site. One challenge of using text on a Web page is getting the message across in an exciting, creative, and visual way. Meeting this challenge means recognizing how text is used on the Web differently than how it is used in print. Two considerations when using text in Web pages are how fonts will be displayed using different browsers and how to accommodate multimedia applications that are text-intensive.

**DETAILS**

- The two major Web browsers, Microsoft Internet Explorer and Netscape Navigator, essentially determine which fonts designers use. Why? Because most users will access a Web page using one of these two browsers. A designer must ensure that the Web page displays as expected by specifying fonts that are compatible with these two browsers. If the Web page designer specifies a font that is not available on the user’s computer, then the browser substitutes a different font. A substitute font can have a negative effect on the page design. For example, it may take up more line space and thus wrap differently on the page—creating bad line breaks.

- To ensure that text is displayed in the desired way, Web page designers can use a **fontset**, which lists acceptable fonts in a specified order. If the first font is not available on the user’s computer, then the second font in the list is used. If the second font in the list is not available, then the third font in the list is used, and so on. The use of fontsets is fairly common, but it does not give a great deal of control to Web page designers.

- One way to gain more control over the use of text on the Web is by using a **Cascading Style Sheet** (CSS). A CSS is a template that defines the appearance of a Web page, including text fonts. When a CSS is applied to a Web page, the Web page displays text and other style formats based on the information in the CSS. Web page designers can apply a CSS to all pages on a Web site so that all pages are formatted in the same way or to selected pages or even selected sections of pages within a Web site. Using a CSS provides consistency of style throughout a Web site. It also allows the designer to make a change in the CSS template, which updates all pages assigned to the CSS simultaneously.

- The most effective way to ensure that a specific font will work with various computer systems and browsers is to embed it into your Web pages. Two competing standards are **OpenType** (supported by Microsoft and Adobe) and **TrueDoc** (supported by Netscape and Bitstream). Programs such as Microsoft’s Web Embedding Fonts Tool and Bitstream’s WebFont Wizard allow designers to embed fonts in a Web page.

- Another way to ensure that text will be displayed in a specific format is to change the text into an image—that is, to create the text and save it as a graphic format. The graphic will be displayed as created, irrespective of the fonts installed on the computer or the browser used. There are problems with this approach, however. For example, more development time is needed, which increases development costs; a graphic image is large, which increases the time it takes to display on the user’s screen because of its size; and the developer cannot easily edit the text, which increases maintenance costs.

- There are times when the multimedia title must include a great deal of text—for example, in reference titles such as encyclopedias. However, there are ways to accommodate large amounts of text without overwhelming and perhaps turning off the user.
  - First, consider if there are other ways to communicate the message. For instance, can you show an animation or use narration rather than text to present the idea?
  - Second, consider including a small amount of text and then allowing the user to obtain more information as desired via a hyperlink. See Figure B-4. A hyperlink allows the user to select a button (or word, graphic, or other element) that “jumps” or connects to another part of the title where more text and other information about the concept appear.
  - Third, consider dividing a Web page into sections, called frames, or using drop-down boxes. Figure B-5 shows frames with scroll bars that display more text as the user drags the scroll button. It also shows a text box with a list arrow, which displays more text when clicked.
The Web page on the left has a minimal amount of text to describe each link. The Web page on the right shows the text that appears when the MP3.com link in the Web page on the left is clicked.

This Web page has the expanded story, that is, the full text associated with the link in the Web page on the left; it also has a back button that allows you to link back to the Web page on the left.
Understanding software for working with text

Word processing programs, such as Microsoft Word and Corel WordPerfect, are useful in generating text for text-intensive multimedia titles. Once text is created in a word processing program, it can easily be copied to a multimedia title. In addition, word processing programs now allow you to save a document in HTML format so that it can be used on the Web. When you want text in your multimedia title to have a special effect such as animation, however, you can use other programs designed specifically for working with text.

**Details**

- You might use two types of programs for multimedia titles that are not text-intensive: graphics programs (software used to draw and paint images, such as CorelDRAW and Adobe Illustrator) and authoring programs (software used to create multimedia titles, such as Macromedia Director and Authorware). These programs have text tools that allow you to enter and edit text—for example, by selecting fonts, font sizes, and type styles and colors. Figure B-6 shows the type effects of Adobe Illustrator. These programs also allow you to create special effects with text, such as distorting or animating it.

- You can expand the font library associated with these graphics programs by purchasing font packages, which provide a variety of specialized fonts. The Web is an excellent source of font packages because you can search various Web sites, select the fonts you want, and download them to your computer. Figure B-7 shows a Web site that sells fonts.

- Programs such as Macromedia Fontographer, which is shown in Figure B-8, allow you to create your own fonts or to modify existing ones. You can create fonts by using a calligraphic pen tool or a pressure-sensitive drawing tablet that will generate fonts using your handwriting.

- Multimedia titles that are text-intensive often use electronic copies of documents. For example, if you were creating an online Yellow Pages directory for a particular geographical area, you would not type in all of the text from the current directory. Instead, you would obtain the electronic files used to publish the current paper-based directory and then simply import or copy the data into your title. In some cases, electronic copies of printed documents may not be available. In such cases, when only small parts of a document are needed, you can use a scanner and an optical character recognition (OCR) program to capture the desired text. As the document is scanned, the OCR program translates the text into a format that can be used by a word processing program.

An important consideration in selecting fonts for use on a Web page is whether the user has the same fonts available in his or her software program. Multimedia designers must consider whether their titles will be played back on a Macintosh or Windows-based computer and whether their titles will be accessed via the Web using Internet Explorer or Netscape Navigator. All of these playback systems have built-in (default) fonts. PostScript fonts for the Macintosh and True Type fonts, such as Helvetica and Times on the Macintosh and Arial and Times New Roman on Windows-based computers, are usually installed with the operating system and thus are available on most of these computers. If you use a font that is not on the playback system, the system will substitute a default font. It will try to match the developer’s font with a substitute font that resembles it. Unfortunately, even a close match can have disastrous effects on the appearance of the text—for example, it might change word spacing, wrap the text inappropriately, or even alter the size of the text. To avoid these problems, you can bundle the font with your title so that it is always available.
FIGURE B-6: Adobe Illustrator text tool features

FIGURE B-7: A Web site that sells fonts

FIGURE B-8: A font design program
Using graphics in multimedia applications

The introduction of the Apple Macintosh computer and the Microsoft Windows program simplified the way we interact with computers. Using a mouse and a desktop metaphor on our computers, we use graphical images such as icons, drop-down menus, folders, and windows. We are accustomed to interacting with graphical images on the screen and, in fact, we now expect to see them. Visualization can be an important part of the communications process, and graphical images can be used to add emphasis, direct attention, illustrate concepts, and provide a background for the content. Just as graphical images are important in our day-to-day encounters with computers, graphics—such as illustrations and photographs—are integral to multimedia titles. Two types of graphics are used in multimedia titles: draw-type and bitmap.

**Details**

- **Draw-type graphics** (also called vector graphics) represent an image as a geometric shape made up of straight lines, ovals, and arcs. When you draw a line, a set of instructions is written to describe its size, position, and shape. If more than one line is drawn, it has a precise relationship to the other parts. Figure B-9 shows a graphic, a pie chart, composed of arcs and lines. The instructions that create the arcs and lines establish the relationship between them. If a change is made, such as a modification of the size of the arcs, then the relationship between the arcs and the lines stays the same. Figure B-9 also shows the graphic reduced in size and rotated. The reduced graphic keeps the same relationship (relative position and relative size) as the original graphic.

- **A bitmap graphic**, as shown in Figure B-10, represents the graphic image as an array of dots, called pixels. As you learned in Unit A, the screen is made up of a grid, and each part of the grid is a pixel. Color information, called **color depth**, is recorded for each pixel. Unlike a draw-type graphic, which keeps the same relationship (relative position and relative size) among its parts when its size or placement is changed, a bitmap graphic becomes distorted under those same circumstances. To avoid distortion, bitmap graphics need to be redrawn using different resolution settings.

- There are advantages and disadvantages to using draw-type graphics. The ability to resize and rotate a graphic without distortion is a major advantage of a draw-type graphic. Another advantage of a simple draw-type graphic is its smaller file size. Because each draw-type graphic is stored as a set of instructions, its file size may be significantly smaller than bitmap graphics. One disadvantage of draw-type graphics is that the more complex the graphic is, the larger the file size and the longer it takes to appear on the screen. Another disadvantage is that draw-type graphics cannot be displayed in photo quality.

- **A clear difference exists between draw-type graphics and bitmap graphics**. Because draw-type graphics are displayed using a set of instructions that define each line in the graphic, they are not as discrete as bitmap graphics, which are displayed using a set of instructions that define each pixel in the graphic. Consequently, the quality of the draw-type image is lower than the quality of the bitmap image. For example, creating a circle with a draw-type program allows you to specify only one color for the entire circle, whereas creating a circle with a bitmap program allows you to change the color of every pixel in the circle. Thus the bitmap graphic can have a photo quality. The trade-off is that a bitmap graphic file is larger than a draw-type graphic file.

- **Commercially available programs for creating draw-type graphics** include CorelDRAW and Adobe Illustrator. Commercially available programs for creating bitmap graphics include Adobe Photoshop and Jasc Paint Shop Pro.
FIGURE B-9: A draw-type graphic composed of arcs and lines

FIGURE B-10: A bitmap graphic
Understanding graphic image file sizes

Graphic image file sizes can become unproductively large depending on the complexity of the images and the way the images are developed. The multimedia designer must balance the need for quality images with the need to keep file sizes small. An understanding of graphic image file sizes can help the developer reduce the time it takes to download images and display them on the computer screen. This lesson takes a closer look at graphic image file sizes.

**Details**

- **Screen resolution.** Screen resolutions are measured in horizontal and vertical pixels with 640 × 480 being the lowest standard. The larger the pixel count and the smaller the pixel diameter are the higher the image resolution. A screen resolution of 1024 × 768 will display a much better-quality image than a screen resolution of 640 × 480 on the same size monitor.

- **Image size.** The image size is determined by the number of pixels making up the image. The screen resolution and the image size determine how much of the screen is occupied by the image. For example, if the image size is 640 × 480 and the screen resolution is 640 × 480, then the image will occupy the entire screen.

- **Color depth.** Each pixel can display from one color to millions of colors. The number of colors is determined by information associated with the pixel. Various numbers of colors can be associated with each pixel, depending on the number of bits specified (8-bit for 256 colors, 16-bit for 65,000 colors, and 24-bit for 16.7 million colors). The range of colors available for pixels is called the color depth.

  How is the range of colors available for each pixel determined? The information is coded in bits, which means binary digits. Computers operate on the basis of the flow of electricity and the sensing of electrical impulses. The symbols used to represent this are 1 for “on” and 0 for “off.” Because there are two symbols (1 and 0), this is a binary system. Everything that is done by the computer can be represented by this binary system—including determining how many colors can be displayed by a pixel.

  Let’s say that you want to use 16 different colors in your graphic. Each pixel in the graphic would need to be able to display each of the 16 colors. Each color could be assigned a number ranging from 0 to 15 (16 total colors). The question then becomes, “How many bits are needed to represent 16 colors?” Using a binary number system, 4 bits in different combinations of “on” and “off” can represent 16 different numbers (colors). The process requires assigning each bit a value based on its position relative to the other bits, as shown in Table B-1.

- **File size.** The file size of a bitmap graphic is related to the image size and color depth. It can be estimated using the formula:

  \[ \text{Image size in pixels} \times \text{color depth in bits} / 8 \]

  You divide by 8 because the file size is measured in bytes and there are 8 bits per byte. Table B-2 shows examples of file sizes for particular image sizes and color depths. Figure B-11 shows the image quality of various bitmap graphics. The more colors, the higher the image quality.

- **File formats.** Graphic images can be saved in a variety of file formats. The more popular file formats include **TIFF** (Tagged Image File Format), **BMP** (Bitmap), **PCX** (Windows Paint), and **PICT** (Macintosh picture format), which are the standard file formats for multimedia development. **JPEG** (Joint Photographer Experts Group), **GIF** (Graphics Interchange file format), and **PNG** (Portable Network Graphics), are the standard file formats for the World Wide Web. The file format determines how the file will be displayed. Some file formats are more space-efficient than others. For example, a file saved in the TIFF format generally has a smaller file size than a file saved in the BMP format. You select the file format based on the intended use. For example, TIFF is used to exchange files between applications and computer formats, and JPEG is used when preparing photographs for display on the Web.
### Table B-1: How 4 bits can represent 16 colors

<table>
<thead>
<tr>
<th>BIT VALUES</th>
<th>PIXEL COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 0 0</td>
<td>0</td>
</tr>
<tr>
<td>0 0 0 1</td>
<td>1</td>
</tr>
<tr>
<td>0 0 1 0</td>
<td>2</td>
</tr>
<tr>
<td>0 0 1 1</td>
<td>3</td>
</tr>
<tr>
<td>0 1 0 0</td>
<td>4</td>
</tr>
<tr>
<td>0 1 0 1</td>
<td>5</td>
</tr>
<tr>
<td>0 1 1 0</td>
<td>6</td>
</tr>
<tr>
<td>0 1 1 1</td>
<td>7</td>
</tr>
<tr>
<td>1 0 0 0</td>
<td>8</td>
</tr>
<tr>
<td>1 0 0 1</td>
<td>9</td>
</tr>
<tr>
<td>1 0 1 1</td>
<td>10</td>
</tr>
<tr>
<td>1 1 0 0</td>
<td>11</td>
</tr>
<tr>
<td>1 1 0 1</td>
<td>12</td>
</tr>
<tr>
<td>1 1 1 0</td>
<td>13</td>
</tr>
<tr>
<td>1 1 1 1</td>
<td>14</td>
</tr>
<tr>
<td>1 1 1 1</td>
<td>15</td>
</tr>
</tbody>
</table>

The 8, 4, 2, and 1 represent the values associated with each bit. The 0s and 1s indicate whether the bit is turned “on” or “off.” The sum of the bit values that are turned “on” represents the number associated with the pixel color. This example is intended merely to illustrate the relationship between the binary system and the display of different colors. In practice, 16 colors would be too few to provide quality images. In most cases, 256 colors would be a minimum.

### Table B-2: File sizes of bitmap graphics given the image size and color depth

<table>
<thead>
<tr>
<th>IMAGE SIZE IN PIXELS</th>
<th>SCREEN SIZE</th>
<th>COLOR DEPTH IN BITS</th>
<th>NUMBER OF AVAILABLE COLORS</th>
<th>FILE SIZE IN BYTES (APPROXIMATE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>640 × 480</td>
<td>Full screen</td>
<td>8</td>
<td>256</td>
<td>300,000</td>
</tr>
<tr>
<td>320 × 240</td>
<td>Quarter screen</td>
<td>8</td>
<td>256</td>
<td>77,000</td>
</tr>
<tr>
<td>1024 × 768</td>
<td>Full screen</td>
<td>24</td>
<td>16.7 million</td>
<td>2,400,000</td>
</tr>
</tbody>
</table>

### Figure B-11: The image quality of various bitmap graphics

Depth: 4 bits per pixel (16 colors) Resolution: 75 pixels per inch
Depth: 8 bits per pixel (256 colors) Resolution: 75 pixels per inch
Depth: 4 bits per pixel (16 colors) Resolution: 300 pixels per inch
Depth: 24 bits per pixel (millions of possible colors) Resolution: 75 pixels per inch
Depth: 24 bits per pixel (millions of possible colors) Resolution: 300 pixels per inch
Depth: 8 bits per pixel (256 colors) Resolution: 300 pixels per inch

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Understanding software for working with graphics

Graphics programs are the tools that allow an artist to create and edit all graphic elements used in multimedia titles. There are dozens of graphics programs. The most basic programs are those that come with operating systems (such as Microsoft Paint, which comes with Windows 95 and Windows 98) and those that are included in authoring programs used to create multimedia applications. These programs are relatively unsophisticated and, as a result, lack many features found in high-end programs. Generally, graphics programs can be categorized as drawing, paint, or image editing programs. You will probably need to use a combination of these programs when designing a multimedia title. Several of the high-end programs include features from all three of these categories (drawing, painting, and image editing).

**Details**

- **Drawing programs** are used to create draw-type graphics. They provide for freehand as well as geometric shapes. Consequently, they are useful in creating designs where precise dimensions and relationships are important. Figure B-12 shows an example of a drawing program, Illustrator.

- **Paint programs** are used to create bitmap images. They are useful in creating original art because they provide the tools (such as brushes and pens) used by artists. Figure B-13 shows an example of a paint program, PaintShop Pro.

- **Image editing programs** are useful in making changes, such as changing the brightness or contrast, or applying textures or patterns to existing images. Figure B-14 shows an example of an image editing program, Photoshop.

- **Features of graphics programs.** Since features available in graphics vary, you should ask yourself questions such as those listed here and on Table B-3 when analyzing which graphics programs to use. Some high-end graphics programs address all of the issues raised in these questions.
  - **Types of images.** Which type of images (draw-type or bitmap) will the program support? Is the program primarily a drawing, paint (bitmap), or image editing program? Many graphics programs allow you to create both draw- and paint-type graphics.
  - **Cross-platform compatibility.** Does the graphics program support cross-platform compatibility? Does the program come in both Windows and Macintosh versions? Can it create graphics that can be used on both Macintosh and Windows-based computers?
  - **File format support.** Which graphics file formats does the graphics program support? Does the program allow saving and/or converting graphic images using the more popular file formats, including TIFF, BMP, PCX, PICT, JPEG, GIF, and PNG?
  - **Object layering.** Does the graphics program support object layering? Object layering allows you to include more than one bitmap in an image and edit each bitmap independently of the others.
  - **Image enhancements.** Does the graphics program allow you to make image enhancements with painting tools? Does the program have a pencil, a brush, an airbrush, and text and line tools? Does it allow you to define brushes and to preview the brush size? Does the program have an option to paint with textures and patterns and to retouch using smudge, sharpen, and blur features?
  - **Selection tools.** Which selection tools does the graphics program include? Does the program allow selection of any part of an image using a freehand tool? Programs that allow for the most precise development of graphic images permit you to select all pixels of a certain color, which allows for fine detail work. Does the program support the use of masks, which are used to isolate parts of an image so that you can work on them separately? Finally, does the program have selection tools that will allow you to apply a special effect such as a drop shadow?
  - **Color adjustments.** To what extent can color adjustments be made? Does the graphics program allow adjusting of image color and choosing from a range of colors simultaneously? Can you selectively change hue (the shade or color itself), saturation (the relative brilliance or vibrancy of a color), and brightness?
Image manipulation Does the graphics program allow you to stretch, skew, and rotate an image?

Filters Does the graphics program have filters for sharpening, softening, and stylizing the image?

Anti-aliasing Does the graphics program support anti-aliasing? Anti-aliasing smooths edges by blending the colors on the edge of the image with the adjacent colors. Because bitmaps are made up of rectangular pixels, the outside edge of the image can appear jagged. Anti-aliasing adjusts for this problem.

Text support How extensive is the text support? Does the graphics program support manipulation of PostScript and TrueType fonts?

Graphics tablets Does the graphics program support pressure-sensitive graphics tablets, which are peripheral devices that can be used for freehand drawing?

Open architecture Does the graphics program support open architecture? Is it compatible with third-party software such as programs that provide special effects?