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The Next Generation Electronic Library - Capturing the Experience

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The first wave of digital library research and implementation had to do with advancing the infrastructure for organizing and accessing the vast stores of archival and emerging information abundant in all media (text, image and video). Current research ambitions relate to the application of cognitive technologies for extracting the information content from within the linear media (e.g., the quotation from a book, the crescendos of a symphony, the underwater scenes within a movie, the clip from last night's TV news) and indexing it for subsequent full-content search and retrieval. Information accessibility is increasing through interoperability of resources and information content is growing through contemporaneous indexing and incorporation of content as it is created. Automated subject identification and classification techniques for the sub-documents will evolve to improve browsing by subject over searching by keyword. Natural language technology will be applied to comparison of retrieved documents so that duplication of content is eliminated or minimized in the resultant set, when desired.

We will need to go beyond management of existing content to automated creation of new content in response to the query. This starts even in current research systems with the automated generation of short summaries or abstracts created using word relevance techniques, both with text and video. More expansively, natural language can again be applied to the creation of full synthetic documents which summarize the "story" across multiple source documents, even across media, by detecting differences in content between them. This summarization will need to be of variable granularity, enabling zoom-in and out of level of detail interactively at any point. The synthetic time-series summarization could similarly construct a timeline of events from related content retrievals to show how a story or event unfolded.

As information collections are linked and queries across them become possible, the need for multilingual search and retrieval in the global information resource grows. Machine translation can be applied to expanding the queries to multiple target languages and retrieving the "foreign" content with pointers to appropriate translation aides. Restricting the domain in all such language tasks significantly improves the relevance and accuracy of the result, a requirement common to many library organizations and search strategies.

The role of the electronic library and information resource and the nature of its content will also evolve. A predominant role of the library is to provide information; the need is to solve problems. A transformation needs to occur that moves the search from information space to solution space. One approach to this challenge is to extend the content of the library from a capture of the record of society's events to a capture of society's experiences. The video medium, in particular, enables a capture of the emotion and thinking surrounding the events of record - speeches (with audience reaction), lectures (with student questions and answers), design and decision meetings (with discussion of rejected alternatives). Recording and capturing repeated experiences, from machine disassemblies and repairs to medical diagnoses and surgical procedures, enables one to compare and contrast a current problem with multiples of those that have been solved before. Video conferences may likely be the first to be so archived as a major stepping stone in capturing the organizational memory. We record not just the experience for its own sake, but attempt in so doing to also preserve the knowledge that underlies it. The issues of making these experience records useful and useable for interactive problem solving relate to reducing them to searchable, indexed content. Applications of integrated speech understanding, natural language processing and machine vision to the video and audio content have demonstrated potential for enabling the required transformation.
