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

Aims:

1 Supporting in-situ exploration and filtering of geolocated content without unnecessary interference in people's everyday behaviour

2 Using multimodal feedback to help break the barriers between the digital and physical worlds we live in

Casual discovery

▶ Exploring the effect of different levels of feedback on users' pointing and targeting accuracy

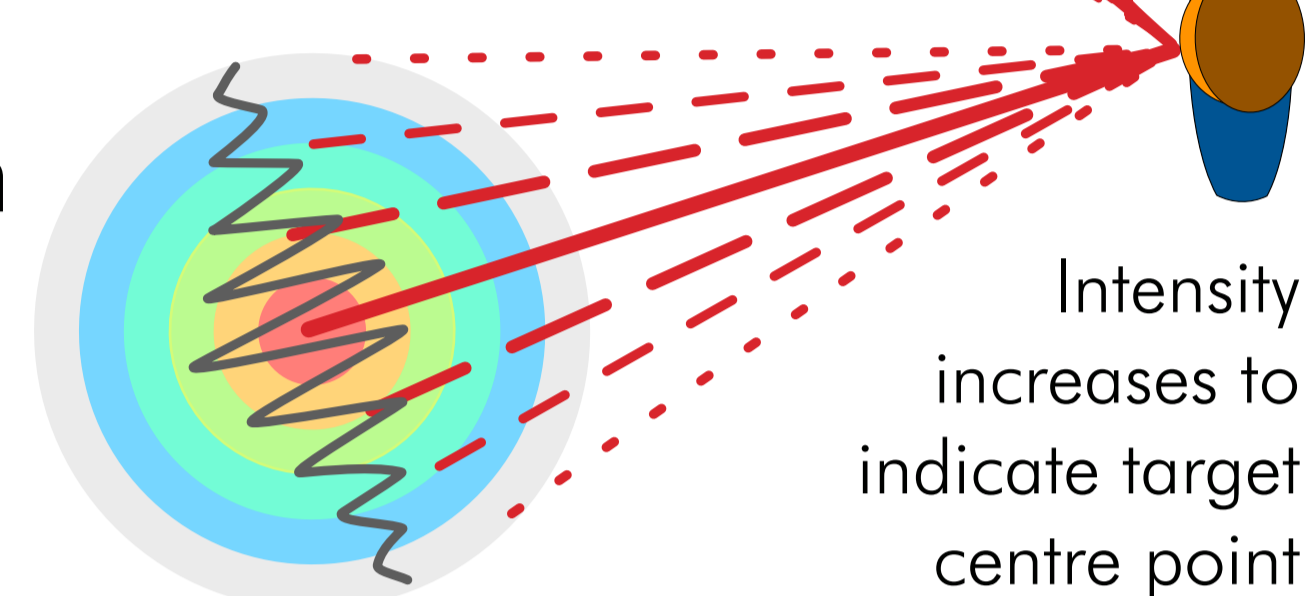▶ Point to indicate direction; tilt to refine distance and mark target

Point-and-tilt to interact

Increasing feedback resolution

Three separate interfaces

4 locations marked

100m / 75m / 50m / 25m / 0m

2 locations marked

Results: Aerial view most accurate for targeting, but low-attention interfaces can also offer benefits in some cases

Publications:
S. Robinson, P. Eslambolchilar, M. Jones, "Point-to-GeoBlog: Gestures and Sensors to Support User Generated Content Creation". In Proc. MobileHCI '08, 197–206
S. Robinson, P. Eslambolchilar, M. Jones, "Exploring Casual Point-and-Tilt Interactions for Mobile Geo-Blogging". Pers. and Ubiquitous Comput. (In press)

Low-attention browsing in-situ

▶ Comparing visual and vibrotactile feedback for efficiency, accuracy and speed in target discovery and selection

▶ Point and sweep to browse; feedback felt when on-target

Feedback felt is relative to available content

Intensity increases to indicate target centre point

Sample scanning behaviours

Results: Tactile feedback effective; visual can cause false positives. Similar performance between systems in ⅔ cases

Publications:
S. Robinson, P. Eslambolchilar, M. Jones, "Evaluating Haptics for Information Discovery While Walking". In Proc. BCS HCI '09, 93–102
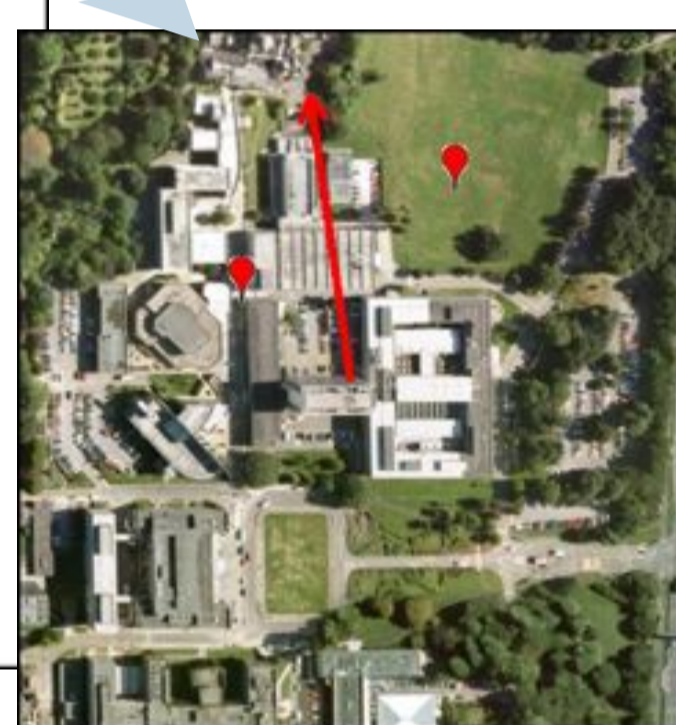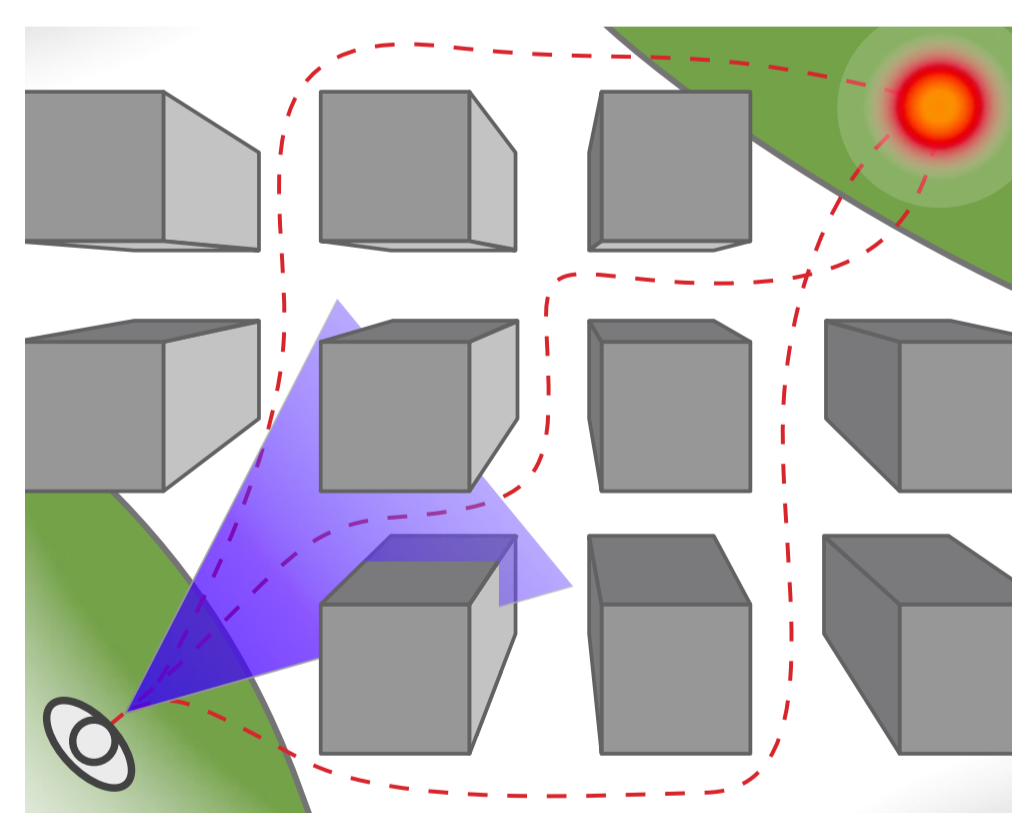
Vibrotactile navigation

Narrow feedback zone when path choices are restricted

Wider area when more possibilities are available; aims to prompt exploration

▶ Exploring low-attention tactile feedback for pedestrian rendezvous and navigation

▶ Navigation: comparing speed and accuracy of fixed-width versus dynamic feedback

Results: Users successfully fused physical and digital to navigate to an unknown target
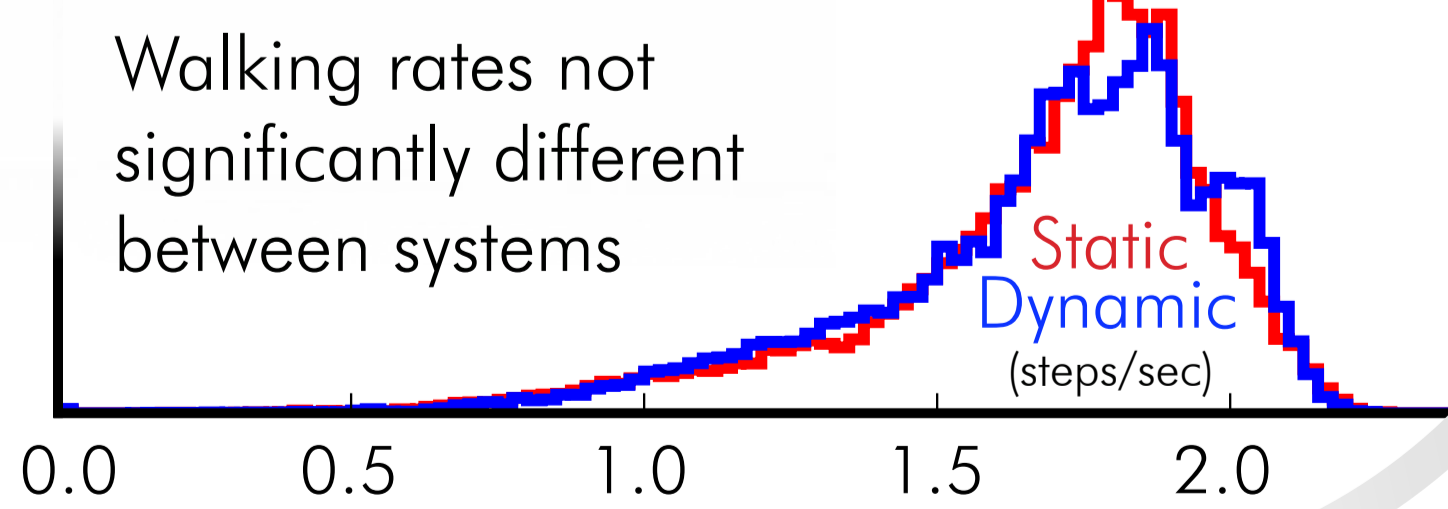
Walking rates not significantly different between systems

Static / Dynamic (steps/sec)

0.0   0.5   1.0   1.5   2.0

Publications:
S. Robinson, M. Jones, P. Eslambolchilar, "I Did It My Way: Moving Away from the Tyranny of Turn-by-Turn Pedestrian Navigation". In Proc. MobileHCI '10
Collaborative work on pedestrian rendezvous: J. Williamson, S. Robinson, C. Stewart, R. Murray-Smith, M. Jones, S. Brewster, "Social Gravity: A Virtual Elastic Tether for Casual, Privacy-Preserving Pedestrian Rendezvous". In Proc. CHI '10
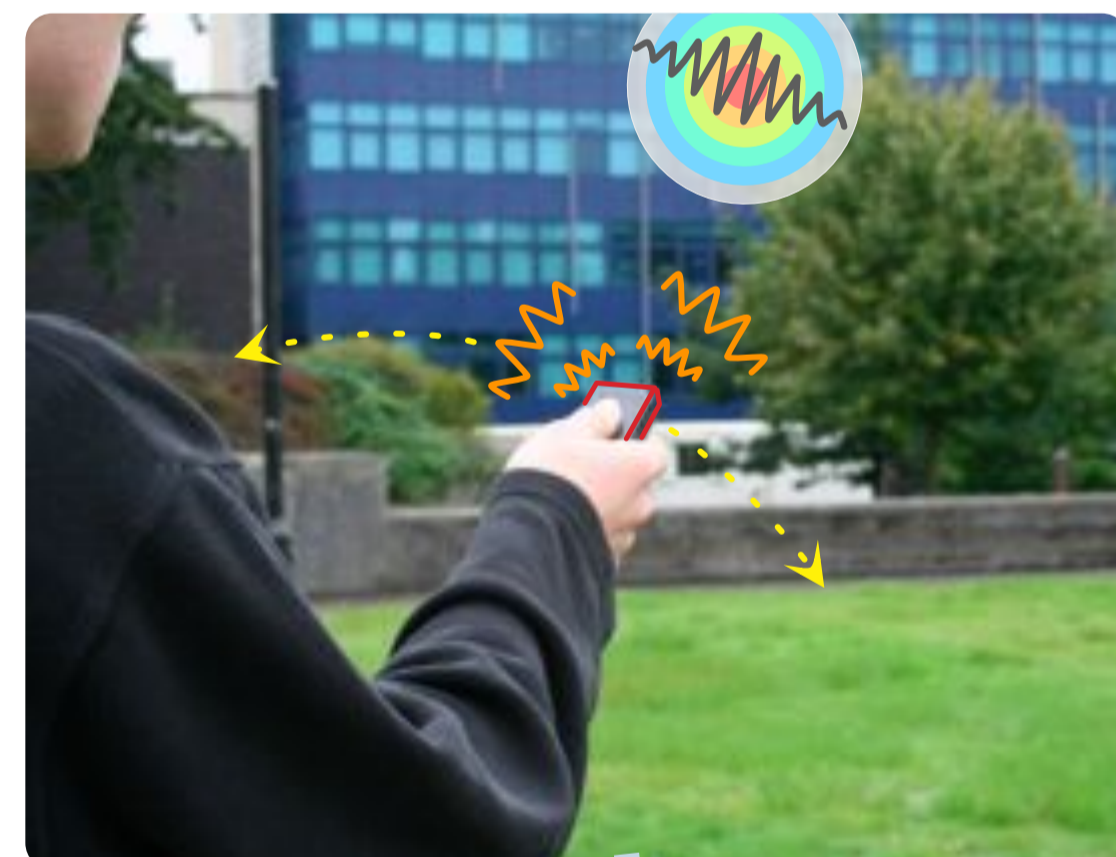
Haptic filtering

▶ Investigating content filtering via haptic feedback and small, unobtrusive hand gestures

▶ Feedback felt when requested content type is present; aims to maintain real-world engagement
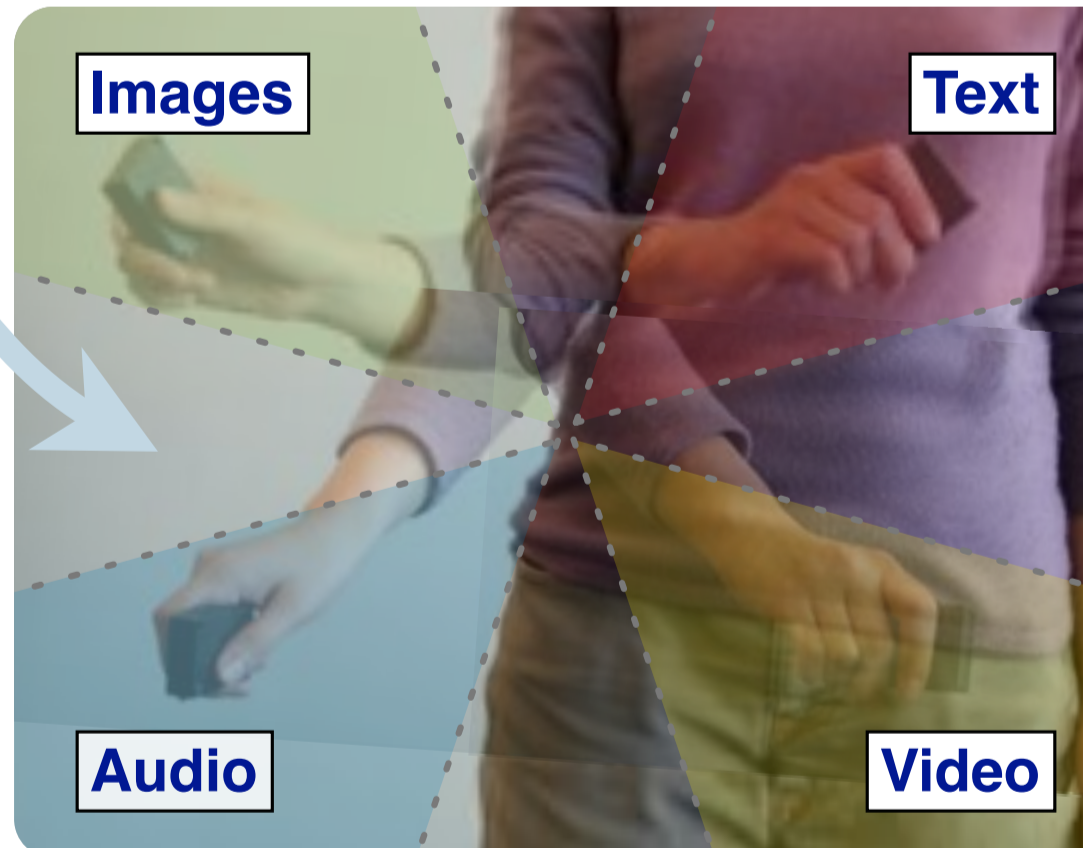
Sensor pack for 3-axis movement data

(acc, mag, gyro)

When target is found, zooming filters geotagged information into content types

zoom in

Images / Text / Audio / Video

Results: Haptic filtering successful with low level of familiarity. Visual more efficient when standing still; tactile offers benefits while moving

Publications:
1. S. Robinson, P. Eslambolchilar, M. Jones, "Sweep-Shake: Finding Digital Resources in Physical Environments". In Proc. MobileHCI '09, 85–94. Awarded best full paper

What's next?

? Pico projectors offer huge potential for real-world mobile augmented reality

? Projection for collaboration, browsing and sharing

Publications:
S. Robinson, M. Jones, "HaptiProjection: Multimodal Mobile Information Discovery". In Ubiprojection 2010 workshop
M. L. Wilson, S. Robinson, D. Craggs, K. Brimble, M. Jones, "Pico-ing into the Future of Mobile Projector Phones". CHI '10 WIP

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