Comp 388/441 - Human-Computer Interface Design

Week 1 - 21st January 2016

Dr Nick Hayward

Course Details

Lecturer

- Name: Dr Nick Hayward
- Office: 316 Loyola Hall (LSC) & 531 Lewis Towers (WTC)
- Office hours
    - *Monday afternoon by appointment (531 Lewis Towers, WTC)*
- Faculty Page

TA

- Name: Katharine Herringshaw
- Email: kherringshaw@luc.edu

Course Schedule

Important dates for this semester

- Class schedule = Thursday @ 7pm to 9.30pm (9.15pm with no break)
- Spring break: 7th to 12th March 2016
    - *No class: 10th March 2016*
- Easter holiday: 24th to 28th March 2016
    - *No class: 24th March 2016*
- Final class: 28th April 2016
    - *Demonstration of final assessment due on 28th April 2016 @ 7pm*
- Exam week: 2nd May to 7th May 2016
    - *Final assessment report due on 5th May 2016 @ 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 = 35%)
  - *based on course notes, reading, and examples*
  - *multiple-choice questions for quizzes*
- preparatory work for final assessment (Total = 30%)
  - *end of each course section*
- demo and report of final assessment (Total = 35%)
  - *demo due 28th April 2016 @ 7pm*
  - *report due 5th May 2016 @ 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)

An Introduction to HCI - 1

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

An Introduction to HCI - 2

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

An Introduction to HCI - 3

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

An Introduction to HCI - 4

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

An Introduction to HCI - 5

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*

User-Interface Design Rules - 2

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*

User-Interface Design Rules - 3

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.

User-Interface Design Rules - 4

DesignBytes: Intro To Material Design

YouTube - Google's Material Design

User-Interface Design Rules - 5

Microsoft's convergence...

User-Interface Design Rules - 5

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

User-Interface Design Rules - 6

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

User-Interface Design Rules - 7

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

User-Interface Design Rules - 8

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	

User-Interface Design Rules - 9

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.

Design Example - 1

The world is awash with poorly designed things...

Remote controls are a prime example!

Design Example - 2

and many good things aswell...

1931 London Underground Map

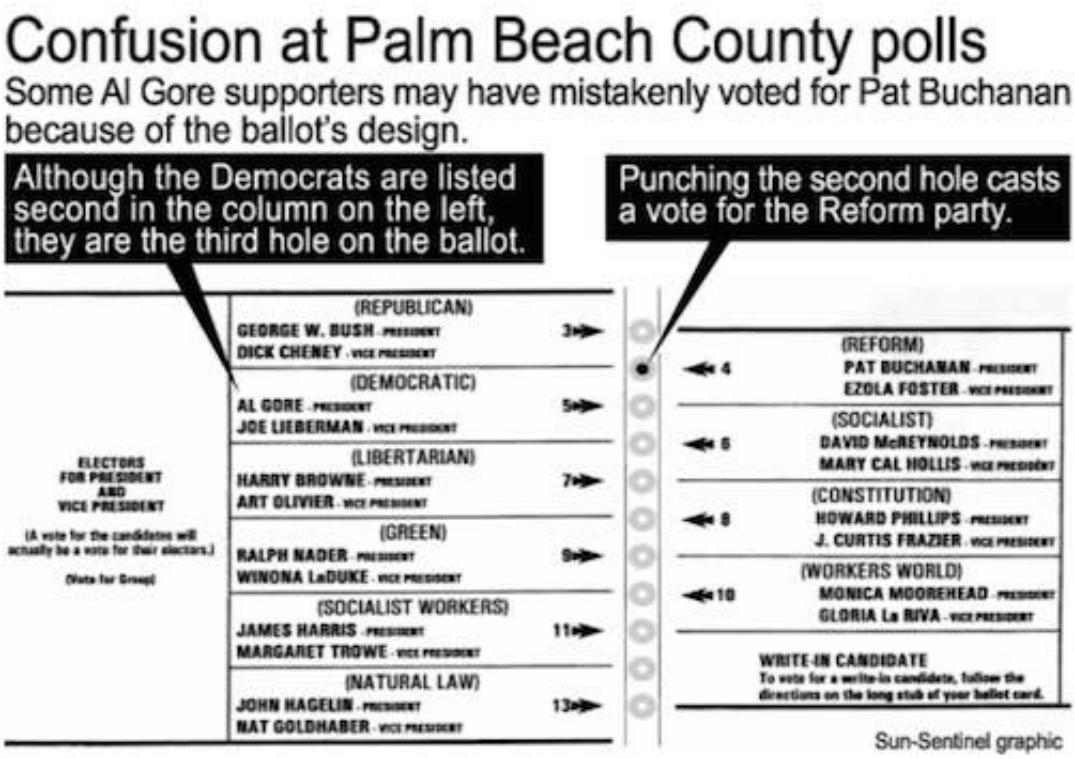
Design Example - 3

Does it really matter if things are poorly designed?

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

Design Example - 4

Confusion due to poor design



2000 USA Presidential Ballot in Florida

Cultural considerations...

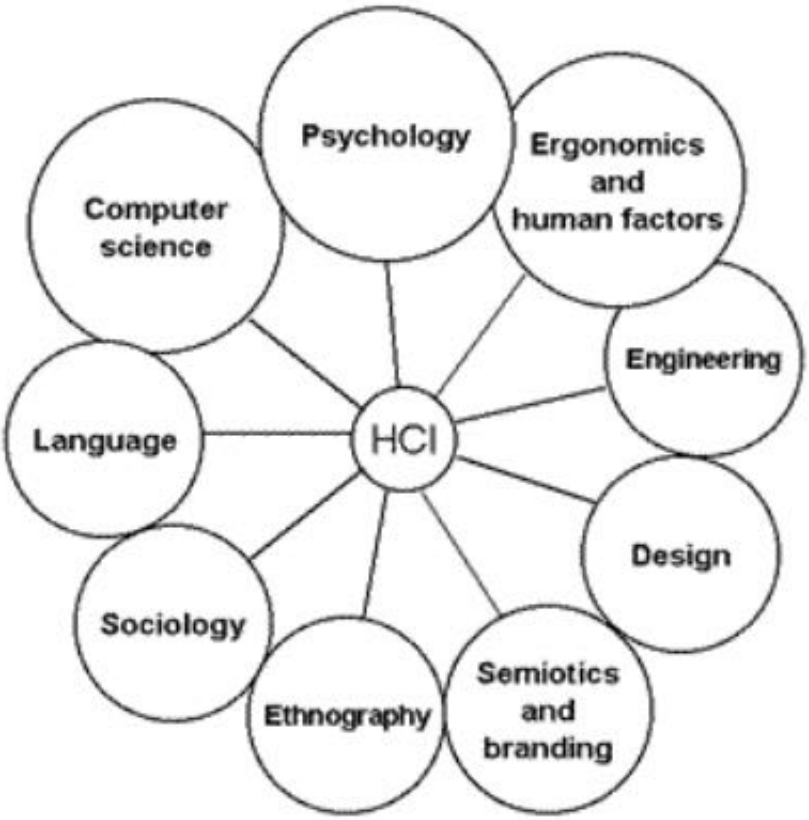
- standardising an interface or localising...
- local issues arise from cultural misunderstanding
- Cardiff City Football Club change their colours...then change them back again
    - *Report*

This is a very interesting consideration for interface design.

More to come later in the semester.

HCI - 1

The many fields of HCI



Not just computer science and design...

HCI - 2

HCI Components

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

HCI - 3

HCI is

- Creative
- Design aware
- Evaluative

HCI - 4

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)

Colour & Vision - I

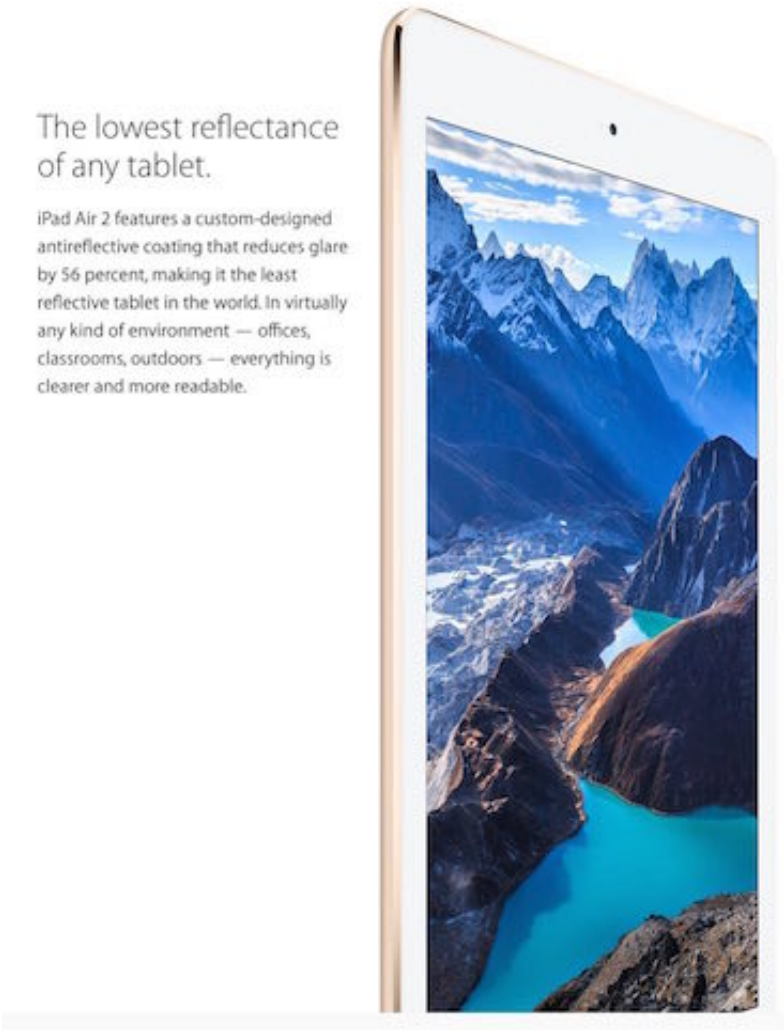
Perception

- colour perception in humans
  - *inherent strengths and weaknesses*
- a few limitations in everyday lives
- considerations as UI designers
  - *presentation of colours affects a user's ability to recognise and distinguish them*
  - *display influences a user's perception of colour*
    - eg: their monitor, screen or other viewing device
  - *user's vision optimal at detecting contrasts, edges*
    - not absolute brightness
  - *some users may have some degree of colour-blindness*

Display performance - I

A comparison of glare (source: Amazon)

Display performance - 2



Reducing glare - Apple iPad Air 2 (source: Apple)

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