

IMPERIAL COLLEGE LONDON

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING  
EXAMINATIONS 2003

EEE/ISE PART III/IV: M.Eng., B.Eng. and ACGI

**HUMAN-COMPUTER INTERACTION**

Tuesday, 13 May 10:00 am

Time allowed: 3:00 hours

**There are SIX questions on this paper.**

**Answer FOUR questions.**

*Corrected Copy*

**Any special instructions for invigilators and information for candidates are on page 1.**

Examiners responsible	First Marker(s) :	J.V. Pitt
	Second Marker(s) :	Y.K. Demiris



1. FlowerPower is a large garden centre which offers a wide range of flowers, shrubs and small trees for sale to the general public. As an expert in *Information Visualisation*, you have been commissioned by FlowerPower, with a short deadline, to propose a design for an interactive tool. This tool will allow customers without specialised gardening knowledge to make an informed choice of one or more items for planting in their own garden.

Initially the tool will be implemented on a large display (e.g. 100 cm by 60 cm) with interaction device(s) of your choice. Assume for purposes of your first trial design the availability of a very high resolution colour display and adequate computing power.

- (a) Identify the major design issues associated with the visualisation of the data processed by the garden design tool.

[10]

- (b) Describe, with illustrative sketch(es), your first trial design, explaining your choice of representation, presentation and interaction techniques. Do not include, in your design, any mechanism for ordering or paying for items.

In view of the limited time available for design and lack of consultation with FlowerPower, briefly indicate any aspects of your design which need further consideration or the participation of FlowerPower.

[10]

2. (a) Define what *guidelines* are in Human-Computer Interaction, and briefly indicate why they are useful.

[4]

- (b) Define what *standards* are in Human-Computer Interaction, and briefly indicate why they are useful.

[4]

- (c) The Apple Interface design goals include ease of use and learning, with desired qualities of permissiveness, responsiveness and consistency. Explain how the heuristics used in heuristic evaluation can instead be specified and applied as interface guidelines intended to support the design goals and desired qualities.

[8]

- (d) Specify guidelines for the usage and positioning of controls and displays, with respect to each other and themselves, considering user requirements, task performance and workspace context.

[4]

3. (a) Describe the objective and method of observational evaluation. For each step of the method, indicate the purpose of the step, describe how it may be performed and discuss the issues that need to be considered.

[10]

- (b) Describe how observational evaluation could be supported by user reports, and discuss the advantages and disadvantages associated with the two different types of user report.

[6]

- (c) Explain when observational methods of evaluation might be performed in preference to the method of user reports, and vice versa. Indicate under what conditions other kinds of evaluation method might be preferred.

[4]

4. The Skyliner is a device which allows people to write 'messages in the air' by rotating a series of LEDs which spell out a message. The Skyliner is operated and programmed using 3 buttons, P1, P2 and P3.

The Skyliner has two modes: pre-set mode and user-programmable mode. In pre-set mode, the user can cycle between 15 pre-set messages, forwards and backwards, using the P1 and P3 buttons. The user presses and holds P2, until the LEDs go out and come back on again, to toggle between modes. In user-programmable mode, the user can enter and save three messages. Pressing P1, P2 or P3 shows the message stored in the corresponding slot, or  $P_i$  ( $1 \leq i \leq 3$ ) if no message is stored. Pressing and holding P1 (again, until the LEDs go out and come back on again) erases any message in the slot and displays a cursor. The user can now program a message. This is done by pressing P1  $n$  times to change the cursor into the desired letter (i.e. A = 1 press, B = 2 presses, etc.). Pressing P2 adds the displayed letter to the message and redisplay the cursor (to start inputting the next letter), and pressing P2 followed by P2 again saves the entire message.

If there is no user action for more than 60 seconds, then the Skyliner switches off automatically. When the user turns it back on, the Skyliner starts off in either pre-set or user-programmable mode, depending on which state it was in when it turned off.

- (a) Draw a Dialogue Network Diagram (DND) for the Skyliner interface. Explain your notation.

[8]

- (b) Indicate any disadvantages of DNDs in trying to represent this dialogue.

[4]

- (c) Redesign the Skyliner interface using a single control mechanism. Explain how the interactions above are simplified by a redesign of the dialogues. Justify any design decisions you make.

[8]

5. Fizz, a low cost airline, are installing seatback TV screens on their long-haul flights. These will enable passengers to watch movies, play games, listen to music, shop duty-free, view flight/travel data, and get help on using the system.

Fizz have also asked Mr Ira Archie Cal, the lead system developer, to design the interface to the system. He has drawn up a JSD (Jackson Structured Diagram) for the tasks, and his first trial version uses a touchscreen for the seatback screen. The user is presented with the first screen, where the user must choose an entertainment type: movies, music, games, shopping, travel, and help. If the user chooses movies, they are presented with a screen of categories (comedy, action, arthouse, etc.), if they choose comedy, a screen of certificates is presented (family, PG, X-rated, etc), and so on until they reach a final screen of movie titles, where they can select a preview, then decide whether or not they want to watch the movie. Because of his own experience on long-haul flights, if there is not enough time to watch the whole movie before the flight lands, then the system does not allow the movie to start.

- (a) Indicate some of the possible problems that passengers might experience in using such an interface. Explain how it might also cause problems for the passenger in the seat in front of the seatback TV screen.

Indicate the advantages of JSD that make it superficially attractive as the basis for design, and explain the drawback that is the source of the identified problems.

[12]

- (b) Redesign the interface using a continuous input mechanism. Construct an Action-Condition-Effect diagram for your redesigned interface. Indicate how your interface satisfies the slogan "copious with information, parsimonious with choice". Also indicate how your interface could cope with a wide range of users, from experienced to novices.

[8]

copious = plentiful or generous

parsimonious = frugal or mean

6. (a) In the domain of Human Computer Interaction, the phrase *Extreme Interfaces* is used to identify a certain type of interface. Give a brief definition of this interface type and nominate 3 interfaces that could be identified as examples of the type.

[4]

- (b) For each of the 3 examples nominated in part (a), describe the operation of a single I/O device or technique used in, and briefly describe the application of, the extreme interface.

[6]

- (c) Consider the situation of an ordinary member of the public walking through a shopping mall. Describe, using illustrative examples, how *Affective Interaction* and/or *Extreme Interfaces* could support customer-store interaction or an "ambient shopping experience".

[10]

