Master Recherche Informatique - Université Paris-Sud

Fondements de l'Interaction Homme-Machine

Exam - 3 December 2009 - 2h **ENGLISH**

Authorized document : a single A4 handwritten sheet.
Please read the questions carefully. Answer clearly, precisely and concisely.

A. Course questions (8 points)

1. Describe two features of the Xerox Star that are still present in many of today's interactive applications.

2. Who is the atuthor of the concept of "affordance". Define this concept and give two examples of affordance (not necessarily in the field of HCI).

3. Describe three menu techniques other than the traditional linear menu. List their respective advantages and drawbacks.

4. Describe three pointing facilitation techniques, i.e. three techniques that make pointing on a screen easier than in the real world.

5. Draw the diagram of the conceptual model of an interface and explain the difference between feedback and response.

6. What is multiscale navigation? Give two examples of multiscale navigation techniques.

B. Interactive wall (4 points)

An interactive wall is composed of a very large touch screen. Its physical size is 6m wide by 2m high. Its resolution is 20480 x 7680 pixels.

1. What is the maximum index of difficulty for a horizontal pointing task with a 10-pixel wide target, in each of the following cases:

- a regular monitor (resolution 1280 x 1024 pixels) ;
- the wall display.

You can approximate the calculation if you justify the approximation.

2. Why does Fitts' Law *not* apply for such a pointing task on the wall display?

3. Horizontal pointing on the wall is modeled as follows: first, the user walks to the target area until the distance to target is less than one meter; then the user performs a classic pointing task. Write a mathematical formula that predicts the pointing time. For the first phase, movement time can be assumed to be proportional to the distance convered. Justify your mathematical formula.

C. Interactive table (8 points)

An interactive table features a horizontal multitouch display, i.e. a device that can detect multiple simultaneous contact points. The display screen shows part of a much larger display surface. The goal of this exercise is to provide users with intuitive means to navigate the content displayed on this surface.

1. The first version of the navigation technique is as follows:

- When the user touches the screen with a finger and moves the finger across the screen, the display surface scrolls according to the finger movements, as with the "little hand" tool in Adobe Acrobat;
- As the finger moves, the system measures its speed; When the user lifts the finger from the table, scrolling continues automatically with a decreasing speed, until it stops;
- If the user touches the screen again while the content is scrolling, scrolling stops immediately but the user can use the interaction above to scroll it again.

It is therefore possible to reach a remote part of the display surface by using a quick finger movement to start a fast scrolling motion and touching the screen again to stop the scrolling and adjust the position of the display surface.

Describe this interaction with a state machine. In order to manage animation (automatic scrolling), you may use a "TimeOut" event that is triggered *t* milliseconds after calling "*arm(t)*" in an action of the state machine.

2. The scrolling technique described above interferes with other classic interactions such as pointing and drag-and-drop. This is because the gestures used to control scrolling are the same as those used to select and move objects displayed on the surface, such as a window or icon.

Create two interaction techniques that combine scrolling the surface and drag-and-drop of objects in an intuitive way. Illustrate each technique with a storyboard and justify your choice of techniques.

Reminder : The table can detect multiple simultaneous contact points.

3. Describe the state machine for one of the techniques proposed in question 2.

4. You are asked to design an application to manipulate photos on the display surface. Each photo is displayed in a window that can be moved, rotated and rescaled by direct interactions using one or more fingers. It must also be possible to hide photos, to duplicate them, to change their overlapping order, and to scroll the surface area as described above. You need to design the overall user interface for the application and each of the interaction techniques.

Describe the user interface for this application and fill out the functional table (see attached page).

Objects	Representations	Properties	Operations
Photo	Window containing the image	Position Orientation Scale	- move - rotate - ...

Operations	Commands	Feedback/Response
- move photo	...	...