**HCI Area Qualifying Exam (Written Portion)**

*Spring Semester 2013*

*Thursday March 14, 9am‐5pm.*

**Answer FOUR questions as follows: Answer any TWO of the four questions from Section A (HCI Process and Theory). From Section B (Special Topics in HCI), answer ONE question from EACH of your TWO declared areas of specializations.**

Each of the four questions you answer will be given equal weight.

You will be assigned an identifying number and are required to hand in final versions of your written answers with each page identified only by that number. This enables us to grade your answers anonymously. You should NOT identify yourself explicitly by name on your answer sheets or implicitly by referring in the first person to your work (my project on ABC).

Please answer each question starting on a new page, with your answer following the text of the question. To avoid having to type the questions yourself, electronic copies of the questions will be available after 9am from a URL that you should already have been given. You may copy the questions from there.

Place any relevant references that you cite in an answer at the end of that answer, NOT in a

separate section at the end of the whole exam.

If you have any questions or feel it necessary to make any assumptions in your answers, *do not seek clarification* from faculty or staff. Simply record your assumptions as part of your answer1.

**Section A (HCI Process and Theory)**

**Answer 2 of the following 4 questions**

1.Background: In-vehicle infotainment systems (the in-dash combination of radio, media player, navigation system, communications portal, etc.) are evolving very quickly. As just one example, Cadillac has been promoting its new CUE infotainment system. See, for example: external link: <http://www.youtube.com/watch?v=CB_FmEfedA0.> Some herald this as the evolution of infotainment; others consider it an abomination and an example of terrible HCI. You are the user interface expert at a competing car company, and have been tasked to analyze the Cadillac system (as presented in the YouTube video above), and determine if your company should develop a similar system, or not.

To do:

a) Suggest two realistic usage scenarios that demonstrate the kinds of design tradeoffs that are essential when considering this new "infotainment" system. Discuss the design tradeoffs that are demonstrated by both of your scenarios.

b) Discuss how you would resolve each of these design tradeoffs, grounding your analysis of the system in the theory and research literature.

2. Grounded Theory

a) What is Grounded Theory (GT)? Explain the central tenets of GT, and the researchers and literature who have developed/promoted/discussed it. Describe the theoretical origins of GT, including its stance on epistemological and ontological concerns.

b) Discuss the types of theories a GT analysis produces.

c) How would one support or refute a theory produced by a GT analysis? Give a concrete example.

3. Tolmie, et al.'s paper "Unremarkable Computing" discusses how the 'practical invisibility' routines in the home are a key aspect of domestic life that is often overlooked by technology-driven research. Pick a common domestic routine, in the sense of Tolmie, et al., and describe the requirements analysis methods that would provide a framework to create an understanding of the subtleties of this routine and how technology may or may not need to support this routine, keeping in mind the principles of unremarkable computing outlined in the paper. Consider how the variety of formative and observational evaluation techniques may or may not apply in support of understanding this routine.

4. Good user interface design traditionally relies on concepts Norman outlines in his book on the Design of Everyday Things, such as conceptual mapping, affordances, and feedback. Assistive technology, however, does not always fit the model of a traditional user interface. Brain-Computer Interfaces can provide a means of controlling computers with brain signals alone. Discuss the issues that could arise in designing a communication application controlled by brain signals associated with mental language imagery (counting, singing, or reciting poetry silently to activate the interface).

**Section B (Special Topics in HCI)**

**Answer ONE question from EACH of your TWO declared areas of specializations.**

**Info Vis Pick one of 2 questions (5 or 6)**

5. Many real-world networks are complex, dynamic, and evolving. Information visualization, however, has not addressed those types of networks much. What are the challenges in visualizing such networks? In absence of the use of animation (which you commonly face when publishing articles), suggest possible approaches to portraying these types of networks. Consider different levels of network size and complexity.

6. You've just started a new job at a company that makes extensive use of Data Warehousing to create Business Intelligence to drive their business decisions. They know that they will need Information Visualizations to help their business decision makers interpret the mass of data they are warehousing in order to make good decisions. They have already had two different visualizations developed to show some of the most business-critical information, and want to decide which one (or possibly neither one) to deploy.

The company's CIO asks you for a briefing on various ways to evaluate the two visualizations.

List at least four evaluation approaches that could be the basis for your a comparison of the two visualizations, how you would go about doing the comparison for each of the approaches, and the advantages and disadvantages of doing the evaluation with each of the four methods you have listed. Be sure to thoroughly explain each of the approaches and their advantages and disadvantages (don't just list a few key words for each).

**Ubicomp Pick one of 2 questions (7 or 8)**

7. Two of the application themes for ubiquitous computing are context-awareness and automated capture.

Choose either context-awareness or automated capture to answer the following questions.

a) Where did the definition of context-awareness/automated capture arise in the ubicomp literature? Provide specific names and approximate dates as well as canonical demonstration projects.

b) Arguably, the definitions provided in the ubicomp literature are too broad. Citing at least one article that provides a definition of context-awareness/automated capture, explain why it might be too broad. How would you clarify the definition in order to make its meaning for ubicomp research clearer?

c) Abowd and Mynatt (TOCHI 2000) describe two other themes in applications research, natural interaction and everyday computing. For each theme, describe how it is different from and how it is related to context-awareness/automated capture.

d) Finally, considering all of these four application themes, suggest recent work in the ubicomp research literature that you feel is different from all of these themes, and explain why.

8. One of the critical features of ubicomp is a more seamless bridge between the physical and digital worlds. This question requires you to think about that feature of ubicomp.

a) The DigitalDesk project was done at EuroPARC in the early 1990's. It is a good early example of a project that demonstrated the bridge between the physical and digital world. How would that same project be realized or explored differently today, given the changes in technology and understanding that have ensued in the past 15-20 years?

b) Augmented reality and tangible interaction are two research themes that demonstrate the bridge between physical and digital worlds. Provide a historical account of those themes, citing the major initial examples of each. What are the key sensing technologies that have impacted each of those areas of research?

c) In his Ubicomp 2012 vision statement, Abowd indicated a software engineering challenge for ubicomp. What was that challenge and how does it relate to the physical-digital bridge? With an emphasis on being creative in your answer, explain what role AR and tangible computing might have for this challenge? Explain why you think this challenge may or may not be achieved in the next 5 years?

**UIST Pick one of 2 questions (9 or 10)**

9. Yankelovich, et al., describe the SpeechActs tool, a conversational speech-based system for providing access to existing desktop applications, such as email and calendaring (1). One of the key contributions of SpeechActs is that it adheres to conversational conventions, making it very different than standard voice menu-based systems. SpeechActs was designed long before the rise of powerful mobile computing devices, however. In this question, describe how a SpeechActs-style user interface might work for Google Glass.

a) Describe two scenarios, appropriate to mobile computing, in which you might use a SpeechActs-like interface.

b) Describe how the interface would function, particularly how you'd support the conversational approach used by SpeechActs.

c) What special challenges to using this sort of interface might present themselves in a mobile context? How might you overcome these? (1) Yankelovich, Levow, and Marx. "Designing Speech Acts: Issues in Speech User Interfaces." CHI 1995.

10. Dan Olsen makes the case for the importance of UI systems research (1), despite the fact that such research has declined in recent years due to the changing constraints of the hardware landscape (memory is now abundant, displays are huge, CPUs are fast) and software landscape (OSs and toolkits have become commoditized, with most people running common platforms such as Windows, iOS, or Android, which work "well enough" and do not allow easy tinkering).

Pick a domain in which these hardware and software constraints do not hold, that is, where either hardware capabilities still require challenging systems research, or where software capabilities are not yet commoditized and fixed in stone. Make the case for a systems research agenda in this domain, and articulate:

a) how you might organize this agenda (that is, what projects would you do, and why); and

b) how you'd evaluate "success" in this agenda. Be sure to ground your answer in the concepts Olsen uses to articulate the value of systems research.