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MAY 1971

A Standard Pattern for Sequential File Maintenance; Norman D. Peterson (p. 5) "The author explores the possibilities of ready-made logic in developing programs and, as an illustration, proposes a standard or prototype approach to file maintenance. The approach Illustrated is defined by an annotated program logic chart and a series of checklists, cross-referenced to each other. ... The present article is proposed as such an approach to sequential file maintenance. Although the files are characterized in terms of magnetic tape, the approach is capable of being generalized to other sequential media." (p. 6) "As a base for subsequent discussion, distinctions must be made among three broad groupings of transactions. The most generally considered class consists of those transactions that modify existing records on the master file. The other two classes, itemized first below, can be regarded as special transactions in that each is processed only once during the life of a master record. ... Deletion ... Insertion ... Modification. ...Since input occurs at more than one point in the logic, it is desirable that these be accomplished by branching to a closed subroutine or, in Cobol, by a 'Perform' statement. ... In the classic file updating program, two files are read-one containing master records and one containing transactions." [Editor's note: The article concentrates exclusively on problems that arise when working with sequential files (on tape). It is structured into 42 paragraphs that have to be applied more or less sequentially to establish what the author aims for—a standardized way of handling sequential files.]

A Standard for Computer Networks; Theodore H. Bonn (p. 10) "The problem is complicated by rapidly evolving computer and applications technology. Standards in most fields are fairly static in nature, and are generally formalized only after a long period of usage on a de facto basis, but not so in the computer field. In many cases, as in this instance, the need for standardization is recognized before there is widespread

Digital Object Identifier 10.1109/MC.2021.3055673 Date of current version: 7 May 2021 usage." (p. 12) "The CCITT is the international standards body for communications. Its membership is the telephone companies of the various countries involved. ... Practically all communication control is based upon recognition of one or more of the ten (10) ASCII communication control characters. ... Expansion of the procedures can be accomplished by adding additional Establishment/Termination or Message Transfer sub-categories. They must, however, conform to some rules in order to form a consistent set." [Editor's note: This standardization effort went on until some CCITT standards, for example, X.25 in 1976 and X.400 in 1984, were established. Unfortunately, when they were ready for widespread utilization, the Internet with its protocols was around and took over the world.]

How the Fast-Fourier Transform Got Its Name; T.S. Huang (p. 15) "The amazing (and improbable) story of the hitherto unknown origins of the FFT. ... After much deliberation, the distinguished members of the international committee decided unanimously (when the Russian members went out for a caviar break) that since the Chinese emperor invented the method before anybody else had even been born, the method should be named after him. The Chinese emperor's name was Fast, so the method was called the Fast Fourier Transform." [Editor's note: The fast Fourier transform (FFT) is widely used for applications in engineering, music, science, and mathematics. The development of fast algorithms can be traced to Carl Friedrich Gauss's unpublished work in 1805. His method was very similar to the one published in 1965 by James Cooley and John Tukey, who are generally credited for the invention of the modern generic FFT algorithm. However, between 1805 and 1965, many other people suggested FFT algorithms. From this fact the author derives the rather cynical discussion about the name.]

Forum on Social Implications: The Computer—Hell or Heaven; Paul Furnas (p. 36) The computer, damaged in a University bombing, bore mute witness to stresses within a society. Not too many months ago, the same computer left the plant, clean in its brushed aluminum and accompanied by the confident hopes of those who watched. The scene symbolizes the conflicting attitudes toward computers in contemporary society. ... These two profiles seem to meet the requisites of a Hell and a Heaven. Subsequent discussion will refer to the two profiles and the groupings they represent as lay and professional, respectively. ... Examination of the table above can be made to reveal that one group sees the dangers more realistically than the other group and that the other group sees the potential and strength more realistically." [Editor's note: This short article lists, on one side, concerns about computers and, on the other, the benefits of them. The lists are worth reading in themselves, but they also reflect the fact that the same issues still exist 50 years later in today's much more complex information and communications technology environment.]

MAY 1996

www.computer.org/csdl/mags/co/1996/05/index.html

Building Large-Scale Digital Libraries; Bruce Schatz (p. 22) "Digital library research projects thus have a common theme of bringing search to the Net. This is why the US government made digital libraries the flagship research effort for the National Information Infrastructure (NII), which seeks to bring the highways of knowledge to every American. As a result, the four-year, multiagency DLI was funded with roughly \$1 million per year for each project. ... This issue of Computer includes project reports from these six university sites." (p. 23) "The ultimate goal ... deep semantic interoperability-the ability of a user to access, consistently and coherently, similar (though autonomously defined and managed) classes of digital objects and services ... to consider the entire Net as a single virtual collection from which users can extract relevant parts." (p. 26) "What the DLI projects promise is effective search of multimedia objects across multiple repositories in the Web. In the longer term, there is even hope for semantic interoperability, which is necessary to handle the coming variability and volume of electronic materials." [Editor's note: The six projects are described following this guest editor introduction, and I will only briefly mention them here. They are very interesting to read from the points of view of both what was achieved and what failed to be archived when looking back these 25 years. The aim for a "semantically unified digital world" is still elusive despite continuous research but usually not under the name of "digital libraries."]

Federating Diverse Collections of Scientific Literature; Bruce Schatz et al. (p. 28) "A University of Illinois project is developing an infrastructure for indexing scientific literature so that multiple Internet sources can be searched as a single federated digital library. ... Our test-bed efforts concentrate on journal articles from the scientific literature, with structure specified by the Standard Generalized Markup Language (SGML). Our research efforts extract semantics from documents. We then merge these efforts with traditional library indexing to provide a single Internet interface to indexes of multiple repositories." (p. 33) "We have developed algorithms to extract concepts from documents so as to provide automatic indexing for semantic retrieval. The automatic indexing we are investigating generates concept spaces, which are concept graphs based on co-occurrence analysis." [Editor's note: Twenty-five years ago, SGML seemed to have won the markup language game, but it happened differently. The simplified alternative XML and the semantic web languages Resource Description Framework and Web Ontology Language became the widely used successors.]

Toward Work-Centered Digital Information Services; Robert Wilensky (p. 37) "Information retrieval becomes an increasing challenge as comprehensive image databases emerge alongside traditional text databases. Here, a set of digital information services offers intriguing new retrieval possibilities. ... requires a broad technical agenda that includes · document image analysis, natural language analysis, and computer vision analysis for effective information extraction; • new user interface paradigms and authoring tools for better accessing of multimedia information; and • improved protocols for client program interaction with repositories." (p. 38) "Our system has a simple architecture, consisting of repositories, clients, indexing and searching, interoperability, and protocols." [Editor's note: The article describes different approaches for handling the multimedia collections they expect for the future. It is interesting to see that they do not refer to standards that already existed at that time, such as SGML, MPEG, JPG, and others, which, of course, became widely used in later years.]

Intelligent Access to Digital Video: Informedia Project; Howard D. Wactlar et al. (p. 46) "Information retrieval is an increasingly complex process, due to digital integration of video, audio, and text resources." (p. 47) "Without suitable indexing, a collection of video material cannot serve as an information resource. Our goal of full-content search/ retrieval in the Informedia library requires an automatically generated index. ... Our multimodal approach to generating the index and the abstractions poses difficult challenges for each of the speech, image, and language understanding technologies that we incorporate." (p. 51) "When sufficient data exists in the library in the form of interviews or news conferences with a single individual, it's possible to construct a simulated interview interface, whereby the user interacts virtually with the subject." [Editor's note: These are different methods but with a similar approach to that of the preceding article with a focus on videos. The synthetic automatic interviews, of course, are not something we have reached even today.]

A Digital Library for Geographically Referenced Materials; Terence R. Smith (p. 54) "ADL (Alexandria Digital Library) will provide on-line public access to maps, photos, and other information referenced in geographic terms. Much of this data currently is found only at major research

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libraries." (p. 55) "To meet these criteria, we developed a rapid prototype catalog schema by using elements from the US Machine-Readable Cataloging (USMARC) standard and Federal Geographic Data Committee (FGDC) metadata standard." (p. 58) "Wavelets have been widely used in many image-processing applications, including compression, enhancement, reconstruction, and image analysis. ... Wavelet transformations support the rapid delivery of the low-resolution browse images and the incremental higher-resolution components." [Editor's note: The article concentrates mostly on georeferenced material, but some of the algorithms applied would help as well for general image and even video retrieval.]

Using Distributed Objects for Digital Library Interoperability; Andreas Paepcke et al. (p. 61) "Distributed object technology can provide interoperability among emerging digital library services. This project uses CORBA objects as wrappers to handle differences in service interaction models." (p. 64) "Because we cannot dictate how clients and services operate, the LSP search method must be as general-purpose as possible. A client that wants to wait for complete results should be able to do that. If the information service (or its proxy) can give piecemeal information, and the client can handle it, then the search method should support that too." (p. 67) "To users of digital libraries that include some feebased services, the differences in payment schemes are one more potential source of frustration. Our InterPay architecture is designed to ease this problem." [Editor's note: This is an interesting article that analyzes the interoperability problem in a way that also could be used for other applications. It also includes an analysis for payment schemes for such a distributed environment.]

Toward Inquiry-Based Education Through Interacting Software Agents; Daniel E. Atkins et al. (p. 69) "The University of Michigan Digital Library (UMDL) project is creating an infrastructure for rendering library services over a digital network. ... Many researchers and policy groups argue that students should engage in sustained inquiry to develop an in-depth understanding of science. ... However, we must avoid the inflated expectations typical of technology in the schools." (p. 74) "A second real problem in the classroom is the lack of collaboration among students. Substantive classroom conversation is a key component of learning." [Editor's note: The article proposes an agent-based environment that allows students access to "digital information" for inquiry-based education. It correctly states that much more than information access is needed but assumes it can be handled via electronic communication—something that later studies and, of course, our COVID-19 experience have proven to be false.]

Employment 2005: Boom or Bust for Computer Professionals? John Keaton et al. (p. 87) "Over the last four years, the world's corporations have been restructured, reengineered, downsized, and rightsized. Whatever it is called, the process usually involves laying off workers. ... Is it boom or bust for the computer professional? In this article we examine the various trends that are important to computer professionals. ... The fact is that the computing profession as a whole is enjoying stable employment and renewed hiring, and the job market for computer professionals is bullish over the next 10 years. Thanks to new applications, technologies are coming on line for information providers, and opportunities are springing up in entertainment and communication services. These trends are expected to foster a growing demand for computer professionals through 2005." (p. 89) "We found that the computer industry is evolving in line with its origins in business computing. Demand for PCs for the home, which drove the PC market during the last decade, has stabilized." (p. 97) "The bottom line: Keep up with technology, learn new skills to stay competitive, take the pulse of the market periodically to keep abreast of the skills needed." [Editor's note: The overall outlook for IT professionals was judged positive in the article. That, as we now know, proved to be true, but the job types predicted turned out to be only partially correct. The whole smartphone and app world was not foreseen. In addition, online services of all kinds have provided many IT job opportunities.]

Object Technology: The Many Faces of Inheritance: A Taxonomy of Taxonomy; Bertrand Meyer (p. 105) "My own view of inheritance is broad. My colleagues and I have used all 12 of the categories extensively. I find them both theoretically legitimate and practically indispensable. ... The Figure shows the taxonomy's general structure." (p. 108) "The variety of uses of inheritance may lead to the impression that we should have several language mechanisms to cover the underlying notions. ... Such a division seems to cause more harm than good. ... There is only one serious objection to the use of a single mechanism: The extra complication it imposes on the task of static type checking." [Editor's note: The author of this article provides a good explanation of the 12 different inheritance mechanisms he introduces but then reduces the actual use to a single "generic" mechanism. Of course, nobody who uses inheritance differentiates among all those 12, but reading the description makes one think about inheritance in a new fashion.]

Open Channel: Technocentrism; Dwayne Phillips (p. 136) "I derived the word technocentrism, which means the belief that one's technical group is superior, from the word ethnocentrism, which means the belief that one's ethnic group is superior. Technocentrism operates much like the law of Not Invented Here. ... It lets us discount almost everything about almost everyone who doesn't work in our group. Therefore, we can dismiss their inventions, ideas, speeches, papers, clothes, and even software (Windows 95 versus the Macintosh OS versus OS/2)." [Editor's note: This is a very true observation that, as it turns out, is timeless.]