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

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
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.

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
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

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.
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.

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.
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