

# 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?



1



2



3

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

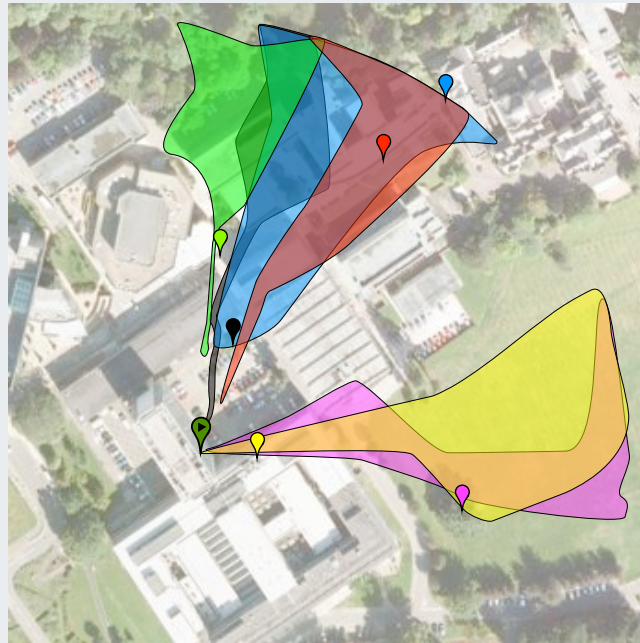


# Results

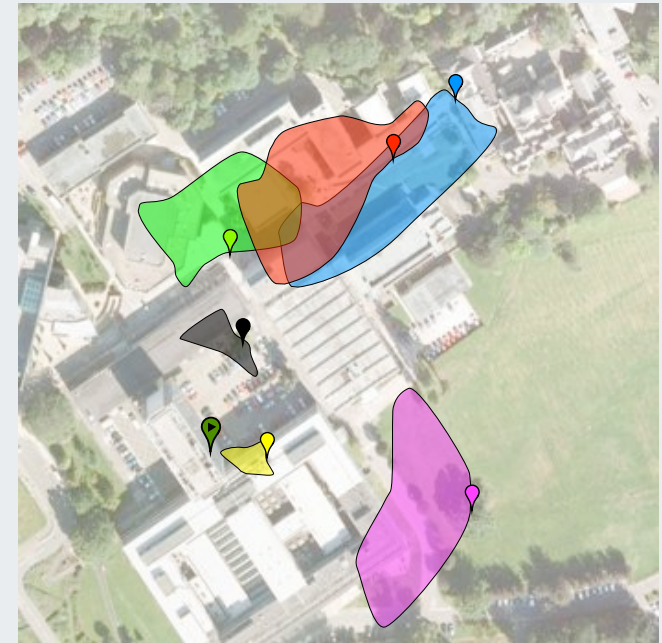
- Aerial view most accurate; variability (but also speed) increases for lower-resolution interfaces



1

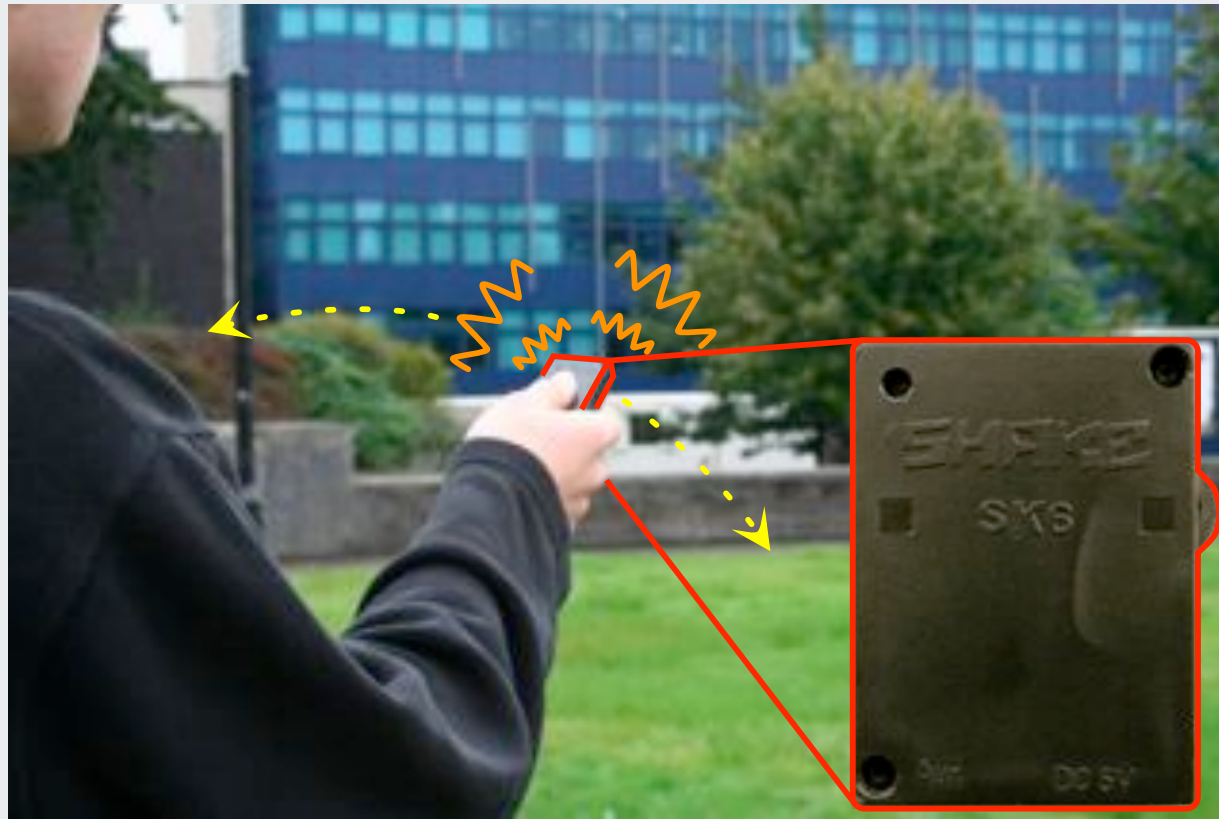


2



3

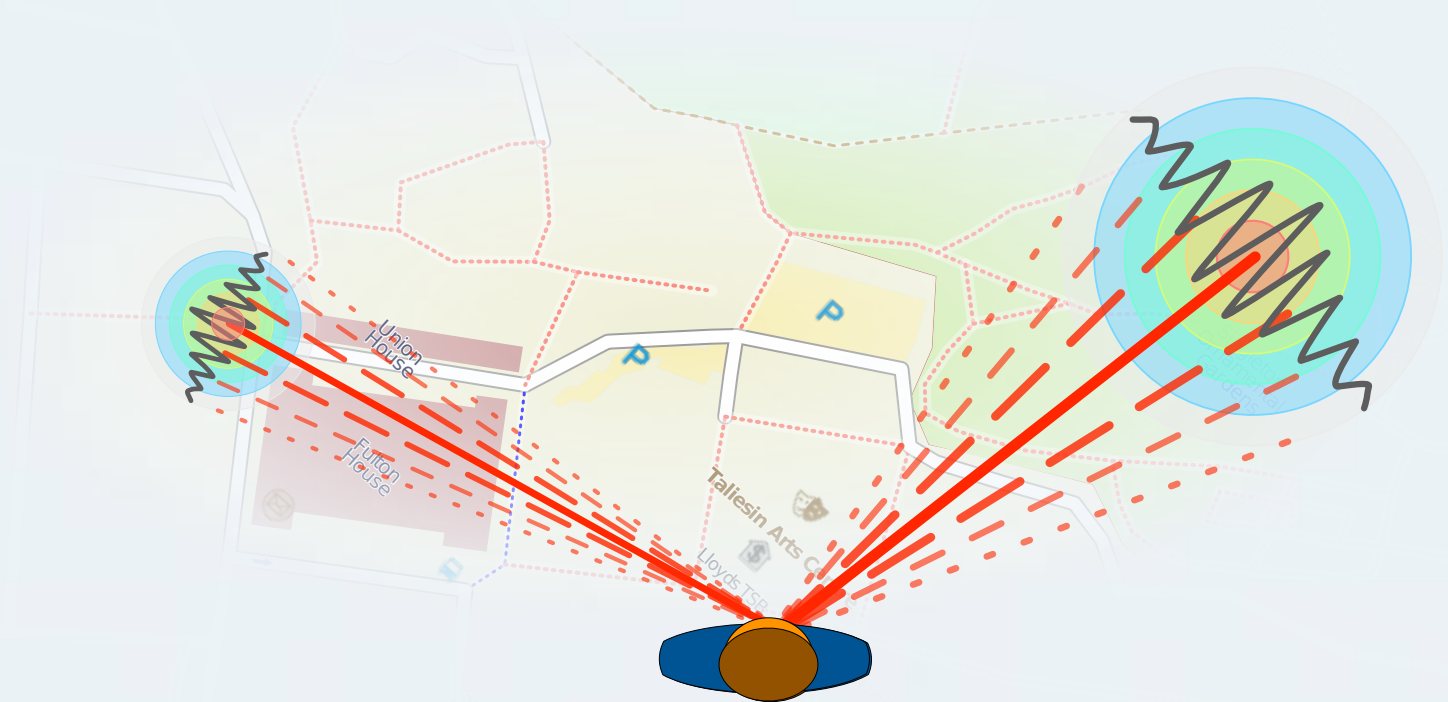
# Minimal tactile feedback



- 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

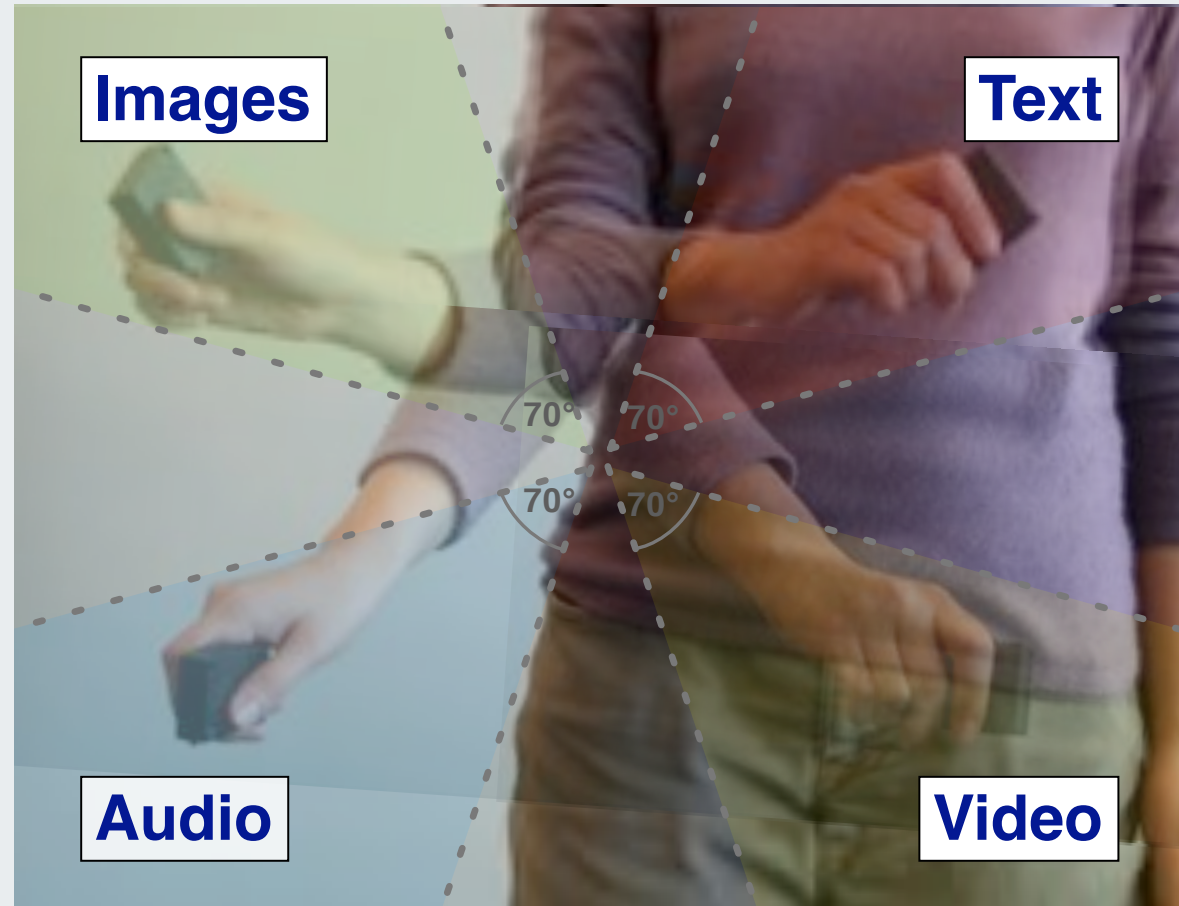
- Comparing to visual: 100% of targets found on both systems
- Similar times taken
- More precision needed

# 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

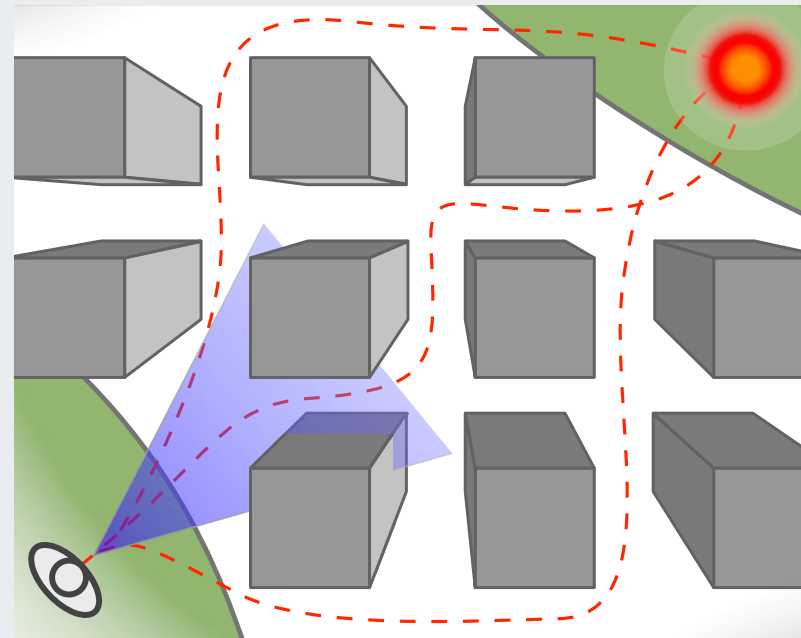
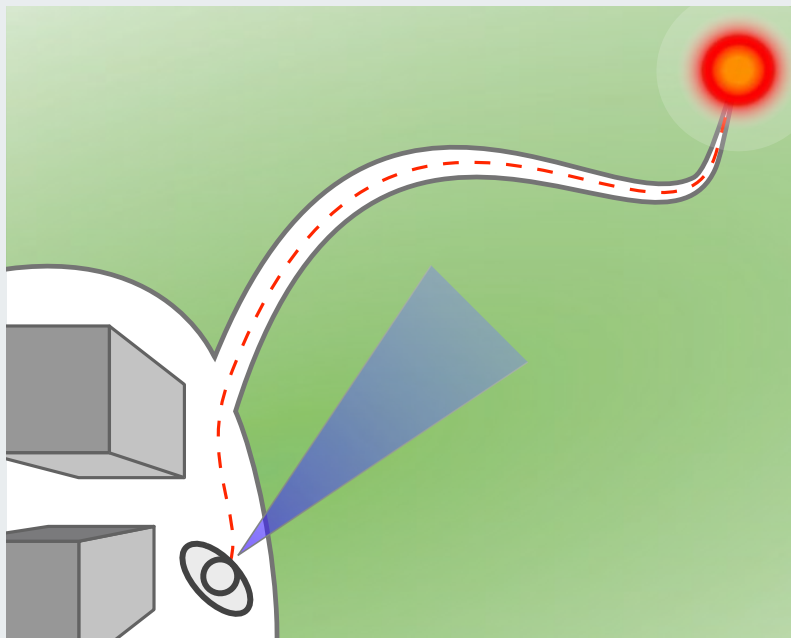
# Navigation while walking

- 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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