Newsletter of the
BRITISH MACHINE VISION ASSOCIATION
AND SOCIETY FOR PATTERN RECOGNITION.
Vol 2, No 4, November 1991.

Editor: Dr Edwin Hancock, Dept. of Computer Science, University of York, York. Y01 5DD.
Tel: (0904) 433374, Fax: (0904) 432767, email: erh@uk.ac.york.minster

Editors Note

This months newsletter contains three main items. Firstly, there have been new elections to the BMVA Committee and these are described below. There are messages from Chris Taylor, the retiring Chairman and from his successor Bernard Buxton. Secondly, there are reports from the second British Machine Vision Conference held in Glasgow during September. This newsletter contains accounts from the Conference Chairman Peter Mowforth and from a delegate, Mark Wright. Finally, the issue contains reports on the latest technical meeting: "Recent advances in Machine Vision - Implications for Human Vision". The organiser Geoff Sullivan gives an overview of the meeting and a participant, Rhona Johnston, gives some personal impressions.

BMVA Elections

In the recent postal ballot the following people were elected as members of the BMVA Executive Committee:

Mr W.G.L. Adaway
Dr B. Buxton
Dr A. Clark
Dr T. Ellis
Dr J. Illingworth
Professor J. Kittler
Dr P. Mowforth
Professor P. Saraga
Mr A.C. Sleigh
Mr G.D. Sullivan
Professor C.J. Taylor
Dr M. Varga

Nominally the Committee consists of 10 elected members but both Professor Taylor and Dr Mowforth are ex-officio members in their capacities of Chairman of the North of England and Scottish Chapters respectively. It is noteworthy that three of the above are new to the Committee: Dr Adrian Clark, Dr Tim Ellis and Dr Margaret Varga. This is an encouraging development and one much welcomed by the old Committee. Following the first meeting of this new Committee the following officers were elected:

Chairman: Dr B. Buxton.
Secretary: Dr J. Illingworth.
Treasurer: Mr G. Sullivan.
IAPR Representatives: Prof. J. Kittler
Prof. C.J. Taylor

In addition two new posts have been created: Technical Meeting Officer (to organise and coordinate the Association Technical programme) and Publicity Officer (to promote the Association to a wide range of external organisations). These posts have been filled as follows:

Technical Meetings Officer: Dr T. Ellis.
Publicity Officer: Dr A. Clark.

Finally, the Committee is completed by several co-optees who hold specific jobs within the Association. These include:

Newsletter Editor: Dr E. Hancock.
Membership Secretary: Miss A. Harris.
BMVC92 Chairman: Professor D. Hogg.

Dr J. Illingworth
Surrey University.

BMVA Subscriptions

At the recent AGM held during BMVC91 in Glasgow it was announced that the annual subscription is to rise. The reason for this is that the subscriptions income does not cover our recurrent expenses for technical meetings, newsletters etc. The Association has some accumulated reserves but the Committee feel these should not be used to subsidise recurrent costs for an extended period. The subscription is to rise from 1 January 1992 to £15 for full members and £7:50 for student members. The Committee feel that this level of subscription is excellent value for money given the services currently offered (free technical meetings, Travel Bursary schemes, discounts to attend BMVC, BMVA News and IAPR Newsletter) and

wish to make it even more attractive in the future by developing new services. It is hoped that the increase will not disssuade anyone from continuing membership of the Association. A further minor change is that the present rule stating that defaulting members are not deleted from the membership list until 1 year after the subscription due date is to be changed to allow only a six month period of grace.

Dr J. Illingworth
Surrey University.

Retiring Chairman's Message

When I took on the chairmanship of the British Pattern Recognition Association in 1988 it was on the understanding that I would be the last chairman of the Association. Over the years it had become clear that, although machine vision was a central interest of the BPRA, we were failing to cater properly for a major segment of the research community. This was exemplified by the growing success of the Alvey Vision Conferences which popularised important research on stereo, motion and model-based vision which blossomed during the 1980's.

Well, the deed is done. The BPRA merged with the Alvey Vision Club in January 1990 to form BMVA; we now have a single organisation with a significantly larger membership than either of its predecessors, a flourishing annual conference, a lively programme of one day meetings, and a healthy bank balance. We need now to build on this good start, particularly by continuing to improve the quality of the annual conference and increasing the range of services offered to members.

I am thus very happy to see the chairmanship pass to Bernard Buxton who I am certain will make a very positive contribution to the Association. I hope to continue as an active member of the committee and, like Bernard, I am very pleased that we have a healthy transfusion of new blood, following the recent elections.

One reason for the change in the composition of the committee was the decision of Mike Duff to retire from active involvement in running the Association. This will be a great loss to us, and, as those of you who attended BMVC 91 will know, we have presented him with a crystal decanter as a token of appreciation for his services to our research community. Mike was responsible in the late 1960's for forming the Pattern Recognition Discussion Group which subsequently became the BPRA. He was at different times Chairman and Secretary of the BPRA and has over the years devoted immense energy to organising and developing the Association. He was a member of the working party which arranged the merger of BPRA and AVC and I know intends to remain an active member of the BMVA. I am sure you will all join with me in thanking Mike for all he has done for us and hoping that he will continue his involvement for many years to come.

Finally I would like to thank all those members of the BPRA and BMVA committees with whom I have worked, for their support during my term of office. I believe we have a healthy organisation which I hope to see develop with vigour over the next few years.

Chris Taylor
Manchester University

Chairman's Message

Professor Chris Taylor of the Department of Medical Biophysics at the University of Manchester retired as chairman of the BMVA at our last Committee meeting on 29 October and I was elected as his successor. Since it is premature to thank my colleagues on the Committee for this honour and their confidence in me, perhaps my first three duties are to thank Chris for his stirling service to the Committee, to thank members of the Committee who are retiring, and to welcome our three new members who were elected in this summer's ballot. In particular, thanks go to Chris who has been chairman of the BMVA since it was formed in January 1990 and has seen the Association through its birth pangs and oversaw the merger of the BPRA and the Alvey Vision Club. During his stint as chairman, Chris has also presided over the beginning of several new initiatives and activities within the Association that we hope will enable us to serve our members better and increase awareness of machine vision work in the UK. Indeed, our three new Committee members, Adrian Clarke, Tim Ellis and Margaret Varga have all already taken on responsibilities for the BMVA Committee or are to organise forthcoming meetings that should help us meet these objectives. It is particularly important that new faces are elected to the Committee to maintain enthusiasm and the flow of ideas although an element of continuity is also required unless the membership should feel that the Association were being steered in completely the wrong direction!

Pleased though I am to welcome these three new members to our Committee, there is one respect in which they fail to match our aspirations. Approximately 40% of the Association's members are from industry yet less than one third of the members of the Committee are. The last figure includes me and I, working in the Long Range Research Laboratory at the GEC-Marconi Hirst Research Centre in Wembley, have more than once been accused by colleagues of being "more of an academic than the academics". Given that one of the Association's main aims is to improve contact between academe and industry and to promote the rapid transfer of results from research to applications, enthusiastic volunteers from industry are required with ideas, time and energy to spare to join the Committee and help us fulfil this objective. The Committee will of course itself be seeking to strengthen its industrial representation, but I would particularly like to hear from members, especially those from small companies involved in the supply, use or application of machine vision systems or software, who would like to help the Association in this way.

Bernard Buxton
GEC-Marconi, Hirst Research Centre
Tel: 081 908 9081
email: bfb@uk.co.gec-rl-hrc

BMVC'91 - Chairmans report

The annual get together of the British Machine Vision Community took place at Glasgow University between the 24th and the 26th September 1991. The event was organised by the Turing Institute and attracted over 130 delegates. The first guest speaker was Peter Burt from the David Sarnoff Research Center who has played an important role in the popularisation of the multi-scale foveated pyramid as a framework for solving general vision problems. His presentation concentrated on an approach to object segmentation from image sequences that was both simple and fast and was particularly appropriate for moving agents in dynamic scenes. The second invited paper was from Demetri Terzopoulos of the University of Toronto. He has made a major impact on those trying to bring together the fields of computer vision and computer graphics and gave a talk on visual modeling. The work showed how CAD models could be rendered with natural images and, using a model for the behavioural animation of facial muscles, was able to animate CAD representation of a human head.

The BMVA committee presented the 'Vision Science' prize to C.A. Rothwell, A. Zisserman, D.A. Forsyth and J.L. Mundy from the Robotics Research Group at Oxford University for their paper 'Using projective invariants for constant time library indexing in model-based vision'. The Computer Recognition Systems Ltd industrial practice of vision prize went to P. Rosin and T. Ellis from the machine vision group at City University for their work on 'Detecting intruders in image sequences'. Best poster prize went to R.F. Marslin, G.D. Sullivan, and K.D. Baker from Reading University for 'Kalman filters in constrained model based tracking'.

In a departure from previous conferences, the BMVA committee decided that it would be in the best interests of the British machine vision community to have the proceedings take on a more professional appearance and also, to reach a wider audience. Consequently, an agreement was made with Springer-Verlag and the proceedings were produced as a book in time for the conference. In order to meet the very short time schedules and to have the costs in line with the printing costs for previous years, we were forced to reduce the size of the proceedings. If anybody has any practical suggestions concerning the form of these proceedings, comments should be passed onto BMVA committee representatives.

Pete Mowforth
Turing Institute, Glasgow
email: boffin@uk.ac.turing

BMVC'91 - a delegate reports

The British Machine Vision Conference 1991 was held from the 23rd to the 26th of September in Glasgow University's Boyd Orr Building. There were 134 delegates from as far afield as Czechoslovakia, Taiwan and Hull (home town of local organiser Tanya Oliver), demonstrating both national and international interest in the conference. A full program coupled with a submission acceptance ratio of 3:1 ensured a high quality event and points to an active and healthy UK research community.

Formal sessions included Segmentation, Feature Extraction, Motion and Tracking, Shape, Applications and Hardware, and Medical Image understanding. Six separate poster sessions were held allowing exhibitors ample opportunity for discussion and to gain feedback about their work.

C.Rothwell et al introduced a model based vision system using projective invariants. This approach avoids the expensive verification processes found in pose estimation based methods, and sublinear time indexing of models makes operation with large model databases feasible. This paper was awarded the conference science prize.

The Intelligent systems group at Reading, show progress on a wide range of fronts concerning model based tracking in the context of the VIEWS ESPRIT project. A simple and efficient Structure from Motion algorithm was created by exploiting a priori information such as scene geometry and object motion constraints. Tracking stability has been improved by the use of Kalman filtering in work which was awarded the conference poster prize.

R.Taylor and P.Lewis presented a novel shape representation based on fractal geometry. In contrast to the usual scale space approach to multiscale shape description they used a fractional Brownian model and gave quantitative results of its performance in the presence of noise and occlusion.

P.Rosin and T.Ellis introduced a knowledge based vision system for detection of intruders in image sequences. Geometric modeling was rejected due to poor resolution and the great spatial and temporal variability of forms encountered. Much of the systems power, to cope with a very difficult real world problem, arises from the integration of information from a wide range of sources. Image based data such as area and velocity is combined with data from other sensing systems, weather information, and even the behavioural patterns of animals likely to trigger false alarms. This paper was awarded the conference industry prize donated by Computer Recognition Systems.

Medical image applications included analysis of Magnetic Resonance images, retinal images and mammographic Xrays. Tasks include enhancement to aid human assessment and automatic detection of specific features or anomalies.

The conference also featured invited talks by P.Burt and D.Terzopoulos. Burt showed that motion analysis can be made faster by "focus of attention", using methods analogous to foveation and eye tracking in humans. Computation is performed within a pyramid framework well suited to this approach, offering simple control over resolution and the range of velocities selected for analysis.

Terzopoulos used his talk on visual modeling to stress the inverse relationship between Computer Graphics

and Computer Vision, the former concerned with the rendering of an image from a model and the latter with the inference of models from images. In a talk supported by fascinating video sequences he showed how "physics based" models, incorporating not just geometry, but force, torque and energy can capture intuitively very realistic behaviour. In the context of computer vision, image data and models interact to maximise their consistency over time.

Both invited talks found resonance with other conference presentations. Burt's use of "focus of attention" is central to the philosophy behind the Oxford and Turing vision heads. The notion of "physics based" modeling has links to the Oxford work on "snakes" with Lagrangian dynamics, the latter introducing concepts like mass and viscosity to image tracking mechanisms. I am sure we will soon see systems embodying both these related ideas as the concept of active vision develops.

Social events included a reception in Glasgow's impressive marble Civic Chambers and a dinner in Glasgow University's equally stunning Bute Hall. Thanks are due to conference chairman Peter Mowforth and his staff at the Turing institute for another successful conference in the series. The proceedings have been published by Springer-Verlag ISBN 3-540-1975-X and ISBN 0-387-19715-X.

Mark Wright
Cambridge University Engineering Department

Recent Advances in Machine Vision

The meeting was the second in what is intended to be a regular forum for a dialogue between researchers working in the two disciplines of Natural and Machine Vision. The first meeting in 1990 consisted of talks by 6 neurophysiologists, psychophysicists and psychologists. This year we had talks by 6 researchers in feature analysis, active vision and visual recognition.

Professor Harry Barrow (Sussex University) started the meeting with a discussion of artificial neural nets, and reported experiments on a simulation of the early stages of vision. When the net is trained on suitable images, it takes on properties strikingly similar to the properties of cells in the visual cortex.

Dr. Sue Astley (Manchester University) then presented work on fusing information from multiple sources to derive reliable "cues" in mammography. Likelihood maps, constructed under different types of operator, were used to combine cues together probabilistically. Considerable improvements in performance were obtained. The work raises many questions for studies of natural visual search - laboratory experiments in Natural Vision seem limited and artificial compared to "real" problems in visual search.

Dr. Andrew Blake (Oxford University) then spoke about active contours, which allow computational effort to be concentrated on "relevant" parts of the image, and avoid the grouping process inherent in the more conventional constructive approaches to detecting extended edges. Examples of the use of B-splines were shown, running on a system comprised of 9 transputers which can track edges at video rates.

Professor John Mayhew (Sheffield University) was concerned to show that "neural nets can solve real vision problems" such as finding points on the two images corresponding to the ground-plane, for their mobile stereo system. The 7 df problem is too ill-conditioned to be solved analytically, and look-up-tables were learned instead. The talk emphasized that disparity information must be moderated by head and eye position to obtain reliable depths.

Geoff Sullivan (Reading University) then described work on recognising road traffic by machine vision. "Hard" vision problems can be solved, if we have sufficient information about the objects and their context. Is natural vision also influenced by non-visual knowledge? The extensive feedback in the visual system from areas specialised for object perception to lower areas provides an ideal architecture - but testable theories are lacking.

Professor David Hogg (Leeds University) gave the final talk in which he reviewed work on the perception of actions and events. It was surprising how clear an understanding of events could be obtained from simple information taken from images, again pointing to the primacy of expectation and meaningful interpretation in vision. An extended version of this report is available from the author.

Geoff Sullivan
Department of Computer Science, University of Reading
email: gds@uk.ac.reading.cs.isg

BMVA Technical Meeting - delegates report

The B.M.V.A. organised a one day special meeting addressing the implications that machine vision may have for understanding natural vision. As a postgraduate student of psychology I was keen to learn how people from other disciplines might approach the problems of understanding how vision works. The meeting attracted a varied audience; physiologists, physicists, psychologists, computer scientists and engineering scientists all attended.

The meeting had a very relaxed atmosphere, with people obviously taking advantage of the opportunity to meet each other. As a graduate student I found it a very approachable situation. The talks provided an overview of machine vision, from low level modelling to high level application. On the whole they were pitched at a general level of understanding which suited the audience. At times though a lack of knowledge of the different technologies and of the maths left me wondering.

The most obvious synthesis of machine and natural vision is the neural network approach. It is in this area that I am particularly interested. I was fascinated to find out if a psychologists viewpoint would be any different to that of a machine vision researcher. Many of the models put forward were more mathematically based, and perhaps had a stronger link with neuroscience. This

was exemplified by the talk of Professor Barlow on the computer simulation of retinal and cortical cell processing. For me, this was one of the highlights of the meeting.

The meeting also provied the opportunity to learn about the diverse approaches used in machine vision, and the success that they have achieved. The demonstration of a prototype system for breast scanning and a traffic vigilance scheme were both impressive. They showed how useful research into machine vision can be in its own right. They also pointed to a role for psychology in analysing how machine vision systems may best aid the end-user.

Implications? There were many. I certainly benifited from talking with people from different disciplines and felt that the meeting offered me a broader picture of research in vision. I hope the dialogue between machine and natural vision may continue.

Rhona Johnston
Department of Psychology
University of York

Parallel Image Analysis

The Second International Conference on Parallel Image Analysis will take place in Ube, Japan between December 21 and 23 1992. The programme will concentrate on the following topics
Data Structures
Parallel Algorithms and Architectures
Neural Networks
Computational Vision
Syntactic Generation and Recognition
Multidimensional Models

Authors should send nine copies of their full paper manuscripts (not extended abstracts) to : *Katsushi Inoue Computer Science and Systems Engineering Department, Faculty of Engineering, Yamaguchi University, Ube, 755 Japan*

Papers are restricted to 20 double-spaced pages, including figures. Papers must be received by march 1, 1992. Authors will be notified of acceptance by June 15, 1992. Camera-ready copy will be due by September 21, 1992. We intend to publish a special issue on "Parallel Image Analysis" in some journal.

AVA Meeting: Visual Segmentation

The general task of analysing real images is complex and daunting. The existence in human and animal visual systems of a fast, parallel preattentive stage seems to be one solution to the problem of processing the large amount of data quickly, but in sufficient detail to then allow direction of an attention mechanism for further scrutiny of portions of an image. The investigation of these preattentive mechanisms covers a variety of techniques and disciplines, including psychophysics, computer modelling and neurophysiology. The Applied Vision Association is always keen to bring together different groups to encourage exchange of ideas. To this end the Association plans to hold a 1 day meeting on Visual Segmentation at the Radcliffe Infirmary, Oxford, on 19th February 1992.

Papers are invited on the general subject and in particular:-

Visual Psychophysics of Preattentive Processing
Computer Models of Preattentive Vision
Neurobiology
Neural Network Models

Abstracts and enquiries to: Dr Ian Moorhead
WS6 Group, DRA (Military Division)
RARDE, Fort Halstead, Sevenoaks, Kent TN14 7BP
Tel 0959-32222, Ext 2426, Fax Ext 2453
e-mail ra1@ukc.ac.uk

Future BMVA Programme.

Dr Tim Ellis has taken over the role of meetings co-ordinator. At the last committee meeting, the following programme was arranged for the next year.

11 December 1991 *"Kalman Filters"*
8 January 1992 *"Combining Evidence in Computer Vision"*
12 February 1992 *"Active Vision"*
11 March 1992 *"Intelligent Image Databases"*
15 April 1992 *"Speech Processing"*
27 May 1992 *"Shape"*
8 July 1992 *"Colour and Texture"*
22-24 September 1992 *"BMVC 92 - Leeds"*
21 October 1992 *"Machine and Natural Vision"*
21 December 1992 *"Geographic Information Systems"*

The majority of meetings will be in Central London and are scheduled as one-day events. No registration fee is payable by BMVA members although a charge of £10 will be levied for non-members (unless they are members of a co-sponsoring organisation). Arranged lunches will be available on prior registration but a small fee may be payable for these. Fuller details including final programme will be mailed to members nearer the time of each meeting. For further information about the BMVA meetings programme contact

Tim Ellis
Centre for Information Engineerin
City University
Northampton Square
London Ec1V 0HB
email: t.j.ellis@uk.ac.city

DIARY

18-23 May 1992 2nd European Conference on Computer Vision, Italy
15-18 June 1992 IEEE CVPR Conference, Champaigne, USA
August 30 - October 3 1992 11^{th} International Conference on Pattern Recognition, The Hague, Netherlands