A web portal for situated interaction

Rui José

University of Minho
Information Systems Department
Campus de Azurém, Guimarães, Portugal
rui@dsi.uminho.pt

Abstract. The combination between ubiquitous computing environments and ambient displays enables a broad range of new scenarios for situated interaction. In this paper, we describe our web based approach for situated displays. The concept of situated portal is introduced as a web portal that is targeted for presentation at a specific situation and that is based on interaction metaphors that are radically different from hypertext and point-and-click interactions. We have created a prototype in which a situated portal is used for managing content presentation and user interaction at two different displays. This prototype has provided an important proof-of-concept and has allowed us to gain considerable feedback on its usage and scientific challenges, based on which we will now deploy a new large-scale prototype where some of the key issues will be addressed by a multi-disciplinary team.

Introduction

When used as part of a larger ubiquitous computing infrastructure, public displays have a strong potential for enriching transitional spaces by enabling brief encounters with information that is relevant for their specific situation. In this paper, we describe our particular approach to address these issues by building on web technologies, and particularly on the traditional concept of web portal. In our research, we introduce the concept of situated portal as being a web portal, i.e. an organised and customisable collection of web resources, targeted for the public display, using large screens or wall projections, of situationally relevant information. The situated portal is also different from traditional web portals in that it is based on interaction paradigms that are radically different from the traditional desktop-oriented interaction paradigms. Instead of point-and-click and hypertext interactions, the situated portal explores alternative metaphors and channels, such as bluetooth, SMS, RFID tags, presence sensors, microphones, or video cameras.

We have created a prototype of our system that is currently running at two locations in our department. In this paper we briefly describe the architecture of our system and our early results on its use.

Architecture of the system

The architecture of the system is composed by the situated portal, by the situation installations, and by individual presentation elements. The situated portal is a web application that manages a dynamic display programme for each of the multiple situations for which it is responsible. The display programme involves the sequential and periodic display of a set of presentation elements, but may also include interactive elements that are only displayed upon certain events such as a user request.
The presentation elements are the web resources that are going to be displayed by the portal. One of the interesting characteristics of using web technology is the diversity of presentation elements, or pages, that can be integrated for presentation. Basically, anything that can be displayed on a web browser, can be integrated in the situated portal, from static html pages to images, videos or complex web applications. These presentation elements can be presented individually or aggregated on a single page.
The installation of a situation refers to the physical devices and software placed at a particular location to enable the operation of a situation. In our prototype this was typically a personal computer running Windows XP, a web browser (IE) and sensor control software, a video camera, networking devices, a set of sensors and a flat screen display. The display process begins with the selection of the situation and the introduction of the respective password. The result is a control window that is meant to be automatically reloaded at every refresh period, typically one second for interactive situations. Whenever it is time to change the displayed page, this control window will run a JavaScript code that commands the browser to open or reload another window with the next presentation element to be displayed. After the display time is finished, the process continues and the next page is loaded for presentation.

Presentation elements

For our prototype we have developed a set of presentation elements of various types and interaction modes. Some of those elements were just web pages with information about the department, news, or the weather. An important criterion for external pages was their ability to be used on the very specific setting of the situated portal, i.e. presenting its most relevant information without requiring any user input or page scrolling. Interestingly, this was not a problem, as many modern sites are already designed to convey significant information on their first page.

We also created some applications specifically for these situations. The Moments application, represented in Figure 1, presents images of that same location at various points in the past. In this application, a video camera is prepared for taking photographs whenever movement is detected in the area where the display was installed. Those photographs are then presented in a page showing a series of moments that can range from a few moments ago to one year ago. The recent images provided a sense of awareness about the recent past of the place, while the older ones show up as short glimpses of a more distant past and provoked and interesting and contrasting sense of continuity and change.

Fig. 1. The Moments application

The WhoIsThere application shows the currently connected machines from a set of selected personal computers from people at the department. By using a combination of colours, the produced image explores the concepts of background awareness by providing an aggregate view of how many people are currently using their machines. This was enough for people passing by to get a perception of the overall level of activity at the department. Information about individual machines is also available if people approach the display close enough to read the individual machine names. The use of DNS names, provides a certain degree of privacy as normally people will only remember the names of the people with whom they usually work.

The ShowMeASite is another simple application that receives a URL via bluetooth and presents the respective page on the situated portal.

Results

The creation of a prototype has provided an important proof-of-concept and has allowed us to gain considerable feedback on its usage and technological challenges. In general, one the most compelling characteristics that we were able to observe was that once the system is in place, and people start to understand its concept, there are always many new ideas on how to use it, many of which unforeseen by the development team. We believe that because of this potential for new applications, work on public displays can have an inspiring effect on a vast community and play an important role in the promotion of ubiquitous computing.

Regarding the presentation elements, their development can still be very challenging, even within the framework of the situated portal, as each of them normally raises complex issues that are specific to its objectives. One important design trade-off was the level of integration between the portal and each of the presentation elements. At the lowest level of integration, the portal has no interaction with the presentation element, and simply instructs the situation browser to present the resource located at the indicated URL, whereas, at the highest level of integration, all the elements are

integrated into the portal itself and follow strict design rules. In between there is a vast range of approaches in which elements main remain external, but obey certain interaction rules for initialisation, status information or configuration. From our experience, there are good reasons for any of these approaches, depending on the nature of the elements, and the situation. This is thus an area in which a flexible design of the architecture is essential.

Moments was clearly the most popular element, either because of the natural way photographs were taken or by its dynamic nature, allowing people to always find a different content. An interesting issue regarding this element was the position of the camera that was taking the photos. Initially, the camera was placed immediately above the display, typically taking close-distance photos of the people watching the display. This has had the effect that, after a short while, people would avoid standing in front of the display. While most people do not care about showing up in a photo when passing by the hall, very few were indifferent to the idea of having many close distance photos displayed on the portal, which is what would happen to frequent visitors of the portal. After a while, we decided to change the camera position to a higher location above the display, still photographing people passing by, but not people standing in front of the display. As a result movement detection was not so accurate, and people were often confused by the lack of typical photography metaphors, such as posing (where to look, how do I look), or clicking to take the photograph (when to smile, how to force the system to take me a photo now, how to prevent the system from taking me a photo now).

Another interesting observation made by users was the will to have a “hold” button that would prevent the currently displayed page from changing. A frequent sequence of events was for someone to be passing by the portal, then noticing some interesting page was being displayed, and thus approach the situated portal. What often happens is that by the time the person stops in front of the display to watch the interesting page more closely, the time for that presentation element is just finishing and the page is replaced by the next one.

Our work was also an experiment of trying to use a technology, in this case MS Windows XP and Internet Explorer, under different assumptions from those for which the technology was primarily designed. Removing the use of the mouse and keyboard from the system, may not seem very complex when there is the invaluable help of Remote Desktop solutions, which were intensively used for almost all the administration tasks. However, unexpected input requests by the system can become a disturbance, which was what happened with messages about the availability of application updates or about the level of the wireless connection. Every time a message like these was detected, the system manager would have to connect remotely to the situation system and click on the notification to close it. A similar problem also occurred with Internet Explorer. When trying to access certain web pages from external sites, a warning window could be prompted, caused for example by a missing plug-in. The warning window would then stay in middle of the display until the system manager would be notified, and once again, though remote desktop click on the buttons to close it. While some of these problems can be addressed through a careful configuration of the system, the assumption that a simple click will not be too annoying for the user still prevails, meaning that unexpected messages requiring user input are always possible.

Related Work

The use of large displays has been proposed in multiple settings with very diverse objectives. Semi-immersive visualization environments, normally based on tiled display systems with high resolution per unit area, have been proposed to enable information spaces that surround the user with diverse ways of interacting with data and multimedia flows [2]. Our research differs from such approaches in that we do not want to alienate the user from its physical environment, but rather to enhance its awareness and interaction with that same environment.

A number of projects have also explored the use of large format displays for shared manipulation of data, particularly for cooperative work in office settings, e.g. the Stanford Interactive Workspaces [4] and the Blueboard Large Information Scale Appliance from IBM [5]. The Dynamo system [3] is a multi-user situated display system that allows several users to share a communal display, each of them controlling its own pointer via, for example, wireless mice. People are also allowed to share their interactions and exchange digital media, which can be downloaded from compatible devices, e.g. USB drives or mobile phones. These systems share many technological challenges with the situated portal, but their interaction metaphor is fundamentally different in that their main objective is to support direct manipulation of digital data, possibly in shoulder-to-shoulder collaborations between people sharing a common task.

The webwall system [1] is a framework for multi-user communication and interaction via public communication displays. The system is targeted for a broad, loosely related, non-determined and unstructured audience in public spaces. The main usage scenario is that people in the vicinity of the display can send messages to one of its services, which they can do by using a variety of channels, such as SMS, WAP or HTTP. A set of service classes is used for supporting various types of application such as sticky notes, opinion polls or images galleries. The Aware Community Portal [6] is a shared display system from the MIT Media Lab that is meant to support short-term awareness of visual activity and long-term community interests. This project includes some early experiments on a number of key topics for this proposal such as the selection by the target community of the relevant information to be presented, the use of proximity and movement as a mean for interaction, and the use of video for capturing people gaze.

These systems share many of their objectives with our own research and provide an essential basis for our own work. In particular, their design experiments, their proposed applications, and in some cases their exploration of unobtrusive interaction techniques, will be an important contribution for our research. Despite sharing many of overall objectives, our work is fundamentally different in its web-based approach. The option for web technology as the basis for the situated portal presents unique characteristics and particular design challenges, but we also expect it to enable many new applications that were too costly and complex to be supported by proprietary technology. This will create a much stronger potential for the dissemination of this type of display, as the costs for creating new situations would be much lower.

Conclusions

The work described in this paper refers to the early results of our on-going research programme that we plan to develop much further. Regarding the infra-structure, we are at the point of beginning the deployment of campus–wide prototype, in which the situated displays will be available to a much broader community, and in which we will be able to explore a new set of applications. Additionally, we are also involved in a multi-disciplinary team that will use that campus prototype as the basis for evolving the systems architecture and for studying the application of image processing techniques, sensor networks, awareness models and multi-modality to the specific requirements of situated portals. Furthermore, considering the novelty of the concept, there is an obvious need to study the characteristics that may drive the acceptance of this technology. In our campus prototype, we will have the opportunity to expose the system to a vast community of users, and evaluate its contribution to promote community awareness and interaction. Overall, we believe that work on interactive public displays can play a seminal role in complementing and motivating other lines of research in ubiquitous computing.

ACKNOWLEDGMENTS

Our thanks to Ricardo Simões, Remi Mikalsen, Narciso Rodrigues and Marco Ascensão for their work on the development and installation of the situated portal or individual presentation elements.

REFERENCES

1. Ferscha, A. and Vogl, S., The WebWall. in *Workshop on Collaboration with Interactive Walls and Tables*, (2002).
2. Hereld, M., judson, I.R. and Stevens, R.L. Introduction to Building Projection-based Tiled Display Systems. *IEEE Computer Graphics and Applications*, *20* (4). 22-28.
3. Izadi, S., Brignull, H., Rodden, T., Rogers, Y. and Underwood, M., Dynamo: A public interactive surface supporting the cooperative sharing and exchange of media. in *UIST 2003*, (Vancouver, 2003), 159-168.
4. Johanson, B., Fox, A. and Winograd, T. The Interactive Workspaces Project: Experiences with Ubiquitous Computing Rooms. *IEEE Pervasive Computing Magazine*, *1* (2).
5. Russell, D.M. and Sue, A., Using Large Public Interactive Displays for Collaboration. in *Workshop on Collaboration with Interactive Walls and Tables*, (2002).
6. Sawhney, N., Wheeler, S. and Schmandt, C. Aware Community Portals: Shared Information Applicances for Transitional Spaces. *Personal and Ubiquitous Computing*, *5* (1). 66-70.