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IMAGE SYSTEMS (p. 10) "A pictorial information system is a special type of information system supporting the manipulation, storage, retrieval, and analysis of pictorial data. In the past, pictorial information systems have usually been designed for specific applications. But recent advances in database technology, computer graphics, and pictorial data structures have led to the development of more general-purpose systems. This special issue is a survey of several design aspects of these systems."

IMAGE DATABASES (p. 12) "The list of new applications in digital picture processing has grown to include interactive computer-aided design, geographic data processing, remote sensing of earth resources, regional economic and health data processing, and cartographic and mapping applications. Efficient and economical storage, flexible retrieval, and the manipulation of a vast amount of pictorial information have become problems that require careful consideration."

IMAGE QUERIES (p. 23) "Here, we review several recent picture query languages. To overview the facilities of picture query languages, we first describe the system organization of IMAID, an integrated image analysis and image database management system."

IMAGE CONTENT (p. 35) "The availability of Landsat image data has brought about major changes in geographical analysis. While pilot studies in the mid-sixties attempted to demonstrate what can be done with image data alone, it has become increasingly clear that most important applications require the combination of image data with many other sources of geographical information."

IMAGE RETRIEVAL (p. 43) "The collection and processing of digital image data based on photographs, drawings, and maps is currently undergoing a period of rapid growth. Industry, universities, and governmental agencies are producing an ever-increasing volume and variety of such data."

IMAGE ANALYSIS (p. 53) "Broadly speaking, image processing can be broken down into three categories: image database management, image coding, and image analysis for pattern recognition. ... This article is primarily concerned with architecture for image analysis. But since some basic operations are common for all the above categories, it should also be relevant to image databases and image coding."

HERBERT A. SIMON (p. 69) "Increasingly, the mental tasks of our society—routine mental tasks, to be sure, but mental

tasks nonetheless—are being done by computers or with the aid of computers. All of this has taken place within the last 35 years, and we are convinced that this is only the beginning.

With the advent of VLSI technology, I think we are more convinced than ever that this really is a second Industrial Revolution."



PERFORMANCE (p. 76) "Program execution monitoring has been neglected as a research topic; the available literature contains mainly case studies, without an adequate discussion of the fundamental concepts, goals, and limitations. This survey attempts to present the field systematically in four almost self-contained sections."

SOFTWARE DESIGN (p. 101) "The Flex software design system gives the software designer a flexible language with which to communicate his designs, as well as providing him with the precise, machine-checkable form and function of a modern programming language."

SOFTWARE MAINTENANCE (p. 103) "However, even without resorting to technological innovation or R&D investment, there is much that can be done to reduce life-cycle costs, provided that the acquisition agencies understand the issues and are willing to spend the required time and effort (money) during the development phase."

PROGRAMMING STANDARDS (p. 113) "Whatever happens, there will be simple applications, which for economic reasons will continue to use small computers (by today's standards). ... Instead of using conventional mnemonic assembly languages, these applications might be coded in systems implementation languages."

SEWAGE MONITORING (p. 128) "To assure that the quality of treated effluent being dumped into South San Francisco Bay by surrounding communities remains consistent with the Clean Water Act and Environmental Protection Agency standards, a complex network of minicomputers and electronic sensors has been developed to continually monitor the sewage as it moves through pipelines and processing plants on its way to the bay."

PROSTHETICS (p. 129) "The principle behind the Boston Arm is that biological signals from the brain, intended for the now-missing limb, can be detected in the stump and used to control an artificial elbow in a natural way."

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DEFECTIVE SOFTWARE (p. 6) “It is not ‘moralistic’ or ‘compulsive’ to see fields similar in complexity and creativity to our own producing fewer defective products, and to wonder why we can’t (or won’t) do the same. It may be moralistic, however, to view engineering excellence in our field as more important than short-term market share (since it may lead to long-term market share).”

AVOIDING DILBERT (p. 10) “To accomplish objectives, project managers must communicate with their engineers. ... Honesty, integrity, leadership, a sense of humor, and common sense will serve managers well. They will also keep their projects from becoming Dilbert cartoons.”

THE INTERNET (p. 14) “Many organizations would like to use the Internet for applications that require real-time service, such as telephony. The Internet has not lent itself to such service in the past, but various products, services, and standards could help solve the Internet’s quality-of-service problem.”

VIRTUAL PRIVATE NETWORKS (p. 18) “However, as with many Internet technologies, potential VPN users are concerned about possible security, reliability, and performance problems. In addition, a lack of open standards has created concerns about compatibility. The industry is working toward adoption of such standards, but it remains to be seen whether this will lend credibility to VPN technology.”

MULTIAGENT SYSTEMS (p. 28) “The passive nature of most existing computer systems provides little assistance for highly complex, specialized, or autonomous tasks. In order to enable software to be more proactive in executing these kinds of tasks, recent research has focused on enhancing the abilities of industrial-strength intelligent agents.”

USER INTERFACES (p. 36) “Graphical user interfaces have helped evolve a world of easily accessible information, where computer use centers on viewing and editing, rather than on programming. Yet the need for end-user programming is becoming increasingly apparent: users, who often find themselves performing repetitive tasks, want the ability to customize applications easily.”

EDUCATION ROUNDTABLE (p. 46) “But merely using the techniques and tools afforded by computing and information technology is not itself the solution to fitting education to the demands of an information society. We must do much more than be caught up in technology. We must aggressively go after the skills and methods needed

to produce designers of the complex information systems our society requires.”

FOCUS (p. 59) “Most professional degree programs for software engineering focus on solving today’s problems with today’s technologies. Carnegie Mellon’s master of software engineering program takes a different approach, preparing engineers to work with new science and technology throughout their careers and helping them become agents of change in the industry.”

ASYNCHRONICITY (p. 67) “Synchronous processors, dependent on a clock, are not necessarily the perfect computing solution. As this look at several approaches indicates, asynchronous processors may one day offer improvements over present system performance.”

CACHING (p. 77) “Predicate caching improves memory utilization and response time of repetitive queries by pre-storing partial results in primary memory, which results in minimizing secondary storage access. With traditional caching, a system copies data from a slower device to a faster one to improve throughput. With predicate caching, a system applies a *predicate* to the data on its way from one memory device to another.”

DRAFT CODE OF ETHICS (p. 89) “The dynamic and demanding context of software engineering requires a code that is adaptable and relevant to new situations as they occur. However, even in this generality, the Code provides support for the software engineer who needs to take positive action by documenting the ethical stance of the profession.”

Y2K (p. 137) “By now you have probably heard more than you really care to about the ‘millennium crisis,’ also known as the Year 2000 problem or—license plate style—Y2K. If you haven’t brushed off the whole thing altogether, you’ve probably included in your New Year’s resolution plan for January 1, 2000, to wait a little before rushing to the airport, stepping into an elevator, or cashing in on your mutual funds.”

WEB EDUCATION (p. 139) “The World Wide Web has the potential to revolutionize instruction and increase educational opportunities across corporate, government, and educational sectors. Not only will the Web enable distance learning and peer-to-peer connectivity, but it will also enhance student feedback and let instructors understand whether and how long students have studied a particular lesson. It also has the potential to reduce training costs.”

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