

BMVA News

The Newsletter of the British Machine Vision Association and
Society for Pattern Recognition

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BMVA News¹ is published every three months. Contributions on any activity related to machine vision or pattern recognition are eagerly sought. These could include reports on technical activities such as conferences, workshops or other meetings. Items of timely or topical interest are also particularly welcome; these might include details of funding initiatives, programmatic reports from ongoing projects and standards activities. Items for the next edition should reach the editor by 31st March 1997.

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Editorial

Thinking about computer vision research recently, I wondered if there are any evident national characteristics. After all, other disciplines have their different, competing schools of thought. For instance, in Literary Theory there are the predominantly French post-structuralists versus the British traditionalists, while in philosophy there are relativists versus analysts. It seems to me that such debate is a healthy sign, but is mostly lacking in computer vision research which restricts itself to one paradigm. Even if there is little debate, at least there might be some stereotypical national applications of computer vision. For instance, during my stay in Australia I came across such applications as meat analysis (measurement of fat and muscle), the famous sheep shearing robot, and the CSIRO's grisly Automated Slaughter Technology project, the Australian version of the classic bin picking problem, except using eviscera instead of toy blocks! As well as their interest in the enormous numbers of sheep covering the country there is also the national obsession

with sport. This was reflected in a project on monitoring the shape of the sail using a camera mounted on the top of the mast to optimise the sailing performance for the America's Cup. Can any readers inform me of other countries' stereotypical computer vision applications? Does Italy have systems to analyse pasta, Parmesan cheese, wine, and football?!

EPSRC Update

Many of you will be aware that EPSRC is funding the UK implementation of the US-funded Image Understanding Environment (IUE) as an enhancement to the existing EPSRC Integrated Machine Vision programme (IMV). The aim is to develop a machine vision software library for the UK research community. Professor Chris Taylor, University of Manchester, has already received EPSRC support to contribute to the design and implementation of the IUE in the UK and to co-ordinate the overall UK activity. Last year a call for proposals was issued to provide a core of software specifically aimed at UK research needs. Seven proposals have been funded and will make a significant contribution to the adoption of the IUE in the UK. The scope of these proposals does not cover all the technical areas highlighted as being important for the UK. If significant gaps are identified, further funds may be made available in the future to address those particular areas.

Mechanisms will shortly be put in place to monitor and disseminate progress on all projects funded under the IMV programme. These are likely to include a one-day meeting of presentations, posters and demonstrations, to be held around October 1997.

Since the IMV programme has been closed to new proposals, machine vision and image processing research has been supported through the responsive mode. From 1 April 1996, Systems Architectures has funded approximately £1.5M of machine vision research out of a total requested value of about £3M. The value funded, which includes the IUE-related proposals, represents 34% of Systems Architectures commitment for that period. Excluding the IUE-related proposals, machine vision research represents 29% of the Systems Architectures responsive mode element in 1996/7.

Finally, EPSRC welcomed the report of the BMVA Strategic Workshop on Machine Vision and Image Processing, held in February 1996. It is a very useful

statement of technical challenges and research issues. We are committed to continued support for research in this field, and see it as a very positive step that researchers, system developers and users have come together to establish a research agenda. The debate that the BMVA has engendered, together with peer review, will ensure the quality and relevance of the work EPSRC supports.

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The Colour Group

Colour is a universal human experience and one of the aims of the Colour Group is to promote the study of colour in all its aspects. The Group is unique in this country as it brings together those who are involved in colour in many ways. Membership includes physicists and others who are concerned with colour measurement and other work in industries such as photography, printing, paper, dyestuffs and plastics, in fact anywhere where the accurate reproduction of colour matters. Other members are in lighting, television and computer world and there are artists and architects and art conservationists.

One of the benefits of the Group lies in the opportunities given for various groups and individuals concerned with the scientific, industrial, artistic and educational aspects of colour to exchange information and discuss problems and matters of mutual interest.

Meetings are generally held the first Wednesday afternoon in each month from October to May. Some take place at the City University, others are at different venues such as The National Gallery, The Institute of Optamology and the Royal Institute, and sometimes at colleges and schools of art or architecture. There is no charge for ordinary meetings. Subjects covered are wide ranging from aspects of vision, reports of international meetings, and colour standards to colour photography, visual displays, stage lighting, stained glass and picture restoration. Symposia, one and two-day are arranged from time to time; 'Bridging the Gap' (between art and science) was held at the Royal College of Art, one on 'Light, Colour and the Environment' is another example (held jointly with the CIBS).

The Group was originally formed by the Physical Society at Imperial College in 1940. When the Physical

Society and the Institute of Physics amalgamated in 1961 the Colour Group became independent to admit as members non-scientists who were practitioners in any aspect of colour application.

The international contacts are an important part of the Group's interests. It was a Founder Member and is the British Representative of the Association Internationale de la Couleur (AIC) and its members sit on committees of the Commission Internationale d'Eclairage (CIE) and the Royal College of Art Colour Reference Library. The Group is a sponsor of the international journal 'Colour Research and Application'.

The membership of such bodies as mentioned requires opinions to be formed on questions of standardisation, specification, nomenclature and the like and ensures that this country keeps abreast of development abroad and participates in international activities concerning the theory and practice of colour.

It will be appreciated that colour is a very wide subject indeed and another aim of the Group is to encourage investigation of colour phenomena, the measurement of colour and to assist in the dissemination of colour knowledge. The wider the representation in membership the easier it will be to implement our aims.

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BMVC96 Prizes

It was a pleasure to announce the prizes at BMVC96 and it is again a pleasure to give the people involved some wider publicity. The Science Prize was awarded to T. Thorhallsson of Oxford University for his paper "Detecting Bilateral Symmetry of 3D Point Sets from Affine Views". The Industrial Prize was awarded to P. P. Smith, C. J. Taylor and J. E. Adams of Manchester University for their paper "Automatic Measurement of Vertebral Shape Using Active Shape Models". The Poster Prize was awarded to T. N. Tan of Reading University for his paper "Monocular Reconstruction of 3-D Bilateral Symmetric Objects". Clearly, it was a very symmetric conference. Congratulations again to all of the prize winners.

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Pattern Recognition Award

Arian Hilton, John Illingworth and Terry Windeatt of the Vision, Speech and Signal Processing Research Group at the University of Surrey have been selected as "Honorable Mention winners of the 22nd Annual Pattern Recognition Society Award" for their paper entitled "Statistics of Surface Curvature Estimates". The paper was published during 1995 in the journal *Pattern Recognition*. The editorial board of *Pattern Recognition* award a prize for the best paper followed by 2-3 Honorable Mention awards. The journal publishes over 150 papers each year.

The paper develops a model of how the variance of surface curvature estimates depends on image noise. Previous models gave poor agreement with experimental data but the new analysis allowed predictions accurate to within a few percent. The model provides the theoretical justification for the empirical hopelessness of simple pixel-by-pixel thresholding of curvature approaches to surface classification. The work was carried out as part of an IED funded project entitled "Advanced Automatic Inspection of Loaded Printed Circuit Boards using Machine Vision".

The authors each receive a Certificate of Honorable Mention and John Illingworth has been invited to join the editorial board of the *Pattern Recognition* journal.

Computer Vision Product wins EU IT Grand Prize

Each year the EU runs a technology product competition with three Grand Prize winners receiving \$200,000 each. This year one of the major prizes has been awarded to 3D Scanners, a London based firm for the development of the first commercial hand-held device that can quickly and easily produce models of real 3D objects, the ModelMaker Reality Capture System.

The product consists of a compact laser range finder mounted on a 6 degree of freedom moveable arm.

The sensor also contains a small CCD camera so that colour and texture can be captured as well as 3D shape information.

The project benefitted from collaboration with academic groups. In particular, the difficult problem of integrating range data into full 3D models was solved using an algorithm developed by Dr Adrian Hilton of the Centre for Vision, Speech and Signal Processing at the University of Surrey. Dr Hilton's algorithm overcame speed and robustness issues which dogged previous attempts to produce a real-time solution to the geometric fusion problem.

3D Scanners believe that they have a product which will make strong inroads into markets, such as animation, 3D Web pages and virtual museums, where speed of data capture of complex, real world objects is paramount.

Further information can be found on the Web:

<http://www.ee.surrey.ac.uk/Research/VSSP/3DVision/> (Surrey's 3D Vision Research)

and

<http://www.3DScanners.com> (3D Scanners).

Recognition Award for Excellence in Transfer of Technology in Computer Vision

The European Computer Vision Network is offering an award for recognition of excellence in the transfer of computer vision technology from the laboratory to applications. The prize for this award will be a cheque for 1000 ECU, a plaque, and public recognition at the Scandinavian Conference of Image Analysis in Lappeenranta, Finland 9-11 June 1997. This award is the second in a series, the first having been awarded to Dimension for 3D Sphinx at the 13th International Conference of Pattern Recognition in Vienna, Austria, in August 1996. More details and photograph can be found at <http://pandora.imag.fr/ECVnet>

The award will be presented to a project team composed of scientists and/or engineers by the ECVnet Industrial activities committee on the basis of nominations received by the awards committee at the address listed below. Nominations should describe the novel use of computer vision techniques for a product or an industrial process or service within the last 5 years. Nominations may nominate themselves or others.

The nominations should explain the technique used and the application area in 300 words or less, clearly indicating:

1. The novelty of the approach
2. The generality of the process or technique for other applications
3. The potential for market, market need and size, how likely the approach is to be duplicated

Supporting documentation (reports, papers, press cuttings, etc.) may be added.

Eligibility: To be eligible a team must be physically based in the European Union. Project teams may include members from more than one institution or corporation. The award will be granted to the individuals or to the institution, as specified in the application.

Scope: Computer vision is intended here in the largest possible sense. Any process which involves sensing, measurement or control using analysis or interpretation of images is eligible. This includes such diverse domains as medical image processing, satellite image interpretation, industrial inspection, video-surveillance, highway monitoring, manufacturing processes, robot vision, etc.

Runners up: If a sufficient number of interesting nominations are received, the awards committee may organise a presentation workshop.

The European Computer Vision Network (ECVnet) is an association of public, private and industrial research laboratories devoted to the advancement of the science and technology of computer vision in Europe.

The deadline for applications is 15th March 1997. Please send nominations or request for further information to:

ECVnet Technology Transfer Prize,
c/o Patrick Courtney,
ITMI-Aptor,
61 Chemin du Vieux Chene,
38244 Meylan,
FRANCE.
tel +33-76-41-4017
fax +33-76-41-2805
email: Patrick.Courtney@itmi.cgs.fr

ECVNet

The European Computer Vision Network

ECVnet exists to encourage the development and take up of computer vision technology in Europe. It was setup in 1994 as an EC-funded Network of Excellence, alongside similar networks in high performance computing and speech understanding. Coordinated from Grenoble by Prof. J.L. Crowley, ECVnet currently consists of 12 nodes and some 40 affiliate nodes. Activities are organised around the following committees (more information can be found on the Webserver at <http://pandora.imag.fr>):

Industrial Activities concerned with liaison with industry. A consultants pool has been established, a prize for technology transfer was awarded in 1996 and a workshop is arranged for IPOT in the UK in february. Another prize is announced for 1997.

The Science Committee, headed by Erik Granum of Aalborg, has arranged workshops on a number of "hot topics" and is currently involved in the preparation of a technology white paper to which numerous vision groups have participated.

Education headed by Hans-Helmut Nagel, has prepared and collated a number of vision tutorials on the web. A satellite delivered modular vision course will be recorded and transmitted in january and tapes will be available to ECVnet members.

The Benchmarking committee is concerned with the evaluation of performance aspects of vision algorithms and systems to address the criticism that vision is too fragile for serious use. It promotes both theoretical and empirical work via workshops and publications. A special issue of Machine Vision Applications was organised in which some 10 papers has been organised by Henrik Christensen of KTH. A study is being sponsored into best practice use of image databases for performance evaluation.

Software Environments covers promoting the use of IUE and Target Junior. Supported by INRIA-Sophia Antipolis, in cooperation with Oxford, Leuven and the US IUE effort, two summer schools were held in 1996 and the latest software packages are available via ftp.

The infrastructure committee has ensured that a network of webserver has been setup with major servers in Genoa (afrodite.lira.dist.unige.it) and in Greece (www.ics.forth.gr/ecvnet).

A proposal to extend ECVnet for another 3 years is in preparation. For more information, please either take a look at the web server or contact the coordinator Jim.Crowley@imag.fr.

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Report on M²VIP'96

Guimarães, Portugal, 18-20 September 1996

Mechatronics is an interdisciplinary subject encapsulating mechanisms, mechanics, electronics and instrumentation under one head. To some extent it tries to be all things to all people, and it is arguable whether it succeeds. However, to many it is the life blood of sophisticated mechanical design and engineering, incorporating all the latest features of computer control, reaching even to the depths of computer vision for practical solutions. Be this as it may, the organisers of the M²VIP series of conferences applied the title "Mechatronics and Machine Vision in Practice", so as to be sure of attracting as many participants as possible. Certainly over 150 people attended the conference, held this year in Guimarães, Portugal, and to match the wide range of papers there were usually four sessions in parallel. I noted very few weak papers, though I didn't find many really outstanding ones either. However, the environment was congenial and workers got to know each other very well during the course of the conference, with the result that the level of questioning and discussion during each session were quite high. In fact, I feel in retrospect that this was also an outcome of having 'cosier' parallel sessions, since fewer people attend each session, but those that do are more knowledgeable and interested. Perhaps the paper that made the most lasting impression on me was that presented by D.A. Bradley (Bangor) on automated Howitzer loading of tanks, with a rather macabre one on laser measurement of tooth wear by K.R.G. Rotter et al. coming in a close second; also notable was an intriguing application of Hausdorff distance transforms to the inspection of lace, in the paper by H.R. Yasdi and T.G. King.

To give a bit more of the flavour of the conference, it may be remarked that five of the 31 sessions had

the title “Novel sensors and actuators”, four the title “Mobile robotics and AGVs”, three the title “Vision in real-time control”, three the title “System modelling and simulation”, three the title “Calibration, measurement and inspection”, and two the title “Neural and fuzzy logic applications”. It was notable that a whole session was devoted to mechatronics education, thereby perhaps giving BMVC something to think about.

Fostering the conference environment were the well organised social events - the reception in the university on the first evening; the city tour (covering Guimarães castle and the Ducal Palace) on the second evening; the packed and in fact highly exciting concert in the Ducal Palace on the third evening; and the conference banquet in a nearby converted convent on (unusually) the final evening. The castle was a ruin but still impressive in its own right and was also a high-up vantage point from which to view the local region. I found later that the view was better from just two other places - the penthouse of my hotel, the Fundador, and a fortiori from the Teléferico (cable car) leading up to the 1700 metre-high Penha mountain park. The restored convent of Santa Marinha was superbly decorated with statues, carvings, azulejos (the local blue decorative tiles) and frescos. Ah, and I mustn't forget our post-conference visit to Oporto, with a fascinating tour of the town and the riverside region, a compulsory (for me!) visit to the cellars to see how port is made, and to learn to distinguish its various grades - not least the white port whose taste resembles sherry and which is drunk locally as an aperitif.

Overall, this was a highly memorable event, made all the more pleasant by the remarkable friendliness and hospitality of the Portuguese, including particularly Mário Lima who proved a master of organisation with a light touch, many an instant historical anecdote, and a sparkling word for everyone. Well done, Mário: when can we come again?!

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Low Level Feature Extraction

The detection and description of image features is the first primary task of a vision system and it

made a pleasant change to attend a technical meeting that had as its specific theme low level vision. This fact was perhaps born out by the good attendance at the BMVA meeting in October 1996 organised by Paul Rosin on low level feature extraction. The aim of the meeting was to cover edge, corner, line and region detection as well as contour grouping and texture analysis. The papers presented at the meeting were all of a high standard and covered a wide range of topics from Bayesian labelling on neural networks to genetic algorithms as well as our old friend the Hough transform. It was encouraging to see that some of the presenters had considered the more mundane practical problems of algorithm implementation on some form of hardware platform. An interesting example was presented in that a multiply\accumulate hardware architecture can be used to approximate a Bayesian network. The general course of the meeting underpinned the fact that the quality of processed image data in the early stages of a vision system was of particular importance for higher level processing elements performing an interpretation process. To conclude the meeting a short general discussion took place on the future direction of low level image processing. A question posed was ‘do we consider edge detection to be a solved problem’. The general feeling was that low level image processing needed to be considered not as a separate task but as an integral part of a complete vision system incorporating high level knowledge and information about the task in which the vision system is engaged. Could this be one of the reasons why we have so many different implementations of a Canny edge detector ?

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[The abstracts of this meeting as well as information on other BMVA technical meetings can be found at <http://peipa.essex.ac.uk/bmva/bmva-mtg.html> - *Editor*]

New Approaches to Dynamic Filtering

A one day technical meeting ‘New Approaches to Dynamic Filtering’ was held at the British Institute of Radiology, London on 15 January 1997. A broad range of methods was described by speakers

drawn from these very different fields: computer vision, statistics and modern probability theory.

The Bayes net is a construction for assimilating and combining data from a complex system. The nodes of the net represent different parts of the system and the edges describe the flow of information from one part to another. The net is a 'Bayes' net because Bayes theorem is used to estimate probabilities for the different states of the nodes conditional on the available information. Y. Shao (AIVRU, Sheffield) used a Bayes net to estimate the position and orientation of an object, whilst S.-J. Farmer (DRA, Malvern) analysed chains of inferences about the behaviours of military units.

Two speakers described very different approaches to bearings only tracking, in which the task is to infer the 3D motion of a target from a sequence of angle measurements. N. Gordon (DRA, Malvern) advocated a Monte Carlo approach in which measurement information is incorporated by resampling the cloud of points. P. Clifford (Statistics, Oxford) searched over the space of possible paths of the target for one which best fitted the measurements.

N. Crisan (Mathematics, Imperial) showed how good solutions to non-linear filtering can be obtained by a Monte Carlo approach in which each sample point branches randomly. The branching is most intense in regions where the conditional density for the system state is large. M. Isard (Engineering Science, Oxford) described the condensation algorithm for estimating conditional densities. The applications are in image analysis, where the data is complicated and the target conditional density has many local maxima.

S. Moss (Computer Science, York) described an algorithm for matching radar data to map data and S.J. Maybank (Computer Science, Reading) described a car tracker in which both the geometry and the motion of the car are modelled accurately.

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Optimisation Issues in Computer Vision

Call for participation

One Day BMVA Technical Meeting

Optimisation is the process of finding the best solution to a problem according to a certain criteria. Some typical techniques used for this are Mathematical Programming, Gradient and Newton type approaches, as well as stochastic methods such as Simulated Annealing and Genetic Algorithms. Optimisation in Computer Vision has been attempted in a wide variety of tasks, from low level feature extraction to high level recognition methods. The optimisation process itself may occur on-line or off-line as a training stage. The British Machine Vision Association will be holding a one day Technical Meeting at the BIR, London on May 8th 1997, entitled "Optimisation Issues in Computer Vision" to allow a platform for presentation of new work or "work in progress" both in theoretical development and applications. Prospective contributors should submit a short abstract (50-70 words) describing their current work in this area. The deadline for contributions is 28th February 1997.

Submissions should be made by email, fax or post using the details below:

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Tel/Fax: (+44) 1483 259842 / 534139

For up-to-date information please see this WWW page: <http://www.ee.surrey.ac.uk/People/M.Mirmehdi/CFP.html>

The WWW address for the Centre for Vision, Speech & Signal Processing at Surrey University is at: <http://www.ee.surrey.ac.uk/Research/VSSP/>

CVonline

The Evolving, Distributed, Non-Proprietary, On-Line Compendium of Computer Vision

In 1982, if you wanted to know about a technique or idea from computer vision, you just reached for your Ballard and Brown. Probably you still do, but just wish that it were more up-to-date. Now there is a remedy for these problems. Edinburgh University is collating the

CVonline: The Evolving, Distributed, Non-Proprietary, On-Line Compendium of Computer Vision

CVonline is a collection of hypertext summaries on the central topics in computer vision. We have organized an index of about 650 topics, of which about 100 already have hyperlinked text. CVonline is intended to be a summary of methods and applications of computer vision, organized into sections covering the main topics of practice and research. Each section contains a number of topics, and each topic hyperlinks to a set of materials associated with that text.

CVonline can help provide the materials to help learn about computer vision. Teachers need only link to particular topics in the CVonline and then will not need to write the notes themselves. Learners interested in particular topics have one location to go to for most major topics, at least at an introductory level.

The entry point into CVonline is:

http://www.dai.ed.ac.uk/daidb/staff/personal_pages/rbf/CVonline/CVentry.htm

What could CVonline contain when complete?

- a tutorial (2000 words maximum) on a topic, containing example images, graphs, tables, everything needed to explain clearly what a topic was and how it can be used, plus key references for more detail or original sources.
- alternative or improved tutorials
- a suggestion for a new topic under a category
- a comparison of several approaches to a topic
- a criticism of a topic or the viewpoint of a text

- an expansion of the topic hierarchy to include new subtopics
- examples of use (e.g. input and output images with text explanations)
- C/C++/java implementations

How do you contribute?

Everyone will have written some notes on a few topics, and we are linking from the central index to contributors' text. Thus, everyone can benefit from your efforts, and the computer vision community can advance by having a common set of widely read text materials available at virtually no expense to your library nor students.

You email rbf@dai.ed.ac.uk the WWW link to your contribution, which category(s) you think it should be linked to, and your name and institution. Please email with the subject line "CVonline contribution".

We will add the link to the index with an attribution of the source of the contribution. Your contribution will remain in your area, you can correct, update, or even remove it under your control. You have copyright control. Of course, people move, so we can update the links, or even take over responsibility for storing the text if requested.

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