- **Doctor HTML - Web Page Analyzer:**

  - Did not find the required open and close HEAD tag. You should open and close the HEAD tag in order to get consistent performance on all browsers.

  - Found extra close STRONG tags in the document. Please remove them.

UNIT -5:
Keyboard Layouts

QWERTY layout

  - 1870 Christopher Latham Sholes

  - good mechanical design and a clever placement of the letters that slowed down the users enough that key jamming was infrequent

  - put frequently used letter pairs far apart, thereby increasing finger travel distances

Dvorak layout

  - 1920

  - reduces finger travel distances by at least one order of magnitude

  - Acceptance has been slow despite the dedicated efforts of some devotees

  - it takes about 1 week of regular typing to make the switch, but most users have been unwilling to invest the effort

ABCDE style

  - 26 letters of the alphabet laid out in alphabetical order nontypists will find it easier to locate the keys

Additional keyboard issues

  - IBM PC keyboard was widely criticized because of the placement of a few keys

    - backslash key where most typists expect SHIFT key

    - placement of several special characters near the ENTER key

  - Number pad layout

  - wrist and hand placement

Keys

- 1/2 inch square keys

- 1/4 inch spacing between keys

- slight concave surface

- matte finish to reduce glare finger slippage

- 40- to 125-gram force to activate

- 3 to 5 millimeters displacement

- tactile and audible feedback important

- certain keys should be larger (e.g. ENTER, SHIFT, CTRL)

- some keys require state indicator, such as lowered position or light indicator (e.g. CAPS LOCK)

- key labels should be large, meaningful, permanent

- some "home" keys may have additional features, such as deeper cavity or small raised dot, to help user locate their fingers properly (caution - no standard for this)

Function keys

- users must either remember each key's function, identify them from the screen's display, or use a template over the keys in order to identify them properly

- can reduce number of keystrokes and errors

- meaning of each key can change with each application placement on keyboard can affect efficient use

- special-purpose displays often embed function keys in monitor bezel

- lights next to keys used to indicate availability of the function, or on/off status

- typically simply labeled F1, F2, etc, though some may also have meaningful labels, such as CUT, COPY, etc.

- frequent movement between keyboard home position and mouse or function keys can be disruptive to use

- alternative is to use closer keys (e.g. ALT or CTRL) and one letter to indicate special function

Cursor movement keys

- up, down, left, right

- some keyboards also provide diagonals

- best layout is natural positions

- inverted-T positioning allows users to place their middle three fingers in a way that reduces hand and finger movement

- cross arrangement better for novices than linear or box

- typically include typamatic (auto-repeat) feature

- important for form-fillin and direct manipulation

- other movements may be performed with other keys, such as TAB, ENTER, HOME, etc.

Keyboard and keypads for small devices

- Wireless or foldable keyboards

- Virtual keyboards

- Cloth keyboards

- Soft keys

- Pens and touchscreens

<u>Pointing Devices</u>

Pointing devices are applicable in six types of interaction tasks:

1. Select:
  - user chooses from a set of items.
  - used for traditional menu selection, identification of a file in a directory, or marking of a part in an automobile design.
2. Position:
  - user chooses a point in a one-, two-, three-, or higher-dimensional space
  - used to create a drawing, to place a new window, or to drag a block of text in a figure.
3. Orient:
  - user chooses a direction in a two-, three-, or higher-dimensional space.
  - direction may simply rotate a symbol on the screen, indicate a direction of motion for a space ship, or control the operation of a robot arm.
4. Path:
  - user rapidly performs a series of position and orient operations.
  - may be realized as a curving line in a drawing program, the instructions for a cloth cutting machine, or the route on a map.
5. Quantify:
  - user specifies a numeric value.
  - usually a one-dimensional selection of integer or real values to set parameters, such as the page number in a document, the velocity of a ship, or the amplitude

of a sound.

6. Text:
  − user enters, moves, and edits text in a two-dimensional space. The
  − pointing device indicates the location of an insertion, deletion, or change.
  − more elaborate tasks, such as centering; margin setting; font sizes; highlighting, such as boldface or underscore; and page layout.

Direct-control pointing devices

lightpen

  − enabled users to point to a spot on a screen and to perform a select, position, or other task

  − it allows direct control by pointing to a spot on the display

  − incorporates a button for the user to press when the cursor is resting on the desired spot on the screen

  − lightpen has three disadvantages: users' hands obscured part of the screen, users had to remove their hands from the keyboard, and users had to pick up the lightpen

Touchscreen

  − allows direct control touches on the screen using a finger

  − early designs were rightly criticized for causing fatigue, hand-obscuring-the-screen, hand-off-keyboard, imprecise pointing, and the eventual smudging of the display

  − lift-off strategy enables users to point at a single pixel

  − the users touch the surface

  − then see a cursor that they can drag around on the display

  − when the users are satisfied with the position, they lift their fingers off the display to activate

  − can produce varied displays to suit the task

  − are fabricated integrally with display surfaces

Tablet PCs and Mobile Devices:

• Natural to point on the LCD surface

• Stylus

• Keep context in view

• Pick up & put down stylus

• Gestures and handwriting recognition

Indirect pointing devices

- mouse
  - the hand rests in a comfortable position, buttons on the mouse are easily pressed, even long motions can be rapid, and positioning can be precise
- trackball
  - usually implemented as a rotating ball 1 to 6 inches in diameter that moves a cursor
- joystick
  - are appealing for tracking purposes
- graphics tablet
  - a touch-sensitive surface separate from the screen
- touchpad
  - built-in near the keyboard offers the convenience and precision of a touchscreen while keeping the user's hand off the display surface
    - Human-factors variables
      - speed of motion for short and long distances
      - accuracy of positioning
      - error rates
      - learning time
      - user satisfaction
    - Other variables
      - cost
      - durability
      - space requirements
      - weight
      - left- versus right-hand use
      - likelihood to cause repetitive-strain injury
      - compatibility with other systems

Comparison of pointing devices

- Some results
  - direct pointing devices faster, but less accurate

- graphics tablets are appealing when user can remain with device for long periods without switching to keyboard

- mouse is faster than isometric joystick

- for tasks that mix typing and pointing, cursor keys a faster and are preferred by users to a mouse

- muscular strain is low for cursor keys

- Fitts' Law

- Index of difficulty = $\log_2 (2D / W)$

- Time to point = $C_1 + C_2$ (index of difficulty)

- C1 and C2 and constants that depend on the device

- Index of difficulty is $\log_2 (2*8/1) = \log_2(16) = 4$ bits

- A three-component equation was thus more suited for the high-precision pointing task:

- Time for precision pointing = $C_1 + C_2$ (index of difficulty) + $C_3 \log_2 (C_4 / W)$

Novel devices

- Foot controls

- Eye-tracking

- Multiple-degrees-of-freedom devices

- DataGlove

- Haptic feedback

- Bimanual input

- Ubiquitous computing and tangible user interfaces

- Handheld devices

Speech and auditory interfaces

- Speech recognition still does not match the fantasy of science fiction:

  - demands of user's working memory

  - background noise problematic

  - variations in user speech performance impacts effectiveness

  - most useful in specific applications, such as to benefit handicapped users

- Discrete word recognition

- recognize individual words spoken by a specific person; can work with 90- to 98-percent reliability for 20 to 200 word vocabularies

- Speaker-dependent training, in which the user repeats the full vocabulary once or twice
- Speaker-independent systems are beginning to be reliable enough for certain commercial applications
- been successful in enabling bedridden, paralyzed, or otherwise disabled people
- also useful in applications with at least one of the following conditions:
  - speaker's hands are occupied
  - mobility is required
  - speaker's eyes are occupied
  - harsh or cramped conditions preclude use of keyboard
- voice-controlled editor versus keyboard editor
  - lower task-completion rate
  - lower error rate
- use can disrupt problem solving

- Continuous-speech recognition

  - Not generally available:
    - difficulty in recognizing boundaries between spoken words
    - normal speech patterns blur boundaries
    - many potentially useful applications if perfected

- Speech store and forward

  - Voice mail users can
    - receive messages
    - replay messages
    - reply to caller
    - forward messages to other users, delete messages
    - archive messages

- Systems are low cost and reliable.

- Voice information systems

  - Stored speech commonly used to provide information about tourist sites, government services, after-hours messages for organizations
  - Low cost
  - Voice prompts
  - Deep and complex menus frustrating

- Slow pace of voice output, ephemeral nature of speech, scanning and searching problems
- Voice mail
- Handheld voice recorders
- Audio books
- Instructional systems

- Speech generation
  - Michaelis and Wiggins (1982) suggest that speech generation is "frequently preferable" under these circumstances:

    - The message is simple.
    - The message is short.
    - The message will not be referred to later.
    - The message deals with events in time.
    - The message requires an immediate response.
    - The visual channels of communication are overloaded.
    - The environment is too brightly lit, too poorly lit, subject to severe vibration, or otherwise unsuitable for transmission of visual information.
    - The user must be free to move around.
    - The user is subjected to high G forces or anoxia

Audio tones, audiolization, and music
  - Sound feedback can be important:
    - to confirm actions
    - offer warning
    - for visually-impaired users

- music used to provide mood context, e.g. in games
- can provide unique opportunities for user, e.g. with simulating various musical instruments

Displays – Small and Large

- The display has become the primary source of feedback to the user from the computer
  - The display has many important features, including:
- Physical dimensions (usually the diagonal dimension and depth)
- Resolution (the number of pixels available)
- Number of available colors, color correctness
- Luminance, contrast, and glare
  - Power consumption
  - Refresh rates (sufficient to allow animation and video)
  - Cost
  - Reliability

Usage characteristics distinguish displays:

- Portability
- Privacy
- Saliency
- Ubiquity
- Simultaneity

Display technology

- Monochrome displays
  - are adequate, and are attractive because of their lower cost
- RGB shadow-mask displays
  - small dots of red, green, and blue phosphors packed closely
- Raster-scan cathode-ray tube (CRT)
  - electron beam sweeping out lines of dots to form letters
  - refresh rates 30 to 70 per second
- Liquid-crystal displays (LCDs)

- — voltage changes influence the polarization of tiny capsules of liquid crystals
- — flicker-free
- — size of the capsules limits the resolution
- Plasma panel
- — rows of horizontal wires are slightly separated from vertical wires by small glass-enclosed capsules of neon-based gases
- Light-emitting diodes (LEDs)
- — certain diodes emit light when a voltage is applied
- — arrays of these small diodes can be assembled to display characters
- Electronic ink
- — Paper like resolution
- — Tiny capsules with negatively and positively charged particles
- Braille displays
- — Pins provide output for the blind
- Large displays
- — Informational wall displays
- — Interactive wall displays
- — Multiple desktop displays
- Heads-up and helmet mounted displays
- — A heads-up display can, for instance, project information on a partially silvered widescreen of an airplane or car
- — A helmet/head mounted display (HMD) moves the image with the user
- — 3D images

Mobile device displays

- Currently mobile devices used for brief tasks, except for game playing
- Optimize for repetitive tasks
- Custom designs to take advantage of every pixel
- DataLens allows compact overviews
- Web browsing difficult
- Okay for linear reading, but making comparisons can be difficult

Animation, image, and video

- Accelerated graphics hardware
- More information shared and downloaded on the web
- Scanning of images and OCR
- Digital video
- CDROMS and DVDs

- Compression and decompression through MPEG
- Computer-based video conferencing

Printers

- Important criteria for printers:
— Speed
— Print quality
— Cost
— Compactness
— Quiet operation
— Use of ordinary paper (fanfolded or single sheet)
— Character set
— Variety of typefaces, fonts, and sizes
— Highlighting techniques (boldface, underscore, and so on)
— Support for special forms (printed forms, different lengths, and so on)
— Reliability
- dot-matrix printers
— print more than 200 characters per second, have multiple fonts, can print boldface, use variable width and size, and have graphics capabilities
- inkjet printers
— offer quiet operation and high-quality output
- thermal printers or fax machines
— offer quiet, compact, and inexpensive output on specially coated papers
- laser printers

- — operate at 30,000 lines per minute
- • color printers
- — allow users to produce hardcopy output of color graphics, usually by an inkjet approach with three colored and black inks
- • photographic printers
- — allow the creation of 35-millimeter or larger slides (transparencies) and photographic prints