Computer Science

Physical information spaces, in context

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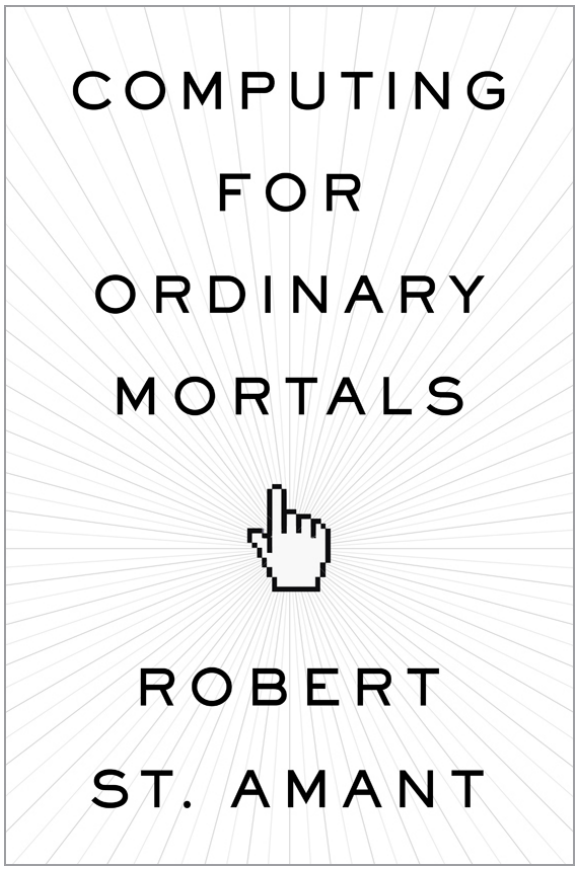
Shameless self-promotion



Oxford University Press, 2012

"Computing isn't only (or even mostly) about hardware and software; it's about the ideas *behind* the technology."

Pointing at Responsive Objects

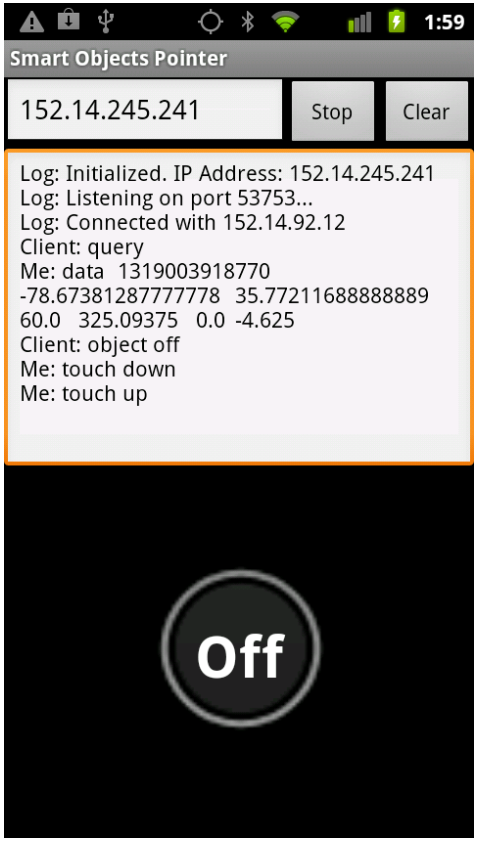
Yanglei Zhao (M.S., 2011), Arpan Chakraborty
KyungWha Hong, Shishir Kakaraddi (M.S., 2012)

"Responsive" objects

- Physical objects in a large-scale environment
  - Visible location and extent
  - Networked
  - Can provide data or be controlled
- Selection by pointing
  - Purpose-built glove
  - Mobile phone

What might we point at?

- Real objects
  - *"Is my building in that direction?"*
    "What's the status of that alarm?"
    "Replay that camera's video feed."
- Virtual objects
  - *"What's that construction site for?"*
- Interactive objects
  - *"Turn off those lights."*
    "Lock those doors."

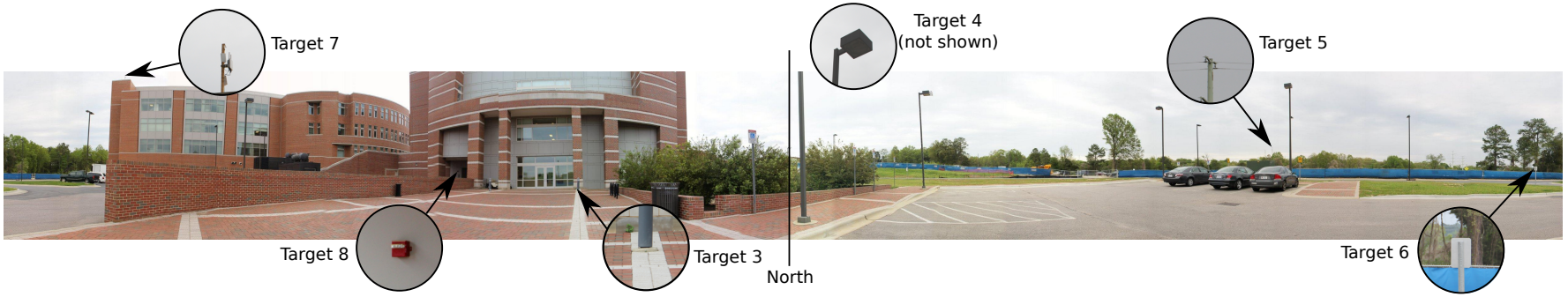


Different pointing techniques

Camera condition

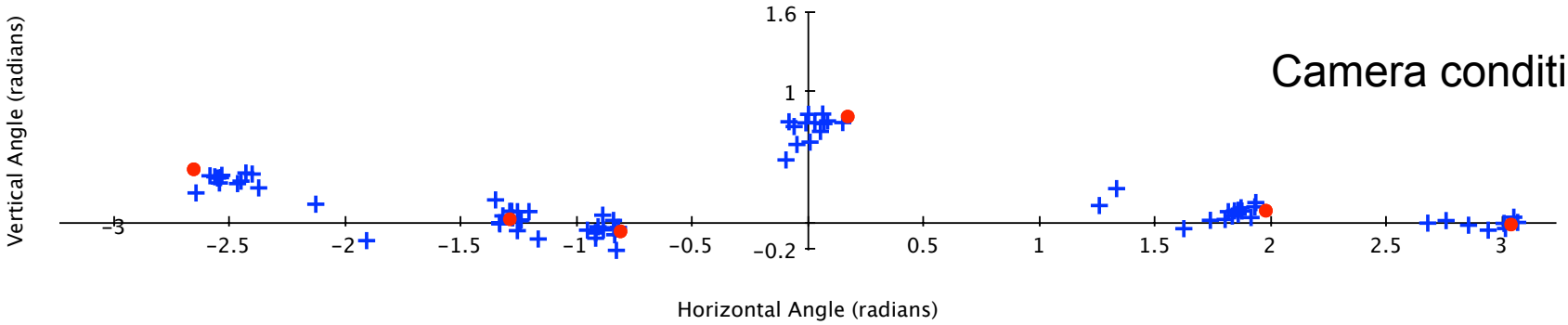
Compass condition

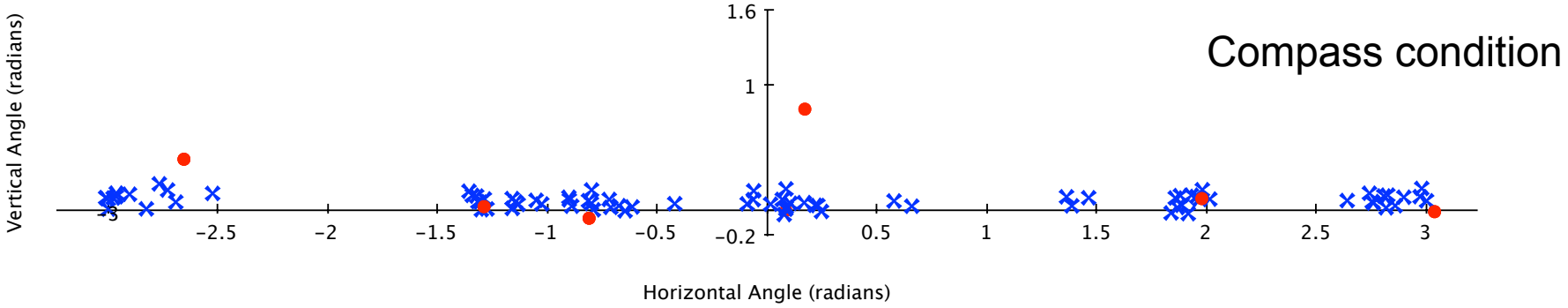
An ad hoc testbed



- We set up targets for pointing, and we asked professional surveyors to measure directions to the targets.

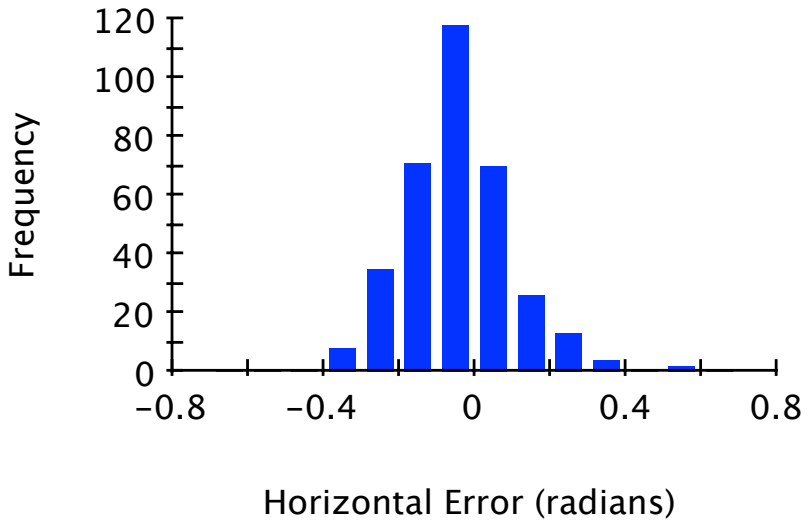
Pointing accuracy



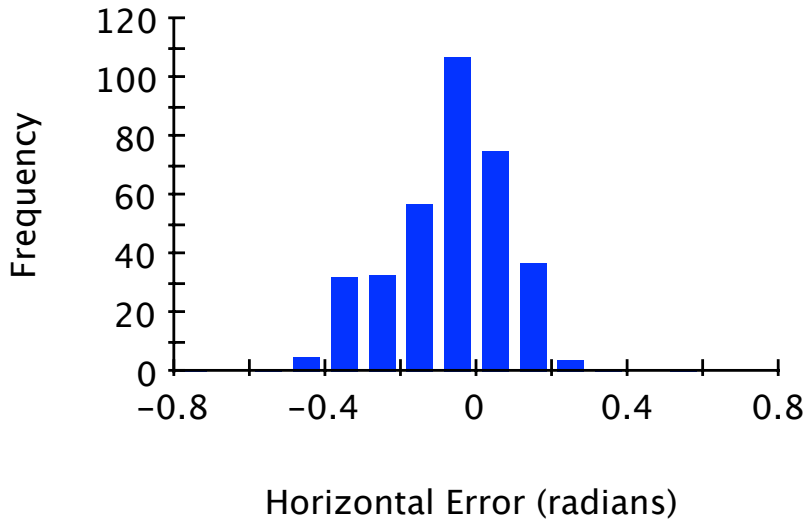


Pointing accuracy

Camera condition



Compass condition



Status

- Field results consistent with the literature.
- Performance limitations impose tradeoffs (interesting to us as HCI researchers).

But it's a solution in search of a problem…

Zhao, Y.-L. (2011). *Gibbon: A wearable device for pointing gesture recognition*. MS thesis, Department of CS, NCSU.
Zhao, Y.-L., et al. (2012). Pointing at responsive objects outdoors. *Proceedings of IUI*, pp. 281-284.

TIKISI: Touch It, Key It, Speak It

Sina Bahram, Arpan Chakraborty

Background

- Most graphical information is inaccessible to people with vision impairment (PWVI)
  - Maps, diagrams, bar charts, graphs…
- This is an enormous barrier
  - Implications for STEM education and access to information that sighties take for granted

Existing approaches

- Low-tech
- Tactile overlays
- Haptic feedback
- Keyboard interaction
- Touch interaction
- Sonification
- Embossed and tactile graphics

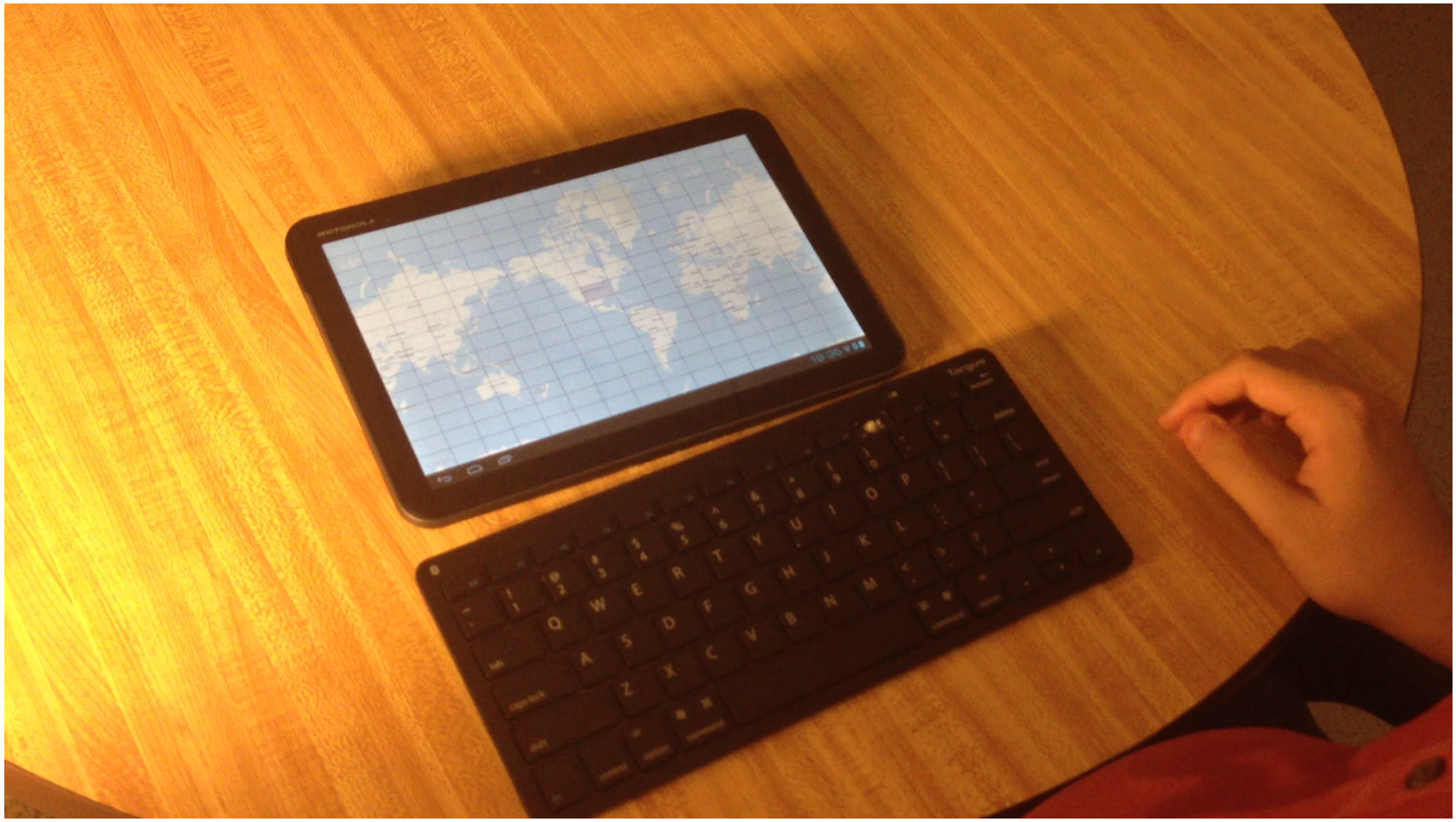
TIKISI

- Multimodal framework for eyes-free exploration of graphical information
- Input and output resolution decoupled
- Domain-dependent interaction, access to data
  - Domain-independent software components and interaction primitives

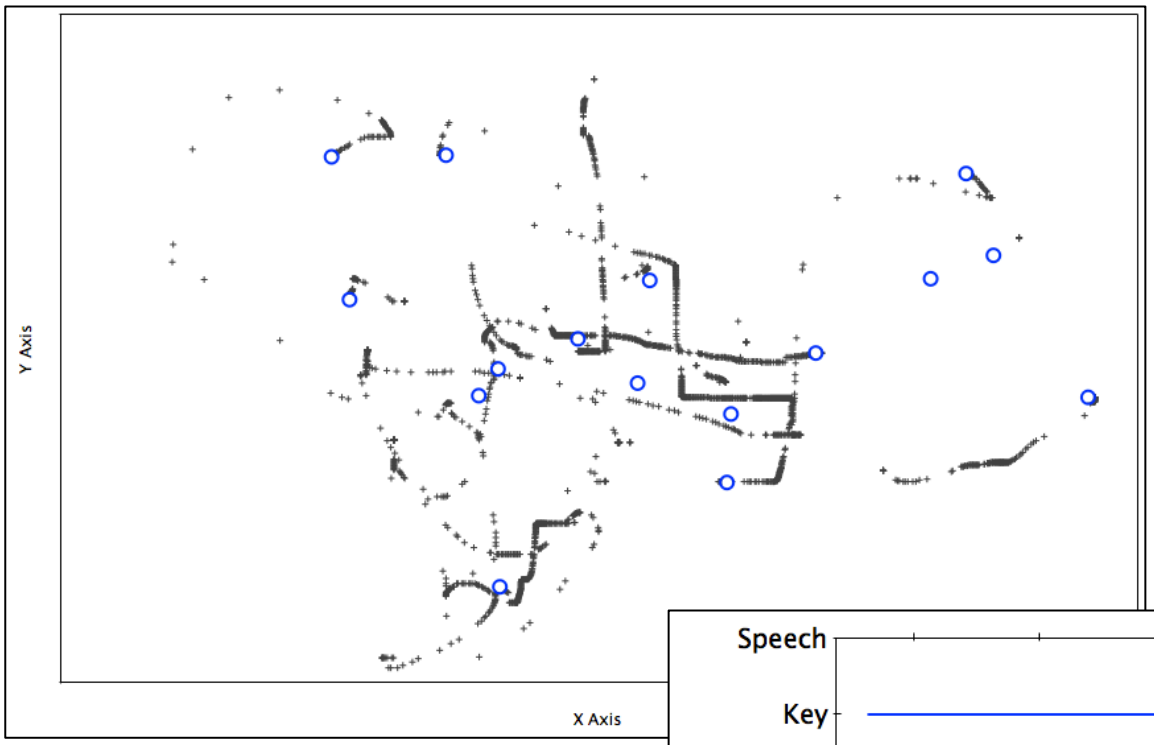
Current TIKISI for Maps features

- Directional movement by touch
- Navigation
  - *"Take me to <x>," "Center that," "Put <x> here."*
- Localization
  - *"Where am I?"*
- Orientation
  - *"What's around me?" "What's to the west?"*
- Zooming
- Discretization changes

Playing with TIKISI

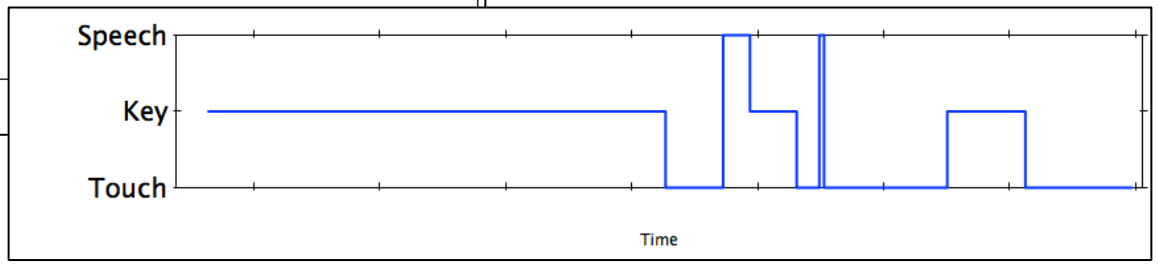


Spatial and temporal patterns



Finger touches and lifts (filtered)

Modality shifts



Planned TIKISI extensions

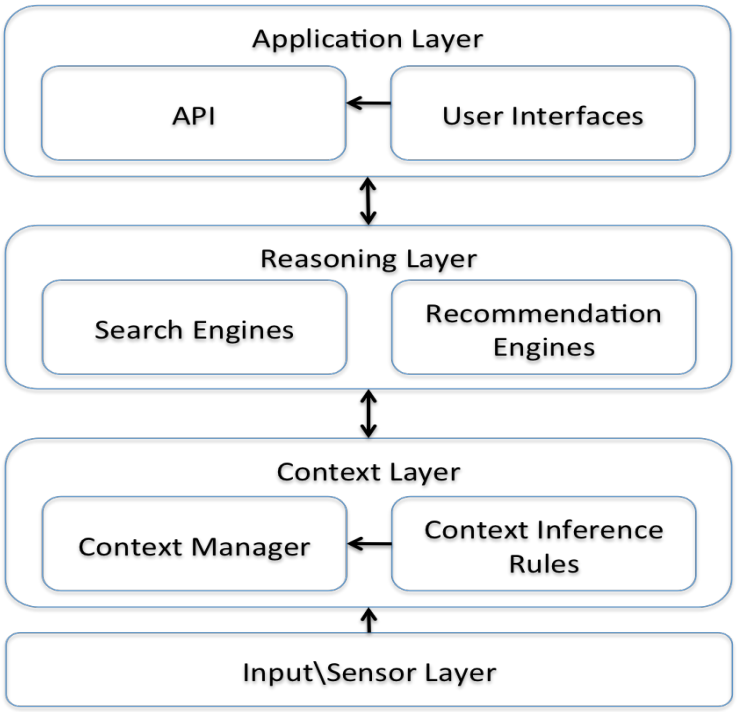
- Charts
  - Auto snap, relative comparisons
- Plots
  - Graph exploration, relative comparisons
- Image processing
  - Segmentation, component identification, connectivity identification, line/arrow detection and resolution, text localization and recognition

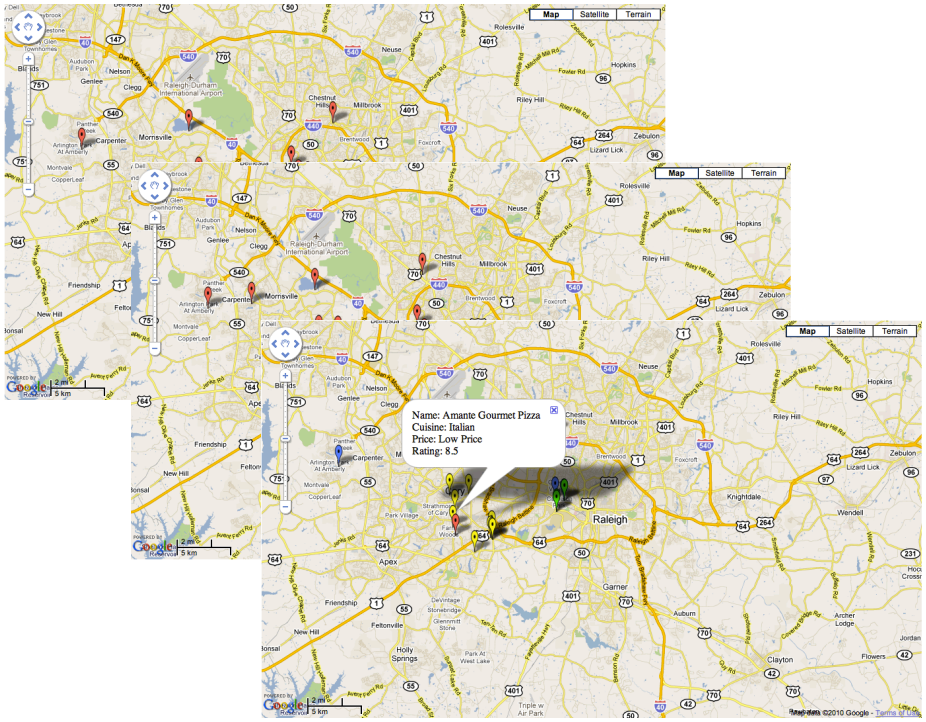
Status

- NSF proposal under review
  - TIKISI for STEM education
  - Collaboration with Derek Smith, UAL-Huntsville
  - Cooperation from five schools for the blind

Research for social impact

Bahram, S. (2012). User-controllable reduction of complexity for eyes-free exploration of information. *ASSETS Doctoral Consortium* presentation.
Bahram, S., et al. Intelligent interaction in accessible applications. Under review.





Improving Mobile Search

Pat Cash

Initial research

- Context-aware computing
  - *Context is any information that can be used to characterize the situation of an entity.* [Dey]
  - Individuality, activity, location, time, relations
- Our approach: Leverage history of search and recommendations

Current focus

- Exploratory search through semi-structured information spaces on mobile platforms
  - Limited input, small displays, low bandwidth
  - Inference of relevant categories on the fly

Intelligent faceted search/recommendation

The ACM Digital Library interface

Searching for: intelligent user interfaces (start a new search)

Found **49,810** within *The ACM Guide to Computing Literature* (Bibliographic citations from major publishers in computing)

Limit your search to Publications from ACM and Affiliated Organizations (Full-Text collection: **360,430** items)

REFINE YOUR SEARCH

Refine by Keywords
intelligent user interfac SEARCH

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Results 1 - 20 of 49,810 Sort by relevance in expanded form

Result page: **1** 2 3 4 5 6 7 8 9 10 next >>

1 An intelligent 3D user interface adapting to user control behaviors

Tsai-Yen Li, Shu-Wei Hsu

January 2004 **IUI '04:** Proceedings of the 9th international conference on Intelligent user interfaces

Publisher: ACM Request Permissions

Full text available: Pdf (277.15 KB)

Bibliometrics: Downloads (6 Weeks): 18, Downloads (12 Months): 102, Downloads (Overall): 1478, Citation Count: 7

The WALK mode is one of the most common navigation interfaces for 3D virtual environments. However, due to the limited view angle and low frame rate, users are often blocked by obstacles when they navigate in a cluttered virtual scene with such a mode. ...

Keywords: adaptive assisting mechanism, artificial force field, intelligent 3D interface, personalized user interface control

2 Multimodal event parsing for intelligent user interfaces

Will Fitzgerald, R. James Firby, Michael Hannemann

January 2003 **IUI '03:** Proceedings of the 8th international conference on Intelligent user interfaces

Publisher: ACM Request Permissions

Full text available: Pdf (827.30 KB)

Bibliometrics: Downloads (6 Weeks): 5, Downloads (12 Months): 32, Downloads (Overall): 637, Citation Count: 1

Many intelligent interfaces must recognize patterns of user activity that cross a variety of different input channels. These multimodal interfaces offer significant challenges to both the designer and the software engineer. The designer needs a method ...

Interaction issues

- Presentation and interaction: when and how
  - Initial presentation of pre-defined facets?
  - Facet suggestions as user enters queries?
  - Application of recommended facets to results?
  - Balance of facets versus results in presentation?
- Interaction efficiency tradeoffs

Facet recommendation issues

- Facet generation
  - How much information should be surfaced?
  - What is relevant in recommending facets?
    - Domain knowledge, user history, context information
- Can intelligibility and control be improved in comparison with traditional search? How much?

Status

- Collaboration with NCSU Libraries in place
  - Regular interaction with library developers
  - User search logs available
  - Hunt Library receptive to innovation
- Contacts with NCSU Digital Humanities group

Now to do the work…

Conclusion

- HCI has undergone enormous change.
  - **1963**: Sketchpad [Sutherland]; the mouse [Engelbart].
  - **1973**: Xerox Alto.
  - **1996**: *The human interface is stuck.* [Gentner & Nielsen]
  - **2020**: *What will it mean to be human when everything we do is supported or augmented by technology?* [Rodden et al.]

Engineering concepts for understanding HCI.