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Graphical interaction (part 1)

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Direct manipulation

Shneiderman (1983)

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







Direct manipulation + menus + forms

BEWARE of the notion of **object of interest**

Objects of the application domain Characters, words, paragraphs of a text Pixels of an image, graphical shapes, ... Menus and forms are NOT objects of interest

Direct manipulation vs. Indirect Manipulation

Direct manipulation of the *objects of interest* ≠ Interaction with *menus and forms*

3 levels of graphical interaction

Basic actions

"alphabet" of graphical interaction

Basic interaction tasks

"vocabulary" of graphical interaction

Interaction patterns

"syntax" of graphical interaction





Basic actions

Interaction through a mouse or trackpad and a **cursor Pointing**: move cursor to designate an object **Activation**: click (simple / multiple / with modifier) **Drag**: move cursor with button pressed **Keyboard input**: keys and/or modifiers

Pointing



Pointing



Pointing









Pointing



Activation



Pointage



Activation



Pointage



Activation



Extend activation actions



Conventions:

Right click = contextual menu Simple click = select ; Double click = open Shift-click = add/remove from selection

Drag



Drag

ghosts





Drag

ghosts







Drag

ghosts









ghosts







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Basic actions

Interaction through a mouse or trackpad and a **cursor Pointing**: move cursor to designate an object **Activation**: click (simple / multiple / with modifier) **Drag**: move cursor with button pressed **Keyboard input**: keys and/or modifiers

Interaction through a touch screen (finger or pen) **Tap**: one or more contact points without movement **Swipe**: short motion of one or more contact points **Mark**: motion of one or more contact points **Pinch**: motion of 2 contact points in opposite directions

Basic interaction tasks

Input tasks

Selection tasks

Trigger tasks

Navigation tasks

Property setting tasks

Transformation tasks

Input task : numbers



Note : the scale needs not be linear



Input task : text

Single-line text field

hello

Text cursor

- Validate with Return or Tab key
- Default value

Label

Name:

Multi-line text area

Name

text spanning multiple lines

Position



Position



Bounding rectangle

Position



Bounding rectangle



Control points

Position



Bounding rectangle

Control points



Input task : geometry

Position



Bounding rectangle

Control points

Free form



Input task

Adapt interaction to the type of value : size of a table



Input task

Adapt interaction to the type of value : size of a table



Select one or more items in a set Size of the set : small, medium, large Content of the set : fixed or variable Selection : one or more items

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Fixed content, small/medium size Single selection: Radio buttons, Combo box

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Multiple selection: Checkboxes


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Fixed content, small/medium size Single selection: Radio buttons, Combo box



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Trigger task

Buttons









Links

Add comment

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Drag-and-drop

Move an object to a drop zone The action depends on both the source and destination







Trigger tasks: Menus and palettes

Menu bar + pull-down menu



Tool palette



Pop-up menu

Hierarchical menus

Pull-off menus







Trigger task: Radial menus

Pie Menus (Hopkins)





Selection three times as fast as a linear menu but limited to 8 items

Trigger task: Radial menu

Pie Menus (Hopkins)





Selection three times as fast as a linear menu but limited to 8 items

Marking menus (Kurtenbach)



Transition to expert mode : the menu is not displayed when the selection gesture is executed quickly



Marking Menus - Kurtenbach & Buxton, 1993

Trigger task: gestural input



Delete

Edit musical score



Octopus - Bau & Mackay, 2008

Access content that is not visible

Scrollbars

The thumb represents the position of the view in the document



Access content that is not visible

Scrollbars

The thumb represents the position of the view in the document



Access content that is not visible

Scrollbars

The thumb represents the position of the view in the document Scrolling direction is the opposite of direction of motion of the thumb Division of attention between scrollbar and content





Amount of information

Access content that is not visible

Direct scrolling Direct manipulation of the content



Access content that is not visible

Direct scrolling Direct manipulation of the content



Access content that is not visible

Direct scrolling Direct manipulation of the content



Access content that is not visible

Direct scrolling

Direct manipulation of the content

Automatic scrolling when reaching the side of the view



Access content that is not visible

Direct scrolling

Direct manipulation of the content

Automatic scrolling when reaching the side of the view



Access content that is not visible

Pan-and-Zoom Zoom in to see detail Pan to scroll Zoom out to see context



Access content that is not visible

Pan-and-Zoom Zoom in to see detail Pan to scroll Zoom out to see context



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Access content that is not visible

Pan-and-Zoom Zoom in to see detail Pan to scroll Zoom out to see context





Push the wheel to zoom in or to zoom out?

Access content that is not visible

Hypertext links or navigation buttons Navigate to other part of the content (table of content, references, ...) Navigate to next/previous page Navigate to other content



Property and parameter specification task

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



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

Optional parts







Problem with OK button

Transformation task

Manipulation handles



Transformation task

Manipulation handles



Conclusion

3 levels of analysis of graphical interaction

Basic actions:

Pointing, Activation, Dragging

Basic interaction tasks:

Input, Selection, Trigger, Navigation,

Property/parameter specification, Transformation

Interaction patterns:

[next week]

Conclusion

Direct manipulation vs. Indirect manipulationObjects of interestMenus & Forms

Analyzing interfaces in terms of basic interaction tasksSelect (among existing info.) vs. Input (new information)Recognitionvs.RecallGeneric methods vs. specific ones

Exercise: analyze (multi-)touch interfaces