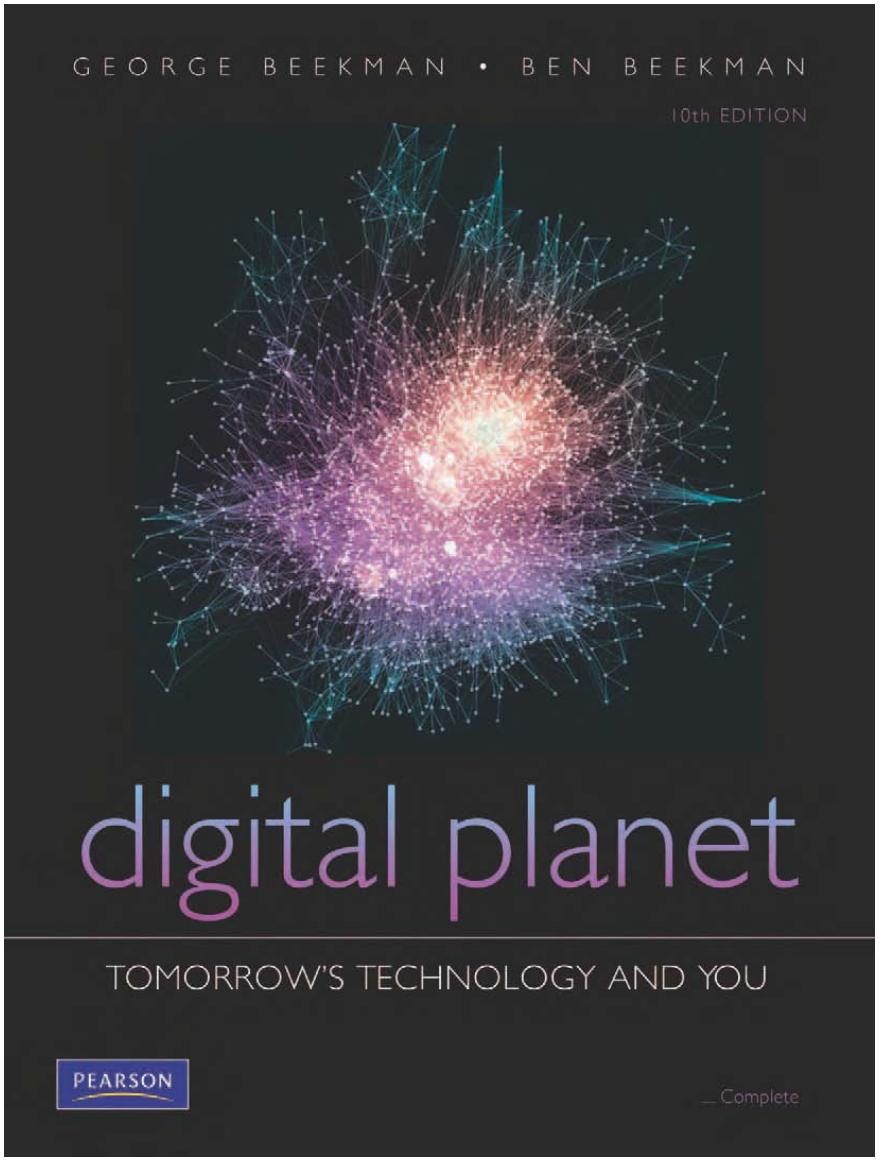

Digital Planet:

Tomorrow's Technology and You

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Tenth Edition

Digital Planet: Tomorrow's Technology and You

Chapter 3

Hardware Basics

Peripherals

Chapter 3 Objectives

- ✓ List several examples of input devices and explain how they can make it easier to get different types of information into the computer
- ✓ List several examples of output devices and explain how they make computers more useful
- ✓ Explain why a typical computer has different types of storage devices
- ✓ Diagram how the components of a computer system fit together

Input: From Person to Processor

- ✓ Nuts and bolts of information processing hidden from computer user.
- ✓ User sees only input and output or I/O.
- ✓ Early computer users had to flip switches or plug wires into switchboards.
- ✓ Today, users have choice of hundreds of input devices that make it easy to enter data and commands.

The Keyboard

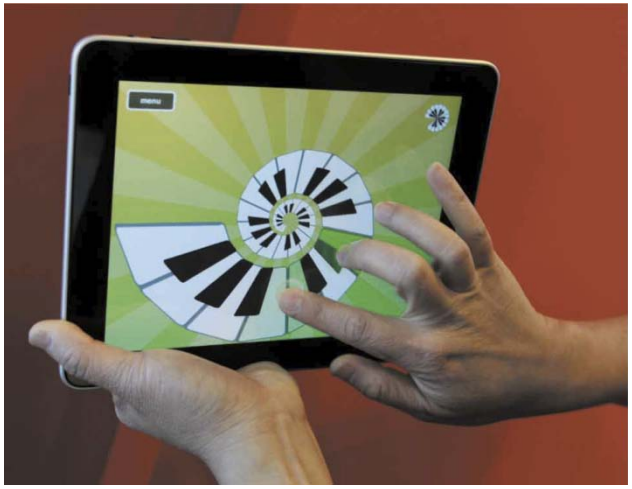
- ***Keyboard:*** Most familiar input device
- QWERTY keyboard dates back to manual typewriters
- Typical keyboard sends signals to computer through cable—usually USB
- Keyboards may be wireless
- ***Ergonomic keyboards:*** Keys are at angles; easy on arms and hands

Pointing Devices

- ***Mouse:*** Designed to move pointer around screen
- ***Wireless mice:*** Use Bluetooth or other wireless frequencies
- ***Touchpad:*** A flat panel, sensitive to light pressure
- ***Trackpoint*** and ***trackball:*** Used to control pointer
- ***Game controllers***, ***graphics tablets***, ***touch screens:*** Used for inputting

Multi-Touch Input Devices

- ✓ Use multi-finger or multi-hand gestures to accomplish complex tasks quickly
- ✓ Touch-sensitive screen, touch tablet, or trackpad can recognize position, pressure, and movement of more than one finger or hand at a time
- ✓ Best known example is Apple's iPhone
- ✓ iPad recognizes one- and two- fingered movements



Reading Tools

- ✓ Devices allow computers to read marks that represent codes:
  - ***Optical mark readers***
  - ***Magnetic ink character readers***
  - ***Bar code readers***
  - ***Radio frequency identification (RFID) readers***
  - ***Scanners*** and ***pen scanners***
  - ***Handwriting recognition devices***

Digitizing Devices and Sensors

- ✓ Devices for capturing and ***digitizing*** information—converting it into digital form:
  - ***Scanners***
    - Flatbed scanner
    - Film scanners
    - Drum scanners
  - **Digital cameras** and ***digital video cameras***

Digitizing Devices and Sensors (cont.)

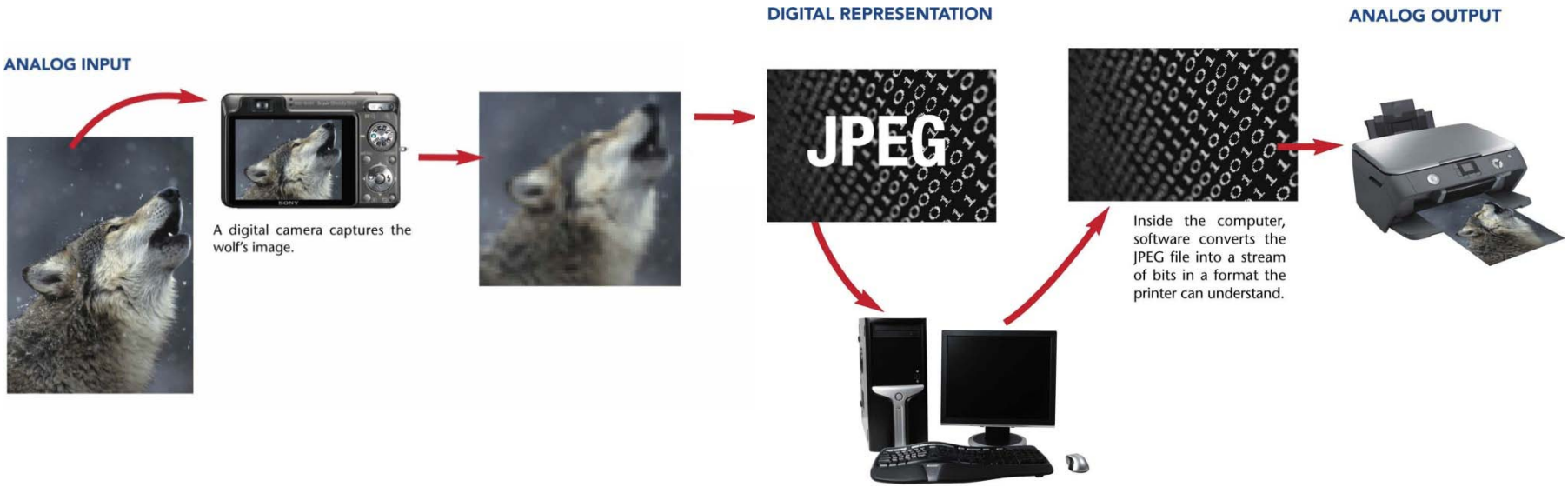
- ✓ Voice Input
  - PCs contain circuitry to convert audio signals from microphones or other sound sources into digital signals.
  - ***Speech recognition software*** can convert voice data into words that can be edited and printed.

Output: From Pulses to People

- ✓ Output devices convert computer's internal bit patterns into a form humans can understand.
- ✓ Output produced through two main devices:
  - Display screens for immediate visual output
  - Printers for permanent paper output

Digitizing the Real World

- ✓ Digitizing involves using an input device to take millions of tiny samples.
- ✓ A representation of the original image can be reconstructed by assembling all samples in sequence.

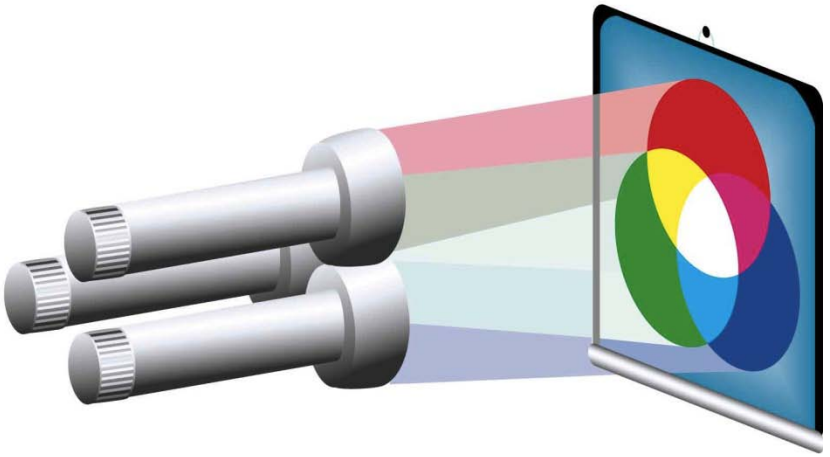


Screen Output

- ***Display:*** Also called a ***monitor***
- Display size measured length of diagonal line across screen
- Images composed of tiny dots called ***pixels***.
- ***Resolution:*** Measured in dots per inch (dpi)
- ***Aspect ratio:*** Relationship between width and height
- Monitors use ***liquid crystal digital (LCD)*** technology.

Color Display

- ✓ Image is made up of rows of colored pixels
- ✓ Pixels are extremely small and can't be distinguished
- ✓ Monitor's image is refreshed many times per second
- ✓ Each pixel is made up of mixture of red, green, blue
- ✓ By varying the brightness of the three colors, a monitor can display millions of unique colors



Paper Output

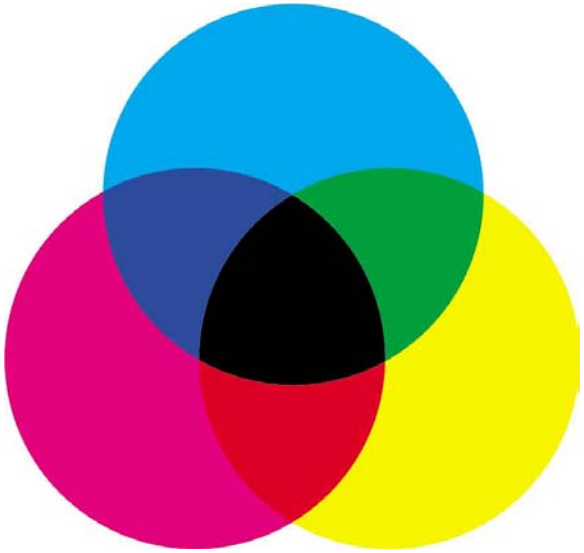
- ✓ Printers come in two basic groups:
- ✓ ***Impact printers:*** Form images by physically striking paper, ribbon, and print hammer together
- ✓ ***Nonimpact printers:*** Replaced impact printers
  - ***Laser printers:*** High-quality pages, quickly
  - ***Inkjet printers:*** Spray ink directly onto paper
  - ***Photo printers:*** Specialized inkjets print photos

Paper Output (cont.)

- ✓ Multifunction Printers
  - ***All-in-one devices:*** Take advantage of fact that different tools can use similar technology
  - Devices can serve as a printer, scanner, color photocopy machine, and fax machine.

Color Printing

- ✓ Most printers, like monitors, form images from tiny dots.
- ✓ Most printers mix various amounts of cyan, magenta, yellow, and black pigments to create a color.
- ✓ Matching on-screen color with printed color is difficult.
- ✓ Monitors can display more colors than printers.



Fax Machines and Fax Modems

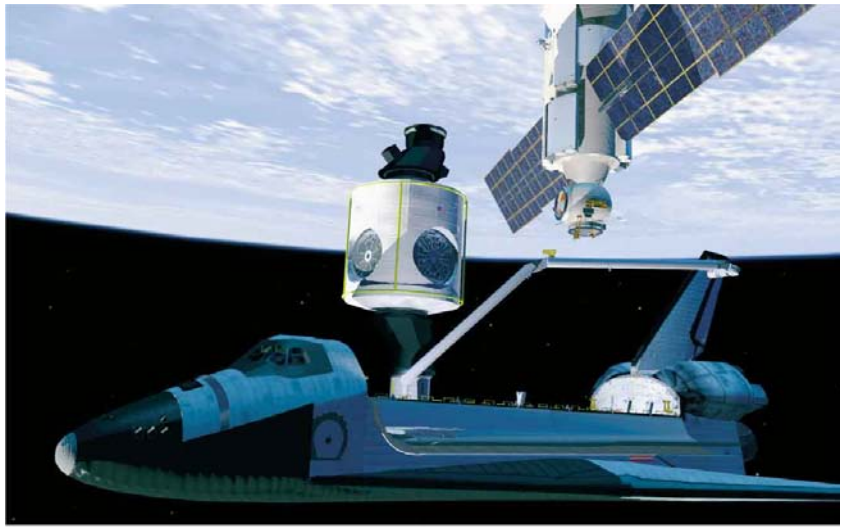
- ***Facsimile (fax) machine:*** Scans page, converts it to series of electronic pulses, and sends signals over phone lines to another fax machine
- ***Fax modem:*** Translates document into signals that can be sent over phone wires
- Receiving fax machine uses signals to construct and print facsimile of original pages

Output You Can Hear

- ✓ Most PCs have internal speakers
  - Play system sounds and spoken recordings
- ✓ Sound output jacks for headphones, powered speakers, and other audio output devices
  - High-fidelity music playback
- ✓ Headsets are particularly useful for telephone and teleconferencing applications

Controlling Other Machines

- ✓ Many machines and systems accept orders from computers:
  - Robot arms
  - Telephone switchboards
  - Transportation devices
  - Automated factory equipment
  - Spacecraft



Storage Devices: Input Meets Output

- ✓ Some peripherals perform both input and output functions:
  - ***Storage devices:*** Include tape and disk drives
  - Referred to as ***secondary storage***
  - Record information so it can be read later

Magnetic Tape

- ✓ ***Tape drives:*** Common storage devices on most mainframe computers
  - Can store massive amounts of information on ***magnetic tape*** in a small space at a relatively low cost
  - Tape is ***sequential-access*** medium, so retrieving information is time consuming
- ✓ Primarily used to back up data

Magnetic Disks

- ✓ Magnetically coated surface stores encoded information
  - Provide ***random access*** capability
  - Retrieve information rapidly
- ✓ PCs include ***hard disks*** as main storage device
- ✓ Older diskettes (floppy disks) and Zip disks have all but disappeared

Optical Discs

- ***Optical disc drives:*** Use laser beams to read and write data
- Transparent plastic disc surface protects from physical damage – while letting laser light through
- Access speeds are slower than for magnetic disks
- Often used to make backup copies
- Upper surface is more sensitive to scratching – which leads to deterioration & information loss

Optical Discs (cont.)

- ✓ ***CD-ROM*** (compact disc—read-only memory) discs – oldest & also identical to those used to store music
- ✓ ***CD-RW drive:*** Read data from CD-ROMs; record data onto CD-R and CD-RW discs
  - CD-R (compact disc-recordable)—write-once, read-many
  - CD-RW (compact disc rewritable) erasable
- ✓ ***Rewritable DVD drives:*** Commonplace in PCs today
  - Can read and write to CD and DVD media
  - Gradually being replaced by Blu-ray drives

Disc Capacity

CD-ROM (read-only CD)	CD-RW	DVD-ROM (read-only DVD)	DVD/RW	BD/ROM (read-only Blu-ray)	BD/RW
		4.7 GB (single-layer disc)	4.7 GB (single-layer disc)	27 GB (single-layer disc)	27 GB (single-layer disc)
700 MB	700 MB	9.4 GB (dual-layer disc)	9.4 GB (dual-layer disc)	50 GB (dual-layer disc)	50 GB (dual-layer disc)

Internal and External Drives

- ✓ Hard disk drives and optical disk drives can be external or internal.
  - ***Internal drives:*** Reside inside casing of computer
  - ***External drives:*** Can be connected through USB or FireWire ports
    - Relatively easy to transport between locations
    - Can be shared between computers

Disk Storage

Magnetic disks

- Coated with a magnetic oxide similar to material used to coat cassette tapes and videotapes
- Hard disks consists of several platters, each accessed by a read/write head on a movable armature.

CD-ROM

- CD-ROM drive contains a small laser that shines on the disc surface, “reading” reflections.
- Information is represented optically on bottom surface of CD.
- CD-ROMs are read only.

Flash Memory Storage Devices

- ***Flash memory:*** Type of erasable memory
- ***Flash memory cards:*** Used to store images in digital cameras
- ***USB flash drives:*** Store and transport data
- Still more expensive than spinning drives

Ergonomics and Health

- Choose equipment that's ergonomically designed.
- Create a healthful workspace.
- Build flexibility into work environment.
- Protect your ears.
- Rest your eyes.
- Let technology work for you.
- Stretch.
- Listen to your body.
- Don't leave healthy habits at home.
- Seek help when you need it.

The Computer System: The Sum of Its Parts

- ✓ **Four basic design classes for personal computers:**
  - ***Tower systems:*** Tall narrow boxes that generally have more expansion slots and bays
  - ***Flat desktop systems:*** Designed to sit under the monitor like a platform
  - ***All-in-one systems:*** Combine the monitor and system unit into a single housing
  - ***Laptop computers:*** Include all essential components in one compact box

Ports and Slots Revisited

- ✓ ***Legacy ports*** are too slow for today's needs:
  - Serial ports send and receive data one bit at a time
  - Parallel ports send and receive bits in groups
- ✓ ***USB (universal serial bus)*** transmits data faster:
  - USB 1.0 data transmitted at approximately 11 Mbps
  - USB 2.0 has transfer rates of up to 480 Mbps
  - USB 3.0 has data transfer rate of more than 3 Gbps

Ports and Slots Revisited (cont.)

- ✓ ***FireWire:*** A high-speed connection standard developed by Apple
- ✓ Can move data between devices at:
  - 400 Mbps (original version)
  - 800 Mbps (newer FireWire 800)
- ✓ FireWire allows multiple devices to be connected to the same port.
- ✓ Also can supply power to peripherals so they don't need an external power supply

Wireless Peripherals, Network Peripherals, and the Cloud

- ✓ Wireless technology
  - Wireless keyboards, mice, cameras, printers
- ✓ Computer networks
  - Peripherals communicate with multiple PCs
- ✓ Internet “cloud”
  - Common for computers to use peripherals—especially storage devices—located somewhere in the cloud

Chapter 3 Summary

- ✓ Peripherals allow computer to communicate with outside world and store information for later use.
- ✓ Some peripherals are strictly input devices.
- ✓ Others are output devices
- ✓ Storage devices can accept and send information.
- ✓ Keyboard and mouse are most common peripherals.
- ✓ Growing number of devices can support multi-touch technology.

Summary (cont.)

- ✓ Bar code readers, optical mark readers, and magnetic ink readers recognize and translate specially printed patterns and characters.
- ✓ Scanners and digital cameras convert photographs, drawings, and other analog images to digital files.
- ✓ Sound digitizers convert information from microphone and other external audio devices.
- ✓ Sensors detect motion, temperature, pressure, and other characteristics.

Summary (cont.)

- ✓ Output devices accept strings of bits from the computer and transform them into a form useful outside the computer.
- ✓ Video monitors used to display information
- ✓ Variety of printers produce paper output.
- ✓ Sound output is delivered through speakers and headphones.
- ✓ Output devices allow computers to control other machines.

Summary (cont.)

- ✓ Storage devices designed to send and receive large quantities of data
- ✓ Large capacity magnetic disks are most common form of storage because of high-speed random access capability.
- ✓ Optical discs are most common removable storage media
- ✓ Solid-state flash memory is replacing disks and tapes for many applications.