



International Association for Pattern Recognition, Inc.
An affiliate member of the International Federation for Information Processing

NEWSLETTER

Editor

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Contents

From the Editor's Desk	1
News in Brief	2
King Sun Fu Award 1988	2
Message from the Outgoing President	2
Conference Reports	5
Bookshelf	7
Calls for Papers	8
Calendar of Events	10

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FROM THE EDITOR'S DESK

Once again your copy of the IAPR Newsletter will turn up on your desk a few weeks late. While I normally aim at producing the copy for the printer early in the month when the Newsletter is published, this time I managed to complete the issue only on the very last day of the publication date, New Year's Eve. So it is still a December issue but, admittedly, a very late December one. The main reason for the delay is that some news-worthy material became available only at and well after the Rome conference.

The ICPRs are the most significant events in the life of IAPR in at least two respects. First of all, they constitute the most important and prestigious forum for the presentation of the latest scientific and technical advances in the field of pattern recognition. Second, the IAPR biennial cycle commences at each ICPR with the meeting of the Governing Board where most of the decisions which chart the directions of IAPR's future evolution are made, and new IAPR Officers and Committee Chairmen are elected. Not surprisingly, the two issues of the Newsletter immediately following an ICPR are

dominated by the news generated at the meeting. Practically all the items in the first half of the current issue are connected either directly or indirectly with the Rome conference. The material includes the 9th ICPR opening address presented by the outgoing IAPR President, Dr Pierre Devijver, a report on the Conference, an announcement of the winner of the first King Sun Fu Award which was presented at the Conference banquet, and many IAPR news items. The next issue will contain a message from the new IAPR President Prof Martin Levine, new IAPR Directory and hopefully, if the negatives from Prof Levialdi arrive in time, snapshots of some memorable events from the Rome conference.

Contributors of material for future issues of the Newsletter please note my new email address on the front page of the Newsletter.

With best wishes for a happy and productive new year.

The Editor

NEWS IN BRIEF

IAPR OFFICERS ELECTED At their meeting in Rome on 15 November 1988 the Governing Board of IAPR elected the following officers to serve during the period 1988-1990: **President** Prof M D Levine (Cnd); **Vice-Presidents** Prof S Levialdi (Italy) and Prof M Takagi (Japan); **Secretary** Prof M J B Duff (UK); **Treasurer** Prof J K Aggarwal (USA).

USSR JOINING IAPR The Scientific Council on Pattern Recognition and Scene Processing of the USSR (1187 members) has been accepted as a new member of IAPR with effect from 1 January 1989. As a Category C member, the USSR will have four representatives on the Governing Board. Prof Ju I Zhuravliev and Dr P P Koltsov had been nominated to serve as two of the four representatives.

9 ICPR ATTENDANCE FIGURES Three hundred and ninety eight delegates from twenty five countries participated in the 9th International Conference on Pattern Recognition in Rome.

11 ICPR VENUE The Governing Board of IAPR accepted unanimously the recommendation of the Conference and Meetings Committee that the 11th International Conference on Pattern Recognition be held in the Hague, the Netherlands in 1992.

PATTERN RECOGNITION LETTERS One of the official publications of IAPR, disseminating technical and scientific papers in the field of pattern recognition,

computer vision and image processing has reached the circulation figure of 1000. The journal which is published by North Holland is available to IAPR members at a substantial discount through their national member organisations.

KING SUN FU AWARD 1988

Brussels, 25 October 1988

It is my greatest honour and my pleasure to hereby announce that the IAPR Governing Board, upon recommendation from the IAPR Award Committee has decided to award the King Sun Fu Award for 1988 to **Professor Azriel Rosenfeld, University of Maryland**. The citation for the award is as follows: "for fundamental contributions to image analysis, pattern recognition and computer vision". The award consists of an inscribed certificate and a cash gift from the K S Fu award fund and will be presented to Professor A Rosenfeld on 16th November 1988, at the 9th International Conference on Pattern Recognition, Rome, Italy.

Pierre A Devijver
President IAPR

MESSAGE FROM THE OUTGOING PRESIDENT

The following is the address given by the outgoing President of IAPR, Dr Pierre Devijver, at the opening ceremony at the 9th International Conference on Pattern Recognition held in Rome last November.

Ladies and gentlemen, there should be no need to tell you that it is a great pleasure, and a great honour for the president of IAPR to address such a large audience on the occasion of this 9th International Conference on Pattern Recognition, the biggest, periodic event organized under the auspices of IAPR. Your presence here is testifying to the vitality of the field and the attractiveness of IAPR, and I like to thank you all on both these grounds.

It seems fitting to take advantage of this opportunity to reflect for a few minutes about where IAPR is coming from, where it is today, and where it is likely to go in the coming years.

I am pretty sure that for many of you, in spite of it being professionally important, attending an ICPR every other year is becoming kind of a routine business,

just as if you had always done so in the past. Likewise, I am sure that many of you have got somehow the impression that IAPR has always been with us, or if not always, at least for quite a long time.

Let me show you that those views are not quite correct.

It is not very easy to decide when IAPR was actually born, but according to a report by its first Secretary, Professor Verhagen from Delft University of Technology, the formal foundation of IAPR was on November 6, 1978, at the 4th ICPR in Kyoto, exactly ten years ago. Likewise, the first ICPR was held in Washington, DC, October 30 - November 1, 1973, exactly 15 years ago. How is it that we could squeeze 9 international conferences in 15 years? Well, the answer is simple: The first two ICPRs were organized in two successive years and the following ones every other year in order to avoid conflicts with the international conferences on AI which are being held during odd-numbered years. In those early days, ICPRs were organized under the auspices of the so-called "Standing Committee for the Joint International Conference on Pattern Recognition" which was the seed from which IAPR would grow a couple of years later.

To give you an idea of how things have evolved, let me point out a couple of figures: In Washington, in 1973, 89 papers were presented, 2/3 of which were naturally from the US. (This conference, in Rome, will have about 4 times as many papers out of about 700 submissions.) The attendance in Washington was 312 from 14 countries. Five years later, in Kyoto, about 200 papers were accepted for presentation at the 4th ICPR which was attended by about 550 people from 23 countries. Two years ago, in Paris, we approached the threshold of 1000 participants.

If the numbers of submitted and accepted papers and the size of the attendance to ICPRs can be used to measure the vitality of the field, then it is clear that Pattern Recognition as a whole is showing evidence of growing interest worldwide; and as we perceive no sign of saturation, this process is likely to continue for some time.

In parallel, the size of the membership of IAPR is also confirming those findings. Ten years ago, in Kyoto, the initial size of IAPR was 13 national member organizations together with a few individual members. When I became president, two years ago, one of my secret hopes was that I could report an increase by a factor of two, but this has not quite been achieved, I must admit. Nevertheless, the list of countries which will hopefully become member of IAPR in the coming

years is still about as large as the list of countries which are already member. So, we may also expect a dramatic growth of IAPR in the years to come.

Measuring the sizes of attendance to conferences or membership in international organizations does not uncover all aspects of the situation of a scientific field like ours. Even more significant assurance that the field will keep growing and gaining even more widespread recognition must be found in the very nature of our activities. Let me try to clarify this point.

In retrospect, it seems obvious to me that the scientific programs of the first ICPRs were, quite rightly so, out of balance, with very many papers of a very speculative nature and very few papers devoted to real achievements. Some exaggerated speculations were to be deflated sooner or later, nevertheless, many others eventually found their way from the laboratory to the market place and this has been most notably the case in the last few years.

My position as a member of a huge industrial research organization gave me, perhaps more than many of you, a prime chance to observe over, say, the last six or eight years, a tremendous increase in the research efforts and research achievements in such domains as speech recognition, office automation, industrial inspection, computer vision, medical applications of pattern recognition etc. In turn, by a kind of feedback effect those achievements have further stimulated the interest of research managers and their openness and willingness to support further projects. Due to this cumulative effect, it should come as no surprise that nowadays, pattern recognition has gained full respectability in computer science and information processing circles, something that is evidenced, for instance, by its economic importance in a number of national and international research programs such as the ESPRIT program of the European Community.

The conclusion that I like to draw from these considerations is that we may definitely look very optimistically at the second decade of IAPR's life. Please do not extrapolate my statement up to the point of believing that IAPR can keep making good living by simply letting things keep going like they want. There are, ... I should better say there have always been a number of difficult and embarrassing problems which confront the IAPR management. Presently, I feel that the important challenges that IAPR is facing are well identified and I may assure you that they will be given the attention they deserve during the various Executive Committee and Governing Board meetings that are scheduled to take place during this conference.

The achievements that may already be attributed to IAPR would not have been possible without the efforts and dedication of quite a number of people. During my term as president I have had the chance to cooperate with very efficient collaborators and—at the risk of not mentioning them all—I would like to take this opportunity to thank some of them publicly. Thanks to Professor Michael Duff who fulfilled the office of secretary in an admirable way. Thanks also to Professor Herbert Freeman who must be credited for maintaining IAPR in a healthy financial condition in addition to serving as program chairman for this conference. I have probably put less pressure on our vice-presidents Professors Danielson and Levine, but I also never called them for help in vain. Thanks also to Dr. Josef Kittler, our Newsletter editor, who revived the tradition of publishing four issues of the IAPR Newsletter per year, right on schedule. Congratulations to Professors Gelsema and Backer who are now publishing Pattern Recognition Letters at a rate of two volumes a year. I would also like to thank a number of chairmen of Technical Committees, some of whom have been particularly active during the last two years. However, as I haven't had the very last update on this item yet, I will refrain from mentioning any name. Eventually, I would like to call your attention to two persons who served IAPR as Conference Chairman on the one hand and IAPR President on the other hand, namely Professors Sakai and Simon. Both, they are leaving the IAPR Executive Committee at this time and they certainly deserve our gratitude.

As I said before, there are already fifteen years since the first conference was organized in Washington. In those days, Professor King Sun Fu from Purdue University, served simultaneously as Standing Committee chairman and Conference chairman. Thanks to his extraordinary dedication, he was instrumental, more than anyone else, in the founding of IAPR. He was also one of the most prominent scientists in our field, an inspiring colleague or teacher and a dear friend for many of us until his untimely death in 1985. In recognition of his many accomplishments, the IAPR has established a King Sun Fu Award, and it will be my privilege to announce the name of the first recipient of the Award during this conference. The Award Committee was headed by Professor Jack Sklansky and I also want to thank him and his committee for a job well done.

You are all perfectly aware that this very conference was scheduled initially to take place in Beijing, and that exceptional events forced the IAPR Executive Committee to move it from Beijing to Rome in May of this year. I suspect that some of you might be expecting me to give

you some explanation for the decision we have made. I have given this question quite a lot of consideration and come to the conclusion that the issue has already been more than adequately covered in the June issue of the Newsletter. I hope you will agree with me that this opening session is also not the right place nor the right moment to start a discussion on this controversial issue. But let me assure you that I am prepared to answer any question that will be raised by your national representatives at the Governing Board meeting that is scheduled to take place tomorrow evening. For those who do not receive the Newsletter, let me summarize the conflictual situation which arose by saying that the matter at issue was one of human rights, specifically, restrictions to the freedom of access to the conference. Accepting such restrictions would have been a distinct violation of the IAPR Constitution. Accordingly, the Executive Committee was left with no other choice than moving the conference to some other location, once it became certain that our Chinese colleagues would not reconsider their position.

Very soon after making the decision of moving the conference away from Beijing, the IAPR Executive Committee met in Amsterdam, and, needless to say, the selection of a new site for the conference was one of the major items on the agenda. The committee came very quickly to the conclusion that Rome would be a first choice and we were very fortunate that Professor Levialdi responded very positively to our demand for help. Thanks to Professor Levialdi's admirable dedication, the final decision could be made in less than two weeks. On behalf of IAPR and all the participants in this conference, I wish to extend my most sincere thanks to Professor Levialdi and all those around him whose hard work during the last six months has made this conference possible.

Finally, it is my greatest pleasure to extend my warmest greetings to all of you. I am quite confident that, thanks to the high scientific level of the technical program and the traditional Italian hospitality, you will all find your stay in Rome quite gratifying both scientifically and socially.

I thank you very much for your attention.

Pierre Devijver

CONFERENCE REPORTS

9th INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION

Rome, Italy - November 14-17, 1988

This was the second ICPR that I had attended; the first being the Paris conference two years previous. At the time of the Paris ICPR, I was a pattern recognition rookie - a complete newcomer to the field - I felt overwhelmed by the scale and diversity of the conference. Two years later, I felt less of a rookie but no less overwhelmed. Four days of intensively concentrated parallel sessions covering every possible aspect of pattern recognition, offering a daunting selection of talks to attend. There was material in the traditional pattern recognition areas, talks on newly emergent or fast developing topics and others that simply offered a unique fascinating promise. Should I confine my attention to the material directly relevant to my own research interests or explore? Talks with such appealing titles as "The extraction of sentiment from music" were there to tempt me from the sessions on vision. And how to choose from this cornucopia? To be conservative or to experiment? As if these decisions were not hard enough to make, Rome itself was posing a serious tourist distraction!

You have probably read at length about the problems that beset the 9th ICPR and some of the issues that relate to the future of the conference series. From my own point of view the relocation from Beijing to Rome was entirely serendipitous since it made attendance feasible. From the organisational point of view, I appreciate that the relocation must have caused all those concerned a big headache. In the event, I think the meeting was a triumph over adversity. The audience was of a good size. This itself was encouraging since a major function of a meeting such as this is providing the chance to meet old acquaintances and establish new ones. Understandably, a large number of speakers did not show up to present their papers. The absence of speakers was the only major frustration - several of the sessions that I attended had only two speakers out of eight show up.

Now to the contents of the conference. There were four days of parallel sessions and a poster session. The parallel sessions covered the main areas of pattern recognition methodology and application. Basic methodology was represented by sessions on classification and clustering, pattern recognition techniques, artificial intelligence methods, expert systems, pattern analysis, and, pattern

recognition algorithms. As usual, the bulk of the papers presented was concerned with the processing and interpretation of image data. There were five sessions devoted to object recognition, four to computer vision, two to image processing, and, several more to applications and systems. There was a multiplicity of sessions on related topics such as image segmentation and edge detection, shape analysis, texture analysis, optical flow, and, relaxation. Speech and character recognition were well represented with a total of six sessions. In addition to two sessions on applications in biomedicine there were related sessions on cardiological analysis and tomographic imaging.

My own interests were catered for in the sessions relating to image interpretation. I particularly enjoyed several presentations on the uses of context both in recursive classification schemes and through the use of dynamic programming techniques. There was a lot of interesting material on the matching of symbolic descriptions to image data. This work spanned the main methodologies of the conference with syntactic, statistical and AI approaches being reported. Another area which demonstrated the diversity of methods being reported was the analysis of shape. Papers were presented not only on the traditional image processing approaches, such as the Hough transform, but also upon approaches which are considered the domain of AI vision such as differential geometry and topology. This diversity is a very refreshing aspect of the ICPR. It is not a conference that has become bogged down with the dogma of methodology.

Most of the talks were allocated twenty minutes. In some sessions there were longer invited papers, usually in the form of a review. I especially welcomed these talks as they afforded a chance to gain an appreciation of an unfamiliar topic. In particular, I very much enjoyed those presented by Steffano Levialdi on architectures for computer vision and by Renato De Mori on neural networks and Markov models in speech recognition. I would urge the organisers of future conferences to consider allocating a greater fraction of the time available to this kind of talk and of holding them in plenary sessions. It is sometimes impossible to gain anything more than a highly fragmented impression of a topic from a multitude of short presentations.

A very welcome feature of this conference was the number of panel sessions devoted to emergent technologies of great importance to the pattern recognition community. These gave delegates a chance to question expert practitioners in the areas of machine vision in industry, object oriented programming and parallel computer architectures. It is unfortunate that a record of

the panel sessions will not be available. The interaction of ideas can often provide fresh insights that do not occur in the traditional form of conference presentation.

Finally, the conference dinner was a very significant event worthy of mention. The venue, the Villa Maiani, was high on a hill with a fine panorama of Rome. Prior to the meal Pierre Devijver presented Azriel Rosenfeld with the King Sun Fu Award. This seemed a very popular choice.

Overall I found the 9th ICPR a very rewarding experience. It was hard picking my way through the mass of presentations. I did manage to attend some very stimulating talks which provided useful ideas and insights. Thankfully, I have the conference proceedings to refer to - at times the avalanche of new information was just too much to assimilate.

Edwin Hancock
SERC Rutherford Appleton Laboratory

FROM THE PIXELS TO THE FEATURES

Bonas, France - August 22-26, 1988

A workshop was organised by Prof. J-C Simon and funded from the COST 13 project, a Europe wide EEC funded collaborative venture concerned with low level image processing operations for coding, median filtering etc. The workshop brought together the collaborators along with invited researchers from Europe and the North American Continent to present papers and discuss advances in feature extraction from images. There were a wide range of different aspects of feature extraction discussed including methods based on models of human feature extraction, the use of neural networks and more classical feature extraction via edge detection etc.

Highlights of the workshop included an excellent presentation by Alex Pentland on the work he is directing at MIT into shape from shading, depth from focus and 3-d modelling. Depth from focus was an interesting method in that it used two cameras with differing depths of field aligned along approximately the same axis. The different appearance of an edge between the two images could be used to determine depth simply and quickly. Many fine videos demonstrated his results. Larry Davis (Maryland) discussed investigations of the Connection Machine for performing pyramidal operations and addressing the problem of inefficient use of processors in a pyramid. Bob Hummel (New York) presented a good paper on computational aspects of Gaussian convolution and derivations. Important mention was made of accuracy of zero crossing detection. He also presented

results showing that you can recover almost perfectly, the original image from a multi-resolution zero crossing representation using the heat equation and knowing the direction of the edge. A COST 13 collaborator Stefan Carlsson (Royal Inst. Tech., Stockholm) presented a similar algorithm for use in image coding schemes.

Some interesting results on computation models of the human visual system were discussed. Helmut Glunder (Tech. Univ., Munich) hypothesised a duality between motion detection, and multi-invariant shape descriptors using generalised autocorrelation functions. He showed that the same neural network could be used for both.

Some participants described hardware implementations of detection algorithms. Hans Burkhardt (Tech. Univ. Hamburg) presented a method useful for object recognition that enabled image matching to take place between two images, one of which was translated w.r.t. the other, without the usual need to slide one over the other. The hardware is structurally similar to butterfly processing for the FFT.

The symposium was held at a Chateau de Bonas, just north of Toulouse between 22nd and 26th of August. The Chateau is run as a non-profit making establishment for the use of researchers to meet through conferences, symposia etc. The standard of food and accommodation were excellent with facilities such as a swimming pool provided. An interesting observation was that there were no keys to the doors. Needless to say nothing was reported stolen so we must be an honest collection of researchers.

Overall, the workshop was a great success with many new contacts being made. Some of the post-lecture discussions were lively, especially between the computer scientists and psychophysicists. The proceedings of the workshop should be available in the near future.

G A W West

City University, London

BOOKSHELF

Computational Geometry

*G Toussaint, Ed., North-Holland,
Amsterdam, 1985, ISBN 0-444-87806-8*

This is a book I thoroughly enjoyed reading as a British Rail commuter! It left me with the taste of wishing to have more time to try some of the tricks suggested! How can one man a museum so that all points are watched? If a community of users desire the services of some facility, where should the facility be located so as to minimize the greatest distance from the facility to any user? What is the largest sofa one can move into a flat through a narrow corridor? How can we reduce the plotting time for making the road map of the Kanto district of Japan, from $9^h 50^m$ down to $33^m 35^s$? But it is not only that! Computational Geometry has a lot to offer to Pattern Recognition and Computer Vision. Path planning for robots and syntactic approaches to vision are some of the problems tackled by Computational Geometry.

If anyone is interested in the field, this book is a good starting point. The articles are written in a tutorial fashion, such as basic concepts and terms are defined so that even a non-initiated reader to the fascination of Computational Geometry can enjoy reading the book. On the negative side, the papers are presented in alphabetical order, according to first author's name. This is unfortunate because it makes the book lack structure. It would have been much more helpful if papers of more tutorial nature were presented first.

The first article by Akl presents three algorithms for selection, sorting and computing convex hulls, appropriate for SIMD computers. In the context of convex hulls, Avis, ElGindy and Seidel present two new and very simple algorithms for point insertion and plane intersection.

On a more general note, Bhattacharya and Toussaint show, using counter examples, that the diameter of a set of n points P on the plane is not necessarily an edge in the dual of the furthest point Voronoi diagram of P —the nitty gritty being that several algorithms proposed earlier for finding the minimum spanning circle for n points are invalidated. New algorithms are given instead. Melville presents the implementation and study of two algorithms for the same problem and makes a convincing point for presentation of algorithms which have been actually implemented and tested in practice, rather than merely designed.

Chazelle and Dobkin show that the problem of decomposing a non-convex simple polygon into the minimum number of convex polygons can be solved in polynomial time and present an appropriate algorithm for that. Keil and Sack have written a tutorial paper on the same subject, i.e. minimum decompositions of polygonal objects of various types.

Seidel, using the index of a point as an additional coordinate, derives lower bounds for a number of geometric problems. On the other hand, Devroy, arguing that lower bounds are not always representative of algorithmic performance, gives a brief survey of recent results helpful in expected time analysis of various algorithms. The convex hull is the prototype problem considered but several other problems are discussed too.

Asano, Edahiro, Imai, Iri and Murota discuss the practical importance of bucketing techniques and propose algorithms for the problems of minimum weight perfect matching in the plane, 2-dim Voronoi diagrams, point location and range search in the plane and shortest paths in networks.

Kirkpatrick and Radke talk about computational morphology and skeletons—creeping stuff...

Lee and Chen present an algorithm for the hidden-line or hidden-surface elimination problem in computer graphics. Their algorithm is based on the scan-line approach and is particularly appropriate for situations when the same scene consisting of various objects needs to be displayed repeatedly for different view directions.

O'Rourke and Washington introduce curve signatures and their pros and cons for measuring curve similarity.

The area of separability of sets of objects under different kinds of motions avoiding collisions is surveyed by Toussaint. Moving objects in the presence of obstacles is the problem of path finding and recent algorithms in this area are surveyed by Whitesides.

Finally, Wood surveys a number of results concerning isothetic polygons in the plane. These are polygons with their sides parallel to the coordinate axes and appear, according to the author, in circuit routing and testing, in VLSI and in Saskatchewan!

A book with plenty for plenty!

Maria Petrou

University of Surrey, UK

Algorithms for Clustering Data

A K Jain and R C Dubes, Prentice Hall, 1988

Interpretation of collected data often requires organizing data into a set of meaningful groups. While scientists and engineers rely on a variety of data collection mechanisms ranging from mailed questionnaires to sophisticated sensors, the methodology of data grouping is the same across diverse disciplines. This grouping methodology is usually called *clustering*. Although there are several books available on this subject, including the most comprehensive one from Anderberg (1973), the present book by Jain and Dubes is a very welcome addition to the literature on clustering. The earlier books on clustering were either very formal in the treatment of the subject matter or they tended to be collections of programs with an introduction to the subject and the terminology. Jain and Dubes in this respect strike a nice balance and present the subject matter in an informal way, making use of mathematics only when necessary and describing algorithms in concise and clear steps.

The book is organized into five chapters and eight appendices. The introductory chapter provides a useful pointer to the existing literature on clustering. Chapter Two covers material on data representation. The authors opt for terminology drawn from the pattern recognition literature. Linear as well as nonlinear projection techniques are introduced for the purpose of data visualization. One of the key features of this chapter is an excellent discussion on the intrinsic dimensionality of the data.

Chapter Three along with Chapter Four form the bulk of the book. The authors organize various clustering procedures under the categories of *hierarchical* and *partitional* clustering. After motivating the reader for a particular algorithm the authors provide the steps of the algorithm followed by an illustrative example. Numerous comments given in the examples are expected to provide readers with a thorough understanding of clustering techniques and their pitfalls. The various algorithms discussed in these chapters are fairly representative of the literature. The discussion on the choice of clustering methods is interesting and emphasizes the *exploratory data analysis* aspect of the clustering methodology.

Many times one is satisfied with clustering results that support the preconceived structure in the data. However, an objective evaluation of the clustering results must be performed by considering a number of factors such as the stability and sensitivity of the global as well as the individual cluster structure. Appropriate techniques and methodologies for performing objective

evaluation of clustering results are thus part of Chapter Four under the heading Cluster Validity. After describing the performance indices for clustering validation the authors cover in detail validation methods for hierarchical, partitional, and individual cluster structures. A large separate section is devoted to the clustering tendency problem which in the past has received less attention in other books.

Chapter Five covers clustering applications. Image segmentation and registration are chosen by the authors to describe how clustering can be used in typical computer vision problems. For the readers not familiar with image processing and computer vision, the authors provide a very brief introduction to image processing. Some of these application results are drawn from the current research being pursued by the authors or their colleagues. In this respect, this chapter should prove to be very fruitful to any graduate student who is about to begin his research in the area of computer vision and image processing.

Numerous examples throughout the book and the tutorial-like presentation make this book a very valuable collection for anyone interested in data interpretation. A number of appendices have been included at the end of the book to provide a quick reference to some of the material used in the book. The value of these appendices would have been greater, though, had the authors provided references to some standard textbooks at the end of these appendices. However, this is a very minor flaw in an otherwise excellent treatment of clustering.

Ishwar K Sethi

Wayne State University, USA

CALLS FOR PAPERS

2nd CONFERENCE OF THE INTERNATIONAL FEDERATION OF CLASSIFICATION SOCIETIES

Charlottesville, VA, USA - June 27-30, 1989

Program

The conference which is co-sponsored by IAPR is devoted to the presentation of theoretical, methodological and applied papers on classification, pattern recognition, and related methods of statistics and data analysis in the broad sense. It includes mathematical, statistical and practical investigations in special fields of knowledge, and the interface between classification and the Information Sciences. Suitable topics include:

- Classification, discrimination and clustering methods
- Pattern recognition and image analysis methods
- Statistical and probabilistic methods for data analysis and classification
- Similarity and distance measures, data quality and reliability
- Multidimensional scaling and structure recovery methods
- Consensus methods and correspondence analysis methods
- Analysis and comparison of tree and graph patterns
- Classification and clustering algorithms and algorithmic aspects
- Classification and clustering software
- Computer graphics for classificatory problems
- Applications

Deadlines

Jan 15, 1989 Summary (1 page)

Paper Submission

Prof R F Ling
 Chairman, IFCS-89 Program Committee
 Dept Math. Sciences
 Clemson University
 Clemson, SC 29634-1907
 USA

INTERNATIONAL CONFERENCE ON IMAGE PROCESSING '89

Singapore - September 5-8, 1989

Program

The 1989 IEEE International Conference on Image Processing will include regular sessions on all aspects of the theory and applications of image processing. Papers describing original work on the following topics are invited.

- Image analysis/modelling
- Image restoration/enhancement
- Video communications
- Image pattern recognition
- Remote sensing
- Biomedical imaging
- Office image processing
- Machine vision
- AI vision techniques
- VLSI implementation
- System architectures
- Colour image processing

Deadlines

Feb 1, 1989 Summary (1000 words, 4 copies)
 March 31, 1989 Authors notified
 June 1, 1989 Camera-ready manuscripts

Paper Submission

Technical Program Chairman, ICIP'89
 c/o Meeting Planners Pte Ltd
 100 Beach Road, 33-01
 Shaw Towers
 Singapore 0718
 Republic of Singapore

5TH INTERNATIONAL CONFERENCE ON IMAGE ANALYSIS AND PROCESSING

Positano, Italy - September 20-22, 1989

Program

The conference is organised by the Italian Association for Pattern Recognition. The program will consist of invited papers as well as contributed papers. The major topics are:

- Computer architectures for image processing
- Image analysis
- Image storage and retrieval
- Visual languages
- Human perception and image processing
- Image interpretation and recognition
- Motion analysis
- Applications

Deadlines

March 1, 1989 Summary (1000 words, 4 copies)
 May 15, 1989 Authors notified
 September 1, 1989 Camera-ready manuscripts

Paper Submission

Gabriella Sanniti di Baja
 Chairman 5ICIAP
 c/o Istituto di Cibernetica, CNR
 80072 Arco Felice
 Naples
 Italy

1ST IEE INTERNATIONAL CONFERENCE ON ARTIFICIAL NEURAL NETWORKS

London, United Kingdom - October 17-18, 1989

Program

This is the first conference on neural networks to be held by the Institution of Electrical Engineers. The principal objective is to provide a forum for discussion of recent advances in the field, to review progress and

identify future directions for artificial neural network research. The conference will cover four principal areas of interest:

- Architectures for artificial neural networks
- Learning algorithms
- Implementations
- Applications

Deadlines

March 3, 1989	Summary (2 page)
April, 1989	Authors notified
June 30, 1989	Camera-ready manuscripts

Paper Submission

IEE Conference Services Dept.
IEE
Savoy Place
London WC2R 0BL
United Kingdom

3RD INTERNATIONAL SYMPOSIUM ON DEFECT RECOGNITION AND IMAGE PROCESSING FOR RESEARCH AND DEVELOPMENT OF SEMICONDUCTORS

Tokyo, Japan - September 22-25, 1989

Program

Contributed papers are solicited from the following areas: visualisation and characterization of defects in bulk semiconductor materials as well as epitaxially grown crystals; interfacial defects between substrate and epitaxial layer; mapping of imperfect areas for characterization of devices; new techniques for detection and recognition of defects and their physical significance; algorithms for image processing.

Deadlines

May 15, 1989	Summary
July 15, 1989	Authors notified
September 22, 1989	Camera-ready manuscript

Paper Submission

Prof Tomoya Ogawa
Department of Physics
Gakushuin University
Mejiro
Tokyo 171
Japan

INTELLIGENT AUTONOMOUS SYSTEMS 2

Amsterdam, The Netherlands - December 11-14, 1989

Program

The conference will comprise invited as well as submitted papers in the following areas:

- Sensor data interpretation
- Neurocomputing
- Artificial Intelligence and Sensors
- Tools for autonomous system design
- Applications

Deadlines

May 1, 1989	Summary (four A4 pages)
July 1, 1989	Authors notified
September 1, 1989	Camera-ready manuscript

Paper Submission

IAS-2 Conference Secretariat
PO Box 41882
NL-1009 D B Amsterdam
The Netherlands

10TH INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION

Atlantic City, NJ, USA - June 3-7, 1990

Program

The 10th ICPR, sponsored by the IEEE Computer Society and the International Association for Pattern Recognition, will be organized as a set of 4 specialty conferences, each dealing with a different topic but held in the same place at the same time. The opening session as well as all social events will be common to the four conferences. The titles of the individual conferences will be:

- 1 - Computer Vision
- 2 - Pattern Recognition Systems and Applications
- 3 - Image, Speech and Signal Processing
- 4 - Computer Architectures for Vision and Pattern Recognition

Each conference will have its own program committee and will consist of a single track of paper presentations, with the papers published in separate proceedings volumes. There will be a basic registration fee which

will entitle a participant to attend one subconference of choice. For small supplementary fees, attendees will be able to attend (and receive the proceedings for) any of the other conferences as well. Each conference will have about 50 quality paper presentations, as well as panel discussions and poster displays. Based on previous conferences, a total attendance of close to 1000 persons

is expected from all over the world.

Paper Submission

Detailed instructions for paper submission will be published in early 1989 and will appear in the next issue of the IAPR Newsletter.

CALENDAR OF EVENTS

<i>Date</i>	<i>Event</i>	<i>Location</i>	<i>Sponsor/Information</i>
Jan 29 - Feb 3, 1989	Medical Imaging III	Newport Beach, California, USA	SPIE, PO Box 10, Bellingham, Washington 98227-0010, USA
March 20-22, 1989	IEEE Workshop on Visual Motion	Irvine, California, USA	Ellen Hildreth, Artificial Intelligence Laboratory, 545 Technology Square, Cambridge, MA 02139, USA
April 10-12, 1989	International Workshop on Industrial Applications of Machine Intelligence and Vision (MIV-89)	Roppongi, Tokyo, Japan	Prof Mitsuru Ishizuka (General Chair of MIV-89), Institute of Industrial Science, University of Tokyo, 7-22-1, Roppongi, Minato-ku, Tokyo 106, Japan
April 24-28, 1989	The International Congress on Optical Science and Engineering	Palais des Congrès, Porte Maillot, Paris, France	Amanda Caillot, Conference Coordinator, Europtica Services I.C., 16 avenue Bugeaud, 75116 Paris, France
May 14-19, 1989	1989 IEEE International Conference on Robotics and Automation	The Registry Resort, Scottsdale, Arizona, USA	IEEE Robotics and Automation, PO Box 3216, Silver Spring, MD 20901, USA
May 23-26, 1989	IEEE 1989 International Conference on Acoustics, Speech, and Signal Processing	Glasgow Forum Hotel, Glasgow, Scotland, United Kingdom	Peter M Grant, Dept. Electrical Engineering, University of Edinburgh, The King's Buildings, Edinburgh EH9 3JL, Scotland, UK
June 4-8, 1989	IEEE Computer Society Conference on Computer Vision and Pattern Recognition	Sheraton Grand Hotel on Harbor Island, San Diego, California, USA	The Computer Society of IEEE, 1730 Massachusetts Avenue, N.W., Washington, DC 20036-1903, USA
June 19-22, 1989	7th Workshop of the European Society for the Study of Cognitive Systems	St-Maximin-la-Stebaume, Provence, France	Dr G J Dalenoort (ESSCS), Institute of Experimental Psychology, University of Groningen, PO Box 14, 9750 AA Haren, The Netherlands
June 19-22, 1989	The 6th Scandinavian Conference on Image Analysis	University of Oulu, Finland	Prof Matti Pietikäinen, 6SCIA Chairman, Dept Electrical Engineering, University of Oulu, SF-90570 Oulu, Finland
June 19-23, 1989	Vision Interface '89	London, Ontario, Canada	Irene A Gargantini, General Chairman, Department of Computer Science, Middlesex College 375, University of Western Ontario, London, Ontario N6A 5B7, Canada
June 27-30, 1989	2nd Conference of the International Federation of Classification Societies	Charlottesville, VA, USA	IFCS-89, Dept Mathematics, University of Virginia, Charlottesville, VA 22903, USA
June 27-30, 1989	Computer Graphics International 89	University of Leeds, United Kingdom	Mrs F J Johnson, CGI89 Secretariat, Commercial Office, University of Leeds, Leeds LS2 9JT, United Kingdom

July 18-20, 1989	3rd International Conference on Image Processing and its Applications	University of Warwick, United Kingdom	IEE Secretariat, Conference Services, Savoy Place, London WC2R 0BL, United Kingdom
August 21-25, 1989	NATO Advanced Research Workshop on Mapping and Spatial Modelling for Navigation	Denmark	Prof L F Pau, Technical University of Denmark, Building 348/EMI, DK 2800 Lyngby, Denmark
August 31 - Sept 2, 1989	3rd International Conference on Computer Analysis of Images and Patterns	Leipzig, DDR	Präsidentium KDT, WGMA, Conference Secretary of CAIP '89, Clara-Zetkin-Str 115/117, Berlin, DDR
September 4-8, 1989	5th European Congress for Stereology	Freiburg im Breisgau, West Germany	Dr O Leder, 5ECS, Anatomisches Institut, Albertstr. 17, D-7800 Freiburg im Breisgau, West Germany
September 5-8, 1989	International Conference on Image Processing (ICIP '89)	Pan Pacific Hotel, Singapore	Meeting Planners Pte Ltd, 100 Beach Road 33-01, Shaw Towers, Singapore 0718, Republic of Singapore
September 20-22, 1989	5th International Conference on Image Analysis and Processing	Positano, Italy	Dr Gabriella Saniti di Baja, Chairman 5ICIAP, c/o Istituto di Cibernetica, CNR, 80072 Arco Felice, Naples, Italy
October 17-18, 1989	1st IEE International Conference on Artificial Neural Networks	IEE, Savoy Place, London, United Kingdom	IEE, Conference Services, Savoy Place, London WC2R 0BL, United Kingdom
June 3-7, 1990	10th International Conference on Pattern Recognition	Resorts International Hotel, Atlantic City, NJ, USA	10th International Conference on Pattern Recognition, c/o Conference Department, IEEE Computer Society, 1730 Massachusetts Avenue, N.W., Washington, DC 20036-1903, USA