

Oi! Capturing User Attention Within Pervasive Display Environments

Keith Mitchell and Nicholas J.P. Race

Network Research and Special Projects Unit
Computer Centre, ISS, Lancaster University
Lancaster, LA1 4YW, U.K.
[k.mitchell, n.race]@lancaster.ac.uk

Abstract. The eCampus project at Lancaster University is an interdisciplinary project aiming to deploy a wide range of situated displays across the University campus in order to create a large pervasive communications infrastructure. At present, we are conducting a series of parallel research activities to investigate how the pervasive communications infrastructure can support the daily needs of staff, students and visitors to the University. This position paper summaries one of our current research investigations into how one is able to capture and maintain user attention and raises a number of issues relevant to pervasive display environments.

1 Introduction

The eCampus project at Lancaster University is currently in the process of creating a campus-wide pervasive communications infrastructure. More specifically, we are in the process of deploying a range of display technologies (plasma, LCD and projection systems), communications technologies (wi-fi and Bluetooth) and sensors (cameras, PIR, etc) within a number of public (indoor and outdoor) spaces across campus. Perhaps uniquely to eCampus, the infrastructure must satisfy some high level goals, namely to be available to all members of the University 24/7 365 days of the year and furthermore, to act as a research resource for all faculties of the University.

The duality related to supporting both a 'research' and a 'production' service poses many challenges both for design, deployment and on-going maintenance. To overcome some of these issues we have deployed a hardware platform in which each display can be controlled from multiple sources. This allows developers and content providers across campus to be able to use their own preferred tools and platforms (Mac, PC, Linux). This architecture not only offers redundancy but additionally allows us to toggle rapidly between production level (i.e. reliable) news and information services and a research infrastructure in order to facilitate researcher experiments and user trials.

At present, the eCampus infrastructure has been used for several new media and artistic performances [9] as well as offering daily information pertaining to campus with local news and information. However, we believe there are a

number of significant challenges to be overcome in order that the infrastructure is successful in the long term, in particular the need to repeatedly capture user attention and stimulate user interaction.

2 Facilitating User Interaction

The goal of ubicomp and pervasive computing systems is that they are invisible and become part of the fabric of everyday life. Whilst at a high level this is an objective for the eCampus project, a dichotomy exists between this goal and the goal of attracting user attention at appropriate times. During our initial deployments we have been interested in determining the perceived success of the content being offered. More specifically, at this early stage we are interested in determining whether the infrastructure is attracting attention and to what extent people are likely to interact with our systems. We have thus far used cameras co-located with displays in order to capture footage of the spaces surrounding the display area in order to determine usage patterns and establish whether or not groups gather around them.

Initial observations of the current infrastructure reveal that it is a non-trivial task to design captivating content for multiple public displays. In fact, while peoples attention is automatically drawn to things which are novel in our environment [6], we believe this novelty factor will soon disappear and something more compelling is required in order to stimulate user-interaction with pervasive display environments long term.

While spatial facets such as location and positioning are crucial on a basic level and careful placement of these devices is required in order to capture attention initially, the types of public spaces being targeted also offer significant and often contrasting challenges. For example, whether transient spaces (e.g. walkways), social (e.g. coffee shops, bars), public/open (e.g. squares) or informative spaces (notice boards) are targeted is a significant factor in determining its likely usage. Furthermore, the role of a display and its affordance, such as a passive information screen or an interactive access point, and the style of interaction (e.g. touch, gesture or mobile device) assumed will exert a significant influence on the amount of attention required to focus on the display itself.

Although some studies have been carried out in relation to large or situated display environments [7] they often focus on single deployment scenarios (such as within a school) or as multi-user interaction. We believe that the positive feedback and results often captured in these studies reflect to some extent the novelty factor associated with something new. We suspect that within a pervasive computing environment an equivalent phenomenon to that of 'banner blindness' (within the context of online advertising) may play a significant role in maintaining user interest. More specifically, research demonstrates that web users are easily able to ignore adverts placed within web pages. Furthermore, it can be demonstrated, by using eye tracking technology, that web users are actually able to ignore an entire region of a page as if it were invisible. Our next phase of work will examine whether this phenomenon also exists in the situated

display domain, where users are so used to seeing screens as part of everyday life that they actually choose to ignore them altogether.

During a recent display deployment, we experienced first hand the tension between what messages/information a content provider wishes to get across to their audience and what a (prospective) user actually wishes to know. For example, one of our displays is located close to the entrance of the University Library such that everyone entering the building passes and sees the display. The Library staff therefore believe this to be an ideal opportunity for them to broadcast 'useful' messages relating to the opening hours and their returns and fines policies - amongst other information. However, since the library also acts the largest public space on campus offering PC terminals, perhaps more useful information to students would be to tell them if there were any free PC's currently available in the building and if not, which nearby location was the next best option with resources available.

We feel that simply offering screen real estate over to 'simple' digital sign-age in this way (i.e. re-creating a paper A4 sign) is a redundant use of the technology and perhaps has a negative impact on the overall infrastructure. If people start ignoring the displays since they display information they do not feel is relevant to them then they may choose to ignore other displays across campus.

As Agamanolis [1] explains, half the battle in designing an interactive public display is designing how the display will invite interaction. More specifically, what will make users glance at a display and what turns a glance into a more extended gaze and thus likely to result in some meaningful interaction? Questions such as these are interesting in our environment since we are covering a large geographic area and are not interested in capturing user attention once, but perhaps many times each day and within many different situations (social spaces, public spaces, walkways, etc) and perhaps crucially, everyday.

3 Current Investigation

We are currently exploring some of the social and psychological processes involved relating to the following questions; what makes us walk over to a display; and, what makes us want to interact in the first place? More specifically, we are interested in exploring and evaluating the different views introduced by Salem *et al* [8] when considering interactive systems design, namely, system centered view, user centered view, and interaction centered view. Since pervasive display environments are concerned with delivering a user experience which is entirely based on the interactive process itself, one of the first questions to address is how to describe the interaction, and second what are the criteria for an aesthetic pleasing and compelling interactive process.

Techniques such as the creation of mystery [2] and being able to leverage our natural curiosity in order to reveal or clarify things that are hidden or ambiguous may offer a way of enticing spontaneous user interaction. For example, iCom [3] achieves this goal by displaying cryptic subject lines from announcements and thus attempts to motivate passers-by to click and reveal their full text.

In order to investigate the views introduced above we are currently in the process of carrying out a number of experiments in collaboration with our Psychology department. In the first instance we are simply interested in determining how much attention each display is attracting based on the content being shown. We are achieving this by altering the content type being displayed (high quality digital images, RSS News feeds rendered by Quartz Composer, live BBC News 24 feeds, interactive Bluetooth games) and monitoring user reaction and activity by way of CCTV style cameras co-located with each display.

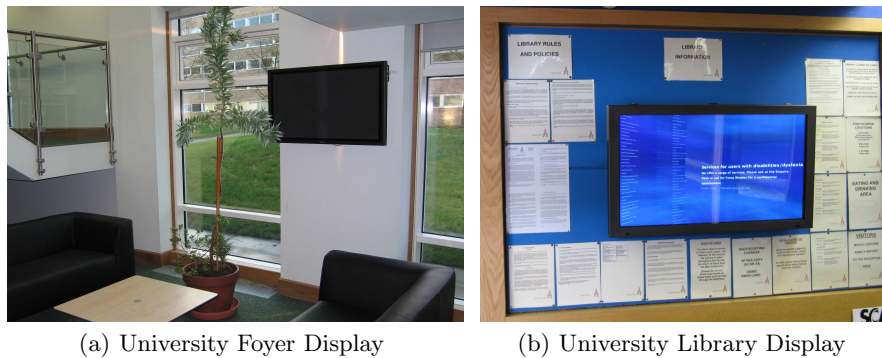


Fig. 1. eCampus Plasma Screen Deployments

Thus far, we have anecdotal evidence to suggest that, the displays themselves (40" LCD and 42" plasma panels, as shown in fig 1.) do seem to attract attention. Furthermore, we also have evidence to support the findings described by Brignall *et al* [4] result relating to what they term as the honey pot effect. This simply refers to a progressive increase in the number of people attracted to the immediate vicinity of the display by the mere presence of others.

4 Conclusion and Future Work

Pervasive computing and communications technologies are being rapidly deployed and becoming more familiar within contemporary society. However, these presently focus on marketing/advertising deployments or scenarios such as train stations in which they are used to represent context related information such as timetables, local news. However, their ubiquity could be used to stimulate more compelling user interaction on a large scale. This paper discusses some of the issues faced by designers and engineers when faced with developing content for these pervasive computing environments. In particular, we introduce our early studies in order to understand some of the social and psychological factors present[5]. From this we aim to derive some clear and useful benchmarks by which one is able to evaluate pervasive display environments.

References

1. Agamanolis, S. (2002) Designing displays for Human Connectedness. In: Workshop on Public, Community and Situated Displays at CSCW02, New Orleans. 4.
2. Berlyne, D.E., Conflict, Arousal and Curiosity, McGraw-Hill, 1960.
3. Bly, S. A., Harrison, S. R., and Irwin, S. (1993) Media Spaces: Bringing People Together in a Video, Audio, and Computing Environment, Communications of the ACM 36, 1 (January 1993), pp. 28-47.
4. Brignall, H. Rogers, Y., "Enticing People to Interact with Large Public Displays in Public Spaces", Proceedings of INTERACT' 03, Zurich, September 2003. pp. 17-2
5. Denoue, L., Nelson, L., and Churchill, E. (2003) AttrActive Windows:Dynamic Windows for Digital Bulletin Boards, CHI 2003 Extended Abstracts, ACM Press.
6. Fleck, R. (2003) How the move to physical user interfaces can make human computer interaction a more enjoyable experience. In: Workshop on Real World User Interfaces, Mobile HCI 2003, Udine, Italy, September 8th
7. Izadi S., Brignull H., Rodden T., Rogers Y. and M. Underwood, "Dynamo: A Public Interactive Surface Supporting the Cooperative Sharing and Exchange of Media". Proceedings of UIST 2003, Symposium on User Interface Software and Technology, November 2-5, 2003, Vancouver, Canada: ACM Press, 2003, 159-168.
8. Ben Salem, Matthias Rauterberg (Technische Universiteit Eindhoven, Aesthetics as a key dimension for ubiquitous entertainment, in The 2nd International Workshop on Ubiquitous Home, Kyoto, Japan.
9. Metamorphosis, Interactive Art
<http://domino.lancs.ac.uk/info/lunews.nsf/I/97F2B7D7B37636BA8025703C00559183>