



Chapter 11: Input

Overview

- Properties of input devices in relation to design needs
- Selecting input devices and techniques appropriate for user, work and environment characteristics
- Design impacts of emerging input technologies

2/15/99



Input Devices

- **Definition:** a device that, together with appropriate software, transforms information from the user into data that a computer application can process.
- **Appropriate input devices:**
 - match the users' physiological and psychological characteristics
 - are appropriate for task being performed
 - are suitable for the intended work and environment

2/15/99



Terms

- **System feedback:** guides, reassures, informs, and if necessary, corrects users' errors. Example: visual display on screen, alarm warning, click of mouse.
- **Discrete entry device:** a device that senses one of two or more discrete positions. Example: keyboards, buttons and switches.
- **Continuous entry device:** a device that senses a continuous range. Example: moving joysticks, rollerballs, tablets.

2/15/99



Keyboards

- **Design Considerations**
 - **Size:** if keys are too small, then difficulty in locating and hitting keys becomes a problem.
 - **Feedback:** Sound of keys being hit reassures user that a key has been hit.
 - **Arrangement**
 - Qwerty keyboard : designed to prevent keys jamming in manual typewriters
 - Dvorak keyboard: layout is arranged according to frequency of usage of letters and letter patterns in language
 - Chord keyboard: key combinations form a character

2/15/99



Pointing Devices

- **Cursor Controls**
 - Mice, trackballs, joysticks, cursor keys
- **Touch Screens**
 - Screen becomes an instrument for input and output.
 - Advantage: easy to use, requires no extra workspace, has no moving parts, is durable.
 - Disadvantage: lack of precision, high error rates, fatigue, obstruction of screen details, and screen smudging.
 - Beneficial for large targets and untrained users.
- **3D Trackers**
 - measure position and orientation in 3D
 - use ultrasound or magnetic techniques

2/15/99



Matching Devices with Work

- **Consider:**
 - the task requirement (e.g. zoom or panning)
 - expressiveness considerations (what manipulations are required?)
 - usability (what is easy, feasible, or natural for people)
- **Example:** Trackball may be used to look at a layout since the trackball allows panning via rolling. The direction of pan corresponds to direction of displacement from center position.

2/15/99



Matching Devices with Disabled Users

- **Types of eye and head movement methods of input:**
 - **Electrophysiological sensing of movement:** records the movements of the eye muscles.
 - **Photoelectric reflection to track movement:** records movements in reflected light from the eye.
 - **Head movement tracking:** a headset transmits signals to a measurement unit on top of the computer.

2/15/99



Matching devices with Environments

- **Handwriting recognition systems**
 - **Replace keyboard and mouse**
 - **Advantages:**
 - useful for applications requiring small quantities of text input or input of a restricted kind (e.g. organizers, forms)
 - **Disadvantages:**
 - problems with character recognition, symbol segmentation, limited symbol vocabularies
 - limitations in speed and accuracy of character recognition software.

2/15/99



Developments

- **Speech recognition**
 - Advantages vs. disadvantages
 - Isolated word vs. continuous speech recognition systems
 - Speaker dependent vs. speaker independent systems
- **High-precision touch screens**
 - new technology enables line drawing, dragging, sliding, typing, direction and velocity sensing.
- **Handwriting recognition**
 - train neural networks with sample handwriting
- **Footmice**
 - delegate control to other part of body besides hands
 - a rubberized surface pivots and moves cursor

2/15/99