

# IAPR Newsletter

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## Pattern Recognition in Defense Applications

Do you remember that moment when you first applied a 2-D fast Fourier transform (FFT) to a scene image, multiplied the result with the transform of a target, performed the 2-D inverse transform, and saw a clear peak indicating the location of the target in the scene? Magical!

people. His research continues to extend matched filtering to new levels.

Part of Kumar's insight into matched filtering originates in the field of optical information processing. For this, we rewind to 15 years before Kumar's work for some background. In 1964, Anthony Vanderlugt

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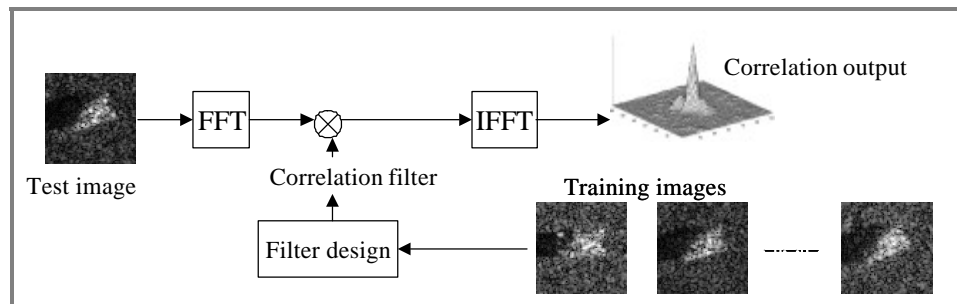
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Unfortunately, you learned over time that this matched filter, or correlation operation, lacked in robustness what it had in magic. If the target in the scene differed from the matched filter target in scale or perspective, the resultant peak was not as large or as clean as desired to detect the target. In such cases where the scene target and prototype target differed, multiple filters and transforms were needed that entailed time-consuming processing. In the past couple of decades, many researchers and practitioners of pattern recognition have favored spatial domain feature processing over matched filtering because of these robustness issues. Dr. Vijayakumar Bhagavatula (or Kumar), a professor at Carnegie Mellon University (CMU) in Pittsburgh, is not one of these

published a paper in the *IEEE Transactions on Information Theory* showing how a matched filter could be implemented optically. As is demonstrated to any child who has separated sunlight into a spectrum with a prism, an optical lens can perform a Fourier transform. If the transformed light from the lens is then passed through a translucent material such as photographic film, these signals multiply – as in matched filtering. Vanderlugt's contribution was describing how to produce a matched filter on the film that contained complex values needed for phase preservation. This is done by using a laser to produce a hologram of the filter. Scientists in the defense industry immediately saw the power of this

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# Technical Committee Reports

## TC 5: Benchmarking and Software

The role of TC5 is to assist researchers in implementing and benchmarking pattern recognition systems. While other IAPR Technical Committees are concerned with particular theoretical or application areas, TC5 is unusual in that it covers all fields of pattern recognition.

One of the aims of TC5 is to define standard dataset formats for various general classes of problem and to republish many of these datasets in the standard format. This minimizes the effort needed for doing comparisons since it then becomes straightforward to run a particular recogniser on compliant datasets and generate results for any new dataset using compliant recognisers.

The standards do not stop at datasets. We are also in the process of defining standard output formats, so that the results of each recogniser can be easily compared with each other, and also used as inputs to multiple classifier systems. We've already seen the benefits of this in running the ICDAR 2003 Text Locating contest (finding text in natural scenes), where all text regions had to be identified using simple XML mark-up. Having available all the outputs of each individual text locator on each image allowed another researcher to then independently design a combination scheme, which was able to outperform any of the individual text-locators.

The process of storing all outputs of all recognisers also allows great insights into the strengths and weaknesses of

individual systems. Where feasible, we'll make it possible for users to explore these details using a standard web browser. The central resource of TC5 is its website:

<http://algoval.essex.ac.uk/tc5>.

We're in the process of expanding the features and content available at the website. Currently you'll find some interesting sequence recognition datasets and a list of current competitions. We'll soon add a discussion forum and lists of datasets, software and relevant publications. TC5 members will be able to upload their own contributions directly to the site. Another feature will be the web-form entry of new results.

A major ambition of TC5 is to get more pattern recognisers deployed as web services. This allows a recogniser to be invoked via (typically) an HTTP request (or sequence of requests). One of the most exciting aspects of web services is that they are both platform and language independent.

TC5 currently has 38 members, most of whom have joined in the last two months. TC5 has the potential to provide a valuable service to all areas of pattern recognition, but this depends on having a large and active set of members. Join and help it fulfill that potential!



*Simon M. Lucas,  
Chair*



*Thomas P. Runarsson,  
Vice-chair*

## TC 11: A World of

The history of TC11 is as exciting as Greek drama. Do not fear, we will not go back to the Stone Age, but will start in the year 1995 with the Third International Conference on Document Analysis and Recognition (ICDAR). With the revival of neural networks and the improved availability of large training sets for the classification of machine-printed characters, our research field was thriving, attracting up to 600 participants at that magnificent ICDAR in Montreal. Fortunately, we may observe today that the field is still thriving. Of course many things were not solved and are not solved as we speak. Old problems such as the recognition of cursive script remain challenging. New problems, such as the recognition of text in streaming video and on web images introduced themselves. The challenge of designing input methods for hand-held devices has spawned a whole new generation of researchers in on-line handwriting recognition. New applications are emerging in camera-based reading systems, such as in support systems for the blind, robotic navigation, advanced license-plate reading and camera-based reading in

## Free Remote Sensing Images from TC7

Technical Committee 7 "Remote Sensing" has started to provide to its members some free data sets for benchmarking and algorithm comparison purposes. A description of these data sets is available at <http://www.iapr-tc7.org/free.htm> Images comprise hyperspectral sets provided by the LAST Laboratory of the University of Rennes, France; some multi-temporal SAR and multispectral data over an urban area, provided by the Department of Electronics of the University of Pavia, Italy; and a stereoscopic couple at very high spatial resolution, provide by the Technical University of Jerusalem, Israel.

In the near future a memorandum of understanding (MoU) will be signed with IEEE, and in particular the Data Fusion Committee of the Geoscience and Remote Sensing Society, to share their large library of remote sensed data. TC7 is planning to sign more MoUs, and data providers or research groups willing to share their data or algorithms may contact TC7 chair at [paolo.gamba@unipv.it](mailto:paolo.gamba@unipv.it) or download the MoU template at the web address [http://www.iapr-tc7.org/MoU\\_template.doc](http://www.iapr-tc7.org/MoU_template.doc).

## Reading Systems

the environment. Writer identification is a forensic topic that enjoys an increased interest. The evolution of Digital Libraries with their massive amounts of scanned and stored complex text images represents a research heaven to many of us. Finally, it could be noticed at the ICDAR 2003 in Edinburgh that several formal benchmark tests were organized, which is a clear sign of a mature and active research field.

While the traditional focus of the field of document image analysis (DIA) started out with the analysis and conversion of paper documents, it is clear that the meaning of "document" has been expanding dramatically over the last ten years. Being able to adapt to new ways documents are being created and consumed in an ever more technically savvy society is crucial to maintaining the relevance and vigor of this field. I believe TC11 could and should play a major role in promoting research in, and attracting young researchers to, the new research areas vital to the growth of this community. To name a few: Web Document Analysis (WDA), Electronic ink, Mobile user interfaces & Multimedia annotation and Vintage documents/Digital Libraries.

We expect TC11 to continue to represent an important research area within the IAPR in the coming years.



Lambert Schomaker,  
Chair



Jianying Hu,  
Vice-chair

## TC10: Graphics Recognition

Graphics recognition is a particular field in the domain of document analysis, that combines Pattern Recognition and Image Processing techniques to the analysis of any kind of graphical information. Along with optical character recognition (OCR) and document layout analysis, graphics recognition forms the broader area of document image analysis and recognition.

The relevance of research in graphics recognition comes from both scientific contribution and application development. TC10 promotes activities and the exchange of new ideas and knowledge among active researchers from academia or industry in the field of graphics recognition and other related fields. Currently, TC10 has 260 members worldwide. The current TC10 chairman is Josep Lladós (Spain), and Dorothea Blostein (Canada) serves as vice-chair.

The TC10 web site has a new address ([www.iapr-tc10.org](http://www.iapr-tc10.org)) and has been redesigned to be the main forum of interaction among graphics recognition researchers. The web site contains recent information about activities, conferences and news related to the field. In addition, we have put particular attention in the resources and forum sections.

The main activity of TC10 is the Graphics Recognition Workshop (*see related article on page 5*).

For the near future, the goals of TC10 are to complete the web site, to publish the post-GREC Workshop book in the Springer LNCS series and to promote a special issue on Graphics Recognition by the fall of 2004 in a renowned international journal.

Josep Lladós

## From the ExCo

In the last Newsletter, we announced the admission to membership of the IAPR of a special interest group on pattern recognition of the Brazilian Computer Society. Well, this growth process is not finished, and this time we are very pleased to announce that the IAPR Governing Board has just approved by email ballot the admission to membership of the IAPR of the Moroccan Pattern Recognition Section of AMADEIA, our 40<sup>th</sup> member society. We warmly welcome this new member, the first member society from the African continent.

The Governing Board has also approved the creation of a new technical committee, TC-19 on computer vision for cultural heritage applications. You will find presentations of this new TC and of the new member society in one of the next issues of the newsletter.

In a previous column, we announced a survey on this Newsletter, to know if members at large preferred to receive it electronically or on paper. The deadlines for the survey are now over, and we must unfortunately admit that a significant number of member societies never sent in any feedback, and among those who did, several had received only scarce input from their own members. It is therefore difficult to come up with some general tendencies from this survey, although the general trend is for people to prefer information in electronic format. The issue will be taken up again at the next Governing Board meeting.

The IAPR Education Committee has worked out clear guidelines for the Piero Zamperoni Best Student paper Award; these guidelines will be made available to the community in due time, on the web site of ICPR'04. It can be noted that the name of the winner of the award for ICPR'04 will be announced both in the IAPR Newsletter and on the IAPR web site, and the award will be presented by the Chair of the IAPR Education Committee at the Conference banquet.

By the time you receive this newsletter, it is certainly timely for us to wish you a very successful and happy new year 2004.

## PR in Defense Applications

*(Continued from page 1)*

operation. Matched filters of surface landmarks and images of ships and tanks could be developed onto holographic plates, and matched filtering could be performed from reconnaissance planes to identify these objects. And this could all be done at the speed of light – magical! Except for the robustness problem.

Fast forward to 1980 when Kumar was doing his Ph.D. research at CMU under Professor David Casasent. The application was target recognition in military images. Kumar and Casasent developed synthetic discriminant function (SDF) filters, which combined multiple views into a single filter. The multiple views might combine 10 or so different rotations, perspectives, or scales of the object. So that addressed the robustness issue with respect to these variables. But, the early SDF filters produced sidelobes much larger than the values where the correlation peaks were supposed to be, making target detection nearly impossible. In 1987, Kumar and Abhijit Mahalanobis made this idea practical, not by increasing the target signal but by minimizing energy in the rest of the correlation plane. Now, the center value of the correlation plane would be strong for the target and weak for anything else. They called this filter the MACE (Minimum Average Correlation Energy) filter. This generalization of the matched filter was now practical and robust. According to Kumar, MACE filters

made correlation filters useful.

Although correlation filters were inspired by the parallel, “speed of light” 2-D Fourier transforming properties of optical systems, correlation filters can be implemented now in digital processors using fast Fourier transforms (FFTs). In the past, 2-D FFTs were avoided because of the high computational load, but with the increasing processor speeds and memory sizes, digital processing using 2-D FFTs is no longer slower. One speed disadvantage of optical filtering is due to the need to change filters (for multiple targets or perspectives, etc.). Optical filters are no longer developed onto film, but are on devices such as LCD displays; however, even on these devices, there is still a finite period of time between applying different filters that results in delays. Because of this, there is significant current activity in doing correlation filters digitally. Despite this change, Kumar considers his years in optical processing as having provided excellent fundamentals for his digital work now. “My 15 years in optical correlation produced an understanding of the physics of the operations.” For instance, in optical, one can see the result of scaling and rotation simply by scaling or rotating the filter.

There is some degree of dissatisfaction in developing correlation theory that is applied to military applications. Kumar, who has no security clearance, is not told of where his work is applied. Although only the military knows the details, correlation appears to be

used for defense-related target recognition. For instance, the Tomahawk cruise missile employs the DSMAC (Digital Scene Matching Area Correlator). Even today with widespread use of GPS (Global Positioning System), matched filtering can be a complement in landmark detection and navigational guidance. Since GPS can be jammed, correlators can help recognize land patterns to perform mid-course corrections.

Recently, Kumar has applied correlation to a field that he can talk about, face recognition. Recall that the basic correlation operation is not robust to image differences, which for face recognition includes different poses, facial expressions, lighting, and scale. Using the MACE filter approach to combine a range of poses of a person’s face, and applying this to face images in CMU’s PIE (Pose, Illumination, Expression) database, Kumar’s group has realized superior recognition results. Kumar points out an advantage of the global approach to those who are advocates only of spatial domain feature detection. Feature recognition degrades sharply if key facial landmarks are not found or are located incorrectly. By using global information as correlation does, you can achieve a robustness that is either better than, or can be used as a complement to, feature-based recognition.

With excellent comparative results in face recognition, Kumar’s faith in correlation continues to be rewarded. As other researchers are hitting recognition rate ceilings for the spatial domain methods they

have honed over the years, Kumar believes that others might now revisit correlation filters either solely or combined with spatial domain processing, for improved results. The magic of the matched filter is still there, and now with robustness improvements that have been realized over the past 20 years, perhaps now is the time for a rebirth of matched filtering.

*Larry O’Gorman*

If you have suggestions for other interesting pattern recognition stories, please email these to the editor.

logorman@avaya.com

# Calls for Papers

Complete list of conferences and workshops at [www.iapr.org](http://www.iapr.org)

## DAS 2004

6th Workshop on Document Analysis Systems

8-10 July September 2004

Florence, Italy

Deadline: 1 February 2004

## MLDM 2005

International Conference on

Machine Learning and Data Mining in Pattern Recognition

9-11 July 2005

Leipzig, Germany

Deadline: 10 January 2005

## Conference & Workshop Reports

Workshop Report: GREC 2003

### 5th IAPR International Workshop on Graphics Recognition 30-31 July 2003, Barcelona, Catalonia, Spain

The IAPR International Graphics Recognition Workshop (GREC) is the main activity of the IAPR TC10 (*see related article on page 3*). GREC2003 was chaired by Josep Lladós and Young-Bin Kwon. 48 papers were received (43 papers accepted in the final scientific program). The workshop had 45 registered participants.

The scientific program was organized in a single-track 2-day workshop. For each session, there was an overview talk, followed by a number of short presentations. Each session was concluded by a panel discussion. Session topics included vectorization and primitive-level processing, symbol recognition, perceptual organization, document retrieval by graphical content, document mining, systems and architectures, technical drawings, maps, charts, on-line processing, user interfaces and performance evaluation. Selected papers of GREC2003 will be published in a book of Springer LNCS series.



Two contests were held during GREC2003: The *second arc segmentation contest*, organized by Liu Wenyin, with 2 participants. The *first symbol recognition contest*, organized by Ernest Valveny and Philippe Dosch, with 4 participants. Contests are useful not only to evaluate the state-of-the-art on algorithms related to different problems of graphics recognition, but also to provide evaluation databases to the community. All the material used in the contests was distributed on CD to GREC2003 delegates and is available at the TC10 web page.

The social program consisted of a sightseeing tour visiting the most emblematic places in Barcelona, and afterwards the attendees enjoyed the workshop banquet with musical entertainment held at the Romanesque Monastery in the *Poble Espanyol* of Montjuic.

In order to improve future editions of the GREC workshop, a committee will be created. This committee will take into account feedback from the community. With that purpose, a questionnaire was distributed in Barcelona among participants. People interested in filling in the questionnaire can get it from the TC10 web site.

The Sixth GREC Workshop will be held in Hong-Kong (China) in 2005, and will be organized by Dr. Liu Wenyin.

*Josep Lladós*

**12th International  
Conference on Image  
Analysis and Processing  
17-19 Sept. 2003, Mantova, Italy**

The 12<sup>th</sup> ICIAP continued a fine tradition of quality conferences with an excellent, collegial spirit in an outstanding venue. Thanks to the efforts of Marco Ferretti, Maria Grazia Albanesi and colleagues the conference was also well managed. The Academia Vergiliana, also known as "Teatro Bibiena", built in 1769 by Antonio Galli Bibiena as a private club, served as a unique conference location. There were a total of 130 registrants and 108 papers.

The three invited papers were all interesting and covered areas of Multimodal Biometrics (Bigun et al), Visualization (Seidel, et al) and Content-based Video Summarization (Chang). Conference topics demonstrated interest in many different application domains--Biometrics, Multi-media Databases, Surveillance and Biomedical Image Understanding. At the same time a significant number of papers addressed fundamental areas of computer vision and pattern recognition, including low-level feature extraction, colour vision, stereo and segmentation. There were also a number of papers dealing with correspondence algorithms, graph matching, video data modeling and analysis, including stochastic tracking models like particle filters and different types of hidden Markov models. The quality was generally high and consistent with the ICIAP tradition.

The Best Student Paper award went to Massimiliano Pavan (with Marcello Pelillo), from Venice, dealing with a model for image segmentation based on Dominant Sets and Game Dynamics.

The social events were most enjoyable, including tours of Palazzo Gonzaga, the huge and magnificent residence of the Dukes of Mantova in the Reinassance and a sunset boat trip on the lakes surrounding the town. The conference banquet was excellent and in the tradition of the area.

*Terry Caelli*

**10th International Conference on Computer Analysis of  
Images and Patterns  
25-27 August 2003, Groningen, The Netherlands**

CAIP 2003 was held in Groningen, a city in the north of the Netherlands. The conference was chaired by Nicolai Petkov and co-chaired by Michel Westenberg from the Institute of Mathematics and Computing Science, University of Groningen.

From an initial 160 submissions, 42 papers were selected for oral presentation and 52 as posters. The programme followed a single-track format. Non-overlapping oral and poster sessions ensured that all attendees had the opportunity to interact personally with presenters.

Besides the regular paper presentations, three invited lectures were presented: Nicholas Ayache (INRIA Sophia-Antipolis) presented state-of-the-art applications of computer vision in medical imaging with a talk entitled "Medical image analysis and simulation: combining models from geometry, physics, and physiology". John Daugman (University of Cambridge) discussed work that has resulted in a very successful security product currently used at many airports in his lecture entitled "Recognizing

persons by their iris patterns". Dariu Gavrilă (DaimlerChrysler Research) had a talk entitled "Intelligent vehicles that see (and act)", and he described pedestrian detection systems that are likely to be built into cars in the near future.

The conference proceedings are available at Springer Verlag as volume 2756 in the series Lecture Notes in Computer Science, ISBN 3-540-40730-8, ISSN 0302-9743.

The social program consisted of two events: a guided city tour by a professional Tourist Information Centre guide, and the banquet at "De Plaats Melkema", which is an important monument in the province of Groningen. Already in 1326, this place was known for its strict, but fair judge Abel Melkema. Later in history, it became an important center for the Mennonites. It was inhabited until the end of the 1960's, after which it was gradually changed into a catering establishment.

CAIP 2005 will be organized by Andre Galgalowicz, and will be held in Paris.

*Michel Westenberg*



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**The deadline for submission of material  
for the next issue is  
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**7th International Conference on Document Analysis and Recognition  
3-6 August 2003, Edinburgh Conference Centre, Edinburgh, Scotland**

ICDAR is co-sponsored by the IAPR Technical Committees TC10 (Graphics Recognition) and TC11 (Reading Systems). ICDAR2003 was organized by Andy Downton and Mike Fairhurst. It was a big success, characterized by: 310 delegates, interesting invited lectures, presentations, posters, nice weather, good food and perfect organization.

In addition to the high quality papers, the conference featured the following keynote speakers: Henry Baird ("Digital Libraries and Document Image Analysis"), Horst Bunke ("Recognition of Cursive Roman Handwriting – Past, Present and Future"), Andreas Dengel ("Making Documents Work: Challenges for Document Understanding"), David Doermann ("Progress in Camera-Based Document Image Analysis"), Michael Fairhurst ("Document identity, authentication and ownership: The future of biometric verification"), Ching Suen ("Analysis and Recognition of Asian

Scripts – the State of the Art"), and Karl Tombre ("Graphics Recognition – from Re-engineering to Retrieval"). Copies of keynote presentations can be found at the ICDAR2003 web site [www.essex.ac.uk/ese/icdar2003/](http://www.essex.ac.uk/ese/icdar2003/).

The technical program was complemented by a very nice social program. Conference delegates and accompanying persons had the opportunity to enjoy a Scottish banquet at Murrayfield international rugby football ground. The banquet had good meals (including the typical haggis), Scottish whisky, musical entertainment and dancing. During the banquet, the ICDAR2003 Awards ceremony was held. The awardees were Dr. Henry Baird (senior researcher award) and Dr. Liu Wenyin and Dr. Umapada Pal (young researcher awards). The event of presenting the ICDAR2003 Award to Henry Baird for Outstanding Contributions was especially pleasant. Since Henry has Scottish roots, the TC-10 and 11 chairmen

went to the Royal Mile, downtown Edinburgh, to collect some typical Scottish items. The token gift consisted of a Scottish flag, a tie (since Baird is a Scottish clan, a tartan pattern exists) and a Celtic harp. More details and a log of the event written by Lambert Schomaker can be found in the TC10 and TC11 web page.

The next ICDAR Conference will take place in Seoul, Korea. For further information, please visit [www.ICDAR2005.org](http://www.ICDAR2005.org). During the TC10-TC11 joint meeting in Edinburgh, a bid for the organization of ICDAR'2007 was presented. After a ballot period among the community members, the ICDAR Advisory Board ratified the proposal that ICDAR 2007 will be held in Curitiba, Brazil. We would like to congratulate the organizers and wish them a lot of success with the organization!

*Josep Lladós  
Lambert Shomaker*

**Workshop Report: ANNPR 2003**

**1st IAPR TC3 Workshop on Artificial Neural Networks  
12-13 September 2003, Florence Italy**

The First IAPR-TC3 Workshop on Artificial Neural networks was held on September 12-13, 2003 at the University of Florence with a total of 37 participants from Europe, USA, Canada, and Japan. The workshop, organized by Marco Gori (University of Siena, TC3 Chair) and Simone Marinai (University of Florence, TC3 Co-Chair), took place at "Villa La Quiete alle Montalve," a 15th-century building on the outskirts of Florence.

The aim of the workshop was to bring together researchers from the neural network community to exchange ideas and results and to identify areas of common research in the field of pattern recognition. The workshop covered research aspects of artificial neural networks in pattern recognition, including applications from time series

classification to document processing, as well as theoretical aspects of neural network learning in classification and function approximation.

Terry Caelli (University of Alberta, TC2 Chair) gave an inspiring keynote talk where he discussed various topics of neural networks and graphical models for syntactic and structural pattern recognition. The contributed sessions included papers addressing artificial neural networks to 1D-signals, 2D patterns, image processing, document processing, learning in structured domains, classifiers and learning, and theoretical issues. The workshop proceedings are available online at the workshop web site [www.dsi.unifi.it/ANNPR](http://www.dsi.unifi.it/ANNPR), and best papers of the workshop will be collected and published as a special

issue of "Pattern Recognition Letters".

There was plenty of time for questions and discussion during the oral and poster sessions. On the second day of the workshop the participants were taken on a guided tour through the beautiful historical garden of "Villa La Quiete alle Montalve" where many fruitful discussions were held during the breaks.

The workshop ended with a panel discussion. The participants greatly appreciated the organisation of the conference and the quality of the contributions. We thank the organizers for an excellent workshop and look forward to a follow-up meeting in the near future.

*Friedhelm Schwenke*



**For a complete list of IAPR-sponsored  
conferences and workshops, visit  
[www.iapr.org/iapr-conf.html](http://www.iapr.org/iapr-conf.html)**

## ICPR2004

17th INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION

the IAPR and BMVA, and at the time of writing, can count Hewlett Packard Labs (Bristol) and Microsoft Research (Cambridge) as *local* part-sponsors.

For those of you who have never attended an ICPR conference, this particular event could be a doubly wholesome experience! First, ICPR conferences tend to be extremely dynamic, maintaining your interest throughout the event. Second, with regularly well over 800 attendees, there is never enough time to meet all your colleagues, yet it is the best forum for chatting with as many of those names you have seen on papers and always wanted to catch up with! Finally, ICPR2004 will provide a great chance to visit the historic city of Cambridge.

Originally a Roman military outpost, the city adopted its name when River Cam was bridged. Cambridge can boast of ancient monuments, a wealth of museums and galleries, as well as its famous book-shops and markets. The city is small enough for most of its major attractions to be visited on foot. Visitors can walk along the famous grass-covered banks of the River Cam or take a lazy summer punt along the rivers and enjoy the architectural glories of the riverside colleges.

The best known of all the Cambridge buildings is King's College Chapel, with its world-famous choir. It also hosts Ruben's *Adoration of the Magi*. Other university colleges are Clare College with the oldest surviving river bridge in Cambridge, Corpus Christi College founded in 1352 by two town guilds, St. John's College with the Bridge of Sighs, and many more.

Cambridge can also be proud of its many museums. One that soon becomes a favourite of most visitors is the Fitzwilliam Museum with extensive Egyptian, Greek, and Roman collections containing medieval works, paintings, drawings, sculptures, ceramics, glass, and armour. The Cambridge Museum of Technology is based in the Old Pumping Station with the original pumps and boilers and many other engines. There are a number of hands-on pumps, a printing room, a collection of early Cambridge wirelesses, instruments and other local artefacts. The oldest museum in Cambridge is the Sedgwick containing over 1 million fossils ranging from the earliest forms of life over 3000 million years old through huge ammonites, giant marine reptiles, and dinosaurs. There is even a 125,000 years old hippopotamus from the nearby Barrington gravel pit. There are also other University-owned museums.

Cambridge is located about 60 miles (100 km) from London and is easily accessible from the UK's major airports (Heathrow, Gatwick, Birmingham, Stanstead) by rail and coach. August is one of the best months to visit the UK as temperatures generally vary between 14 and 25C. More information about the city and its forthcoming events can be found at <http://www.camcity.co.uk/>.

The ICPR2004 Theme is "Pattern Recognition in the Digital World", and will be a multi-track international forum for discussions on recent advances in the fields of:

- Computer Vision and Robotics
- Pattern Recognition
- Neural Networks
- Document Analysis
- Image and Signal Processing
- Biomedical, multimedia and e-commerce applications

For further details visit [www.eim.surrey.ac.uk/icpr04](http://www.eim.surrey.ac.uk/icpr04).

*Majid Mirmehdi, ICPR2004 Publicity Chair*

***The views expressed in this newsletter represent the personal views of the authors  
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