CS160 Fall 2010 Midterm

Part I: Short-Answer Questions (40 points)
Give short answers to the following questions:

1. What is a persona, and what is its role in user-centered design? [2 points]

A persona is an artifact that precisely describes the personality, needs, goals, capabilities and backgrounds of archetypical potential users. A collection of personas can be used to reason about how different types of users will respond to alternate designs of a system or interface. Personas allow you to generalize about the needs of your users while providing a specific reference point to ground group design discussions (e.g. “What would Sonya think of removing that button? Remember, she’s colorblind…”).

2. Explain “The Space Remembers” and “Stretch Your Mental Muscles” as principles for brainstorming? [2 points]

The Space Remembers: Spatial memory is powerful. By writing ideas down and clustering them around the physical space where the brainstorm is occurring, you can associate parts of the room with concepts and reactions. Returning to those locations will allow participants to not only remember (read from the written sticky notes, etc.) the ideas that were generated but also the group’s mind-set when the idea was initially discussed.

Stretch Your Mental Muscles: Doing brainstorming warm-up exercises can significantly increase productivity during the brainstorm. By helping the group focus and bond you can easily recoup the time spent on the warm-up.

3. How does conformity impede creativity, and how can it be overcome? [2 points]

Quickly converging on an idea or small set of ideas will limit the overall creative output of a group and can lead to missing opportunities for radical innovation. This can be avoided by actively encouraging brainstormers to provide potential solutions that are “silly,” “bad,” or “impractical.” While these ideas themselves may be genuinely poor, they may serve as the jumping off point for new, more refined concepts.

4. Explain the role of the task analysis questions in the task analysis process [2 points]

The 10 task analysis questions exist to focus the designer’s exploration of the design space. Successfully answering all ten questions (through, for example, observation methods like contextual inquiry) will help the designer answer higher-level questions about who her users are, what their needs are, and what tasks they will want to carry out. The answer to the task analysis questions will also help in the formulation of usage scenarios and make for more realistic storyboards.
5. What is the principle of “context” in contextual inquiry? [2 points]

*Context* implies that we are interested in everything going on around our user while they perform their tasks or use our interfaces. Capturing this information requires being physically present with the (potential) user while they engage in real practices. Keeping the user in their authentic context helps us to gather ongoing experiences rather than summary experiences and concrete data rather than abstract data.

6. What are the affordances of a Wii remote (give at least 3)? [3 points]

The Wii remote directly affords pushing on 11 distinct buttons: A, B, +, -, Home, 1, 2, and the four points of the directional pad. The Wii remote can sense three-dimensional movement using accelerometers, which afford gesture-based interactions. Finally, absolute position (a pointing affordance) is driven by an IR emitter and sensor.

7. Sketch the state diagram for a touch screen (finger only, no hover)? [3 points]

![State Diagram for Touch Screen](From Hinckley, 2002)

8. Draw the main blocks and connections in the model-view controller (MVC) pattern [2 points]

![MVC Diagram](It would also be reasonable to connect the model to the view directly, as this is often done when rendering the model.)

9. What are the four experimenter roles in a user study (e.g. evaluation of a low-fi prototype)? [4 points]

Greeter, Facilitator, Computer, Observers
10. What is the “index of difficulty” in Fitt’s law? What other two factors does task performance depend on? [2 points]

Index of difficulty is \( \log_2(1 + \frac{D}{W}) \) where \( D \) is the distance from the starting point to the center of the target and \( W \) is the width of the target measured along the axis of motion. The other two factors in Fitts’s law are the empirically derived constants \( a \) and \( b \), each of which is a physical characteristic of the pointing device being used and the person using it. \( a \) is the inertia of the device (start/stop cost) and \( b \) is the speed of the device.


When you submit a “Callable” object to an executor it will return a Future object. The Future can be checked to determine if the callable has executed yet and to retrieve the results from the Callable’s computation.

12. Show the flow of information through sensory, working and long-term memory in the MHP. [2 points]

[From slides]

13. List the principles of rapid ethnography [3 points]

Narrow the focus of inquiry to only the most relevant activities (using key informants to guide you). Use multiple interactive observation techniques to help find unusual and useful facets of behavior. Use collaborative and computerized iterative data analysis methods.

14. List some differences between ethnographic and ethnomethodological studies of behavior? [2 points]

Ethnographic methods focus on avoiding disruption of the existing context and social order – they are primarily observational. Ethnographers are primarily interested in what their subjects do in ordinary days, why they do those things, and what they think they are accomplishing by doing them. Ethnomethodology uses observation but then tries to construct detailed descriptions of how action is coordinated. What kinds of "accounts" do people use? How are they "reflexively accountable" i.e. clear to others. Also it is very concerned with breakdowns in the coordination process, and on the techniques people use to "restore the social order".
15. Suppose you want to compare times for a pointing task using finger touch vs. a digital pen. Give one example each of: independent, dependent, control and random variables. What is the null hypothesis in this case? [3 points]

Independent Variable: Device used (touch screen vs digital pen)
Dependent Variable: Time to acquire the target in the pointing task
Control Variable: Target size (the size of the target to be acquired will remain constant across both conditions)
Random Variable: Participant age (We won’t control for this, but we would hope that it would be randomly distributed in a way that models our real user population.)

The null hypothesis for this experiment would be something like: “Time to acquire a target will not vary between two different input devices (finger touch and digital pen).”

16. What is a Likert scale? Give one advantage of its design. [2 points]

A Likert scale is a numeric scale that measures participant agreement/disagreement with a statement (often related to questions of satisfaction or experience). They usually (but not always) have either 5 or 7 levels. An advantage of this design is that the values you get back can be used directly in quantitative analysis (e.g. the mean of the responses is a meaningful value).

17. What is a type I error in a statistical test? What is the significance level? [2 points]

A type-I error is the situation that occurs when the null hypothesis is true, but is rejected due to chance. The significance level is the rate at which you are willing to accept type-I errors. For instance, a p value of 0.05 implies that one in twenty experiments in which the null hypothesis is true will result in a positive result in which the null hypothesis is rejected.
Part II: Heuristic Evaluation (10 points)
Describe five usability problems in the Android UI on the next page. Label each violation with an index number 1-5 (not the heuristic number) on the figure and make a list of violations on the next page using the index numbers to refer to the figure. For each problem, you must discuss which guideline is violated and why. You should also suggest a solution for each of these problems. Use Nielsen’s second set of heuristics below to label each violation. Remember to list each violation separately. Remember: If the same violation occurs in multiple places, it is still one violation, but the same interface element may cause several violations.

HEURISTIC POINT BREAKDOWN:
1 point for “labeling each violation with a number on the figure”
1 point for description of which heuristic is violated, why it is a violation and how to fix it
10 points for five violations

Reference: Nielson’s Revised Set of Ten Usability Heuristics

H2-1: Visibility of system status
H2-2: Match between system and the real world
H2-3: User control and freedom
H2-4: Consistency and standards
H2-5: Error prevention
H2-6: Recognition rather than recall
H2-7: Flexibility and efficiency of use
H2-8: Aesthetic and minimalist design
H2-9: Help users recognize, diagnose, and recover from errors
H2-10: Help and documentation
Type UPC code here: 1

Or type product name here: 2

Here is its barcode: 3

Find related products:

- Under $100 4
- Over $100 5

For technical support, browse to http://www.priceexpress.com/support/findme/itsnoteasy/main.html 6
Write heuristic violations here:

1: **Error Prevention.** It is difficult to read a small UPC number and accurately enter it into your phone. The system could be doing many things to help the user avoid errors here. Most obviously, it appears that the app already has a picture of the barcode. The UPC number can be derived easily from this image. The app could also give feedback as the user types in the number, telling them whether or not they are entering a valid UPC.

2: **Recognition rather than recall.** Again, the user will have difficulties both recalling and correctly entering the product’s name. Image that the user is no longer holding the product from which the barcode came from – it would be very helpful to be able to recognize the proper product from a list of products rather than having to recall its exact name. Given that we have the UPC of this product in the app already it should be possible to find out what the product is directly. The user could then simply confirm that the process worked correctly. If this is not possible, perhaps it would be possible to get a list of potential matches and display that as a list for the user to choose from.

3: **Aesthetic and minimalist design.** There is no obvious reason that this barcode needs to be displayed to the user. The only useful part of the image would be the numbers at the bottom, which the app has helpfully cropped out. A better design would either omit this image entirely use the entire image so it will be useful to the user’s task.

4: **Consistency and standards.** There is no other way to proceed forward in the app, so we must assume that these controls are buttons that move to another view in the app. However, the widget being used is a standard radio button group, which is not usually used to directly change views. If this design is really necessary (see next point), it would be better to replace the radio buttons with normal buttons.

5: **Flexibility and efficiency of use.** There is no obvious reason that these two categories should be split up. Does the user really need to be able to access them independently? It would probably be better to let the user directly specify a price range to search with. Also, this design precludes finding products that are exactly $100.

6: **Help and documentation.** This is not a reasonable mechanism for providing help to the user. Assuming that that is not a link, the user will have to write down or memorize that URL to open in a web browser. Even if it is a direct link, it would be much more helpful if the documentation and help were more tightly integrated into the app, allowing the user to get help with each feature individually rather than having to refer to a manual.
Part III: Design Sketches (20 points)

Your task is to design an Android app to help users improve their health. The app will use the device’s accelerometer to measure users’ activity. The app should support the following tasks: 

(a) Tracking exercise over the last week/month, showing the user what they have done. Allow user to set exercise goals for themselves. (Assume the app can recognize activities such as running, walking, biking etc., from the accelerometer data.)

(b) Allow sending and receiving automatic updates about activity from other users in a “fitness group”. Users should be able to reply immediately with an encouraging message when they receive such a notification. (The purpose of this part is to motivate users through social influence.)

Create scenarios for each task, and show example sequences of screens for each task with sketches. [10 points each]

Task A)

Scenario 1:
User has just been on a jog and would like to review the workout and compare the distance she jogged to the jog she went on last week.
Scenario 2:
User is displeased with her progress on getting fit. She decides to set an exercise goal of jogging at least 10 miles per week for the next 4 months.

Task B)

Scenario 3:
User is pleased with herself for going on a 50 mile bike ride. She shares her accomplishment with her fitness group.
Scenario 4:
User receives a notification that his friend has gone on an impressive bike ride. He views it and responds with an encouraging message.