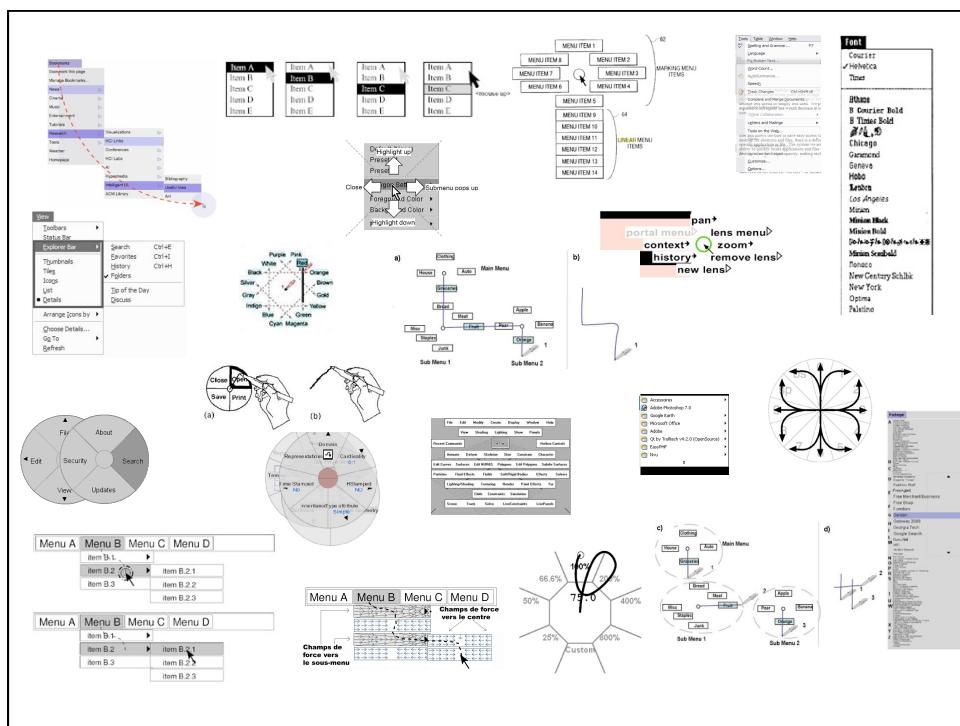


# MENU

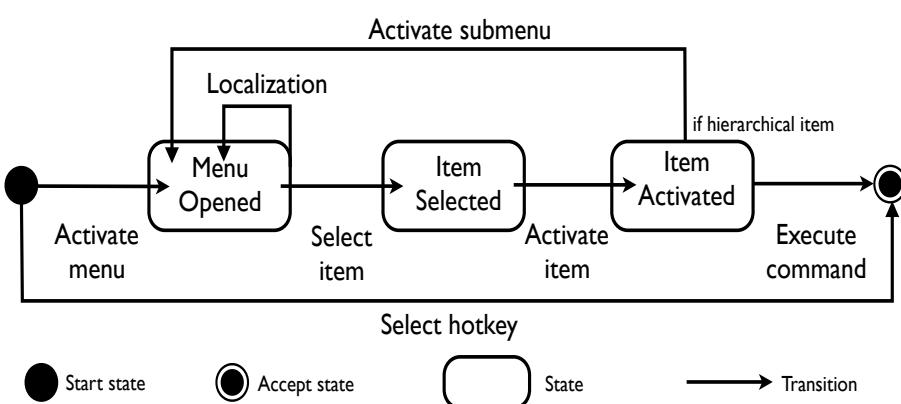
Laurence Nigay  
Nombreux transparents sont réutilisés du cours de G. Bailly (Telecom ParisTech)



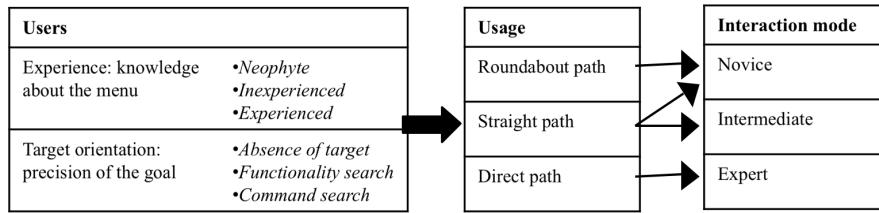
# Menu usage

## Novice / Expert / Goal

### Command execution process



# Users' experience



- a) Visual search
- b) Decision time
- c) Pointing task
- d) Learning

Edit		View	History	Bookmarks
Undo				⌘Z
Redo				⇧⌘Z
Cut				⌘X
Copy				⌘C
Paste				⌘V
Paste and Match Style				⌘⇧⌘V
Delete				
Select All				⌘A
AutoFill Form				⇧⌘A
Find				▶
Spelling and Grammar				▶
Substitutions				▶
Transformations				▶
Speech				▶
Special Characters...				⌘⌘T

$$Tl = (1-e) * T_{vs} + e * T_d$$

Novice:  $e=0$   
(visual search)

$$T_{vs} = a_{vs} + b_{vs} * n$$

Expert:  $e=1$   
(decision time)

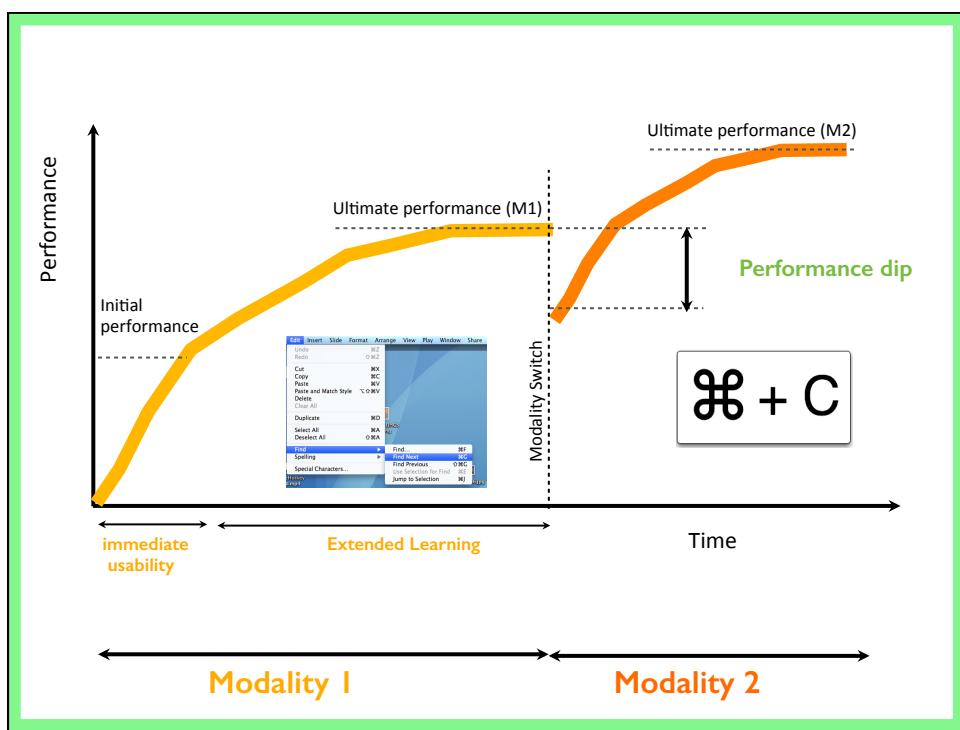
$$T_d = a_d + b_d * \log_2(1/P_i)$$

**Fitts' Law (Pointing task)**

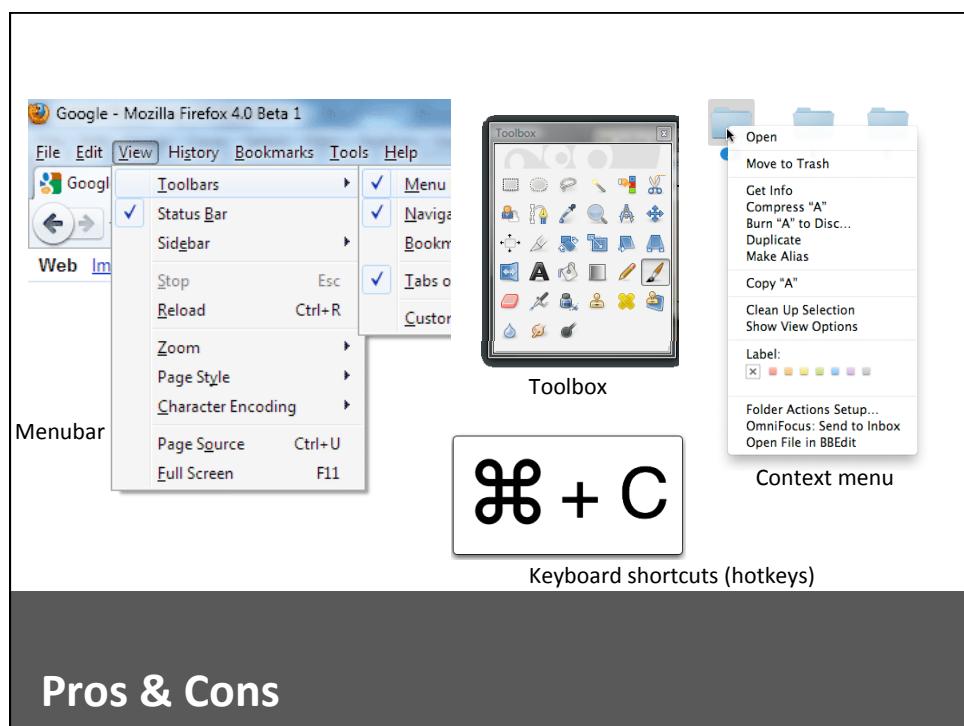
$$T = a + b \log_2(1 + D/W)$$

→  $T = a + b \log_2(1 + n * h / h)$   
 $T = a + b \log_2(1 + n)$

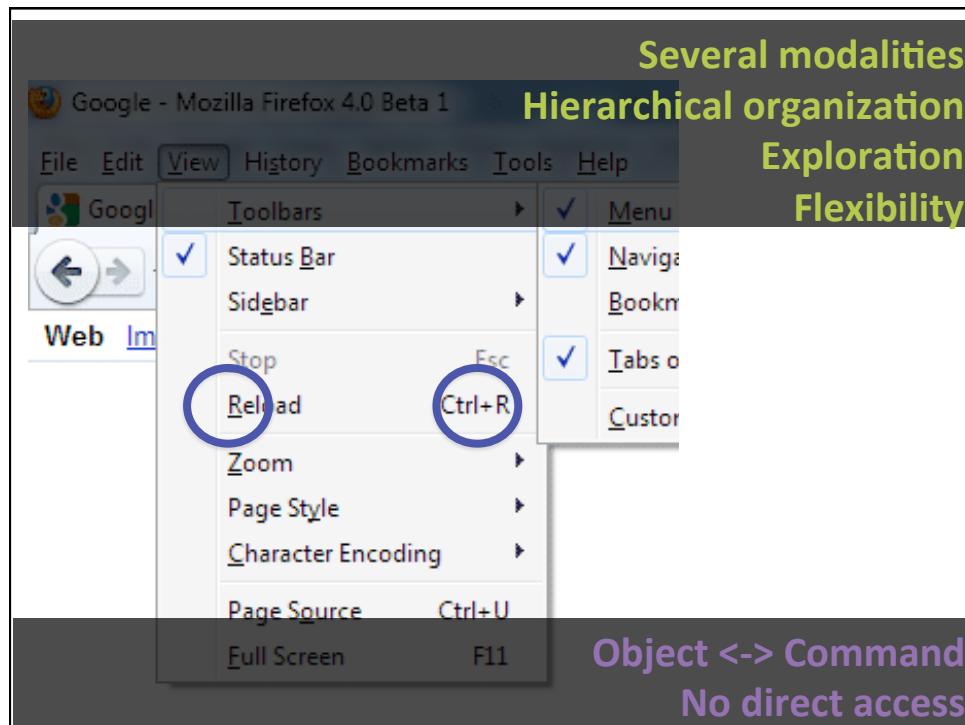
n: the number of items  
h: item height

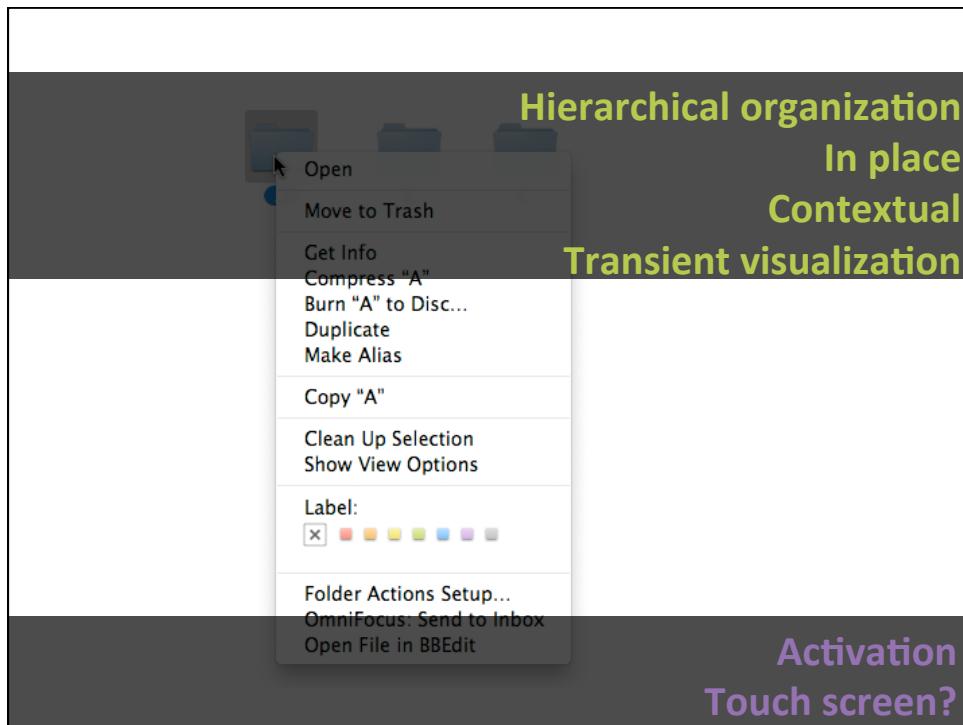
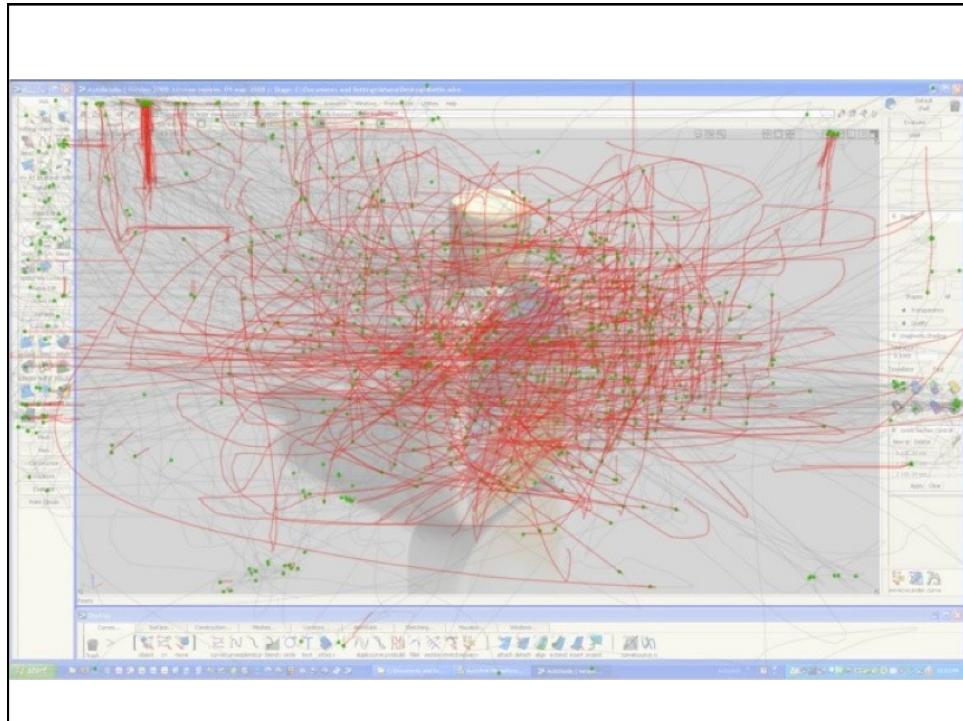


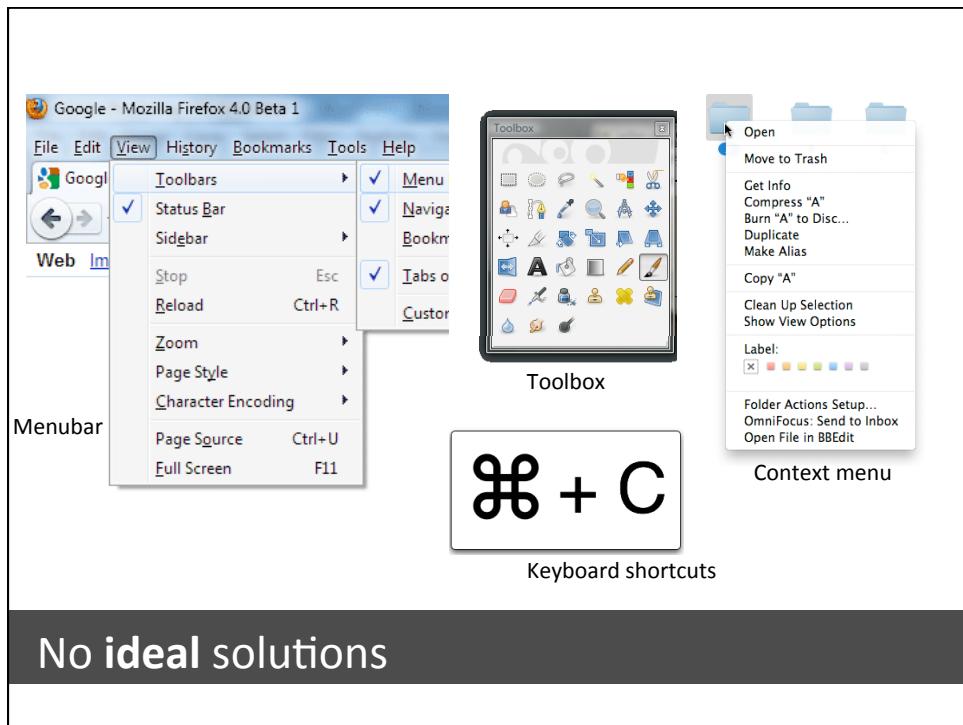
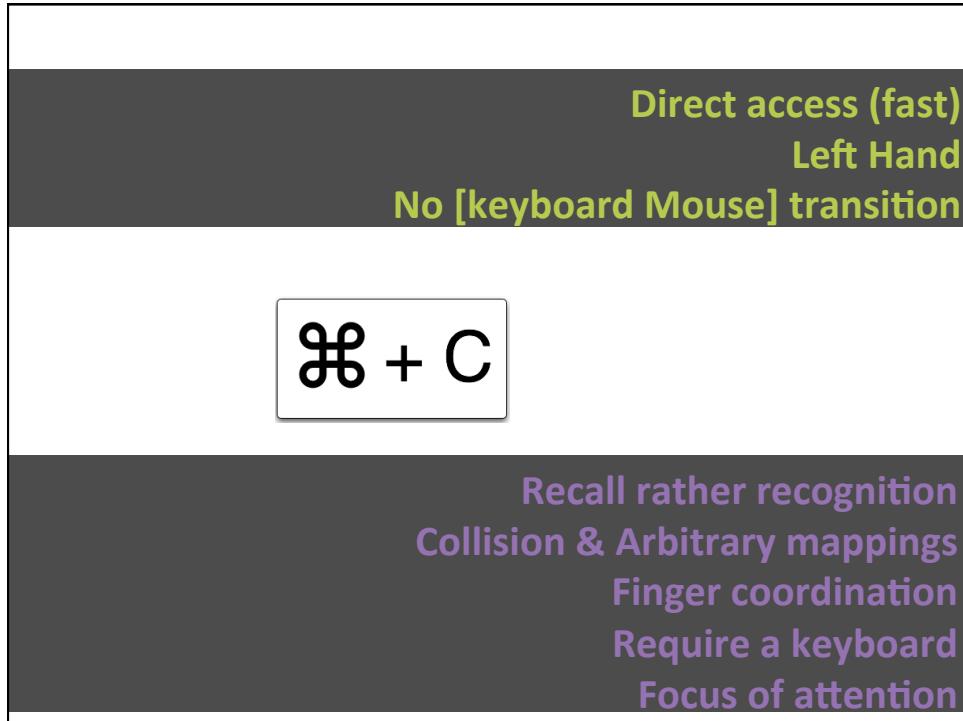
# Examples



## Pros & Cons





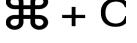


# Design : Multiple criteria

## Menu / Menu System / Menu Technique

- The **menu structure** is the graph of commands, which is generally a tree
- A **menu system** is a set of linked menus, such as hierarchical menus.
- A **menu technique** denotes the interaction technique used to navigate in the menu structure and to select the nodes of the graphs
- The **current** menu is the menu with which the user is currently interacting
- A **submenu** is a menu that can be accessed from a hierarchical item of the current menu
- The **super-menu** (or parent menu) is the menu that makes it possible to access the current menu

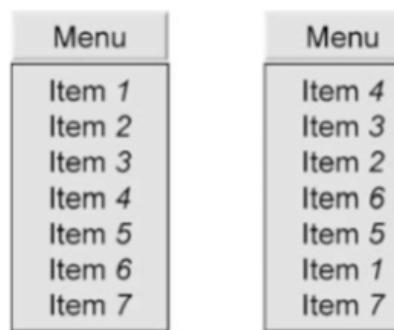
## Several criteria

First modality	Dimension
	Item
	Menu
	Menu System
Second modality 	Expert mode

## Strategies

First modality	Dimension
	Item
	Menu
	Menu System
Second modality 	Expert mode

## Item: geometry



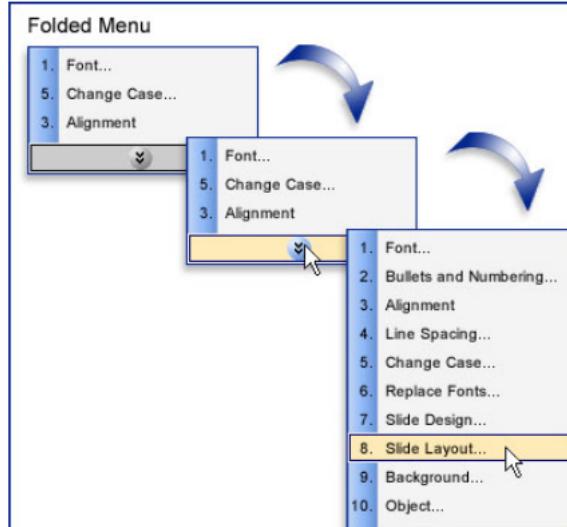
Frequency Ordered menus



Split menus

## Item: geometry

Folded menus



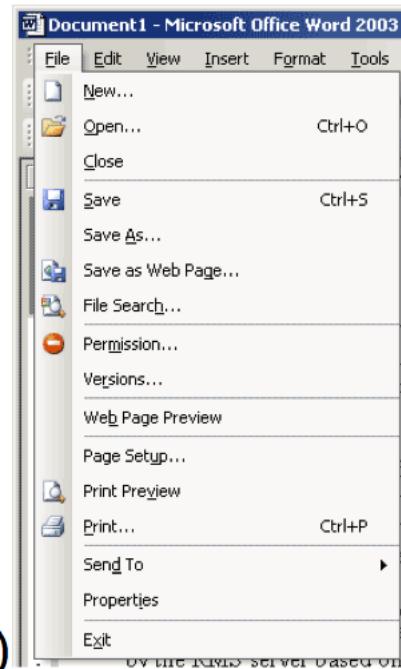
## Item: geometry

Morphing Menus



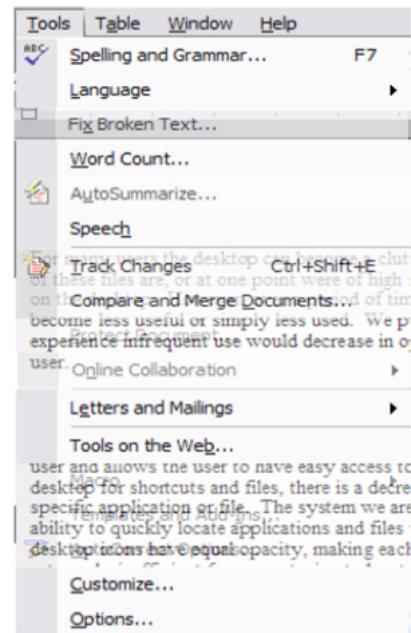
## Item: Visual cues

icons



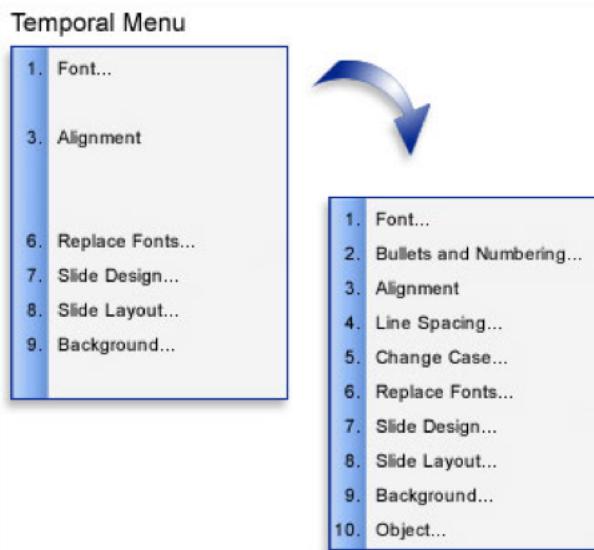
## Item: Visual cues

Transparent Menus



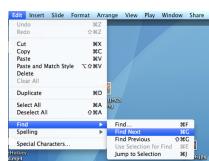
## Item: Visual cues

Temporal menus



# Strategies

## First modality



Dimension

Item

## Second modality

⌘ + C

Menu

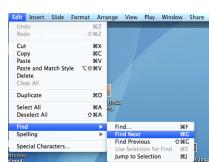
Menu System

Expert mode

- Geometry: ordering, size
- Visual cues: icons, transparency, temporal

# Strategies

## First modality



Dimension

Item

## Second modality

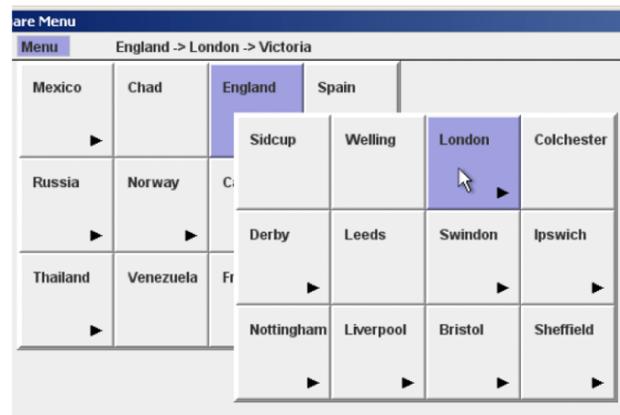
⌘ + C

Menu

Menu System

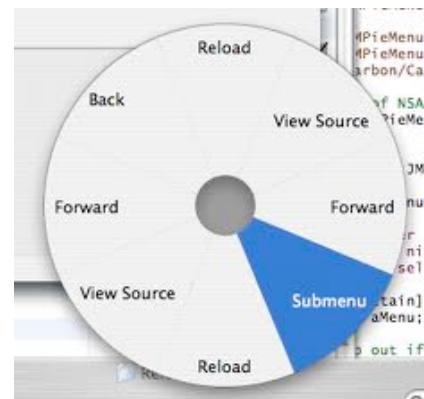
Expert mode

## Menu: Layout



Square menus (grid layout)

## Menu: Layout

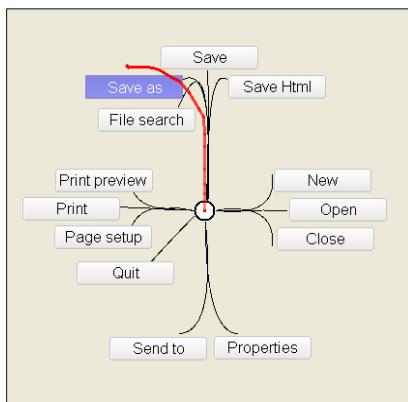


Pie Menus

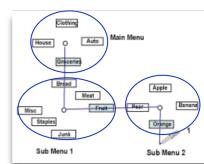


## Menu: Layout

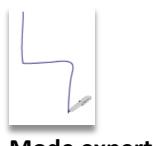
### Flower menus



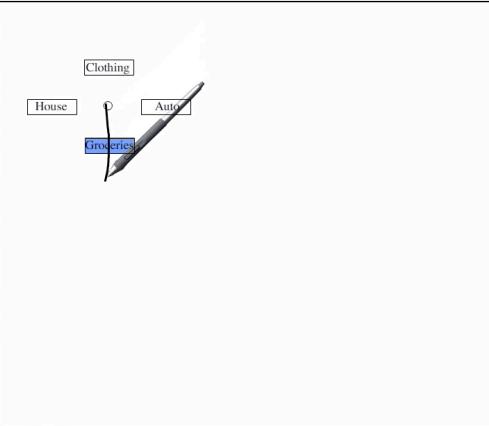
## Marking menus hiérarchiques



Mode novice

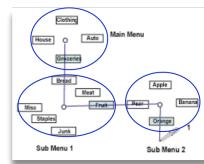


Mode expert

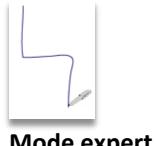


Mode novice

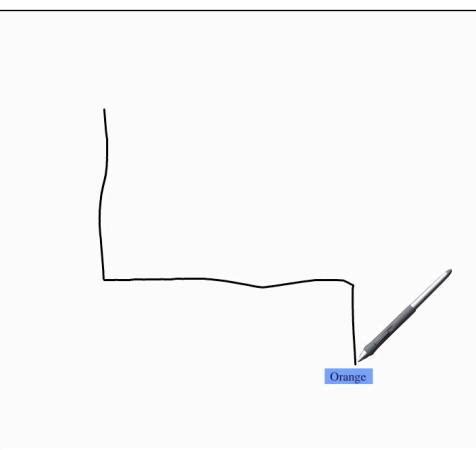
## Marking menus hiérarchiques



Mode novice



Mode expert



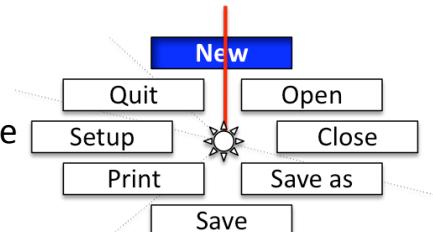
Mode expert

## Nombre de commandes et mémorisation

- Menus circulaires

- 8 items

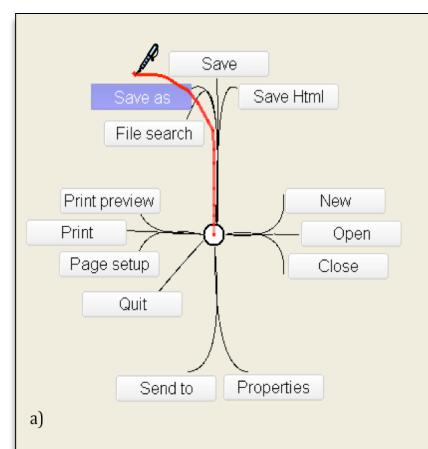
- Pas de groupement interne



Marking menus

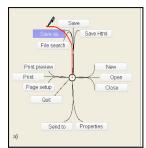
## Flower menus

- Nombre de commandes
- Groupements internes
- Apprentissage et mémorisation

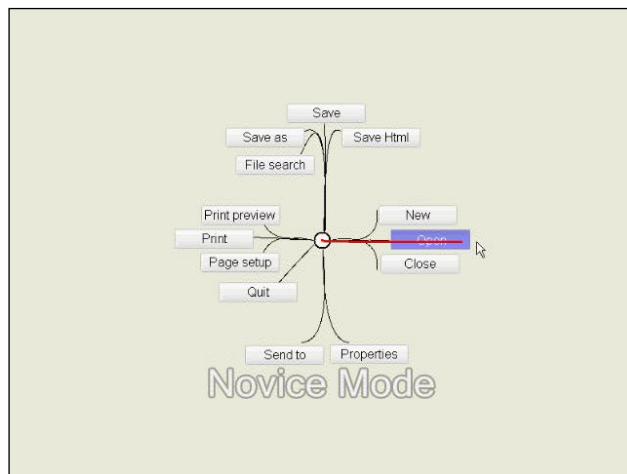


Flower menus

## Flower menus

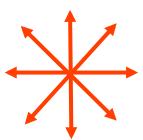


mode novice



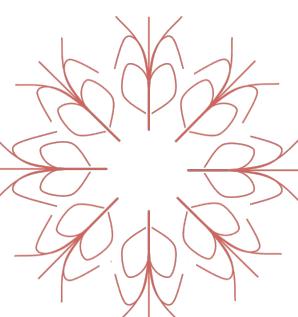
Novice Mode

## Vocabulaire gestuel



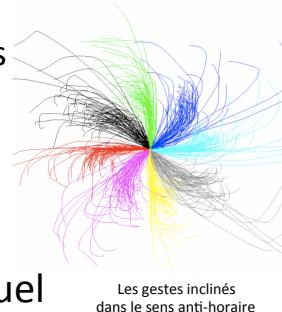
$$\text{Orientation} + \text{Courbure \& Sens} = \text{56 gestes}$$

Courbure & Sens



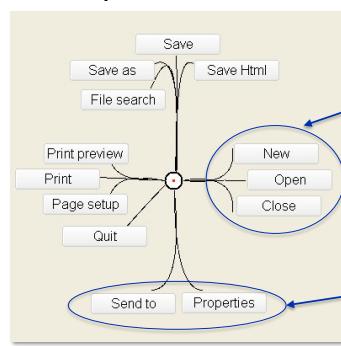
## Vocabulaire gestuel

- Capacité des utilisateurs
  - à dessiner correctement ces gestes
- Biais sur les diagonales
- Système de reconnaissance gestuel
- Taux de reconnaissance de 99%
  - pour les configurations standard : droit et courbé  
 $8 \times 3 = 24$  commandes

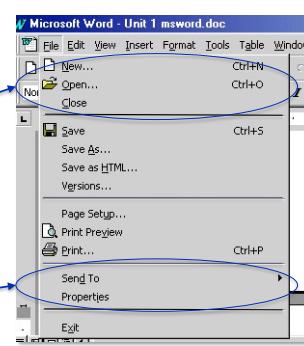


## Flower menus

- Apprentissage et mémorisation
  - Groupement interne



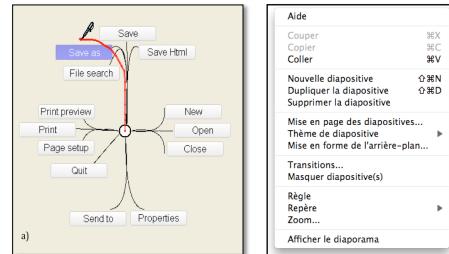
1 groupement interne par branche



1 groupement interne par séparateur

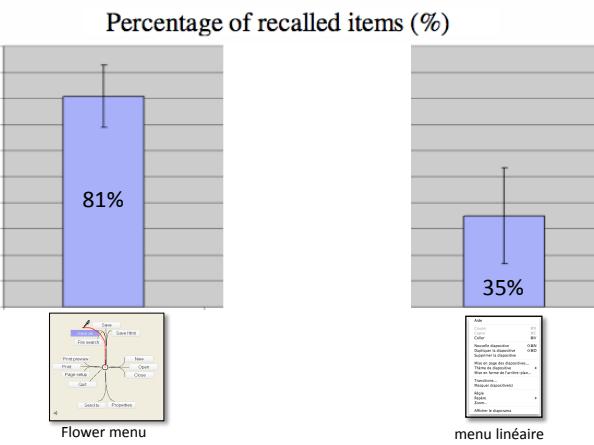
## Evaluation expérimentale

- Tâche de mémorisation
- 5mn d'apprentissage
- Apprentissage explicite du mode expert
  - Mesure le nombre d'items exécutés correctement en mode expert
- 2 Techniques

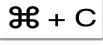


## Evaluation expérimentale

- Performance 2 fois meilleure pour les Flower menus

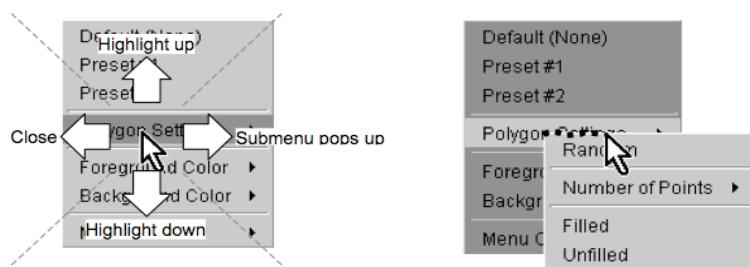


# Strategies

First modality		Dimension Item
Second modality		Menu System
		Expert mode

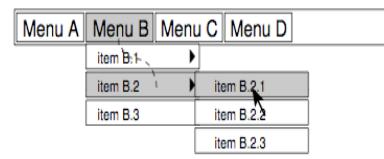
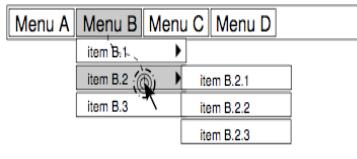
- Menu geometry
- Menu positioning

## Menu geometry: positioning



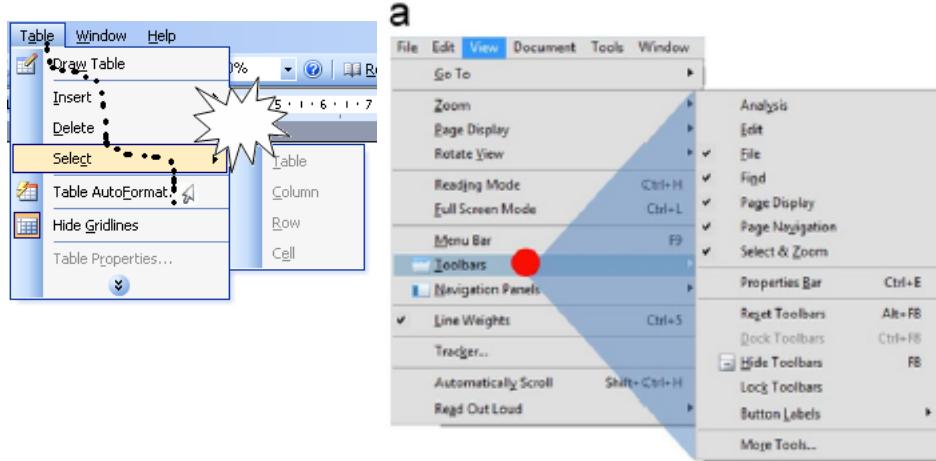
Motion menus

## Menu geometry: positioning



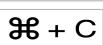
Jumping menus

## Menu geometry: positioning



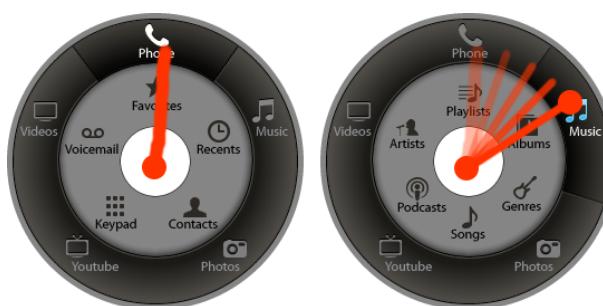
AAMU

# Strategies

First modality	Dimension
	Item
	Menu System
Second modality	Expert mode

- Menu geometry
- Menu positioning
- Menu temporality

## Menu: temporality



Wavelet Menus: previsualization

## Menu: temporality



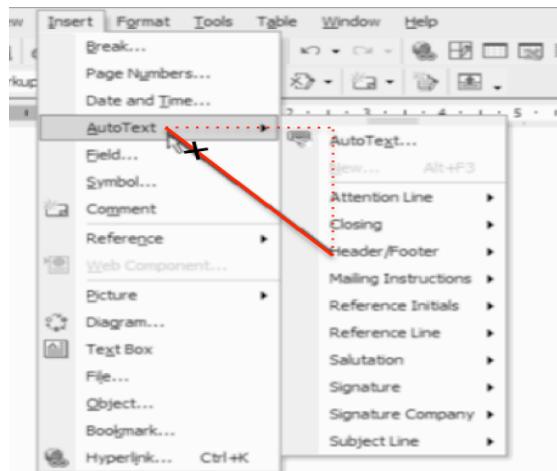
Wavelet Menus: previsualization

## Menu: temporality



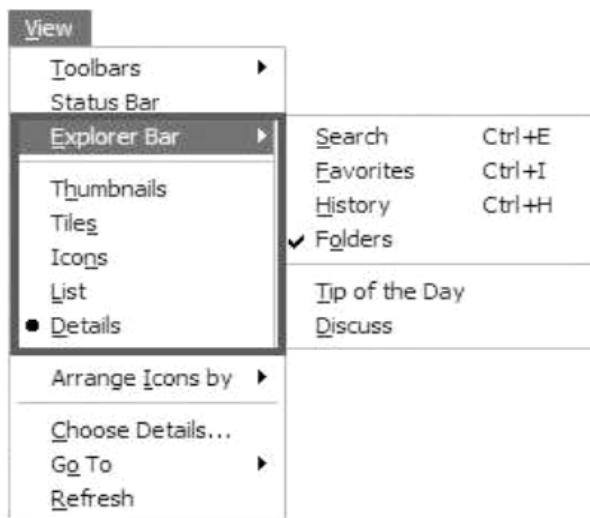
earPod: Auditory menu

## Menu: temporality



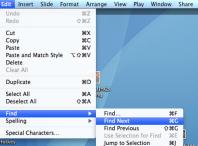
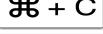
a temporal delay that prevents a menu to be closed when the user quickly moves the cursor to an opened submenu. This allows accessing submenu items by performing an optimal diagonal movement

## Menu: temporality



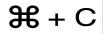
keeping the submenu opened while the cursor does not enter a new hierarchical item

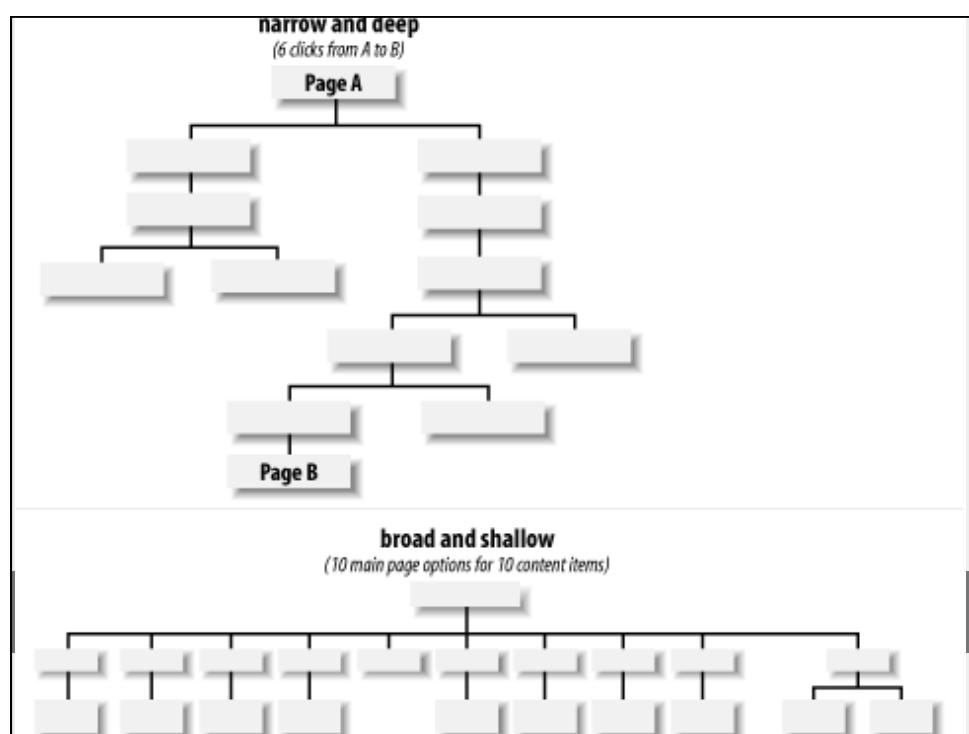
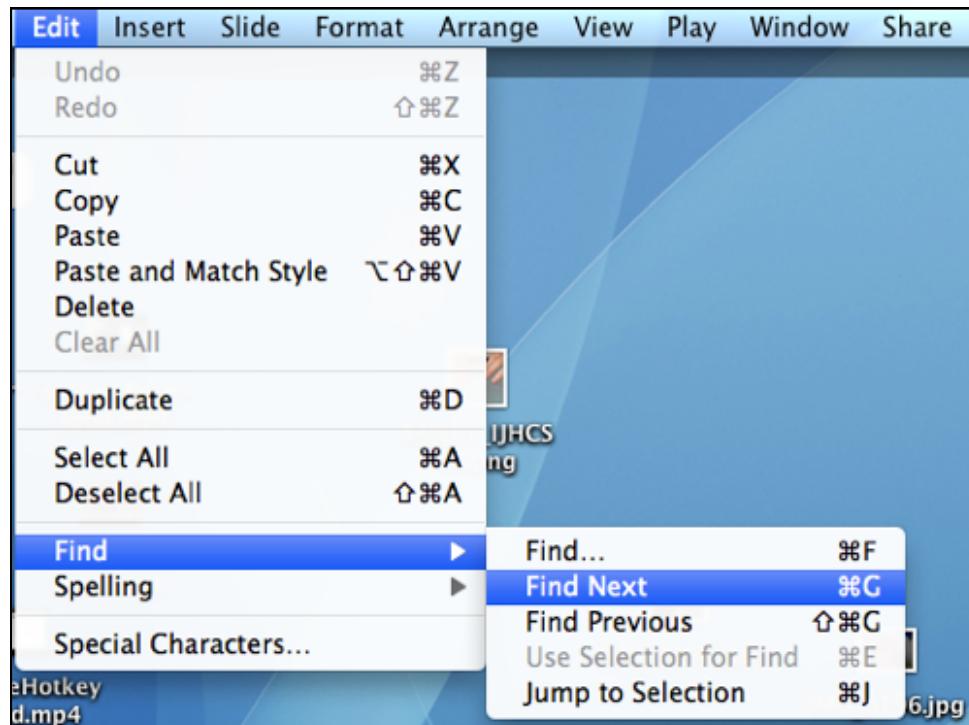
# Strategies

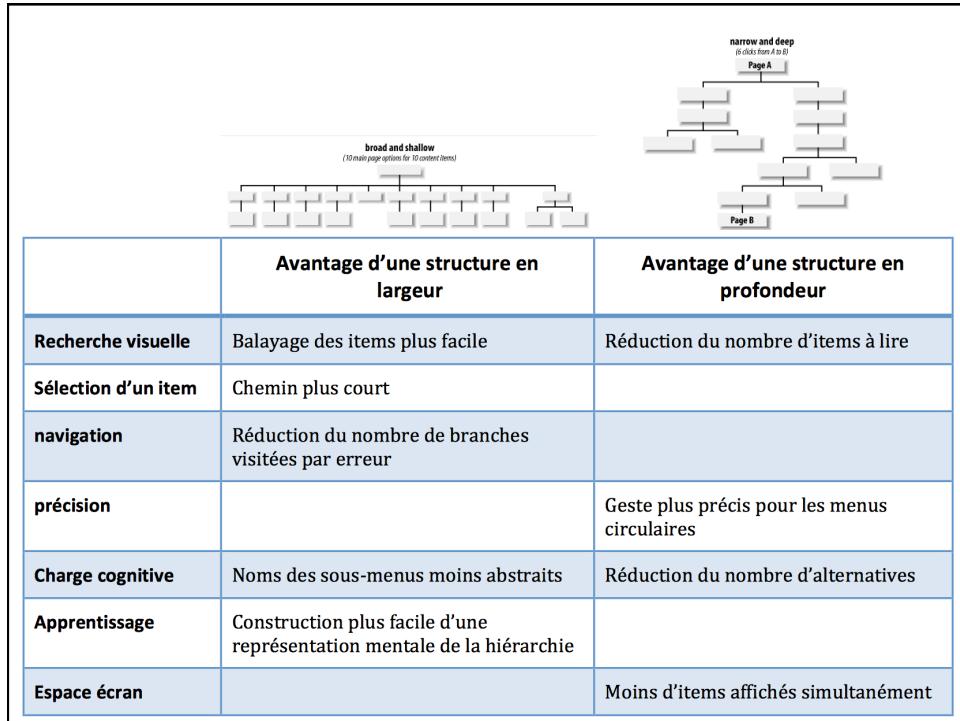
First modality		Dimension Item
Second modality		Menu System
		Expert mode

- Menu geometry
- Menu positioning
- Menu temporality

# Strategies

First modality		Dimension Item
Second modality		Menu System
		Expert mode





## Menu depth: marking menus

- **Multi-Stroke Marking menus**
  - Instead of considering a spatial compound stroke, Multi-Stroke menus introduce a series of simple strokes

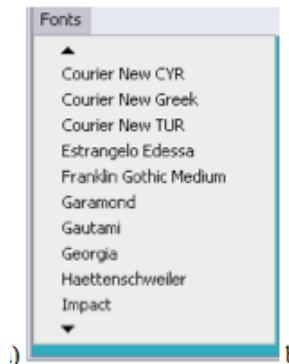
(1) ↗ (2) →

Expert mode

Novice mode

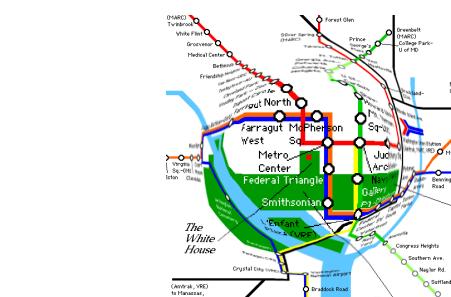
Speed and accuracy in selection  
 - Inflection free gestures  
 - Scale independent gestures

## Menu breadth: Large number of items



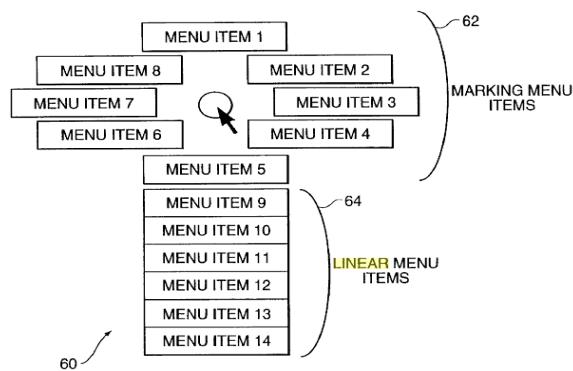
Scrollable menus

## Menu breadth: Large number of items

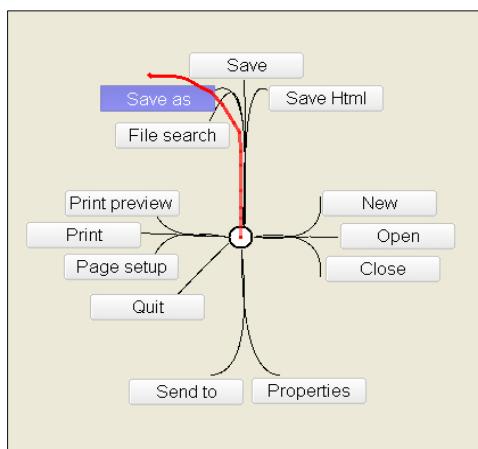


Fish-eye menus

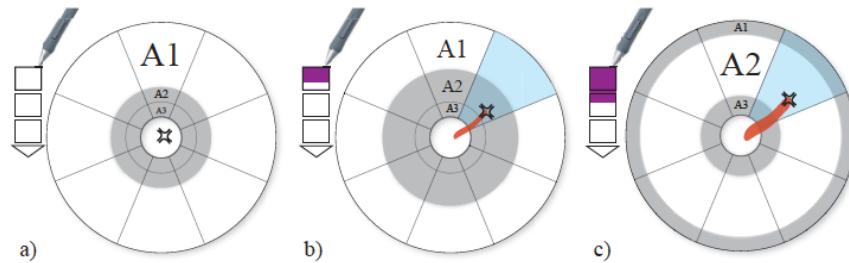
## Menu breadth



## Menu breadth



## Menu breadth



### A 3-level Push Menu

- a) initial state (level 1 is active, colored in white).
- b) as the pressure increases, the ring of level 2 grows.
- c) when the applied pressure has raised above level 1, the level-2 ring is activated (in white) and the level-3 ring starts growing.

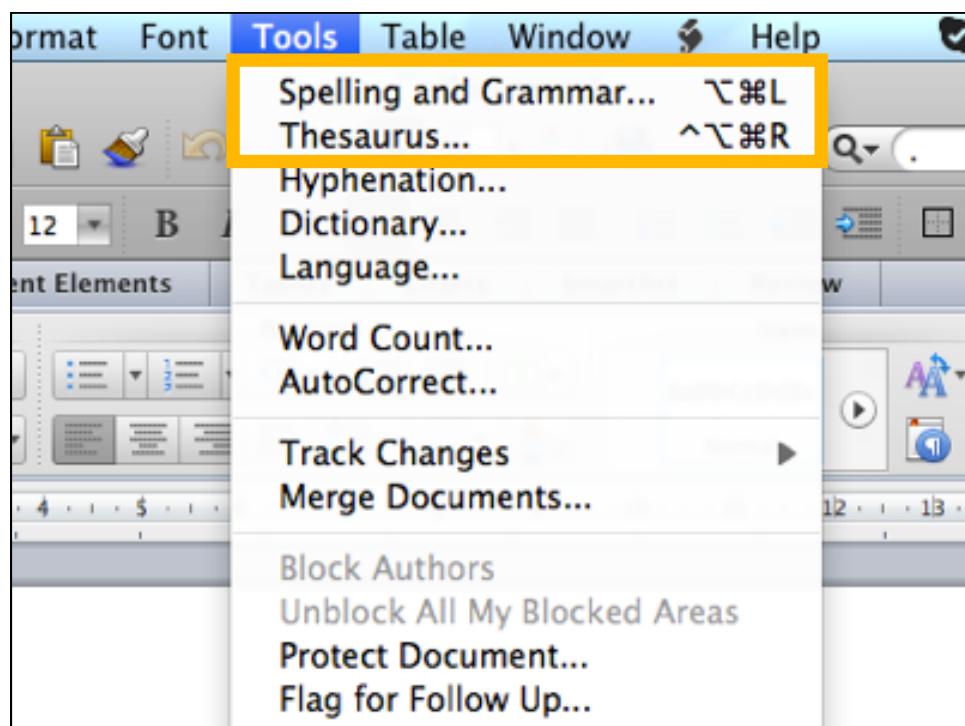
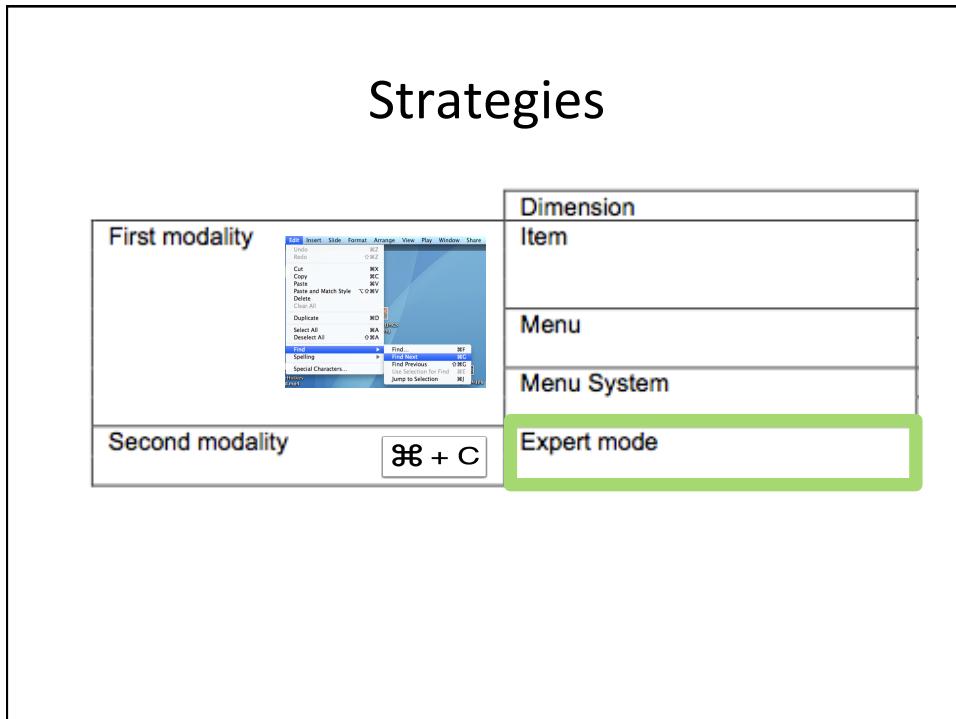
## Strategies

First modality		Dimension
Item		Item
Menu		Menu
Second modality	$\text{⌘} + C$	Menu System
		Expert mode

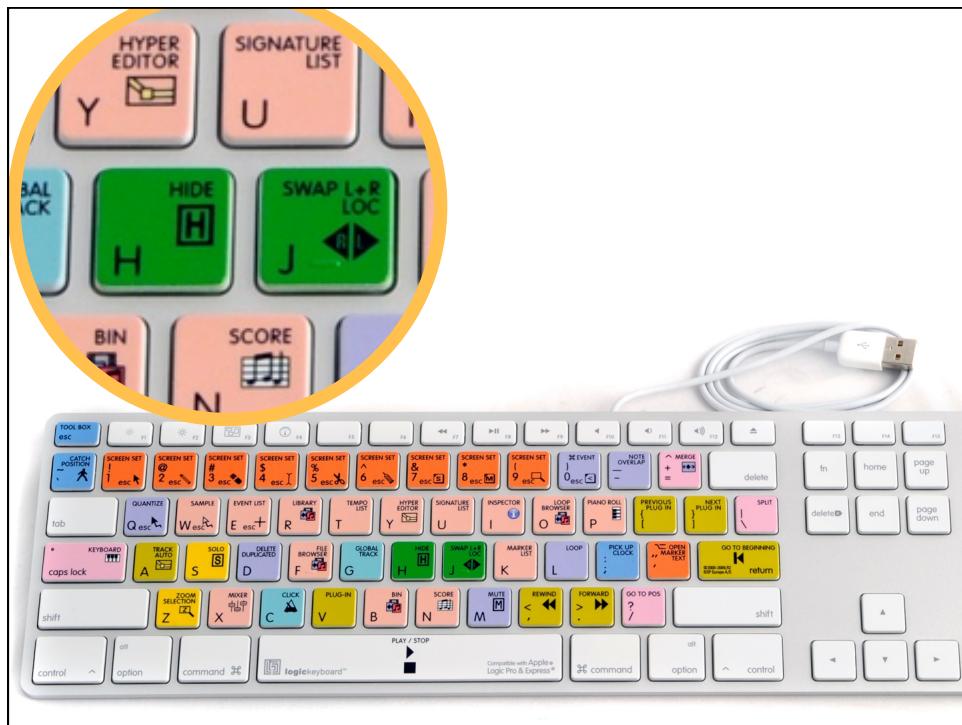
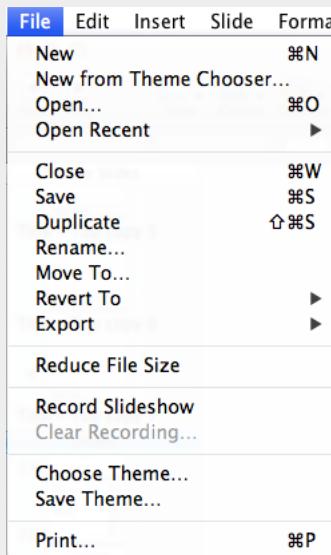
The diagram illustrates a menu system with two modalities. The first modality is shown in a window with a menu bar (Edit, Insert, Slide, Format, Arrange, View, Play, Window, Share) and a submenu (Cut, Copy, Paste, Paste and Match Style, Delete, Duplicate, Select All, Find, Spelling, Special Characters). The second modality is represented by the keyboard shortcut  $\text{⌘} + C$ . To the right, a table maps these to menu system dimensions: Item, Menu, and Menu System. The 'Menu System' row is highlighted with a green background.

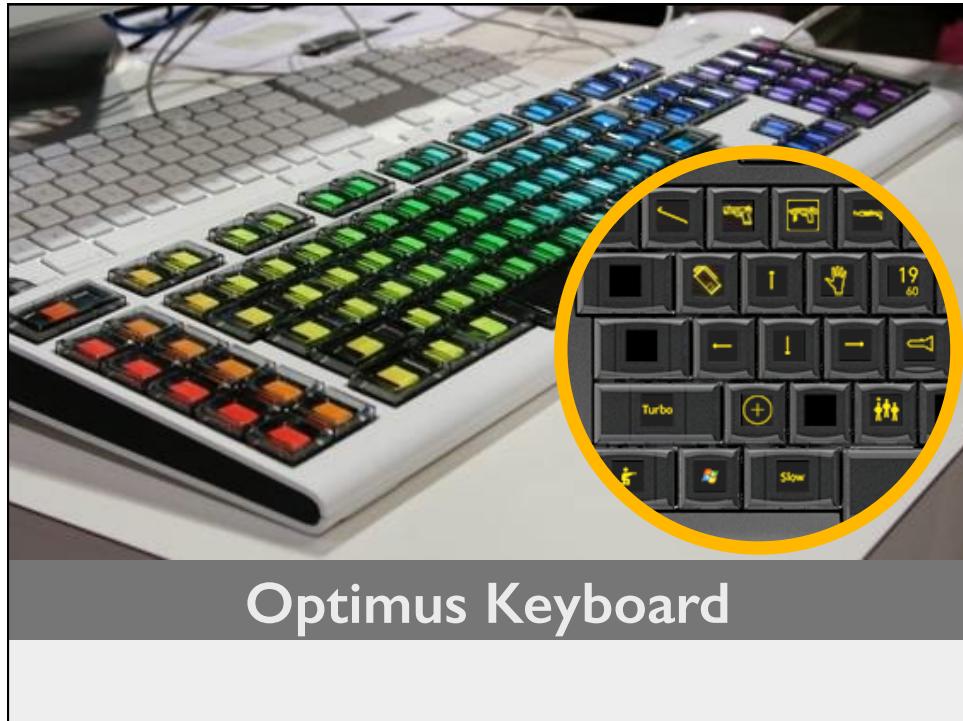
- Menu depth / breadth

# Strategies



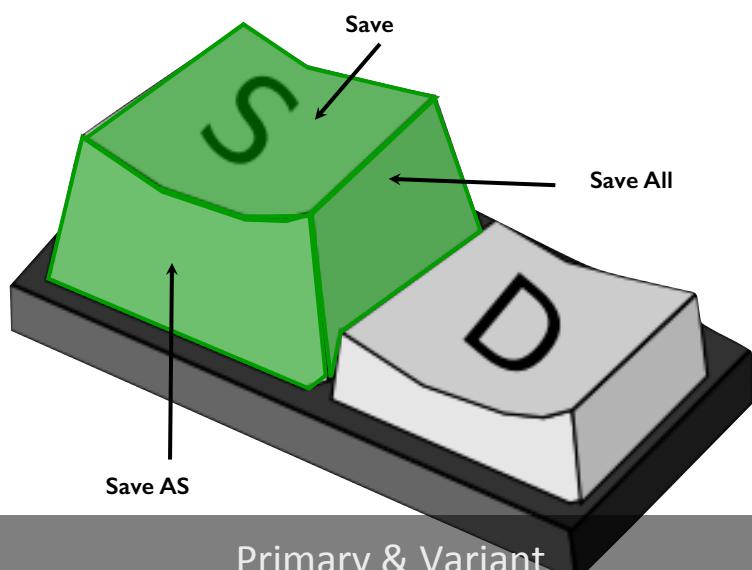
## Expert Mode: Mapping

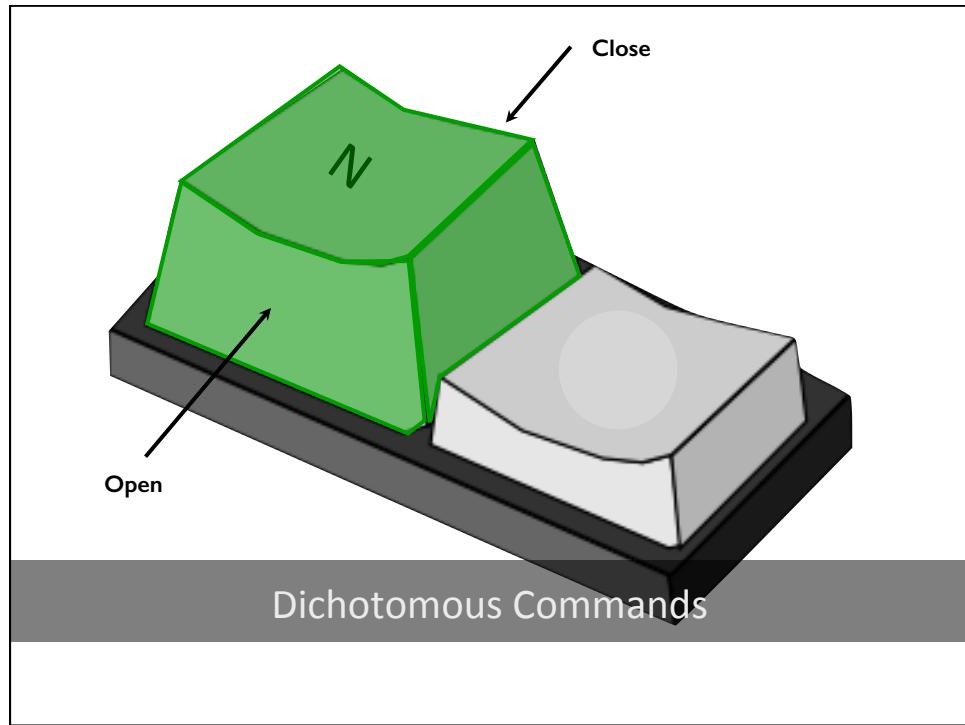
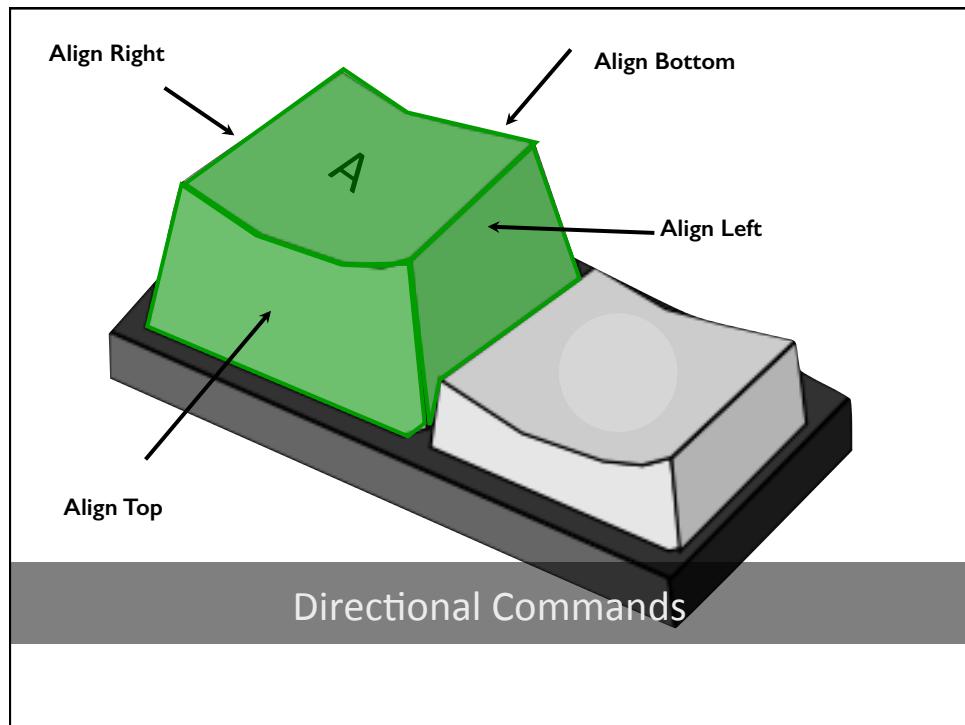




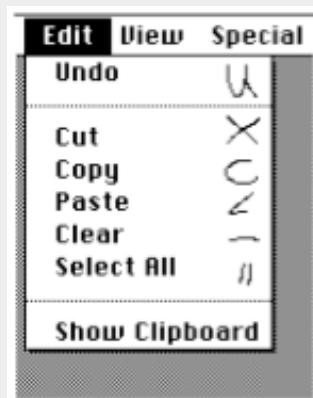
### ExposeHotkey (EHK)

# Métamorphe





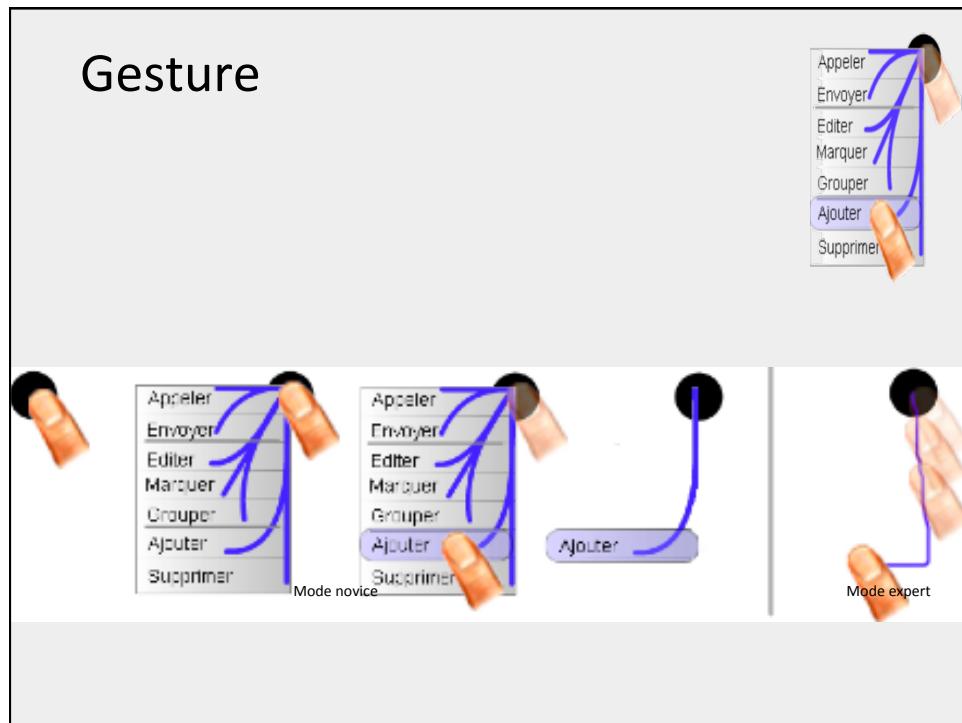
## Gesture



## Gesture

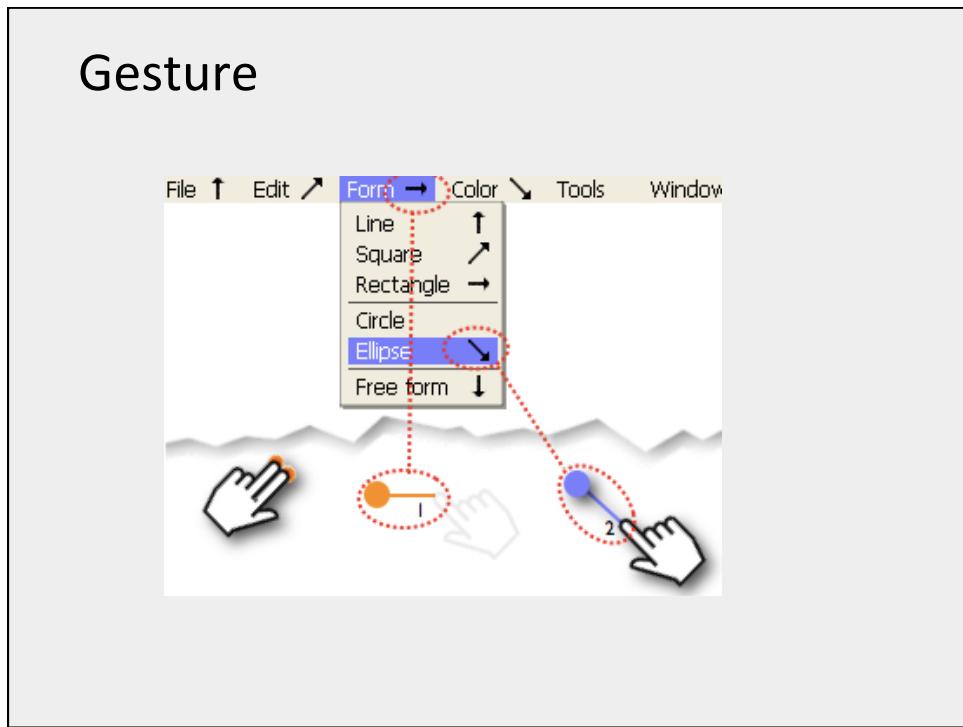
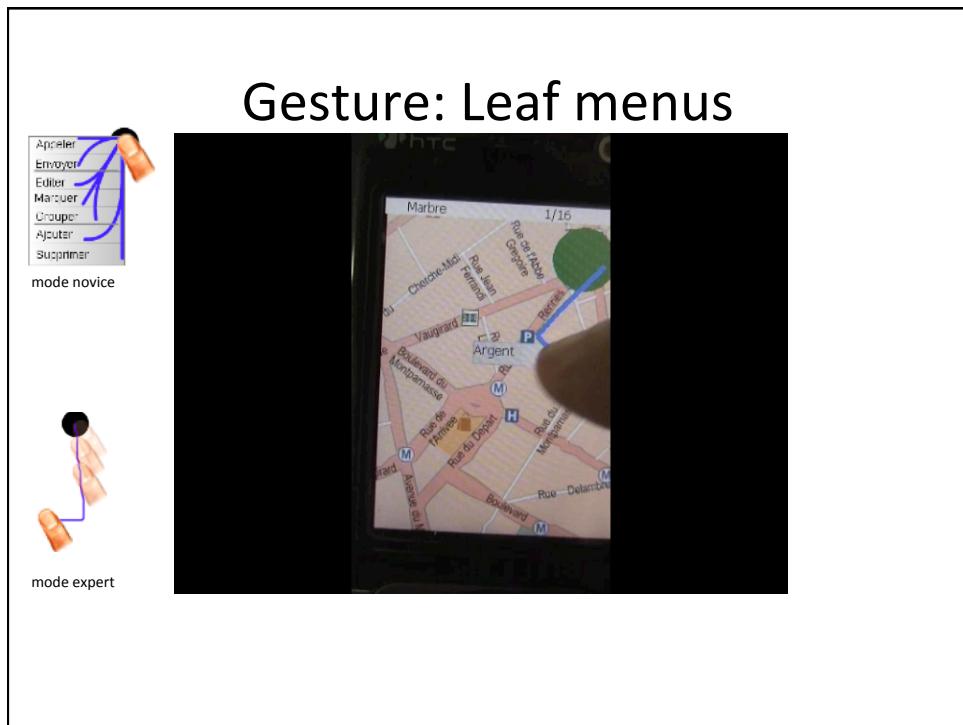


## Gesture



## Gesture: Leaf menus





## Several criteria

		Dimension
First modality		Item
Second modality	$\text{⌘} + \text{C}$	Menu
		Menu System
		Expert mode

## Design choices

Factor	Criteria
Usability	<b>Speed and accuracy</b> Menu efficiency for selecting commands
Adequacy of menu systems for the cognitive, motor and sensory abilities of the user	<b>Learning and memorization</b> The capacity of the menu to allow the user to use it in a optimal way quickly and on long-term
Satisfaction	The capacity of the menu to provide a pleasant feeling that results from the fulfillment of what the user wants
Applicability	<b>Application adequacy</b> Capacity of the menu to become integrated into applications
Adequacy of menu systems for the user's needs that are related to the application	<b>Device adequacy</b> Capacity of the menu to adapt different input and output devices