Name: _____ **Student ID Number:** _____

Signature: _____

CPSC 444 2010-11 (T2) Final Exam

Department of Computer Science
University of British Columbia
J. McGrenere

Exam Instructions (read carefully):

1. Sign this page of the exam with your signature in the space provided on the upper left immediately.
2. Continue reading the instructions, but do not open the exam booklet until you are told to do so by a proctor.
3. Cheating is an academic offense. Your signature on the exam indicates that you understand and agree to the University's policies regarding cheating on exams.
4. The exam is closed book. No aids are permitted, except for a simple non-programmable calculator.
5. There are 10 questions on this exam, each worth the indicated number of points. Answer as many questions as you can.
6. Keep your answers short and to the point (i.e., avoid any unnecessary details).
7. Write all of your answers on these pages. If you need more space, there is blank space at the end of the exam. Be sure to indicate when a question is continued, both on the page for that question and on the continuation page. Do not write on the back of any page.
8. Interpret the exam questions as written. No questions will be answered by the proctor(s) during the exam period. State your assumptions if you are unsure about a question.
9. You have 3 hours in which to work. Budget your time wisely.
10. No one will be permitted to enter the exam room after one half-hour from the start time, or to leave during the first half-hour of the exam. In addition, no one can leave the exam room during the last ten minutes of the exam.

Question	Points Possible	Mark
1	10	
2	8	
3	8	
4	8	
5	9	
6	12	
7	8	
8	14	
9	12	
10	14	
Total	103	

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Question #1 [10 points total]: True/False

For each question, circle **one** of either true or false. You do **not** have to provide a justification for the answer you have given. [1 pt each]

(a) One of the fundamental axioms in the social sciences, and anthropology in particular, is that what people say they do and what they actually do are not always the same.

True False

(b) Convenience sampling relies on participants referring others whom they think would be good candidates for the research.

True False

(c) With respect to the ethical treatment of subjects, subjects are allowed to quit a study at any time, even if they consented to participating for the full duration of the study.

True False

(d) Part way into term your professor broke her arm which caused her to miss one 444 lecture.

True False

(e) Symmetry, similarity, and connectedness are three of the gestalt laws.

True False

(f) In an F-statistic, if for a given experiment the probability of achieving the resulting F-value came out to .049, you would be able to reject the null hypothesis assuming a confidence interval of 95%.

True False

(g) According to McGuffin & Balakrishnan's "Acquisition of Expanding Targets," Fitts's law can model and predict performance of widgets that dynamically grow in size as the user's cursor approaches.

True False

(h) The core theory of colour vision (Opponent Process Theory) is that the human's receptor signals are processed into two separate opponent channels in the early stages of neural processing.

True False

(i) According to the ethics guidelines used in CPSC 444, video captured during a user study can be given to other researchers to be used in another study.

True False

(j) When capturing video of users interacting with systems, it is best practice to use more than one type of light.

True False

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Question #2 [8 points total]: User Abilities – Memory

(a) What are the **two** main differences between working memory and long-term memory? [2 pts]

(b) Describe the interference model of forgetting and provide **one example.** [2 pts]

(c) Name **one** form of sensory memory/buffer as described by the Dix et al. reading and provide **one example.** [2 pts]

(d) What is prospective memory? Briefly explain why designing user interfaces to support prospective memory is important. [2 pts]

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Question #3 [8 points total]: User Abilities – Visual Processing

(a) Why is it discouraged to have bright red text on a bright blue background? What is a better combination? [2 pts]

(b) It is supposedly difficult to see small blue objects (such as blue text). What is the basis of this claim? Is it true? (Explain your answer). [2 pts]

(c) Assume you are designing an interface to visualize 5 categories of data. Which 5 colours would you choose to map to the 5 categories of data in order to maximize the separability of the different data categories? **Explain your answer**. [3 pts]

(d) In pre-attentive processing, how does the number of distracters impact the time it takes to locate the target? [1 pts]

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Question #4 [8 points total]: User Abilities – Motor Processing + Empirical Laws

(a) Explain with reference to an empirical law discussed in class why it is faster to have a "reduced" toolbar that contains only the icons a user actually uses rather than a "full" toolbar (i.e., the default toolbar that contains all the icons). Assume that in the reduced toolbar all unused icons are removed, and all remaining icons stay in their original position. Name the law and describe it in plain language. [4 pts]

Name the relevant empirical law [1 pt]: _____

Describe the law in plain language (you may provide the formula, but it is not necessary and this does not negate your need to describe the law in plain language) [1 pt]:

Explain why it is faster to have only the icons a user actually uses on the toolbar [2 pts]:

(b) In Fitts's Law research, in order to compare the results of one experiment to the results of another experiment, it is necessary to normalize error rates. Explain why this is the case with respect to the speed-accuracy tradeoff. [2 pts]

(c) Two novel input devices were evaluated in a Fitt's Law experiment. Device A showed an index of performance of 10.4 and Device B's was 5.8. Assuming a properly run and analyzed experiment, which device would you adopt (assuming you need to pick one of the two)? Explain your answer. [2 pts]

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Question #5 [9 points total]: Experiment Design, Analysis, and Report Writing

(a) A company that develops 3D modeling software for the film industry is testing out two prototype interfaces for a new quick-sketch application they are developing. One of the prototypes relies on a traditional mouse-and-keyboard interface while the other relies on a stylus (pen)-based interface. They hypothesized that the stylus interface would be faster than the mouse-and-keyboard interface. Unfortunately, after conducting a simple two condition experiment with 10 participants, where 5 participants used one prototype, and 5 used the other, their statistical analysis found **no statistically significant difference** between the two interfaces.

i. What **valid conclusions** can the company come to about the difference between their interface prototypes? Explain your answer. [2pts]

ii. Identify **two things** that the company could do to make their future user studies comparing the two interfaces **more statistically powerful.** [2pts]

(b) Your 444 assignment consisted of writing a report about a soft keyboard typing experiment. The following statements are related to that experiment. In which report section should each statement be found: Conditions, Discussion, Procedure, Results, or Tasks? [5 pts]

i. "The finding that participants' typing speed was faster on the alphabetic keyboard than keypad is consistent with MacKenzie et al.'s (1999) previous findings." _____

ii. "Participants were shown a demonstration of the two layouts. Participants were then asked to complete a questionnaire on their typing experiences." _____

iii. "Participants were given the same three sentences for each layout - one practice sentence followed by two sentences. None of the sentences contained capital letters, since one could not capitalize letters in the prototypes." _____

iv. "No significant main effect of phone keypad experience on task completion times was found. In addition, no significant interaction of keyboard layout and phone keypad experience level on error rates was found." _____

v. "We compared two soft keyboard layouts: the phone keypad layout and the alphabetic keyboard layout. These layouts are described next." _____

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Question #6 [12 points total]: Field Study

Current message boards at UBC (in places like the SUB and the bus loop) are a mess, and your interaction design consulting company suspects it might be easier if people could post to them electronically, perhaps in person using a smartphone as an input device, and/or remotely through a web interface. Before your company can move in this design direction, however, you need to better understand how message boards are currently being used. Your goal is to conduct an **initial exploratory field study** to gather information to clarify how message boards at UBC are being used.

1. Provide **two focal points** for your initial study, and briefly **justify each one**. [6 pts]

2. Provide **three interview questions** related to **each** focal point (6 questions in total). [6 pts]

focal point #1:

justification:

question 1:

question 2:

question 3:

focal point #2:

justification:

question 1:

question 2:

question 3:

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Question #7 [8 points total]: Field Experiment

(a) What is the **main difference** between a field experiment and a more general **field study**? [1 pt]

(b) Relative to a **laboratory experiment**, what are **three main advantages of a field experiment**? [3 pts]

(c) The field experiment from the McGrenere et al. paper "An Evaluation of a Multiple Interface Design Solution for Bloated Software" was discussed in class. Name **two limitations** to this study as it was conducted and **briefly (in one or two sentences) provide alternative study designs** that would address each of the limitations. [4 pts]

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Question #8 [14 points total]: Using Video

(a) Video can be a powerful tool in the early (formative) stages of interaction design, as demonstrated by Wendy Mackay's "Using Video to Support Interaction Design". Briefly describe **three different ways that video can be used in early design stages, and explain why video is especially useful for each.** [6 pts]

(b) What is the **primary drawback** to using video in these early stages of design? [1 pt]

(c) Imagine that you have been hired to study the effectiveness of a new interactive table-top system (e.g., a smart table) in an architectural firm. The firm has the table installed in their primary meeting room and intends to use it for team reviews of architectural drawings. You are going to collect data from the first 6 meetings that make use of the interactive table top, and are considering using video and/or field observations notes for data collection. List **3 pros** and **3 cons of using video**, relative to field observation notes, for this situation. **Explain which technique (video and/or field observation) you would decide to use in the end**. [7 pts]

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Question #9 [12 points total]: Guest Lectures

Parts a-b refer to Dr. Ron Rensink's guest lecture.

(a) Describe **change blindness** and **give one way in which it is induced.** [3 pts]

(b) Describe **one implication** of change blindness for interface design. [1 pts]

Parts c-d refer to Dr. Mike Wu's guest lecture.

(c) Briefly **describe the study design** used to evaluate the Family-Link Calendaring System. Provide **one strength** OR **one limitation** of this study design. [2 pts]

(d) Describe **one strength** of the data analysis approach used. [2 pts]

Parts e-f refers to Dr. Roger Miller's guest lecture.

(e) In lay terms (i.e., non-legal terms), what is a patent? [2 pts]

(f) Give **one pro** and **one con** to securing a patent? [2 pts]

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Question #10 [14 points total]: Statistical Analysis

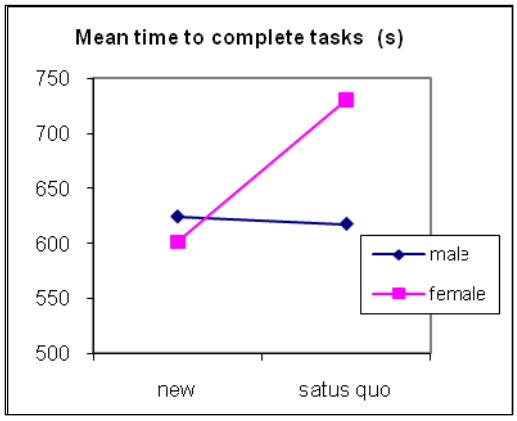
A graphics company is trying out a new interactive technique for one of its 3D software packages. The company hopes that the new technique will improve performance (time and accuracy) for doing 3D manipulation tasks (tasks that are known to be time intensive and error prone). The company ran a controlled experiment to see if their new technique does in fact offer performance improvements. Given that there is some evidence that females and males differ in their visual-spatial abilities, gender was controlled for.

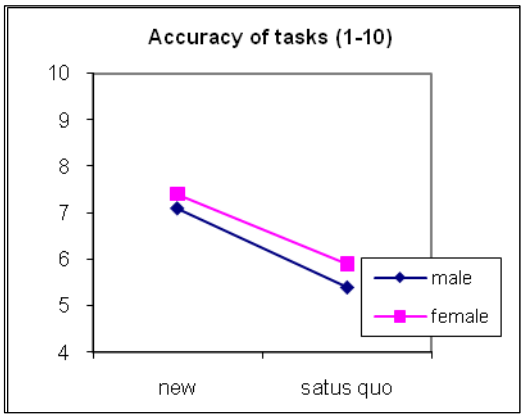
2 Independent variables: (1) technique (new, status-quo; within subjects); (2) gender (male, female; between subjects)

2 Dependent variables: (1) time (in seconds, lower is better); (2) accuracy (1-10 scale, higher is better)

Study design: 10 males and 10 females each completed 5 tasks using each of the two techniques. (The order of seeing the software packages was properly counterbalanced.)

Results: These two graphs show the means (across all 5 tasks) for each dependent measure:





A 2-way ANOVA (technique X gender) was run for each of the dependent variables:

ANOVA **time**

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample (gender)	20250	1	20250	2.454364	0.125948	4.113165
Columns (technique)	37210	1	37210	4.509969	0.040638	4.113165
Interaction	45697.6	1	45697.6	5.538693	0.024181	4.113165
Within	297022	36	8250.611			
Total	400179.6	39				

ANOVA **accuracy**

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample (gender)	1.6	1	1.6	0.454976	0.50429	4.113165
Columns (technique)	25.6	1	25.6	7.279621	0.010548	4.113165
Interaction	0.1	1	0.1	0.028436	0.867032	4.113165
Within	126.6	36	3.516667			
Total	153.9	39				

Provide you answer on following page.

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Question #10 (continued)

Your job is to explain and interpret these results.

(a) For each dependent measure **state all the effects tested** and **state which of those effects resulted in a significant finding**. You must state your assumed **confidence level**. [6 pts]

(b) Next, **interpret** these results by explaining what the graphics company can conclude from this study, both about the 3D manipulation techniques and about gender? [6 pts]

(c) Assuming performance is the main determinant, should the company adopt the new technique? **Explain** your answer. [2 pts]

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