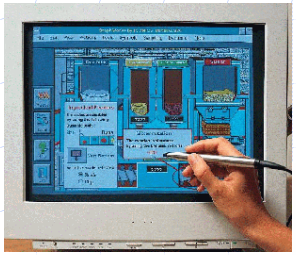
The User Interface Design Process

Step 6: Select the Proper Device-Based Controls



Characteristics of Device-Based Controls

- Several specific tasks are performed using graphical systems.
  - **To point at an object on the screen.**
  - **To select the object or identify it as the focus of attention.**
  - **To drag an object across the screen.**
  - **To draw something free form on the screen.**
  - **To track or follow a moving object.**
  - **To orient or position an object.**
  - **To enter or manipulate data or information.**

Characteristics of Device-Based Controls (Continued)

- Trackball
  - Description:
    - a spherical object (ball that rotates freely in all directions in its socket.
    - Direction and speed is tracked and translated into cursor movement.
  - Advantages:
    - Direct relationship between hand and pointer movement in terms of direction and speed.
    - Does not obscure vision of screen.
    - Does not require additional desk space (if mounted on keyboard).

Characteristics of Device-Based Controls (Continued)

- Trackball (Continued)
  - Disadvantages:
    - Movement is indirect, in a plane different from the screen.
    - No direct relationship exists between hand and pointer movement in terms of distance.
    - Requires a degree of eye-hand coordination.
    - Requires hand to be removed from keyboard keys.
    - Requires different hand movements.
    - Requires hand to be removed from key board (if not mounted on keyboard).
    - Requires additional desk space (if not mounted on keyboard)l
    - May be difficult to control.
    - May be fatiguing to use over extended time.

Characteristics of Device-Based Controls (Continued)

- Joystick
  - Description:
    - A stick or bat-shaped device anchored at the bottom.
    - Variable in size, smaller ones being operated by fingers, larger ones requiring the whole hand.
    - Variable in cursor direction movement method, force joysticks respond to pressure, movable ones respond to movement.
    - Variable in degree of movement allowed, from horizontal-vertical only to continuous.
  - Advantages:
    - Direct relationship between hand and pointer movement in terms of direction.
    - Does not obscure vision of screen.
    - Does not require additional desk space(if mounted on keyboard.

Characteristics of Device-Based Controls (Continued)

- Joystick (Continued)
  - Disadvantages:
    - Movement indirect, in plane different from screen.
    - Indirect relationship between hand and pointer in terms of speed and distance.
    - Requires a degree of eye-hand coordination.
    - Requires hand to be removed from keyboard keys.
    - Requires different hand movements to use.
    - Requires hand to be removed from keyboard (if not mounted on keyboard).
    - Requires additional desk space (if not mounted on keyboard).
    - May be fatiguing to use over extended time.
    - May be slow and inaccurate.

Characteristics of Device-Based Controls (Continued)

- Graphic Tablet
  - Description:
    - Pressure-, heat-, light-, or light-blockage-sensitive horizontal surfaces that lie on the desktop or keyboard.
    - May be operated with fingers, light pen, or objects like a stylus or pencil.
    - Pointer imitates movements on tablet.
  - Advantages:
    - Direct relationship between touch movements and pointer movements in terms of direction, distance, and speed.
    - More comfortable horizontal operating plane.
    - Does not obscure vision of screen.

Characteristics of Device-Based Controls (Continued)

- Graphic Tablet (Continued)
  - Disadvantages:
    - Movement is indirect, in a plane different from screen.
    - Requires hand to be removed from keyboard.
    - Requires hand to be removed from keyboard keys.
    - Requires different hand movements to use.
    - Requires additional desk space.
    - Finger may be too large for accuracy with small objects.

Characteristics of Device-Based Controls (Continued)

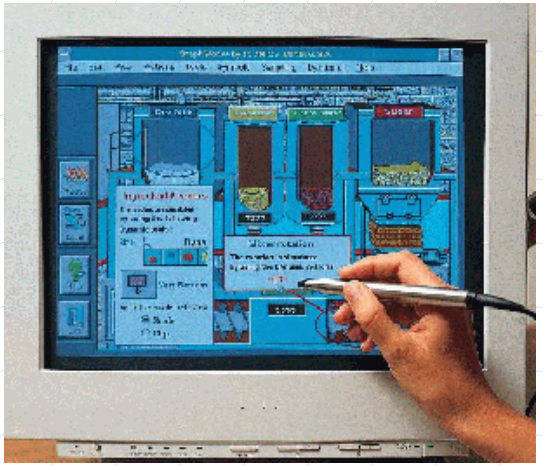
- Touch Screen
  - Description:
    - A special surface on the screen sensitive to finger or stylus touch.
  - Advantages:
    - Direct relationship between hand and pointer location in terms of direction, distance, and speed.
    - Movement is direct, in the same plane as screen.
    - Requires no additional desk space.
    - Stands up well in high-use environments.
  - Disadvantages:
    - Finger may obscure part of screen.
    - Finger may be too large for accuracy with small objects.
    - Requires moving the hand far from the keyboard to use.
    - Very fatiguing to use for extended period of time.
    - May soil or damage the screen.

Characteristics of Device-Based Controls (Continued)

- Touch Screen (Continued)
  - Design Guidelines:
    - Screen objects should be at least 3/4” x 3/4” in size.
    - Object separation should be at least 1/8”.
    - Provide visual feedback in response to activation. Auditory feedback may also be appropriate.
    - When the consequences are destructive, require confirmation after selection to eliminate inadvertent selection.
    - Provide and instructional invitation to begin using.

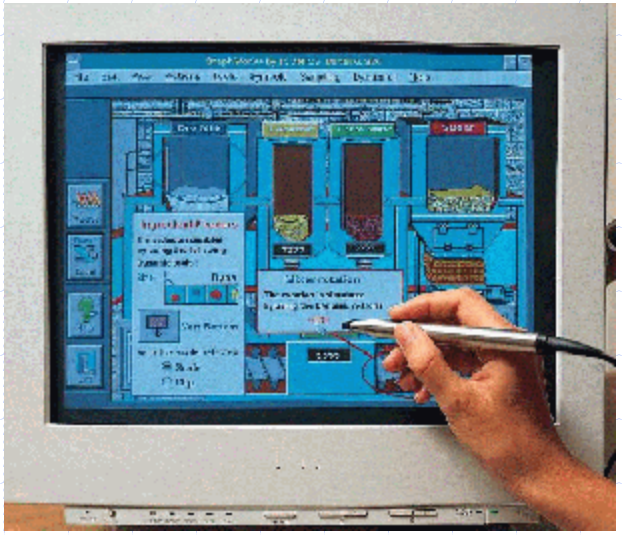
Characteristics of Device-Based Controls (Continued)

- Light Pen
  - Description:
    - A special surface on a screen sensitive to the touch of a special stylus or pen.
  - Advantages:
    - Direct relationship between hand and pointer movement in terms of directions, distance and speed.
    - Movement is direct, in the same plane as screen.
    - Requires minimal additional desk space.
    - Stands up well in high-use environments.
    - More accurate than finger touching.



Characteristics of Device-Based Controls (Continued)

- Light Pen (Continued)
  - Disadvantages:
    - Hand may obscure part of screen.
    - Requires picking it up to use.
    - Requires moving the hand far from the keyboard to use.
    - Very fatiguing to use for extended period of time.



Characteristics of Device-Based Controls (Continued)

- Voice
  - Description: Automatic speech recognition by the computer.
  - Advantages:
    - Simple and indirect.
    - Useful for people who cannot use a keyboard.
    - Useful when the user's hands are occupied.
  - Disadvantages:
    - High error rates due to difficulties in:
      - Recognizing boundaries between spoken words.
      - Blurred word boundaries due to normal speech patterns.
    - Slower throughput than with typing.
    - Difficult to use in noisy environments.
    - Impractical to use in quiet environments.

Characteristics of Device-Based Controls (Continued)

- Mouse
  - Description:
    - A rectangular or dome-shaped, movable, desktop control containing from one to three buttons used to manipulate objects and information on the screen.
    - Movement of screen pointer mimics the mouse movement.
  - Advantages:
    - Direct relationship between hand and pointer movement in terms of direction, distance, and speed.
    - Permits a comfortable hand resting position.
    - Selections mechanisms are included on mouse.
    - Does not obscure vision of the screen.

Characteristics of Device-Based Controls (Continued)

- Mouse (Continued)
  - Disadvantages:
    - Movement is indirect, in a plane different from screen.
    - Requires hand to be removed from keyboard.
    - Requires additional desk space.
    - May require long movement distances.
    - Requires a degree of eye-hand coordination.
  - Mouse Usage Guidelines
    - Provide a "hot zone" around small or thin objects that might require extremely fine mouse positioning.
    - Never use double-clicks or double-drags as the only means of carrying out essential operations.
    - Do not use mouse plus keystroke combinations.
    - Do not require a person to point at a moving target.

Characteristics of Device-Based Controls (Continued)

- Keyboard
  - Description:
    - Standard typewriter keyboard and cursor movement keys.
  - Advantages:
    - Familiar
    - Accurate.
    - Does not take up additional desk space.
    - Very useful for:
      - Entering text and alphanumeric data.
      - Inserting in text and alphanumeric data.
      - Keyed shortcuts - accelerators.
      - Keyboard mnemonics - equivalents.
    - Advantageous for:
      - Performing actions when less than three mouse buttons exist.
      - Use with very large screens.
      - Touch typists.

Characteristics of Device-Based Controls (Continued)

- Disadvantages:
  - Slow for non-touch -typists.
  - Slower than other devices in pointing.
  - Requires discrete actions to operate.
  - No direct relationship between finger or h keys and cursor movement on screen in terms of speed and distance.

Characteristics of Device-Based Controls (Continued)

- Keyboard Guidelines
  - Provide keyboard accelerators.
    - Assign single keys for frequently performed, small-scale tasks.
    - Use standard platform accelerators.
    - Assign Shift=key combinations for actions that extend or are complementary to the actions of the key or key combination used without the Shift-key.
    - Assign Ctrl-key combinations for:
      - Infrequent actions or tasks that represent larger-scale versions of the task assigned to the unmodified key.
  - Provide keyboard equivalents.
    - Use standard platform equivalents
    - Use the first letter of the item description.
    - If first letter conflicts exist, use: another distinctive consonant in the item description or a vowel in the item description.
  - Provide window navigation through use of keyboard keys.

Selecting the Proper Device-Based Controls

- Keyboard versus Mouse
- Control Research
- Guidelines for Selecting the Proper Device-Based Controls
- Pointer Guidelines

Selecting the Proper Device-Based Controls (Continued)

- Keyboard Versus Mouse
  - Typists prefer a keyboard over the mouse.
  - Mouse is slower.
  - A skilled typist can type 13 to 15 characters in the amount of time it takes to move one's hand from the keyboard, grasp the mouse, and point at a screen object.

Selecting the Proper Device-Based Controls (Continued)

- Control Research
  - The fastest tools for pointing at stationary targets on the screen are the devices that permit direct pointing: the touch screen and light pen.
  - Indirect pointing devices - the mouse, trackball, and graphic tablet, do not differ greatly from one another.
  - The mouse offers a very effective design configuration for tasks requiring separate confirmation action.
  - For tracking small, slowly moving targets, the mouse, trackball, and graphic tablet are preferred to the touch screen and light pen.

Guidelines for Selecting the Proper Device-Based Control

- Consider the characteristics of the task
  - Provide keyboards for tasks involving heavy text entry and manipulation and movement through structured arrays of a view discrete objects.
  - Provide an alternative pointing device for graphical or drawing tasks.
  - Provide touch screens under the following conditions:
    - The opportunity for training is minimal.
    - Targets are large, discrete, and spread out.
    - Frequency of use is low.
    - Desk space is a t a premium.
    - Little or no text input requirement exists.

Guidelines for Selecting the Proper Device-Based Control (Continued)

- Consider user characteristics and preferences
  - Provide keyboards for touch typists.
- Consider the characteristics of the environment
- Consider the characteristics of the hardware.
- Consider the characteristics of the device in relation to the application.
- Provide flexibility
- Minimize eye and hand movements between devices.

Pointer Guidelines

- The pointer
  - Should be visible at all times.
  - Should contrast well with its background.
  - Should maintain its size across all screen locations and during movement.
  - The hotspot should be easy to locate and see.
  - Location should not warp (change position).
- The user should always position the pointer
- The shape of a pointer:
  - Should clearly indicate its purpose and meaning.
  - Should be constructed of already defined shapes.
  - Should not be used for any other purpose other than its already defined meaning.
  - Do not create new shapes for already defined standard functions.

Pointer Guidelines (Continued)

- Use only as many shapes as necessary to inform the user about current location and status.
- Be conservative in making changes as the pointer moves across the screen.
  - Provide a short "time-out" before making non-critical changes on the screen.
- Animation should not:
  - Distract
  - Restrict one's ability to interact.