Advances in Microcomputer Peripherals

Jean-Daniel Nicoud
Swiss Federal Institute of Technology, Lausanne

Not too many years ago, computer peripherals were huge and expensive. Today's microcomputer peripherals, however, are small and efficient, and they provide better performance at much lower cost than their counterparts of 10 years ago. The evolution of microcomputer peripherals is far from over, though. The progress being made in magnetic media, flat screen displays, laser printers, sensors, local networks, input devices, and VLSI interface and controller chips shows that the most dramatic developments are yet to come.

Technology influences applications. The tasks to which computers are applied reflect the capabilities provided by a particular level of technology. The evolution of computers is toward artificial intelligence, i.e., the selection of an appropriate response to a complex problem. Just storing the information associated with such a problem is a challenge now, in terms of both memory size and methods of inputting the information.

As applications track technical evolution, we find (and will find) computers being used for a continually expanding range of tasks:

- by 1950, for number crunching, data processing, and communication,
- by 1984, for text processing, drafting, and information archiving, and
- by 2000, for AI-based simulation, design, and education.

The progress made in the first stage depended primarily on increases in processor power. The same will be true for the last stage. The intermediate stage of computer applications—where we find ourselves today—has been and will continue to be strongly influenced by the technology of peripherals:

- Text processing will reach maturity soon as a result of the progress in laser and ink-jet printing.
- Drafting systems, popularly called computer-aided design systems but still far from real integrated design tools, are nonetheless being improved with better input and output devices.
- Archiving large amounts of information electronically will become more effective than archiving such information on paper, due to advances in mass storage device technology.

The peripherals needed to support these applications are...
easy to name: printers, plotters, displays, mice, tablets, scanners, and disks.

The evolution of peripherals affects the evolution of other products. For example, portable personal computers, the development of which is now exploding, have benefited from the availability of small printing mechanisms, small displays, and small mass storage devices. More data will be prepared and handled with such computers, but the development of mainstream desktop machines—with greater and greater peripheral and processor performance—will also continue.

To assess the status of and trends in microcomputer peripheral technology, the Swiss Federal Institute of Technology—Lausanne organized the International Conference on Advances in Microcomputer Peripherals, held October 9 through 11, 1984. The articles appearing in this special issue of IEEE Micro are adapted from papers presented at that meeting. It is difficult to cover all the interesting developments in microcomputer peripherals at a small international conference. It is even more difficult to do it in a special issue that features only a selection of the conference papers. Those which we did select either examine general aspects or describe particular techniques.

"Microcomputer Peripherals—Status and Trends," by engineer and market analyst Andrew Allison, surveys existing devices and technologies and discusses future developments. In "The Non-Death of Paper," Roy G. Lahr, a well-known consultant in the area of printer technology, predicts the healthy survival of paper despite the announcements, for years now, of the paperless society.

In the area of technique, Peter D. Noakes and Robert Aish ("A New Peripheral for Three-Dimensional Computer Input") present the results of an original research project aimed at the problem of entering spatial information into a computer. Wolfgang Doster and Richard Oed ("Word Processing with On-Line Script Recognition") describe their work on a more widely acknowledged but no less important problem: computer recognition of handwritten information.

Analog VLSI circuits open the door to new applications. Ernst Habekotté and Stefan Csrevény, in "A Smart Circuit for a Capacitive Microtransducer," discuss a CMOS switched-capacitor A/D converter for a capacitive microtransducer. This converter and transducer comprise a two-chip solution to the problem of analog data capture.

Because most peripherals now embody at least one microprocessor to provide some degree of "smartness," advances in microprocessor technology are of high interest to designers of peripheral equipment. The availability of low-power CMOS microprocessors, for example, has made it possible to design units powered by small battery packs. And the development of more compact types of microprocessor packages has further contributed to the physical shrinking of peripheral devices. Jim Farrell, in "The Advancing Technology of Motorola's Microprocessors and Microcomputers," shows what one manufacturer can do.

Our articles do not constitute anything like a complete survey of peripheral technology, of course. We must at least mention special-purpose VLSI circuits, which promise to reduce further the size and cost of peripheral equipment by integrating more and more functions on smaller and smaller amounts of silicon. Software in all its aspects is also missing from our coverage. Software is now a part of functions that have always been regarded as involving hardware only—it is playing a larger and larger role in enabling designers to maximize the performance and usability of mechanical and electronic features.

Although our treatment is incomplete, our authors have nonetheless addressed many important issues in the few pages available to them. We thank them, and the reviewers, for their efforts.

Jean-Daniel Nicoud is a professor at the Swiss Federal Institute of Technology in Lausanne, Switzerland. He has been active in microprocessor-related research for more than a decade and has designed many microprocessor-based systems. His and his research group's interests include microcomputer design, development tools, local networks, microcomputer peripherals, graphic workstations, laser printers, and computer-aided design.

Nicoud received a degree in engineering physics from the Swiss Federal Institute of Technology in Lausanne, and a PhD degree in electrical engineering from the same institution in 1969. He has been an associate editor of IEEE Micro since its inception.

Nicoud's address is École Polytechnique Fédérale de Lausanne—Laboratoire de Microinformatique (EPFL—LAMI), 16 Chemin de Bellerive, CH-1007 Lausanne, Switzerland; telephone (021) 47 26 42.