

# Graphical interaction

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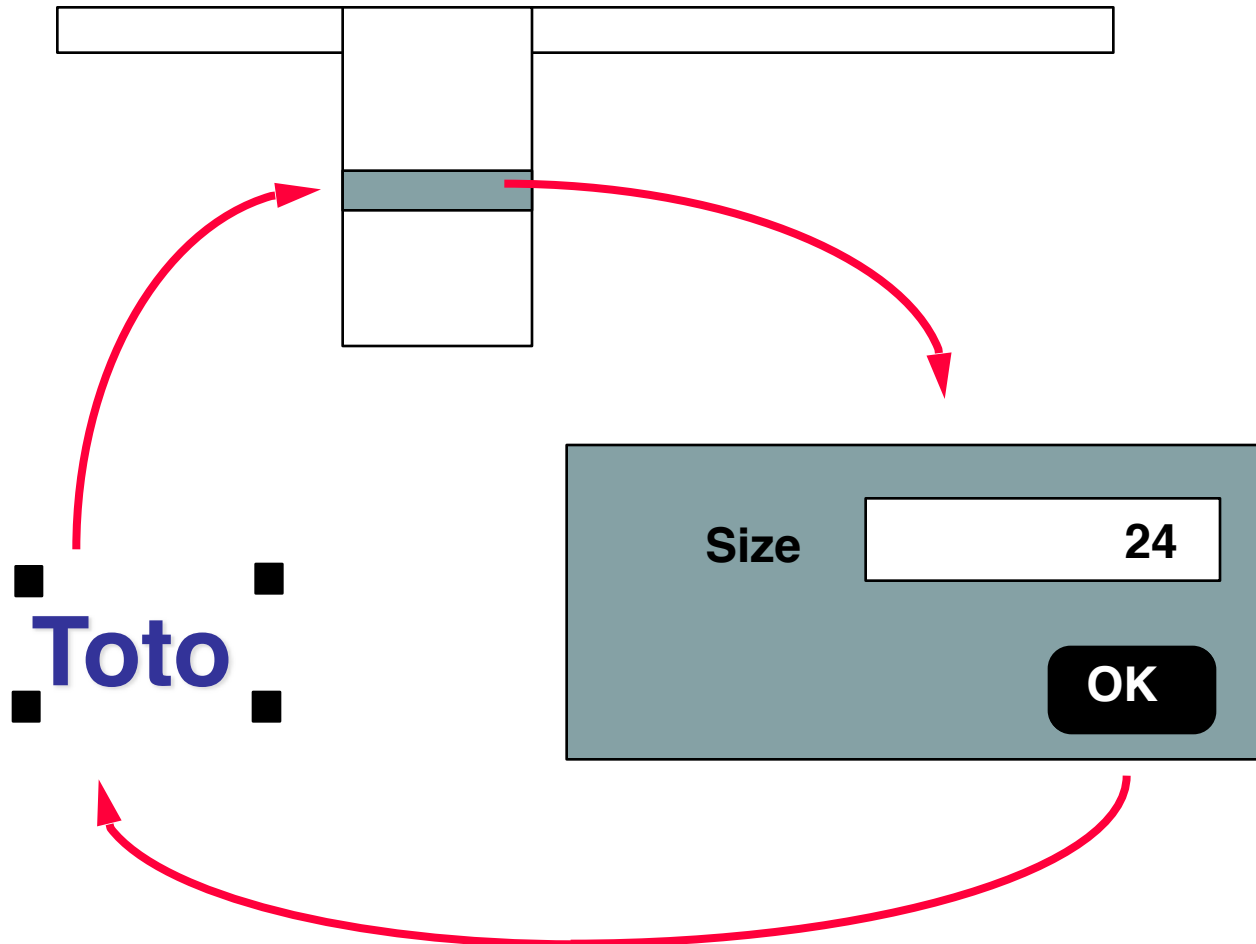
<http://ex-situ.lri.fr>

# 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



**Hello**

**World**



# Problems of direct manipulation

Identify the objects of interest  
example : styles in Word

Direct vs. Indirect manipulation?

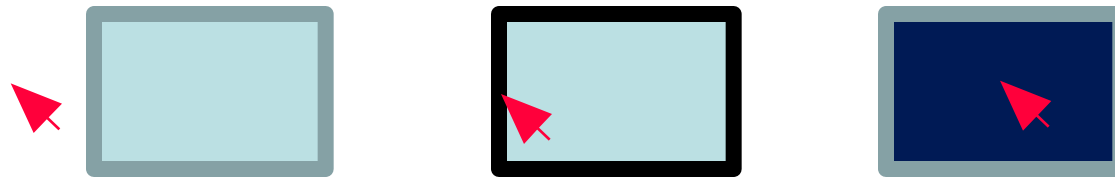
Menus  
Dialog boxes  
Scrollbars  
etc.

Pragmatic approach

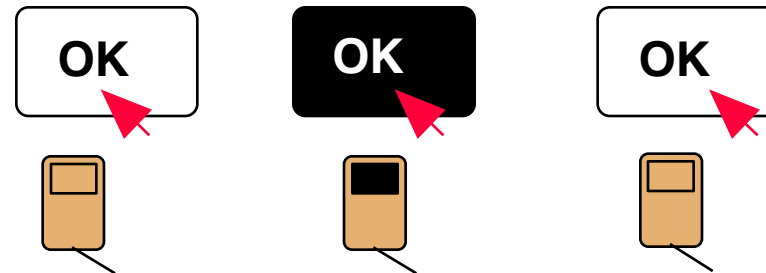
Graphical interaction techniques

# Input: feedback

## Pointing

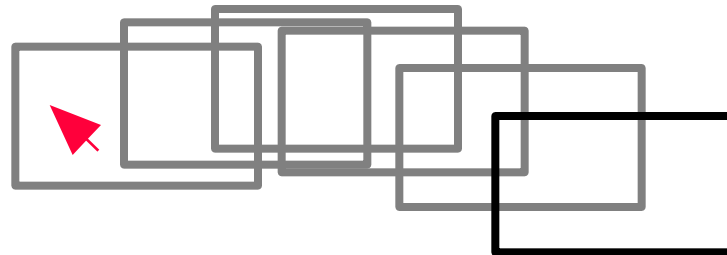


## Selection (single/multiple click, with/without modifier)

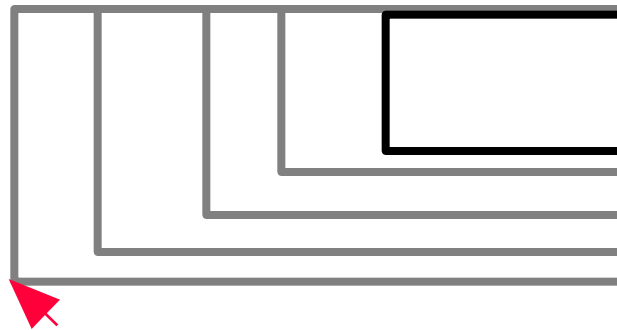


# Input: feedback

Drag



"ghosts"  
or shadows



ink



# Basic interaction tasks

Input tasks

Selection tasks

Trigger tasks

Navigation tasks

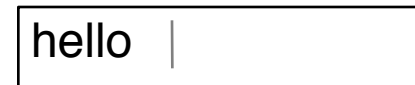
Property setting tasks

Transformation tasks

# Input tasks

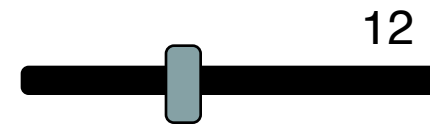
## Input text

Text field + keyboard



## Input a single value

Slider



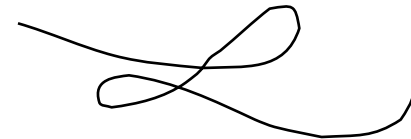
## Input positions

Pointing



## Input a path

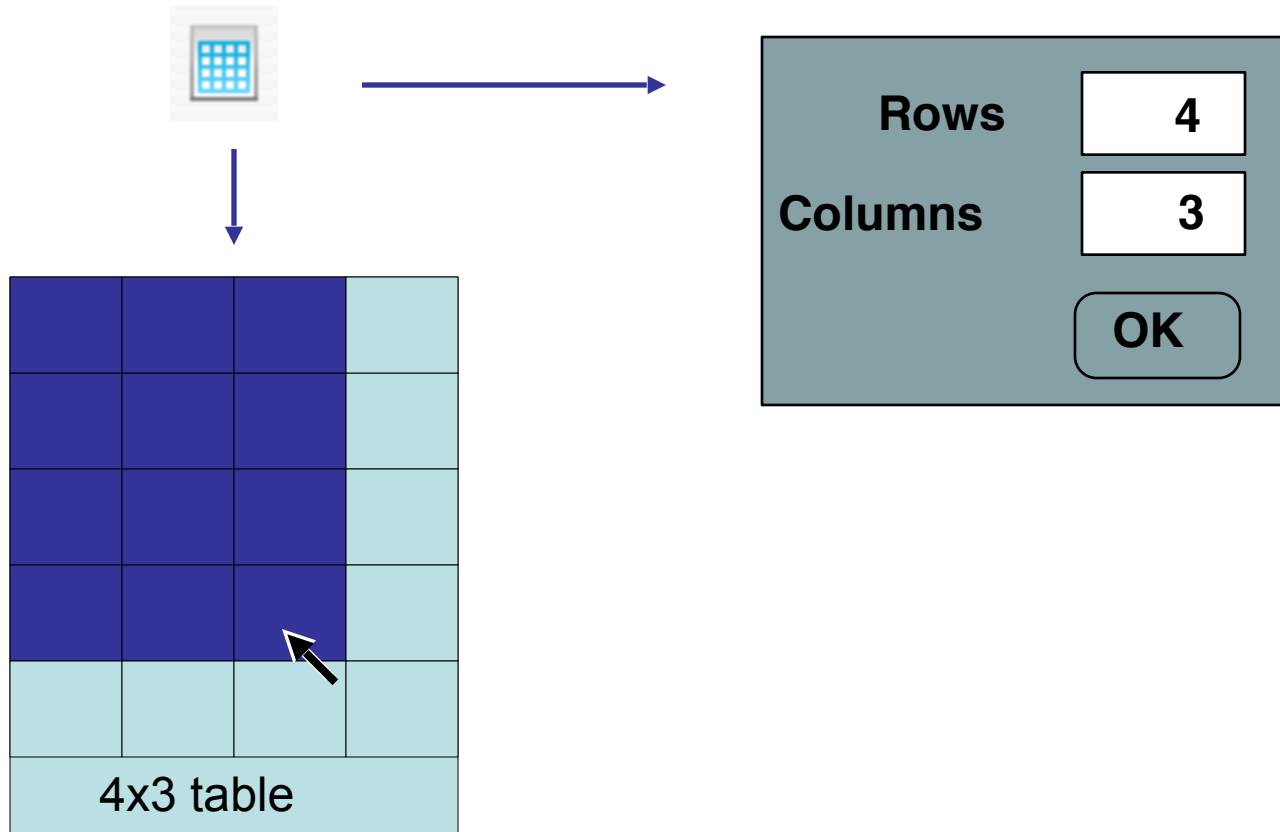
Sampling (feedback = ink)



# Input tasks

Adapt interaction to the type of value

Example : size of a table



# Selection tasks

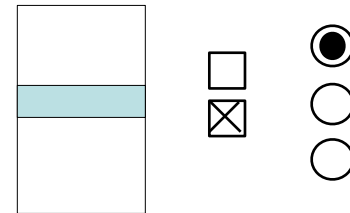
Choose one or several items within a set

Fixed- or variable-size set

Small or large set

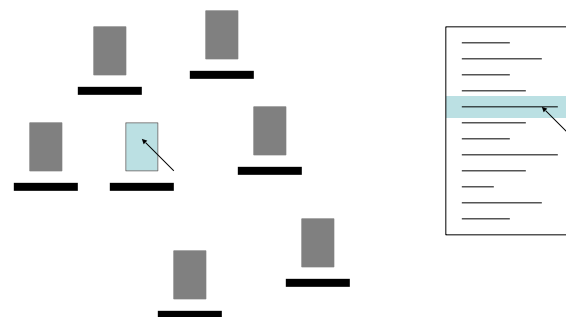
Fixed-size set

Menu, checkboxes, radio buttons



Variable-size set

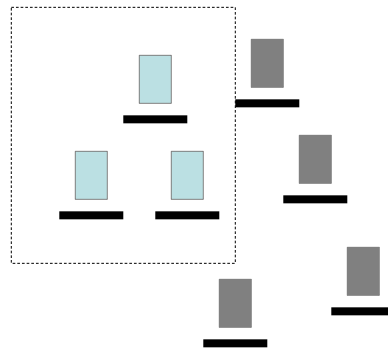
Pointing, list, text input



# Selection tasks

## Multiple selection

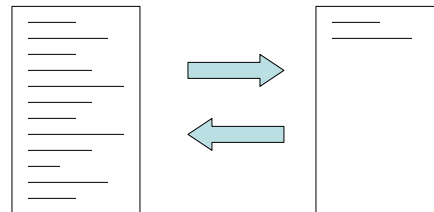
by group



by interval



add/remove

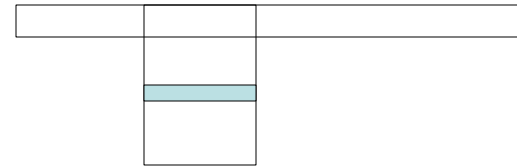


## Combine techniques

Point element in list / use keyboard to input prefix

# Selection tasks: Linear menus

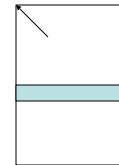
Menu bar +  
pulldown menus



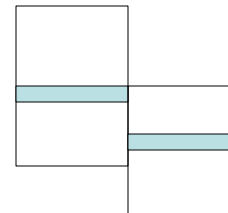
Fixed palette



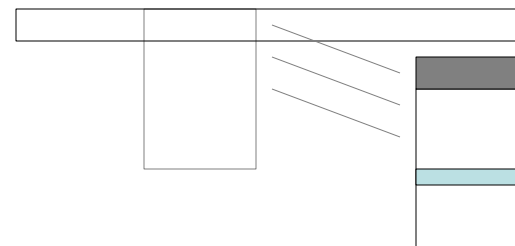
Pop-up (or contextual) menus



Hierarchical menus

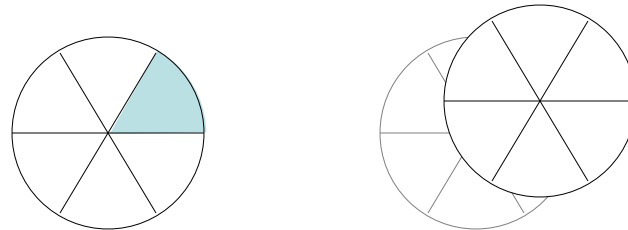


Pull-off menus



# Selection techniques: Radial menus

## Pie Menus (Hopkins)



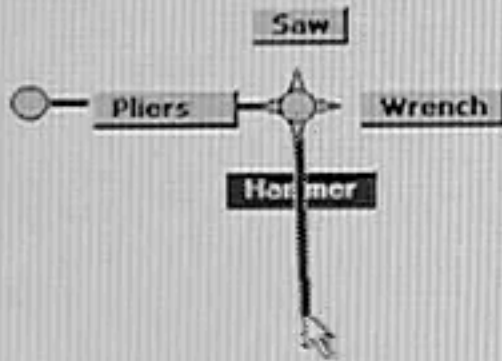
Selection is faster in a radial menu than in a linear menu  
But radial menu limited (in practice) to 8 items

## Marking menus (Kurtenbach)



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

## Marking Menus



time: 1.19 secs.

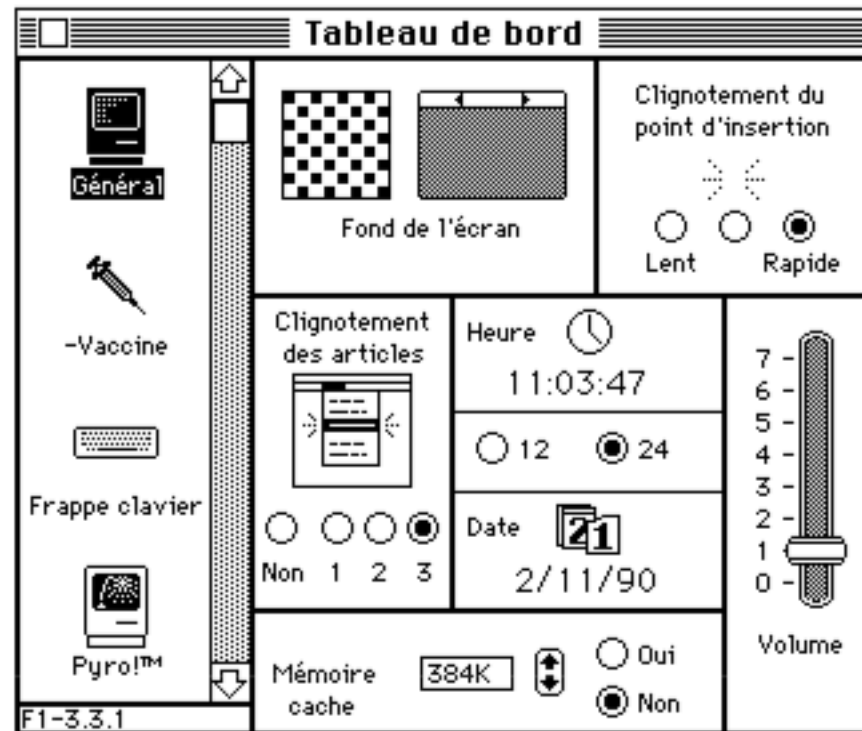
Hammer

## Linear Menus

time: 1.58 secs.

Hammer

# Selection tasks – Examples



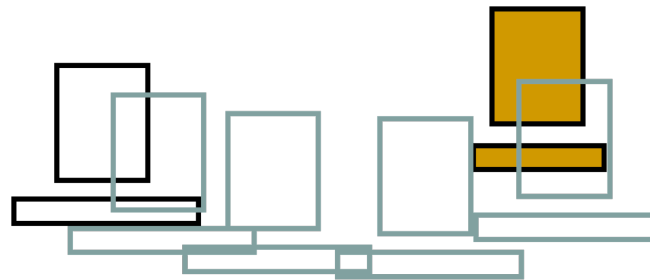
# Trigger tasks

Buttons and Menus



Drag and drop

Action depends on both the source and destination

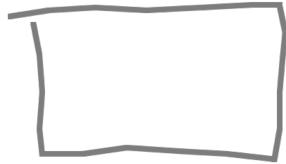


Gestural input

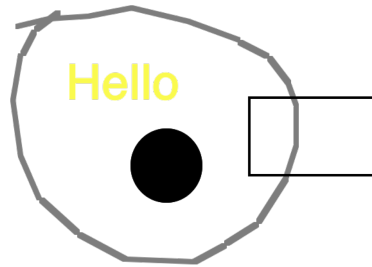
Specifies the object and command simultaneously

# Trigger tasks

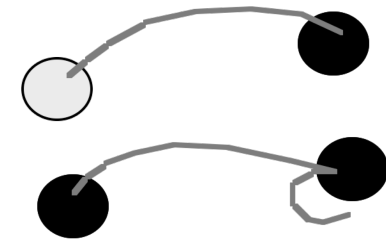
## Gestural input



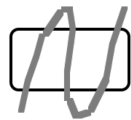
Create



Select



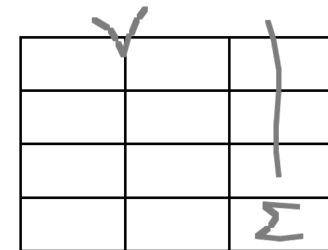
Move  
Copy



Delete



Edit musical score



Edit spreadsheet

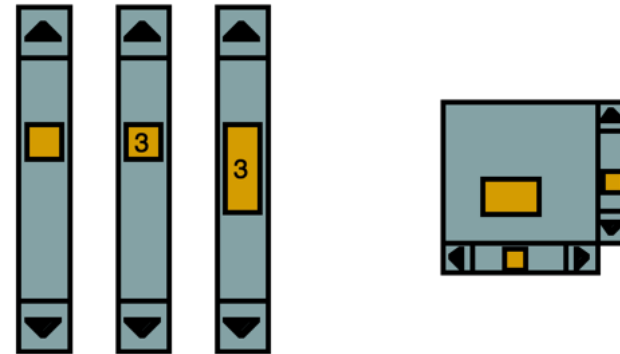


Octopus - Bau & Mackay, 2008

# 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

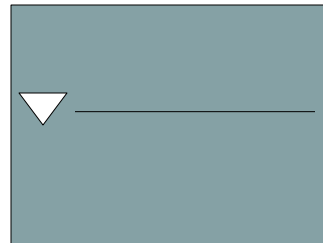
Fields + OK / Apply / Cancel buttons

Modal or non-modal

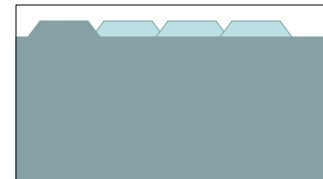


Temporal and spatial decoupling between the specification of the command, its parameters, and its execution

## Optional parts



## Tabs



Problem with OK button

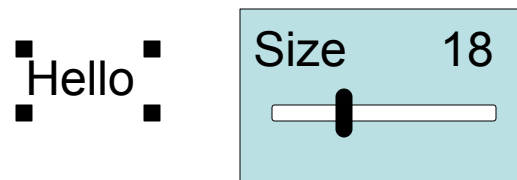
# Property and parameter specification tasks

## Property boxes / inspectors

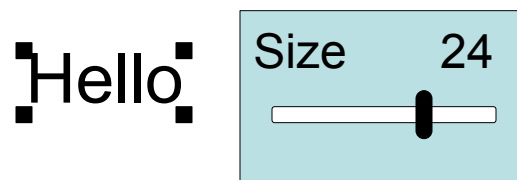
Inspector is always displayed



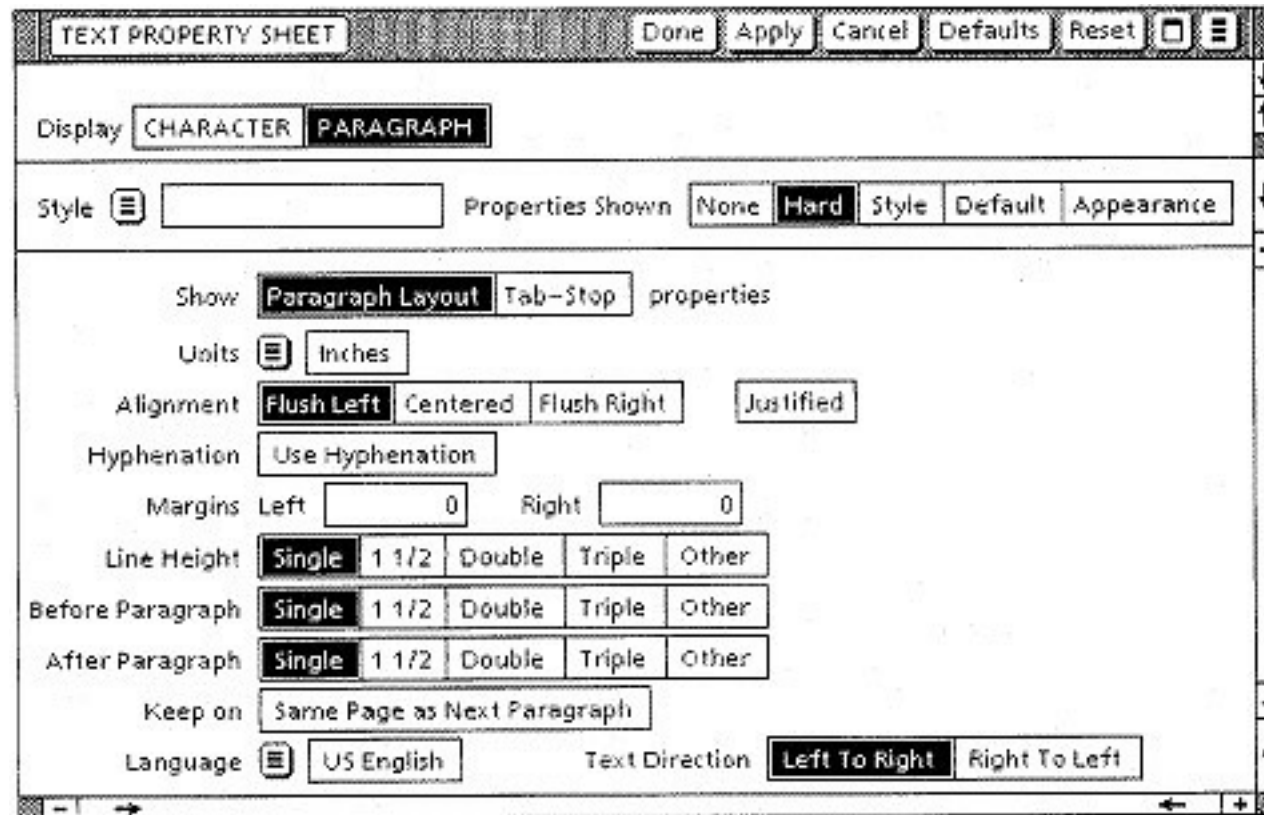
Content of inspector changes according to selected item



Editing properties immediately affects selected items

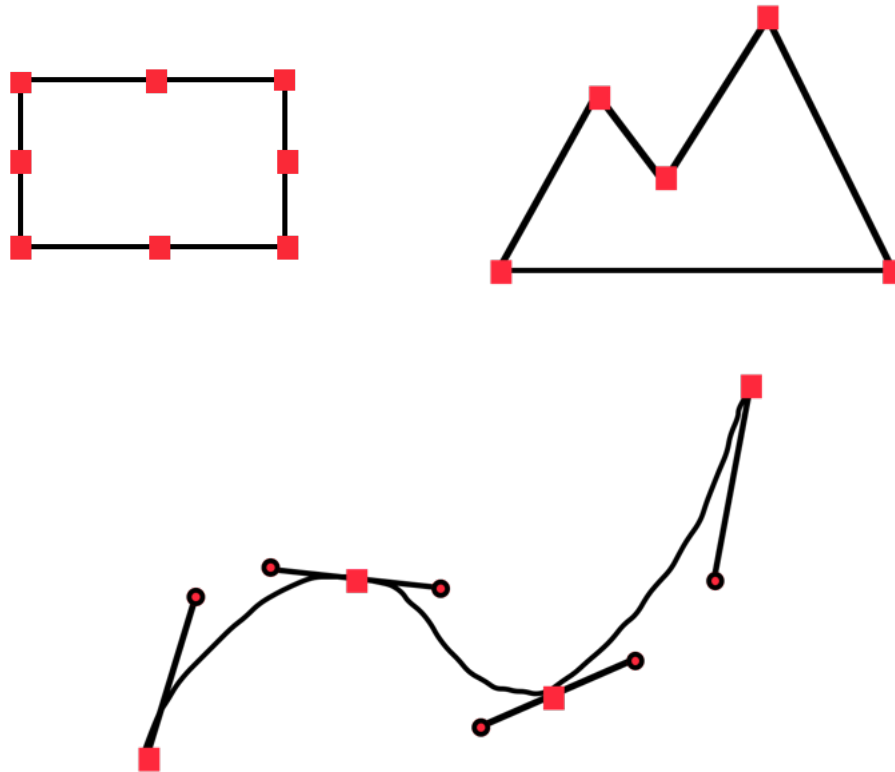


# Property boxes – the Xerox Star



# 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