Analyse, modélisation et conception

Design of Interactive Software

Yves Pigneur
University of Lausanne
yves.pigneur@unil.ch

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Tuesday 8:15 - 12:00
Room 237 (Internef)

1 Course Description

This course mainly provides the participants with human-computer interaction concepts, theory, and practice, for analyzing the user requirements, designing interactive software, and evaluating usability. The course mainly deals with requirement analysis, design, prototyping, usability evaluation, and other design topics. The framework, adopted from [Rosson and Carroll, 2002], *"is founded on the use of scenarios as a central representation for the analysis and design of use. A scenario describes an existing or envisioned system from the perspective of one or more users and includes a narration of their goals, plans, and reactions".* Learning will be accomplished through lectures, case studies, group projects, and research. The course also aims at making sensitive the students in the science of design.

2 Course Objectives

Upon completion this course, the participants will

- have a general understanding of the human-computer interactions and usability engineering,
- be aware of the scenario-based design,
- be familiar with the science of design.

3 Course Materials

Course materials are provided on the web site (`http://www.hec.unil.ch/yp/HCI`). Weekly reading materials will acquaint the participants with the topic to be covered in the upcoming class. Students are required to read all of them for the course. The assigned reading list is provided in the "Course Schedule" section of this syllabus.

Required text

Rosson, M., Carroll, J. 2002. *Usability Engineering: Scenario-Based Development of Human-Computer Interaction*, Morgan Kaufmann, and its case studies (`http://ucs.ist.psu.edu/`).

4 Course Requirements and Grading Criteria

Class preparation, attendance and participation are vital to a productive and stimulating learning environment. Allow ample time to read and reflect on the assigned readings prior the class period.

The students will conduct, by group of three, a project and a scenario-based design of a human-computer interaction, with the three main phases: requirement analysis, design and prototype, and usability evaluation.

The deliverables have to be uploaded on the group web site. This project will produce the three following sets of deliverables:

First Deliverables - Requirements analysis

In this first phase, your main goal is to present a shared understanding of the needs, concerns, and opportunities reflected in your customers' current activities. You will synthesize and present this understanding in a description of the organizations' stakeholders and their tasks, as well as a set of problem scenarios and claims.

Project proposal	(due March 4)
Requirements and scenarios	(due March 11)
Task analysis	(due March 18)

Second Deliverables - Design

During this phase, you will design a simple interactive tool that will meet the needs of your client. This process will include the exploration of metaphors and technologies as an aid in generating activity, information, and interaction design ideas.

Activity design	(due April 1)
Information design	(due April 8)
Interaction design	(due April 15)

Third Deliverables - Prototypes and usability evaluation

During this phase, you will develop three (progressively more refined) prototypes and gather empirical data regarding the usefulness, ease of use, and user satisfaction associated with the prototype you will have built. You will be conducting a think-aloud evaluation and a cognitive walkthrough of the prototyped scenarios. You will run the usability test on six different users, three who are relatively experienced with computers, and three who are relatively inexperienced.

Paper prototype	(due April 22)
Usability specifications	(due April 29)
Interactive prototype	(due May 6)
Usability tests	(due May 13)
Interactive prototype - 2nd version	(due May 20)
Final comments	(due May 27)

Further details on the objectives, contents, and the report structure will be presented during the course.

There will be a three-hour written closed-book exam, which will consist of questions and exercices.

For grading purpose, activities will be issued based on the following scheme:

Participation	20%
Project	30%
Exam	50%

5 Course Schedule

5.1 Requirements analysis

This first part discusses the problem in software development that motivate the use of scenario-based design (SBD). It provides an overview of the scenario-based framework that form the basis of this course [Alexander and Maiden, 2004] [Carroll, 2000] [Rosson and Carroll, 2002]. This chapter also introduces the goals and the methods of requirements analysis, the phase of software development in which the needs of clients with respect to a proposed project or technology are analyzed.

DATE	TOPIC	READING
Feb. 19	Course introduction and scenario-based design basics Introduction to *Designing Interactions*	[Rosson and Carroll, 2002] ch. 1 [Moggridge, 2006] `http://www.designinginteractions.com/`
Feb. 26	Requirements analysis	[Rosson and Carroll, 2002] ch. 2
Mar. 4	Task modeling	[Mori et al., 2002]

In this course, we present the tool CTTE (`http://giove.cnuce.cnr.it/ctte.html`) that provides support for defining, decomposing, and analyzing the tasks of the various stakeholders.

5.2 Activity, information and interaction design

This second part introduces the concepts and methods of activity design, in which the problems and opportunities of current practice are transformed into new way of behaving. It also introduces the concepts and techniques of information design, in which the objects and actions are represented and arranged in a way that facilitates perception and understanding. The goal of interaction design is to specify the mechanisms fro accessing and manipulating task information.

DATE	TOPIC	READING
Mar. 11	Activity design and use cases *The Mouse and the Desktop*	[Rosson and Carroll, 2002] ch. 3 [Moggridge, 2006] ch. 1
Mar. 18	Information design and patterns *My PC*	[Rosson and Carroll, 2002] ch. 4 [Moggridge, 2006] ch. 2
Apr. 1	Interaction design *From the Desk to the Palm*	[Rosson and Carroll, 2002] ch. 5 [Moggridge, 2006] ch. 3

In this part, we present the tool DENIM (`http://dub.washington.edu:2007/denim/`) that provides support for defining storyboards for designing user interfaces through informal interaction such as sketching.

5.3 Prototype and usability evaluation

A logical entailment of iterative design is that prototypes, concrete but partial implementations of a system design, are constructed and evaluated to guide redesign and refinement. Usability [Nielsen, 2000] evaluation is any analysis or empirical study the usability of a prototype or software. The goal is to provide feedback in software development, supporting an iterative development process.

DATE	TOPIC	READING
Apr. 8	Prototyping	[Rosson and Carroll, 2002] ch. 6
	Adopting Technology	[Moggridge, 2006] ch. 4
Apr. 15	Usability	[Rosson and Carroll, 2002] ch. 7
	Play	[Moggridge, 2006] ch. 5
Apr. 22	Documentation	[Rosson and Carroll, 2002] ch. 8
	Services	[Moggridge, 2006] ch. 6

In this part, we present the tools DATALOGGER (`http://www.userfocus.co.uk/resources/datalogger.html`) and GLEAN (`http://www.eecs.umich.edu/~kieras/goms.html`) that provides support for reporting and evaluating the usability.

5.4 Issues in design

This part concerns advanced topics in designing information systems (groupware, data visualization and system integration).

DATE	TOPIC	READING
Apr. 29	Emerging paradigms for user interaction	[Rosson and Carroll, 2002] ch. 9
	The Internet	[Moggridge, 2006] ch. 7
May 6	Data visualization and GIS	
	Multisensory and Multimedia	[Moggridge, 2006] ch. 8
May 13	System integration (Air Traffic Control)	
	Futures and Alternative Nows	[Moggridge, 2006] ch. 9

5.5 Design science

This last part mainly deals with topics related to the science of design in architecture, management and information systems.

DATE	TOPIC	READING
May 20	Managing as designing	[Boland and Collopy, 2004]
	People and Prototypes	[Moggridge, 2006] ch. 10
May 27	Design science in information systems	[Hevner et al., 2004]

6 Class policies

1. *(Classroom attendance and contribution)*
   Students are expected to attend all classes and group meetings; class participation grades will be significantly reduced for absences. Individual contributions to class sessions are very important and will be evaluated for the course grade.

2. *(Group project)*
   Collaboration within groups is encouraged for project work. However individual contribution in the project has to be specified for each member.

3. *(Plagiarism)*
   Copying work form the Internet or other sources without reference or acknowledgement is considered plagiarism, and subject to disciplinary action, as enforced by the University of Lausanne.

References

[Alexander and Maiden, 2004] Alexander, I. and Maiden, N. (2004). *Scenarios, Stories, Use Cases: Through the systems development life-cycle.* John Wiley.

[Boland and Collopy, 2004] Boland, R. and Collopy, F. (2004). *Managing as Designing.* Stanford Business Books.

[Carroll, 2000] Carroll, J. (2000). *Making Use: Scenario-based design of human-computer interactions.* The MIT Press.

[Hevner et al., 2004] Hevner, A., March, S., Park, J., and Ram, S. (2004). Design science in information system. *MIS Quarterly*, 28(1).

[Moggridge, 2006] Moggridge, B. (2006). *Designing Interactions.* The MIT Press.

[Mori et al., 2002] Mori, G., Paterno, F., and Santoro, C. (2002). Ctte: Support for developing and analyzing task models for interactive system design. *IEEE Transaction on Software Engineering*, 28(9):1–17.

[Nielsen, 2000] Nielsen, J. (2000). *Designing web usability.* New Rider.

[Rosson and Carroll, 2002] Rosson, M. and Carroll, J. (2002). *Usability Engineering: Scenario-based development of human-computer interaction.* Morgan-Kaufmann.

The students can access the *BCU* digital library (`http://dbserv1-bcu.unil.ch/dbbcu/cds/menu.php`), for consulting many useful databases (*ABI/Inform, Business Source Premier, ScienceDirect, Blackwell, Ingenta, Kluwer, JSTOR, ...*).


HCI Challenge 2008

This year the project takes the form of a *"HCI Challenge 2008"* which will harness the creativity and energy of the participants to address different issues facing the students living on the Unil campus. The challenge will focus on the design of IT artefacts supporting different exchanges between students and Unil; the solution will be mainly based on portable, nomadic and "post-modern" gadgets (*iTouch* and *Nabaztag*).

ASSIGNMENT: Requirements analysis

In this first phase, your main goal is to present a shared understanding of the needs, concerns, and opportunities reflected in your customers' current activities. You will synthesize and present this understanding in a description of the organizations' stakeholders and their tasks, as well as a set of problem scenarios and claims.

Assignment 1 - Project proposal (due March 4)

The one-page proposal includes the following information:

- Problem statement
- User characteristics
- Project participants (who would assess the design)
- Initial design description
- Projects members

Assignment 2 - Requirements and scenarios (due March 11)

Based on interviews to assess what current or potential users (or user proxies) would like to see in the design, the requirements include the following information:

- Project planning: root concept
- Method and materials: interview guide (questions)
- Information gathering: system overview, interviews, photos, ...
- Interpretation: interview summary, stakeholder or persona profiles, task list (necessary and optional)
- Synthesis: scenarios and claims

Assignment 3 - Task analysis (due March 18)

The task analysis includes the following information, for the main task(s) only:

- Personas and goals
- Analysis input: relevant tasks, users, workstation, activity domain
- Analysis output: context, user profile, usability criteria, task parameters, structure
- Task decomposition: steps necessary to achieve the goals
- Use case: goal, scope and level, primary actor and stakeholder, precondition, success guarantee, trigger, description, extensions, variations, special requirements
- Synthesis: user feedback

ASSIGNMENT: Design

During this phase, you will design a simple interactive tool that will meet the needs of your client. This process will include the exploration of metaphors and technologies as an aid in generating activity, information, and interaction design ideas.

Assignment 4 - Activity design (due April 1)

Using the requirements, the problem scenarios and the task analysis, the activity design aims at specifying the services that the system will provide the user with, using scenarios-narratives and schemas. The focus is on functionality. The activity design includes the following information:

- Exploration: conceptual metaphors and technology options
- Envisionment: scenarios, and point of view analysis
- Rationale: design claims and evaluation results
- Services and functions: business objects and rules or actions with input, output, pre- and post-conditions
- Synthesis and user feedback

Assignment 5 - Information design (due April 8)

Based on the activity design, the information design deals with the information the application will provide to users, and the way they will appear to users. The information design includes the following information:

- Exploration: information metaphors, technology options, screens
- Envisionment: scenarios, and hand sketches
- Rationale: design claims and evaluation results
- Screen and design principles: proximity, alignment, repetition, contrast, typography, space, ...
- Synthesis and user feedback

Assignment 6 - Interaction design (due April 15)

After the information design, the interaction design describes the user actions and system responses. The interaction design includes the following information:

- Exploration: metaphors and technology options
- Envisionment: scenarios, the context and sequences diagrams, and task allocation
- Rationale: design claims and evaluation results
- Adopted and customized patterns: name, context, problem, forces, solution, rationale, example, diagram, related patterns
- Synthesis and user feedback

ASSIGNMENT: Prototypes and usability evaluation

During this phase, you will develop three (progressively more refined) prototypes and gather empirical data regarding the usefulness, ease of use, and user satisfaction associated with the prototype you will have built.

Assignment 7 - Paper prototype (due April 22)

This step aims at constructing one or more low-fi (paper-based) prototypes using the techniques presented during the course and outlined in the NN video. These prototypes should be based on your your designs and scenarios, adopted in your previous deliverables.

Assignment 8 - Usability specifications and tests (due April 29)

The objective of this assignment is to define the usability specifications and evaluate your designs and low-fi prototypes via informal usability testing. The deliverable includes the following information:

- Introduction: the designs that will be evaluated, and the goal and reason why of the experiment
- Prototype: a brief description of the prototype that will be tested (pictures, photo, ...)
- Method: participants (who and selection mechanism), task scenarios, usability specifications and procedure (questions)
- Measurements and observations (which measures and why)
- Results of the tests (summary of what has been observed, or answered), discussion (what have been learned), future (what will be changed)

Assignment 9 - Interactive prototype (due May 6)

This assignment aims at revising your interface design using the results of the usability test of your low-fi prototype, and, based on this revision, at building an interactive prototype using a prototype tool. Time is short, and you should prototype what you consider as essential; the underlying functionality does not have to work fully! This prototype should allow to run through one of the scenarios you designed during the previous phases.

Assignment 10 - Usability tests (due May 13)

The objective of this second usability testing is to conduct a think-aloud evaluation and a cognitive walkthrough of the prototyped scenarios. You will run the usability test on six different users, three who are relatively experienced with computers, and three who are relatively inexperienced.

Assignment 11 - Interactive prototype - 2nd version (due May 20)

The goal of this phase is to incorporate feedback from the previous usability tests and to build the second version of your computer-based prototype.

Assignment 12 - Final comments (due May 27)