

SUPPORTING COLLABORATION AND ENGAGEMENT USING A WHITEBOARD-LIKE DISPLAY

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Abstract

Large interactive display surfaces have the potential to combine the simplicity, spontaneity and presence of a conventional whiteboard with the convenience, clarity, and archiving and retrieval capabilities of a computer display. Recent developments in display projection and large surface digitising have brought the cost of such displays to a level where they can be utilised to support a range of everyday activities. This paper describes the LIDS (Large Interactive Display Surfaces) project, recently commenced at the University of Waikato. LIDS focuses on the use of low-cost whiteboard-like shared interactive displays, and is exploring whiteboard metaphors and lightweight interaction techniques to support group collaboration and engagement. Three closely related application areas are being studied: (i) support for single and multiple site meetings and informal discussions, (ii) the use of such displays in teaching, and (iii) their use in personal information management.

Authors' Backgrounds and Motivations

Mark Apperley has more than 25 years of research and publication experience in the field of HCI. Previous work has focused on interactive systems design, interaction techniques, information visualisation, visual languages and collaborative systems. He is Principal Investigator for the Large Interactive Display Surfaces (LIDS) and Collaborative Information Gathering (CIG) projects at the University of Waikato, both supported by government grants through the New Economy Research Fund. The LIDS project focuses on applications of low cost large interactive display screens, with specific reference to single and multiple site meeting/collaboration support, in addition to applications in teaching and personal information management.

Masood Masoodian (attending author) has been doing research in the field of CSCW for several years. The primary focus of his research has been the study of the effectiveness of different human-to-human communication media in supporting group interaction in synchronous computer-based shared workspaces. He has also been involved in design, development, and evaluation of a number of computer-supported collaborative work environments. He is a member of the LIDS research team.

Research Description

LIDS (Large Interactive Display Surfaces) is a joint project between the University of Waikato and Auckland University of Technology, funded by the Foundation for Research, Science and Technology through the New Economy Research Fund. Work on the project commenced in May, 2000. This paper provides an overview of the project, and its underlying general philosophy. The research objectives are described, with a particular emphasis on those objectives relating to face-to-face collaboration, along with preliminary outcomes and results.

Overview and Philosophy

Large display screens have long been an important medium for teaching and business presentations. They enable the presenter to share a visual space with the audience. Simple passive systems, such as blackboards and whiteboards, offer transparency of use and permit spontaneity in presentation. Projection systems offer superior quality images, sound and animation, but with the cost that the material must be prepared in advance, and cannot be altered significantly during a presentation. More recently, video projection from a computer has become a popular large screen presentation tool. It offers more flexibility than film or slides, in that the presenter can interact with the presentation and make changes on the fly, but this usually means disengaging from the audience in order to “fiddle” with the keyboard or mouse. In the research described here, the intention is to foster engagement and participation through direct interaction with the display, emulating the use of a conventional whiteboard.

A number of studies in recent years have explored the potential of large screen displays, both passive and interactive. These have considered such diverse applications as office whiteboards [7], meeting support [1, 6, 9] and remote site collaboration [10]. A common characteristic of all of these studies has been the high cost of the display technology. Recent developments in display projection and digitising devices have meant that truly interactive large screen displays, resembling whiteboards both in appearance and style of use, can now be assembled at a relatively low cost. In the LIDS programme, we are exploring and developing the application of such displays in supporting teaching (both face-to-face and distance modes), meetings and discussions (face-to-face and remote collaboration) and personal information management (the individual office environment). This is being achieved through the utilisation of existing low-cost technology, the development of new software and interaction paradigms, and the modification and exploitation of existing software, and by drawing on results and experience from the earlier research already mentioned.

Our general approach is to emphasise “lightweight” interaction, and a matching of the supporting technology to the task. For example, teachers already prepare class material using presentation software such as PowerPoint™; they often annotate this material with a felt-marker as it is delivered. An ideal record of the class is a combination of these two,

synchronised with the spoken delivery, without being unduly formalised or sanitised by the requirement to record it. Similar considerations relate to meeting records, and to the informal use of a whiteboard in an individual's office. This is the approach we are taking, to provide tools which combine the informality and utility of a whiteboard with the convenience and recall of computer-based applications.

Research Objectives

Within the LIDS programme, three closely related application areas are being explored: teaching and distance learning, meeting support, and personal information management. In all three of these areas, large display surfaces have the potential to be used both in collaborative and stand-alone modes. In teaching, and particularly distance learning, we intend to demonstrate the ability to efficiently record, retrieve and disseminate lectures, seminars and tutorials, with almost no additional effort on the part of the teacher. Similar technology will be applied to the support of meetings and tutorials conducted over multiple sites, and this technology will be adapted to support both informal and formal face-to-face discussions and meetings. Related developments will be shown to be applicable in managing information and informal discussions within a personal office environment.

Common threads which run through these application areas, and which are particularly relevant to the support of face-to-face collaboration, include:

- (i) The underlying display technology, comprising a wall mounted display surface and pen-like interaction devices. The emphasis here is on a simple, inexpensive display system and interaction device(s), which are consistent with the whiteboard model.
- (ii) The development of a "whiteboard" metaphor, utilising tools and interaction techniques consistent with this informal tool, but which exploit the dynamic nature and retrieval capabilities of a computer display. We are particularly interested in the informal early design styles seen in SILK [2] and DENIM [3], and in assessing the relative merits of free-form versus OCR'd text, in this context.
- (iii) The sharing of the display real estate, allowing face-to-face participants to interact with the shared space from individual laptops, PDAs or WAP devices. We see this extending beyond the interactions described for iRoom [1], to allow multiple users to interact with a common document or screen, providing annotations, moving material, or claiming sections of real estate on which to present their own arguments or views.
- (iv) The development of tools which can operate transparently with standard desktop applications. We consider it important to allow the integration of standard applications into our environment, so that previously prepared documents or diagrams can be discussed and annotated, and that early designs can be gracefully transformed into completed solutions.

Other aspects of the project, of less direct relevance here, include the recognition of hand-drawn mathematical expressions [4], and “through the window” views of participants at remote locations [10]. This research is still in its very early stages, and only modest outcomes can yet be reported.

Progress to Date

At this stage two display systems have been constructed, one at each of the two sites involved. These comprise a rear projected glass screen and a Mimio™ whiteboard digitiser [11]. Each screen is approximately 900mm high by 1200mm wide. In one case frosted glass has been used for the screen, and in the other, clear glass with a tracing paper underlay. In both cases, projection is from a standard data projector. The Mimio digitiser has proved an inexpensive yet very effective means of providing pen-based interaction directly on the screen surface.

Evaluation of the display prototypes has been carried out using the Mimio™ mouse software, PenOffice for Windows [8], standard Windows applications, and the DENIM software[3]. The performance of the display system is more than satisfactory for the proposed research.

Work is now beginning on the main objectives of the programme (ii, iii and iv above).

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Justification for Participation

Although the research described in this paper is in its very early stages, the research programme is directly concerned with the topic of the workshop. It is concerned with *novel environments that support users' natural collaborative behaviour, and issues surrounding shared environments for face-to-face collaboration*, and it exploits *wall style displays, alternative collaborative input devices, multiple input devices and collaborative interfaces*. Both the workshop itself and the research programme described will benefit from the work being presented at the workshop.