- ENGLISH VERSION -

Master Recherche Informatique - Université Paris-Sud

Fondements de l'Interaction Homme-Machine

Final exam - December 1st, 2005 - 3 hrs

Only authorized document: two-sided A4 sheet.
Read the entire exam. Be clear, precise and concise in your answers.

A. Questions from the lectures (6 points)

1. Describe the three facets of a widget in a user interface toolkit.

2. Among the videos that were shown in class, describe one that showed an Augmented (or Mixed) Reality system.

3. Give four interaction techniques that implement at least one of the design principles of instrumental interaction: reification, polymorphism, reuse. Justify your answer.

4. What is Fitts' law?

B. Modeling interaction (8 points)

Consider the "spring-loaded folders" interaction technique which, on the Macintosh, allows the opening of folders while dragging a document into a window. **Storyboard 1** (p.3) illustrates this interaction technique.

1. Describe the state machine that implements this interaction technique. You may use the following events: *Down*, *Up* and *Move* are sent by the mouse, *TimeOut* is triggered by a call to *arm(delay)*, *Enter* and *Leave* are sent when the cursor enters or leaves an object of type *Document*, *Folder* or *Window*, corresponding to document icons, folder icons and windows. This set of events makes it possible to specify transitions such as "*Down on Document*" or "*Enter on Folder*". The object under the cursor for such transitions can be retrieved with *GetDocument()*, *GetFolder()* and *GetWindow()*.

2. The "spring-loaded folders" interaction technique is a bit more complex than that shown in the first storyboard. **Storyboard 2** (p.4) shows that when a window has been opened with this technique, it closes automatically when the cursor leaves the window with the mouse button pressed. Revise your state machine to include this feature.

3. In order to test the performance of this technique, now called **T1**, we use a controlled experiment to compare it with two other techniques:

- technique **T2**: Open windows along the hierarchy of folders until the destination window is visible, then use traditional drag-and-drop to move the document into the window;
- technique **T3**: Select the document icon, activate the "Cut" command from the "Edit" menu, open the destination window and then activate the "Paste" command from the "Edit" menu.

The **null hypothesis** for the experiment is:

There is no difference in selection time among the three techniques T1, T2, T3, irrespective of the depth of the destination and the screen size. (The depth of the destination is the number of levels in the hierarchy that must be opened to reach the destination folder).

Given these elements, define the experiment:

a) List the independent variables and the dependent variables;
b) Describe the task that operationalizes the behavior being studied;
c) Define the experimental procedure : number of subjects, conditions, etc.;
d) Identify and justify which statistical tests to use;
e) Make a prediction as to the results and justify your answer.

4. List the advantages and disadvantages of the "spring-loaded folders" technique, especially in comparison to techniques T2 and T3. Use arguments from class to justify your answer.

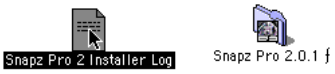
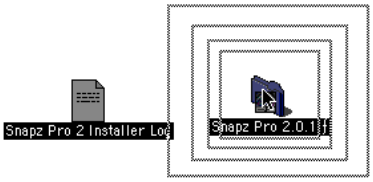
C. Conceptual modeling (6 points)

1. Examine the conceptual model of a simple Web browser on page 5. Briefly and informally describe the functions of this browser. Fill in the missing items directly onto this sheet: do not forget to enter the exam number and return this sheet with the rest of your exam.

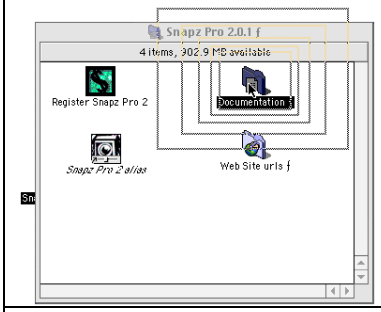
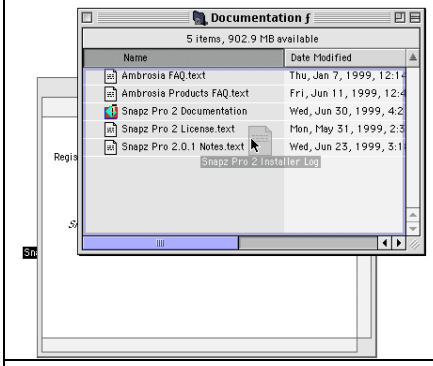
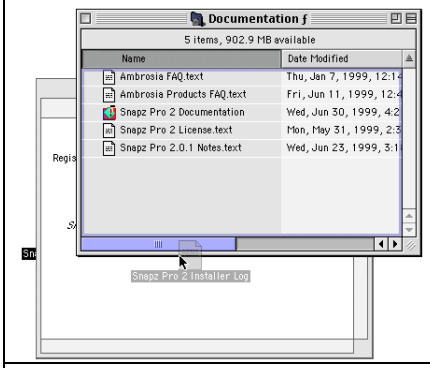
2. The designer wants to add the ability to manage multiple tabs in the browser window. In particular, he wants to be able to open all the links from a page into separate tabs and change the order of the tabs. He wants to use *direct* interaction techniques rather than indirect ones such as menus and dialog boxes.

a. Design the interaction techniques for managing tabs. Describe them with the help of a short storyboard.
b. Revise the task conceptual model to include tab management.

Exercise B : Storyboard 1

	The user selects a document and starts dragging it.
	She drags the document over a folder and waits for about one second (with the mouse button pressed).
	An animation shows that the folder is opening into a window.
	The window that corresponds to the folder is now open, the user still has the mouse button pressed and can therefore keep dragging the document.
	Here she decides to drop the document in the newly opened window. She could also have continued navigating folders by opening the "Documentation" folder, therefore going down to an arbitrary level in the hierarchy.

Exercise B : Storyboard 2

	In this example, the user drags the document onto the "Documentation" folder and pauses to open it.
	As before, the folder opens into a window with an animation.
	The users realizes that she does not want to drop the document into that window.
	She moves the document outside the window (still pressing the mouse button).
	As the cursor leaves the window, it closes automatically, providing access to the window underneath.

Exercise C : Conceptual model

Please fill in this page, including your exam sheet number: _____

Objects	Representations	Properties	Operations
URL	text entry field at the top of the window	- address	- _____ - _____
	underlined text in an HTML page	- _____	- load the destination page
HTML page	formatted text and images	- _____	- scroll the content
Favorites	_____	- list of URLs	- load a favorite

Operations	Commands	Feedback/Response
Load a page	- type: Enter in the text field - _____ - _____	the new page loads
Add a favorite	- select the "add" command in the "Favorites" menu	_____
_____	- use the scrollbar	the page scrolls