Human–Computer Interaction:
as it was, as it is, and as it may be
Connected, but Under Control?
Big, but Brainy?

Alan Dix
InfoLab21, Lancaster University, UK
www.hcibook.com/alan
www.alandix.com/blog

today I am not talking about ...
(but may have mentioned earlier!)

• situated displays, eCampus,
small device – large display interactions

• fun and games, artistic performance,
slow time

• physicality and design, creativity and bad ideas
+ modelling dreams and regret!!
‘my stuff bit’, but lots of other people

Athens: Akrivi, Costas, Giorgos, Yannis, +++
Lancaster: Azrina, Devina, Nazihah, Stavros, +++
Madrid: Estefania, Miguel, Allesio
Rome: Antonella, Tiziana, +++

plus the old aQtive team

some numbers
back of the envelope ... the Dix number

how much memory for full AV record of your life?
- assume ISDN quality (10Kbytes/sec)
- 30 million seconds / year => 300 Gbytes/year
- one hard disk x number of years
- but Moores Law ... size reduces each year
- max is after 2 years
- never need more than one big disk

baby born today ...
- the life of man is 3 score and ten = 70 years
- 21 tera bytes ... but with Moores Law ...
- memory the size of a grain of dust
... from dust we came ...

more back of the envelope

The Brain
- number of neurons ~ 10 billion
- synapses per neuron ~ 10 thousand
- information capacity
  - number neurons x synapses/neuron x 40 bits
  - 40bits = address of neuron (34 bits) + weight (6 bits)
  - total = 500 terabytes or 1/2 petabyte

The Web
- web archive project 100 terabytes compressed
- or Google 10 billion pages x 50K per page
  = 500 terabytes
and more ...

The Brain
- total number synapses = 100 trillion \((10^{14})\)
- firing rate = 100 Hz
- computational capacity = 10 peta-nuops / second
- nuop = neural operation - one weighted synaptic firing

The Web
- say 100 million PCs
- assume 1 GHz PC can emulate 100 million nuop / sec
- computational capacity = 10 peta-nuops / second

so what?

- **global** computing approximating raw power of **single** human brain
- does not mean artificial humans!
  - but does make you think
- we live in interesting times
  - an age pregnant for “intelligent” things
- but maybe not as we know it
  - ... AI = Alien Intelligence
using intelligence

on the desktop

onCue

onCue origins

• dot.com company aQtive
  with Russell Beale, Andy Wood, and others
• venture capital funding from 3i
  ... BEFORE dot.com explosion
• onCue principal product
  – over 600,000 copies distributed
  – 1000s of registered copies
• needed second round funding ...
  ... just AFTER dot.com collapse :-(
onCue

- intelligent ‘context sensitive’ toolbar
- sits at side of the screen
- watches clipboard for cut/copy
- suggests useful things to do with copied date

onCue in action

user selects text

and copies it to clipboard

slowly icons fade in
kinds of data

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>short text</td>
<td>search engines</td>
</tr>
<tr>
<td>single word</td>
<td>thesaurus, spell check</td>
</tr>
<tr>
<td>names</td>
<td>directory services</td>
</tr>
<tr>
<td>post codes</td>
<td>maps, local info</td>
</tr>
<tr>
<td>numbers</td>
<td>SumIt! (add them up)</td>
</tr>
<tr>
<td>custom</td>
<td>order #, cust ref ...</td>
</tr>
<tr>
<td>tables</td>
<td>...</td>
</tr>
</tbody>
</table>

issues ...
appropriate intelligence

- often simple heuristics
- combined with the right interaction

rules of standard AI interfaces

1. it should be right as often as possible
2. when it is right it should be good

good for demos
look how clever it is!
rules of appropriate intelligence

1. it should be right as often as possible

2. when it is right it should be good

3. when it isn’t right ... it shouldn’t mess you up

Hit or a Miss?

✗ paper clip
  – can be good when it works
  – but interrupts you if it is wrong

✓ Excel ‘∑’ button
  – guesses range to add up
  – very simple rules (contiguous numbers above/to left)
  – if it is wrong ... simply select what you would have anyway

what makes a system really work!
onCue appropriate?

1. it should be right as often as possible
   - uses simple heuristics:
     e.g. words with capitals = name/title

2. when it is right it should be good
   - suggests useful web/desktop resources

3. when it isn’t right it shouldn’t mess you up
   - slow fade-in means doesn’t interrupt

architecture

- high level
  - recognisers & services

- low level
  - Qbit components
  - based on status–event analysis

<table>
<thead>
<tr>
<th>events</th>
<th>happen at single moment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>e.g. button click, lighting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>status</th>
<th>can always be sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>e.g. screen, temperature</td>
</tr>
</tbody>
</table>

theoretical framework bridging human activity to low-level implementation
related systems ‘data detectors’

- late 1990s
  - Intel selection recognition agent
  - Apple Data Detectors (Bonnie Nardi)
  - CyberDesk (Andy Wood led to onCue)
- recently
  - Microsoft SmartTags
  - Google extensions
  - Citrine – clipboard converter
  - CREO system (Faaberg, 2006)
- way back
  - Microcosm (Hypertext external linkage)

using intelligence

... and on the web

Snip!t
Snip!t origins

- MSc project 2002 (Jason Marshall)
- studying bookmarking
  - focus was organisation
- exploratory study
  - found users wanted to bookmark sections
- so one evening Alan has a quick hack
  ... and about once or twice a year since
- now being used for other projects
- live system ... try it out

Snip!t

1. users selects in web page and presses “Snip!t” bookmarklet
2. Snip!t pops up page with suggested things to do with the snip (and saves it for later, like bookmark)
**Snip!t**

- Recognises various things e.g. dates

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**Issues ...**
architecture

- server-side ‘intelligence’
- recognisers + services again
- different kinds of recogniser chaining:
  - from semantics to wider representation
    e.g. postcode suggests look for address
  - from semantic to semantic
    e.g. domain name in URL
  - from semantic to inner representation
    e.g. from Amazon author URL to author name

provenance

when you have a recognised term:

- where did it come from
  - text char pos 53-67
  - transformed from Amazon book URL

- how confident are you
  - 99% certain Abraham Lincoln is a person

- how important
  - mother-in-law’s birthday
using intelligence

the bigger picture ...

the ecology of the web

on the web

on the desktop

web data

web apps

browser

local data

desktop apps

linking it together?

Semantic Web answer – providers add semantics

onCue & Snip!t – use intelligence add at point of use
• onCue & Snip!t (data detectors)
  – semantics for *source* of interaction
• text mining (crawlers)
  – semantics for *target* of interaction

• other parts of the ecology ...

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**folksonomy mining**

folksonomies (tags)

... emergent human vocabulary

but no semantics 😞

mine structure using co-occurrence
  generates ‘similar to’ and ‘sub-type’
structure on the desktop personal ontologies

user’s own connections and relationships
egocentric & ideocentric classes

hand-produced or mined
(e.g. Gnowsis)

spreading activation over ontology

long-term modification of schema relation weights
spread activation through relation instances
weaker spread through 1-m links than m-1
from use to data

using interaction to generate semantics

• selection:
  – user selects data and uses it in semantic field

• confirmation
  – if user uses inferred data assume correct

• web forms
  – type annotation from use

context in forms

but what is the relationship?
maybe semantic markup on form
  – good SemWeb style ... but rare
... or more inference ...
context in forms - inference

match terms in form to ontology
look for ‘least cost paths’
  - number of relationships traversed, fan-out


context in forms - inference

match terms in form to ontology
look for ‘least cost paths’
  - number of relationships traversed, fan-out
later suggest based on rules