The WebWall

Alois Ferscha, Simon Vogl

Department of Computer Science, Johannes Kepler University of Linz

{ferscha,vogl}@soft.uni-linz.ac.at

Abstract

A media and service independent framework for multi-user communication and interaction via public communication displays, WebWalls, has been developed to enable seamless WWW access for people in public areas via mobile phones or handheld devices. A software architecture is presented that strictly separates wall access technologies (like HTTP, email, SMS, WAP) from the display technologies used and the presentation logic involved. The architecture integrates the most common and first truly ubiquitous wireless network (GSM), allowing a vast community of mobile phone users to access the WWW via public communication displays in an ad-hoc mode. A centralized backend infrastructure hosting content posted by users in a display independent format has been developed together with rendering engines exploiting the particular features of the physical output devices installed in public areas like airports, trainstations, lecture halls, fun and leisure centres and even car navigation systems. A variety of service classes supports the posting of and interaction with WWW media elements ranging from simple sticky notes, opinion polls, auctions, image and video galleries to mobile phone controlled web browsing, sharing features like a defined life time and a set of commands for interaction.

Keywords: Public Messaging, Multi-User Awareness, Ubiquitous WWW Access, Wireless Networking, GSM, Ad-Hoc Communication, Team Collaboration.

1 Introduction

In this paper we explore the diffusion of digital artifacts into our physical world and how it enriches our perception of reality. Particularly, we are concerned with the fact that visual displays have played an important role in individual WWW usage, and the fact that very little research has been conducted to explore the potential of large, shared visual displays for group and community communication and interaction. While the use of visual displays and desktop projections is getting quite popular in group work settings (shared whiteboards, smartboards, etc.), their use in public spaces to allow for a ubiquitous WWW access for a broad, loosely related, non-determined and unstructured audience is only rudimentarily understood today.

With this work we address the potentials of ad-hoc communication in public spaces using a wall metaphor. We have developed a software framework, the WebWall framework, providing a seamless WWW access over visual displays in public spaces via a manifold of access technologies including HTTP and email, bust most importantly SMS and WAP - these connect the first truly omnipresent and meanwhile most important public communication network, the GSM based mobile telephone network, to the WWW. In this paper, we present the WebWall framework as a means to enrich public places with digital communication and interaction means for people to access their personal 'multimedia memories', to share information (e.g. notes, videos, pictures) with others or to interact with others (e.g. opinion polls, auctions, games) – all over the WWW and possibly all over their mobile phones.

2 Architecture

The WebWall framework system architecture builds on a strict separation of access and display technologies from services and accounting. The access logic layer supports any user side technologies for input and output to

WebWalls using a modular concept. Service classes are managed by a backend system together with community data and usage accounting. The service instance or runtime layer of the architecture is responsible for the operation of WebWalls based on user requests. Requests are accepted after authentication and must adhere the syntax of predefined service classes. Upon request, service instances are drawn from the respective service classes in the backend system, and their output is rendered to the specific display technolgogies (see Figure 1). The three layer architecture of the WebWall framework thus allows to orthogonally develop different interactive services as well as to dynamically incorporate new I/O technologies (like EMS, MMS) in the future.

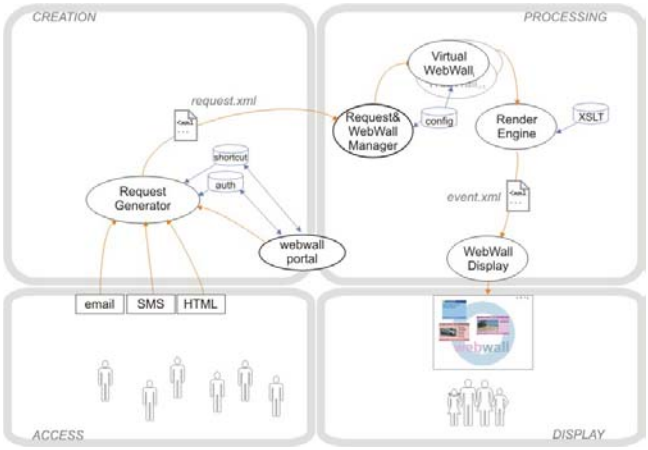

Figure 1: WebWall System Architecture

The integration of Internet- and mobile networking technologies demands for flexible access to a WebWall system which is granted via the representation of requests in a standardized format, independent of the access media (in this work we consider SMS, WAP, email, and HTTP as access technologies). The WebWall system is designed to provide flexible support for the full range of exisiting (projectors, plasma screens, CRT, etc.) and upcoming display technologies (laser projection, amorphous computing displays,...). A presentation module is responsible for arranging the service instances on the screen according to service type and priority. It uses a *renderer* for each service class that translaties the data into a displayable form, e.g. a HTML page of a given size. Users interact with the objects (i.e. service instances) on a WebWall by passing messages and/or commands through one of the access modules. The current implementation of a WebWall provides GSM, wireless as well as standard LAN access to receive requests, which are passed on to the service access module that is responsible for translating the text into requests to specific service instances or classes. Personal preferences, login data and pre-defined objects are managed by the backend system.

Users may create service instances not only by direct interaction with a WebWall, but also via a web-interface. This way, many service classes – like picture *galleries* or personal *videos* – can be costumized and saved for display at any later time. Besides user related data, the backend system hosts the code for the service classes and the renderer classes, which implement application-specific behaviour. It also handles configuration sets for individual clients that define the services that should run, as well as the display areas where individual instances may appear on a visual display. This central storage of configuration sets and class code enables application providers to implement new service classes and distribute them to a defined set of clients.

WebWall supports a range of *service classes* (SCs) that implement different applications (see Figure 2). The most basic service is the one for posting notes (SC *Note*) to a WebWall that can be viewed by everyone in the spatial proximity of the (public) display. Replies to a note are routed invisibly to the author of the referred note, if enabled at creation time. After a defined lifetime, notes are removed from the WebWall. While notes may be posted instantly when viewing a WebWall, other service classes are better defined first using a Web-client: *Video* and picture *galleries* (SC *Gallery*) can be used to display multimedia content by composing URLs of the media to display and save them under a userdefined name. *Polls* may be used to solicit the public opinion on local issues that arise in the geographical vicinity of a WebWall, for example. Polls display an up-to-date view

of the current collective opinion, thus providing an effective means for instant democracy. For ad-hoc buy&sell applications and advertising the framework provides two service classes: *Auction* and *Banner*. Banners work analogously to their WWW counterparts, but could be used to send vouchers to the interested reader upon request. Auctions lets users bid for an item on sale, with the highest bid being on display on the WebWall.

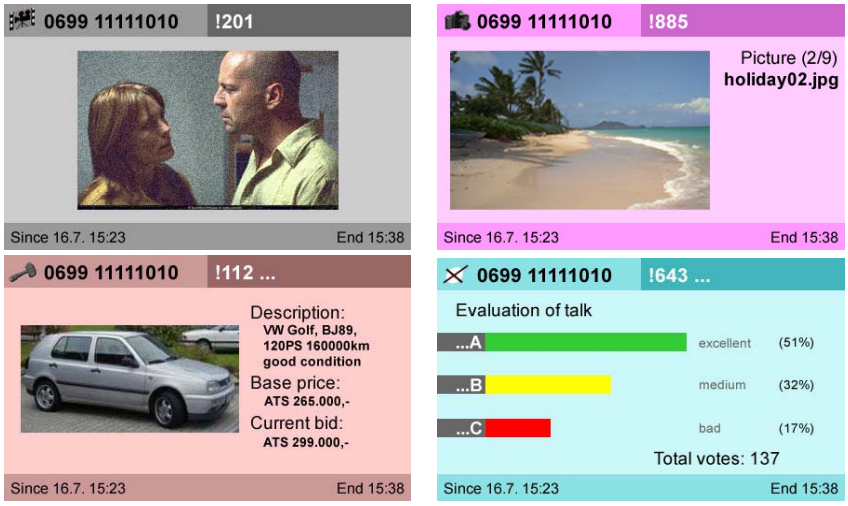

Figure 2: WebWall and Service Classes

2.1 Visual Components and Styles

A variety of different visual components have been created for the individual service classes, some of which are displayed below. For the video service class (Figure 2, upper left) the streaming video is displayed in the main frame. The service instance id is placed in the upper right header and can be used to stop, replay or removie the video. The gallery class (Figure 2, upper right) overlays image by image out of a collection of objects in img MIME type from the CMS. The auction class (Figure 2, lower left) displays an image and description text of an entity upon which an auction is set up in the public. New bids are posted by referring to the instance id, and once registered by the WebWall overwrite the current bid tag. An opionion poll like e.g. the evaluation of presentation by the audience accepts votes for one of the displayed alternatives (Figure 2, lower right), counts the votes, computes percentiles and displays the information in real time.
Figure 3 shows a normal WebWall and a transparent variant that enables augmented reality interaction: A transparent display surface (here, a shop window) is used to overlay digital information over physical items.

3 Related work

Current research efforts can therefore be summarized as concentrating on some major areas: *Visualisation* research covers advanced uses of projection systems to provide seamless output of multiple beamers on arbitrary surfaces, even deliberately integrating physical objects into the digital realm ([RWC 98]). Several architectures for the configuration, calibration and transparent access of a multi-display Wall have been proposed ([HH 99],[CWGL 02]). Projects focusing on *cooperation* and groupware issues deal with the interaction of a known group of users (normally in an office setting) on shared displays, using a variety of input devices ([FHJW 00], [GHKMT 99], [Tand 01]). These efforts deal with the cooperative manipulation of artifacts, enhancing group awareness ([GR 01]) and privacy issues ([SI 01]). *Interaction* research tries to handle the size of the displays that creates new problems for human computer interaction, as normal keyboard and mouse input becomes impractical (if not impossible). Therefore, new input devices have been proposed like pen input, laser-based pointing devices ([DC 02], [Wiss 01]), tangible interfaces ([IU 97], [Rek02]), gesture and speech recognition ([NR 97] , [Tay 99]).

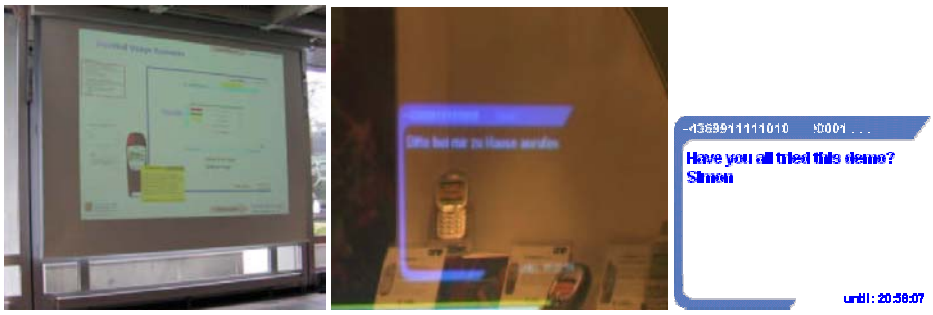

Figure 3: 'Normal' WebWall showing a note and a background presentation.
Translucent setup in a shop window and transparent note style.

While these projects deal with closed user groups in fixed settings, the WebWall project makes use of a variety of dislocated displays for ad-hoc interaction of people with one another and with Internet-originated artifacts. Large displays are used as one possible output technology, but it does not limit itself to this presentation medium. Instead it can be adapted to a wide variety of interfaces.

4 References

[CWGL 02] H. Chen, G. Wallace, A. Gupta, K. Li, et.al., "Experiences with Scalability of Display Walls",To appear in Immersive Projection Technology Symposium (IPT), March 2002.

[DC 02] J. Davis, X. Chen, "LumiPoint: Multi-User Laser-Based Interaction on Large Tiled Displays", to appear in Displays, Mar 2002.

[FHJW 00] A. Fox, P. Hanrahan, B. Johanson, T. Winograd: "Integrating Information Appliances into an Interactive Workspace." Techn. Report, Stanford University, 2000.

[GHKMT 99] J. Geissler, T.Holmer, S. Konomi, C. Müller-Tomfelde, W. Reischl, et.al. „i-LAND: An interactive Landscape for Creativity and Innovation." Proceedings of the ACM Conference on Human Factors in Computing Systems, pp. 120 – 127. ACM Press, Pittsburgh, USA, 1999.

[GR 01] S. Greenberg, M. Rounding: "The Notification Collage: Posting Information to Public and Personal Displays." Tech Report, Dept of Computer Science, University of Calgary Canada, 2001.

[HH 99] G. Humphreys, P. Hanrahan, "A Distributed Graphics System for Large Tiled Displays", Proceedings of IEEE Visualization 99, San Fransisco, CA, October 24-29, 1999.

[IU97] H. Ishii and B. Ullmer. "Tangible bits: Towards seamless interfaces between people, bits and atoms". In CHI 97, Atlanta, Georgia, USA, March 22-27 1997.

[NR 97] M. Nobuyuki, J. Rekimoto: "HoloWall: Designing a Finger, Hand, Body, and Object Sensitive Wall." Proceedings of UIST'97, Sony Computer Science Laboratory Inc., 1997.

[RWC 98] R. Raskar, G. Welch, M. Cutts et.al., "The Office of the Future: A Unified Approach to Image-Based Modeling and Spatially Immersive Displays", ACM SIGGRAPH 1998, Orlando FL, 1998.

[Rek02] J. Rekimoto. "Smartskin: An infrastructure for freehand manipulation on interactive surfaces". In ACM CHI 2002, Minneapolis, Minnesota, USA, April 20–25 2002.

[SI 01] Garth B. D. Shoemaker and Kori Inkpen, "Single display privacyware: augmenting public displays with private information", CHI 2001, pp 522-529, 2001.

[Tand 01] P. Tandler, "Software Infrastructure for Ubiquitous Computing Environments: Supporting Synchronous Collaboration with Heterogeneous Devices", In: Proceedings of UbiComp 2001. Heidelberg: Springer LNCS 2201, pp. 96-115, 2001.

[Tay 99] C. Taylor. Virtual keyboards. Technical report, GRASP Laboratory, univ. of Pennsylvania, 1999.

[Wiss 01] M. Wissen, " Implementation of a Laser-based Interaction Technique for Projection Screens", ERCIM News No.46, July 2001.