Sélection de commandes / Post-Wimp interfaces

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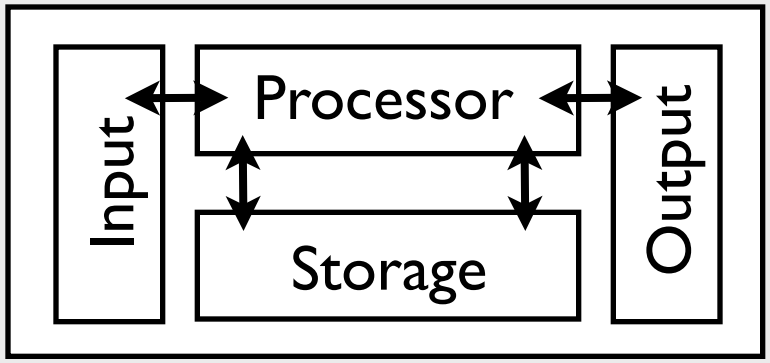
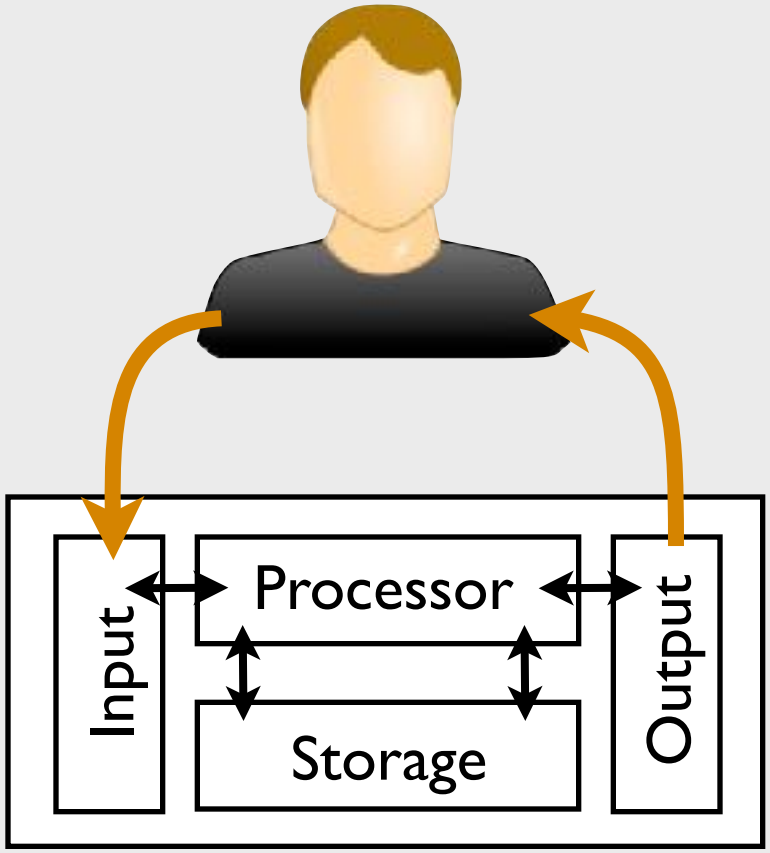
Diapositives inspirées de Gilles Bailly et Aurélien Tabard

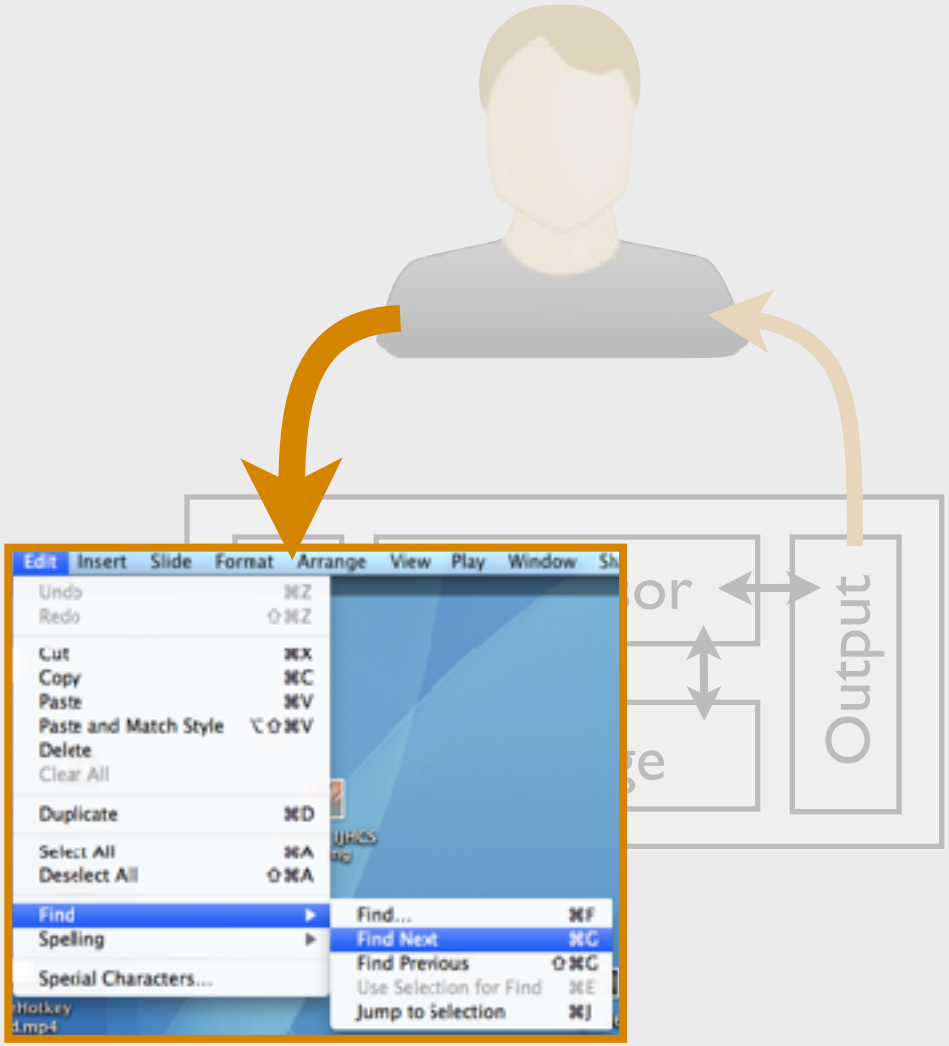
What?



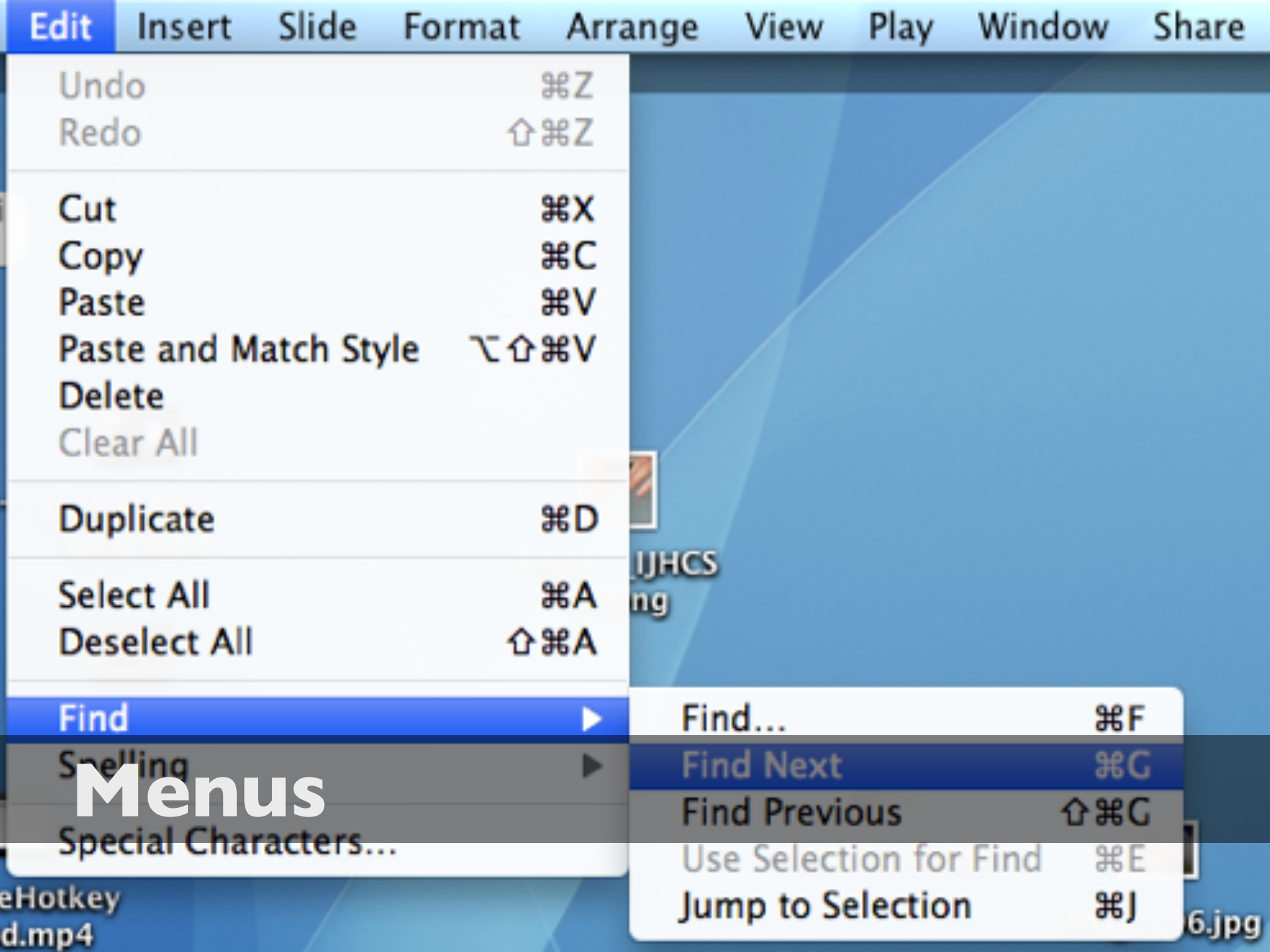
Interactive Systems



Interactive Systems



Command Selection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Special Characters...
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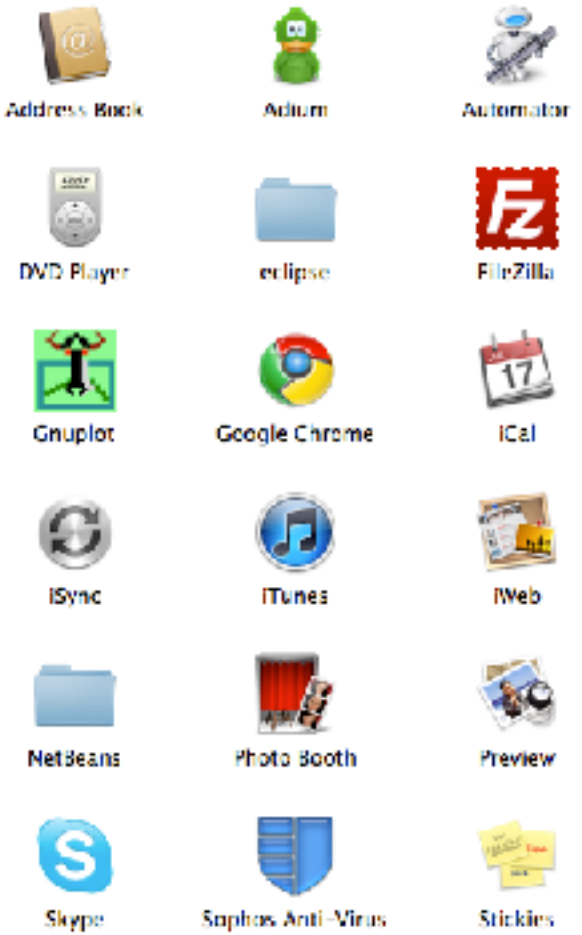
Use Selection for Find ⌘E
Jump to Selection ⌘J
Menus

Why?

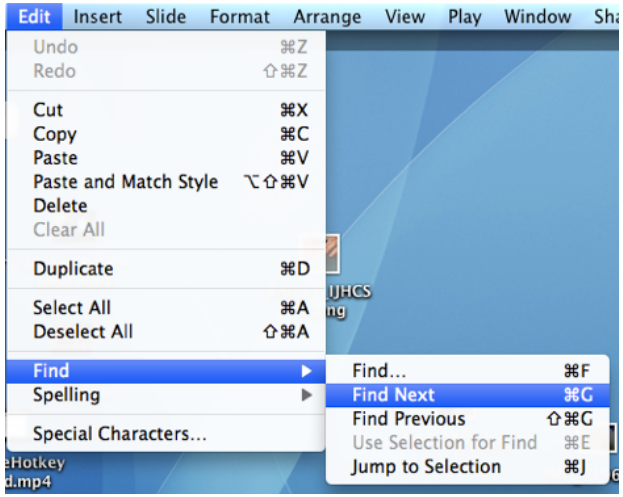


Application

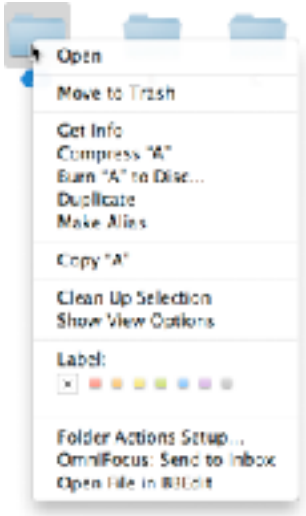
Platform

User

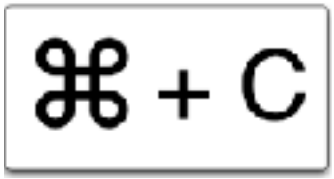
1/ Affects all Interactive Systems



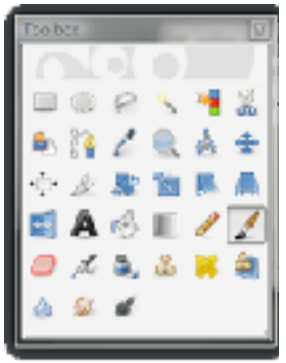
Menubar



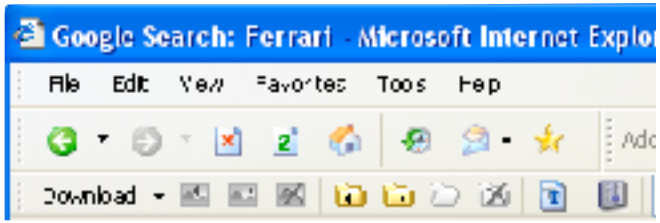
Context menu



Hotkeys

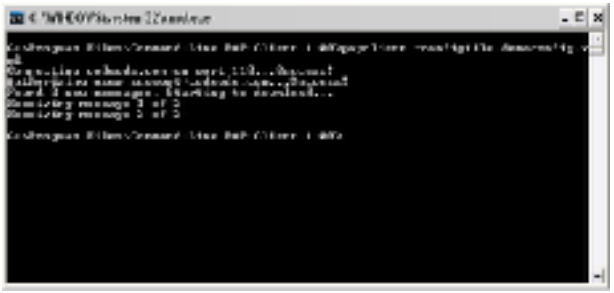


Toolbox



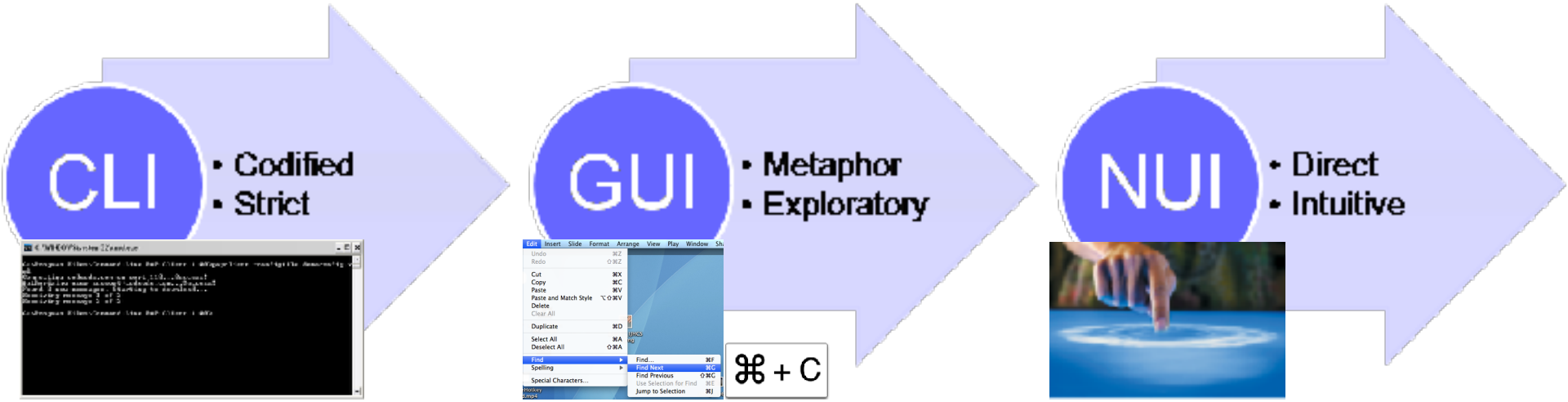
Toolbar

Ribbon



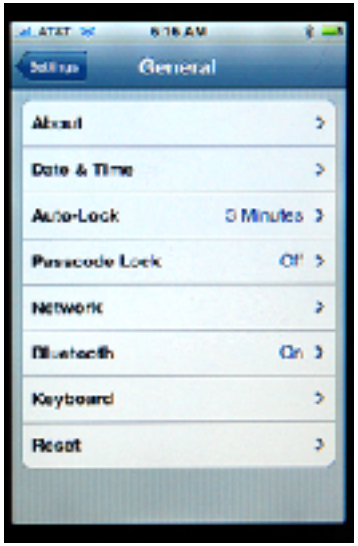
Command line

2/ affect all interaction paradigms

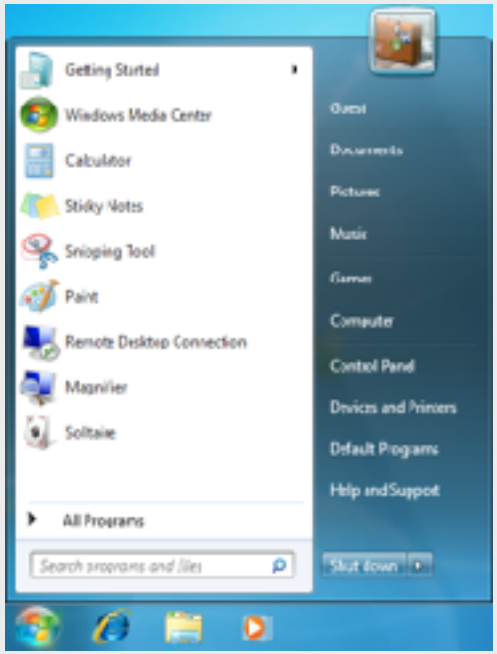


We need to:

- **present**, **organize** available commands
- let users **select** commands



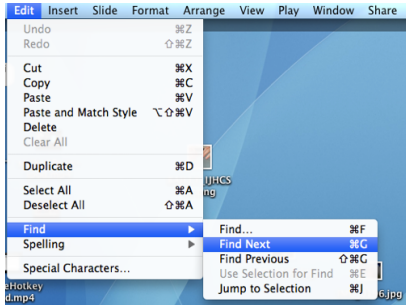
Folders & Hierarchies



Launch Menu

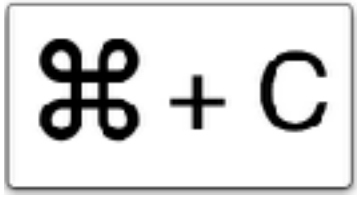
Metro Menu

Some math...



Technique 1

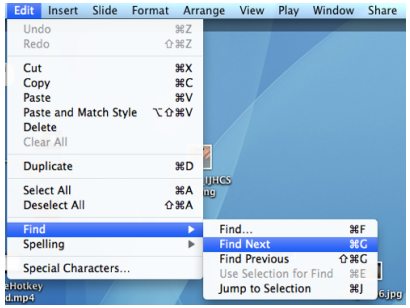
VS.



Technique 2

3/ can have a big impact

Some math...



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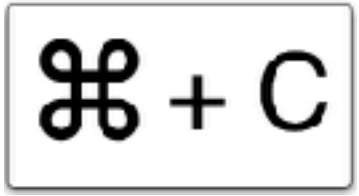
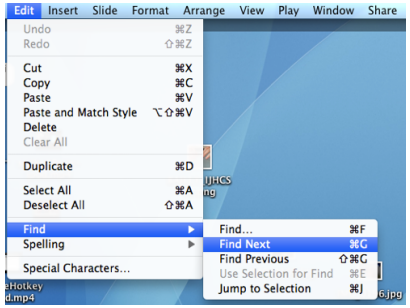


Technique 2

0.5 seconds

3/ can have a big impact

Some math...



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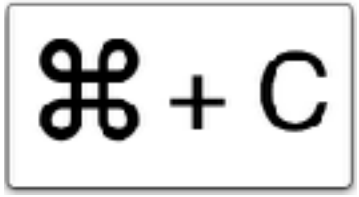


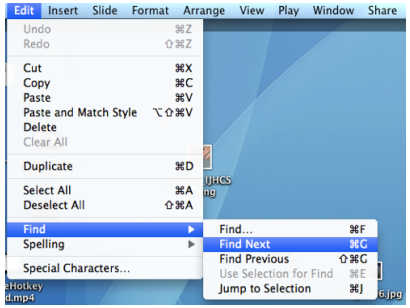
Technique 2

0.5 seconds

500 million users

3/ can have a big impact

Some math...



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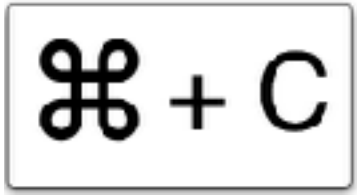


Technique 2

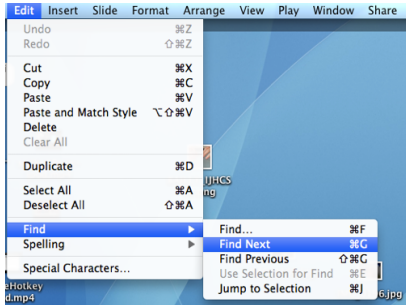
0.5 seconds

500 million users

5 commands per user per day

3/ can have a big impact

Some math...



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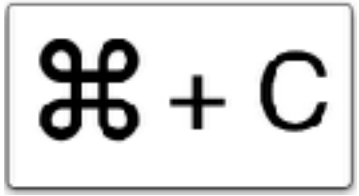


Technique 2

0.5 seconds

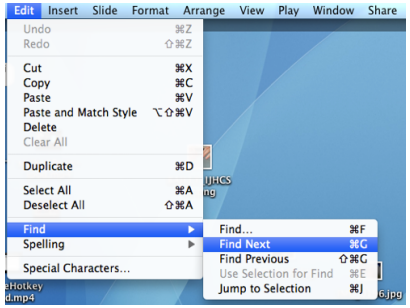
500 million users

5 commands per user per day

= 465 billion seconds per year

3/ can have a big impact

Some math...



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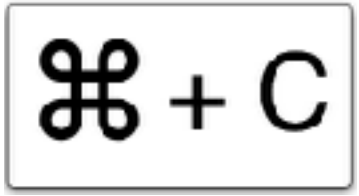


Technique 2

0.5 seconds

500 million users

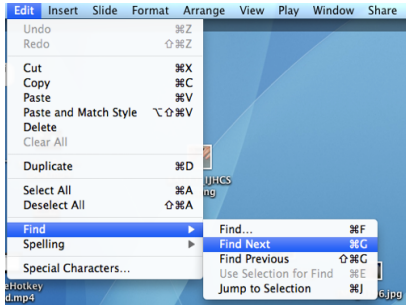
5 commands per user per day

= 465 billion seconds per year

= 126 million hours

3/ can have a big impact

Some math...



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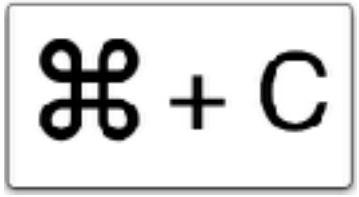


Technique 2

0.5 seconds

500 million users

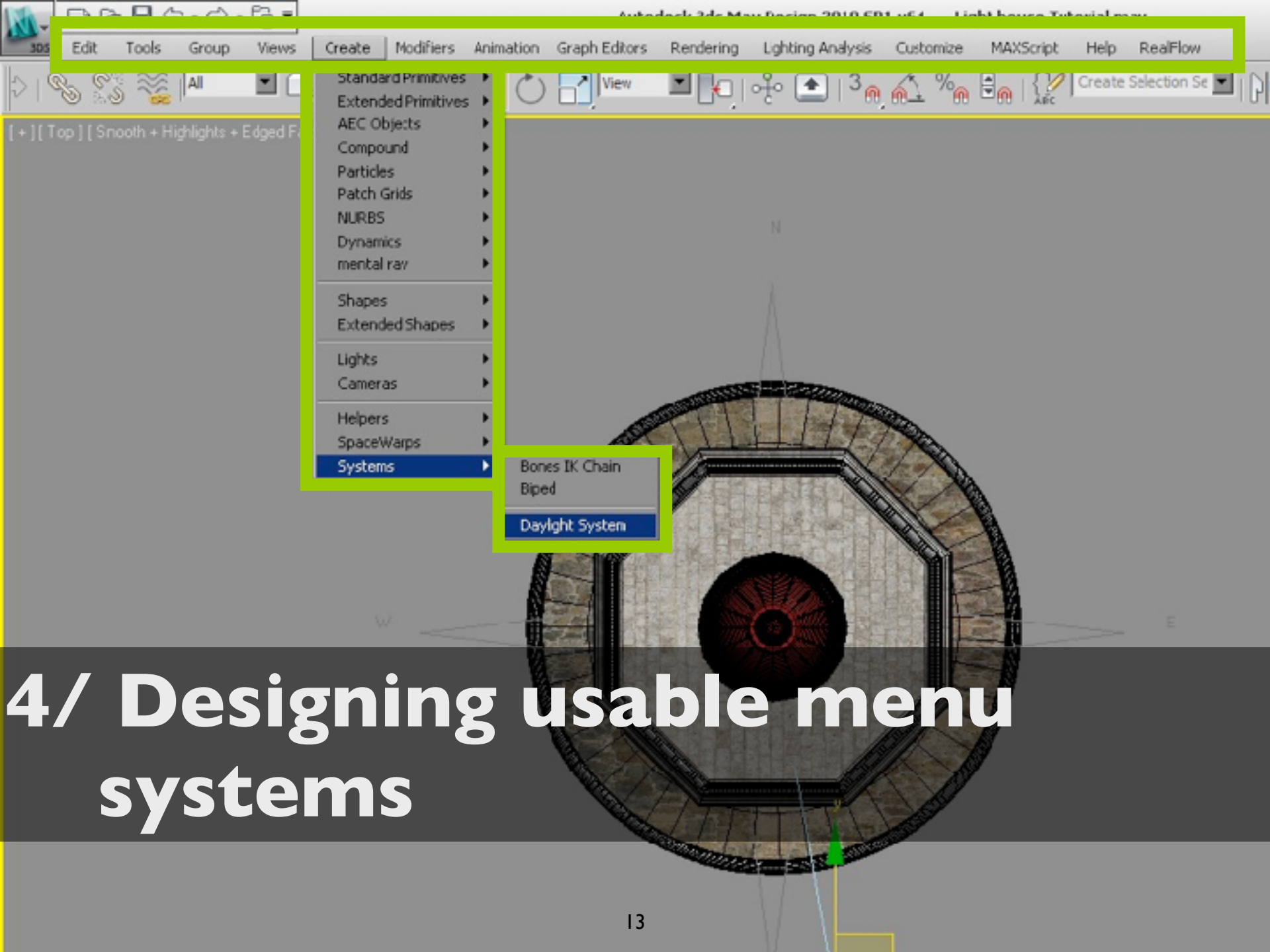
5 commands per user per day

= 465 billion seconds per year

= 126 million hours

= 14,400 years

3/ can have a big impact



4/ Designing usable menu systems

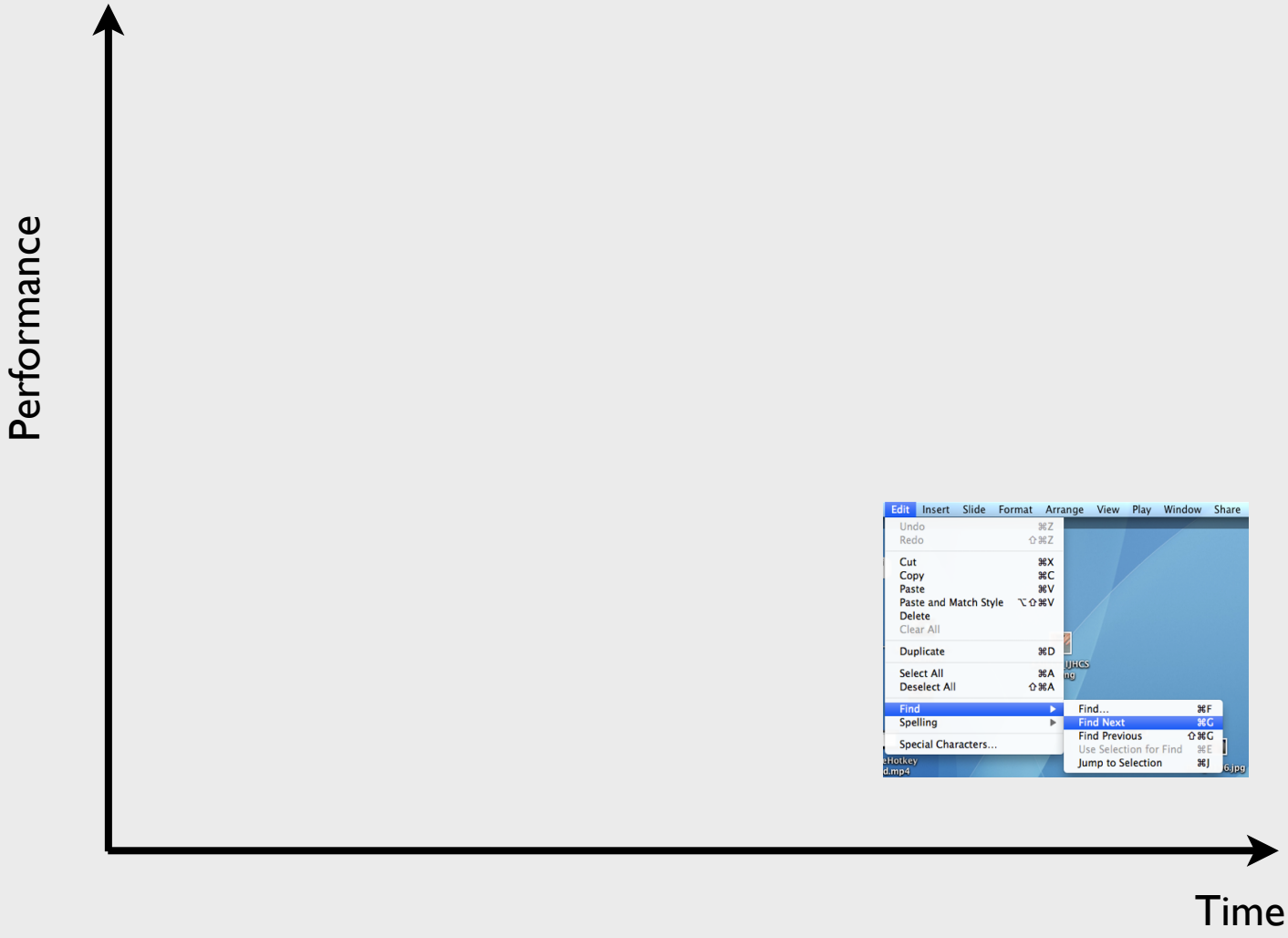
Numerous novel **interaction techniques**

have been proposed in the **literature**

Goals

Simple Model of Performance

J Scarr, A Cockburn, C Gutwin and P Quinn.
Dips and Ceilings: Understanding and Supporting Transitions to Expertise in User Interfaces. Proceedings of ACM CHI'2011 Conference on Human Factors in Computing Systems. Vancouver, Canada. 2011. 2741-2750.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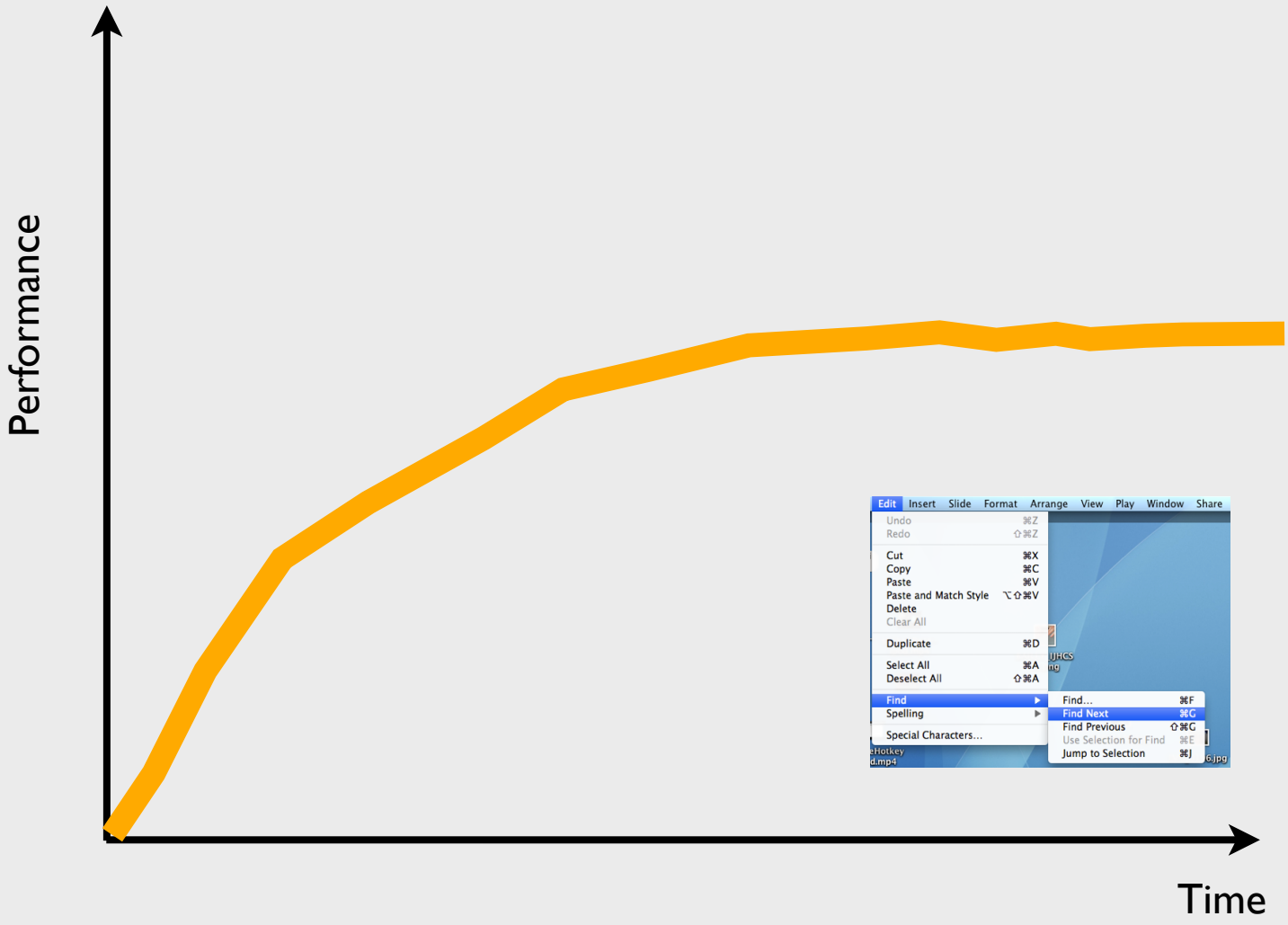
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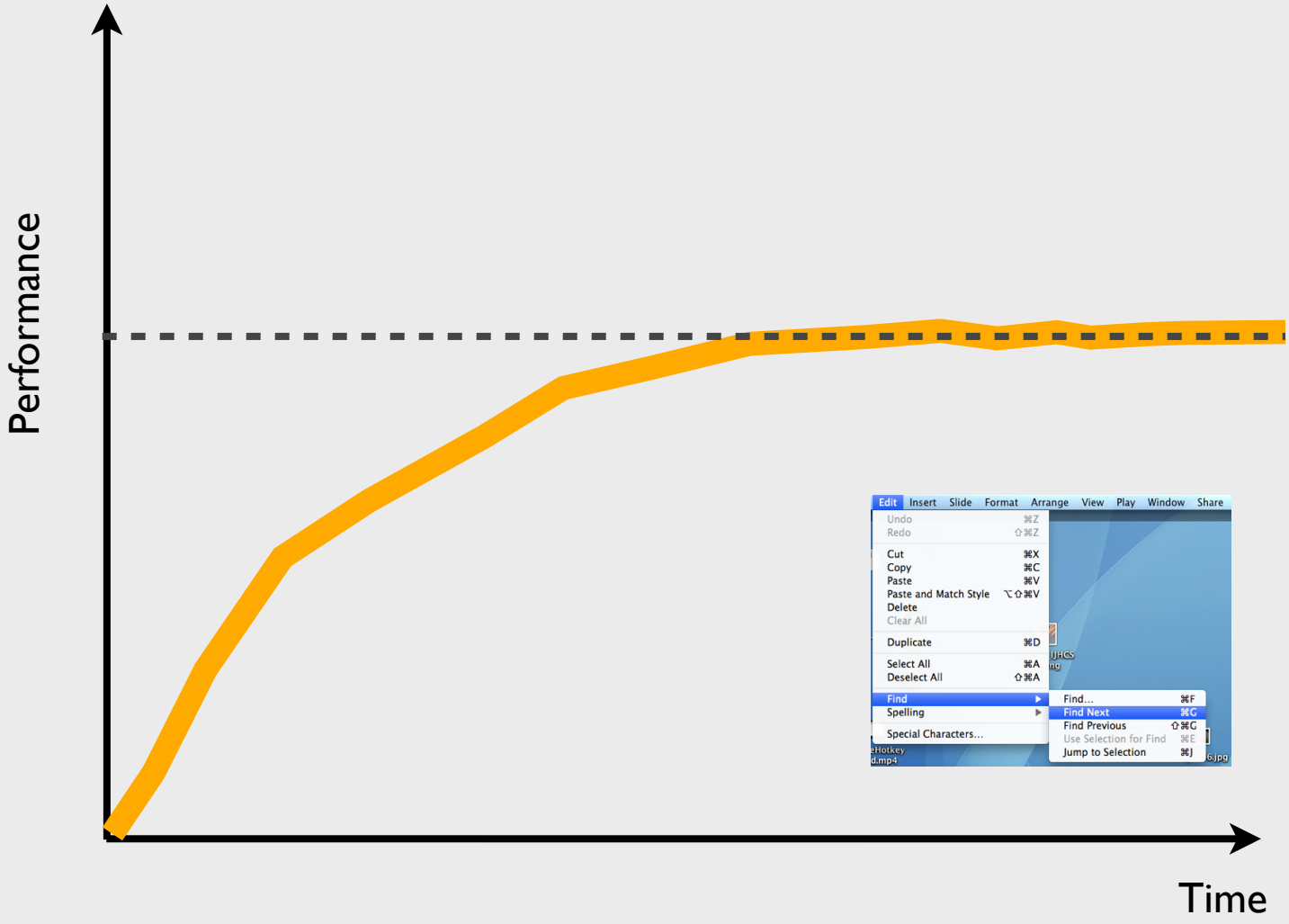
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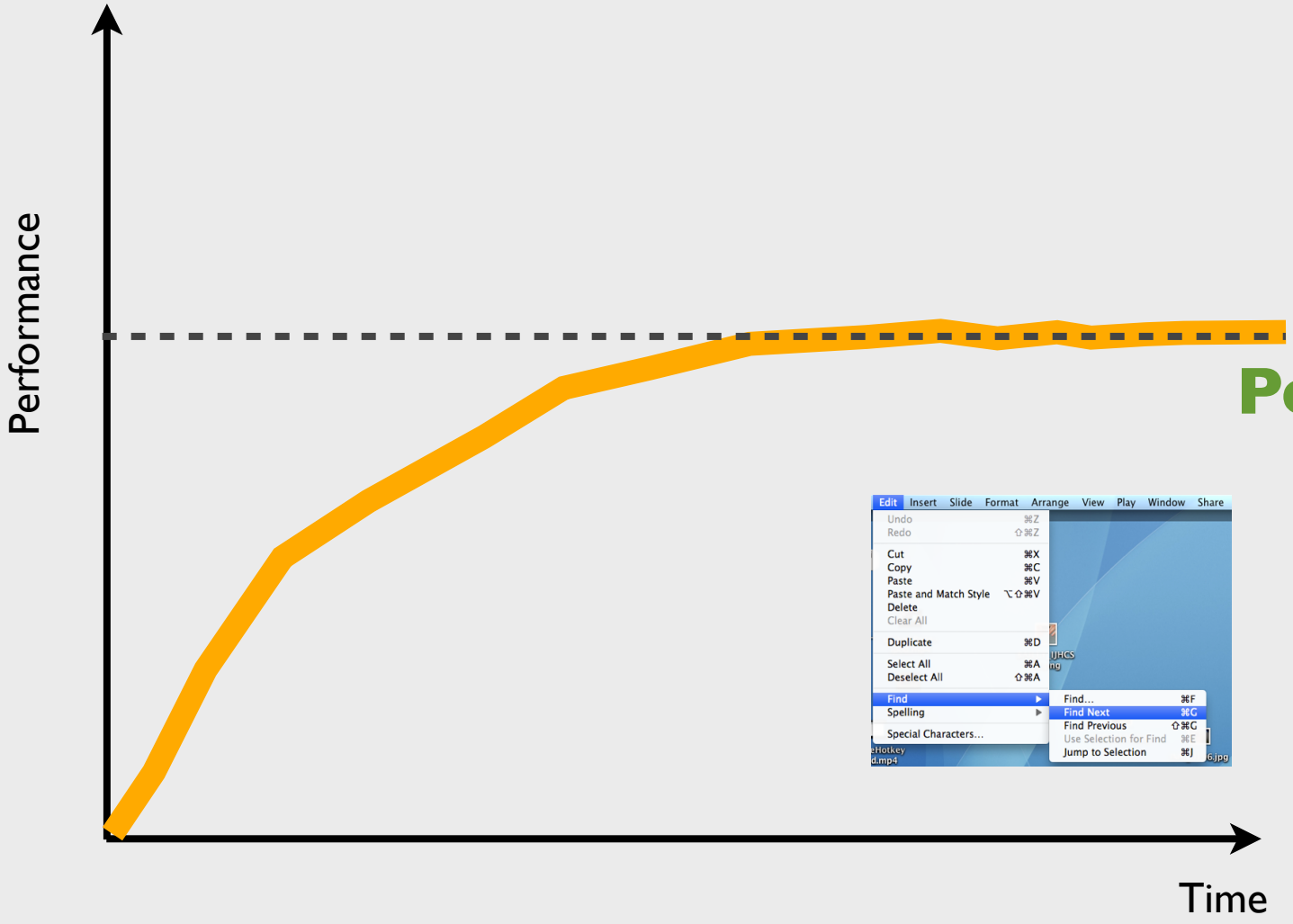
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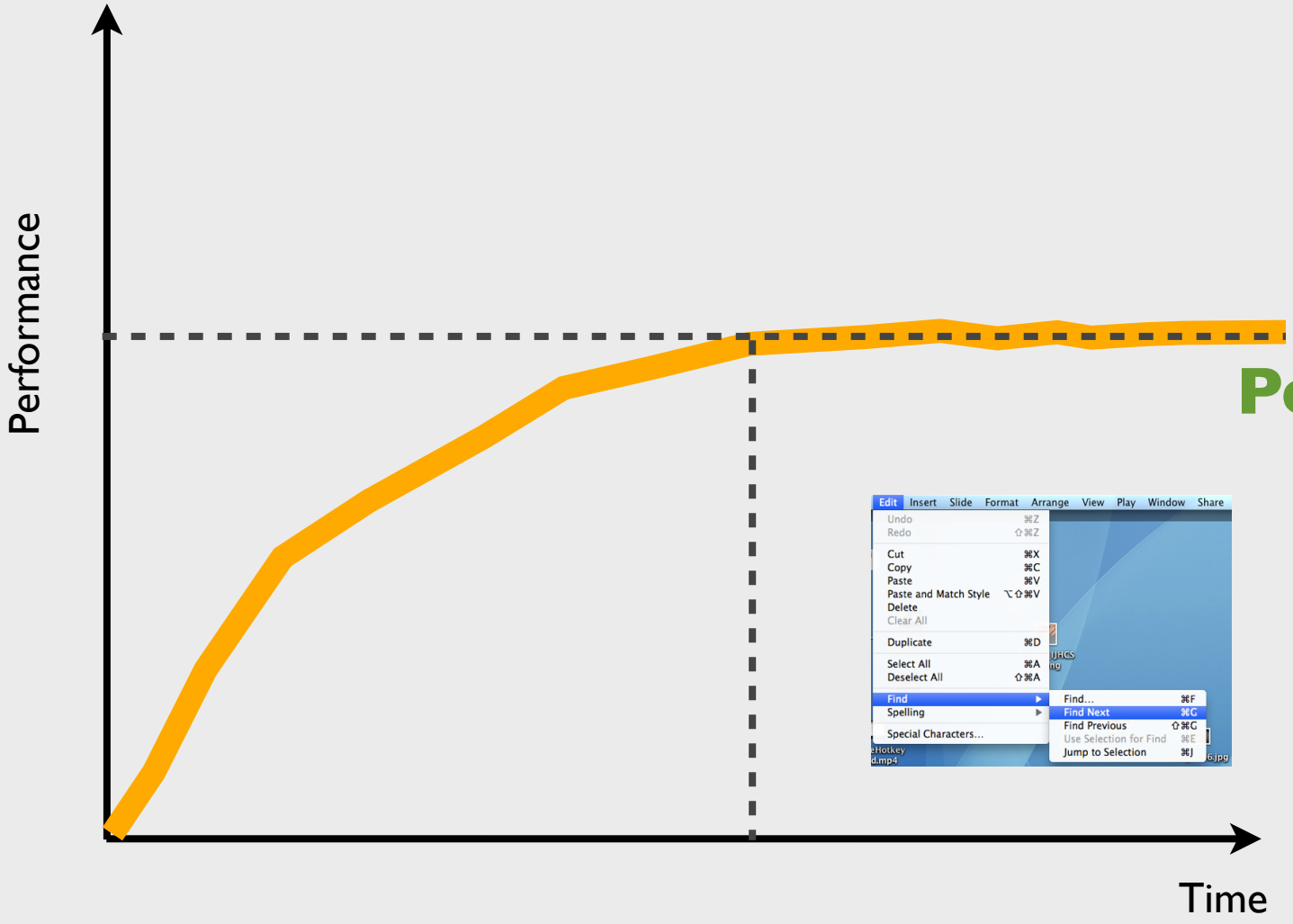
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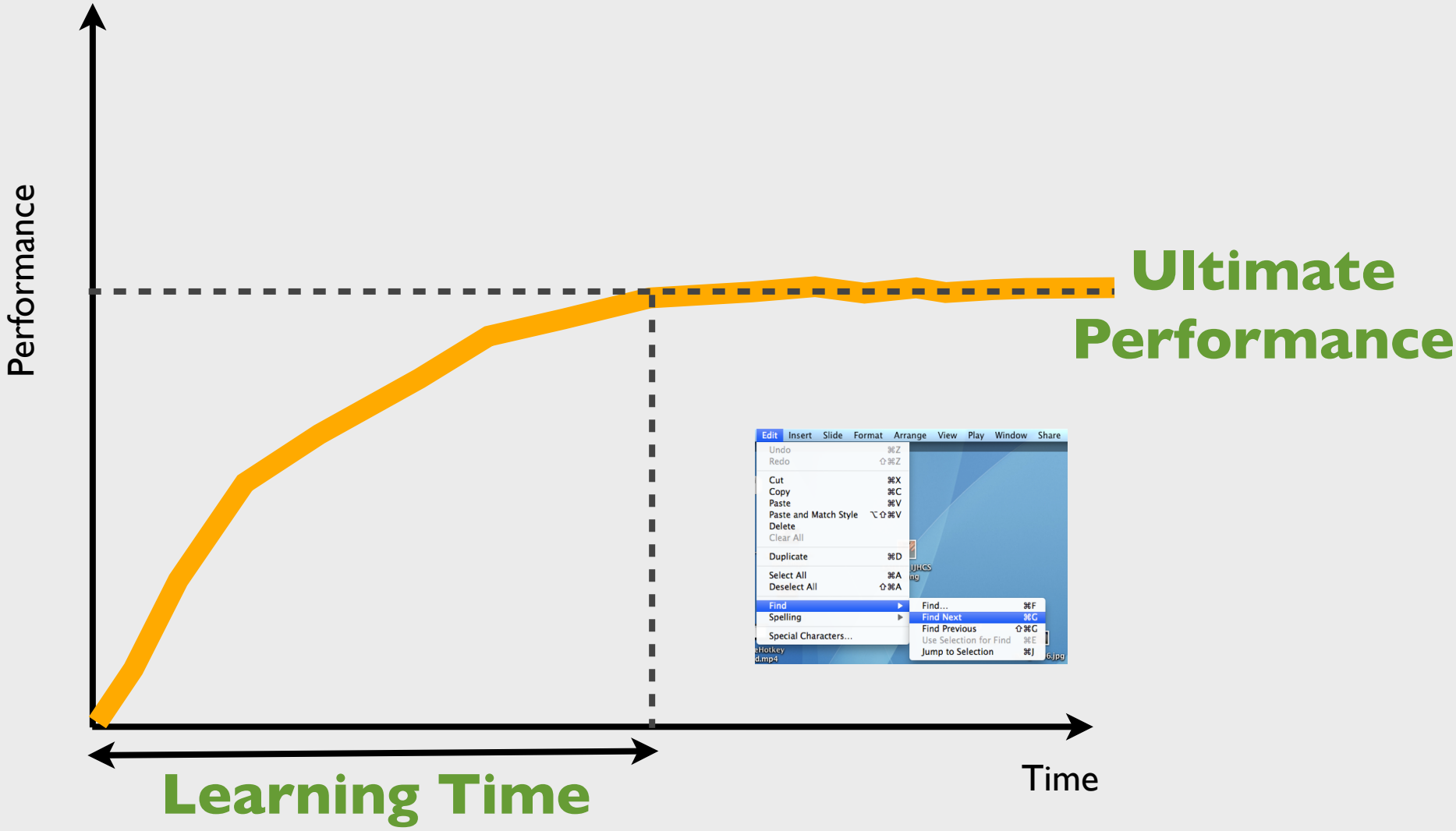
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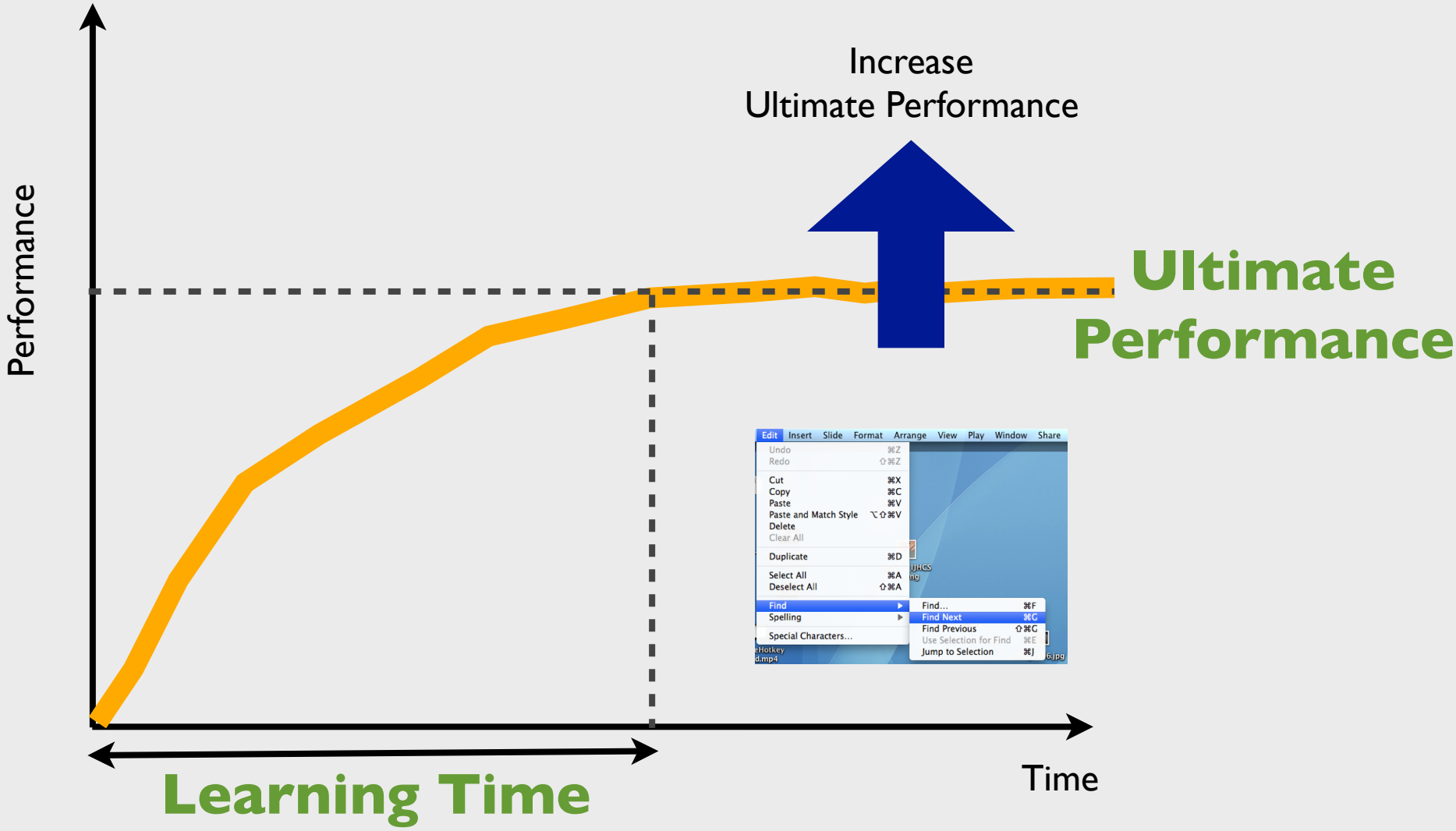
Learning Time
Time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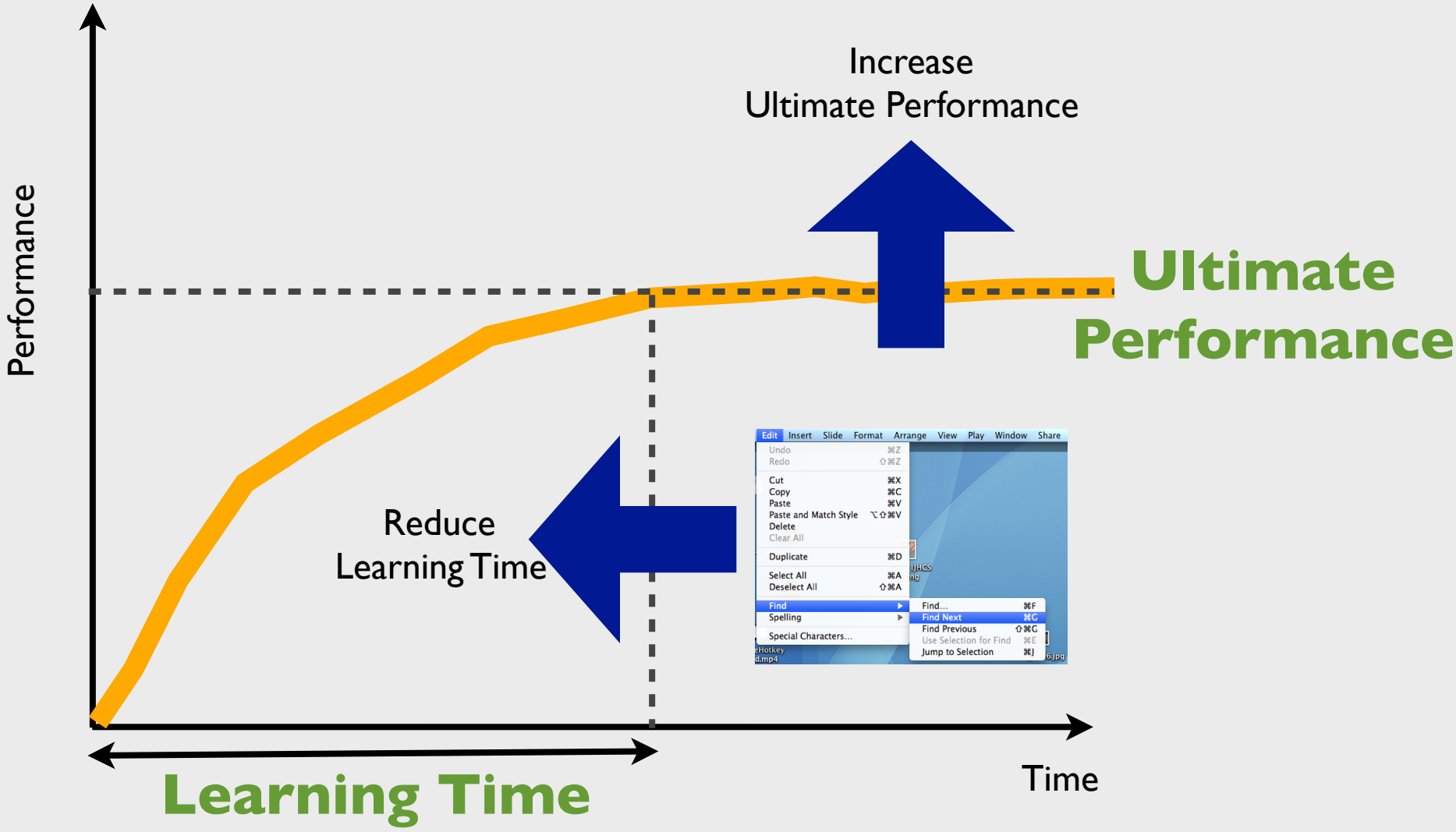
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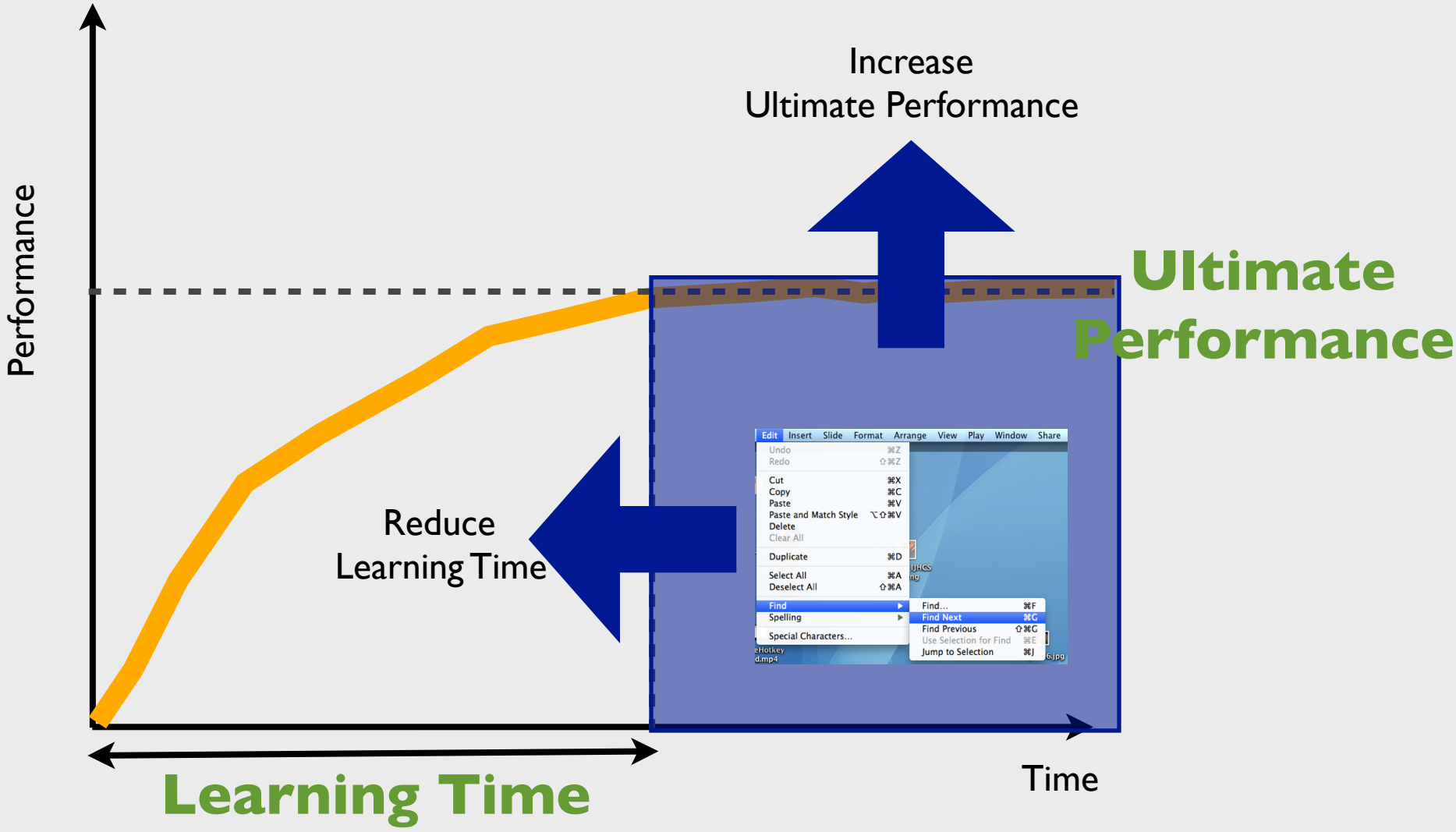
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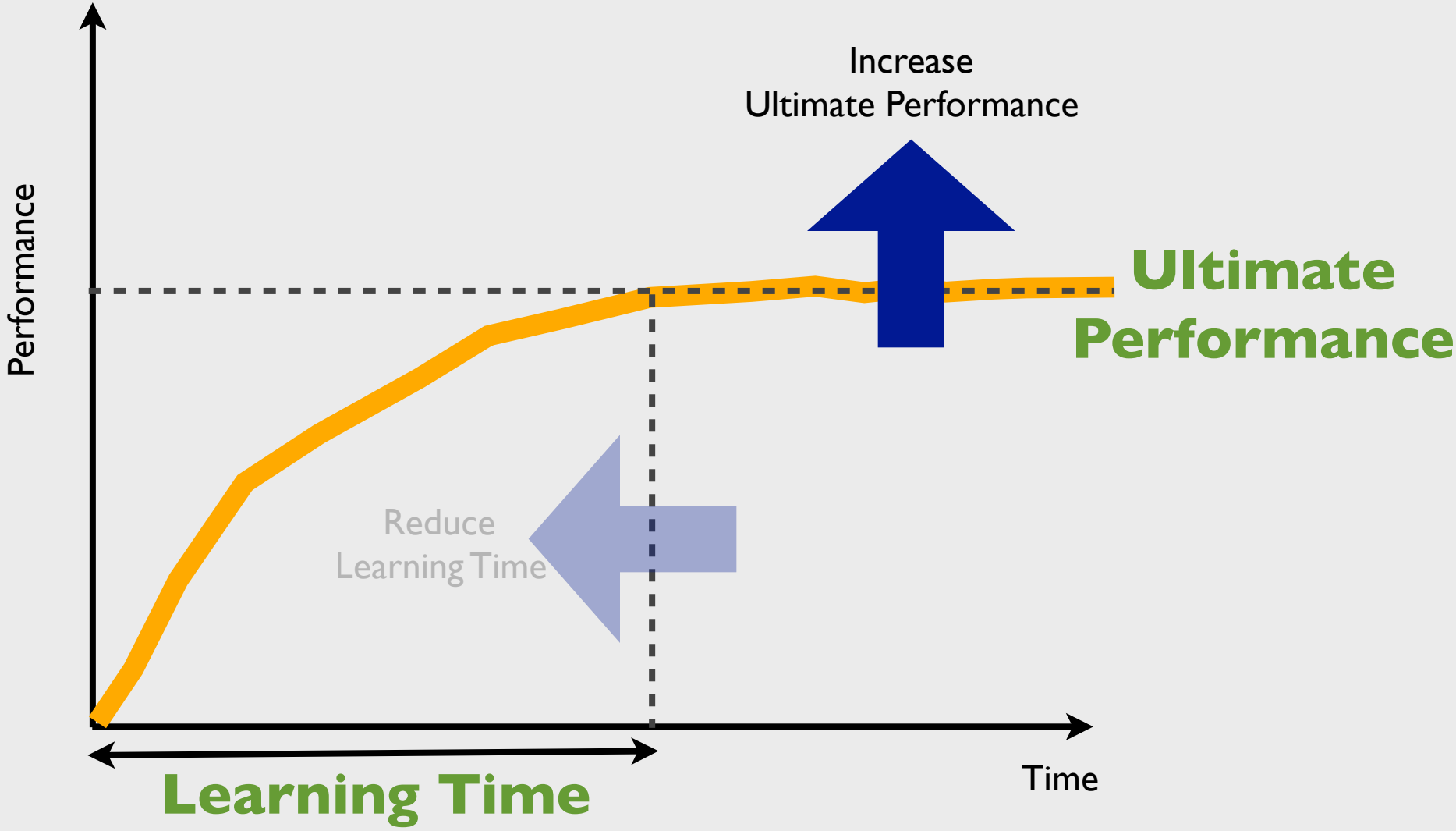
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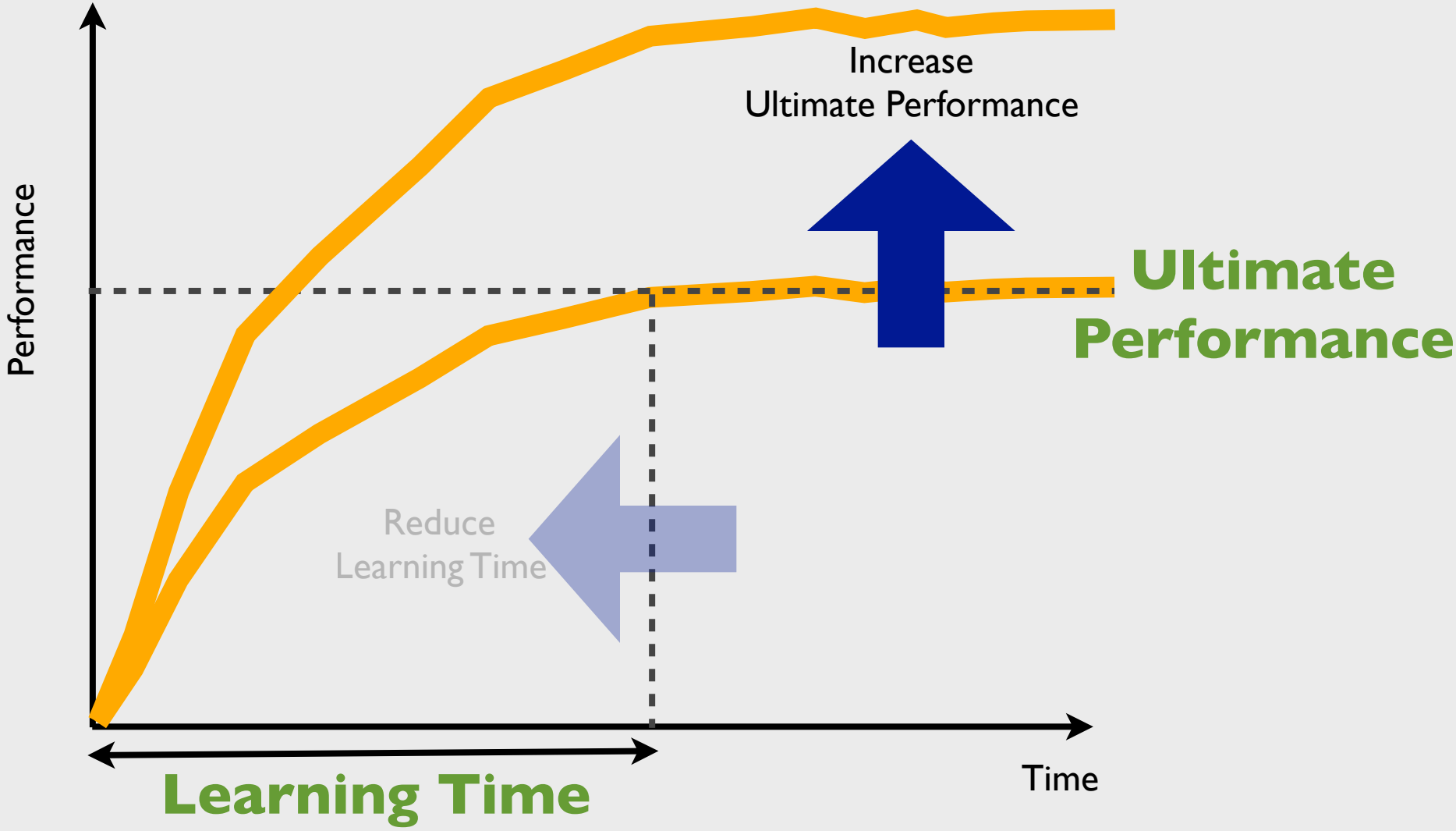
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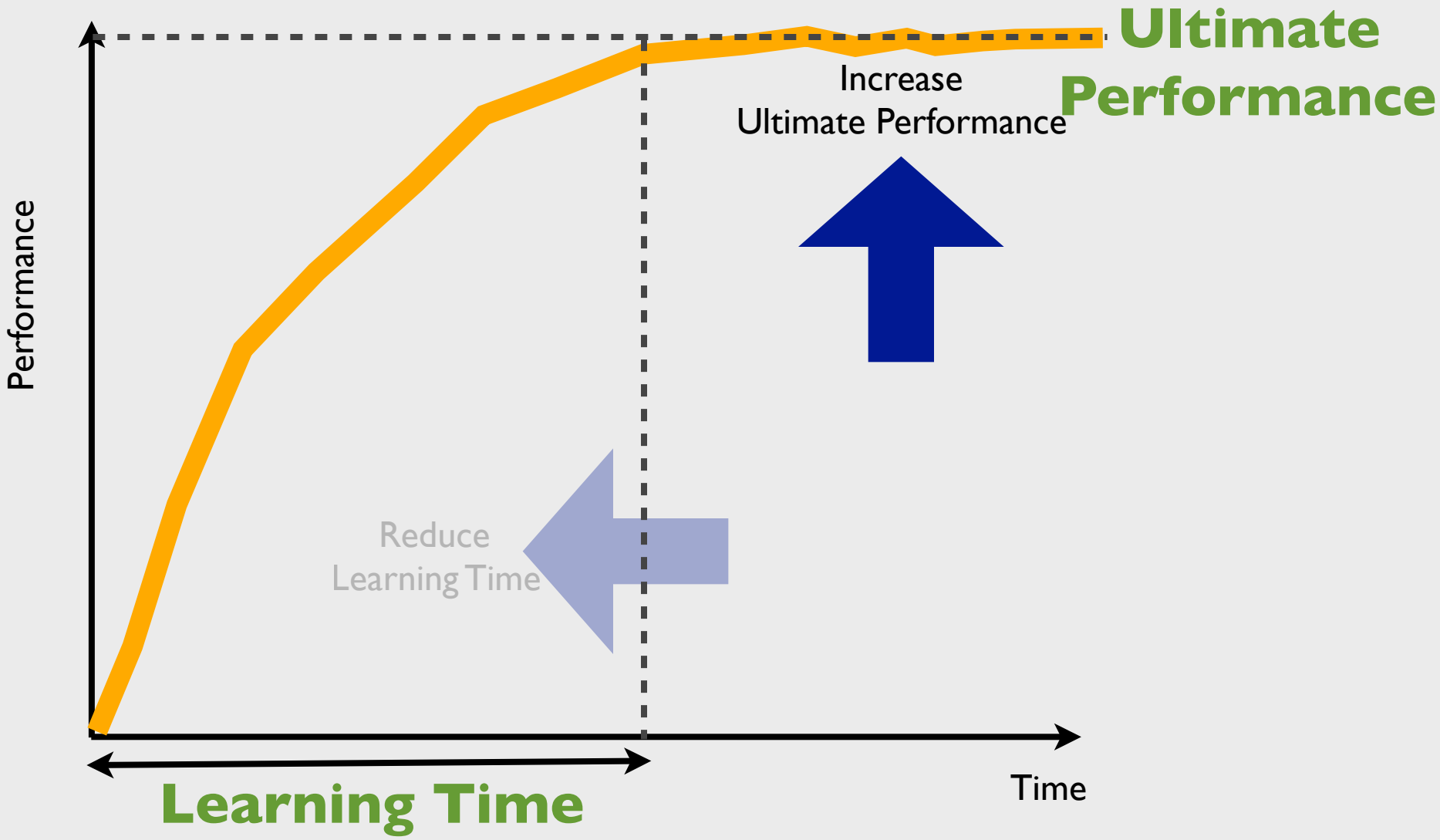
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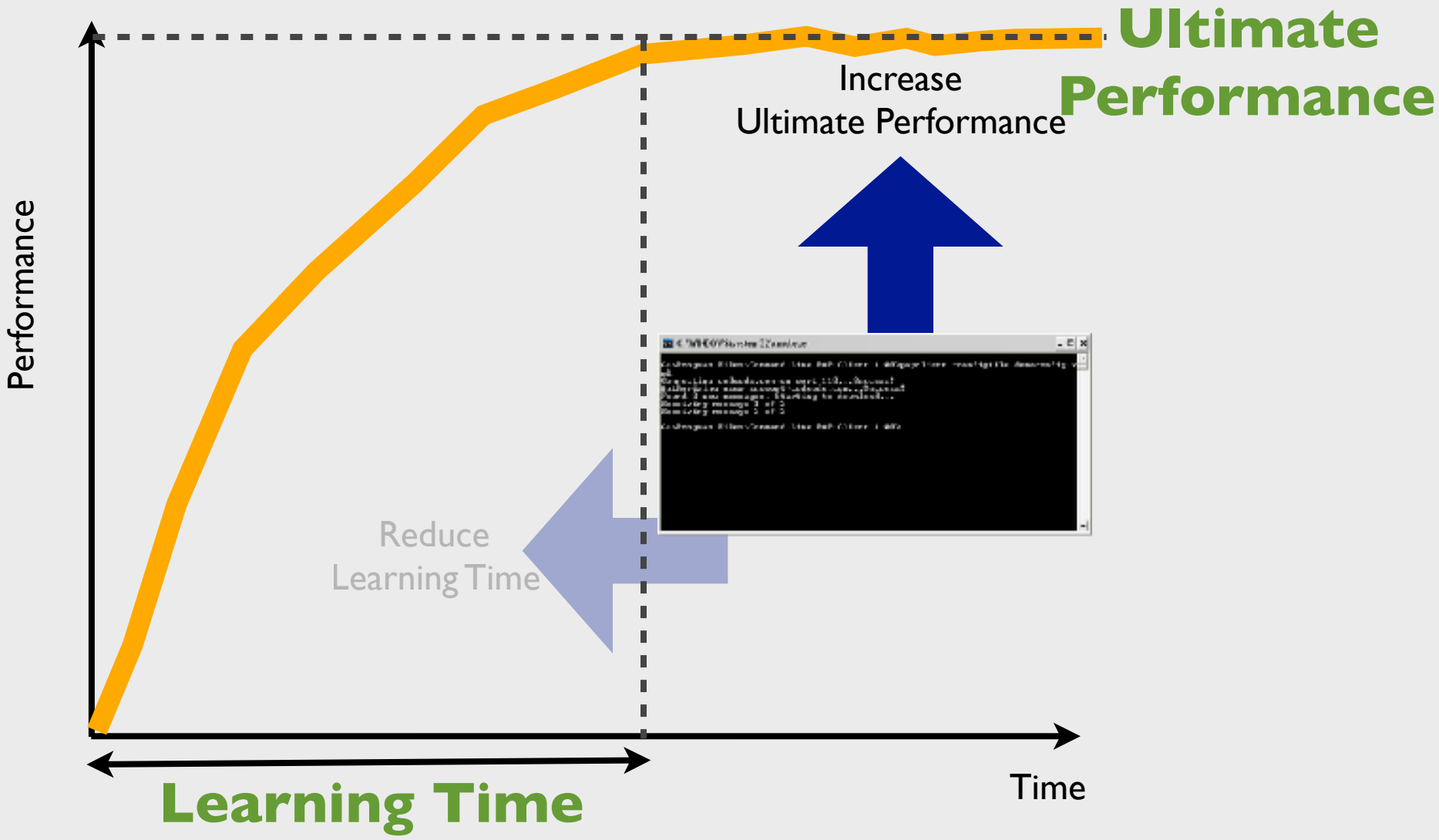
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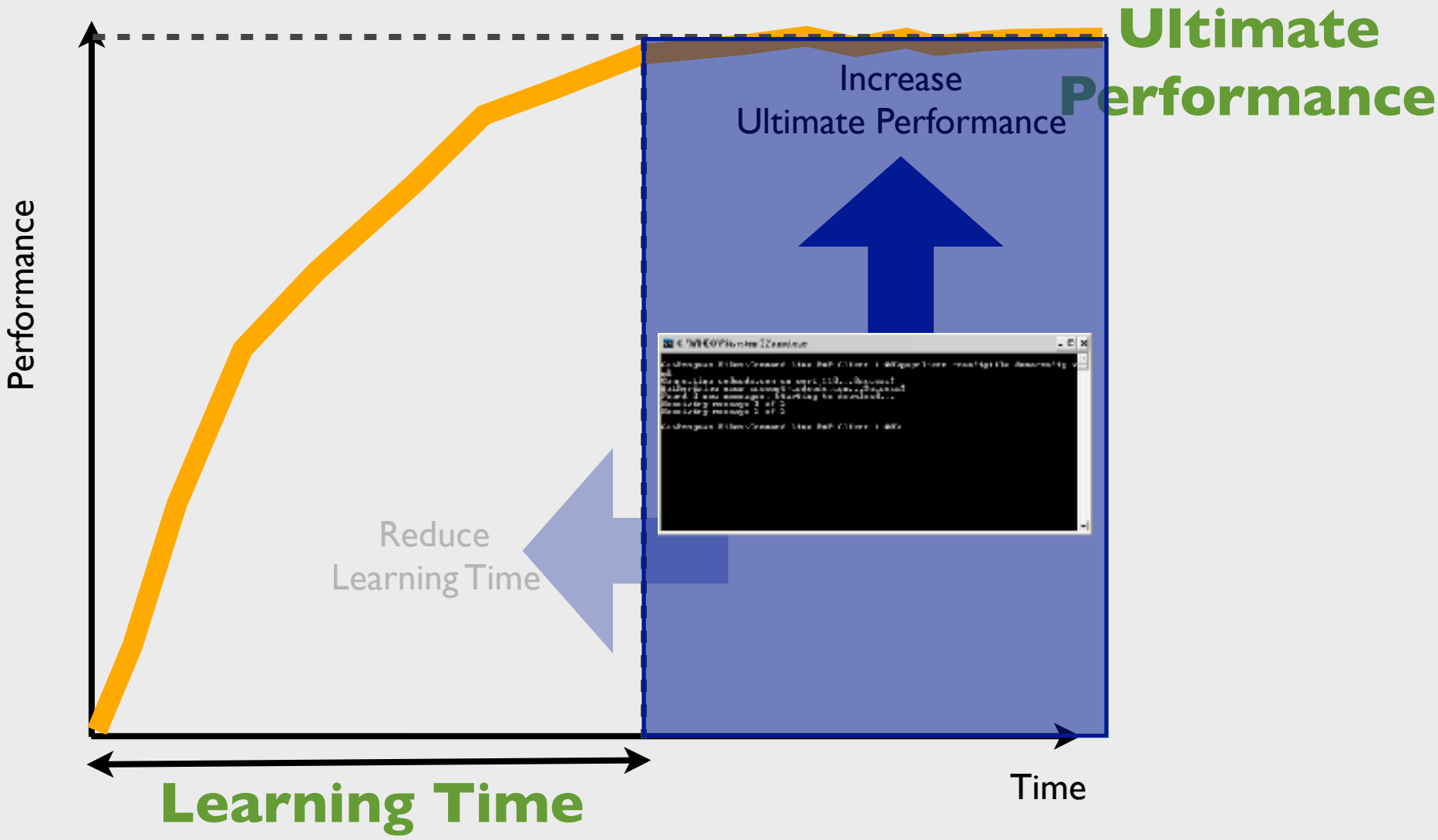
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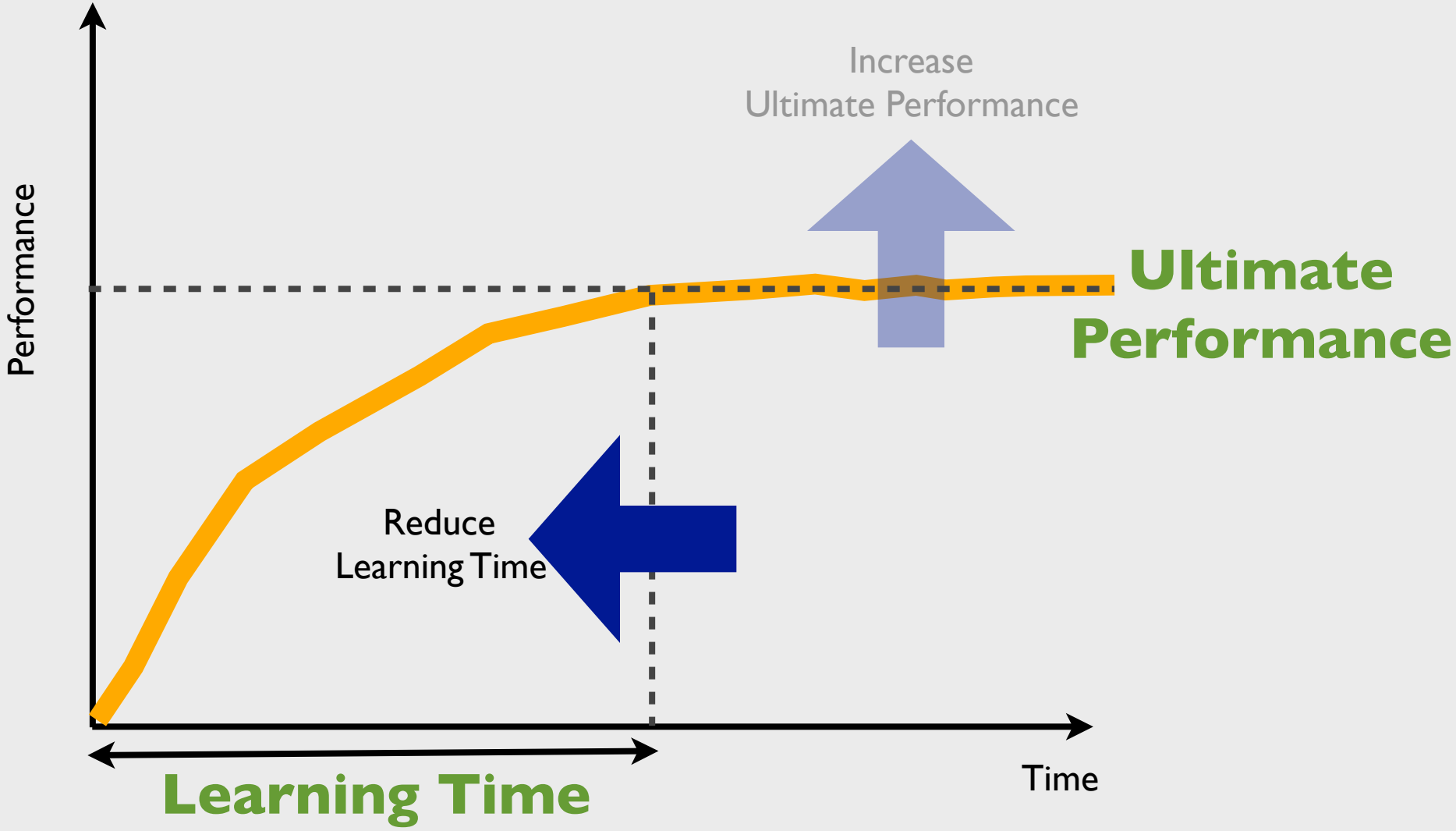
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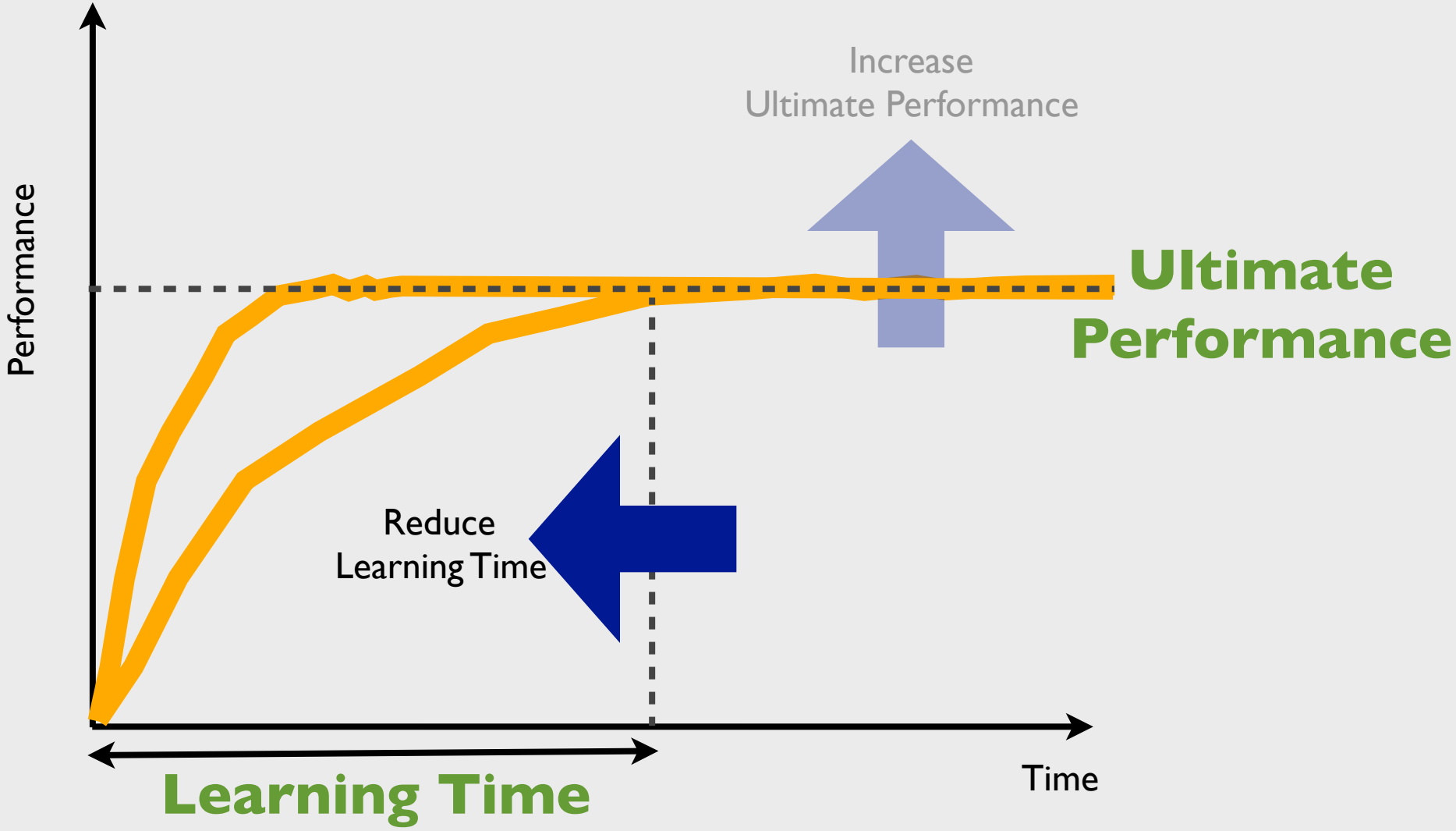
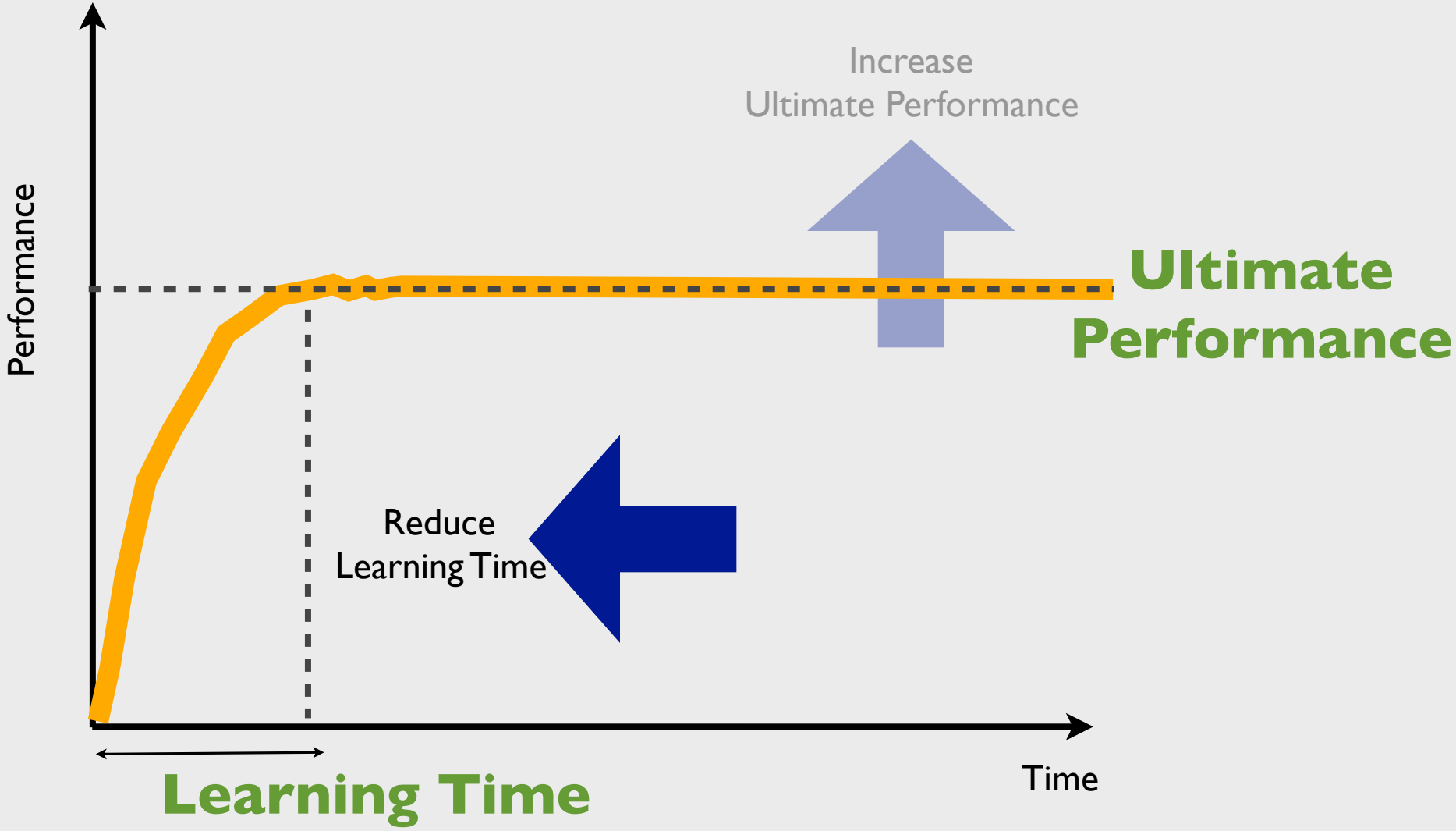
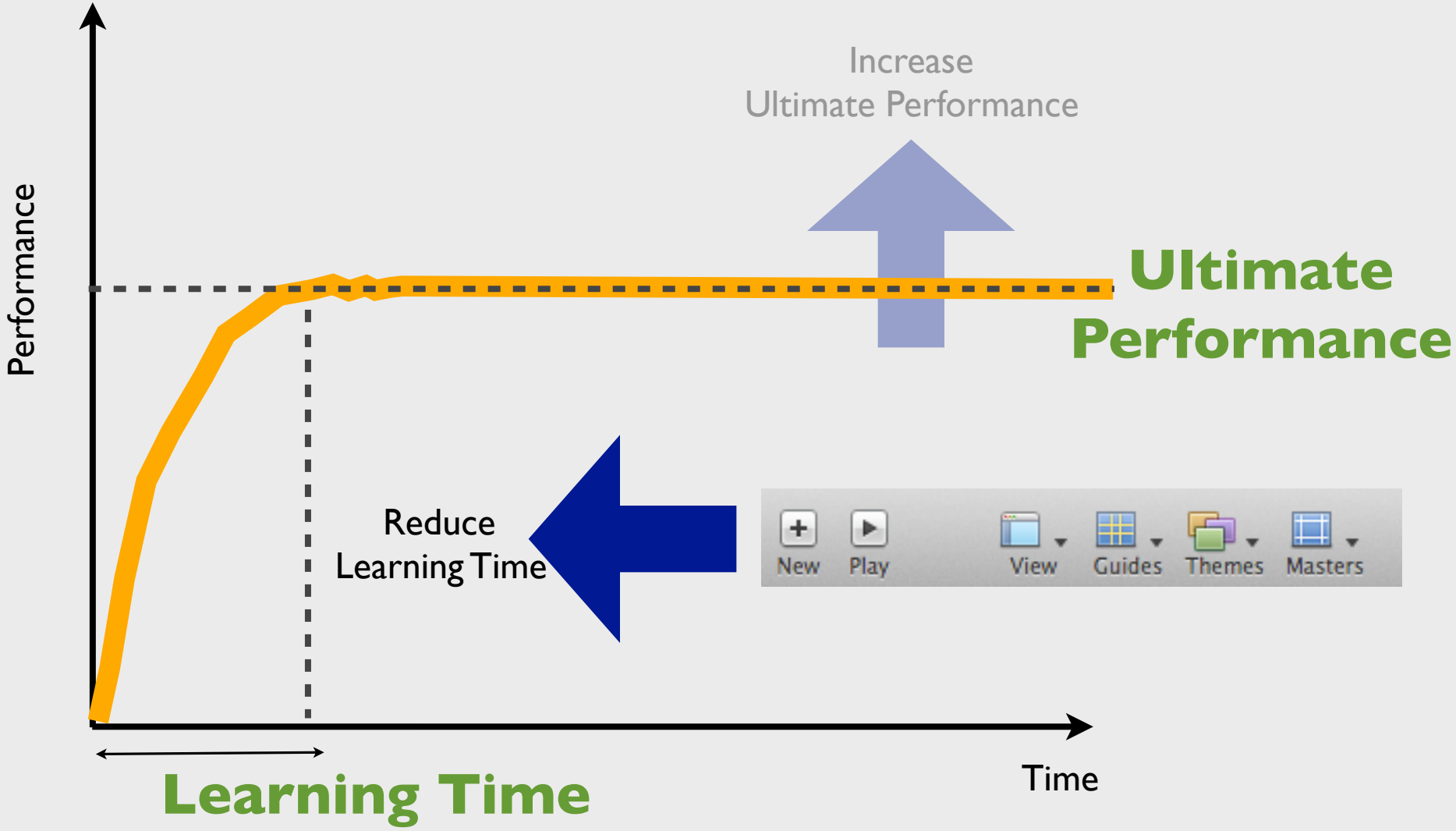
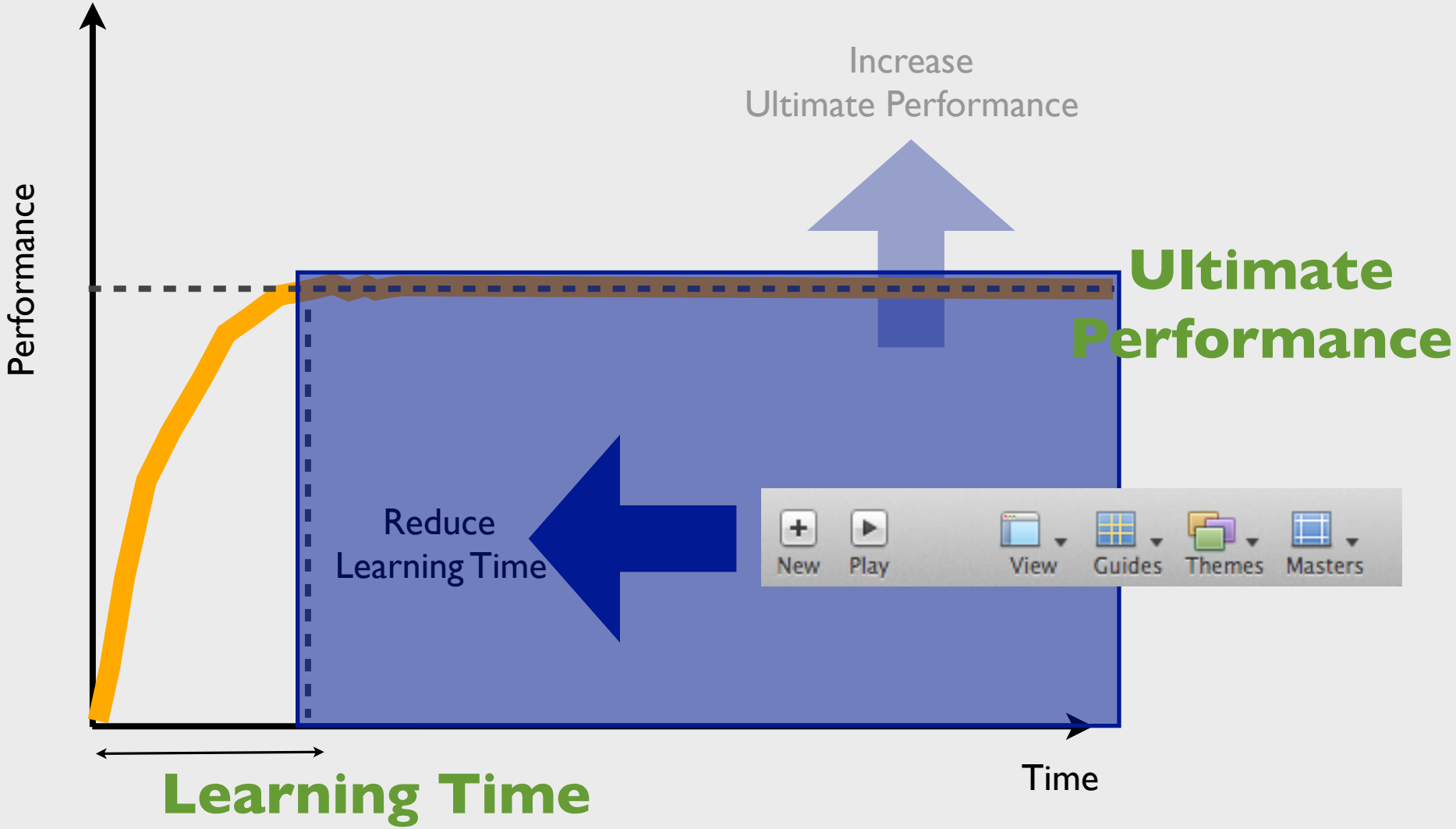
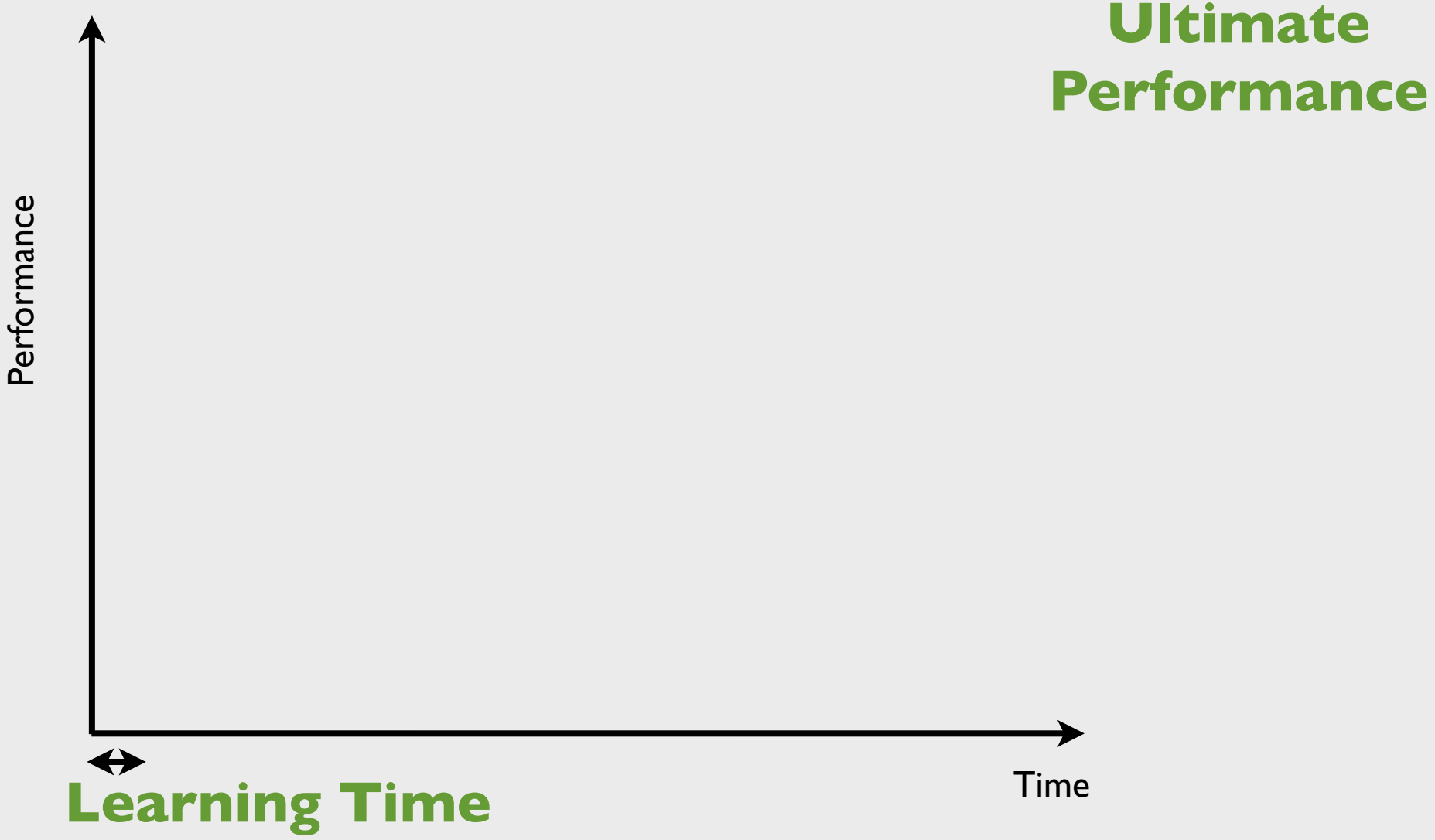
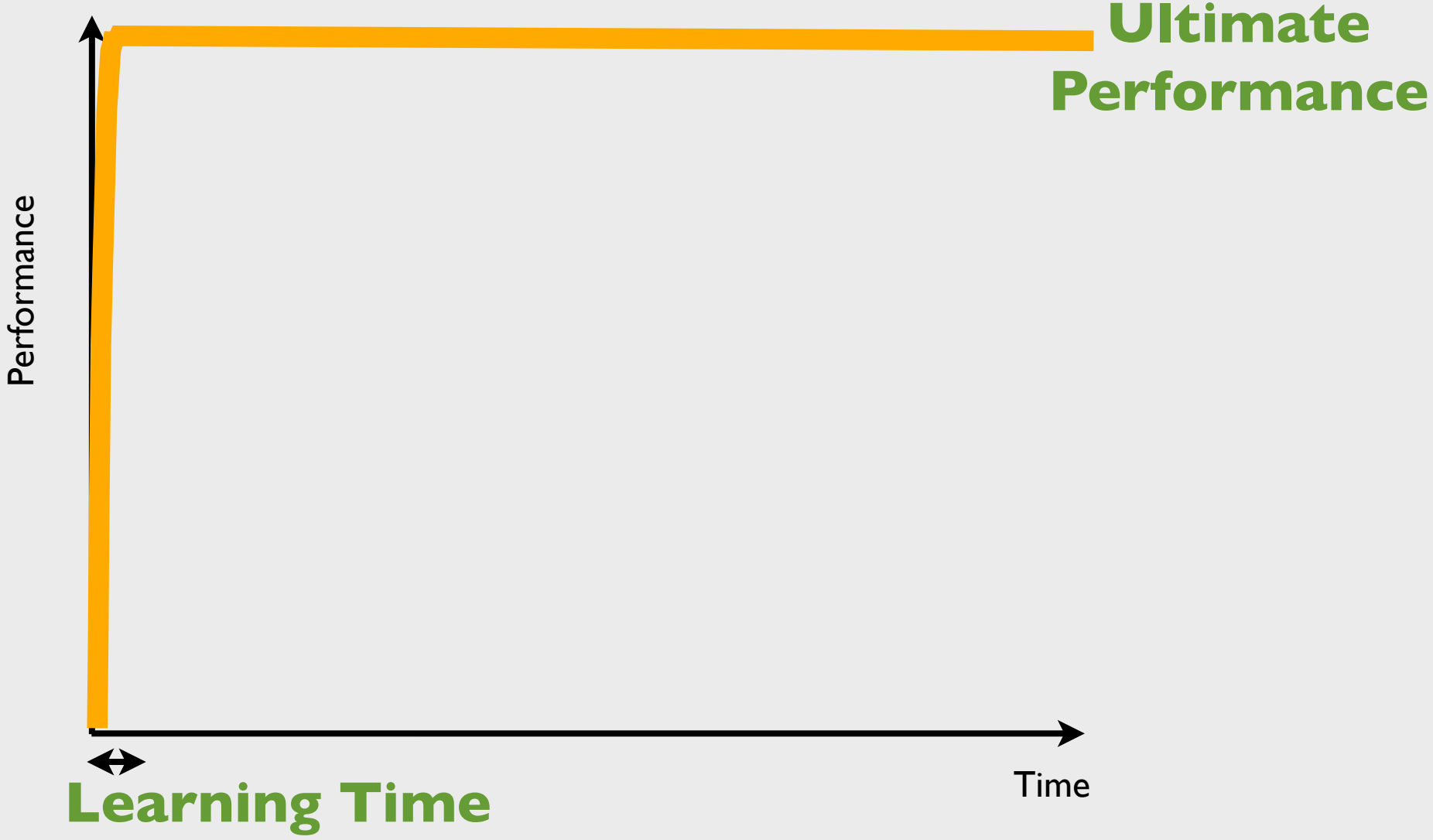

Increase
Ultimate Performance
Ultimate
Performance
Performance
Reduce
Learning Time
Learning Time
Time

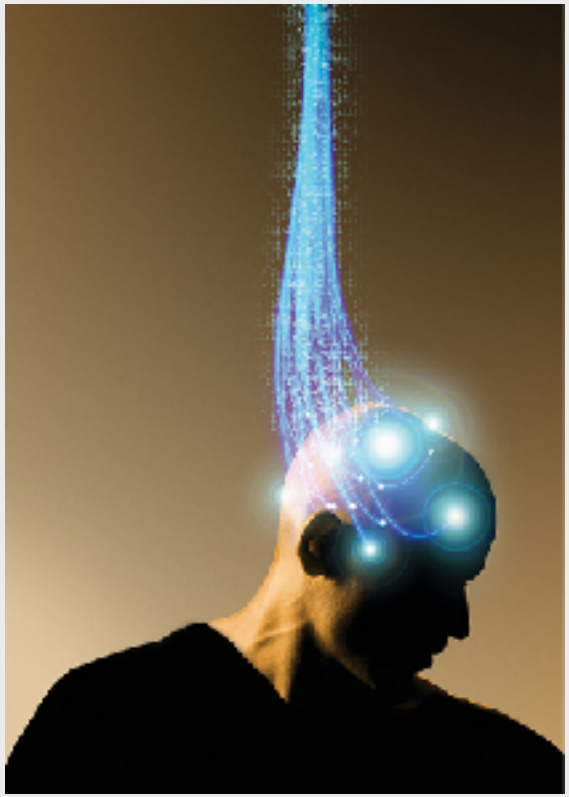

Increase
Ultimate Performance
Ultimate
Performance
Performance
Reduce
Learning Time
Learning Time
Time


Increase
Ultimate Performance
Ultimate
Performance
Performance
Reduce
Learning Time
New
Play
View
Guides
Themes
Masters
Time
Learning Time


Increase
Ultimate Performance
Ultimate
Performance
Performance
Reduce
Learning Time
New
Play
View
Guides
Themes
Masters
Time
Learning Time


Ultimate Performance
Performance
Time
Learning Time


Ultimate
Performance
Performance
Time
Learning Time

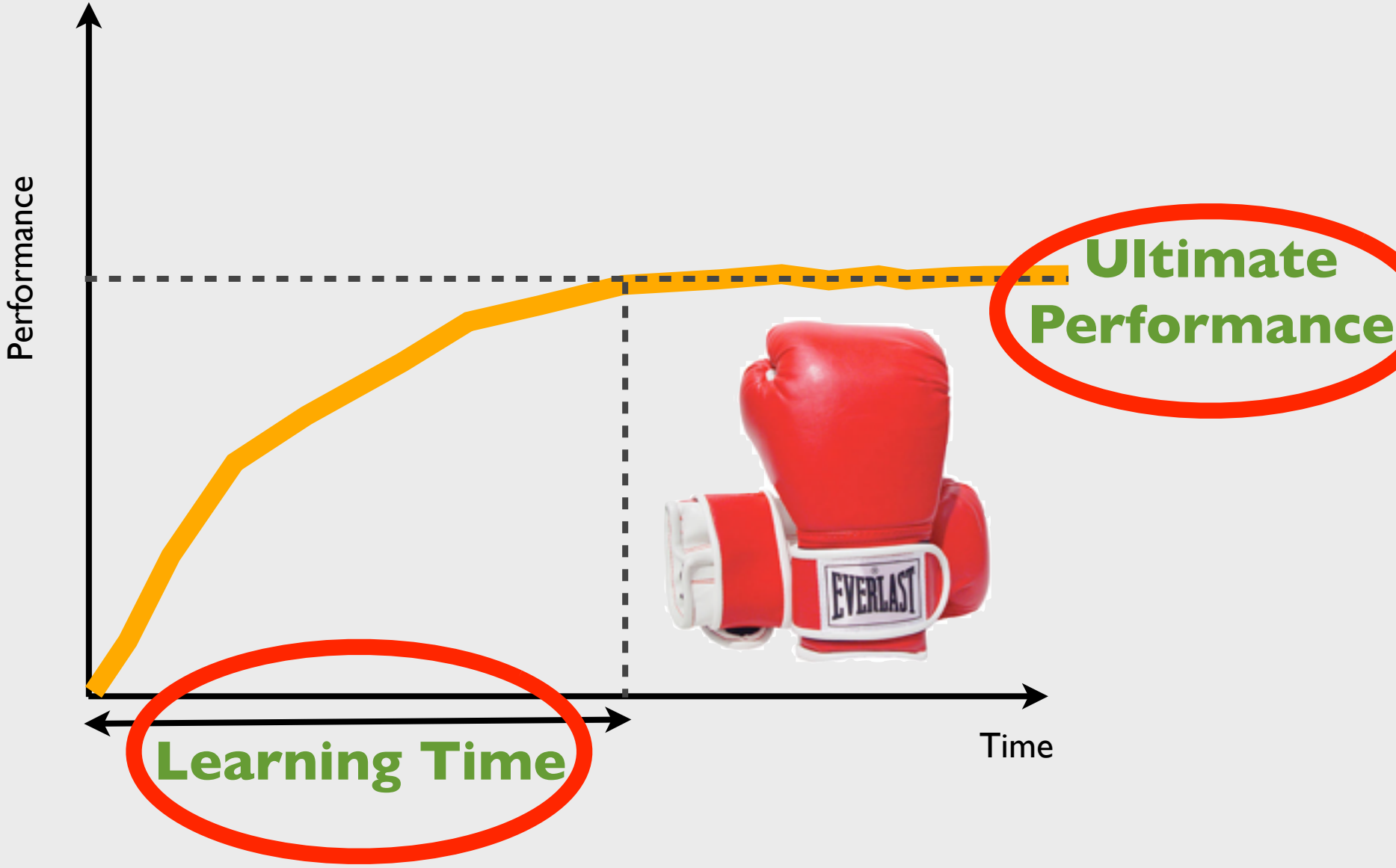


Ultimate Performance

Performance

Time

Learning Time


Performance
Ultimate Performance
EVERLAST
Learning Time
Time

Criteria

10s Brainstorming

Ultimate Performance

Learning Time

non exhaustive list

Criteria

Ultimate Performance

Learning Time

non exhaustive list

Criteria

Speed
Accuracy

Ultimate Performance

Learning Time

non exhaustive list

Criteria

Speed
Accuracy

Ultimate Performance

Immediate Usability

Extended Learning

Learning Time

non exhaustive list

Criteria

Accessibility
Satisfaction
Fatigue
etc.

Speed
Accuracy

Ultimate Performance

Immediate Usability

Extended Learning

Learning Time

non exhaustive list

Criteria

Accessibility
Satisfaction
Fatigue
etc.

Speed
Accuracy

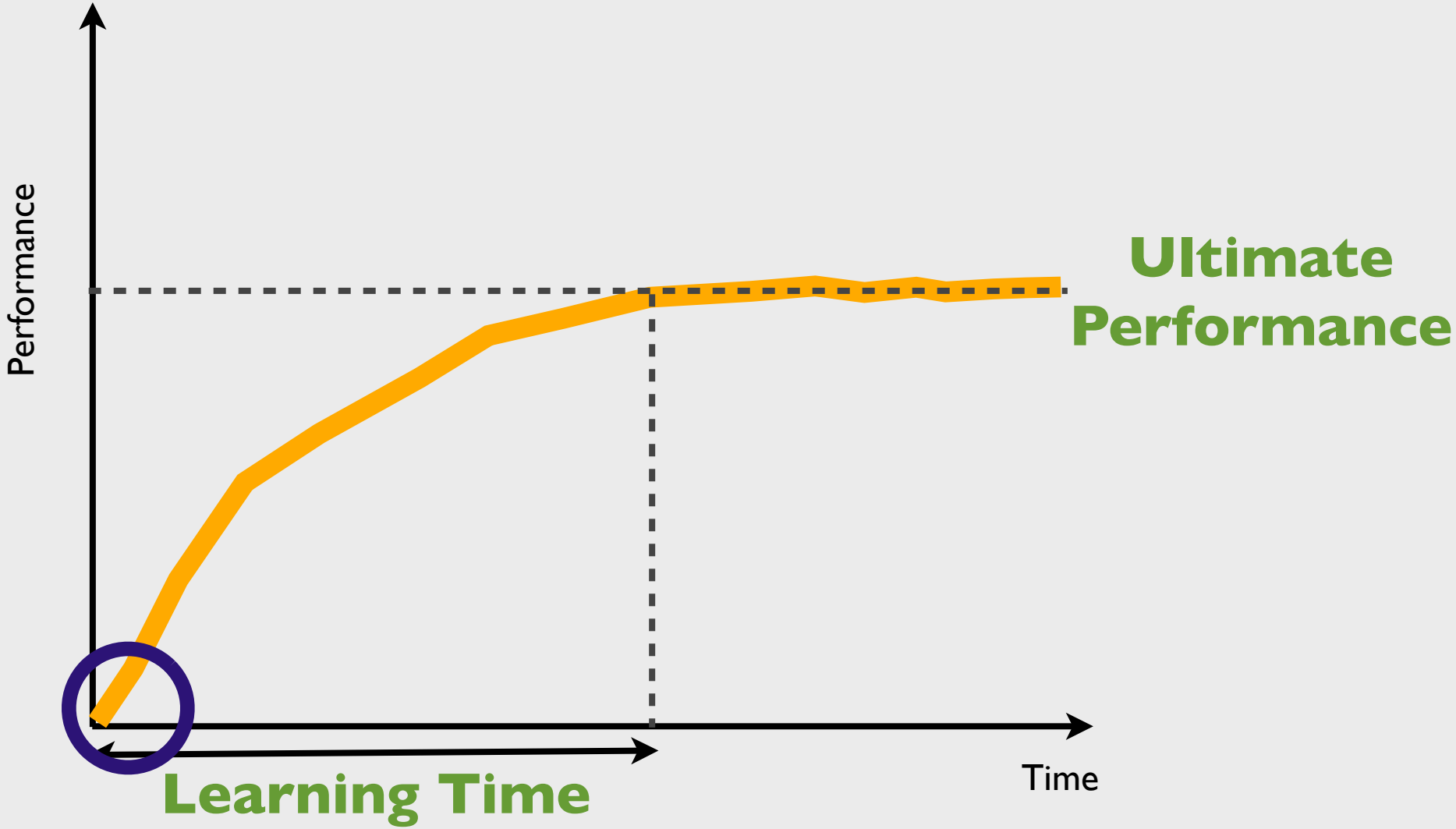
Ultimate Performance

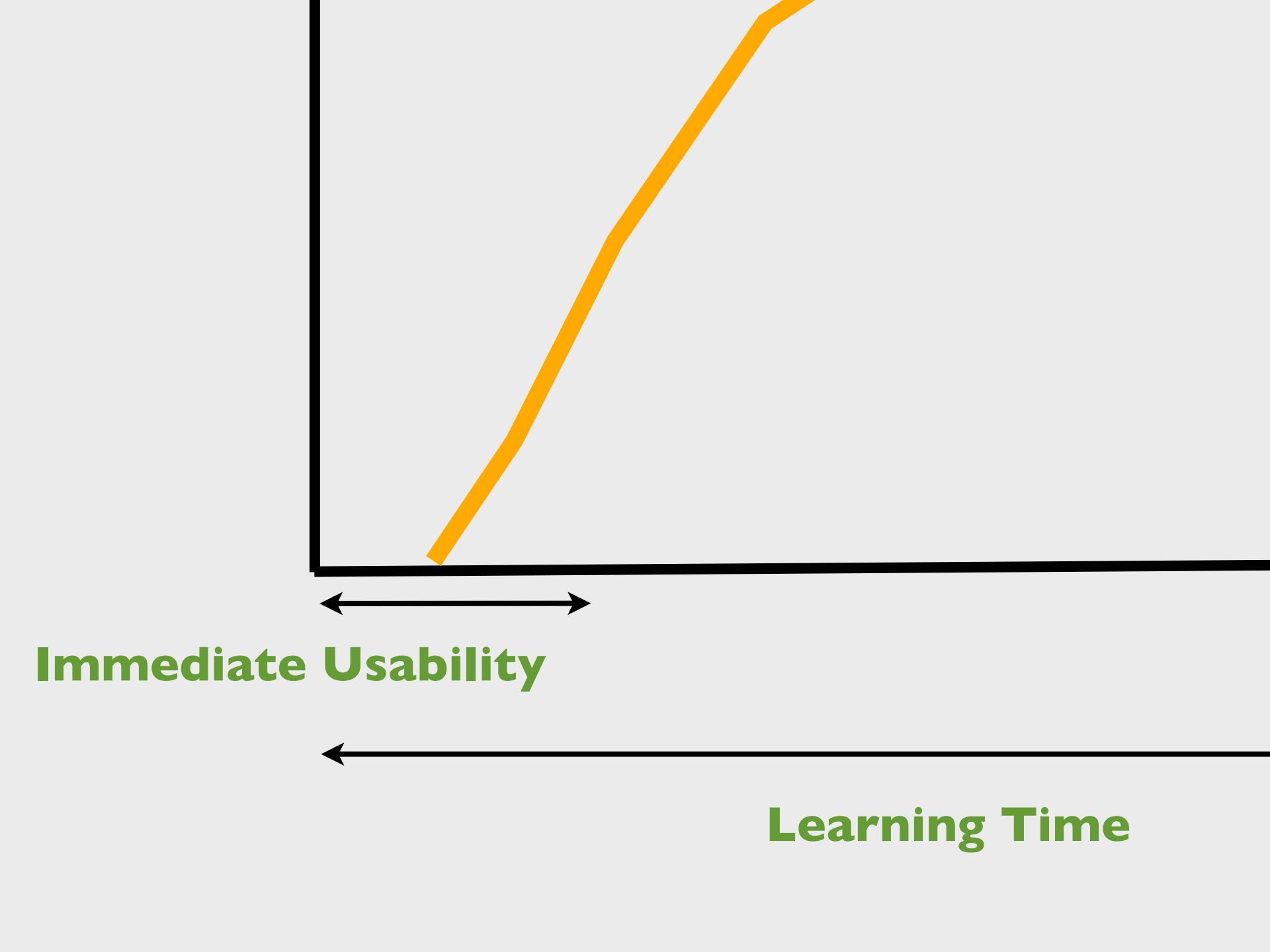
Immediate Usability

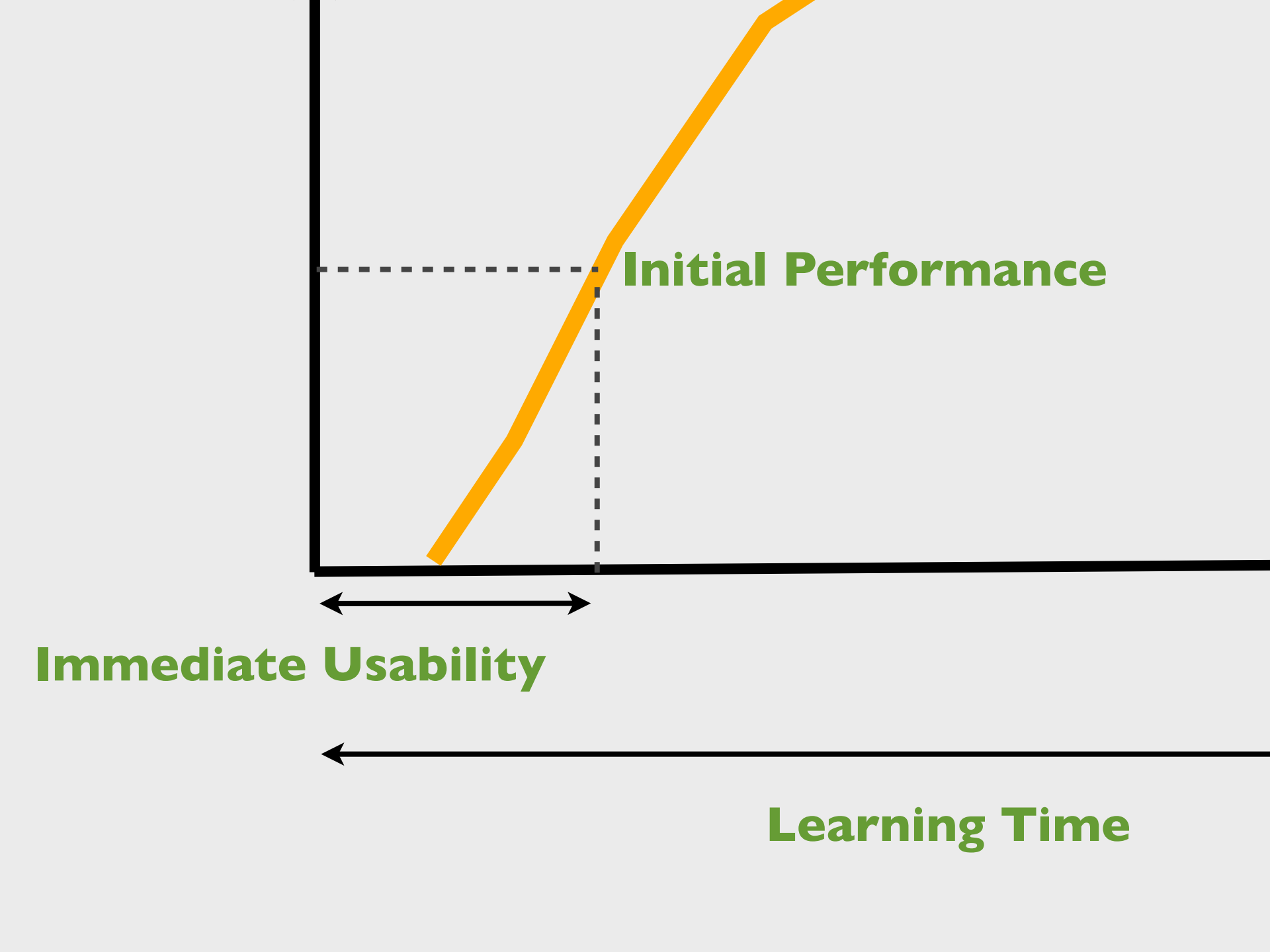
Extended Learning

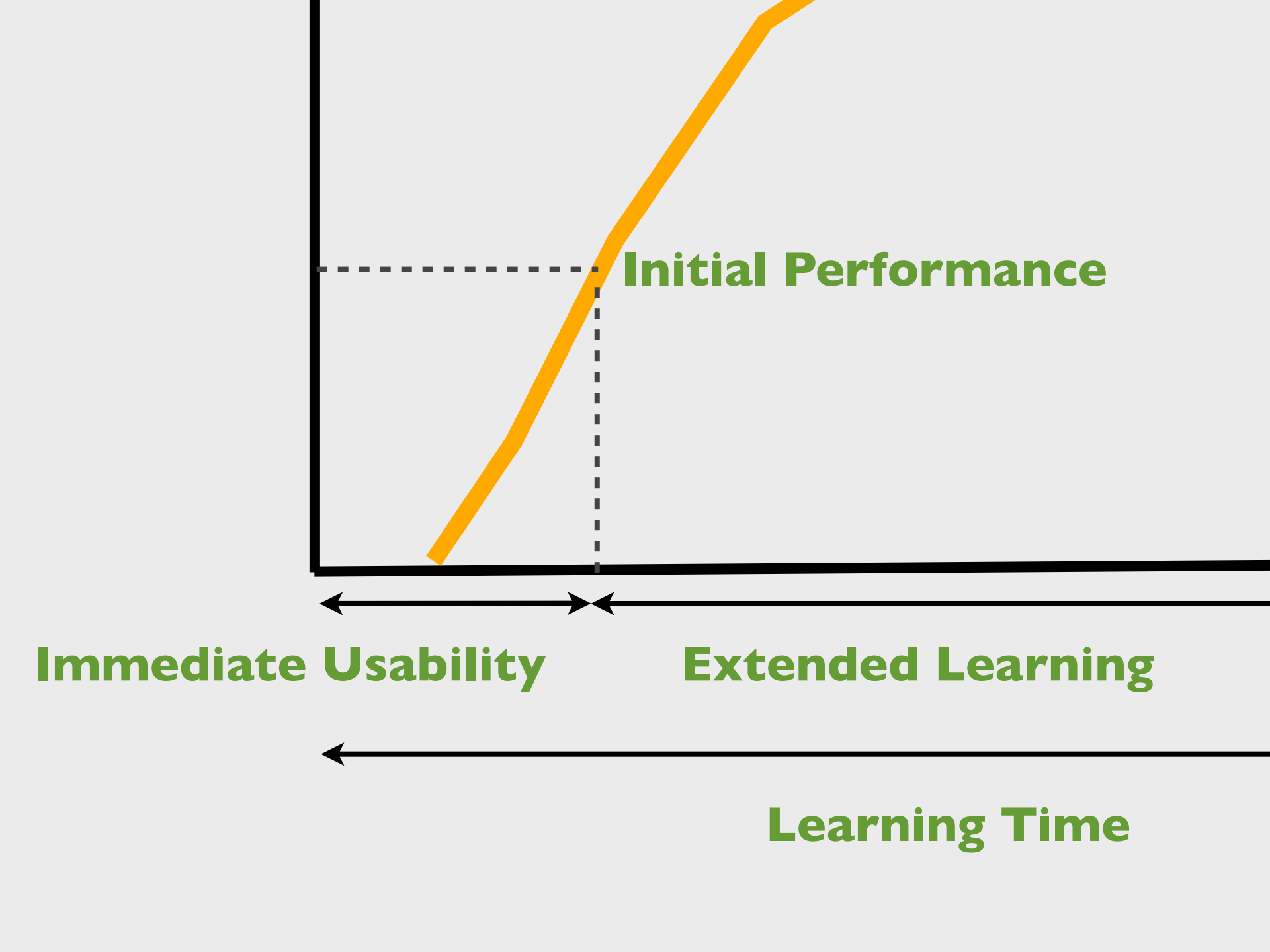
Learning Time

non exhaustive list

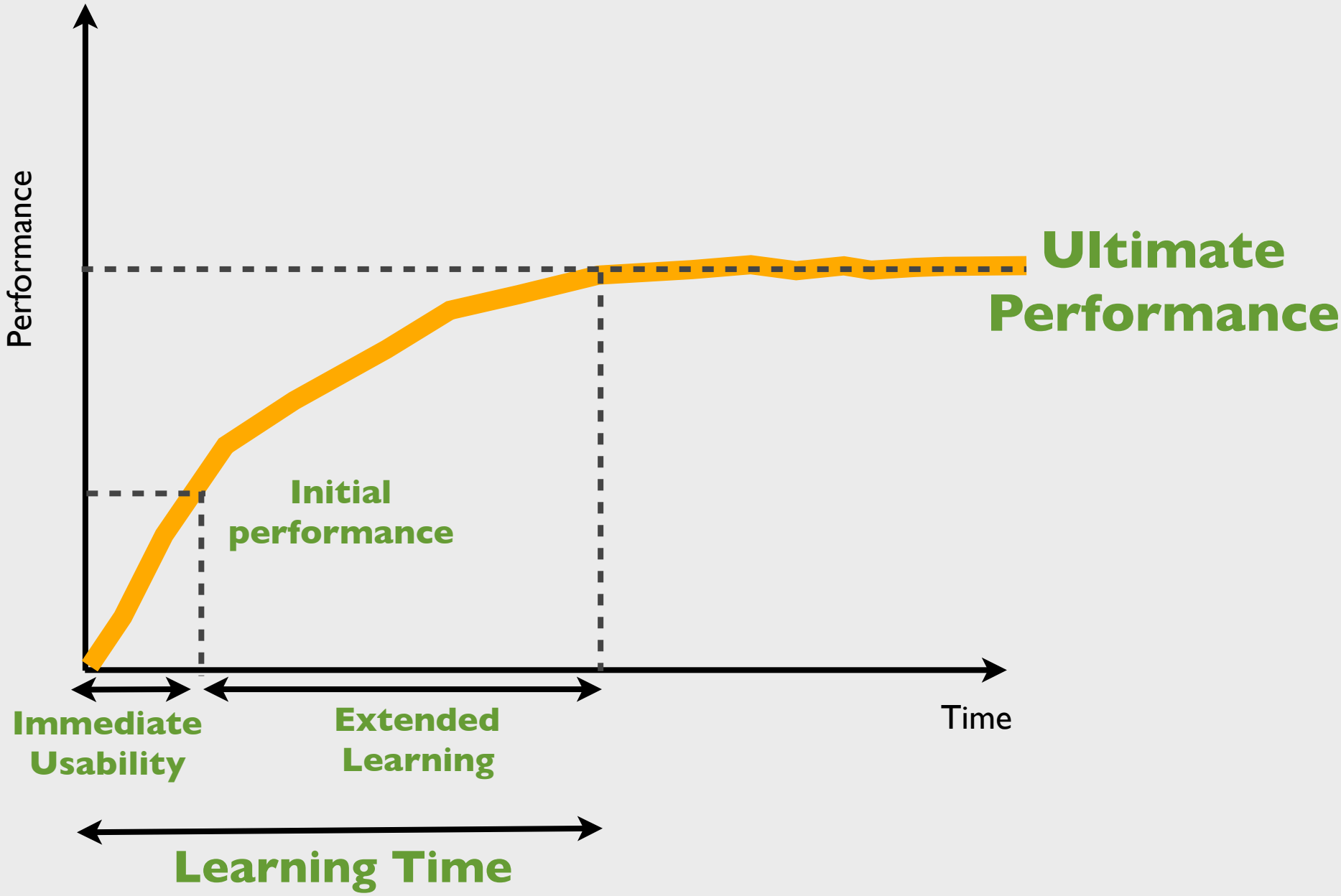

Performance
Ultimate
Performance
Time
Learning Time


Immediate Usability
Learning Time


Initial Performance
Immediate Usability
Learning Time

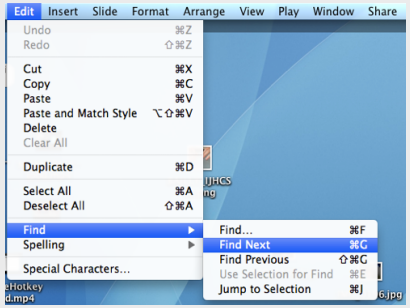

Initial Performance
Immediate Usability
Extended Learning
Learning Time

Interactive Public Displays


Performance
Ultimate
Performance
Initial
performance
Time
Immediate
Usability
Extended
Learning
Learning Time

is it so easy?

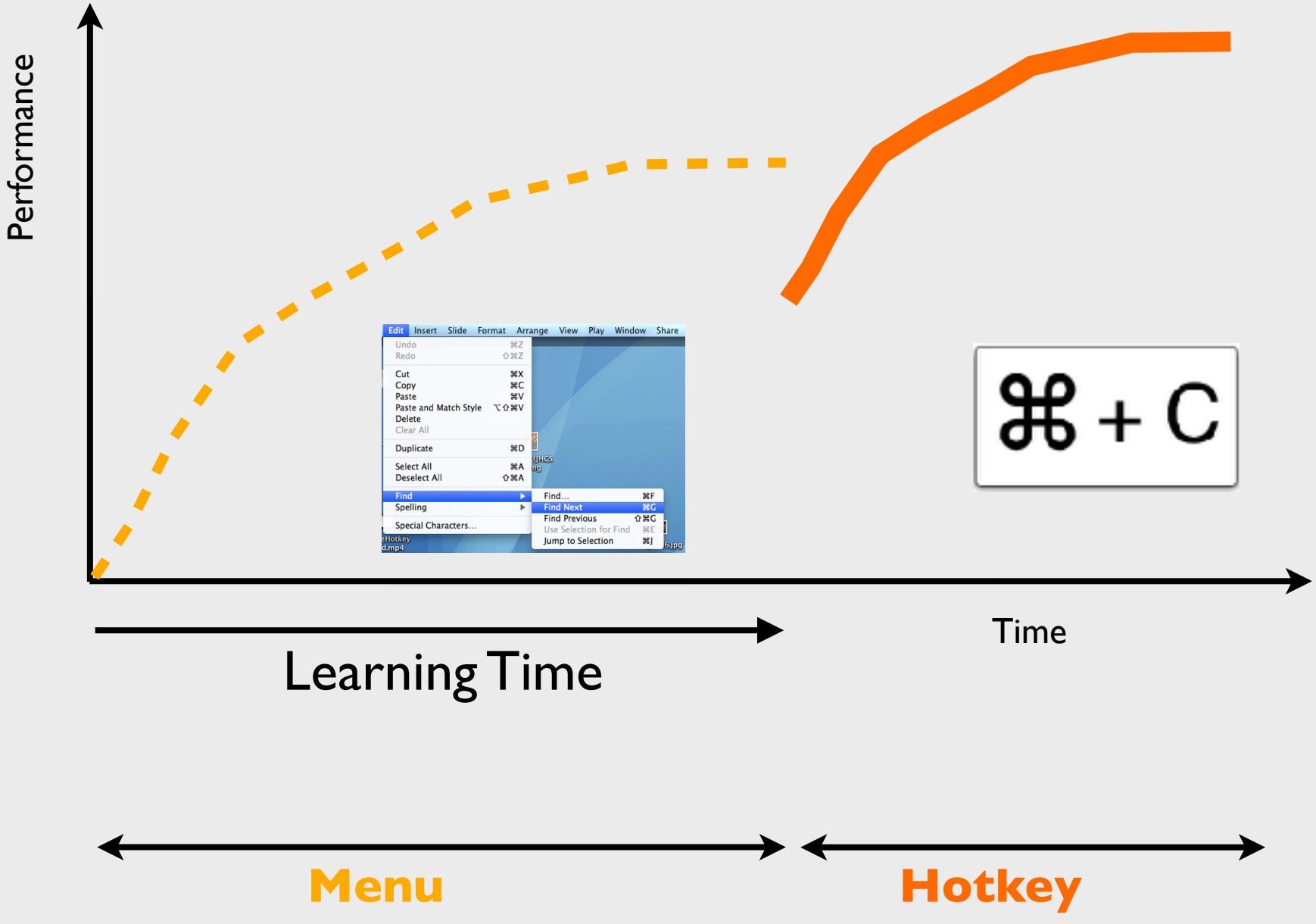
Several Modalities?

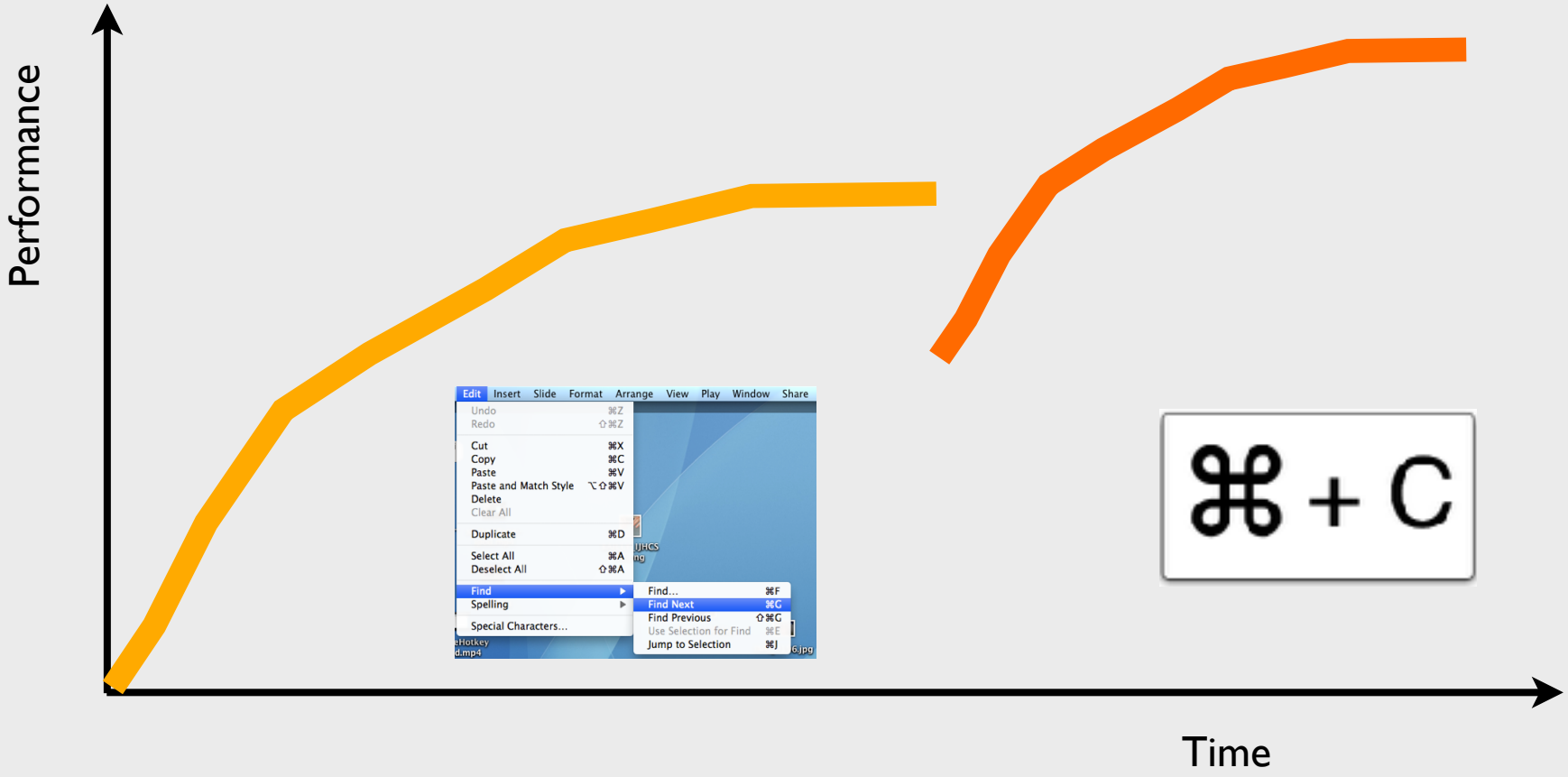


First modality
ex: Menu

Second modality
ex: Hotkeys

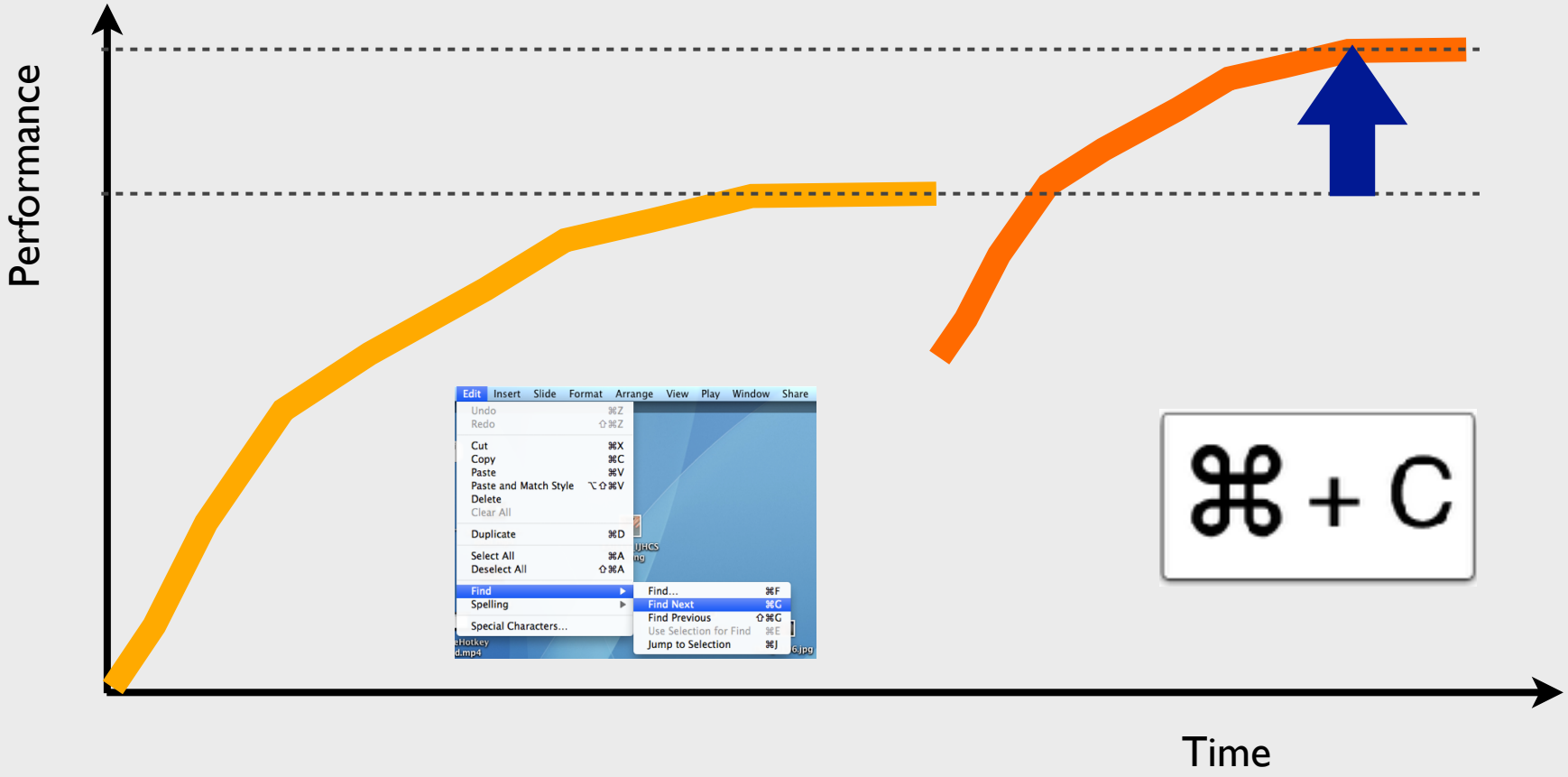
Several Modalities?


Performance
Edit Insert Slide Format Arrange View Play Window Share
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find... ⌘F
Find Next ⌘G
Find Previous ⇧⌘G
Use Selection for Find ⌘E
Jump to Selection ⌘J
⌘ + C
Time
Learning Time
Menu
Hotkey



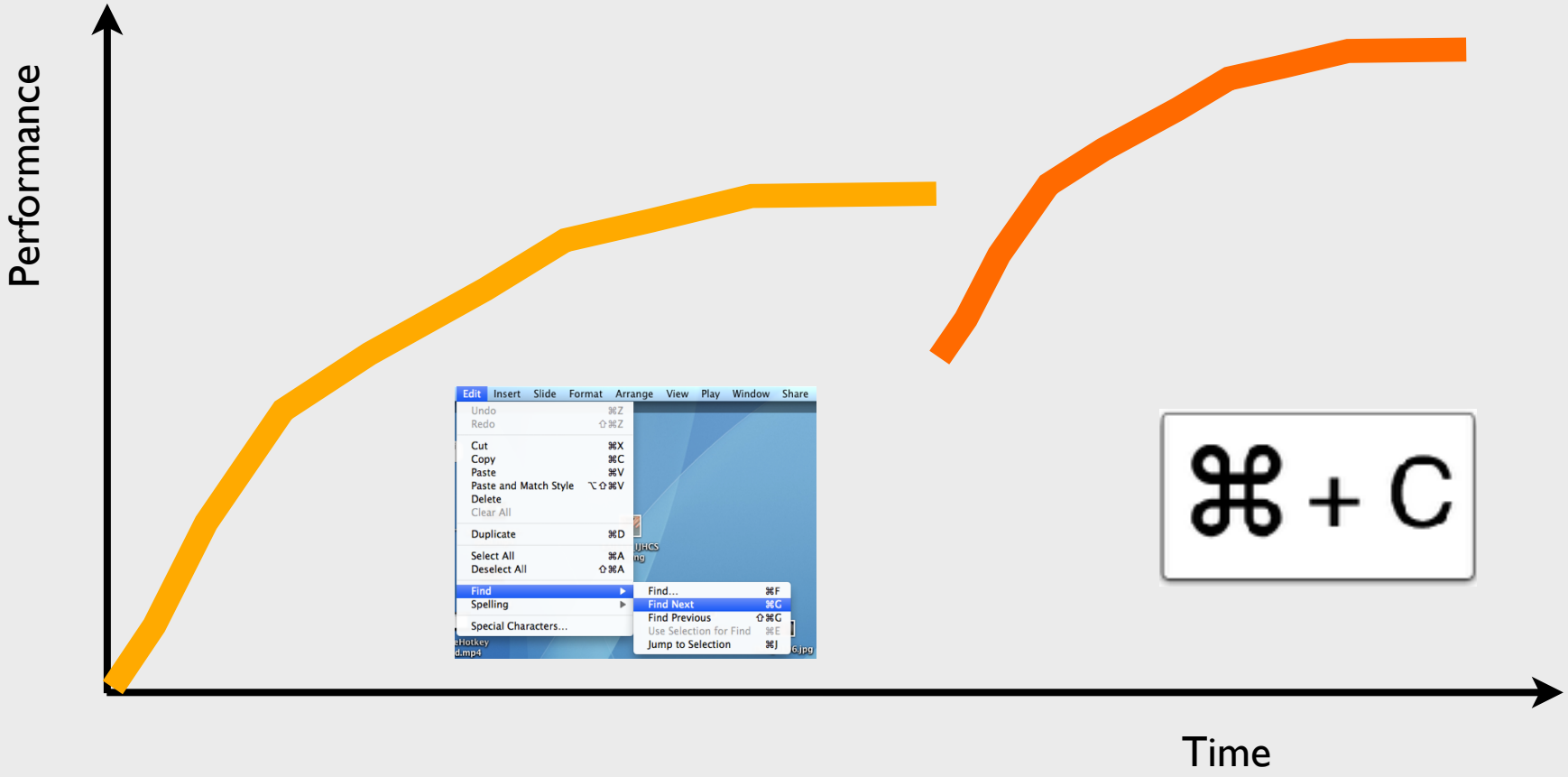
Modality 1

Modality 2



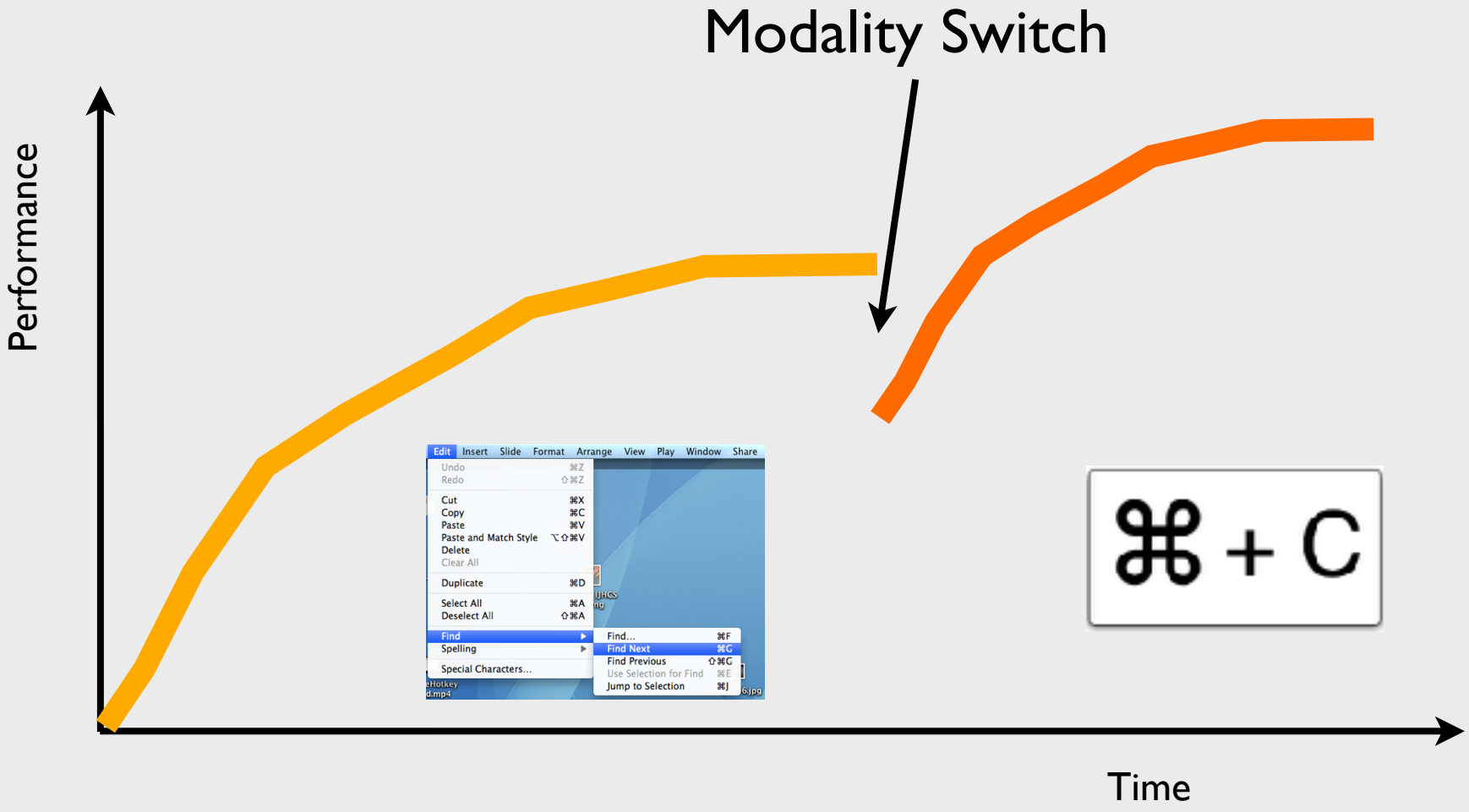
Modality 1

Modality 2



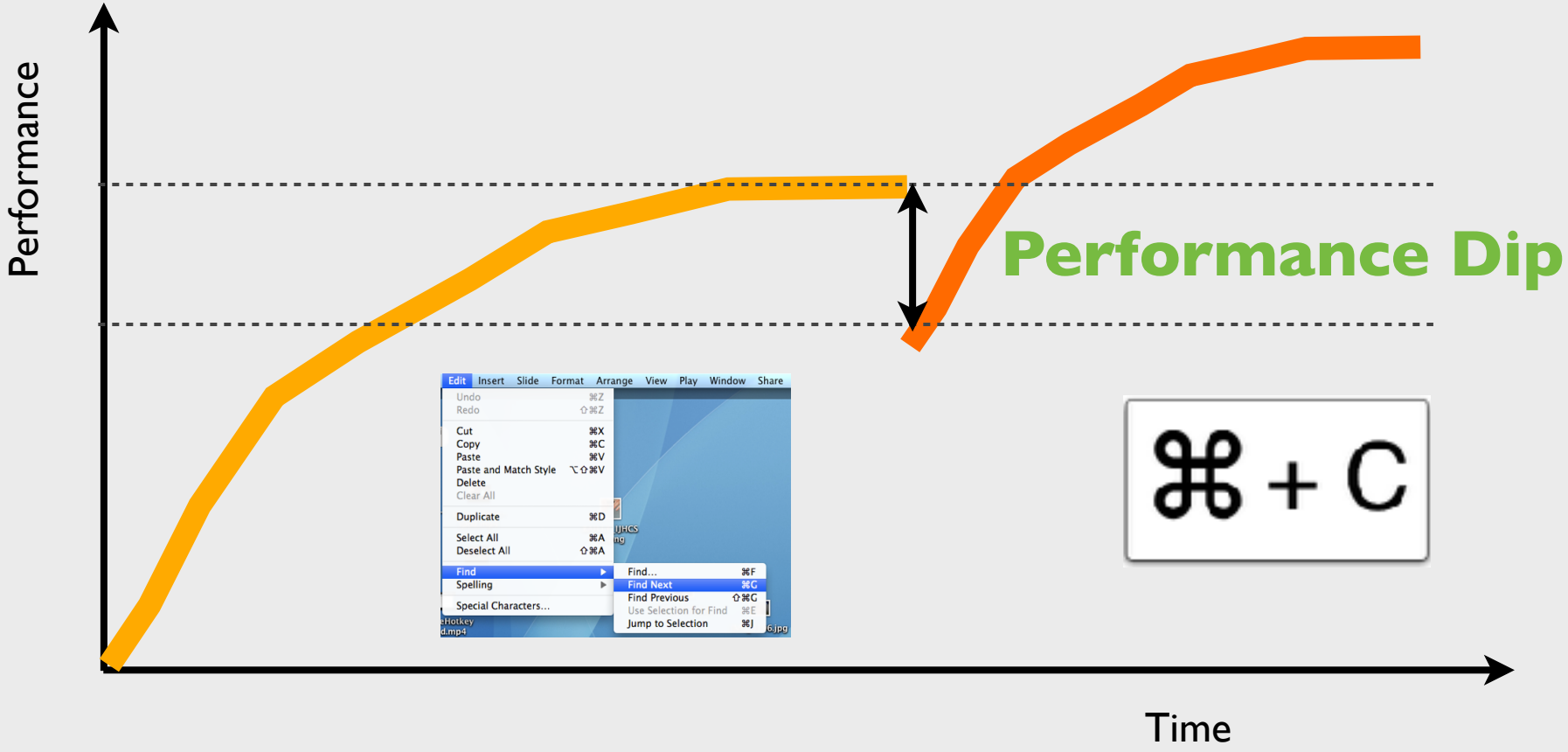
Modality 1

Modality 2

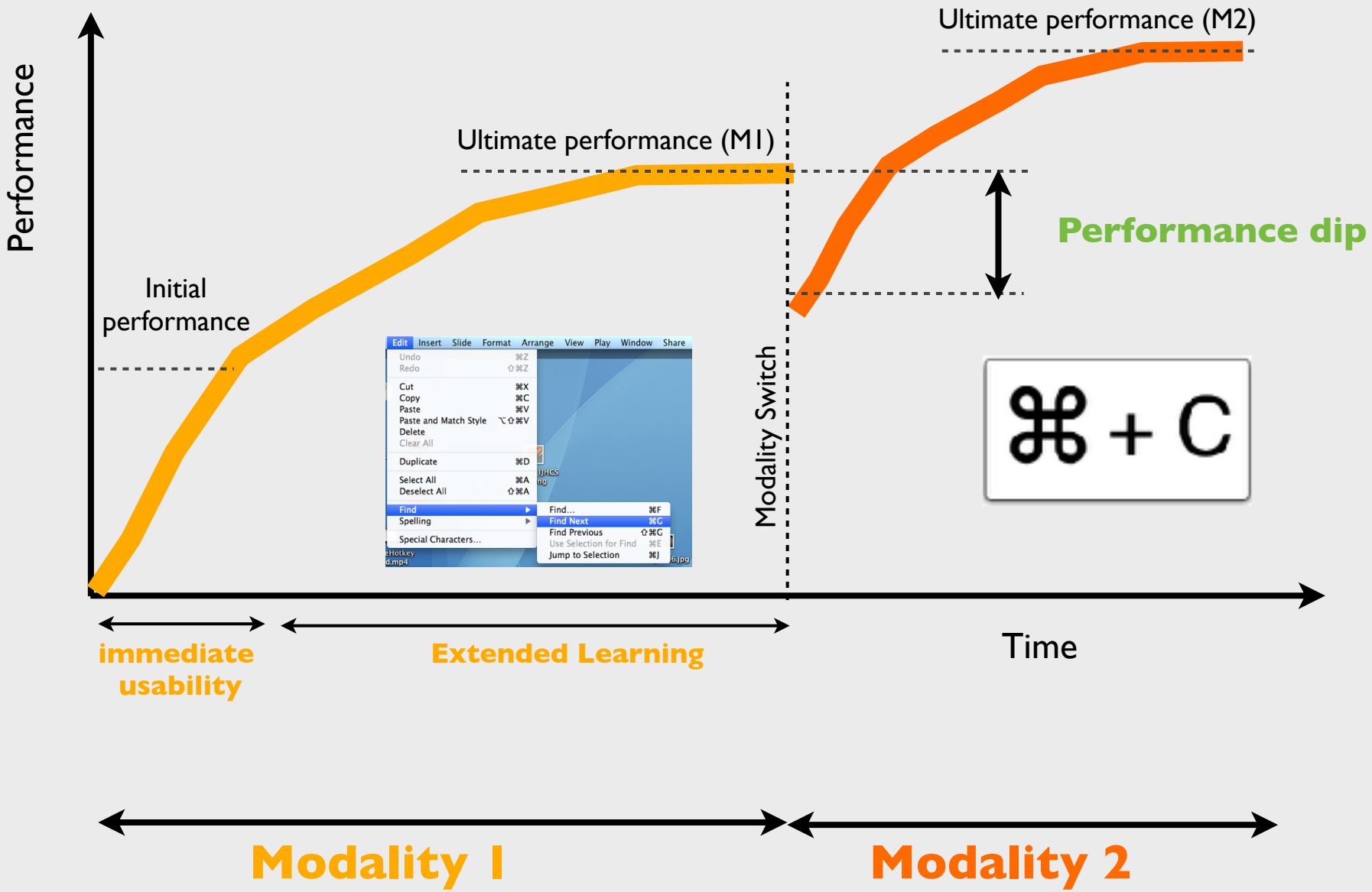


Modality 1 **Modality 2**

Modality Switch

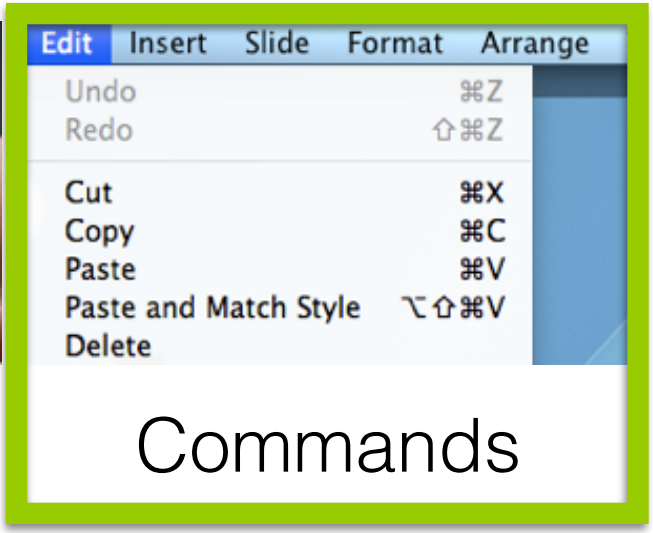


Modality 1 **Modality 2**


Performance
Ultimate performance (M2)
Ultimate performance (M1)
Performance dip
Initial performance
Modality Switch
⌘ + C
Time
immediate usability
Extended Learning
Modality 1
Modality 2

Pointing

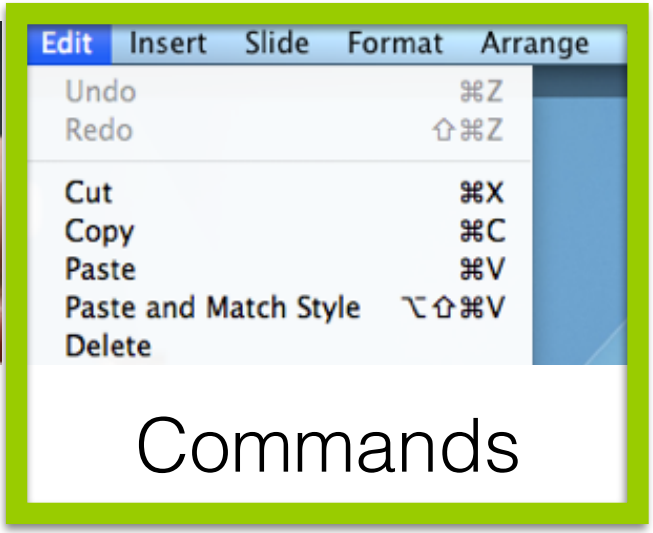
Text entry



Commands

Pointing

Text entry



Commands

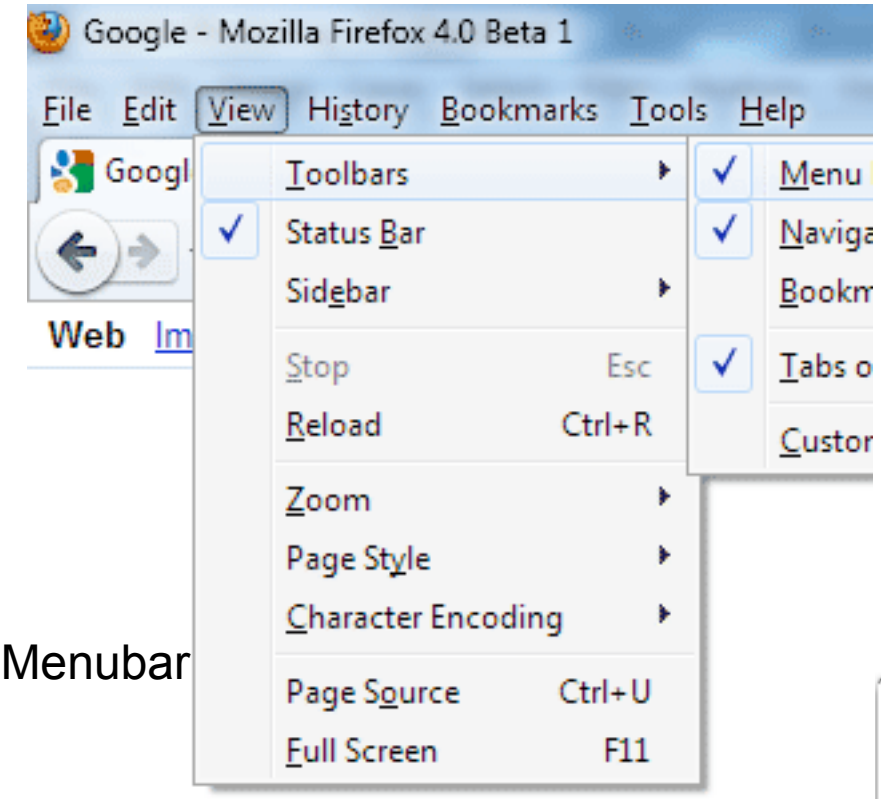
Outline

1. Traditional Interaction Technique
2. Novel Interaction Technique
3. Model of Menu Performance

Outline

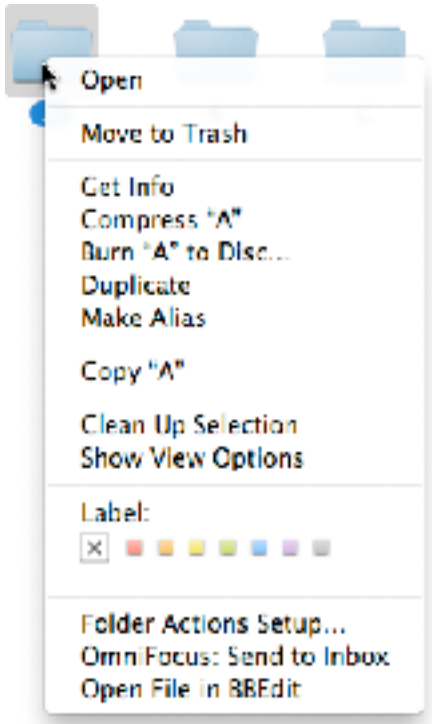
How?

Traditional Interaction Techniques

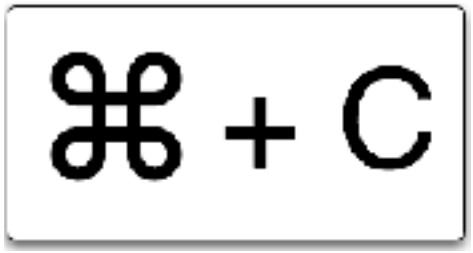


Menubar

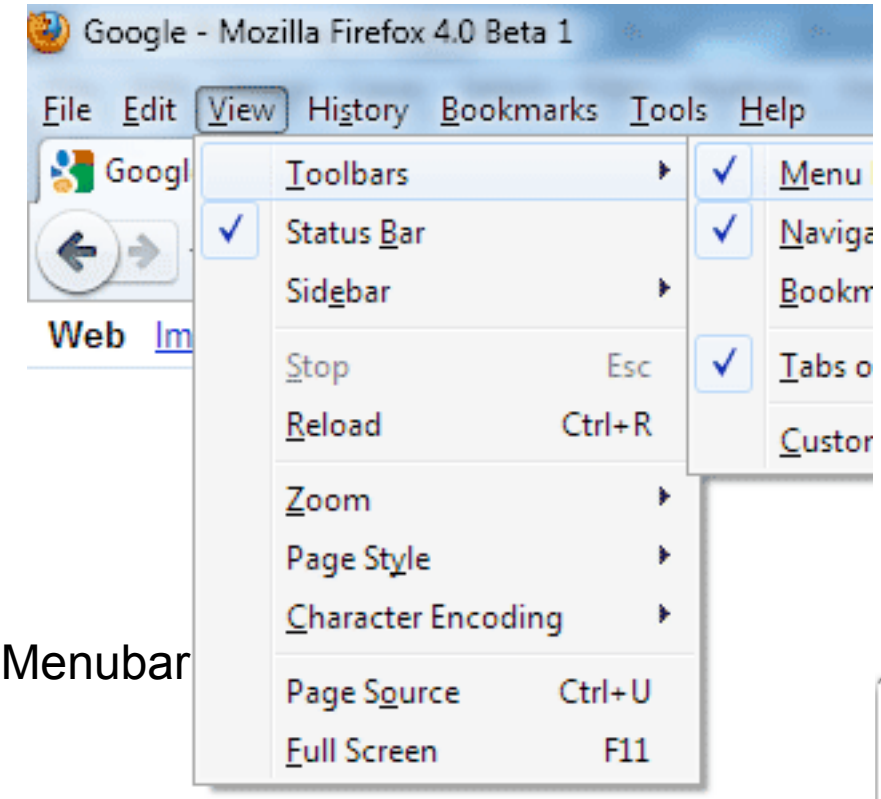
Toolbox



Context menu

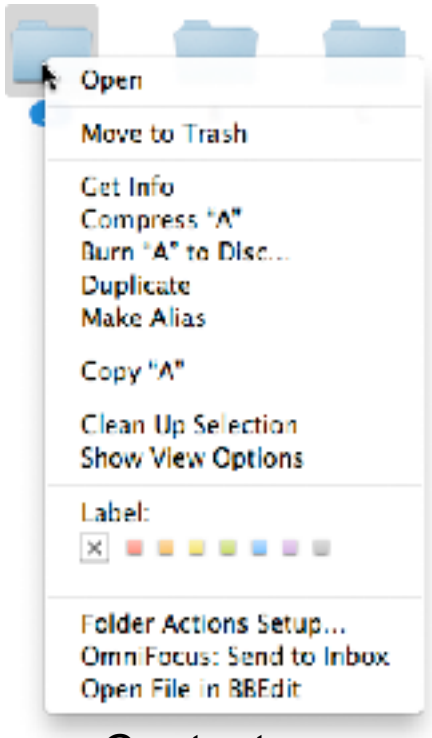


Keyboard shortcuts (hotkeys)

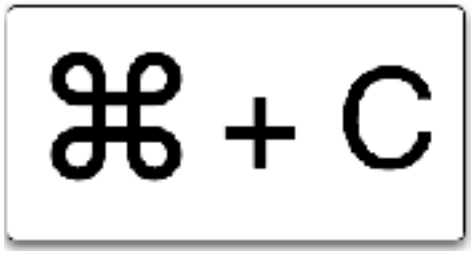


Menubar

Toolbox

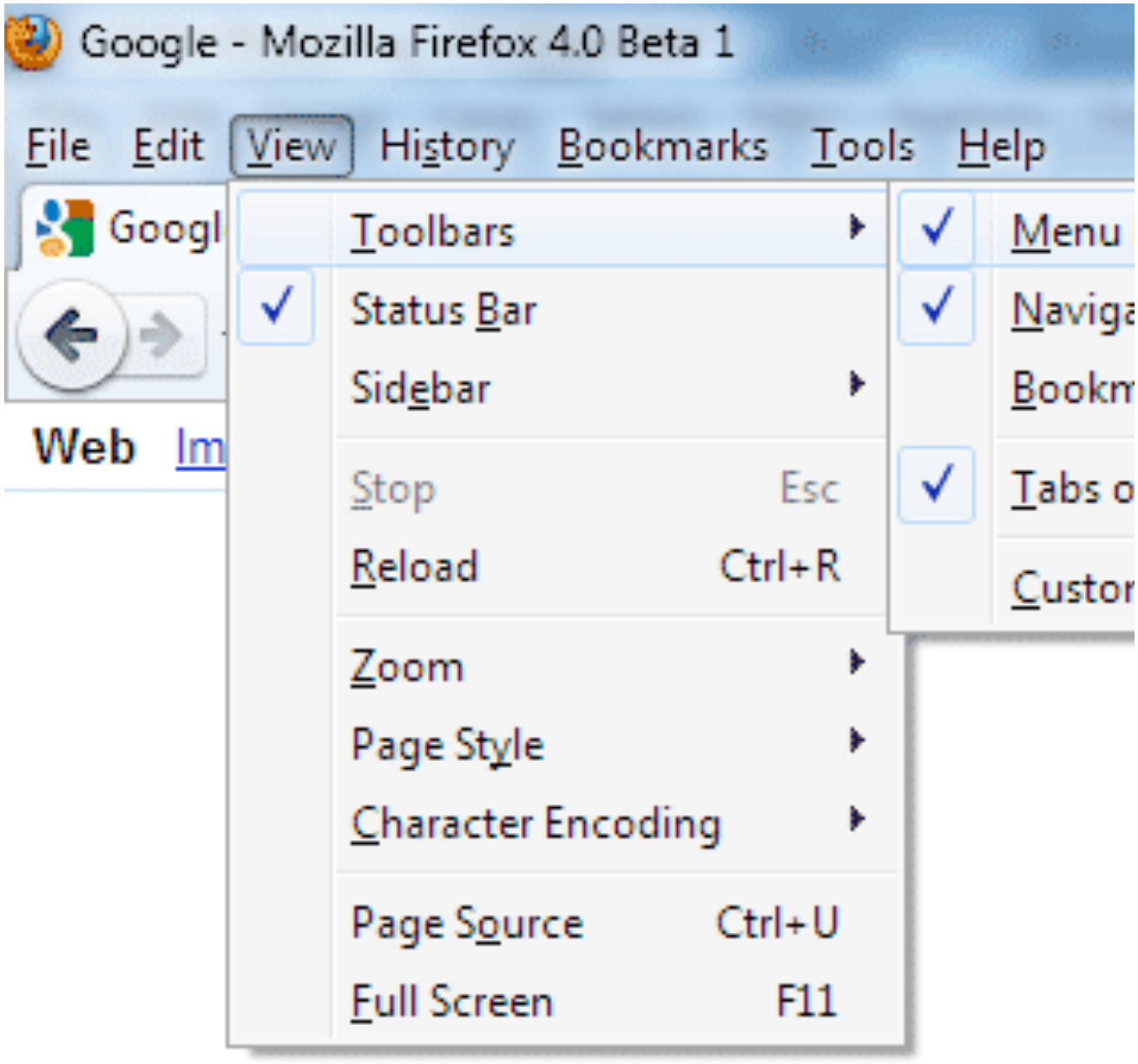


Context menu

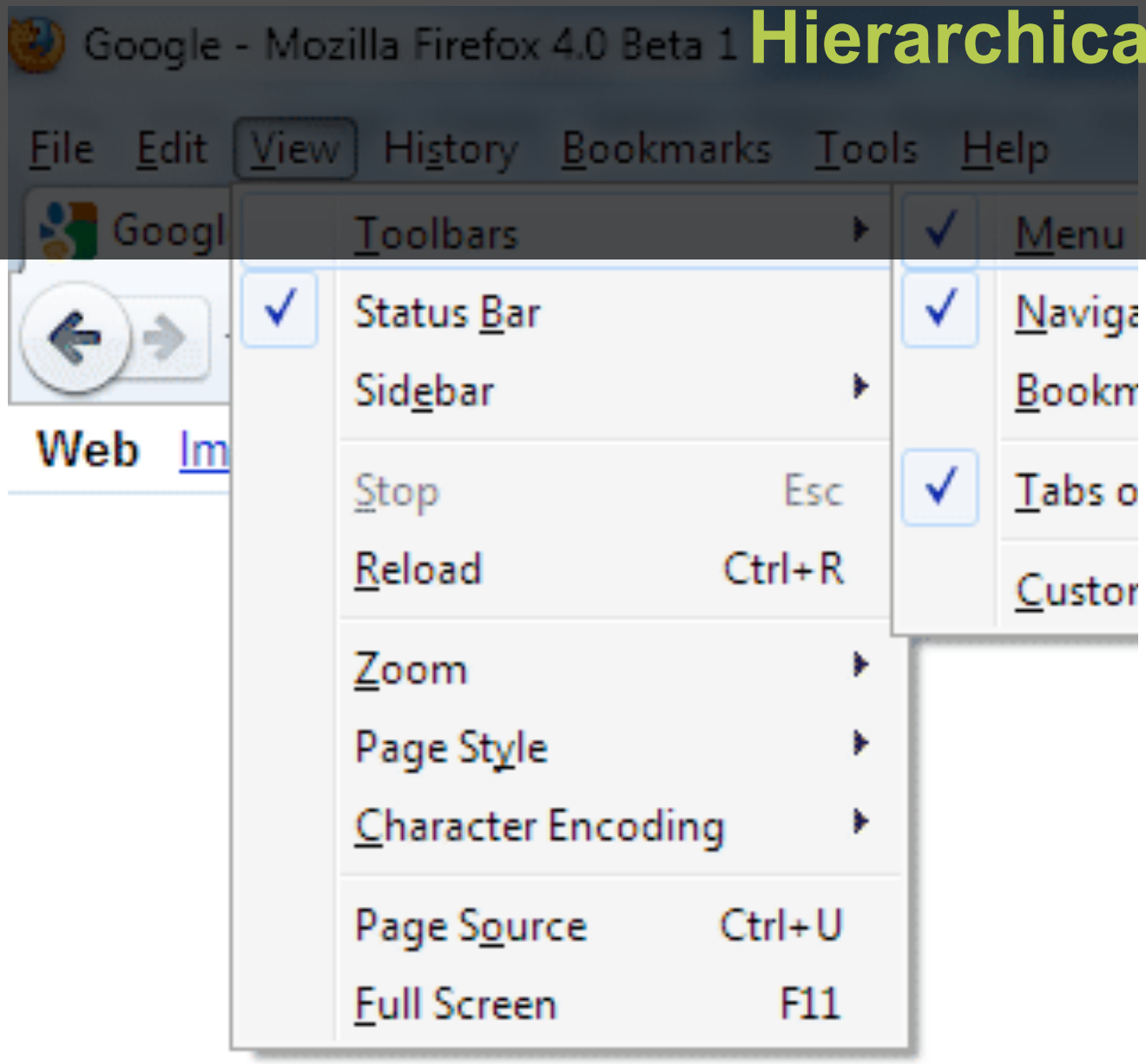


Keyboard shortcuts (hotkeys)

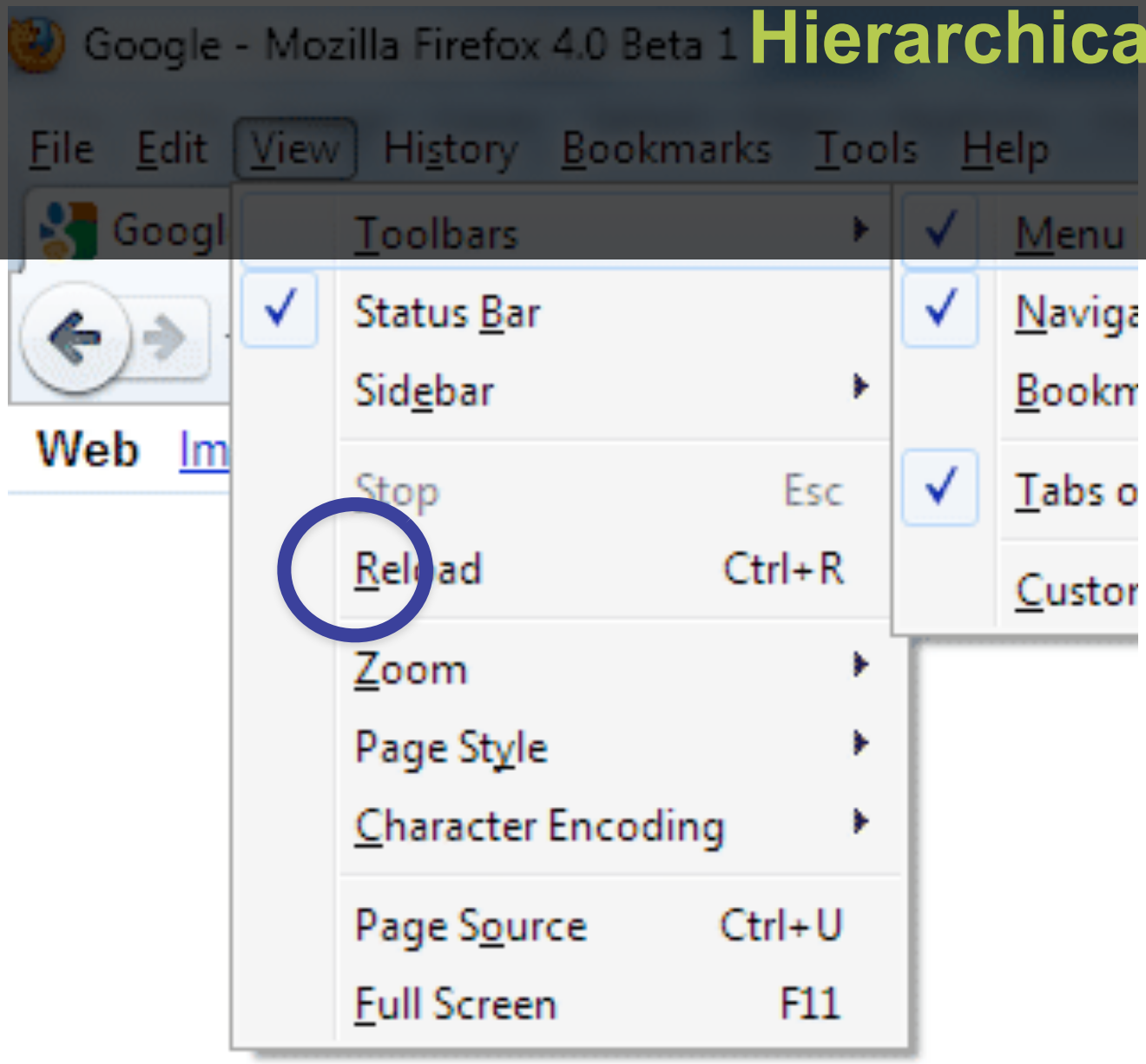
Brainstorming (30s)
Pros & Cons


Google - Mozilla Firefox 4.0 Beta 1
File
Edit
View
History
Bookmarks
Tools
Help
Toolbars
Status Bar
Sidebar
Stop
Esc
Reload
Ctrl+R
Zoom
Page Style
Character Encoding
Page Source
Ctrl+U
Full Screen
F11
Menu
Naviga
Bookm
Tabs o
Custor
Web

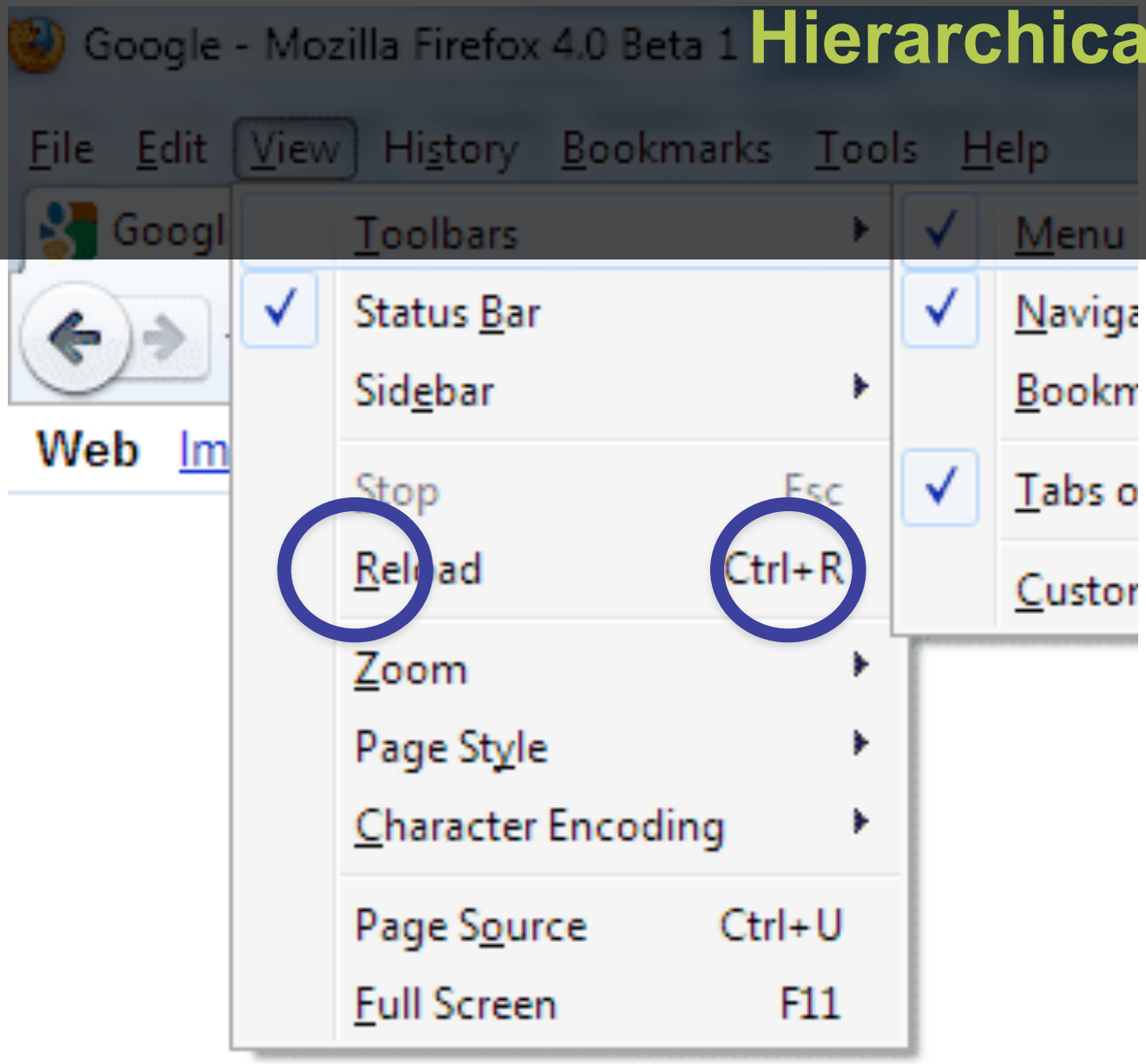
Several modalities
Hierarchical organization
Exploration
Flexibility



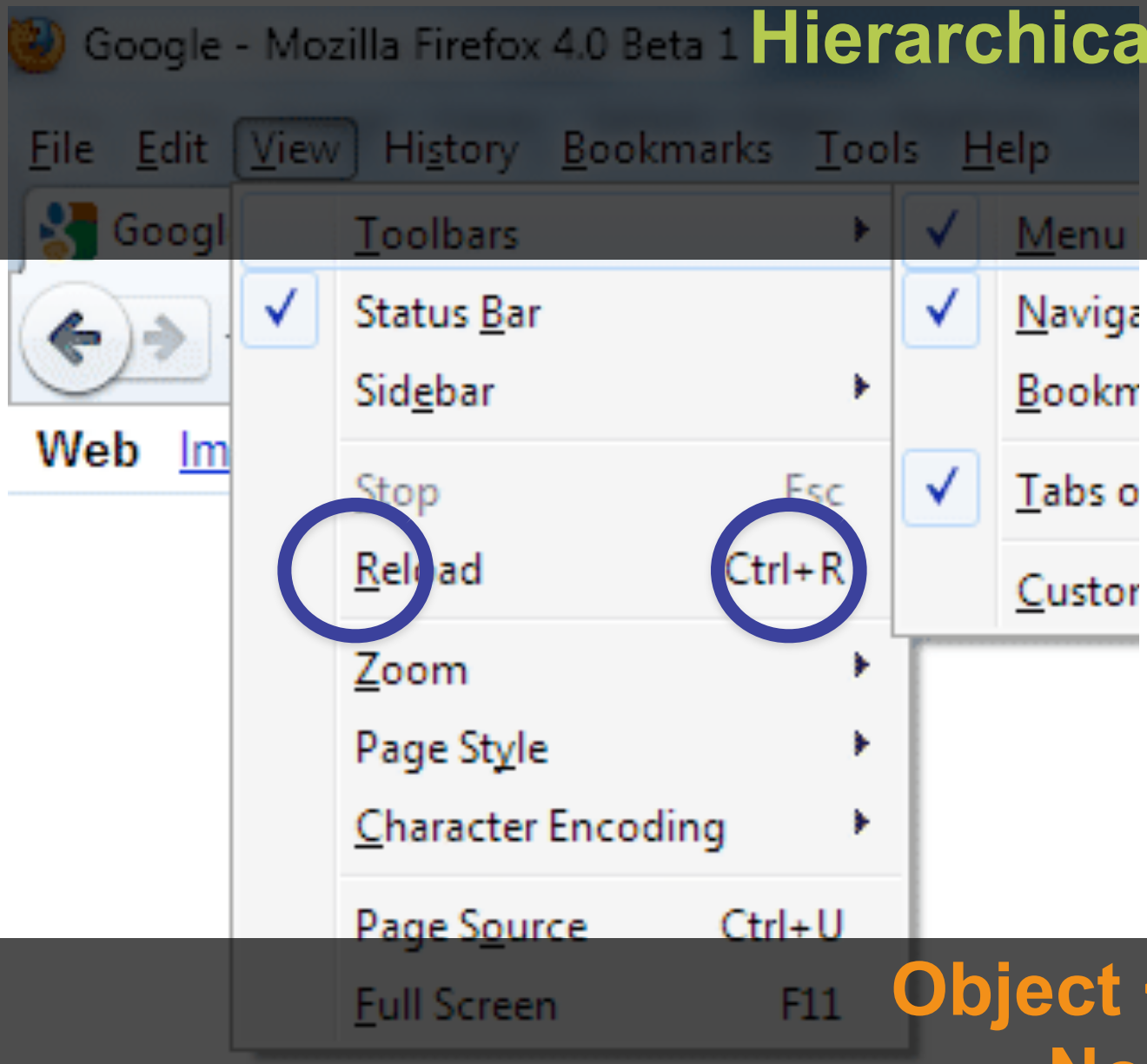
Several modalities
Hierarchical organization
Exploration
Flexibility



Several modalities
Hierarchical organization
Exploration
Flexibility



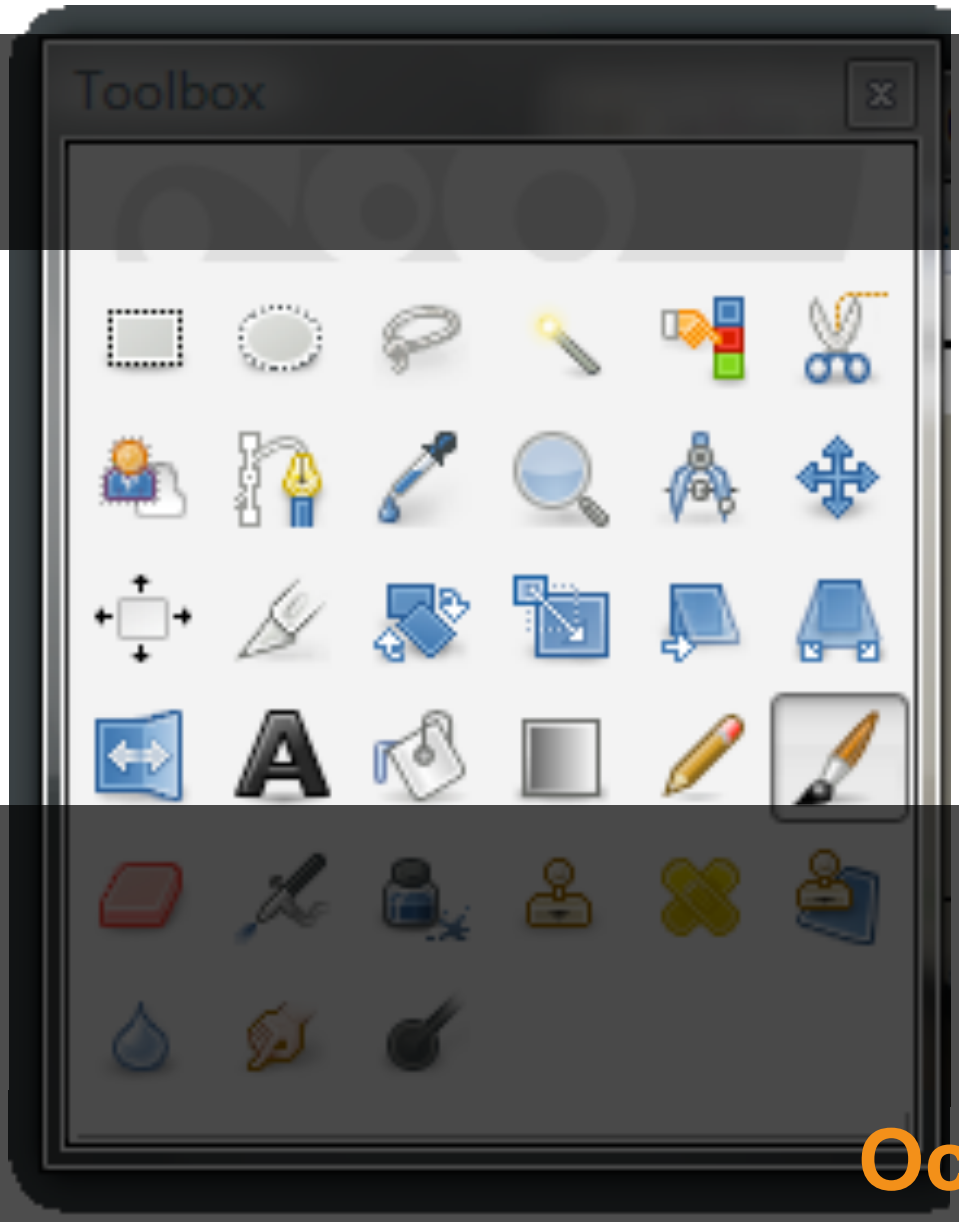
Several modalities
Hierarchical organization
Exploration
Flexibility



Object <-> Command
No direct access

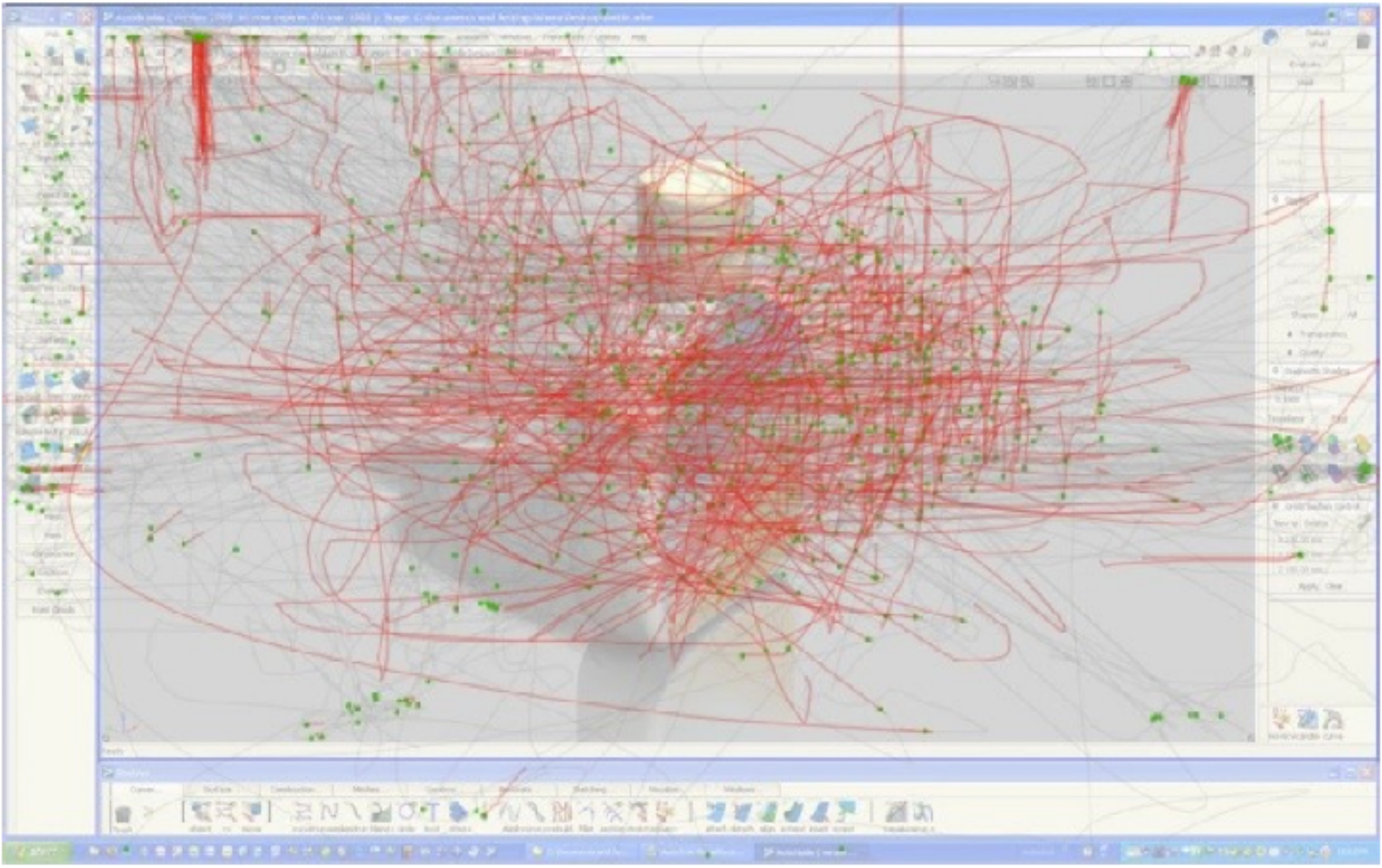

Toolbox

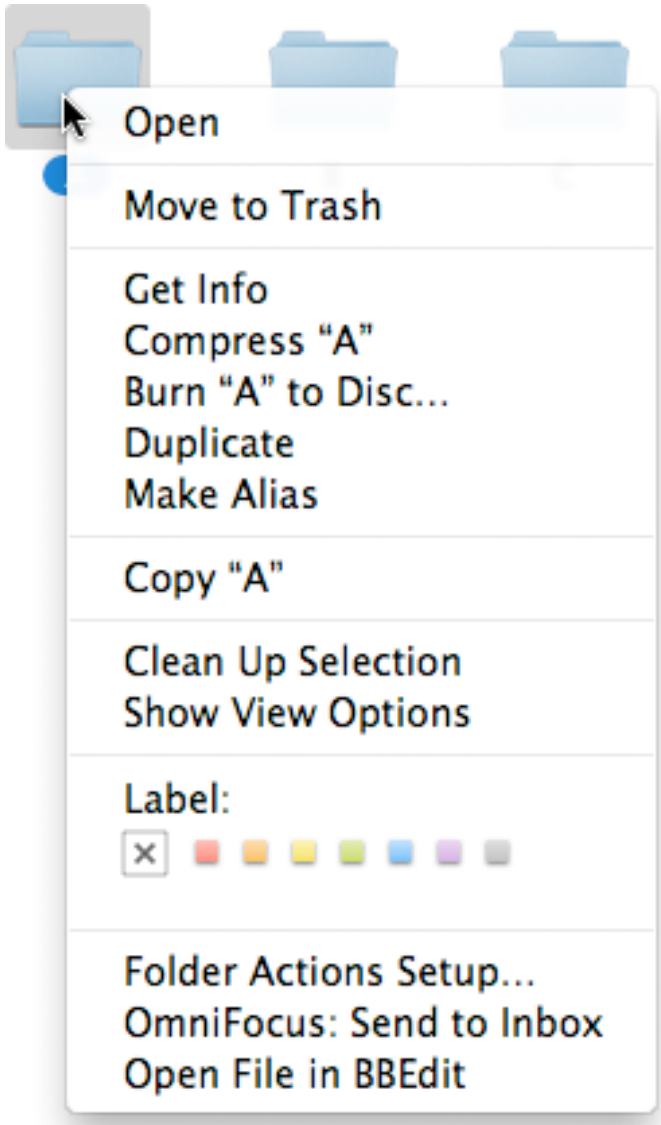
Visible
Modal commands



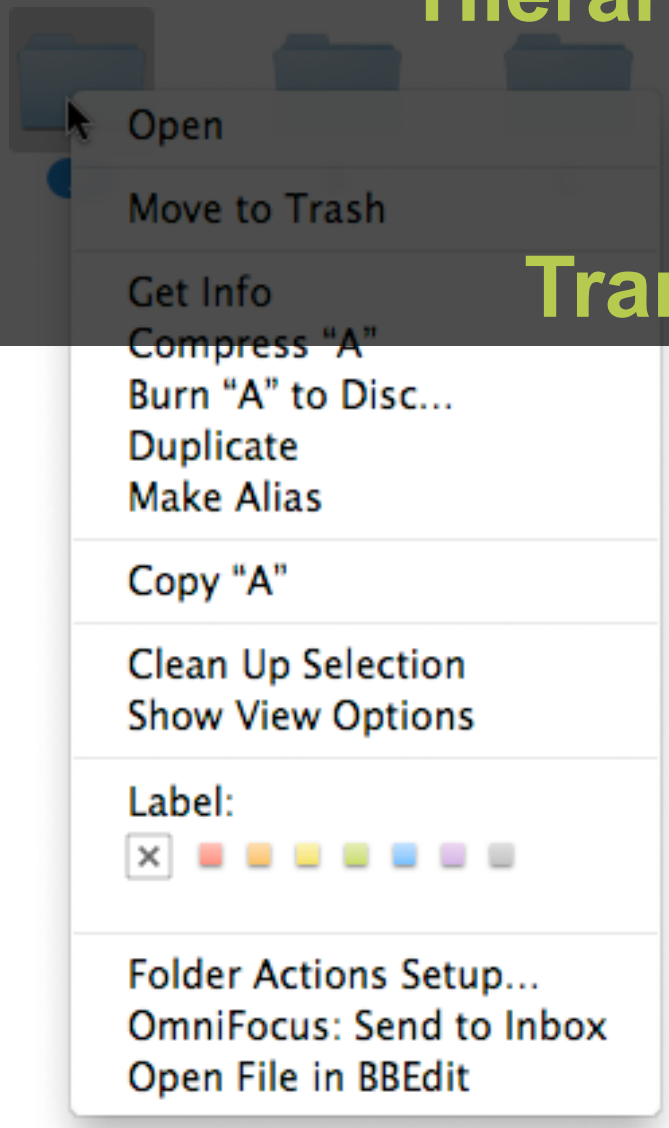
Visible
Modal commands

Object <-> Command
Small Target
No text Label
Occlusion (content area)
No organization

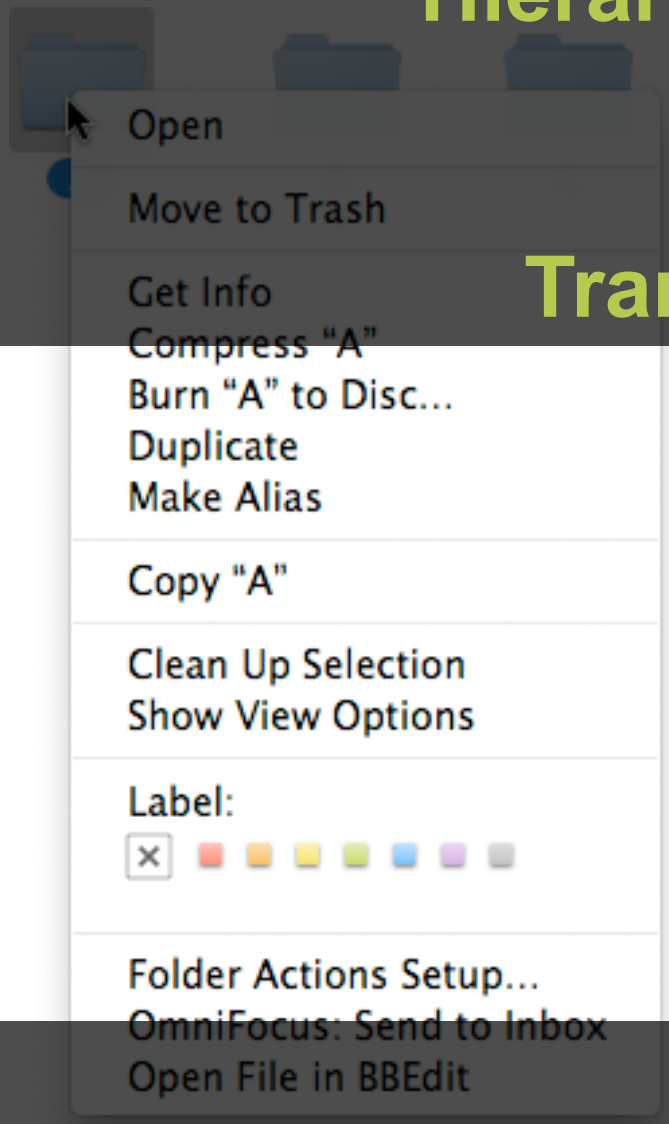



Open
Move to Trash
Get Info
Compress “A”
Burn “A” to Disc...
Duplicate
Make Alias
Copy “A”
Clean Up Selection
Show View Options
Label:
Folder Actions Setup...
OmniFocus: Send to Inbox
Open File in BBEdit

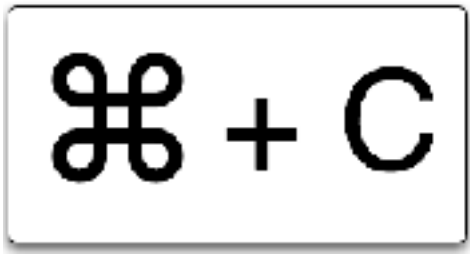
Hierarchical organization
In place
Contextual
Transient visualization



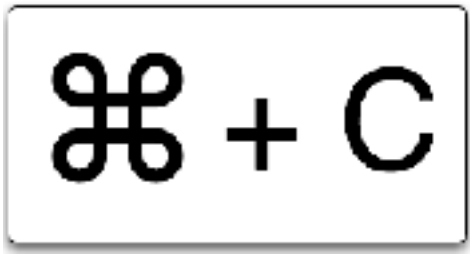
Hierarchical organization
In place
Contextual
Transient visualization



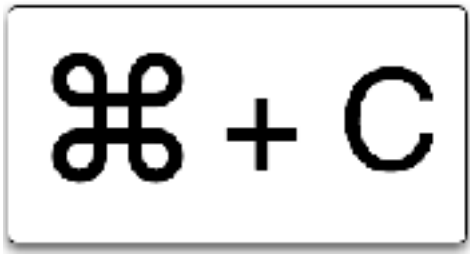
Activation
Touch screen?


⌘ + C

Direct access (fast)
Left Hand
No [keyboard Mouse] transition

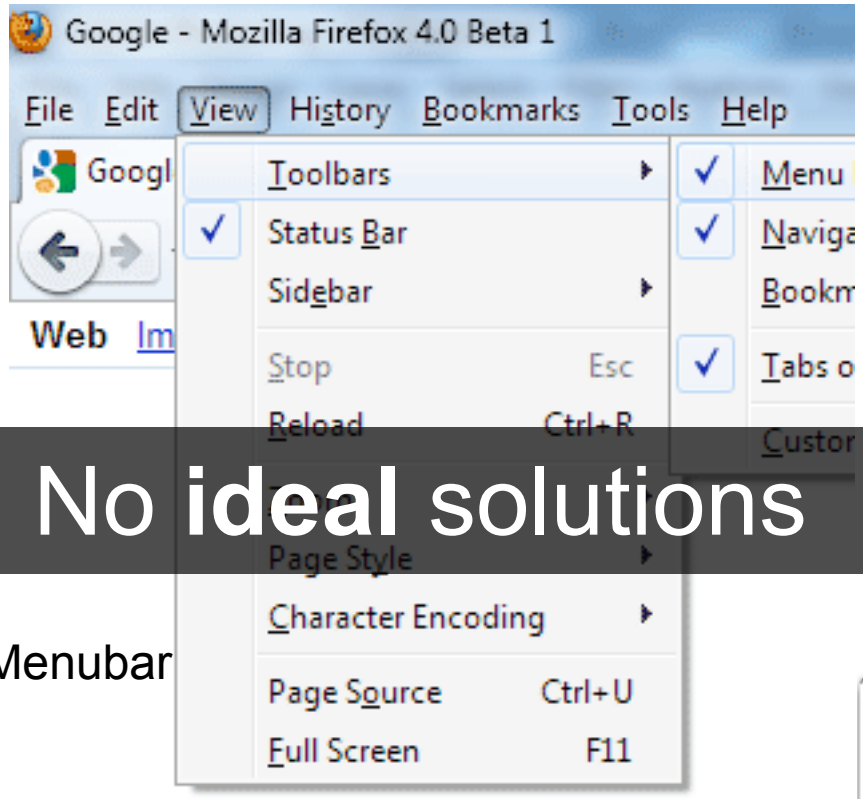


Direct access (fast)
Left Hand
No [keyboard Mouse] transition



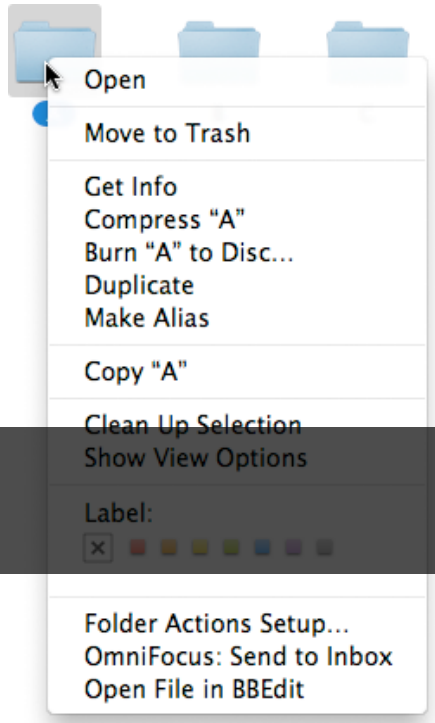
Recall rather recognition
Collision & Arbitrary mappings
Finger coordination
Require a keyboard
Focus of attention

No **ideal** solutions

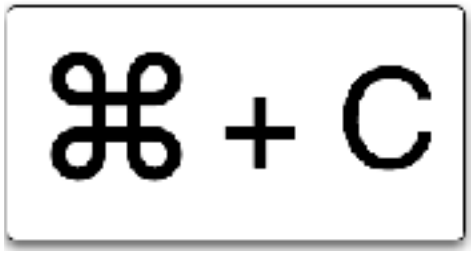


Menubar

Toolbox



Context menu

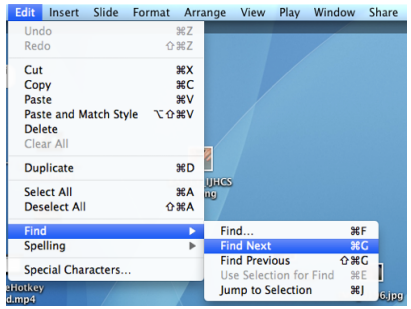


Keyboard shortcuts

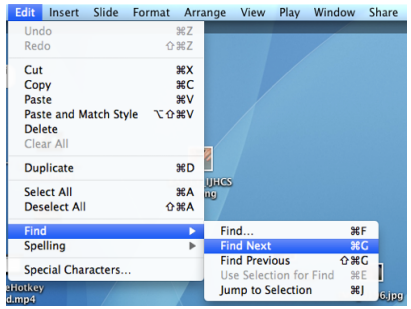
How?

“Novel” Interaction Techniques

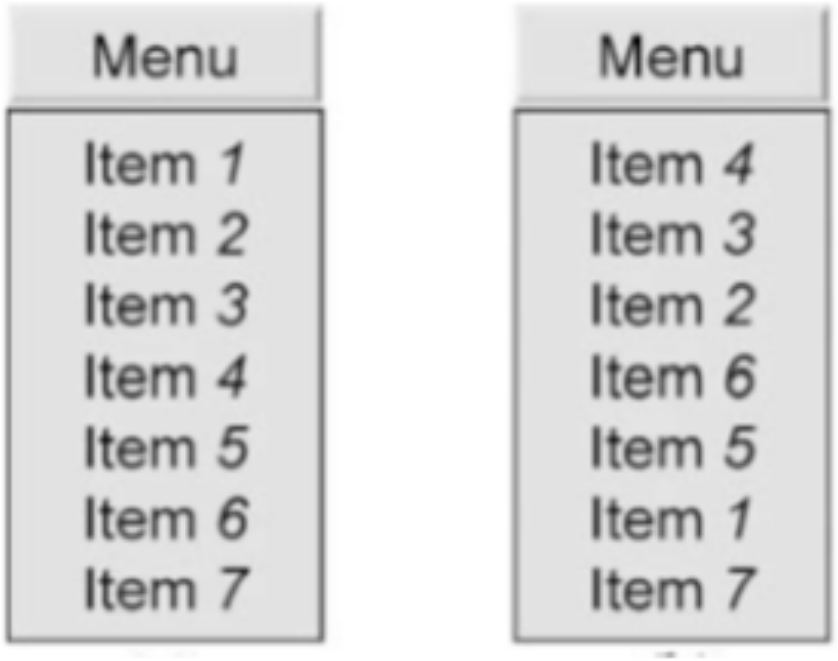
Strategies

	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode

Strategies

First modality 	Dimension Item
Second modality ⌘ + C	Menu Menu System Expert mode

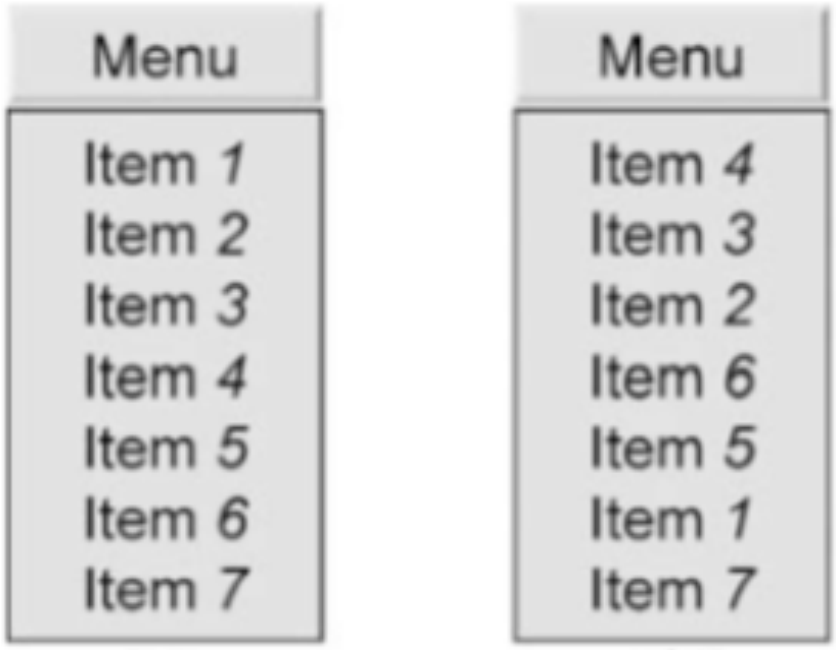
Item: geometry



Frequency Ordered menus

Split menus

Item: geometry

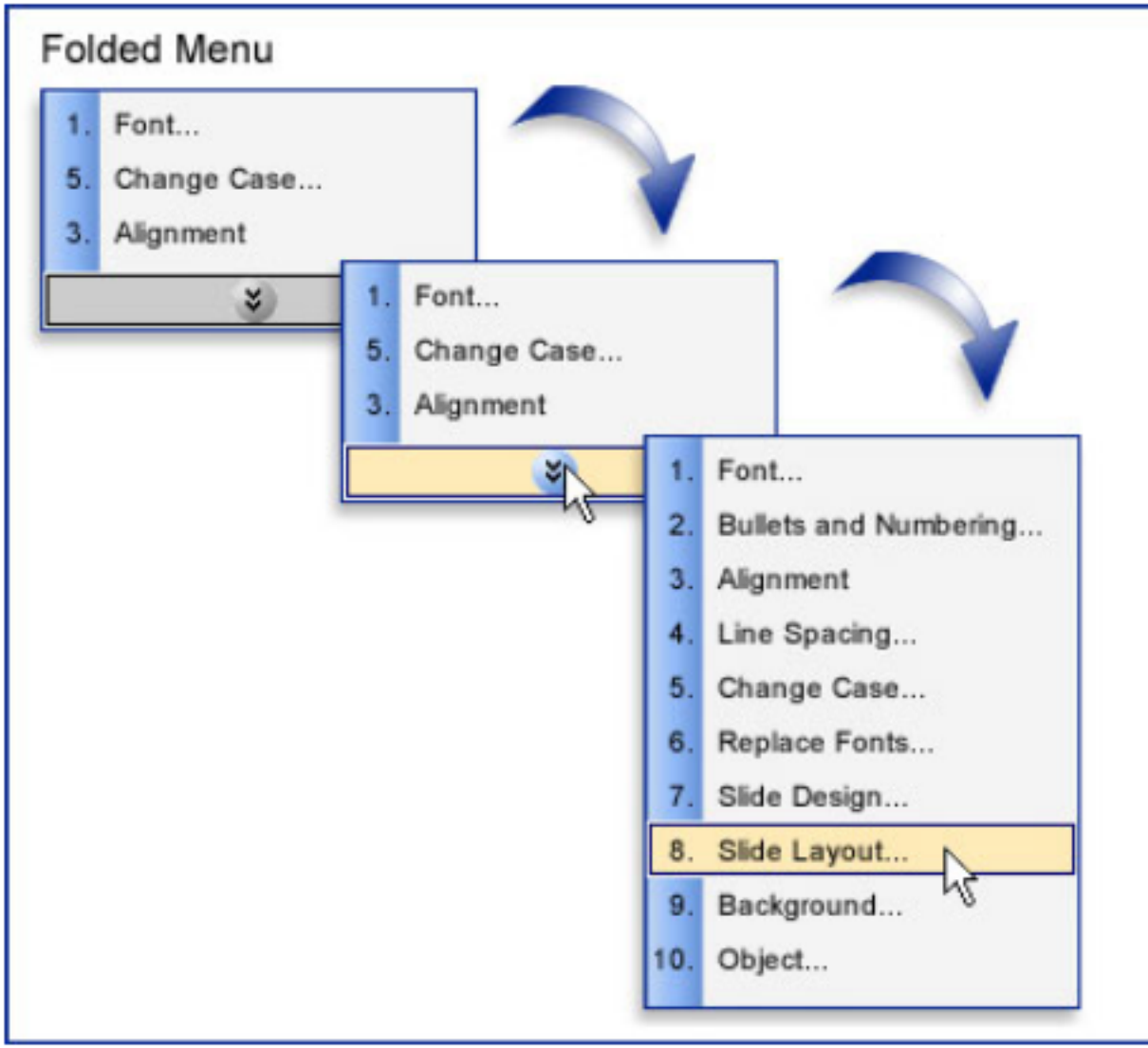


Frequency Ordered menus

Split menus

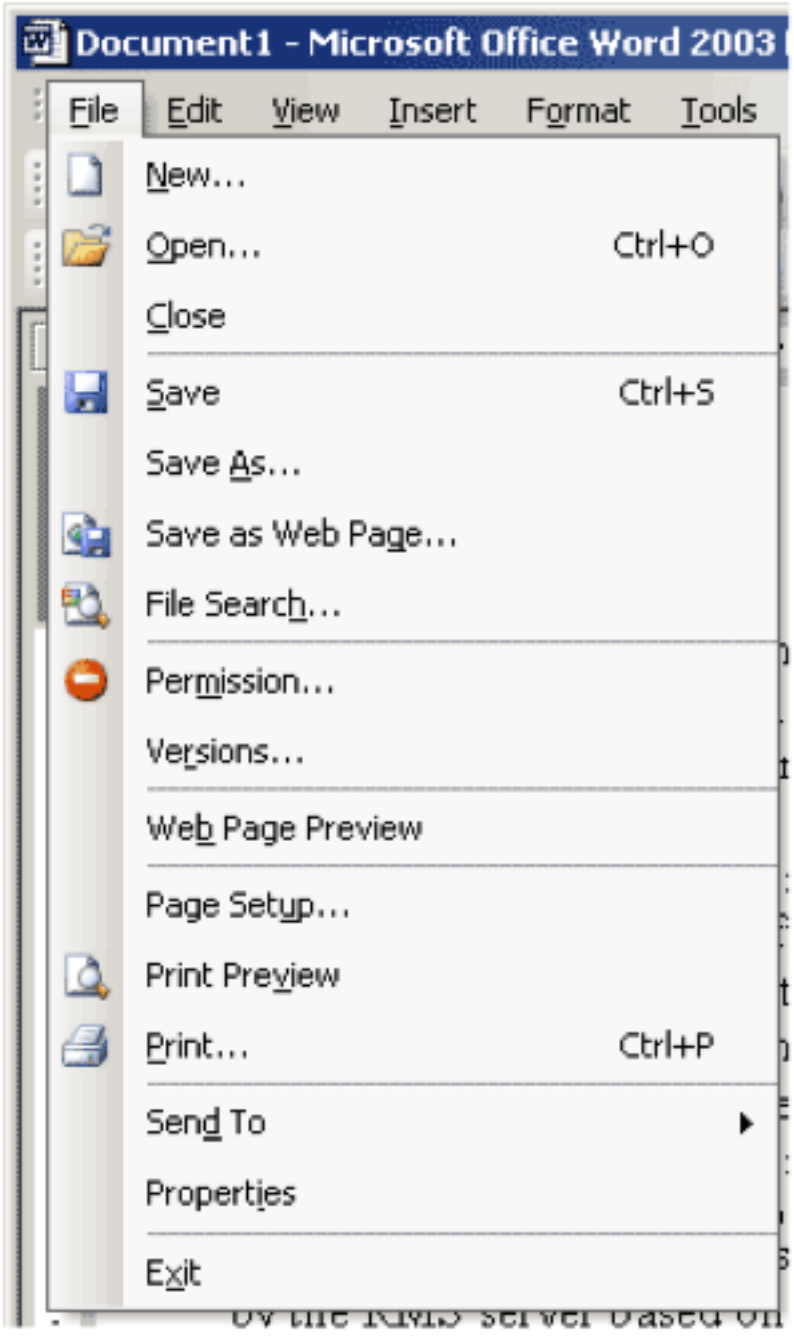
Item: geometry

Folded Menus

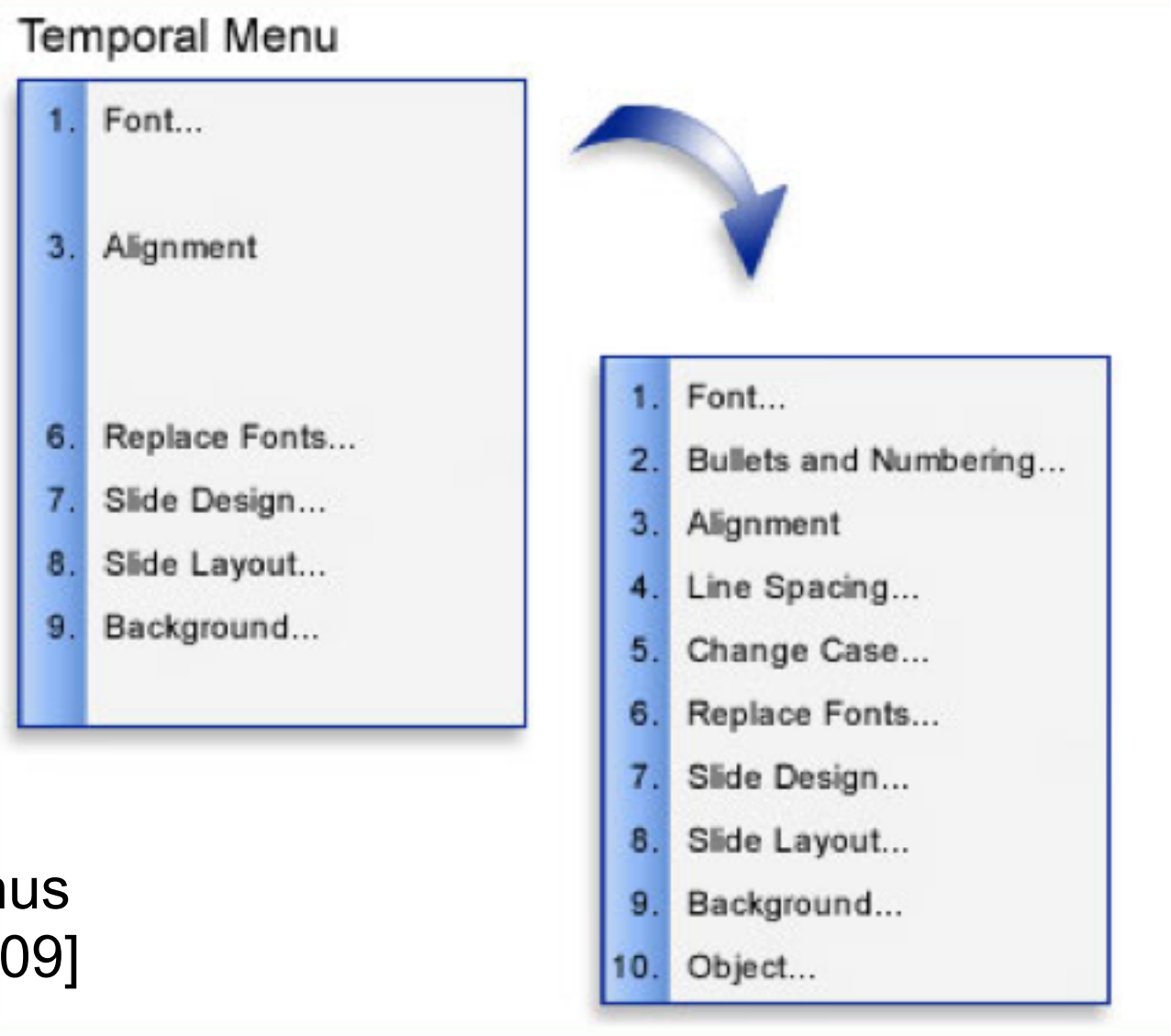


Item: Visual cues

icons

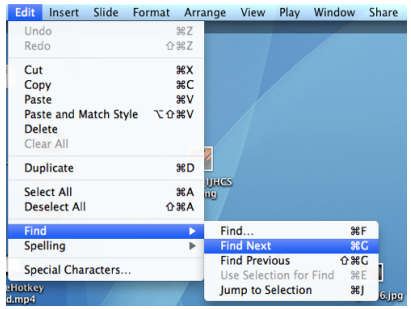


Item: Visual cues

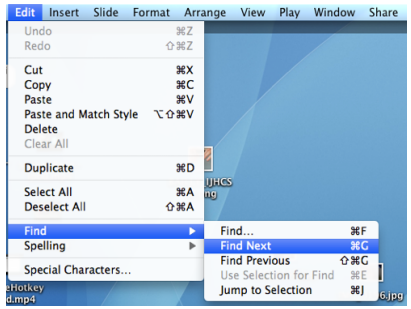


Ephemeral menus
[Findlater et al. 09]

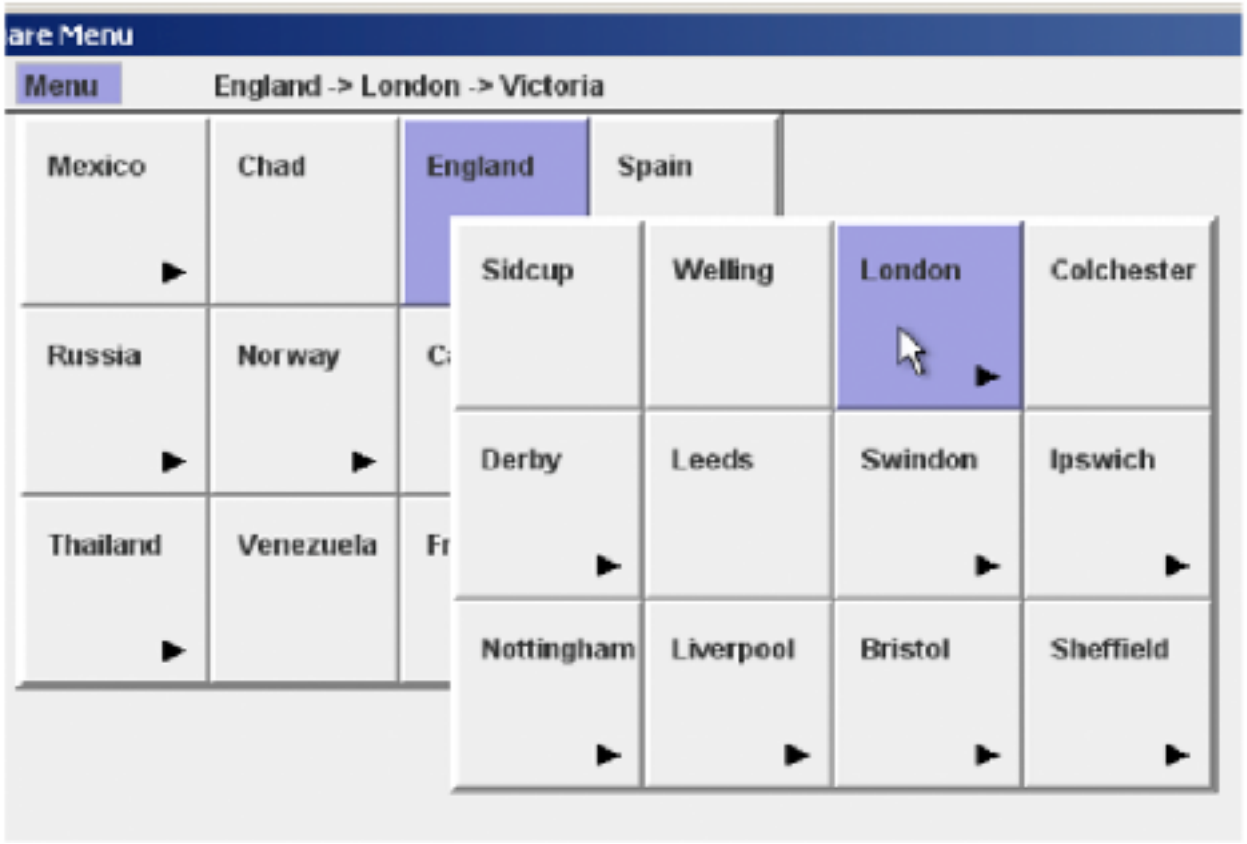
Strategies

	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode

Strategies

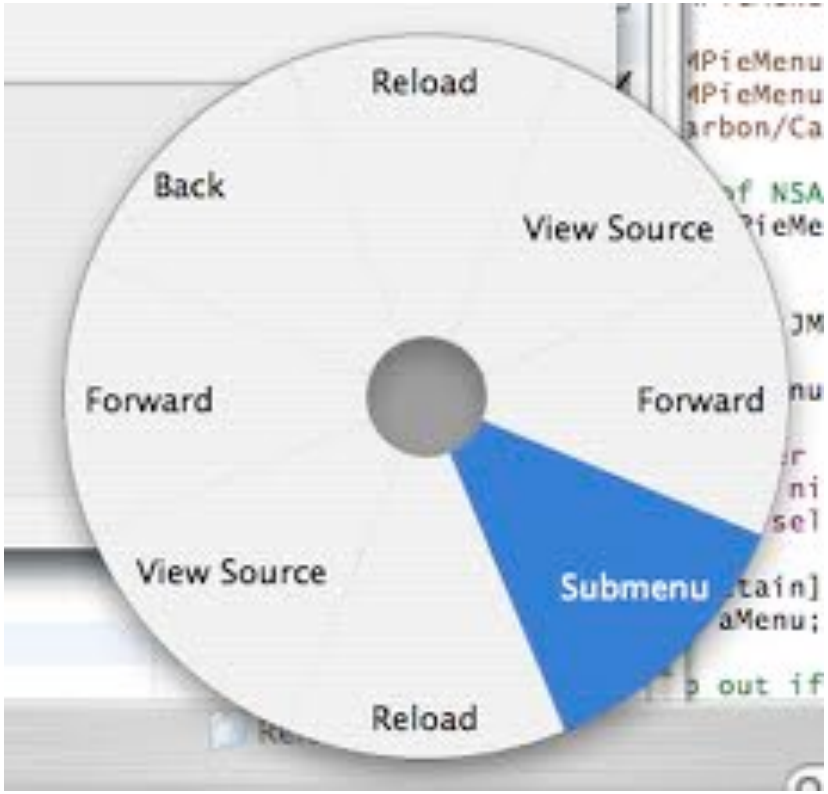
	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode

Menu: Layout



Square menus (grid layout)
[Ahlstrom et al. 10]

Menu: Layout



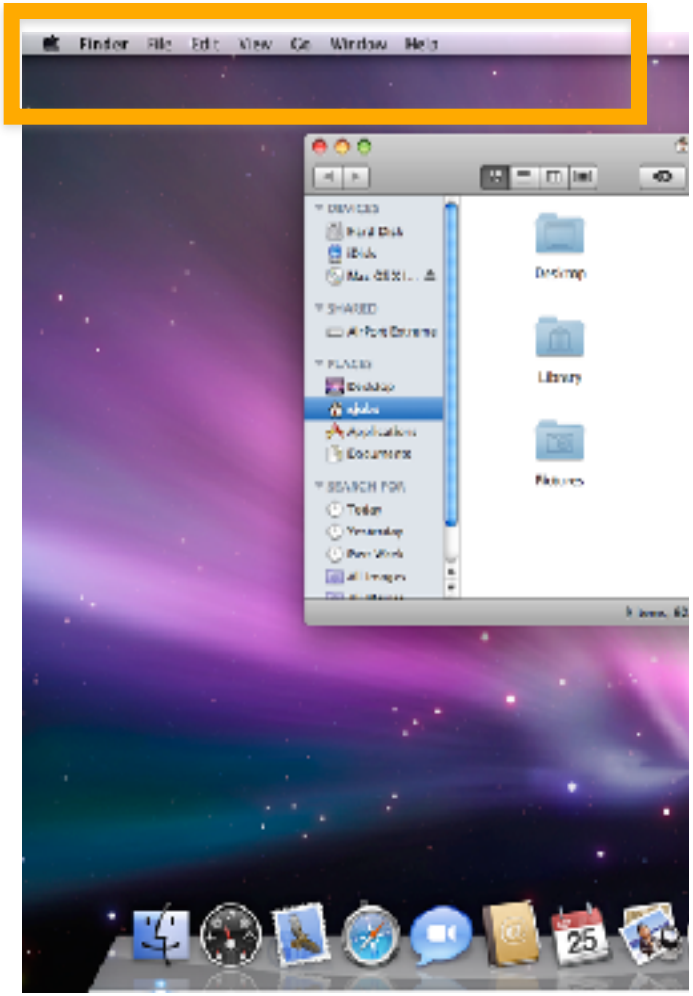
[Callahan et al. 08]

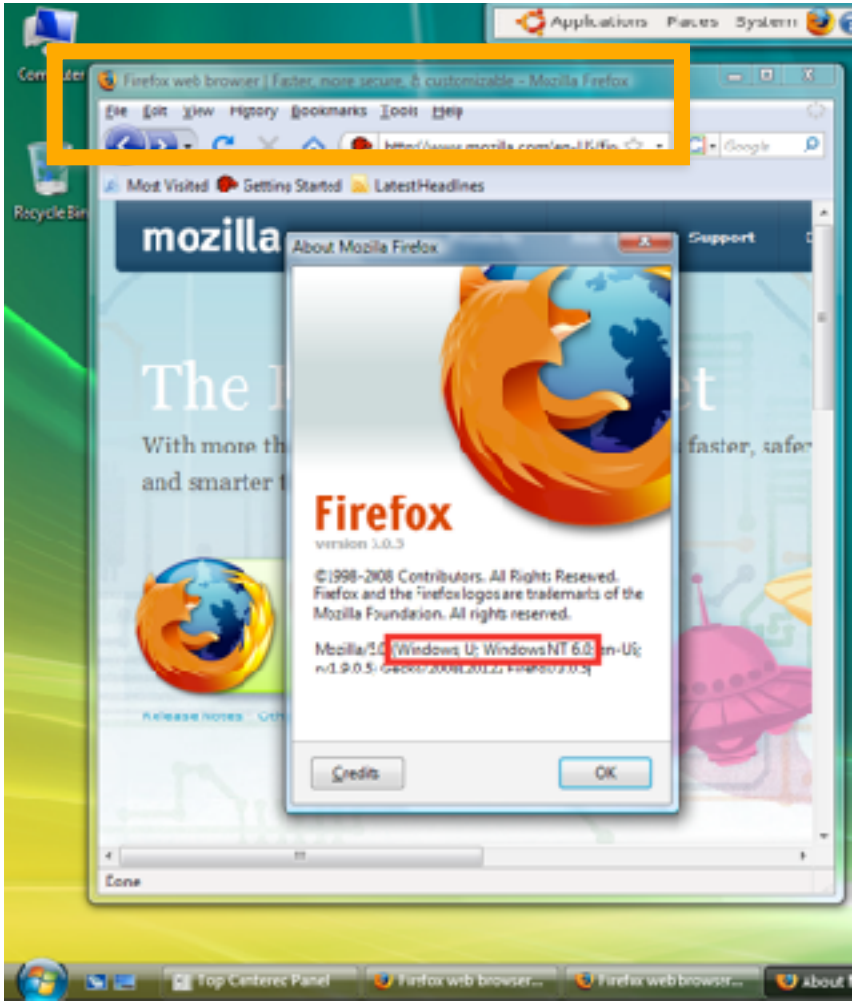
Pie Menus


Undo
Redo
Tools
Spelling
Lang
Alpha
Apps

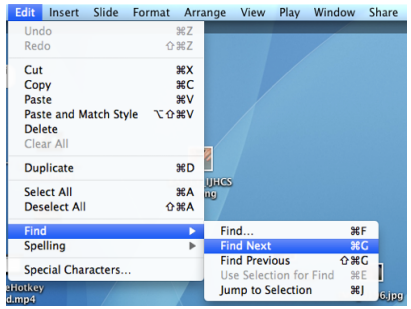

Open University UK
RoughBounds Shepherd
Member
Khoisan Fisher
Member
Go To
Mute
Add Friend
Profile...
Pay...
Send IM...
More ›

Menu: Geometry

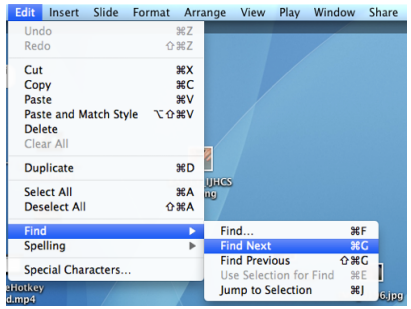


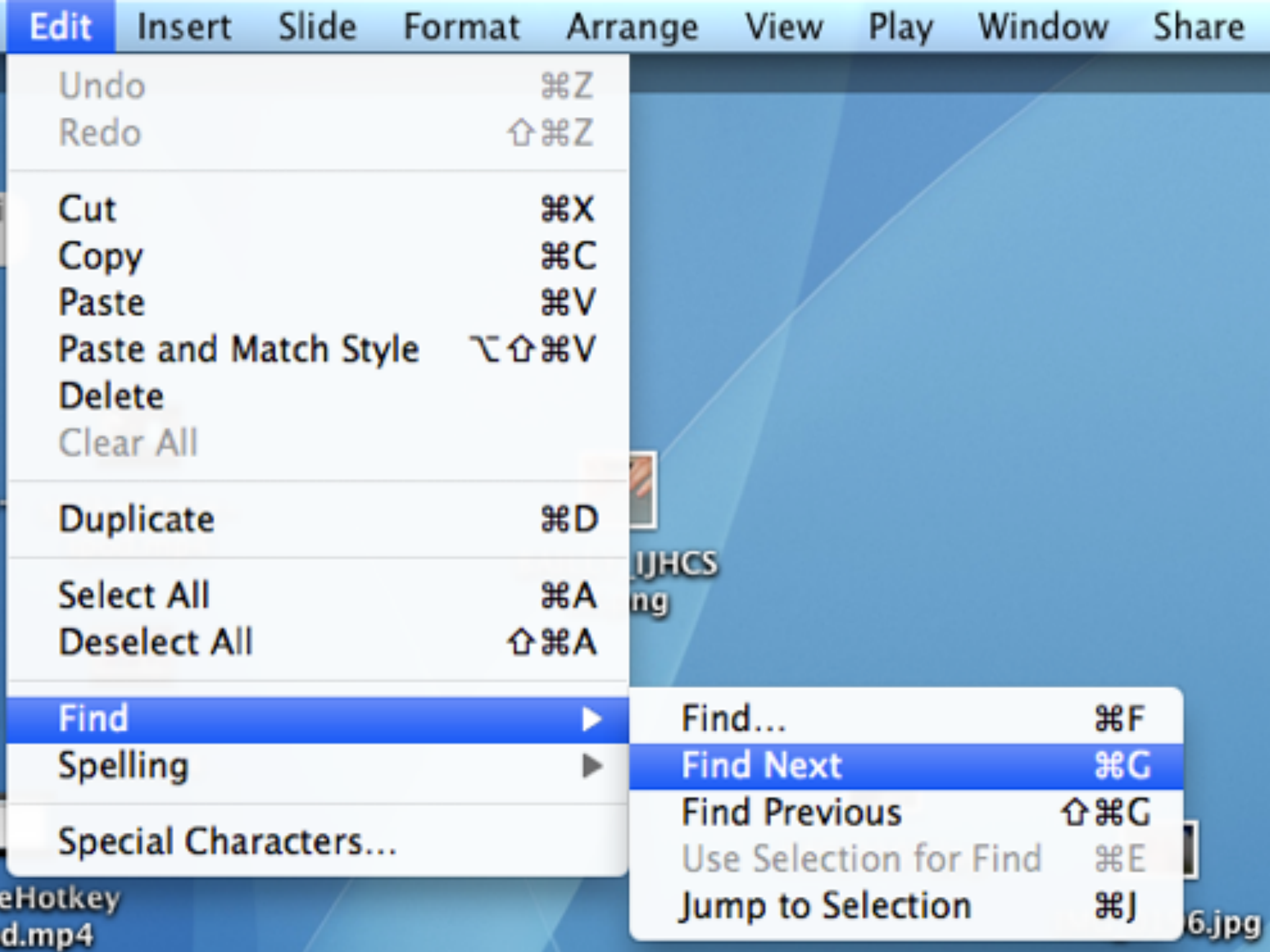


Strategies

	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode

Strategies

	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode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Redo ⇧⌘Z
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Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find... ⌘F
Find Next ⌘G
Find Previous ⇧⌘G
Use Selection for Find ⌘E
Jump to Selection ⌘J
IJHCS
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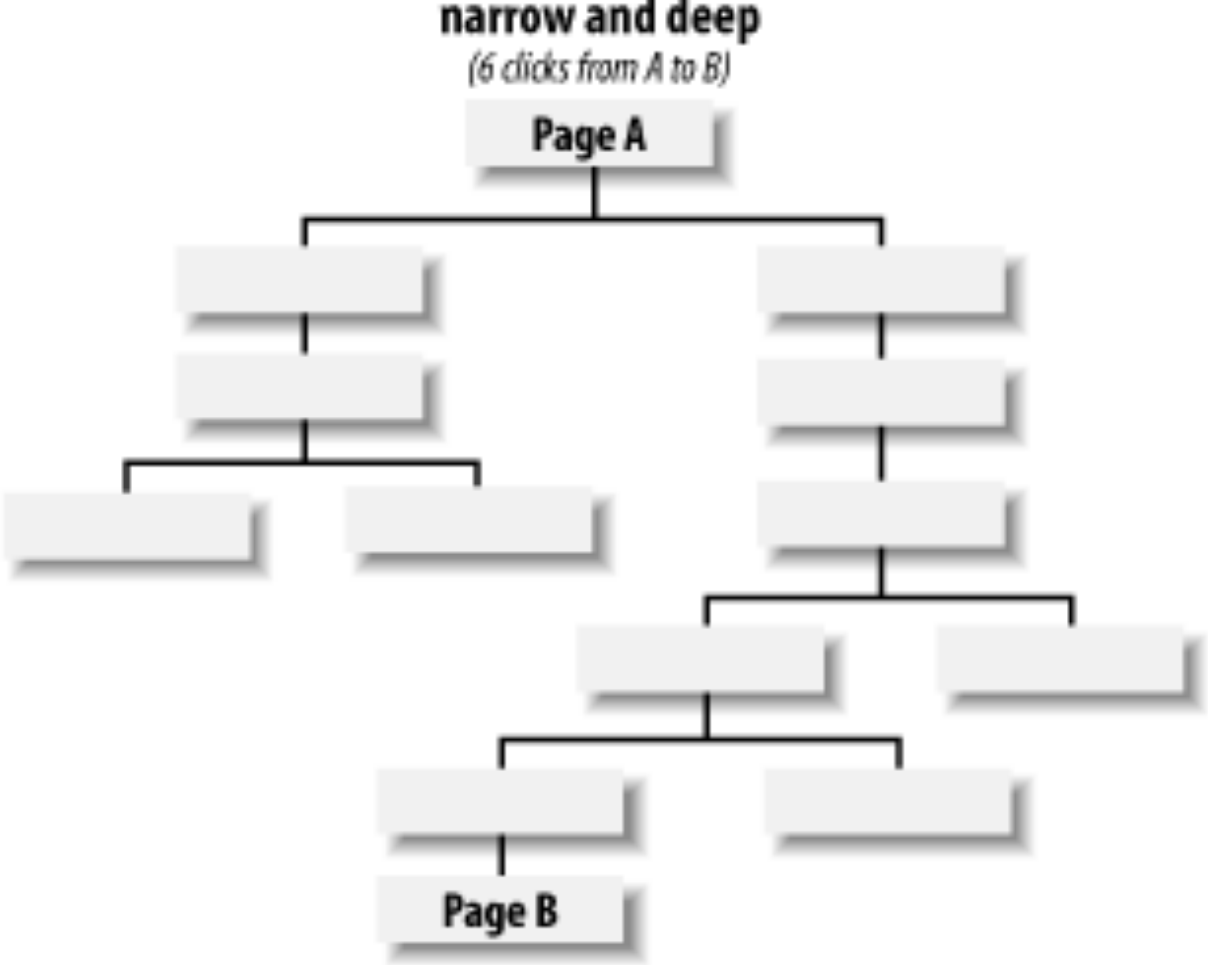
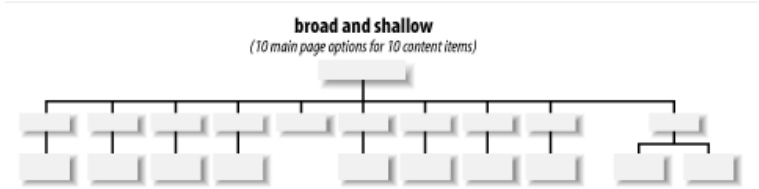
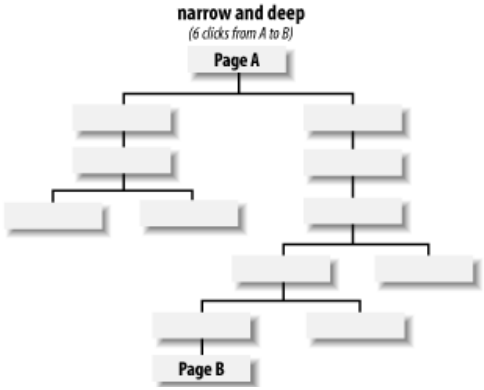

narrow and deep
(6 clicks from A to B)
Page A
Page B

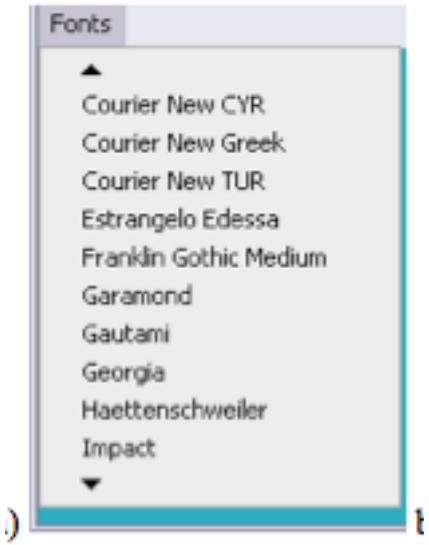

broad and shallow
(10 main page options for 10 content items)



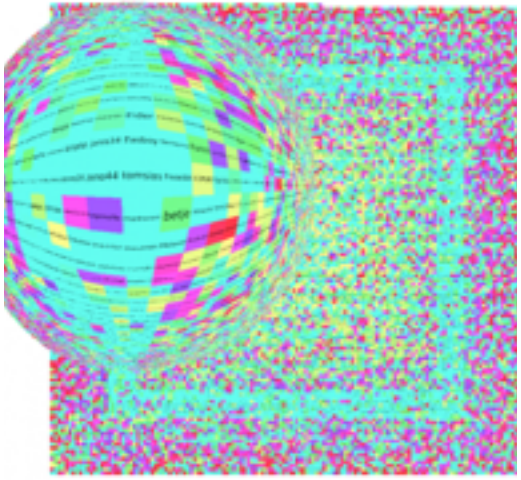


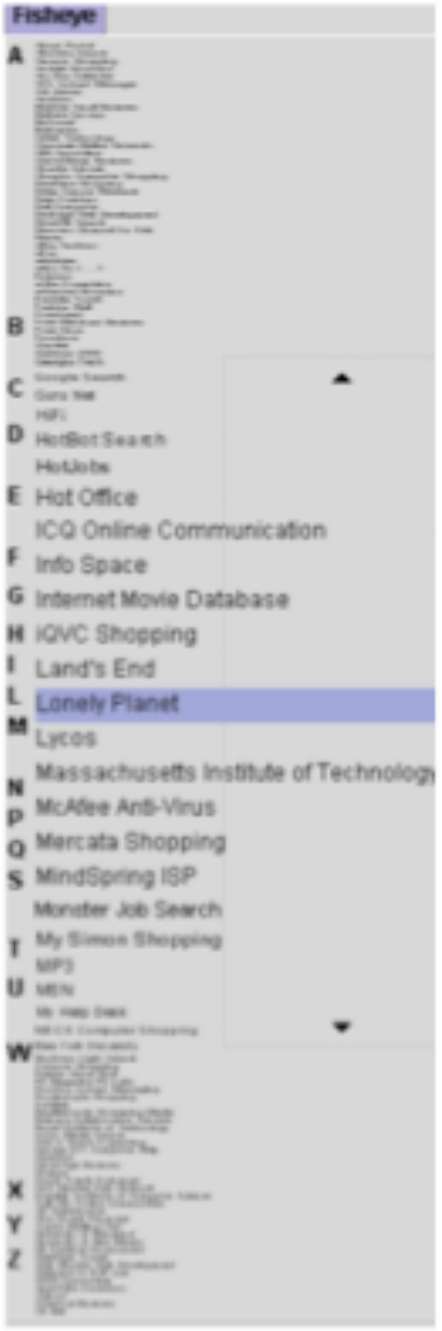
	Avantage d'une structure en largeur	Avantage d'une structure en profondeur
Recherche visuelle	Balayage des items plus facile	Réduction du nombre d'items à lire
Sélection d'un item	Chemin plus court	
navigation	Réduction du nombre de branches visitées par erreur	
précision		Geste plus précis pour les menus circulaires
Charge cognitive	Noms des sous-menus moins abstraits	Réduction du nombre d'alternatives
Apprentissage	Construction plus facile d'une représentation mentale de la hiérarchie	
Espace écran		Moins d'items affichés simultanément

Menu: Large number of items



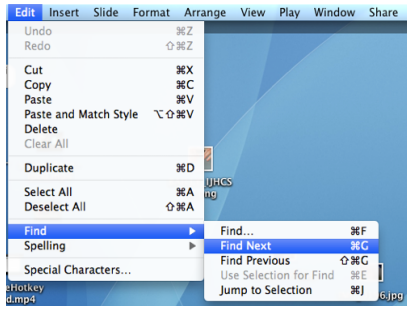
Menu:
Large number of items



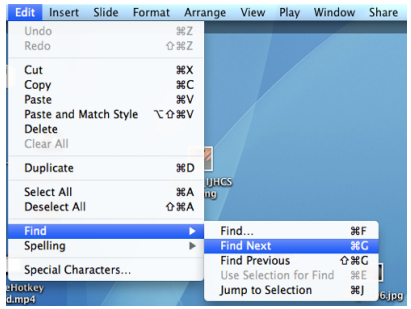


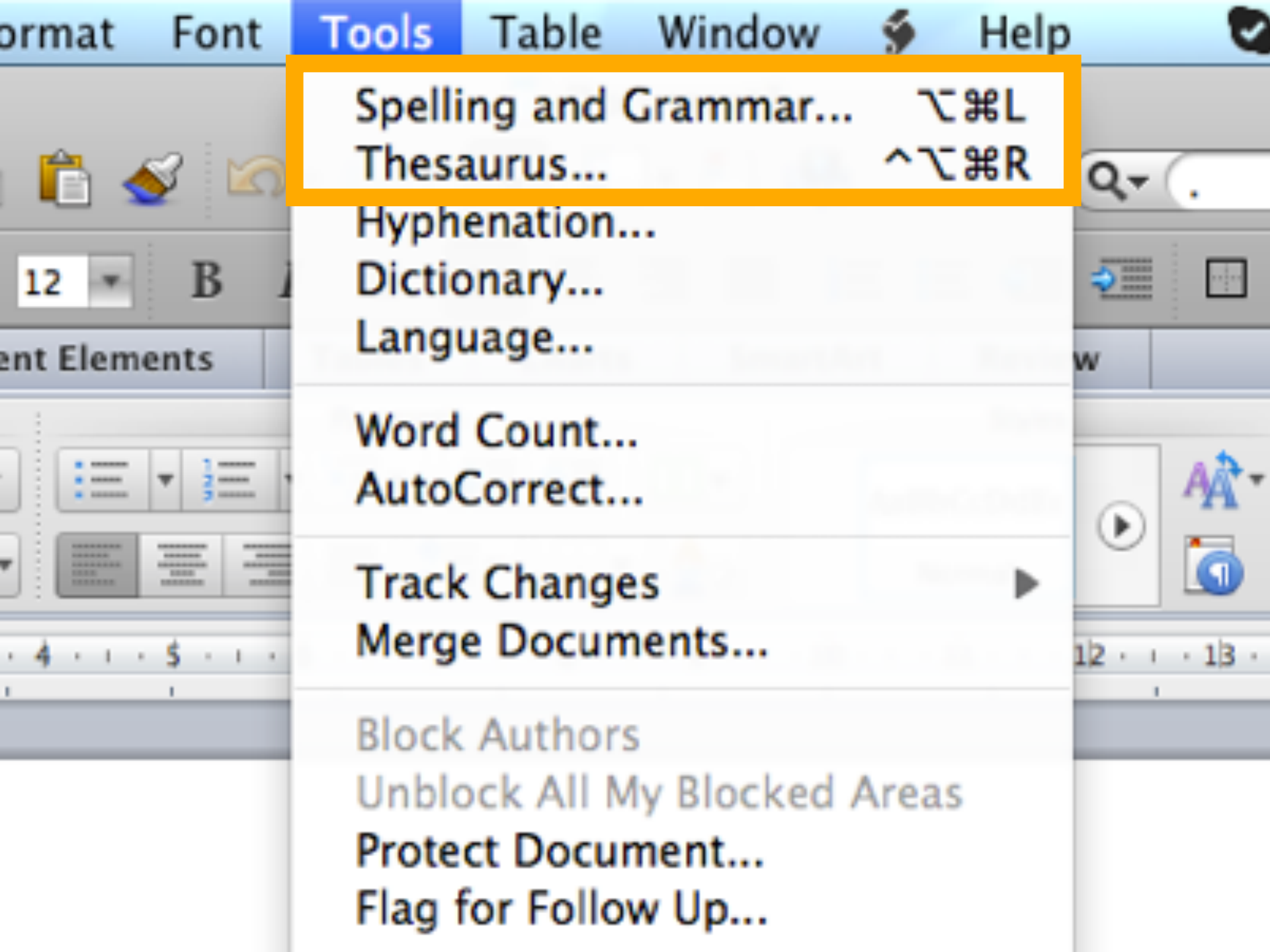
Fish-eye menus

Strategies

	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode

Strategies

	Dimension
First modality 	Item
	Menu
	Menu System
Second modality ⌘ + C	Expert mode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Thesaurus... ^⌥⌘R
Hyphenation...
Dictionary...
Language...
Word Count...
AutoCorrect...
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Protect Document...
Flag for Follow Up...
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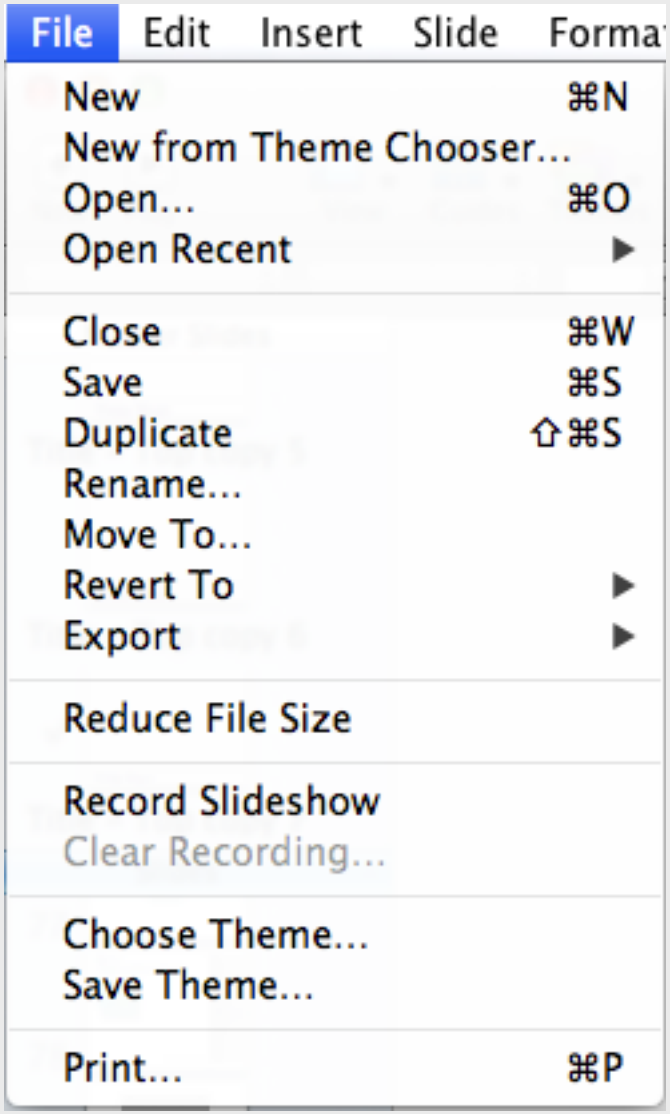
Expert Mode: Mapping

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EVENT
NOTE OVERLAP
MERGE
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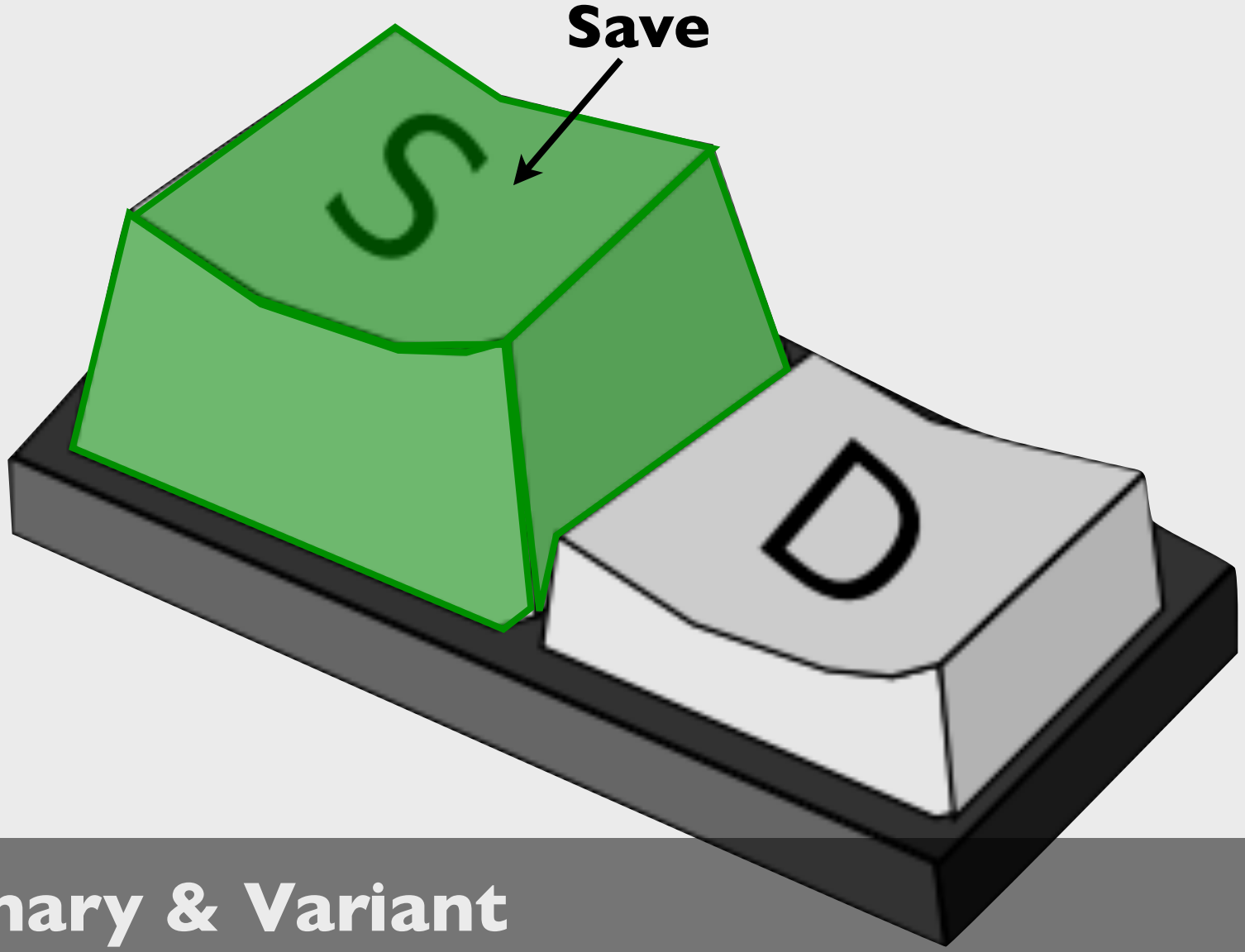
fn
home
page up
tab
QUANTIZE
SAMPLE
EVENT LIST
LIBRARY
TEMPO LIST
HYPER EDITOR
SIGNATURE LIST
INSPECTOR
LOOP BROWSER
PIANO ROLL
PREVIOUS PLUG IN
NEXT PLUG IN
SPLIT
delete
end
page down
KEYBOARD
caps lock
TRACK AUTO
SOLO
DELETE DUPLICATED
FILE BROWSER
GLOBAL TRACK
HIDE
SWAP L+R LOC
MARKER LIST
LOOP
PICK UP CLOCK
OPEN MARKER TEXT
GO TO BEGINNING
return
shift
ZOOM SELECTION
MIXER
CLICK
PLUG-IN
BIN
SCORE
MUTE
REWIND
FORWARD
GO TO POS
shift
control
option
command
PLAY / STOP
logickeyboard
Compatible with Apple Logic Pro & Express
command
option
control

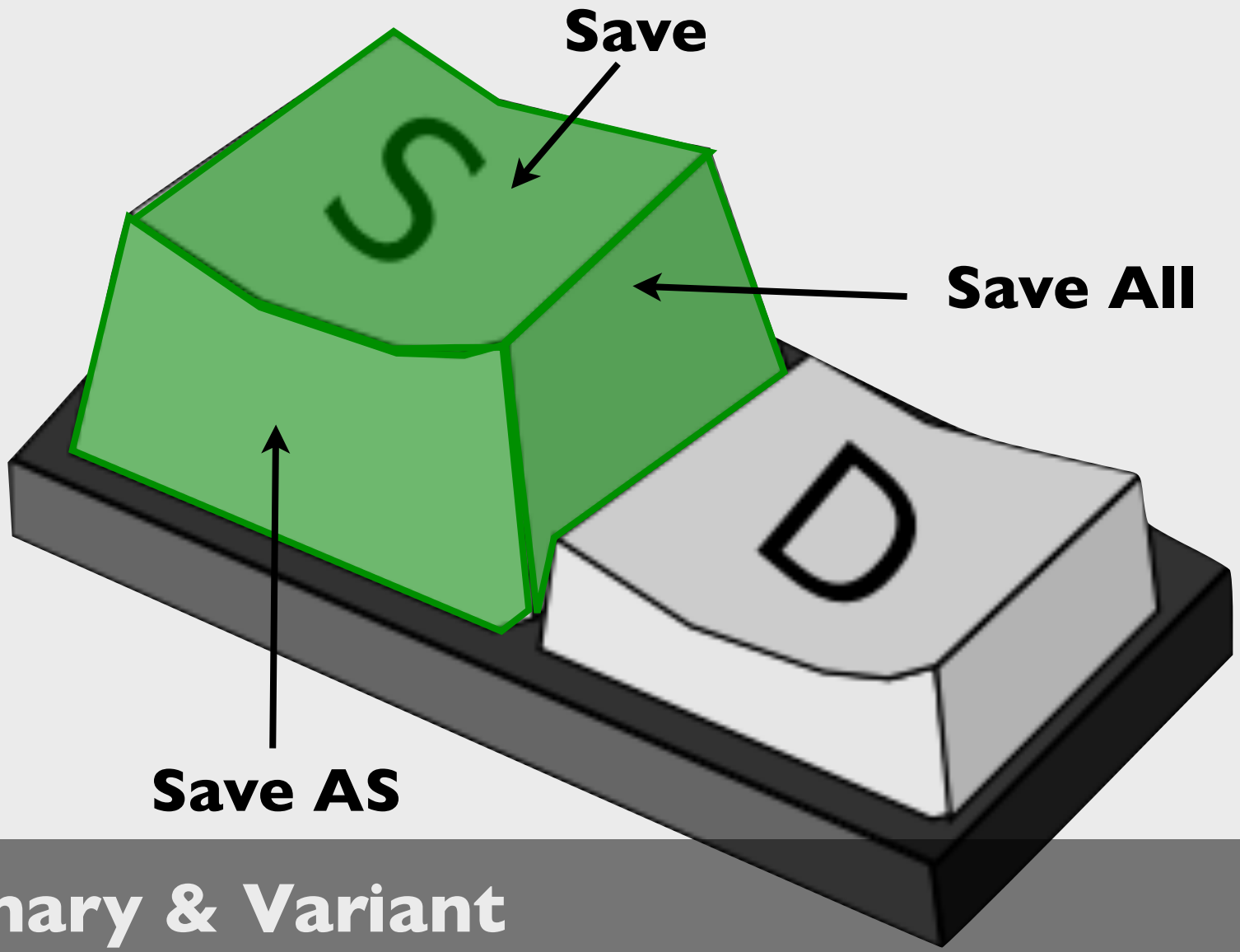
Optimus Keyboard

Métamorphe

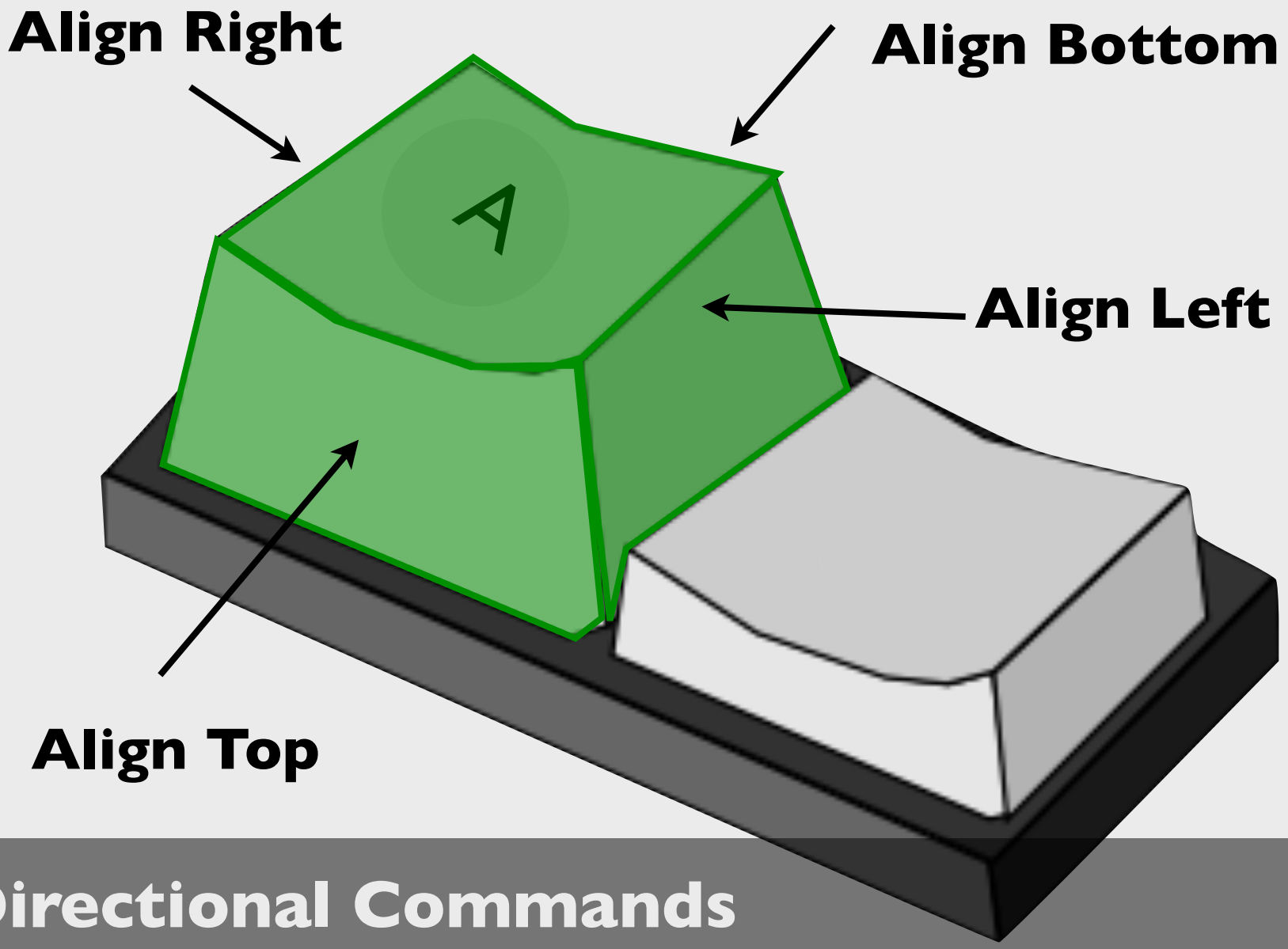
Métamorphe



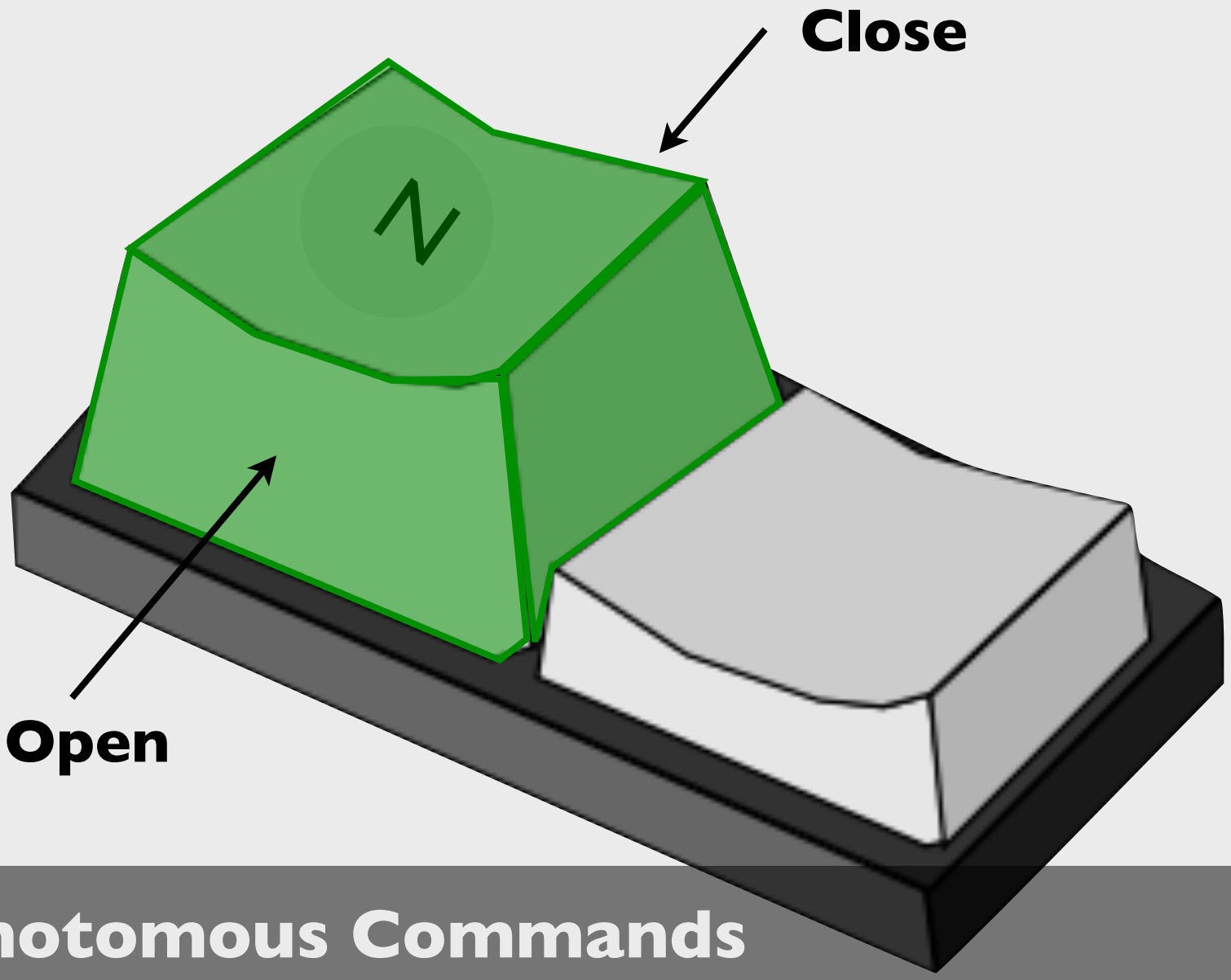
Primary & Variant



Primary & Variant

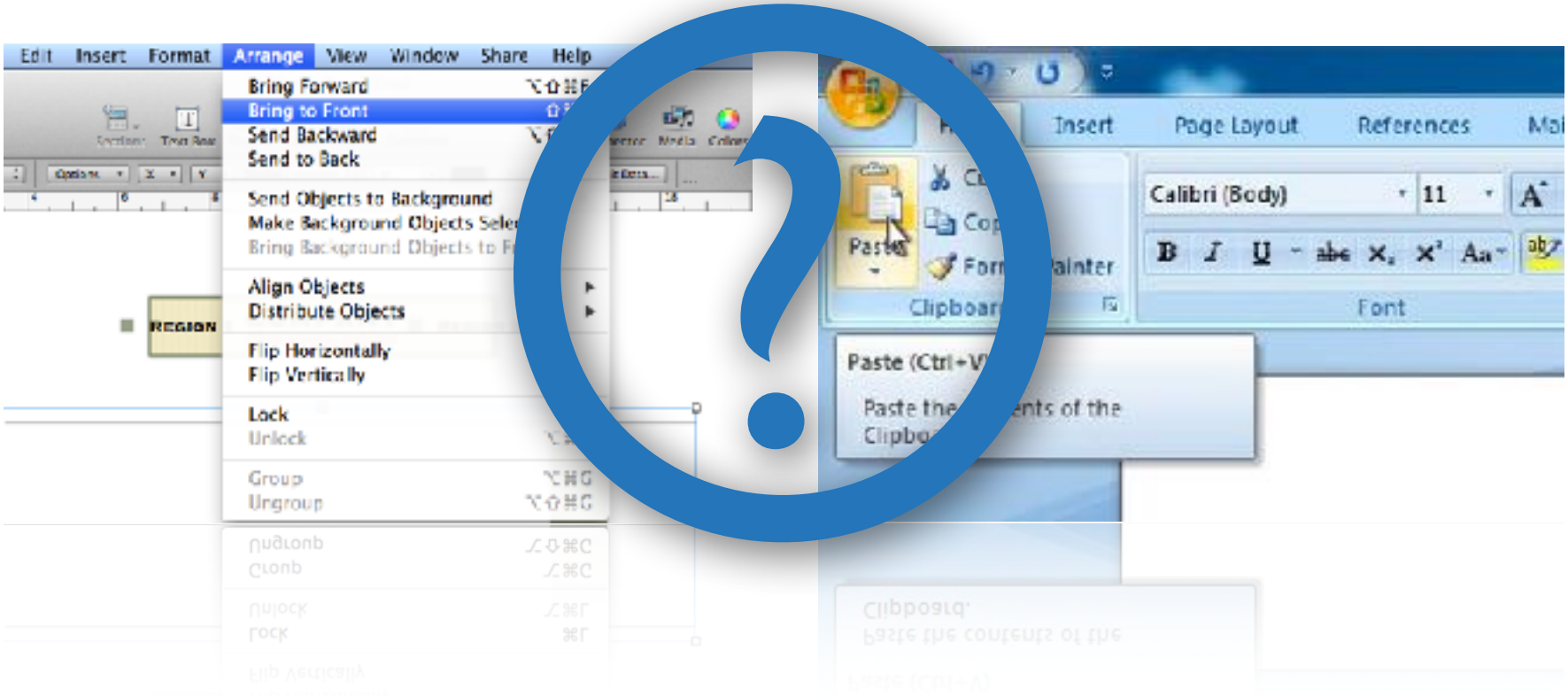


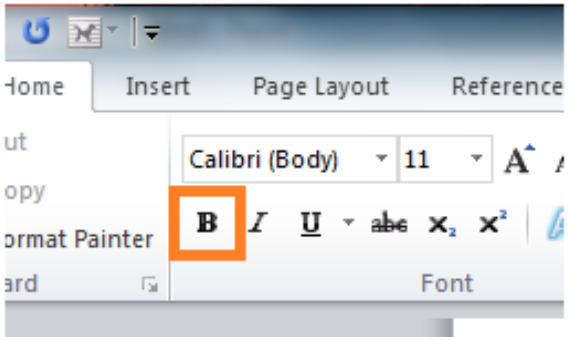
Directional Commands



Dichotomous Commands

Why are hotkeys underused?

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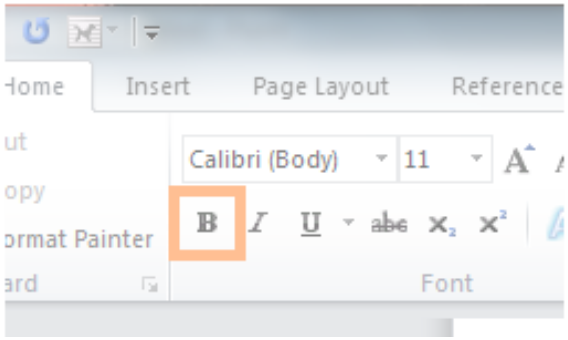
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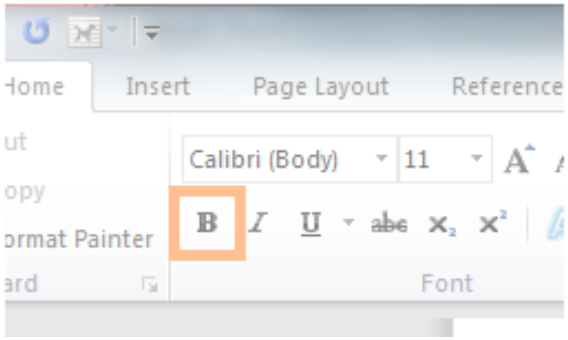
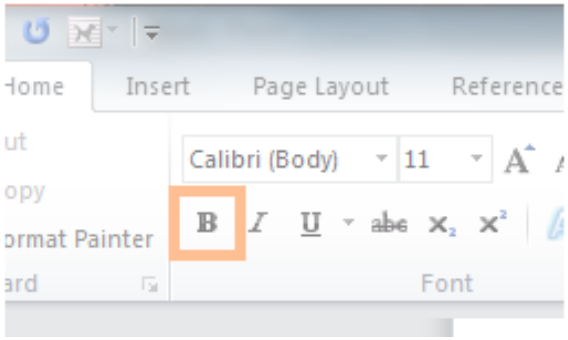
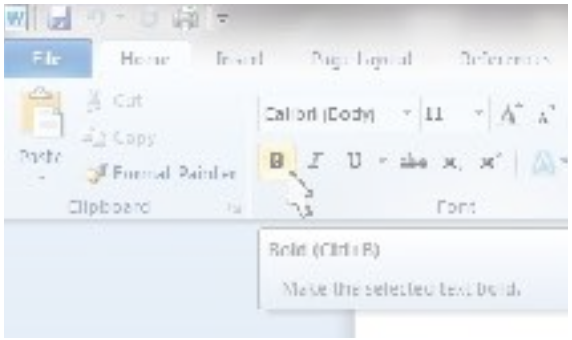


Mouse

Expose



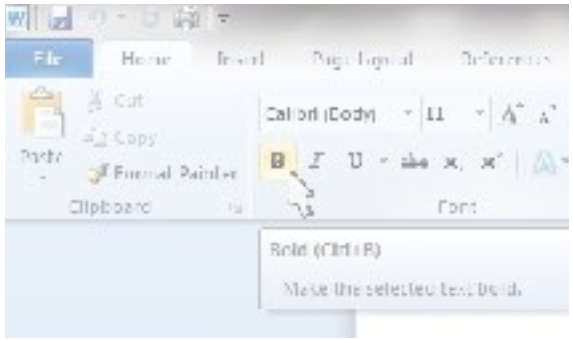
Mouse



Expose

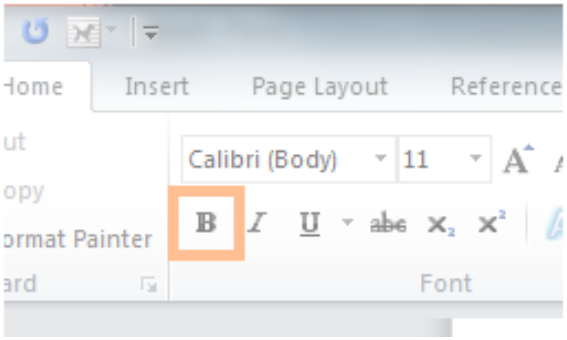
Keyboard

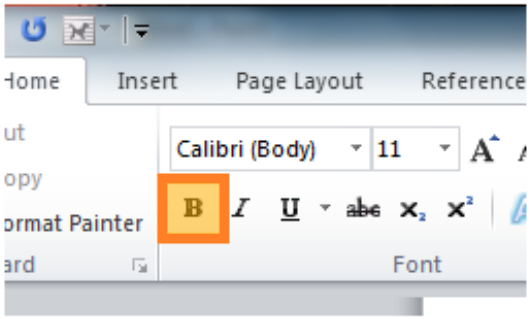
Mouse



Expose

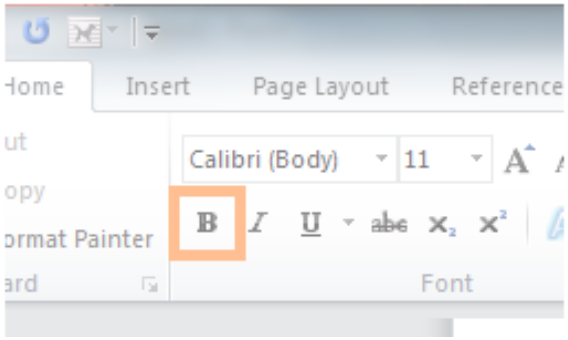
Keyboard

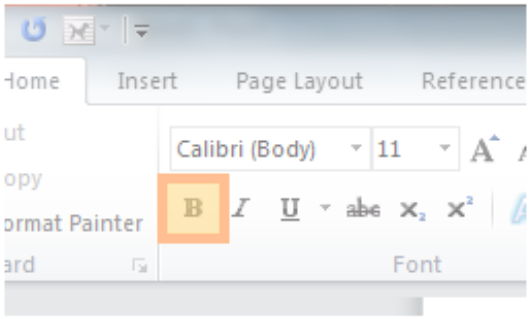




Keyboard Selection

Mouse

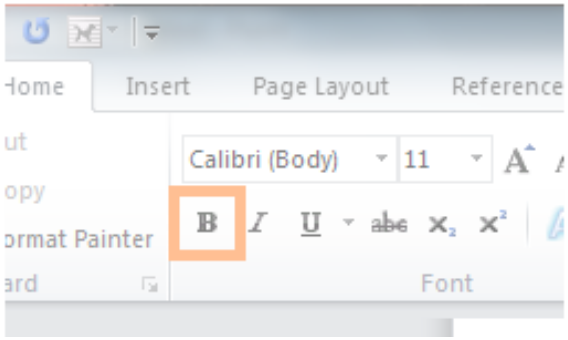




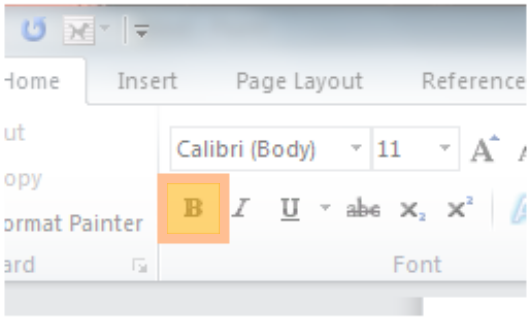
Keyboard Selection

Keyboard

Mouse

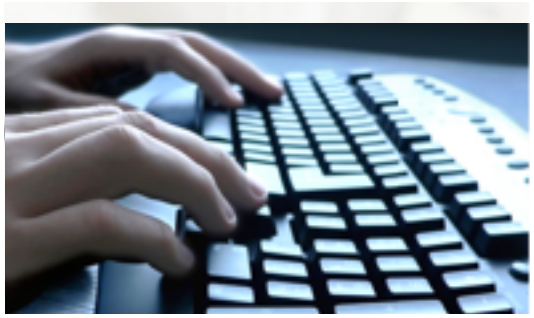


Mouse Selection



Keyboard Selection

Keyboard



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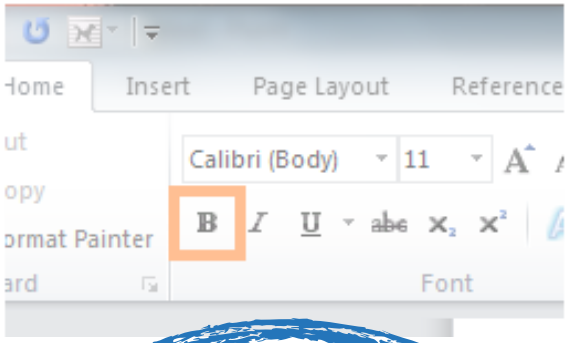
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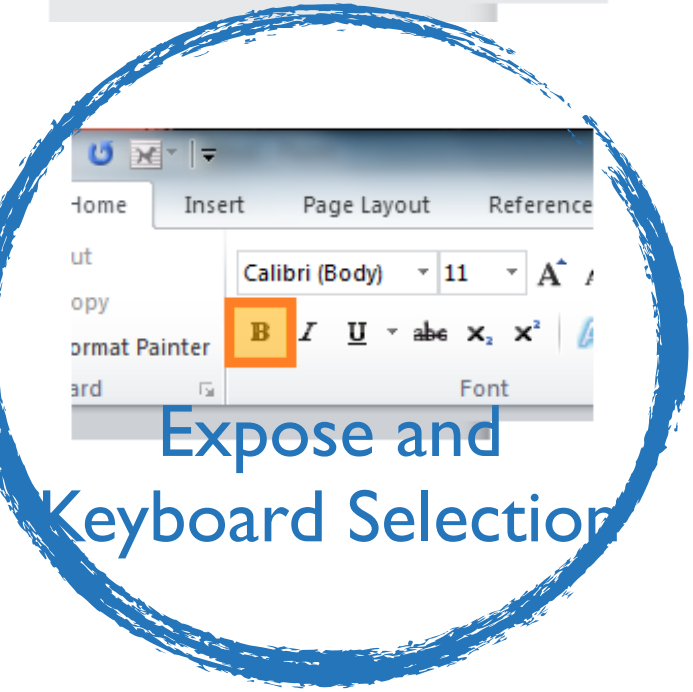
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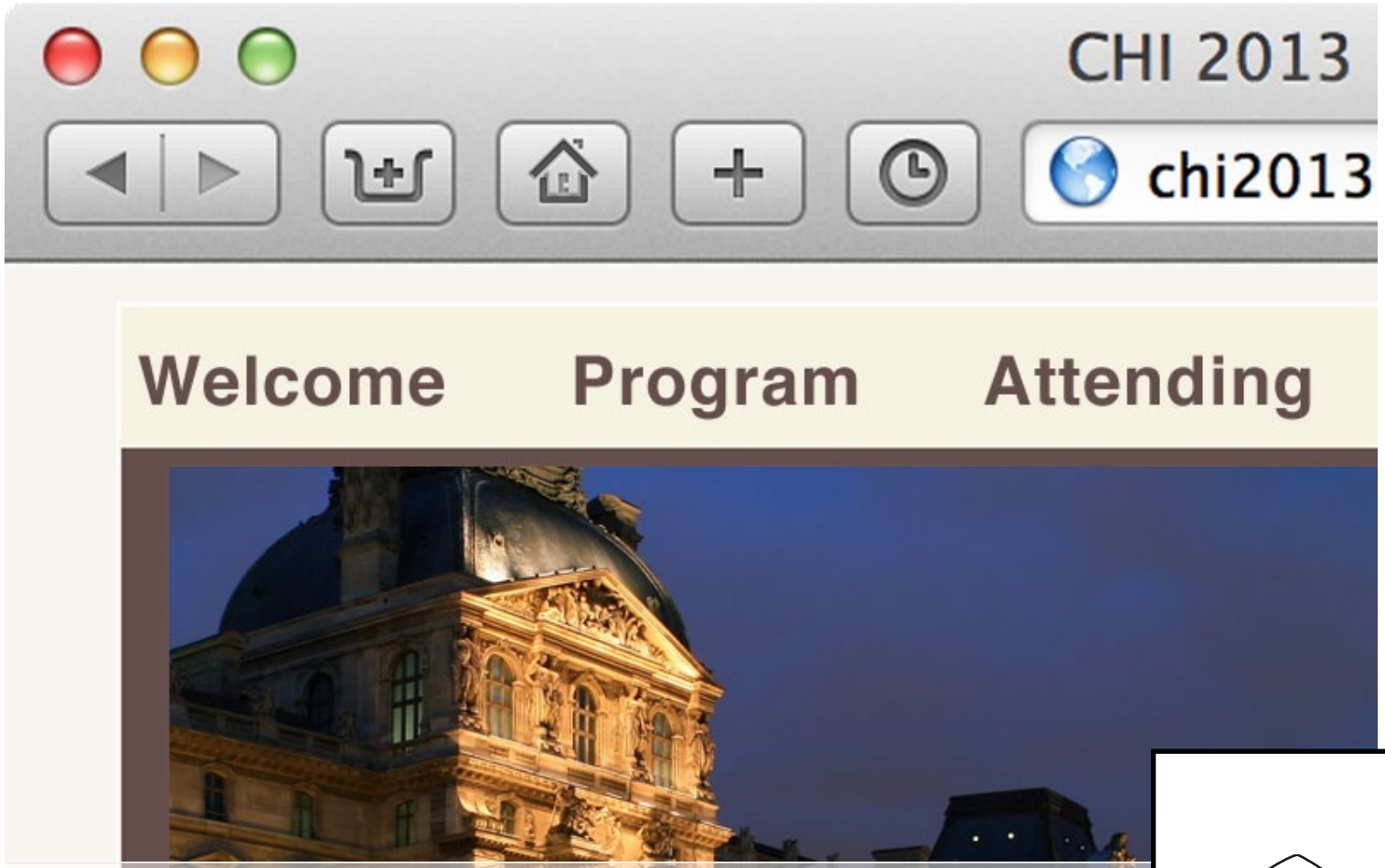
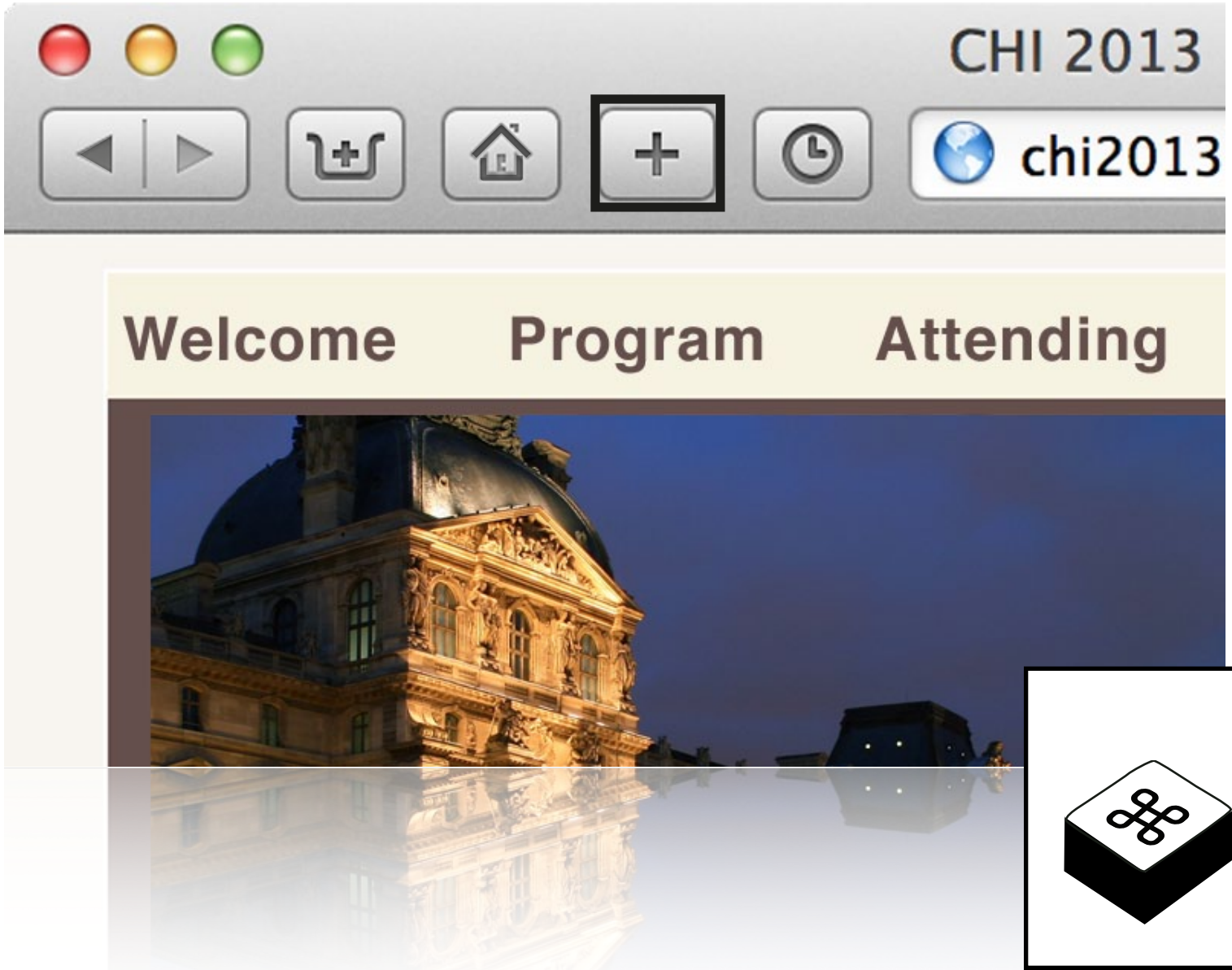
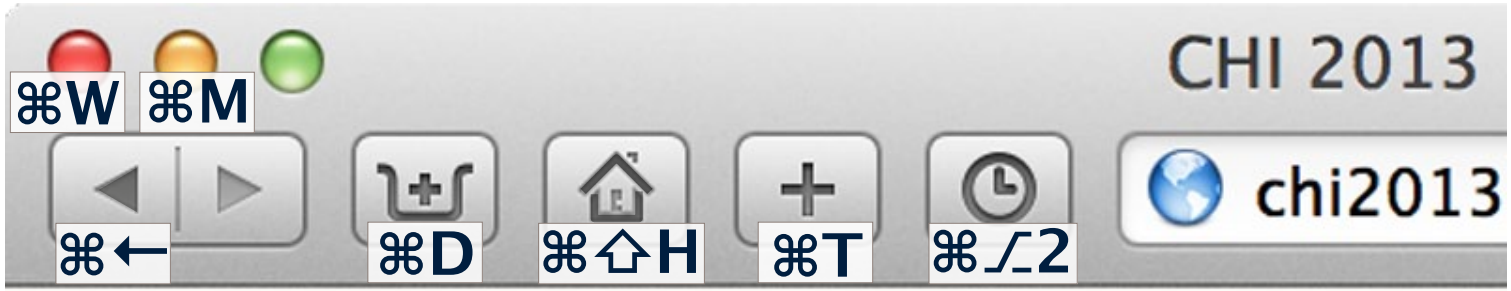
ExposeHotkey (EHK)

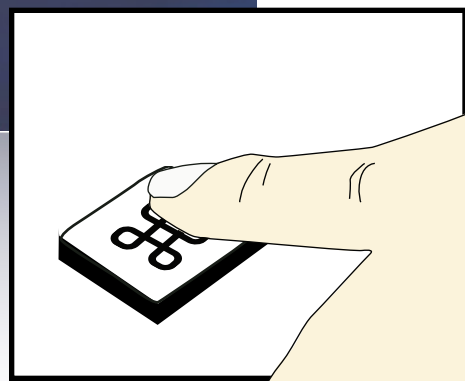


ExposeHotkey (EHK)

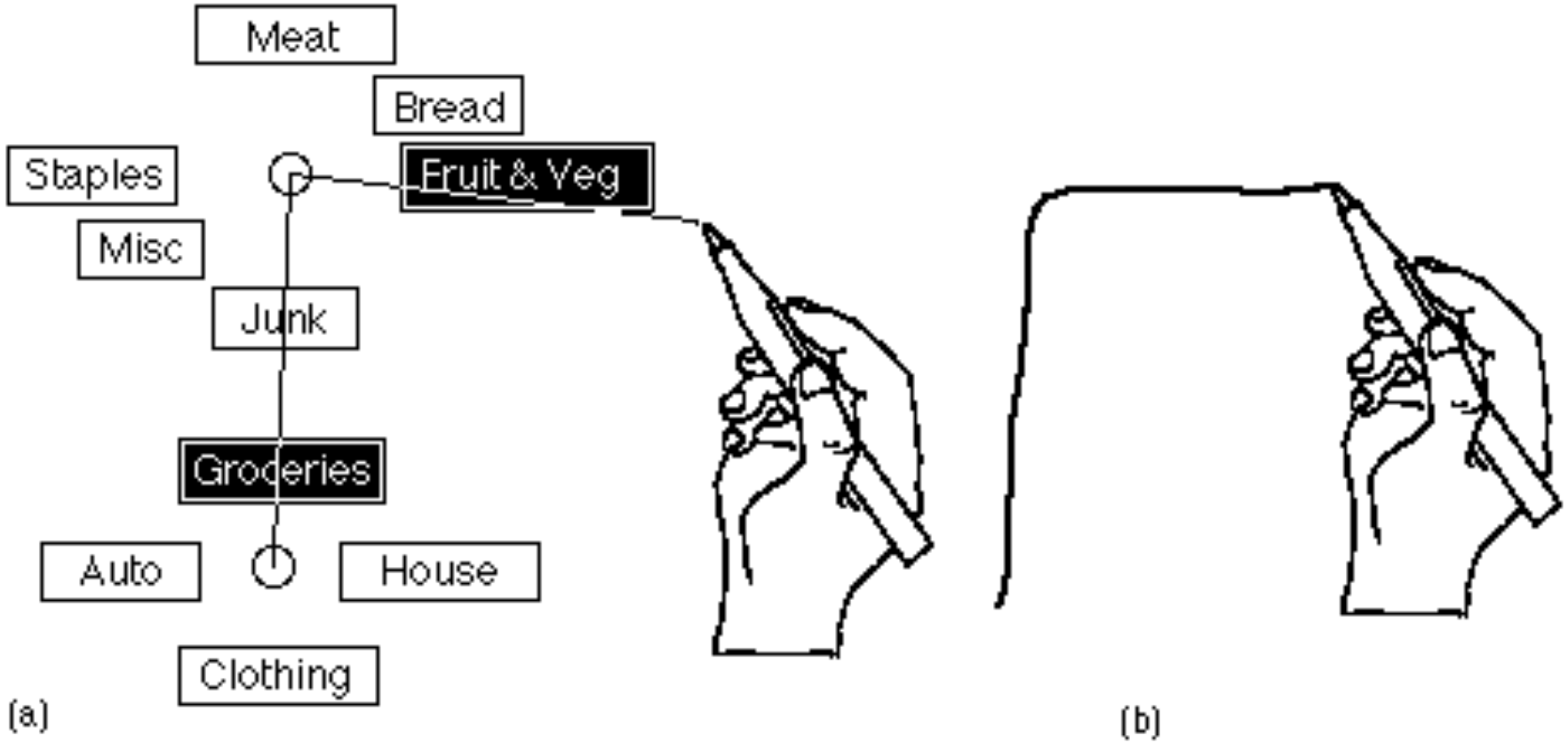


ExposeHotkey (EHK)



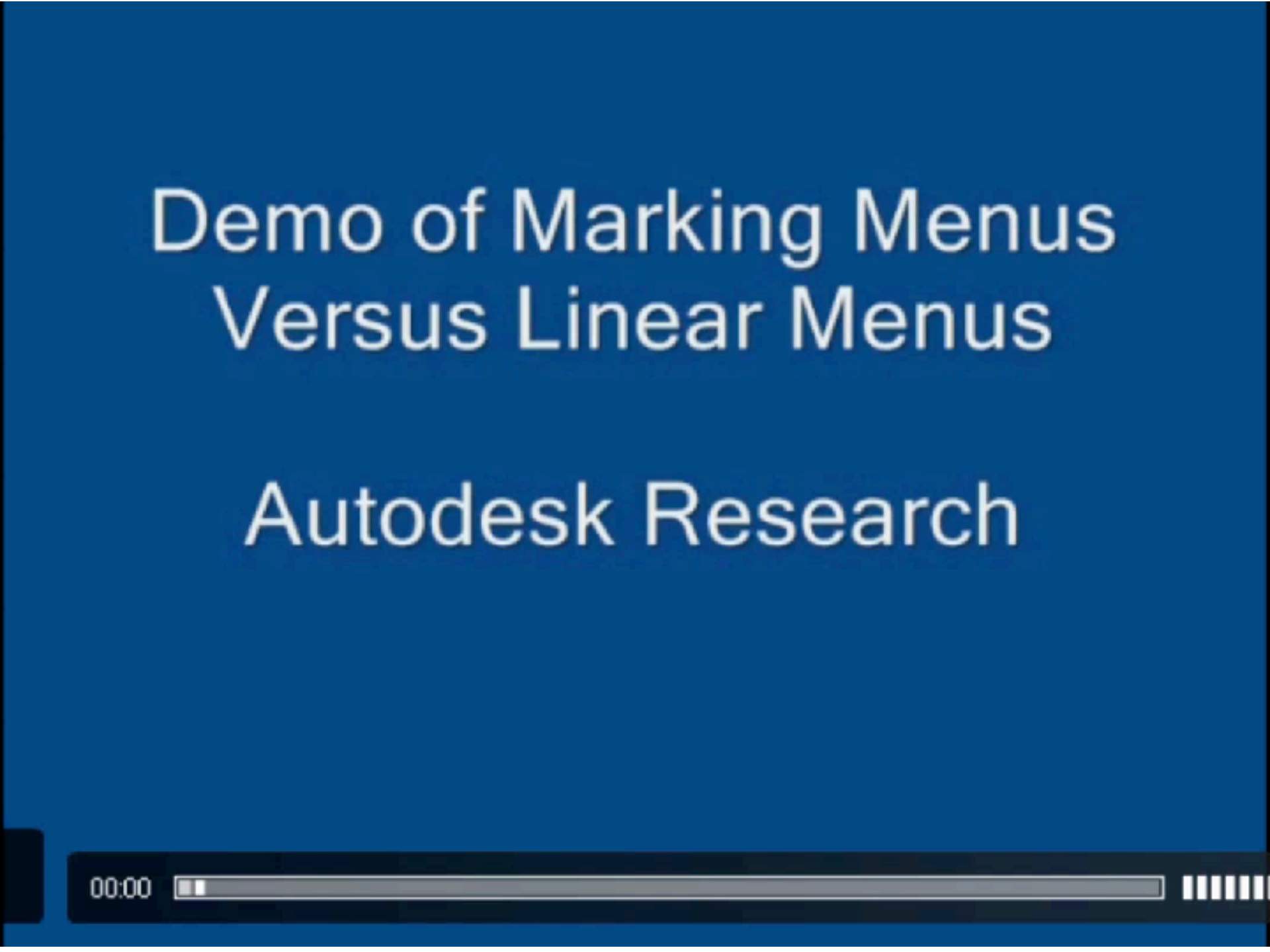


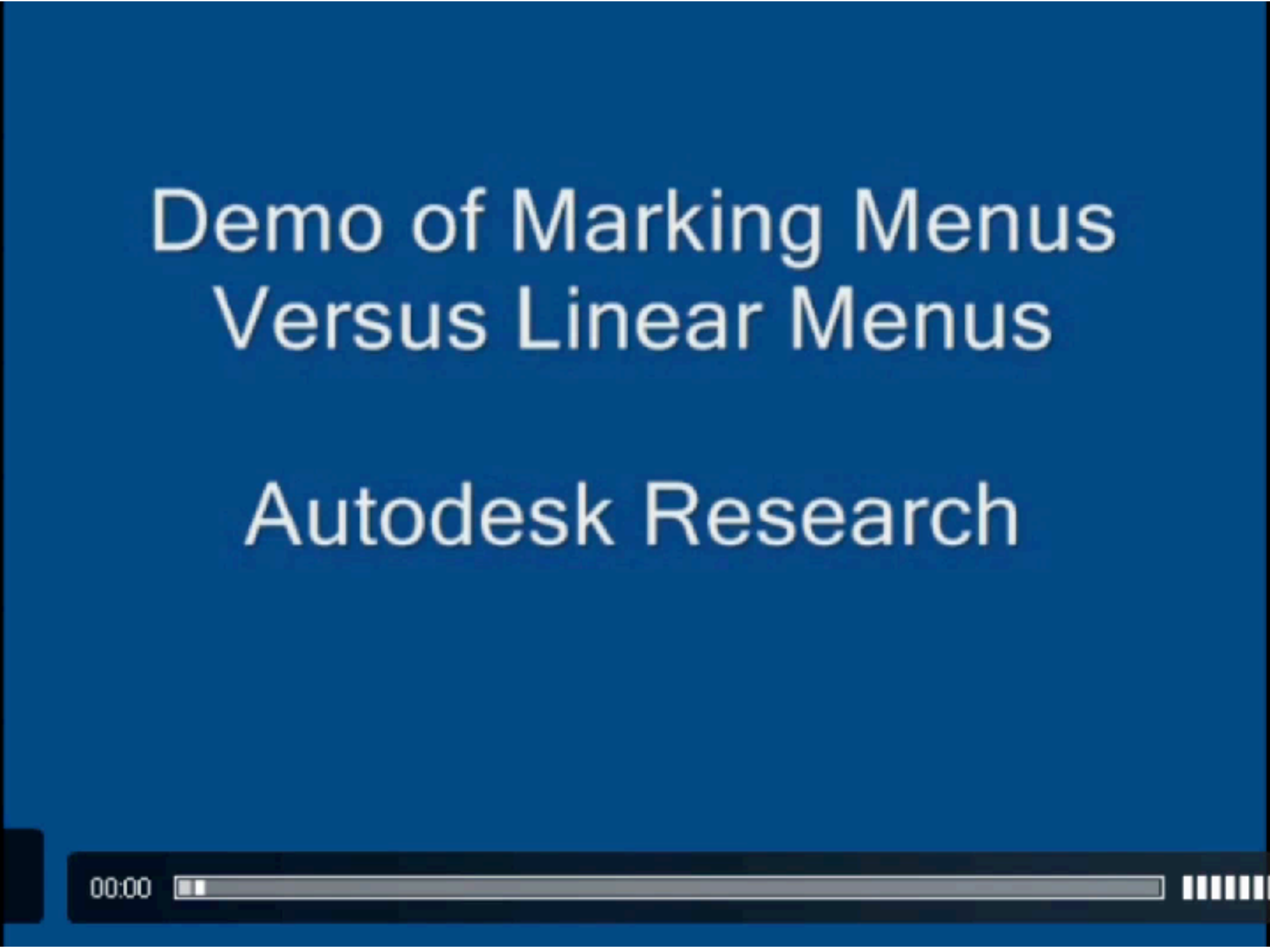
Gestural
Menu Techniques



[Kurtenbach et al. 91]

Marking menus


Demo of Marking Menus
Versus Linear Menus
Autodesk Research
00:00

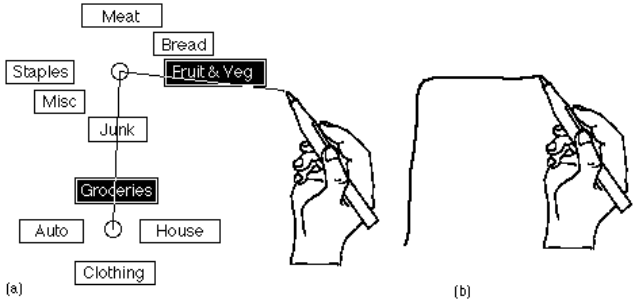

Demo of Marking Menus
Versus Linear Menus
Autodesk Research
00:00

Speed & Accuracy

Learning & Memorization

Satisfaction

Other?

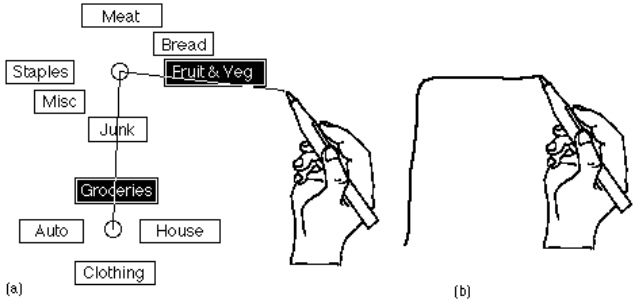


Speed & Accuracy

Learning & Memorization

Satisfaction

Other?



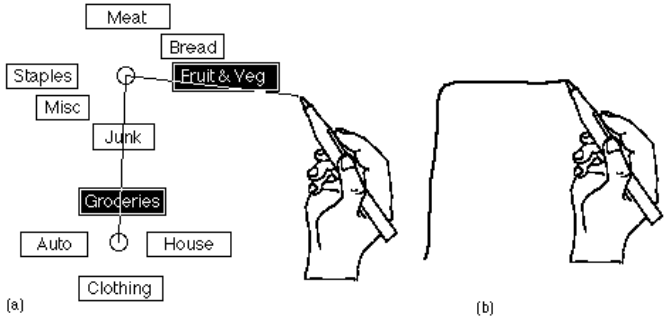
Brainstorming (2 minutes)
Pros & Cons & Properties (why)

Speed & Accuracy

- Circular design (decrease the average distance)
- Scale independence (the size of the marks does not matter)
- Expert mode (direct access)

Learning & Memorization

- Spatial memory (orientation)
- Muscular memory (fluid transition)
- Semantic relationship (open / close)



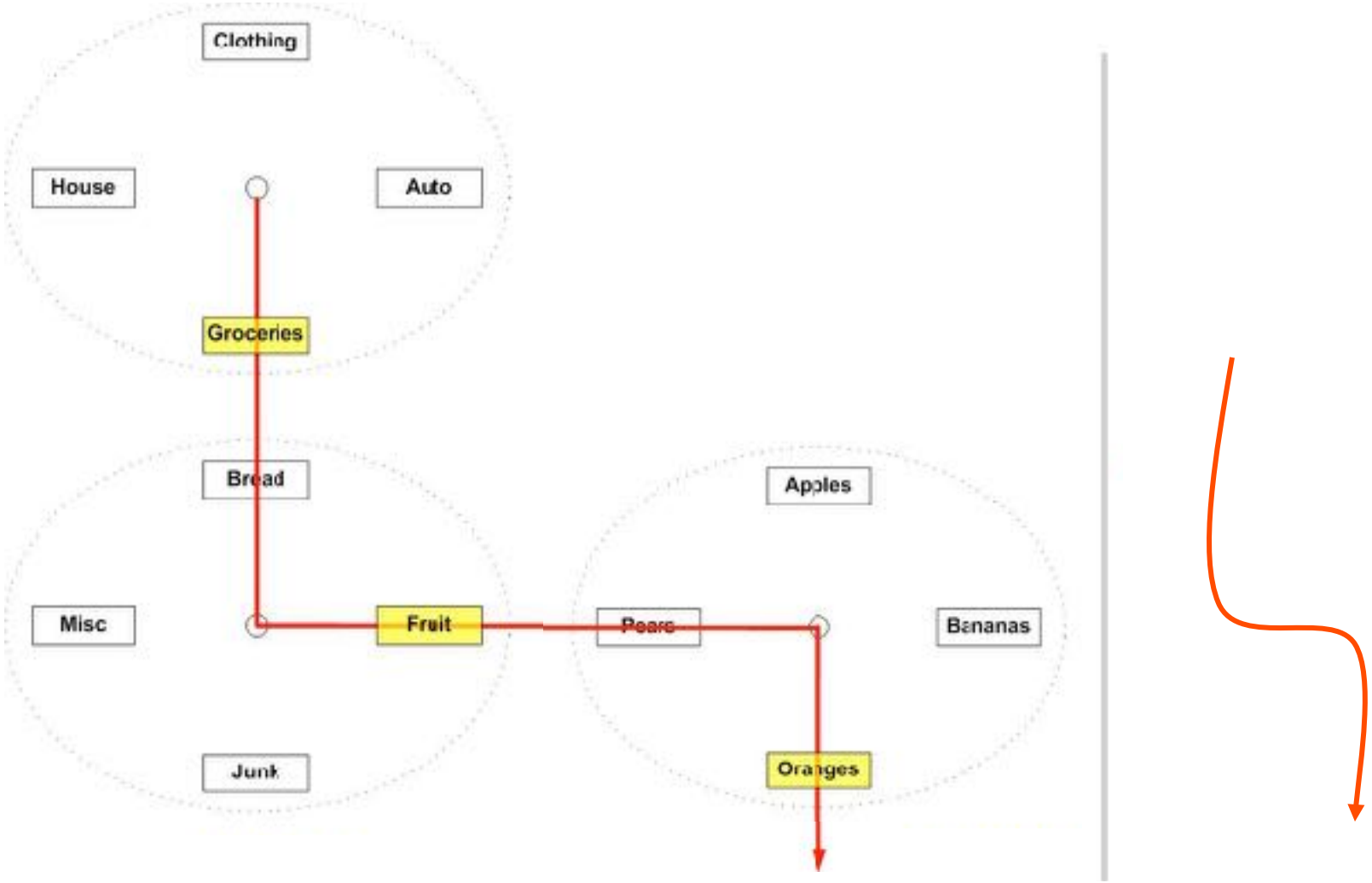
Satisfaction

- Gestural interaction

Software adequacy

- In place
- Eyes-free selection (do not require visual control)
- **Number of commands (menu depth:3 / menu breadth: 8)**
- **require space**

Compound marks

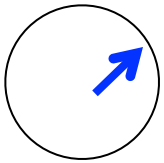


Limitations of Hierarchical Marking

Limitations of Hierarchical Marking

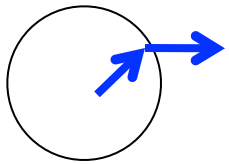
NE

Limitations of Hierarchical Marking



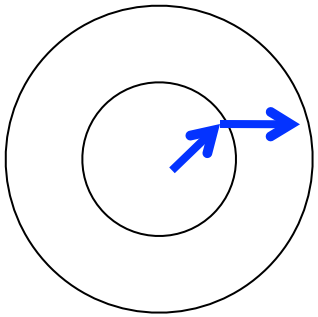
NE

Limitations of Hierarchical Marking



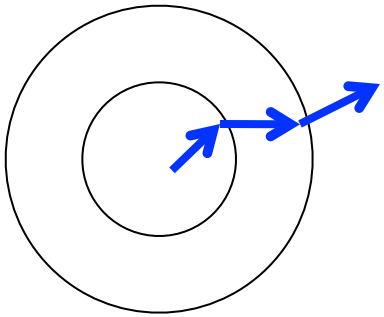
NE-E

Limitations of Hierarchical Marking



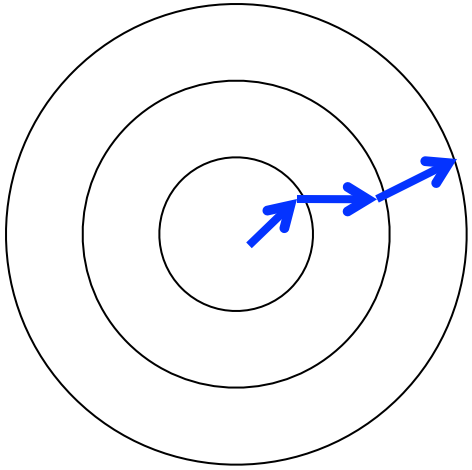
NE-E

Limitations of Hierarchical Marking



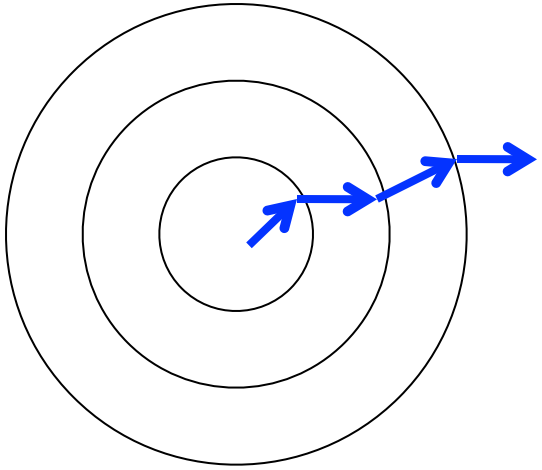
NE-E -NE

Limitations of Hierarchical Marking



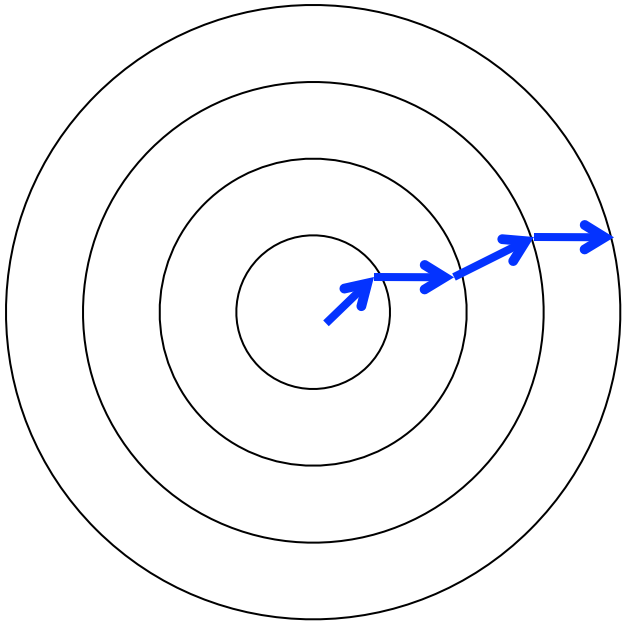
NE-E -NE

Limitations of Hierarchical Marking



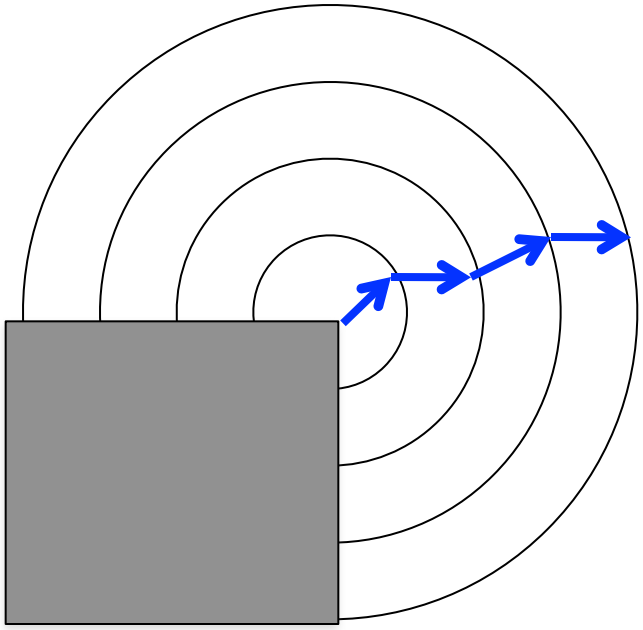
NE-E **-NE** -E

Limitations of Hierarchical Marking

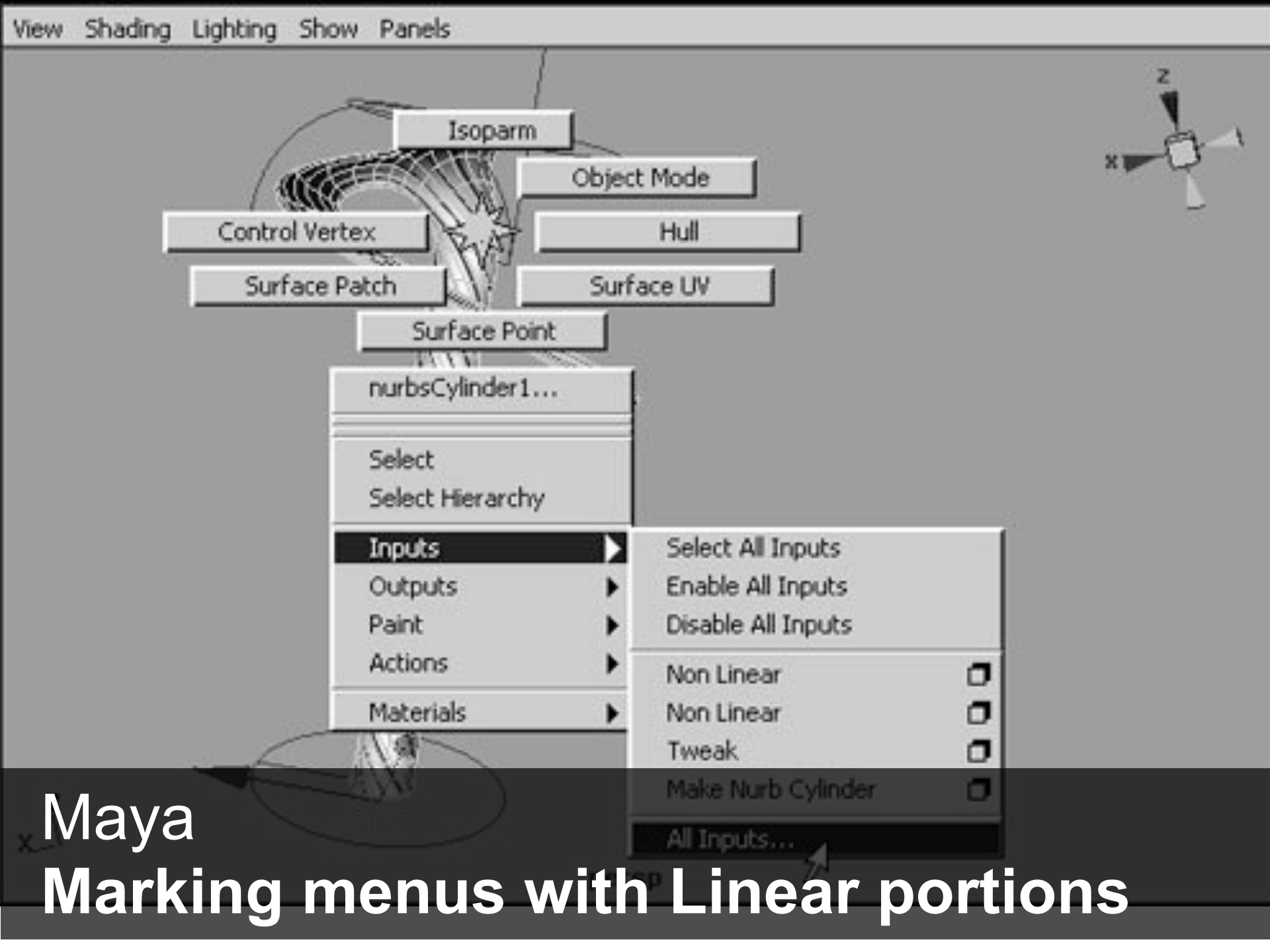


NE-E **-NE** -E

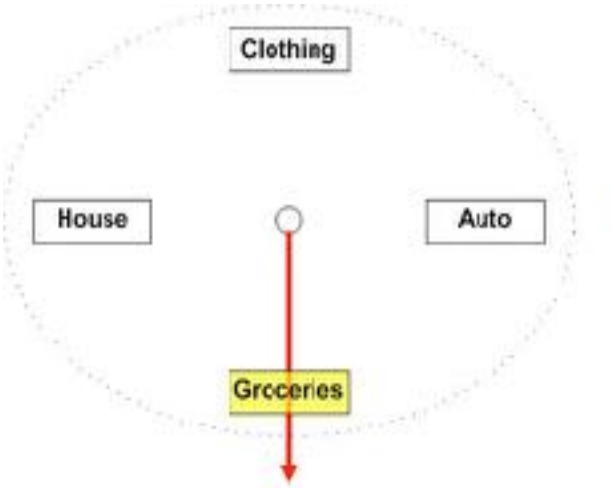
Limitations of Hierarchical Marking



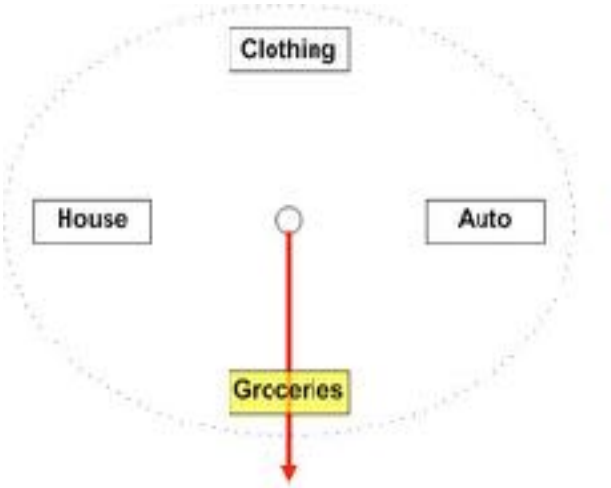
NE-E **-NE** -E


View Shading Lighting Show Panels
Isoparm
Object Mode
Control Vertex
Hull
Surface Patch
Surface UV
Surface Point
nurbsCylinder1...
Select
Select Hierarchy
Inputs
Outputs
Paint
Actions
Materials
Select All Inputs
Enable All Inputs
Disable All Inputs
Non Linear
Non Linear
Tweak
Make Nurb Cylinder
All Inputs...
Maya
Marking menus with Linear portions

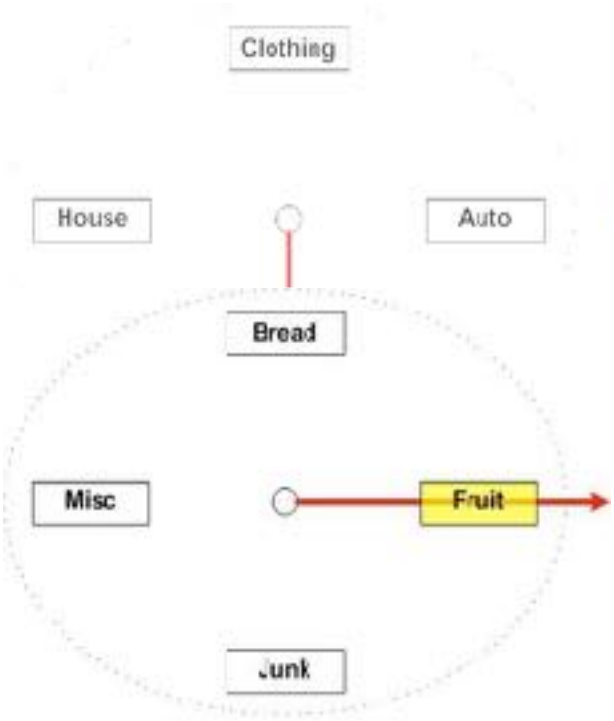
Simple marks (Menu depth)



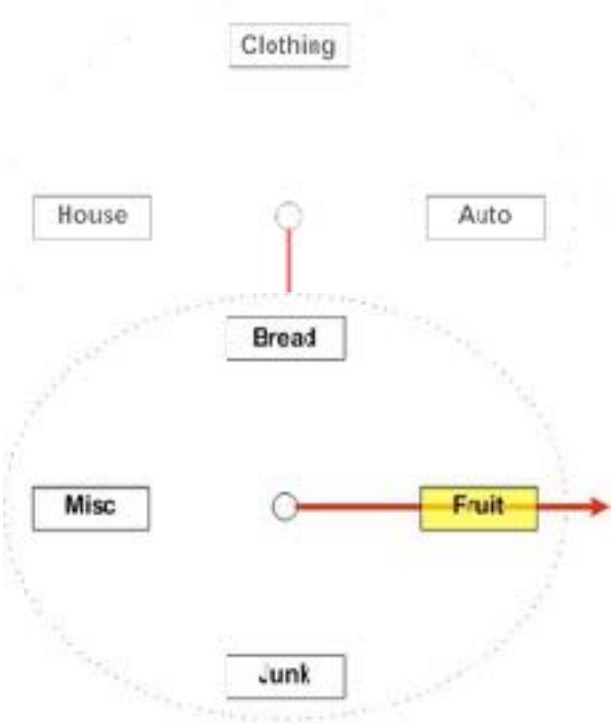
Simple marks

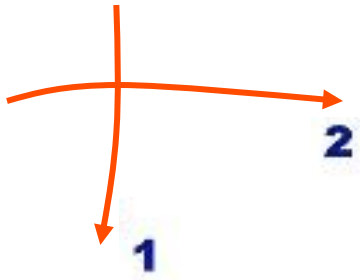


Simple marks

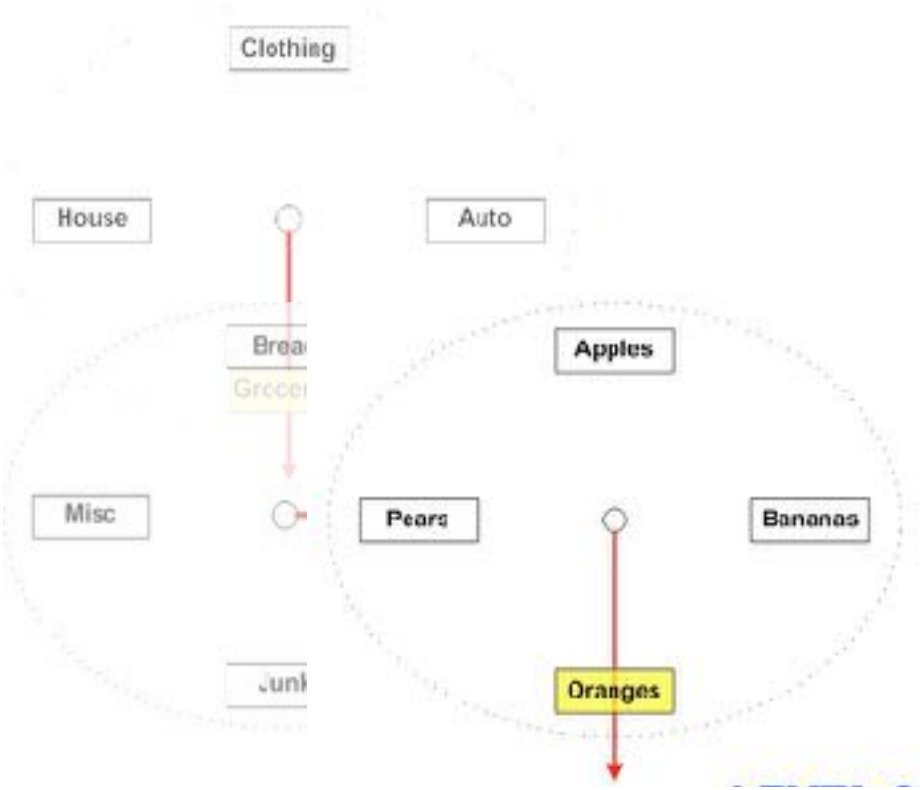


Simple marks

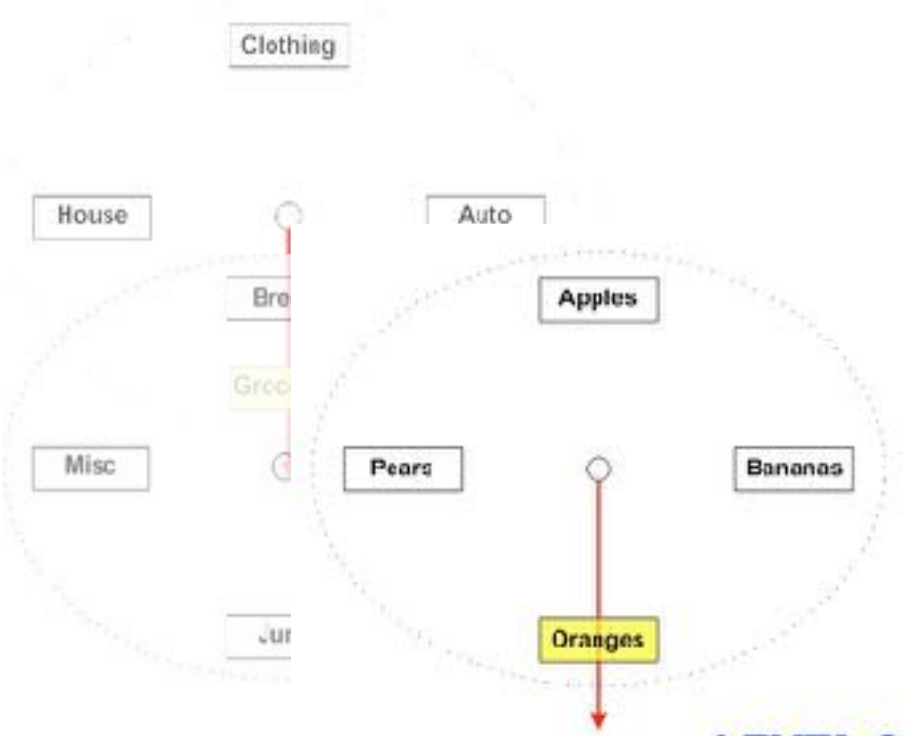


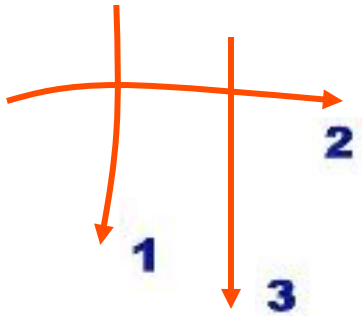


Simple marks



Simple marks



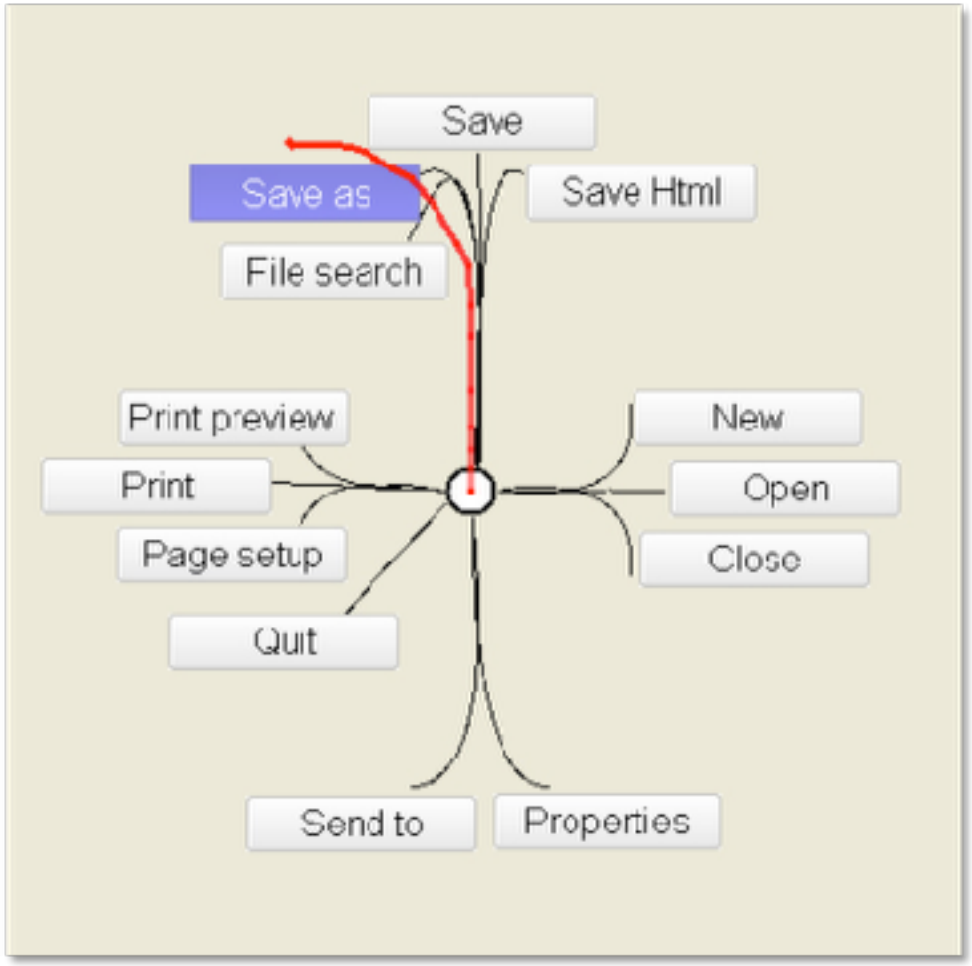


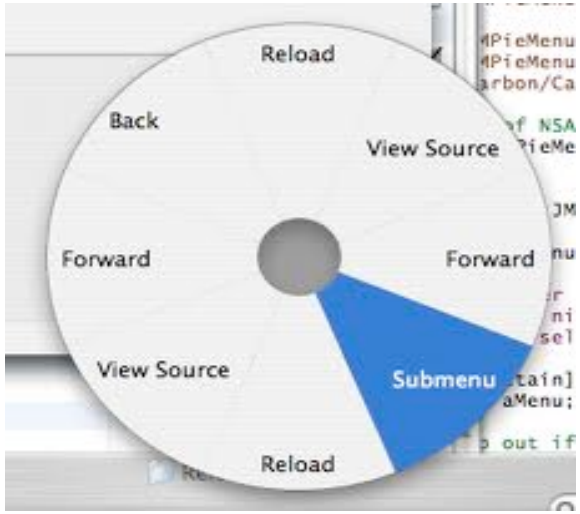
Limitation of simple marks?

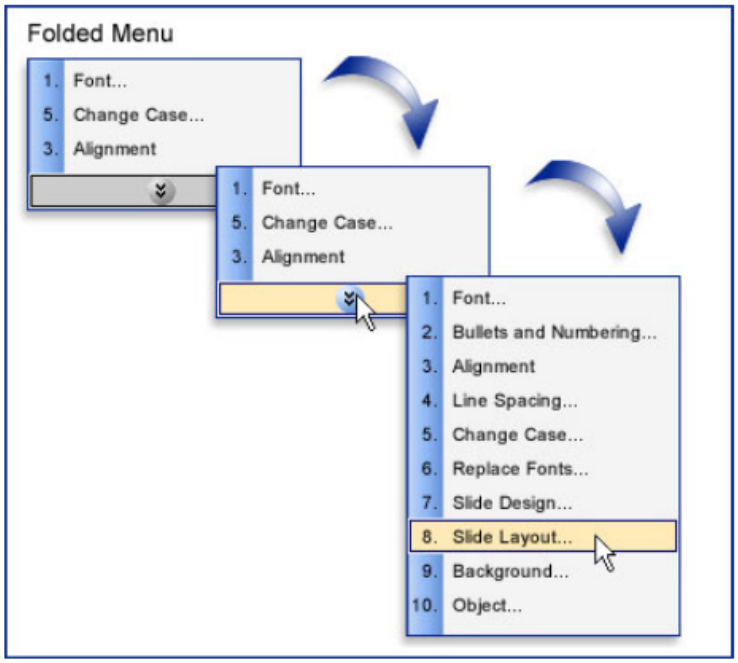
– forget that I have a mark already → **error**

– (they are “**modal**”)

Flower Menus (curved gestures)





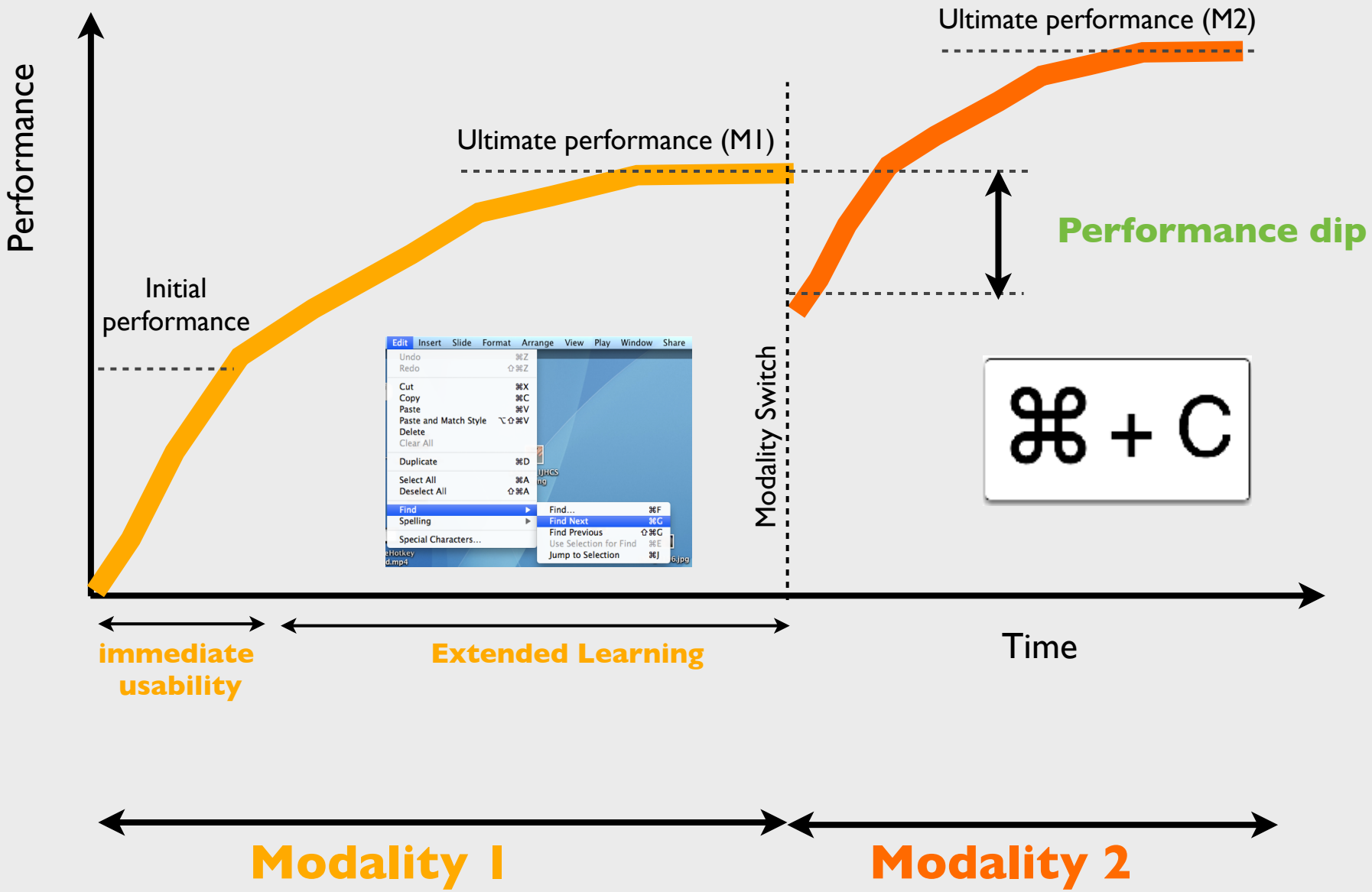


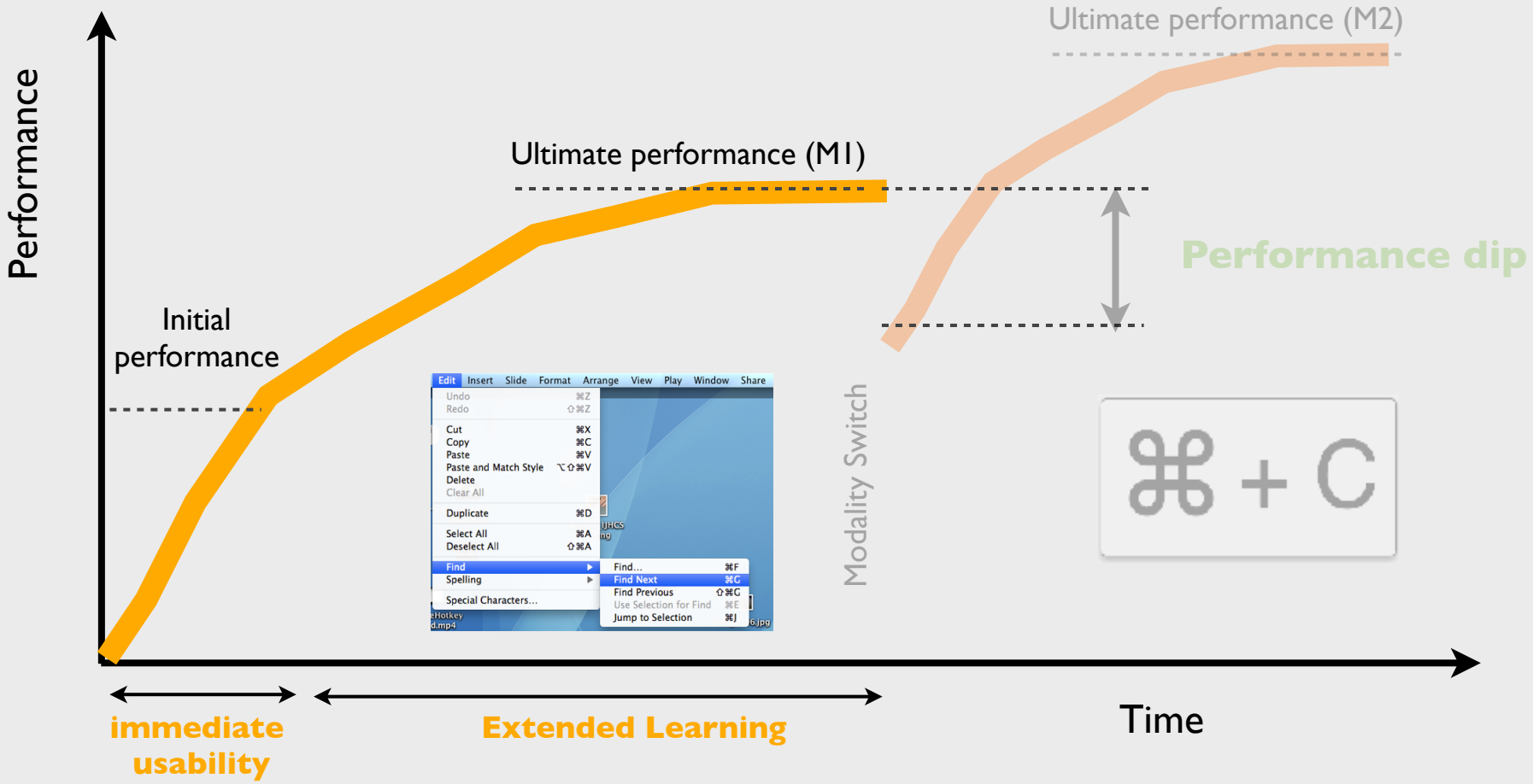
Fame or Shame?

How to predict whether a novel menu technique will be efficient?

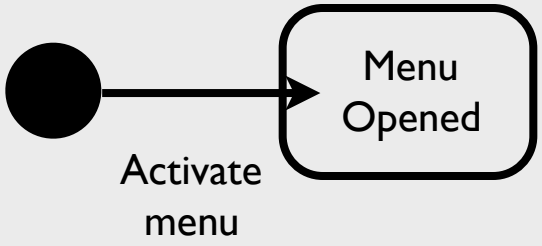
Model of Menu Performance

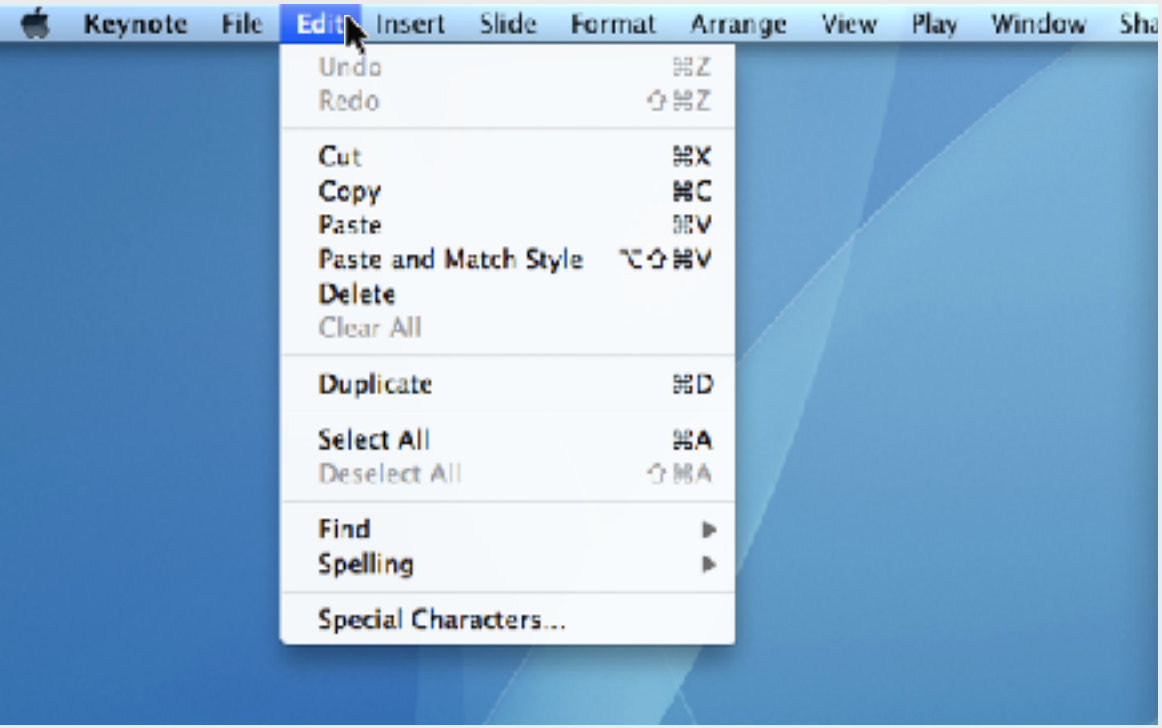
Cockburn, A., Gutwin, C. and Greenberg, S. (2007)
A Predictive Model of Menu Performance.
ACM CHI'07. ACM Press, pages 627-636


Performance
Ultimate performance (M2)
Ultimate performance (M1)
Performance dip
Initial performance
Modality Switch
⌘ + C
Time
immediate usability
Extended Learning
Modality 1
Modality 2


Performance
Ultimate performance (M2)
Ultimate performance (M1)
Performance dip
Initial performance
Edit Insert Slide Format Arrange View Play Window Share
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find... ⌘F
Find Next ⌘G
Find Previous ⇧⌘G
Use Selection for Find ⌘E
Jump to Selection ⌘J
Modality Switch
⌘ + C
immediate usability
Extended Learning
Time
Modality 1
Modality 2


Keynote
File
Edit
Insert
Slide
Format
Arrange
View
Play
Window


Menu
Opened
Activate
menu


Keynote
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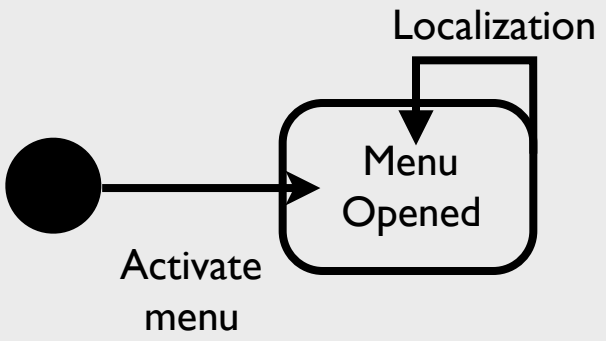
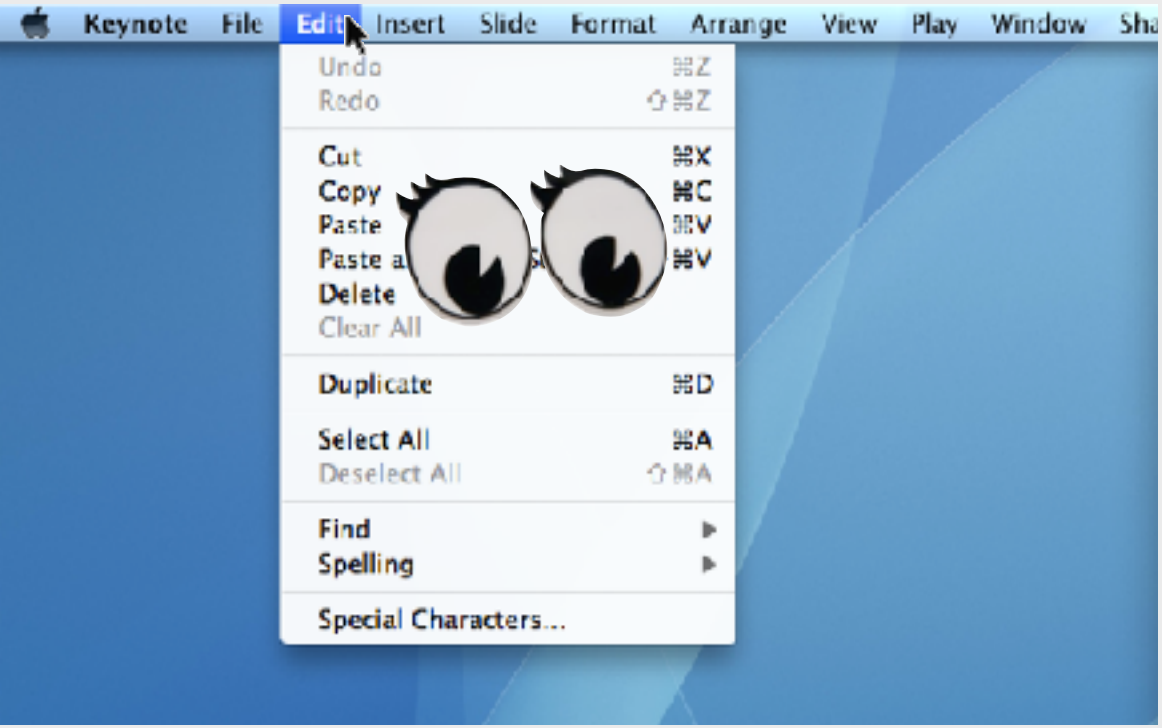
Format
Arrange
View
Play
Window
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...


Localization
Menu
Opened
Activate
menu


Keynote
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Format
Arrange
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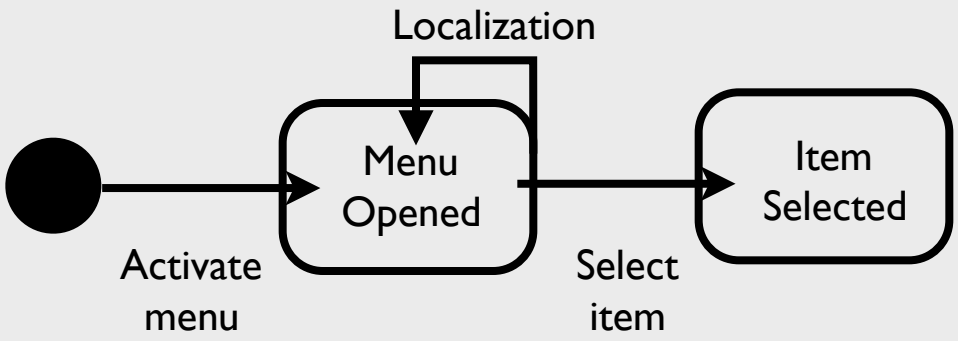
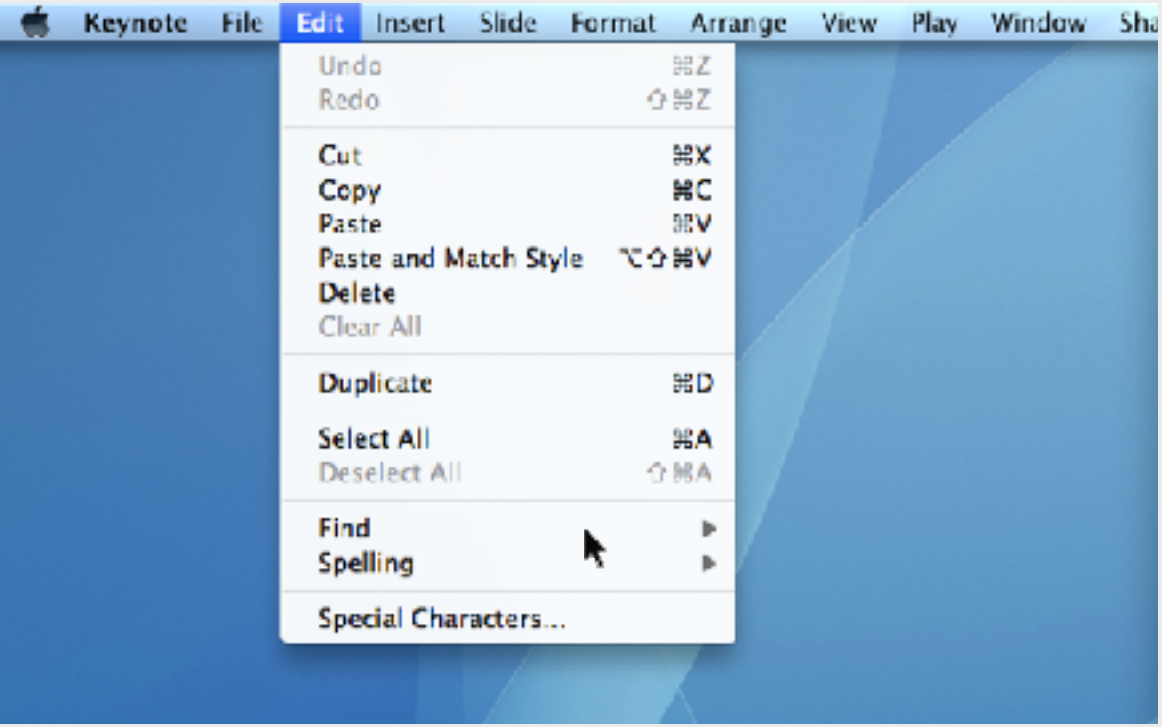
Window
Undo
Redo
Cut
Copy
Paste
Delete
Clear All
Duplicate
Select All
Deselect All
Find
Spelling
Special Characters...


Localization
Menu
Opened
Item
Selected
Activate
menu
Select
item


Keynote
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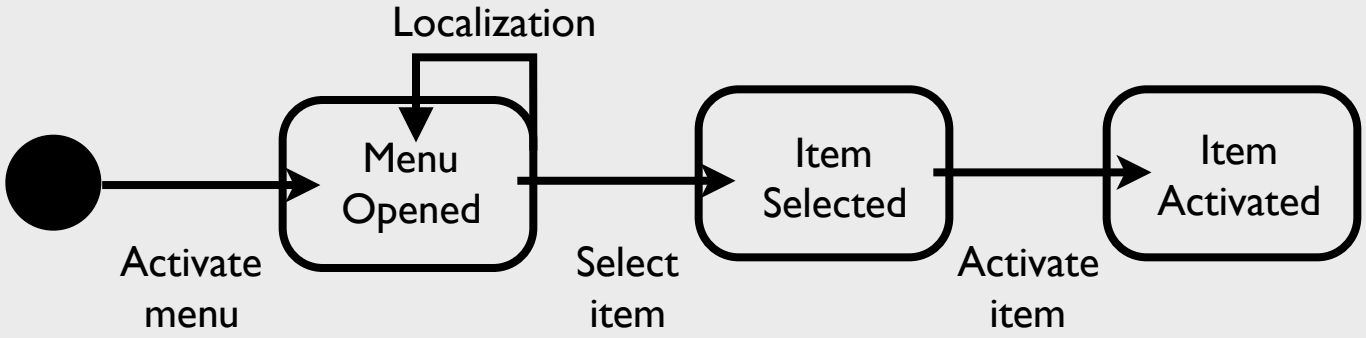
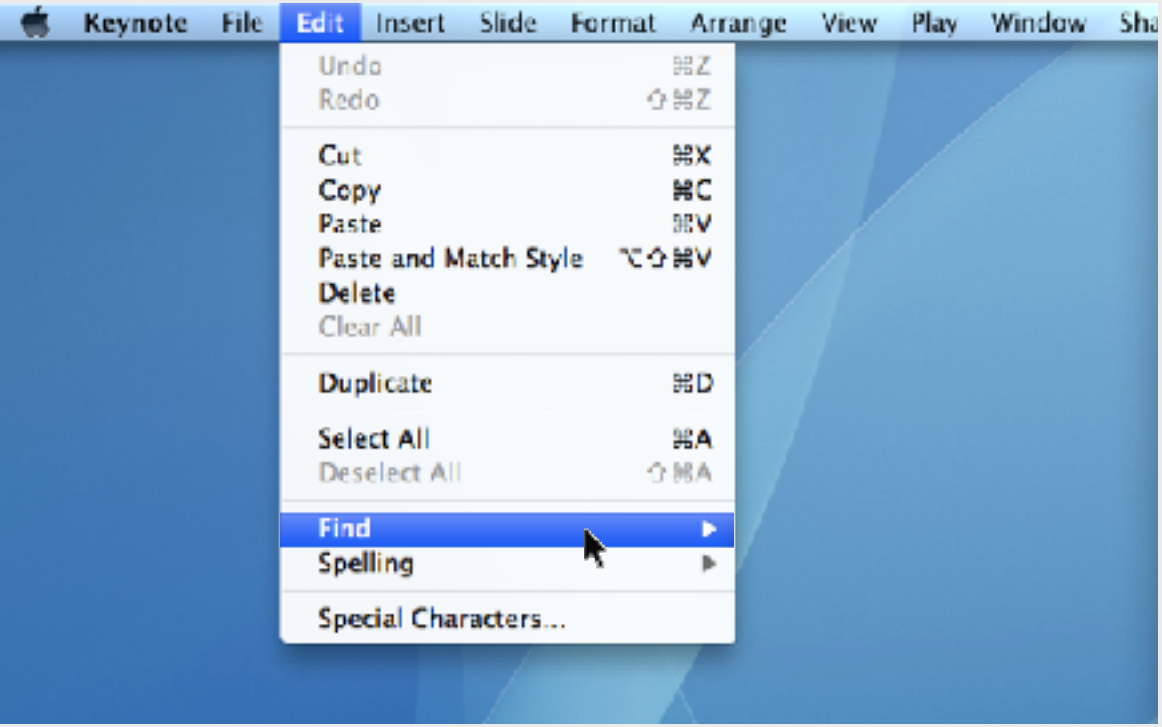
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...


Localization
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item


Keynote
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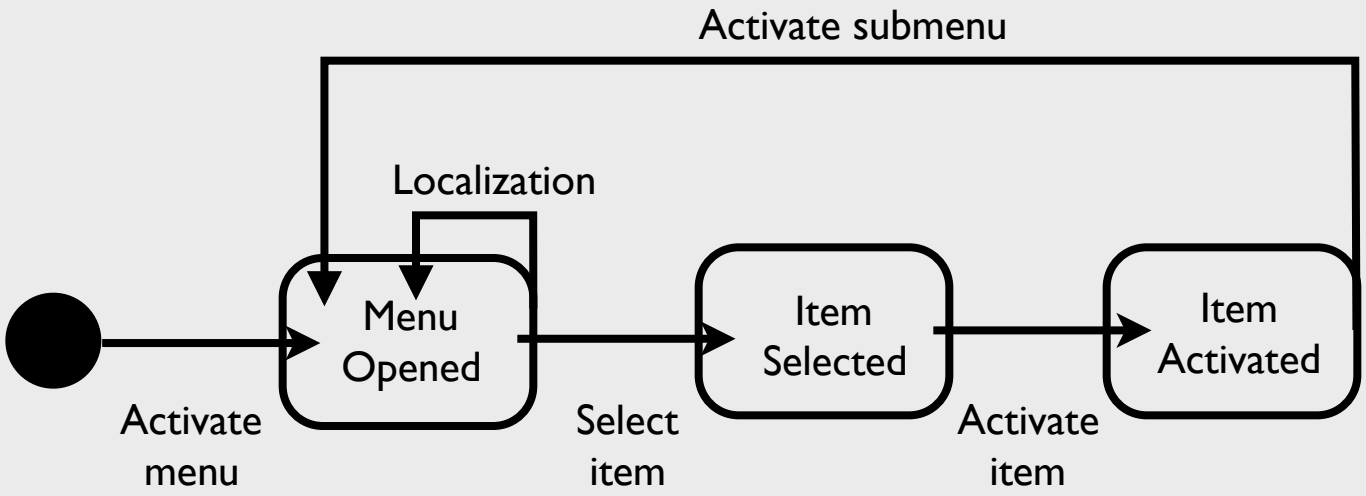
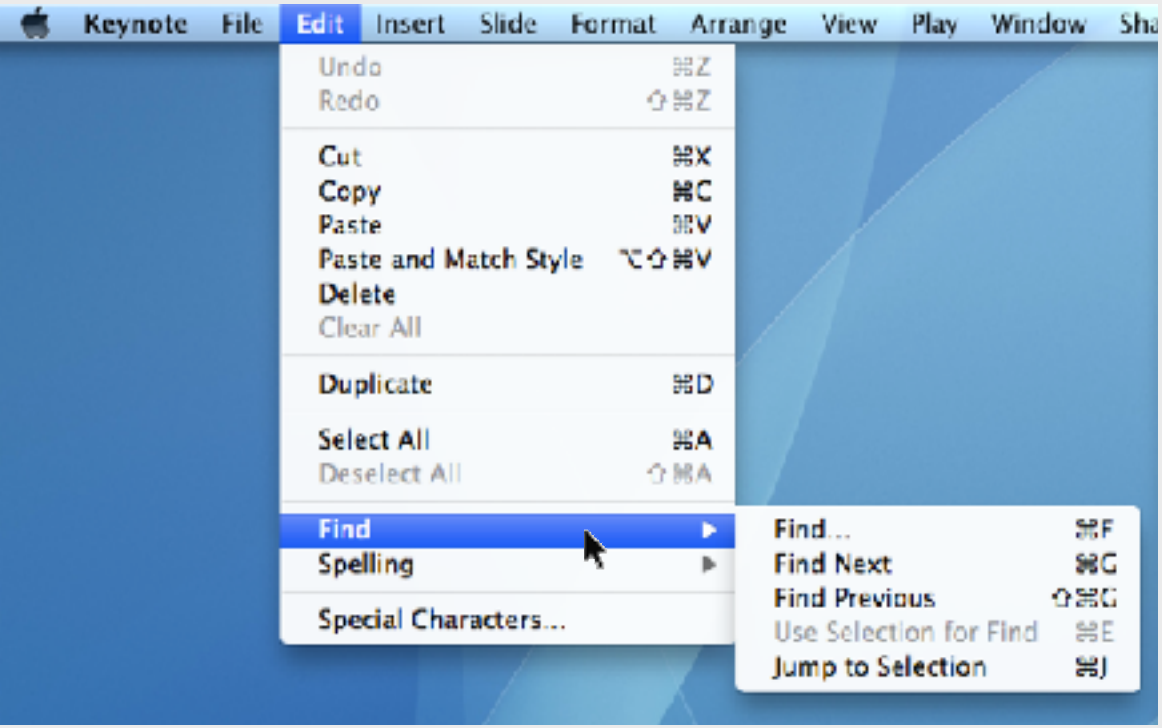
Slide
Format
Arrange
View
Play
Window
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...


Activate submenu
Localization
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item


Keynote
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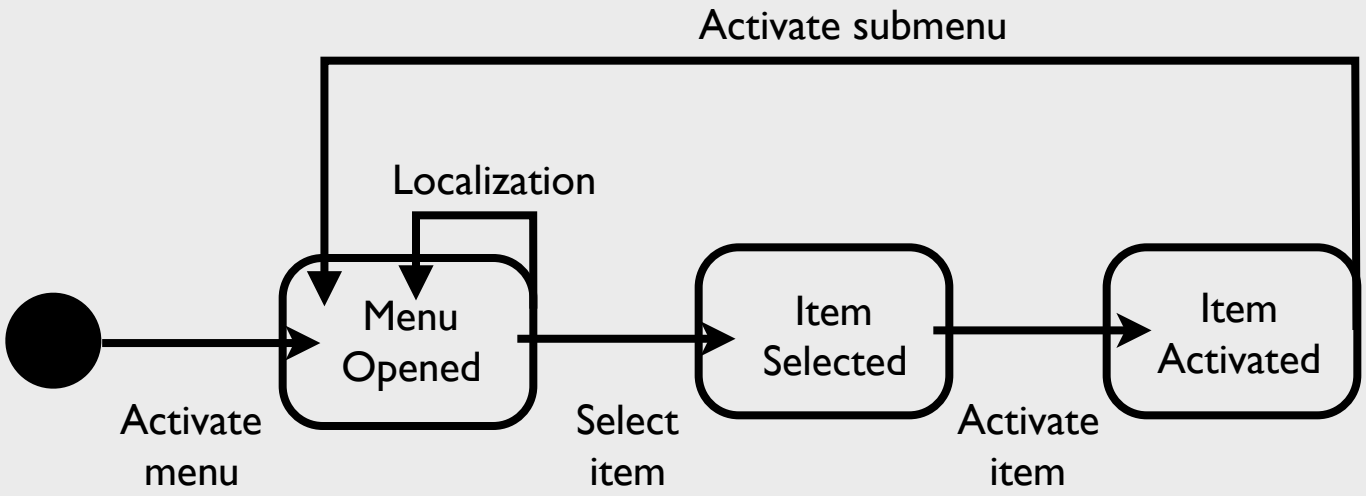
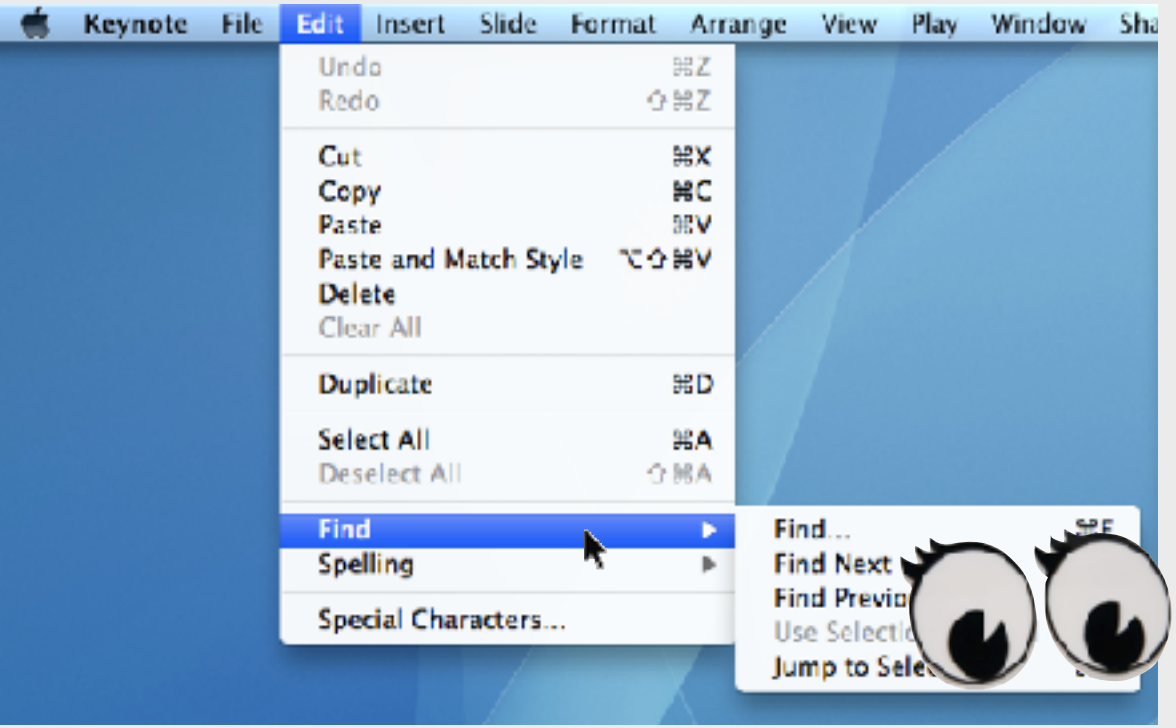
Slide
Format
Arrange
View
Play
Window
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find... ⌘F
Find Next ⌘G
Find Previous ⇧⌘G
Use Selection for Find ⌘E
Jump to Selection ⌘J


Activate submenu
Localization
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item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Window
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
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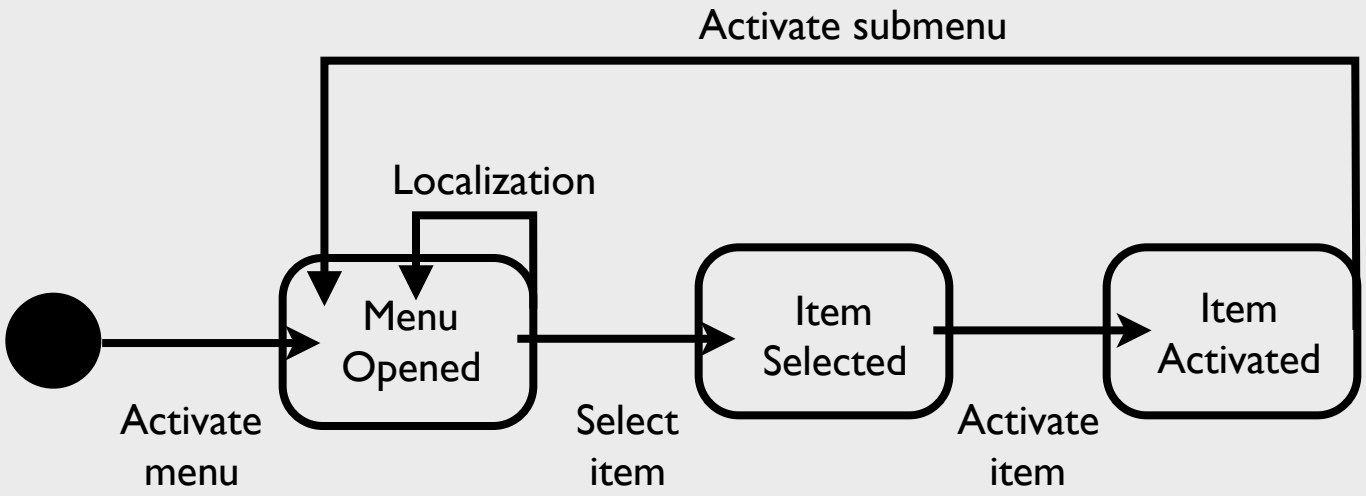
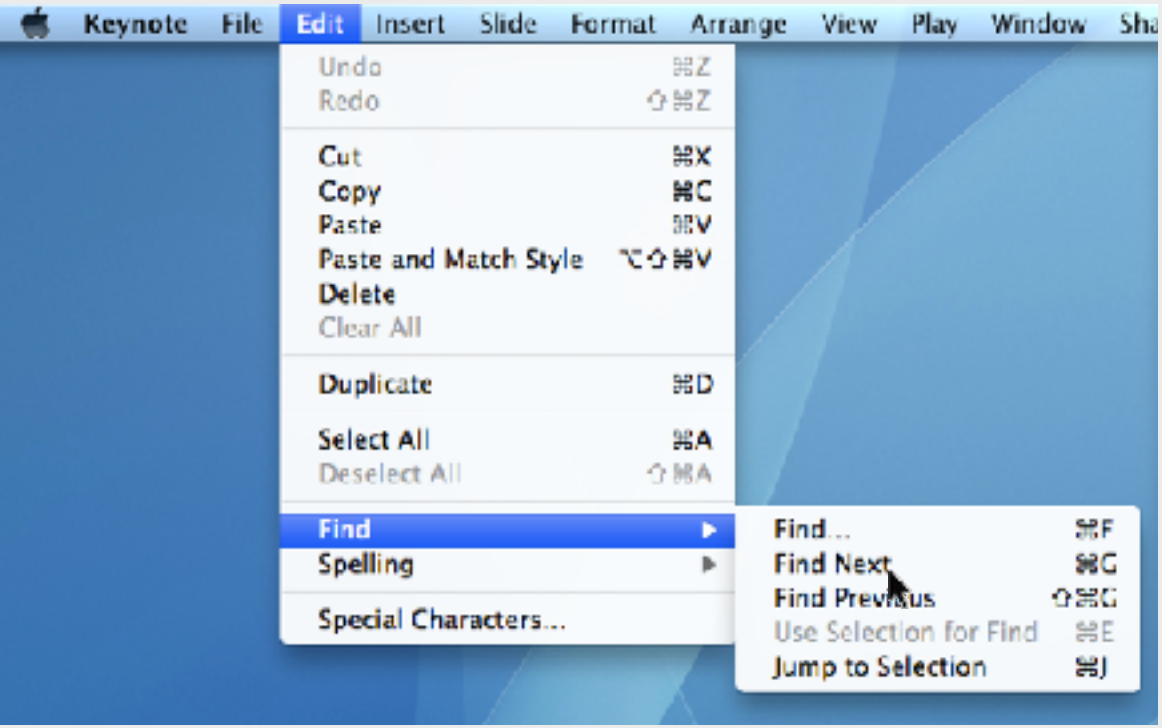
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find...
Find Next
Jump to Sele


Activate submenu
Localization
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item


Keynote
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Format
Arrange
View
Play
Window
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
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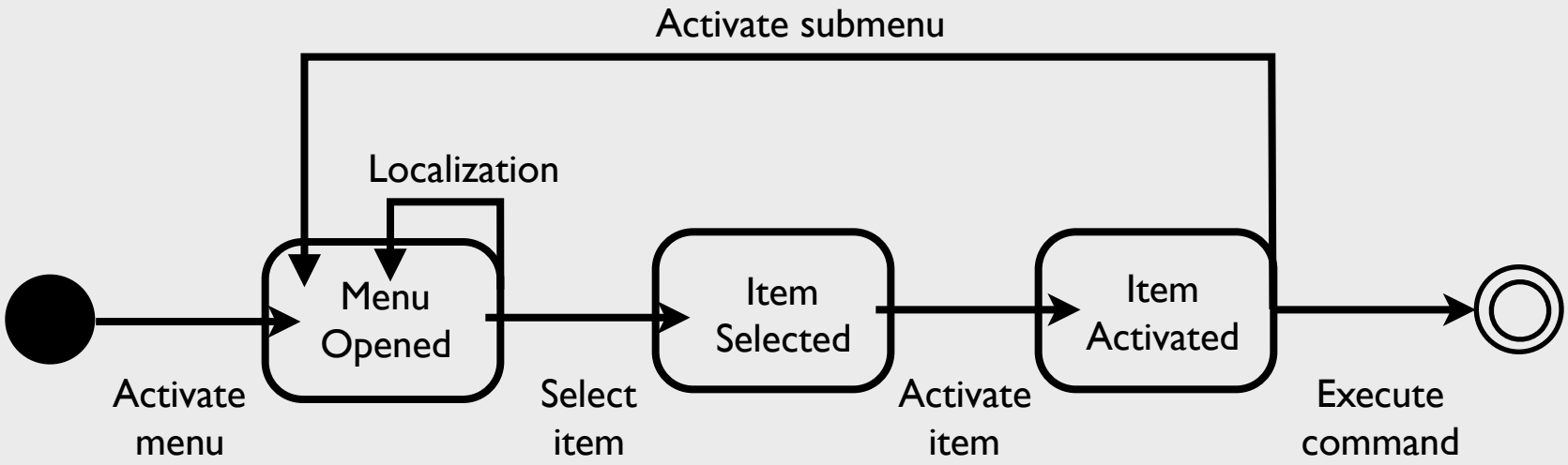
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find... ⌘F
Find Next ⌘G
Find Previous ⇧⌘G
Use Selection for Find ⌘E
Jump to Selection ⌘J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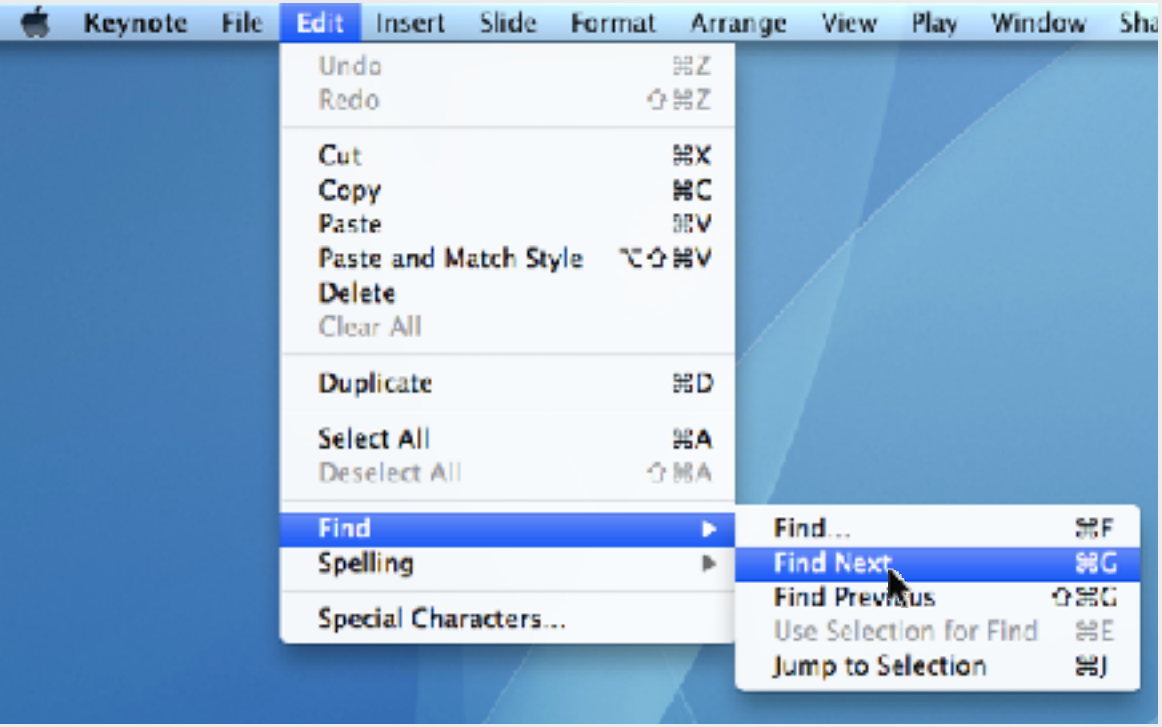
Localization
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item
Execute command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Arrange
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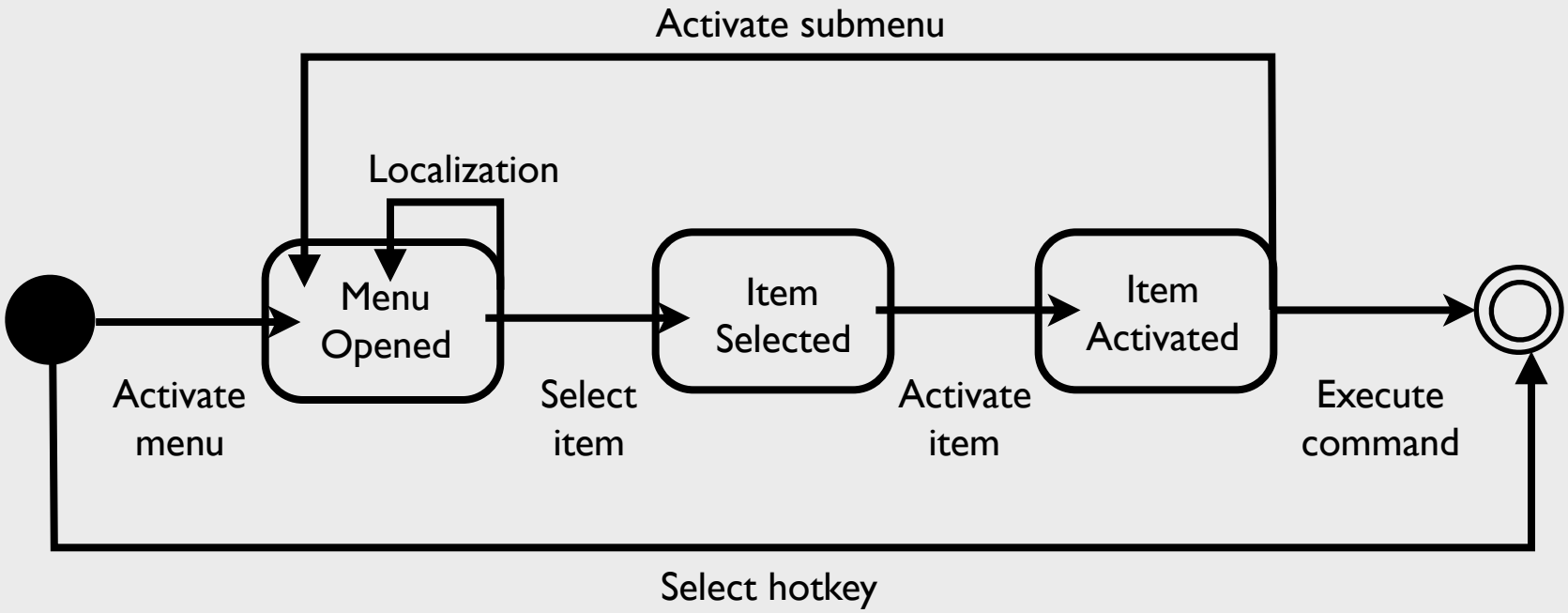
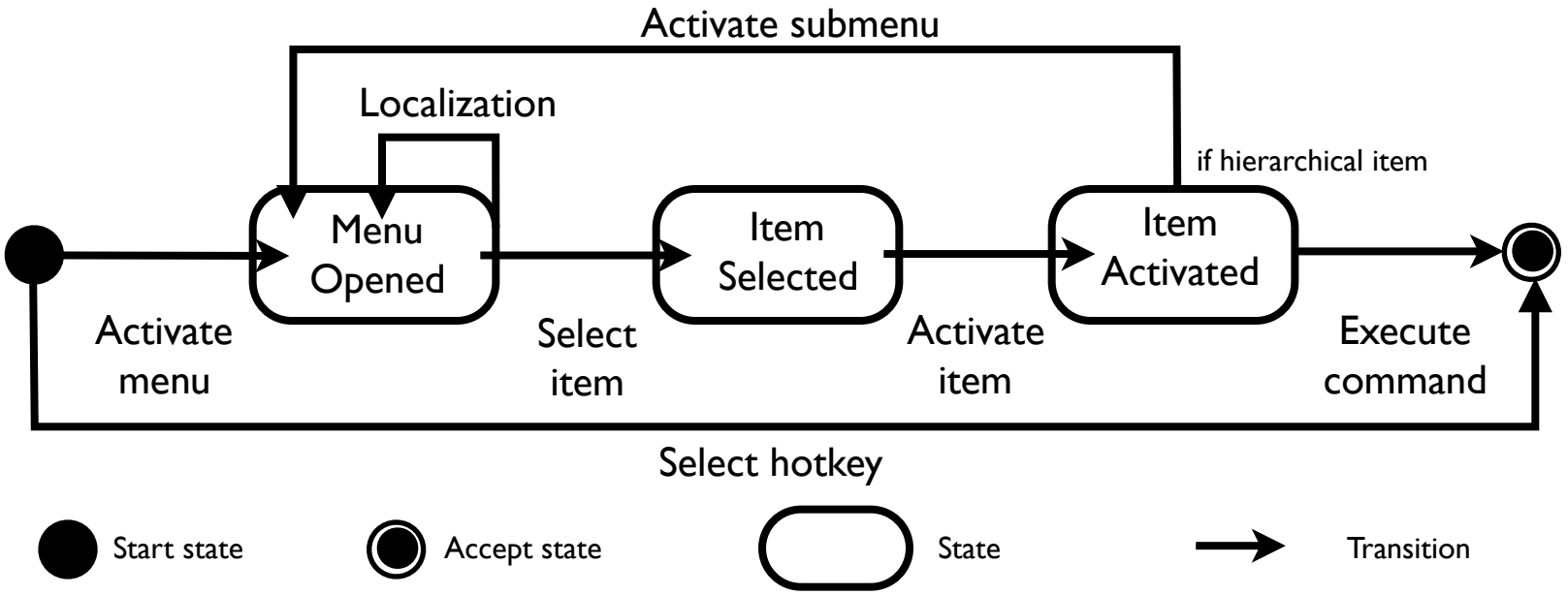
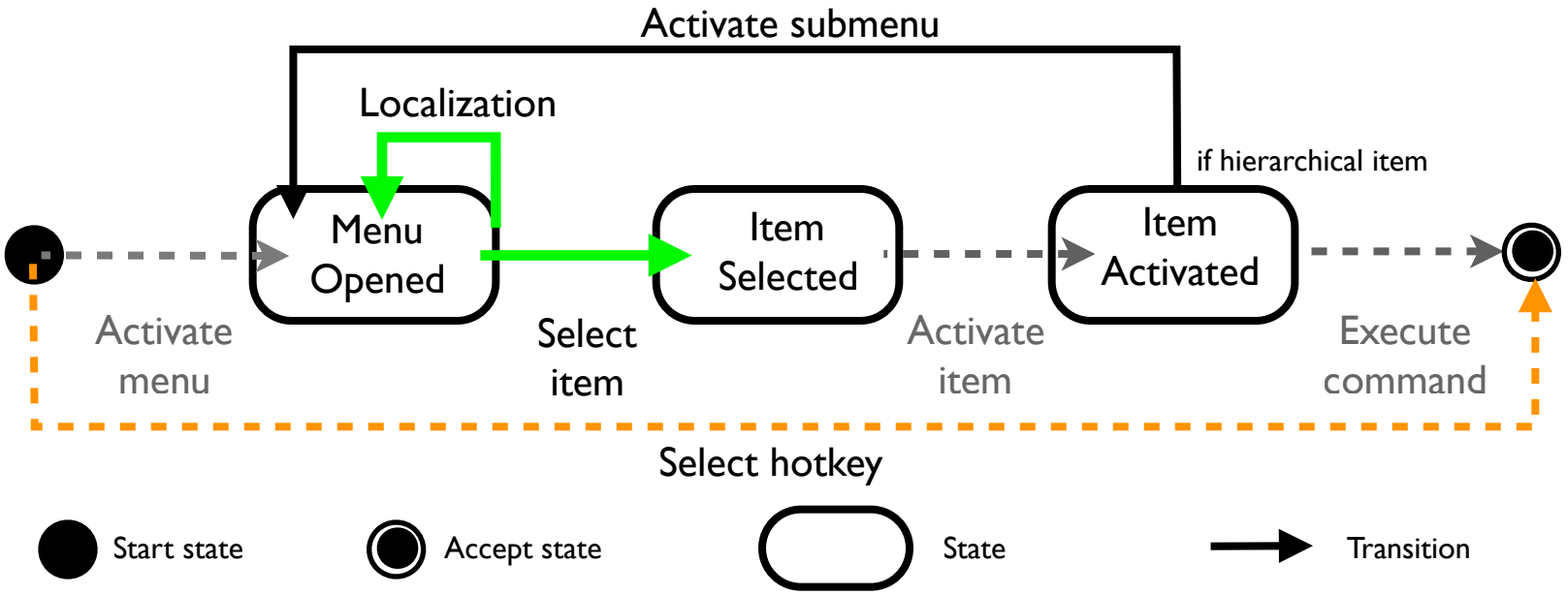
Window
Undo ⌘Z
Redo ⇧⌘Z
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste and Match Style ⌥⇧⌘V
Delete
Clear All
Duplicate ⌘D
Select All ⌘A
Deselect All ⇧⌘A
Find
Spelling
Special Characters...
Find... ⌘F
Find Next ⌘G
Find Previous ⇧⌘G
Use Selection for Find ⌘E
Jump to Selection ⌘J


Activate submenu
Localization
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item
Execute command
Select hotkey


Ctrl


Activate submenu
Localization
if hierarchical item
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item
Execute command
Select hotkey
Start state
Accept state
State
Transition

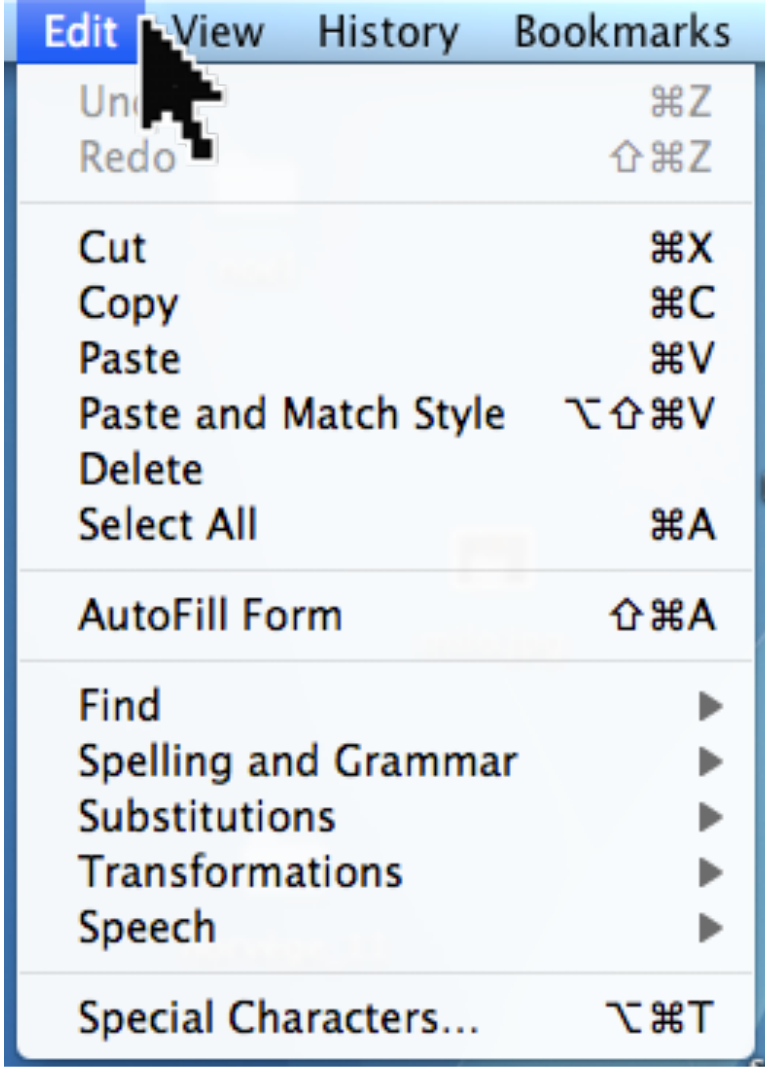

Activate submenu
Localization
if hierarchical item
Menu Opened
Item Selected
Item Activated
Activate menu
Select item
Activate item
Execute command
Select hotkey
Start state
Accept state
State
Transition

Goal:

Select the command “**Find**”

Novice Users

1) Localization: Visual search
2) Pointing task

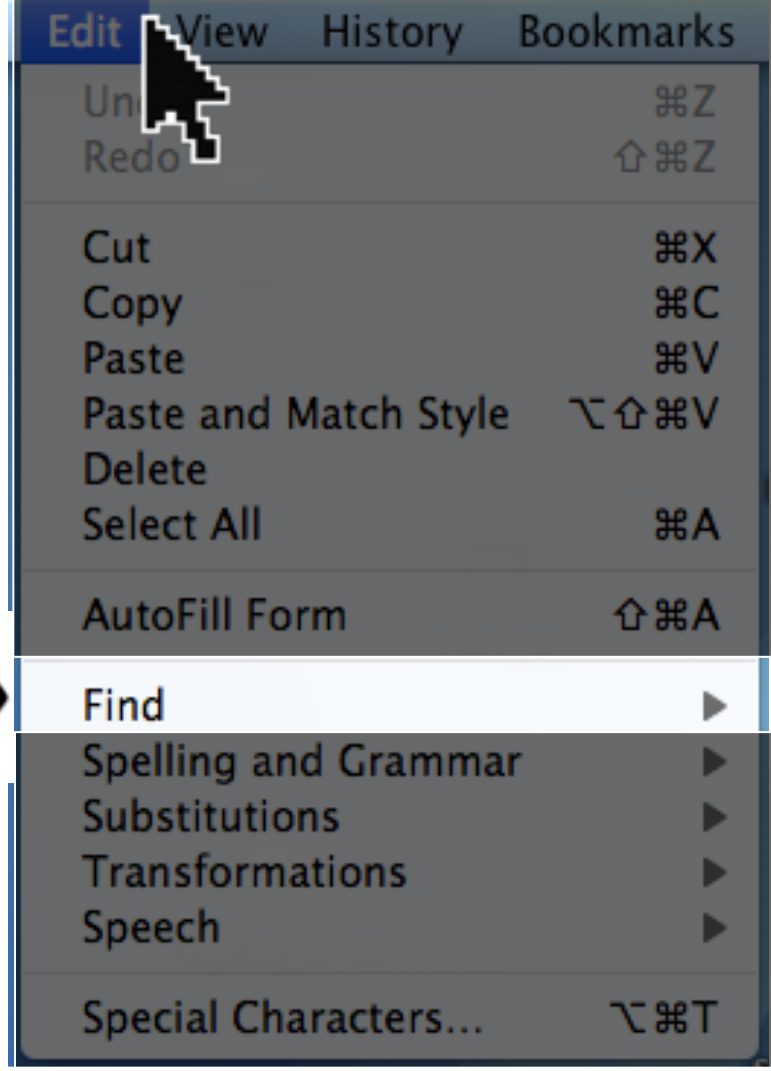


Goal:

Select the command “**Find**”

Novice Users

1) Localization: Visual search
2) Pointing task

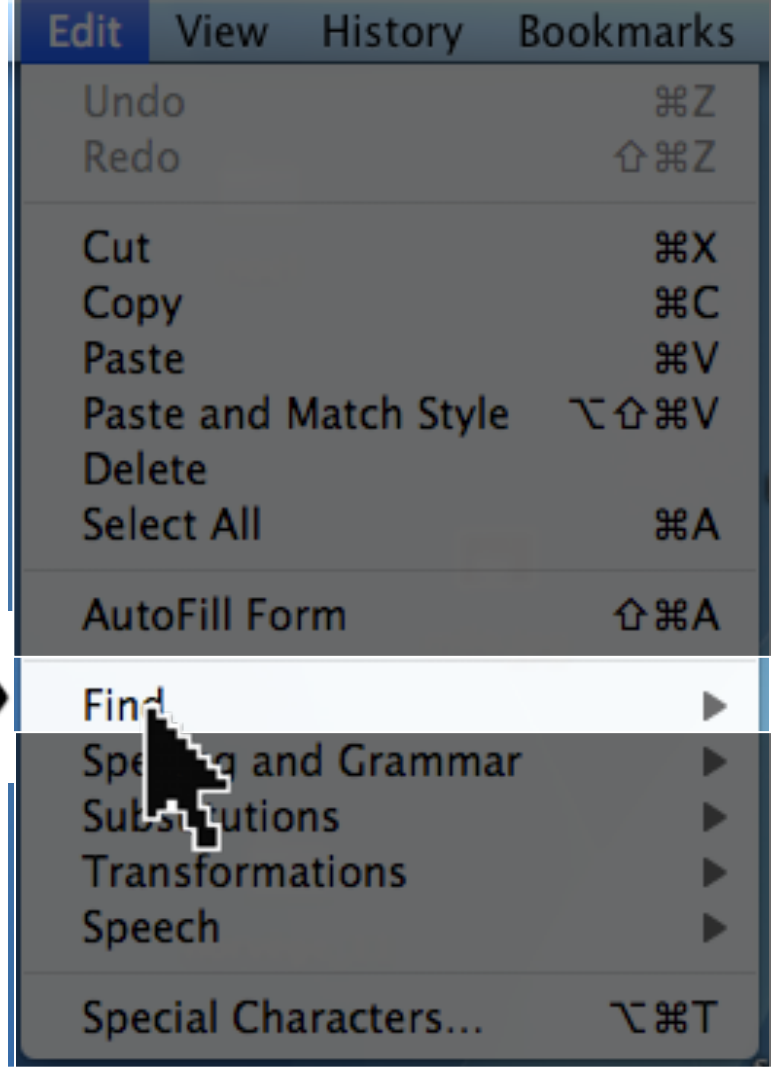


Goal:

Select the command “**Find**”

Novice Users

1) Localization: Visual search
2) Pointing task

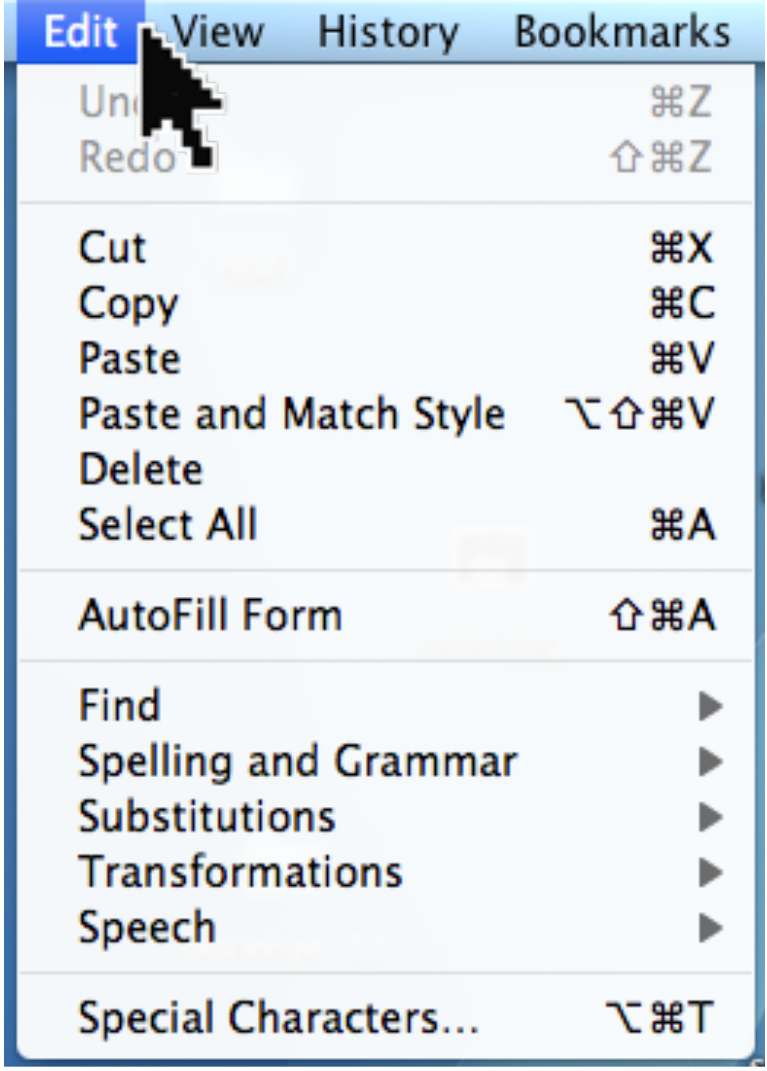


Goal:

Select “**Find**”

Novice Users

1) Localization: Visual search
2) Pointing task



Expert Users

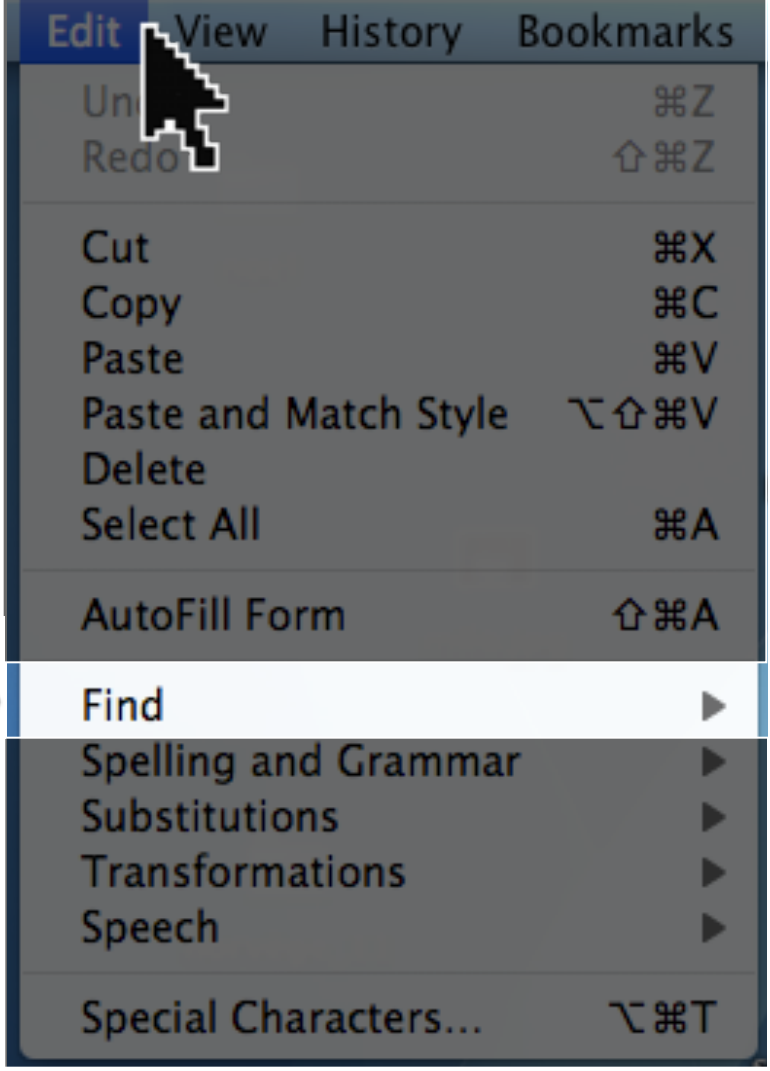
1) Localization: Decision time
2) Pointing task

Goal:

Select “**Find**”

Novice Users

1) Localization: Visual search
2) Pointing task



Expert Users

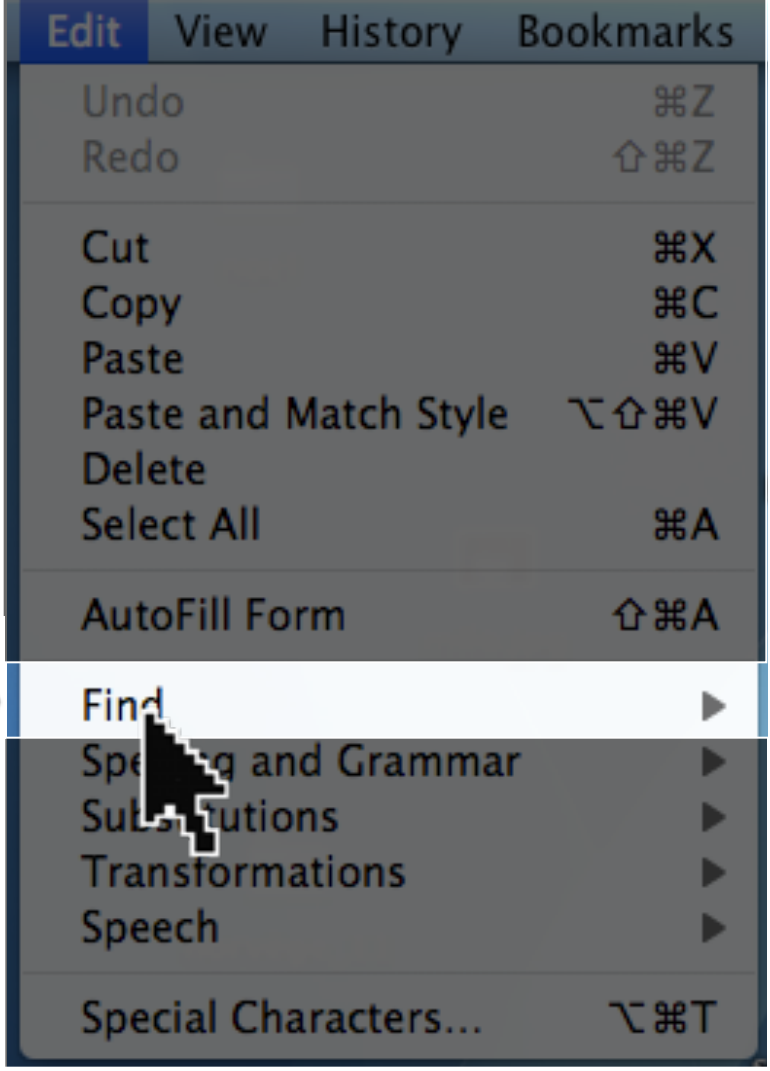
1) Localization: Decision time
2) Pointing task

Goal:

Select “**Find**”

Novice Users

1) Localization: Visual search
2) Pointing task



Expert Users

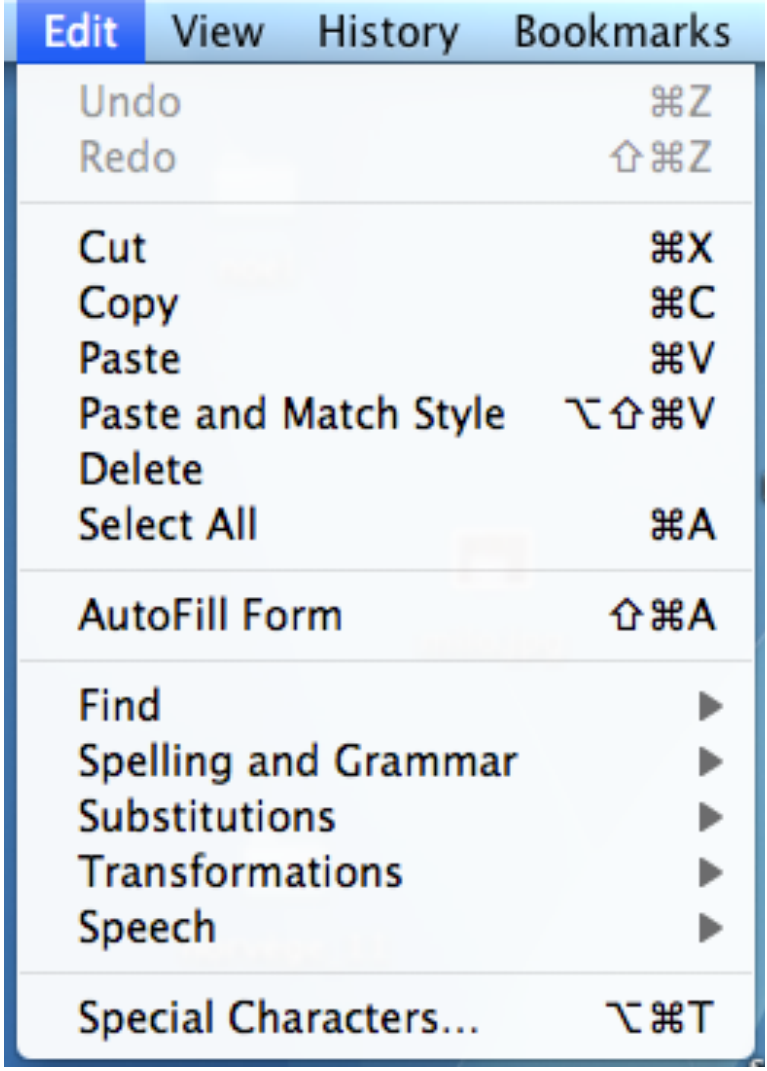
1) Localization: Decision time
2) Pointing task

localization

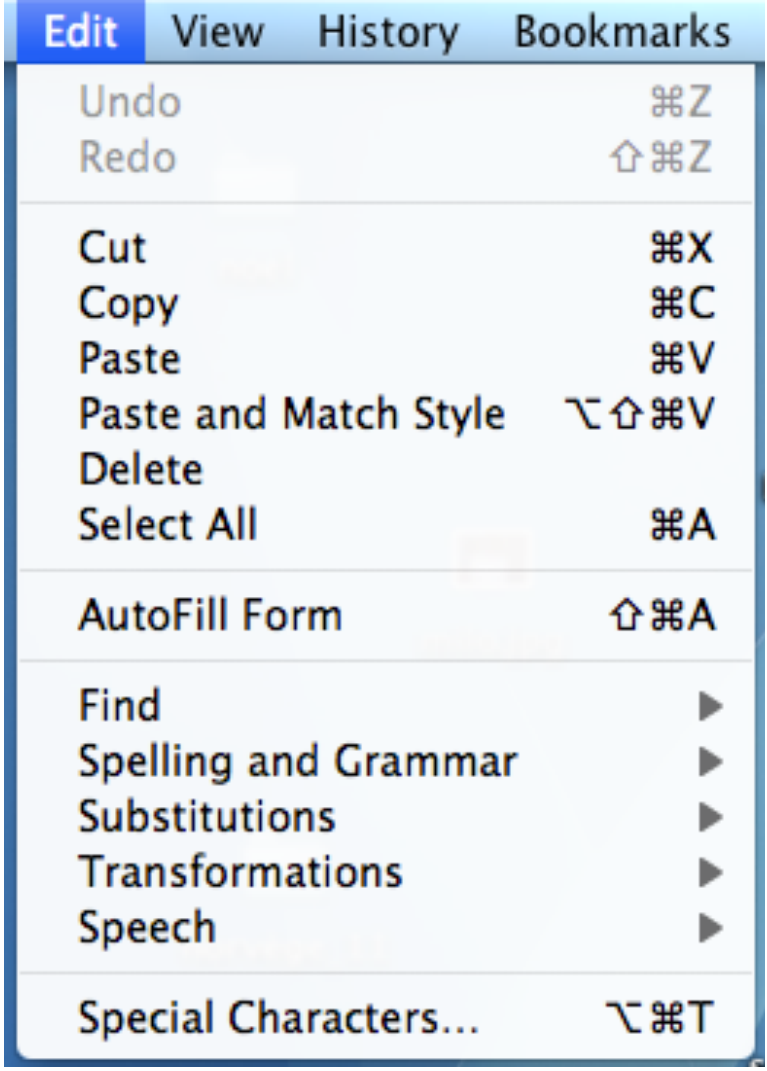
a) Visual search
b) Decision time

c) Pointing task

d) Learning

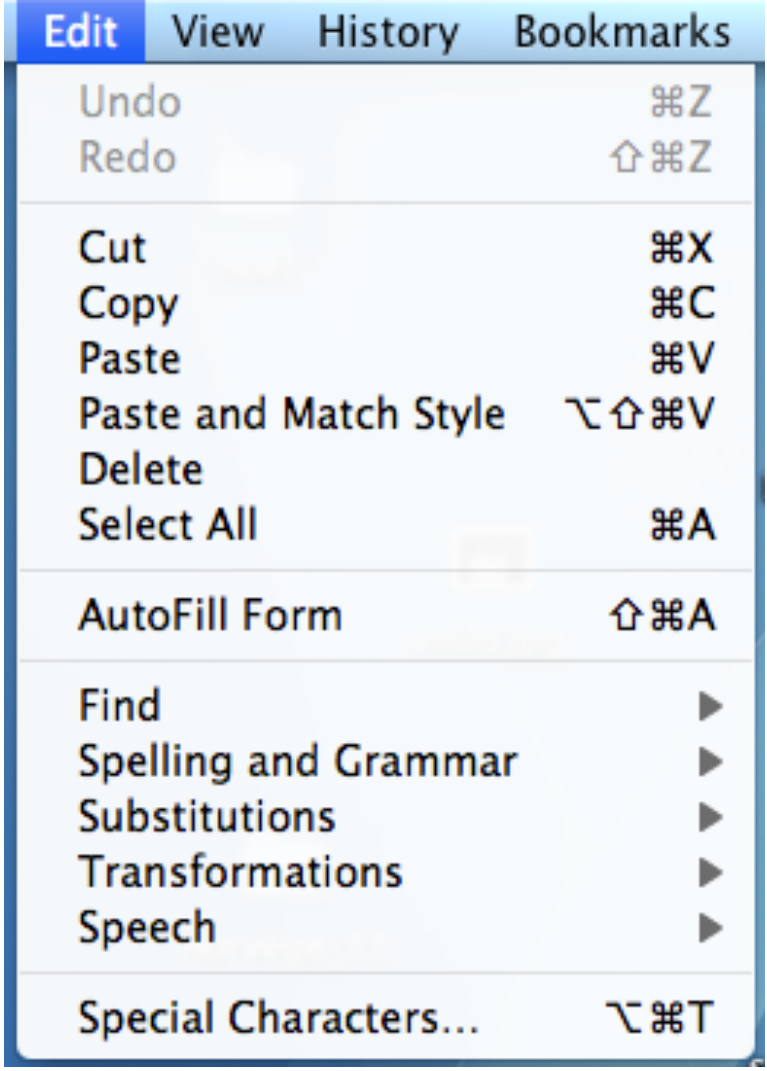


Fitts' Law (Pointing task)



Fitts' Law (Pointing task)

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



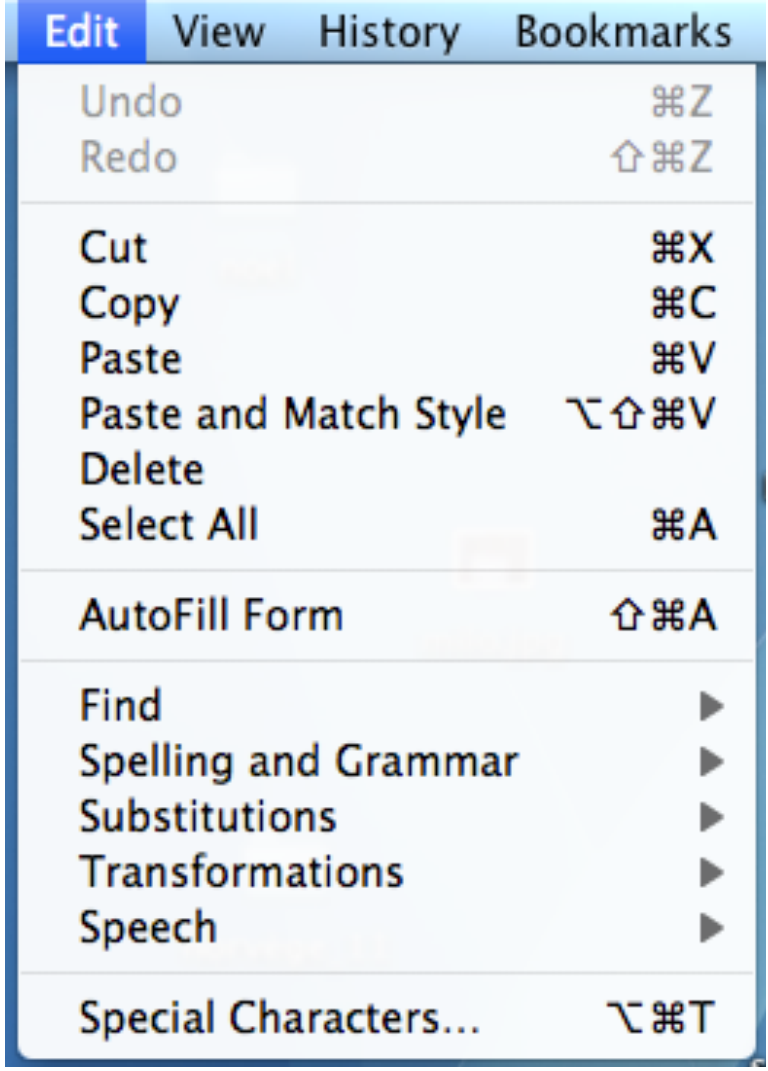
Fitts' Law (Pointing task)

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

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

n: the number of items

h: item height



Fitts' Law (Pointing task)

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

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n: the number of items

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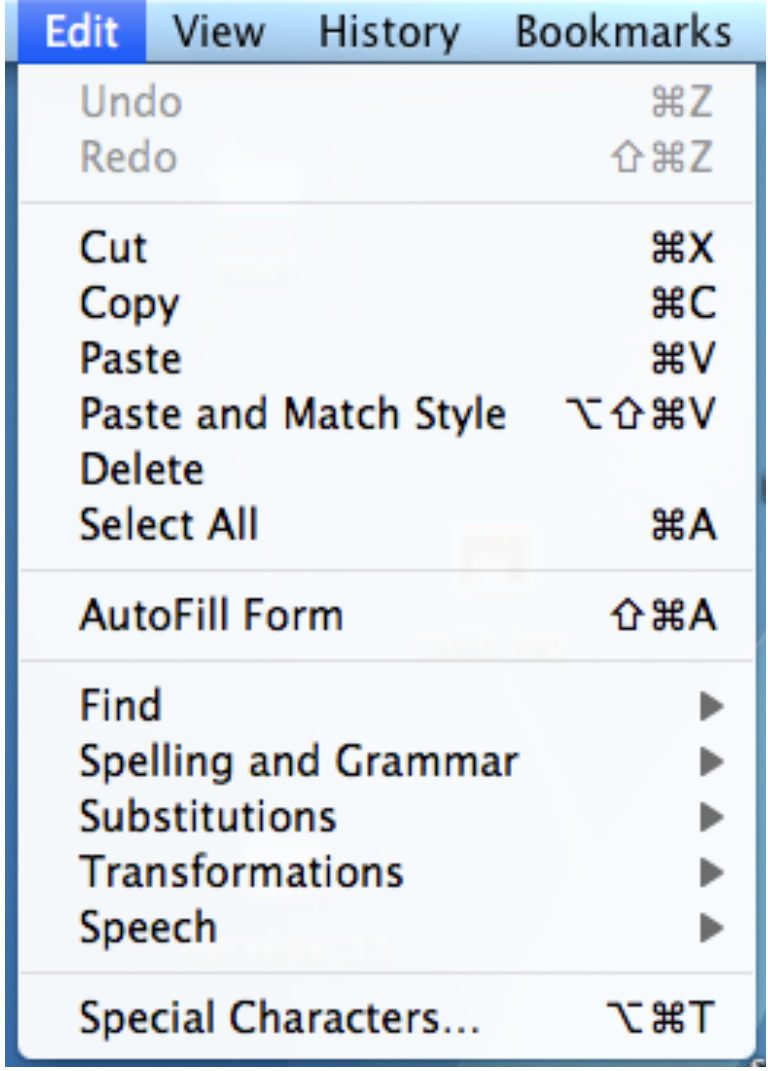
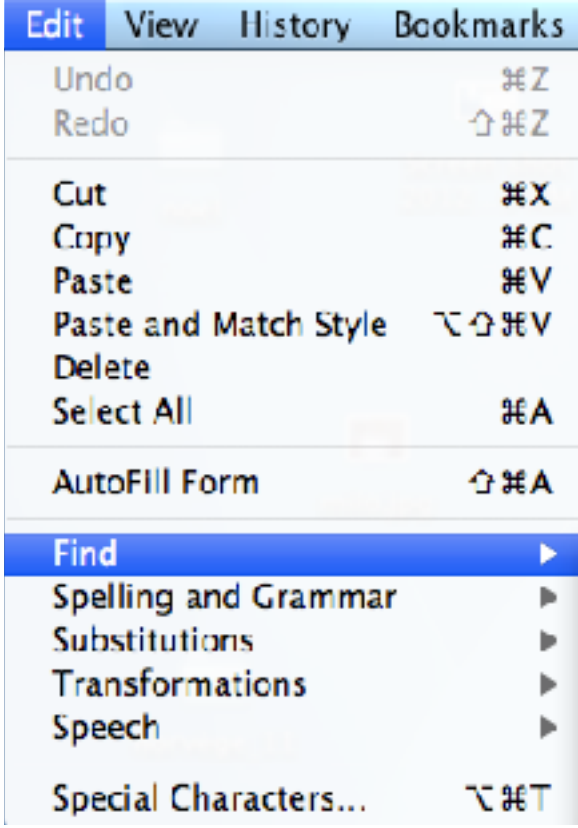


Localization: Novice

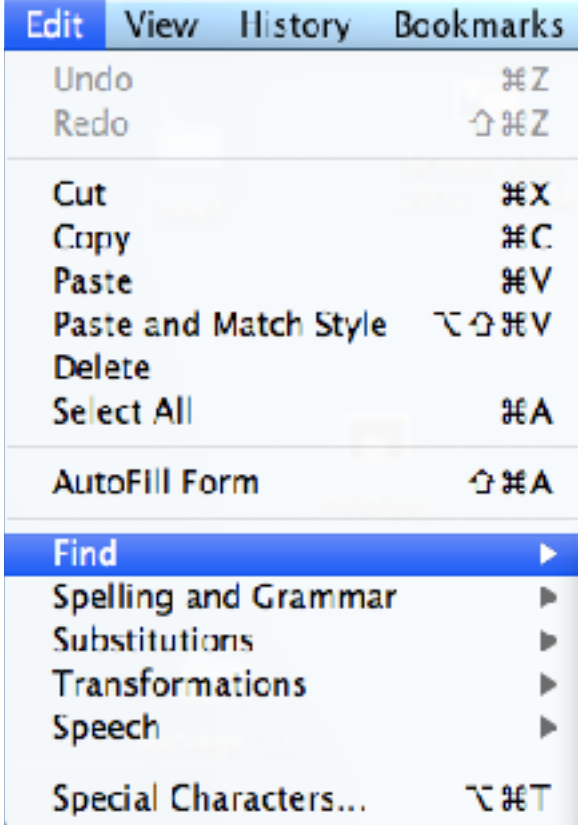
Visual search



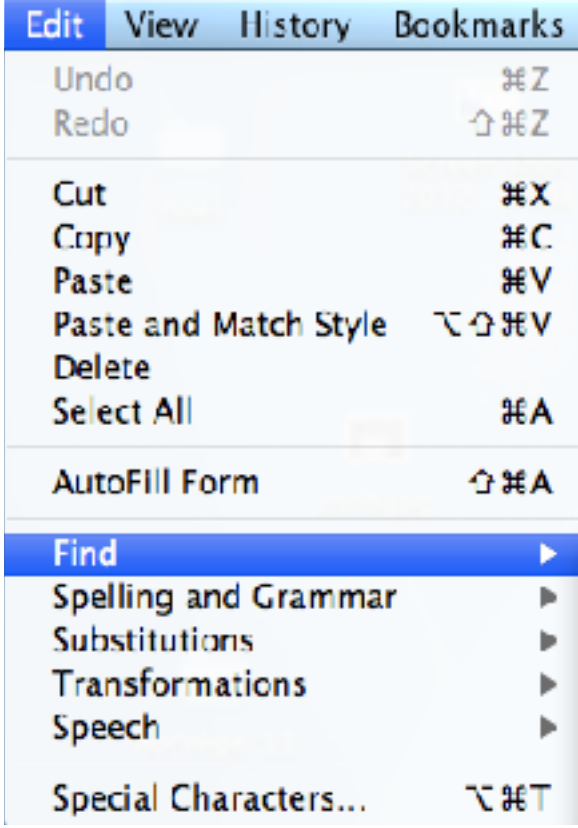
Localization: Novice

Visual search

$$T = a + b * n$$



Localization



Novice: Visual search

$$T = a + b * n$$

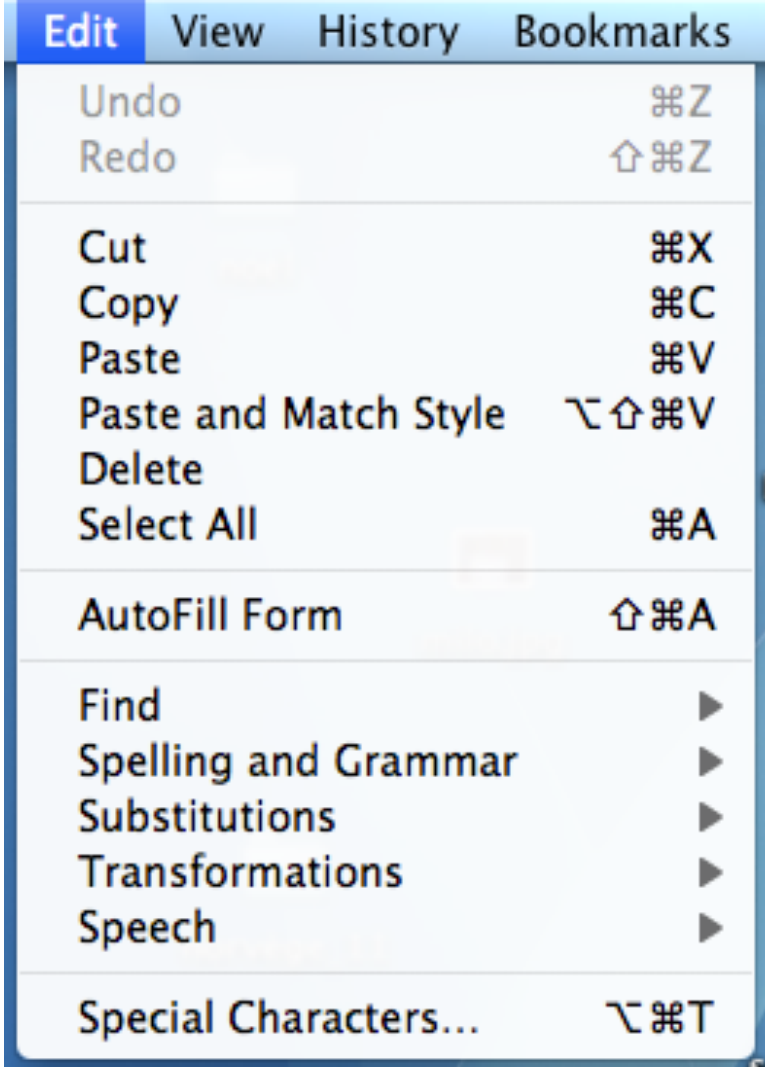
Expert: Decision Time

(Hyck-Hyman Law)

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

P_i: probability of the event

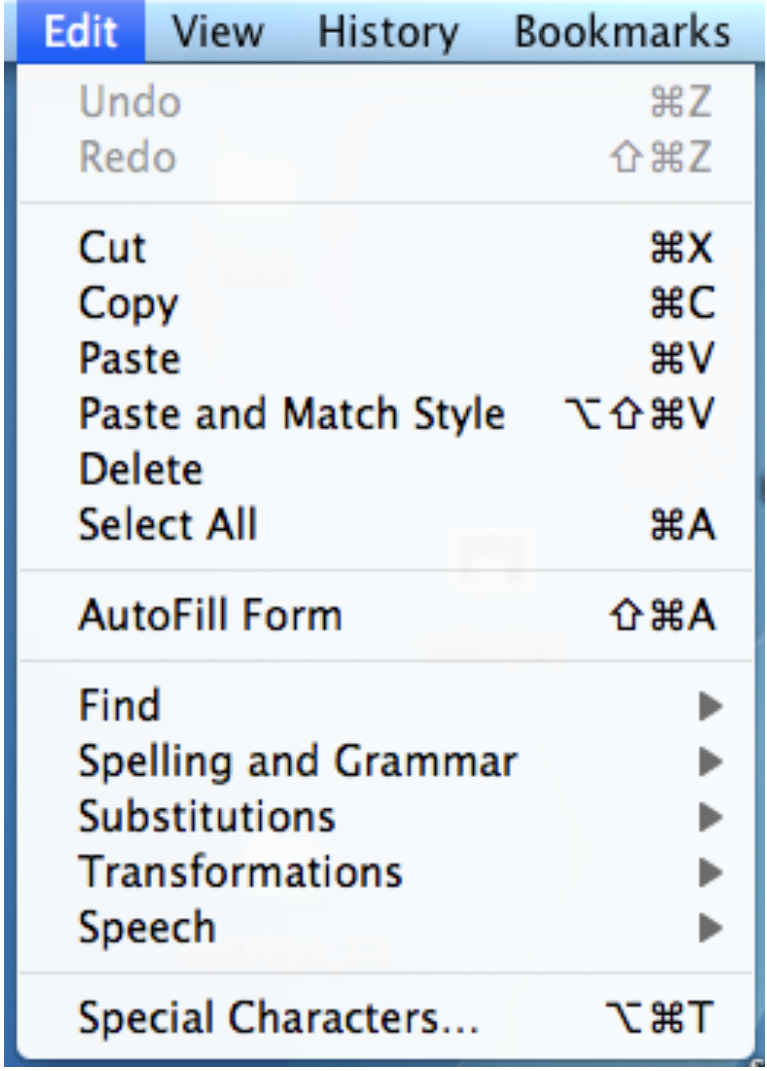
a) Visual search
b) Decision time
c) Pointing task
d) Learning



Novice: e=0
(visual search)

Expert: e=1
(decision time)

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

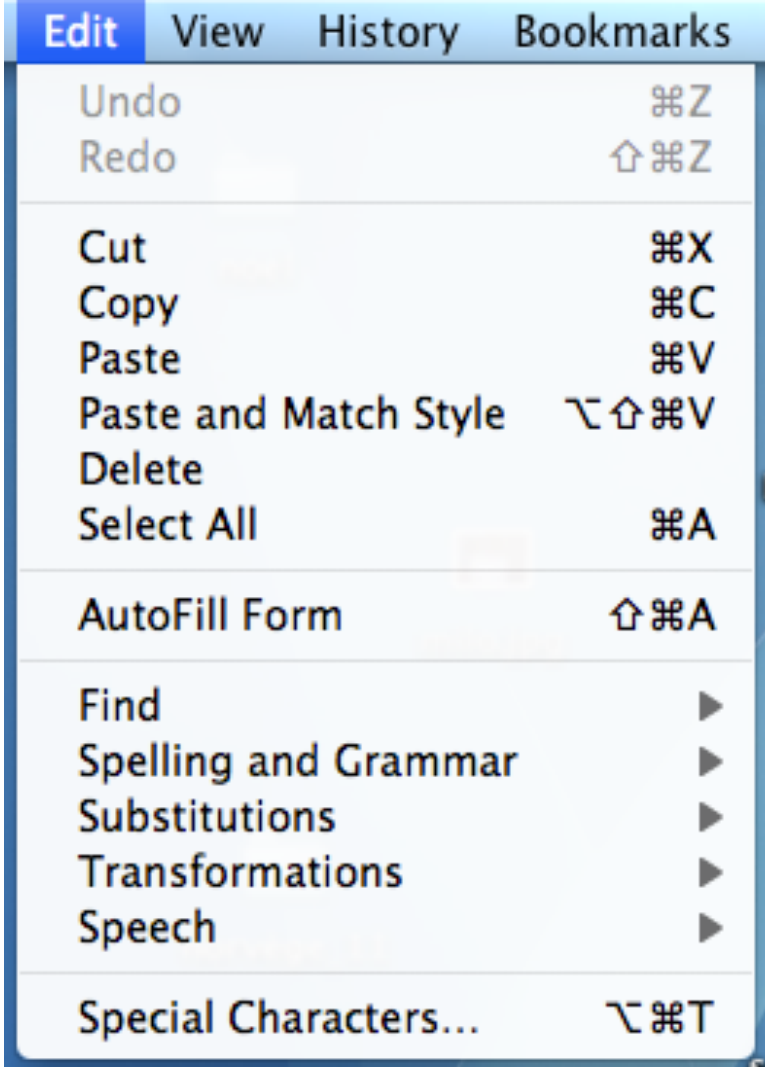


Novice: e=0
(visual search)

Expert: e=1
(decision time)

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

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



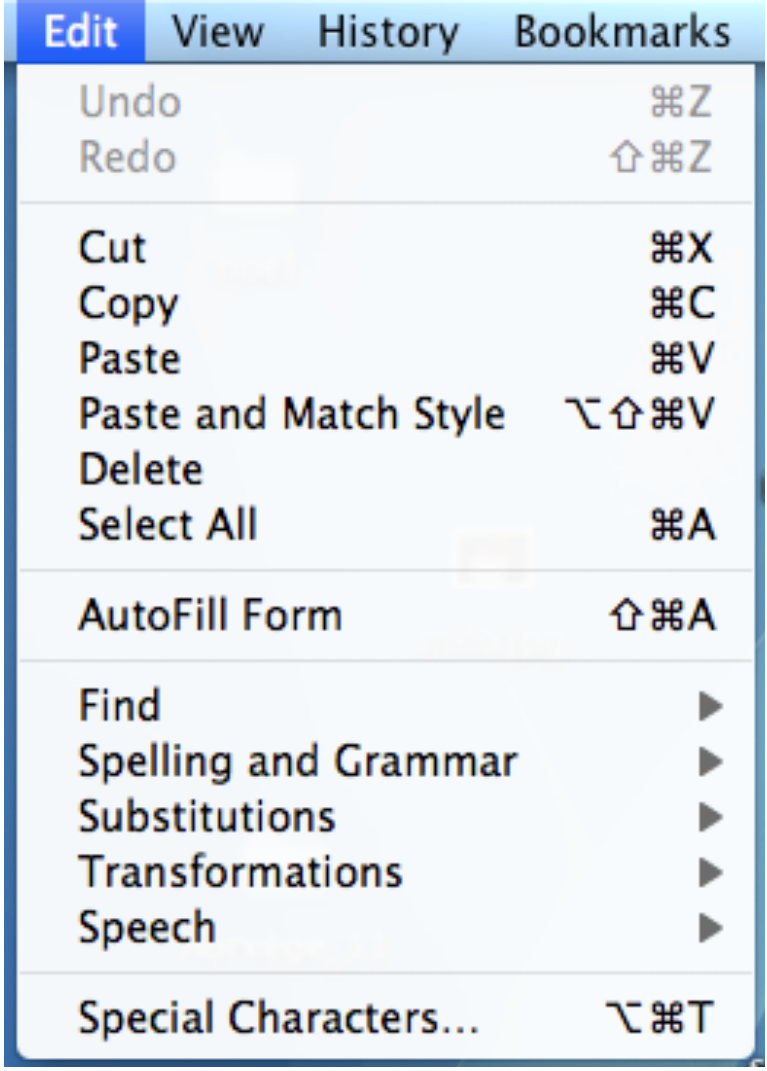
Novice: e=0
(visual search)

Expert: e=1
(decision time)

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

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

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



$$TI = (I\text{-}e) * T_{vs} + e * T_d$$

Novice: e=0
(visual search)

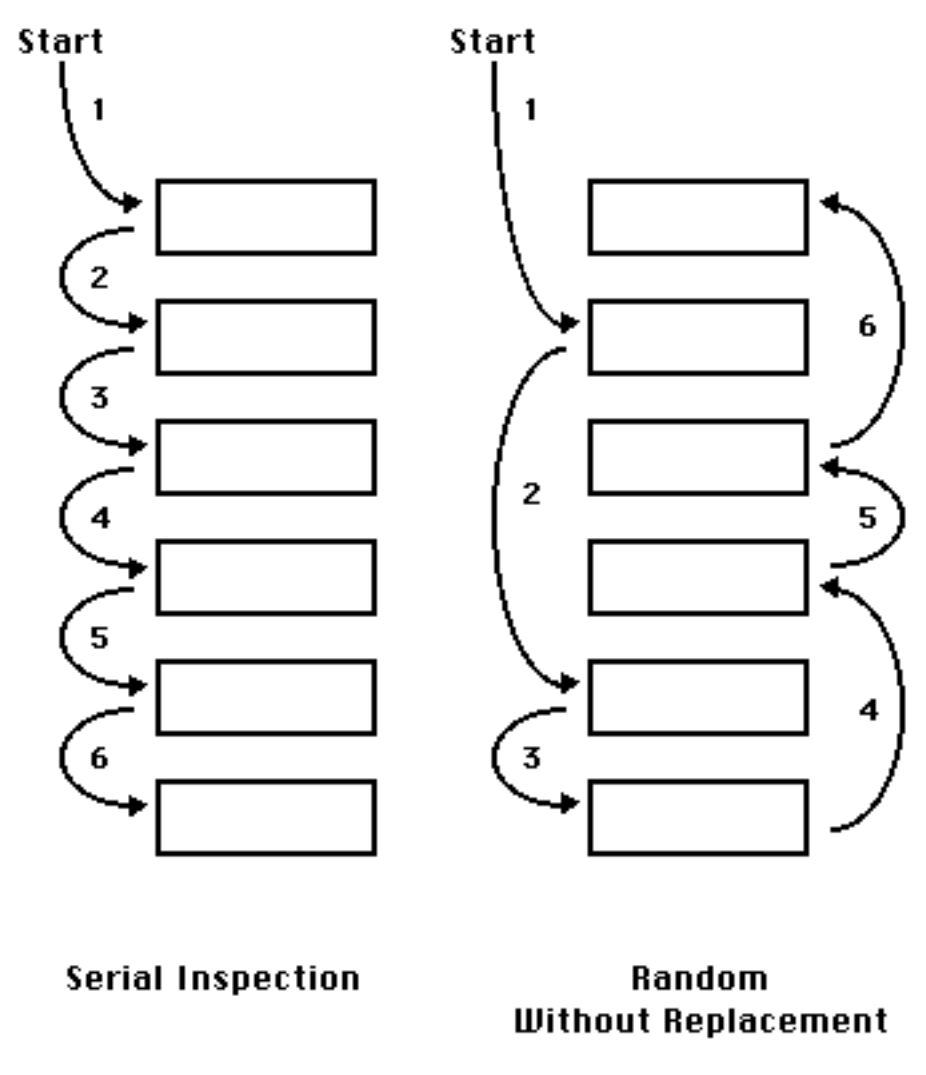
Expert: e=1
(decision time)

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

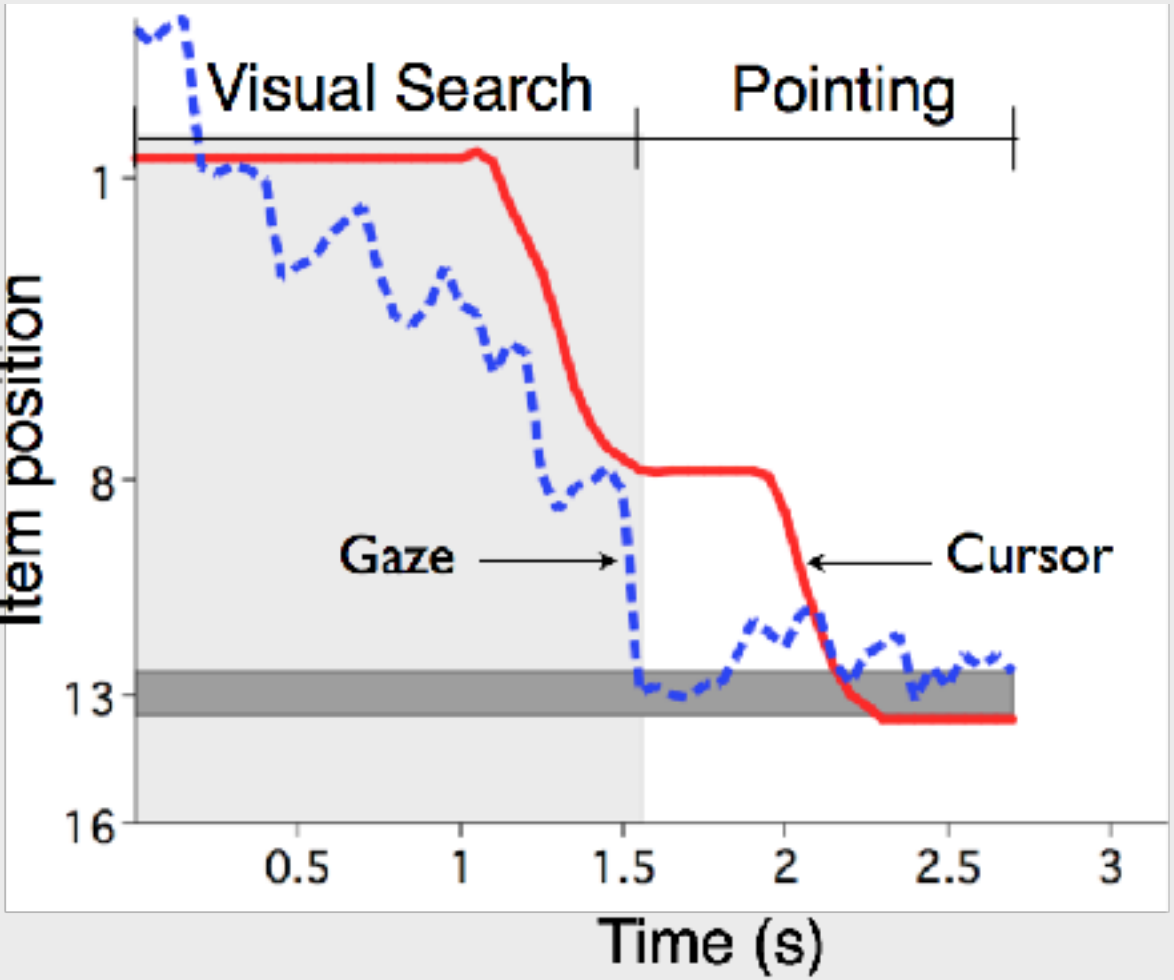
$$T_d = a_d + b_d * log_2(I/Pi)$$

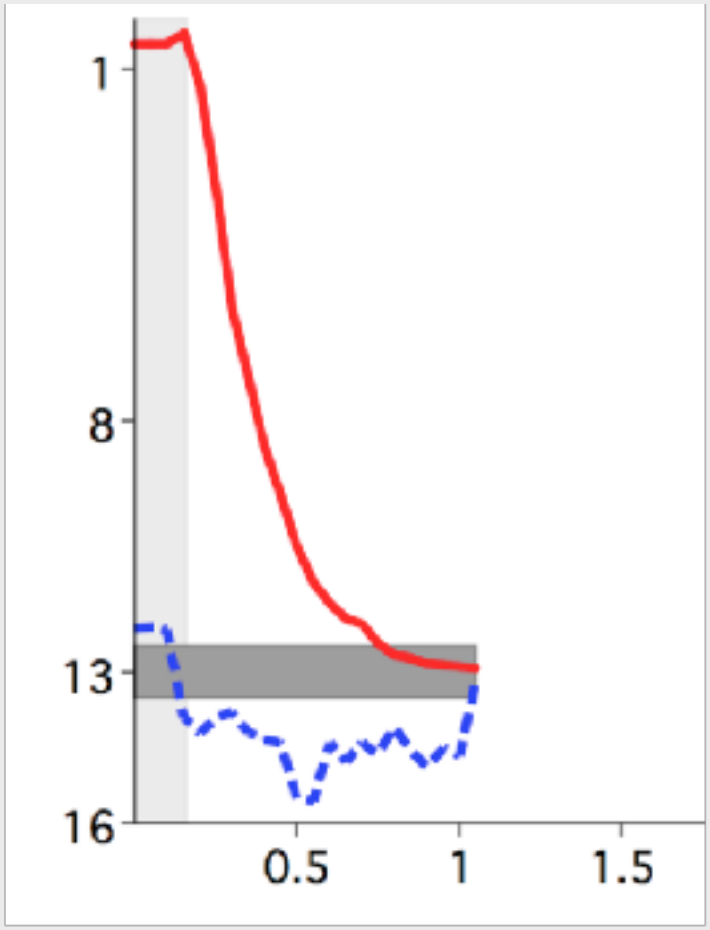
Brainstorming (30s)

Limitations & Possible Improvements


Start
1
2
3
4
5
6
Serial Inspection
Start
1
6
2
5
4
3
Random
Without Replacement

Inspection

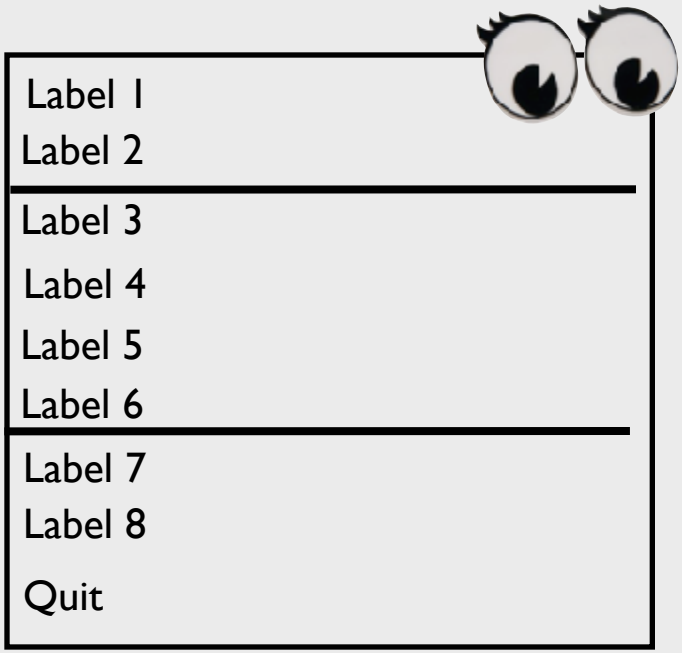

Visual Search
Pointing
Item position
1
8
13
16
Gaze
Cursor
0.5
1
1.5
2
2.5
3
Time (s)


1
8
13
16
0.5
1
1.5

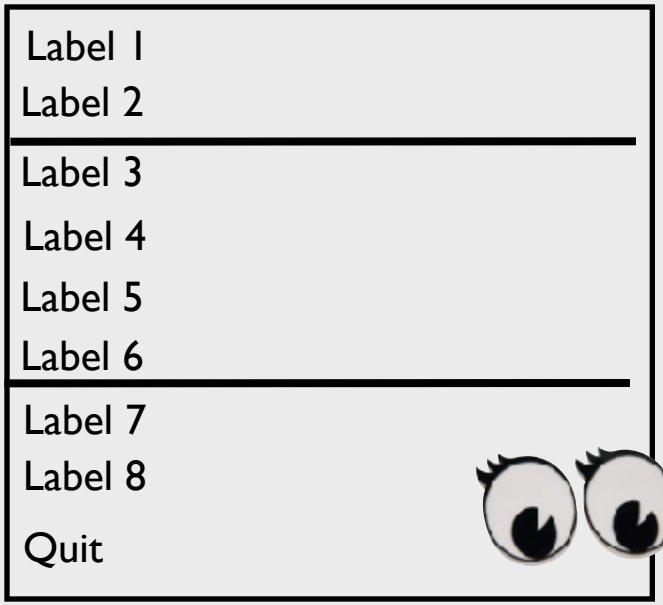
Pointage


Label 1
Label 2
Label 3
Label 4
Label 5
Label 6
Label 7
Label 8
Label 9

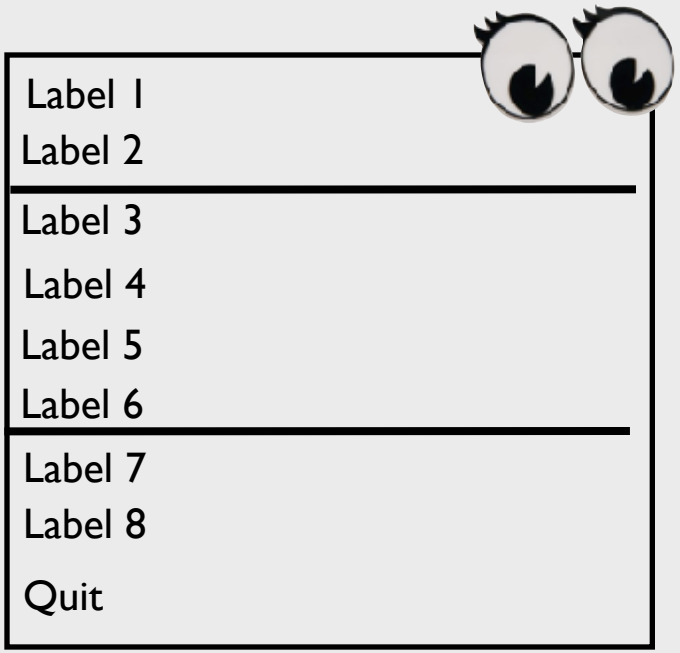
Saliency


Label 1
Label 2
Label 3
Label 4
Label 5
Label 6
Label 7
Label 8
Quit

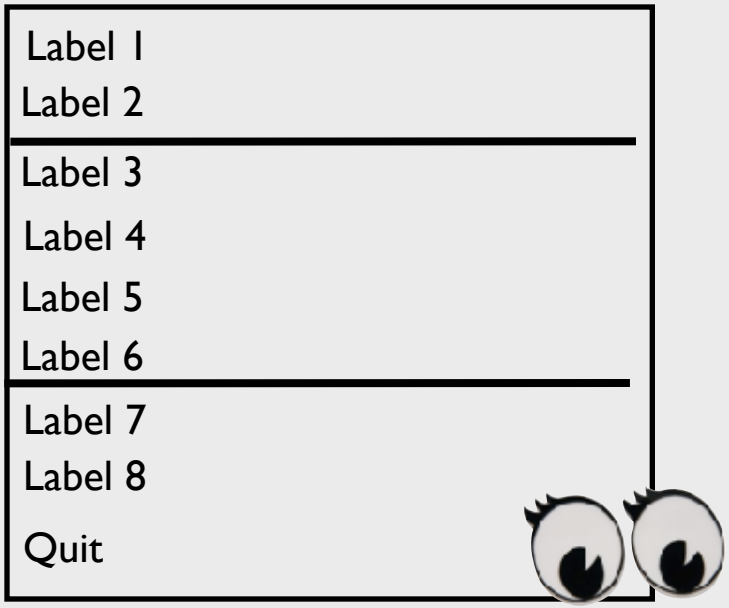
Groups


Label 1
Label 2
Label 3
Label 4
Label 5
Label 6
Label 7
Label 8
Quit

Groups

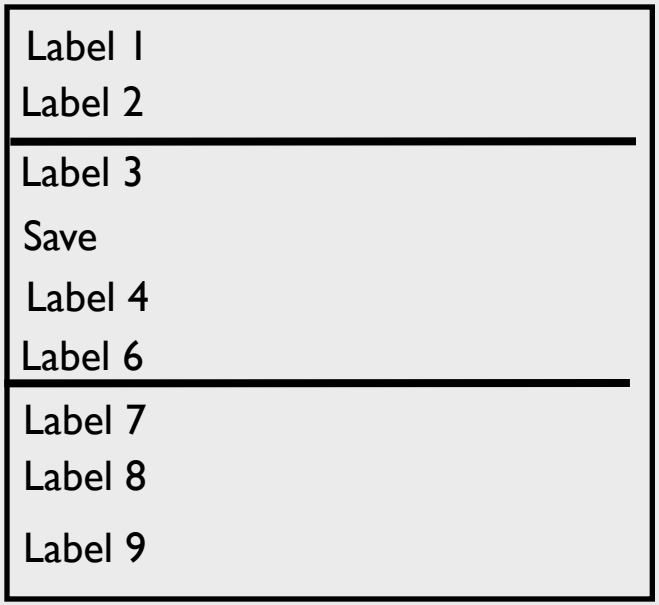

Label 1
Label 2
Label 3
Label 4
Label 5
Label 6
Label 7
Label 8
Quit

Groups


Label 1
Label 2
Label 3
Label 4
Label 5
Label 6
Label 7
Label 8
Quit

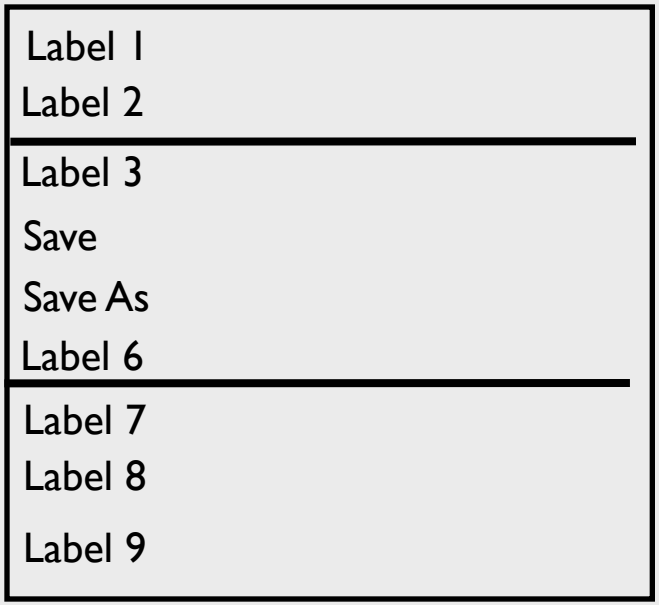
Groups

Where is **Save As**?



Semantic

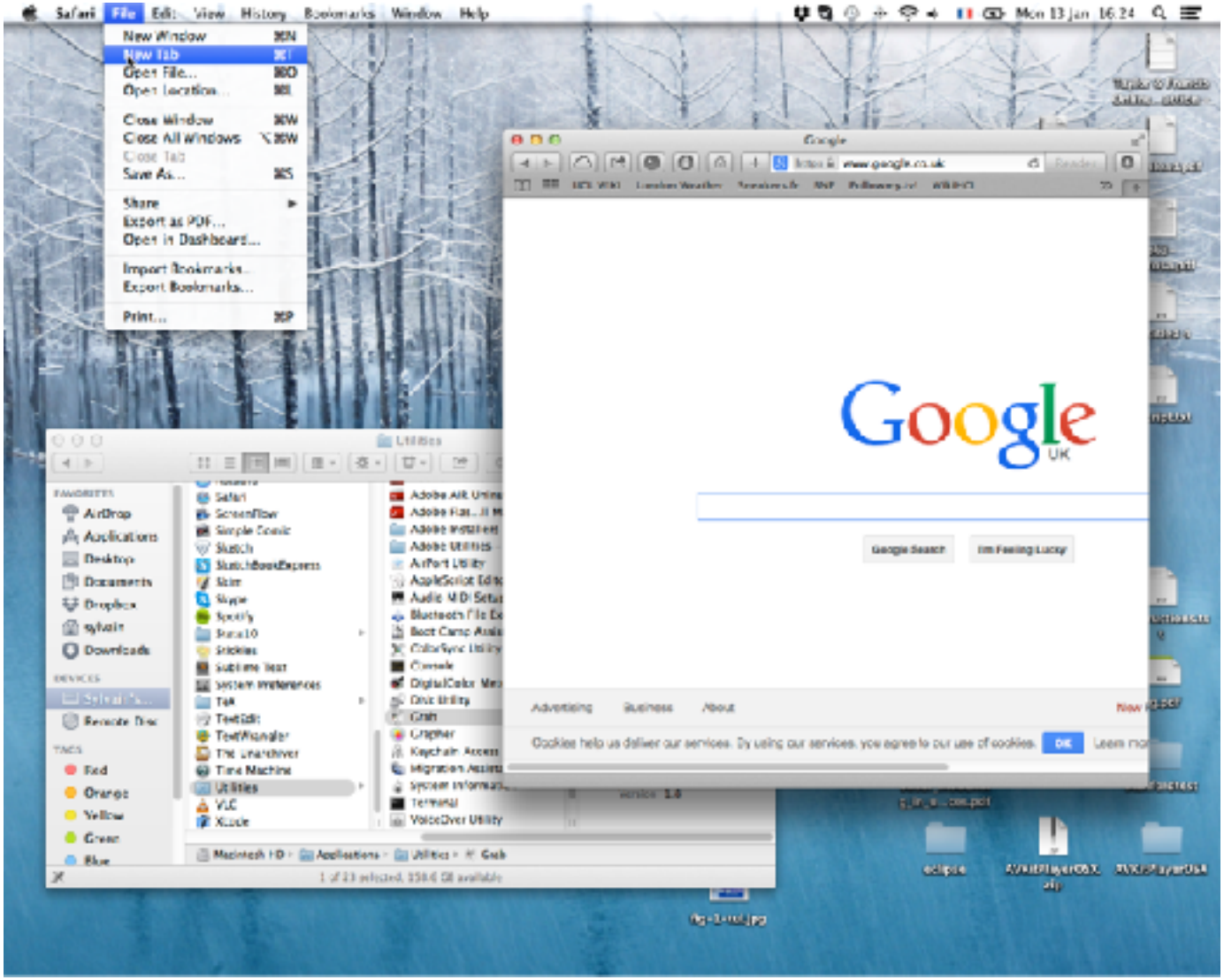
Where is **Save As**?



Semantic

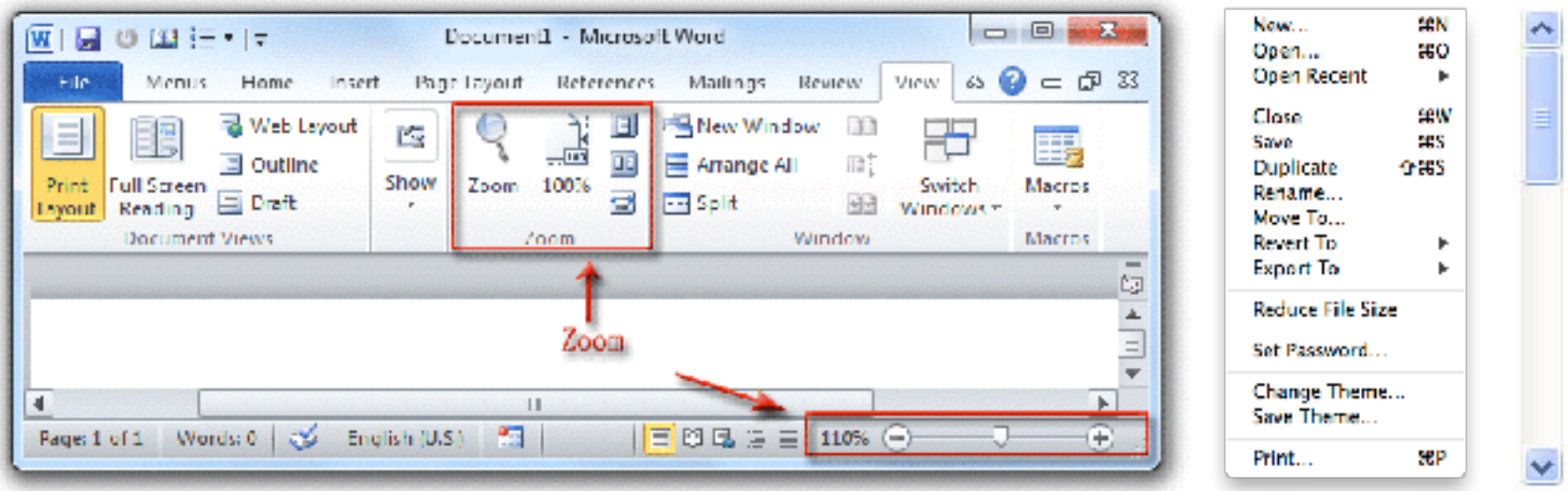
Post-Wimp interaction

Windows Icons Menus Pointer



Not "direct enough"

Indirect interaction through manipulation of *interface elements*




Not adapted

Not adapted

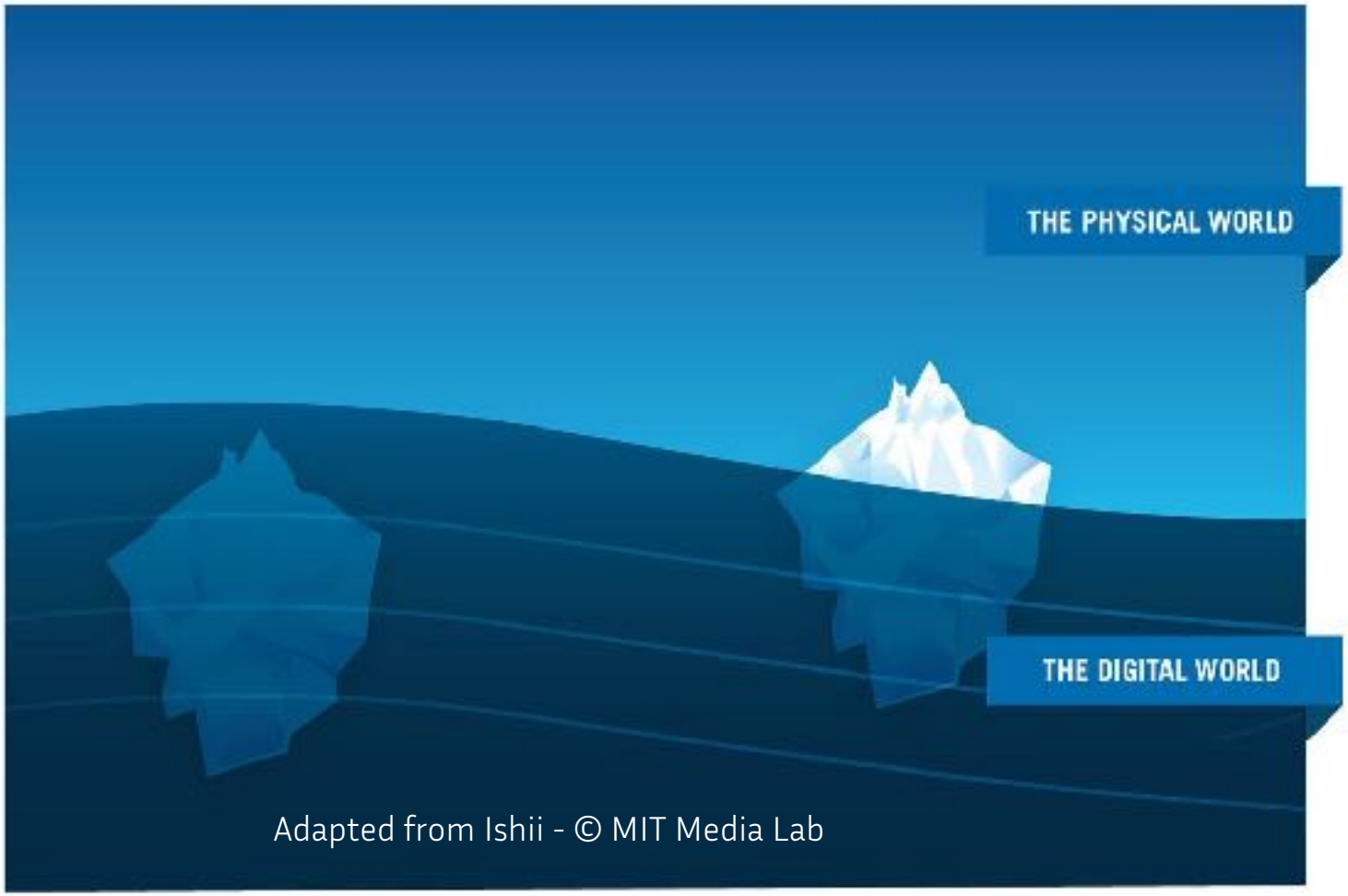
Tangible interfaces


pCubee
Ian Stavness, Billy Lam, Sidney Fels
Human Communication Technologies Lab
University of British Columbia 2010


pCubee
Ian Stavness, Billy Lam, Sidney Fels
Human Communication Technologies Lab
University of British Columbia 2010

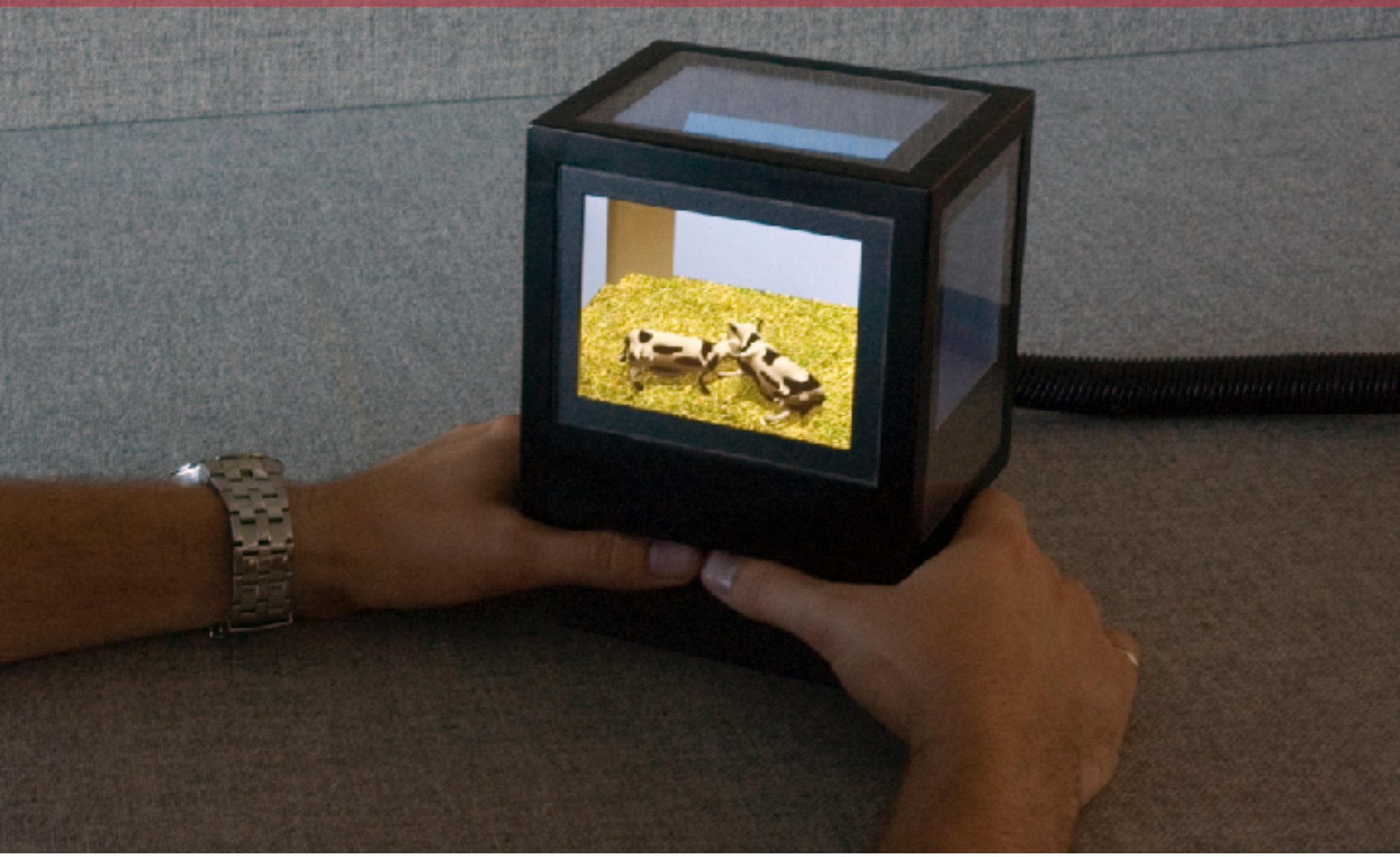
GUI PAINTED BITS

TUI TANGIBLE BITS

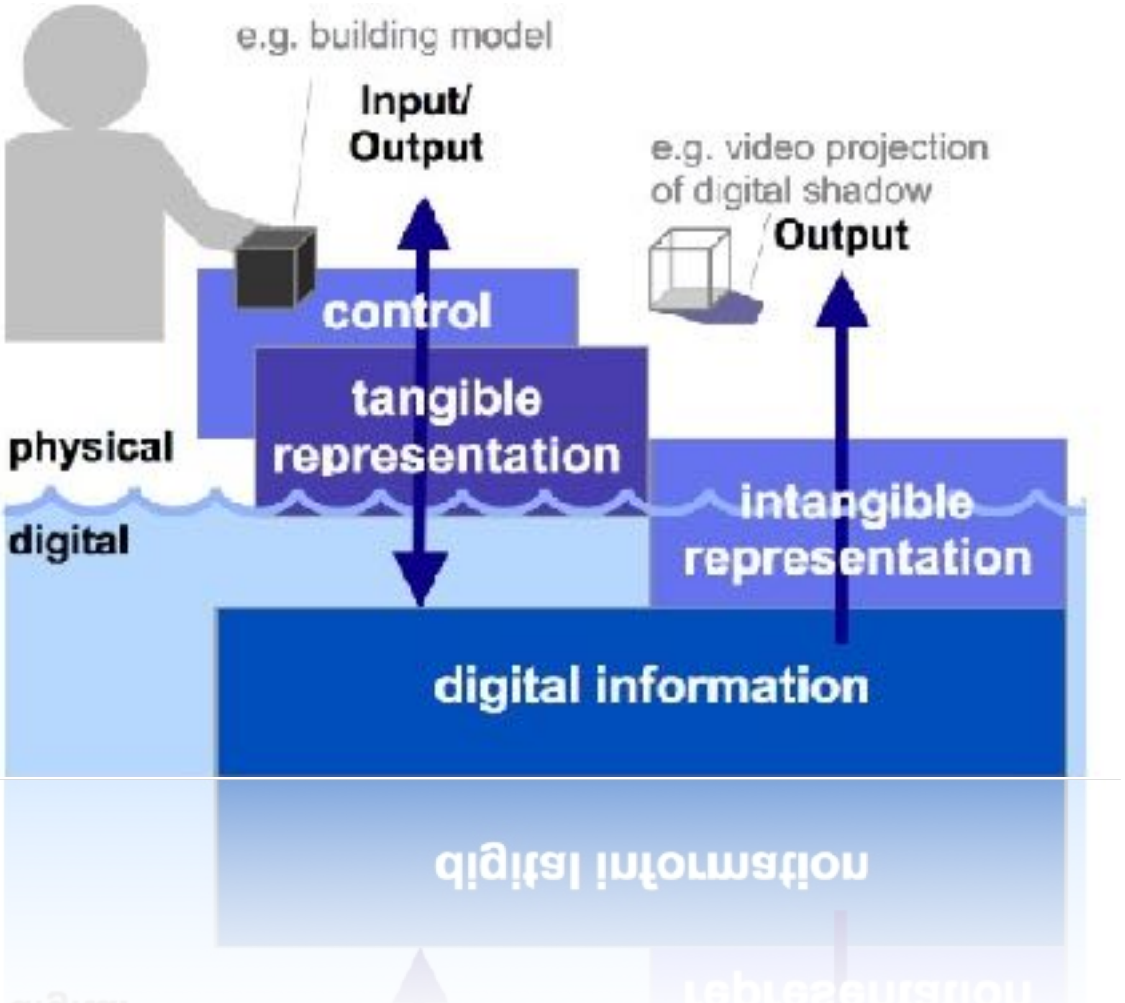


Adapted from Ishii - © MIT Media Lab

Physical embodiment of digital information and computation



Architecture of Tangible UIs



SenseBoard (2001)

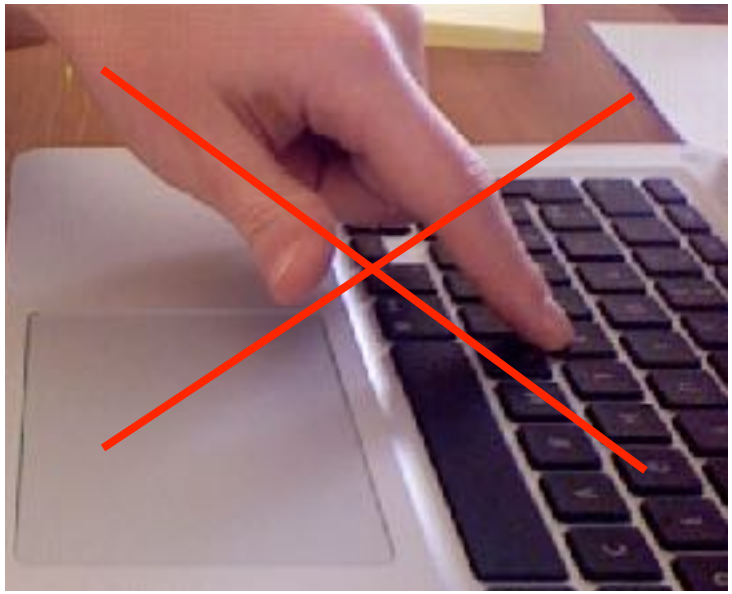
SenseBoard (2001)

I/O Brush (2004)

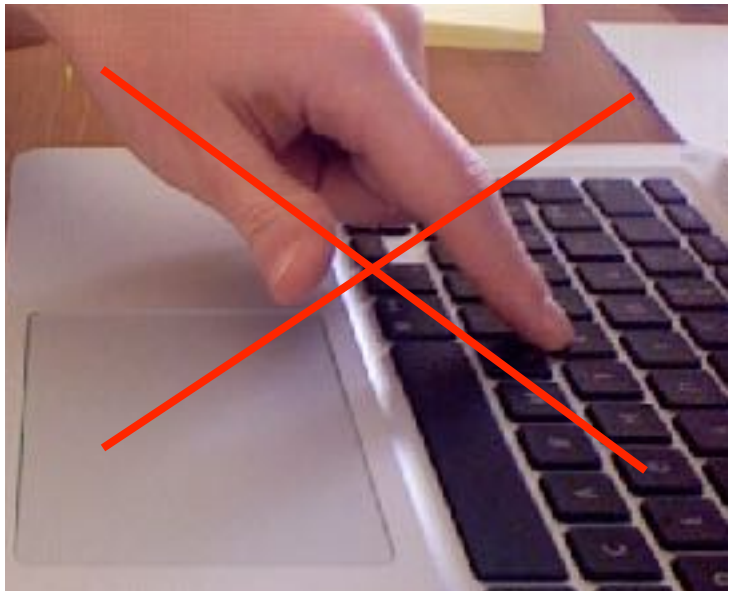
I/O Brush (2004)

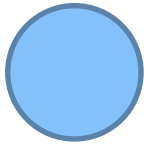
Gestural interaction

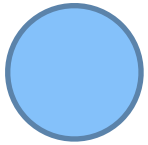
A gesture is a motion of the body that contains information [Kurtenbach]

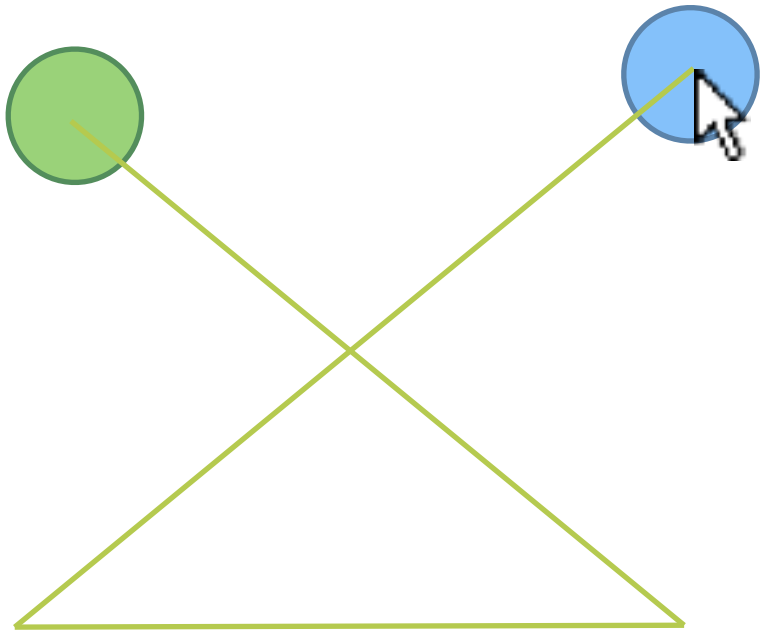


A gesture is a motion of the body that contains information [Kurtenbach]

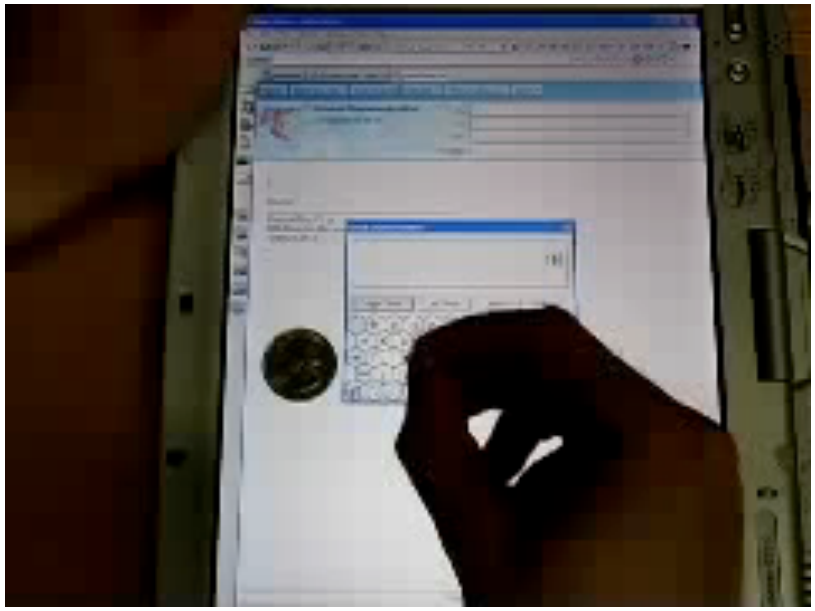




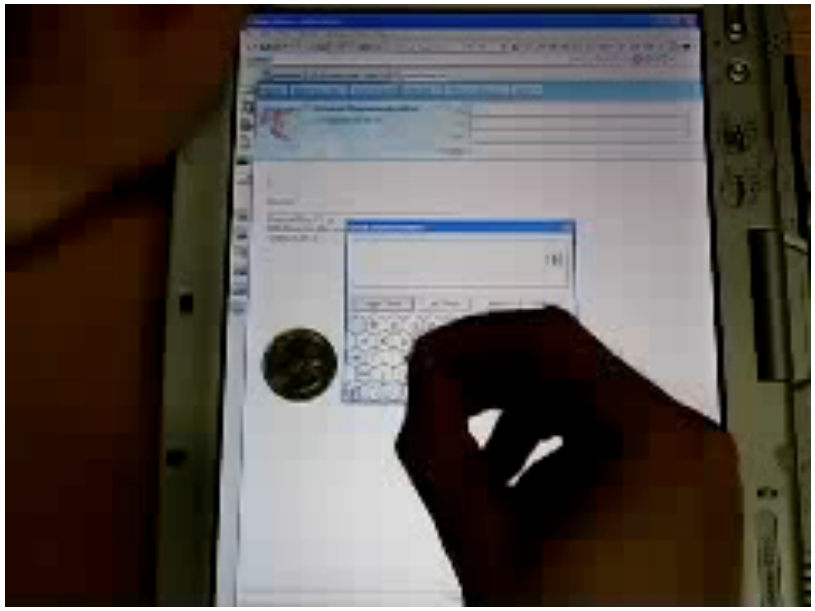




Shark 2004/Shapewriter 2007



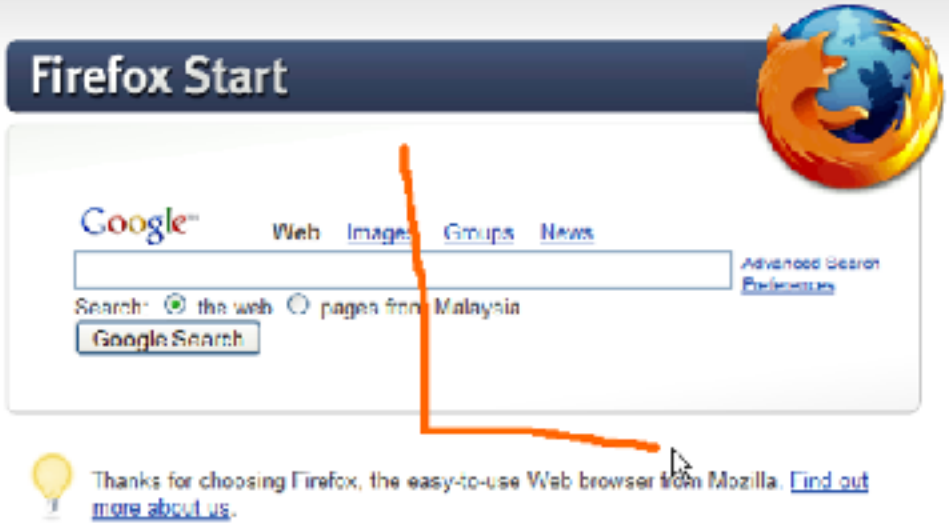
Shark 2004/Shapewriter 2007



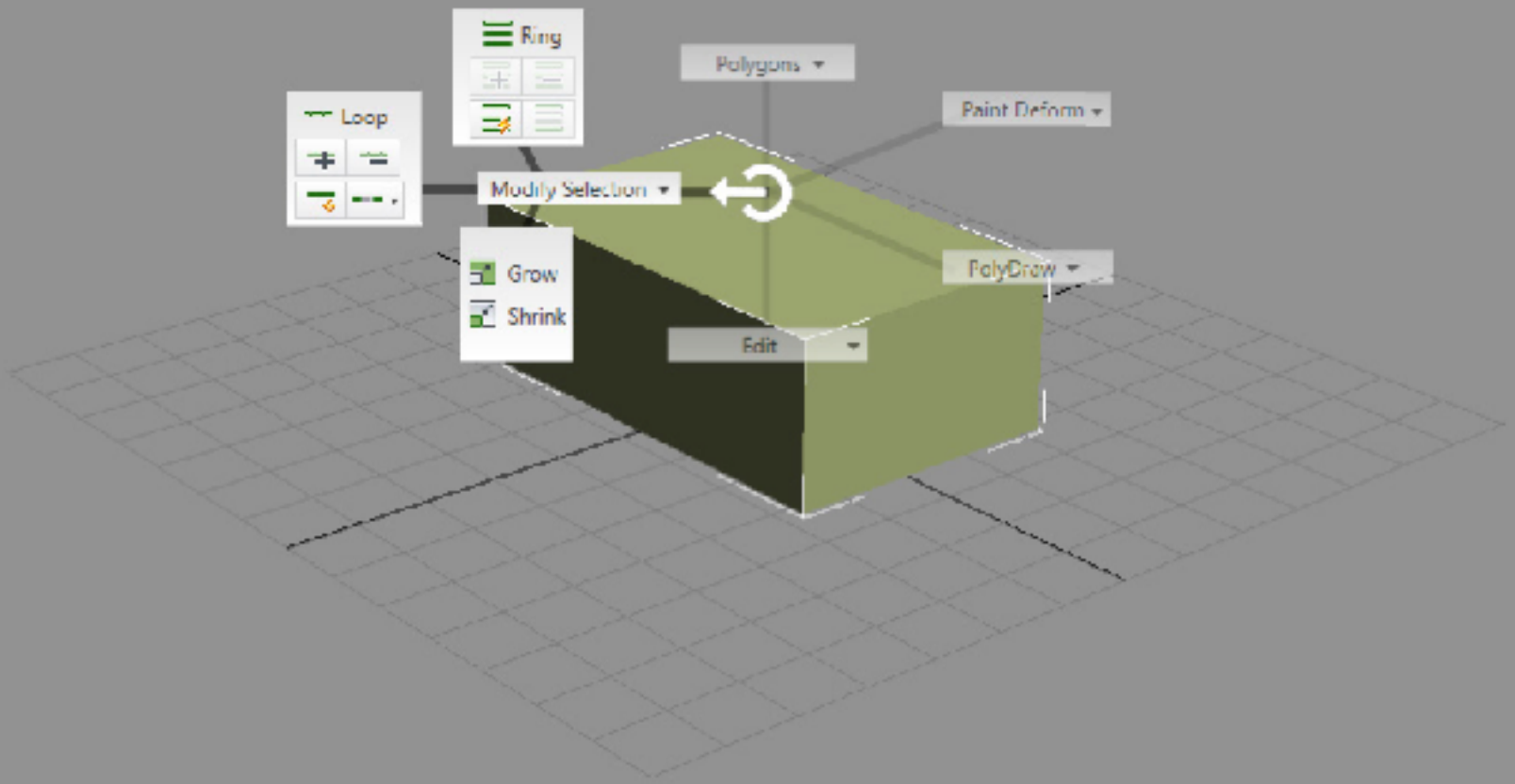
Why?

- Based on user's existing drawing and handwriting skills [Kurtenbach et al. 94]
- Physically chunk a command and its operands into a single action [Buxton et al. 86]
- Implicit and fast mode switching
- A lot of works in HCI

Applications: mouse gestures

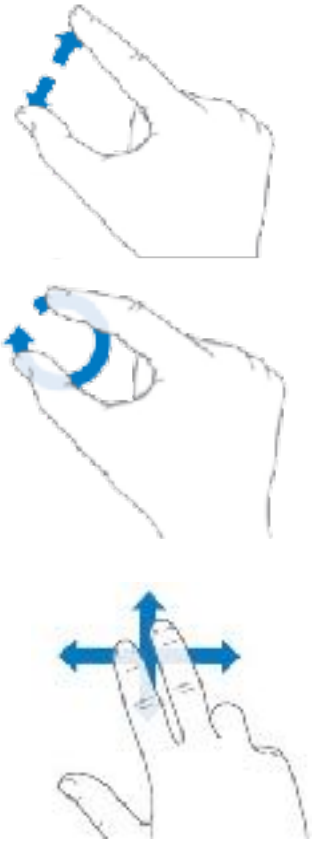


Applications: mouse gestures



Smartphone


cingular
12:34 PM
SMS
Text
9
Calendar
Photos
Camera
Calculator
Stocks
Maps
Weather
Notes
Clock
Settings



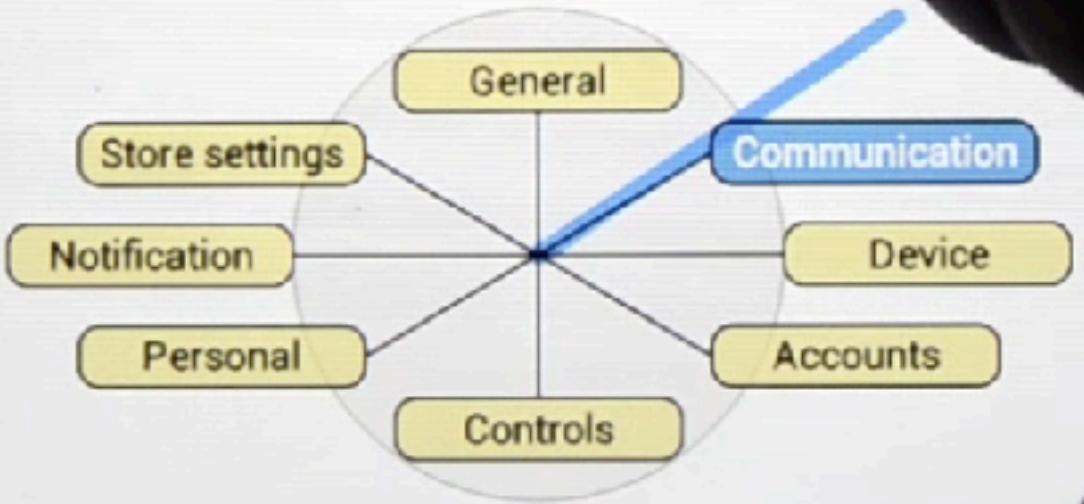
Smartphone

Tabletop

Gaming

Gaming

Movies


General
Store settings
Communication
Notification
Device
Personal
Accounts
Controls

Turn off

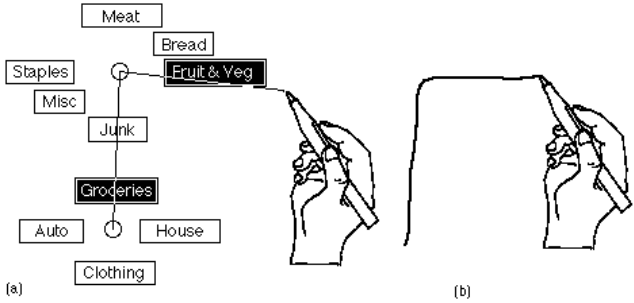
Turn off

Speed & Accuracy

Learning & Memorization

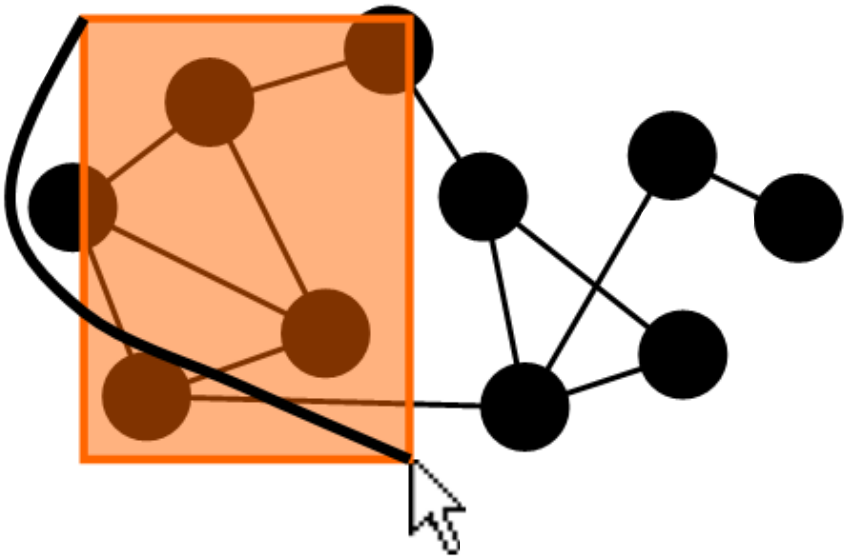
Satisfaction

Other?

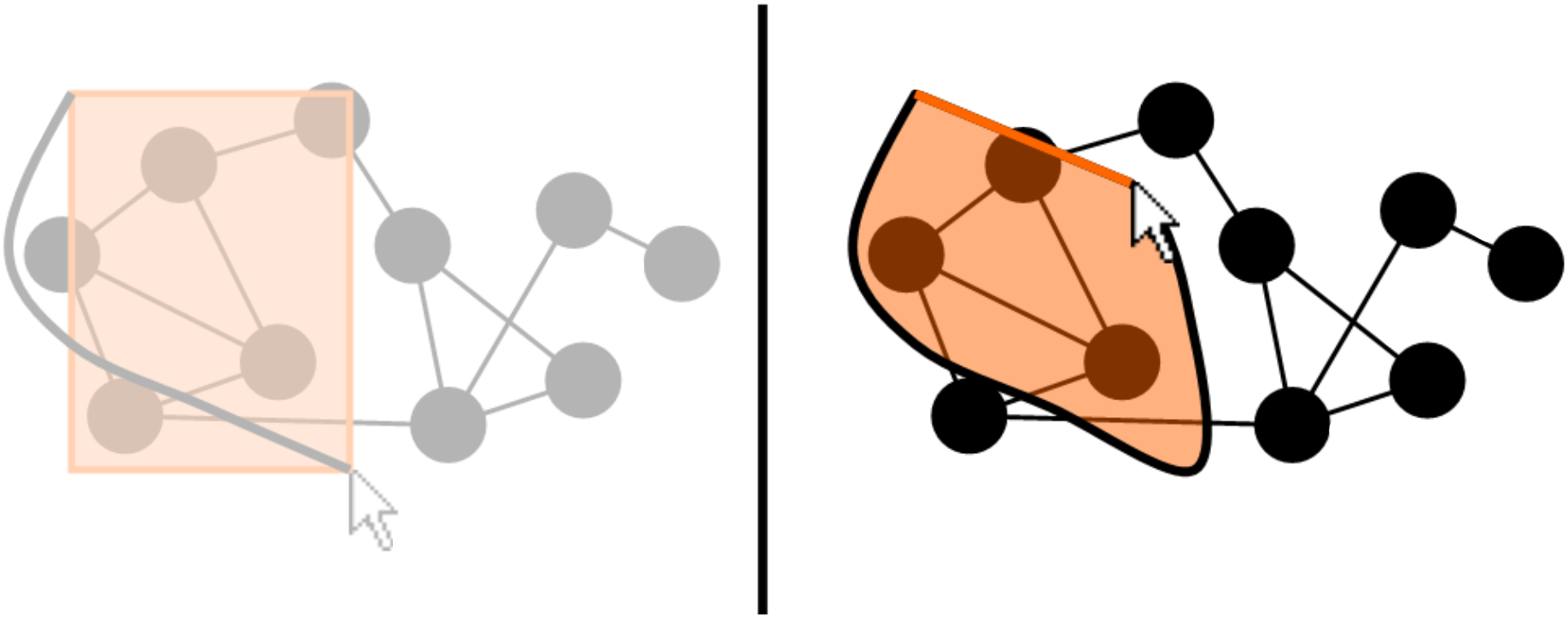


Text entry

Command selection

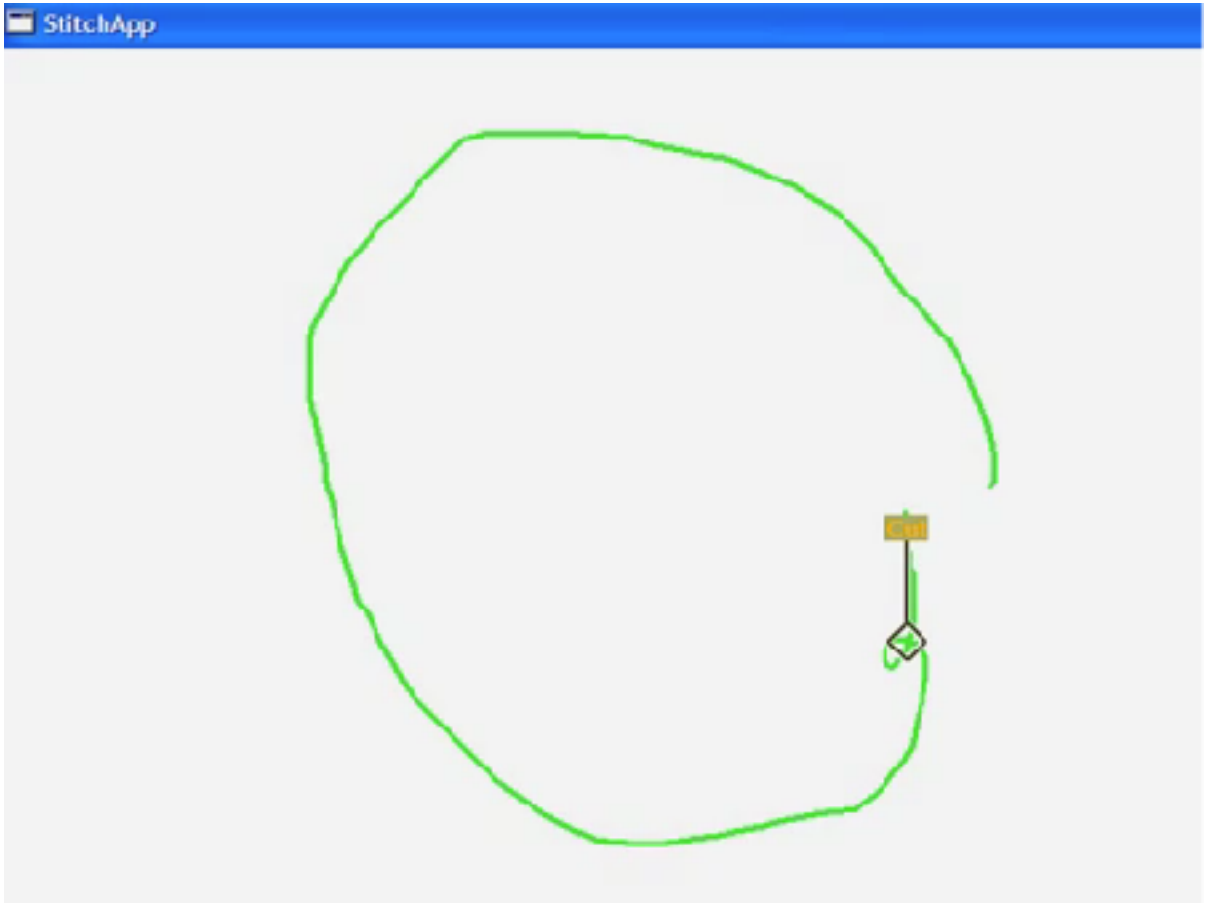


Object selection

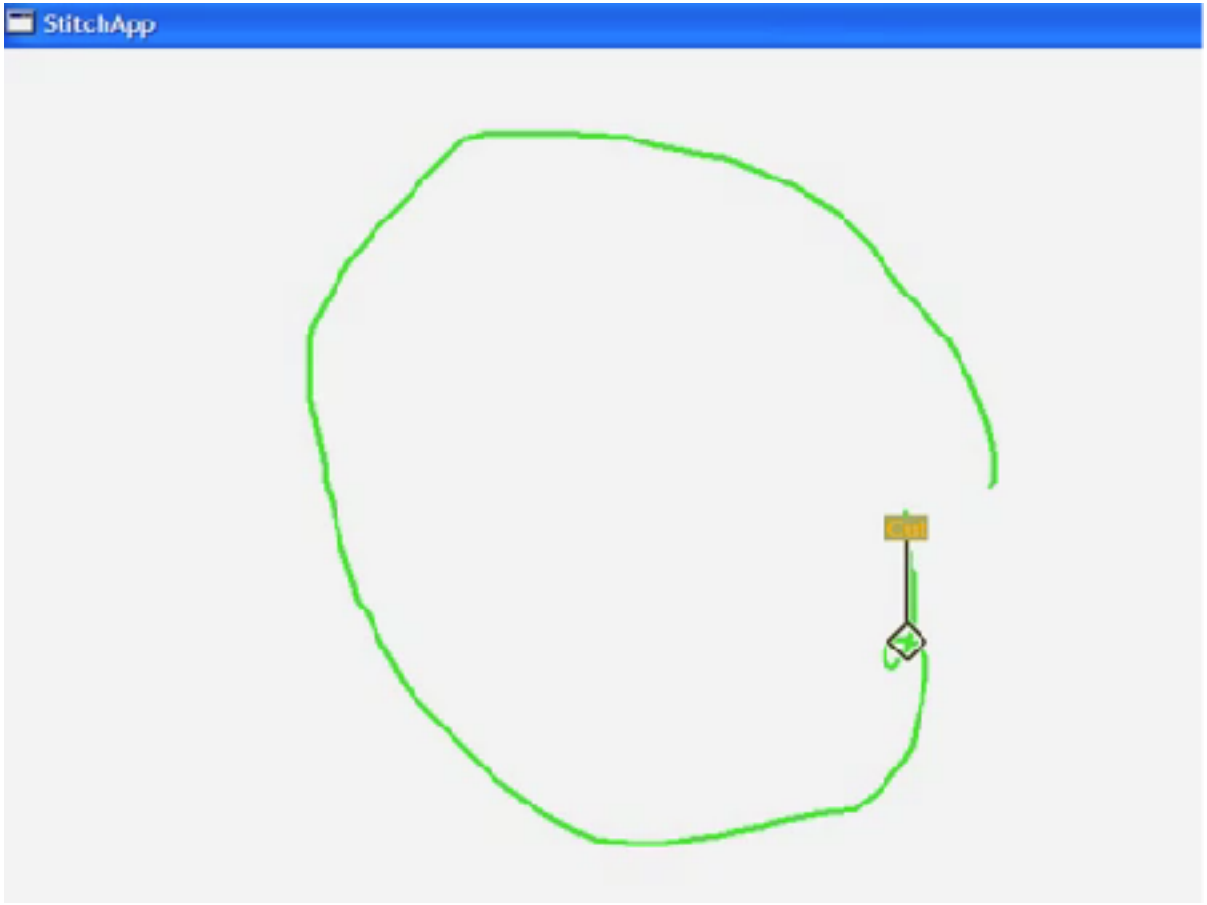


Object selection

Selection+command in one gesture



Selection+command in one gesture



Challenges

Create a gesture set

Define a gesture-command mapping

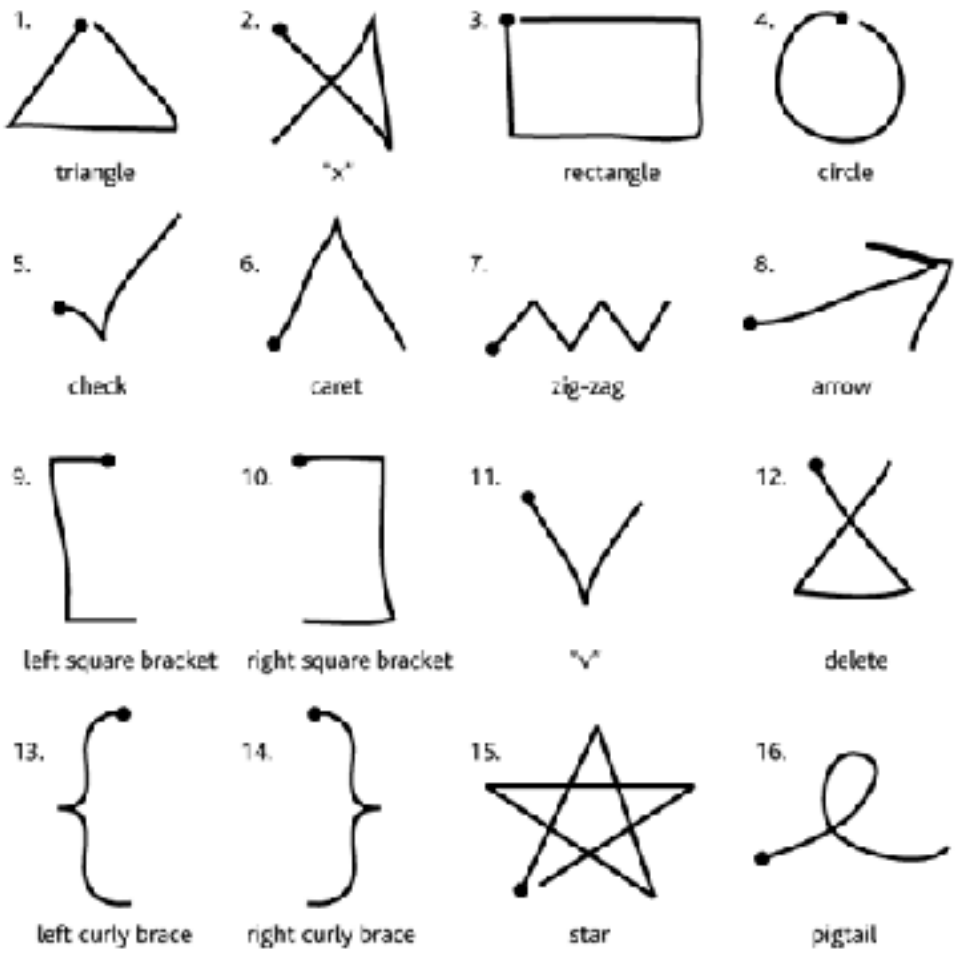
Imagine that you are designer
You have a list of 24 commands and
You want to build a gestural interface

How do you proceed?

Create a gesture set

Symbolic gestures

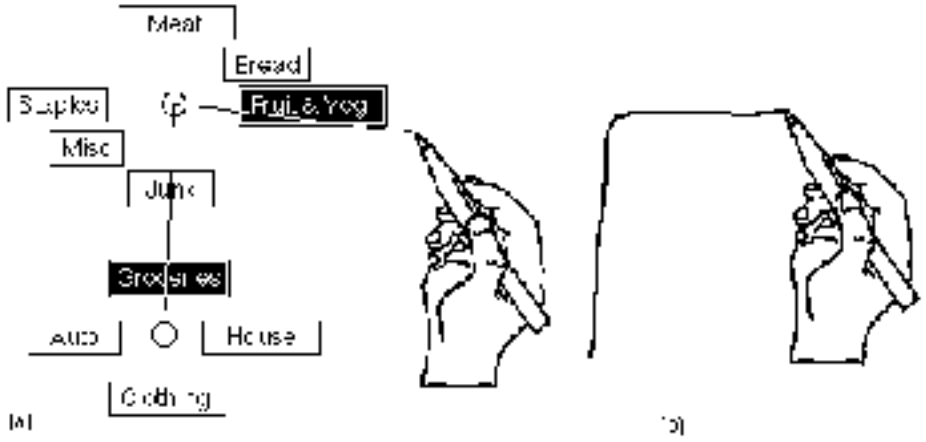
self-mapping



Create a gesture set

Abstract Gestures

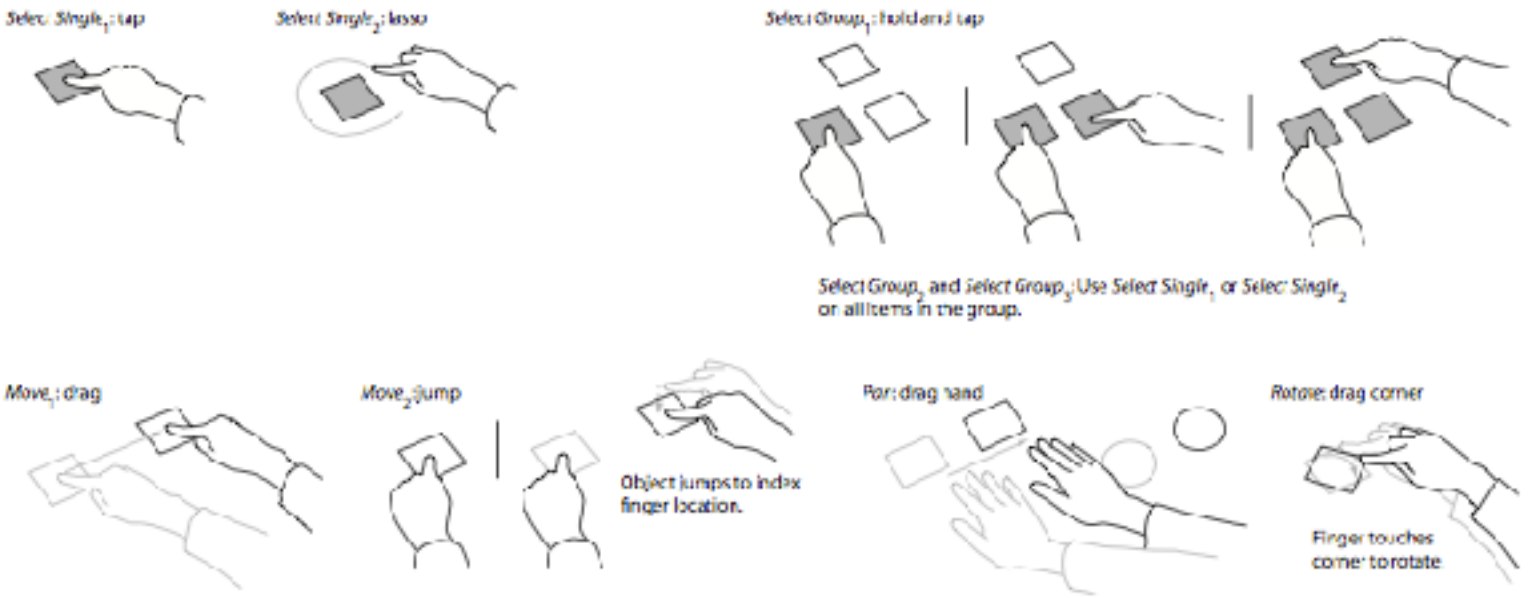
- + Organization
- + Accuracy
- - Gesture shape suggests no meaning



Define a mapping

User defined gestures

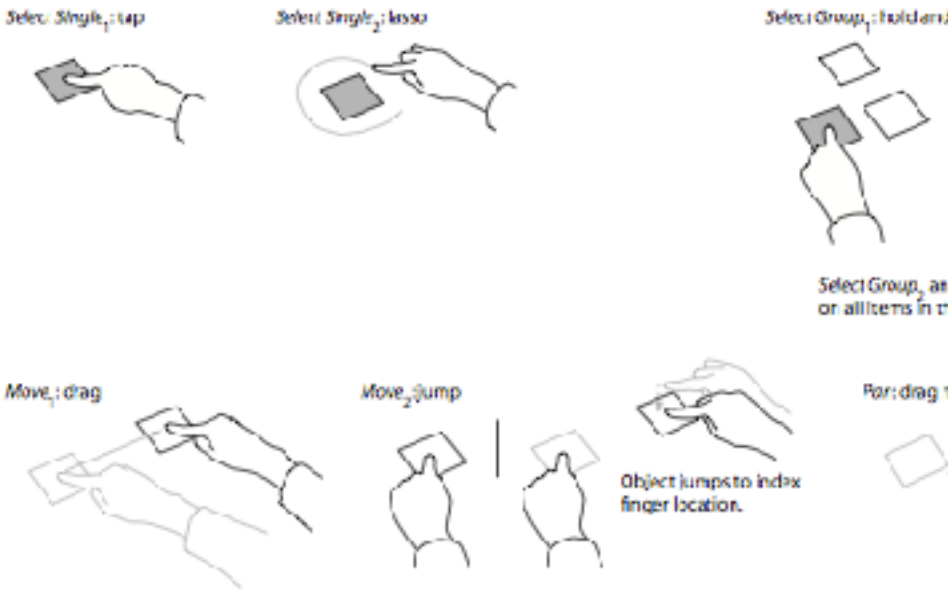
Capture "natural" mappings



Define a mapping

User defined gestures

Capture "natural" mappings



command	number of gestures	% choosing "winner"
accept	1	100%
minimize	3	90.9%
previous	2	90.9%
select single	3	90.9%
help	3	86.4%
next	2	86.4%
open	5	86.4%
move	3	81.8%
cut	2	77.3%
rotate	4	68.2%
shrink	5	68.2%
delete	5	63.6%
pan	2	63.6%
undo	4	63.6%
select group	3	59.1%
menu	5	54.5%
paste	4	54.5%
reject	5	54.5%
enlarge	5	45.5%
zoom in	5	45.0%
duplicate	4	36.4%
zoom out	6	22.7%

Define a mapping

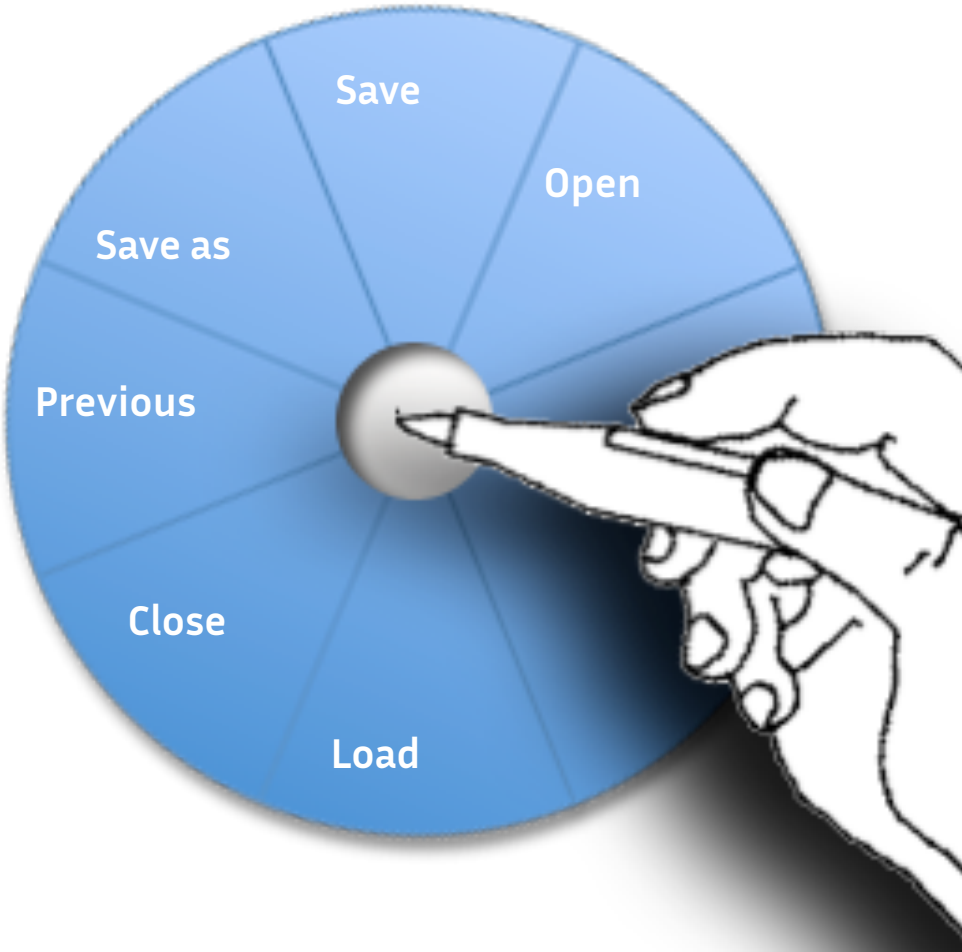
Semantic relationships

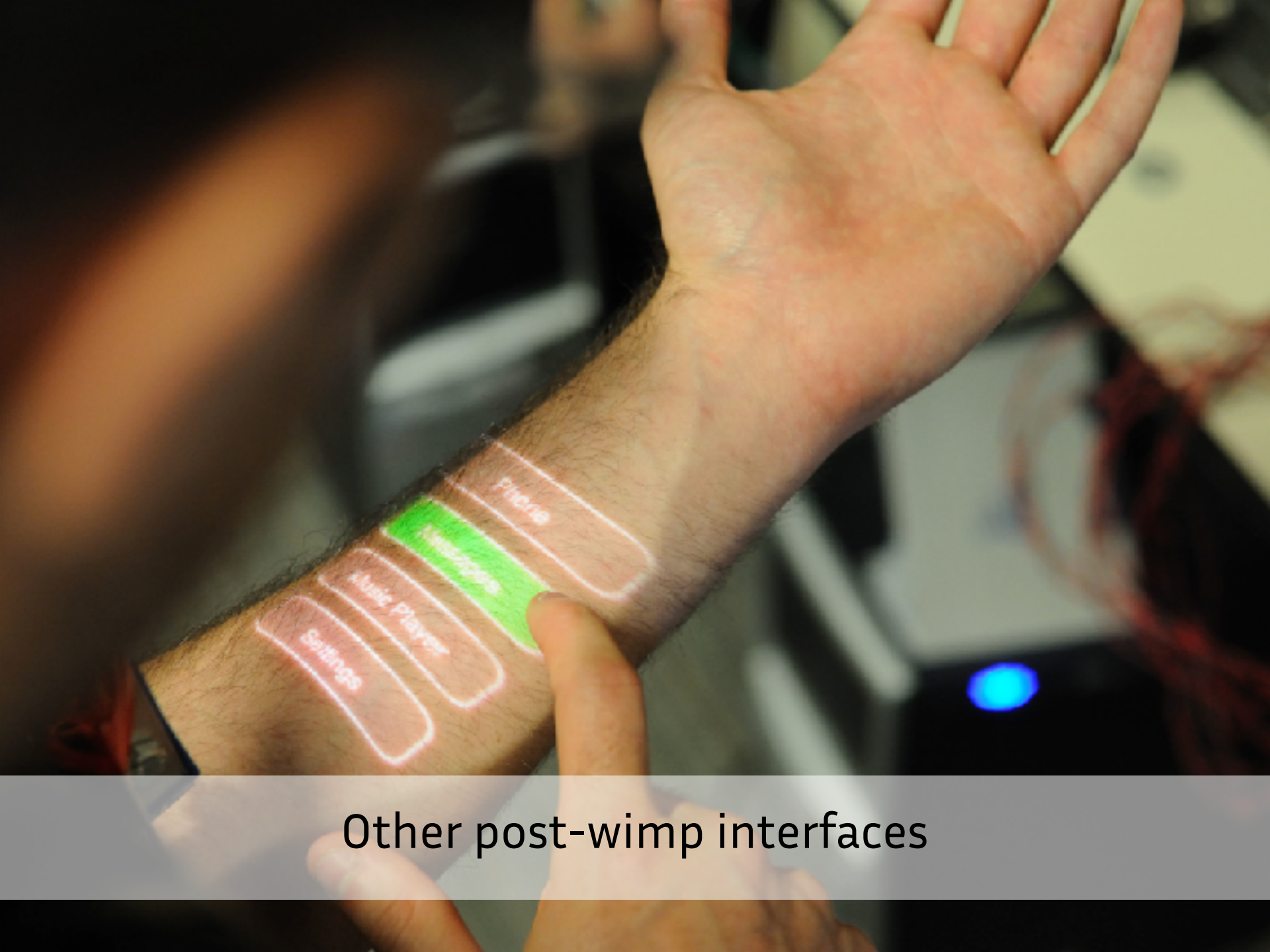
Focus on the relation between

- the different gestures
- the different commands

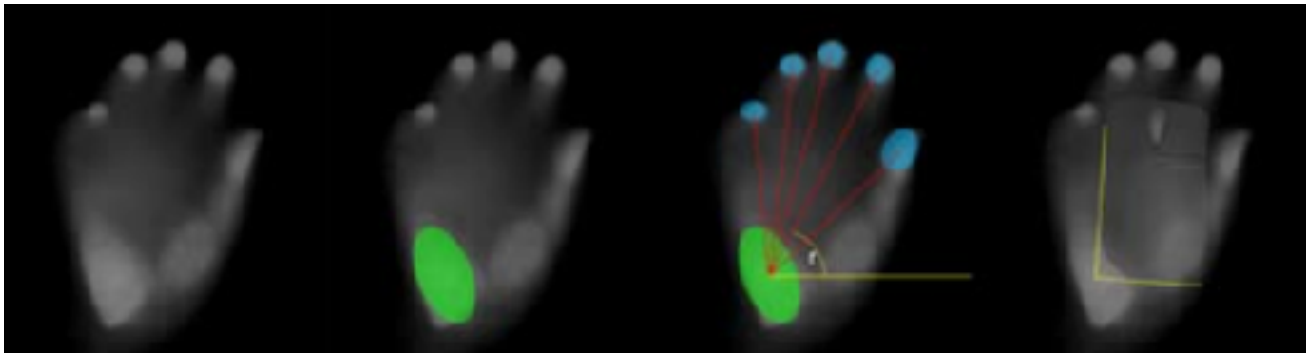
Highlight:

- Similarity
- Opposition
- etc.





Other post-wimp interfaces

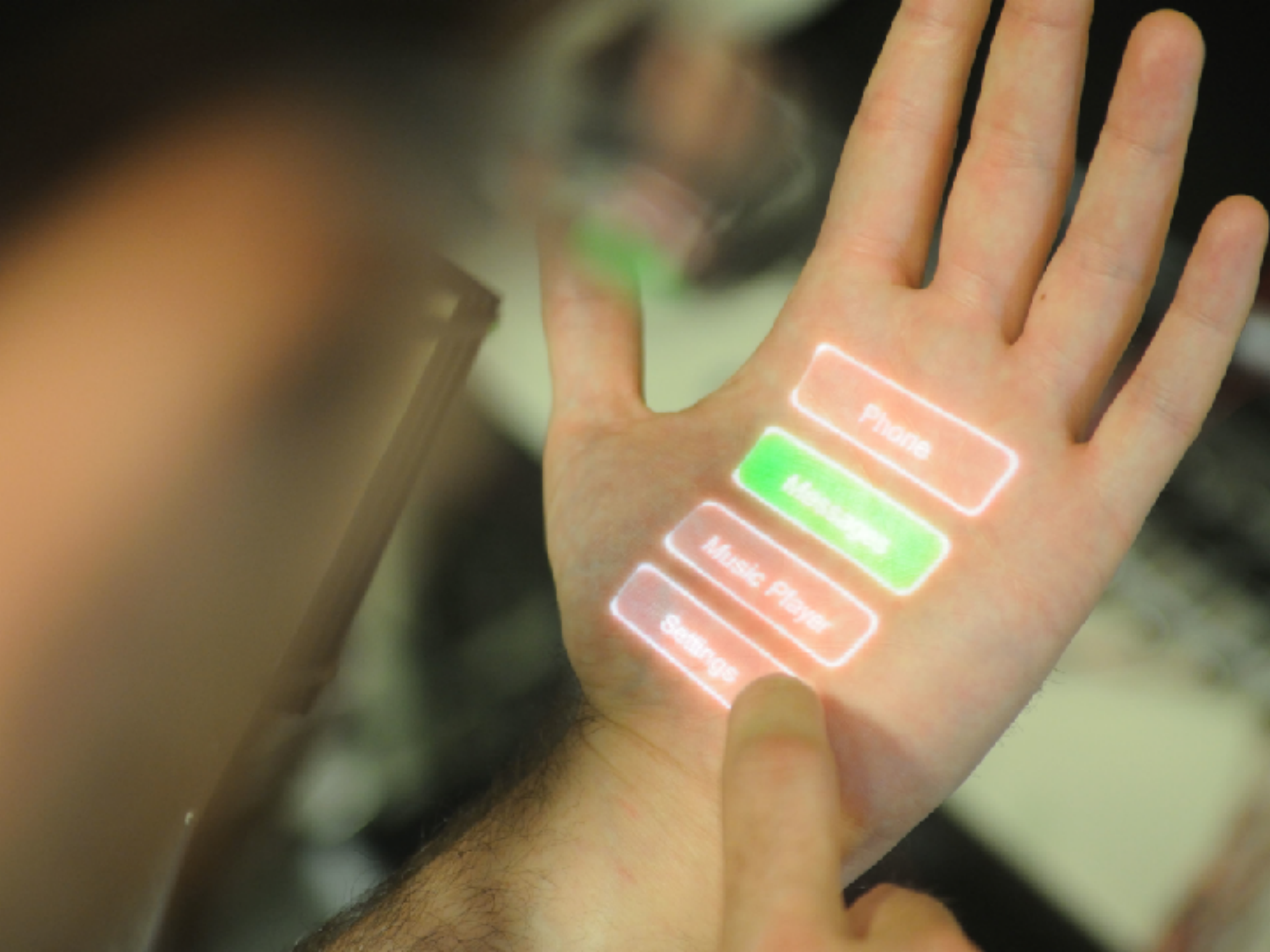


Scratch input

Scratch input

Scratch input

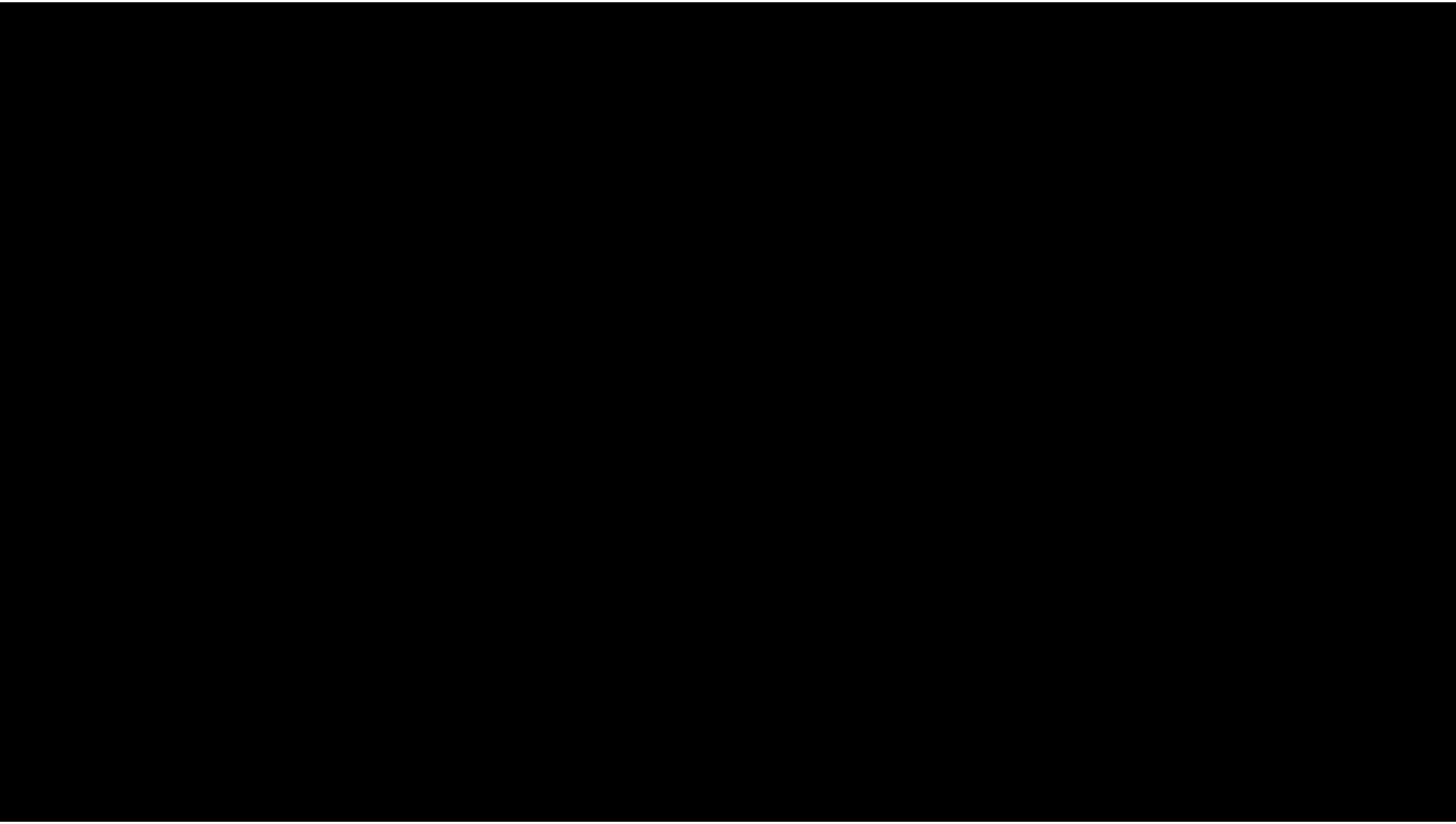
Scratch input


Phone
Messages
Music Player
Settings

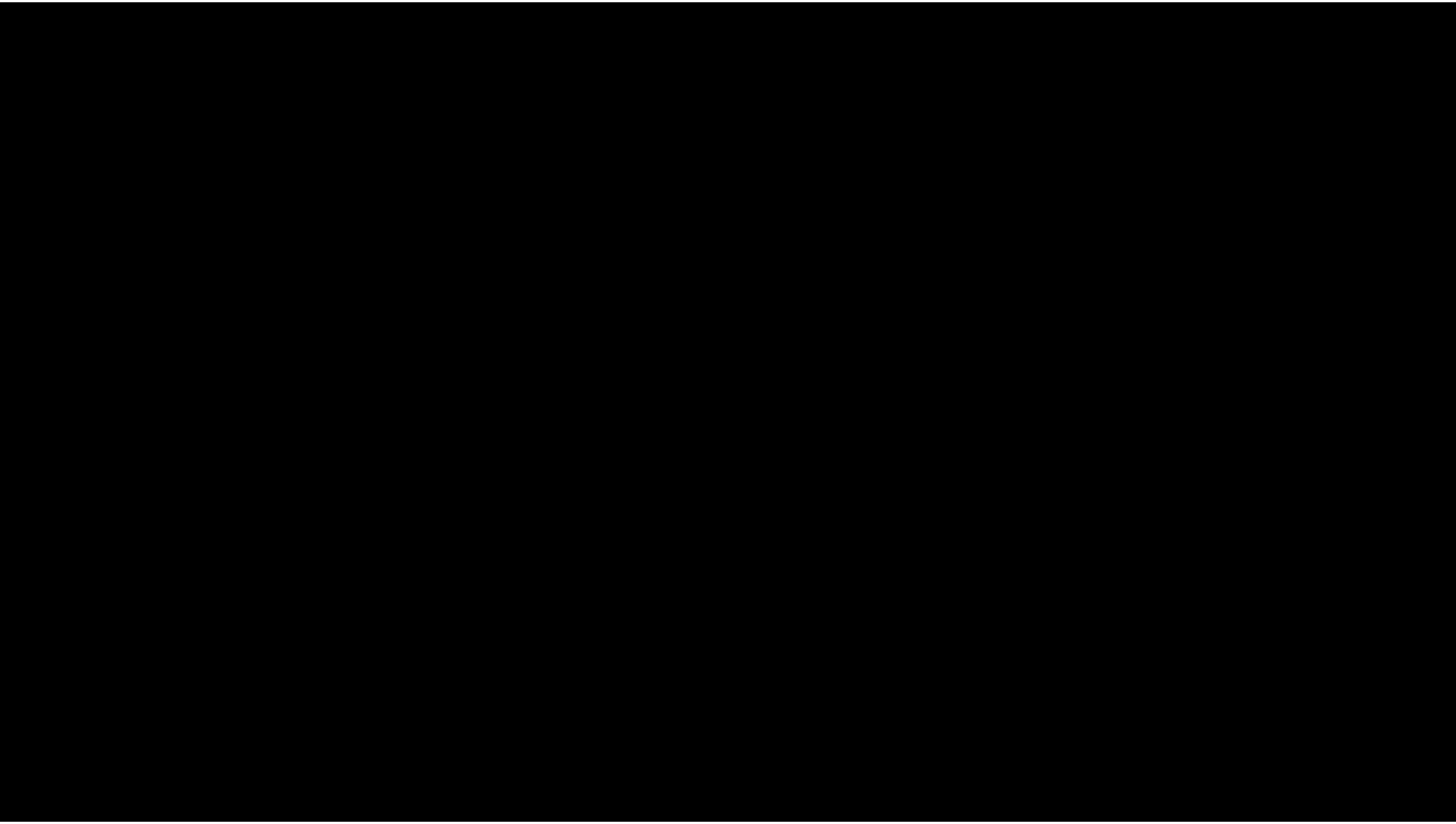
Watch-it

Watch-it

Pinstripe



Pinstripe



- Hiroshi Ishii — Tangible User Interfaces
- pCubee — University of British Columbia
- I/O Brush — Tangible Media Group
- Sense board — Tangible Media Group
- Shapewriter — Shumin Zhai
- Marking Menus — Bill Buxton and Gordon Kurtenbach
- Scriboli — Ken Hinckley
- Cyclostar — Télécom ParisTech
- User-defined gestures
- Foundational Issues in Touch-Surface Stroke Gesture Design
- Chris Harrison webpage
- WatchIt — Télécom ParisTech
- Pinstripe — Aachen University