Contentment & Communicating Context

Matt Jones
Future Interaction Technology Lab
University of Wales, Swansea.
always@acm.org
www.undofuture.com
Context & Services

- Your experiences?
- ...
- ...
Humans are really good at it, eh?

- Dialects
- Sunny Swansea
- ...
- Lucy Suchman
  - “Plans and Situated Actions”
Computers & Context

• Context-adaptation & mobile/ ubicomp systems (Abowd & Mynatt 2000)
  – Where
  – When
  – What
  – Why

“Context is a slippery notion”
(Paul Dourish)
Aside

• Context *Adaptation* vs. Context *Accommodation*
• *All* mobile systems should strive to ‘fit in’
Computers and Context

• My iPod

• Why are things hard to do?
  – Imperfect sensing (input)
  – Imperfect models; matching; modification (process)
  – Imperfect communication (output)
This workshop can help!

– perfecting sensing (input)
– perfecting models, matching, modification (process)
– perfecting communication (output)
Communicating context

• “Notify a consumer as they enter a shopping center that an office supply store’s back-to-school sale is over in two hours; …
• Send tourists brief multimedia descriptions in the Washington, D.C. Mall as they enter each monument’s surrounding are; …
• Inform lottery players that they are close to the ‘pot of gold at the end of the rainbow’ and they should look for someone dressed as a leprechaun”

(Munson and Gupta 2002)
Trying to be more ecological – the *onTrack* System

• Music continuously adapted
Testing concept

- Virtual world – hospital grounds
- Lab-based
- Participants had to navigate from start-to-end points along path
- Path defined in terms of series of audio beacons
  - Stereo panning; volume adjustments w.r.t beacons
- Time taken, route etc recorded; task-load measured at end.
- 25 participants
  - 13 using audio system
  - 12 non-audio with paper map to assist (control)
### Task completion rates/ times

<table>
<thead>
<tr>
<th>Condition</th>
<th>Task success rate</th>
<th>Mean successful task time (std. dev) secs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontrack</td>
<td>32/38 (84%)</td>
<td>117.8 (110.8)</td>
</tr>
<tr>
<td>Map</td>
<td>28/32 (87%)</td>
<td>105.8 (57.1)</td>
</tr>
</tbody>
</table>

Table 1: Successful completion performance. 5 tasks were not logged due to a software failure.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Route A</th>
<th>Route B</th>
<th>Route C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontrack</td>
<td>184.7(164.1)</td>
<td>57.1(13.9)</td>
<td>124.6(39.6)</td>
</tr>
<tr>
<td>Map</td>
<td>124.5 (51.2)</td>
<td>63.9(22.9)</td>
<td>120.2(69.1)</td>
</tr>
</tbody>
</table>

Table 2: Successful mean completion times in seconds (and standard deviations) for the three routes. Route presentation orders were randomised for each subject.
<table>
<thead>
<tr>
<th>Task-load dimension</th>
<th>Ontrack mean (std. dev)</th>
<th>Map mean (std. dev)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental effort</td>
<td>7.3 (2.3)</td>
<td>5.9 (2.4)</td>
</tr>
<tr>
<td>Perceived success</td>
<td>8.2 (1.5)</td>
<td>7.9 (1.5)</td>
</tr>
<tr>
<td>Performance satisfaction</td>
<td>8.1 (1.3)</td>
<td>7.6 (2.6)</td>
</tr>
<tr>
<td>Confidence in ability to complete tasks</td>
<td>8.4 (1.6)</td>
<td>8.0 (1.9)</td>
</tr>
<tr>
<td>Frustration level</td>
<td>8.7 (1.5)</td>
<td>7.1 (2.4)</td>
</tr>
<tr>
<td>Overall task load rating</td>
<td>8.1 (1.6)</td>
<td>7.3 (2.3)</td>
</tr>
</tbody>
</table>

Table 3: Subjective task load ratings for Ontrack and control. Normalised rating scale: 1 (least positive) to 10 (most positive rating).
• Map participants could refer to a map and often did so; *OnTrack* users only had music to guide them.
• Surprising were so successful (and fast)…
• Variations in time; but less so in paths; music has potential to lead…
Navigation Traces
In-wild prototype

• Version 1 (nov. 2004)
  – Pocket PC, SysOn GPS
  – GPS errors/ non-signal
  – OK but not very robust

• Version 2 (aug. 2005)
  – GPS + electronic compass
  – Under testing…
Related work

• Speech cues
• Non-speech cues, spatial audio
  – AudioGPS (Holland et al, 2002), GuideShoes etc
• Minimal Attention Interfaces (Pascoe et al, 2000)
  – Hands/eyes free
• Ambience
  – On periphery; move to centre when need you to attend
• Management of context communication
Ongoing work

- Coping with uncertainty…
  - … imperfect location data
  - … moving targets
  - … profile/ context matches
- Audio ‘vocabulary’
  - C.f. work at Glasgow on earcons
- Applications
  - Tourist service
  - Rendezvous
  - Gaming
  - Child monitoring
Navigation via Continuously Adapted Music
Nigel Warren, Matt Jones, Steve Jones
Department of Computer Science
University of Waikato, Hamilton, NZ

ABSTRACT
Listening to music on personal, digital devices while walking is an enjoyable, everyday activity. This paper explores a
subsystem for exploiting this pleasure to enhance location awareness via music. Our prototype, Ondoor, continuously adapts audio, modifying the spatial balance and volume to localise to their target destination. A rigorous lab-based evaluation has demonstrated the approach's efficacy, users were able to complete tasks within a reasonable time and with an acceptable error rate. These findings, we are building a pocket-sized prototype for further testing.

Author Keywords
Mobile systems, navigation, audio, ambience, GPS.

ACM Classification Keywords
H.5.5. Information interfaces and presentation (i.e., HCI); User-centered computing.

INTRODUCTION
Portable personal audio players are essential pieces of
close equipment. While such devices have been available for over a quarter of a century, recently digital versions
have emerged. These provide powerful-performance processing and integration with other computing resources via closed
and wireless connections. Commercial systems are exploiting these resources providing, in turn, enables
multiple applications for the creative use of auditory information to complement the audio-visual.

Our interest, however, is in the types of information that can
be presented to a listener using only the music that is
played on their device. One approach is to adapt the
music to provide location and context

We have built a prototype system - Ondoor - to help
pedestrians navigate in a large, busy environment. The system is illustrated in the next-section.

Find out more

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As he is going to meet a friend in a restaurant across town.
After stepping from the main corner closest to the
restaurant, he puts on his headphones and starts his
personal music player to have a new song. He's just
downloaded it. At the same time, he sees on the map
music begins to fade, the volume decreasing; he looks
around and notices he's just walked past his destination.

The remainder of the paper is structured as follows. First
we outline alternative approaches to existing systems in
the area of mobile navigation. Next, we describe the
implementation of the Ondoor system to enable
exploitation of the audio interface. The experimental
methodology and results are then discussed. Finally, we
conclude by outlining our ongoing work aimed at further
understanding the role of the approach and the implementation on a pocket-sized device using readily available technology.

RELATED WORK
Commercial navigation systems currently use spoken text to
provide route guidance. In the research literature, there has
also been interest in using diverse, meaningful clips of
natural speech to convey directional information. Spatial
audio - where the listener's perception of the location of the
digital source is manipulated - has been used to convey
information with such techniques. e.g., a personalised voice
retrieved from the listener's local environment, for example
the listener's local environment, for example

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