



No electronic/communication devices are permitted.

Students may take exam question paper away after the exam.

Computer Science and Software Engineering EXAMINATION

End-of-year Examinations, 2019

COSC368-19S2 (C) Humans and computers

Examination Duration: 120 minutes

Exam Conditions:

Closed Book exam: Students may not bring in any printed materials.

No calculators are permitted.

Materials Permitted in the Exam Venue:

Closed Book exam: Students may not bring in any printed materials.

Materials to be Supplied to Students:

1 x Standard 16-page UC answer book

Instructions to Students:

This exam contains 100 possible marks.

Questions Start on Page 3

1. Warm up questions.

- (a) (5 marks) Name and describe the five main goals of HCI as identified by Nielsen (and used in lectures).
- (b) (4 marks) Two of these five goals might be considered to be less important than the others. Identify these two, and explain why they may be of lesser importance.
- (c) (2 marks) Briefly describe two key characteristics of human short term memory.
- (d) (3 marks) Describe, with an example, one way in which the limitations of human short term memory can influence interaction with computer systems.
- (e) (2 marks) What is meant by *good mappings*, and why are they important for interface design?
- (f) (3 marks) How do the concerns of *internal consistency*, *external consistency*, and *consistency beyond computing* differ from one another?
- (g) (3 marks) What is a *capture error*? Provide an example of a capture error during interaction.
- (h) (2 marks) When considering human error during interaction, what distinguishes a *mistake* from a *slip*?
- (i) (3 marks) What is a user interface *mode*?
- (j) (3 marks) Explain how *homeostasis* might influence interaction with computing systems.

2. Human error and human phenomenon.

Each of the following question parts describes or exemplifies a human phenomenon or type of human error described in class. In each question part, name the phenomenon or error type.

- (a) (2 marks) Mary needs information on EndNote bibliography formats. She switches to her web browser to do a Google search. The browser window shows a 'BBC News' web article that she read earlier, and the side bar contains a link to 'Sports Results', which she clicks. After fifteen minutes of browsing the sports pages she can't remember what she was working on.
- (b) (2 marks) John is trying to add some text into a Microsoft Word document, but everything he types appears in UPPER CASE. He presses the **Caps Lock** key on the keyboard, but it has no effect. He assumes the keyboard is broken, unplugs it, and tries another, but still the text appears in capitals. He reboots the computer and the problem goes away. Much later he learns about the **All Caps** font option, and realises that it must have caused the problem.
- (c) (2 marks) Having precise terminology better enables HCI researchers to think about and describe user interface issues.
- (d) (2 marks) The act of evaluating a user interface influences the users' opinions of the system under evaluation.
- (e) (2 marks) A user disables the predictive feature of their mobile phone because they find it infuriating it when it incorrectly replaces their correctly typed words, despite the fact that overall, it makes the user more efficient.
- (f) (2 marks) A user types the email message "As promised, here's my CV.", but after typing the message she clicks Send without attaching the relevant file.

3. Understanding and modelling novice and expert interaction.

In this question, the following a and b parameters may be useful.

	a	b
Visual search time	150 ms	250 ms/item
Choice reaction time	200 ms	100 ms/bit
Fitts' Law	300 ms	200 ms/bit

Note that $\log_2(2) = 1$, $\log_2(4) = 2$, $\log_2(8) = 3$, $\log_2(10) = 3.32$, $\log_2(16) = 4$, $\log_2(20) = 4.32$

Marking Menus are a form of radial or 'pie' menu in which all menu items are organised as segments of a circular menu that is centred at the user's cursor (when a mouse button is pressed) or finger (when using a touchscreen) – the items are arranged like slices of a pie. The user then selects an item by releasing the mouse button or finger having dragged the cursor/finger into any of the segments (or in the direction of any of the segments).

- (3 marks) Name and write the formula describing human choice reaction time when optimally prepared, as a function of the number n of equally probable items.
- (3 marks) Name and write the formula describing human aimed pointing time as a function of the Amplitude of movement A and target width W .
- (3 marks) With respect to pointing time requirements, describe one advantage of *marking menus* in comparison to traditional pull down menus (in which items are laid out in a linear list).
- (4 marks) Describe the low level human activities required for a novice to select a target item that is present in a marking menu (for example, when the user has not previously seen the menu, selecting the target item 'Cut' from a marking menu that contains options 'Cut', 'Copy', 'Paste', and 'Duplicate'). Note that 'novice user' refers to a user who has not previously seen the content of the menu, but who knows how to use marking menus.
- (4 marks) Assuming that the marking menu contains eight items and that the target item is always present in the menu, according to the values in the table above how long (on average) would it take a novice user to find the target item in the menu? (Show your calculation).
- (4 marks) Assuming that the arrangement of items in the marking menu does not change over time, describe the low level human activities required for an expert user to select a target item that is present in a marking menu. Note that 'expert user' refers to a user who has made a large number of previous selections of all items in the menu.
- (4 marks) Is Fitts' Law likely to be useful for modelling the pointing time component of item selection in a marking menu? Explain your answer.
- (4 marks) Marking menus include a feature that is intended to promote a transition from novice styles of interaction to expert styles of interaction. Explain what this feature might be and why it should promote a transition from novice to expert selections.

4. Interface evaluation.

- (2 marks) What is a 'Wizard of Oz' evaluation?
- (4 marks) Explain the main advantages and disadvantages of having the user 'think aloud' during an interface evaluation.
- (2 marks) What does the p value represent in a null hypothesis significance test?
- (2 marks) How does the 'file drawer effect' influence the dissemination of scientific results?
- (2 marks) Provide an example of a dependent variable that requires between-subjects treatment.

5. Design scenario.

Mary and John are discussing the design of a photo browsing app for a touchscreen mobile phone. The app needs to allow the user to move to the next or previous photo in a collection and also move around within any individual photo after zooming it. John and Mary agree that zooming a photo should be supported by pinch/de-pinch gestures, and that moving around within a photo should be possible by dragging and swiping. But John and Mary disagree about how to move between photos in the collection. John thinks that the movement between photos should occur whenever the user drags beyond the left/right edge of the photo. Mary disagrees, and she argues that a button panel with left and right icons for previous/next photo should slide into view at the bottom of the photo when the user does a sliding gesture upwards across the bottom edge of the photo, and that this panel should disappear after 3 second of inactivity with the panel widgets.

- (a) (4 marks) Describe the main pros and cons of John's design.
- (b) (4 marks) Describe the main pros and cons of Mary's design.
- (c) (4 marks) If forced to choose one of the two designs, which would you choose and why?
- (d) (5 marks) Explain how you would improve the chosen design to overcome its primary limitations, and explain the advantages of your modification.

End of Examination