Comp 441 - Human-Computer Interface Design

Week 1 - 19th January 2017

Dr Nick Hayward

Course Details

Lecturer

- Name: Dr Nick Hayward

- Office: 531 Lewis Towers (WTC)

- Office hours
  - *Monday afternoon by appointment (531 Lewis Towers, WTC)*

- Faculty Page

Course Schedule

Important dates for this semester

- Class schedule = Thursday @ 7pm (9/9.15pm with no break)

- Spring break: 6th to 11th March 2017
  - *n.b. no formal class: 9th March 2017*

- Easter holiday: 13th to 17th April 2016
  - *n.b. no formal class: 13th April 2017*

- Final class: 27th April 2017
  - *Final presentation due on Thursday 27th April 2017 @ 7pm*

- Exam week: 1st May to 6th May 2017
  - *Final assessment due on Thursday 4th May 2017 @ 7pm*

Assignments and Coursework

Course will include

- weekly bibliography and reading
- weekly notes, examples, extras...

Coursework will include

- quizzes or group exercises at the end of each section (Total = 30%)
  - *based on course notes, reading, and examples*
  - *multiple-choice questions for quizzes*

- preparatory work for final assessment (Total = 40%)
  - *throughout the semester*
  - *posted to Trello group...*

- demo and report of final assessment (Total = 30%)
  - *demo due 27th April 2017 @ 7pm*
  - *report due 4th May 2017 @ 7pm*

Final Assessment

Initial overview

- combination of semester's preparatory work and final demo and report
- final demo
  - *presentation, online demo, video overview...it's your choice*
  - *anonymous peer review*
- individual work or group (max. 4 persons)
- design and develop a new interface for an existing computing product, service, application, tool or publication
  - *idea is not to invent completely new product etc...*
  - *iterate or modify to meet specified requirements*
- explain pros and cons of existing interface
- contrast old and new interface

Goals of the course

A study of the interaction between humans and computer-based systems.

Course will provide

- methods for evaluating, designing, and developing better interfaces
- focus upon interface design
  - *guidelines and examples*
  - *prototyping*
  - *testing...*
- additional details on interaction
- acquire an awareness of different design and evaluation methods
- practical and effective methods for improving interfaces and interaction

Course Resources

Website

Course website is available at
http://csteach441.github.io

- timetable
- course overview
- course blog
- assignments & coursework
- bibliography
- links & resources
- notes & material

GitHub

Course repositories available at
http://github.com/csteach441/

- weekly notes, examples, and source code (where applicable)

What is human-computer interface design?

- inherently a simple topic or concept

- simple act of inserting a mediating computer

- eg: a user wants to send a message or play some music...
  - *could use paper and pen, or play an instrument*
  - *may involve an intermediary tool*
  - *essence of design and usage bears some resemblance to HCI*
  - *related discipline of human factors*

- it is the computer that makes HCI distinctive

Adding a computer

- transforms the representation of a task and required skills

- changes our user's act of writing or playing a musical instrument
  - *flesh out a message or story*
  - *compile, contrast, splice, and manipulate our music*

- add users, become a crowd or group

- add networks and more machines

- disparate variants of computer mediation forming our concept of HCI

HCI Components

- an object, an artifact that needs engineering and implementing

- the process of design for the interaction, and the objects themselves

- the principles, theories, abstractions, guidelines, facts...surrounding HCI

We can consider these as

- engineering interaction

- designing interaction

- the actual science of interaction itself

HCI as a technology

- importance of linking engineering, design, and science together

- technologies largely derived from other technologies
  - *Brian Arthur, W. 'The Nature of Technology: What it is and how it evolves.' Free Press. 2011.*

- technologies composed of disparate parts, each technologies as well

- technologies devolve to a point where they cease to be a technology
  - *this is the point where science plays a role*
  - *eg: keyboards and electrical capacitance*

- exploitation of natural occurrence of capacitance
  - *provides HCI function of signaling known, reliable interaction*

For example, text editor keypress demo

HCI and Science

- science should continue to play an important role in the development of HCI

- development and promotion of theory

- enables further *explanatory evaluation*
  - *expand upon rudimentary A-B testing*
  - *limited without an understanding of why*

- enables *generative design*
  - *allows us to modify design based upon an understanding of interaction*
  - *adjust design according to interaction*

User-Interface Design Rules - 1

Historical Background

- advent of interactive computer systems and promotion of *good* design

- publication of user-interface design guidelines

- notable examples since early 1976
  - *1976: CHERITON and early interactive computer systems*
  - *1983: NORMAN's rules for designing user-interfaces based upon human cognition*
  - *1986: SMITH & MOSIER penned one of the most comprehensive sets of user-interface design guidelines*
  - *1987: SHNEIDERMAN's "Eight Golden Rules of Interface Design", which is now in its fifth edition.*
  - *1988: BROWN wrote a set of design guidelines, simply entitled "Human-Computer Interface Design Guidelines"*
  - *1990: NIELSEN & MOLICH suggested a set of design rules for the application of heuristic evaluation of user interfaces.*
  - *1992: MARCUS presented guidelines for graphic design in online documents and user interfaces*

21st Century Approach

- growing popularity of mobile platforms and online systems

- new and targeted user-interface guidelines

- notable examples include
  - *2005: STONE et al outlined general guidelines for user-interface design and evaluation*
  - *2006: KOYANI et al addressed design and usability guidelines specifically for research-based web design*
  - *2007: JOHNSON suggested some common user-interface design do's and don'ts*
  - *2009: SHNEIDERMAN updated his well-known tome to its current 5th edition*

Platform Guidelines

- new century saw more platform specific publications
  - *Apple, Google, Microsoft...many, many others*

- each set promotes design suggestions, preferences, rules for their given platform

- examples include
  - *Apple - UI Design Basics*
  - *Gnome - Human Interface Guidelines*
  - *Google - Material Design*
  - *Microsoft - Guidelines for Windows Runtime apps*
  - *and many, many more...*

Links & Resources

More to come later in the semester.

Video - User-Interface Design Rules - 4

Introduction to Google's Material Design

DesignBytes: Intro To Material Design

YouTube - Google's Material Design

Image - User-Interface Design Rules - 5

Microsoft's platform convergence...

MS One Design

Resolving Conflicts

- following user-interface design guidelines is not always simple

- aspirational goals of design rules and guidelines
  - *inherently general to broaden potential application*
  - *often open to broad interpretation*

- many rules will appear to be suitable for a given design situation

- applicable design rules will often appear to conflict

- application of these rules will suggest potentially different designs

- designers will need to choose their preferred design rule for a given situation...

- designers choose an order of precedence for their design

Conflicting Goals

- design problems and scenarios will often present conflicting goals

- potential for conflicting design guidelines and rules

- examples such as
  - *Powerful and Simple*
  - *High Resolution and Fast Loading*
  - *Multifunctional and Easy to Learn*
  - *WYSIWYG and Accessible for the Blind*

- designers need to address such conflicts and make informed decisions

- decisions guided, not restricted or dominated, by design guidelines and rules

Application of Laws

- consider user-interface design rules and guidelines as a set of laws
  - *instead of step-by-step recipes*

- laws interpreted and applied by experienced practitioners

- understand the basis for user-interface rules

- learn from experience the application of these rules

- focus upon an understanding of how to apply these guidelines

- understand the underlying rationale of user-interface rules

Quick Comparison: User-Interface Design Guidelines

Nielsen & Molich (1990)	Shneiderman & Plaisant (2009)
Aesthetic & minimalist design	Cater to universal usability
Consistency & standards	Design task flows to yield closure
Error prevention	Make users feel they are in control
Flexibility & efficiency of use	Minimise short-term memory load
Help users recognise, diagnose, and recover from errors	Offer informative feedback
Match between system and real world	Permit easy reversal of actions
Provide online documentation & help	Prevent errors
Recognition rather than recall	Strive for consistency
User control & freedom	
Visibility of system status	

Origin of Design Guidelines

- similarity between each set of rules is not simply due to coincidence or inheritance
  - *not the result of author's whim...*

- noticeable similarity, and close association in context and emphasis

- due to the influence of human psychology
  - *how we learn, perceive, reason, remember, process and convert intentions into actions*

- many authors of guidelines had a background in psychology
  - *this was then applied to the design of computer interfaces*

- Brown, Molich, Nielsen, Norman, and Shneiderman...
  - *applied knowledge of cognitive and perceptual psychology*
  - *improve the design of interactive systems*

User-Interface guidelines are based upon human psychology.

The world is awash with poorly designed things...

Remote controls are a prime example!

and many good things aswell...
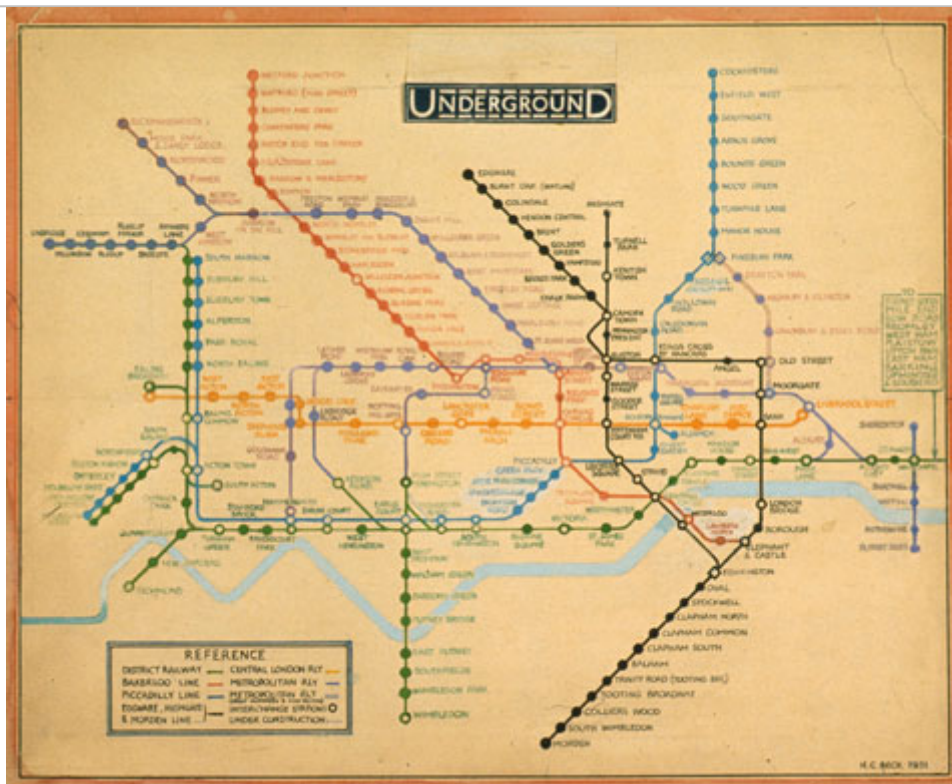
1931 London Underground Map

1931 London Underground Map

Does it really matter if things are poorly designed?

No Camping!

You may camp in the wrong place, and at the wrong time...

Image - Design Example - 4

Confusion due to poor design

Ballot Paper

2000 USA Presidential Ballot in Florida
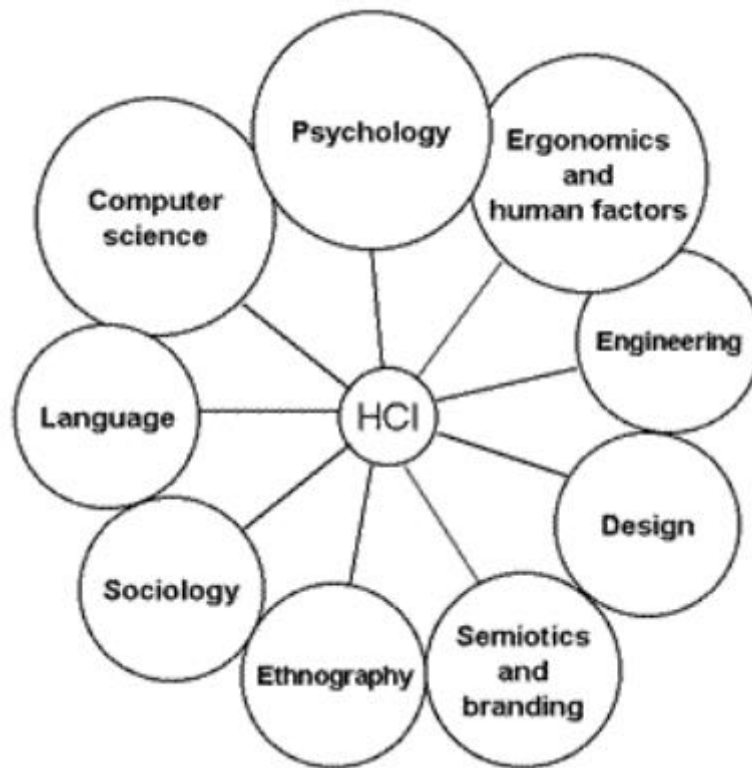
Cultural considerations...

- standardising an interface or localising...
- local issues arise from cultural misunderstanding
- Cardiff City Football Club change their colours...then change them back again
  - *Report*

This is a very interesting consideration for interface design.

More to come later in the semester.

The many fields of HCI

Field of HCI

Not just computer science and design...

HCI Components

- Guidelines
- Methods
- Models
- Principles
- Techniques
- Theories

HCI is

- Creative
- Design aware
- Evaluative

Design

- design is all around us
- art, music, culture in general
- to be good designers we have to appreciate the arts
- understand the rich history of graphic design
- its trends, products, and leading figures
- Vimeo - Milton Glaser Intro
  - *http://vimeo.com/11577085*

References

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- Cheriton, DR. "Man-machine interface design for time-sharing systems." *Proc ACM National Conference.* 1976. PP.362-380.

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- Nielsen, J. & Molich, R. "Heuristic evaluation of user interfaces." *Proc ACM CHI'90 Conference, Seattle.* 1990. PP.249-256. (NB: Updated by Nielsen, J. & Mack, RL. "Usability Inspection Methods." John Wiley & Sons, Inc. 1994.)

- Norman, DA. "Design rules based on analysis of human error." *Commun ACM.* 1983. PP.254-258.

- Norman, DA. "Design principles for human-computer interfaces." In Janda, A. ed. *Proceedings of the CHI-83 conference on human factors in computing systems, Boston. ACM Press.* 1983.

- Shneiderman, B. & Plaisant, C. "Designing the user interface: Strategies for effective human-computer interaction." 5th Edition. Addison-Wesley. 2009.

- Smith, SL. & Mosier, JN. "Guidelines for designing user interface software." *National Technical Information Service.* 1986. Technical Report ESD-TR-86-278.

- Stone, D. et al. "User interface design and evaluation." Morgan Kaufmann. 2005.