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WELCOME

The theme to be explored during this conference is that of pictorial data, in itself a difficult matter to define. Very likely, there are many conflicting definitions. The conference memorandum says, that pictorial data is that which relates to the shape of an object or its location in physical space. In planning the conference, the organizing committee was only too aware of the multitude of applications which encompass data meeting such a definition. It is obvious that these applications are very important in many areas of today's world. It was suggested that this conference works towards a first understanding of the various pictorial application areas and their potential and then tries to identify the underlying commonalities, especially as far as data is concerned, its representation, structuring, and storage.

Why are the Scientific Centers of IBM Europe interested in that subject and why are they sponsoring a conference on pictorial data? An outline of their role might provide the basis of an answer to these questions.

As technology advances and as scientific achievements become greater and technical development more rapid, we feel that the establishment of Scientific Centers is increasingly important in order to conduct long and medium range research, and to develop applications which meet the needs of modern society. The projects undertaken by IBM's Scientific Centers represent a wide range of topics in computer applications research, in advanced studies in system/user interfaces as well as system design and programming, and in many problems of information science encountered by computer users. Among these topics there has been work in pictorial applications and data base issues for many years. Some of the relevant work of the Scientific Centers might be mentioned:

- The Scientific Center at Heidelberg has worked in the past on the processing of scintigraphic images and is now dealing with man-machine interaction and with related information management.

- The Italian Scientific Centers are engaged in a wide range of problems in areas such as natural sciences, econometrics, and computer networking.

- The Scientific Center in Haifa deals with the design of computer systems for agriculture, for medical research, and for aquifer management.

- The newly established Scientific Center in Winchester is initiating work on image processing in medicine and on social sciences.

- The Madrid Scientific Center works in image processing of remotely sensed data, e.g. for the identification and assessment of earth resources.

- The Scientific Center in Paris is also engaged in this field as well as in speech signal processing with the objective to teach deaf children through visual feedback how to speak.

The result of this work is published in the scientific community. Very often, research is done in collaboration with academic and scientific institutions. Examples are the studies with the University of Pisa, the Italian National Council of Research, the University of Vienna, the Institute of Molecular Biology in Madrid, and the Universities in Berlin and Heidelberg. We consider these joint studies an ideal vehicle for the exchange of expertise and for cross fertilization.

This conference, too, is directed towards an open exchange of knowledge and results of research. It is with such an open exchange of expertise that the growth of new ideas is encouraged and science thrives. And it is in this spirit, that I would like to express my welcome and my gratitude to the participants for coming and sharing with us today's knowledge about data base techniques for pictorial applications.

I want to thank IBM Italy for the offer to host this conference in wonderful Florence and for the organizational and administrative effort undertaken to make it a pleasant and beneficial experience for all the participants.

Paris, June 1979

R. Aguilar
IBM Europe
Director of Scientific Centers

INTRODUCTION

Over the years, technological trends in hardware and software have significantly improved the processing power of computers, their primary and secondary storage capacity and accessing speed, their telecommunications facilities, as well as their user interfaces via general and special purpose terminals. This has facilitated, among others, the advancements of integrated data bases and of their administration on the one hand, and of graphical and image processing (in brief: pictorial) applications on the other.

Developments in these two fields have traditionally been unrelated. Integrated data bases have been and are still being nearly exclusively used for commercial and administrative applications of batch or transactional type. Conversely, pictorial applications have been pursued mainly in technical, scientific, and planning disciplines as diversified as architectural and engineering design, biochemistry, air traffic control, robotics, utility and geographical mapping, urban and regional planning, meteorology, medicine, and in the analysis of remotely sensed data e.g. for earth resources and agricultural inventory development and environmental protection.

There are, however, several strong arguments for an integration of data base techniques with pictorial applications. To mention just a few of them:

(1) The processing of pictorial data poses quite severe computational problems and the volumes of data to be manipulated and analyzed grow larger and larger. Therefore, much attention must be given to choosing between the various methods known for structuring and retrieving this data.
(2) Pictorial (as conventional) information is an expensive resource which should profitably be used for as many applications at as many places as possible. As an example, the same remotely sensed data can and should be used e.g. for earth resources identification, environmental protection, agriculture, and meteorology. This calls for an organization of this data on which to build a variety of different applications.
(3) Graphical and image applications enter into commercial and administrative environments. Business (or data presentation) graphics and facsimile are just 2 subjects to be mentioned. This is to some extent due to the fact that advanced problems in business and administration call for similar modes of operation (e.g. interactive problem solving) as known in technical and scientific disciplines, where graphical presentation of information is an indispensable tool.
(4) Many applications require pictorial data in combination with conventional data (computer aided design can be

mentioned as an example). This calls for the management of both types of information in the same system.

IBM Scientific Centers have traditionally been active in pictorial applications research (e.g. in engineering, medicine, remote sensing applications), as well as in data base research (e.g. in relational data base management systems and interactive enduser interfaces). Recognizing the needs mentioned above, some projects began to investigate scientific problem solving on the basis of prototyped data base management systems accommodating pictorial information.

To assess the work which has been going on for several years in application and data base fields and to discuss data base features necessary or desirable for pictorial applications, the Scientific Centers of IBM Europe organized this international conference. More precisely, its objectives are to seek an understanding of the various application areas which involve the use of pictorial data, especially to consider their requirements for the structuring, storage, and analysis of such data, and to identify commonalities and differences as well as to learn of relevant data base research. The emphasis is placed on the interaction between data base and application experts to exchange their views on the data base needs of, or the facilities for, pictorial applications.

To meet these objectives and to create a basis for mutually beneficial discussion, application oriented contributions were invited to particularly address the needs of their respective application for data regarding its volume, structure, storage, search (the algorithms used and the types of searches), and the extent to which data access can be pre-defined or needs to be dynamic and flexible. Data base contributions were encouraged to emphasize those features of their work which are relevant to pictorial data and applications.

The agenda has been structured according to our assessment of the conference subject and of the expected commonalities and differences in data related aspects of the applications. The first two sessions deal with geographic applications, e.g. in geographic and utility mapping and in urban and regional planning. The third session addresses the administration and accessing of data representing two- or three-dimensional geometric objects as they occur for instance in architecture, engineering, and biochemistry. The fourth session is devoted to remote sensing and image processing applications, among others in water resources management, agriculture, astronomy, meteorology, and biomedicine. The fifth session, eventually, covers some related data base research.

This is one of the first conferences totally devoted to the

subject. It is supposed to draw its success from pointing the applications oriented audience to the common problem of organizing and accessing pictorial information and to the solutions already visible, and in making the data base researchers aware of unresolved problems deserving their attention. There will be conferences on that subject in the years to come. We would be pleased if this one could play a kind of pioneering role for the others.

The conference was instigated by the Chief Scientist of the IBM Corporation. It was sponsored by IBM Europe and IBM Italy, and locally organized by the Scientific Centers of IBM Italy. Nevertheless, the contents of this introduction and of the conference contributions express the authors' own personal opinions and not IBM's.

I would like to express my gratitude and appreciation to all the lecturers and session chairmen, to the sponsors, to hosting IBM Italy, to the members of the programme committee, to the local organizers, and to the many contributors within and outside of IBM, who gave advice and assistance in preparing, organizing, and running this conference.

Heidelberg, June 1979 A. Blaser

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