CSE 100: Computer Skills

Lecture 2: Computer Hardware
-Input and Output Devices

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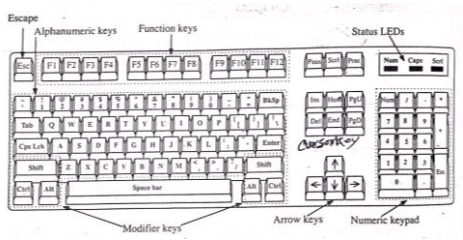
Computer Hardware

- Input Devices
  - Used to input data and instructions to computer
- Output Devices
  - Produces output for human users
- Memory and Storage Devices
  - Used to store data and programs
- Processing Devices
  - Processes data. All processing devices combined called CPU
- Other devices
  - Special purpose device for specific task

Keyboard

- The most common input device
- Ideal for textual data input and control commands
- Can range from 84 to 100 plus keys
- Many different Keyboard layout available
- IBM enhanced layout most common

Keyboard



Keyboard

- Alphanumeric Keys
  - Used for inputting letters, digits, punctuation marks and other symbols
  - Few special keys also available
    - **Tab**: Moves current typing positions by a predefiend amount.
    - **Caps lock**: Used to input uppercase
    - **Backspace**: It allows erasing characters last typed
    - **Enter**: Finishes command or data entry. In text editor ends current line and starts new one

Keyboard

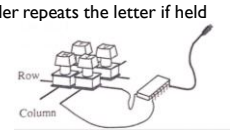
- Numeric Keypad (Num Pad)
- Modifier Keys
  - Shift:
  - Ctrl:
  - Alt:
- Function Keys
  - Used for direct command to application program
  - Common functions include
    - F1 for help
    - F5 for refresh
- Cursor Control Keys
  - Used to control cursor in applications

Keyboard

- Special Keys
  - ESC: Used to cancel any command
  - Print Screen: prints the content of the screen to a printer or to memory, Used to capture screen
  - Scroll lock: Stops scrolling of large running text
  - Pause: Pauses execution of running program
  - Insert:: Used to overwrite test in current position
  - Delete: Deletes clears content in current cursor position

Keyboard

- How keyboard works
  - Keyboard controller detects a key press
  - Controller sends a code to the CPU
    - Code represents the key pressed
  - Controller notifies the operating system
  - Operating system responds
  - Controller repeats the letter if held



Keyboard Connector

- 5-pin DIN
- 6-pin IBM PS/2 mini DIN
- 4-pin USB

Mouse

- All modern computers have a variant
- Allows users to select objects
  - Pointer moved by the mouse
- Mechanical mouse
  - Rubber ball determines direction and speed
  - The ball often requires cleaning
- Optical mouse
  - Light shown onto mouse pad
  - Reflection determines speed and direction
  - Requires little maintenance

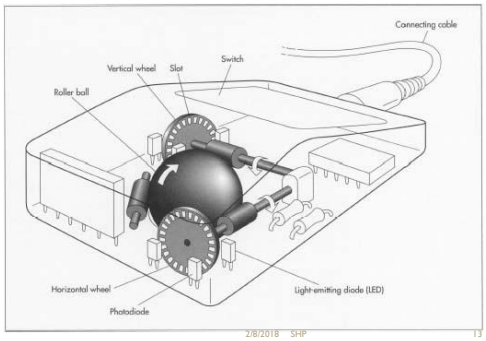
Mouse

- Interacting with a mouse
  - Actions involve pointing to an object
  - Clicking selects the object
  - Clicking and holding drags the object
  - Releasing an object is a drop
  - Right clicking activates the shortcut menu
  - Modern mice include a scroll wheel

Mouse

- Benefits
  - Pointer positioning is fast
  - Menu interaction is easy
  - Users can draw electronically
- Mouse button configuration
  - Configured for a right-handed user
    - Can be reconfigured
  - Between 1 and 6 buttons
  - Extra buttons are configurable

How Mouse works



Variants of the Mouse

- Trackballs
  - Upside down mouse
  - Hand rests on the ball
  - User moves the ball
  - Uses little desk space

Variants of the Mouse

- Track pads
  - Stationary pointing device
  - Small plastic rectangle
  - Finger moves across the pad
  - Pointer moves with the pointer
  - Popular on laptops

Variants of the Mouse

- Track point
  - Little joystick on the keyboard
  - Move pointer by moving the joystick

Ergonomic and Input Devices

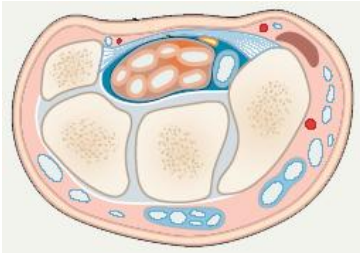
Ergonomics and Input Devices

- Ergonomics
  - Study of human and tool interaction
  - Concerned with physical interaction
  - Attempts to improve safety and comfort

Ergonomics and Input Devices

- Repetitive Strain Injury (RSI)
  - Caused by continuous misuse of the body
  - Many professions suffer from RSI
- Carpal Tunnel Syndrome
  - Carpal tunnel is a passage in the wrist
  - Holds nerves and tendons
  - Prolonged keyboarding swells tendons

Carpal Tunnel Syndrome

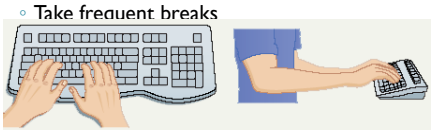


Ergonomics and Input Devices

- Office hardware suggestions
  - Office chairs should have
    - Adjustable armrests and height
    - Armrests
    - Lower back support
  - Desks should have
    - Have a keyboard tray
    - Keep hands at keyboard height
    - Place the monitor at eye level

Ergonomics and Input Devices

- Techniques to avoid RSI
  - Sit up straight
  - Have a padded wrist support
  - Keep your arms straight
  - Keyboard properly
  - Take frequent breaks



Inputting Data In Other Ways

Devices for the Hand

- Pen based input
  - Tablet PCs, PDA
  - Pen used to write data
  - Pen used as a pointer
  - Handwriting recognition
  - On screen keyboard

Devices for the hand

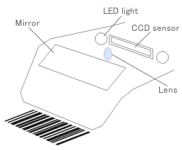
- Touch screens
  - Sensors determine where finger points
  - Sensors create an X,Y coordinate
  - Usually presents a menu to users
  - Found in cramped or dirty environments

Devices for the hand

- Game controllers
  - Enhances gaming experience
  - Provide custom input to the game
  - Modern controllers offer feedback
  - Joystick
  - Game pad

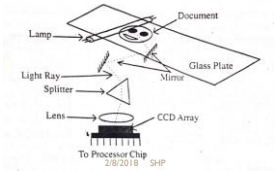
Optical Input Devices

- Allows the computer to see input
- Bar code readers
  - Converts bar codes to numbers
    - UPC code
  - Computer find number in a database
  - Works by reflecting light
    - Amount of reflected light indicates number



Optical Input Devices

- Image scanners
  - Converts printed media into electronic
  - Reflects light off of the image
  - Sensors read the intensity
  - Filters determine color depths

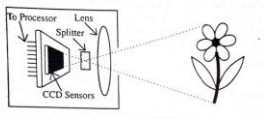


Optical input devices

- Optical character recognition (OCR)
  - Converts scanned text into editable text
  - Each letter is scanned
  - Letters are compared to known letters
  - Best match is entered into document
  - Rarely 100% accurate

Audiovisual Input Devices

- Digital cameras
  - Captures images electronically
  - No film is needed
  - Image is stored as a JPG file
  - Memory cards store the images
  - Used in a variety of professions



Audiovisual Input Devices

- Microphones
  - Used to record speech
  - Speech recognition
    - "Understands" human speech
    - Allows dictation or control of computer
    - Matches spoken sound to known phonemes
    - Enters best match into document

Audiovisual Input Devices

- Musical Instrument Digital Interface
  - MIDI
  - Connects musical instruments to computer
  - Digital recording or playback of music
  - Musicians can produce professional results

Output Devices

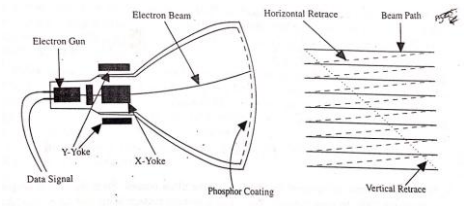
Monitors

- Most common output device
- Connects to the video card
- Categorized by color output
  - Monochrome
    - One color with black background
  - Grayscale
    - Varying degrees of gray
  - Color
    - Display 4 to 16 million colors

Monitors

- Cathode Ray Tube (CRT)
  - Most common type of monitor
  - Electrons fired from the back
  - Electrons excite phosphor to glow
  - Phosphor is arranged in dots called pixels
  - Dot mask ensures proper pixel is lit

Monitors



Monitors

- CRT color
  - Phosphor dots arranged in triads
  - Red, green, and blue dots
  - Three colors blend to make colors
  - Varying the intensity creates new colors
- CRT drawbacks
  - Very large
  - Very heavy
  - Use a lot of electricity

Monitors

- Liquid Crystal Display (LCD)
  - Much slimmer than traditional CRT
  - Solve the problems of CRT
  - Fluorescent lights provide illumination
    - Backlight can be Tubes or LED
  - Also called TFT (Thin Film Transistor)

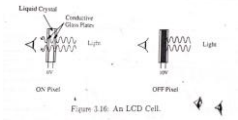


Figure 3.16. An LCD Cell.

Monitors

- Passive matrix LCD
  - Pixels arranged in a grid
  - Pixels are activated indirectly
    - Row and column are activated
  - Animation can be blurry
- Active matrix LCD
  - Each pixel is activated directly
  - Pixels have 4 transistors
    - One each for red, green, blue
    - One for opaqueness
  - Transistors arranged in a thin film
  - Animation is crisp and clean

Monitors

- Drawbacks to LCD
  - More expensive than CRT
  - Must sit directly in front of screen
  - Can be more fragile than CRT

Monitors

- Paper-white displays
  - High contrast between fore and background
- Electro-luminescent displays (ELD)
  - Similar to LCD
  - Uses phosphor to produce light
- OLED
  - Each pixel has LEDs to produce light
- Plasma monitor
  - Gas is excited to produce light

Monitors and Video Cards

- Monitors impacts user effectiveness
- Monitors should have
  - Crisp text
  - Clear graphics
  - Adjustable controls
  - Clear edges

Monitors and Video Cards

- Size of monitor
  - Measured in inches
  - Measured diagonally
  - Actual size
    - Distance from corner to corner
  - Viewable size
    - Useable portion of the screen

Monitors and Video Cards

- Resolution
  - Number of pixels on the screen
  - Higher number creates sharper images
  - Higher number creates smaller images
- Refresh rate
  - Number of time the screen is redrawn
  - Modern equipment sets this automatically
  - Improper settings can cause eyestrain

Technical terms about monitor

- Common Resolution values
  - 800 X 600
  - 1024 X 768
  - 1600 X 1200
- Physical Size of Pixel is called dot pitch
- AGP (Accelerated Graphics Port)
- CGA (Color Graphics Adapter)
  - Resolution of 320 X 200 with only 4 colors
- EGA (Extended Graphics Adapter)
  - Resolution of 640 X 350 with 16 colors
- VGA (Virtual Graphics Array)
  - Resolution of 640 X 480 with 256 colors
- SVGA (Super VGA)
  - Resolution of 800 X 600 with 256 colors

Video Cards

- Device between the CPU and monitor
- Better cards result in better output
- Removes burden of drawing from CPU
- Have their own processor and RAM
- Modern cards have gigabytes of RAM
- Capable of rendering 3D images

Ergonomics and Monitors

- Eyestrain
  - Fatigue of the eyes
  - Steps to avoid
    - Choose a good monitor
    - Place the monitor 2 – 3 feet away
    - Center of screen below eye level
    - Avoid reflected light

Ergonomics and Monitors

- Electronic magnetic fields (EMF)
  - Generated by all electronic devices
  - EMF may be detrimental to health
  - Steps to avoid
    - Keep the computer at arms length
    - Take frequent breaks
    - Use an LCD monitor

Data Projectors

- Replaced overhead and slide projectors
- Project image onto wall or screen
- LCD projectors
  - Most common type of projector
  - Small LCD screen
  - Very bright light
  - Require a darkened room
- Digital Light Projectors
  - A series of mirrors control the display
  - May be used in a lighted room

Sound Systems

- Integral part of the computer experience
- Capable of recording and playback
- Sound card
  - Device between the CPU and speakers
  - Converts digital sounds to analog
  - Can be connected to several devices
  - Modern cards support Dolby Surround Sound

Sound Systems

- Headphones and headsets
  - Replacement for speakers and microphones
  - Offer privacy
  - Does not annoy other people
  - Outside noise is not a factor
  - Headsets have speakers and a microphone

Printers

Commonly Used Printers

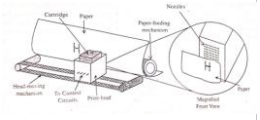
- Impact printers
  - Generate output by striking the paper
  - Uses an inked ribbon
- Non-impact printers
  - Use methods other than force
  - Tend to be quiet and fast

Commonly Used Printers

- Dot matrix printers
  - Impact printer
  - Used to print to multi-sheet pages
  - Print head strikes inked ribbon
  - Line printers
  - Band printers
  - Speed measured in characters per second

Commonly Used Printers

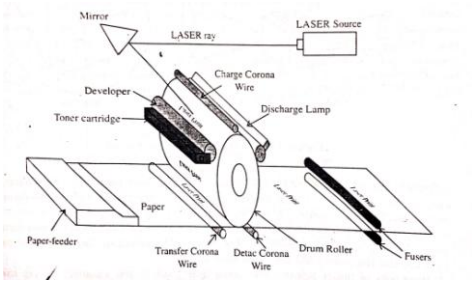
- Ink-jet printers
  - Non-impact printer
  - Inexpensive home printer
  - Color output common using CMYK
    - Cyan, magenta, yellow, black
  - Sprays ink onto paper
  - Speed measured in pages per minute
  - Quality expressed as dots per inch



Commonly Used Printers

- Laser printer
  - Non-impact printer
  - Produces high quality documents
  - Color or black and white
  - Print process
    - Laser draws text on page
    - Toner sticks to text
    - Toner melted to page
  - Speed measured in pages per minute
  - Quality expressed as dots per inch

Commonly Used Printers



Commonly Used Printers

- All-in-one peripherals
  - Scanner, copier, printer and fax
  - Popular in home offices
  - Prices are very reasonable

Comparing Printers

- Determine what you need
- Determine what you can spend
- Initial cost
- Cost of operating
- Image quality
- Speed

High-Quality Printers

- Special purpose printers
  - Used by a print shop
  - Output is professional grade
  - Prints to a variety of surfaces

High-Quality Printers

- Photo printers
  - Produces film quality pictures
  - Prints very slow
  - Prints a variety of sizes

High-Quality Printers

- Thermal wax printers
  - Produces bold color output
  - Color generated by melting wax
  - Colors do not bleed
  - Operation costs are low
  - Output is slow

High-Quality Printers

- Dye sublimation printers
  - Produces realistic output
  - Very high quality
  - Color is produced by evaporating ink
  - Operation costs are high
  - Output is very slow

High-Quality Printers

- Plotters
  - Large high quality blueprints
  - Older models draw with pens
  - Operational costs are low
  - Output is very slow

END