HCI Area Qualifying Exam (Written Portion)
Fall Semester 2009
Thursday October 22, 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 printed or written copies of your 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.

Question 1

Mixed-method studies are one approach to empirical HCI. We consider a mixed-method study to be a combination of a quantitative evaluation technique with a qualitative evaluation technique into a new, hybrid study.

a. Using a specific example (either from the literature, or one that you define yourself), describe a mixed-method study. Clearly describe what two techniques are being combined and how.

b. Discuss how the combination of the two evaluation techniques provides an advantage over using the two techniques separately.

c. Discuss what problems might arise from the combination of those techniques and why.

d. Recently, HCI researchers have begun to explore the use of a variety of autonomic (e.g., heart-rate, galvanic skin response), physiological (e.g., EMG for muscle activation, EOG for eye movement analysis) and other medical imaging technologies (e.g., fMRI for dynamic brain activity localization) might be incorporated into their research. Choose a sensing technology from one of these categories (autonomic, physiological, medical imaging) and imagine you are writing a grant proposal for a 1-year exploratory grant to NSF to use this sensing technology in combination with some qualitative technique. Describe a specific mixed-methods experiment you would conduct for some specific problem of interest to the HCI community.

Question 2

As end-users and creators of “mashups” become increasingly successful, users other than the developers may begin to rely on applications (and interfaces) created by non-experts. As Jakob Nielsen writes in Discount Usability Engineering, it is possible to improve a user interface with low-cost usability evaluation.

a. What *one* technique would you want all of these end-user developers to know and use to check the usability of their interfaces? Why that one over other options? Be sure to compare your selected technique against other options and use evidence from the literature to support your answer.

b. As we all know, it is better to design for usability from the start. Thus, checking the interface created by an end-user programmer after the application is completed is the wrong time. At issue here is how to get the end-user developer to think about the interface early in the process. Given your selected technique, discuss what would be a better approach to encourage better design practices in creating mashups, incorporating the technique into the tools used to create the designs, or ensure proper education of the end user developer to appreciate the value of the technique. Describe realistic ways to achieve both options (integration into a development tool vs. education) for the general population of
end user developers, most of whom will not have the advantage of a degree 
program to attend for training.

**Question 3**

Consider Grudin's classic challenges paper for adoption and evaluation of groupware. In it, there is an assessment from 1990 that groupware would never attain adoption at its "current" trajectory. Now consider some of the major successful groupware systems, for example instant messaging and Wikis.

a. Are these successful counterexamples to Grudin's argument?

b. Which of Grudin's challenges can be used to justify why these are successful groupware systems?

**Question 4**

In *The Design of Everyday Things*, Don Norman presents many examples of user interface design gone awry; he contends that if a user cannot understand how to use an everyday object, it is the fault of the designer, not the user.

View the YouTube video "engineering student glass door":  
http://www.youtube.com/watch?v=w60Sxop5I38

a. Comment on the user in this video from Norman’s perspective. Be sure to pick at least four of the general principles that Norman suggests in his book to comment on whether that principle applies to the problem presented in the video.

b. What are the issues, both technical and social, that caused the confusion with this student?

c. Is the user displaying “extreme stupidity” as the title suggests?

d. Automatic doors are fairly commonplace in our culture, but the introduction of those features into the doors of automobiles is more recent. Examine two particular features of car doors, power-assisted sliding doors on mini-vans and doors that unlock through the use of "smart keys" (see http://electronics.howstuffworks.com/gadgets/automotive/unlock-car-door-remote2.htm for more details). Discuss how these newer features may or may not present problems for different kinds of people.
Section B: Special Topics in HCI

User Interface Software – answer ONE of questions 5 or 6.

Question 5

Constraints have long been a focus of UI software research, where they have been used in a range of toolkits and libraries largely aimed at traditional, desktop, GUI programming. Discuss how you might use constraints in creating web-based applications. In particular:

a. What role would you see for constraints to play in web applications? Be sure to justify your answer, and provide detail in how constraints would be used. For example, what are the external objects being constrained in your proposed framework?

b. How would you implement this system so that it works with the current suite of web-based technologies?

c. There are many types of constraint systems available. What specific constraint systems would you choose for your intended application, and why? What are the pros and cons of this choice?

Question 6

One strong area of empirical research in HCI is the establishment of learning curve data to explore the transition from novice to expert behavior for some specific interaction technique.

a. Take one interaction technique and describe an example of research that established learning curve data for the use of that interaction technique by some class of users.

b. You have been hired as the senior HCI researcher at Nokia and need to convince your senior VP that an empirical approach to establish learning curve data is important to the company as it explores new interaction techniques on mobile platforms. Given a new phone equipped with multitouch, describe why learning curve data may be important in determining the usefulness and usability of a novel interface (as opposed to current practice). Support your answer by drawing several learning curves and describing what the curves might indicate. (Suggestion: Note that the question allows you to describe your own specific interface for testing. Make your answer concrete by describing an interface (or interfaces) that best illustrate your points.)
Ubiquitous Computing – answer ONE of questions 7 and 8.

Question 7

Tolmie et al. in their CHI paper “Unremarkable Computing” state: “Things with a routine character may then have many of the qualities we are aiming for by being tacit and calm in that they are not ‘dramatic’ and do not command attention except when they need to.” The paper can be found at http://portal.acm.org/citation.cfm?id=503448. People with disabilities, however, may need to use technologies that are the opposite of ‘tacit and calm’ in their daily lives. Augmented and Assistive Communication (AAC) devices provide the ability to communicate, usually verbally, for people who have speech disabilities. These systems are often obtrusive and obvious, and studies show that AAC users are treated differently than able-bodied speakers.

a. According to the ideas in Tolmie, create design guidelines to make an AAC device ‘invisible.’

b. How would you design a study to test whether you have succeeded?

Question 8

With mobile devices, such as laptops, mobile phones, PDAs, media players, GPSs, etc., battery power can be a very important attribute. This question is about how to address power consumption challenges for a wide variety of mobile devices.

a. From a technology perspective, give two different examples of how power consumption can be addressed in mobile or wearable devices. Provide references to relevant examples that point to the practicality

b. From a human or behavioral perspective, describe two specific ways in which a human-centered approach to power consumption can provide tools and insight to device designers for conserving battery power.