Touch screens – the ergonomics

A Namahn brief

Advantages

- The input device is also the output device
- All valid inputs are displayed on screen
- Fast command selection (compared to a mouse)

Disadvantages

- The user must sit within arm's reach of the display
- Possible arm fatigue
- Difficult to select small items
- Possible retrofit problem (the touch screen must be fitted on the screen)

Ergonomic aspects

Relation between arm fatigue and touch screen inclination (from horizontal):

- 22,5%: least fatiguing
- 30%: best trade-off for precision and comfort
- 90%: poorest inclination

Elbow support reduced arm fatigue.

Parallax

Definition: Parallax occurs when the touch surface or detectors are separated from the targets and causes the user to touch slightly next to the target.

For scanning IR touch systems, parallax occurs because the invisible grid of IR beams can be interrupted before actual contact is made with the display.

The amount of parallax depends on:

- the type of integration (higher on IR screens)
- the display type (higher on curved screens).
- user position (lower when user sits directly in front of the target and places his finger perpendicular to the screen)

Touch Resolution

Definition: number of touch active points or the physical spacing between them

Overview:

Conductive screens	Capacitive screens	IR screens
1000 x 1000 to 4000 x 4000	256 x 256	25 x 40*

* due to limitations on the number of light beams that can be placed around the screens.

Acoustic screens have a resolution a little higher than the IR screens, but less than the other technologies.

Not all applications need to have a high resolution (control panels, public access, computer-based training), but additional touch points:

- allow greater pointing precision because the software can average all the points that have been touched.
- make it easier to map them to targets on the display.

Touch screens with low resolution can lead to selection errors if touch points are not centered over the targets.

Touch User Interface

Target Locations

Users tend to touch toward the sides of the screen and slightly below target, especially for targets near the top of the display and when the screen stands at a steep angle (45 to 90 degrees). These problems are probably due to parallax and a need to extend the arm further for the top targets.

Number of Targets

- As few as possible (in case of menus, more items can be put on the screen)
- How: nesting and prioritizing.

Target Size

- Touch keys may be closely spaced provided the individual keys are adequately sized.
- Minimal size: 22 millimeters across, surrounded with a dead zone, where touches are not recognized.

Touch Feedback

Use highlighting or sounds to indicate a key has been successfully pressed

Touch Activation Mode

- A typical button target has three states: normal, hovered over, and pressed.
- When the user presses a button and releases the screen, the button is activated.
- When the user presses a button, but drags his finger away from it, it is not activated.

Further reading

Handbook of Human-Computer Interaction, M. Helander (ed.), Elsevier Science Publishers, 1988

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