Sweep-Shake: Finding Digital Resources in Physical Environments

Simon Robinson
Parisa Eslambolchilar
Matt Jones

Future Interaction Technology Lab
Swansea University, UK
Overview

• Motivation
• Background → Our approach
• Sweep-Shake system
• Exploratory trial → User study
• Results
• Conclusions
Motivation

- Finding geo-tagged information about the places around you
- Engaging with surroundings: Often need to divide attention
- No reliance on screen for initial discovery
  - Lightweight, casual interaction
  - Filtering of information
Background

- Spatial Information Appliances (Egenhofer [4])
- Point to Discover (Fröhlich et al. [5], Simon et al. [15])
- Bearing-based selection (Strachan, Murray-Smith [16])
- Vibrotactile waist belt (Van Erp et al. [18])
- Earcons (Brewster et al. [2])
- AudioGPS (Holland et al. [7])
Our approach: Sweep-Shake

- Haptic feedback for direction
- Gestures to refine selection
- Heads-up
Mode 1: Discovering places (browsing)

- Sweep the device to scan the area
- Feedback felt when pointing at a target
  - Direction
  - Size
- Press button to explore further
Mode 2: Filtering information

- Simple gestures
- 4 categories
- Small pointing movements to filter
- Once found, press to view (on UMPC)
Proposed benefits

• Seeking of real-world digital resources without looking at a screen

• Encourage interaction with the surroundings rather than the device
Initial exploratory trial

- 4 participants, explore campus at will
  - Verbal feedback
  - Observed behaviours
- Positive feedback
  - Enjoyed interaction method
  - Some used as background cue: Heads-up
  - Less interested in audio/video content
  - Save for later?
User study

• Focus on discovery and selection process: simulated targets
  • Scan device to discover
    • Press button to select
  • Search for filtered information types
    • Find and select each one
  • Repeat

• Compare to visual system...
Prototype 2: Visual

- Visual analog of haptic
- Rotating aerial view
- Same method for scanning
- Touch for filtering
- Heads down
User study: Method

• 32 participants
• 6 targets
• Fixed participant location

• Between groups, gather:
  • Success rate; time taken; false positives
  • Observed behaviours; verbal feedback
## Results: Discovering targets

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<th>Visual</th>
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<tr>
<td>Targets found (of 6)</td>
<td>75%</td>
<td>97%</td>
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<td>Time to select (secs, per target)</td>
<td>16.5 (sd: 22.3)</td>
<td>8.8 (sd: 5.6)</td>
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<td>Overall time (secs)</td>
<td>105.2 (sd: 32.3)</td>
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Time taken:

![Time taken graph showing comparison between Haptic and Visual systems for different targets.](image-url)
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Verbal feedback

- Liked haptics
  - ‘fun’, ‘easy’
- Saw value in heads-up interaction
  - ‘More helpful than my GPS’
  - ‘Guide me’ mode requested
- But: can be hard to interpret
  - Feedback and mode clarification needed
Conclusions

• Haptic feedback can offer heads-up interaction

• Users appreciated haptic feedback

• Issues with usability
  • Work needed on modes
Conclusions

- Haptic not yet on-par with visual
  - Lack of familiarity
  - Getting closer...

- Visual has its own issues
  - False positives similar to haptic
Ongoing work

• Haptic feedback in other situations
  • Find objects instead of place information
    • Navigation instead of sat-nav
  • Multi-level hierarchy
• Completely on-phone
  • Low-cost applications - no specific hardware
• Projector for visual content
Thank you

• Questions?

• cssimonr@swan.ac.uk

• http://cs.swan.ac.uk/negotiatedinteraction

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