Increasing Engagement with the Real World: Multimodal Techniques for Bridging the Physical-Digital Divide

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My research

- My goal: develop methods to lessen the impact of interaction with located information
- Many physical-digital interaction methods put barriers between the user and their surroundings
- I want to encourage interaction with the surroundings, rather than the device they’re using
Background

- Spatial Information Appliances [Egenhofer, 1999]
- AudioGPS [Holland et al, 2002]
- Point to Discover [Fröhlich et al, 2006, Simon et al, 2007]
Heads-up interactions

• Allow you to look at the places around you when interacting with devices

• Already some options; not always ideal
More direct interaction

Point-to-Discover project: http://p2d.ftw.at
Approach

• Developing methods for in situ exploration of geolocated content without unnecessarily interfering in the user’s normal behaviour

• Research progress:
  • **Minimal visual interaction:** less-visual interaction
  • **Tactile feedback:** simple vibrotactile feedback
  • **Multi-level interaction:** filtering content via haptics
  • **Dynamic content:** pedestrian navigation
Minimal feedback

- Using simple gestures to tag areas of interest while mobile
- Point to select; tilt to refine distance
- Simple interaction: gesture, then continue as normal
How much detail is necessary?

- How accurately can people specify a location with different levels of feedback?
Results

- Aerial view most accurate; variability (but also speed) increases for lower-resolution interfaces
Minimal tactile feedback

- Discovering interesting content by using the device to scan surroundings
Tactile feedback

- Feedback is felt when pointing at places of interest:
  - Direction
  - Quantity
Using while moving

- Comparing to visual: 100% of targets found on both systems
- Similar times taken
- More precision needed
Can we be more precise?

- Original distance refinement was removed due to complexity
- Another alternative is by content type
- Previous work on audio hierarchies shows a possible approach...
Tactile filtering

• Simple gestures
• 4 categories
• Small pointing movements to filter
• Once found, press button to view
Evaluation

• Successful usage in initial exploratory trial (while moving)

• When standing still, not as good:
  • Mode confusion
  • High variance

• However, usage for navigation suggested by several participants
Navigation while walking

- Mobile pedestrian navigation is hard
- Requires environment model for turn-by-turn directions
  - Car navigation shows people switch off concentration

- Is it feasible to offer pedestrian navigation without directions?
Pedestrian navigation

- Dynamic feedback to give an idea of the path choices available
Results

- Everyone found the goal
- Very little stopping
- Walking rates not significantly different
- Dynamic feedback allowed more freedom in route choices
What’s next

- So far, techniques considered have been non-visual or semi-visual
- I’d like to consider other modalities for a more general view
- Visual options are increasing: pico projectors could offer augmented interactions in situ
Contributions

• Development of low-attention methods for in-situ information browsing and discovery
  • Removing barriers that mobile devices can put between the user and their surroundings
  • Allow interaction with both static and dynamic content

• Designing and developing mobile prototypes; using these to offer guidelines for future engaged interaction systems
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