The Production of Multimedia Publications

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This paper reports experience in establishing a production environment for the parallel publication of documents in paper and electronic form. A multimedia active document architecture is described and illustrated through examples of published material.

Introduction

It has been common for many years for major laboratories to operate "Technical Report Series" in which documents are freely distributed to the relevant research community. In recent years the cost of printing, warehousing, managing and mailing such reports has risen to a level where the overhead is significant and it has become necessary to recover costs by charging for the reports. An increasingly attractive alternative is to make the reports available in digital form through the Internet and CD-ROM.

A transition to digital documents motivated by cost reduction, however, rapidly generates new approaches to knowledge dissemination based on the multimedia capabilities of digital systems. Color no longer involves expensive production processes and it is possible to incorporate colored diagrams and photographs as readily as text. Sound and movies are simply issued in digital form. Computer programs may also be incorporated that process data, graph and animate the results, operate as an expert system illustrating the solution of problems, and so on. The digital medium opens up major new possibilities.

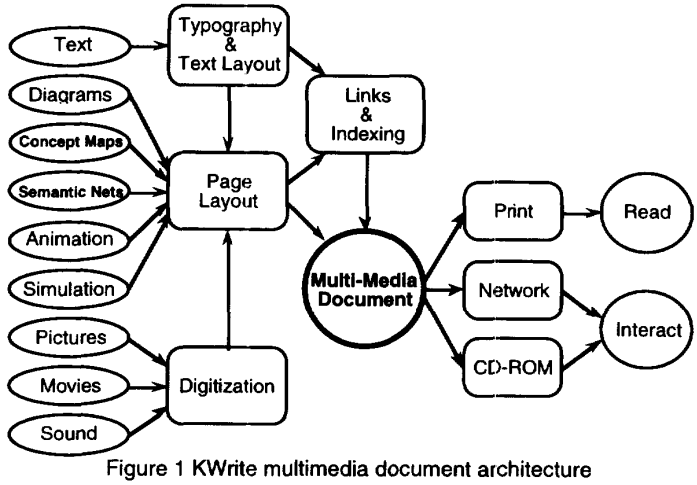

Figure 1 KWrite multimedia document architecture

Multimedia active documents

Figure 1 shows the *KWrite* multimedia document architecture developed for parallel publication on paper, the Internet and CD-ROM (Gaines and Shaw 1993a). The document architecture provides a word processing and page makeup environment similar in functionality and quality to that of the commercial packages. It supports embedded

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panes which in the paper form appear as normal diagrams and pictures, but which in the electronic form are fully interactive windows into a range of computer applications. Multimedia and hypermedia capabilities are supported in this way, together with animation, simulation, active concept maps (Gaines and Shaw 1993b) providing informal knowledge representation, and active semantic nets (Gaines 1991) providing formal knowledge representation (Gaines and Shaw 1992).

For simpler documents commercially available products are used, but there is no product currently that provides all the functionality needed. It is also important that the document reader technology can be licensed at a sufficiently low cost not to undermine the production economics of CD-ROM.

Example application: An international project report archive
An example application that illustrates many features of the technology is a CD-ROM produced as the final report of IMS TC7, GNOSIS, a one year test case under the auspices of the international Intelligent Manufacturing Systems research program. The project involved some 110 technologists from 31 organization in 14 countries in collaborative research, and it was important to disseminate the large volume of materials generated as rapidly and effectively as possible to the relevant international community.

The utility of multimedia CD-ROMs had already been demonstrated in an earlier exercise where material from a 3-day workshop in Tokyo has been digitized to create a 350 page conference proceedings in a uniform format on CD-ROM within a week of the workshop. This included QuickTime videos of computer software demonstrations, digitized slides and OCR'ed papers.

A movie had been made about the project and other technical movies were available together with color screen dumps from some of the computer tools used. Some 1600 pages of technical reports were also available together with demonstrations of some of the software tools.

A hybrid CD was cut which could be read in native mode on the Macintosh and as ISO 9660 on PC and Unix platforms. The reports were put on the CD in 3 formats, Word, Replica and PostScript. Indexing and multimedia material was put on using the active document architecture described above.

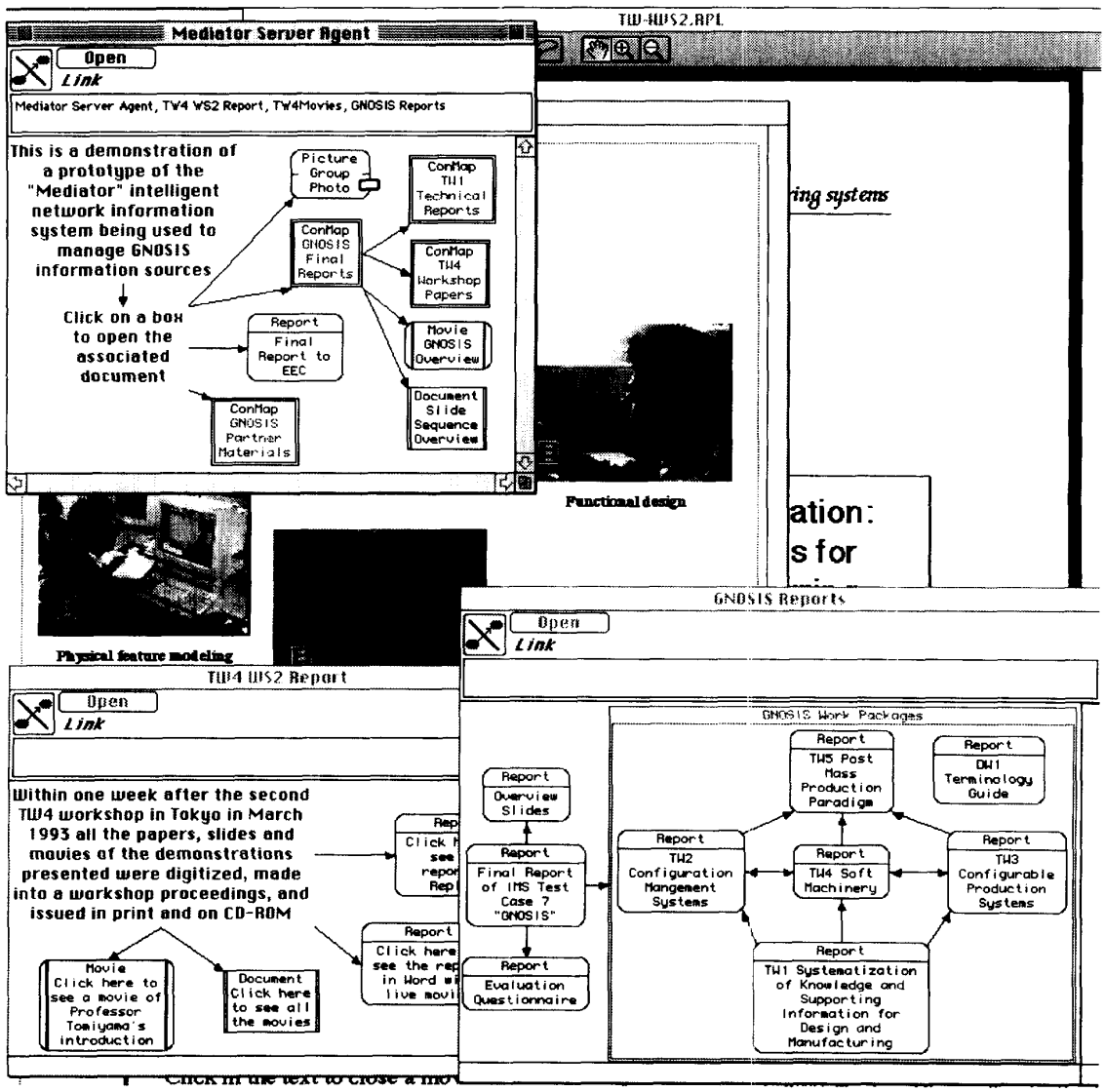

Figure 2 Accessing the CD-ROM through layered concept maps

Figure 2 shows a screen dump of the material being accessed. The concept map at the top left is the top-level index. It is currently write-disabled, and the cursor has changed to a button as the user mouses over the "Group Photo" node. Clicking at this point will display the photograph in a separate window.

The user has already clicked on the node "GNOSIS Final Reports" to open the concept map shown at the lower right. This has a node for each report, and clicking on one will open the appropriate report, in this application using Farallon's *Replica* tool to make the material available in a platform-independent form. The node at the top left gives access to a series of slides on the project displayed using Persuasion's GIF *Player* tool. A similar node in the original concept map at the top left gives access to a movie on the GNOSIS project that will be opened in Apple's *MoviePlayer*.

The user has already clicked on the "TW4 Workshop Papers" node in the concept map at the top left, and opened the relevant concept map at the bottom left. She has then clicked on the node "Click here to see the report in Replica" and opened the report visible at the back on the right of Figure 5. She has also clicked on the "Click here to see all the movies" node, and opened the *KWrite* document visible behind the concept maps. This displays eight QuickTime movies of various demonstrations given at the Workshop, any of which can be played by double clicking upon it.

Example application: A document as a knowledge base

An example of parallel publication of an active document in KWrite is a publication at the British Computer Society Expert Systems Conference in December 1992 in which the abstract states:
"This paper is written in a document production tool that appears to a user as a word processor but also acts as an expert system shell with frame and rule representations supporting deductive inference. The electronic version of the document is active, providing typographic text and page layout facilities, versioning, hypermedia sound and movies, hypertext links, and knowledge structures represented in a visual language. It can be read as a hypermedia document and also interrogated as a knowledge-based system for problem-solving. The paper version of the document, which you are now reading, is produced by printing the electronic version. It loses its active functionality but continues to act as a record of the knowledge in the document. The overall technology has been developed as an alternative approach to the dissemination of knowledge bases. It also provides a different interface to knowledge-based systems that emulates document interfaces with which many users are already familiar." (Gaines and Shaw 1992)

The electronic version of the paper was made available through anonymous ftp and as a CD-ROM. It demonstrated parallel publication of the paper version as a camera-ready copy book copy and the electronic version, identical in appearance, as a full working demonstration of the problem solution. Figure 3 is a screen dump of some interaction with the active document. The embedded knowledge structures are in color and editable through the popup floating dialogs and menus shown. What is particularly significant is that there were *no* hidden data structures. The semantic networks in the paper were the complete knowledge structures and operated directly in the inference engine to solve the problem. Thus, the document was also the knowledge base.

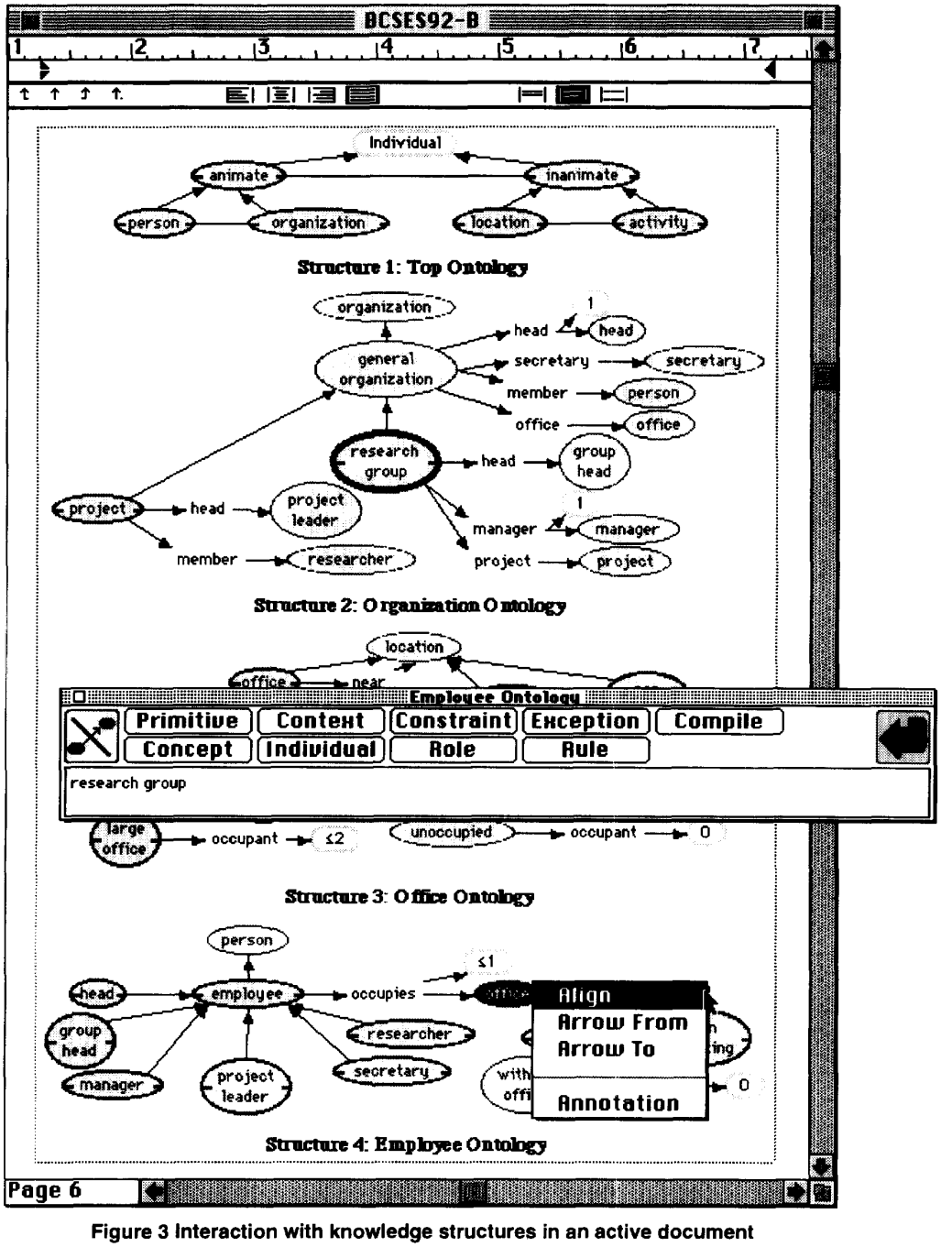

Figure 3 Interaction with knowledge structures in an active document

Conclusions

Multimedia active document production has become an attractive means of disseminating technical reports that is both cost-competitive with paper and offers significant new facilities for knowledge dissemination.

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