50 & 25 YEARS AGO



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Application of Digital Computers to Air Traffic Control in the United States; Howard J. Kirshner (p. 14): "Radar-oriented tracking and alphanumeric display systems using digital computers are just now emerging as the key data processing tool in air traffic control, although the Great Falls Center, using air defense computer and display facilities, has been in operation since 1963." (p. 15) "Aircraft operations in the United States are conducted under two forms of ATC procedures. The first procedure is called Visual Flight Rules, or VFR, and the second, Instrument Flight Rules, or IFR. ... Under Visual Flight Rules, it is the responsibility of the aircraft's pilot to maintain adequate separation from other aircraft. ... The ground-based ATC system is responsible for providing separation among aircraft flying under IFR, although in clear weather the pilot also has a responsibility to see and avoid other traffic, since not all aircraft in most segments of low-altitude airspace will be under control of the ground system." (p. 16) "At 61 locations having radars and beacons, the computer-based Advanced Radar Terminal System (ARTS) is being deployed." [Editor's note: The article describes in detail the use of computers to analyze and display information that is captured by radar and beacon facilities. The impression is that none of these systems is yet (1972) ready for use but will become available soon.]

The Traffic Control System on the Hanshin Expressway; Toshiharu Hasegawa (p. 21): "The inflow traffic control system on the expressway is very important because a smooth traffic flow can be assured and traffic congestion can be eliminated within a short time." (p. 22) "One is the inflow traffic control phase which is for a stationary traffic flow. The other is an emergency control phase for unstationary flow such as that which takes place when an accident occurs. These two

Digital Object Identifier 10.1109/MC.2022.3200077 Date of current version: 24 October 2022 phases are not independent of each other but are strongly related. Especially, when an accident takes place amid heavy traffic, the relation between the two phases is very important." [Editor's note: The article describes in detail the hardware and system configuration, and in a way, already foresees the two main components: access control and speed control. As we now know, it took a long time to establish those systems widely, but on the other hand, our traffic control even today did not move far beyond that.]

Airline Operations: The Real-Time Environment; Michael J. Fenello (p. 27): "One of the biggest assets in reducing operating costs and in protecting revenue in the airline industry is the continuous application of state-of-the-art computer technology to operations systems." (p. 28) "Armed with the hardware, in August of 1969 we implemented the Flight Watch system and simultaneously consolidated our flight dispatch, operations planning, aircraft routing, meteorology and maintenance technical services functions into one Systems Operations Center in Miami, Florida." (p. 30) "Since we have many different functions utilizing differ-rent systems and hardware in support of this real-time industry, we've tied our different systems and hardware together so that they may converse and exchange information that may supplement functional requirements." [Editor's note: This is an interesting article that shows how Eastern Airlines' real-time system was extended stepwise, with each step analyzed with respect to improving the airline's operations.]

The Electronic Voting System for the United States House of Representatives; Frank B. Ryan (p. 32): "This Electronic Voting System presents few technical complexities and does not reach to the frontier of modern computer science. Though there are no severe technological barriers, nonetheless there are complexities in designing a computer system which will not do violence to the parliamentary and democratic traditions of the legislative process." (p. 35) "The Legislative Reorganization Act of 1970 specifically mentions the use of an electronic voting system, no doubt influenced by the fact that a large number of state legislatures employ electro-mechanical voting devices." (p. 36) "One computer configuration is termed the "master", while the other is termed the "monitor". ... In summary, fully redundant operations are provided whenever the hardware allows this capability." (p. 37) "The advent of this new voting system will change the character of the voting process in both its political and legislative dimensions. ... However, there is every reason to believe that these changes can be so adapted as to enhance, rather than to destroy, the traditional and shared objectives of representative voting in a democratic system." [Editor's note: This is an interesting discussion that expresses a hope that I, as an outsider, can neither confirm nor deny.]

The Digital Computer as a Tool in an Intensive Care Unit; Kenneth M. Kempner et al. (p. 38): "A state-of-the-art intensive care unit monitoring system, currently being implemented at the National Institutes of Health, is described in depth." (p. 39) "At the low end of the spectrum, the midicomputer (like its twelve bit counterpart) is used in a dedicated mode to acquire, display and store data. ... At the upper end of the spectrum, the 32K word midi-class machine equipped with an array of peripheral devices and costing approximately \$350K is generally used in a multiprogrammed environment to perform data acquisition, data display, real-time data analysis and instrument control. ... Large scale time-shared machines costing upward of half a million dollars provide all the foregoing capabilities and, in addition, permit substantial sophisticated off-line data processing." [Editor's note: The article then continues with a detailed description of various systems existing in the 1972 time frame. It is somewhat surprising, to me at least, what was achieved at that time despite the limitations of compute power.]

Computers and Cartography; Dennis L. Bress (p. 44): "Computer-aided plotting is turning the ancient art of cartography into an exact science. Today's geologist, civil engineer, city planner, highway engineer and government cartographer have turned to small computers and digital plotters for maps that in the past were produced entirely by hand. This movement to computer-aided cartography has yielded more accurate maps faster and at lower cost." [Editor's note: This interesting article then describes numerous devices and software packets available in 1972 that support digitized cartography. Despite the limitations of compute power, an amazing number of hardware devices and applications are described in the article.]

New Products (p. 59): "**New DEC Cassette:** A dual transport tape cassette unit that features direct reel-to-reel drive which eliminates belts, capstans, pulleys and clutches found in the typical transport was announced for its PDP-8 and PDP-11 minicomputers by Digital Equipment Corporation at WESCON. ... The system has a transfer rate averaging 487 bytes per second at 256 byte blocks. Tape speed averages

nine inches per second (IPS) for read/write, 21 IPS during search, and 100 IPS during rewind. Typical full rewind time is 20 seconds." (p. 61) "Low-Cost Graphics Terminal: A high-performance, minicomputer based graphics terminal priced at less than \$11,000 has been announced by Digital Equipment Corporation. ... A light pen, full ASCII keyboard and character set, a serial communications interface and 31 special mathematical and scientific symbols are standard on the GT40." (p. 63) "CALCULATORS: Texas Instruments: Texas. Instruments has introduced three new calculators, the TI-2500 portable calculator and the Tl-3000 and Tl-3500 desk models. The Tl-2500 portable electronic calculator is a four-function, full-floating-decimal-point unit with an eightdigit light-emitting-diode display. With a suggested retail price of under \$120, the TI-2500 calculator is rechargeable and capable of portable or ac operation. The TI-2500 unit uses algebraic entry -ideal for general public use." [Editor's note: I select some of the new products that show the computer capabilities in 1972. Texas Instruments' very successful introduction of their calculators took over the market precisely by not using the Polish notation utilized by HP's calculators.]

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Open Channel: Is Your Project a Dilbert Cartoon?; Dwayne Phillips (p. 10): "It happened again the other day at work. Management asked me to look at a project to see if it was in trouble. It was. However, what most indicated trouble was the one thing that most often signals trouble with a project in the mid- 1990s-the project had become a Dilbert cartoon to its engineers. This is the worst thing that can happen to a project, a project manager, or an organization. ... PREVENTING THE DILBERT SYNDROME ... To accomplish objectives, project managers must communicate with their engineers. To succeed at this, managers should know how they sound and appear, and should not assume that everyone understands their intentions. Honesty, integrity, leadership, a sense of humor, and common sense will serve managers well. They will also keep their projects from becoming Dilbert cartoons." [Editor's note: Dilbert cartoons have been around since April 1989 and are as enjoyable to read and are relevant today as they were then. This "Open Channel" column, which I suggest you read, points to facts that appear in real life not only in 1997 but also today and are well pointed out in this article as well as in many Dilbert Cartoons.]

Virtual Private Networks: Leveraging the Internet; Sixto Ortiz Jr. (p. 18) "The industry is working toward adoption of such standards, but it remains to be seen whether this will lend credibility to VPN technology. ... VPNs offer several advantages over traditional private networks. Barry Voltz, information systems manager with Omron Electronics, cites the significant cost savings provided by the company's VPN.

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Voltz also said the service has provided enhanced flexibility and convenience." (p. 19) "Security: Two key issues are user authentication, which can be accomplished with passwords, and the security of the VPN's encryption tunnel." [Editor's note: Interestingly enough, the article sees virtual private network (VPN) mostly as an Internet-based alternative for private networks. We know today that the real issue of VPN is the security and privacy protection that it provides. Its universal acceptance, I believe, is still blocked by the Open Internet mentality of users and, of course, by its performance overhead.]

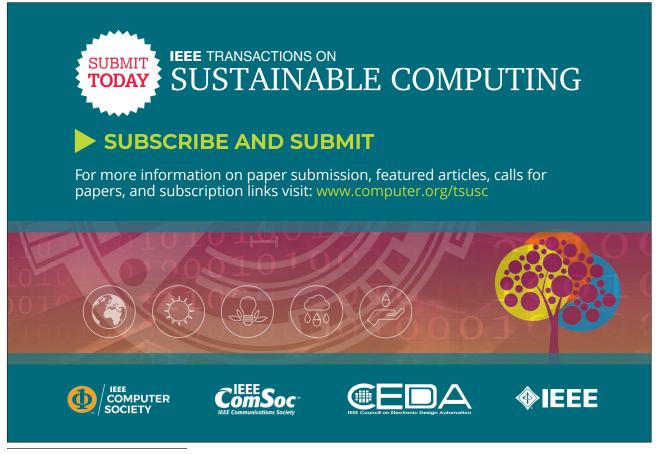
Teaching Agents to Learn: From User Study to Implementation; David Maulsby et al. (p. 36) "Most user interfaces eschew formal notation and encourage concrete expressions of a user's ideas. Perhaps the best way to customize a program, given current interface and software design, is for users to annotate tasks-verbally or via the keyboardas they are executing them." (p. 37) "In order to understand how best to create a system that can learn, we conducted an experiment in which users attempt to train an intelligent agent to edit a bibliography. In our experiment, a researcher sat behind a curtain masquerading as the intelligent agent, which we named Turvy." (p. 39) "Based on our observations, the key learning strategies include generalizing from a single example and from multiple examples." (p. 40) "The manifest advantages of this style of interaction-and the general success of the Turvy study-led us to develop Cima, an agent implementation of Turvy's learning mechanism." (p. 43) "Our experience with both Turvy and Cima demonstrates that even ambiguous hints improve learning from examples, provided the learning system uses other sources of knowledge to interpret the ambiguous hints and measure their credibility." [Editor's note: This is an interesting experiment that, in some way, relies on the gent using extensive background knowledge and in that respect has only limited learning capacity from examples only.]

Keeping Pace With an Information Society; Hesham El-Rewini et al. (p. 46): "In the past, educators asked themselves if they needed to change. Today the question is not if but how education will reengineer itself. It is time to embrace technology and solidify partnerships with industry. ... 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. ... First, it should exploit the advances in computing and communications technology to improve the educational environment. ... Our second reengineering goal should be to equip our graduates with the skills they will need as professionals. This is not a new theme, but we may for the first time be truly partnering with industry to solve the issues. ... Finally, we owe it to our information society to teach professional responsibility through courses like computing ethics." [Editor's note: This short thematic article is followed by 10 articles from different authors that extrapolate on these ideas. For space reasons, I will not elaborate on them, but I can recommend that you go and have a look at them as many of the issues discussed are still relevant in teaching, developing, and applying computer technology (pp. 47–59 and also p. 139).]

Asynchronous Processor Survey; Tony Werner et al. (p. 67) "Synchronous processors, dependent on a clock, are not necessarily the perfect computing solution. As this look at several experimental approaches indicates, asynchronous processors may one day offer improvements over present system performance. ... This article examines the key architecture issues that concern designers and compares six developmental asynchronous architectures." (p. 68) "To spur more research in asynchronous processing, we reviewed six distinctly different asynchronous processors-all that existed at the time we surveyed them, actually—and report our findings here." [Editor's note: This is a very interesting article that analyzes the advantages that asynchronous processing may offer but also points to the obstacles that may arise. What it unfortunately does not mention (maybe they did not exist in 1997) and compare to are data flow architectures, another variant of asynchronous processing.]

Predicate Caching for Data-Intensive Autonomous Systems; Nabil N. Kamel (p. 77): "Predicate caching, unlike traditional caching, relies not only on device speed to improve performance but also on preprocessing data. It is particularly effective on data-intensive AI and expert system applications. ... A predicate, in this context, is any predetermined calculation made by a program. Examples are a numerical integration function, a database SQL query, a shortest path calculation in a network, a complex weather calculation, and a sorting program. ... Predicate caching differs from hardware and disk caching in the amount of processing applied to the data before it is placed in the cache." (p. 78) "Typically, a predicate caching scheme would use a main memory for the cache and a disk for the main data sets (database), thus saving on both computation time and disk accessing." (p. 82) "To realize the potential of predicate caching, designers must decide how to ensure cache consistency in the face of updates. This is particularly true in data-intensive systems. Because the predicate cache stores partially evaluated predicates, the problem of cache updating is tied to updating materialized views and derived relations." [Editor's note: This is an interesting article that is mostly oriented to predicate caching in database (DB) systems and their query processing. Claims for applicability in artificial intelligence (AI) and knowledge-based (KB) systems are not solidified. The term predicate caching did not really catch on, but the optimization techniques in the mentioned systems (DB, AI, and KB) very much utilized the methods discussed here.]

ISO 14001: The Green Standard; Roger Howe (p. 133): "Formally published September 1, 1996, ISO 14001 is a comprehensive Environmental Management System (EMS) that, when adopted, enables organizations to formulate corporate objectives in the context of environmentally oriented legislative requirements and general environmental concerns." (p. 134) "All the same, the benefit of ISO 14001's current version is clear: It establishes a collective responsibility for environmental management between vendors, customers, shareholders, and regulators. And, ultimately, it can help companies save money." [Editor's note: This environmental standard was only piecemeal and slowly implemented the world over. The European Union may be an exception to it, but in all cases, it needed legislative actions to really establish the necessary behavior. Unfortunately, the standard fell very short in controlling/limiting the now raging "planned obsolescence" that wastes untold amounts of raw materials and energy for the sake of business objectives.]



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