University of Fribourg – Department of Informatics

DIVA Research Group

INTERACTIVE WALLS

Collaborative Tangible Interfaces

Seminar

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Abstract

This paper exposes the recent considerations about interactive walls and their actual applications. It describes also briefly how these very large and high resolution touchable walls have enabled another way of collaboration in today's work environments.

1 Introduction

If today computer support has been accepted as an useful tool of interaction due to its easy handling and availability, it's a matter of fact that collaboration in group work don't take a real advantage of this technology. Usually in a group work environment, "face-to-face" collaboration turns to the use of traditional media and forms of interaction.

This basic approach of collaboration has the major disadvantage to force actors to communicate and interact with dedicated computer systems instead of assisting them through collaborative environments. The architecture of a collaborative environment could be represented as physical space (like a room, building, etc…) providing intuitive interaction due to a ubiquitous computer infrastructure.

Interactive walls, also known as interactive screens, are considered as a new computing medium offering to group workers another approach of collaboration, increasing effectiveness through large interactive and touchable displays.

1.1 Definition

The main definition of an interactive wall is a very large, high-resolution display which can be touch-sensitive. The content displayed on these interactive screens is generally the same that could be found on a desktop computer but magnified onto a larger area.

The "touch" functionality may be extremely reduced to standard elements (like buttons, images, links, etc…) or extended to a complete user control. In this case, user is able to interact with the wall by accomplishing dynamic actions.

The second inherent definition is to consider an interactive wall as a collaborative tool due to the fact that it moves the interaction space from the desktop to a wall. This use case requires that the content has been specially designed to take advantage of large interactive displays.

2 Motivations

The rising interest to provide interaction spaces in face-to-face collaboration motivated researched to describe the main aspects of an interactive environment. This has trend to increase interaction facilities, productivity and satisfaction in face-to-face collaboration.

The next paragraphs will explain some features of an ideal interactive wall, how their capabilities can enhance group collaboration and personal implication and how they influence walls design.

2.1 Large size

Working together in a group project will require space but also a large field of view as every participant should contribute to the project. These contributions could be in the form of documents or images but also non-digital output like marks on a white board.

Furthermore, a large size presentation makes more sense because objects are displayed at a lifelike size which will give the user another perception of the environment. This humanlike and shared view, in addiction on accessibility and edition assumptions, enhances considerably cooperative understanding, which couldn't adequately be done with standard computer displays.

2.2 High Resolution

Displaying large amounts of accessible information requires high resolution to give to users a real overview on the situation, standing as well near or far away from the interactive wall. Complex information sets, as diagrams, map or videos will be better represented with a fine-grained screen, that's why the pixel count should be as much as possible.

If high resolution provides perfect visual fidelity of even small elements, the effects of users interactions on the interactive wall should be designed to be large enough so that distant users are able to recognize them. In the other hand, a user touching the wall will be unable to see the entire surface, that's why information must be intelligently disposed.

2.3 Touch-sensitive

Giving a user the ability to simply touch the interactive wall, without special tools or skills, in order to participate in a group work may be considered as the preferred input mode in collaboration. So, in addiction of sharing, visualizing and discussing about a project, the user is directly involved through his natural participation.

As said before, a large sized interactive wall will allow multiple simultaneous touch inputs which will bring people to entertain together and cooperate or compete depending on their actions. This feature will require

that the interactive wall can handle multi-tasking and alerts users in case of conflicts.

2.4 Multi-user

As collaboration tool, an interactive wall should allow multiple users to access its surface so that participation in teamwork is considerably simplified. Taking in account that multiple touch inputs can be done by multiple users through relatively large motions of their hands or arms, it will certainly result in an engaged and motivated collaboration.

Remember that even a novice user expects multi-touch capability from an interactive wall, that's why this feature is an important key in walls designs.

3 Challenges

After describing the main features of an interactive wall, developing content to use medium effectively will produce some challenges to take in consideration. Particularly, the way of interaction between the user and the wall could show some lacks if the wall design hasn't been considered to the expected public.

3.1 Interaction

The touch interaction problematic must be discussed to implement a good wall design. First, it could be an obvious statement but the user must be aware that he can interact with the wall. Then, he should learn intuitively how to execute actions on the wall, either in touching it or through body gestures.

But the main difficulty is to fulfil user considerations by trying to guess user expectations. Every person will have a particular manner to interact with the wall, that's why this interaction must be as flexible as possible.

3.2 Field of view

Depending on the user position, the user will have access to a certain quantity of information. User's field of view will be reduced if he stands near the wall and increased if he moves back.

The questions here are how to give the same capabilities to an user independently from his position? That means interact and be aware of the environment's evolution.

4 Actual applications

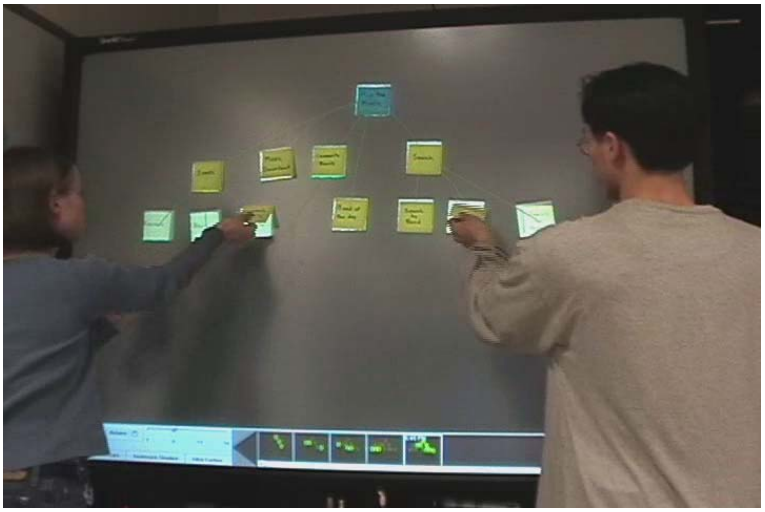
To illustrate above assumptions, a few examples from actual applications in different research directions will complete this overview

about interactive walls. You can retrieve an extended list of interactive walls at [1].

4.1 The Designers' Outpost

The Designers' Outpost is a tangible user interface that combines the use of paper and a large physical workspace with the advantages of electronic media to support collaborative information design for the web.

Based on an human comportments studies, web site design practice has been revisited, that's why this system has been developed to support the designers during the early phases of information design. See [2] for more information.



4.2 Accenture's Wall

The Accenture Technology Labs has created a scalable architecture which can support Walls of any size and resolution. The natural parallelism of the system allows for full workstation performance across the entire Wall. Applications might feature complex CAD models, high-resolution video, interactive simulations, game graphics, or all of the above.

To draw the pixels, various display solutions are possible, from stackable "cube"-style monitors to tiled-projection displays. To detect user touch, the Labs has developed its own camera-based touch system, which operates at a very large scale with a fine degree of resolution. See [3] for more information.

4.3 The Onomy Interactive Digital Wall

The Interactive Digital Wall is an ideal display for chronological information, for executive briefings, and for putting a "magic lens" onto otherwise static material. The combination of a bold printed background (or vitrenes containing artifacts) with a glowing user-movable high resolution LCD display is an irresistible draw to visitors of all ages.

The dynamic and progressively revealed content allows you to include a very large amount of information in a small space. In the executive briefing tools above, the Interactive Digital Wall is ideally suited for the presentation of linear spatialized information, such as signal flow, project paths, and topographies. See [4] for more information.

5 Conclusion

In the previous sections, we have introduced interactive walls and their ability to turn collaboration into engaged participation. This interactive approach, allowing users to contribute and share information under humanlike manners and proportions, reflects a sensible evolution towards teamwork or public entertainment.

Nevertheless, this medium requires further development, particularly in user interaction and in concrete application examples. As display technologies become more powerful and at lower cost, we can expect that interactive walls will probably integrate today’s collaboration tools.

6 References

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- [2] http://guir.berkeley.edu/projects/outpost/
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- [4] http://www.onomy.com/blue/wall.html