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# Information Processing in Medical Imaging

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# PREFACE

The 1991 International Conference on Information Processing in Medical Imaging (IPMI '91) was the twelfth in the series and followed the successful meeting in Berkeley, California, in 1989. The 1991 meeting was held in a glorious setting in the Kent countryside at Wye College, the Agricultural College of the University of London. The purpose of IPMI is to provide a forum for the detailed examination of methodological issues in computing which are at the heart of advances in medical image formation, manipulation and interpretation. Full-length scientific papers describing the latest techniques and results in this subject area are presented. Many of the ideas will form the basis of important journal articles in the future. This year, for the first time, the proceedings are published at the time of the conference. Papers were submitted at the end of 1990 and were reviewed in detail by the Scientific Committee. Authors of accepted papers were allowed to include their latest results before submitting the final version of their paper in March 1991. Thus, these proceedings provide a very up-to-date overview of the field. The long-paper format of IPMI means that readers and delegates can obtain a real insight into the methods in a way that can normally only be achieved from journal articles. We are very grateful for the cooperation of the authors, who were asked to submit full papers further in advance than usual, and for their adherence to the deadlines. We are also grateful to the unsuccessful authors; many papers which could not be included were of very high quality and were only excluded on space considerations.

We have decided to group papers according to information processing methodology rather than, for example, modality or clinical application. The first section contains several papers on image formation and reconstruction. Four papers on the use of prior information (especially anatomical) are grouped together in Section 2; this has emerged as an important theme this year. Registration of images from different modalities is discussed in four papers in Section 3. The excellent spatial resolution and discriminability of different tissues in MR images is exploited in several papers on segmentation in Section 4. However, there continues to be a need for improved general purpose methods of segmentation to cope with images of lesser quality and images of pathological tissues. Recent results using multi-scale approaches and methods based on analysis of surface topology are described in Section 5. In Section 6 there are papers using techniques derived from engineering, including deformable models and thin-plate splines, to represent anatomical structures and their variability. Two papers on factor analysis form Section 7. There are four papers on rule based systems and learning in Section 8; the use of uncertain classification rules increases the power of these approaches. The final section is composed of papers on image quality, display and interaction.

There is no doubt that developments in computer assisted quantitation and interpretation of medical images are being held up by fundamental problems in computer vision which are common to industrial and other application areas. Researchers in the medical area need to keep abreast of developments in the non-medical domain, and of course advances in medical image analysis can have important implications for other application areas. IPMI is a unique forum in which basic scientists and application-orientated researchers come together. We hope to see increasing input from clinical scientists with technical expertise at future conferences.

Part of the success of IPMI has been the workshop style of the meeting, which allows informal, in-depth discussions. The corollary of this is that the numbers attending the meeting need to be limited; this year we were significantly over-subscribed and unfortunately had to disappoint many people. The IPMI meetings are complementary to larger scale meetings where numerous examples of clinical applications are presented. The organisers of IPMI welcome the close cooperation with Computer Assisted Radiology (CAR) which has become established as the premier European meeting in the latter category. IPMI '91 followed CAR '91 which helped delegates travelling long distances to attend both meetings.

In recent years there have been rapid advances in the application of computing techniques to information processing in medical imaging. This volume is a timely collection of results of research by groups throughout the world including most of the major centres of activity in this area. The publication of the IPMI proceedings in the Springer Lecture Notes in Computer Science series increases its availability, and its publication at the time of the conference ensures that it is completely up-to-date. This volume will be an essential part of the library of all groups active or about to start work in this expanding area.

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We are extremely grateful to the Scientific Committee for their prompt and careful refereeing of manuscripts. We had over one hundred full papers submitted and the Scientific Committee members had to referee up to ten papers each in less than one month. The quality of these proceedings and of the conference itself reflects the considerable time and effort that they all contributed.

A small meeting such as IPMI has to survive on a very tight budget and this in turn means that we have relied heavily on our long suffering Research Assistants (Glynn Robinson, Derek Hill, Lewis Griffin and Clifford Ruff) and Secretarial Staff (Margaret Micklewright, Ann Quarterman and Linda Skelton), who all worked long and hard, way beyond the call of duty, to ensure that the conference organisation ran as smoothly as possible. We also thank Nicky Colchester and Liz Hawkes for support in numerous ways over the past two years, and Liz in particular for preparing the IPMI mailing list.

Finally we thank all the participants and contributors without whom IPMI would not have its unique character.

London — A. C. F. Colchester

May 1991 — D. J. Hawkes

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