HCI Area Qualifying Exam (Written Portion)

Fall Semester 2010
Friday November 5, 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 answer.
Section A: HCI Process and Theory – answer any TWO of questions 1 through 4.

1. *Grounded Theory* is one approach to analysis of qualitative data.
   A. Pick an alternate approach. Briefly describe the name of the approach and the methods by which it turns the data into an analytic product.
   B. Compare and contrast your approach with *Grounded Theory*. When would you use these different analytic methods. How would they influence your data collection and the type of analysis derived.

2. *Questionnaire design*.
   A. Discuss how to make an effective questionnaire, or survey, for evaluating a system. *(Hint: Discuss both the questions/items and the overall instrument.)*
   B. Discuss practical issues of data collection with a questionnaire, and discuss (specifically) how you would analyze the data collected using a questionnaire.
   C. Describe a challenge in the design of a “closed” question (or set of related closed questions) that would impact the quality of analysis that is possible. Give a concrete example of a problem when designing such a question and how you would fix that problem to improve the result of your analysis of the question.
   D. Similarly, describe a challenge in the design of an “open-ended” question (or set of related open-ended questions) that would impact the quality of analysis that is possible. Again, give a concrete example of such a problem and how you would fix that problem to improve the result of your analysis of the question.

   A. Discuss how modeling and simulation can be used in formative evaluation of a system. That is, how can we predict human performance with a system, before it is even prototyped or built?
   B. Discuss two (2) specific and different modeling or simulation approaches, and compare them as tools for making design decisions.
   C. Also, provide specific examples of your own design work, and discuss how modeling either did contribute, or could have contributed to design decisions.

4. *Applying human performance to interaction design*. Knowledge of human perception, cognition, and motor capabilities (or limitations) is often very beneficial to the design of human-computer interfaces. Unfortunately, it seems that many systems are designed without a deep understanding of user capabilities.
   A. Discuss a specific system presented or discussed at a recent HCI-related conference (CHI, CSCW, UIST, Ubicomp, etc.) that could have been better if the researchers had given more consideration for human abilities. Alternatively, you can select a paper from the HCI Body of Knowledge reading list you studied in
preparation for this exam. In your answer, make clear what the paper is that you are considering, the system described in that paper and the specific consideration of human performance that is relevant to that system. You may use references to other literature that helps to support your claims for or against the system in the paper you are analyzing.

B. Discuss in detail how you would demonstrate or evaluate an improved version of the system you described above, in comparison to the original system.
Section B: Special Topics in HCI

Information Visualization – answer ONE of questions 5 or 6.

5. One of the important properties of information visualizations is how well they scale with larger data sets.

   A. Define what scalability means for each of the following types of data:

   1. Tabular (row/column) data
   2. Text documents
   3. Text search results

   B. For the following list of 7 information visualizations, pick 4 and discuss in detail their scalability. If an information visualization is not scalable, is there some modification you could make so that it would scale?

   1. ThemeScape
   2. TreeMaps
   3. Parallel Coordinates
   4. TileBars
   5. Dust and Magnets
   6. FacetMaps
   7. Dynamic queries as used in movie-finder/home-finder.


   A. What is Shneiderman's oft-repeated paradigm for Infovis?

   B. Why would a tool or system choose not to follow that design paradigm? List and explain three potential reasons.

   C. Identify and describe an example infovis tool or system that does not follow the paradigm. Why did its creators make that design choice?
Ubiquitous Computing – answer ONE of questions 7 and 8.

7. Location and privacy.
   A) Concerning location technology in isolation, describe three different dimensions by which you can distinguish one location technology solution from another solution.
   B) Explicit consideration of errors in location technologies can impact the design of location-aware applications. Give an example of a design heuristic that can be used to overcome an inherent (or unavoidable) problem with a location technology. Discuss how this heuristic can be used to provide a more robust or user experience for a location-aware application. Use examples from the literature.
   C) Discuss a single issue relating to privacy raised by location-aware computing. Describe how that issue is made more difficult in a world of ubiquitous location services. Describe how technological (relating to part A of this question) and design solutions may positively impact the concern of privacy and location-awareness.

8. Design tools for ubicomp
   A. HCI research has a long tradition of exploring tools to help designers. In the domain of "traditional" interfaces, for example, systems such as Silk allow designers to quickly create "sketchy" interfaces that can actually be run; tools such as Denim allow designers to mockup executable web UIs; and tools such as Satin provide support for executable wizard-of-oz prototypes of speech interfaces. Currently, however, designers of the context-aware, multi-device applications common in Ubicomp do not have good tool support for designers. Describe what the challenges are of designing general ubicomp applications meant to be used "in the world."
   B. Propose how a system might look that would support designers of such applications—what features would it include, and why? Be sure to reference relevant literature to support your case.
User Interface Software & Technology – answer ONE of questions 9 and 10.

9. Many documents these days are created collaboratively. From Wikipedia articles to simple Word documents, multiple users often interact to create the content in a document. The timelines or histories of editing of these documents can be useful in understanding how a document came to be in its present form, and how multiple users have contributed to it. Currently, however, the interactive support for accessing or understanding such timelines is impoverished at best. Wikipedia, for example, has a history log that shows who made edits, but these are not contextualized in the document itself; Word does slightly better, by showing the edit histories of all users, but a document with lots of editing can quickly become a mess.

A. What are the key HCI problems that must be overcome in order to leverage document histories as a useful resource in collaboration?

B. What key interaction techniques might you propose in order to allow users to leverage and use such histories? Be sure to reference the relevant literature to support your case, as well as to mention any previous work that has been done in this area.

10. Most current touch-screen devices, such as the iPad and iPhone, cannot differentiate between a "MouseOver"-like event and a "MouseDown"-like event: every touch on the screen is treated the same. This can pose particular problems for content such as web-based applications, which are often designed to perform different actions for MouseOver and MouseDown events (e.g., providing a preview of a link on a MouseOver event, and following a link on a MouseDown event). More touch-only devices are being designed to use web content (e.g., the Apple iPhone and the Android devices), but it is unlikely that all web media will be rewritten to support such devices. Thus, the devices must be made to support existing web media.

A. Describe two different techniques that you might use that leverage the events already present in a touch-based interface (e.g., in the "Mouse Down"-like events that already exist) to emulate a "MouseOver"-like event.

B. What are the downsides of these approaches. Are there "edge cases" that might cause each of these two "MouseOver" emulation techniques to fail to perform as intended?

C. Are there other touch- or surface-based interaction techniques that would not have this problem? How might you apply these different techniques to overcome these problems, or even expand the range of interactions available to users?