

Fundamentals of Human-Computer Interaction

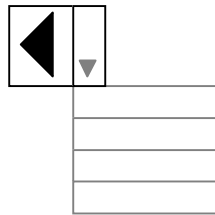
Exam - 19 November 2015 - 3h

Authorized document: a single A4 handwritten sheet.

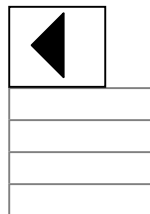
Please read the questions carefully. Answer clearly, precisely and concisely.

A. Modeling interaction (5 points)

The designer of a web browser is faced with a choice between two designs for a back button that also gives access to the history of pages:



- Solution 1 uses two buttons: a left arrow (20 pixels wide) and a down arrow (10 pixels wide). A click on the left arrow goes to the previous page; a click on the down arrow displays a pull-down menu (as shown on the left) with the list of recent pages.



- Solution 2 uses a single button (30 pixels wide): a simple click on the arrow goes to the previous page, while a long click on that arrow displays the pull-down menu with the recent pages (as shown on the left). The delay for the long click is 300ms.

1. Define the four sequences of operations corresponding to the two actions (Back and History) for each solution, using the following operations: *Point(D,W)* for a pointing task, *Click* for clicking and *Wait(delay)* for waiting. (Mental operations are ignored).

Use diagrams showing the cursor trajectory to explain your answers.

2. Estimate the execution times to select the 5th item in the history menu with solution 1 and solution 2 when the user starts with the cursor:
 - 200 pixels away from the button;
 - 800 pixels away from the button.

Click time is 100ms and the height of the menu items is 20 pixels. The following table gives some (rounded) values for *Point(D,W)*:

MT (ms)	D=50	D=100	D=200	D=400	D=800
W=10	490	620	760	900	1050
W=20	370	490	620	760	900
W=30	310	420	540	675	820
W=40	275	370	490	620	760

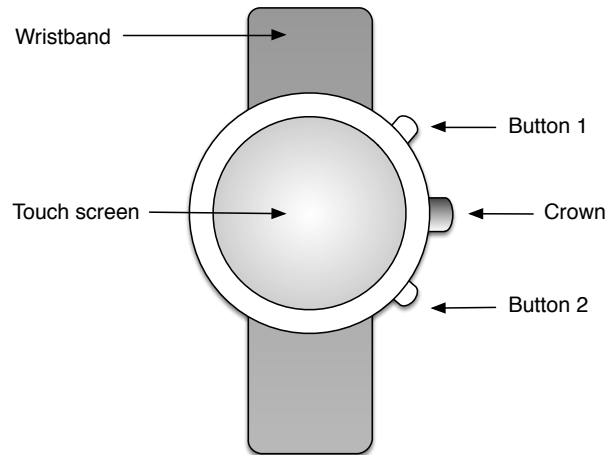
3. For each solution, is it faster to click the back button five times or to use the history menu to select the 5th item?
4. The comparison above ignores an important point: each time the user clicks the back button, the browser displays the previous page, which takes 200ms. Assuming that the user cannot click the back button until the page is displayed, make the same comparisons as in question 3. What do you conclude?

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Next exercise on page 3

B. Conceptual modeling (8 points)

Design the interface for an interactive watch that communicates with a smartphone. The watch has a touch screen, a crown that can turn and be clicked, and two other buttons (Button 1 and Button 2):



The screen is round and has a resolution of 300x300 pixels. The touch screen can detect only one contact point (because of the small size of the screen) and only the following gestures:

- Tap, Double tap, Long tap,
- Flick in any direction.

The watch has four apps with basic functions:

- Clock Current time, set time zone, set alarm.
- Notifications Browse notifications, discard notification.
- Calendar Browse events, set an alarm for an event.
- Messaging Browse messages, answer message, send message.

When paired with a smartphone, the watch displays messages when a phone call or a text message is received. The user cannot type messages, but instead selects a message within a predefined list and sends it. Some of these messages include a variable part that can be set by the user, for example:

- “I will call you back in <nn> minutes”
- “I am in a meeting until <hh:mm>”
- “I will be home at <hh:mm>”
- ...

When an alarm occurs, the watch displays a notification.

When the next event in the calendar is about to start, the watch displays a notification. If the event has an associated contact person, the watch posts a message instead, and the user can send that person a predefined message with a variable part, such as “I will be <minutes> late. Sorry.”

1. Identify the objects and operations of the watch's conceptual model.
2. Design a consistent interface to navigate between apps, to trigger commands and to specify their parameters.

Use drawings to illustrate your descriptions.

Explain why your design is consistent, and to what extent it follows the principles of direct manipulation and/or instrumental interaction.

3. Fill out the objects and operations tables to describe the complete conceptual model of the interface. To help you get started, the tables below include one object and one operation (you can change these in your design).

Objects table:

Objects	Representations	Properties	Operations
Time	Analog clock	Time of day Timezone	Change timezone
...			

Operations table:

Operations	Commands	Feedback	Responses
Change timezone	Push button 1 Use crown to select timezone & push crown when ready	List of timezones appears	The new timezone is set
...

4. We want to add a Health app to the watch. This app tracks the number of steps of the user and an estimate of the number of calories consumed.

We want the user to be able to set daily goals for steps and calories, and the watch to notify him when they are reached.

Design the Health app, with drawings to illustrate your description, and add it to the conceptual model.

Answer part C questions on both sides of this page.

C. Course questions (7 points)

1. Check all that apply to Ivan Sutherland's SketchPad:

- | | |
|--|---|
| <input type="checkbox"/> used a mouse | <input type="checkbox"/> used a lightpen |
| <input type="checkbox"/> used bimanual interaction | <input type="checkbox"/> had videoconferencing |
| <input type="checkbox"/> had windows | <input type="checkbox"/> solved geometric constraints |

2. List the four principles of direct manipulation:

1. _____
2. _____
3. _____
4. _____

3. List the 3 components of the sense of touch and briefly describe them:

1. _____

2. _____

3. _____

4. Indicate the type of task (from the list of six basic interaction tasks seen in class) corresponding to each of these interactions:

Drag a file icon to the trash: _____

Use the scrollwheel when reading a document: _____

Open a Print dialog box : _____

Click and drag to specify the position and size of a rectangle: _____

Select the Cut command in the Edit menu: _____

Click and drag to move a corner of a rectangle: _____

5. Describe two menu techniques other than the traditional linear menu and list one advantage and one drawback for each of them:

Technique 1: _____

Advantage: _____

Drawback: _____

Technique 2: _____

Advantage: _____

Drawback: _____

6. Cite the formula for Fitts' Law and 2 techniques that improve pointing:

Fitts' Law: _____

Technique 1: _____

Technique 2: _____

7. Briefly describe the 3 design principles of Instrumental Interaction:

1. Reification: _____

2. Polymorphism: _____

3. Reuse: _____
