NEW PERSPECTIVES

Chapter 8
Digital Media

Computer Concepts 2014

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8 Chapter Contents

- Section A: Digital Sound
- Section B: Bitmap Graphics
- Section C: Vector and 3-D Graphics
- Section D: Digital Video
- Section E: Digital Rights Management

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8 FastPoll True/False Questions
Answer A for True and B for False

- 080100 Audio is digitized by dividing a sound wave into samples and storing the numbers that represent the height of each sample.
- 080200 A higher sampling rate produces higher quality sound than lower sampling rates.
- 080300 MP3 and BMP are examples of two popular digital music formats.
- 080400 WAV is a format for synthesized sound.
- 080500 Software with speech synthesis capabilities can convert your spoken dictation into a digital document.

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8 FastPoll True/False Questions
Answer A for True and B for False

- 080600 RAW, PNG, TIFF, and JPEG formats store graphics as bitmaps.
- 080700 Bitmap graphics are resolution dependent.
- 080800 When bitmaps are enlarged, pixel interpolation can result in the graphic becoming pixilated.
- 080900 Images that have been compressed with lossless compression can be reconstituted to their original appearance without any data loss.
- 081000 Vector graphics maintain their quality better than bitmaps when resized.

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8 FastPoll True/False Questions
Answer A for True and B for False

- 081100 The technique for adding light and shadows to a 3-D graphic is called rasterizing.
- 081200 Videos with a low compression rate tend to be small, low-quality files.
- 081300 A video with a bitrate of 340 will have less compression and better quality than a video with a bitrate of 150.
- 081400 Recording a television show to watch at a later time is an example of digital rights management.
- 081500 Digital watermarks, HDCP, and broadcast flags rely on compliant hardware devices to protect content.

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8 Section A: Digital Sound

- Digital Audio Basics
- Digital Audio File Formats
- MIDI Music
- Speech Recognition and Synthesis

8 Question

> 082100 Computers can work with digital audio as well as MIDI music. Which is the more prevalent format and why?
>> A. Digital audio is more prevalent because it is used for music downloads.
>> B. Digital audio is more prevalent because it is a far more compact format than MIDI.
>> C. MIDI is more prevalent because browsers can play it without a plug-in.
>> D. MIDI is more prevalent because the Americans with Disabilities Act mandates its use for reading computer screens.

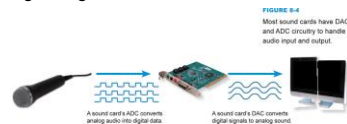## 8 Digital Audio Basics

> Sampling a sound wave

FIGURE 8-1
Sampling a Sound Wave
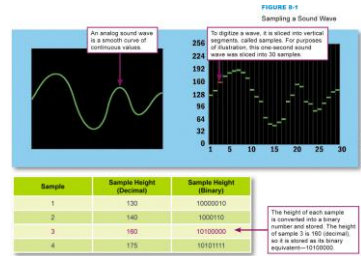
8 Digital Audio Basics

> Sampling rate refers to number of times per second that a sound is measured during the recording process

FIGURE 8-2
A higher sampling rate produces more true-to-life sound quality. Use your interactive eBook to compare the quality of these audio clips, which were digitized at different sampling rates. You'll have to listen carefully to notice the differences.

Low sampling rate: File size = 66 KB

Medium sampling rate: File size = 124 KB

High sampling rate: File size = 235 KB

8 Digital Audio Basics

> A sound card is a device that contains a variety of input and output jacks, plus audio-processing circuitry
>> Integrated audio
>> Digital-to-analog converter
>> Analog-to-digital converter

FIGURE 8-4
Most sound cards have DAC and ADC circuitry to handle audio input and output.

A sound card's ADC converts analog audio into digital data.

A sound card's DAC converts digital signals to analog sound.

8 Digital Audio File Formats

> The most popular digital audio formats include AAC, MP3, Ogg Vorbis, WAV, and WMA
> Audio or media player software allows you to play digital audio files
> You can embed digital audio files into a Web page using the HTML5 <audio> tag
> Streaming audio plays as its file is downloaded

FIGURE 8-6
Streaming audio provides the technology for real-time Internet radio broadcasts, podcasts, and voice chat sessions.

8 MIDI Music

> MIDI (Musical Instrument Digital Interface) specifies a standard way to store music data for synthesizers, electronic MIDI instruments, and computers
> MIDI music is encoded as a MIDI sequence
> MIDI-capable sound cards contain a wavetable
>> Set of prerecorded musical instrument sounds
> Does not produce high-quality vocals
> Does not have full resonance of real sound

8 MIDI Music

FIGURE 8-8
MIDI music tends not to have the full resonance of digital audio. Use your interactive eBook to listen to these two sound clips and see if you can hear a difference.

8 MIDI Music

FIGURE 8-9
Music composition software provides tools for entering notes, specifying instruments, printing sheet music, and saving compositions in formats such as MIDI. ● You can use your interactive eBook to take a tour of music composition software and see how the TexMex music was created.

8 Speech Recognition and Synthesis

➢ Speech synthesis is the process by which machines produce sound resembling spoken words
  ➢ Text-to-speech software
➢ Speech recognition refers to the ability of a machine to understand spoken words
  ➢ Speech recognition software

8 Speech Recognition and Synthesis

FIGURE 8-10
The Windows Speech Recognition Wizard displays short text passages. As you read each passage, the computer listens to the way you pronounce each word and stores it in your speech profile.

You can voice surf with a handheld device, too. ● Find out how Google Voice Search works.

8 Section B: Bitmap Graphics

➢ Bitmap Basics
➢ Scanners and Cameras
➢ Image Resolution
➢ Color Depth and Palettes
➢ Image Compression

8 Question

➢ 082200 Bitmap files are typically quite large and so it is handy to compress them before FTPing or e-mailing them. However, some bitmap files don't seem to shrink very much when you use a compression utility, such as WinZip. Why?
  ➢ A. The files are already as small as they can get.
  ➢ B. Compression utilities use lossless compression, which won't allow you shrink the size of a file without losing data.
  ➢ C. Some types of files are already in compressed format, which can't be further compressed.
  ➢ D. The files have a small color palette that doesn't allow compression.

8 Bitmap Basics

➢ Composed of a grid of dots
  ➢ Color of each dot is stored as a binary number

FIGURE 8-11
A bitmap graphic is divided into a grid of individually colored pixels. The color number for each pixel is stored in binary format. ◉ Learn how to use Windows Paint to create bitmap graphics and see how to work pixel by pixel to edit an image.

8 Bitmap Basics

8 Scanners and Cameras

FIGURE 8-13
To scan an image, turn on the scanner and start your scanner software. Place the image face down on the scanner glass, and then use the scanner software to initiate the scan. The scanned image is saved in RAM and can then be saved on your computer's hard disk. ◉ Learn the difference between scanning an image and scanning a document into an editable word processing file.

8 Scanners and Cameras

FIGURE 8-14
A digital camera's CCD converts the image captured by the camera lens into a grid of colored pixels, which are stored as bits. ◉ Watch the video for this figure in your interactive eBook for an overview of digital camera features, file formats, and the process of transferring photos from a camera to your computer.

8 Scanners and Cameras

➢ Digital cameras use storage medium
  ➢ Solid state memory cards
➢ Transfer images using:
  ➢ Card readers
  ➢ Direct cable transfer
  ➢ Infrared port
  ➢ Media transfer
  ➢ Docking station
  ➢ E-mail

FIGURE 8-15
Card readers can be connected to your computer's USB port, built into a computer system unit, or built into a photo printer.

8 Scanners and Cameras

➢ Graphics software is used to modify or edit bitmap graphics
  ➢ Modify individual pixels to:
    ➢ Wipe out red eye
    ➢ Erase rabbit ears
    ➢ Retouch photographs
➢ Require a bit of storage space

FIGURE 8-16
Bitmap graphics can be easily modified. Many graphics software products include wizards that help you retouch photographs.

Before

After

Image Resolution

- Expressed as the number of horizontal and vertical pixels
  - Higher resolutions contain more data (larger file size) and are higher quality
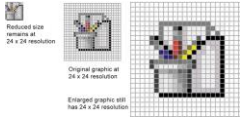- Bitmaps do not have a fixed physical size

Reduced size remains at 24 x 24 resolution

Original graphic at 24 x 24 resolution

Enlarged graphic still has 24 x 24 resolution

FIGURE 8-17
When a bitmap graphic is enlarged or reduced in size, it still retains its original resolution—24 x 24.

Image Resolution

- File size of bitmaps can be reduced by cropping
- Bitmaps are resolution dependent

FIGURE 8-18
When viewing an image larger than the screen, you must scroll to see all parts of the image or set the zoom level of your graphics software to less than 100%. You should understand, however, that changing the zoom level stretches or shrinks only the size of the image grid. It has no effect on the printed size of a graphic or the graphic's file size.

Image Resolution

- When you increase the resolution of a bitmap, pixel interpolation may occur
  - Some images may appear pixilated

The figure above has a resolution of 130 x 130. The figure at right was enlarged to a resolution of 260 x 260, but it has a rough, pixilated appearance.
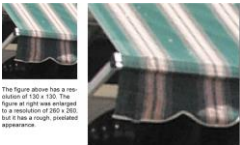
FIGURE 8-19
When you increase the resolution of an existing graphic, the file size increases, but the quality might deteriorate.

Color Depth and Palettes

- Color depth is the number of colors available for use in an image
  - Monochrome bitmap
- Increasing color depth increases file size
- Color palettes are used to control color depth
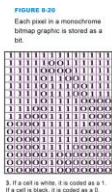 - Grayscale palette
  - System palette
  - Web palette

Color Depth and Palettes

FIGURE 8-20
Each pixel in a monochrome bitmap graphic is stored as a bit.

1. This image originated as a black-and-white silhouette.
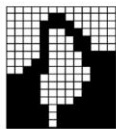
2. The computer divides the picture into a matrix.

3. If a cell is white, it is coded as a 1. If a cell is black, it is coded as a 0.

Image Compression

- Any technique that recodes data in an image file so that it contains fewer bits
  - Lossless compression
  - Lossy compression
- Run-length encoding
- File compression utility

FIGURE 8-21
JPEG compression can slightly adjust the colors of adjacent pixels to make them the same. These like-colored pixels can then be compressed with RLE.

Non-compressed JPEG image

JPEG image with 35% compression

8 Image Compression

8 Image Compression
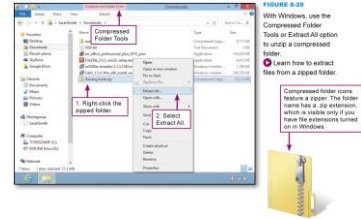
8 Section C: Vector and 3-D Graphics

➢ Vector Graphics Basics
➢ Vector-to-Bitmap Conversion
➢ Vector Graphics on the Web
➢ 3-D Graphics

8 Question

➢ 082300 2-D vectors don't look very realistic, whereas 3-D vectors tend to look very realistic. Why is this the case?
  ➢ A. 3-D images use a more realistic color palette than 2-D images.
  ➢ B. 3-D images constructed using a wireframe can be rendered with surface textures and lighted with realistic ray tracing.
  ➢ C. 3-D images can be enlarged or shrunk more realistically than 2-D images.
  ➢ D. 3-D images can be animated, whereas 2-D images cannot.

8 Vector Graphic Basics

➢ Contain instructions for re-creating a picture

8 Vector Graphic Basics

➢ Vector graphics resize better than bitmaps
➢ Vector graphics usually require less storage space than bitmaps
➢ Vector graphics are not usually as realistic as bitmap images
➢ It is easier to edit an object in a vector graphic than an object in a bitmap graphic
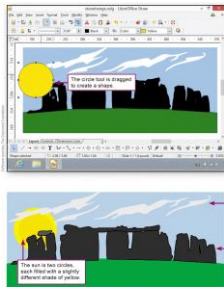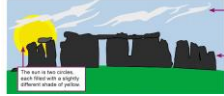
8 Vector Graphic Basics

FIGURE 8-33

To draw a circle, select the filled circle tool, and then drag the mouse pointer to indicate the circle's location and size. A color palette allows you to select the circle color. After you create the circle object, you can move it and change its size or color. You can also create irregular shapes for objects, such as clouds, by connecting short line segments. ● Learn the basics of drawing vector images by accessing this figure in your interactive eBook.

8 Vector-to-Bitmap Conversion

➢ Rasterization superimposes a grid over a vector image and determines the color for each pixel

➢ Tracing software locates the edges of objects in a bitmap image and converts the resulting shapes into vector graphic objects

FIGURE 8-34

When vector images are rasterized, they become bitmaps and can't be enlarged without becoming pixelated.

8 Vector Graphics on the Web

➢ SVG (Scalable Vector Graphics) and Flash are vector graphic formats for the Web

➢ Advantages of using vector graphics
  ➢ Consistent quality
  ➢ Searchable
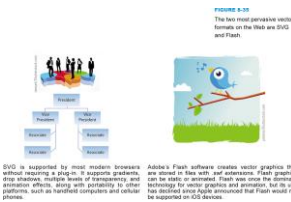 ➢ Compact file size

FIGURE 8-35

The two most pervasive vector formats on the Web are SVG and Flash.

SVG is supported by most modern browsers without requiring a plug-in. It supports gradients, drop shadows, multiple levels of transparency, and animation effects, along with portability to other platforms, such as handheld computers and cellular phones.

Adobe's Flash software creates vector graphics that are stored in files with .swf extensions. Flash graphics can be static or animated. Flash was once the dominant technology for vector graphics and animation, but its use has declined since Apple announced that Flash would not be supported on iOS devices.

8 3-D Graphics

➢ Stored as a set of instructions
  ➢ Contain locations and lengths of lines forming a wireframe
➢ Rendering covers a wireframe with surface color and texture
➢ Ray tracing adds light and shadows to a 3-D image
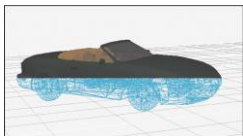
8 3-D Graphics

FIGURE 8-36

3-D graphics are based on a wireframe, which can be rendered into a bitmap image that looks three-dimensional.

8 3-D Graphics

FIGURE 8-38

3-D graphics software provides tools for drawing a wireframe and then specifying colors and textures for rendering. ● Watch a wireframe being rendered and animated in your interactive eBook.

8 ## Section D: Digital Video

- Digital Video Basics
- Producing Video Footage
- Video Transfer
- Video Editing
- Video Output
- Web Video
- DVD-Video

8 ## Question

- 082400 YouTube is popular video site. Which one of the following statements is NOT true about these videos?
  - A. YouTube supports streaming video.
  - B. You need the UTube Show browser plug-in to view videos on the YouTube site.
  - C. YouTube videos have a low compression ratio and a high bitrate.
  - D. Each YouTube video has a unique URL.

8 ## Digital Video Basics

- Uses bits to store color and brightness data for each video frame
- The color for each pixel is represented by a binary number
- Footage for digital videos can be supplied from a digital source, or from an analog source that requires conversion

FIGURE 8-40
A video is composed of a series of bitmap graphics, each one called a frame.

8 ## Digital Video Basics

FIGURE 8-41
Creating digital videos requires a few fairly simple steps.

8 ## Producing Video Footage

- Use digital or analog video camera to shoot video footage
  - Digital video cameras store footage as a series of bits
  - Analog video cameras store video signals as a continuous track of magnetic patterns
  - Another option for shooting video footage is a small, inexpensive webcam that is built in over the screen of a notebook computer or attached as a peripheral device

FIGURE 8-43
A Web camera can be built into a computer display device or can be attached as shown. It is designed mainly for 'talking head' applications, such as online video chats and video-conferences.

8 ## Producing Video Footage

FIGURE 8-44
Video Filming Tips

- Use a tripod to maintain a steady image.
- Move the camera slowly if it is necessary to pan from side to side.
- Zoom in and out slowly.
- Direct your subjects to move slowly, when possible.
- Position your shot to eliminate as much background detail and movement as possible.
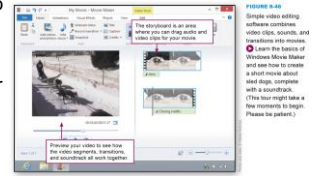- Ask the subjects of your video to wear solid-colored clothing, if possible.

Video Transfer

➤ The basic method for transferring digital video footage to your computer's hard disk for editing is to remove the SD card from the camera and insert it into a card reader on your computer
  ➤ Video capture converts analog video signals into digital format

Video Editing

➤ Linear editing
  ➤ Requires at least two VCRs
➤ Nonlinear editing
  ➤ Requires a computer hard disk and video editing software

Video Output

Video Output

Web Video

➤ A video for a Web page is stored on a Web server in a file
➤ Streaming video
➤ YouTube is a video-sharing Web site that encourages members to upload, view, and rate video clips

Web Video

➤ On today's Web, most videos are embedded in Web pages so that they appear to play in place
➤ The HTML5 <video> tag supports several video formats, but it does not designate a common video format for all HTML5-compliant browsers
➤ Several ways to reuse & share Web videos
  ➤ Video sharing sites
  ➤ E-mailing videos

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8 Web Video

8 DVD-Video

➢ Incorporate digital videos onto DVDs with interactive menus
  ➢ DVD authoring software

8 DVD-Video

➢ With advance planning, menus are easy to create
➢ Output video in DVD-Video format
➢ A DVD image is a prototype of your DVD
  ➢ Stored on your computer's hard disk
➢ Thoroughly test DVD on your computer before you burn it
➢ Recordable vs. rewritable DVDs

8 Section E: Digital Rights Management

➢ Content Basics
➢ DRM Technologies
➢ Music DRM
➢ Movie DRM
➢ Ebook DRM
➢ Enforcement

8 Question

➢ 082500 Digital rights management is an important aspect of protecting digital music and movies from illegal distribution. Opponents believe that:
  ➢ A. Digital rights management is too hard to break.
  ➢ B. Digital rights management has not been effective for preventing large-scale piracy.
  ➢ C. Digital right management for movies is effective, but it is not effective for music.
  ➢ D. Digital rights management should apply to CDs and DVDs, but not to downloads.
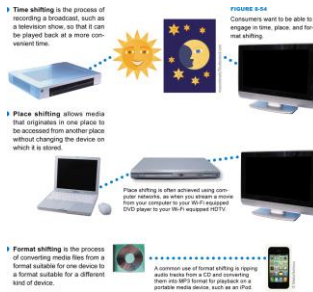
8 Content Basics

➢ Media content (or simply content) includes television shows, movies, music, and books.
➢ Digital content is a term used for movies and other content that is stored digitally
➢ Consumers expect to be able to manipulate media content so that they can use it on multiple devices at a convenient time and place
  ➢ Time shifting
  ➢ Place shifting
  ➢ Format shifting

8 Content Basics

Time shifting is the process of recording a broadcast, such as a television show, so that it can be played back at a more convenient time.

FIGURE 8-54 Consumers want to be able to engage in time, place, and format shifting.

Place shifting allows media that originates in one place to be accessed from another place without changing the device on which it is stored.

Place shifting is often achieved using computer networks, as when you stream a movie from your computer to your Wi-Fi-equipped DVD player to your Wi-Fi equipped HDTV.

Format shifting is the process of converting media files from a format suitable for one device to a format suitable for a different kind of device.

A common use of format shifting is ripping audio tracks from a CD and converting them into MP3 format for playback on a portable media device, such as an iPod.

8 DRM Technologies

- Digital rights management (DRM) is a collection of techniques used by copyright holders to limit access to and use of digital content
  - Apple's FairPlay
  - Microsoft's Windows Media DRM
- Authentication is a very simple form of digital rights management that allows content to be accessed only by authorized individuals
- A digital watermark is a pattern of bits, inserted at various places in an image or a content stream, that can be used to track, identify, verify, and control content use

8 Music DRM

- Between 2000 and 2005, the recording industry produced copy protected CDs that did not play correctly on computers or when copied
- Ripping tracks from these CDs is difficult, but not impossible
- It is easier to protect streamed content than downloaded content
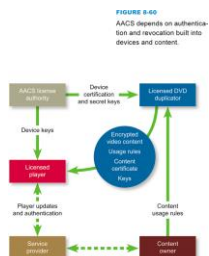
8 Movie DRM

- CSS (Content Scramble System) is a digital rights management technology designed to encrypt and control the use of content stored on DVDs
- The primary DRM technology for Blu-ray discs is AACS (Advanced Access Content System)

8 Movie DRM

FIGURE 8-60 AACS depends on authentication and revocation built into devices and content.

8 Movie DRM

- Movie downloads tend to have more rigorous DRM protection than music downloads
- Streaming movie DRM technologies
  - Encryption
  - HDCP
    - HDCP (High-bandwidth Digital Content Protection) is a hardware-based DRM technology that requires compliant devices for content playback

8 Ebook DRM

➢ Early DRM efforts for ebooks tied books to dedicated ebook readers
➢ In response to consumer demand, ebook distributors expanded the platforms on which digital books can be read

FIGURE 8-51
Ebooks can be displayed on a dedicated reader, such as the Kindle, which handles digital rights.

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8 Enforcement

➢ When using digital content, make sure you know the rules
➢ The copyright owner is entitled to recover monetary damages resulting from infringement, and any profits made from illegal sales of the work
➢ Copyright holders periodically crack down on infringers

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8 What Do You Think?

➢ 083100 Have you had trouble using software, music CDs, or movie DVDs because of copy protection?

  ➢ A. Yes   B. No   C. Not sure

➢ 083200 In your opinion, do sites like the iTunes Music Store provide consumers with enough flexibility for copying files and creating playlists?

  ➢ A. Yes   B. No   C. Not sure

➢ 083300 Do you think digital rights management technologies are justified because of the high rate of piracy?

  ➢ A. Yes   B. No   C. Not sure

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NEW PERSPECTIVES

Chapter 8 Complete

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