

Concepts and Techniques for User Interface Design

Course No.: EECS 498-001; Credit Hours: 4; Instructor: David Kieras (kieras at umich)

Prerequisites: EECS 281 and CS major or EECS 282 and Informatics major

Approved for Upper-Level Computer Science Elective Credit

What makes an interface usable?

It is not just "what you are used to", nor is it just looking good. In fact, a user interface can actually be *engineered* to be "intuitive", "natural", and "user friendly", using techniques based on concepts from scientific psychology and human factors. This course is an introduction to these concepts and techniques for designing good user interfaces.

Scientific concepts

The relevant properties of human perception, cognition, and action will be surveyed. These allow us to make principled up-front decisions about topics such as:

- What will make display objects easy to find
- How to make interface procedures easy to learn and easy to execute
- How to choose interaction devices that make actions natural and fast

Examples: Display colors could be used much more effectively than they usually are; the real advantage of Mac-like GUIs is that the interface procedures are simple and consistent; there are good scientific reasons why the mouse has been popular, the QWERTY keyboard has persisted, and touchscreens have become so important.

Practical techniques

The most important technique is *user testing*, in which test users try to use a prototype, and problems are noted and fixed. However, user testing is slow and expensive, so additional techniques have been created to allow good designs to be developed more quickly, systematically, and easily:

- Task analysis - what do users actually need to do?
- Functionality analysis - what functions can we provide that will help them do what they need to do?
- Heuristic evaluation - quick rules of thumb for identifying interface problems.
- Keystroke level model - which design will let users perform tasks more quickly?
- Cognitive walkthrough - will users be able to tell how to use the interface just by looking at it?
- GOMS model - how good is the overall design in consistency, ease of learning, and ease of use?

Coursework

The course will have significant reading assignments from textbook, handbook chapters, or primary papers. There will be exams on the conceptual knowledge. There will be several projects in which you will try out the techniques, mostly on systems of your choice. The projects will involve either existing systems or "on paper" designs, so actual implementation of your user interface designs in running software is *optional*; for example, you might want to work on the design of the UI for a system you are building for another course or another purpose. The projects will involve careful analysis, design, and evaluation work, and the deliverables will be written reports.

Relation to EECS 493

EECS 493 emphasizes user interface software development, with some discussion of usability and design. This course covers usability and design with no required implementation. **Roughly speaking**, 493 emphasizes "how to build it" while this course focusses on "what to build and why." Taking both courses would provide excellent background in the user interface field.

Workload expectations

The workload for this course will be "normal" for a ULCS course, unlike Kieras's EECS 381, whose insane workload is due to its goals and subject matter. However, this course will differ from a typical ULCS course in that it will require no coding, but will require more reading and writing, and possibly more careful and creative thinking, so take that into account in your planning.