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Interaction and Architectural Space

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Abstract

For many in the field of HCI, *location* and *space* are synonymous; yet, as we move from the mobile era to the ubiquitous era, computing becomes entangled with notions of space. This workshop critically examines the role of space in human-computer interfaces. The objective is to bring together diverse perspectives of space, drawing from architecture, philosophy, art, geography, design, dance, spatial-cognition, mathematics, computing, and still other domains, towards foregrounding *space* in theoretical discussions and explorations within the CHI community. Expected outcomes are the reporting of fresh insights into the impact and role of space in the interaction process.

Author Keywords

Architecture; Space; Interaction; Ubiquitous Computing;

ACM Classification Keywords

H.5.2 [Information Interfaces And Presentation]: User Interfaces - Interaction styles).

Introduction

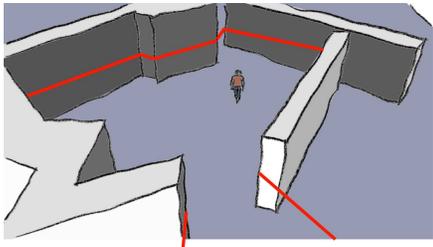
From the days when computing abandoned the command line interface, human-computer interaction has dealt implicitly with space. Our awareness of space and its role in the interaction process is becoming more urgent as we move from the earliest two-dimensional graphical user interface, through to games & virtual



reality, and now emerging into mobile computing, urban computing, ambient computing, tangible computing and ubiquitous computing [1]. As computing becomes embedded in our homes, our streets and our buildings, it reminds us that our understanding of the role of space in HCI has been largely neglected. The Workshop on Interaction and Architectural Space strives to re-address this shortcoming.

We view space as an active participant in the interaction system. Proxemics [2], for example, show how space can become part of the interaction dynamics. Ishi and Ulmer [3] [4] and Wisneski [5] describe ambient computing as fusing architectural surfaces with active interfaces, implying the role of space, spatiality and architecture in interaction. From a theoretical perspective, Rodden & Benford[6] point to new directions in HCI, observing that ubiquitous interaction has so far focused on 'stuff' and has failed to explore space.

Numerous authors have meanwhile challenged our notions of context. Brignull & Rogers [7], for example, are strong proponents of leaving the lab and engaging space. Hornecker & Nicol [8] observed that re-contextualizing museum interfaces from the living laboratory to the museum environment changes many factors of the interaction model. Harrison & Dourish [9] also reviewed the simplistic models of space in CSCW research, suggesting that place, rather than space, should configure interaction. Fischer & Hornecker [10] moreover discuss the complex arrangement of seven types of space in an interactive media façade. This rather specific framework of Media Facades seems to be the most complex description of space yet available to the HCI community. Yet while space in interaction is as



old as Fitts Law[11], and while there have been some very notable exceptions, the field of HCI has very little well-organized literature on the subject of space in interaction. For many in the field of HCI, location and space become synonymous, yet in architecture, numerous diverse spatial representations allow architects to more fully understand the role of space within the social organization of a building.

This juxtaposes strongly with the sense that the human computer interface is awash with spatial and architectural metaphors. We have the home button, we navigate to a page, we surf the web and the "information super highway," we click the back button, we mine information, the website is under-construction, we get lost in cyberspace, we follow 'trails of bread crumbs' to navigate 'up' to the top level, and software is built by Software Architects who perform 'cognitive walkthroughs'. It is of little surprise that, cognitively speaking, Computing, like Architecture, is one of those systems which cannot be wholly appreciated from one perspective. Operating complex software is like inhabiting a building: it needs to be explored and learned, forming a cognitive model. Expert software users and building occupants become "local" or "of the neighborhood" moving beyond fixed paths and memorized routes towards combining different paths through programming flexibly. Effectively, routes and commands are akin to words in a sentence that can be rearranged in pursuit of a goal. Like a pedestrian or a driver, an expert software user can navigate through a habitat with very little consideration or apparent mental effort. Architects talk about the language or grammar of space, and we know from neuroscience that the right half of the hippocampus is responsible for the cognitive map, and that the left (much more recently developed)



half is responsible for language learning[12]. From these two contexts, space is not so much a language, as language is a type of space. There is some evidence to suggest that users who have difficulty navigating space have difficulty navigating websites [13]. This poses questions to the field of human computer interaction, such as: When we talk about being 'lost on a website' or interface, are we talking metaphorically or literally, in a cognitive sense? UbiComp, Pervasive Computing and Adaptive Architecture mean that the computer interface is now literally spatial (i.e. it is all around us); yet as interaction designers we have failed to interact fully with those who have explored this area previously. One might say that interface design overlaps with architectural design, both looking at how to shape our environment. Space mediates access (amongst other things) to parts of the interface and to architecture. Navigation, routes, being lost, and the grammar of space are all affected by this merging of architecture and interface.

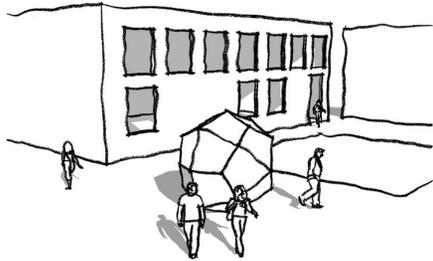
This multidisciplinary workshop invites researchers, philosophers, theorists, and practitioners to come together to discuss theories of space within the wider remit of human computer interaction. We are open to all those who wish to articulate the use of space in interaction, including but not limited to: interaction designers, human factors psychologists, computer scientists, architects, geographers, spatial cognition psychologists, artists, philosophers, neuroscientists, industrial designers, educators, and product researchers. Space can be considered at all scales – from the intimate scale of human tools, to that of furniture, to the scale of buildings, the metropolis and beyond.

Goals of the workshop

- To identify the theoretical boundaries of spatial interaction.
- To present and discuss design and research projects with a theoretical foundation in space;
- To share and discuss concepts/prototypes designed to explore ubiquitous computing in empirical work;
- To identify fundamental differences, similarities and synergies between different design and research approaches that use space in HCI.

The workshop hopes to build on previous workshops, and particularly Ar-CHI-texture of CHI 2012, initiated by many of the same authors. We hope to promote the coming together of many diverse backgrounds to maximize the heterogeneity of the viewpoints attending, and to clarify the roadmap for future research and collaboration through presentations at the "spotlight on workshops" poster session. While this workshop may dwell in the tentative and the explorative, it aims to facilitate concrete, cross-disciplinary investigations subsequent to the workshop. Outcomes may lead to a special journal edition.

Our view is that space is not a container nor a background, nor is it homogenous. Space contains structure, hierarchy and agency. A clear view of human-computer interaction today cannot ignore the impact of "spatial architectonics" [14]. This workshop ultimately intends to highlight and heighten the role of space and spatiality in broader HCI activity



References

- [1] M. Weiser and J. S. Brown, "The coming age of calm technology," *Xerox Parc*, vol. 8, p. 2007, 1996.
- [2] T. Ballendat, N. Marquardt, and S. Greenberg, "Proxemic interaction: designing for a proximity and orientation-aware environment," in *ACM Conf. on Interactive Tabletops and Surfaces*, 2010, pp. 121–130.
- [3] B. Ullmer and H. Ishii, "Emerging frameworks for tangible user interfaces," *Ibm Syst. J.*, vol. 39, no. 3.4, pp. 915–931, 2000.
- [4] H. Ishii, C. Wisneski, S. Brave, A. Dahley, M. Gorbet, B. Ullmer, and P. Yarin, "ambientROOM: integrating ambient media with architectural space," in *CHI 98 conference summary on Human factors in computing systems*, 1998, pp. 173–174.
- [5] C. Wisneski, H. Ishii, A. Dahley, M. Gorbet, S. Brave, B. Ullmer, and P. Yarin, "Ambient displays: Turning architectural space into an interface between people and digital information," *Coop. Build. Integrating Inf. Organ. Arch.*, pp. 22–32, 1998.
- [6] T. Rodden and S. Benford, "The evolution of buildings and implications for the design of ubiquitous domestic environments," in *Proceedings of the SIGCHI conference on Human factors in computing systems*, 2003, pp. 9–16.
- [7] H. Brignull and Y. Rogers, "Enticing people to interact with large public displays in public spaces," in *Proceedings of INTERACT*, 2003, vol. 3, pp. 17–24.
- [8] E. Hornecker and E. Nicol, "What do lab-based user studies tell us about in-the-wild behavior?: insights from a study of museum interactives," in *Proceedings of the Designing Interactive Systems Conference*, 2012, pp. 358–367.
- [9] S. Harrison and P. Dourish, "Re-place-ing space: the roles of place and space in collaborative systems," in *Proceedings of the 1996 ACM conference on Computer supported cooperative work*, 1996, pp. 67–76.
- [10] P. T. Fischer and E. Hornecker, *Urban HCI: Spatial Aspects in the Design of Shared Encounters for Media Façades*. submission, 2012.
- [11] I. S. MacKenzie and W. Buxton, "Extending Fitts' law to two-dimensional tasks," in *Proceedings of the SIGCHI conference on Human factors in computing systems*, 1992, p. 226.
- [12] *Memory & Cognition*, Volume 29, Number 5 - SpringerLink .
- [13] S. Jones and G. E. Burnett, "Spatial Skills and Navigation of Hypertext in Children and Adults," *Adv. Technol. Learn.*, vol. 10.
- [14] H. Lefebvre, *The Production of Space*. Wiley-Blackwell, 1992.