



Master of Computer Applications

CAPOL403 – Computer Organization and Architecture

Unit IV – Lesson 1: IO devices

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IO devices

- IO device
 - A hardware device which is used by the human to communicate with the computer
 - If the device is used to give inputs, then it is called input device
 - Example: Keyboard, OMR
 - If the device is used to get outputs from computer, then it is called output device
 - Ex: Printer, Monitor

Input devices

- Key board
- Mouse
- Trackball
- Joystick
- Optical Mark Reader (OMR)
- Bar-code reader
- Magnetic Ink Character Reader (MICR)
- Digitizer
- Card reader
- Voice Recognition
- Web Cam
- Video Cameras

Keyboard



- Keyboard is considered as one of the principal input devices
- It has characters, digits and special functional keys

Keyboard...

- Each key has a unique binary code
- When a key is pressed, that binary code is passed to the computer and the processor recognizes the key
- This process is called as “keyboard scanning”

Common keys

- 1. Backspace: This key deletes letters backward.*
- 2. Delete: This key deletes letters forward.*
- 3. Shift: This key, when pressed WITH another key, will perform a secondary function.*
- 4. Spacebar: This key enters a space between words or letters.*
- 5. Tab: This key will indent what you type, or move the text to the right. The default indent distance is usually ½ inch.*

Common keys...

6. *Caps Lock: Pressing this key will make every letter you type capitalized.*
7. *Control (Ctrl): This key, when pressed WITH another key, performs a shortcut.*
8. *Enter: This key either gives you a new line, or executes a command (pressed in a word processing program, it begins a new line).*

Common keys...

- 9. Number Keypad: These are exactly the same as the numbers at the top of the keyboard; some people just find them easier to use in this position.*
- 10. Arrow Keys: Like the mouse, these keys are used to navigate through a document or page.*
- 11. Function keys: These keys are used as shortcuts for various functions.*

Mouse



- Mouse is an example for pointing input device
- It has usually a ball and two buttons (left and right) and is connected to the system through serial port
- Left button is used to select, drag and open
- Right button is used to choose an operation from the inbuilt popup menu

Track ball



- This is also a pointing device
- Unlike mouse it does not move
- The ball in the device is used to control a GUI pointer
- As it has smaller size than mouse, it is opt for the people who has limited movement

Joystick

- It is mainly used for playing games
- The movements forward/backward left/right are sent to the computer
- Most joysticks are 2D allowing x movements (left/right) and y movements (forward/backward)
- 3D joysticks allow z movement when the stick is twisted left or right (counter clockwise and clockwise)



Optical Mark Reader

- OMR reads pen/pencil marks made in pre-defined positions on paper forms
- It is usually taken as a response to the given questions
- The OMR data entry system contains the information to convert the presence or absence of marks into a computer data file.



OMR based Questionnaire form

1. A square matrix B is skew symmetric if
(A) $B^T = -B$ (B) $B^T = B$ (C) $B^{-1} = B$ (D) $B^{-1} = B^T$
2. For a scalar function $f(x, y, z) = x^2 + 3y^2$, the gradient at the point P (1, 2, -1) is
(A) $2i + 6j + 4k$ (B) $2i + 12j - 4k$ (C) $2i + 12j + 4k$ (D) $\sqrt{56}$
3. The analytic function $f(z) = \frac{z-1}{z^2+1}$ has singularities at
(A) 1 and -1 (B) 1 and i (C) 1 and -i (D) i and -i
4. A thin walled cylindrical pressure vessel having a radius of 0.5m and wall thickness of 25mm is subjected to an internal pressure of 700kPa. The hoop stress developed is
(A) 14MPa (B) 1.4MPa (C) 0.14MPa (D) 0.014MPa

Bar code reader

- A bar code is a machine readable code
- It is commonly used for labeling goods
- This code is sensed and read by a barcode reader using reflective light
- This is recorded in the barcode reader and later fed into the computer
- The computer recognizes the information from the thickness and the space of the bars



Magnetic Ink Character Reader (MICR) / Card reader

- A magnetic ink character recognition (MICR) technology reads **iron oxide** ink pre-printed or encoded on checks, deposit slips or on documents
- An MICR reader electronically captures data, by **first magnetizing** the magnetic ink characters and then sensing the signal
- In magnetic stripe technology which are used in credit cards, the dark magnetic stripe on the back of cards is the iron oxide coating and it is read by a magnetic stripe reader (**card reader**)



Digitizer

- A digitizer tablet is also called a graphics tablet
- The digitizer is a drawing tablet used to sketch new images or trace old drawing or photograph.
- The user uses a pen-like device called a cursor to draw images
- Designers and architects usually use digitizers.
- Light pen and digitizer technologies are used for pen-based computing.



Microphone

- A microphone is a transducer which converts acoustic signal to electrical signal
- It allows us to record voice / sound and place them on computers
- Integrated microphones are available in laptops



Web Cam

- This is a very basic video camera used to feed live videos to the computer
- This is a low quality camera but acceptable for web chatting
- Usually it is mounted on the top of the monitor



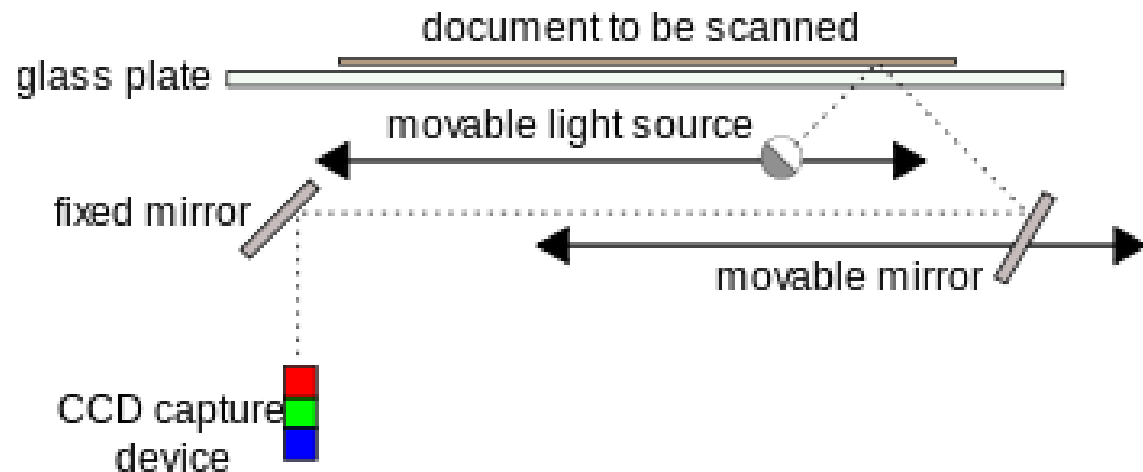
Scanner

- Scanners convert a hard copy of book with texts and image to a soft copy (e-copy)
- Scanners operate by shining light at the object or document being digitized and directing the reflected light (usually through a series of mirrors and lenses) onto a **photosensitive** element.
- CCD is used as a common sensing medium
- CCD is an electronic, light-sensing integrated circuit which converts photons into electrons

Scanner...

- Light-sensitive **photosites** arrayed along the CCD convert levels of brightness into electronic signals that are then processed into a digital image.
- the brighter the light that hits a single photosite, the greater the electrical charge that will accumulate at that site.
- The image reaches the CCD through a series of mirrors, filters and lenses

Scanner...



- A light source illuminates the document through a glass plate
- Usually two or three mirrors are used
- The reflection from the last mirror reaches a lens
- The lens focuses the image through a filter on the CCD

Types of Scanners

- Flat bed
 - CCD and a light source are mounted on a moving arm, sweep past the stationary document on a glass platen.
 - Sometimes, automatic document handlers (ADH) are available
 - They help to increase throughput
 - Overhead book scanner is a specialized variant of the flatbed scanner
 - Its light source, sensor array and optics are moved to an overhead arm assembly under which a bound volume can be placed face up for scanning.



Flatbed Scanner



Overhead Scanner

Types of scanners...

- Sheetfeed scanners
 - The light source and sensor are stationary and the document is moved
 - Documents are expected to be in uniform size
 - Sheetfeed scanners maximize the throughput by compromising the quality



Sheetfeed Scanner

Types of scanners...

Drum Scanners

- Drum scanners produce the highest resolution, highest quality scans of any scanner type
- Expensive, slow and not suitable for brittle documents and require a high level of operator skill



Microfilm Scanners

- Microfilm scanners are highly specialized devices for digitizing roll film, fiche, and aperture cards.
- Operationally complex, film quality and condition may vary, offer minimal enhancement capability



Characteristics of scanners

- Resolution
 - Expressed in dots per inch (dpi)
 - It defines the fineness
 - Quality and number of captors affect horizontal resolution
 - Accuracy of the drive motor affects vertical resolution
 - Optical resolution: Actual resolution
 - Interpolated resolution: calculating intermediate pixels from the neighboring pixels
 - It is not used to compare scanners

Characteristics of scanners...

- Document format support
 - Depending on their size, scanners are able to accommodate documents of different size
 - generally A4 (21 × 29.7 cm)
 - Rarely A3 (29.7 × 42 cm)
- Acquisition speed:
 - Number of scanned papers per minute
 - Expressed in pages per minute (ppm)
 - It depends on the previous two factors

Characteristics of scanners...

- Interface
 - Firewire
 - USB
 - SCSI
 - Parallel port
 - Firewire and USB dominate over the other two
- Physical characteristics
 - Size
 - weight
 - Electricity consumption
 - Operating and storage temperatures
 - Noise level

References

- <http://preservationtutorial.library.cornell.edu/technical/technicalB-01.html>
- <https://computer.howstuffworks.com/scanner1.htm>

Thank you