**HCI CORE**

**STUDENTS ANSWER 2 OF 4 QUESTIONS**

**Q1**

In Ishii and Ullmer’s 1997 paper “Tangible Bits: Towards Seamless Interfaces between People, Bits, and Atoms”, the authors propose interactions with real-world objects that are instrumented to communicate and integrate with digital worlds.  The paper introduces the concepts of interactive surfaces, tangible objects, and ambient displays.

1. Examine the three main concepts of Ishii and Ullmer’s work in terms of concepts from Norman’s Design of Everyday Things.  What is the potential for tangible interfaces to augment cognition?
2. Evaluate the Marble Answering Machine (as described by Ishii and Ullmer) from the perspective of Norman’s Gulf of Evaluation and Gulf of Execution.

**Q2**

In their paper, “Unremarkable Computing,” Tolmie, Pycock, et al. take an ethnomethodological approach to defining what it means for a technology to be “unremarkable,” by which they mean technology that is effectively invisible in use. Star’s paper, “The Ethnography of Infrastructure,” likewise focuses on a whole class of technologies that are effectively invisible at times, and to certain people.

1. Would Star consider Tolmie, et al.’s “routines” a form of infrastructure?  Why or why not? Make your case using concepts from both papers.
2. Star describes the concept of “infrastructural inversion” as a way to surface and study infrastructures. How might you apply this to the concept of routines in order to study them?

**Q3**

On the topic of paradigm and paradigm shifts, Mackay’s (1998) article titled *“Augmented Reality: Linking real and virtual worlds. A new paradigm for interacting with computers.”* presents a primer on how to augment reality and then presents three examples of “interactive paper.”

1. The article promised a new paradigm for HCI. Did the article deliver on its promise? Why or why not? Please cite relevant literature in support of your answer.
2. What is meant by a “paradigm” within HCI? Please provide an example of a prevailing paradigm in HCI and defend your position that it is, in fact, a paradigm.
3. What is a current (non-AR) interface that appears to promise a paradigm shift in HCI? What can we learn from the Mackay article as to whether or not this interface will actually endure for the next 20 years?

**Q4**

Audio-browsing of large tables

The latest Accessibility Programming Guide (iOS) provides guidance to developers who are implementing VoiceOver to enable users with visual impairments to use their mobile devices to navigate interactive content. The VoiceOver feature uses automated speech to provide feedback to the user describing the current application state, application labels, available controls, and pre-defined attributes of non-textual data in the display, such as images. However, designing VoiceOver techniques that can aid interaction with complex data types (such as large tables) is non-trivial.

You are tasked with designing a VoiceOver technique to enable a visually-impaired user to both browse and locate specific entries in nested tables. The tables can contain both numerical and textual information, and the technique is expected to work in a mobile tablet that is speech- and touch-enabled. What is meant by VoiceOver here is that speech-based feedback is provided to the user---feedback can be given in response to specific user interactions, or in response to any update in the application state.

1. How would the user-centered process you learned in 6750 (or an equivalent class) have you go about designing a technique that recognizes the user’s interactions with nested tables presented on the tablet display, and responds with auditory (e.g., speech-based) feedback?
2. Briefly describe (you can use sketches if you like) a design idea you have to solve this problem. **Note**: You do not need to know how iOS applications currently support VoiceOver functionality to answer this question. You can state any assumptions you wish about how the technique you use employs auditory feedback and recognizes input from the user.
3. Outline a process for doing an evaluation of your design idea.  State which methods you choose to use to do so, and justify your choice of methods. Provide some specific examples of evaluation criteria that are relevant, and provide a detailed example of how you might design a study to investigate these criteria. Justify your choice of criteria and your use of methods to investigate them.

**SPECIALIZATION AREA** --**STUDENTS PICK TWO AREAS (ANSWER 2 QUESTIONS)**

**UIST questions  - students choose 1 of 2**

**Q5**

Dixon and Fogarty’s work on Prefab demonstrates that it is possible to reverse engineer graphical applications purely through their visual output (that is, without any form of instrumentation of the GUI toolkit itself).  From this reverse engineered representation of the application structure, Dixon and Fogarty are then able to selectively augment and transform the original interface to create new, advanced interactions.

One could make a loose analogy between this work and some Augmented Reality applications: in AR, the computer “sees” the visual representation of the physical world, and has to decipher its underlying structure so that it can be augmented.

Using the Prefab paper as a reference point, explain:

1. What challenges would you as a UI technology creator face in trying to apply the Prefab-based approach to real world scenes such as in AR? In other words, what are the ways in which Prefab would fail in this context, and what new technology would you have to create?
2. For Part B, assume the challenges in Part A are solved.  Since you now have the technical ability to “reverse engineer” structure in the physical world, explain 2-3 AR-based interactions that you could create that would take advantage of this capability. Your examples should be technically feasible, given the technology you outline in Part A, and compelling/justified from a UI perspective.

**Q6**

Window Systems have a number of well-defined responsibilities, such as multiplexing user input devices (the mouse and keyboard), giving applications the illusion of a “virtual frame buffer” that they can paint into without conflicting with other applications, and so forth.  While this architectural model has stood the test of time for traditional GUI applications, it is far less widely used in other styles of UIs.

Pick one of the following UI styles:  auditory interfaces, augmented reality, or pervasive computing-style interaction.  Explain the following for your chosen UI style:

1. Why might a “Window Manager-like component” be needed for this UI style? In other words, what problems exist in creating and managing multiple applications in this particular style?
2. What might the functionality of a “Window Manager-like component” be for your chosen UI style? In other words, explain the features that this component would have, and how it would fit into your architecture.  Be as specific as possible about how this system would work.  The specific architectural features you described here should address the problems discussed in Part A.

**Ubicomp   - students choose 1 of 2**

**Q7.**

When Mark Weiser defined the vision of ubiquitous computing, he differentiated it as a third generation of computing. Each generation is marked by one or more canonical technologies.

1. Briefly describe what the canonical technology is for the first three generations of computing, according to Weiser and how they differ with respect to the relationship between the users of that technology and the technology itself.
2. One trend from the past is that canonical technologies have consolidated into a small set of standard hardware and software solutions.  Will the same consolidation happen with newer technologies beyond the first, second and third generations?  Why or why not? Answer this question with specific reference to the technologies of wearable computing and the Internet of Things.
3. Assuming there will be no convergence of wearable technology into a single hardware (let’s ignore the software convergence), what challenges are there for creating satisfying user experiences with collections of wearable devices?  In your answer, cite research not done at Georgia Tech.

**Q8.**

In his article, “What next, Ubicomp?…”, Abowd describes one of the main contributions of the ubicomp research community, using the expression “Your noise is my signal.”

1. What is the basic argument that Abowd is making about this strand of ubicomp research and what are some examples of this phenomenon?
2. Provide an example from the research literature that shows “your noise is my signal.” Discuss why this example supports Abowd’s notion that “your noise is my signal.” Also discuss any other related concepts from Abowd’s paper.  The example you cite should be different from what Abowd provides in his paper (and should also be from outside GT).
3. At the heart of this research strand is the importance of understanding the physics of how phenomena in the natural world work, as a means of then leveraging that physics to provide a computational or interactive capability.  How does this physics-based approach relate to the use of pattern recognition or machine learning approaches to producing these computational or interactive capabilities? What are the advantages of physics-based or machine learning approaches?

**Info Viz - students choose 1 of 2**

**Q9.**

Visualization for storytelling or presentation purposes clearly shares much in common with visualization for analysis and exploration.

1. How do these two goals/objectives for visualization differ?  Explain at least three ways that visualizations for these two different purposes would likely vary.
2. What are techniques for transforming exploratory visualizations into narrative ones?

**Q10.**

Suppose you have developed a new visualization technique (and system) to represent tabular data.  How might you evaluate the effectiveness of this new technique?  Pick two diverse evaluation techniques to do so. For each, argue both in favor and against using such an evaluation technique to evaluate the system.  That is, explain why the evaluation technique would be an appropriate and effective way to evaluate the technique. Also, explain why some people might question the technique or cite potential problems with conducting such an evaluation.