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BSCS4A

Directions: Answer the following questions correctly.

Lesson 1

1. Suggest ideas for an interface which uses the properties of sound effectively

Answer:

Speech sounds can obviously be used to convey information. This is useful not only for the visually impaired but also for any application where the user's attention has to be divided (for example, power plant control, flight control, etc.). Uses of non-speech sounds include the following:

Attention – to attract the user's attention to a critical situation or to the end of a process, for example. 1.2 Input–output channels 25

Status information – continuous background sounds can be used to convey status information. For example, monitoring the progress of a process (without the need for visual attention).

Confirmation – a sound associated with an action to confirm that the action has been carried out. For example, associating a sound with deleting a file.

Navigation – using changing sound to indicate where the user is in a system. For example, what about sound to support navigation in hypertext?

2. Devise experiments to test the properties of (i) short-term memory (ii) long-term memory, using the experiments described in this lesson to help you. Try out your experiments on your friends. Are your results consistent with the properties described in this lesson?

Answer:

I. Short term memory (STM)

The student should first choose an aspect to investigate: for example, digit span, recency effect, decay.

Example solution: STM decay

Subjects
Ideally selected to represent population, more probably undergraduate students (try to get a range of academic subjects).
Sample size: 10+

Experiment

- Split subjects into two groups. Each subject studies list of 15-20 words (could try with both nonsense words and actual words to see any difference). Subject has to recall list either (a) immediately or (b) after 20 second delay. Measure the number (or percentage) of the words remembered correctly.

- A within-groups design can be used to avoid individual bias or group variation (as long as different lists are used for each attempt).

- Independent variable -- delay in recall
  dependent variable -- number correctly recalled.

- Group (b) should be given a task to do during the delay period in order to avoid rehearsal. If possible this task should occupy a different channel to minimise interference, e.g. a visual recognition task.

Hypothesis

Those in (b) perform worse than those in (a) since STM will decay.

Analysis

- graphs to see decay.
- T test

(For this I haven't created the graphs and T test but it should be the basis for the analysis)

II. Long term memory (LTM)

The student should first choose an aspect to investigate: for example, the total time hypothesis or the distribution of practice effect.

Example solution: distribution of practice effect

Subjects

As above, should have no prior experience of the skill to be learned.

Experiment

- Split subjects into 3 groups. Each subject must learn a skill (for example shorthand or typing -- must be measurable). Group A learns for 1 hour a week for 6 weeks. Group B learns for 2 hours a week for 3 weeks. Group C learns for 3 hours a week for 2 weeks.

- After each group's training is complete the subjects are tested and the numbers of mistake made are noted.

- Between-groups design.

- independent variable - style of learning
  dependent variable - accuracy

Hypothesis

Group A will be best (due to the distribution of practice effect)

Analysis
ANOVA

3. Identify the goals and operators involved in the problem 'delete the second paragraph of the document' on a word-processor. Now use a word processor to delete a paragraph and note your actions, goals and sub-goals. How well did they match your earlier description?

Answer:

Assume you have a document open and you are at some arbitrary position within it. You also need to decide which operators are available and what their preconditions and results are. Based on an imaginary word processor we assume the following operators (you may wish to use your own WP package):

Operator	Precondition	Result
delete_paragraph	Cursor at start of paragraph	Paragraph deleted
move_to_paragraph	Cursor anywhere in document	Cursor moves to start of next paragraph (except where there is no next paragraph when no effect)
move_to_start	Cursor anywhere in document	Cursor at start of document

Goal*: delete second paragraph in document*

Looking at the operators an obvious one to resolve this goal is **delete_paragraph** which has the precondition 'cursor at start of paragraph'. We therefore have a new subgoal: **move_to_paragraph**. The precondition is 'cursor anywhere in document' (which we can meet) but we want the second paragraph so we must initially be in the first.

We set up a new sub goal, **move_to_start**, with precondition 'cursor anywhere in document' and result 'cursor at start of document'. We can then apply **move_to_paragraph** and finally **delete_paragraph**.

We assume some knowledge here (that the second paragraph is the paragraph after the first one).

4. Observe skilled and novice operators in a familiar domain, for example, touch and 'hunt-and-peck' typists, expert and novice game players, or expert and novice users of a computer application. What differences can you discern between their behaviours?

Answer:

My observation on these domains, the differences between their behaviors are mainly involved the 2 characters; the first timers and the experts. Between the touch and the 'hunt-and-peck' typists; in this area, the touch typist is the one you will certainly choose as a valuable in which anybody could entrust him in terms of encoding/typing, and that could even make his work fast, easy and spotless rather than a 'hunt and peck typist' that could probably create a mix up texts. In relation to this, just as to expert and novice game players, it is not a challenging play if you're an expert then you play with someone like a novice player as your companion or an opponent in a game, if that so, it would just run as a funny game. When it comes to this area – computer application; there is really a big difference between the experts and the novice. The expert can manipulate computer apps on his own, and is reliable to a novice operator.

Lesson 2

1. What is the basic architecture of a computer system?

Answer:

The basic architecture of a computer system consists of the computer itself (with associated memory), input and output devices for user interaction and various forms of hard-copy devices. (Note: the 'computer science' answer regards output to the user and output to a printer as essentially equivalent. This is not an acceptable user-centered view.)

A typical configuration of user input–output devices would be a screen with a keyboard for typing text and a mouse for pointing and positioning. Depending on circumstance, different pointing devices may be used such as a stylus (for more direct interaction) or a touchpad (especially on portable computers).

The computer itself can be considered as composed of some processing element and memory. The memory is itself divided into short-term memory which is lost when the machine is turned off and permanent memory which persists.

2. How do you think new, fast, high-density memory devices and quick processors have influenced recent developments in HCI? Do they make systems any easier to us? Do they expand the range of applications of computer systems?

Answer:

Arguably it is not so much the increase in computer power as the decrease in the cost of that power which has had the most profound effect. Because 'ordinary' users have powerful machines on their desktops it has become possible to view that power as available for the interface rather than hoarded for number-crunching applications. Modern graphical interaction consumes vast amounts of processing power and would have been completely impossible only a few years ago. There is an extent to which systems have to run faster to stay still, in that as screen size, resolution and color range increase, so does the necessary processing power to maintain the 'same' interaction. However, this extra processing is not really producing the same effect; screen quality is still a major block on effective interaction. The increase in RAM means that larger programs can be written, effectively allowing the programmer 'elbow room'. This is used in two ways: to allow extra functionality and to support easier interaction. Whether the former really improves usability is debatable – unused functionality is a good marketing point, but is of no benefit to the user. The ease of use of a system is often determined by a host of small features, such as the 120 Chapter 2.

The computer appropriate choice of default options. These features make the interface seem 'simple', but make the program very complex . . . and large. Certainly the availability of elbow room, both in terms of memory and processing power, has made such features possible. The increase in both short-term (RAM) and long-term (disks and optical storage) memory has also removed many of the arbitrary limits in systems: it is possible to edit documents of virtually unlimited size and to treat the computer (suitably backed up) as one's primary information repository. Some whole new application areas have become possible because of advances in memory and processing. Most applications of multimedia including voice recognition and online storage and capture of video and audio, require enormous amounts of processing and/or memory. In particular, large magnetic and optical storage devices have been the key to electronic document storage whereby all paper documents are scanned and stored within a computer system. In some contexts such systems have completely replaced paper-based filing cabinets.

3. What input and output devices would you use for the following systems? For each, compare and contrast alternatives, and if appropriate indicate why the conventional keyboard, mouse and c.r.t screen may be less suitable.

   a) portable word processor
   b) tourist information system
   c) tractor-mounted crop-spraying controller
   d) air traffic control system
   e) worldwide personal communications system
   f) digital cartographic system

Answer:

a. **Portable word processor** - The determining factors are size, weight and battery power. However, remember the purpose: this is a word processor not an address book or even a data entry device.
    - ❖ LCD screen – low-power requirement
    - ❖ trackball or stylus for pointing
    - ❖ real keyboard – you can't word process without a reasonable keyboard and stylus handwriting recognition is not good enough
    - ❖ small, low-power bubble-jet printer – although not always necessary, this makes the package stand alone. It is probably not so necessary that the printer has a large battery capacity as printing can probably wait until a power point is found.

b. **tourist information system -** This is likely to be in a public place. Most users will only visit the system once, so the information and mode of interaction must be immediately obvious.
    - ❖ Touchscreen only – easy and direct interaction for first-time users.
    - ❖ NO mice or styluses – in a public place they wouldn't stay long!

c. **Tractor-mounted crop-spraying controller -** A hostile environment with plenty of mud and chemicals. Requires numerical input for flow rates, etc., but probably no text
    - ❖ touch-sensitive keypad – ordinary keypads would get blocked up
    - ❖ small dedicated LED display (LCDs often can't be read in sunlight and large screens are fragile)
    - ❖ Again no mice or styluses – they would get lost.

d. **Air traffic control system** - The emphasis is on immediately available information and rapid interaction. The controller cannot afford to spend time searching for information; all frequently used information must be readily available.
    - ❖ several specialized displays – including overlays of electronic information on radar
    - ❖ light pen or stylus – high-precision direct interaction
    - ❖ Keyboard – for occasional text input, but consider making it fold out of the way.

e. **Worldwide personal communications system** - Basically a super mobile phone! If it is to be kept on hand all the time it must be very light and pocket sized. However, to be a 'communications' system one would imagine that it should also act as a personal address/telephone book, etc.
    - ❖ standard telephone keypad – the most frequent use
    - ❖ small dedicated LCD display – low power, specialized functions
    - ❖ possibly stylus for interaction – it allows relatively rich interaction with the address book software, but little space

- ❖ A 'docking' facility – the system itself will be too small for a full-sized Keyboard (!), but you won't want to enter in all your addresses and telephone numbers by stylus!

f. **Digital cartographic system** - This calls for very high-precision input and output facilities. It is similar to CAD in terms of the screen facilities and printing, but in addition will require specialized data capture.

(i) Large high-resolution color VDU (20 inch or bigger) – these tend to be enormously big (from back to front). LCD screens, although promising far thinner displays in the long term, cannot at present be made large enough

(ii) Digitizing tablet – for tracing data on existing paper maps. It could also double up as a pointing device for some interaction

(iii) Possibly thumbwheels – for detailed pointing and positioning tasks

(iv) Large-format printer – indeed very large: an A2 or A1 plotter at minimum.

Lesson 3

1. Choose two of the interaction styles (described in lesson 3 that you have experience of using. Use the interaction framework to analyze the interaction involved in using these interface styles for a database selection task. Which of the distances is greatest in each case?

Answer:

NATURAL LANGUAGE INTERFACE and COMMAND LINE INTERFACE

A natural language interaction style would allow the user simply to type in the selection query exactly as they think of it. The articulation distance is small both because it is easy to articulate (possibly even easier if a spoken interface is provided rather than typing), and because the coverage is total (the user is allowed to articulate anything as a query). On the other hand, for a command line interface, the limited vocabulary of the input language makes it more difficult for the user to articulate a task even though the limited language provides complete coverage in terms of possible queries allowed. The real difficulty for a natural language interface is how the system translates the input expression into the actual query that accesses the library records. This performance translation will be much easier for the command line interface since it may not even require any translation of an input expression, that language having already been constructed with the database engine in mind.

Therefore, we can see that for a natural language interface the performance distance is greatest, whereas for a command line interface it is the articulation distance that is greatest. However, the above analysis only really deals with the execution translations. On the evaluation side, a natural language interface must try to present the results of the database query in the form in which the user phrased the question. This can in general be a difficult translation for the system as it attempts to answer questions in the style in which an arbitrary user has posed them. Having accomplished that, the observation by the user should be easy to perform. For a command line interface, there is no guarantee that the result of the query will be displayed automatically, and the user may have to request a display explicitly (and they may have to express how the display be formatted).

Neglecting that point, presentation by the system is made easier, as the output language can be very constrained. Observation is made more difficult, as the user must translate the output into the terms of their original task formulation. For example, having asked for books by Alan Dix published after 1990, the user may have a difficult time locating author name and year of publication to determine if the resulting records match their expectations. For evaluation, a natural language interface has a greater presentation distance and a command line interface a greater observation distance. In general, therefore, we would expect that a natural language interface would be easier from the user's perspective but more difficult from the system builder's perspective. The opposite should hold for a command language interface.

2. Find out all that you can about natural language interfaces. Are there any successful systems? For what applications are these most appropriate?

Answer:

Natural language interfaces

Communicating with a computer using natural language is an appealing idea. Although it is technically difficult to program a computer to communicate intelligently, it is much easier to program one to understand commands in a set environment. For example, communicating with a word processing package to open, print or close a file.

At a glance

Natural language interfaces allow the user to interact using written or spoken 'human' commands instead of computer language. Words are used to instigate functionality such as creating, selecting and modifying data.

Sample natural language interfaces: Siri, Alexa, Google Assistant or Cortana

Natural language are applicable for application such as

- Voice Assistants
- Chatbots & Virtual Assistants
- Speech Recognition
- Sentiment Analysis
- Text Classification
- Machine Translation

- Text Prediction
- Spell Check Social
- Media Monitoring

3. What influence does the social environment in which you work have on your interaction with the computer? What effect does the organization (commercial or academic) to which you belong have on the interaction?

Answers:

The particular influences will vary from environment to environment, but consider some or all of the following.

- **Work context** - Is the work place shared? Are the machines shared?
- **Peer pressure** - Is there pressure to compete or impress?
- **Management pressure** - Is there pressure to achieve? Is the interaction carried out in the presence of management?
- **Motivation** - What motivates the interaction? Does this encourage or discourage experimentation?
- **Organizational goals** - What is the objective of the organization? (profit? education? etc.) How does this affect the interaction?
- **Organizational decision making** - Who determines the systems that you use? Do you have any choice or influence? Does this influence the way you interact with the system?
- In each case consider what influence there may be on the interaction. It may be helpful to consider other possible environments in order to identify how the interaction would differ under these different circumstances. For example, if you currently share a machine with colleagues, would your interaction practice change if you were given a personal machine?