

Unit-4

Input & Output Devices

Input and Output Devices

Introduction

- An input/output device, often known as an IO device, is any hardware that allows a human operator or other systems to interface with a computer. Input/output devices, as the name implies, are capable of delivering data (output) to and receiving data from a computer (input). An input/output (I/O) device is a piece of hardware that can take, output or process data. It receives data as input and provides it to a computer, as well as sends computer data to storage media as a storage output.

Uses of Input and Output Devices

Input Devices.

- Input devices are used to allow us to enter information into a computer system.

Output Devices.

- Output devices are used to send data from a digital device to a user or another device.

Input-Output Unit

The Input Unit: Computer Input unit means the device of the input and a part of the computer hardware which is used for the transport of the data processing system involves the information devices of the computer with the control and data signals of the computer. **Example –** Mouse, Camera and Keyboard

The Output Unit: Computer Output is the device which deals with transmitting the data of the computer among the device and the clients. The computer is designed for humans in the form of audio and video format.

Input Devices

Input Devices

All computer peripheral devices which use to input data and instructions to the computer are called Input Devices. A Input devices accept data and instructions from the user and convert information or data into a form which can be understood by the computer.

A good input device should provide accurate, timely and useful data to the main memory of the computer for processing.

Some Input devices or Human Data Entry Devices

1. Keyboard
2. Mouse
3. Light Pen
4. Trackball
5. Joystick
6. Scanner
7. Optical Mark Reader
8. Optical Character Reader
9. Barcode Reader
10. Magnetic Ink Character Recognition
11. Digitizer or Graphics Tablet
12. Digital Camera

Human Data Entry Devices

Keyboard

- A **computer keyboard** is an input device that allows a person to enter letters, numbers and other symbols (these are called characters) into a computer. It is one of the most used input devices for computers. Using a keyboard to enter lots of data is called typing.
- A keyboard contains many mechanical switches or push buttons called "keys". When one of these are pushed, an electrical circuit is closed, and the keyboard sends a signals to the computer that tells it what letter, number or symbol it would like to be shown on the screen.

Human Data Entry Devices

Keyboard

- The computer's CPU then shows the character on the screen, usually at the place where the cursor is. Besides entering characters, computer keyboards also have keys that change the symbol (such as shift or caps lock) or give the computer special commands (such as the arrows keys , CTRL and ALT)

Human Data Entry Devices

Keyboard



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Human Data Entry Devices

Mouse

A **computer mouse** is a hand-held pointing device that detects two - dimensional motion relative to a surface. This motion is typically translated into the motion of a pointer on a display which allows a smooth control of the graphical user interface . The first public demonstration of a mouse controlling a computer system was in 1968. Originally wired to a computer, modern mice are often cordless, relying on short-range radio communication with the connected system. Mice originally used a ball rolling on a surface to detect motion but modern mice often have optical sensors that have no moving parts.

Human Data Entry Devices

Wireless or Cordless Mouse



Human Data Entry Devices

Optical Mouse



Human Data Entry Devices

Light Pen

- It allows the user to point to displayed objects or draw on the screen in a similar way to a touch screen but with greater positional accuracy. A light pen can work with any CRT-based display but its ability to be used with LCDs was unclear (though Toshiba and Hitachi displayed a similar idea at the "Display 2006" show in Japan).
- A light pen detects a change of brightness of nearby screen pixels when scanned by cathode ray tube electron beam and communicates the timing of this event to the computer.

Human Data Entry Devices

Light Pen



Human Data Entry Devices

Trackball

- A **trackball** is a pointing device consisting of a ball held by a socket containing sensors to detect a rotation of the ball about two axes—like an upside-down mouse with an exposed protruding ball. The user rolls the ball to position the on-screen pointer using their thumb, fingers or commonly the palm of the hand while using the fingertips to press the mouse buttons. Compared with a mouse, a trackball has no limits on effective travel at times. A mouse can reach an edge of its working area while the operator still wishes to move the screen pointer farther.

Human Data Entry Devices

Track ball



Human Data Entry Devices

Joystick

- A **joystick** is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling. It often has supplementary switches to control various aspects of the aircraft's flight.
- Joysticks are often used to control video games and usually have one or more push-buttons whose state can also be read by the computer.

Human Data Entry Devices

Joystick



Human Data Entry Devices

Touch Screen

A **touchscreen** or **touch screen** is the assembly of both an input (touch panel) and output (display) device. The touch panel is normally layered on the top of an electronic visual display of an electronic device.

Human Data Entry Devices

Touch Screen



Human Data Entry Devices

Digitizer or Digitizing Tablet

A digitizer also known as a graphics tablet or drawing tablet, is a device that allows you to input drawings, sketches and handwritten notes into a computer.

Human Data Entry Devices

Digitizer



Source Data Entry Devices

Speech Recognition

Speech recognition is an interdisciplinary subfield of computer science and computational linguistics that develops methodologies and technologies that enable the recognition and translation of spoken language into text by computers.

Source Data Entry Devices

Speech Recognition



Source Data Entry Devices

Digital Camera

A **digital camera** is a camera that captures photographs in digital memory. Most cameras produced today are digital, largely replacing those that capture images on photographic film . Digital cameras are now widely incorporated into mobile devices like smartphones with the same or more capabilities and features of dedicated cameras (which are still available). High-end, high-definition dedicated cameras are still commonly used by professionals and those who desire to take higher-quality photographs.

Source Data Entry Devices

Digital Camera



Source Data Entry Devices

Scanner

- A scanner is a device that captures images from photographic prints, posters, magazine pages and similar sources for computer editing and display.
- Scanners work by converting the image on the document into digital information that can be stored on a computer through optical character recognition (OCR).
- This process is done by a scanning head which uses one or more sensors to capture the image as light or electrical charges.

Source Data Entry Devices

Scanner



Source Data Entry Devices

OMR

- **OMR (optical mark recognition)** is a form of automated data input. **Marks** are made on a specially printed paper forms which are then read by an **OMR** reader. The data is then sent to a computer for processing. One of the most common uses of **OMR** is in multiple choice examinations.

Source Data Entry Devices

OMR



Source Data Entry Devices

OCR

- **OCR (optical character recognition)** is the **recognition** of printed or written **text characters** by a computer. This involves photo scanning of the **text character-by-character**, analysis of the scanned-in image, and then translation of the **character** image into **character** codes such as ASCII, commonly used in data processing.

Source Data Entry Devices

OCR



Source Data Entry Devices

Bar code reader

- A **barcode reader** (or **barcode scanner**) is an electronic device that can read and output printed barcodes to a computer. Like a flatbed scanner , it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain *decoder* circuitry analyzing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port.

Source Data Entry Devices

Bar code reader



Source Data Entry Devices

MICR

- **MICR code** is a character-recognition technology used mainly by the banking industry to process and clearance of cheques and other documents. The MICR encoding, called the *MICR line*, is at the bottom of cheques and other vouchers and typically includes the document-type indicator, bank code, bank account number , cheque number, cheque amount. The technology allows MICR readers to scan and read the information directly into a data-collection device. Unlike barcodes and similar technologies, MICR characters can be read easily by humans.

Source Data Entry Devices

MICR



Output devices

Output device displays result of the computer processing. A output devices return processed data that is information, back to the user.

Some of the commonly used output devices are :

- Monitor (Visual Display Unit)
- Printers
- Plotter
- Speaker
- Projector

Output Devices

Output is two types.

- Soft copy output

The **devices** that generate **soft copy output** are called **soft copy devices**. Visual **output devices** like computer monitor, visual display terminal, video system and audio response system are common **soft copy output devices**.

- Hard copy output

Hard copy output devices are devices that provide **output** on **printed paper** or other permanent media that is human readable (tangible). Examples of devices that produce **hard copy** are printers, plotters etc.

Output Devices

Monitor

- A **computer monitor** is an output device that displays information in pictorial or textual form. A discrete monitor comprises a visual display , support electronics, power supply, housing, electrical connectors and external user controls.

Output Devices

Monitors are CRT,LCD,LED,Plasma etc.

- Cathode Ray Tube(CRT)
- A cathode ray tube (**CRT**) is a specialized vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. Most desktop computer displays make use of **CRTs**. The **CRT** in a computer display is similar to the "picture tube" in a television receiver.

Output Devices

CRT Monitors



Output Devices

Liquid Crystal Display(LCD)

is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

Output Devices

LCD Monitor



Output Devices

Light-emitting diode(LED)

A light-emitting diode is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

Output Devices

LED Monitor



Output Devices

Printer

- Printers are one of the most used peripherals on computers and are commonly used to print text, images, and photos. Some printers can print documents stored on memory cards or from digital cameras and scanners. The world's first computer printer was a 19th-century mechanically driven apparatus invented by Charles Babbage for his difference engine.

Output Devices

Printer is two types.

- Impact Printer
- Non-impact Printer
- **Impact printers**

are **printers** which works by creating a direct contact between ink ribbon and paper. These **printers** are noisy yet popular. **Impact printers** have mechanical moving parts to conduct printing. Examples: **Dot-matrix printers**, **Daisy-wheel printers**, and **line printers**.

Output Devices

- **Non-Impact printers**

Don't uses any direct contact between ink ribbon and paper. They use laser, electrostatic, chemical or inkjet technology. These **printers** are less noisy and don't have mechanical moving parts to conduct **printing**. Examples: Inkjet **printers** and Laser **printers**.

Output Devices

Example of printers



Output Devices

Plotter

- Plotters draw lines on paper using a pen. In the latter case, they are sometimes known as a **cutting plotter**.
- In the past, plotters were used in applications such as computer-aided design , as they were able to produce line drawings much faster and of a higher quality than contemporary conventional printers. Smaller desktop plotters were often used for business graphics. Printers with graphics capabilities took away some of the market by the early 1980s.

Output Devices

Plotters



Output Devices

- **Computer speakers** or **multimedia speakers**, are speakers sold for use with computers, although usually capable of other audio uses, e.g. for an MP3 player . Most such speakers have an internal amplifier and consequently require a power source which may be by a mains power supply often via an AC adapter , batteries or a USB port.

Output Devices

Projector

- A **projector** or **image projector** is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen . Most projectors create an image by shining a light through a small transparent lens but some newer types of projectors can project the image directly by using lasers.

Output Devices

Projector



I/O Port

Concept of I/O port

An I/O port is a socket on a computer that a cable is plugged into. The port connects the CPU to a peripheral device via a hardware interface or to the network via a network interface. See port, standards - hardware interfaces, Display Port, HDMI and USB.

I/O Port

Serial Ports

A serial port is a serial communication interface through which information transfers in or out sequentially one bit at a time. This is in contrast to a parallel port which communicates multiple bits simultaneously in parallel.

I/O Port

Serial Ports



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I/O Port

Parallel Ports

A **parallel port** is a type of interface found on early computers (personal and otherwise) for connecting peripherals . The name refers to the way the data is sent; parallel ports send multiple bits of data at once (parallel communication), as opposed to serial communication in which bits are sent one at a time.

I/O Port

Parallel ports



I/O Port

USB Ports

Universal Serial Bus (USB) is an industry standard that allows data exchange and delivery of power between many various types of electronics. It specifies its architecture, in particular its physical interface and communication protocols for data transfer and power delivery to and from *hosts* such as personal computers to and from peripheral *devices*. As for example, displays, keyboards and mass storage devices.

I/O Port

USB Ports



I/O Port

Fire wire ports

- IEEE 1394, commonly known as FireWire, is a standard connection type for many electronic devices such as digital video cameras, printers and scanners, external hard drives and other peripherals.
- The terms IEEE 1394 and FireWire usually refer to the types of cables, ports and connectors used to connect these types of external devices to computers.

I/O Port

Fire wire Ports



Working of I/O System

Detail working of I/O system

The working of I/O system combines I/O hardware and I/O software. The I/O hardware includes ports, buses and device controllers for different devices, and I/O devices. The I/O software is the device driver software that may be embedded with operating system or comes with each device. The working of I/O system is described as follows:

Working of I/O System

- **I/O Devices** are attached to computer via the ports of computer. There are many standard ports available on the backside of the computer case like serial port and parallel port. If one or more devices use a common set of wires, it is called a bus. For example, PCI bus, PCI Express bus etc.

Working of I/O System

- **Device Controller** operates on a bus, a port or a device. It controls the signals on the wires of port or bus. The controllers have one or more registers for data and control signals. Controller may be simple like a serial port controller for a serial port, or, complex like a SCSI controller. Some devices have their own built-in controllers.
- **Device Driver** is software via which the operating system communicates with the device controllers. Each device has its own device driver, and a device controller which is specific to the device. The device drivers hide the differences among the different device controller and present a uniform interface to the operating system.

Working of I/O System

- **Application programs** use an I/O device by issuing commands and exchanging data with the device driver. The device driver provides correct commands to the controller, interprets the controller register and transfers data to and from device controller registers as required for the correct device operation.

Working of I/O System

- I/O Hardware is a set of specialized hardware devices that help the operating system access disk drives, printers, and other peripherals. These devices are located inside the motherboard and connected to the processor using a bus. They often have specialized controllers that allow them to quickly respond to requests from software running on top of them or even respond directly to commands from an application program.

Working of I/O System

I/O Software

- I/O Software is used for interaction with I/O devices like mouse, keyboards, USB devices, printers etc. Several commands are made via external available devices which makes the OS function upon each of them one by one.

Working of I/O System

I/O software is often organized in the following layers –

- **User Level Libraries** – This provides simple interface to the user program to perform input and output. For example, **stdio** is a library provided by C and C++ programming languages.
- **Kernel Level Modules** – This provides device driver to interact with the device controller and device independent I/O modules used by the device drivers.
- **Hardware** – This layer includes actual hardware and hardware controller which interact with the device drivers and makes hardware alive.

Working of I/O System

- **Block devices** – A block device is one with which the driver communicates by sending entire blocks of data. For example, Hard disks, USB cameras, Disk-On-Key etc.
- **Character devices** – A character device is one with which the driver communicates by sending and receiving single characters (bytes, octets). For example, serial ports, parallel ports, sounds cards etc.