

Graphical interaction

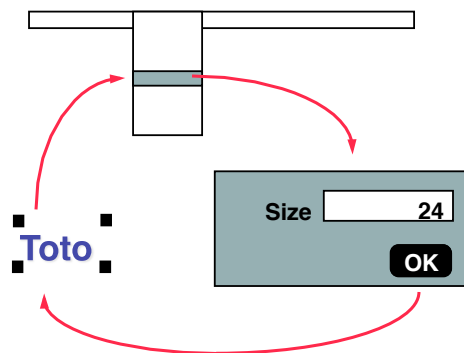
Michel Beaudouin-Lafon
Laboratoire de Recherche en Informatique
Université Paris-Sud / CNRS
mbl@lri.fr
<http://insitu.lri.fr>

Direct manipulation

Shneiderman (1983)

1. Continuous representation of the objects of interest
2. Physical actions instead of complex syntax
3. Rapid, incremental, reversible actions whose effects on the objects of interest are immediately visible
4. Layered approach to discover the interface progressively, so that it can be used with little previous knowledge

(In)direct manipulation



Problems of direct manipulation

Identify the objects of interest
example : styles in Word

Direct vs. Indirect manipulation?


Menus
Dialog boxes
Scrollbars
etc.

Pragmatic approach


Graphical interaction techniques

Input: feedback

Pointing




Selection (single/multiple click, with/without modifier)

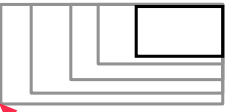


Input: feedback


Drag



"ghosts" or shadows



ink



Basic interaction tasks

Input tasks

Selection tasks

Trigger tasks

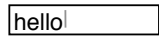
Navigation tasks

Property setting tasks


Transformation tasks

Input tasks


Input text
Text field + keyboard




Input a single value
Slider



Input positions
Pointing



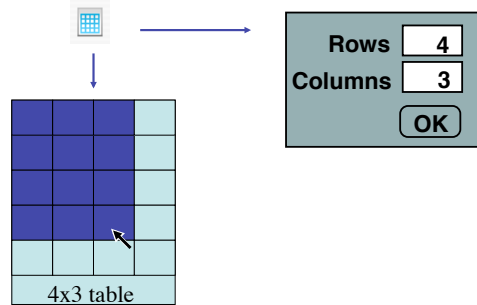
Input a path
Sampling (feedback = ink)



Input tasks

Adapt interaction to the type of value

Example : size of a table



Selection tasks

Choose one or several items within a set

Fixed- or variable-size set

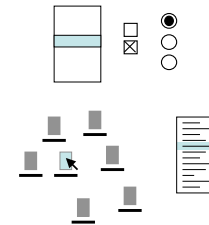
Small or large set

Fixed-size set

Menu, checkboxes, radio buttons

Variable-size set

Pointing, list, text input

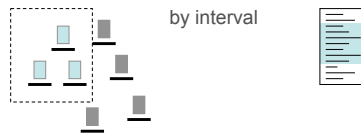


Selection tasks

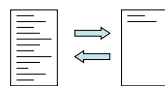
Multiple selection

by group

by interval



add/remove



Combine techniques

Point element in list / use keyboard to input prefix

Selection tasks: Linear menus

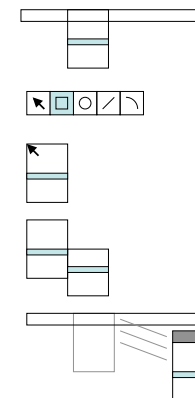
Menu bar +
pulldown menus

Fixed palette

Pop-up (or contextual) menus

Hierarchical menus

Pull-off menus



Selection techniques: Radial menus

Pie Menus (Hopkins)



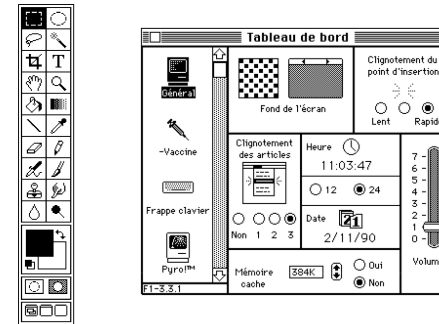
Selection is faster in a radial menu than in a linear menu
But radial menu limited (in practice) to 8 items

Marking menus (Kurtenbach)



Natural transition from novice to expert:
perform the selection gesture faster – the menu does not display

Selection tasks – Examples



Trigger tasks

Buttons and Menus



Drag and drop

Action depends on both the source and destination



Gestural input

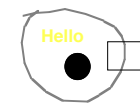
Specifies the object and command simultaneously

Trigger tasks

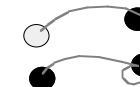
Gestural input



Create



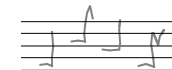
Select



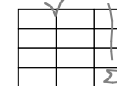
Move
Copy



Delete



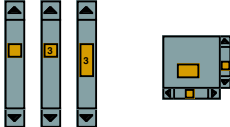
Edit musical score




Edit spreadsheet

Navigation tasks

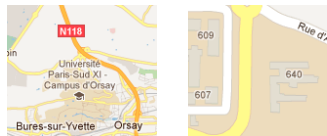
Scrollbars
Direction of scrolling
Division of attention



Direct scrolling
Move with the hand
Automatic scrolling




Zooming
Zooming in to see detail
Zooming out to see context



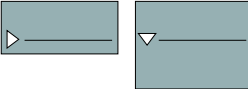
Property and parameter specification tasks

Dialog boxes
Fields + OK / Apply / Cancel buttons
Modal or non-modal

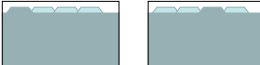


Temporal and spatial decoupling between the specification of the command, its parameters, and its execution

Optional parts



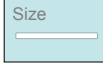
Tabs



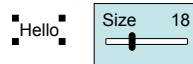
Problem with OK button

Property and parameter specification tasks

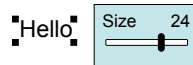
Property boxes / inspectors
Inspector is always displayed

Hello 

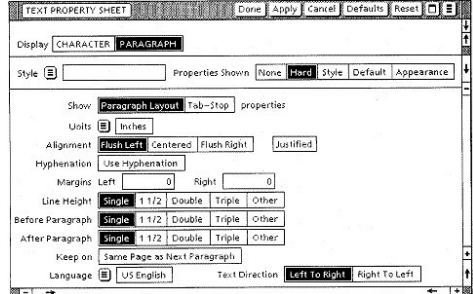
Content of inspector changes according to selected item

Hello 

Editing properties immediately affects selected items

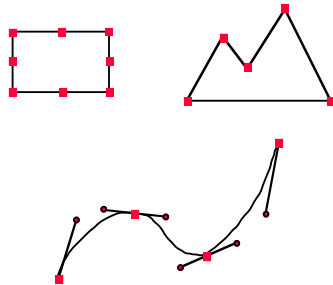
Hello 

Property boxes – the Xerox Star



Transformation tasks

Manipulation handles



Modes

Mode = state of the interface where user actions are interpreted consistently, and differently than in other modes

Problems: Mode visibility, mode change

Examples

“vi” text editor :

Type “Esc” to switch between input/command modes

“emacs” text editor :

User Control and Meta modifiers to enter commands

Tool palettes:

Select a tool to activate it



Modes

Temporal modes

The same user action performed at different times
has different effects

Problem : Initiative of the mode change

Spatial modes

The same user action performed at different locations
has different effects

Quasi-modes

Temporal modes activated as long as a physical action is sustained

An interface is a collection of modes

Conclusion

Direct vs. indirect manipulation

=> level of indirection

Analyzing interfaces in terms of basic interaction tasks

Input (new information) vs select (among existing info.)

Generic methods vs. specific ones

Modes organize/structure the interface

Spatial vs. temporal

Exercise: analyze (multi-)touch interfaces