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What Is Multimedia?

ULTIMEDIA is an eerie wail as two cat's eyes appear on a dark screen. It's the red rose that dissolves into a little girl's face when you press "Valentine's Day" on your iPhone. It's a small window of video laid onto a map of India, showing an old man recalling his dusty journey to meet a rajah there. It's an e-catalog of hybrid cars with a guide to help you buy one. It's a real-

time video conference with colleagues in Paris, London, and Hong Kong, using whiteboards, microphones, and question techniques (see www.webtrain.com) on your office computer. At home, it's an interactive geometry lesson for a fifth-grader. At the arcade, it's goggle-faced kids flying fighter planes in sweaty, virtual reality. On a DVD, it's the interactive video sequence (or screen hot spots) that explain how the Harry Potter movie was made—all using your remote control.

Multimedia is any combination of text, art, sound, animation, and video delivered to you by computer or other electronic or digitally manipulated means. It is richly presented sensation. When you weave together the sensual elements of multimedia—dazzling pictures and animations, engaging sounds, compelling video clips, and raw textual information—you can electrify the thought and action centers of people's minds. When you give them interactive control of the process, they can be enchanted.

This book is about creating each of the elements of multimedia and about how you can weave them together for maximum effect. This book is for computer beginners as well as computer experts. It is for serious multimedia producers—and for their clients as well. It is for desktop publishers and video producers who may need a leg-up as they watch traditional methods for delivery of information and ideas evolve into new, technology-driven formats. This book is also for hobbyists, who want to make albums and family histories on the World Wide Web; for mainstream businesses, where word-processed documents and spreadsheets are illustrated with audio, video, and graphic animations; for public speakers, who use animation and sound on large monitors and auditorium projection systems to present ideas and information to an audience; for information managers, who organize and distribute digital images, sound, video, and text; and for educators and trainers, who design and present information for learning.

If you are new to multimedia and are facing a major investment in hardware, software, and the time you will need to learn each new tool, take a gradual approach to these challenges. Begin by studying each element of

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multimedia and learning one or more tools for creating and editing that element. Get to know how to use text and **fonts**, how to make and edit colorful graphic images and animate them into movies, and how to record and edit digital sound. Browse the computer trade periodicals that contain the most up-to-date information. Your skills will be most valuable if you develop a broad foundation of knowledge about each of the basic elements of multimedia.

Producing a multimedia project or a **web site** requires more than creative skill and high technology. You need organizing and business talent as well. For example, issues of ownership and copyright will be attached to some elements that you wish to use, such as text from books, scanned images from magazines, or audio and video clips. The use of these resources often requires permission, and even payment of a fee to the owner. Indeed, the management and production infrastructure of a multimedia project may be as intense and complicated as the technology and creative skills you bring to bear in rendering it. Keys to successful development of a multimedia project are management of digital tools and skill sets, teamwork, general project management, documenting and archiving the process, and delivering the completed product on time and within budget.

> The implementation of multimedia capabilities in computers is just the latest episode in a long series: cave painting, hand-crafted manuscripts, the printing press, radio, and television. . . . These advances reflect the innate desire of man to create outlets for creative expression, to use technology and imagination to gain empowerment and freedom for ideas.
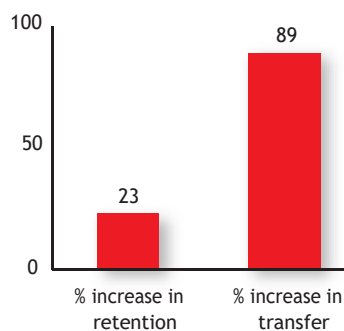>
> Glenn Ochsenreiter, Director, Multimedia PC Council

Definitions

Multimedia is, as described previously, a woven combination of **digitally manipulated** text, photographs, graphic art, sound, animation, and video elements. When you allow an end user—also known as the viewer of a multimedia project—to control what and when the elements are delivered, it is called **interactive multimedia**. When you provide a structure of linked elements through which the user can navigate, interactive multimedia becomes **hypermedia**.

Although the definition of multimedia is a simple one, making it work can be complicated. Not only do you need to understand how to make each multimedia element stand up and dance, but you also need to know how to use multimedia computer tools and technologies to weave them together. The people who weave multimedia into meaningful tapestries are called **multimedia developers**.

The software vehicle, the messages, and the content presented on a computer, television screen, PDA (personal digital assistant), or mobile phone together constitute a **multimedia project**. If the project is to be shipped or sold to consumers or end users, typically delivered as a download on the Internet but also on a CD-ROM or DVD in a box or sleeve, with or without instructions, it is a **multimedia title**. Your project may also be a page or site on the World Wide Web, where you can weave the elements of multimedia into documents with **HTML** (Hypertext Markup Language) or **DHTML** (Dynamic Hypertext Markup Language) or **XML** (eXtensible Markup Language) and play rich media files created in such

programs as Adobe's Flash, LiveMotion, or Apple's QuickTime by installing plug-ins into a **browser** application such as Internet Explorer, Safari, Google Chrome, or Firefox. Browsers are software programs or tools for viewing content on the Web. See Chapter 12 for more about plug-ins, multimedia, and the Web.

A multimedia project need not be interactive to be called multimedia: users can sit back and watch it just as they do a movie or the television. In such cases a project is **linear**, or starting at the beginning and running through to the end. When users are given navigational control and can wander through the content at will, multimedia becomes **nonlinear** and user interactive, and is a powerful personal gateway to information.

Determining how a user will interact with and navigate through the **content** of a project requires great attention to the message, the **scripting** or **storyboarding**, the artwork, and the programming. You can break an entire project with a badly designed interface. You can also lose the message in a project with inadequate or inaccurate content.

Multimedia elements are typically sewn together into a project using **authoring tools**. These software tools are designed to manage individual multimedia elements and provide user interaction. **Integrated multimedia** is the "weaving" part of the multimedia definition, where source documents such as montages, graphics, video cuts, and sounds merge into a final presentation. In addition to providing a method for users to interact with the project, most authoring tools also offer facilities for creating and editing text and images and controls for playing back separate audio and video files that have been created with editing tools designed for these media. The sum of what gets played back and how it is presented to the viewer on a monitor is the **graphical user interface**, or GUI (pronounced "gooey"). The GUI is more than just the actual graphics on the screen—it also often provides the rules or structure for the user's input. The hardware and software that govern the limits of what can happen here are the multimedia **platform** or **environment**.

Where to Use Multimedia

Multimedia is appropriate whenever a human user is connected to electronic information of any kind, at the "human interface." Multimedia enhances minimalist, text-only computer interfaces and yields measurable benefit by gaining and holding attention and interest; in short, multimedia improves information retention. When it's properly constructed, multimedia can also be profoundly entertaining as well as useful.

Multimedia in Business

Business applications for multimedia include presentations, training, marketing, advertising, product demos, simulations, databases, catalogs,

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Multimedia is a very effective presentation and sales tool. If you're being driven somewhere in the back seat of a car, you may not remember how you got to your destination. If you had been driving the car yourself, chances are you could get there again. Studies indicate that if you're stimulated with audio, you will have about a 20 percent retention rate. With audio-visual, retention is up to 30 percent and in interactive multimedia presentations, where you are really involved, the retention rate is as high as 60 percent.

. . . .

Jay Sandom,
Einstein & Sandom

For viewers presented with graphics and words, not just words alone, there was a 23 percent increase in retention (ability to remember information) and an 89 percent increase in transfer (ability to creatively apply information).

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From: *Multimedia Learning* by Richard E. Mayer, Cambridge University Press, 2001

instant messaging, and networked communications. Voice mail and video conferencing are provided on many local and wide area networks (LANs and WANs) using distributed networks and Internet protocols.

After a morning of mind-numbing overhead presentations delivered from the podium of a national sales conference, a multimedia presentation can make an audience come alive. Most presentation software packages let you make pretty text and add audio and video clips to the usual slide show of graphics and text material.

Multimedia is enjoying widespread use in training programs. Flight attendants learn to manage international terrorism and security through simulation. Drug enforcement agencies of the UN are trained using interactive videos and photographs to recognize likely hiding places on airplanes and ships. Medical doctors and veterinarians can practice surgery methods via simulation prior to actual surgery. Mechanics learn to repair engines. Salespeople learn about product lines and leave behind software to train their customers. Fighter pilots practice full-terrain sorties before spooling up for the real thing. Increasingly easy-to-use authoring programs and media production tools even let workers on assembly lines create their own training programs for use by their peers.

Multimedia around the office has also become more commonplace. Image capture hardware is used for building employee ID and badging databases, scanning medical insurance cards, for video annotation, and for real-time teleconferencing. Presentation documents attached to e-mail and video conferencing are widely available. Laptop computers and high-resolution projectors are commonplace for multimedia presentations on the road. Mobile phones and personal digital assistants (PDAs) utilizing Bluetooth and Wi-Fi communications technology make communication and the pursuit of business more efficient.

As companies and businesses catch on to the power of multimedia, the cost of installing multimedia capability decreases, meaning that more applications can be developed both in-house and by third parties, which allow businesses to run more smoothly and effectively. These advances are changing the very way business is transacted by affirming that the use of multimedia offers a significant contribution to the bottom line while also advertising the public image of the business as an investor in technology.

Multimedia in Schools

Schools are perhaps the destination most in need of multimedia. Many schools in the United States today are chronically underfunded and occasionally slow to adopt new technologies, and it is here that the power of multimedia can be maximized for the greatest long-term benefit to all.

The U.S. government has challenged the telecommunications industry to connect every classroom, library, clinic, and hospital in America to

History has proven that advances in the way we communicate can give rise to entirely new communication cultures. Much like the transition from radio to TV, the evolution from text messaging to multimedia messaging (MMS) marks a whole new era of mobile communications, combining images with sound and text.

Jorma Ollila,
Chairman and CEO of Nokia

Here, in the country that invented the Internet, every child should have the chance to get online.

Barack Obama,
President of the United States

the information superhighway. Funded by telephone surcharges (eRate), most schools and libraries in America are now connected. Steps have also been taken to provide governmental support for state-of-the-art technology in low-income rural and urban school districts. The National Grid for Learning (NGfL) has established similar aims for schools in the United Kingdom.

Multimedia will provoke radical changes in the teaching process during the coming decades, particularly as smart students discover they can go beyond the limits of traditional teaching methods. There is, indeed, a move away from the transmission or passive-learner model of learning to the experiential learning or active-learner model. In some instances, teachers may become more like guides and mentors, or facilitators of learning, leading students along a learning path, rather than the more traditional role of being the primary providers of information and understanding. The students, not teachers, become the core of the teaching and learning process. E-learning is a sensitive and highly politicized subject among educators, so educational software is often positioned as "enriching" the learning process, not as a potential substitute for traditional teacher-based methods.

Figure 1-1 shows a selection of instructional videos used for training emergency medicine specialists. Such online e-learning provides a cost-effective vehicle to learn clinical techniques outside of the hospital setting. From real-time echocardiographic images to explanations of the chemistry of synaptic transmission, multimedia is used as an effective teaching medium in medicine and other disciplines.

An interesting use of multimedia in schools involves the students themselves. Students can put together interactive magazines and newsletters, make original art using image-manipulation software tools, and interview students, townspeople, coaches, and teachers. They can even make video clips with cameras and mobile phones for local use or uploading to YouTube. They can also design and run web sites. As schools become more a part of the Internet, multimedia arrives by glass fiber and over a network

ITV (Interactive TV) is widely used among campuses to join students from different locations into one class with one teacher. Remote trucks containing computers, generators, and a satellite dish can be dispatched to areas where people want to learn but have no computers or schools near them. In the online version of school, students can enroll at schools all over the world and interact with particular teachers and other students—classes can be accessed at the convenience of the student's lifestyle while the teacher may be relaxing on a beach and communicating via a wireless system. Washington On Line (www.waol.org), for

Figure 1-1 Multimedia e-learning is a powerful, convenient, and cost-effective tool for both instructors and students. From *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*, *6e*, available online at www.accessmedicine.com.

example, offers classes to students who do not wish to spend gas money, fight traffic, and compete for parking space; they even provide training to professors so they can learn how best to present their classes online.

Multimedia at Home

From gardening, cooking, home design, remodeling, and repair to genealogy software (see Figure 1-2), multimedia has entered the home. Eventually, most multimedia projects will reach the home via television sets or monitors with built-in interactive user inputs—either on old-fashioned color TVs or on new high-definition sets. The multimedia viewed on these sets will likely arrive on a pay-for-use basis along the data highway.

Today, home consumers of multimedia own either a computer with an attached CD-ROM or DVD drive or a set-top player that hooks up to the television, such as a Nintendo Wii, X-box, or Sony PlayStation machine. There is increasing **convergence** or melding of computer-based multimedia with entertainment and games-based media traditionally described as "shoot-em-up." Nintendo alone has sold over 118 million game players worldwide along with more than 750 million games. Users with TiVo technology (www.tivo.com) can store 80 hours of television viewing and gaming on a stand-alone hard disk.

Figure 1-2 Genealogy software such as Reunion from Leister Productions lets families add text, images, sounds, and video clips as they build their family trees.

An interactive episode of *Wild Kingdom* might start out with normal narration. "We're here in the Serengeti to learn about the animals." I see a lion on the screen and think, "I want to learn about the lion." So I point at the lion, and it zooms up on the screen. The narration is now just about the lion. I say, "Well that's really interesting, but I wonder how the lion hunts." I point at a hunt icon. Now the lion is hunting, and the narrator tells me about how it hunts. I dream about being the lion. I select another icon and now see the world from the lion's point of view, making the same kinds of decisions the lion has to make—with some hints as I go along. I'm told how I'm doing and how well I'm surviving. Kids could get very motivated from experiencing what it's like to be a lion and from wanting to be a competent lion. Pretty soon they'd be digging deeper into the information resource, finding out about animals in different parts of the world, studying geography from maps displayed on the screen, learning which animals are endangered species. . . .

Trip Hawkins, Founder, Electronic Arts

First Person

Live Internet pay-for-play gaming with multiple players has also become popular, bringing multimedia to homes on the broadband Internet, often in combination with CD-ROMs or DVDs inserted into the user's machine. Microsoft's Internet Gaming Zone and Sony's Station web site boast more than a million registered users each—Microsoft claims to

be the most successful, with tens of thousands of people logged on and playing every evening.
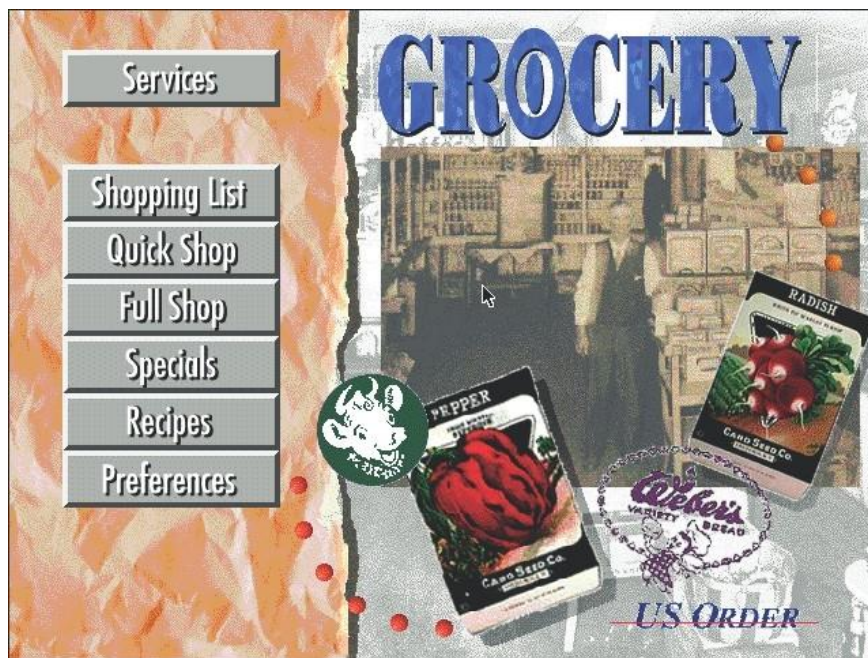
Multimedia in Public Places

In hotels, train stations, shopping malls, museums, libraries, and grocery stores, multimedia is already available at stand-alone terminals or kiosks, providing information and help for customers. Multimedia is piped to wireless devices such as cell phones and PDAs. Such installations reduce demand on traditional information booths and personnel, add value, and are available around the clock, even in the middle of the night, when live help is off duty. The way we live is changing as multimedia penetrates our day-to-day experience and our culture. Imagine a friend's bout of maudlin drunk dialing (DD) on a new iPhone, with the camera accidentally enabled.

Figure 1-3 shows a menu screen from a supermarket kiosk that provides services ranging from meal planning to coupons. Hotel kiosks list nearby restaurants, maps of the city, airline schedules, and provide guest services such as automated checkout. Printers are often attached so that users can walk away with a printed copy of the information. Museum kiosks are not only used to guide patrons through the exhibits, but when installed at each exhibit, provide great added depth, allowing visitors to browse through richly detailed information specific to that display.

My wife, the keeper of remotes, has rigged an entertainment system in our house that includes a remote controlled, ceiling mounted 96" × 96" drop-down screen, a 27" 16 × 9 format LCD screen, and an 1100 lumin Dell LCD projector connected to Wavecable, our Internet provider. We can watch our own CDs or Internet or Wavecable's TV/HDTV on our big screen while we track a sports show on the smaller screen off another Wavecable box. We have three cable boxes in our house.

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Joe Silverthorn,
Interactive Media Professor,
Olympic College

Figure 1-3 Kiosks in public places can make everyday life simpler.

The power of multimedia has been part of the human experience for many thousands of years, and the mystical chants of monks, cantors, and shamans accompanied by potent visual cues, raised icons, and persuasive text has long been known to produce effective responses in public places. Scriabin, the 19th-century Russian composer, used an orchestra, a piano, a chorus, and a special color organ to synthesize music and color in his Fifth Symphony, *Prometheus.* Probably suffering from synesthesia (a strange condition where a sensory stimulus, such as a color, evokes a false response, such as a smell), Scriabin talked of tactile symphonies with burning incense scored into the work. He also claimed that colors could be heard; Table 1-1 lists the colors of his color organ.

Frequency (Hz)	Note	Scriabin's Color
256	C	Red
277	C#	Violet
298	D	Yellow
319	D#	Glint of steel
341	E	Pearly white shimmer of moonlight
362	F	Deep red
383	F#	Bright blue
405	G	Rosy orange
426	G#	Purple
447	A	Green
469	A#	Glint of steel
490	B	Pearly blue

Table 1-1 Scriabin's Color Organ

Prometheus premiered before a live audience in Moscow in 1911, but the color organ had proved technologically too complicated and was eliminated from the program. Then Scriabin died suddenly of blood poisoning from a boil on his lip, so his ultimate multimedia vision, the Mysterium, remained unwritten. He would have reveled in today's world of MIDI synthesizers (see Chapter 4), rich computer colors, and video digitizers, and, though smell is not yet part of any multimedia standard, he would surely have researched that concept, too. The platforms for multimedia presentation have much improved since Scriabin's time. Today, multimedia is found in churches and places of worship as live video with attached song lyrics

shown on large screens using elaborate sound systems with special effects lighting and recording facilities. Scriabin would have loved this.

Virtual Reality

At the convergence of technology and creative invention in multimedia is virtual reality, or VR. Goggles, helmets, special gloves, and bizarre human interfaces attempt to place you "inside" a lifelike experience. Take a step forward, and the view gets closer; turn your head, and the view rotates. Reach out and grab an object; your hand moves in front of you. Maybe the object explodes in a 90-decibel crescendo as you wrap your fingers around it. Or it slips out from your grip, falls to the floor, and hurriedly escapes through a mouse hole at the bottom of the wall.

VR requires terrific computing horsepower to be realistic. In VR, your cyberspace is made up of many thousands of geometric objects plotted in three-dimensional space: the more objects and the more points that describe the objects, the higher the resolution and the more realistic your view. As you move about, each motion or action requires the computer to recalculate the position, angle, size, and shape of *all* the objects that make up your view, and many thousands of computations must occur as fast as 30 times per second to seem smooth.

On the World Wide Web, standards for transmitting virtual reality worlds or scenes in VRML (Virtual Reality Modeling Language) documents (with the filename extension .wrl) have been developed. Intel and software makers such as Adobe have announced support for new 3-D technologies.

Using high-speed dedicated computers, multi-million-dollar flight simulators built by Singer, RediFusion, and others have led the way in commercial application of VR. Pilots of F-16s, Boeing 777s, and Rockwell space shuttles have made many simulated dry runs before doing the real thing. At the Maine Maritime Academy and other merchant marine officer training schools, computer-controlled simulators teach the intricate loading and unloading of oil tankers and container ships.

Virtual reality (VR) is an extension of multimedia—and it uses the basic multimedia elements of imagery, sound, and animation. Because it requires instrumented feedback from a wired-up person, VR is perhaps interactive multimedia at its fullest extension.

Delivering Multimedia

Multimedia requires large amounts of digital memory when stored in an end user's library, or large amounts of **bandwidth** when distributed over

> People who work in VR do not see themselves as part of "multimedia." VR deals with goggles and gloves and is still a research field where no authoring products are available, and you need a hell of a computer to develop the real-time 3-D graphics. Although there is a middle ground covered by such things as QuickTime VR and VRML that gives multimedia developers a "window" into VR, people often confuse multimedia and VR and want to create futuristic environments using multimedia-authoring tools not designed for that purpose.
>
> Takis Metaxis, Assistant Professor of Computer Science, Wellesley College

wires, glass fiber, or airwaves on a network. The greater the bandwidth, the bigger the pipeline, so more content can be delivered to end users quickly.

CD-ROM, DVD, Flash Drives

CD-ROM (compact disc read-only memory, see Chapter 7) discs can be mass-produced for pennies and can contain up to 80 minutes of full-screen video, images, or sound. The disc can also contain unique mixes of images, sounds, text, video, and animations controlled by an authoring system to provide unlimited user interaction.

Discs can be stamped out of polycarbonate plastic as fast as cookies on a baker's production line and just as cheaply. Virtually all personal computers sold today include at least a CD-ROM player, and the software that drives these computers is commonly delivered on a CD-ROM disc. Many systems also come with a DVD player combination that can read and burn CD-ROMs as well. Multilayered Digital Versatile Disc (**DVD**) technology increases the capacity and multimedia capability of CDs to 4.7GB on a single-sided, single-layered disc to as much as 17.08GB of storage on a double-sided, double-layered disc. CD and DVD **burners** are used for reading discs and for making them, too, in audio, video, and data formats. DVD authoring and integration software allows the creation of interactive front-end menus for both films and games.

In the very long term, however, CD-ROM and DVD discs are but interim memory technologies that will be replaced by new devices such as flash drives and thumb drives that do not require moving parts. As high-speed connections become more and more pervasive and users become better connected, copper wire, glass fiber, and radio/cellular technologies may prevail as the most common delivery means for interactive multimedia files, served across the broadband Internet or from dedicated computer farms and storage facilities.

The Broadband Internet

These days telecommunications networks are global, so when information providers and content owners determine the worth of their products and how to charge money for them, information elements will ultimately link up online as **distributed resources** on a data highway (actually more like a toll road), where you will pay to acquire and use multimedia-based information.

Curiously, the actual glass fiber cables that make up much of the physical backbone of the data highway are, in many cases, owned by railroads and pipeline companies who simply buried the cable on existing rights of way, where no special permits and environmental studies are necessary.

One railroad in the United States invested more than a million dollars in a special cable-laying trenching car; in the United Kingdom, fiber-optic cable runs in the towpaths of the decaying 19th-century canal and barge system. Bandwidth on these fiber-optic lines is leased to others, so competing retailers such as AT&T, Verizon, MCI, and Sprint may even share the same cable.

Full-text content from books and magazines is downloadable; feature movies are played at home; real-time news feeds from anywhere on earth are available; lectures from participating universities are monitored for education credits; street maps of cities are viewable—with recommendations for restaurants, in any language—and online travelogues include testimonials and video tracks. Just think—each of these interfaces or gateways to information is a multimedia project waiting to be developed!

http://earth.google.com

http://maps.google.com/help/maps/streetview

www.moviefone.com

www.netflix.com

www.travelocity.com

www.nytimes.com

www.5pm.co.uk

Showtimes for many major cities, restaurants, vacation trips, and current news items are quickly available on the Web.

Interactive multimedia is delivered to many homes throughout the world. Interest from a confluence of entertainment mega-corps, information publishers and providers, cable and telephone companies, and hardware and software manufacturers is driving this inevitable evolution, and profound changes in global communications strategy are on the drawing boards. What will be piped through this new system for entertainment, reference, and lifelong learning experiences are the very **multimedia elements** discussed in the chapters of this book, including text, graphics, animation, sound, and video.

The actual content provided, let us hope, will be excellent fare, generated by thinking and caring creative people using ideas that will propel all of us into a better world. Entertainment companies that own content easily converted to multimedia projects are teaming up with cable TV companies. Film studios are creating new divisions to produce interactive multimedia and wealthy talents have formed new companies to join in on

the action. Google is scanning millions of books and periodicals. Even without a clear business model with known profits, large media corporations are uniting to create huge conglomerates to control the content and delivery of tomorrow's information.

Some companies will own the routes for carrying data, other companies will own the hardware and software interfaces at the end of the line, at offices and homes. Some will knit it all together and provide supply-on-demand and billing services. Regardless of who owns the roadways and the hardware boxes, multimedia producers will create the new literature and the rich content sent along them. This is a fresh and exciting industry that is coming of age, but one that is still faced with many growing pains.

Chapter 1 Review

■ Chapter Summary

For your review, here's a summary of the important concepts discussed in this chapter.

Define common multimedia terms such as multimedia, integration, interactive, HTML, and authoring and qualify various characteristics of multimedia: nonlinear versus linear content

- Multimedia is any combination of text, graphic art, sound, animation, and video delivered by computer or other electronic means.

- Multimedia production requires creative, technical, organizing, and business ability.

- Multimedia presentations can be nonlinear (interactive) or linear (passive).

- Multimedia can contain structured linking called hypermedia.

- Multimedia developers produce multimedia titles using authoring tools.

- Multimedia projects, when published, are multimedia titles.

Describe several different environments in which multimedia might be used, and several different aspects of multimedia that provide a benefit over other forms of information presentation

- Multimedia is appropriate wherever a human interacts with electronic information.

- Areas in which multimedia presentations are suitable include education, training, marketing, advertising, product demos, databases, catalogs, entertainment, and networked communications.

Describe the primary multimedia delivery methods—the Internet, wireless, CD-ROM, and DVD—as well as cite the history of multimedia and note important projected changes in the future of multimedia

- Multimedia projects often require a large amount of digital memory; hence they are often stored on CD-ROM or DVDs.

- Multimedia also includes web pages in HTML or DHTML (XML) on the World Wide Web, and can include rich media created by various tools using plug-ins.

- Web sites with rich media require large amounts of bandwidth.

- The promise of multimedia has spawned numerous mergers, expansions, and other ventures. These include hardware, software, content, and delivery services.

- The future of multimedia will include high-bandwidth access to a wide array of multimedia resources and learning materials.

■ Key Terms

authoring tools *(2)*	environment *(2)*	multimedia element *(11)*
bandwidth *(9)*	font *(1)*	multimedia project *(1)*
browser *(2)*	graphical user interface (GUI) *(2)*	multimedia title *(1)*
burner *(10)*	HTML *(1)*	nonlinear *(2)*
CD-ROM *(10)*	hypermedia *(1)*	platform *(2)*
content *(2)*	integrated multimedia *(2)*	scripting *(2)*
convergence *(5)*	interactive multimedia *(1)*	storyboarding *(2)*
DHTML *(1)*	ITV *(4)*	web site *(1)*
digitally manipulated *(1)*	linear *(2)*	XML *(1)*
distributed resource *(10)*	multimedia *(0)*	
DVD *(10)*	multimedia developer *(1)*	

■ Key Term Quiz

1. _____ is any combination of text, graphic art, sound, animation, and video delivered to you by computer or other electronic means.

2. _____ allows an end user to control what and when the elements are delivered.

3. _____ is a structure of linked elements through which the user can navigate.

4. A _____ multimedia project allows users to sit back and watch it just as they do a movie or the television.

5. _____ tools are software tools designed to manage individual multimedia elements and provide user interaction.

6. The sum of what gets played back and how it is presented to the viewer on a monitor is the _____.

7. The hardware and software that govern the limits of what can happen are the multimedia _____.

8. The information that makes up a multimedia presentation is referred to as_____.

9. CD and DVD_____are used for reading and making discs.

10. HTML and DHTML web pages or sites are generally viewed using a_____.

■ Multiple-Choice Quiz

1. LAN stands for:
    a. logical access node
    b. link/asset navigator
    c. local area network
    d. list authoring number
    e. low-angle noise

2. A browser is used to view:
    a. program code
    b. storyboards
    c. fonts
    d. Web-based pages and documents
    e. videodiscs

3. The "ROM" in "CD-ROM" stands for:
    a. random-order memory
    b. real-object memory
    c. read-only memory
    d. raster-output memory
    e. red-orange memory

4. The software vehicle, the messages, and the content presented on a computer or television screen together make up:
    a. a multimedia project
    b. a CD-ROM
    c. a web site
    d. a multimedia title
    e. an authoring tool

5. A project that is shipped or sold to consumers or end users, typically in a box or sleeve or on the Internet, with or without instructions, is:
    a. a CD-ROM
    b. an authoring tool
    c. a multimedia project
    d. a multimedia title

6. The 19th-century Russian composer who used an orchestra, a piano, a chorus, and a special color organ to synthesize music and color in his Fifth Symphony, *Prometheus* was:
    a. Rachmaninoff
    b. Tchaikovsky
    c. Scriabin
    d. Rimsky-Korsakoff
    e. Shostakovich

7. Which one of the following *is not/are not* typically part of a multimedia specification?

    a. text
    b. odors
    c. sound
    d. video
    e. pictures

8. VR stands for:

    a. virtual reality
    b. visual response
    c. video raster
    d. variable rate
    e. valid registry

9. According to one source, in interactive multimedia presentations where you are really involved, the retention rate is as high as:

    a. 20 percent
    b. 40 percent
    c. 80 percent
    d. 60 percent
    e. 100 percent

10. Which of the following is displayable on a web page after installation of a browser plug-in?

    a. Windows 7
    b. Adobe Flash
    c. Mozilla
    d. Internet Explorer
    e. Firefox

11. PDA stands for:

    a. primary digital asset
    b. processor digital application
    c. personal digital assistant
    d. practical digital accessory
    e. portable digital armor

12. The glass fiber cables that make up much of the physical backbone of the data highway are, in many cases, owned by:

    a. local governments
    b. Howard Johnson
    c. television networks
    d. railroads and pipeline companies
    e. book publishers

13. DVD stands for:

    a. Digital Versatile Disc
    b. Digital Video Disc
    c. Duplicated Virtual Disc
    d. Density-Variable Disc
    e. Double-View Disc

14. Genealogy software is used to

    a. Study benthic sediments
    b. Organize class reunions
    c. Display family trees
    d. Compute shortest routes for ambulances
    e. Open e-mail

15. Which of the following is *not* a technology likely to prevail as a delivery means for interactive multimedia files?

    a. copper wire
    b. glass fiber
    c. radio/cellular
    d. floppy disk
    e. CD-ROM

■ Essay Quiz

1. Briefly discuss the history and future of multimedia. How might multimedia be used to improve the lives of its users? How might it influence users in negative ways? What might be its shortcomings?

2. You are a marketing director for a small telecommunications company. You are considering using multimedia to market your company's product. Put together an outline detailing the benefits and drawbacks of using a CD-ROM presentation, a multimedia web site, or a television advertisement.

3. Multimedia is shifting from being localized (contained on a CD-ROM) to being distributed (available on the World Wide Web). What are some of the implications of this? Who will have access to the presentation? How will you keep it secure? How will you distribute it?

Lab Projects

■ Project 1.1

You have been given the task of creating an interactive Web presentation for marketing a new bicycle. Visit four different bicycle web sites using a suitable search tool. For each web site you visit, write in the table below the name of the site, its URL, and:

1. Describe each site in terms of its multimedia incorporation.

2. Discuss whether its multimedia content is appropriate and where and how additional media content might improve the site.

3. Describe what multimedia presentation formats it uses. Video? Virtual reality? 3-D animations?

Site 1	
URL (address):	
Describe the GUI. What navigational elements does it have? What colors does it use? Is it cluttered?	
Is the content relevant and appropriate? What additions/deletions of content might improve the site?	
Describe any multimedia presentations of specific products. What formats did they use?	
Site 2	
URL (address):	
Describe the GUI. What navigational elements does it have? What colors does it use? Is it cluttered?	
Describe any multimedia presentations of specific products. What formats did they use?	
Site 3	
URL (address):	
Describe the GUI. What navigational elements does it have? What colors does it use? Is it cluttered?	
Describe any multimedia presentations of specific products. What formats did they use?	
Site 4	
URL (address):	
Describe the GUI. What navigational elements does it have? What colors does it use? Is it cluttered?	
Describe any multimedia presentations of specific products. What formats did they use?	

■ Project 1.2

Review an educational multimedia CD-ROM title, and then fill out the table that follows.

Title of CD	
Describe the GUI. What navigational elements does it have? What color scheme(s) does it use? Is it cluttered?	
Describe the educational content. Is it well organized?	
Would you be able to easily learn the subject matter using this package?	
Describe the product in terms of its multimedia incorporation.	
Discuss whether its multimedia content is appropriate and where and how additional media content might improve the site.	

■ Project 1.3

Contact a local multimedia development company. Ask them what kinds of products they develop and whether they would describe two projects they have recently completed. Be sure that they provide you with enough information to answer each of the following questions.

Multimedia Project 1

1. Name of project.
2. Kind of product created.
3. What authoring tool(s) were used to create the project?
4. Who made up the development team for the project?
5. How did the production of the project develop?
6. How long did the project take to complete?
7. What problems were encountered?

Multimedia Project 2

1. Name of project.
2. Kind of product created.
3. What authoring tool(s) were used to create the project?
4. Who made up the development team for the project?
5. How did the production of the project develop?
6. How long did the project take to complete?
7. What problems were encountered?

■ Project 1.4

Visit a large public area such as a shopping mall, the downtown area of a city, or a museum. Locate a kiosk or other public multimedia installation. Spend 15 minutes observing who uses it and for how long.

1. Describe the installation. Where was it located? Is there a lot of foot traffic going past it? Is it conveniently located? Is it accessible to a wide range of users (tall, short, disabled, wheelchair, or vision impaired)?
2. Describe the usage pattern. Characterize the users. Were children attracted to it? Did users "play" with it?
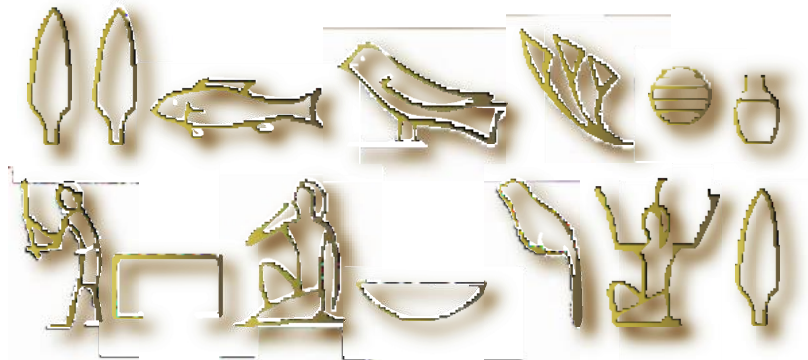
Text

U SING text and symbols for communication is a very recent human development that began about 6,000 years ago in the Mediterranean Fertile Crescent—Mesopotamia, Egypt, Sumeria, and Babylonia—when the first meaningful marks were scraped onto mud tablets and left to harden in the sun. Only members of the ruling classes and the priesthood were allowed to read and write the pictographic signs and cuneiforms. The earliest messages delivered in written words typically contained information vital to the management of people, politics, and taxes. Because this new medium did not require rote memorization by frail human gray matter, written messages became popular among the elite. Unlike their human counterparts, these new messages were less likely to perish due to dysentery or acts of God, or suffer from amnesia. Even if a message were intercepted by foes or competitors, it would still be indecipherable—except by those few who had acquired reading skills.

In fact, because those who could read probably attended the same private school or shared the same tutors, in those days reading, writing, and power politics were naturally intertwined. In some former eras it was a capital offense to read unless you belonged to the proper social class or possessed a patent granted to you by your rulers.

Today, text and the ability to read it are doorways to power and knowledge. Reading and writing are expected and necessary skills within most modern cultures. Now, depending upon your proficiency with words, you may be awarded a doctorate instead of the death penalty. And, as has been the case throughout history, text still delivers information that can have potent meaning.

In this chapter, you will learn how to:

- Recognize the importance of word choice

- Describe the difference between a typeface and a font and list at least three attributes of a font, for example, upper/lowercase, serif/sans serif, PostScript/TrueType/OpenType

- Discuss the importance of text and the ways in which text can be leveraged in multimedia presentations

- Discuss the presentation of text on Windows and Macintosh platforms

- Find sources for free and shareware fonts

- Define hypermedia, hypertext, links, anchors, and nodes and be able to discuss both the potential and limitations of hypertext and hyperlinking systems

Since the explosion of the Internet and the World Wide Web, text has become more important than ever. Indeed, the native language of the Web is HTML (Hypertext Markup Language), originally designed to display simple text documents on computer screens, with occasional graphic images thrown in as illustrations (see Chapter 12 for more history of the Internet). Academic papers, magazine articles, complex instruction manuals, and even the contents of entire books are now available for reading with a web browser. Add a built-in function that links, with a click of the mouse, selected words and phrases to other related and perhaps more-detailed material (the "hypertext" part of HTML, discussed later in this chapter), and you can surf the Net in a medium much richer than the paper pages of a book.

First Person

The social impact of this text-biased medium on the way people access and use information will be profound as the Web matures further. In contrast to today's television medium, which consists of sound and images with a few text headlines "dumbed down" to the level of a perceived lowest common denominator of passive audience, the Web offers an active experience laden with enough choices to challenge even bright people

> With its penchant for inter-activity, multimedia too often ignores the power of narra-tive, of stories. There's really something to be said for documents with a beginning, middle, and end.
>
> ....
>
> Steven Levy, author of *Hackers, Artificial Life, Insanely Great, Unicorn's Secret,* and *Crypto*; Senior Editor and chief technology writer for *Newsweek*

who can read. More than television, with its 50 or 100 or even 400 chan-nels, the Web offers an explorer's paradise of billions of HTML docu-ments. Yahoo! Search once claimed, "Our index now provides access to over 20 billion items. For those who are curious, this update includes just over 19.2 billion web documents, 1.6 billion images, and over 50 million audio and video files." Until 2009, the search engines displayed (bragged about) the total number of documents they indexed, in the billions. These huge numbers were very inaccurate, it turned out, and they have ceased making precise statements about quantity. A trick in the Google search engine is to type in "site:" and the name of a domain. Google will tell you how many pages from that domain are indexed:

As bandwidth improves and more information is successfully embed-ded within these documents, developers of content will not escape the dif-ficult design issues discussed in Chapter 10. Who is the audience? What words should I use? What typeface is best?

The Power of Meaning

Even a single word may be cloaked in many meanings, so as you begin working with text, it is important to cultivate accuracy and conciseness in the specific words you choose. In multimedia, these are the words that will appear in your titles, menus, and navigation aids as well as in your narrative or content.

> I'd like to write something that comes from things the way wine comes from grapes.
>
> ....
>
> Walter Benjamin, Philosopher/Writer

Today's poets and songwriters concentrate text by distilling lengthy prose into few words heavy with meaning. Advertising wordsmiths render the meaning of entire product lines into an evocative single word, logo, or tag line. Multimedia authors weave words, symbols, sounds, and images, and then blend text into the mix to create integrated tools and interfaces for acquiring, displaying, and disseminating messages and data.

The words "Barbie," "green," and "lite" may each easily trigger a rush of different meanings. A piercing cry in the night, the sight of fire engines leaving your street as you steer your car into your neighborhood, the scent of drying kelp along the seashore, the feel of rough pine bark against your chest as you climb, fingernails on a chalkboard—all these raw sensory mes-sages are important only because of what they mean to you. Indeed, you alone know the words that will stop you dead in your tracks with anger, or, better, soothe you seductively over a quiet dinner for two. These words have meaning.

All of these examples demonstrate the following multimedia principle: it's important to design labels for title screens, menus, and buttons or tabs using words that have the most precise and powerful meanings to express what you need to say. Understand the subtle shadings. GO BACK! is more powerful than Previous; Quit is more powerful than Close. TERRIFIC! may work better than That Answer Was Correct. Experiment with the words you plan to use by letting others try them. If you have the budget, set up a focus group to have potential users experience your words. Watch them work. See if users flinch, balk, or click the Help button in confusion. See if they can even find the Help button.

Words and symbols in any form, spoken or written, are the most common system of communication. They deliver the most widely understood meaning to the greatest number of people—accurately and in detail. Because of this, they are vital elements of multimedia menus, navigation systems, keyword lists, and content. You will reward yourself and your users if you take the time to use excellent words. Let your poet loose!

TIP *Browse through a thesaurus. You will be surprised at the number of synonyms and related words that are closely associated to the word you start with, and you will certainly find the one word that most perfectly fits your need. The majority of today's popular word processors ship with a bundled electronic thesaurus; many are also available for free on the Internet.*

The Power and Irregularity of English

If you are reading this book in English, you might consider yourself lucky. A study by the British Council estimated that one billion people spoke English by the beginning of the second millennium as a first, second, or "foreign" language. English is the official or joint official language of more than 75 countries, and Algeria, when it dumped French in favor of English as the second language in schools, irritated a great many Parisian intellectuals. More than two-thirds of the world's scientists read English, and three-quarters of the world's mail is written in English. It is estimated that 80 percent of the world's information that is stored on computers is written in English. As Dutch-born Professor Boeree of Shippensburg University has said, "Unfortunately for learners of English, it still has several irregular verbs (e.g., to be and to have) and a large number of strong verbs (e.g. sing-sang-sung), plus a few irregular plurals (e.g. child-children, man-men...). Nevertheless, people around the world find English relatively easy, with one huge exception: English has the worst spelling of any language using the Latin alphabet!"

The most recent changes in English spelling have been driven by technology limits as SMS (Short Message Service) text messages commonly used by social networking sites such as Twitter and Facebook to

When we have a technical meeting with engineers coming from Germany, France, Spain, Sweden, Japan, and other countries, people say "Hello!" when they walk into the room; English is clearly the international common language of business and commerce and science. Sometimes the etiquette of polite speech is even more fascinating: when you have a room with a group of Germans talking to each other in German and suddenly a foreign visitor comes in, from one sentence to the other, they seamlessly switch to English.

Dipl.-Ing. Roland Cuny
Karlsruhe, Germany

communicate and "tweet" allow only about 160 characters per message (140 bytes). As today's most pervasive method of human-to-human data communication (more than three billion texters worldwide sending trillions of short text messages from phone to phone each year), users speaking many languages quickly developed word shortcuts to pack the most meaning into the fewest characters. NetLingo (www.netlingo.com) maintains a list of almost two thousand English acronyms and instant messaging jargon words such as XOXO (hugs & kisses), U (you), and NME (enemy). When assembled into a message, you might discover "were I a tear in ur eye i wood roll down onto ur lips. but if u were a tear in my eye i wood never cry as i wood be afraid 2 lose u!" With the arrival of MMS (Multimedia Messaging Service), which allows for 350,000-byte transmissions, perhaps these shortcut spellings will fade away. But perhaps not.

About Fonts and Faces

A **typeface** is a family of graphic characters that usually includes many type sizes and styles. A **font** is a collection of characters of a single size and style belonging to a particular typeface family. Typical font **styles** are boldface and italic. Your computer software may add other style **attributes**, such as underlining and outlining of characters. Type sizes are usually expressed in points; one **point** is 0.0138 inch, or about 1/72 of an inch. The font's size is the distance from the top of the capital letters to the bottom of the descenders in letters such as *g* and *y*. Helvetica, Times, and Courier are typefaces; Times 12-point italic is a font. In the computer world, the term font is commonly used when typeface or face would be more correct.

A font's size does not exactly describe the height or width of its characters. This is because the **x-height** (the height of the lowercase letter *x*) of two fonts may vary, while the height of the capital letters of those fonts may be the same (see Figure 2-1). Computer fonts automatically add space below the descender (and sometimes above) to provide appropriate line spacing, or **leading** (pronounced "ledding," named for the thin strips of lead inserted between the lines by traditional typesetters).
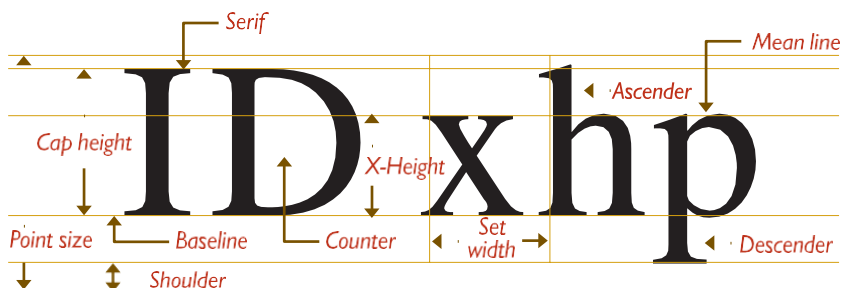
Figure 2-1   The measurement of type

Leading can be adjusted in most programs on both the Macintosh and the PC. Typically you will find this fine-tuning adjustment in the Text menu of image-editing programs or the Paragraph menu of word processing programs, though this is not an official standard. No matter where your application has placed the controls for leading, you will need to experiment with them to achieve the best result for your font. With a font editing program like Fontographer from Fontlab, Ltd. at www.fontlab.com (you'll see an example of it later in the chapter), adjustments can also be made along the horizontal axis of text. In this program the character metrics of each character and the kerning of character pairs can be altered. **Character metrics** are the general measurements applied to individual characters; **kerning** is the spacing between character pairs. When working with PostScript, TrueType, and Master fonts—but not bitmapped fonts—(see "Computers and Text" later in this chapter), the metrics of a font can be altered to create interesting effects. For example, you can adjust the body width of each character from regular to **condensed** to **expanded**, as displayed in this example using the Sabon font:

Regular
Condensed
Expanded

Or you can adjust the spacing between characters (**tracking**) and the kerning between pairs of characters:

Tighter Track   Av Av

Looser Track   Kerned   Unkerned

When it converts the letter *A* from a mathematical representation to a recognizable symbol displayed on the screen or in printed output (a process called **rasterizing**), the computer must know how to represent the letter using tiny square **pixels** (picture elements), or dots. It does this according to the hardware available and your specification, from a choice of available typefaces and fonts. Search for "free fonts." High-resolution monitors and printers can make more attractive-looking and varied characters because there are more fine little squares or **dots per inch (dpi)**. And today's broad selection of software fonts makes it easier to find the right typeface and

font for your needs. The same letter can look very different when you use different fonts and faces:

$$A \; \mathbf{A} \; \mathcal{A} \; A \; A \; A \; \mathbf{A} \; \mathcal{A} \; \mathbf{A}$$

Cases

In centuries when type was set by hand, the type for a single font was always stored in two trays, or *cases*; the upper tray held capital letters, and the lower tray held the small letters. Today, a capital letter is called **uppercase**, and a small letter is called **lowercase**.

TIP   *Studies have shown that words and sentences with mixed upper- and lowercase letters are easier to read than words or sentences in all caps (uppercase). While uppercase can make your message appear important or urgent, use this sparingly; in online messaging it's known as "SHOUTING" or "YELLING" and can be annoying, if not offensive.*

In some situations, such as for passwords, a computer is **case sensitive**, meaning that the text's upper- and lowercase letters must match exactly to be recognized. But nowadays, in most situations requiring keyboard input, all computers recognize both the upper- and lowercase forms of a character to be the same. In that manner, the computer is said to be **case insensitive**.

WARNING   *The directory names and filenames used in Uniform Resource Locator (URL) addresses on the Internet are case sensitive! Thus, http://www. timestream .com/info/people/biotay/biotay1.html points to a different directory and file than http://www.timestream.com/info/people/bioTay/biotay1.html. On the other hand, the record type (HTTP) and the domain name (www.timestream. com), and e-mail addresses (tay@timestream.com) as well, are usually case insensitive. Read more about addresses on the Internet in Chapter 12.*

Company and product names such as WordPerfect, OmniPage, PhotoDisc, FileMaker, and WebStar have become popular. Placing an uppercase letter in the middle of a word, called an **intercap**, is a trend that emerged from the computer programming community, where coders discovered they could better recognize the words they used for variables and commands when the words were lowercase but intercapped.

Serif vs. Sans Serif

Typefaces can be described in many ways, just as a home advertised by a realtor, a wine described by a food critic, or a political candidate's platform

can all be described in many ways. Type has been characterized as feminine, masculine, delicate, formal, capricious, witty, comic, happy, technical, newsy—you name it. But one approach for categorizing typefaces is universally understood, and it has less to do with the reader's response to the type than it does with the type's mechanical and historical properties. This approach uses the terms **serif** and **sans serif**.

Serif versus sans serif is the simplest way to categorize a typeface; the type either has a serif or it doesn't (*sans* is French for "without"). The serif is the little decoration at the end of a letter stroke. Times, New Century Schoolbook, Bookman, and Palatino are examples of serif fonts. Helvetica, Verdana, Arial, Optima, and Avant Garde are sans serif. Notice the difference between serif (on the left) and sans serif:
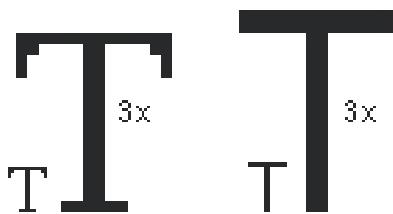
On the printed page, serif fonts are traditionally used for body text because the serifs are said to help guide the reader's eye along the line of text. Sans serif fonts, on the other hand, are used for headlines and bold statements. But the computer world of standard, 72 dpi monitor resolution is not the same as the print world, and it can be argued that sans serif fonts are far more legible and attractive when used in the small sizes of a text field on a screen. Indeed, careful selection of a sans serif font designed to be legible in the small sizes (such as Tahoma or Verdana) makes more sense when you are presenting a substantial amount of text on the screen. The Times font at 9-point size may look too busy and actually be difficult and tiring to read. And a large, bold serif font for a title or headline can deliver a message of elegance and character in your graphic layout. Use what is right for your delivery system, which may not necessarily be the same as what is right when you're printing the material to paper. This is because when you're printing out what you create on a computer monitor, **WYSIWYG** (What You See Is What You Get) is more of a goal than an absolute fact.

Using Text in Multimedia

Imagine designing a project that used no text at all. Its content could not be at all complex, and you would need to use many pictures and symbols to train your audience how to navigate through the project. Certainly voice and sound could guide the audience, but users would quickly tire of this because greater effort is required to pay attention to spoken words than to browse text with the eye.

A single item of menu text accompanied by a single action (a mouse click, keystroke, or finger pressed to the monitor) requires little training and is clean and immediate. Use text for titles and headlines (what it's all about), for menus (where to go), for navigation (how to get there), and for content (what you see when you get there).

TIP   *In designing your navigation system, bring the user to a particular destination with as few actions and as short a wait as possible. If the user never needs the Help button to get there or never has to click the Back button when at a dead end, you're doing everything right!*

Designing with Text

Computer screens provide a very small workspace for developing complex ideas. At some time or another, you will need to deliver high-impact or concise text messages on the computer screen in as condensed a form as possible. From a design perspective, your choice of font size and the number of headlines you place on a particular screen must be related both to the complexity of your message and to its venue.

If your messages are part of an interactive project or web site where you know the user is seeking information, you can pack a great deal of text information onto the screen before it becomes overwhelmingly busy. Seekers want dense material, and while they travel along your navigational pathways, they will scroll through relevant text and study the details. Here is where you must strike a balance, however. Too little text on a screen requires annoying page turns and unnecessary mouse clicks and waits; too much text can make the screen seem overcrowded and unpleasant.

On the other hand, if you are creating presentation slides for public-speaking support, the text will be keyed to a live presentation where the text accents the main message. In this case, use bulleted points in large fonts and few words with lots of white space. Let the audience focus on the speaker at the podium, rather than spend its time reading fine points and subpoints projected on a screen.

TIP   *A lengthy text document read by a web browser may scroll for hundreds of lines without annoying the user because it's expected. As a rule of thumb, however, try to make your web pages no longer than one-and-a-half to two screenfuls of text. On a 1024 × 768-pixel monitor, for example, you have about 600 pixels in height to work with before scrolling is necessary while viewing web content in a browser. Limit the width of your lines by using columns—reading a line of text across an entire 21-inch monitor screen is cumbersome, if not uncomfortable, For printing text documents, provide a separate link to a complete document in either*

plain text (.txt), rich text format (.rtf), word processor format (.doc, .odt, or .wpd), or Adobe PDF format (.pdf) instead of relying on a browser's print facilities. It is often more convenient to print and read a document than to scroll through many pages of text on a monitor.

Choosing Text Fonts

Picking the fonts to use in your multimedia presentation may be somewhat difficult from a design standpoint. Here again, you must be a poet, an advertising psychologist, and also a graphic designer. Try to intuit the potential reaction of the user to what is on the screen. Here are a few design suggestions that may help:

- For small type, use the most legible font available. Decorative fonts that cannot be read are useless, as shown at right.

- Use as few different faces as possible in the same work, but vary the weight and size of your typeface using italic and bold styles where they look good. Using too many fonts on the same page is called ransom-note typography. Visit http://lifehacker.com/software/writing/faster-ransom-notes-for-busy-kidnappers-248692.php to make your own ransom notes.

- In text blocks, adjust the leading for the most pleasing line spacing. Lines too tightly packed are difficult to read.

- Vary the size of a font in proportion to the importance of the message you are delivering.

- In large-size headlines, adjust the spacing between letters (kerning) so that the spacing feels right. Big gaps between large letters can turn your title into a toothless waif. You may need to kern by hand, using a bitmapped version of your text.

- To make your type stand out or be more legible, explore the effects of different colors and of placing the text on various backgrounds. Try reverse type for a stark, white-on-black message.

- Use anti-aliased text where you want a gentle and blended look for titles and headlines. This can give a more professional appearance. **Anti-aliasing** blends the colors along the edges of the letters (called **dithering**) to create a soft transition between the letter and its background.

- T ry drop caps (like the T to the left) and initial caps to accent your words. Most word processors and text editors will let you create drop caps and SMALL CAPS in your text. Adobe and others make initial caps (such as the one shown to the right from Adobe, called Gothic). The letters are actually carefully drawn artwork and are available in special libraries as encapsulated PostScript files (EPSF).

Can you read me?

Can you read me?

- Coding an initial cap for a web page is simple. Use CSS attributes:

```
p:first-letter { font-size: 200%; }
p:first-line { line-height: 100%; }
```

- If you are using centered type in a text block, keep the number of lines and their width to a minimum.
- For attention-grabbing results with single words or short phrases, try graphically altering and distorting your text and delivering the result as an image. Wrap your word onto a sphere, bend it into a wave, or splash it with rainbow colors.
- Experiment with drop shadows. Place a copy of the word on top of the original, and offset the original up and over a few pixels. Then color the original gray (or any other color). The word may become more legible and provide much greater impact. With web sites, shadowed text and graphics on a plain white background add depth to a page. Surround headlines with plenty of white space. **White space** is a designer's term for roomy blank areas, while programmers call the invisible character made by a space (ASCII 32) or a tab (ASCII 9) white space. Web designers use a nonbreaking space entity ( ) to force spaces into lines of text in HTML documents.
- Pick the fonts that seem right to you for getting your message across, then double-check your choice against other opinions. Learn to accept criticism.
- Use meaningful words or phrases for links and menu items.
- Text links on web pages can accent your message: they normally stand out by color and underlining. Use link colors consistently throughout a site, and avoid iridescent green on red or purple on puce.
- Bold or emphasize text to highlight ideas or concepts, but do not make text look like a link or a button when it is not.
- On a web page, put vital text elements and menus in the top 320 pixels. Studies of surfer habits have discovered that only 10 to 15 percent of surfers *ever* scroll *any* page.

If you are older than eleven years, never *ever* use the Comic Sans face or the "fantasy" CSS attribute on a web page.

. . . .

Brad Borch, Designer

NOTE *Characters identified in a particular font (say, Garamond 10-point) do not always look the same on a Macintosh as they do on Windows display monitors. Typically, what is called 12-point on a Macintosh will be a 10- or 9-point size in Windows. And the actual shape of the characters may be different (see Figure 2-2). Take care to visually test the flow of your text on all platforms.*

Uppercase 10 pt Garamond T on a Macintosh

Uppercase 10 pt Garamond T in Windows
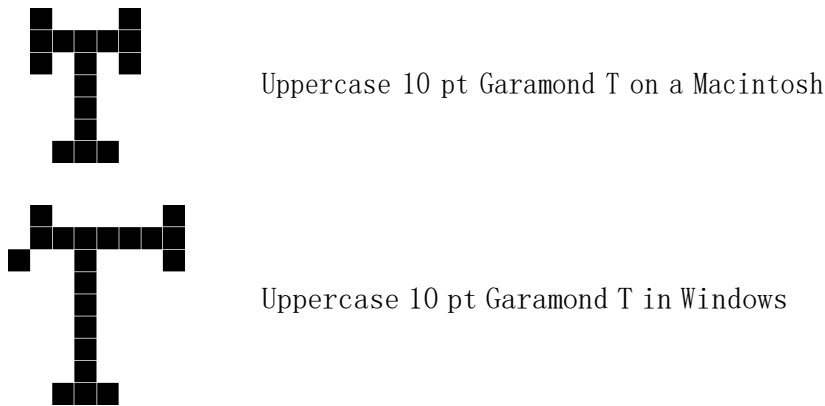
Figure 2-2 Examples of Garamond typeface displayed on a Macintosh (top) and in Windows

Installed Fonts Before you can use a font, it must be recognized by the computer's operating system. If you want to use fonts other than those installed with your basic operating system, you will need to install them. When you install applications, fonts are often added to your collection.

Philip Shaw at www.codestyle.org maintains a useful list of the most commonly installed fonts for both Mac and Windows, shown in Figure 2-3. The most commonly reported fonts available on Windows computers are Tahoma, Microsoft Sans Serif, Verdana, and Courier New. On Macs expect Helvetica, Lucida Grande, and Courier.

My parents offered my brother and sister $50 to teach me the alphabet, but that didn't work. So I flunked second grade. I had the same nun again, and she was mean. She paddled me for two years, but I still didn't learn the alphabet or how to read. By the time I was 15 or 16, I could get by in class with reading. But I could never spell. I was a woodshop major in high school, and my typical report card was two Cs, three Ds, and an F. I just got used to it. Though reading is still difficult for me, I do like readers. I like the written language because I like photocopying. I believe in double-spacing, since it helps my business!

Paul Orfalea,
founder of Kinko's,
discussing his reading disability

100.00%	Helvetica	98.54%	Arial Black	94.25%	Times New Roman
99.71%	Lucida Grande	98.49%	Lucida Sans Unicode	94.04%	DejaVu Sans Mono
99.71%	Tahoma	98.39%	Palatino Linotype	93.97%	Arial Black
99.70%	Microsoft Sans Serif	97.91%	Franklin Gothic Medium	93.47%	Nimbus Sans L
99.61%	Verdana	97.41%	Arial	92.24%	Gill Sans
99.56%	Courier New	97.19%	URW Chancery L	91.88%	Nimbus Roman No9 L
99.43%	Monaco	97.13%	Times	91.67%	Courier New
99.27%	Trebuchet MS	97.13%	Verdana	91.09%	Impact
99.22%	Arial	96.88%	Century Schoolbook L	91.06%	Bitstream Charter
99.14%	Geneva	96.88%	URW Gothic L	91.02%	DejaVu Sans
99.12%	Lucida Console	96.56%	URW Bookman L	90.80%	Futura
99.07%	Comic Sans MS	95.63%	Nimbus Mono L	90.52%	Arial Rounded MT Bold
99.07%	Times New Roman	95.62%	Sylfaen	90.23%	Andale Mono
98.85%	Courier	95.11%	Helvetica Neue	90.23%	Apple Chancery
98.83%	Impact	95.00%	URW Palladio L		
98.68%	Georgia	94.54%	Trebuchet MS		

Figure 2-3 The most commonly installed fonts on Windows, Macintosh, and Linux (March, 2010)

Use of **Cascading Style Sheets (CSS)**, preferred over the deprecated HTML <font> tag, allows you to be quite precise about font faces, sizes, and other attributes (see Table 2-1).

Property	Value	Description
color	color	Sets the color of text
direction	ltr rtl	Sets the text direction. Use with Unicode-bidi property
line-height	normal number length %	Sets the distance between lines
letter-spacing	normal length	Increases or decreases space between characters
text-align	left right center justify	Aligns the text in an element
text-decoration	none underline overline line-through blink	Adds decoration to text
text-indent	length %	Indents the first line of text in an element
text-shadow	none color length	
text-transform	none capitalize uppercase lowercase	Controls the letters in an element
unicode-bidi	normal embed bidi-override inherit	Use for languages that run from left to right or both. Works with direction property
vertical-align	baseline sub super top text-top middle bottom text-bottom length %	Sets the vertical alignment of an element

Table 2-1   Available Text Properties Using Cascading Style Sheets (CSS)

Property	Value	Description
white-space	normal pre nowrap	Sets how white space inside an element is handled
word-spacing	normal length	Increases or decreases space between words

Table 2-1 Available Text Properties Using Cascading Style Sheets (CSS) *(Continued)*

WARNING   *Although in HTML and using CSS you can specify a base font size, color, and other attributes for displaying text on a web page, you still have no guarantee that the font is installed in the user's system. If it is missing, a browser will attempt to substitute a similar font, but the look is not guaranteed to be the same as the one you have designed. In the font-family property you should add a generic catch-all such as "serif" or "sans serif" to cover an instance when your specified fonts are unavailable. If the right look is important to you, provide a way to download the font to the end user's computer. If the look is crucial, use a bitmap image of the text drawn in the selected font.*

In a font-family list, you can include the names of both Windows and Macintosh fonts; if a font is not found on the local computer, the browser's preference-specified default font will be used.

```
h1 {font-family: Helvetica, Arial, Verdana, sans-serif;}
```

To address copyright and cross-platform font issues, Microsoft hired type designer Matthew Carter of Carter & Cone Type, Inc. (http://new. myfonts.com/foundry/Carter_and_Cone_Type_Inc./) to design a serif font and a sans serif font that display well on a computer monitor. The two fonts Carter designed are Georgia (the serif font) and Verdana (the sans serif font), both of which Microsoft makes available for free. Since they are freely available and designed specifically for screen display, many designers recommend them as a "first choice" when specifying font faces for web pages.

Animating Text   There are plenty of ways to retain a viewer's attention when displaying text. For example, you can animate bulleted text and have it "fly" onto the screen. You can "grow" a headline a character at a time. For public speakers, simply highlighting the important text works well as a pointing device. When there are several points to be made, you can stack keywords and flash them past the viewer in a timed automated sequence (as in the roadside Burma Shave ads—signs placed every half mile or so along the highway, each offering the motorist just a few more words toward a complete slogan). You might fly in some keywords, dissolve others, rotate or spin others, and so forth, until you have a dynamic bulleted list of words

that is interesting to watch. But be careful—don't overdo the special effects, or they will become boring. For simple presentations, PowerPoint (see the custom Animation Palette at left) has bells and whistles to reveal a line of text one word or one letter at a time, or to animate an entire line.

Symbols and Icons

Symbols are concentrated text in the form of stand-alone graphic constructs. Symbols convey meaningful messages. The trash can symbol, for instance, tells you where to throw away old files; the hourglass cursor tells you to wait while the computer is processing. Though you may think of symbols as belonging strictly to the realm of graphic art, in multimedia you should treat them as text—or visual words—because they carry meaning. Symbols such as the familiar trash can and hourglass are more properly called **icons**: these are symbolic representations of objects and processes common to the graphical user interfaces of many computer operating systems.

Certainly text is more efficient than imagery and pictures for delivering a precise message to users. On the other hand, pictures, icons, moving images, and sounds are more easily recalled and remembered by viewers. With multimedia, you have the power to blend both text and icons (as well as colors, sounds, images, and motion video) to enhance the overall impact and value of your message.

Word meanings are shared by millions of people, but the special symbols you design for a multimedia project are not; these symbols must be learned before they can be useful message carriers. Some symbols are more widely used and understood than others, but readers of even these common symbols had to grow accustomed to their meanings. Learning a system of symbols can be as difficult as lessons in any foreign language.

WARNING *Do not be seduced into creating your own language of symbols and icons.*

Here are some symbols you may already know:
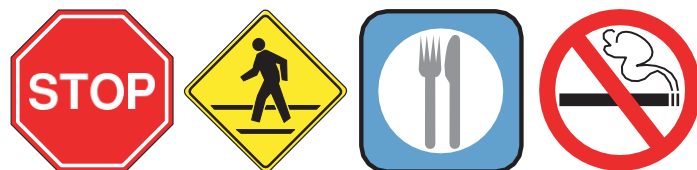
And here are some astronomer's symbols from the days of Kepler and Galileo that you may not have learned. Still in heavy use by astrologers, they represent the 12 constellations of the zodiac:

But why are there 13 icons in the preceding illustration? Or did you notice? Find the sign for the planet Venus among the constellations. Not easy if you are unfamiliar with the meaning of these symbols.

When early computers began to display bitmaps as well as lines of text, there was a flurry of creative attempts by graphic artists to create interesting navigational symbols to alleviate the need for text. The screens were pure graphic art and power—all lines and angles and stunning shadows. But many users were frustrated because they could not get to the data right away and had to first wade through help and guidance material to learn the symbols. In this context it is clearly safer, from a product design point of view, to combine symbols with text cues. This ensures the graphic impact of the symbols but allows prompting the user on their meaning. The Macintosh trash can icon, incidentally, also has a text label, "Trash," just in case people don't get the idea from the symbol. Indeed, long arguments occur among designers dealing with clarity of meaning and ambiguity: the Macintosh trash can is used to obliterate files but is also used to eject discs and mounted volumes, which are not "trashed" when ejected.

Nonetheless, a few symbols have emerged in the interactive multimedia world as an accepted lexicon of navigation cues that do not need text. These symbols are by no means universal, but Figure 2-4 shows some that have roots from the days of teletypewriters, others from early computer software and hardware development, and yet others from the consumer electronics world. Even for these "common symbols," text labels are often added to the graphic icons to avoid uncertainty. Microsoft's Word and Adobe's Acrobat, for example, use an icon representing a 3.5" diskette to indicate "Save to Disk." While this storage medium has been relegated to museums, the iconic meaning persists.
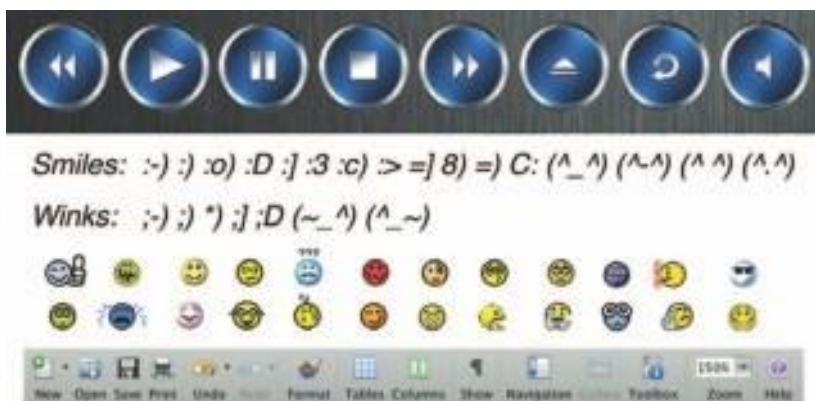
Figure 2-4 Some symbols, like Play, Pause, and Fast Forward, are easily recognized but may still be more precise with text titles. "Smiley" symbols, or emoticons, used in Internet conversation to express mood, once were made up entirely of text and punctuation characters. These have been replaced by both custom-made graphic symbols and official type characters as part of the international Unicode library (Block 1F600..1F64F). Indeed, sometimes it's difficult to know what a smiley really *means*! ☺

Menus for Navigation

An interactive multimedia project or web site typically consists of a body of information, or content, through which a user navigates by pressing a key, clicking a mouse, or pressing a touch screen. The simplest menus consist of text lists of topics. Users choose a topic, click it, and go there. As multimedia and graphical user interfaces become pervasive in the computer community, certain intuitive actions are being widely learned.

For example, if there are three words on a computer screen, the typical response from the user, without prompting, is to click one of these words to evoke activity. Sometimes menu items are surrounded by boxes or made to look like push buttons. Or, to conserve space, text such as Throw Tomatoes, Play Video, and Press to Quit is often shortened to Tomatoes, Video, and Quit. Regardless, the user deduces the function.

Text is helpful to users to provide persistent cues about their location within the body of content. When users must click up and down through many layers of menus to reach their goal, they may not get lost, but they may feel transported to the winding and narrow streets of a medieval city where only the locals know the way. This is especially true if the user moves slowly from screen to screen en route to that goal. If Throw Tomatoes leads to Red or Green, then to California or Massachusetts, then to President or Vice President, then to Forehead or Chest, then to Arrested or Got Away, and so on, the user can end up tangled in the branches of a navigation tree without cues or a map. However, if an interactive textual or symbolic list of the branches taken (all the way from the beginning) is continuously displayed, the user can at any time skip intervening steps in a nonlinear manner or easily return to one of the previous locations in the list.

> Tomatoes
> > Red
> > > Massachusetts
> > > > President
> > > > > Chest
> > > > > > Arrested

The more locations included in the menu list, the more options available for navigation. On the Web, designers typically place on every page at least a Main Menu of links that offers the user a handhold and mechanism for returning to the beginning. Often they will also place a list, such as

Home > Store > Home & Garden > Patio & Grilling > Gas Grills & Accessories > Gas Grills > Burners

along the tops of storefronts to let shoppers know where they are currently located within the store. Inventive interface developers first referred to this

array of menu items as "breadcrumbs," for they represent a map of the virtual forest and often the "trail" users have taken, like the edible markers so intelligently placed by Hänsel und Gretel along the way to the witch's house in the Brother Grimms' famous fairytale.

Navigation methodologies and navigation maps are discussed in greater detail in Chapter 13.

TIP *Avoid using more than a few levels of GO BACKs or RETURNs if you do not provide a map. Too much tunneling in and out with repetitive mouse clicks will frustrate users and discourage exploration. Display a perpetual menu of interactive text or symbolic cues so users can always extricate themselves from any place in the tunnel. In a web browser, this can be handled by a Back or Previous button containing a history of pages visited.*

Buttons for Interaction

In most modern cultures a doorbell is recognized by its context (next to the door itself, possibly lit); but if you grew up in a high-rise apartment, you may have seen 50 or more buttons at the entrance. Unless you knew that yours was the third from the top on the left, you could find your button only by reading the printed or scrawled name beside it. And certainly your Aunt Barbara needed this text cue to avoid having to push the Help button, which in this case rang in the building superintendent's apartment.

In multimedia, **buttons** are the objects, such as blocks of text, a pretty blue triangle, or a photograph, that make things happen when they are clicked. They were invented for the sole purpose of being pushed or prodded with cursor, mouse, key, or finger—and to manifest properties such as highlighting or other visual or sound effects to indicate that you hit the target. On the Web, text and graphic art may be buttons. Buttons and the art of button design and human interaction are discussed in detail in Chapter 10. For now, remember that the rules for proper selection of text and fonts in your projects apply to buttons as well as headlines, bulleted items, and blocks of text.

The automatic button-making tools supplied with multimedia and HTML page authoring systems are useful, but in creating the text for you, they offer little opportunity to fine-tune the look of the text. Character- and word-wrap, highlighting, and inverting are automatically applied to your buttons, as needed, by the authoring system. These default buttons and styles may seem overused or trite, but by using common button styles, shapes, borders, and highlights, you increase the probability that users will know what to do with them—especially when they are also labeled.

Pick a font for buttons that is, above all, legible; then adjust the text size of the labels to provide adequate space between the button's rim and

When I was four years old, a button was the little plastic knob mounted in brass next to the front door. When I pushed it, a muffled ringing sound worked its way through the house from the kitchen. Sometimes I would push the button a lot and somebody would always come to the door. As an adult, I'm still pushing buttons to make things happen.

Ann Stewart, Multimedia Developer, Smyrna, Tennessee

the text. You can choose from many styles of buttons and several standard methodologies for highlighting. You will want to experiment to get the right combinations of font, spacing, and colors for just the right look.

In most authoring platforms, it is easy to make your own buttons from bitmaps or drawn objects. In a message-passing authoring system, where you can script activity when the mouse button is up or down over an object, you can quickly replace one bitmap with another highlighted or colored version of the bitmap to show that the button has been "pushed" or that the mouse is hovering over it. Making your own buttons from bitmaps or drawn objects gives you greater design power and creative freedom and also ensures against the missing font problem. On the other hand, this custom work may require a good deal more time. You can also implement these graphic image **rollovers** on web pages, using JavaScript to replace the image when there is a MouseOver or hover event; when a MouseUp event occurs on the image, the user can be directed to another page (see "Clickable Buttons" in Chapter 13). Typically the destination address (URL) is displayed in the status bar of the browser when the mouse is over a linked image or text element. So users know first if the mouse is over an active button and second, where that button will take them if they click.

Whether default or custom, treat the design and labeling of your buttons as an industrial art project: buttons are the part of your project the user touches.

Fields for Reading

You are already working uphill when you design text to be read on the screen. Experiments have shown that reading text on a computer screen is slower and more difficult than reading the same text in hard-copy or book form. Indeed, many users, it seems, would rather print out their reports and e-mail messages and read them on paper than page through screens of text. Reading hard copy is still more comfortable.

WARNING *Research has shown that when people read text on a computer screen they blink only 3 to 5 times per minute, but they blink 20 to 25 times per minute when reading text on paper. This reduced eye movement may cause dryness, fatigue, and possibly damage to the eyes. Research also suggests that monitors should be placed lower than eye level.*

Unless the very purpose of your multimedia project or web site is to display large blocks of text, try to present to the user only a few paragraphs of text per page. Use a font that is easy to read rather than a prettier font that is illegible. Try to display whole paragraphs on the screen, and avoid

breaks where users must go back and forth between pages to read an entire paragraph.

Portrait vs. Landscape

Traditional hard-copy and printed documents in the taller-than-wide orientation are simply not readable on a typical monitor with a wider-than-tall aspect ratio. The taller-than-wide orientation used for printed documents is called **portrait**; this is the 8.5-by-11-inch size unique to the United States or the internationally designated standard A4 size, 8.27 by 11.69 inches. The wider-than-tall orientation normal to monitors is called **landscape**. Shrinking an 11-inch-tall portrait page of text into your available monitor height usually yields illegible chicken tracks. There are four possible solutions if you are working with a block of text that is taller than what will fit:

- Put the text into a scrolling field. This is the solution used by web browsers.
- Put the text into a single field or graphic image in a project window, and let the user move the whole window up or down upon command. This is most appropriate when you need to present text with page breaks and formatting identical to the printed document. This is used by Adobe's popular Acrobat Reader for displaying PDF files.
- Break the text into fields that fit on monitor-sized pages, and design control buttons to flip through these pages.
- Design your multimedia project for a special monitor that is taller than it is wide (portrait) or a normal monitor rotated onto its side. Dedicated "page view" monitors are expensive; they are used for commercial print-based typesetting and layout. Video controllers can rotate the text display for you:

Electronic ink is a proprietary material that is processed into a film for integration into electronic displays. Although revolutionary in concept, electronic ink is a straightforward fusion of chemistry, physics and electronics to create this new material. The principal components of electronic ink are millions of tiny microcapsules, about the diameter of a human hair. In one incarnation, each microcapsule contains positively charged white particles and negatively charged black particles suspended in a clear fluid. When a negative electric field is applied, the white particles move to the top of the microcapsule where they become visible to the user. This makes the surface appear white at that spot. At the same time, an opposite electric field pulls the black particles to the bottom of the microcapsules where they are hidden. By reversing this process, the black particles appear at the top of the capsule, which now makes the surface appear dark at that spot.

To form an E Ink electronic display, the ink is printed onto a sheet of plastic film that is laminated to a layer of circuitry. The circuitry forms a pattern of pixels that can then be controlled by a display driver. These microcapsules are suspended in a liquid "carrier medium" allowing them to be printed using existing screen printing processes onto virtually any surface, including glass, plastic, fabric, and even paper. Ultimately electronic ink will permit most any surface to become a display, bringing information out of the confines of traditional devices and into the world around us.

From E Ink Corporation
(www.eink.com)

eBooks, E-Readers, and Tablet Computers

eBooks are books digitized and formatted to be read using an eReader. eReaders display text, graphics, and multimedia—most using E Ink screens between five and ten inches diagonal, some with touch screens, some with wi-fi and 3G connectivity, and all with varying and sometimes non-standard input formats (see Table 2-2). Among eBook devices are the Apple iPad, Arrow, Astak EZ Reader, Barnes & Noble Nook, BeBook Neo, COOL-ER, Cybook, Foxit eSlick, iLiad, iRex Digital Reader, Jetbook, Kindle, and the Sony Reader.

Format	Filename Extension
Plain text	.txt
HTML	.html
PostScript	.ps
Portable Document Format	.pdf
DjVu	.djvu
EPUB	.epub
FictionBook	.fb2
Mobipocket	.prc, .mobi
Kindle	.azw
eReader	.pdb
Broadband eBook	.lrf, .lrx
WOLF	.wol
Tome Raider	.tr2, .tr3
ArghosReader	.aeh
Microsoft Reader	.lit
Multimedia EBook	.exe

Table 2-2   E-Readers Can Read Many File Formats, Some Proprietary

The e-Ink screen is a technology for "electronic paper," designed to imitate the appearance of ordinary ink on paper (see sidebar). e-Ink displays can be used in direct sunlight and boast a long battery life. But e-Ink is not required to read eBooks, which can be viewed on most computers and many Personal Digital Assistants (PDAs) and mobile phones using format converting/reading software such as Adobe Digital Editions.

HTML Documents

The standard document format used for displaying text pages on the Web is called Hypertext Markup Language (HTML). In an HTML document you can specify typefaces, sizes, colors, and other properties by "marking up" the text in the document with **tags**. The process of marking up documents or "styling" them is simple: Where you want text to be bold, surround it with the tags <B> and </B> or <STRONG> and </STRONG>; the text between the tags will then be displayed by your browser application in bold type. Where you have a header, surround it with <H1> and </H1>; for an ordered list of things (1, 2, 3, … or a, b, c, …, etc.), surround your list with <OL> and </OL>. There are many tags you can use to lay out a page. Cascading Style Sheets (CSS) work in conjunction with HTML and provide fine tuning and control of text and layout. How HTML and CSS work is discussed in greater detail in Chapters 12 and 13, and there are many good learning guides and references available on the Web.

www.w3.org/TR/html4/

www.w3.org/MarkUp/Guide/

www.w3schools.com/html/default.asp

www.w3.org/Style/CSS/

Check out these web sites for more information about HTML

The remarkable growth of the Web is straining the "old" designs for displaying text on computers. Indeed, while marked-up text files (HTML documents) remain at the foundation of Web activity, when you visit a well-designed web site, you often discover graphic images, animations, and interactive work-arounds contrived to *avoid* displaying text. The neat paragraphs, indented lists, and formats for text documents for which HTML was originally intended are evolving into multimedia documents, not text documents, and the original HTML method and standard is consequently suffering great stress.

HTML Version 5 is a redesign that stretches into a multimedia delivery tool, making HTML no longer just a text display tool with assorted attachments and plugged-in objects. A new <canvas> element allows a box to be defined on a web page in which 2-D graphics can be drawn under program control. Video and audio (timed media) playback is supported. Still, HTML doesn't provide you with much flexibility to make pretty text elements, which are often done as graphical bitmaps placed within the HTML document's layout with image tags, <IMG>, or incorporated into Flash animation files. Indeed, using plain HTML, you do not know what

font a reader will use to view your document—the default display font is a preference that can be set in the viewer's browser, which knows it's installed on that viewer's machine. So some viewers may read your words in serif Times Roman, others in sans serif Helvetica or Arial.

Computers and Text

Very early in the development of the Macintosh computer's monitor hardware, Apple chose to use a resolution of 72 pixels per inch. This matches the standard measurement of the printing industry (72 points per inch) and allows desktop publishers and designers to see on the monitor what their printed output will look like (WYSIWYG). In addition, Apple made each pixel square-shaped, providing even measurements in all directions. Until the Macintosh was invented, and the VGA video standard set for the PC (at 96 pixels per inch), pixels were typically taller than they were wide. The aspect ratio for a pixel on older EGA monitors, for example, is 1.33:1, taller than it is wide. VGA and SVGA monitor resolutions for both Macintosh and Windows display pixels at an aspect ratio of 1:1 (square).

The Font Wars Are Over

In 1985, the desktop publishing revolution was spearheaded by Apple and the Macintosh computer, in combination with word processing and page layout software products that enabled a high-resolution 300 dpi laser printer using special software to "draw" the shapes of characters as a cluster of square pixels computed from the geometry of the character. This special software was the **Adobe PostScript** page description and **outline font** language. It was licensed by Apple and included in the firmware of Apple's LaserWriter laser printer.

PostScript is really a method of describing an image in terms of mathematical constructs (Bézier curves), so it is used not only to describe the individual characters of a font but also to describe entire illustrations and whole pages of text. Because each PostScript character is a mathematical formula, it can be easily scaled bigger or smaller so it looks right whether drawn at 24 points or 96 points, whether the printer is a 300 dpi LaserWriter or a high-resolution 1200, 2400, or even 3600 dpi image setter suitable for the finest print jobs. And the PostScript characters can be drawn much faster than in the old-fashioned way. Before PostScript, the printing software looked up the character's shape in a bitmap table containing a representation of the pixels of every character in every size. PostScript quickly became the de facto industry font and printing standard for desktop publishing and played a significant role in the early success of Apple's Macintosh computer.

There are two kinds of PostScript fonts: Type 3 and Type 1. Type 3 font technology is *older* than Type 1 and was developed for output to printers; it is rarely used by multimedia developers. There are currently over 6,000 different Type 1 typefaces available. which are special instructions for grid-fitting to help improve resolution. Hints can apply to a font in general or to specific characters at a particular resolution.

Other companies followed Adobe into the desktop publishing arena with their own proprietary and competitive systems for scalable outline fonts. In 1989, Apple and Microsoft announced a joint effort to develop a "better and faster" quadratic curves outline font methodology, called **TrueType**. In addition to printing smooth characters on printers, True-Type would draw characters to a low-resolution (72 dpi or 96 dpi) monitor. Furthermore, Apple and Microsoft would no longer need to license the PostScript technology from Adobe for their operating systems. Because TrueType was based on Apple technology, it was licensed to Microsoft. Adobe and Microsoft then developed a new and improved font management system incorporating the best features of both PostScript and TrueType, and by 2007, **OpenType** became a free, publicly available international standard. The font wars were over.

WARNING   *TrueType, OpenType, and PostScript fonts do not display (or print) exactly the same, even though they may share the same name and size. The three technologies use different formulas. This means that word-wrapping in a text field may change. So if you build a field or a button that precisely fits text displayed with a PostScript font, be aware that if you then display it with the same font in TrueType or OpenType, the text may be truncated or wrapped, wrecking your layout.*

Font Foundries

Today collections of fonts are available through retail channels or directly from their manufacturers. Typefaces are created in a **foundry**, a term much like case, that has carried over from times when lead was poured into molds to make letter faces. There is also a special interest group (SIG) at America Online (go to Computing:Software Libraries:Desktop & Web Publishing Forum:Fonts) where people who enjoy designing and making interesting fonts post them for others to download—hundreds and hundreds of them with names like Evil of Frankenstein, CocaCola, Kerouac, LED, PonchoVia (sic), Spaghetti, TreeFrog, and Sassy. When you purchase some applications, such as CorelDraw or Adobe Illustrator, many extra fonts are included for free.

www.typequarry.com/
www.oldfonts.com/
www.myfonts.com/
www.bitstream.com/
www.will-harris.com/

Commercial type foundries and font sites. These gateways lead to a discussion of fonts and where to find them. With *Esperfonto*, Will Harris provides an interesting tool for making font decisions: Casual or Formal, Body or Display, Friendly or Serious, Cool or Warm, Modern or Traditional.

WARNING *It is easy to spend hours and hours downloading neat and interesting fonts; they are like the midnight snack table on a Caribbean cruise liner—ice carvings and delectable goodies laid out as far as the eye can see.*

Character Sets and Alphabets

Knowing that there is a wide selection of characters available to you on your computer and understanding how you can create and use special and custom-made characters will broaden your creative range when you design and build multimedia projects.

The ASCII Character Set

The **American Standard Code for Information Interchange (ASCII)** is the 7-bit character coding system most commonly used by computer systems in the United States and abroad. ASCII assigns a number or value to 128 characters, including both lower- and uppercase letters, punctuation marks, Arabic numbers, and math symbols. Also included are 32 control characters used for device control messages, such as carriage return, line feed, tab, and form feed.

ASCII code numbers always represent a letter or symbol of the English alphabet, so that a computer or printer can work with the number that represents the letter, regardless of what the letter might actually look like on the screen or printout. To a computer working with the ASCII character set, the number 65, for example, always represents an uppercase letter *A*. Later, when displayed on a monitor or printed, the number is turned into the letter.

ASCII was invented and standardized for analog teletype communication early in the age of bits and bytes. The capabilities of the technology have now moved far beyond the original intent of the standard, but because millions of installed computers and printers use ASCII, it is difficult to set any new standards for text without the expense and effort of replacing existing hardware. At least, for these 128 characters, most computers and printers share the same values.

The Extended Character Set

A byte, which consists of eight bits, is the most commonly used building block for computer processing. ASCII uses only seven bits to code its 128 characters; the eighth bit of the byte is unused. This extra bit allows another 128 characters to be encoded before the byte is used up, and computer systems today use these extra 128 values for an extended character set. The extended character set is most commonly filled with ANSI (American National Standards Institute) standard characters, including often-used symbols, such as ¢ or ∞, and international diacritics or alphabet characters, such as *ä* or *ñ*. This fuller set of 255 characters is also known as the ISO-Latin-1 character set; it is used when programming the text of HTML web pages.

NOTE   *The rules for encoding extended characters are not standardized. Thus ASCII value 165, for example, may be a bullet (•) character on the Macintosh or the character for Japanese yen (¥) in Windows (ANSI).*

Unicode

As the computer market has become more international, one of the resulting problems has been handling the various international language alphabets. It was at best difficult, and at times impossible, to translate the text portions of programs from one script to another. For example, the differences between the Latin script (also known as "Roman") used by western European writers and the kanji script used by Japanese writers made it particularly challenging to transfer innovative programs from one market to another.

Since 1989, a concerted effort on the part of linguists, engineers, and information professionals from many well-known computer companies has been focused on a 16-bit architecture for multilingual text and character encoding. Called **Unicode**, the original standard accommodated up to about 65,000 characters to include the characters from all known languages and alphabets in the world.

Figure 2-5 Writing systems currently in use around the world. Unicode provides a consistent methodology for encoding the characters of any alphabet.

While 65,000 characters are sufficient for encoding most of the many thousands of characters used in major languages of the world, the Unicode standard and ISO/IEC 10646 now support three encoding forms that use a common repertoire of characters but allow for encoding as many as a million more characters. This is sufficient for all known character encoding requirements, including full coverage of all historic scripts of the world, as well as common notational systems.

The Unicode® Standard: A Technical Introduction (www.unicode.org/unicode/ standard/principles.html)

Where several languages share a set of symbols that have a historically related derivation, the shared symbols of each language are unified into collections of symbols (called **scripts**). A single script can work for tens or even hundreds of languages (for example, the Latin script used for English and most European languages). Sometimes, however, only one script will work for a language (such as the Korean Hangul). Figure 2-5 shows a map of writing systems used in the world today.

The Unicode standard includes more than 18,000 Han characters (ideographs for Japanese, Chinese, and Korean) as well as obsolete alphabets such as cuneiform, hieroglyphs, and ancient Han characters. In addition, character space is reserved for users and publishers to create their own scripts, designed especially for their own applications. For example, a carpenter might develop a script that included a character meaning "half-inch Sheetrock," another character meaning "three-quarter-inch plywood," and so forth. HTML allows access to the Unicode characters by numeric reference. Thus 水 (in hexadecimal) represents the Chinese character for water:

水

Mapping Text Across Platforms

If you build your multimedia project on a Windows platform and play it back on a Macintosh platform (or vice versa), there will be subtle (and sometimes not-so-subtle) differences. Fonts are perhaps the greatest cross-platform concern, because they must be mapped to the other machine. If a specified font doesn't exist on the target machine, a substitute must be provided that does exist on the target. This is **font substitution**. In many cross-platform-savvy applications, you can explicitly define the **font mapping**. Table 2-3 shows some typical mappings when crossing platforms.

Mac→Win	Win→Mac
Mac:Chicago→Win:System	Win:Arial→Mac:Helvetica
Mac:Courier→Win:Courier New	Win:Courier→Mac:Courier
Mac:Geneva→Win:MS Sans Serif	Win:Courier New→Mac:Courier
Mac:Helvetica→Win:Arial	Win:MS Serif→Mac:New York
Mac:Monaco→Win:Terminal	Win:MS Sans Serif→Mac:Geneva
Mac:New York→Win:MS Serif	Win:Symbol→Mac:Symbol Map None
Mac:Symbol→Win:Symbol Map None	Win:System→Mac:Chicago
Mac:Times→Win:Times New Roman (sizes: 14→12, 18→14, 24→18, 30→24)	Win:Terminal→Mac:Monaco
Mac:Palatino→Win:Times New Roman	Win:Times New Roman→Mac:Times (sizes: 12→14, 14→18, 18→24, 24→30)

Table 2-3 Typical Mappings for Common Macintosh and Windows Fonts

TIP *Never assume that the fonts you have installed on your computer will also be installed on another person's computer. Pay attention to the way you include fonts in a project so that you never face the nightmare of your carefully picked fonts being replaced by an ill-suited default font like Courier (see the next "First Person"). If your work is being distributed to sites that may not have the fonts you are using, or if you do not license these fonts for distribution with your work, be sure to bitmap the special font text you use for titles, headlines, buttons, and so forth. For text to be entered by users, it is safest to stay with the installed Windows or Macintosh fonts, because you know they are universally available on that platform. In Windows, use the TrueType fonts installed during the Setup procedure.*

First Person

Always be sure your fonts travel with your application when you are delivering software to run on a hardware platform other than the one you used to create the application. To avoid many font display problems, particularly for menus and headlines, you may wish to snap a picture of your text with a screen capture utility and use this image, or bitmap, instead of text that you type into a text field. (Chapter 3 describes bitmaps and how to capture and edit images.) This will ensure that the screen always looks right, regardless of what hardware platform you use or what fonts are installed.

It is not just fonts that are problematic; characters, too, must be mapped across platforms. Character mapping allows bullets, accented characters, and other curious characters that are part of the extended character set on one platform to appear correctly when text is moved to the other platform. Curly quotation marks, for example, rarely, if ever, map successfully across platforms.

Languages in the World of Computers

In modern Western languages, words are made up of symbols or letters strung together, representing as a whole the sounds of a spoken word. This is not so for Eastern languages such as Chinese, Japanese, and Korean (and the ancient languages of Sumeria, Egypt, and Mesopotamia). In these languages, an entire concept might be represented by a single word symbol that is unrelated to a specific phonetic sound.

The letters or symbols of a language are its alphabet. In English, the alphabet consists of 26 Roman or Latin letters; in Japanese, the kanji alphabet comprises more than 3,000 kanas, or whole words. The Russian alphabet, made up of Cyrillic characters based on the ancient Greek alphabet, has about the same number of letters as the Roman alphabet. All languages, from Navajo to Hebrew, have their own unique alphabets.

First Person
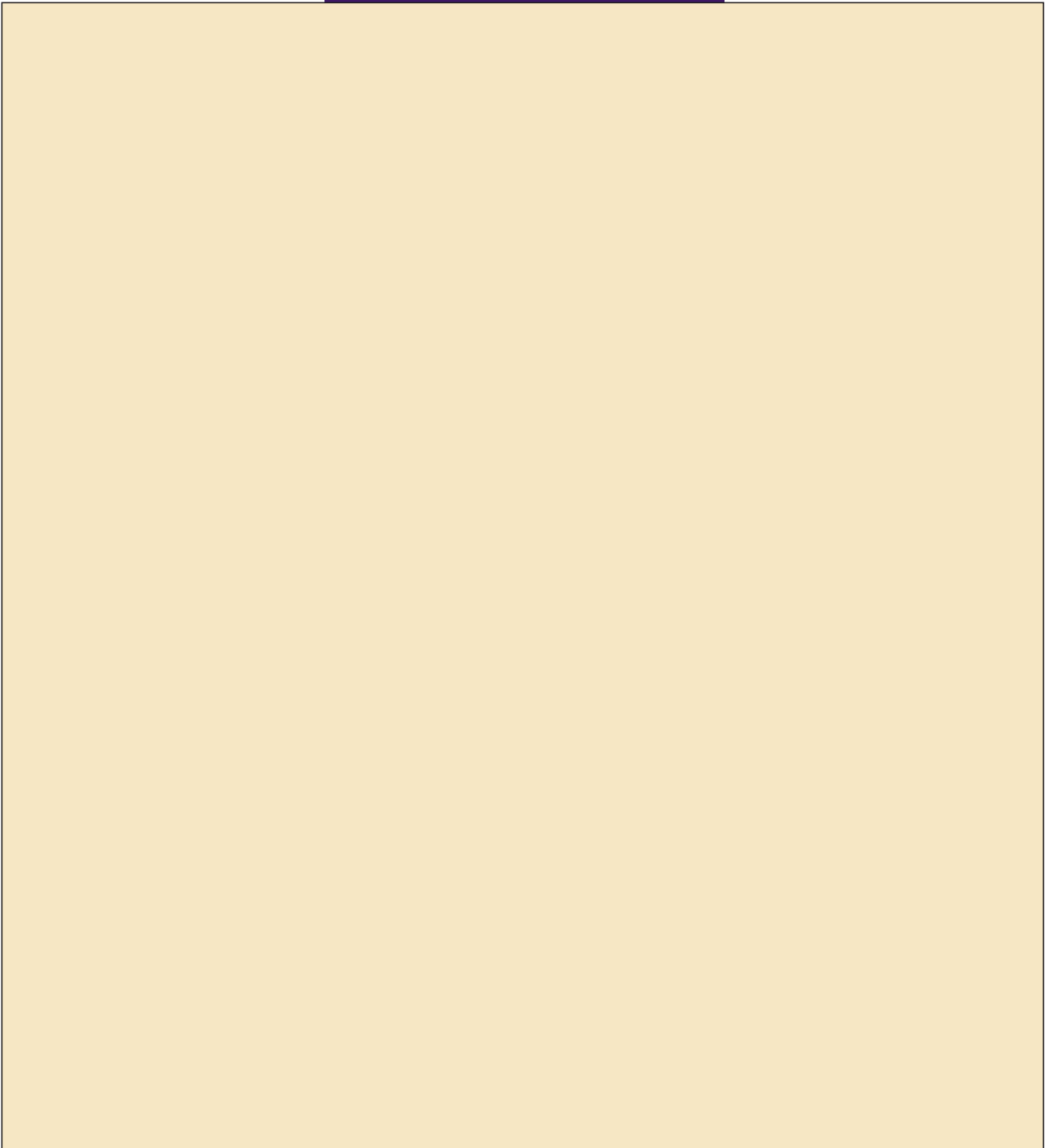
The written Japanese language consists of three different types of character sets, namely: kanji, kata-kana, and hiragana. Kanji was originally taken from the Chinese language and is essentially a pictographic representation of the spoken word. Each kanji has two different readings, "on-yomi" and "kun-yomi," respectively, the "Chinese rendering" and the "Japanese rendering." Both are used depending on the conjugation of the kanji with other kanji.

Due to certain incompat-ibilities between the Japanese spoken word and kanji, two sets of kana or phonetic syllabary (alphabet) were developed. Katakana is the "square" kana and is used today for writing only foreign words or onomato-poeic expressions. Hiragana is the "cursive" kana and can be used alone to represent a certain word or combined with kanji to form other words and sentences. Romaji, a more recent addition to the alphabets of Japan, allows for the phonetic spelling of the Japanese language using the Roman characters familiar to the Western world.

. . . .

Ross Uchimura, Executive Vice-President, GC3 Ltd., a cross-cultural expert

Most modern alphabets share one very important attribute: the graphic shapes and method for writing the Arabic numbers 0 1 2 3 4 5 6 7 8 9. This is a simple system for representing decimal numbers, which lends itself to easy reading, writing, manipulation, and calculation. Expressing and performing

$$16 + 32 = 48$$

is much easier in Arabic numbers than in Roman or Greek numerals:

$$XVI + XXXII = XLVIII$$

$$\iota\varsigma + \lambda\beta = \mu\eta$$

Use of Arabic notation has gradually spread across the world to sup-plant other systems, although Roman numerals are still used today in Western languages in certain forms and contexts.

Translating or designing multimedia (or any computer-based mate-rial) into a language other than the one in which it was originally written is called **localization**. This process deals with everything from the month/day/year order for expressing dates to providing special alphabetical char-acters on keyboards and printers. Even the many Western languages that share the Roman alphabet have their own peculiarities and often require special characters to represent special sounds. For example, German has its umlaut (¨); French its various accents (é), the cedilla (ç), and other diacrit-ics; and Spanish its tilde (ñ). These characters are typically available in the extended character set of a font.

Special Characters in HTML

In HTML, **character entities** based upon the ISO-Latin-1 standard make up the alphabet that is recognized by browser software on the World Wide Web. All of the usual characters of an English keyboard are included (the 7-bit ASCII set is built in), but for the extended character set that includes tildes, umlauts, accents, and special symbols, you must use an escape sequence to represent them in an ISO-Latin-1 HTML document. A character entity is represented either by a number or by a word and is always prefixed by an ampersand (escape) and followed by a semicolon. For example, the name for the copyright symbol is "copy" and its number is 169. The symbol may be inserted into a document either as © or as ©—either way, the character © is generated by the browser. The list of character entities allowed in standard HTML is growing and will soon include mathematical symbols and even icons to represent things like trash cans, clocks, and disk drives. Word processors

First Person

for languages other than English automatically insert the necessary character entities when a document is saved in HTML format or specify the character set to use.

* * *

www.w3.org/TR/REC-html40/sgml/entities.html

An encyclopedic discussion and reference for HTML character entity references

* * *

Multilanguage Web Pages

When building a project in more than one language for the Web, consider translating the languages that use Roman fonts and displaying them as text in the browser in the normal way. Languages other than English may have many escaped characters, as you can see in Figure 2-6. If Chinese or Japanese or Arabic is desired, translate the Roman text onto a computer running an operating system using that native language. For the web page, the translator can then capture a screen image of the translated text, and you can embed that image into your web page. This process takes precise coordination among the designers, the content providers, and the translators, but it can be done smoothly with careful labeling of the bits and pieces.

```
<p>
What can this integrated network solution offer your business? Lower
costs, increased flexibility, and greater reliability by supporting all voice
and data requirments, including:</p>
<p>
O que esta solu&ccedil;&atilde;o de rede integrada pode oferecer a sua
empresa? Menores custos, elevada flexibilidade, e maior confiabilidade,
pelo suporte a todos os requisitos de voz e dados, incluindo:</p>
<p>
Qu&eacute; puede ofrecerle a su negocio esta soluci&oacute;n integrada
de redes? Menores costos, mayor flexibilidad y mayor fiabil-idad mediante
la compatibilidad con todos los requisitos para voz y datos, incluso:</p>
<p>
<img src="images/chinese/story 1-1.gif">
```

這種綜合性的網路產品能為您的公司企業需來哪些好處呢？它能降低成本，提昇
服務的靈活性，以及具有更大的可靠性，因為它能支持各種話音與數據傳輸的要
求，包括：

```
</p>
<p>
<img src="images/japanese/story 1-1.gif">
```

この統合的ネットワークソリューションは、以下を含む音声・データ要件のすべてに対応し、費用
節減、フレキシビリティや信頼性の向上を実現させます。

求，包括：

```
</p>
```

Figure 2-6 Portion of a five-language web site using normal HTML code for the Roman languages and screen-captured graphic images to display the Chinese and Japanese translations

Font Editing and Design Tools

Special font editing tools can be used to make your own type, so you can communicate an idea or graphic feeling exactly. With these tools, professional typographers create distinct text and display faces. Graphic designers, publishers, and ad agencies can design instant variations of existing typefaces.

Typeface designs fall into the category of industrial design and have been determined by the courts in some cases to be protected by patent. For example, design patents have been issued for Bigelow & Holmes' Lucida, ITC Stone, and Adobe's Minion.

WARNING *If your commercial project includes special fonts, be sure that your license agreement with the font supplier allows you to distribute them with your project.*

Occasionally in your projects you may require special characters. With the tools described in the paragraphs that follow, you can easily substitute characters of your own design for any unused characters in the extended character set. You can even include several custom versions of your client's company logo or other special symbols relevant to your content or subject right in your text font.

www.fontfoundry.com
www.larabiefonts.com

There are hundreds of sites for downloading free and shareware fonts drawn by others. For starters, try these two.

Fontlab

Fontlab, Ltd., located at www.fontlab.com, specializes in font editors for both Macintosh and Windows platforms. You can use this software to develop PostScript, TrueType, and OpenType fonts for Macintosh, Windows, and Sun workstations. Designers can also modify existing typefaces, incorporate PostScript artwork, automatically trace scanned images, and create designs from scratch. A sample of the Fontographer screen is shown in Figure 2-7.
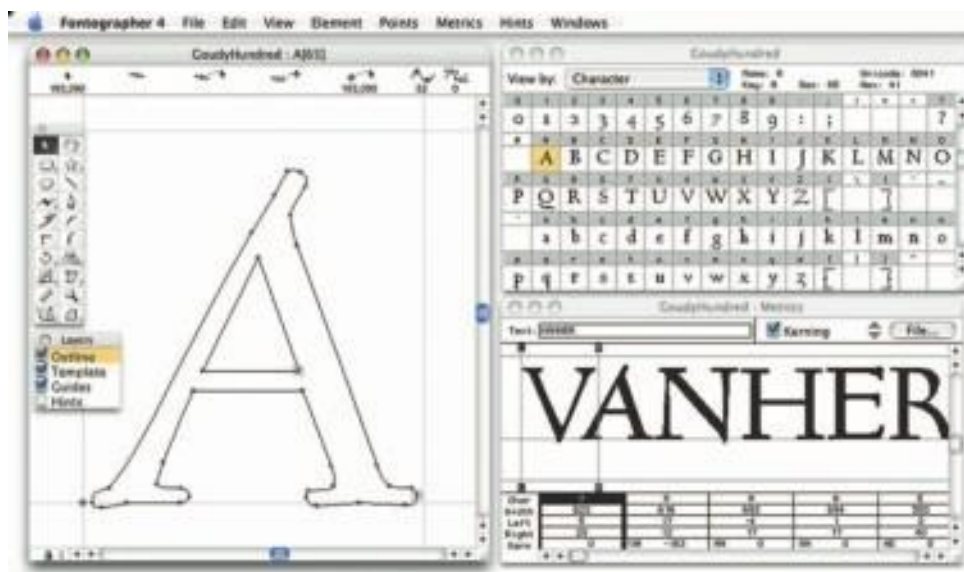
Figure 2-7 Fontographer is a powerful font editor for Macintosh and Windows.

Fontographer's features include a freehand drawing tool to create professional and precise inline and outline drawings of calligraphic and script characters, using either the mouse or alternative input methods (such as a pressure-sensitive pen system). Fontographer allows the creation of multiple font designs from two existing typefaces, and you can design lighter or heavier fonts by modifying the weight of an entire typeface.

Making Pretty Text

To make your text look pretty, you need a toolbox full of fonts and special graphics applications that can stretch, shade, shadow, color, and anti-alias your words into real artwork. Pretty text is typically found in bitmapped drawings where characters have been tweaked, manipulated, and blended into a graphic image. Simply choosing the font is the first step. Most designers find it easier to make pretty type starting with ready-made fonts, but some will create their own custom fonts using font editing and design tools.

With the proper tools and a creative mind, you can create endless variations on plain-old type, and you not only choose but also customize the styles that will fit with your design needs.

Most image-editing and painting applications (see Figure 2-8 for a PowerPoint example) let you make text using the fonts available in your system. You can colorize the text, stretch, squeeze, and rotate it, and you can filter it through various plug-ins to generate wild graphic results.

As a multimedia developer, you may only need to be concerned about how your fonts look on monitors, not how they are printed to paper—unless, of course, you are printing perfect proposals, bids, storyboards, reports, and above all, invoices ☺. TrueType, OpenType, and PostScript outline fonts allow text to be drawn at any size on your computer screen without jaggies:

Figure 2-8 PowerPoint lets you manipulate text in many ways.

Jaggies are avoided by anti-aliasing the edges of the text characters, making them seem smoother to the eye. Note the improved look of the anti-aliased letters in the bottom row of letters in Figure 2-9. Pasting an image that was anti-aliased against a light background onto a darker-colored background using transparency (so that the new, dark background is seen, instead of the old, light one) can be problematic: the blending pixels along the edge will show as a halo and may have to be edited pixel by pixel.

Macintosh and PCs handle anti-aliasing differently. Authoring programs such as Adobe Flash allow you to fine-tune anti-aliasing settings for text fields (see Figure 2-10), useful when you want a different look for text that will be static versus text that will be animated.

Figure 2-9 Anti-aliasing text and graphics creates "smooth" boundaries between colors. The top row of letters is not anti-aliased; the bottom row is.

Figure 2-10 In some authoring programs, anti-aliasing can be fine-tuned.

Hypermedia and Hypertext

Multimedia—the combination of text, graphic, and audio elements into a single collection or presentation—becomes interactive multimedia when you give the user some control over what information is viewed and when it is viewed. Interactive multimedia becomes hypermedia when its designer provides a structure of linked elements through which a user can navigate and interact.

When a hypermedia project includes large amounts of text or symbolic content, this content can be indexed and its elements then linked

When they first invented typesetting, there were variants cut of each character so that text would look as if it had been handwritten by a monk! Desktop designers have been fighting so hard to get their setting to look like it's come from a Berthold system, that most of the new potential of desktop typography has been overlooked.

David Collier, Author of
Collier's Rules for Desktop Design and Typography

together to afford rapid electronic retrieval of the associated information. When words are keyed or indexed to other words, you have a **hypertext system**; the "text" part of this term represents the project's content and meaning, rather than the graphical presentation of the text. Hypertext is what the World Wide Web is all about.

When text is stored in a computer instead of on printed pages, the computer's powerful processing capabilities can be applied to make the text more accessible and meaningful. The text can then be called **hypertext**; because the words, sections, and thoughts are linked, the user can navigate through text in a nonlinear way, quickly and intuitively.

Using hypertext systems, you can electronically search through all the text of a computer-resident book, locate references to a certain word, and then immediately view the page where the word was found. Or you can create complicated Boolean searches (using terms such as AND, OR, NOT, and BOTH) to locate the occurrences of several related words, such as "Elwood," "Gloria," "mortgage," and "happiness," in a paragraph or on a page. Whole documents can be linked to other documents.

A word can be made hot, as can a button, thus leading the user from one reference to another. Click on the word "Elwood," and you may find yourself reading a biography or resume; click on "mortgage," and a calculator pops up. Some authoring systems incorporate a hypertext facility that allows you to identify words in a text field using a bold or colored style, then link them to other words, pages, or activities, such as playing a sound or video clip related to that hot word. You cannot do this kind of nonlinear and associative navigation in a sequentially organized book. But on a CD-ROM, where you might have more than 100,000 pages of text to investigate, search, and browse, hypertext is invaluable.

Because hypertext is the organized cross-linking of words not only to other words but also to associated images, video clips, sounds, and other exhibits, hypertext often becomes simply an additional feature within an overall multimedia design. The term "hyper" (from the Greek word "over" [υπερ]) has come to imply that user interaction is a critical part of the design, whether for text browsing or for the multimedia project as a whole. When interaction and cross-linking is then added to multimedia, and the navigation system is nonlinear, multimedia becomes hypermedia.

In 1945, Vannevar Bush wrote a seminal eight-page article, "As We May Think," for the *Atlantic Monthly* (www.theatlantic.com/unbound/flashbks/computer/bushf.htm). This short treatise, in which he discusses the need for new methodologies for accessing information, has become the historic cornerstone of hypertext experimentation. Doug Englebart (inventor of the mouse) and Ted Nelson (who coined the term "hypertext" in 1965) have actively championed the research and innovations required of computer technology for implementing useful hypertext systems, and they have worked to combat the historic inertia of linear thought. Nelson

would claim that the very structure of thought is neither sequential nor linear and that computer-based hypertext systems will fundamentally alter the way humans approach literature and the expression of ideas during the coming decades.

The argument against this theory of associative thought is that people are, indeed, more comfortable with linear thinking and are easily overwhelmed by too much freedom, becoming quickly lost in the chaos of nonlinear gigabytes. As a practical reminder, it is important always to provide location markers, either text-and-symbol menus or illustrative maps, for users who travel the threads of nonlinear systems.

The Power of Hypertext

In a fully indexed hypertext system, all words can be found immediately. Suppose you search a large database for "boats," and you come up with a whopping 1,623 references, or hits—among them, Noah's Ark (open boat in water), television situation comedies *(The Love Boat)*, political criticisms of cabinet members who challenged the status quo (rocked the boat), cabinet members who were stupid (missed the boat), and Christmas dinner trimmings (Grandmother's gravy boat). So you narrow your search and look for "boats" and "water" when both words are mentioned on the same page; this time you get 286 hits. "Boats," "water," and "storms" gets you 37; "boats," "water," "storms," and "San Francisco," a single hit. With over a thousand hits, you are lost. With one hit, you have something! But you still may not find what you are looking for, as you can see in this fictional example:

> The *storm* had come and gone quickly across the Colorado plains, but *water* was still puddled at the foot of the house-high bank of mud that had slid into town when the dam burst. In front of the general store, which had remained standing, four strong men carefully lifted a tiny *boat* onto the large dray wagon borrowed from the woodcutters. On a layer of blankets in the bilge of the *boat*, the undertaker had carefully laid out the remains of both the mayor and his paramour. The mayor had not drowned in the flood, but died of a heart attack in the midst of the panic. Children covered the *boat* with freshly cut pine boughs while horses were quickly harnessed to the wagon, and a strange procession began to move slowly down *San Francisco* Street toward the new cemetery. …

The power of such search-and-retrieval systems provided by a computer for large volumes of data is immense, but clearly this power must be channeled in meaningful ways. Links among words or clusters of information need to be designed so that they make sense. Judgments must be made about relationships and the way information content is organized and made available to users. The lenses through which vast amounts of data

[Vannevar] Bush identified the problem—and the need to provide new ways to access information—but was he right about how the mind works? I suspect a purely associative model of human memory and mental processes is too simplistic.
. . . .
Philip Murray, *From Ventura to Hypertext*, Knowledge Management Associates, Danvers, MA

are viewed must necessarily be ground and shaped by those who design the access system.

The issue of who designs the lenses and how the designers maintain impartial focus is troubling to many scientists, archivists, and students of cognitive thinking. The scientists would remain "hermeneutically" neutral, they would balance freedom against authority and warn against the episte-mological unknowns of this new intellectual technology. They are aware of the forces that allow advertising and marketing craftspeople to intuitively twist meanings and spin events to their own purposes, with actions that can affect the knowledge and views of many millions of people and thus history itself. But these forces remain poorly understood, are not easily controlled by authority, and will express themselves with immeasurably far-reaching, long-term impact on the shape of human culture.

The multimedia designer controls the filtering mechanisms and places the lenses within the multimedia project. A manufacturer, for instance, that presents its products using interactive multimedia can bring abundant information and selling power within reach of the user, including back-ground information, collateral marketing material, pricing statistics, and technical data. The project design will be, of course, biased—to sell more of the manufacturer's products and generate more profit; but this bias is assumed and understood in these circumstances. When the assumptions and understandings of inherent bias in any information base break down, when fiction or incomplete data is presented as full fact, these are the times when the powerful forces of multimedia and hypermedia can have their greatest deleterious effect.

WARNING *Bad multimedia projects will not alter the collective view of history; really bad projects might.*

Using Hypertext

Special programs for information management and hypertext have been designed to present electronic text, images, and other elements in a data-base fashion. Commercial systems have been used for large and compli-cated mixtures of text and images—for example, a detailed repair manual for a Boeing 747 aircraft, a parts catalog for Pratt & Whitney jet turbine engines, an instant reference to hazardous chemicals, and electronic refer-ence libraries used in legal and library environments. Such searchable database engines are widely used on the Web, where **software robots** visit millions of web pages and index entire web sites. Hypertext data-bases rely upon proprietary indexing systems that carefully scan the entire body of text and create very fast cross-referencing indexes that point to

---

The hype about hyper-text may be justified. It can provide a computer-supported information envi-ronment which can add to our appreciation of the text, can go some way towards aping the mental agility of the human mind, can allow navigation along patterns of association, can provide a nonlinear information envi-ronment. But the problems of constructing nonlinear documents are not few and can prove to be very complex.

Patricia Baird, Editor of *Hypermedia,* a scientific journal published in the United Kingdom

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Hypermedia on its own simply functions as a refer-ence tool. But when it is integrated within a goal-based activity, it becomes a powerful learning resource.

Brigid Sealy and Paul Phelan, INESC, Porto, Portugal (conclusions from research funded by the European Commission's Human Capital and Mobility Program)

the location of specific words, documents, and images. Indeed, a hypertext index by itself can be as large as 50 percent to 100 percent the size of the original document. Indexes are essential for speedy performance. Google's search engine produces about 1,220,000,000 hits in less than a quarter of a second!

Commercial hypertext systems were developed historically to retrofit gigantic bodies of information. Licenses for use and distribution of these commercial systems are expensive, and the hypertext-based projects typically require the large mass-storage capability of one or many CD-ROMs and/or dedicated gigabyte hard disks. Simpler but effective hypertext indexing tools are available for both Macintosh and Windows, and they offer fairly elaborate features designed to work in concert with many multimedia authoring systems. Server-based hypertext and database engines designed for the Web are now widely available and competitively priced.

Google Multimedia | Search | Advanced Search

Web   Results 1 - 10 of about **197,000,000** for **Multimedia** [definition]. (1.66e-15 epochs)

TIP *Rather than designing an elaborate, fully cross-referenced hypertext system for your multimedia project, you can "hardwire" the links between the most salient words (highlight them in your text) so that a mouse click leads to a topic menu specific to the chosen word. Though this constrains the user's movement through the text, the user will not perceive it as such, and you can thus maintain strict control over your navigation pathways and design.*

Searching for Words

Although the designer of a hypermedia database makes assumptions, he or she also presents users with tools and a meaningful interface to exercise the assumptions. Employing this interface, users can tailor word searches to find very specific combinations. Following are typical methods for word searching in hypermedia systems:

- **Categories** Selecting or limiting the documents, pages, or fields of text within which to search for a word or words.
- **Word relationships** Searching for words according to their general proximity and order. For example, you might search for "party" and "beer" only when they occur on the same page or in the same paragraph.

- **Adjacency**   Searching for words occurring next to one another, usually in phrases and proper names. For instance, find "widow" only when "black" is the preceding adjacent word.
- **Alternates**   Applying an OR criterion to search for two or more words, such as "bacon" or "eggs."
- **Association**   Applying an AND criterion to search for two or more words, such as "skiff," "tender," "dinghy," and "rowboat."
- **Negation**   Applying a NOT criterion to search exclusively for references to a word that are not associated with the word. For example, find all occurrences of "paste" when "library" is not present in the same sentence.
- **Truncation**   Searching for a word with any of its possible suffixes. For example, to find all occurrences of "girl" and "girls," you may need to specify something like **girl#**. Multiple character suffixes can be managed with another specifier, so **geo*** might yield "geo," "geology," and "geometry," as well as "George."
- **Intermediate words**   Searching for words that occur between what might normally be adjacent words, such as a middle name or initial in a proper name.
- **Frequency**   Searching for words based on how often they appear: the more times a term is mentioned in a document, the more relevant the document is to this term.

Hypermedia Structures

Two buzzwords used often in hypertext systems are link and node. **Links** are connections between the conceptual elements, that is, the **nodes**, which may consist of text, graphics, sounds, or related information in the knowledge base. Links connect Caesar Augustus with Rome, for example, and grapes with wine, and love with hate. The art of hypermedia design lies in the visualization of these nodes and their links so that they make sense, not nonsense, and can form the backbone of a knowledge access system. Along with the use of HTML for the World Wide Web, the term **anchor** is used for the reference from one document to another document, image, sound, or file on the Web (see Chapter 13).

Links are the navigation pathways and menus; nodes are accessible topics, documents, messages, and content elements. A **link anchor** is where you come from; a **link end** is the destination node linked to the anchor. Some hypertext systems provide unidirectional navigation and offer no return pathway; others are bidirectional.

The simplest way to navigate hypermedia structures is via buttons that let you access linked information (text, graphics, and sounds) that is contained at the nodes. When you've finished examining the information, you

return to your starting location. A typical navigation structure might look like the following:

Pages of text with hot words linked to InfoBites only

Information bites
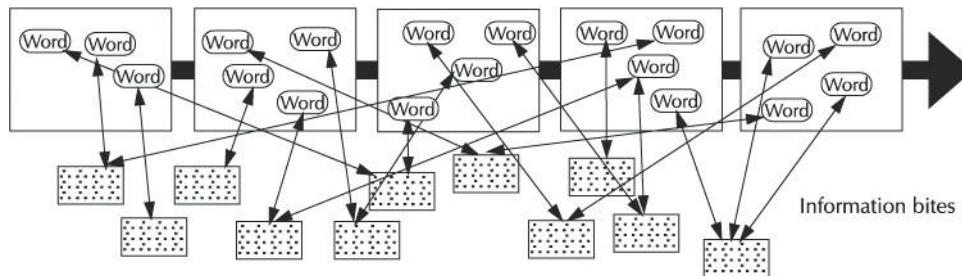
Navigation becomes more complicated when you add associative links that connect elements not directly in the hierarchy or sequence. These are the paths where users can begin to get lost if you do not provide location markers. A link can lead to a node that provides further links, as shown here:

Pages of text with hot words linked to InfoBites linked to pages and to other InfoBites

Information bites
(can be linked to
other InfoBites)
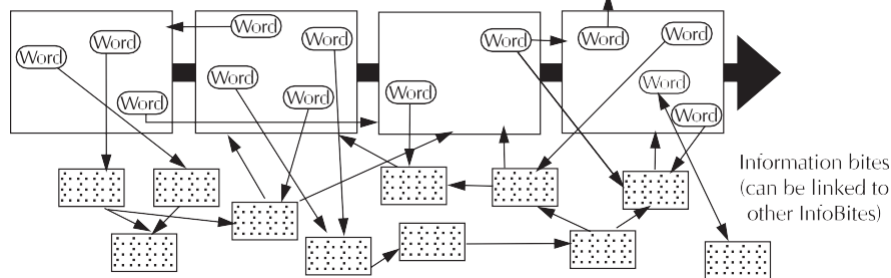
When you offer full-text search through an information base, there may be links between any number of items at your current node and any number of other nodes with items that meet your relationship criteria. When users are browsing freely through this system, and one page does not follow the next (as expected in the linear metaphor of books and literature), users can get lost in the associative maze of the designer's content:
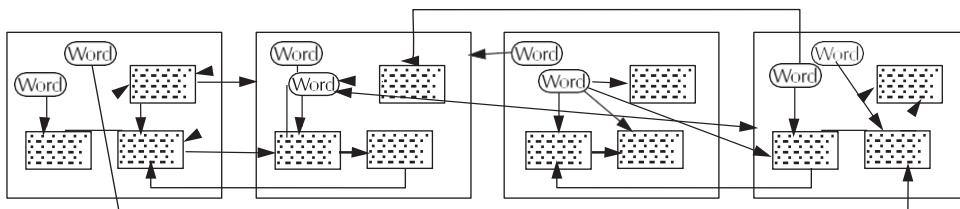
One publisher of hypermedia products claims that becoming lost in "hyperspace" may not be all that bad. The struggle to find your way back can be valuable in itself, and certainly a learning experience.

Hypermedia can take advantage of powerful capabilities that are becoming clearer as the new multimedia medium matures, giving us a greater choice in exploration, if not in outright plot definition, for example. From my experiences with "Playa Sirenas," the real challenge facing storytellers in this new medium is allowing readers appropriate choices (some authorship of the story, really) while they navigate through the hypermedia experience, without destroying the successful and basic patterns that have been part of storytelling since people first gathered around campfires.
There is something organic about these time-proven storytelling patterns. As an author in the new medium, you must first design the DNA or template of your story, then allow (and promote) mutation along evolutionary lines that you, as the author, have created as part of the template…

Hermann Steffen, hypermedia novelist, San Jose, Costa Rica

Hypertext Tools

Two functions are common to most hypermedia text management systems, and they are often provided as separate applications: building (or authoring) and reading. The builder creates the links, identifies nodes, and generates the all-important index of words. The index methodology and the search algorithms used to find and group words according to user search criteria are typically proprietary, and they represent an area where computers are carefully optimized for performance—finding search words among a list of many tens of thousands of words requires speed-demon programming.

Hypertext systems are currently used for electronic publishing and reference works, technical documentation, educational courseware, interactive kiosks, electronic catalogs, interactive fiction, and text and image databases. Today these tools are used extensively with information organized in a linear fashion; it still may be many years before the majority of multimedia project users become comfortable with fully nonlinear hypertext and hypermedia systems. When (and perhaps if) they do, the methodology of human thought and conceptual management—indeed, the way we think—will be forever changed.

Chapter 2 Review

■ Chapter Summary

For your review, here's a summary of the important concepts discussed in this chapter.

Recognize the importance of word choice

■ With the recent explosion of the Internet and the World Wide Web, text has become more important than ever. Words and symbols in any form, spoken or written, are the most common system of communication. It's important to design labels for title screens, menus, and buttons using words that have the most precise and powerful meanings to express what you need to say. Experiment with the words you plan to use by letting others try them.

Describe the difference between a typeface and a font and list at least three attributes of a font, for example, upper/lowercase, serif/sans serif, PostScript/TrueType/OpenType

■ A typeface is a family of graphic characters that usually includes many type sizes and styles.

■ Serif versus sans serif is the simplest way to categorize a typeface.

■ A font is a collection of characters of a single size and style belonging to a particular typeface family.

■ Three common font styles are bold, italic, and underline, but there are several others; some, such as superscript, emboss, or strikethrough, have specialized uses.

■ Type sizes are usually expressed in points (about 72 per inch).

■ Leading is the space between lines.

■ Kerning is the space between individual characters.

■ Alignment can be left, right, centered, or justified.

Discuss the importance of text and ways text can be leveraged in multimedia presentations

■ Size, color, background color, style, and leading are factors that affect the legibility of text.

■ On the printed page, serif fonts are traditionally used for body text because the serifs are said to help guide the reader's eye along the line of text. Sans serif fonts, on the other hand, are used for headlines and bold statements. But sans serif fonts are far more legible and attractive when used in the small sizes of a text field on a screen.

■ You must strike a balance between too little text on a screen and too much text.

Discuss the presentation of text on Windows and Macintosh platforms

■ There will be subtle (and sometimes not-so-subtle) differences in how text looks on Windows and Macintosh platforms.

Find sources for free and shareware fonts

■ Download free fonts and use shareware tools to modify fonts by adding special characters and even logos.
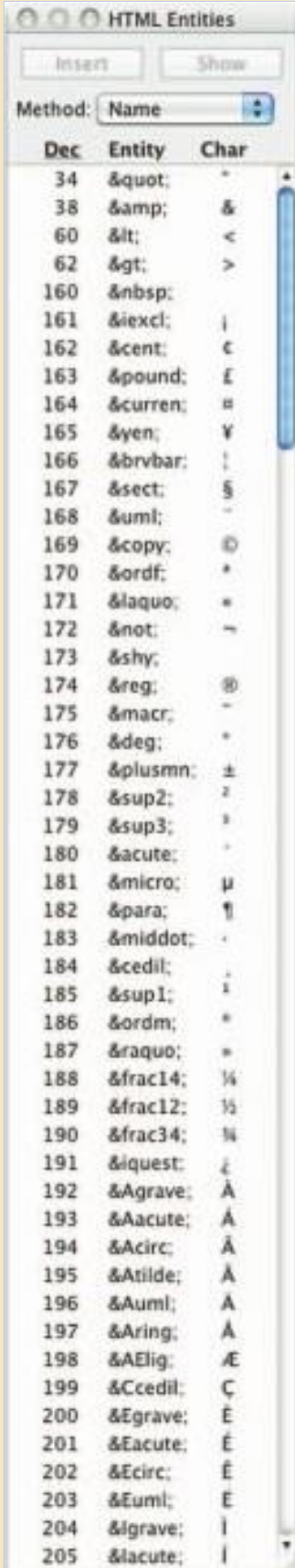
Define hypermedia, hypertext, links, anchors, and nodes and be able to discuss both the potential and limitations of hypertext and hyperlinking systems

■ Multimedia—the combination of text, graphic, and audio elements into a single collection or presentation—becomes interactive multimedia when you give the user some control over what

information is viewed and when it is viewed. Interactive multimedia becomes hypermedia when its designer provides a structure of linked elements through which a user can navigate and interact.

■ When a hypermedia project includes large amounts of text or symbolic content, this content can be indexed and its elements then linked together to afford rapid electronic retrieval of the associated information. When words are keyed or indexed to other words, you have a hypertext system; the "text" part of this term represents the project's content and meaning, rather than the graphical presentation of the text. Hypertext is what the World Wide Web is all about.

■ When text lives in a computer instead of on printed pages, the computer's powerful processing capabilities can be applied to make the text more accessible and meaningful. The text can then be called hypertext; because the words, sections, and thoughts are linked, the user can navigate through text in a nonlinear way, quickly and intuitively. Because hypertext is the organized cross-linking of words not only to other words but also to associated images, video clips, sounds, and other exhibits, hypertext often becomes simply an additional feature within an overall multimedia design.

■ Links are connections between the conceptual elements, that is, the nodes containing text, graphics, sounds, or related information in the knowledge base. The term anchor is formally used in HTML as the reference from one document to another document, image, sound, or file. Links are the navigation pathways and menus; nodes are accessible topics, documents, messages, and content elements. A link anchor is where you come from; a link end is the destination node linked to the anchor.

■ The standard document format used for pages on the Web is called Hypertext Markup Language (HTML). In an HTML document you can specify typefaces, sizes, colors, and other properties by "marking up" the text in the document with tags. The remarkable growth of the Web is straining the "old" designs for displaying text on computers. **Dynamic HTML** uses Cascading Style Sheets (CSS) to define choices ranging from line height to margin width to font face. HTML character entities are represented either by a number or by a word and always prefixed by an ampersand (escape) and followed by a semicolon.

■ You can search and view potentially billions of documents and files (information), but you can also become "lost in hyperspace."

Dec	Entity	Char
34	"	"
38	&	&
60	<	<
62	>	>
160		
161	¡	¡
162	¢	¢
163	£	£
164	¤	¤
165	¥	¥
166	¦	¦
167	§	§
168	¨	¨
169	©	©
170	ª	ª
171	«	«
172	¬	¬
173	­	
174	®	®
175	¯	¯
176	°	°
177	±	±
178	²	²
179	³	³
180	´	´
181	µ	µ
182	¶	¶
183	·	·
184	¸	¸
185	¹	¹
186	º	º
187	»	»
188	¼	¼
189	½	½
190	¾	¾
191	¿	¿
192	À	À
193	Á	Á
194	Â	Â
195	Ã	Ã
196	Ä	Ä
197	Å	Å
198	Æ	Æ
199	Ç	Ç
200	È	È
201	É	É
202	Ê	Ê
203	Ë	Ë
204	Ì	Ì
205	Í	Í

■ Key Terms

Adobe PostScript *(40)*

American Standard Code for
  InformationInterchange
  (ASCII) *(42)*

anchor *(58)*

anti-aliasing *(27)*

attribute *(22)*

button *(35)*

Cascading Style Sheets
  (CSS) *(30)*

case insensitive *(24)*

case sensitive *(24)*

character entity *(48)*

character metrics *(23)*

condensed *(23)*

dithering *(27)*

dots per inch (dpi) *(23)*

Dynamic HTML (DHTML) *(62)*

expanded *(23)*

font *(22)*

font mapping *(45)*

font substitution *(45)*

foundry *(41)*

hint (for Type 1 PostScript
  fonts) *(41)*

hypertext *(54)*

hypertext system *(54)*

icon *(32)*

intercap *(24)*

jaggies *(53)*

kerning *(23)*

landscape *(37)*

leading *(22)*

link *(58)*

link anchor *(58)*

link end *(58)*

localization *(48)*

lowercase *(24)*

node *(58)*

OpenType *(41)*

outline font *(40)*

pixel *(23)*

point *(22)*

portrait *(37)*

rasterizing *(23)*

rollovers *(36)*

sans serif *(25)*

scripts *(44)*

serif *(25)*

software robots *(56)*

style *(22)*

tag *(39)*

tracking *(23)*

TrueType *(41)*

typeface *(22)*

Unicode *(43)*

uppercase *(24)*

white space *(28)*

WYSIWYG *(25)*

x-height *(22)*

■ Key Term Quiz

1. Type sizes are usually expressed in_____.

2. When a password must be entered in upper- or lowercase in order to match the original password, it is said to be_____.

3. Symbolic representations of objects and processes common to the graphical user interfaces of many computer operating systems are called_____.

4. Special HTML characters, always prefixed by an ampersand (escape) and followed by a semicolon, are called_____.

5. "What you see is what you get" is spoken as_____.

6. Translating or designing multimedia (or any computer-based material) into a language other than the one in which it was originally written is called_____.

7. The little decoration at the end of a letter stroke is a_____.

8. Designers call roomy blank areas_____.

9. _____ blends the colors along the edges of the letters (called dithering) to create a soft transition between the letter and its background.

10. Conceptual elements consisting of text, graphics, sounds, or related information in the knowledge base are called_____.

■ Multiple-Choice Quiz

1. A family of graphic characters that usually includes many type sizes and styles is called a:
   a. typeface
   b. font
   c. point
   d. link
   e. node

2. Which of the following is a term that applies to the spacing between characters of text?
   a. leading
   b. kerning
   c. tracking
   d. points
   e. dithering

3. Intercapping, the practice of placing a capital in the middle of a word, is a trend that emerged from the computer programming community because:
   a. it looks cool
   b. they wanted to copy marketing practices in the electronics industry
   c. they found they could see the words used for variables and commands better
   d. one of the first computer programmers had a faulty SHIFT key on his keyboard
   e. it increases security in case-sensitive passwords

4. Dynamic HTML uses_____to define choices ranging from line height to margin width to font face.
   a. Cascading Style Sheets
   b. font mapping
   c. font substitution
   d. software robots
   e. encapsulated PostScript

5. If a DHTML document includes a font face that is not installed on the user's computer, a browser will:
   a. automatically download the correct font
   b. refuse to load the page
   c. leave a blank space where that text is
   d. crash
   e. try to substitute the font with a similar looking font

6. In the URL http://www.timestream.com/info/people/biotay/biotay1.html, which part is case sensitive?
   a. the record type: "http://"
   b. the domain name: "timestream.com"
   c. the subdomain "www"
   d. the document path: "info/people/biotay/biotay1.html"
   e. all are case sensitive

7. Multimedia becomes interactive multimedia when:
   a. the user has some control over what information is viewed and when it is viewed
   b. the information is displayed by a computer with a touchscreen or other input device
   c. the information is available on the Web—either the Internet or a local area network
   d. quizzes and tests with evaluations and scoring are included
   e. the user can change such attributes as volume and type size

8. Interactive multimedia becomes hypermedia when:
   a. the information is available on the Web—either the Internet or a local area network
   b. quizzes and tests with evaluations and scoring are included
   c. it includes a structure of linked elements through which a user can navigate and interact

d. the user can change such attributes as volume and type size

e. the content formatting complies with the American Standard Code for Information Interchange

9. Web pages are coded using:
   a. Unicode
   b. American Standard Code for Information Interchange
   c. File Transfer Protocol
   d. Hypertext Markup Language
   e. encapsulated PostScript

10. Which of the following provides a system for dynamically displaying a font?
    a. Apache
    b. PostScript
    c. HTTPD
    d. serif
    e. WYSIWYG

11. A printed page might be presented in which of these orientations?
    a. newsscape
    b. portrait
    c. flat-file
    d. x-height
    e. node

12. Which of the following is a character encoding system?
    a. FontTab
    b. HTML
    c. CSS
    d. WYSIWYG
    e. Unicode

13. The reference from one document to another document, image, sound, or file on the Web is a(n):
    a. sweetspot
    b. anchor
    c. node
    d. tag
    e. button

14. Which of the following is a problem that might apply to hypermedia?
    a. Users' eye movements affect their ability to link.
    b. Users will be turned off by excessive animation.
    c. Hypermedia software might create inappropriate links.
    d. Current hyperlinking technology far exceeds what today's desktop computers can handle.
    e. Search results generally are too granular to be useful.

15. Which of the following is a typical method for word searching in a hypermedia system?
    a. best fit
    b. adjacency
    c. popularity
    d. tracking
    e. localization

■ Essay Quiz

1. Describe what characteristics a block of text might have.

2. Describe what characteristics a typeface might have.

3. Discuss the problems encountered using text across computer platforms and in different languages.

4. Discuss the differences among multimedia, interactive multimedia, hypertext, and hypermedia.

5. Your boss wants you to create a hypermedia system for Web visitors to find technical support information about your company. What are some of the implications in creating this system? Should you hand-build the links or use an automatic indexing system? Why?

Lab Projects

■ Project 2.1

Visit a web site and print out a page. Visit the same page on another computer (preferably on another operating system), and print out the same page.

Compare the pages. Are the printouts different? Why?

■ Project 2.2

From three different publications, select a printed page. Circle the different blocks of text. Characterize the types of text used in each block by providing for each page:

- Publication name and page number.

- Which blocks are headlines? What type of font is used? Is it bold? serif? Characterize the text. How is it spaced?

- Which blocks are body text? What type of font is used? Is it bold? serif? Characterize the text. How is it spaced?

■ Project 2.3

Access a computer. Identify two programs that allow you to manipulate text. Write some text in varied styles and fonts. Print the results. For each, list:

- The program's name.

- The ways in which that program allows you to change text. Can you easily change the font? the color? the style? the spacing?

■ Project 2.4

Create a new document in a word processing application. Next, type in a line of text and copy the line five times. Now change each line into a different font. Recopy the entire set of lines three times. Finally, change the size of the first set to 10-point text, the second set to 18-point text, and the third set to 36-point text.

- Which of the smallest lines of text is most readable?

- Which line of text stands out the most?

■ Project 2.5

Review two different games or educational programs delivered on CD-ROM. Create a diagram that shows how the information in each is structured. For each, describe:

- How are the navigational structures similar in the two programs?

- What words are common to both programs (for example, "Quit," "Home," "Help," etc.)?

In this chapter, you will learn how to:

- Work out your graphical approach by planning your approach, organizing your tools, and configuring your computer workspace

- Differentiate among bitmap, vector, and 3-D images and describe the capabilities and limitations of all three

- Describe the use of colors and palettes in multimedia

- Cite the various image file types used in multimedia