

# **Chapter 1**

## **Input-Output Devices**

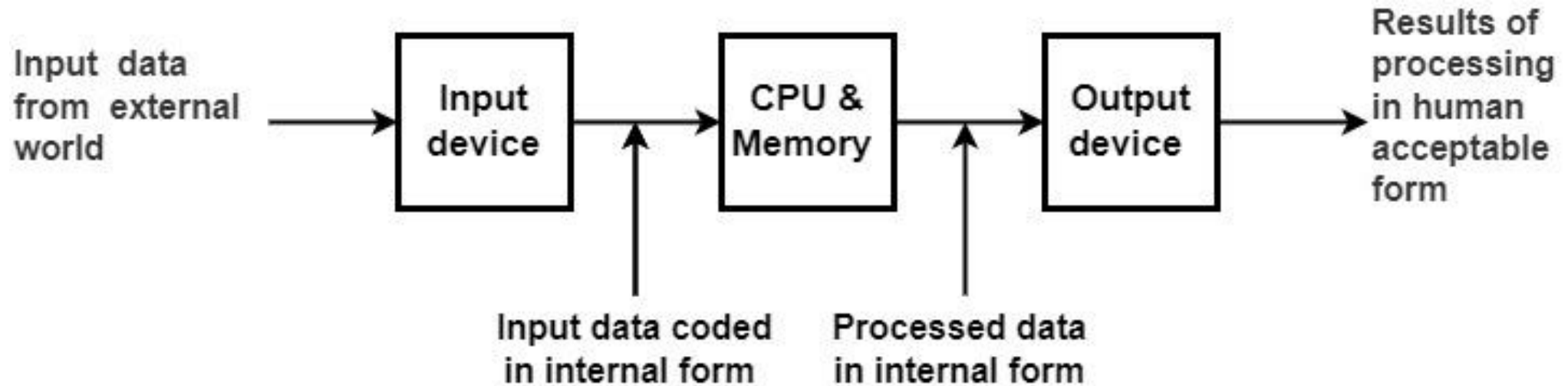
# INPUT DEVICE



# INPUT DEVICE

- Provide means of communication between a computer and outer world
- Also known as peripheral devices because they surround the CPU and memory of a computer system
- Input devices are used to enter data from the outside world into primary storage
- Many types of input device depending on use:
  - A few are generic
  - Many are specialized

# ROLE OF I/O DEVICES



# COMMONLY USED INPUT DEVICES

- Keyboard devices
- Point-and-draw devices
- Data scanning devices
- Digitizer
- Electronic cards based devices
- Speech recognition devices
- Vision based devices

# KEYBOARD

- Update of original typewriter – invented in late 1800s
- Also related to the Telex machine and games console
- Good for entering small quantities of textual data
- Not good for very large quantities of data – too slow
- Not good for non-textual data (graphics or sound)
- Usual layout is called **QWERTY keyboard (101 keys)**
- *There are many alternative formats and layouts*
- *A 'key-press' generates an electronic code to operating system, converted to Unicode characters*



# QWERTY KEYBOARD

**Why We Have QWERTY Keyboard,**



**Not ABCDE?**

# POINT & DRAW DEVICES

- Used to rapidly point to and select a graphic icon or menu item from multiple options displayed on the *Graphical User Interface (GUI)* of a screen
- Used to create graphic elements on the screen such as lines, curves, and freehand shapes
- Some commonly used point-and-draw devices are mouse, track ball, joy stick, light pen, and touch screen



# MOUSE

- A 'pointing' device that captures 2-D spatial movement across a surface
- Originally electro-mechanical, now optical
- Can be wired or wireless
- Multiple styles and features
- Invented by **Douglas Engelbart** in 1963
  - American working at Stanford
  - Never got any money from his invention
  - Patent ran out before mice became used



# MOUSE

- Now many different designs and alternatives:



**Tracker ball**



**Trackpad/touchpad**



**Joysticks**

# ELECTRONIC PEN

- Pen-based point-and-draw device
- Used to directly point with it on the screen to select menu items or icons or directly draw graphics on the screen
- Can write with it on a special pad for direct input of written information to a system
- Pressure on tip of a side button is used to cause same action as *right-button-click* of a mouse
- [https://www.youtube.com/watch?v=V\\_GkPZ5qb7A](https://www.youtube.com/watch?v=V_GkPZ5qb7A)



# TOUCH SCREEN

- Most simple, intuitive, and easiest to learn of all input devices
- Enables users to choose from available options by simply touching with their finger the desired icon or menu item displayed on the screen
- Most preferred human-computer interface used in *information kiosks* (unattended interactive information systems such as automatic teller machine or ATM)



# QUICK BRAIN – Sample Question 1

- What is input device?
- Explain the working procedure of I/O device.

# DATA SCANNING DEVICES

- Input devices that enable direct data entry into a computer system from source documents
- Eliminate the need to key in text data into the computer
- Due to reduced human effort in data entry, they improve data accuracy and also increase the timeliness of the information processed
- Demand high quality of input documents
- Some data scanning devices are also capable of recognizing marks or characters
- Form design and ink specification usually becomes more critical for accuracy

# SCANNER

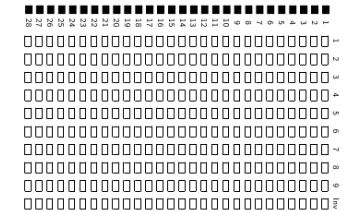
- A variation on digital camera technology
- Uses reflected light (photons) to translate documents into computer data (electrons)
- Scanning technology appears in various forms:
  - Barcode reader (holding product information)
  - Q-Code reader (holding various types of encoded data)
  - Optical mark reader (multiple-choice exams)
  - Flatbed scanner (document pages and photos)



**Barcode**



**Q-Code**



**OMR**



**Flatbed scanner**

# BAR-CODE READER

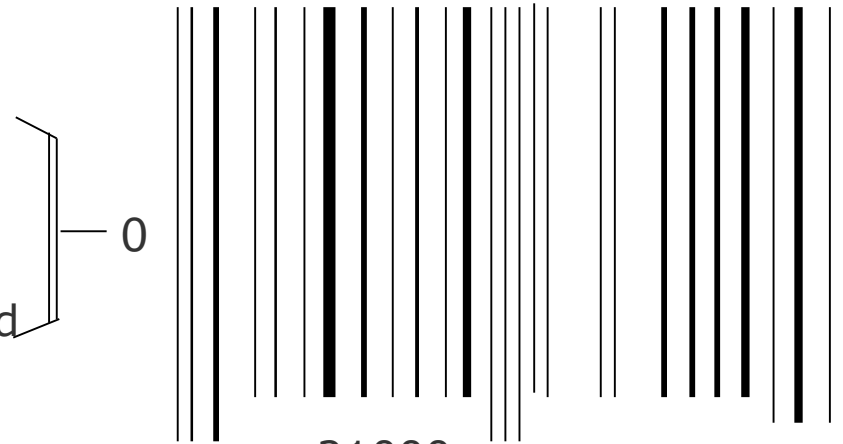
- Scanner used for reading (decoding) bar-coded data
- Bar codes represent alphanumeric data by a combination of adjacent vertical lines (bars) by varying their width and the spacing between them
- Scanner uses laser-beam to stroke across pattern of bar code. Different patterns of bars reflect the beam in different ways sensed by a light-sensitive detector
- Universal Product Code (UPC) is the most widely known bar coding system
- How barcodes work?

➤ <https://www.youtube.com/watch?v=e6aR1k-ympo>



# AN EXAMPLE OF UCP BAR-CODE

Product category  
character 0 – grocery  
products  
3 – drugs and health related  
products, etc.



Manufacturer/supplier  
identification number

Specific product code  
number

# OPTICAL MARK READER (OMR)

- Scanner capable of recognizing a pre-specified type of mark by pencil or pen
- Very useful for grading tests with objective type questions, or for any input data that is of a choice or selection nature
- Technique used for recognition of marks involves focusing a light on the page being scanned and detecting the reflected light pattern from the marks
- <https://www.youtube.com/watch?v=0VPxGt0cw1A>

# SAMPLE USE OF OMR

*For each question, four options are given out of which only one is correct. Choose the correct option and mark your choice against the corresponding question number in the given answer sheet by darkening the corresponding circle with a lead pencil.*

1. The binary equivalent of decimal 4 is:
  - a) 101
  - b) 111
  - c) 001
  - d) 100
2. The full form of CPU is:
  - a) Cursor Positioning Unit
  - b) Central Power Unit
  - c) Central Processing Unit
  - d) None of the above
3. Which is the largest unit of storage among the following:
  - a) Terabyte
  - b) Kilobyte
  - c) Megabyte
  - d) Gigabyte

(a) Question sheet

Indicates direction in which the sheet should be fed to the OMR

1.	a	b	c	d
2.	a	b	c	d
3.	a	b	c	d

(b) Pre-printed answer sheet

A sample use of OMR for grading tests with objective type questions

# **DIGITIZER**

- Input device used for converting (digitizing) pictures, maps and drawings into digital form for storage in computers
- Commonly used in the area of Computer Aided Design (CAD) by architects and engineers to design cars, buildings medical devices, robots, mechanical parts, etc.
- Used in the area of Geographical Information System (GIS) for digitizing maps available in paper form
- How it works: <https://www.youtube.com/watch?v=OuiHvXB1l0w>



# ELECTRONIC CARD READER

- Electronic cards are small plastic cards having encoded data appropriate for the application for which they are used
- Electronic-card reader (normally connected to a computer) is used to read data encoded on an electronic card and transfer it to the computer for further processing
- Used together as a means of direct data entry into a computer system
- Used by banks for use in automatic teller machines (ATMs) and by organizations for controlling access of employees to physically secured areas

# SPEECH RECOGNITION DEVICES

- Input device that allows a person to input data to a computer system by speaking to it
- Today's speech recognition systems are limited to accepting few words within a relatively small domain and can be used to enter only limited kinds and quantities of data

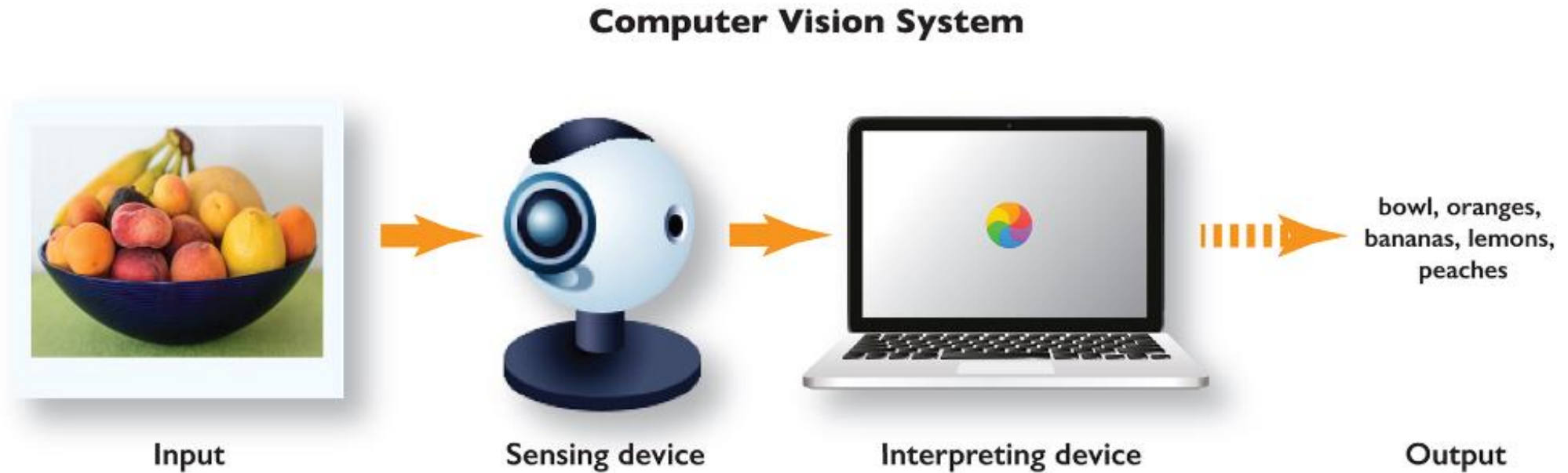
## **Types of speech recognition systems**

- *Single word recognition systems* can recognize only a single spoken words, such as YES, NO, MOVE, STOP, at a time. Speaker-independent systems are mostly of this type
- *Continuous speech recognition systems* can recognize spoken sentences, such as MOVE TO THE NEXT BLOCK. Such systems are normally speaker- dependent

# VISION INPUT SYSTEM

- Allow computer to accept input just by seeing an object.
- Input data is normally an object's shape and features in the form of an image
- Mainly used today in factories for designing industrial robots that are used for quality-control and assembly processes

# VISION INPUT SYSTEM





# QUICK BRAIN – Sample Question 2

- Provide 3 examples of input devices with brief description
- How does a digitizer work?