Discussion

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Fitts' law - recap

A predictive model of time to point at an object

Help decide the location and size of button, indicate which pointing device best suited to performing common tasks

Paul Fitts: A human hand movement model

He noticed that the time for hand movements was dependent on the distance users had to move (D), and the target size (W).

Increasing target size enables users to point at it more rapidly

Direct Manipulation - recap

Typical example: dragging a file into the trash can

A visual representation of the world of action, the users’ task can be greatly simplified, because direct manipulation of familiar objects is possible. Examples include the desktop metaphor, computer-assisted design tools, air-traffic-control-systems and games.
By pointing at visual representations of objects and actions, users can carry out tasks rapidly and can observe the results immediately.
Keyboard entry of commands or menu choices is replaced by use of pointing devices to select from a visible set of objects and actions

Pointing devices - recap

With complex information displays such as those found in computer-assisted design tools, drawing tools, or air-traffic-control-system, it is often convenient to point at and select items = direct manipulation

users avoid learning commands, reduce the chance of typographical errors on a keyboard, and keep their attention on the display

Results: faster performance, fewer errors, easier learning, and higher satisfaction

Pointing devices - recap

Select (choose from a set of items)

Position (choose a point in a dimensional space, used to create a drawing, to place a new window, or to drag a block of text in a figure)

Orient (user chooses a direction in a dimensional space, rotate a symbol, indicate a direction of motion)

Path (a series of positioning and orientation operations

Examples:
Direct-control pointing: lightpen, touchscreen, stylus
Indirect-control pointing: mouse, trackball, joystick, touchpad, graphics tablet

Novel devices - recap

Eye tracking

Data Glove
Gestural input

Pointing devices with haptic feedback
Feel resistance, etc.

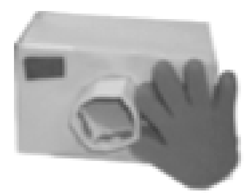
Ubicomp:
Depend on embedded sensing technologies into the environment
Positioning of physical objects can specify modes or trigger actions
Ambient sound and light etc.
Sensors, badges

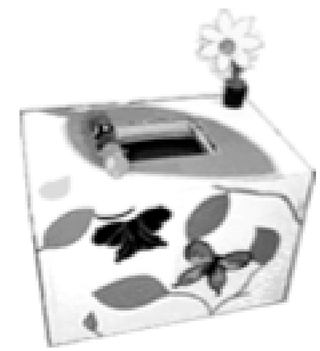
StoryRoom

positioning of physical objects

interactive environments

phicons





Useful Links Fitts' Law

http://www.yorku.ca/mack/RN-Fitts_bib.htm

http://www.yorku.ca/mack/bit95.html

Quiz for interpreting data:
http://www.asktog.com/columns/022DesignedToGiveFitts.html

Fitt's law demo:
http://ei.cs.vt.edu/~cs5724/g1/tap.html

http://www.tele-actor.net/fitts/

Fitts' Law

$MT = a + b \log_2 (D/W + K)$

MT... Movement Time

t... time needed for the pointing act
D... distance to the target
W... width of the target in the direction of the pointing movement
$K = 1$
a... approximate start/stop time in seconds for a given device (y-intercept)
b... measure of the inherent speed of the device (slope - msec/bit)

Fitts' law - racap

a and b are indices for device performance

They vary with factors such as the pointing device and muscles used for input (e.g., mouse, stylus, trackball, gaze tracker), the control display C:D ratio (i.e., the ratio of distance moved by the physical limb, and the distance moved on the screen by the virtual cursor), and the population of users (e.g., children, adults).

They must be determined empirically (without expansion of the target object), they can be computed using regression analysis after pointing times have been measured using different values of A and W.

How to test it: perform many selections while you vary A and W

Fitts' law

Once a and b are known, Fitts' law enables prediction of performance in future selections so long as the factors that influence a and b do not change.

Ideally a is 0. If a device exhibits a large b, increasing ID hurts user performance with it more than with a device that exhibits a smaller b.