Large Display Information Visualization in Public Spaces

Uta Hinrichs
Interactions Lab – Innovis Group
University of Calgary, Department of Computer Science
2500 University Drive, Calgary, AB T2N 1N4, Canada
uhinrich@ucalgary.ca

ABSTRACT

For my doctoral research I am exploring the potential and challenges of large display information visualizations in public settings such as museums. The combination of information visualization as a means to represent abstract data and interactive display technologies, shows great potential for engaging visitor experiences. However, public spaces with their diverse audience and distractions introduce particular design challenges for such information installations. Embedded in an interdisciplinary context drawing from computer science, art, and design, my research focuses on how to initialize interaction with large display information visualizations in such public settings, and how to promote active engagement with and discussion of information. Based on four case studies my research will add to the general understanding on how non-experts approach large display information visualizations in museum spaces and inform the design and evaluation of such installations in this context.

Author Keywords

Large display interaction, information visualization, public spaces, information exploration, user experience.

ACM Classification Keywords

H.5.m Information Interfaces and Presentation: Misc.

INTRODUCTION

The goal of my research is to further our understanding of how information visualization combined with large interactive display technology can be applied to public settings. Public spaces such as museums, art galleries, and libraries are frequented by people for entertainment, relaxation, and/or educational purposes. The combination of new technology such as large touch interactive displays and information visualization to represent abstract data can enrich such spaces by inviting people with different interests and expectations to explore information. The public context, however, raises design challenges regarding interactive displays. For instance, in contrast to work or home settings, public spaces are characterized by a highly diverse audience that can vary in age, education, expectations, or attitude toward technology [4]. It is common for public exhibits to be approached by several visitors at the same time who do not necessarily know each other [5]. Furthermore, activities and interactions with public exhibits are usually spontaneous and open ended. Visitors often serendipitously browse through the presented information searching for something that triggers their interest [1, 4]. The duration of the interactive experience is usually brief and non-recurring, calling for intuitive, walk-up-and-use interfaces. Considering these challenges, my research is structured around the following questions:

1. How to motivate and initialize interaction with large display information visualizations in public spaces?
2. How to promote engagement with information on multiple levels, e.g., lightweight browsing and deeper analysis?

To address these research questions, I am designing and evaluating different large display information visualization prototypes within the museum context based on an experimental design approach. As a general contribution, the findings from these case studies will be summarized as a conceptual framework to describe the use of large display information visualizations in public settings. Furthermore, my research will inform general design considerations for such installations, including aspects of information and interaction design and physical setup, and derive recommendations for evaluating information visualizations in public settings.

CASE STUDIES

memory [en]code

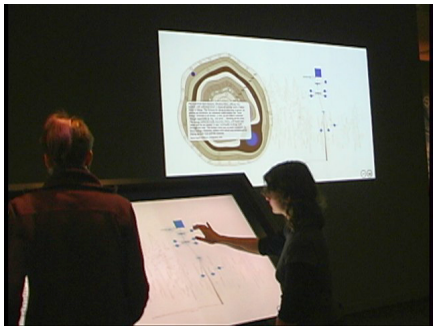
Designed for a gallery setting, *memory [en]code* is an interactive large display information visualization that exemplifies the dynamic behavior of human memory in an artistic way [3]. Cell-like visual structures float on the surface of a large digital table (see Fig. 1(a)); each representing a thought or a memory. People can actively add new memory cells by typing their thoughts, memories, or experiences into the system. Merging cells leads to the creation of a new cell that inherits the appearance and content from its "parent" cells. Depending on their amount of text and people's interaction, cells age over time until they completely disappear. The content of the visualization therefore constantly changes, inviting visitors to construct their own meaning and personal associations of the installation. *memory [en]code* represents my initial foray into questions around promoting engagement with information, providing opportunities for longer visitor interaction and encouraging return visits. These are important factors in both of my research questions.

EMDialog

Created for an exhibition of paintings by the expressionist artist Emily Carr, *EMDialog* is a large display information visualization that invites museum visitors to explore the extensive discourse around the artist [2]. Two interlinked information visualizations are shown on a large tilted touch interactive display as well as on a large video projection on an adjacent wall (see Fig. 1(b)). Both visualizations are

Submitted for review to DIS Doctoral Colloquium 2010.

(a) *memory encode* in an art gallery.



(b) *EMDialog* in a museum setting.

(c) Aquarium study.

Figure 1. Case studies.

based on a tree metaphor to honor the most prominent theme in Carr's paintings. The visualization resembling a tree cut section represents statements about and by Carr in temporal order where each tree ring represents a decade. For the tree diagram visualization, each of these statements has been embedded in a hierarchical diagram of associative terms to provide more context. Both visualizations are interlinked: selecting a statement in the cut section brings up the according tree diagram and vice versa.

My field observations of EMDialog in use and the analysis of visitor comments have led to empirical insights on my research questions regarding information exploration and engagement. My results show, e.g., that the interplay between such factors as rewarding both short and long-term interaction, supporting open-ended as well as guided information exploration, and accommodating group interaction are crucial choices in addressing the diverse audiences and promoting social experiences and discussions. Furthermore, the visibility of the large display technology, direct touch interaction, and visually appealing representations of information can motivate and initiate interaction with large display information visualizations, even in museum settings where multiple information displays compete for visitor attention.

Interactive Aquarium Tables

I conducted a third case study at the Vancouver Aquarium that involved two digital tables designed by the company Ideum[1]. This opportunity allowed me to study third party large display exhibits in light of my research questions. The table applications enable aquarium visitors to explore information about the Arctic. My study of these interactive tabletop exhibits included observations and video recordings of visitor interactions in-situ, as well as, interviews with people that I accompanied on their Aquarium visit. For my data analysis, I am focusing in particular on the use of ad hoc multi-touch gestures as part of walk-up-and-use information visualizations, and patterns of individual and collaborative information exploration.

RESEARCH STATUS

The data analysis of the aquarium study is still in progress. I am also currently developing a fourth case study to further explore the role of active participation for promoting the discussion of information as part of a large display visualization. The findings from all four case studies will provide the foundation for a conceptual framework describing the use of large display information visualization in public settings, such as museums, as well as general recommendations for the design and evaluation of such installations.

The doctoral colloquium will allow me to contrast my initial findings and my interdisciplinary research approach that draws from the areas of science, design, and art with the views of other researchers from the interaction design community. From this discussion I hope to get guidance to structure the remainder of my research and to form a consistent body of work with broad impact on the research community and practitioners.

[1] http://www.ideum.com/

ACKNOWLEDGMENTS

I would like to thank my supervisor Sheelagh Carpendale and my iLab colleagues for their support, as well as iCORE for funding my research. I would also like to thank Holly Schmidt who collaborated with me on *memory [en]code* and *EMDialog* and SMART Technologies for their support.

REFERENCES

1. S. Allen. Designs for learning: Studying science museum exhibits that do more than entertain. *Science Education*, 88(S1):S17–S33, 2004.

2. U. Hinrichs, H. Schmidt, and S. Carpendale. EMDialog: Bringing information visualization into the museum. *IEEE Transactions on Visualization in Computer Graphics*, 14(6):1181–1188, 2008.

3. H. Schmidt, U. Hinrichs, A. Dunning, and S. Carpendale. memory [en]code—Building a collective memory within a tabletop installation. In *Proc. of Computational Aesthetics*, pages 135–142. EG, 2007.

4. C. G. Screven. *Information Design*, chapter 7: Information Design in Informal Settings: Museums and other Public Spaces, pages 131–193. MIT Press, 2000.

5. D. vom Lehn, C. Heath, and J. Hindmarsh. Exhibiting interaction: Conduct and collaboration in museums and galleries. *Symbolic Interaction*, 24(2):189–216, 2001.