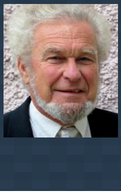
50 & 25 YEARS AGO



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In the early years, *Computer* was published bimonthly. Therefore, we will have to skip our "interesting and/or informative" extractions for October. The next set will appear in the January 2023 issue of *Computer*, and we hope you will eagerly wait for our next publication of this column.

DECEMBER 1997

https://www.computer.org/csdl/magazine/co/1997/12

Open Channel: Matching People and Jobs: The I-CMM Proposal; K.V.K.K. Prasad (p. 10) "Employees are not equally committed to the organization in which they work. In the software industry, turnover is high. … Here I propose the Individual Capability Maturity Model (I-CMM). The I-CMM allows a job candidate to judge the organization and vice versa. Each of the five levels in the I-CMM reflect the capability level of the individual, and each is characterized by an aim and an area of focus." *[Editor's note: The five levels then are explained, from "initial" (an inexperienced employee) to "optimized" (an employee fully integrated into company goals). Unfortunately, that model apparently did not hold then and holds even less today, when company loyalty to employees is sacrificed for profit motives and employee loyalty to the company is sacrificed for career and money considerations.]*

Detecting Attacks on Networks; Chris Herringshaw (p. 16) "Network intrusion-detection systems solve this problem by detecting external and internal security breaches as they happen and immediately notifying security personnel and network administrators by e-mail or pager. … Intrusion-detection systems assume that they can detect an intruder by examining such parameters as network traffic, CPU and I/O utilization, user location, and file activity for signs of an attack. … Intrusion-detection systems use several types of algorithms to detect possible security breaches, including algorithms for statistical-anomaly detection, rules-based anomaly detection, and a hybrid of the two." *[Editor's note: This short article describes these two approaches but would have been much more valuable if it would have compared the approaches with the virus detection systems that were around in 1997.]*

What Should Your Speech System Say?; Niels Ole Bernsen et al. (p. 25) "Telephone-based, spoken-language dialogue systems (SLDS), which help automate relationships between businesses and customers, have been entering the market since the early 1990s. … SLDS designers generally rely on a Wizard of Oz (WOZ) simulation technique to ensure that the system's dialogue facilitates user interaction as much as possible. … We have found that a sound, comprehensive set of dialogue design guidelines is an effective tool to support systematic development and evaluation during early SLDS design. … Task-oriented SLDSs are based on the assumption that users will cooperate with the system to achieve the task. … Users who do not cooperate will fail to get their tasks accomplished." *[Editor's note: The article then continues to develop, using WOZ repeatedly, the principles that are supposed to form the guidelines for successful SLDS design. As we know, SLDSs are still not around. All the human-powered hotlines are an example thereof. Humans give up and look for alternatives rather than struggle through the usually unsatisfying dialogues.]*

Guest Editor's Introduction: Identifying Obstacles in the Path to More; Yale N. Patt (p. 32) "In many aspects of computing, however, providing more is not without obstacles. The six articles in this issue represent attempts by researchers in certain subdisciplines of computing to summarize the current state of their respective fields and then answer the question: To make major improvements in our field, what fundamental research problems need to be addressed, and how should we go about addressing them?" *[Editor's note: These six articles represent different aspects on the theme that came out of task forces held as part of the 30th*

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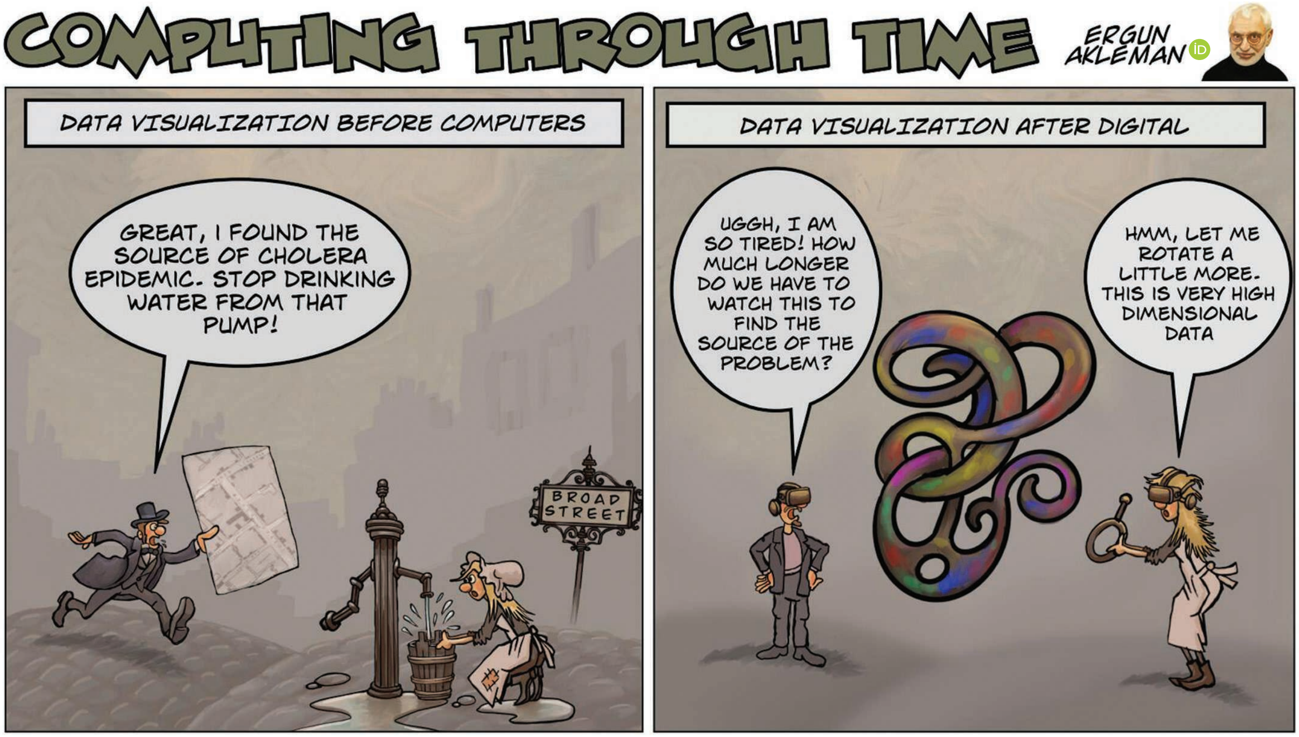
Annual Hawaii International Conference on Systems Sciences, on Maui, USA, in January 1997. I will look at them only briefly, but the reader is encouraged to see what people thought of future developments in 1997.]

Challenges to Combining General-Purpose and Multimedia Processors; Thomas M. Conte (p. 33) "Over the past three years the major vendors of general-purpose processors (GPPs) have announced extensions to their instruction set architectures that supposedly enhance the performance of multimedia workloads. … Processors targeted to embedded multimedia applications—the so-called multimedia processors (MMPs)—have employed similar semantics. … Most of the new instruction semantics for both GPPs and MMPs are based on a subword execution model." *[Editor's note: The article then concentrates on how to pack and access pixel data sizes smaller so that the architectures word-size them efficiently.]*

Seeking Solutions in Configurable Computing; William H. Mangione-Smith et al. (p. 38) "Since at least 1989, configurable computing systems have demonstrated the potential for achieving high performance for a range of applications, including image filtering, convolution, morphology, feature extraction, and object tracking." (p. 42) "It is not surprising that many of the most pressing needs for configurable computing systems can be lumped into the category of FPGA-related technology." *[Editor's note: The article analyses, in detail, the architectural requirements of configurable computing but speculates on the impact adaptive computing would have. Here, the authors underestimate considerably the eventual success of field-programmable gate arrays.]*

Trends in Shared Memory Multiprocessing; Per Stenström et al. (p. 44) "Like uniprocessors, current shared memory multiprocessors are often built from high-performance microprocessors, so there is a clear transition path from uniprocessor to multiprocessor program implementations. The challenge lies in making this transition as smooth as possible, both in performance and the programming required to achieve it." (p. 49) "Within the next decade, it will be possible to integrate a billion transistors on a single component.


COMPUTING THROUGH TIME
ERGUN AKLEMAN
DATA VISUALIZATION BEFORE COMPUTERS
GREAT, I FOUND THE SOURCE OF CHOLERA EPIDEMIC. STOP DRINKING WATER FROM THAT PUMP!
BROAD STREET
DATA VISUALIZATION AFTER DIGITAL
UGGH, I AM SO TIRED! HOW MUCH LONGER DO WE HAVE TO WATCH THIS TO FIND THE SOURCE OF THE PROBLEM?
HMM, LET ME ROTATE A LITTLE MORE. THIS IS VERY HIGH DIMENSIONAL DATA

BEFORE 1850, ALL DISEASES WERE BELIEVED TO SPREAD BY "BAD AIR," CALLED MIASMA. IN 1854, THERE WAS A SEVERE OUTBREAK OF CHOLERA IN LONDON'S SOHO DISTRICT. DR. JOHN SNOW, WHO STRONGLY BELIEVED THAT THERE MIGHT BE ANOTHER REASON FOR THE OUTBREAK, PLOTTED ALL CHOLERA CASES ON A STREET MAP OF THE AREA AND REALIZED THAT THE EPIDEMIC WAS ACTUALLY SPREADING VIA WATER. THE CLUSTERS OF POINTS ON THE MAP THAT HE RECORDED REVEALED THAT THE SOURCE OF THE PROBLEM WAS A PARTICULAR PUMP ON BROAD STREET. HIS PIONEERING WORK IS CONSIDERED TO BE THE FIRST SIGNIFICANT SCIENTIFIC INSIGHT AND DISCOVERY OBTAINED BY USING DATA VISUALIZATION.

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Performance enhancement techniques will become critical as the community looks for the best way to exploit these huge numbers of transistors to deliver high performance." *[Editor's note: This is an interesting article, as it touches on many of the issues of shared memory processing, but it ignores completely the parallel-developed technique of shared-nothing architectures. Both together, of course, have led to the vast performance improvements of the past 25 years.]*

Changing Interaction of Compiler and Architecture; Sarita V. Adve et al. (p. 51) "With recent developments in compilation technology and architectural design, the line between traditional hardware and software roles has become increasingly blurred. ... This increased blurring of compile-time and runtime optimizations opens many new research opportunities, particularly for program optimization—a task typically performed entirely at compile time. In this article, we describe an optimization continuum with compile time and post-runtime as endpoints and show how different classes of optimizations fall within it." (p. 53) "TAXONOMY OF OPTIMIZATIONS: • Static transformations • Dynamic selection of static transformations • Dynamic recovery of speculative transformations • Dynamic transformations • Post-runtime optimizations." *[Editor's note: The article analyzes those optimization opportunities and discusses ways that analysis feeds back into the optimizations that are possible at later executions of the program.]*

Wireless Data Networks: Reaching the Extra Mile; Hasan S. Alkhatib et al. (p. 59) "Development of wireless networks for metropolitan and wide areas has been lagging behind the rapid evolution of wired networking technology. A combination of current and emerging technologies, however, could serve to maximize the transmission data rates available and help use the limited radio spectrum appropriately." (p. 61) "In the near future, networks that provide low-cost communication services with very low access costs will make wireless technology solutions widely available." *[Editor's note: The article is very interesting to read, as it investigates a number of technology solutions that promised to make wireless networks a success story. As we now know, most of these approaches were successful, but the article did predict free frequencies to be widely available and did not foresee the strong bandwidth licensing requirements we have today.]*

Compilers for Instruction-Level Parallelism; Michael Schlansker et al. (p. 63) "Discovering and exploiting Instruction-Level Parallelism in code will be key to future increases in microprocessor performance. What technical challenges must compiler writers meet to better use ILP?" (p. 68) "As ILP becomes increasingly important, language support may improve, given the effect of previous hardware advances on programming languages. For example, the introduction of vector and multiprocessor architectures has profoundly affected scientific programming." *[Editor's note: This is an interesting article to read, as it predicts many of the developments in hardware and software that utilize the highly parallel architectures available today in all our computing systems, large and small.]*

Emerging Calendaring and Scheduling Standards; Frank Dawson (p. 126) "In July of 1996, an overwhelming number of the vendors that produce group schedulers, PIMs, and electronic calendars gathered together at an ad hoc industry meeting to review the need for standards. The group identified and began to outline three key areas for the future standardization of calendaring and scheduling technology: • Exchange format • Interoperability protocol • Access protocol." *[Editor's note: This working group effort led to the standardization of iCalendar (the extension .ics) in 1998 that became the dominant calendar standard of today.]*

Is It Too Late to Put the User Back into HTML?; Ken Magel (p. 131) "These new users expect the Web to be easy to use and to understand. These new users are forming opinions that will influence others, whether the opinions continue to be reasonable or not. ... We need to do everything possible to make it easy for users to find information. One way of doing so is by adding value to links. ... Today, links are indicated by a specific color or by underlined text. Methods that display information about a link's destination would be more effective." *[Editor's note: The article then continues to use underline thickness and underline color to communicate size information about the link destination. Obviously, that approach failed, as linking downloads rapidly became of no concern to users. More information about the link destination could still be helpful, as it would eliminate the frequent need to follow a link only to find out that it did not lead to the expected information.]*