Exam Innovative Interactive Systems Class

Date: January 27, 2011   Time: 9:00–12:00

Instructions, read carefully: Fill in your **name and student number** on each of the answer sheets that you hand in. You have 3 hours to answer the questions. Please answer in English if at all possible, write clearly. Use short answers, usually a bulleted list of key points is sufficient.

This exam has a total number of **16 questions** on **3 pages**. The total number of points (100%) is 80. As announced, the final grade for the class will be derived from both this final exam and the tutorials.

Question 1:   Design Life Cycle (4 points)

a) Which are the three stages of the "Design Life Cycle," in what order are they typically performed? (3 points)

b) At which of these stages does one start? (1 point)

Question 2:   Task-Centered Design (7 points)

a) What are the goals of the Task-Centered Design approach? (3 points)

b) List the four phases of the task-centered design process (bulleted list of points). (4 points)

Question 3:   Design Principles: Providing Feedback and Avoiding Surprises (4 points)

Explain why it is important to provide feedback and not to surprise the user, and how both can be achieved (bulleted list of points, at least two points for each of the two design principles).

Question 4:   Design Principles and Heuristics (5 points)

The new CheapShop interface mentioned in class (and depicted on the right) was designed to support the ordering of items in a store. Users start with Screen 1 (top) where they enter their personal information and the first item'c catalog number and the amount of items they wish to order. Further items can be added using Screen 2 (bottom) by clicking on the 'Next Catalog Item' button. The keyboard is used to enter text, the TAB key or the mouse is used to switch between fields. To complete an order, the 'Trigger Invoice' button is pressed, and shipping and billing details are printed automatically, and then the system returns to Screen 1. An entry process can be canceled by providing no input for 30 seconds, after which the system also returns to Screen 1. The input provided by users is checked for all fields when any button is pressed, erroneous fields blink for 3 seconds and are then cleared, and afterwards the shopper can re-enter the correct values. Based on this brief description, list the design flaws of this system being sure to indicate **which heuristic(s) was/were violated** and also **say why** (for at least five different heuristics).

Question 5:   Participatory Design (4 points)

Name at least two advantages and two disadvantages of participatory design.

Question 6:   Low- and High-Fidelily Prototypes (6 points)

What are examples for low-fidelity prototypes, what are examples for high-fidelity prototypes ($\geq$ two each), what are the advantages of each category ($\geq$ two each), and what are the disadvantages of each category ($\geq$ two each)?

Question 7:   Usability (5 points)

a) What is usability? (2 points)

b) Which aspects of usability are important (name at least three points)? (3 points)

Question 8:   Usability Evaluation (6 points)

a) What are the three main categories of usability evaluation discussed in class? (3 points)

b) Describe briefly what each of the three categories means. (3 points)

Question 9:   Questionnaires (3 points)

a) What are advantages of questionnaires (at least two)? (1 point)

b) What are disadvantages of questionnaires (at least two)? (1 point)

c) What has to be ensured when asking for ratings/choices (numbers) in questionnaires (at least two)? (1 point)

Question 10:   Dependent and Independent Variables, Null Hypothesis (4 points)

A controlled laboratory study is run in order to analyze display settings for a prototypical interface. Test participants are separated into two groups (Group 1: 25 years or younger, Group 2: older than 25 years) and run through to one of two test conditions:

Test condition 1: Person uses a tabletop display.

Test condition 2: Person uses a wall display.

Aside from the use of different display setups, the two conditions are the same. During the study the following information is recorded and will be used to evaluate the effectiveness of each display setting: (1) the amount of time required by each person to complete the task and (2) the number of times that the person selected the wrong item when trying to complete their task.

a) What is/are the dependent variable(s)? (1 point)

b) What is/are the independent variable(s)? (1 point)

c) What hypothesis/hypotheses would be good to serve as null hypothesis/hypotheses in this context? (2 points)

Question 11:   Large Screen Technology (6 points)

Name at least three technologies that allow multi-touch input and, for each, one advantage and one disadvantage.

Question 12:   Large Horizontal Screens (8 points)

a) Name four usability issues unique to large horizontal (tabletop) screens. (4 points)

b) Name a technique each to address these issues. (4 points)

Question 13:   Collaboration using Large Displays (6 points)

a) Why would people want to work as groups using large displays (name at least two)? (2 points)

b) What issues, challenges, and/or conditions need to be observed when supporting (co-located synchronous) collaboration on large displays (name at least four)? (4 points)

Question 14:   Small Screens (4 points)

On small screens there are two types of input control: *discrete* and *pointing* controls.

a) What is a discrete control? (1 point)

b) What are examples for discrete tasks (name at least two)? (1 point)

c) How can pointing control be realized on small devices (name at least two possibilities)? (1 point)

d) What is *rate-control* and is it a discrete or a pointing control? (1 point)

Question 15:   3D Displays (4 points)

What are differences between Virtual Reality settings and true volumetric displays? Name at least two aspects in which they differ and how.

Question 16:   Degrees of Freedom (4 points)

a) What does the term "degrees of freedom (DOF)" describe? (2 points)

b) Give the DOF for (½ point each)

  • a touching finger on a touch-display

  • a 3D mouse

  • a human hand as tracked with a glove in a 3D VR setting (such as a CAVE)

  • the human head as tracked in a 3D VR setting (such as a CAVE)