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Collaborative Multimedia in SHASTRA

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Abstract

We discuss the application of multimedia in scientific design, and describe a multi-user distributed and collaborative scientific manipulation environment, SHASTRA, implemented on the multimedia desktop. We highlight salient features of the underlying collaboration infrastructure an application conferencing substrate that enables user level cooperation. We demonstrate multimedia interfaces incorporating text, graphics, audio and video, and how these interfaces greatly empower users in the process of collaborative scientific design

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KEYWORDS:

Multimedia Collaboration Multi-user

Introduction

Multimedia workstations have become commonplace due to recent advances in electronics, computer and communication technology. Current audio video, and graphics processor architectures, coupled with high speed networking and compression techniques, have presented us with a very powerful tool - today's desktop system. Computer mediated mechanisms built on top of these systems provide us with the means to exchange multimedia information, and will revolutionize how we collaborate in the scientific setting.

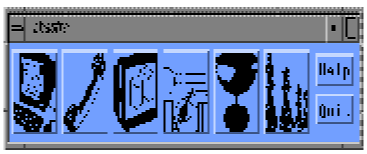

Figure 1: Multimedia Services

Our goal is to depart from traditional single user scientific manipulation systems and build multi-user scientific design and analysis environments, by harnessing current computing technology and utilizing multimedia functionality and performance. The objective is to develop the next generation of scientific software environments where multiple users, eg. a geographically distributed collaborative engineering design team, create, share, manipulate, analyze, simulate, and visualize complex three dimensional geometric designs over a heterogeneous network of workstations and supercomputers.

We have adopted the approach of integrating a collection of function-specific tools into a distributed and extensible environment, where tools can easily use facilities provided by other tools. Isolation of functionality makes the environment modular, and makes tools easy to develop and maintain. Distribution lets us benefit from the cumulative computation power of workstation clusters. Tool-level cooperation allows us to exploit the commonality that is inherent to many scientific manipulation systems. An enabling infrastructure of communication and interaction tools, display and visualization facilities, symbolic processing substrates, and simulation and animation tools saves avoidable re-implementation of existing functionality, and speeds up the application development process.

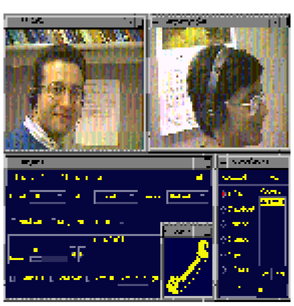

Figure 2: Multimedia Phone Conversation

The collaborative scientific environment provides mechanisms to support a variety of mult-user interactions spanning the range from demonstrations and walk-throughs, to asynchronous multi-user collaboration. In addition, it facilitates synchronous and asynchronous exchange of multimedia information which is useful to successfully communicate at the time of design, and to share the results of scientific tasks, and often necessary to actually solve problems. The infrastructure provides facilities to distribute the input of low computation tasks - to obtain the parallelism benefit of distribution, and the output of compute intensive tasks - to emphasize sharing of resources among applications. It provides a convenient abstraction to the application developer, shielding him from lower level details, while providing him with a rich substrate of high level mechanisms to tackle progressively larger problems.

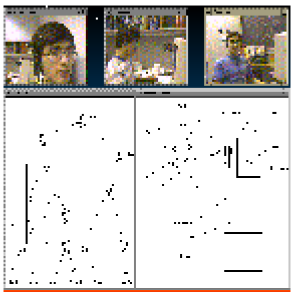

Figure 3: Collaborative Sketching Session

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Multimedia Demonstration

Our demonstration will consist of allowing conference attendees to interact with the SHASTRA multimedia services described in the next section.

If it is allowed by the conference we would also like to allow developers at Purdue University to be collaboratively involved in the demonstrations both as participants and observers. This would allow us to fully demonstrate the capabilities of the SHASTRA substrate and the Multimedia Services.

The interaction of the remote site would be a networked teleconference involving both video and audio as well as allowing the remote site to perform any computer intensive calculations that would be necessary to demonstrate any of the more complex scientific visualization projects.

We envision the potential for three different demonstrations depending upon the hardware environment that is available. Outline below are the scenarios envisioned.

- No hardware is available. We would bring two sparcbooks that would communicate via a wireless network. We would demonstrate the collaborative nature of our Multimedia services by allowing attendees to interactively collaborate back and forth with the tools.

- Workstations available with restricted network access. We would bring our software and install it on the available architecture (we support HP, Sun, and SGI) then present the same demonstration as in the no hardware case.

- Two Indy workstations are available with full Internet access. This is the optimal case. In this situation we would allow conference attendees to use the Multimedia Services to communicate with the system developers at Purdue University and participate in the use of the services in a simulated collaborative problem solving session.

  Attendees would have the opportunity to help formulate the strategy and based on intermediary results alter the approach to solving the problem using the collaborative software.

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Multimedia Services

Below is a list of the Multimedia Services that will be demonstrated.

SHA-PHONE
: is used to record and playback audio information stored in multimedia objects and to conduct n-way audio conferences.

SHA-POLY
: is a collaborative visualization and graphical-object browsing and manipulation tool.

SHA-DRAW
: is a sketching tool, which facilitates the shared generation and display of 2-D pictures.

SHA-TALK
: is a text communication tool which supports synchronous n-way textual conversations.

SHA-VIDEO
: handles image data (without sound). It is used to playback and record video information stored in multimedia objects and to conduct n-way video conferences.

SHA-CHESS
: is a collaborative chess application. It exploits the permission mechanism of SHASTRA to support a variety of modes in which multiple users can interact over a virtual 3D chessboard- from tournament-like regulated conditions to an n-sided free for all, to a chess instruction tool.

SHA-LEGO
: supports a shared virtual 3D design environment and typifies virtual collaborative environments for "building block" games and other entertainment-oriented as well as educational interaction. A collaboration of SHA-LEGO instances creates a virtual world and provides an interface that lets a group of players synchronously interact over a shared design task.

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