Technological Trends, Applications and Markets

A Personal View on the 5th ACM Conference on Hypertext (HT'93)

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Introduction

This year's ACM conference on hypertext (HT'93) took place in Seattle, Washington, USA from November 14 to November 18. It followed the European ACM Conference on Hypertext (ECHT) which was held in Milan, Italy, 1992. Almost 650 people attended HT'93: about 54% from industries, 44% from research organizations and 2% from others. The overwhelming majority were from the US and Canada (82%), followed by European participants (12%) mostly from the United Kingdom, Germany, Denmark, Italy, France, The Netherlands, Portugal, and Austria and participants from other countries (6%) mostly from Japan, Korea, and the Argentine.

The conference program featured papers, panels, technical briefings, demos, and videos on key topics of hypertext technology and various hypertext application domains. Keynote addresses were given by Irene Greif (Lotus Development Corporation), George Landow (Brown University) and Robert Akscyn (Knowledge Systems Incorporated). At a reception in his honor, Ted Nelson presented his ideas on "meta publishing" and his current work on the Xanadu project. The conference was preceded by two parallel workshops, one on "Hyperbase Systems" and the other on "Hypertext in Engineering". Twenty-four tutorials invited the participants to learn about hypertext concepts and applications in depth. For the first time at an ACM hypertext conference, a commercial symposium, comprising eight sessions with about 20 presentations, built a bridge from the scientific to the industrial world. Papers, technical briefing and descriptions of videos are published by ACM Press in the "Hypertext'93 Proceedings". A booklet of abstracts of "Interactive Demonstrations and Posters" was available at the conference.

In the following, we discuss technological topics, application domains and market considerations presented on HT'93. We will not describe particular systems or approaches in detail, nor will we try to summarize the complete conference. Instead, we provide an overview of current trends and developments which we personally found as particularly inspiring – hoping that others might share this view.

Technological Topics

Presentations at the conference addressed a multitude of different technological topics reflecting current research trends in hypertext and hypermedia.

Work on hyperbases proposing underlying data management techniques for building hypertext systems was intensively discussed. Other contributions concerned two major issues in current hypertext research: open hypertext systems, such as link servers, and collaborative hypertext systems which aim to support cooperation, communication and coordination in workgroups. In relation to these issues, innovative concepts for distributed systems were proposed and work on concurrency control in open as well as collaborative environments was presented in papers, posters and demonstrations. New communications protocols were described to ensure integration in open systems. Extensions of nested long transactions as well as modified short transaction models were considered as the basis for collaborative hypertext systems. The work on collaborative systems focussed on asynchronous modes of collaboration, including general annotation concepts for open hypertext systems and multimedia data.

Another important topic was information retrieval and linking. Several new retrieval concepts related to open hypertext environments were introduced. Approaches to integrate text-based information retrieval techniques into hypertext systems pointed to new linking facilities since they offer opportunities for dynamic link definition. Besides the exploitation of text-based information retrieval for dynamic linking, the definition of links as processes or rules, the use of manually created links to derive additional links, and the exploitation of spatial information for the derivation of structural information were proposed. Problems of link resolution in hypermedia systems were specified and first solutions were outlined. Furthermore, techniques for information retrieval of images were presented.

With respect to user interfaces for hypertext systems, several tutorials, papers and posters addressed issues for hypertext design, including work on metaphors and browsing facilities. A key problem in developing hypertext interfaces is the presentation of structural information. The relationships between set-oriented definitions of structure on the one hand and graph-oriented notations on the other hand were discussed for both presentation of hypertext structures and hypertext information management in general. Furthermore, a panel on designing and building hypertext structures as well as several papers demonstrated that hyperdocument structuring continues to be a hot topic.

Two papers presented ideas about exploiting artificial intelligence approaches for hypertext systems. Knowledge-based techniques have been employed to organize hypermedia knowledge bases, to provide local coherence of links, to support the search for the most suitable links in dynamic hypertext systems, and for automatic media conversion in hypermedia systems.

Last but definitely not least, standards, in particular SGML and HyTime, have started to play a major role in authoring hyperdocuments. Several tutorials taught SGML and HyTime and some systems presented on the Commercial Symposium and in the Demo sessions used SGML notations for structuring. The most prominent system in this context is WWW (World-Wide Web), a non-commercial open hypermedia system. Anyone willing to provide documents conforming to WWW's abbreviated SGML definition may publish information by linking it to other documents available in the web. Four demonstrations illustrated different ways of using WWW. These ranged from applications in physics and computer aided instruction to WWW's use as a generic user interface and to its extensions for keyword search.

Throughout the conference, a variety of presentations addressed the relationship between hypertext and other fields of research. Beside the long-standing interest of the hypertext community in databases and information retrieval, a new research area has emerged concerning the combination of hypertext technology with computer supported cooperative work and telecooperation. This trend was reflected by Irene Greif's opening keynote address, entitled "Hypertext and Group-enabling: Lessons from the Desktop". Moreover, the research community has started to extend browsing, navigation and presentation facilities to multimedia documents. Finally, some very recent work presented in the poster sessions considered the combination of virtual reality and hypertext.

Application Domains

In addition to documenting technological progress, the conference showed that a multitude of new applications have been developed in the recent past which are not only scientifically interesting but also promising for commercialization. The most obvious business domain for applying hypertext concepts and systems is certainly electronic publishing. The development of commercial hyperdocuments is definitely fostered by the spreading of interchange standards, such as SGML and HyTime, but also by innovative design approaches addressing visual metaphors and graphical interfaces. The relevance of these approaches became obvious from the growing interest in courses about such topics as SGML for writers, or graphic design principles. Moreover, it seems that electronic publishing is starting to profit from the increasing extension of electronic networks. The publication of electronic documents online is a significant medium of distribution supplementary to CD-ROM. Therefore, it comes as no surprise that business organisations have begun to discover the potentials of hypertext for industrial applications, like interactive technical manuals, digital libraries and corporate-wide information bases.

Interactive literature is also gaining in popularity, as was documented by a panel on hypertext fiction and additional demonstrations. Although some panelists complained that the number of published hypertext novels is still far from being satisfactory, it became apparent that more and more serious literary hyperdocuments have emerged over the last few years. One can speculate that the popularity of "hyperfiction" will strengthen when authors intensify the integration of multimedia features.

The importance of multimedia for hyperdocuments was convincingly demonstrated in two other fields of application: information systems for museums and interactive systems for education. At HT'93, each domain was addressed in courses and in addition similar cultural applications were presented in posters and demos. Particularly, hypertexts for education and training seem to be of growing importance and are being developed in a variety of fields, e.g., for legal education. Other innovative applications were reported from health science, software engineering and design. Another interesting application domain for hypertext systems was presented in a panel about "argumentation in action". The panelists used two hypertext systems (SEPIA and Storyspace) and a text IBIS in Word 5 to capture the exchange of arguments in the preceding panel on interactive fiction. They succeeded in illustrating the potential as well as the limits of electronic argumentation support. Possible application areas became apparent from discussions in and around the panel: Hypertext systems supporting argumentation can be used as facilities for decision making and negotiation, as rhetorical training tools, and as means for analysing and creating complex scientific arguments.

Market Considerations and the Future of Hypertext

The application domains presented at the conference are not only scientifically demanding, they also offer promising opportunities for the commercial exploitation of hyperdocuments. Therefore, they lie on the trend towards discovery of significant markets for hypertext and hypermedia products. Within the hypertext community, the interest in commercial applications has been continuously increasing over the last years. Its impact on the ACM hypertext conference became first obvious at HT'91 where "real-world issues" played an important role and markets and applications were discussed on a panel. At HT'93, these activities were intensified. There was a whole day symposium which addressed eight commercial topics, such as hypertext/hypermedia authoring and publishing, corporate and embedded applications, and SGML authoring and viewing tools. In addition, a panel on "the business of hypertext" discussed various business opportunities for hypertext and hypermedia applications reaching beyond the "natural" domain of electronic publishing. Its major message: There is no one and only hypertext business, but a heterogeneous field of emerging hypermedia applications in industrial contexts, such as construction and law, which probably only few thought of some years ago. However, the great market breakthrough has not occurred yet and hyper-

text is still "a zero billion dollars business".

Will the hypertext community be able to solve this problem and to overcome its current limits in technology as well as in business? According to the ideas presented by Rob Akscyn in his closing keynote on "Reengineering the Field: Hypertext in the 21st Century", this will require a major effort. To prevent stagnation, Akscyn urged the community to intensify cooperation by building "a field-scale collaboratory out of our respective hypertext technologies by developing a protocol that enables our systems to interoperate". A first step in that direction could be a large-scale project (over about ten years) and as an example he suggested a world-wide electronic journal serving as medium for sharing ideas and technical solutions.

Another approach was proposed by Ted Nelson who went "above and beyond hypertext" by outlining "the inexorable logic of metamedia publishing". Nelson described the "Xanadu Publishing Universe" which is based on the idea of a world-wide storage medium for open hyperdocuments. This medium enables readers to access all information they require and allows publishers to include virtually parts of documents from other publishers. The underlying business idea appears as straightforward: publisher pays for storage, reader pays for delivery.

The projects outlined by Rob Akscyn and Ted Nelson are aimed at the next century – but sometimes future is not as far "as we may think". A first – though non-commercial – step towards realizing Nelson's and Akscyn's ideas may be seen in approaches like the WWW. However, more intensive research is still required to support the evolution of open, distributed hyperdocuments allowing for world-wide information sharing and thus creating a new dimension for electronic publishing and large-scale hypertext applications.

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