CPSC 444 Project Milestone III: Prototyping & Experiment Design

Feb 6, 2012

Overview

You have approximately **3.5** weeks to complete this milestone. See course schedule for exact dates.

Milestone III Deliverables

A. Low-fidelity Prototyping & Cognitive Walkthrough

(up to 2 pages, not including appendices, which have no page limit)

A.1. Low-Fidelity Prototype(s) (hard copy only)

A.2. Description of Prototype(s) (up to 1 page)

A.3. Walkthrough Report (up to 1 page)

+ Part A Appendices (A.I)

Appendix A.I: Task examples, if revised or added to since Milestone II. Include summary of revisions. If your task examples have not changed, then state this. (no page limit)

B. Experiment Design

(up to 5 pages, not including appendices, which have no page limit)

B.1. Goal(s) of experiment (up to 1 page)

B.2. Experiment method (up to 4 pages)

+ Part B Appendices (B.I – B.II)

Appendix B.I: Study instruments (no page limit)

Appendix B.II: Task details (no page limit)

C. Medium Fidelity Prototyping

(up to 1 page, not including prototype illustrations, which have no page limit)

C.1. Medium Fidelity Prototype Demonstration

C.2. Rationale of Prototyping Approach (up to 1 page)

C.3. Prototype Illustrations (no page limit)

After Milestone Submission
Mandatory attendance at design review with course staff.

Interaction Between Parts A, B, & C

Note that there is a relatively high degree of interaction between parts A, B, and C in this stage of the project. While they are presented sequentially in this document, you *will likely need* to begin work on the experiment design before you can finalize your low-fi prototype(s), and you *will certainly need* to be well into the experiment design before you can finalize your med-fi prototype(s).

For example, one possibility is that if you have two sketches (i.e., design approaches) for your system concept that seem equally promising, you may want to design an experiment that will test which is better. To do this, however, you need to develop two low-fi prototypes (one for each sketch/approach) and then two medium-fi prototypes.

A. Low-Fidelity Prototyping

Step 1: Develop Low-Fidelity Prototype(s)

Discuss and choose the most promising of your interface sketches from Milestone II. In combination with your task examples and prioritized requirements from that milestone, *develop one low-fidelity prototype using a method of your choice* (e.g., storyboards or the prototype construction approach used in PICTIVE: http://en.wikipedia.org/wiki/Pictive) that demonstrates how the interface fulfills the requirements. You will use this prototype in the next step to walkthrough your design to uncover usability bugs**.**

> *If two sketches seem equally promising, consider developing two prototypes to compare in your experiment (Part B).* In order to go this route, you need to seriously consider the workload involved in developing both alternatives (Part C). It only makes sense if the two approaches are relatively similar or if the designs are relatively small in scope.

Your prototype should illustrate how your system would appear to the user. You should not be concentrating on prettiness or completeness; rather, you are trying to show the overall interaction style and to indicate the scope of your system. Your prototype should contain the core views that illustrate how the system will work as a whole, with emphasis on the parts you are focusing on, including the interactions based upon the key tasks.

The low-fi prototype can be hand-drawn, scanned, drawn on a computer, etc. Whatever approach you take, consider clarity, ease of development, and efficient use of your time. (Note that prototypes created on the computer do actually sometimes take more time than hand-drawn ones. Groups tend to focus more on lower-level details and precision when using the computer than they do when drawing by hand.)

Prototype Scope: When deciding how far to take this:

- Consider what this low-fi prototype is to be used for. *Do no more, no less than needed.*
- Only if your interface is going to be very simple does this and your med-fi prototype need to be comprehensive (i.e., show/implement all features). In many cases you will choose a subset of functionality to prototype for this course. However, *you should choose this subset carefully*, and justify it briefly in the report.

The low-fi prototype does not need to capture every little detail, but it *should capture the details that will dominate the experience of using it.*

Deliverable A.1. Low-Fidelity Prototype(s): Supply the prototype(s), appropriately contained if necessary in a large labeled envelope that is punched and inserted in your 3-ring binder.

Deliverable A.2. Description of Prototype(s): Identify the task examples you have chosen to support in your design (state whether located here or in your Milestone II report). Justify the prototype's scope. Provide any instructions crucial to someone being able to explore it (them) on his/her own.

Step 2: Walkthrough

Test the low-fi prototype for usability bugs (problems, faults, weaknesses) by performing a brief *cognitive walkthrough* using the 2-3 task examples you have deemed to be most crucial. (See http://en.wikipedia.org/wiki/Cognitive_walkthrough if you are unfamiliar with this usability inspection method.) The task examples may be the same as those provided in your Milestone II report (Appendix A); if you have modified them further, then provide the modified versions in the **Appendix A.I** for this report.

You do not need to modify your low-fi prototype in response to any problems you found. However, you should roll these observations into your medium fidelity prototype constructed in Part C.

Deliverable A.3. Walkthrough Report: briefly document what you found in your walkthrough, good and bad. Each task example should be addressed in a separate paragraph. If you found nothing wrong for a given task, (i.e., your interface is perfect) then outline the ways in which it was perfect (e.g. "Our cognitive walkthrough showed that users can do X, Y, and Z without errors or confusion.").

B. Experiment Design

By now, you have one design approach (or possibly two), which you've subjected to a *qualitative* walkthrough analysis. It's time to determine in a *quantitative* controlled manner whether this approach is effective.

The goal of this part is to map out a plan to rigorously test your prototype. It is necessary to do this before you actually implement your medium-fidelity prototype to ensure that it will support the evaluation.

Step 3: Establish Goal(s) of Experiment

Assess your design approach's *key usability challenges or uncertainties.* What needs to be answered to help establish whether this is a good design approach? This should be informed by the walkthrough and any other input you have obtained.

If you have developed two prototypes, or there is a competitor system for certain tasks that your system supports, the main goal is likely to determine which of the two systems is most effective overall (or for given tasks). This represents a classic evaluation of Design A vs. Design B.

Another possible goal is whether users will be able to do a certain task within a threshold amount of time, or within a threshold number of errors. The goal in this case would be to test the task against a reasonable usability requirement target. This approach is covered in Section 10.8 of the Experiments in Support of Design chapter. Note that if you take this approach, you need to clearly justify the usability requirement target.

Deliverable B.1. Goal(s) of experiment: Make a comprehensive list, then rank items by (a) importance and (b) your ability to test them within the scope of 444. Then clearly identify which of the goals you will address in your evaluation. As a guideline, you should have 1 substantial or up to 3 smaller ones goals.

Step 4: Design the Experiment

Now it is time to actually design the experiment that will evaluate your system. This will require a lot of effort, much more than the informal evaluations you have conducted to date.

Determine your hypotheses. These are very specific instantiations of some of your evaluation goals. They need to be testable. You will likely have 2 to 4 hypotheses.

Consider your intended subjects, and how you will recruit them. One possibility may be that you believe demographics will impact the usability of your system and so you may want subjects in two different demographic groups (i.e., this will be an independent variable in your experiment). One example of this is novice and expert users.

Determine the method you will use to test your hypotheses. This forms the bulk of the experiment design and includes your independent and dependent variables, the formal experimental design (e.g., a 2 x 3 mixed factorial design, more specifically a 2 levels of expertise (between subjects) x 3 interfaces (within subjects) design), the tasks that your

subjects will carry out, specific details on how you will measure the dependent variables, and the statistical analysis you expect to carry out.

Create any study instruments you will need, including questionnaires, interview questions, observation sheets, and the script you will follow so that all subjects get identical instructions.

Note that one requirement for your experiment is that you use video as a data collection mechanism. (The use of video in HCI will be covered in upcoming lectures and tutorials.) Video analysis is extraordinarily time consuming; thus, none of your dependent measures should rely on doing detailed video analysis. Rather, you may want to use video to review key interaction moments caught on video. In addition, for Milestone IV you will produce a video of your course project that will likely include snippets of video data collected during your experiment.

Every experiment has limitations. You need to carefully think through the limitations of you chosen design, in particular with respect to different kinds of validity that were discussed in class.

Note: designing an experiment is an art that takes iteration. It is highly recommended that you get started on this step as early as possible and solicit feedback from the course staff to help you evolve your experiment design.

Deliverable B.2. Experiment method: detailed description of the following components:

- Participants – describe participants, including total number expected and recruiting approach
- Conditions – drop this section if not using a Design A vs. Design B approach
- Tasks – briefly describe tasks to give the gist of what participants are expected to do, point to appendices for detailed task descriptions
- Design – formal experimental design
- Procedure – describe the sequence of activities each subject is expected to follow
- Apparatus – describe the physical setup for the experiment (use photos to illustrate if appropriate)
- Independent and dependent variables – includes exactly how you intend to measure each dependent variable
- Hypotheses – remember to state these in terms of the independent and dependent variables
- Planned statistical analyses
- Expected limitations of the planned experiment

Appendix B.I: Study instruments

Appendix B.II: Task details. Use this appendix if you need more space to clarify the tasks, such as showing screen captures or your system, or a competitor's system against which you will be evaluating your system.

C. Medium-Fidelity Prototyping

Step 5: Plan the Prototype

Decide on scope and emphasis of the medium-fidelity prototype(s), based on the needs of the evaluation you have decided to do. All project teams will build (at least) one interactive prototype.

How many prototypes? All projects will include a fully- or semi-functional, coded simulation of the system. For some projects, it may be helpful to also build a very simple non-functional physical mockup so that users can understand the system's form factor. Overall effort should be based on the size of your team.

The functional prototype(s) you build will generally be some combination of *horizontal and vertical*:

- **Horizontal**: include all the main components of your interface, but only at a high level. This gives the illusion of a fully functional prototype, which breaks down almost immediately with exploration.
- **Vertical:** select some of the primary tasks and make sure that a substantial part of the functionality required for those tasks is supported, i.e., the subject can use the prototype to complete those tasks. The completion may be restricted to very specific inputs, which you specify. 'Substantial part' would include, for a GUI example: screens, error messages, handling of unexpected input, defaults, robustness, etc. You may program in 'stubs' for sub-tasks you are not implementing at this time (e.g., certain actions may return some kind of 'Under development' message).

Note that a prototype is rarely either horizontal or vertical, but rather some combination of the two. You need to have a sufficient vertical component that, at an absolute minimum, subjects can complete one task. Likewise, you need to have a sufficient horizontal component to provide some indication of what the envisioned system/interface would look like as a whole.

The point here is that except for a quite simple interface, *we do not expect you to implement everything.* Figuring out the scope (both horizontal and vertical) is an art. Give it careful consideration and solicit input from your TA.

Examples of the questions you must answer at this point include:

1. How much *horizontal* and *vertical*?
2. What *(simulated) functionality* must it contain? What can be Wizard-of-Oz'd (i.e., faked)? How specifically, from a technical standpoint, do you plan on doing the faking? The goal should be that the subjects are as unaware as possible that the system is not fully implemented.
3. How important is *appearance*?
4. If your interface includes physical (non-graphical) elements, is it useful and/or feasible to augment your functional prototype with *form mockups*?

5. Finally, *decide which prototyping tools to use.* Most likely you will want to use one of the tools available in X360 (this includes all software available on the general CS ugrad lab machines as well software only available in X360: http://www.cs.ubc.ca/ugrad/facilities/labs/iccs-x360/HCIstudio/resources.html). Use a combination of your group's skills / comfort level, and the requirements for the prototype to make this choice. IF YOU WISH TO USE A LANGUAGE NOT INSTALLED ON x360 COMPUTERS, CONTACT COURSE STAFF FIRST.

The goal is to get the *most useful evaluative results with the least amount of production effort. Less is good!* But, choose wisely where to direct your effort.

Step 6: Implement the Medium Fidelity Prototype

Embody your design(s) in a *medium fidelity interactive prototype(s);* and if appropriate, a non-functioning supporting prototype as well. Note that we do expect the total prototyping effort involved to be fairly uniform across projects (normalized by team size); so if you are only building one, the expectations for its level of function will be a bit higher.

Deliverable C.1. Medium Fidelity Prototype Demonstration: You will demonstrate your prototype to the course staff during a design review immediately after Milestone III is due. As always, full, on-time attendance of all team members is mandatory.

Deliverable C.2. Rationale of Prototyping Approach: In a brief report, summarize your reasoning for choosing your prototype approach (i.e. the questions stated in step 6).

Deliverable C.3. Prototype Illustrations: Document your *final interface prototype implementation,* using screenshots, photos or the equivalent for your project. Include *explanatory/descriptive captions for figures,* as appropriate. Where appropriate, justify design elements with respect to what you have learned about human abilities and limitations.

There is no specific page limit for deliverable C.3. However, *please avoid excessive length and concentrate on conveying key aspects.* If in doubt, consult course staff.

Marking

In addition to the usual criteria, for the **prototype** and its **demonstration** to course staff at the MS III design review you will be specifically evaluated on:

- quality of user interaction
- quality of non-interaction development
- appropriateness & completeness (e.g., to effectively perform evaluations)
- novelty & ingenuity
- organization & preparation for demo
- handling of questions at demo

Tentative High-Level Marking Scheme

A. Low fidelity prototyping & walkthrough:	20%
B. Experiment design:	40%
C. Medium fidelity prototyping:	40%

Milestone III Design Review

Course staff will conduct a design review with each team at a lab session shortly after the deliverable's due date. The intent of the design review is to give the course staff an opportunity to interact with the prototype(s), and to provide feedback to the team about their progress, and discuss the plan for proceeding to the next project stage.