Appendix A
Some Historical Notes

In this Appendix We Introduce Some of the Historical Figures of Hypertext

Bill Atkinson
Developer of First Commercial Hypertext "HtI"

Doug Engelbart
First Implementer of Hypertext

Ted Nelson
Coiner of the Terms "Hypertext" and "Hypermedia"

John Sculley
Corporate Visionary of the Information Navigator

Nicholas Negroponte and Richard Bolt
Developers of Dataland Spatlan Data Management

The Zog Group at Carnegie-Mellon
and Menu-Driven Hypertext Interfaces

Andries van Dam
and the Brown Univ.
Developers of Instructional Uses of Hypertext

Bush: Inventor of the Concept of Hypertext

Introduction

World War II is over. The Director of the U.S. Government's Office of Scientific Research and Development, science advisor to the President, writes an article in the Atlantic Monthly in which he sketches his vision of a tool that will aid individual knowledge workers. "Consider a future device for individual use, which is a sort of mechanized private file and library. It needs a name, and, to coin one at random, memex will do. A memex is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory." With these words, Dr. Vannevar Bush describes what is to become the personal computer and hypertext systems of today and tomorrow. All quotes are from Bush's 1945 article "As We May Think."

Scanning as Input:
In the Bush machine, input was done by photography. The user would place books, photos, handwritten notes, etc., face down on a transparent glass plate, then "the depression of a lever causes it to be photographed onto the next blank space in a section of the memex film..."

Display Screens
Bush visualized having two display screens so that you could compare data from two documents.

Mass Storage
Bush was writing before the digital computer was fully invented and produced, so he conceived of microfilm as the mass storage medium. Inside the memex is the microphotographic storage device. Bush speculated, "...if the user inserted 5000 pages of material a day, it would take him hundreds of years to fill the repository, so he can be prolific and enter material freely.

Purchase Published Documents
Bush thought there would be a market for books and articles published on microfilm that could be simply dropped into the memory. "Business correspondence takes the same path," he suggests.
Rapid Browsing

Part of the attractiveness of the idea of the memex for Bush was rapid access to the scientific and technical literature. "There is, of course, provision for consultation of the record by the usual scheme of indexing. If the user wishes to consult a certain book, he taps its code on the keyboard, and the title page of the book promptly appears before him... On deflecting one...lever...to the right he runs through the book before him, each paper in turn being projected at a speed which just allows a recognizing glance at each."

Adding Personal Links

Bush also foresaw the idea of user-created links. "A special button transfers him immediately to the first page of the index. Any given book of his library can thus be called up and consulted with far greater facility than if it were taken from a shelf. As he has several projection positions, he can leave one item in position while he calls up another. He can add marginal notes and comments, taking advantage of one possible type of dry photography..."

Retrieving Trails of Links

Bush had a vivid idea of how the retrieval of links would take place. He wrote, "...associative indexing, the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another...When the user is building a trail, he names it, enters the name in his code book, and taps it out on his keyboard. Before him are two items to be joined, projected onto adjacent viewing positions... The user taps a single key, and the two items are permanently joined... Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button... Moreover, when numerous items have been thus joined together to form a trail, they can be reviewed in turn, rapidly or slowly, by deflecting a lever..."
Engelbart's Augment: First Operational Hypertext

Introduction

Douglas C. Engelbart, then with Stanford Research Institute, built the first working and usable hypertext system. His Augment hypertext system, currently marketed by McDonnell Douglas, has supported a group of a thousand or more knowledge workers over 20 years. It provides the most sophisticated demonstration of the structured hypertext principles as well as the idea of an on-line community of knowledge workers that has been implemented. Here we present a brief overview of the Augment system and salute Engelbart for his accomplishments.
Engelbart: Edison of the Personal Computer

Introduction
Doug Engelbart is the Edison of the personal computer. He not only invented many of the familiar devices we have on our PC's and workstations, but also was the first builder of a working hypertext system. His research program was built on an extraordinarily broad vision of "augmenting human intelligence." Here we record just some of the major accomplishments of Engelbart and his colleagues at Stanford Research Institute. His Augmentation Research Laboratory began in 1962 and had a working personal computer with the hypertext system and on-line group work environments by the mid-sixties. Among the accomplishments of Doug and the Laboratory are the following:

Invention of the Mouse

First Major Implementation of Electronic Mail

Invention of Multiple Window on Computer Screen

First Implementation of Word Processing

Invention of On-Line Integrated Help Systems

Invention of Outlining Software And Idea Processors
Nelson: Name-Giver of the Word "Hypertext"

Introduction

Ted Nelson coined the terms "hypertext" and "hypermedia" in 1965 and has acted as an evangelist for the concepts ever since. His definition of hypertext is "computer-supported non-sequential writing." His visionary idea of a "docuverse" containing all of humankind's documents linked has inspired a generation of researchers and educators.

The Xanadu Vision

Xanadu® is Nelson's plan for a "world-wide network, intended to serve hundreds of millions of users simultaneously from the corpus of the world's stored writings, graphics, and data."

"Xanadu is not a large centralized software system but rather an idea for software for running a decentralized network." As Nelson says, "It is a design for a new literature and a system of order to make such a network understandable, usable, and readily expansible to any degree..."

Storage System

Xanadu is a concept of a storage system that permits documents to be stored only once in a "universal data structure to which all other data may be mapped."

Address and Linking System

The address and linking system permits "any spans of bytes in any document or file, on any server, (to be) linked to any other spans of bytes, in any document or file, on any server, by a link type which is unique or used elsewhere in the system."

Authoring

The system would permit

1. allocation of credit of authorship and publishing
2. allocation of payment of royalties based on the reader's use of documents
3. quotability of any document, yet easy tracing to the source of the quotation via hypertext links.

"Imagine everything available and tied together. Grand visions come to mind of what things will be like when 'it's all there and linked.' The thought of that great body of material calls to us, calls to us like the ocean."

"But the ocean of universal hypertext is not enough: we want free sailing on it.... A world of open hypertext publishing promises extraordinary new freedom for the mind, a new empowerment of humanity."
"Everything is deeply intertwined."

"Imagine making your own notes and connections any way you choose in this great interconnected corpus; so that any time you want to reopen this great hypertext world at any of these private annotations that make it your own, it will be like opening a book to a bookmark."

"Universal or grand hypertext, then, means a new publishing system -- an accessible great universe of linked documents and graphics (and audio recordings and video and movies). This is an idea many people now share -- the idea that we can get to everything, keep track of everything, add to everything, tie everything together, that we can have it all."

"By 'hypertext' I mean non-sequential writing."
Van Dam and Brown: First University Instruction

Introduction

Since the late 1960's, Andries van Dam and a team at Brown University have created several generations of experimental hypertext and hypermedia systems. Their focus has been on the use of these systems in college instruction.

English Poetry

One system was used in the early 1970's to teach an English poetry class. Students worked together on the same hypertext document, reading and writing on computer terminals that displayed the hypertext consisting of poetry and commentary.

Biology and English Literature

Two more classes largely supported in hypertext have been developed. The Brown team has in the last few years built a group of multi-media workstations and taught courses in cell biology and English literature on the system.

Prototype sections of other courses have also been implemented. This work has produced important information on how to integrate hypertext documents into normal teaching-learning environments.
Zog Group at Carnegie-Mellon: Menu Interfaces

Menu-Driven Interfaces for Hypertext

In 1972, a group at Carnegie-Mellon University that has included Allen Newell, Donald L. McCracken, Robert M. Aksay, and George G. Robertson began building a series of experimental hypertext systems that were given the collective name Zog. Their work was focused on making a system that would produce rapid response in large networks through a simple menu selection interface. Zog was designed to serve a large community of users.

Nuclear Aircraft Carrier Application

The group was given the opportunity in 1980 to implement its work on the new U.S. Navy nuclear-powered carrier, USS Carl Vinson. They developed a new version that supported the ship's organization and regulations manual and a planning and evaluation application.

Knowledge Management System

Out of the work on the USS Vinson, a commercial version of the Zog system has been marketed since 1983 under the name Knowledge Management System (KMS). It is implemented on Sun workstations.

Current Version of KMS

The current version of KMS is particularly well suited to the joint creation of documents on different workstations in a network, such as when many engineers have to work on a single proposal.

Screen-Sized Frames

The database in KMS consists of screen-sized frames which may contain "any mixture of text, graphics and image items, each of which may be linked to another frame or used to invoke a program." These frames may be stored in the memories of different workstations on the network. Here we show displays of different frames on the screens of several workstations.
Hierarchical Structure Emphasized

KMS emphasizes hierarchical structures and retains fairly conventional implementations of tables of contents, menus, and indexes as key interface devices. Non-hierarchical links are possible.
Negroponte and Bolt: Spatial Dataland

Managing Information Spatially in Dataland

The Architecture Machine Group at MIT in the late 1970's built a number of experimental information environments that expanded the vision of what the possibilities of interacting with the computer can be. They called their information space "Dataland" and it operated in a room where almost everything was manipulatable information. The room, noted Bolt, is the computer terminal. Many of the functions, such as calendars and calculators, that we routinely use on our visual computer interfaces were first demonstrated in Dataland. Strictly speaking, the experiment was not about hypertext but about hypermedia. The ability to switch media and move around in an information environment was the key demonstration. We diagram the room-terminal on these pages.

Spatial Information Management Principle

One major concept used by the dataland experiment is called the "managing things spatially" principle. People "have a place" for information, suggested George Miller. We keep our messy desks because we remember where things are. If we straighten it up, we lose our spatial memory cues.
Each Object On Display Can Be Activated
Each of the objects displayed can be "zoomed in" on for greater detail.

Display Screen
Whole wall is display screen.

Voice Activated Commands
User wears a speech recognition microphone for voice travel. User can say things like "go to the book in upper left," "create a green circle...there," "move data A to green circle," and so on for "copy, delete, make smaller...larger, call that..." etc.

Loudspeakers
Four loudspeakers located in wall provide wrap-around sound.
Brown and Guide: Hypertext for PC and Macintosh

First Commercial System for Two Major Personal Computer Systems

To Owl International, Inc., which was founded in 1985, goes the credit of bringing out the first hypertext system to work on both of the major personal computer platforms, the IBM PC and Apple's Macintosh. Peter Brown of the University of Kent (U.K.) was the inventor of the Guide system. The products are based on further development work at Office Workstations Limited of Edinburgh, Scotland.

Owl has continued to increase the flexibility of Guide and to equip it with a family of support products including Guidance, which provides a context-sensitive environment for online reference and tutorials and Guide Reader, a low cost version that permits reading hypertext, but not authoring.

Guide also supports multi-media connections and the ability to link not only between documents but also between applications so that, for example, a user can link a text document with a spreadsheet.
Scroll and Outline Architecture

Guide relies heavily on a software architecture of scrolls of variable length, an outline structure of the document, and user-controlled expansion of that outline, which are revealed by clicking on portions of the outline. Other link types, such as the ability to link to other places in the text to pop-up notes and to activate other media are also part of the system design.
Sculley: Vision of the Knowledge Navigator

Introduction

John Sculley is a different kind of visionary. He is CEO of a major computer corporation. Yet many of his speeches have dealt with how we must change ourselves and our information environments in order to compete in the new information age.

Sculley inspired and sponsored futuristic work at Apple on the Knowledge Navigator, which describes the possibilities for personal computing in the years beyond 2010. The computer as envisioned by Sculley is driven by voice-activated commands. The computer responds with computer-created speech through the little moving picture of the man in the bow tie. We picture here a sketch of the Knowledge Navigator, which is a book-sized personal computer which has access to large knowledge bases of information.

The original Knowledge Navigator scenario was made into a videotape that simulated the functions of the computer and showed how the computer took its owner through a day that included an exploration of the problems of the destruction of the Amazon rain forests.

Impact of the Knowledge Navigator on Education

Sculley suggests, "Education will not simply be a prelude to a career, but a lifelong endeavor. Some of the important elements that will promote this new paradigm for lifelong learning are: (1) the development of conceptual skills, and the ability to test reality against multiple points of view; (2) the nourishment of individual creativity and the encouragement of exploration; (3) the encouragement of collaboration, and an emphasis on clear communication."

Customize Knowledge

"Most important, the Knowledge Navigator will customize knowledge for you... to make navigating through information and ideas as interesting and understandable as possible."
High Fidelity Sound

"Speech synthesis, speech recognition"

Atkinson: First Commercial Hypertext "Hit"

Introduction

HyperCard, developed by Bill Atkinson, is a multi-functional software tool that includes many hypertext properties. Apple Computer made it the first hypertext "hit" by deciding to give it away with the purchase of a computer.
HyperCard

HyperCard rapidly became the hit of 1987, far outstripping competing hypertext systems and enabling enthusiasts and commercial applications to hook up to laser disks and CD-ROM's to tap enormous text and graphics files.

Card Architecture

As the name implies, HyperCard relies on a software architecture and interface that appears to the user as a stack of index cards. However, these cards are linked in a great variety of ways that give considerable flexibility in the final development of hypertext and hypermedia on it.

HyperCard's Key Components

Atkinson had the genius to put the metaphor of hypertext together with an easy-to-use programming language, a simple word processor, a painting program and an elegant, inviting interface. The ease of use and the combination of functions of HyperCard provided a significant jump for hypertext.

HyperCard Focused Attention

HyperCard almost singlehandedly brought the idea of hypertext into the minds of well over a million people in one stroke, when Apple Computer's John Sculley decided to give it away with each purchase of a Macintosh computer. While HyperCard is much more than hypertext software, it put hypertext on the map.
Chapter 1. Introduction to Hypertext and Hypermedia


p. 20. Hypermedia Application: New Product Marketing. Lou Cassabianca of Hypermedia Magazine first showed me an application like this.

p. 22. Case Study: Hypermedia for Shakespeare. This discussion of hypermedia for Shakespeare was inspired by an implementation at Brown University and by a similar one at Stanford University.


Chapter 2. Current Issues With Hypertext

p. 47. Where to Put How Many Buttons of Which Kind. The seductive buttons were inspired by a slide from Theodor Nelson's dynamic slide show on hypertext.

p. 48-51 Inadequate (and Missing) Reading Cues. Material on these four pages follows the excellent paper by Charney (1987) and summarizes this paper.

p. 52. Branching Difficulties of Serialist Readers. see Pask (1976)

p. 56. Lost in Hyperspace. These issues were most compellingly raised by Conklin (1987).

p. 58. Overchoice and Cognitive Overload. These issues are also well put in Conklin (1987).

p. 60. Chaos in Titles for Documents and Their Parts. The author thanks Michael J. Steinback for formulating commandment number 7.

Chapter 3 Introduction to Information Mapping's Structured Writing Method

p. 76. Overview of This Chapter. Information Mapping, Inc. (for further information on the products and services of the company and the licensing of the methodology for software or training, contact Information Mapping, Inc., 303 Wyman Street, Waltham, MA. 02154 or call 617-890-7003) Brief History of Information Mapping. See items listed under Horn in the bibliography. Other Examples of Applications. Application of Information Mapping's Methodology to Philosophy. Several authors in Horn, ed., (1983) use the methodology in essays on metaphysics, cybernetics, and logic.

p. 82. The Problem of Human Short Term Memory. For further information on these pages see Miller (1956) and Simon (1979).

p. 96-97. Examples of Maps Displayed on Paper. The author acknowledges the permission of Information Mapping Inc. to reproduce these two sample pages of Information Mapping and other example material in this chapter.

p. 107. A Brief Discourse Analysis (Stable Subjects). The data in the two examples are from unpublished data of Horn.

p. 110. What are the Information types? Six of seven of these were first suggested by Horn (1965). See also Horn (1969), (1971, 72, 76) for further information.

Chapter 4 Navigating Structured Hypertrails

p. 128. Prerequisite. Mathematics example adapted from Kemnisky (1965) see also Horn et. al. (1969)

p. 144. Example Hypertrails. Example One (on dreams). see Bonime (1982) "Example of example hypertrail" is from an article which first appeared in Horn (1976).

Chapter 5 Resolving Some Hypertext Problems

p. 152. At the Nodes, Blocks and Maps Structure Hypertext. The author acknowledges permission of Information Mapping, Inc. to publish the map on the example of an information map.

p. 158. Addressing The Major Reading Cues Problem. The best sources are Horn (1976) currently used as course manuals in Information Mapping's courses.

Chapter 6 Relatively Stable Discourse: Documentation and Training

p. 170-171. Operations and Technical Manuals. The author acknowledges permission of Information Mapping, Inc. to reproduce these two maps.

p. 172-173. Personnel Manuals and Policy Manuals. The author acknowledges permission of Information Mapping, Inc. to reproduce these two maps.

Chapter 7 Disputed Discourse: Argumentation Analysis

p. 186-187. Overview of This Chapter. The discussion on this page is from Toulmin (1958) as well as the discussion on the next three pages of claims, grounds, warrants, backing, rebuttal, and qualifiers. Extensive use was also made of Toulmin et. al. (1979).

p. 200-204. Case Study. The example is from an unpublished study of using argumentation analysis in examining the ethics of using nuclear weapons done at the Lexington Institute. The most extensive use of Toulmin structures in hypertext has been done by Cathy Marshall (1987).

p. 204-206. Comparing Ill-Structured and "Tame" Problems. The material on these pages is from an excellent discussion in Mitroff et. al. (1983).

Chapter 8 Experimental Discourse: Scientific Information

p. 218. Miller: Short Term Memory Limits and Chunking. The chart is from Miller (1956). The author gratefully acknowledges permission of the American Psychological Association to reproduce it.

Notes

p. 224. Schaffer: Information Mapping's Methodology. The quotes are all from Schaffer (1982). The author gratefully acknowledges permission of the NSPI Journal to reproduce the quotes.

p. 226. Reid and Wright: Superiority of Visual Structuring. The four diagrams are from Reid and Wright (1973). The author gratefully acknowledges the permission of the Journal of Applied Psychology to reproduce the four examples in the "material used section."

p. 228. Hypertext May Facilitate Identifying Problems. The two quotes are from Root-Bernstein (1982).

p. 230. Linked Comments Will Highlight Deficiencies. The references made are to Drexler (1986).

Chapter 9 Mapping Future Infospace


p. 246. Travelling in Large Visual Landscapes. The graphic possibilities of large landscapes like this have been suggested to me by Jim Channon and David Sibbet. I have taken their 2-D work and applied it to the 3-D world of virtual reality.

Appendix A: Some Historical Notes

p. 252. Bush: Inventor of the Concept of Hypertext. All the quotes from this page are from Bush (1945). The author gratefully acknowledges permission of Atlantic Magazine to reproduce these quotes.


p. 260. van Dam and Brown: First University Instruction. This account is from Yankolovich (1985).

p. 262. The Xerogroup at Carnegie Mellon. This discussion is based on Newell et. al. (1981).

p. 264. Negroponte and Bolt: Spatial Dataland. Details of the material on this page can be found in Bolt (1984).

p. 268. Sculley: Vison of the Knowledge Navigator. The quote on this page is from Sculley (1989). Other quotes are from Sculley (1987).
References

Hypertext

Boston Computer Society, Hypermedia Group, Hypermedia Resource Base. Available as indexed bibliography (paper or on disk) BCS, Hypermedia Group, One Center Plaza, Boston, MA, 02108

References


References


Horn, R. E. (1980) Information and Decision Management through Structured Writing, a concept paper for Delta Force, U.S. Army War College


Stuart, Teresa Habito. (1979) The effectiveness of Information Mapping® compared with the conventional paragraph in communicating technical information Unpublished M.A. Thesis. University of the Philippines at Los Banos

Argumentation Analysis


Other Works Cited

Lanier, J. Virtual Reality - An Interview with Jaron Lanier, Whole Earth Review, Fall 1989, 108-119
Simon, H. A. (1979) "How Big is a Chunk?" in Models of Thought New Haven: Yale University Press pp. 50-61
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Robert E. Horn
Lexington, Massachusetts
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Mapping Hypertext

The Analysis, Organization, and Display of Knowledge for the Next Generation of On-Line Text and Graphics

a new book by
Robert E. Horn

Contents

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Part 4. So What? What Next?

Appendix A. Some Historical Notes


Early Comments on Mapping Hypertext

I am convinced that the future of man's knowledge production and utilization will be deeply enmeshed in the structure, conventions and methods associated with the descendents of today's hypertext. Bob Horn has produced a notable step toward that end.

—Doug Engelbart, Bootstrap Project, Stanford University; first person to implement hypertext on a computer system

Mapping Hypertext is a thoughtful and provocative overview of both hypertext and Information Mapping; full of useful advice and interesting bits of history. It is a must read for anyone concerned about how computers can become effective tools for human communication—Paul Saffo, The Institute for the Future; columnist, Personal Computing

This book will change the way people think about their current information and the hypertext revolution.

—Ken Blanchard, co-author of the best selling The One Minute Manager

Bob Horn suggests an antedote for the problem of disorientation that often comes with navigating through hypertext...


Mapping Hypertext by Robert E. Horn is a tour de force in several respects. First, it is an amazing example of “graphic language”...Mapping Hypertext is a unique and seminal work, covering the history and conceptual underpinnings of hypertext, suggesting applications and design principles capable of stimulating hypertext and hypermedia design for years to come...

—Carl Binder, Performance and Instruction, October 1991

Boy, do I wish we'd had this book when we were designing the CD-ROM Electronic Whole Earth Catalog... This book is the most thorough survey of solutions thus far. And it is organized in a highly visual hypertext-like format which effectively illustrates many of the principles being discussed. An absolutely first-rate work. —Keith Jordan, Whole Earth Review, Summer 1991

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Mapping Hypertext
Analysis, Linkage, and Display of Knowledge for the Next Generation of On-Line Text and Graphics
Robert E. Horn

About the Book
The technology of hypertext offers the very real potential of helping both business and society deal productively with the information explosion. Mapping Hypertext illuminates the promise and the reality of hypertext and information management, bringing hypertext together with a complementary methodology critical to its success: Information Mapping’s method for analyzing, organizing, and presenting information. The book also breaks new ground in its highly graphic presentation, an intriguing visual simulation of hypertext. Mapping Hypertext will change forever the way people approach information organization and the hypertext revolution.

About the Author
Robert E. Horn is the inventor of Information Mapping’s methodology and has spent his professional life applying the principles of cognitive science and learning theory to the solution of communications problems. He has taught on the graduate level at Harvard and Columbia universities. The company Horn founded, Information Mapping, Inc., the recognized leader in high performance communications, has helped many of the world’s largest companies deal successfully with the management of large amounts of complex information.