

Preface

Among the many, major changes sweeping across Europe in these last few years have been changes in the nature and practice of research and development in the computer field. As the nations of Europe draw closer together, cooperation has become the mark of many technological programs—cooperation among companies, industries, universities, and governments. In particular, as the end of 1992 nears, much of the structure of the European Community (EC) is taking shape, including the forms of cooperation for technological advancement. This special issue is an acknowledgment and celebration of those changes, containing ten papers and an essay that represent a sample of the cooperative efforts between IBM in Europe and other European organizations. We are indebted to L. E. Gullstrom of IBM Europe Headquarters in Paris, France, for his enthusiasm and considerable efforts in the creation, planning, and preparation of this special issue.

The first paper, by Elliott, Knapman, and Schlegel, presents results from a project within the EC Advanced Informatics in Medicine (AIM) program. The project, COmputer VIsion in RAdiology (COVIRA), uses the processing power, speed, and modeling capabilities of computers to map the three-dimensional regions requiring radiation therapy in cancer treatment. The maps can be altered interactively by medical personnel on the basis of the display of probabilities for tumor edges and on medical judgment.

Another project within AIM uses the ability of causal probabilistic networks to model uncertainty for the adjustment of insulin dosages in diabetes. The challenge is to maintain normal blood glucose levels while diminishing the risk of a dangerously low level. The technique gives results that are much like, and in concert with, the judgments made by medical personnel. Hovorka et al. describe how causal probabilistic network modeling was har-

nessed in support of this medically important treatment area.

In the area of computer networks and integrated broadband communications (IBC), the EC has embarked on a major program called Research and Development in Advanced Communications in Europe (RACE). Part of that program is the definition and specification of software engineering methods and tools for the creation of the extensive and complex software needed to automate this new IBC backbone for EC-wide telecommunications. That project is known as SPECS—Specification and Programming Environment for Communication Software. Its goals, form, and achievements are documented by Dauphin et al.

Another paper on the SPECS project, by Binding et al., describes the development of an intermediate language and a prototype compiler for translation of specification languages into executable code. The specification languages are Language of Temporal Ordering Specification (LOTOS) and Specification and Description Language (SDL). This approach supports the SPECS goals of using formalized specifications and high levels of automation for development of RACE software.

In order to have standardization, openness, integration, and flexibility for the future within RACE, a project called the RACE Open Services Architecture (ROSA) is producing an architecture for RACE, which is intended for international standardization. ROSA, as described by Oshisanwo et al., will integrate user, control, and management aspects across data and resource dimensions.

Geihs et al. discuss the prototype efforts and preliminary results from the NEMESYS project that is intended to support the IBN Network (IBCN) in RACE. NEMESYS focuses on the complex task of traffic and service management for IBCN. Conclusions are drawn about advanced object-oriented

information processing techniques, the prototype architecture and its reduction of complexity, and management standards for increased efficiency of the resulting solutions.

Moving away from network design, but staying in the realm of architecture and information interchange, the next paper presents the Open Document Architecture (ODA), an international standard for document interchange, and Piloting the ODA (PODA), an EC-sponsored set of projects for exploiting ODA. Fanderl, Fischer, and Kämper describe the ODA technology and the results of using ODA across heterogeneous networks. The Heidelberg System, which is also discussed, is the enhancement of IBM's OfficeVision* to support ODA-based document interchange in heterogeneous environments.

The *PROgrammation en LOGique* (Prolog) programming language is an example of the approach known as logic programming. It was developed and has largely been supported throughout its history by the European community. Bénichou et al. describe recent developments in Prolog, experimental extensions to it, and the current understanding of its place as an application development language. The maturity and power of Prolog are demonstrated through descriptions of 15 significant applications in a variety of application domains, resulting in the conclusion that Prolog is a general-purpose, high-level programming language.

The next paper, by Papetti et al., presents the objectives and technology behind an on-going program of software development for the computerized design and simulation of diesel engines that lower pollution without a loss of power. This work has largely been a cooperation between Renault Vehicules Industriels, Rome University, and the IBM European Center for Scientific and Engineering Computing. The paper focuses on the challenges of simulating the fluid flow behavior of fuel during injection and combustion.

Design criteria for internal combustion engines are also examined through simulation of reactive flow and the example of engine knock in a paper by Hebeker, Maly, and Schoeffel. Due to the high cost and difficulty of direct experimentation in this field, computers are now being enlisted to simulate the key fluid flow effects through numerical methods. The equations, algorithms, and sys-

tems are discussed, with attention to the vectorization and parallelization of the resulting software.

The final contribution is an essay on the modeling of ocean circulation and convection in the North Atlantic and the Greenland-Iceland-Norwegian Sea by Aukrust et al. Such ocean flows and heat exchanges can drive dramatic climatic changes over large expanses of the earth, and are themselves affected by changes in the atmosphere, clouds, and the influence of pollutants. The results of various simulations and studies are shown.

There have been two changes to the form of the *Journal*. The first is the inclusion of authors' electronic mail addresses in the biographies, on a voluntary basis, in order to make it easier for readers to consult with authors. The second is the addition of IBM order numbers to the list of issues and reprints in the annual index, appearing in this issue.

The next issue of the *Journal* will be a special issue on the growing links between a company's business strategy and its information systems strategy, known as strategic alignment.

Gene F. Hoffnagle
Editor

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