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Input Devices

An input device is a piece of computer hardware equipment used to provide data and control signals to an information processing system such as a computer or information appliance.

An input device can be defined as an electromechanical device that allows the user to feed information or data into the computer for analysis, storage and give command to the computer. Input devices accept data and instructions from the user. Generally input devices are manual or direct data entry devices.

The most commonly used or primary input devices on a computer are the keyboard and mouse. However, there are dozens of other devices that can also be used to input data into the computer. Examples of input devices include keyboards, mouse, scanners, digital cameras, joysticks, and microphones.

**Examples of Input Devices**

**1.** **Keyboard**: A keyboard is the most common input device. Generally standard keyboard has 104 keys.

**2.** **Mouse**: A mouse is an electro mechanical, hand held device. It is used as a pointer. It can perform functions like selecting menu commands, moving icons, resizing windows, starting programs, and choosing options.

**3.** **Light pen**: An input device that utilizes a light-sensitive detector to select objects on a display screen.

**4.** **Optical** **scanner**: These devices are used for automatic data collection. The devices of this category completely eliminate manual input of data.

**5.** **Touch** **screen**: Touch panel displays and pads are now being offered as alternatives to keyboard.

**6.** **Microphone** is an input device, which takes voice as input. The voice communication is more error-prone than information through keyboard. There are two types of microphones available: *Desktop Microphone* and *Hand held Microphone*.

**7.** **Trackball** (a pointing device): is a mouse lying on its back. To move the pointer, you rotate the ball with your thumb, your fingers, or the palm of your hand. The advantage of trackballs over mouse is that the trackball is stationary so it does not require much space to use it. In addition, you can place a trackball on any type of surface, including your lap.

**8.** **Joystick**: is one of the low-priced input components. It is used mainly to draw and to play games. Traditionally, a joystick has a rod that sticks out from the main mechanism with a ball attached to the lower end.

**9.** **Digital** **Camera**: Images taken by the digital cameras are stored in the form of digitized images. The main advantage of digital cameras is that the process of manipulating the images is very fast.

**10.** **Scanners**: can copy written documents, pictures or photographs directly into the computer. To be done like this, a scanner photographs the image to be copied and convert it into an electronic form by sensing the intensity of reflections at every point.

Output Device

Output device is simply a device which produces an output or result of any processing. For example: *monitor* is an output device which displays the output of the calculations done by the CPU.

Devices that are used to receive the output of processed data by the computer in the form of display, print, audio and video that user can understand and use it.

*Output of processed data can be divided into two classes:*

**Hard Copy:** Output that is in the form of print document, which can be read directly, long last and permanently stored. E.g. A word document containing text and images printed by the printer on a paper. Hard Copy Devices: printers, fax machine, photographic output devices etc.

**Soft Copy:** Output that is in the form of metallic or audio form, which is cannot be read directly by the user. E.g. A collection of music files and folders on a CD. Soft Copy Devices: monitors, data projectors, speakers etc.

A computer can still function without an output device. However, without an output device, there’s no way to determine what the computer is doing. There is no indicator of errors or the need for additional input. For example, you can detach your monitor from your computer, the computer will still function, but it’s not going to be very beneficial.

**Examples of Output Devices**

**1. Monitor**: This is the most common computer output device. It creates a visual display for users to view processed data. Monitors come in various sizes and resolutions. All monitors depend on a video card that is positioned on the computer motherboard or in a special expansion slot. The video card sorts out the computer data into image details that the monitors can show.

**2. Printer**: generates a hard copy version of processed data such as documents and photographs. The computer transmits the image data to the printer, which then physically recreates the image, usually on paper.

**3. Speakers**: are attached to computers for the output of sound. Sound cards are required in the computer for speakers to function. Speakers range from simple, two-speaker output devices to surround-sound multi-channel units.

**4. Headset**: is a combination of speakers and microphone. It is mostly used by gamers and is also great tool for communicating with family and friends over the internet using VOIP software.

**5.** **Projector**: is a display device that projects a computer-created image. The computer transmits the image data to its video card, which then sends the video image to the projector. It is usually used for presentations or for viewing videos.

**6. Plotter**: generates a hard copy of a digitally depicted design. The design is sent to the plotter through a graphics card and forms the design using a pen. It is generally used with engineering applications. It basically draws an image using a series of straight lines.

Storage Device

A storage device is any computing hardware that is used for storing, porting and extracting data files and objects. It can hold and store information both temporarily and permanently, and can be internal or external to a computer, server or any similar computing device.

A computer storage device is any type of hardware that stores data. The most common type of storage device, which nearly all computers have, is a hard drive. The computer's primary hard drive stores the operating system, applications, and files and folders for users of the computer.

A storage device may also be known as a storage medium or storage media. Storage devices are one of the core components of any computing device. They store virtually all the data and applications on a computer, except hardware firmware. They are available in different form factors depending on the type of underlying device. For example, a standard computer has multiple storage devices including RAM, cache, and hard disk, as well as possibly having optical disk drives and externally connected USB drives.

*There are two different types of storage devices:*

* **Primary storage devices:** Generally smaller in size, these are designed to hold data temporarily and are internal to the computer. They have the fastest data access speed, and include RAM and cache memory.
* **Secondary storage devices:** These usually have large storage capacity, and they store data permanently. They can be either internal or external to the computer, and they include the hard disk, optical disk drive and USB storage device.

*Examples of computer storage devices*

**1. Hard Disk Drive**

A hard disk drive (also known as a hard drive, HD, or HDD) can be found installed in almost every desktop computer and laptop. It stores files for the operating system and software programs, as well as user documents, such as photographs, text files, and audio. The hard drive uses magnetic storage to record and retrieve digital information to and from one or more fast-spinning disks.

**2. Floppy Disk**

Also know as a diskette, floppy, or FD, the floppy disk is another type of storage medium that uses magnetic storage technology to store information. Floppy disks were once a common storage device for computers and lasted from the mid-1970's through to the start of the 21st century. The earliest floppies were 8-inch (203 mm) in size, but these were replaced by 5 1 ⁄ 4 -inch (133 mm) disk drives, and finally a 3 1 ⁄ 2 inch (90 mm) version.

**3. Compact Disc (CD)**

The compact disc, known for short as a CD, is a form of optical storage, a technology which employs lasers and lights to read and write data. Initially compact discs were used purely for music audio, but in the late 1980's they began to be also used for computer data storage. Initially, the compact discs that were introduced were CD-ROM's (read only), but this was followed by CD-R's (writable compact discs) and CD-RW's (re-writable compact discs).

**4. USB Flash Drive**

Also known as a thumb drive, pen drive, flash-drive, memory stick, jump drive, and USB stick, the USB flash drive is a flash memory data storage device that incorporates an integrated USB interface. Flash memory is generally more efficient and reliable than optical media, being smaller, faster, and possessing much greater storage capacity, as well as being more durable due to a lack of moving parts.

Common Problems encountered with Storage devices

1. **Hardware failure**: Hardware failure is one of the most problematic issues affecting most users. Appropriate handling and regular maintenance can be used to prolong the durability of storage devices.

2. **Data** **Loss**: Intentional and accidental file deletion can make one to lose precious data. Data recovery programs provide a solution for lost files, deleted data, corrupt documents and hidden files. In the event of a data loss scenario, a reliable data recovery software can be used to retrieve back 70% of the lost data.

Processing Devices

Processing devices are parts of the computer that are responsible for processing or converting data into meaningful information. There are many processing devices and the most common ones in a computer include the Central Processing Unit (CPU) and the Graphics Processing Unit (GPU).

A processor, or "microprocessor," is a small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output. While this may seem like a simple task, modern processors can handle trillions of calculations per second.

*The Central Processing Unit (CPU) is the main processing device in the computer.*

**The Central Processing Unit (CPU)**

The CPU is a computer chip located on the motherboard inside the system unit. It is the main electronic circuitry in the computer that carries out the instructions contained in a computer program by performing arithmetic, logical, control and input/output operations.

In other words, the CPU is responsible for performing the calculations and comparisons needed to convert data into information and as well control the computer’s operations. As a result, the CPU is often referred to as the ‘brain’ of the computer. It is the most important processing device of a computer without which a computer cannot perform any of the operations for which it is intended.

Most modern CPUs are contained on a single Integrated Circuit (IC) chip and as such are called microprocessors. Nonetheless, the CPU is traditionally referred to as a Processor. A processor can have two or more CPUs or independent processing units called “cores” on a single chip and such is called a multi-core processor. The single processor can run multiple instructions on separate cores at the same time, increasing overall speed for programs to be executed. The microprocessors currently used in almost all personal computers today are multi-core.

The principal components of a CPU include the arithmetic-logic unit (ALU) that performs arithmetic and logic operations, and a control unit that orchestrates the fetching and execution of instructions by directing the coordinated operations of the ALU, registers and other components. Also, an IC that contains a CPU may also contain memory. The CPU register is a small amount of data storage that facilitates some CPU operations. Another storage location is the CPU cache that is a high speed volatile memory which is bigger in size and helps the processor to reduce the memory operations.

Almost all CPUs follow the *Fetch*, *Decode* and *Execute* steps in their operation, which are collectively known as the instruction cycle.

* The first step, fetch, involves retrieving an instruction from program memory. The instruction that the CPU fetches from memory determines what the CPU will do.
* In the decode step, the control unit breaks down or decode the instructions in a way defined by the CPU’s instruction set architecture (ISA).
* After the fetch and decode steps, the execute step is performed. Depending on the CPU architecture, this may consist of a single action or a sequence of actions.

During each action, various parts of the CPU are electrically connected so they can perform all or part of the desired operation and then the action is completed. Although the process is complex, the computer can accomplish it at an incredible speed, in millions of instructions per second (MIPS). The performance or processing speed of a CPU is measured in MIPS with Megahertz (MHz) as the unit of measurement.

The basic elements of a processor

**The arithmetic logic unit (ALU):** which carries out arithmetic and logic operations on the operands in instructions.

**The floating point unit (FPU):** also known as a math coprocessor or numeric coprocessor, a specialized coprocessor that manipulates numbers more quickly than the basic microprocessor circuitry can.

**Registers:** which hold instructions and other data. Registers supply operands to the ALU and store the results of operations.

**L1 and L2 cache memory:** Their inclusion in the CPU saves time compared to having to get data from random access memory (RAM).

**The Graphics Processing Unit (GPU)**

A graphics processing unit (GPU) is a specialized electronic circuit designed to rapidly manipulate and alter memory to accelerate the creation of images intended for output to a display device. Technically, the graphics card or video card contains one or more GPUs.

The difference between a GPU and a graphics card is similar to the difference between a CPU and a motherboard.

System Software

System software is software on a computer that is designed to control and work with computer hardware. The two main types of system software are the operating system and the software installed with the operating system, often called **utility****software**. In some cases, the operating system and utility software depend on each other to function properly.

Some system software is used directly by users and other system software works in the background. System software can allow users to interact directly with hardware functionality, like the Device Manager and many of the utilities found in the Control Panel.

System software is a platform comprised of Operating System (OS) programs and services, including settings and preferences, file libraries and functions used for system applications. System software also includes device drivers that run basic computer hardware and peripherals.

Example of System Software

1. **Operating System Software**

The operating system of a computer controls allocation of hardware resources. It handles input data from peripheral devices, schedules CPU processor time, manages memory use and sends output data to printers and other peripherals.

Today, most operating systems allow multiple applications to run at the same time, switching resource allocation between them. Some of the most well-known examples of operating systems include Windows, Mac OS and Linux.

1. **Device Driver Support**

All of the different peripheral devices used by a computer system, including the mouse, keyboard, display monitor, hard drive and printer, are operated by individual pieces of software known as device drivers. Some drivers are included as part of the system software, while others must be installed the first time the device is connected to the computer.

To ease this process, most drivers today use a standard protocol supported by the system software, such as Plug and Play, to facilitate communication between the device hardware and the computer system.

1. **Programming Tools**

Both system and application software consist of computer instructions that are written in a programming language and then processed for use by the computer. System software may include tools such as compilers, assemblers and linkers that convert human-readable programming code into machine code for the computer to execute.

Examples of system software programming tools include Microsoft's Visual Studio IDE (Interactive Development Environment) and Apple's Xcode IDE.

1. **System Utilities**

A number of utilities that perform administrative tasks are usually part of system software. These may include programs to: compress disk drive and diagnose disk problems; install and uninstall software; manage the recycling bin and perform system backup and restore. System utilities may be built into the system software or added as separate products.

1. **Other Uses of System Software**

Security is a critical issue on computer systems that are connected to the outside world, so most system software provides firewalls and virus checkers to keep out hackers and malicious programs. Support of the user interface, which is the way that humans communicate with the computer, is another important system software function.

A user interface may take the form of a command line or may be a full-blown GUI (graphical user interface) that allows users to interact with windows, menus and buttons. System software is also responsible for managing network connections and providing file systems that utilize external storage.

Basic Functions of a Computer

All computers, from the smallest hand held computer to the largest supercomputer, perform the same basic functions with digital information. Those functions are:

**1. Input:** Receiving or accepting information from outside sources. The most common way of performing this function is through the information entered through the keyboard and the click of mouse. Typing characters on a keyboard, moving the mouse around the screen or speaking through the microphone to a computer.

**2. Output**: The results of the processing are made available for use by any user or other devices. The most common ways of producing such outputs are through computer monitor, speakers, and printers. When a computer is connected to other devices, including through Internet, this output is in the form of electrical pulses. Displaying characters or pictures on the screen, printing a research paper, or sending an e-mail message.

**3. Processing:** This is really the core of computer operation. The computer processes the data that is fed to the computer by various means and the data already contained in internal memory to produce the results that is the core of all computer application. E.g. calculating the square root of a number, sorting a list of names, or producing a three-dimensional image

**4. Storage:** Store information in the computer. The memory is stored in computer in several different ways depending on how the information is used. For simplicity we will classify in two broad categories. First is the memory in the central processing unit of the computer, and second is the auxiliary memory.

The auxiliary memory includes devices such as fixed hard drives. The information stored in computer can also be divided broadly used in two categories. The user data and the instructions used for internal operation and processing in the compute. These instructions are what we call computer programs or software. E.g. Saving your research paper or resume, keeping track of your credit card purchases, or archiving digital pictures of your relatives.

Roles of Computer in the Society

Computers play a significant role in not only making our lives easier but it is considered to be the one stop solution for all our problems these days. We always think about switching the computers on and finding out the solutions to our problems irrespective of how meager it might be, similarly in our offices, the work comes to a halt if computers stop to work.

Computers in society today have become a basic need not only for the adults but for the children of this generation as well. They too are aware of the importance of computer. Be their school projects or examinations, computers play a vital role in making the academics easier.

Social Impact of Computer

Computers have made our social lives much easier. Earlier, there were not much sources of connecting too your friends and family living afar. Letters were the most used medium back then. But, ever since computers came into existence, people are able to connect to their family and friends through social media and different mobile applications.

Our loved ones are just a message away now, no matter how far from us they might be physically. Not only messaging, computers have made it possible for us to actually see each other and converse through video calls.

But, just like any other technology, social media has its consequences too. Sometimes, harmful enough to ruin one’s life. People that we meet through social media are not always forever to be trusted other than the people we know personally.

Our personal information including pictures, residential address, official address and phone numbers should never be shared on the social media. People often find friends to share their agony within social media, yes we all need a friend to share all what is bothering us with someone, but why should we choose some random person? There are people who can advantage of our weaknesses. Crime in our society is given a huge uplift through social media.

Not only crime, but it affects our health, relationships, studies and work as well. Addiction of social media leaves all these negative impacts on our lives. We treat the social media as the most important daily life business whereas the only purpose it should serve is to keep in touch with your loved ones and long lost friends.

The Benefit of Using Computers

**1. Work:** Computers are now used in every domain, field and sector and across industries. They are used for a variety of tasks, applications and activities and to enhance productivity on all fronts.

**2. Communication:** The advent of the Internet and its proliferation have force-multiplied the usage of computers. People all over the world are able to communicate, engage and interact with each other using IM, email, blogs, online forums, social media and other options.

**3. Jobs Influence:** The widespread use and application of computers has created multiple industries, derived sectors and professions and facilitated job opportunities for millions of people.

**4. Entertainment:** High-end desktops and full-featured notebook PCs have become all-in-one entertainment systems for millions of users as they watch movies, sports events and news programs, shop, socialize, download videos and play games.

**5. Education:** Computers have simplified and streamlined the process of education for millions of young teens, college going students and post-graduates. The use of computers has democratized the influence, reach and penetration of education and knowledge to students in far-flung and geographically remote regions.

Positive Impact of Computer

*Let’s look at some of the positive impact of computer on society*

* The academic system has changed since computers came into existence. New techniques that are advanced have been implemented for teachings. The students also find the computers very useful and significant for helping them crack difficult topics and problems.
* Computers help people avail the work from home jobs who are unable to go out like people with physical ailment or disability, mothers with infant babies, the elderly or just a regular person reluctant to go out.
* Days are gone when people had to wait in cues for the application of jobs, examinations and other personal documents like ID card, pan card, passport etc.
* For writers, computers are a huge help for writing and storing their work. It has replaced pens and papers. Easy editing, corrections, illustrations etc. all are done through a few clicks.

Negative Effects of Computers in Society

* Computers work as stress boosters in the human lives.
* It has lessened the proficiency of elder workers who are not familiar with the technologies and workers with lack of English skills.
* According to a research, computers shoot up the rates of cardiac diseases.
* It affects the visions of people working on it and children gaming on it on a regular basis.
* It spreads harmful radiations as well.