Input devices

Lesson Objectives

Students will learn about:

- Input devices and its working in detail.
- How are sensors used in monitoring and control applications

1.

Content

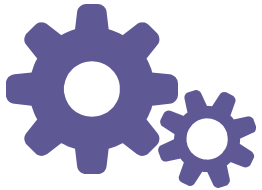
Activity 1

1. Watch the video: https://www.youtube.com/watch?v=TjugZ223R1E&t=65s
2. Answer the questions:
- How many types of scanners are there?
- How does a 2D scanner work?
- How does a 3D scanner work?

Scanner

There are two types of scanners: 2D scanners and 3D scanners.

2D Scanner



The panel is raised, the document is placed on the glass and the cover is closed. A bright light illuminates the document.

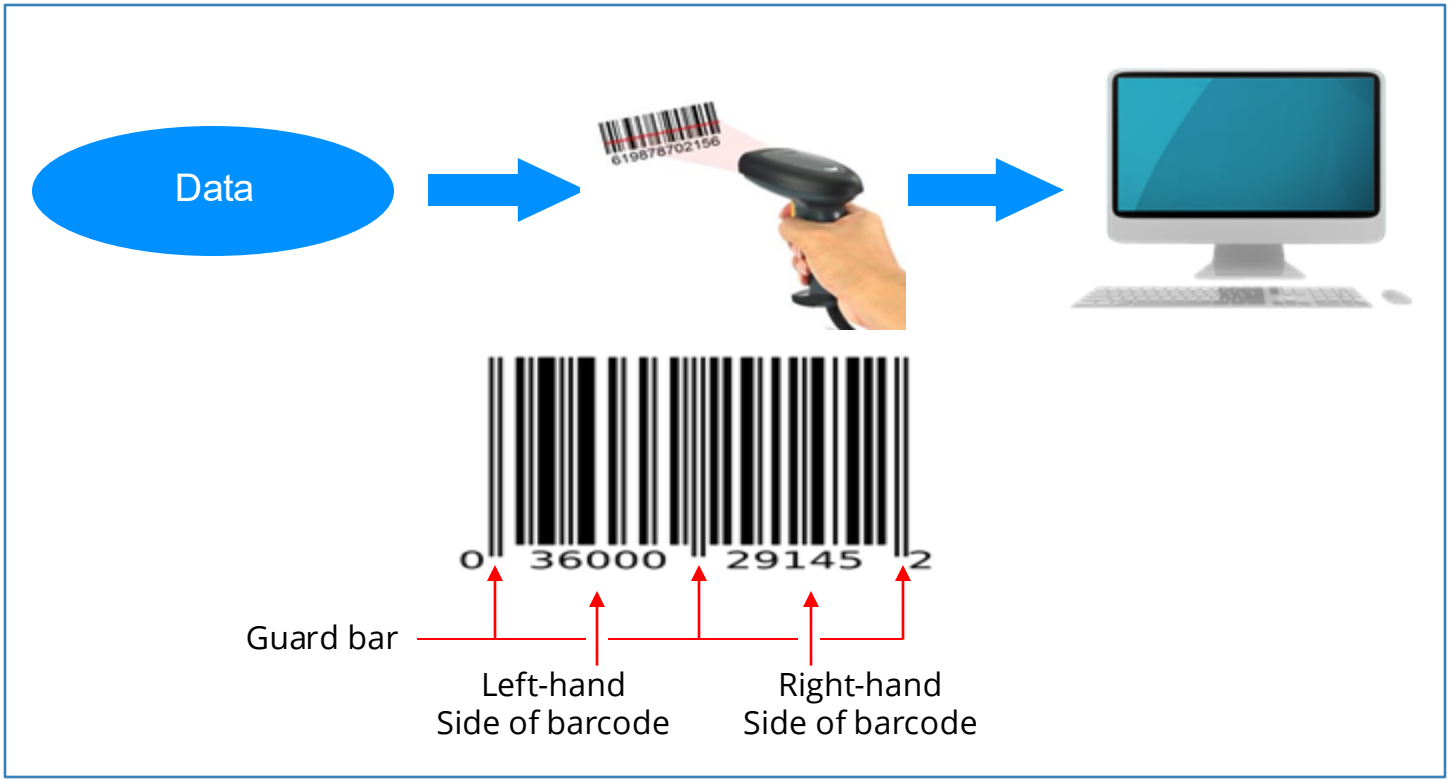
A scan head moves across the document until the whole page has been scanned and an image is produced.

Image is focused and falls on a CCD and is converted to electronic form.

3D Scanner

- A 3D-scanner scans solid objects and a three-dimensional image representing the object is produced.
- Several images at various three-dimensional coordinates of the object are taken by the scanner.

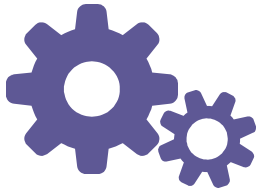
Barcode reader/scanner



Barcode reader/scanner

- A barcode is a series of dark and light parallel lines of varying thickness.
- The numbers 0 to 9 are each represented by a unique series of lines.
- Various barcode methods for representing these digits exist. Universal Product Code (UPC) defines a standard to represent each digit using bars.
- The most common application of barcodes is storing product information.

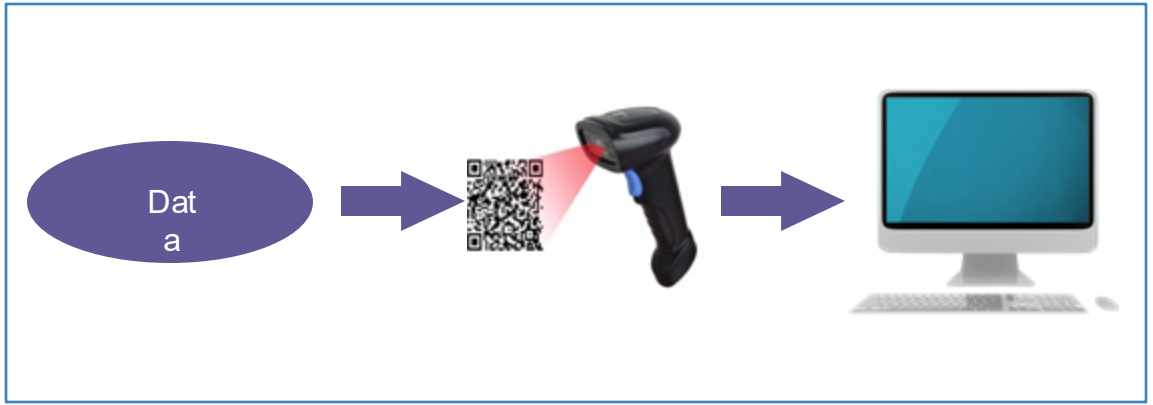
Barcode reader/scanner



1. The barcode is first read by a red LED or laser.
2. Light is reflected back off the barcode. Dark areas: no light reflected
3. After scanning, a pattern is generated and converted to digital data
4. This data identifies the stock item and price details are sent to POS

QR code reader/scanner

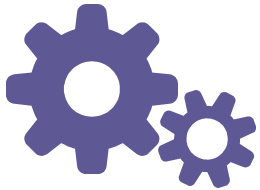
QR code is made up of a matrix of filled-in squares on a light background.

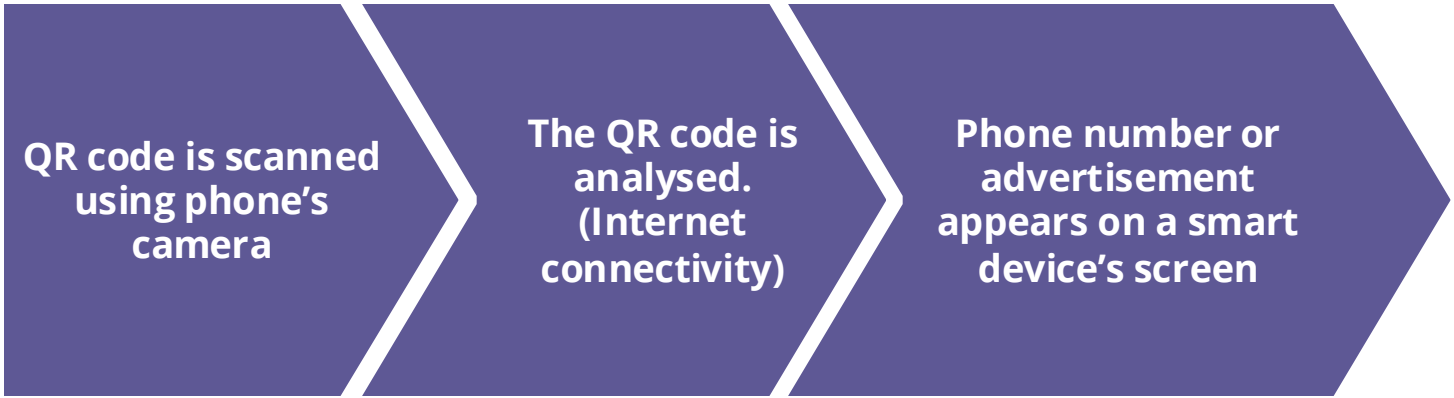


QR code reader/scanner

- QR codes can store up to 7000 digits whereas normal barcodes can only store 30 digits.
- With Internet access, QR codes can be scanned anywhere.
- They are widely used for advertising products on public transport or in public areas like malls.
- This code contains a website link or an advertisement.

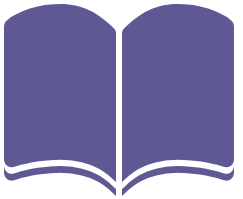
QR code reader/scanner





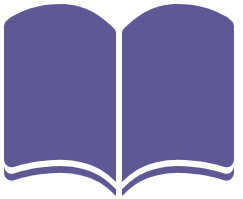
Digital camera

Digital camera



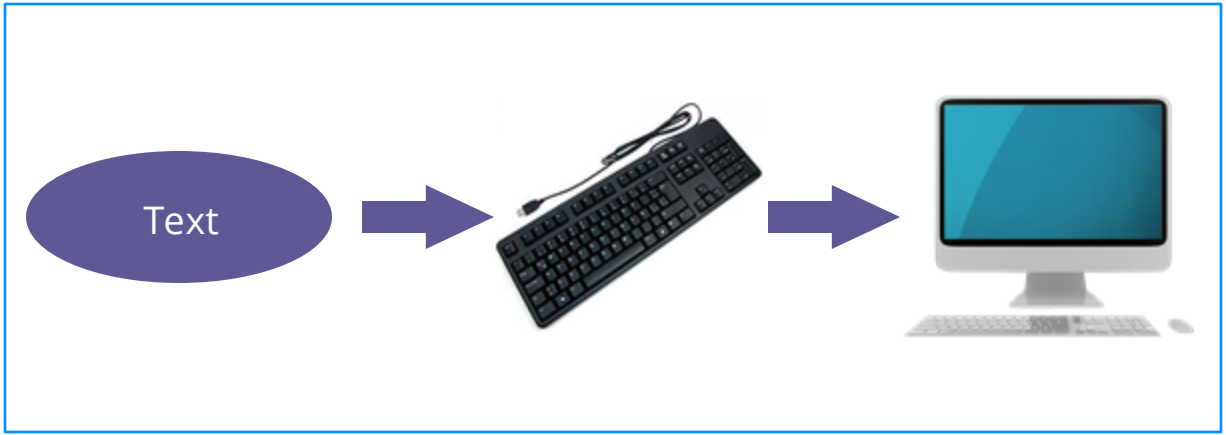
- Digital cameras have replaced traditional cameras because of their many advantages.
- Traditional cameras require film and the photos must be developed and printed.
- These cameras can be connected to a computer using USB, Wi-Fi or Bluetooth connectivity and the photos and videos can be transferred in seconds.
- Unwanted photos or videos can be deleted.

Digital camera



- Digital cameras have a microprocessor to automatically adjust the shutter speed, focus the image, operate the flash, adjust the aperture size, adjust the size of the image, remove ‘red eye’ when the flash has been used, and many more functionalities.
- The number of pixels in a light-sensitive cell of a camera determines the amount of memory the photo captured will occupy.
- The memory occupied by the photo can be reduced by reducing its resolution.

Keyboard

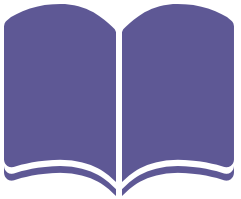


Keyboard

- Each character has a unique ASCII code.
- When a key is pressed, it is converted into a digital signal, which the computer interprets.
- Frequent use of keyboards can lead to Repetitive Strain Injury (RSI) in hands and wrists.
- Ergonomic keyboards are used to overcome this problem. This kind of keyboard supports the wrists and hands for users who do a lot of typing.

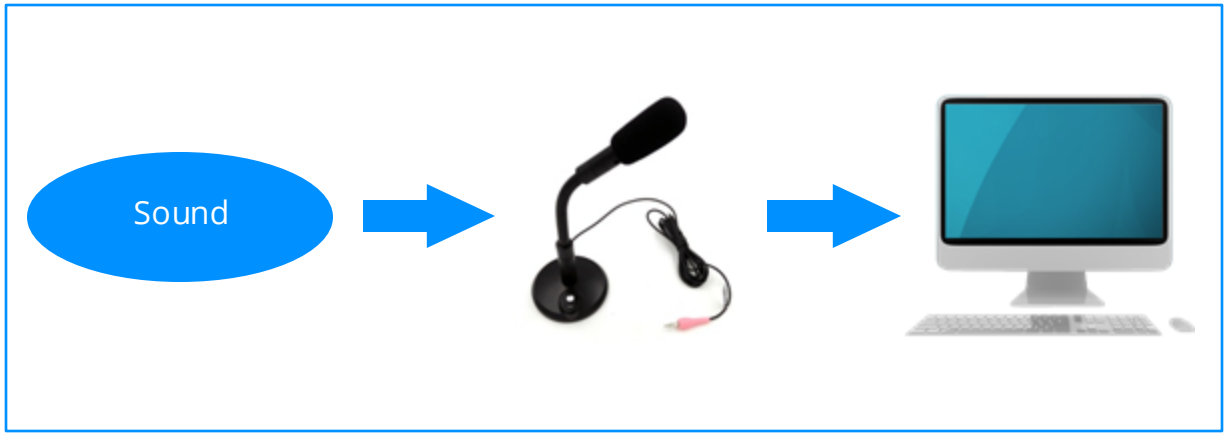
Pointing devices

Pointing devices



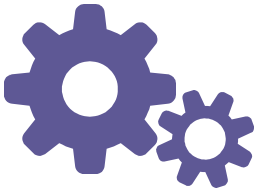
- The traditional form of a mouse has a mechanical ball arrangement that is connected to the computer using a USB port.
- This mouse has been replaced with the optical mouse, which uses a red light to detect motion in the 2D coordinates.
- A mouse requires a desk space or flat surface for movement. A smooth, non-reflective surface is also required.
- A mouse consists of buttons for selection and a scroll wheel for movement up and down the screen.

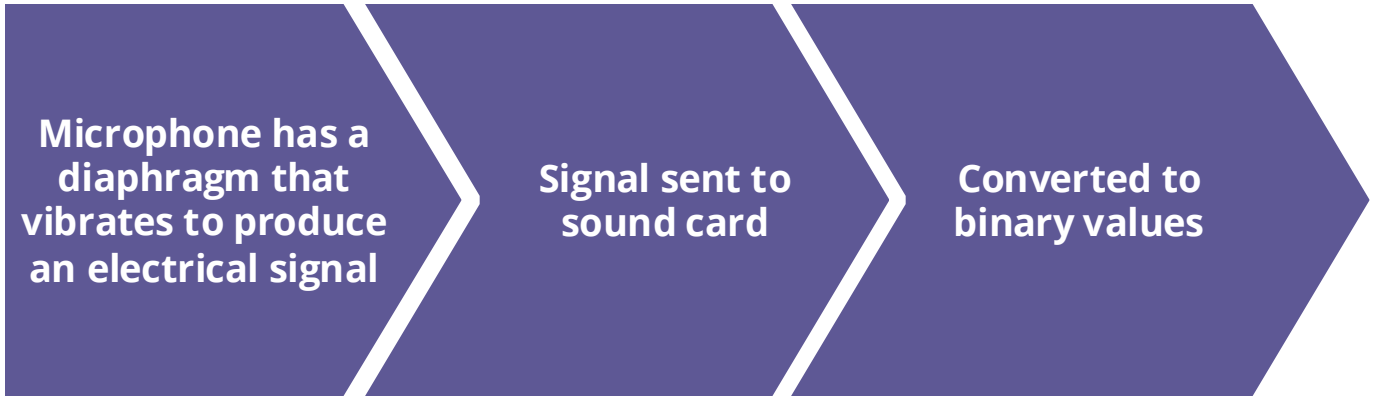
Microphone



Speech recognition systems have enabled disabled people to communicate with computers.

Microphone




Microphone has a diaphragm that vibrates to produce an electrical signal
Signal sent to sound card
Converted to binary values

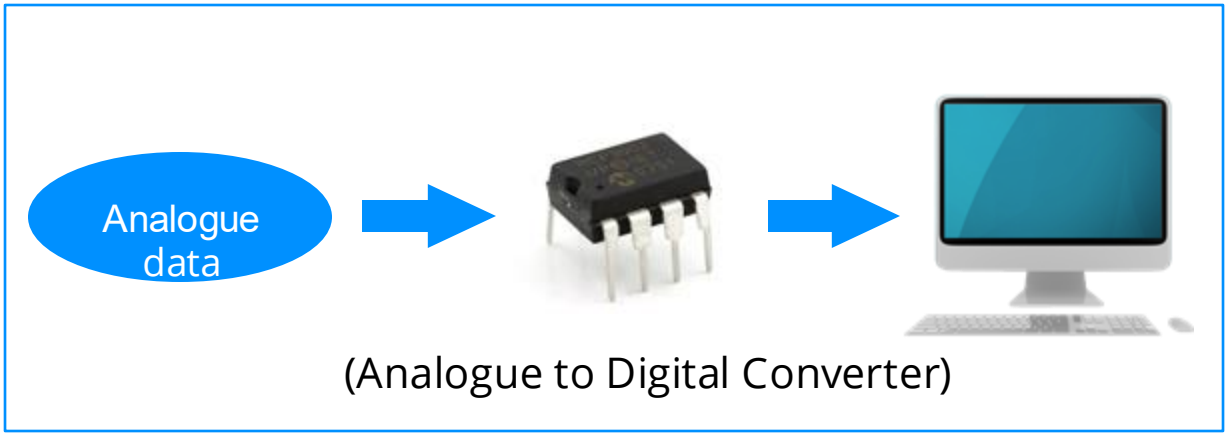
Touchscreen

There are three types of mobile phone screens: capacitive, infrared and resistive.

	Capacitive	Infrared	Resistive
What is it made of?	Many layers of glass that act as capacitors	Glass	An upper layer of polyester and a bottom layer of glass
How does it work?	Due to changes in electric current when the glass layer is touched, the coordinates where it has been touched is sent to the microprocessor	Heat-sensitive: Needs a warm object to give input Optical: An array of sensors in the form of a grid determine the coordinates touched	When the polyester layer is touched, both layers connect and complete the circuit. The microprocessor interprets the signal and determines the coordinates.

	Capacitive	Infrared	Resistive
Advantages	Medium-cost, good screen visibility (even in bright sunlight), multi-touch capability and durable	Multi-touch capability and durability. Gloved fingers and stylus can be used to provide input for optical systems.	Relatively inexpensive technology. Bare fingers, gloved fingers and stylus can be used to provide input.
Disadvantages	Bare fingers and certain stylus can only be used for input	Incorrectly trigger commands Relatively expensive Sensitive to water and moisture	Poor screen visibility in bright sunlight Does not permit multi-touch capability The screen is not durable.

Sensors



Sensors are devices that can read physical quantities such as temperature, light, motion and so on.

Sensors

- Physical quantities are analogue in nature.
- For the computer to interpret these values, an analogue-to-digital converter (ADC) is used.

Sensor	Application
Temperature	Controlling a heating system and temperature of a chemical process in a factory
Pressure	Detect changes in weight or monitor gas pressure
Light	Switching on street lights at night and switching them off in the day
Motion	Counting numbers of people entering and leaving a space
Sound	Detect footsteps of an intruder in a burglar alarm system

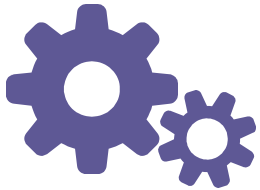
Monitoring and control applications

- The DAC converts the digital data from the computer into analogue values that can control the output devices.
- A computer can control devices such as motors, valves, etc. by using a digital-to-analogue converter (DAC).
- An actuator is an electromechanical device that controls electrical devices.
- Its operation is similar to that of a switch. It switches the electrical device ON and OFF according to the signals from the computer.

Monitoring and control applications

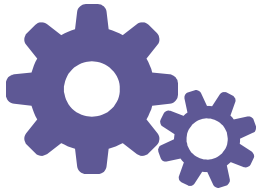
- An actuator is usually a relay, solenoid or motor.
- A solenoid is a digital actuator and hence, can directly control the electrical device when it receives digital signals.
- A motor cannot process a digital signal directly and requires a DAC to convert digital signal from a computer to an analogue signal such as electric current.

Steps in monitoring process



1. The sensor sends the values calculated to the computer or microprocessor.
2. The analogue values of a sensor are converted into digital values.
3. The computer analyses the data received by checking it against the stored values.
4. If the measured value is outside the acceptable range, a warning message is sent to the user or an alarm is activated.
5. Continues monitoring and no action is taken

Steps in controlling process

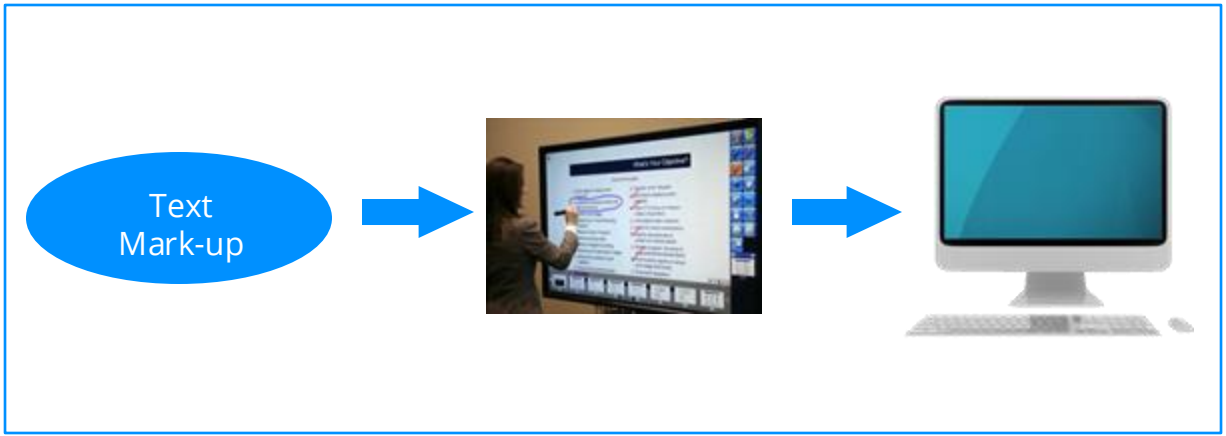


For example: in case of a fire alarm, water is sprayed in the area of the fire.

1. The sensor sends the values calculated to the computer or microprocessor.
2. The analogue values of a sensor is converted into digital values.
3. The computer analyses the data received by checking it against the stored values.
4. If the measured value is outside the acceptable range, control signals are sent to motors, valves, etc.
5. The system affects the next set of inputs.

Note: the last two steps are to understand the difference between monitoring and to control the application

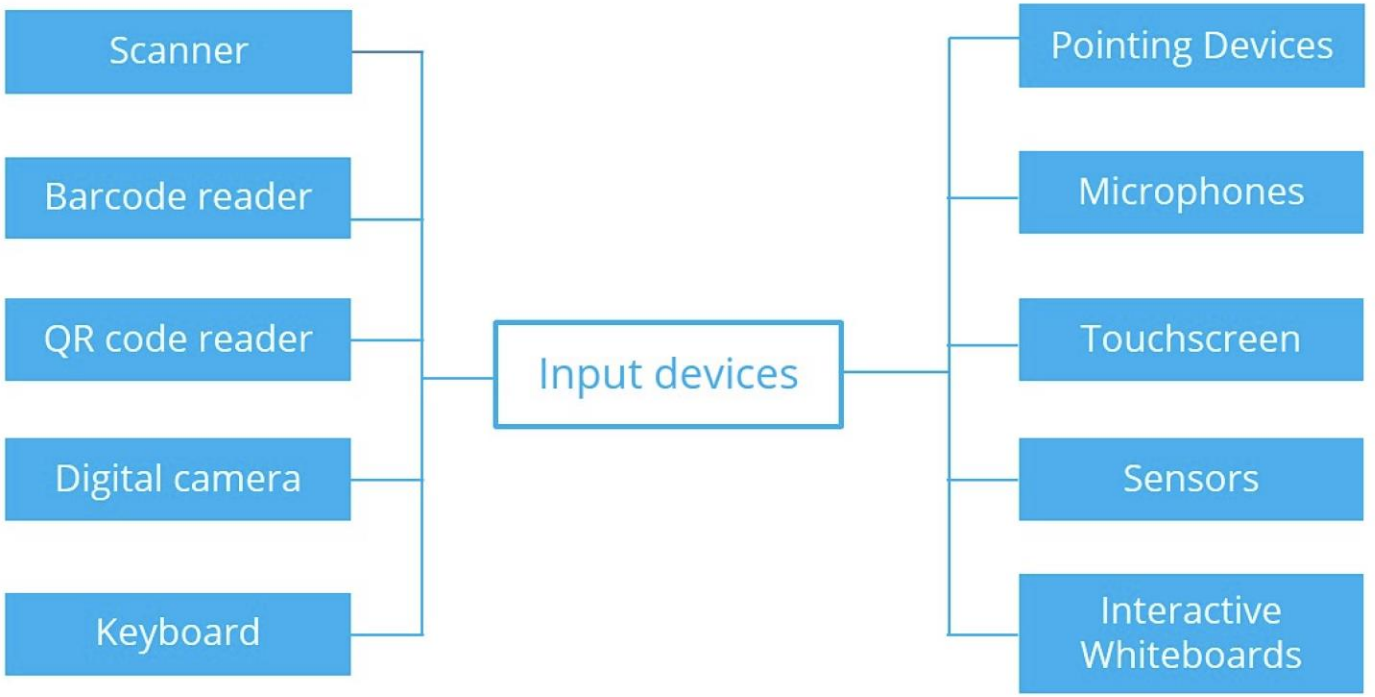
Interactive Whiteboards



Interactive Whiteboards

- Interactive whiteboards enable users to write on the whiteboard.
- These changes can be saved for later use.
- Any application that can be used on the computer can be used on an interactive whiteboard.
- Software applications such as games can also be demonstrated using interactive whiteboards.

Summary


Scanner
Barcode reader
QR code reader
Digital camera
Keyboard
Input devices
Pointing Devices
Microphones
Touchscreen
Sensors
Interactive Whiteboards

Activities

Activity-1

Duration: 15 minutes

1. Create your own flashcards
2. Work in pairs. Take turns, question and answer with your flashcards.