Lecture 04
Input and Output

Information Technology Fundamentals
IT-06016402

Assoc. Prof. Dr. Kitsuchart Pasupa

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What is input?

Input is any data and instructions entered the memory of a computer

It is entered by input device

Input device is any hardware component used to enter data or instructions into a computer

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Commonly Used Input Methods

Keyboard	Pointing Devices	Touch Screen	Pen Input
Motion Input	Voice Input	Video Input	Reading Devices

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Commonly Used Input Methods

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Keyboard

- A keyboard is an input device that contains keys users press to enter data and instructions into a computer or mobile device
- The ANSI standard 104-key keyboard (American National Standards Institute)
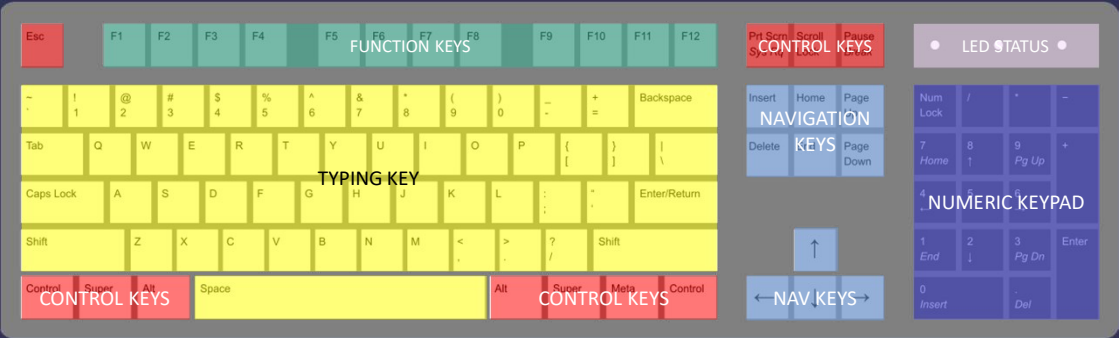
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Keyboard

- Why QWERTY? Why not ABCD…?
- Reduce frequency of key jams on old mechanical typewriter

https://www.sciencedirect.com/science/article/abs/pii/S0020737383800108

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Keyboard

- There are a variety of keyboard options

Desktop Keyboard

Laptop Keyboard

Onscreen Keyboard

Type Cover Keyboard

Mini Keyboard
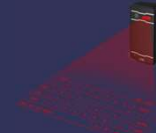
Virtual Keyboard

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Keyboard

An ergonomic keyboard has a design that reduces the chance of repetitive strain injuries of wrist and hand

- Ergonomics incorporates comfort, efficiency, and safety in the design of the workplace

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Commonly Used Input Methods

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Pointing Devices

— Mouse
— Touchpad

- A pointer is a small symbol on the screen whose location and shape change as a user moves a pointing device

Mouse is a pointing device that fits under the palm of your hand comfortably

Touchpad is a small, flat, rectangular pointing device that is sensitive to pressure and motion

Trackball is a stationary pointing device with a ball on its top or side

Pointing Stick is a pressure-sensitive pointing device shaped like a pencil eraser that is positioned between keys on a mobile computer keyboard

Types of Cursor

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Pointing Devices

An ergonomic mouse (vertical mouse) will position your hand in more of a "handshake" shape, which takes pressure off your wrist and forearm

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Commonly Used Input Methods

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Touch Screen

- A touch screen is a touch-sensitive display

Tap	Double tap	Drag	Flick
Briefly touch surface with fingertip	Rapidly touch surface twice with fingertip	Move fingertip over surface without losing contact	Quickly brush surface with fingertip

Pinch	Spread	Press	Press and tap
Touch surface with two fingers and bring them closer together	Touch surface with two fingers and move them apart	Touch surface for extended period of time	Press surface with one finger and briefly touch surface with second finger

Press and drag	Rotate
Press surface with one finger and move second finger over surface without losing contact	Touch surface with two fingers and move them in a clockwise or counterclockwise direction

Gesture

http://babich.biz/in-app-gestures-and-mobile-app-usability/

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Commonly Used Input Methods

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Pen Input

- With pen input, you touch a stylus or digital pen on a flat surface to write, draw, or make selections

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Handwriting Recognition

Input image

Page segmentation

Line segmentation

Handwriting recognition

But discussion on current points of east-west con-
flict could not go much further than, for example, the
truism that policies of menace and mutual disarmment
cannot be followed together. What the council has done -
and it is an achievement - is to make religious con-
tact across the greatest political barrier in what
is not yet a unitary world.

https://medium.com/apache-mxnet/handwriting-ocr-line-segmentation-with-gluon-7af419f3a3d8

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Pen Input

A graphics tablet, also called a digitizer, is an electronic plastic board that detects and converts movements of a style or digital pen into signals that are sent to the computer

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Commonly Used Input Methods

Keyboard	Pointing Devices	Touch Screen	Pen Input

Motion Input	Voice Input	Video Input	Reading Devices

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Motion Input

- With motion input, sometimes called gesture recognition, users can guide on-screen elements using air gestures
- Examples of sensors
  - Gyroscope measures or maintains orientation and angular velocity
  - Accelerometer measures proper acceleration
  - Magnetometer enables compass-like capability
  - Infrared detection senses object position in 3D space
  - Color sensor senses object color

Nintendo Wii

Nintendo Switch

Xbox – Kinect Sensor

Sony Playstation Move

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Motion Input

Eye Tracking (EyeTribe)

https://www.youtube.com/watch?v=XE0aANnzrL8

Forearm Tracking (Myo)

REF: DOI:10.1109/IS.2018.8710489

https://www.youtube.com/watch?v=sTMr5Qk-s14

Hand Tracking (Leap Motion)

https://www.youtube.com/watch?v=_d6KuiuteIA

Brain Signal Tracking (NeuroSky)

https://www.youtube.com/watch?v=iFBhTHGXcMQ

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Commonly Used Input Methods

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Motion Input	Voice Input	Video Input	Reading Devices
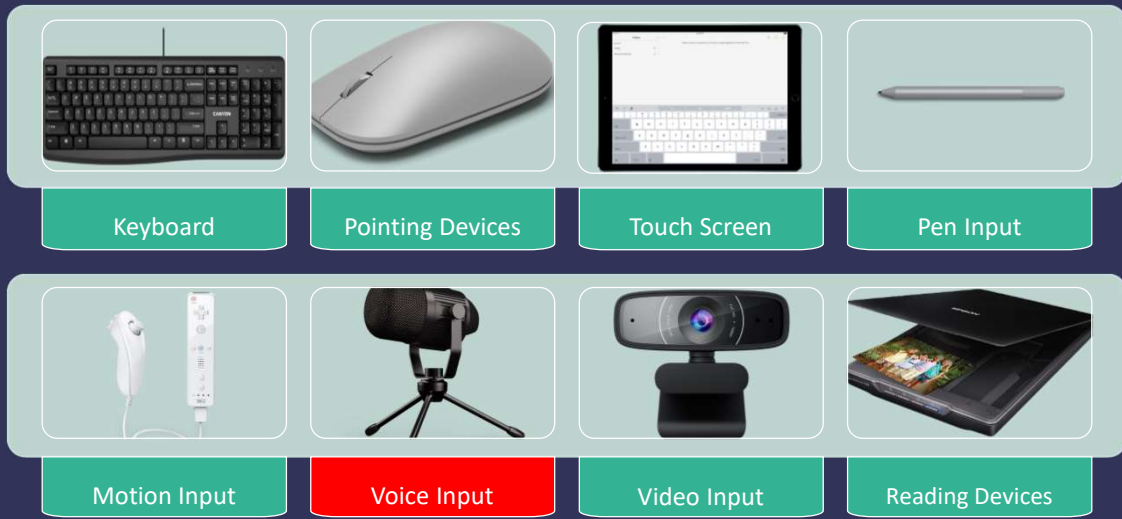
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Voice Input

- Voice input is the process of entering input by speaking into a microphone
- Voice recognition, also called speech recognition, is a process that allows people to speak naturally to a computer on any topic and to be understood accurately.

Dictation lets you speak to the keyboard on your iPhone, that way you can use it hands-free!

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Commonly Used Input Methods
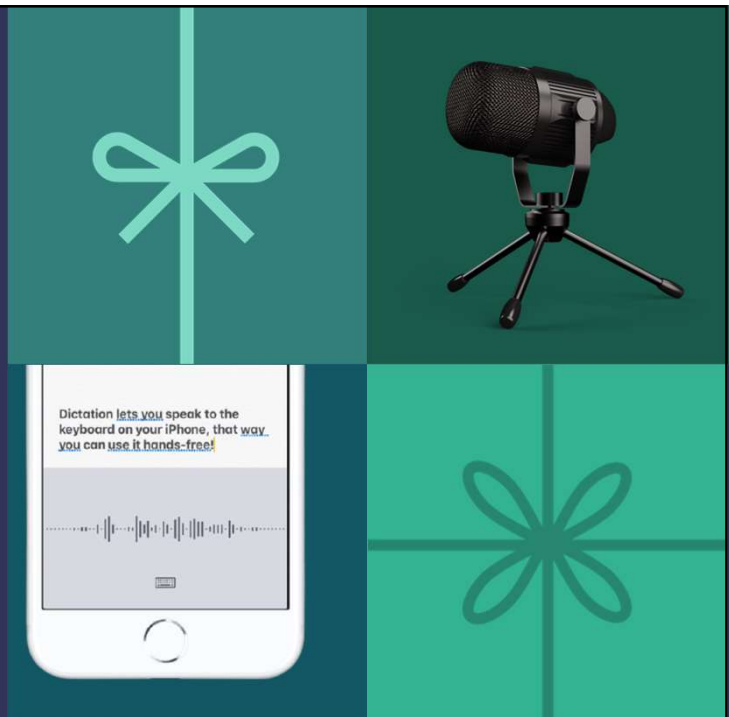
Keyboard	Pointing Devices	Touch Screen	Pen Input
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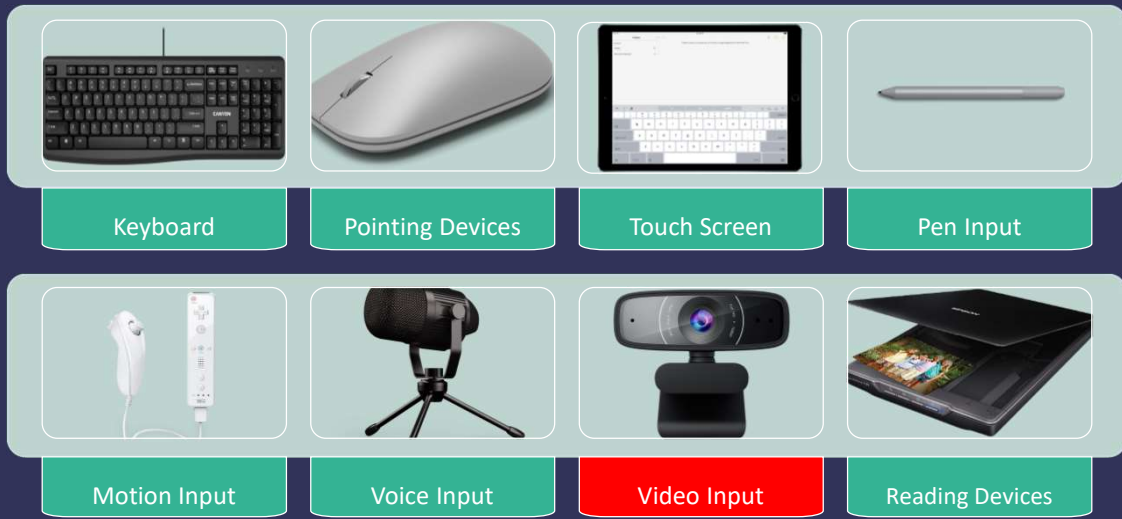
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Video Input

- Video input is the process of capturing full-motion images and storing them on a computer or mobile device's storage medium
- A webcam is a type of digital video camera that enables a user to:
  - Capture video and still images
  - Broadcast live images or video over the Internet
  - Conduct videoconferences
  - Make video calls
- Nowsday, all these devices have the same function as webcam

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Video Input

- Videoconference is a meeting between two or more geographically separated people.
  - Some examples of video conferencing tools are Microsoft team, zoom, Skype, Google Meet, Jabber
- Webinar is a type of web conferencing. It is just like a seminar over the web. Webinars are useful for seminars, lectures, workshops or product and service demonstrations.
  - Some examples of webinar tools are Microsoft Team, Zoho meeting, GoToWebinar, Zoom, etc.

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Video Input

- Gather.Town is a web-conferencing software like Zoom, but with the added component of seeing the virtual "room" you and others are occupying, and with the ability to move around and interact with other participants based on your locations in the room, just like real life.

DSMLR Lab: https://gather.town/app/NBr2iJ62kgWrPtWW/DSMLR

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Commonly Used Input Methods

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Reading Devices

Scanner

A scanner is a light-sensing input device that reads printed text and graphics and then translates the results into a form the computer can process

A flatbed scanner works in a manner like a copy machine except it creates a file of the document in memory instead of a paper copy

Optical Mark Recognition (OMR)

Optical character recognition (OCR) is a solution for automating data extraction from printed or written text from a scanned document or image file and then converting the text into a machine-readable form to be used for data processing like editing or searching.

Optical Character Recognition
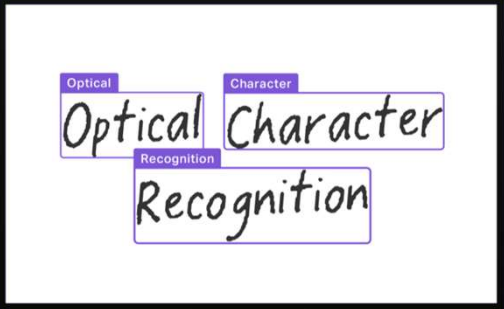
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Reading Devices

Optical Mark Recognition (OMR)
It is the process of capturing human-marked data from document forms such as surveys and tests. They are used to read questionnaires, multiple choice examination paper in the form of shaded areas.
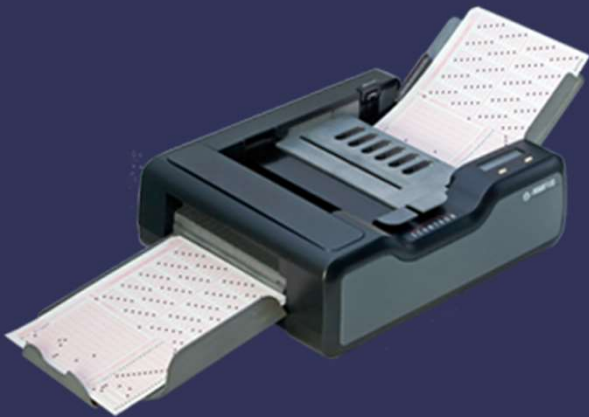
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Reading Devices

Bar code
a machine-readable code in the form of numbers and a pattern of parallel lines of varying widths, printed on and identifying a product.

ISBN: 978-616-338-158-3

9 786163 381583

Quick Response (QR) code
A QR code stores information in both a vertical and horizontal direction. It can contain more information than a bar code.

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Reading Devices

Radio Frequency Identification (RFID)
It uses radio signals to communicate with a tag placed in or attached to an object. An RFID reader reads information on the tag via radio waves
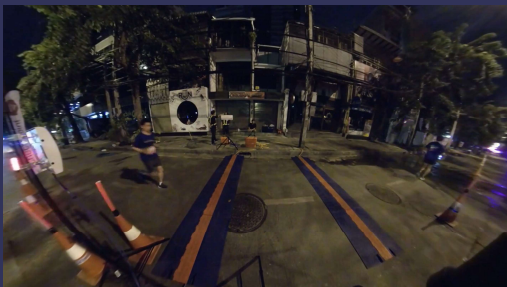
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Reading Devices

Magstripe Readers
Magstripe readers read the magnetic stripe on the back of cards such as: credit/debit card, membership card
It store all the user information, such as name, account number, expiry date, country code. All these information are encoded
By 2033, none of its debit or credit cards will have a strip, with banks in many regions including Europe able to issue the strip-less cards from 2024.
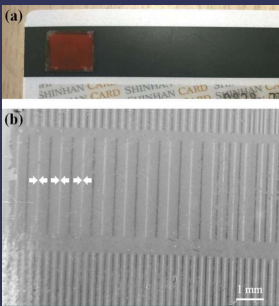
Magneto Optical image of the magnetic domains in the magnetic stripe of the credit card.

https://www.bbc.com/news/technology-58206591

Ref: www.doi.org/10.1063/1.4918907

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Reading Devices

MICR Devices
MICR (magnetic ink character recognition) devices read text printed with magnetized ink
An MICR reader converts MICR characters into a form the computer can process
Banking industry uses MICR for check processing
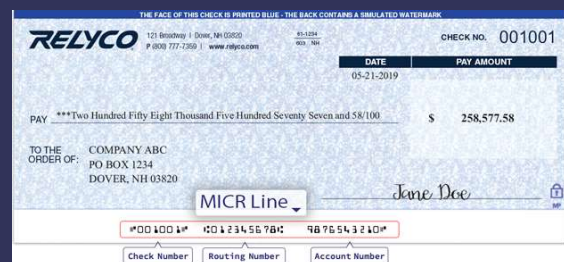
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What is Output?

Output is data that has been processed into a useful form

Output device is any piece of computer hardware equipment which converts information into human readable form.

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Commonly Used Output Methods

Display	Printer	Audio Output	Projector	Interactive Whiteboard	Game Controller

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Commonly Used Output Methods

Display	Printer	Audio Output	Projector	Interactive Whiteboard	Game Controller

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Display

- A display is an output device that visually conveys text, graphics, and video information
- A monitor is a display that is packaged as a separate peripheral device

Desktop Display	Laptop Display	Tablet Display
Smartphone Display	Digital Camera Display	Monitor

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Display

The quality of a display depends primarily on the followings

Resolution	Response Time
Brightness	Dot Pitch

Contrast Ratio

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Display

Video Graphics Array (VGA)	Digital Video Interface (DVI)	High-Definition Media Interface (HDMI)	DisplayPort
Supporting analog signal	Supporting analog & digital signal	Supporting digital signal with digital audio signal	An alterative to HDMI

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Display

Home users sometimes use a digital television (DTV) as a display

High-definition television (HDTV) is the most advanced form of digital television

A Smart TV is an Internet-enabled HDTV

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Commonly Used Output Methods

| Display | Printer | Audio Output | Projector | Interactive Whiteboard | Game Controller |

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Printer

- A printer produces text and graphics on a physical medium

Nonimpact Printers   Impact Printers
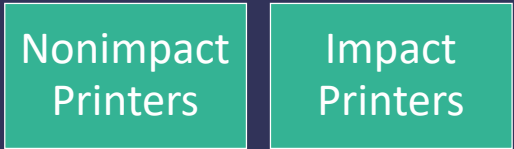
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Nonimpact Printer

- A nonimpact printer forms characters and graphics on a piece of paper without actually contacting the paper

Ink-jet Printers	Photo Printers	Laser Printers	All-in-one Printers	Thermal Printers

Dye Sublimation Printers	Mobile Printers	Label Printers	Plotters	Large-format Printers

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Nonimpact Printer – Inkjet Printer

- An ink-jet printer forms characters and graphics by spraying tiny drops of liquid ink onto a piece of paper
- Color or black-and-white
- Speed is measured by the number of pages per minute (ppm) it can print

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Nonimpact Printer – Photo Printer

- A photo printer produces lab-quality photos
- Many use ink-jet technology
- Some brand allows you to print photos directly from a digital camera
- Print from a memory card

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Nonimpact Printer – Laser Printer

- It is a high-speed and high-quality printer
- It offers both black-and-white and color

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Nonimpact Printer – All-in-one Printer

- An all-in-one printer is a single device that prints, scans, copies, and in some cases, faxes
- It is also called a multifunction printer

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Nonimpact Printer – Thermal Printer

- A thermal printer generates images by pushing electrically heated pins against the heat-sensitive paper

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Nonimpact Printer – Dye Sublimation Printer

- Dye sublimation printer is a computer printing technique which uses heat to transfer dye onto materials such as a plastic, card, paper, or fabric.

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Nonimpact Printer – Mobile Printer

- A mobile printer is a small, lightweight, battery-powered printer that allows a mobile user to print from a mobile device

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Nonimpact Printer – Label Printer

- A label printer is a small printer that prints on an adhesive-type material that can be placed on a variety of items

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Nonimpact Printer – Plotter

- Plotter are used to produce high-quality drawings

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Nonimpact Printer – Large-format Printers

- Large-format printers create photo-realistic quality color prints

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Nonimpact Printer – 3D printer

- A 3-D printer uses a process called additive manufacturing to create an object by adding material to a three-dimensional object, one horizontal layer at a time

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Impact Printer – Dot Matrix Printer

- Impact printers form characters and graphics on a piece of paper by striking a mechanism against an inked ribbon that physically contacts the paper
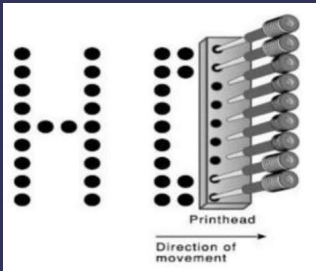
https://www.youtube.com/watch?v=I_VBe3OO9dI

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Commonly Used Output Methods

Display	Printer	Audio Output	Projector	Interactive Whiteboard	Game Controller

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Audio Output

- Many users attach surround sound speakers or speaker systems to their computers, game consoles, and mobile devices to generate higher-quality sounds

FL FR
SW C
SL SR
SBL SBR

7.1-Channel Speakers

Subwoofer

Center Speaker
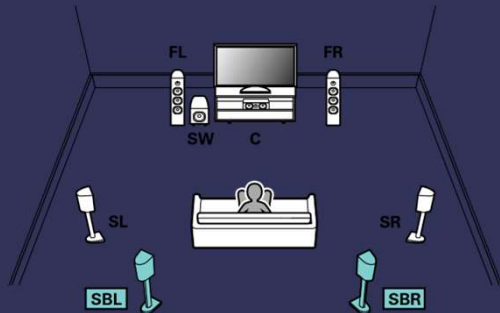
Satellite Speakers

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Audio Output

- Earbuds (also called earphones) rest inside the ear canal
- Headphones are speakers that cover or are placed outside of the ear

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Commonly Used Output Methods

Display	Printer	Audio Output	Projector	Interactive Whiteboard	Game Controller

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Projector

- A data projector is a device that projects the text and images displaying on a computer or mobile device screen on a larger screen so that an audience can see the image clearly
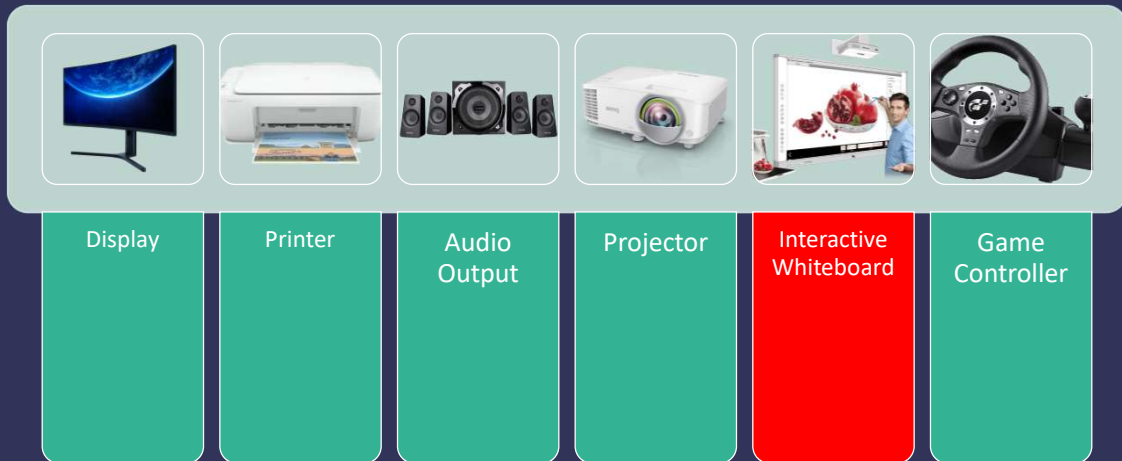
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Commonly Used Output Methods

| Display | Printer | Audio Output | Projector | Interactive Whiteboard | Game Controller |

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Interactive Whiteboard

- An interactive whiteboard is a touch-sensitive device, resembling a dry-erase board, that displays the image on a connected computer screen

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Commonly Used Output Methods

Display	Printer	Audio Output	Projector	Interactive Whiteboard	Game Controller
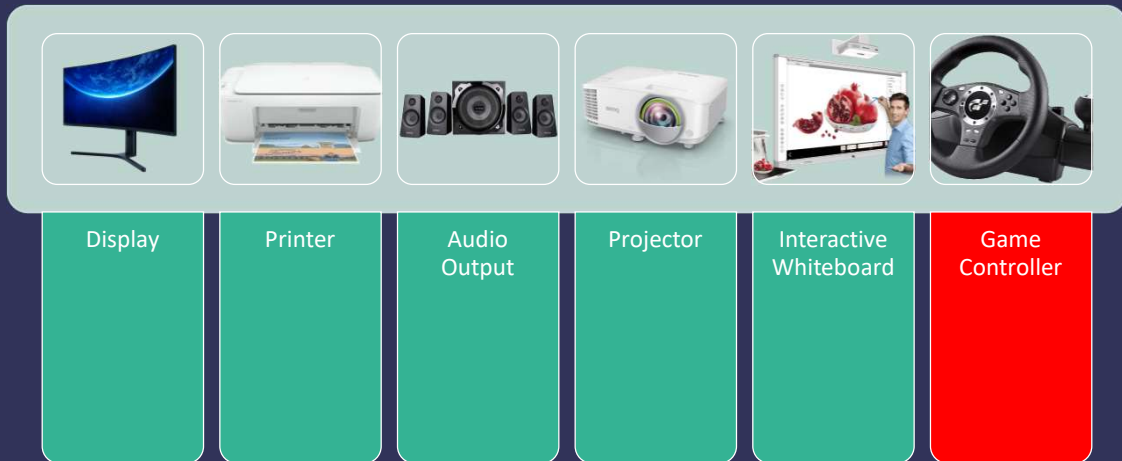
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Game Controller

- Joysticks, wheels, gamepads, and motion-sensing game controllers can be considered output devices when they include force feedback

- Technology that sends resistance to the device in response to actions of the user

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Assistive Technology Input and Output

- Head-mounted pointer
- Braille printer

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Lecture 04
Input and Output - **Completed**

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