Accessible, Usable, and Acceptable Technology for Older Adults

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Outline

Projects focusing on the following technologies:

• computers
  – studies on computer accessibility

• technologies for assessment
  – project on assessing nutrition
“Computers and information technologies, such as e-mail and the Internet, can help older people access information about a particular illness, medication, diet, or exercise program. The Internet can also help older people communicate with health care providers or other people with similar problems.”

- Czaja, 2001
Computers and Healthcare

For diabetes management:

<table>
<thead>
<tr>
<th>Date</th>
<th>Dosage</th>
<th>Daily Units</th>
<th>Before Breakfast</th>
<th>Before Midday</th>
<th>Before Evening</th>
<th>Before Bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2008</td>
<td></td>
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<tr>
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<td>rapid</td>
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<tr>
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<tr>
<td>08/05/2008</td>
<td>15</td>
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<tr>
<td>09/05/2008</td>
<td>10</td>
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<td>10/05/2008</td>
<td>10</td>
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</tr>
</tbody>
</table>
Computers & Accessibility

However…

…to be of benefit to older adults, the computers need to be accessible.

One barrier:
Investigating techniques to improve “point-and-click” (SPARC project)
Motivation

Compared with younger people, older adults have greater difficulties with “point-and-click” interactions

- take longer to make movements
- have more difficulties getting the cursor onto a target and keeping it steady
Investigating techniques to improve “point-and-click”

Expanding Targets

Investigating techniques to improve “point-and-click”

Proxy Targets

[Baudisch et al, 2003; Bezerianos and Balakrishnan, 2005]
Findings

For older adults

- Expanding targets - 13% reduction in time and 52% reduction in errors
- Proxy targets - 12% time increase and no effect on errors
- Both methods are intuitive
- Further work - investigating expansion with multiple targets
Understanding difficulties with double-clicks (current project)
Understanding difficulties with double-clicks

Motivation

• double-clicking has been found to be one of the most difficult mouse control tasks, with the highest error rates and the largest performance differences between age groups
  [Smith et al 1999; Laursen et al 2000]

• difficulties have been attributed to movement errors and timing errors
Motivation

• suggestions have included
  – increase the allowable double-click distance
  – increase the double-click time interval

• but still many questions
  – which methods will be most effective?
  – by how much should intervals be increased?
  – will the methods be effective over time?

• need more empirical data
Understanding difficulties with double-clicks

Study

• 12 older adults (mean = 63.9 yrs), 12 younger adults (mean = 20.8 yrs)

• Each participant completed 192 double-click interactions in a session, for 3 sessions held on different days

• Multiple attempts were allowed, and data about all double-click attempts were recorded
Understanding difficulties with double-clicks

Results (1st session):
Number of errors

- on average, older group made > twice the number of errors as younger
  - older: mean = 44.25 (~1 in 4 trials)
  - younger: mean = 19.83 (~1 in 10 trials)

- for max # of errors made by an individual, older was > 3 times higher
  - older: 101 errors (~1 in 2 trials)
  - younger: 31 errors (~1 in 6 trials)
Understanding difficulties with double-clicks

Results (1st session): Types of errors

- 66% vs. 11%
- 49% vs. 1%
Understanding difficulties with double-clicks

Results (1st session): Types of errors

11% vs. 1%
Implications

• techniques to address movement errors will have a greater impact, for both age groups
• techniques to address timing errors alone will be more beneficial for older adults than for younger adults
• further work: investigating potential methods of assistance
Outline

Projects focusing on the following technologies:

• computers
  – studies on computer accessibility

• technologies for assessment
  – project on assessing nutrition
NANA:
Novel Assessment of Nutrition in Ageing (upcoming project)
Aim
to develop an integrated toolkit to assess
– nutrition,
– physical health,
– mental health, and
– cognitive function
in older people.
Motivation

• the older population faces a high risk of malnutrition

• a number of factors are related to nutritional status, although the specific relationships are not well-understood
  – physical (e.g. mobility)
  – mental health (e.g. depression)
  – cognitive function (e.g. dementia)
Motivation

• Multidimensional assessment would enable
  – better understanding of the specific relationships, and
  – effective targeting of interventions
Challenge

- existing methods for measuring diet, cognition and physical activity
  - provide only a snapshot in time,
  - unsuitable for many older people,
  - cumbersome and labour-intensive (for end-users and researchers)
Example: Dietary Intake

- food frequency questionnaire

<table>
<thead>
<tr>
<th>FOODS AND AMOUNTS</th>
<th>AVERAGE USE LAST YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never or less than once/month</td>
</tr>
<tr>
<td>DRINKS</td>
<td></td>
</tr>
<tr>
<td>Tea (cup)</td>
<td></td>
</tr>
<tr>
<td>Coffee, instant or ground (cup)</td>
<td></td>
</tr>
<tr>
<td>Coffee, decaffeinated (cup)</td>
<td>√</td>
</tr>
<tr>
<td>Coffee whitener, eg. Coffee-mate (teaspoon)</td>
<td>√</td>
</tr>
<tr>
<td>Cocoa, hot chocolate (cup)</td>
<td>√</td>
</tr>
<tr>
<td>Horlicks, Ovaltine (cup)</td>
<td>√</td>
</tr>
<tr>
<td>Wine (glass)</td>
<td></td>
</tr>
</tbody>
</table>
NANA: Novel Assessment of Nutrition in Ageing

Example: Dietary Intake

- 7-day food diary

<table>
<thead>
<tr>
<th>Date: 23.10.1998</th>
<th>Day of Week: Saturday</th>
</tr>
</thead>
</table>

### Before Breakfast

<table>
<thead>
<tr>
<th>Food/Drink</th>
<th>Description and Preparation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange Squash</td>
<td>Robinson's Whole Orange - Sweetened</td>
<td>1 Glass</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food/Drink</th>
<th>Description and Preparation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef w/ onion</td>
<td>Homebaked cold savoury</td>
<td>3a</td>
</tr>
<tr>
<td>Tea</td>
<td>Milk Sugar</td>
<td>1 Cup</td>
</tr>
</tbody>
</table>

### Breakfast

<table>
<thead>
<tr>
<th>Food/Drink</th>
<th>Description and Preparation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato</td>
<td>Homebaked cold savoury</td>
<td>1 Cup</td>
</tr>
<tr>
<td>Syphoo Milk</td>
<td>Skimmed White</td>
<td>1 Teaspoon</td>
</tr>
</tbody>
</table>

### Lunch

<table>
<thead>
<tr>
<th>Food/Drink</th>
<th>Description and Preparation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grilled Steak</td>
<td>Micro waved Deep Fried in Oil (Crisp &amp; Dry)</td>
<td>6oz</td>
</tr>
<tr>
<td>Chips</td>
<td></td>
<td>7a</td>
</tr>
<tr>
<td>Peas</td>
<td>Birds Eye (Frozen)</td>
<td>12a</td>
</tr>
<tr>
<td>Bread</td>
<td>Local Bakery White Enriched</td>
<td>5 Slice 3 Thick</td>
</tr>
<tr>
<td>Apple Pie</td>
<td>Homemade White Sprinkled on</td>
<td>3B</td>
</tr>
<tr>
<td>Sugar</td>
<td></td>
<td>1 Teaspoon</td>
</tr>
<tr>
<td>Custard</td>
<td>Birds - made with Skimmed milk</td>
<td>Small fruit dish</td>
</tr>
</tbody>
</table>

Image: http://www.srl.cam.ac.uk/epic/images/
NANA: Novel Assessment of Nutrition in Ageing

Multi-disciplinary team

- Tim Adlam (Engineering, BIME)
- Arlene Astell (Psychology, St. Andrews)
- Elizabeth Williams (Nutrition, Sheffield)
- Faustina Hwang (HCI, Reading)
Toolkit development

• involve end-users throughout to address issues relating to ease of use, acceptability and motivation

• possibilities include use of
  – non-intrusive sensors in the home
  – digital photography
  – digital paper
Summary

• Improving computer accessibility for older adults
  – investigating techniques to improve “point and click”
  – understanding difficulties with double-clicks

• NANA: Novel Assessment of Nutrition in Ageing
Acknowledgements

• Staff and volunteers at Age Concern, Berkshire
• Study participants
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  – Nitin Williams
  – Helen Batson
  – Nic Hollinworth

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• Interactive Systems Research Group & School of Systems Engineering, University of Reading