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 (guest lecturer)
- Designing meaningful systems (guest lecturer)
- Evaluating interactive system designs
- Designing complex systems
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?
How would you design this?
Is this a good UI?
How do we know?
Could we improve it?

Installing a family printer in 2017

<table>
<thead>
<tr>
<th>Network Summary</th>
<th>Shop for Supplies</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TCP/IP(v4)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status:</td>
<td>Ready</td>
<td></td>
</tr>
<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>212.105.160.100</td>
<td></td>
</tr>
<tr>
<td>Alternate DNS Address:</td>
<td>213.249.130.100</td>
<td></td>
</tr>
</tbody>
</table>

| TCP/IP(v6)      |                  |         |
| Status:         | Ready            |         |
| Link-Local Address:| FE80::1A60:24FF:FECE:F9E3 | |
| Stateless (from Router):| Not Specified | |
| Stateful (from DHCPv6):| Not Specified | |
| Preferred DNS Address:| Not Specified | |
| Alternate DNS Address:| Not Specified | |

<table>
<thead>
<tr>
<th>Network Identification</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Name:</td>
<td>NPICT7F9E3</td>
<td></td>
</tr>
<tr>
<td>Domain Name (IPv4/IPv6):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Name (IPv6 only):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonjour Service Name:</td>
<td>HP Color LaserJet M452dn (C7F9E3)</td>
<td></td>
</tr>
<tr>
<td>Bonjour Domain Name:</td>
<td>NPICT7F9E3.local</td>
<td></td>
</tr>
<tr>
<td>Bonjour Highest Priority Service:</td>
<td>IPP Printing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Network Hardware Configuration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Facebook privacy in 2017

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?
Visual Programming in 2017

How would you design this?

Is this a good programming language?

Derived from: http://dynamoprimer.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

Code Block

```csharp
surf.uParam = (0.15..0.85..#13);
vParam = (0..1..#20);
pt = surf1.PointAtParameter(uParam<2>,vParam<3>);
normal = surf1.NormalAtParameter(uParam<2>,vParam<3>);
startPt = pt.Translate(normal, 5);
vec = normal.Reverse();
endPt = pt.Translate(vec, 4);
```
Use of closure

```csharp
surf uParam = (0.15..0.85..#13);
vParam = (0..1..#20);
pt = surf1.PointAtParameter(uParam<2>,vParam<3>);
normal = surf1.NormalAtParameter(uParam<2>,vParam<3>);
startPt = pt.Translate(normal,5);
vec = normal.Reverse();
endPt = pt.Translate(vec, 4);
```
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 many theories like this

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

Iterative Design

- Coarse
  - Divergence
  - Convergence
- Medium
  - Divergence
  - Convergence
- Fine
  - Convergence

20+ ideas

1 idea

Creative Disruption

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

Grasshopper image: http://www.rhino3dhlep.com/wp-content/uploads/2010/02/jk-0x0.png
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>startRadius</th>
<th>endRadius</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?

Is this a good UI?

How do we know?

Could we improve it?

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

- The “user interface” (or MMI “man-machine interface”) is a separate 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 to model users’ perception, decision and action processes and predict usability.
An information system

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?
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
Blood bag radio

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?

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 - CRASSH
• Game design - Anglia Ruskin University
• Social network analysis - elsewhere in CS Tripos
• Computer music - elsewhere in CS Tripos
• 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 methods, with good summary of theory
- Carroll (Ed.) *HCI Models, Theories and Frameworks: Toward a multidisciplinary science* 2003
  - Expert introductions to different theoretical traditions