Dartmouth College

Dartmouth Digital Commons

Computer Science Technical Reports

Computer Science

1994

The Design and Development of Interactive Multimedia Conference Proceedings

Samuel A. Rebelsky
Dartmouth College

James Ford
Dartmouth College

Kenneth Harker
Dartmouth College

Fillia Makedon
Dartmouth College

P Takis Metaxas
Wellesley College

See next page for additional authors

Follow this and additional works at: https://digitalcommons.dartmouth.edu/cs_tr

Part of the Computer Sciences Commons

Authors

Samuel A. Rebelsky, James Ford, Kenneth Harker, Fillia Makedon, P Takis Metaxas, and Charles Owen

THE DESIGN AND DEVELOPMENT OF INTERACTIVE MULTIMEDIA CONFERENCE PROCEEDINGS

Samuel A. Rebelsky
James Ford
Kenneth Harker
Fillia Makedon
P. Takis Metaxas
Charles Owen

The Design and Development of Interactive Multimedia Conference Proceedings

Samuel A. Rebelsky[1,2], James Ford[1,2], Kenneth Harker[1,2],
Fillia Makedon[1,2], P. Takis Metaxas[2,3], Charles Owen[1,2]

[1]Dartmouth College Department of Computer Science
[2]Dartmouth Experimental Visualization Laboratory
6211 Sudikoff Laboratories, Hanover, NH 03755
(603) 646-3266
samr@cs.dartmouth.edu

[3]Wellesley College Department of Computer Science
106 Central Street, Wellesley, MA 02181

ABSTRACT
Many conferences are now providing electronic proceedings (e.g., [2,10,11,17]). Often, these proceedings are little more than electronic collections of documents put together in a standard software package, such as SuperBook or Acrobat. This means that few of these proceedings incorporate the full range of materials that a conference generates. Furthermore, because these general interfaces are not designed for conference proceedings, they do not provide all the features a conference warrants.

The interactive multimedia proceedings for the DAGS'92 Institute on Parallel Computation [9] used an interface designed specifically for presenting conference materials and provided both talks (audio, video, and slides) and papers (in hypertext form) along with an extensive set of features for navigating and using the proceedings [5]. This interface provided the basis for further work on the design and creation of electronic conference proceedings. As we developed the electronic proceedings for DAGS'93 [13,14] and DAGS'94 [12] we surveyed users of the prior proceedings and reevaluated this interface. This evaluation suggested many alternatives and extensions to the interface and led us to redesign and reimplement the DAGS interactive proceedings interface.

In this paper, we summarize the materials and features that comprise conference proceedings, describe and evaluate the DAGS'92 interface and detail the changes and decisions made in developing the new interface used for DAGS'93 and DAGS'94.

KEYWORDS: Electronic Conference Proceedings; Multimedia Interfaces; Hypermedia; Academic/Educational Applications; User-Interface Components.

INTRODUCTION

Modern computer systems have changed the way that conference proceedings can be presented and archived. No longer are researchers limited by printed text; electronic proceedings allow one to search the proceedings, add and share annotations, and create paths of related concepts through the proceedings. These additional capabilities extend the opportunities and benefit the thought processes of actual conference participants and create new *virtual participants* who experience the conference through the electronic proceedings. These capabilities can also be used to make the proceedings accessible not only as a research tool for specialists, but also as a teaching tool that can accommodate newcomers to a field and help them learn about topics and presentation styles for that field [18].

Electronic conference proceedings also provide the basis of study in the design, implementation, and construction of multimedia objects and interfaces [15] because they

- incorporate a wide variety of materials (including the text of papers; slides, audio, and video from presentations and panels; and accompanying tutorial materials);

- include significantly more text than many multimedia documents (although electronic proceedings can incorporate audio, video, and graphics, the text of the proceedings provides the key material for the proceedings) and require that the disparate segments be coherently connected (e.g., it should be easy to move from talk to paper and back again);

- admit highly nonlinear and unpredictable interactions (many multimedia objects can be pre-"scripted" and "storyboarded" to provide only a few paths; researchers using conference proceedings cannot be limited to linear paths if they are to use the proceedings as research and teaching tools); and

- suggest a wide variety of features including complex searching features, hypertext links, annotation capability, and participant-definable paths through the proceedings.

Many conferences are now providing electronic proceedings (e.g., [2,10,11,17]). However, most electronic proceedings do not provide the full range of components and services that virtual participants need. A complete multimedia conference proceedings interface must provide not just

papers and prepared videos, but also audio, video, and slides from talks. A proceedings must also provide sufficient features for managing and using these components.

Although the original DAGS multimedia proceedings interface [5] provided a wide range of materials and features, we were not satisfied with the design of that interface. It also proved unwieldy to port to other platforms. Hence, we chose to completely redesigned and reimplement the interface to provide a clearer, cross-platform interface that is more uniform, provides more features, and is easier for virtual participants to use.

In this paper, we explore the interfaces to multimedia proceedings, describe the original DAGS multimedia proceedings interface [5], and show why and how we redesigned this interface for future versions of the DAGS proceedings.

ABOUT MULTIMEDIA PROCEEDINGS

Components of Multimedia Conference Proceedings
Electronic proceedings can include a much broader range of materials than traditional proceedings. Therefore, when creating an interactive multimedia conference proceedings, the editors and designers must first consider the nature and types of materials that might be included in the proceedings, then determine the roles these materials can or should play, and, finally, select what to include and what not to include. Many factors influence these decisions and choices, including (a) the needs, expectations, and capabilities of the users of the proceedings, (b) the costs (time, labor, funds, and other resources) of including more sophisticated content, and (c) the benefits additional media provide.

Text	Audio	Video
Papers	Talks	Prepared videos
Transcriptions	Panels	Presentations
Notes	Meetings	...
Glossary	...	
...		

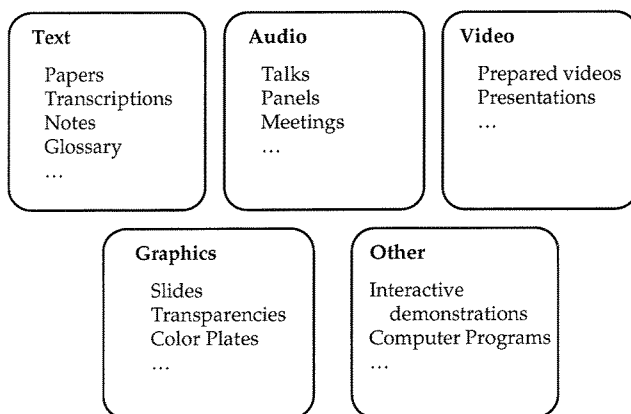| Graphics	Other
Slides	Interactive
Transparencies	demonstrations
Color Plates	Computer Programs
...	...

Figure 1. Potential components of interactive multimedia conference proceedings.

A vast array of materials is available to the designers and editors of an electronic conference proceedings [19]. These materials, which are summarized in figure 1, include

* *Papers presented at the conference.* These papers should be presented in a format designed for onscreen viewing. However, surprisingly many electronic proceedings assume that the electronic version of the paper should precisely mimic the layout of the printed copy (going so far as to include two columns). Although an electronic proceedings can admit much longer papers than a printed proceedings, virtual participants will only be willing to read a limited amount of text, so papers should be presented in short form (and, if the author desires, in an accompanying long form).

* *The audio and video tracks from talks and panels.* To make the multimedia proceedings more than a simple video tape, these should be appropriately segmented and annotated.

* *Slides and transparencies.* Although these are most useful when used in conjunction with the audio and video from talks, they can also serve as independent resources.

* *Annotated transcriptions of presentations and speakers' and panelists' notes.* These materials may also include "scripts" of presentations and other materials that the authors have prepared to guide their presentations.

* *Interactive and noninteractive demonstrations and videos.* These materials are often used by conference presenters to supplement their papers and talks.

* *Additional tutorial materials.* These materials might include a glossary, introductory papers in the field, and a unified bibliography.

* *Informal records from discussions.* These materials help capture the informal nature of the conference and give virtual participants further access to materials not normally included in conference proceedings.

* *Shared comments, links, and annotations.* These extensions to the proceedings help the proceedings grow and provide additional context for virtual participants.

Potential Features of Multimedia Conference Proceedings
If a multimedia proceedings is to be more than a simple collection of papers and videotapes, it must provide a variety of mechanisms that allow virtual participants to manage, manipulate, and extend the content of the proceedings. Some of these features correspond to features most multimedia applications include (or should include); others are especially appropriate for multimedia proceedings. The three primary types of features relevant to electronic proceedings are navigation, searching and indexing, and annotation.

Navigation. A virtual participant should be able to easily navigate to appropriate portions of the proceedings. Navigation utilities include linear navigation (forward, back, previous, beginning, end, recent); hypertext navigation, with links created by both the editors of the proceedings and the virtual participants who use the proceedings; and other, more sophisticated mechanisms, such as ones that take the structure of the document into account (e.g., "skip the following detail"). These features include:

Searching and indexing. A proceedings should provide a variety of searching and indexing mechanisms that range from straightforward and simple (e.g., "find the next object (page or portion of a talk) that mentions ———") to complex (e.g., "find all objects with similar content to this object" or "find all objects with a table in the left column and figure that looks like a directed graph in the right column").

Annotation. Virtual participants should be able to annotate both papers and presentations in a variety of ways, many of which mimic annotations added to printed proceedings. Such annotations include marginal notes on individual "pages," a separate notebook, bookmarks (with participant-definable names and a clear indication of which portion of which paper the bookmark refers to), and highlighting of particular phrases in the text. In addition, electronic proceedings allow for new types of annotations, such as "paths of ideas" through the proceedings. Finally, participants should be able to make new links between components of the proceedings (as originally suggested for all hypertext documents in [4]).

An electronic proceedings should also provide more basic features such as help, printing, and the ability to copy and paste portions of the proceedings (however, some authors object to this last feature).

BACKGROUND: THE DAGS'92 INTERFACE

The original DAGS interactive proceedings interface was developed in conjunction with the construction of the DAGS'92 proceedings [9]. In effect, this proceedings was an experiment in both designing an interface that combined the text of papers with the audio, video, and slides from talks and constructing electronic proceedings. The paragraphs below summarize the key features of the interface which had two main components: a hypertext interface for papers and a separate interface for talks. Both the interface and the construction of the DAGS'92 proceedings are described further in [5].

The Interface for Papers

The paper component of the original DAGS proceedings interface was based on the Gloor-Dynes Hypertext engine [7], shown in figure 2. The Gloor-Dynes engine was created for *Animated Algorithms* [8], an animated version of *An Introduction to Algorithms* [6]. In the Gloor-Dynes interface, the main text is presented at the center of the screen, most features are provided via "palettes" at the sides of the paper and links in the text (e.g., "Equation 5") are indicated with a bold text style. The in-text links are to bibliography entries, equations, figures, and other parts of the same paper.

This interface presents the current context within the paper and proceedings in a variety of ways. The author and title of the paper appear at the bottom of the screen (both in large text and in smaller text). The title of the current section appears at the top of the page. The position within the current section is indicated by the scroll bar at the right of the page. The position of the current section in relation to

the rest of the paper is indicated by the collection of rectangles at the bottom of the screen and the number at the center of the *navigation diamond* at the lower-left-hand corner of the screen.
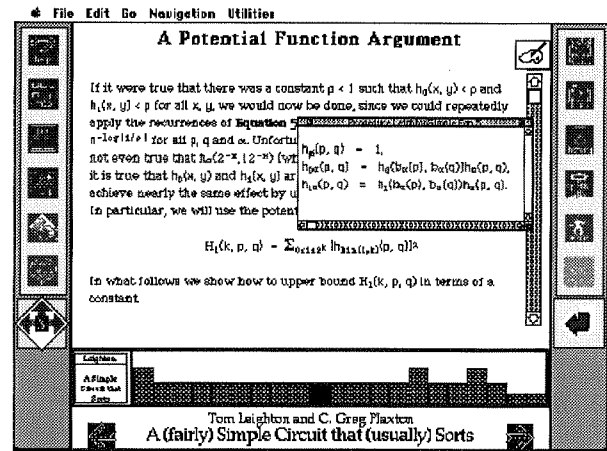

Figure 2. The Gloor-Dynes Hypertext engine.

These rectangles and navigation diamond are perhaps the most novel part of the interface, and provide hierarchical context to the current section. The tallest rectangles represent individual papers, with smaller rectangles representing more refined portions of the paper (section, subsection, ...). The navigation diamond at the lower-left-hand corner of the screen allows the participant to navigate the hierarchy of sections, moving forward to the next section at the same level, up to the enclosing section, or down to a subsection. The navigation diamond changes depending on the relation of the current section to surrounding sections. For example, in the last subsection of a section, there is no "forward to next section at the same level" arrow.

As mentioned above, the palettes on the sides of the screen provide additional features. The buttons on the left provide (a) help, (b) a navigable "map" of the proceedings, (c) a text-based table of contents, (d) a collection of modifiable bookmarks, (e) a log (notebook), and (f) marginal notes. The buttons on the right margin provide (g) a collection of links to related topics (created by the editors of the proceedings), (h) user-definable links, (i) user-definable "paths of ideas," (j) a history of sections visited, (k) a link to the corresponding part of the talk (if it exists), and (l) links to any figures in the current section. The icons for the marginal notes, links, talk, and figures are shown in a different color when those materials are available for the current section.

The Interface for Presentations

For the first DAGS multimedia proceedings, the decision was made to use a simple but straightforward interface for the conference presentations. This interface, shown in figure 3, is significantly less sophisticated than the Gloor-Dynes Hypertext engine. In this interface, the slides and audio are presented as a QuickTime movie at the left of the

screen, while video of the speaker is presented in the upper-right-hand-corner. Apple's QuickTime software is used to present the slides and audio and allows participants to start and stop the talk and to quickly scroll through the slides.
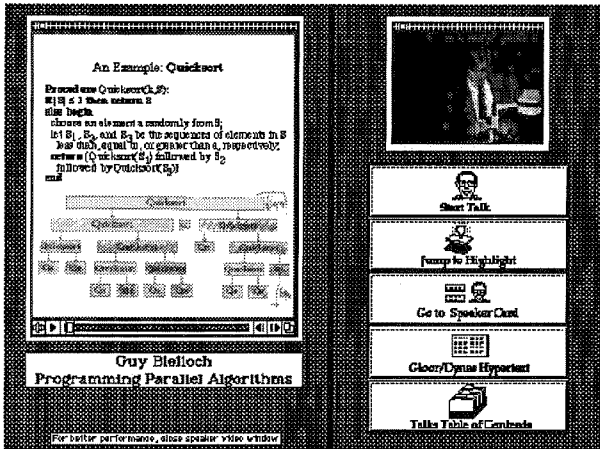

Figure 3. The original DAGS presentation interface.

The buttons on the right-hand-side of the screen provide the basic features for the presentations. These include a table of contents for the current presentation (the button called "Jump to Highlight") which allows the user to quickly navigate to key points of the presentation; a link to a biography of the speaker; a link to the corresponding part of the corresponding paper; and a link to the table of contents.

Because the distribution medium (CD-ROM) did not provide sufficient space to include full video of the speakers, a short (approximately 30 second) video loop was used instead. Many virtual participants reported that this loop provided an appropriate "level of comfort." However, on lower-end Macintoshes with single-speed CD-ROM drives, displaying the video loop interfered with presentation of the audio.

REDESIGNING THE INTERFACE
In building multimedia proceedings for subsequent conferences, we chose to redesign and reimplement the DAGS interface. Many factors contributed to this choice, including:

* a decision to provide equivalent features in both parts of the interface (so that virtual participants could annotate and otherwise use presentations in the same ways that they used papers);

* a desire to provide the proceedings on multiple platforms (the original proceedings were developed in HyperCard using a significant number of newly-created XCMDs which did not allow for easy porting to other machines; the new proceedings are based on "pure" HyperCard, which can be translated to corresponding software packages on other platforms); and

* evaluations and suggestions for improvement from virtual participants who used the earlier interface and by new members of the electronic proceedings team.

This new interface, illustrated in figure 4, incorporates many of the key features from the earlier interface, but provides them in a simpler, more consistent fashion. For example, navigation mechanisms have been unified and simplified and marginal notes have been moved onscreen, so that they more closely resemble marginal notes in printed proceedings.
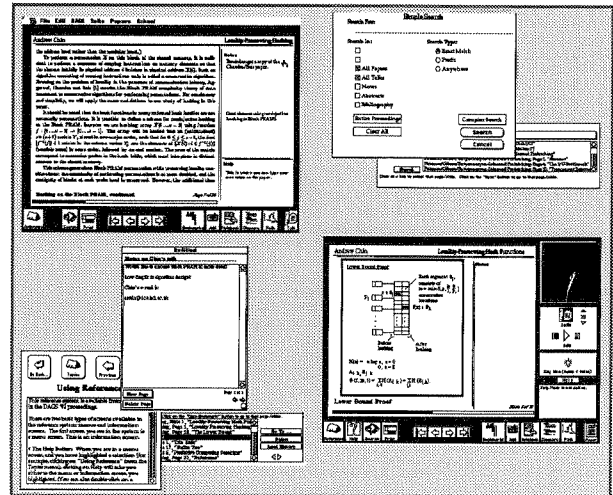

Figure 4. A (simulated) snapshot of the revised interface.

This new interface provides similar features for both presentations and papers. Features that span both parts of the proceedings include searching, annotation (including bookmarks, marginal notes, notebook, and paths), and context (given by a page/slide number and a progress bar).

In addition to providing similar features for both papers and presentations, this new interface extends and updates the original interface in many other ways. In particular:

* The new interface allows the virtual participant to view multiple documents simultaneously. This means that the virtual participant can compare results from multiple papers and scan a paper while listening to the corresponding talk.

* The new interface provides much more sophisticated searching/indexing facilities. In addition to a simple "list all occurrences of ———" search, the new interface provides "N out of M words" and boolean indexing methods. All three types of searching mechanism can be restricted to particular parts of the proceedings (e.g., the current paper, the virtual participant's notes on the proceedings, abstracts, only papers, or only talks). The virtual participant can further restrict the search to exact matches, to prefix matches, or to matches anywhere within a word.

* Because bookmarks, paths, and search results are similar (all are lists of pages/slides in the proceedings), the new interface presents a consistent means of access to all three. These lists also provide a variety of information

for each link, including (a) an optional, participant-definable name for the object (page in paper or slide in talk); (b) a name for the object (chosen by the author or editor); (c) the name of the paper or talk that the object belongs to; and (d) the page or slide number within that paper or talk. In addition, a virtual participant can copy links from list to list (e.g., incorporate search results in a path through the proceedings).

Revising the Interface for Papers
In redesigning the interface used for presenting conference papers (shown in figure 5), we strove for increased simplicity and consistency. In addition, we chose to design an interface that looked somewhat more like a traditional book: we placed the author and title at the top of each screen (rather than at the bottom, as in the Gloor-Dynes engine) and included marginal notes directly onscreen, as opposed to in a separate window.
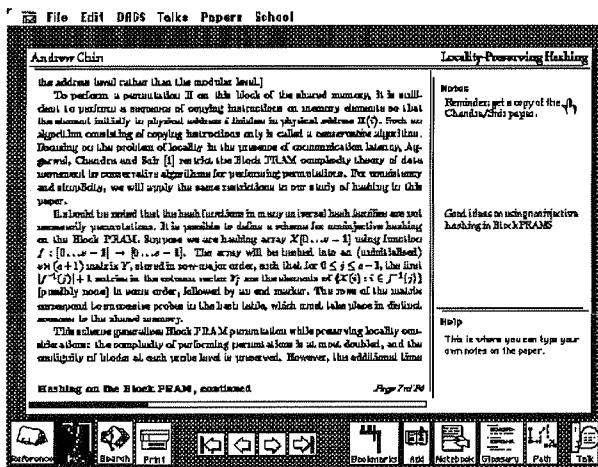

Figure 5. The revised DAGS hypertext interface.

We felt it important to provide as many onscreen cues as possible to help virtual participants orient themselves within the proceedings. Hence, in addition to author and title, each page includes a page number (and total number of pages), a progress bar showing how much of the paper has been read, and a page title chosen by the editor (the page title is used in the bookmarks, path, and search results).

The new interface also discards the Gloor-Dynes hierarchical organization and corresponding navigation mechanism. While this mechanism can be quite useful, most virtual participants either read the pages in order or navigate to other parts of the proceedings using bookmarks, paths, and searches. The simpler interface is also easier for novices to understand; the Gloor-Dynes interface effectively has three notions of forward—forward in the current section (using the scroll bar); forward to the next section at the same level (using the navigation diamond); and forward to the next section, subsection, or supersection (using the arrow button or arrow keys)—while the new interface has only one—forward to the next page.

This is not to say that there is only one way for virtual participants to navigate through the proceedings. They can move forward and backward using the arrow buttons, the arrow keys, and by clicking on an appropriate portion of the progress bar.

Finally, the new interface relegates some features to the menu bar. For example, neither predefined nor participant-defined links are immediately available or obvious from the basic interface; however, they are available through the DAGS menu.

Revising the Interface for Presentations
As suggested above, the new interface for presentations was designed to mimic the interface used for presenting papers. Hence, it provides the materials in a form similar to that for papers. As figure 6 shows, each slide includes the speaker and title at the top of the screen; a progress bar and slide number at the bottom of the screen; a slide title above the progress bar; marginal notes to the side of the slide; and buttons to provide access to the primary features at the bottom of the screen.
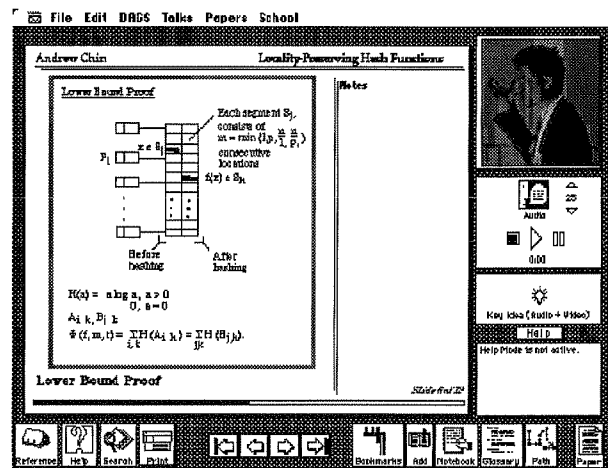

Figure 6. The revised DAGS presentation interface.

Because presentations do differ in many respects from papers, certain aspects of this portion of the interface differ from the interface for papers. In particular the interface for presentations includes a picture and video of the speaker and an audio control panel. This control panel was chosen to resemble a simple VCR control. Using the control panel and other navigation mechanisms, the virtual participant can start, stop, or pause the talk at almost any point as well as move to another slide and restart the talk from that point.

The control panel also provides information about the presentation, including the time elapsed in the talk (which changes automatically both when virtual participants listen to the presentation sequentially and when they navigate to other portions of the presentation) and a numeric volume (some evaluators of the earlier interfere commented that the QuickTime volume control is not immediately obvious and that it is hard to determine the current volume by looking at the icon).

Although it is not immediately obvious from figure 6, the new interface does not employ a video loop during talks. The aforementioned problems with presenting and synchronizing three media (audio, video, and slides) led us to discard the loop. However, the new interface does include video for a selected portion of the presentation. This video is available through the "Key Idea" button.

CONCLUSIONS
While the new interface has not yet had the wide dissemination of the previous interface, initial reactions to this new interface have been quite positive. We anticipate that the ability to annotate and search presentations will further extend the benefits of such proceedings and allow them to be used in a variety of situations. We believe that these interfaces show the potential of multimedia proceedings and hope that they will encourage other electronic conferences to provide proceedings that include papers, presentations, and appropriate features.

FUTURE WORK
Although this new interface makes a significant leap forward in interfaces for electronic conference proceedings, it is not complete and can accommodate many new features and extensions. For example, given that many readers of printed proceedings use highlighting markers to indicate key points, an electronic proceedings might also include such markers.

Electronic proceedings also show promise as a teaching tool. Using the features suggested above, teachers may determine appropriate paths through the proceedings for their students to follow, moving from slide to text and back again, and annotate portions of the path to provide further help and explanation for their students. Because electronic proceedings provide a repository for both papers and presentations, they can also be used to demonstrate presentation techniques to students (e.g., how to turn a paper into a presentation). Some attempts have been made to use these proceedings in those ways; however, more experiments should be taken and the benefits of these pedantic styles evaluated.

Conferences are not the only objects that combine significant amounts of audio, video, slides, and related text. In many ways, a conference resembles a class, albeit with many instructors. We are currently investigating the use of these interfaces for class-based materials, including lecture notes, class transcriptions, blackboards, as well as audio and video.

If electronic conference proceedings are to be successful, the creation of such proceedings must be automated. At present, many proceedings (especially ones that incorporate a wide variety of materials) must be created by hand, at significant expense. We are currently investigating the use of VideoScheme [16] in the automation of audio editing (primarily to remove vocal ticks, such as "um"s, "ah"s and pauses).

Finally, further work on the evaluation of multimedia conference proceedings must be completed. Such work must include determination of appropriate metrics for the value of electronic proceedings. Should value be determined by sales? By reported uses? By novel features presented? By citations to papers in the proceedings? By citations of the proceedings interface? Or by other metrics?

REFERENCES
1. J. Alspector, R. Goodman, and T. X.. Brown (editors). *Proceedings of the International Workshop on Applications of Neural Networks to Telecommunications*. Erlbaum: Hillsdale, NY, 1993.

2. R. B. Allen. "Electronic Proceedings (Eprocs) for IWANNT'93 [1]." *Human Factors in Computing Systems: CHI'94 Conference Companion*, p. 287. ACM Press: New York, NY, 1994.

3. J. F. K. Buford (contributing editor). *Multimedia Systems*. ACM Press: New York, NY, 1994.

4. V. Bush. "As We May Think." *Atlantic Monthly*, 1945.

5. M. Cheyney, P. A. Gloor, D. B. Johnson, F. Makedon, J. W. Matthews, and P. Metaxas. "Conference on a Disk: A Successful Experiment in Hypermedia Publishing (Extended Abstract)." *Educational Multimedia and HyperMedia, 1994*. AACE: Charlottesville, VA, 1994.

6. T. Cormen, C. Leiserson, and R. Rivest. *Introduction to Algorithms*. MIT Press: Cambridge, MA, 1990.

7. S. B. Dynes and P. A. Gloor. "Using hierarchical knowledge representation for an animated algorithm learning environment." MIT LCS/TNS Technical Report, 1993.

8. P. A. Gloor, S. Dynes, and I. Lee. *Animated Algorithms*. MIT Press: Cambridge, MA, 1993.

9. P. A. Gloor, F. Makedon, and J. W. Matthews (editors). *Parallel Computation: Practical Implementation of Algorithms and Machines.* Telos/Springer-Verlag, 1993.

10. Institute of Electrical and Electronics Engineers. *SuperComputing '93.* IEEE Computer Society Press, 1994.

11. MacSciTech. *Proceedings CD-ROM of the 1992 MacSciTech Conference on Scientific and Engineering Applications for the Macintosh.* 15–17 January 1992. San Francisco, California.

12. F. Makedon (senior editor). *Proceedings of the DAGS '94 Symposium on Parallel Computing and Problem Solving Environments.* Hanover, NH, 1994.

13. F. Makedon (senior editor). G. Blelloch, T. Cormen, G. Cybenko, P. Hatcher, D. Johnson, D. Kotz, P. Metaxas, G. Pantziou, E. Schwabe, and C. Stein (editors). *Proceedings of the DAGS'93 Symposium on Issues and Obstacles in the Practical Implementation of Parallel Algorithms and the Use of Parallel Machines: Parallel I/O and Databases.* Hanover, NH, 1993.

14. F. Makedon, P. T. Metaxas, and S. A. Rebelsky (editors). *Parallel Computation and Parallel I/O.* Forthcoming.

15. F. Makedon, S. A. Rebelsky, M. Cheyney, C. Owen, and P. Gloor. "Issues and Obstacles with Multimedia Authoring." *Educational Multimedia and HyperMedia, 1994.* AACE: Charlottesville, VA, 1994.

16. J. Matthews, P. A. Gloor, and F. Makedon. "VideoScheme: A Programmable Video Editing System for Automation and Media Recognition." *ACM Multimedia '93.* Anaheim, CA, 1993.

17. R. Rada (prod. chair). *Proceedings CD-ROM of the First ACM International Conference on Multimedia,* 1-6 August, Anaheim, California, 1993.

18. S. A. Rebelsky, F. Makedon, J. Matthews, C. Owen, L. Bright, K. Harker, N. Toth, and P. T. Metaxas. "Building multimedia proceedings: the roles of video in interactive electronic conference proceedings," submitted to *ACM Transactions on Information Systems special issue on Digital Video in Multimedia Systems,* 1995.