"interazione uomo-macchina" - alan dix, janet finlay, gregory d. abowd, russell b…

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" Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale Answers for tutors and extra exercises 1. The human EXERCISE 1. 4 What are mental models, and why are they important in interface design? answer available for tutors only Mental models are the theories people build to understand the causal behaviour of systems. These are often partial, unstable and subject to change. They may be internally inconsistent. They may be superstitious and based on incorrect interpretation of evidence. They are important, as errors can occur if the user's model is incorrect or if the designer has a different model than the user. One way of minimising problems is supporting conventions - another is to make the correct model explicit. EXERCISE 1. 5 What can a system designer do to minimise the memory load of the user? answer available for tutors only Discuss two ways of remembering - recognition is the knowledge that you have seen something presented to you; recall is the reproduction of something from memory. Recognition is simpler the information required is provided as the cue. Recall is more complex as the information has to be retrieved from memory but cues can help this - e. g. using categories or images. The interface designer can where possible allow recognition by providing information up front (e. g. labelled buttons). Where this is not possible support recall by using cues such as iconic images, categories of menu item. The answer may also discuss short term memory where chunking and restricting number of items are important. EXERCISE 1. 8 [extra - not in book] What is the difference between recognition and recall in relation to human memory? Discuss the implications of this for interface designers. answer available for tutors only Recognition is the knowledge that you have

seen something presented to you. Recall is the reproduction of something from memory. Recognition is simpler - the information required is provided as the cue. Recall is more complex as the information has to be retrieved from memory but cues can help this - e. g. using categories or images. Implications for interface designers include the need, where possible, to allow recognition by providing information up front (e. g. labelled buttons). Where this is not possible support recall by using cues such as iconic images, categories of menu item. Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale EXERCISE 1. 9 [extra - not in book] " A little psychology is worse than none at all". Do you agree with this statement? Justify your stand in the context of designing usable interactive systems. answer available for tutors only There are different ways of answering this question depending on the stand you take. One problem with knowing " a little" psychology is the danger of applying psychological principles out of context and making simplistic judgements. Principles and guidelines that derive from psychology are context dependent. For example, predictability is a principle that might not apply to a computer game. So it is important that the underlying theory is interpreted appropriately and that the context in which the rule is applied is comparable to that of the theory. An example of misuse of psychology is in the application of the 7+/- 2 short term memory limit to menu design. Menus support recognition by presenting the options to the user - this is not a task that relies on short term memory. Therefore the oft-heard recommendation to limit menu items to 7+/- 2 is a misapplication of psychology. Try to find more examples of well and badly applied psychology for yourself. EXERCISE

1. 10 [extra - not in book] What is the difference between a slip and a conceptual error? How might a designer minimise the occurrence of both among users of a system? answer available for tutors only A slip is an error that occurs when the context of skilled behaviour is changed. A conceptual error occurs due to lack of understanding on the part of the user. This may be a result of an inadequate or incorrect mental model. Answer should discuss ways of supporting mental models - e. g. transferring user's knowledge from other domains, using familiar objects, maintaining consistency between platforms, providing feedback, etc. Slips can be avoided by ensuring consistency, taking account of stress in skilled operation, etc. EXERCISE 1. 11 [extra - not in book] How might you use the notion of reward in interface design to increase the positive emotional response of users? Can you find any examples of this? answer available for tutors only Reward is essentially positive reinforcement of desired or good behaviour. This could be through providing explicit praise (used frequently in educational systems when a correct answer is given) or through more implicit elements that engage or entertain the user. Novelty, social interaction, feedback and surprise are all potentially rewarding to the user. For example, seeing a direct relationship between action and effect (feedback) can be rewarding. However care needs to be taken because each of these things can backfire and become irritating if not used properly. An Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale example of this is the Microsoft Office paperclip (see Chapter 11), which attempts to motivate users by making getting help a novel social interaction, was

actually irritating to users and was eventually dropped. 2. The computer

EXERCISE 2. 2 Exercises 2. 2 and 2. 3 involve you examining a range of input

and output devices in order to understand how they influence interaction. A

typical computer system is comprised of a QWERTY keyboard, a mouse, and

a colour screen. There is usually some form of loudspeaker as well. You

should know how the keyboard, mouse and screen work - if not, read up on

it. What sort of input does the keyboard support? What sort of input does the

mouse support? Are these adequate for all possible applications? If not, to

which areas are they most suited? Do these areas map well onto the typical

requirements for users of computer systems? If you were designing a

keyboard for a modern computer, and you wanted to produce a faster, easier

to use layout, what information would you need to know and how would that

influence the design? answer available for tutors only The keyboard supports

a single type of event, a keypress, which includes data that signals the value

of the key pressed. This data is represented as an ASCII key value or some

other international standard representation, such as UNICODE. Some keys on

a keyboard introduce new modes, or interpretations of keystrokes, so you

can use the same key to send uppercase and lowercase letters, or introduce

special commands or modifiers (such as Control-A). Many keyboards also

include special function keys, which produce non-ASCII keyboard events that

must be handled in special ways. A mouse provides two main pieces of

information. One piece of information is the location, in screen coordinates,

of the mouse pointer. The other piece of information is any event information

from the pressing and releasing of buttons of the mouse. Certain mouse

designs include additional inputs, such as a wheel that sends discrete

directional scroll events. The information needed to redesign keyboard layout would include the frequency of letters or commands to be issued by the keyboard as well as empirical data on motor actions of the hands and fingers in performing typing actions. Various modified keyboard layouts do exist, such as the DVORAK keyboard, but none has been successful in supplanting the QWERTY standard. EXERCISE 2. 4 What is the myth of the infinitely fast machine? Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale answer available for tutors only The adverse effects of slow processing are made worse because the designers labour under the myth of the infinitely fast machine. That is, they design and document their systems as if response will be immediate. Designers should plan explicitly for slow responses where these are possible. A good example, where buffering is clear and audible (if not visible) to the user, is telephones. Even if the user gets ahead of the telephone when entering a number, the tones can be heard as they are sent over the line. This type of serendipitous feedback should be emulated in other areas. EXERCISE 2. 5 Pick one of the following scenarios, and choose a suitable combination of input and output devices to best support the intended interaction. It may help to identify typical users or classes of user, and identify how the devices chosen support these people in their tasks. Explain the major problems that the input and output devices solve. Environmental database A computer database is under development that will hold environmental information. This ranges from meteorological measurements through fish catches to descriptions of pollution, and will include topographical details and sketches and photographs. The data has to

be accessed only by experts, but they want to be able to describe and retrieve any piece of data within a few seconds. Word processor for blind people A word processor for blind users is needed, which can also be operated by sighted people. It has to support the standard set of word-processing tasks. answer available for tutors only The environmental database will be operated by skilled experts. It is likely that they will want geographic displays of information, so leveraging off of operations on a map seem likely to be intuitive. Various parameters would likely be overlaid on the map, so some intuitive way to select among parameters, possibly with a purpose-built keyboard with function keys representing the parameters to be revealed. There should be an analysis of current practices by these experts in which the way they like to view information is revealed and the way they like to manipulate information. It seems that an interface to encourage exploration to reveal trends in data would be useful, so how this exploration can be made natural would impact design recommendations for input devices. Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale The word processor for blind people that can also be used by sighted people is more challenging because you need to accommodate two very different modes of interaction. Blind users cannot rely on the visual domain. One approach is to take an existing word processor and attempt to modify it for non-sighted use. It is clear that some level of audio feedback would be useful. Perhaps a screen reader to assist in reading the contents of the text window. The prosody of the voice might indicate formatting of the text (for bold, italics, headings). Providing a chorded keyboard for input might be

easier for the blind user, as orientation on a traditional keyboard might prove difficult without a lot of training. Two handed input techniques would also be useful, whereby one hand could be used for chording/typing text and the other for performing tasks. Audio feedback on commands would be useful, but the granularity of feedback would have to be experimented with. EXERCISE 2. 6 Describe Fitts' Law (see chapter 1). How does Fitts' Law change for different physical selection devices, such as a 3-button mouse, a touchpad, or a pen/stylus? (You'll need to do some research for this.) answer available for tutors only There should be an attempt to write down Fitts' Law in one of its many forms. The form students may be most familiar with is: Movement time = a + b log2(distance/size + 1) The relationship between time and distance and size of a target should be expressed. Students should know what the time stands for (time for selecting a target) and that distance and size are descriptions of the target. They should be able to adequately explain that the constants in the formula are there to calibrate for different selection techniques (3-button mouse, trackpad, pen, etc.). They may simply mention that the law changes for different selection mechanisms, or, more explicitly, mention a and b parameters. NB There are more forms of Fitts' Law than the one above, but the important parts are the constants and the time/distance/size relationships. 3. The interaction EXERCISE 3. 6 Describe (in words as well as graphically) the interaction framework introduced in HumanComputer Interaction. Explain how it can be used to explain problems in the dialogue between a user and a computer. Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale answer available for tutors only

Pictures of the framework are on page 128 of the book. Symbols should be included for user, system, input and output. Names for the articulation, presentation, performance and observation translations should also be included. The concept of translations between languages should be described, even if the names of the translations are not accurate. Students should mention that the framework can be used to explain where in the overall user/system interaction difficulties take place. The framework will isolate it as a problem with one of the translations. One problem might be the ease with which a particular translation can occur. Another might be that the particular translation involved does not actually cover the the possible translation that is needed by a particular situation. Together, the ease and possibility issues are the main reasons why this framework is useful for doing simple analysis. Students may also mention the relation to Norman's execution/evaluation cycle and how this framework is more detailed on the system side; they may give examples of the use of the framework. EXERCISE 3. 7 Describe briefly four different interaction styles used to accommodate the dialog between user and computer. answer available for tutors only These are the commonest interaction styles: Command line interface Provides a means of expressing instructions to the computer directly, using function keys, single characters, abbreviations or whole-word commands. In some systems it is the only way of communicating with the system, e. g. remote access using telnet. More commonly it supplements menu-based interfaces, giving experienced users accelerated access to the system's functionality. Flexible and powerful but may be difficult to learn and use. Because commands must be remembered it is better for expert users than

novices. Menus The set of available options is displayed on the screen, and selected using the mouse, or numeric or alphabetic keys. These visible options rely on recognition rather than recall, but still need to be meaningful and logically grouped. Menus may be nested hierarchically, with the grouping and naming of menu options the only cue for finding the required option. May be text based or have a graphical component. Natural language Understanding of speech and written input is the focus of much research. Natural language is very difficult for a machine to understand. It is ambiguous, syntactically and semantically. It is difficult to provide the machine with context. Unlikely that a general natural language interface will be available soon, but systems can be built to understand restricted subsets of a language. They are limited and the user has to learn what the computer understands. Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale Question/answer, query dialogue Question/answer dialogue is a simple mechanism for providing input to an application in a specific domain. The user is asked a series of questions (mainly with yes/no responses, multiple choice, or codes) and is led through the interaction step by step. Easy to learn and use, but limited in functionality and power. Appropriate for restricted domains and novice/casual users. Query languages are used to construct queries to retrieve information from a database. They use natural-language-style phrases, but require specific syntax and knowledge of the database structure. Their effective use requires some experience. Form-fills and spreadsheets Used primarily for data entry but also useful in data retrieval. The display resembles a paper form, with slots to fill in. May be

based on an actual form with which the user is familiar. Easy to learn and use for novice users and can be flexible for expert users. Spreadsheets are a variation. Users can enter and alter values and formulae in any order. The system will maintain consistency amongst the values displayed, ensuring that all formulae are obeyed, so users can manipulate values to see the effects of changing different parameters. Flexible and natural, as the distinction between input and output is blurred. WIMP interface Also often called simply windowing systems. WIMP stands for windows, icons, menus and pointers (sometimes windows, icons, mice and pull-down menus), and is the default interface style for the majority of interactive computer systems in use today, especially in the PC and desktop workstation arena. Examples of WIMP interfaces include Microsoft Windows for IBM PC compatibles, MacOS for Apple Macintosh compatibles and various X Windows-based systems for UNIX. Mixed styles In UNIX windowing environments the contents of many windows are often simply command line or character-based programs. Mixing of interface styles in the same system is quite common, especially where older legacy systems are used at the same time as more modern applications. Can be a problem if users try to use commands and methods suitable for one environment in another, leading to inconsistency in the interface. Point-and-click interfaces In most multimedia systems and web browsers, most actions take only a single click of the mouse button. The philosophy is simpler than WIMP and more closely tied to ideas of hypertext. Not tied to mouse-based interfaces, but also used in touchscreen information systems, often combined with a menu-driven interface. Has been popularized by World Wide Web pages, which incorporate different types of

point-and-click navigation: highlighted words, maps, iconic buttons. Three-dimensional interfaces Increasingly used in interfaces. Virtual reality is an obvious example, but ordinary WIMP elements, buttons, scroll bars, etc., can be given a 3D appearance using shading. Can highlight active areas if used discriminatingly. Other techniques: 3D workspaces, VR and information visualization systems, where the user can move about within a simulated 3D world. 3D interfaces invite use of real world abilities in the electronic world. EXERCISE 3. 9 [extra - not in book] Explain what is meant by a modal dialog box. Copyright © 2004 — The McGraw-Hill Companies srl " Interazione uomo-macchina" - Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale answer available for tutors only A dialog box that prevents you doing anything else until it is complete - an example of preemptive dialog. 4. Paradigms EXERCISE 4. 2 Choose one paradigm of interaction and find three specific examples of it, not included in this chapter. Compare these three - can you identify any general principles of interaction that are embodied in each of your examples (see Chapter 7 for example principles)? answer available for tutors only There are clearly a variety of ways a student may answer this question, depending on which paradigm is chosen as a focus. It may be difficult for students to think about how older paradigms presented in the textbook might have modern examples. For example, what would be a modern example of a time-sharing system? Expect that students will feel more comfortable with the later examples of paradigms for this exercise. Also, when this part of the book was originally written, the paradigms/historical section was immediately followed by a discussion of principles of interaction. Therefore, it is reasonable to have students consider

this question after having read and understood Chapter 7 of the 3rd edition. Here is an example answer. We will consider the use of metaphor. Metaphors are introduced to support the general learnability principle. Here are some examples of the use of metaphor: 1) The electronic spreadsheet. This is a fairly old, but classic example of the use of metaphor that resulted in a major " killer app" for personal computers. Before electronic spreadsheets, it was traditional to keep various accounting tasks on large ledger sheets, which facilitated row and column tabulation. Columns of numbers could be easily lined up for mathematical operations performed by hand. The row and column metaphor of the ledger sheet (or physical spreadsheet) was replicated in the original electronic spreadsheet programs introduced in the early 1980s (Lotus 1-2-3 and Microsoft's Multiplan). One specific principle of learnability that the spreadsheet supports is synthesizability. Spreadsheets are very good at supporting " what if" calculations. A complicated series of calculations (like determining monthly expected expenses for a family) oftentimes depends on various parameters (e. g., how many times will the family dine out or how many times will the car need refueling). The calculation can be easily parameterized with a number of arguments and the value of the argument can be changed, resulting in a new answer to the overall question. Whenever the user changes the value of some parameter, by changing the value in a " cell" of the spreadsheet, all dependent calculations are performed and the overall spreadsheet is updated. This makes it easy for an individual to synthesize the effect of the change he just made. Spreadsheets became very popular as simplified programming environments, initially for numerical calculations in financial applications.

Over time, just as with the word processor, the metaphor to the original

paper spreadsheet has been Copyright © 2004 — The McGraw-Hill

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