

# Providing Elegant Peripheral Awareness

**JJ Cadiz, Mary Czerwinski**

Microsoft Research  
One Microsoft Way  
Redmond, WA 98052  
jcadiz@microsoft.com  
marycz@microsoft.com

**Scott McCrickard**

Dept. of Computer Science  
Virginia Tech  
Blacksburg, VA 24061  
mccricks@cs.vt.edu

**John Stasko**

College of Computing &  
GVU Center  
Georgia Inst. of Technology  
Atlanta, GA 30332  
stasko@cc.gatech.edu

## ABSTRACT

In a one-day workshop, we strive to build community in this emerging research area, specifically targeting interfaces that are designed to provide awareness in a peripheral and elegant manner. We focus on improving consensus of basic and fundamental issues and developing a structural framework—critical parameters, design themes, and evaluation procedures—for research on these types of user interfaces.

**KEYWORDS:** notification user interfaces, design, usability, awareness, peripheral awareness, information visualization

## INTRODUCTION

As more data has become available digitally, the need and desire for staying aware of large amounts of dynamic information has steadily increased. However, several issues complicate the task of providing users with an elegant way of maintaining awareness about information of interest. The notification user interface is often delivered as a persistent secondary task, requiring users to rapidly and frequently switch between some other primary task(s) and the notification task. Although this additional information is valuable, users typically wish to avoid needless distraction by dynamic information displays—favoring calm and elegant peripheral awareness interfaces.

The kinds of dynamic information traditionally falling into the peripheral awareness domain include content that is time-sensitive and ephemeral (e.g., news events, weather changes, stock updates, traffic patterns, and instant messages). However, the breadth and significance of viable notifications is changing rapidly with new technologies. Soon, it will be possible to know when colleagues have updated a document in real time, or if a co-worker is within shouting distance, or which nearby stores have sales. Availability of this type of information is creating new demands from users for notification delivery. With the rapidly emerging trends and increasing importance of notification interfaces, new research methods and findings are required for their design.

Techniques and tools for providing peripheral information

awareness are quite varied. Perhaps two of the oldest are the graphical load monitors and email biff tools still commonly in use today. Others include small on-screen textual display objects such as scrolling tickers and fading message boxes [3], small- to medium-size graphical tools that reside at the edge of a computer display [1, 11], ambient displays that use physical objects to communicate information [9, 10], and computer displays deployed in environments as information billboards or even artistic objects [4, 6, 8]. The growing use of multiple monitors [2] has provided more screen real estate to people, which is commonly used as a home for various peripheral information awareness tools.

## RESEARCH ISSUES

Despite these exciting demonstrations of design innovation, there is little basic research to date on the optimal format for displaying various notifications, especially across a wide variety of screen sizes or radically different usage contexts. Since the study of notification systems and peripheral interfaces is just beginning to emerge as a research area, very little structural framework is in place to promote or facilitate research cohesion and extension. We elaborate on each of these major issues, which motivate the workshop goal and activities.

### Focus on basic research

There is much need for basic research within the peripheral awareness domain. Each phase of interface development has associated issues—How should user requirements be gathered for multitasking activities? What information and interaction design techniques apply to various usage contexts? What implementation options are possible, and what are the associated tradeoffs? How should user evaluations be conducted and reported to capture the net effect on individual and group productivity?

### Lack of research framework

Although this emerging domain will benefit from the integration of related research and improved consensus on basic research questions, collective progress will be difficult to achieve without a minimal structural framework that establishes the research area. Since contributors to this new community will come from diverse backgrounds, ideas about terminology and fundamental concepts will vary. For example, aspects of what we call “peripheral” interfaces are

often confused with the more precise requirements relating to peripheral vision. Furthermore, the distinctions between notification user interfaces and this sub-class of systems should be clarified. These and many other details must be initially established in a workshop setting.

Fundamental definitions and terminology provide the beginnings of a research framework, but the essential components of a cohesive research structure consist of:

- Critical parameters
- Design themes
- Evaluation procedures

The need for *critical parameters*—key aspects of designs that transcend individual projects and apply to the entire domain—was discussed in the HCI community by Newman [7]. These quantitative measures are manageable through design innovation, refinement, and research, and allow identification of scientific advancement. In an initial consideration of potential critical parameters [5], we have identified *interruption* to other tasks, and *reaction* to and *comprehension* of notification information, along with several other possible parameter candidates (enjoyment/satisfaction, quality and quantity of information).

Just as most other design-science fields, the area of peripheral awareness interface study can likely be refined into several manageable sub-areas that each focus on key *design themes*. Recognizing and articulating the internal regions and external boundaries of the design space and these themes will provide necessary structure for describing user tasks, artifacts, and performance characteristics.

Although the potential for design solutions is limitless, we estimate that several discernable system features can be quite influential in overall interface usability. Identifying *evaluation procedures* to find these key features can establish an initial survey of critical usability concerns, serving as framework for related research integration, problem identification, or critical parameter selection.

#### WORKSHOP GOAL

The goal of this workshop is to initiate progress toward both research issues described above—1) achieving consensus on existing influential work and common, central problems related to basic research in peripheral awareness interfaces, and 2) establishing structural framework for this emerging research area of notification user interface study. Several objectives support this goal:

- Facilitating researchers in this area meeting colleagues and others who have similar research objectives
- Discussing existing system examples and research findings to identify (or resolve) common problems
- Considering critical parameters, design themes, and evaluation procedures to form an initial research framework and taxonomy

- Preparing a discussion of the taxonomy that is suitable for publication, or possibly compiling a special volume or journal issue on all workshop contributions.
- Providing opportunities for potential collaborations and joint projects.

#### REFERENCES

1. Cadiz, J., Venolia, G., Jancke, G., and Gupta, A. Designing and Deploying an Information Awareness Interface, in *Proceedings of CSCW 2002* (New Orleans LA, November 2002), 314 – 323.
2. Grudin, J. Groupware and social dynamics: Eight challenges for developers. *Communications of the ACM* 37, 1 (January 1994), 92 – 105.
3. Maglio, P. and Campbell, C. Trade-offs in Displaying Peripheral Information, in *Proceedings of CHI '00* (The Hague Netherlands, April 2000), 241 – 248.
4. McCarthy, J., Costa, T., and Liongosari, E. UniCast, OutCast & GroupCast: Three Steps Toward Ubiquitous, Peripheral Displays, in *Proceedings of the UbiComp 2001 Conference*, (Atlanta GA, Sept. 2001), 332 – 345.
5. McCrickard, D. S., Catrambone, R., Chewar, C., and Stasko, J. Establishing tradeoffs that leverage attention for utility: Empirically evaluating information display for notification systems. *International Journal of Human-Computer Studies* (2003), to appear.
6. Miller, T. and Stasko, J., Artistically Conveying Information with the InfoCanvas, in *Proceedings of the Advanced Visual Interfaces (AVI) '02 Conference*, (Trento Italy, May 2002), 43 – 50.
7. Newman, W. M. Better or Just Different? On the Benefits of Designing Interactive Systems in terms of Critical Parameters, in *Proceedings of Designing Interactive Systems (DIS) '97*, (Amsterdam Netherlands, August 1997), 239 – 245.
8. Redstrom, J., Skog, T. and Hallnas, L. Informative Art: Using Amplified Artworks as Information Displays, in *Proceedings of the Designing Augmented Reality Environments Conference '00*, (Elsinore Denmark, 2000), 103 – 114.
9. Weiser, M. and Brown, J. S., Designing Calm Technology, *PowerGrid Journal 1.01* (July 1996).
10. Wisneski, C., Ishii, H. and others, Ambient Displays: Turning Architectural Space into an Interface between People and Digital Information, in *Proceedings of International Workshop on Cooperative Buildings (CoBuild) '98*, (Darmstadt Germany, 1998), 22 – 32.
11. Zhao, Q. A. and Stasko, J. What's Happening?: Promoting Community Awareness through Opportunistic, Peripheral Interfaces, in *Proceedings of the Advanced Visual Interfaces (AVI) '02 Conference*, (Trento Italy, May 2002), 69 – 74.