

CS 7474 Mobile and Ubiquitous Computing

Final Exam for Graduate Students

Due: 2:20pm Friday, December 11

Directions: Answer any 2 of the following questions. Your answers for each question should be around 1000 words (don't be much less or much more than 1000 words) and should include references to relevant literature (references do not count in the overall word count). Be sure to answer each part of the question as directly as you can. Your answer will be graded based on answering the question as asked, demonstrating knowledge of the literature, your ability to synthesize across different readings from class and your creativity in the answer. When you have completed the exam, you must turn in a hard-copy version in person to either the instructor or TA. A box will be placed outside of Dr. Abowd's TSRB office (329) and you can also turn in your exam there.

1. Answer the following 3-part question based on your understanding of the history and visions that defined ubiquitous computing as we know it today.

- A) We can view the ubiquitous computing age as the third generation of computing. How is this third generation different from the previous two generations?
- B) What are the three scales of computing devices that Weiser's group explored at Xerox PARC in the late 1980's? How did that experimentation compare with work in the UK and in Japan at the same time?
- C) If you were to start a research effort (either in academia or industry) to explore a fourth generation of computing, what would be the factors driving your research mission? Support your choice based on evidence from this class about emerging trends and challenges remaining in the computing experience that extend Weiser's original vision of ubiquitous computing.

2. This question deals with location and privacy.

- A) Describe the dimensions that characterize the technological approaches to determining location.
- B) Describe a different set of dimensions, or distinguishing characteristics, that define how location can be used in an application.
- C) What are the issues relating to privacy raised by location-aware computing? How are these issues addressed by both the technology and the use of location in applications?

3. 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.

4. In this question, you will be asked to reflect on your class project with respect to both conducting user studies and system deployment. You are to answer either part A or part B, depending on what you did in your project. You must also answer part C. If your project teams did two unrelated projects, please discuss the second project in this question.

- A) (Answer this part only if you conducted any user studies in project 1 or project 2) How would you best classify your study based on the description of field studies or observational/ethnographic studies as described in chapters 4 and 5 of the book. How would you improve upon your user studies if you were to repeat this project, knowing what you know now? Please provide a critical assessment of your user study, realizing that everything can be improved upon.
- B) (Answer this part only if you did not conduct user studies in project 1 or project 2) If you were to redo your project knowing now what you know about the purpose and design of field studies and observational studies, how would you include a user study in your efforts? Please be specific about the goals and intentions of the user study and how it would be used to influence the direction of your project.
- C) Assume you are tasked with creating a real product based on the ideas of your projects this semester. What system deployment issues would be the most challenging ones for you to meet and why? What related research or commercial work would most benefit your efforts to create a real deployment?

5. You have now studied mobile and ubiquitous computing somewhat both broadly and deeply in this class. I want you to read and give a critical review of the following paper:

Shwetak N. Patel, Matthew S. Reynolds, Gregory D. Abowd. Detecting Human Movement by Differential Air Pressure Sensing in HVAC System Ductwork: An Exploration in Infrastructure Mediated Sensing. In *Proceedings of Pervasive Computing 2008*.

http://shwetak.com/papers/air_ims_pervasive2008.pdf

As you can see, this paper has already been published at a top conference, but I want you to provide a review for this paper as if it were to be submitted with some extensions to a top journal. Structure your review in the following way:

- A) Summarize the contributions of this work in a few sentences.
- B) Explain why this paper may or may not be of interest to the ubiquitous computing research community.

- C) Summarize the strengths of the paper in a paragraph.
- D) Summarize the weaknesses of the paper in a paragraph.
- E) What related work do you feel is missing in this paper?
- F) The paper needs to be extended to include at least 30% new material to be included in the journal you are reviewing for. Give explicit advice to the authors on how the paper should be modified and extended.
- G) Provide any other detailed comments that address how the paper must be improved that you have not already stated above.

(Note: Yes, I know one of the authors is your instructor, but it's not going to help you that much to praise the paper. You should feel free to be constructively and appropriately critical of the paper.)