Further HCI

Alan Blackwell and Luke Church
Overview of the course

• Theory driven approaches to HCI
• Design of visual displays
• Goal-oriented interaction
• Designing efficient systems
• Designing smart systems
• Designing meaningful systems (guest lecturer)
• Evaluating interactive system designs
• Designing complex systems as interaction spaces
Lecture 1:
Theory driven approaches to HCI

What is a theory in HCI? Why take a theory driven approach to HCI?
Why theory in HCI?
Installing a family printer in 2017

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?

<table>
<thead>
<tr>
<th>TCP/IP(v4)</th>
<th>Status</th>
<th>FE80:1A60:24FF:FECD:F9E3</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4 Address:</td>
<td>192.168.1.55</td>
<td></td>
</tr>
<tr>
<td>Subnet Mask:</td>
<td>255.255.255.0</td>
<td></td>
</tr>
<tr>
<td>Default Gateway:</td>
<td>192.168.1.1</td>
<td></td>
</tr>
<tr>
<td>IP Configured By:</td>
<td>DHCP</td>
<td></td>
</tr>
<tr>
<td>IP Preferred Address Method:</td>
<td>DHCP</td>
<td></td>
</tr>
<tr>
<td>DHCP/BOOTP Server:</td>
<td>192.168.1.1</td>
<td></td>
</tr>
<tr>
<td>TFTP Server:</td>
<td>Not Specified</td>
<td></td>
</tr>
<tr>
<td>DHCP Expiration Time:</td>
<td>00:23:15 (Days:Hours:Minutes)</td>
<td></td>
</tr>
<tr>
<td>WINS Server:</td>
<td>Not Specified</td>
<td></td>
</tr>
<tr>
<td>Preferred DNS Address:</td>
<td>212.50.160.100</td>
<td></td>
</tr>
<tr>
<td>Alternate DNS Address:</td>
<td>213.249.130.100</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TCP/IP(v6)</th>
<th>Status</th>
<th>FE80:1A60:24FF:FECD:F9E3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link-Local Address:</td>
<td>FE80:1A60:24FF:FECD:F9E3</td>
<td></td>
</tr>
<tr>
<td>Stateless (from Router):</td>
<td>Not Specified</td>
<td></td>
</tr>
<tr>
<td>Stateful (from DHCPv6):</td>
<td>Not Specified</td>
<td></td>
</tr>
<tr>
<td>Preferred DNS Address:</td>
<td>Not Specified</td>
<td></td>
</tr>
<tr>
<td>Alternate DNS Address:</td>
<td>Not Specified</td>
<td></td>
</tr>
</tbody>
</table>

Network Identification

- Host Name: NPICT7F9E3
- Domain Name (IPv4/IPv6): NPICT7F9E3
- Domain Name (IPv6 only): NPICT7F9E3
- Bonjour Service Name: HP Color LaserJet M452dn (C77F9E3)
- Bonjour Domain Name: NPICT7F9E3
- Bonjour Highest Priority Service: IPP Printing
### Facebook privacy in 2017

**How would you design this?**

**Is this a good UI?**

**How do we know?**

**Could we improve it?**

<table>
<thead>
<tr>
<th>Privacy Settings and Tools</th>
<th>Your activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Who can see your future posts?</td>
</tr>
<tr>
<td></td>
<td>Review all your posts and things you’re tagged in</td>
</tr>
<tr>
<td></td>
<td>Limit the audience for posts you’ve shared with friends of friends or Public?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>How people can find and contact you</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Who can send you friend requests?</td>
</tr>
<tr>
<td></td>
<td>Who can see your friends list?</td>
</tr>
<tr>
<td></td>
<td>Who can look you up using the email address you provided?</td>
</tr>
<tr>
<td></td>
<td>Who can look you up using the phone number you provided?</td>
</tr>
<tr>
<td></td>
<td>Do you want search engines outside of Facebook to link to your Profile?</td>
</tr>
</tbody>
</table>
Visual Programming in 2017

How would you design this?

Is this a good programming language?

Derived from: http://dynamoprimmer.com/en/05_Geometry-for-Computational-Design/5-6_solids.html
Theories give a *critical perspective*
Reminder of a theory:
Gestalt theory of perceptual organisation

Use of closure

```
surf uParam = (0.15..0.85..#13);
vParam = (0..1..#20);
pt = surf<1>.PointAtParameter(uParam<2>,vParam<3>);
normal = surf<1>.NormalAtParameter(uParam<2>,vParam<3>);
startPt = pt.Translate(normal,5);
vec = normal.Reverse();
endPt = pt.Translate(vec, 4);
```
Use of closure
Use of **closure**

Problematic use of **closure**
No use of **continuity**
Problematic Similarity

Do users think these are the same?
Summary of gestalt theory application

• Took a candidate design (Dynamo UI)
  • Predicted some properties that probably work well
  • Predicted some properties that might cause problems

• Over the course of the lectures you’ll see many theories like this

• How do we make use of critique?
Critique your way to a design

Iterative Design

20+ ideas

Coarse

Medium

Fine

Creative Disruption

Convergence

Divergence

Convergence

Divergence

Convergence

Derived from Pugh '56
Example of convergence

- Merge features from two candidate designs to produce a better one
- Discard ideas that poorly fit the desired outcome
Example of divergence

- Generate new designs from existing one
- Use any creative technique, e.g. ‘gestalt swapping’, ‘reduction to absurdity’ or exploring metaphors
  (e.g. what happens if we replace connectedness with similarity)

Cone.ByPointsRadii

<table>
<thead>
<tr>
<th>Start Radius</th>
<th>End Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

(Variables as emoji from Seymour, Kasibatla and Warth, 2017)
Why theory in HCI?

• We’ve interested in making interaction with computers faster, more productive, more creative, more social, more fun, somehow ‘better’.

• Theories give us ways of criticising proposed designs and toolkits for inventing new ones
Three waves of HCI

• First wave (1980s):
  • Theory from Human Factors, Ergonomics and Cognitive Science

• Second wave (1990s):
  • Theory from Anthropology, Sociology and Work Psychology

• Third wave (2000s):
  • Theory from Art, Philosophy and Design
Apollo-Soyuz controls 1975

How would you design this?

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Photo: Jonathan H. Ward 2009
First wave: HCI as engineering “human factors”

• The “user interface” (or MMI “man-machine interface”) is a specialist module, designed independently of the main system.
• Design goal is efficiency (speed and accuracy) for a human operator to achieve well-defined functions.
• Use methods from cognitive science and ergonomics to model users’ perception, decision and action processes and predict usability.
An information system

How would you design this?

Is this a good UI?

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Photo: ZeeNews India, 2017
Second wave: HCI as social system

- The design of complex systems is a socio-technical experiment
  - Take account of other information factors including conversations, paper, and physical settings
- Study the context where people work
  - Use Ethnography and Contextual Inquiry to understand other ways of seeing the world
- Other stakeholders are integrated into the design process
  - Prototyping and participatory workshops aim to empower users and acknowledge other value systems
How would you design this?

Is this a good UI?

How do we know?

Could we improve it?

Blood bag radio

Photo: Dunne & Raby, 2009
Third wave: HCI as culture and experience

- Ubiquitous computing affects every part of our lives
  - It mixes public (offices, lectures) and private (bedrooms, bathrooms)
- Outside the workplace, efficiency is not a priority
  - Usage is discretionary
  - User Experience (UX), includes aesthetics, affect,
- Design experiments are speculative and interpretive
  - Critical assessment of how this is meaningful
Specialist topics not covered here:

- Graphics and VR - elsewhere in CS Tripos
- Digital media studies - Cambridge Digital Humanities
- Game design - Anglia Ruskin University
- Social network analysis - elsewhere in CS Tripos
- Computer music - elsewhere in CS Tripos, Centre for Music & Science
- Security - elsewhere in CS Tripos
- Educational technology - Faculty of Education
- Information Systems - Judge Business School
Alternative perspectives

• Positive computing (e.g. Calvo & Peters 2014)
  • Wellbeing, flow, empathy, mindfulness, altruism

• Inclusion and accessibility (e.g. CWUAAT #1-9)
  • physical and sensory capabilities, ageing, low income and human rights

• Feminist utopianism (e.g. Bardzell 2010)
  • Diagnostic critique of hegemonic research and practice, combined with practice-led participatory processes of anticipation that amplify marginalized voices
Supervisions

• 2 supervisions after lecture 4 and lecture 8, recommend completing all the lectures before the last supervision
Textbooks

  • Practical professional advice, with good summaries of relevant theories and research methods
  • Any edition is useful, and there are many copies in Cambridge libraries
• Carroll (Ed.) *HCI Models, Theories and Frameworks: Toward a multidisciplinary science* 2003
  • Expert introductions to the different theoretical traditions of the first and second waves (noting that the third wave is more practice-based, beyond purely academic theory)
Toward original research

We look at user interfaces and software systems through the lens of programming languages. We think this approach illuminates a lot of the important properties of the system.

This is an advanced perspective, but especially relevant to Cambridge students, and to future innovation (the GUI was originally a programming language!)

See Alan’s new book *Moral Codes: Designing software without surrender to AI* for an extended version of this argument: [https://moralcodes.pubpub.org](https://moralcodes.pubpub.org)

For now, we’d love you to give us examples of systems you’d like to talk with us about during the course.
Which systems shall we talk about?

- The UI of a game
- ex-Twitter
- Moodle
- Note taking applications
- Windows
- ChatGPT
- Debugger / Notional machine