Syllabus

Human-Computer Interaction (CS4317/5317)

Fall 2006

Tuesday & Thursday, 3:00—4:20, Computer Science room 321

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Course Objective:
Acquire the knowledge and skills needed to create highly usable software systems.

Main Topics:
- Human Perception, Ergonomics, Cognition, and Psychology
- Task Analysis
- Design
- User-Interface Programming
- System Evaluation

Types of Applications Covered:
- Information Presentation
- Graphical User Interfaces
- The Web
- Mobile Devices
- Groupware
- Spoken Language Interfaces and Multi-Modal Interaction

Format:
Primarily lectures. Several class sessions will be devoted to in-class design exercises, student project presentations, and student-led discussions.

Text:
Ben Shneiderman and Catherine Plaisant, Designing the User Interface (fourth edition). Addison-Wesley, 2005. (henceforth DTUI)
We will be skipping back and forth in the book as we follow the topics listed above.

This will be supplemented by readings handed out in class.

A good second book to own is User-Centered Website Development: A Human-Computer Interaction Approach, by Daniel D. McCracken and Rosalee J. Wolfe. This book provides good brief discussions of most of the topics of the course, and also covers topics missing from DTUI, including graphic design, information architecture, and navigation.

You will also need a book with coverage of Swing (Java’s GUI toolkit) to refer to.
Assignments: There will be a number of structured assignments, designed to give experience with various usability engineering activities. Most assignments will be done in teams. Assignments due at the start of class will be collected after a one minute grace period; late assignments will receive at most two thirds credit. Graduate students will have two additional assignments.

Grading: Approximate weighting:
- assignments 40%
- final 20%
- tests 25%
- quizzes 10%
- participation 5%

Assignments and tests will be challenging; as a result no one will ever feel completely satisfied with their achievements, but this is the nature of HCI. Grading will be on a points-earned basis (points above zero), rather than a points-off basis (points below expectation). Letter grades will be assigned accordingly; in the past, the A/B break has been around 80% and the B/C break around 70%. Grading of design projects will involve subjective judgments, but these will not be a major influence on the overall grade. One page of handwritten notes may be brought to the tests.

Cooperation among students and among teams is encouraged, but not to the extent that it interferes with each individual’s understanding or with learning-by-doing. Help given and received from other students and sources should be noted in the assignment write-up. More generally, students will follow the UTEP Standards of Conduct, available at http://studentaffairs.utep.edu/Default.aspx?tabid=4386.

Students are expected to be punctual. No make-up exams or assignments will be given except under the conditions set forth in the Catalog. Students are free to attend class or not, bearing in mind that absence may annoy other students, interfere with learning, and result in a lower grade.

Important Dates:
- Test 1: September 21
- Test 2: October 24
- Thanksgiving: November 23
- Final Exam: December 7, 1:00-3:45

Course Web Site: http://www.cs.utep.edu/nigel/hci/

Tentative Schedule:

Part I  Introduction

1.  Course Overview (1 day)  Aug 22
   Why Design for Usability?
   Historical Perspective: machinery, the PC, the GUI, the Web
   Possible Futures
   (DTUI 1.1-1.4)
   Assignment A: Analyze a Usability Problem (1hr)

Part II  Foundations

2.  Human Perception and Information Presentation (2 days)  Aug 24, 29
   Perception: gestalt perception
   Color
Graphic design (in-class exercise)
Paper and VDUs
Virtual reality
(DTUI 9.5-9.6, 13.3; 6.6; 12.6; 12.4; 14.5; Graphic Design hand-outs)
Exercise B: Static Information Presentation (2 hr)
Exercise C: Exploring Color Space (.5 hr)

3. The Human Body and Device Design (2 days) Aug 30, Sept 5
Input Devices
Speed, Learning, Fatigue, Injury
Posture Hints and Hand Care for Computer Users
Statistical significance and hypothesis testing
Ergonomics Guest Lecture: Professor Pennathur
(DTUI 9.1-9.3)
Exercise D: A Time-and-Motion study of Mousing (2hr)

4. Low-Level Human Cognition (1 day) Sep 7
Time-scales and the illusion of multi-tasking
GOMS modeling (keystroke level) (in-class exercise)
Case study: correcting speech recognition errors
(DTUI Sec. 2.4, 11.1-11.5s, 2.4.3s, 2.4.4; Raskin handout)

5. Higher Cognition (2 days) Sep 12, 14
Metaphor (in-class exercise)
Direct Manipulation
Command Languages
Exercise U1: The Unix Shell
(DTUI 2.5s, 6.1-6.5, 8.1-8.5s, 1.5)

Part III Usability Engineering

6. Observing Users (3 days) Sep 19, 21, 26
Mindset
Subject-Running Techniques
(DTUI 4.3-4.7)
Exercise E: Observe Users with a GUI (4hr)
[Exercise Z1 (Grads only): Pick a Research Paper to Present]

7. Usability Analysis (3 days) Sep 28, Oct 3, 5
Cognitive Walk-Throughs
Heuristics Evaluation
Usability guidelines
Users, Usability Experts, and Developers
Error
(DTUI 2.1-2.3.5, 2.4.2, 3.3.1s, 4.1s, 4.2, 12.2)
Exercise F: Evaluate the GUI again (2hr)
Exercise G: Widget Evaluation (drop-down scrollable menus) (1 hr)
[Exercise Z2 (Grads only): Formulate a Research Project]

8. Specifying and Prototyping (4 days) Oct 10, 12, 17, 19
Transition Diagrams
Low-fidelity prototyping
Visual Basic Prototyping
Widget Survey
(DTUI 3.4, 5.2; 7.1-7.8)
Exercise H: Propose a Better GUI (Storyboarding) (2hr)
Exercise I: Prototyping in VisualBasic (3hr)
Part IV: User Interface Programming

10. Interface Programming (2 days) Oct 26, 31
- Development Tools
- Events and Handlers/Callbacks
- Responsiveness Issues
  (DTUI 5.1s, 5.3s, Chapter 7, 12.5s; Sierra and Bates Chapter 12)
- Exercise L: Event Handling (2 hrs)
- Exercise M: GUI Exercise 2a: Rough Design (1 hr)
- Exercise N: GUI Exercise 2b: Full Specification (2 hrs)
- Exercise O: GUI Exercise 2c: Implementation (10 hrs)

11. Web Usability (4 days) Nov 2, 7, 9, 13
- Content Analysis
- Organizing information across multiple screens
- Supporting navigation
- Information Architecture (in-class exercise)
- Browser and device dependence/independence
- Assigning functions to client and server
  (DTUI 14.1-14.4s; McCracken and Wolfe 105-120, Appendix as hand-outs)
- Exercise P: HTML and CSS / Build a Personal Home Page (1.5 hrs)
- Exercise R: Navigation and Layout (2 hrs)
- Exercise T: Javascript (2 hrs)

Part V: Special Application Areas

12. Training, Learning, and Help (.5 day) Nov 16
- Documentation and Help
  (DTUI 13.1-2, 13.4-8)

13. Small-Screen Devices (.5 day) ditto
- PDAs, Pagers, and Telephones
- Pen Computing, Wearables, Digital Jewelry, Ubiquitous Computing
- Case Study: A Wearable Communication Aid
  Exercise U2: Examine the Interface of a Mobile Device (2hr)
  (DTUI 7.8.2, 9.5.4)

14. Groupware (1 day) Nov 21
  (DTUI Chapter 10)

15. Spoken Dialog Systems (.5 days) Nov 28
- Strengths and weakness of the medium
  (DTUI 7.8.1, 8.6, 9.4)
  Exercise V: Examine a Spoken Language Interface

16. Games (.5 day) ditto
  (DTUI 6.2.5)

17. Social Cognition and Anthropomorphic Agents ditto
Part VI: Review

17. Review (1 day)  
(DTUI 3.3s)  
Exercise W: A Question for the Exam

(Note that the above time estimates for the exercises are for an efficient person working with a well organized team)  
(Note that chapters and sections suffixed with “s” are to be skimmed only)

Target Learning Outcomes:

Level 3: Synthesis and Evaluation  
(Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery.)  
Upon successful completion of this course, students will be able to  
a. Explain and apply various approaches to designing user interfaces, such as guidelines, user observation, task analysis, user-participatory design, scenario development, and prototyping  
b. Design and evaluate graphical user interfaces in Web and stand-alone applications, including appropriate choice of interaction styles and widgets, information presentation, error prevention, error message design, display design, and use of color

Level 2: Application and Analysis  
(Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details.)  
Upon successful completion of this course, students will be able to  
a. Explain and apply various approaches to evaluating a user interface, such as heuristic evaluation, cognitive walkthrough, GOMS analysis, usability testing, survey, and controlled experimentation  
b. Use software tools such as specification methods, interface-building tools, and evaluation tools  
c. Apply basic principles of human perception and ergonomics to the design of user interfaces, such as response-time models and Fitts' Law  
d. Select an appropriate hardware interface device (from among various keyboards, keypads, pointing and drawing devices, screen types and sizes, etc.) for a given interface task and user population  
e. Select appropriate interaction styles and interfaces (distant and co-located, synchronous and asynchronous) to support a given human collaboration need  
f. (for 5317) Find, systematize, and summarize research literature relevant to a given issue.  
g. (for 5317) Select an appropriate research method and develop a suitable procedure to address a given scientific question.

Level 1: Knowledge and Comprehension  
(Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. The material has been presented only at a superficial level.)  
Upon successful completion of this course, students will be able to  
a. Explain the role of well-designed, usable interfaces in market success, reliability, and accessibility  
b. Explain the use of guidelines, design principles, and theoretical models in designing user interfaces  
c. Explain the roles of HCI professionals and practitioners of related disciplines in the workplace  
d. Explain the role of systems software in achieving acceptable system response times  
e. Explain how interface design is ultimately dependent on human perception and cognition  
f. Explain the advantages and disadvantages of graphic user interfaces, command language interfaces, and spoken dialog interfaces