Computer Fundamentals

Dr. Safdar Nawaz Khan Marwat
DCSE, UET Peshawar

Lecture 2

safdar@uetpeshawar.edu.pk

Looking Inside the Computer System

- The parts of a computer system
  - (Essential computer) hardware
  - Software (brings the machine to life)
  - Computer data
  - Computer users
- The information processing cycle

Parts of the Computer System

- So every computer system has four parts
  - Hardware
  - Software
  - Data
  - User
- No matter how small or large the computer

Parts of the Computer System (cont.)

- Basic definitions
  - Hardware
    - Mechanical devices in computer
    - Anything that can be touched
  - Software
    - Tell the computer what to do
    - Also called a program
    - System Software vs. Application Software
    - Thousands of programs exist

Parts of the Computer System (cont.)

- Basic definitions (cont.)
  - Data
    - Raw facts (pieces of information) that may not make much sense
    - Computer process, converting them to useful information
  - Users
    - People operating the computer
    - Most important part
    - Tell the computer what to do

Essential Computer Hardware

- Computers use the same basic hardware

Source: *http://www.computerguidekey.com*

Essential Computer Hardware (cont.)

- Processing devices
  - Processor, brain of computer
  - Carries out instructions from program
  - Manipulate data
  - Most computers have several processors
    - Central Processing Unit (CPU)
    - Secondary processors
  - Processors made of silicon and copper
  - Plugged into motherboard

Source: *https://www.elprocus.com/microprocessor-history-and-brief-information-about-its-generations*

Essential Computer Hardware (cont.)

- Memory devices
  - Stores data or programs
  - Random Access Memory (RAM)
    - Volatile
    - Stores current data and programs
    - More RAM results in a faster system
  - Read Only Memory (ROM)
    - Permanent storage of programs
    - Holds the computer boot directions

Essential Computer Hardware (cont.)

- Input and output devices
  - Allows the user to interact
  - Input devices accept data
    - Keyboard, mouse
    - Trackball, touchpad, joystick
    - Scanner, digital camera, microphone
  - Output devices deliver data
    - Monitor, printer, speaker
  - Some devices are input and output
    - Touch screens
    - Communication devices

Essential Computer Hardware (cont.)

- Storage devices
  - Hold data and programs permanently
  - Different from RAM
  - Magnetic storage
    - Floppy and hard drive
    - Uses a magnet to access data
  - Optical storage
    - CD and DVD drives
    - Uses a laser to access data
  - Flash Drive
    - Flash memory stores information in an array of memory cells

Software Runs the Machine

- Tells the computer what to do
- Reason people purchase computers
- Two types
  - System software
  - Application software

Software Runs the Machine (cont.)

- System software
  - Most important software
  - Operating system
    - Windows XP, Windows 7 & 8
  - Network operating system (NOS)
    - Windows Server 2003, Unix (Linux, ubuntu)
  - Utility
    - Symantec AntiVirus

Software Runs the Machine (cont.)

- Application software
  - Accomplishes a specific task
  - Most common type of software
    - MS Word
    - MS Excel
  - Covers most common uses of computers

Computer Data

- Data defined as
  - Individual or raw facts
  - Pieces of information
  - May not make much sense
  - Data processed by computer
- Fact with no meaning on its own
  - Alphabets may not mean a lot individually
  - Arranging them to form words and sentences is useful information
- Stored using the binary number system
  - Data can be organized into files
- Data converted to useful information by computer
- Decision taken based on information is knowledge

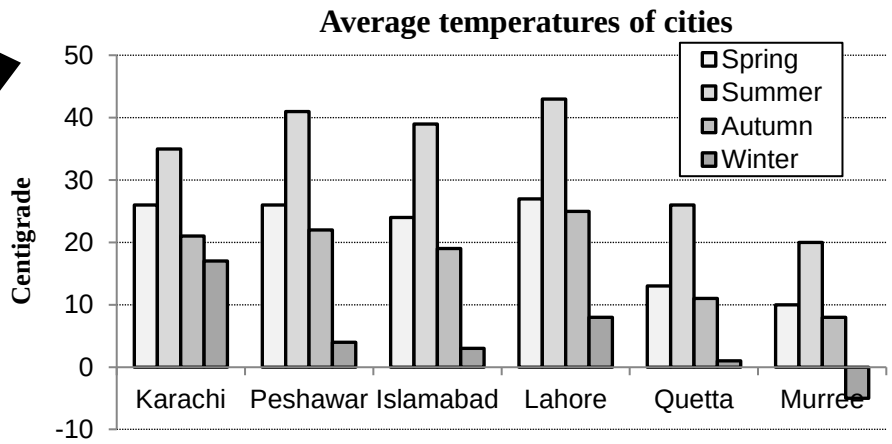
Computer Data (cont.)

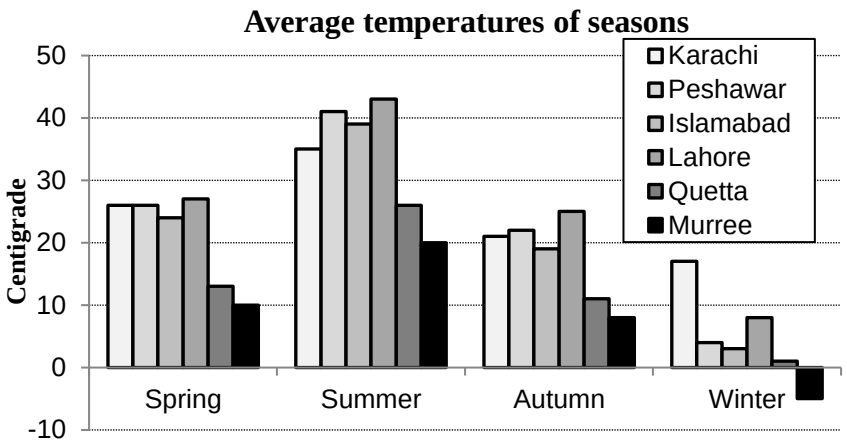
Data

Information

Knowledge

City	Karachi	Peshawar	Islamabad	Lahore	Quetta	Murree
Season						
Spring	26	26	24	27	13	10
Summer	35	41	39	43	26	20
Autumn	21	22	19	25	11	8
Winter	17	4	3	8	1	-5





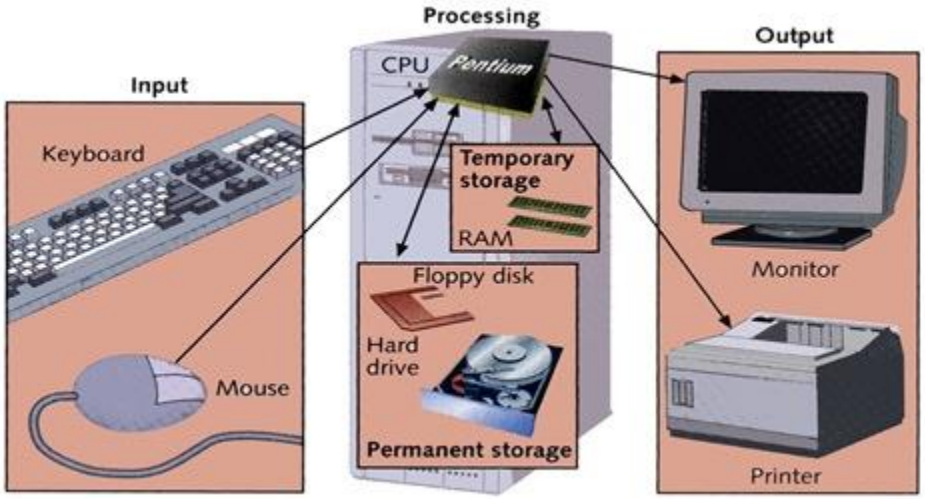
- Murree's weather is cold
- Summer is a hot season

Computer Users

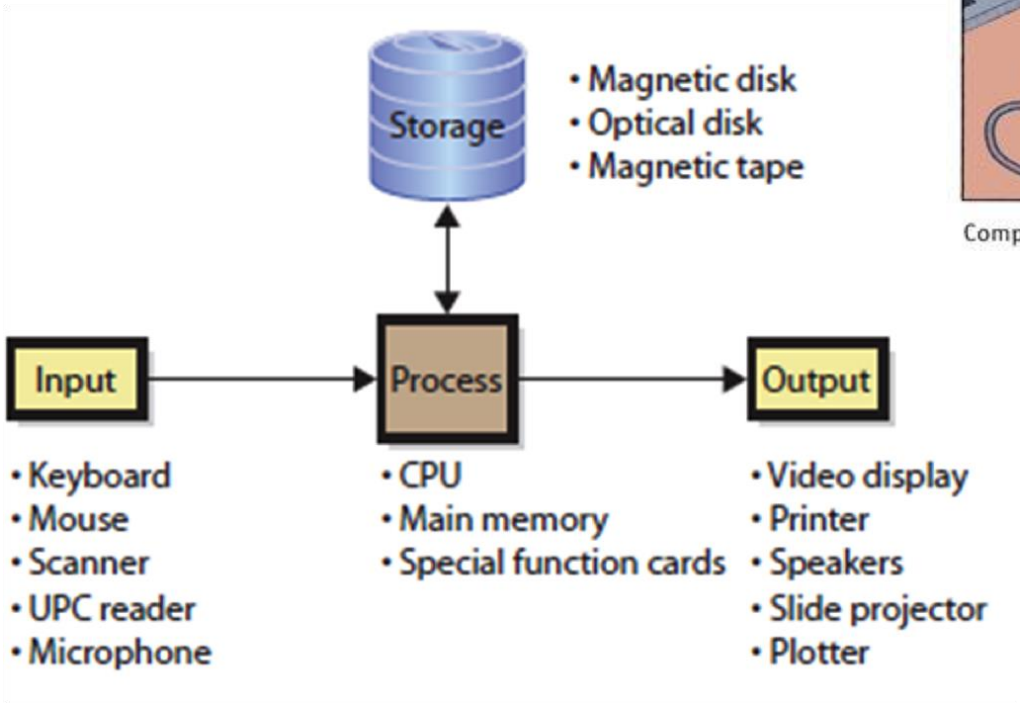
- Role depends on ability
  - Setup the system
  - Install software
  - Manage files
  - Maintain the system
- "Userless" computers
  - Run with no user input
  - Automated systems

Information Processing Cycle

- Steps followed to process data
  - Input
  - Processing
  - Output
  - Storage



Computer activity consists of input, processing, storage, and output



Source: *http://driverlayer.com*

Input and Output Devices

- Input devices
  - Enable user to enter commands and data
- Output devices
  - Enable computer to communicate information to user

Keyboard

- The most common input device
  - Keyboard proficiency very important
  - Skill is called keyboarding
- 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

Mouse

- Invented by Douglas Engelbart in 1963
  - No royalty
- 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

Sources: *www.youtube.com/watch?v=1MPJZ6M52dI* **and** https://en.wikipedia.org/wiki/Douglas_Engelbart

Mouse (cont.)

- 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 (cont.)

- 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

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 (cont.)

- Track pads
  - Stationary pointing device
  - Small plastic rectangle
  - Finger moves across the pad
  - Pointer moves according to finger
  - Popular on laptops

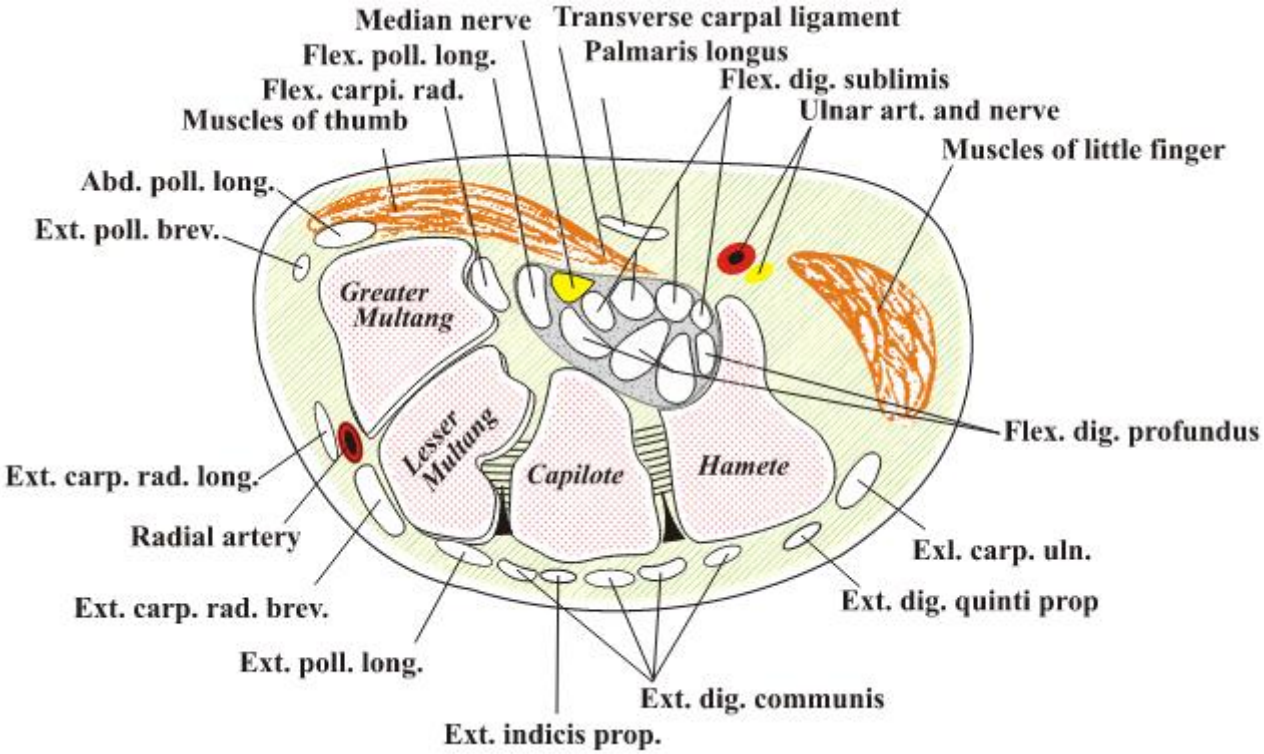
Variants of the Mouse (cont.)

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

Ergonomics and Input Devices

- Ergonomics
  - Study of human and tool interaction
  - Concerned with physical interaction
  - Attempts to improve safety and comfort
  - Human engineering
    - Workspace size, design
- Repetitive Strain Injury (RSI)
  - Caused by continuous misuse of the body
  - Many professionals suffer from RSI
- Carpal Tunnel Syndrome
  - Carpal tunnel is a passage in the wrist
  - Holds nerves and tendons
  - Prolonged keyboarding swells tendons
    - Results in compression of median nerve
  - Check *www.youtube.com/watch?v=J11EIfiHMYw*

Ergonomics and Input Devices (cont.)



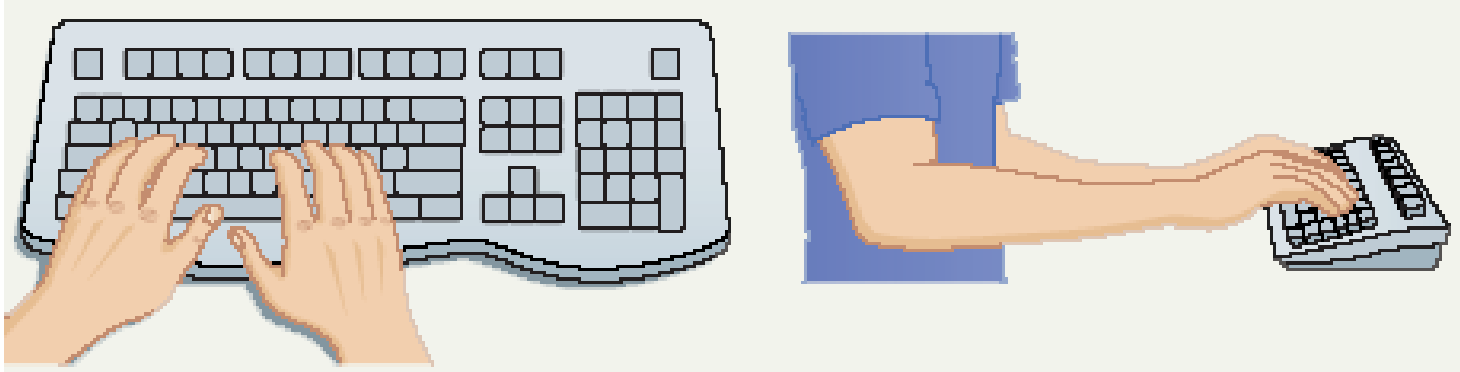
Source: *https://en.wikipedia.org/wiki/Carpal_tunnel_syndrome*

Ergonomics and Input Devices (cont.)

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

Ergonomics and Input Devices (cont.)

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



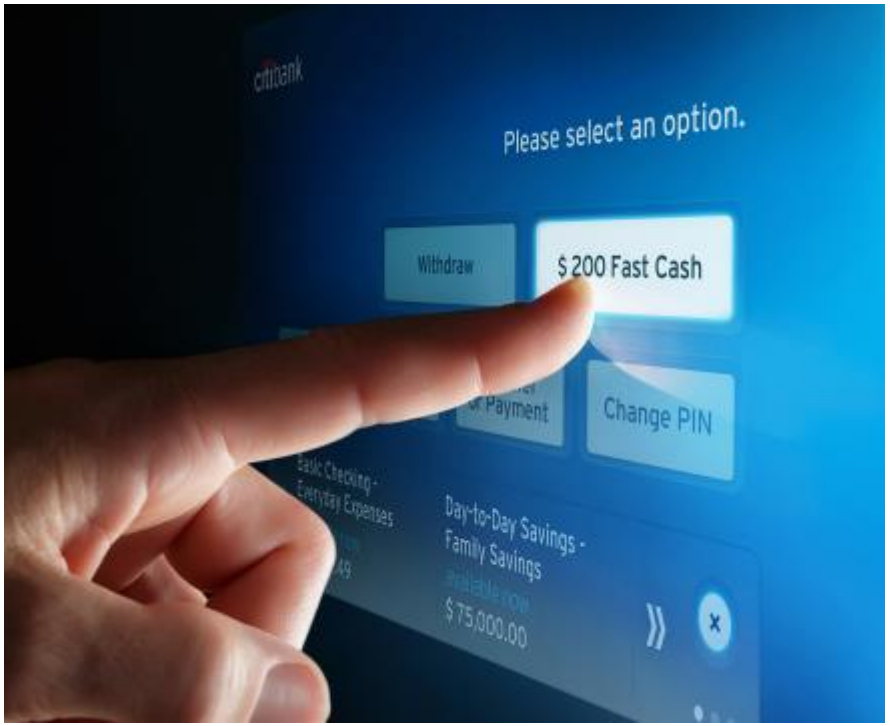
Source: *http://www.humantech.com/two-things-to-consider-when-using-a-mouse-padwrist-rest*

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 (cont.)

- 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
    - Dirt won't allow keyboard usage



Source: *http://www.humantech.com/two-things-to-consider-when-using-a-mouse-padwrist-rest*

Devices for the Hand (cont.)

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

Source: *http://gaming.logitech.com/en-us/gaming-controllers* and *http://gaming.logitech.com/en-us/product/f710-wireless-gamepad*

Optical Input Devices

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

Optical Input Devices (cont.)

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

- 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 (cont.)

- 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