User Interface Design
& Development

Lecture 1
Introduction

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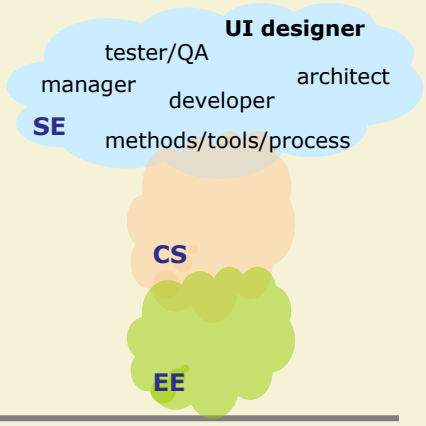
outline

- what is…
  - the course about
  - UI design
  - usability
- the usability lifecycle
- the course
  - participation
  - assignments & project

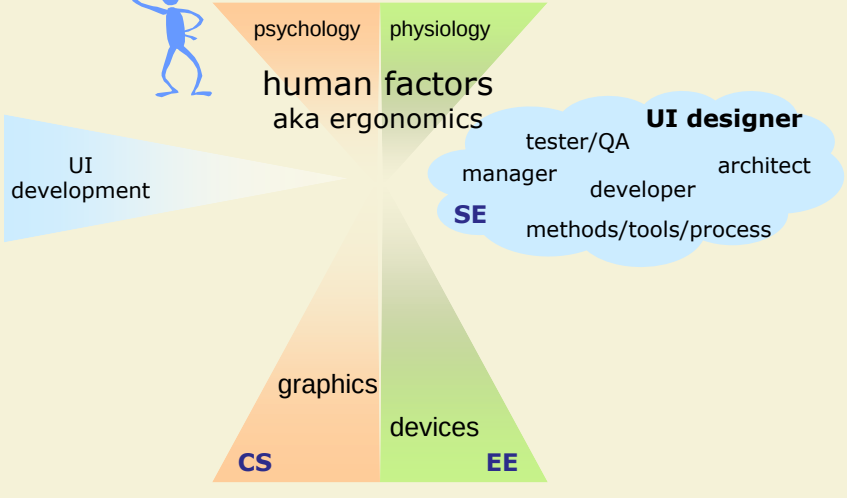
Acknowledgment
some of the material presented throughout this course is adapted from previous offerings of the same by Jeff Offutt

software engineering trades

- human-computer interaction
- applications
- development/execution envs.
- middleware
- OS/storage management
- networking
- hardware



this course is about UI design

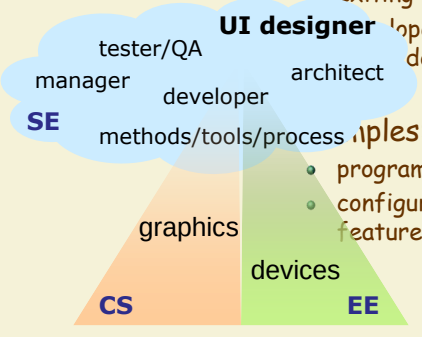


aside
on human factors

- applications well beyond software
  - building layout: smoking area, lighting…
    - offices, restaurants…
  - furniture
  - street signs
  - clothes
  - forms & exams
    - instructions, ordering of questions…

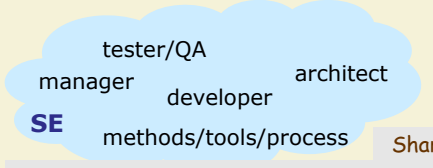
in the old days
users had it hard

- inside out design
  - marketing imagines exiting new features
  - …opers code them …do the UI… and manual



…mples:
- program a VCR
- configure/use some features on a cell phone

"user friendliness" is too vague

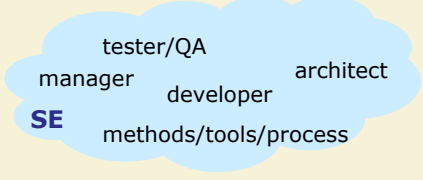


- inside out design
  - marketing imagines exiting new features
  - developers code them … and do the user-friendly UI… and manual

Sharp Electronics manual for a home fax machine

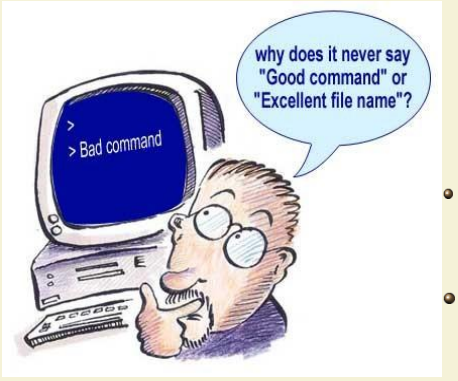
The Remote Transfer Passcode can be used in Extension Telephone Function. To transfer a fax call from an extension phone to the UX-170 for reception. This function, the call is transferred to the UX-170 by pressing the passcode number and * key at the extension telephone. The passode is a one-digit number, selected from 0 to 9. To change the Passcode, redo the entry operation. To check the Passcode, print-out and refer to the Program List (see p. 76). If an incorrect number is entered during the procedure, press the * key and repeat entire procedure.

"user friendliness" is too vague



- inside out design
  - marketing imagines exiting new features
  - developers code them … and do the user-friendly UI… and manual
- what is friendly to one person may be confusing, tedious, or trite to another
- key questions:
  - who are the users?
  - what are they trying to do?

know your users



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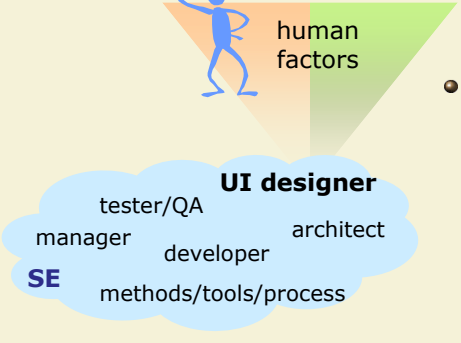
human-computer interaction
takes an outside-in approach



- outside in design
  - marketing imagines exiting new features
  - designer
    - models users & tasks
    - designs UI
  - developers add the features that support the UI

Note: HCI as a research field is born in 1983 with Card, Moran, and Newell's The Psychology of Human-Computer Interaction

graphical UIs
how did it all start?

- in 1963, Ivan Sutherland submits PhD work at the MIT proposing the Sketchpad software, for which he got the 1988 Turing Award
  - http://www.youtube.com/watch?v=USyoT_Ha_bA&feature=related
  - http://www.youtube.com/watch?v=495nCzxM9PI
- in the early 1970s, Xerox Parc introduced the Xerox Star
  - windows, icons, buttons, mouse, pop-up menus…
- in 1983 Apple Lisa is first commercial PC ($9,995) to use GUI
  - quickly followed by the Macintosh (1984, $2,495)
  - …and MS Windows 1.0 in 1985

what is going on?

graphical UIs
enter cognitive psychology

- in 1956 George Miller finds that the human "immediate memory" can hold about 7(±2) chunks of information
- later work on complex and dynamic content estimates about half of that
  - Yntema, D. B. (1963). Keeping track of several things at once. *Human Factors, 5*, 7-17.
  - Yntema, D. B., & Mueser, G. E. (1960). Remembering the present state of a number of variables. *Journal of Experimental Psychology, 60*, 18-22.
  - Venturino, M. (1997). Interference and Information Organization in Keeping Track of Continually Changing Information. *Human Factors, 39(4)*, 532-539
- web usability guidelines recommend 2 to 3 chunks
  - remember 2 to 3 items from one screen to the next
  - 2 to 3 clicks to get to the user's goal…

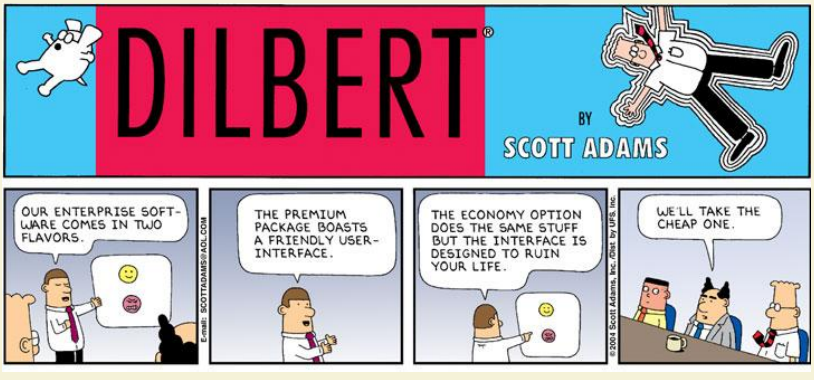
a few decades of experience gave rise to guidelines and best practices

- how to design & code
  - strengths and weaknesses of interaction styles
    menus, commands, forms…
  - when and how to use different kinds of primitives
    icons, buttons, selection boxes…
  - …
- how to evaluate
  1. time to learn
  2. speed of user performance
  3. rate of errors by users
  4. retention over time
  5. subjective satisfaction

measurable quantitatively

we'll look at these metrics in more detail in an upcoming class

best practices and evaluation don't come cheap



usability affects the bottom line

IEEE Spectrum Jan 11 pp. 33

- …The reign of MySpace, however, didn't last long. By September 2009 the company could claim just 30% of the American social-networking market, down from 67% the year before, according to the research firm Hitwise. **Its biggest mistake was losing control over the site's usability**. Rather than develop tools that would **help users** organize the vast amounts of shared information, MySpace dumped all its resources into **new features** it thought would drive traffic: bulletin boards, job listings, horoscopes, even a YouTube-esque video sharing service called MySpaceTV. The site got so cluttered that many users left to **look for something simpler**.

discussion

- after you get training on design guidelines and best practices
  - the quality of your UIs will/will not improve greatly
  - your design is/is not as good as it gets
  - doing more for usability shows on the bottom line

take 5

- read the $300M button

this course covers 3 layers of expertise

	demonstrate
• engineer usability	project
• guidelines and best practices	exams
• code	labs

not enough to evaluate quality
quality is built in

- in the 70's Japan's auto industry
  had trouble exporting because of low quality
- in the 80's the industry overhauls the production processes
  applying the notion of *total quality*
  from Armand Feigenbaum's 1951 book
- by the late 80's Japan built the most reliable cars in the world
- in the 90's the world industry
  catches up to total quality
- software industry: big push in defense contracts SEI's CMM
  Software Engineering Institute, Capability Maturity Model

costs of quality
invest where it matters most

- many total quality attempts subside
  in the software industry
  because of costs of trying to get everything right
- fact:
  a small portion of the functionality
  gets used most of the time
  - in engineering this is called the *80-20 or Pareto rule*
- given a limited budget for quality
  where do you place your chips?

what does *total quality* mean for usability?

usability engineering
is intertwined with design

usability lifecycle

- pre-design
  - model the user, context & tasks
- design
  - participatory design: paratypes, prototypes, Wizard of Oz
  - analysis of current practice and competition
  - coordinated design & guidelines
- post-implementation
  - functional testing
  - empirical studies: lab, in situ, in the wild
- revise design for future releases

evaluation

under limited budgets
know practices with the most impact

most used practices	found to have most impact
1. visit customer site	1. iterative design
2. iterative design	2. user & task modeling
3. participatory design mockups	3. empirical studies
4. prototyping	4. participatory design
5. analysis of competition	5. visit customer site
	6. post-release follow-up

practitioners survey

outline

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participation in the class
read and understand the policies

- posted on the course website
  cs.gmu.edu/~jpsousa/classes/632
  - ask for clarification if you're confused or disagree
- help may be obtained from the TA, instructor or other students to understand the description of an assignment and any technology
- solving assignments must be your own work
- pay attention to authorship/plagiarism
  - all contributing students must be listed as authors
  - if you get "inspiration" and ideas from elsewhere make sure to cite your sources

what is expected of students

- read the materials before coming to class
- come to class on time
  - participate in class discussions
  - if you miss a class, learn the material on your own
- individually do four home work assignments
  - 2 interface evaluations and 2 coding labs
  - see assignments and due dates on schedule page in course web site
  - turn in assignments on time
- group project
- pass a closed-book midterm and final exam
- goals:
  - **learn**
  - get a B grade or better

assignments
interface evaluations

- evaluation of 2 UIs
  - a store automated checkout
  - a web application
- evaluation covered in lecture 5 (Feb 20)
  - first evaluation due Feb 27
  - goal: hands on experience with guidelines and empirical studies
- produce a 4 page report (max) for each evaluation
  - details and guidelines on course web site

labs and project

- 2 individual labs
  - must be familiar with Java
  - goal: bring everyone up to speed with coding for Android
  - Android introduced in lecture 3 (Feb 6)
  - session on Feb 13
- project
  - work in small groups
  - design and implement app on Android and Web
  - goal: hands on experience with
    - usability lifecycle

details to appear soon on course website