

# BMVA News

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

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**BMVA** News<sup>1</sup> 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 1 September 2010.

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## Editorial: *Machine Vision – from Divergence to Convergence?*

When a totally new subject area starts up, it is frequently the case that no-one can predict how it will develop over time. Indeed, there is a tendency for workers to go their diverse ways according to the particular pressures they are under. Everyone is cavalier or even ‘gung-ho’, and the spirit of ‘having a go’ abounds. I remember this situation in the vision community even before the BMVA was founded in 1990: in conferences all sorts of ideas came up, and new ones were always welcomed as possible ways forward for the subject and for others to follow. This was the divergent phase of the subject. But much later on, so much is known in a subject that there is an almost complete web of knowledge and at this stage the cracks are being filled in very rapidly – so it is easy to see the direction in which the subject is developing, and the end-point is in sight. This is pretty much what was happening in Physics at the beginning of the 20<sup>th</sup> Century before the development of quantum mechanics – and I’ve even heard that that’s what’s happening now in Particle Physics, but for the odd reason that it will be too costly to go on building big enough accelerators to test the latest theories.

So is Machine Vision now in a convergent phase? Well, it’s certainly more rigorous, more mathematically based and indeed probabilistic theories and statistical constraints are the order of the day. In a sense, it is therefore in a convergent phase. However, the way subjects develop is explainable not only on a divergent–convergent model (for which geometrical optics is a good example): there is also the possibility of fragmentation. Here Machine Vision is part of a strongly divergent phase in which many other areas are

being sprouted or tagged on. A useful analogy is that of evolution where first minor variants appear and later new species become evident.

Curiously, Machine Vision actually started first as Image Processing, to which Abstract Pattern Recognition was added as an afterthought – largely but not entirely in the form of Statistical Pattern Recognition. Now one can perceive very many hugely enhanced and varied forms – e.g. Content-based Image Retrieval, Multimedia Processing, Video Analytics, Visual Media Production, Biometrics, Facial Analysis and Animation. Of course, some such names may be subject areas that have been invented for the purpose of generating attractive titles for conferences. In fact, my list is intended to be generic, and far more titles are bound to be needed once one brings in other application areas, such as robotics, medicine, crime detection and prevention, broadcasting and so on.

All this reflects that when a subject gets to the divergent phase, with everything being known, it is a mature subject that can be relied upon, and the next phase has to be the real application phase. Here the success of machine vision is the very large number of areas in which it can potentially be applied. The world is full of objects, and the prime means by which they can be assessed is via vision, which unlike most other senses, is 2D or even 3D. Nevertheless, while vision is predominant, it can be useful to combine it with other senses (sound, touch, ...) to give greater capabilities. Neither should we ignore the fact that many other modalities such as X-rays, infra-red and ultrasonics exist whose outputs are increasingly and reliably being converted into normal visual images (not to mention using NMR to obtain 3D images), thereby providing the possibilities for further enhancement and multimedia capability.

So I see the development of Machine Vision as being characterisable as a series of divergent–convergent phases taking place in increasingly parallel and diverse directions. Thus the fragmentation model has to be superimposed on the divergent–convergent model to get the right sort of reality for us. Whatever the truth of this, and we will all look at it differently, this elephant of a subject will no doubt keep us going for a good time to come, if we are prepared to be adaptive to timely vogues and to new capabilities and pressures as they arise.

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## BMVA Technical Meetings 2010–11

The British Machine Vision Association organises a series of one-day technical meetings (symposia), mainly in London. Each meeting is chaired by a member of the UK academic computer vision community and addresses a specific topic in Computer Vision. The meetings usually have 6–10 speakers and are attended by 30–100 people.

We are currently SEEKING VOLUNTEERS to chair meetings for the academic year 2010–2011. This is not an onerous task and involves (i) organising a program of speakers (by call for paper or invitation), (ii) chairing the meeting on the day, (iii) ensuring that a report on the meeting is written by an attendant. All other arrangements (finances, food, registration, room-booking, etc.) will be taken care of by the BMVA.

Please contact the technical meeting organiser, Dimitrios Makris if you are interested in chairing one of the future meetings. Visit the BMVA meeting webpage for up-to-date information on scheduled meetings, programmes, CfPs and detailed instructions for meeting chairs:

<http://www.bmva.org/meetings>

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## MIUA 2010 – Call for Participation

The 14<sup>th</sup> annual Medical Image Understanding and Analysis (MIUA) Conference will be held at Warwick University during 6–7 July 2010. An outline programme of the meeting is available now. Please visit the following webpage for more information:

<http://go.warwick.ac.uk/miua2010>

Please follow the link below for registration:

<http://go.warwick.ac.uk/miua2010/registration/>

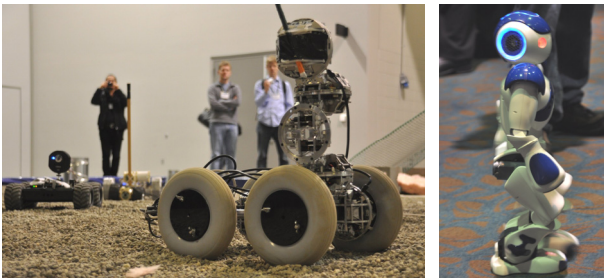
We look forward to welcoming you at Warwick in July.

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## Report on ICRA 2010

Alaska is well known for its arctic climate, its wildlife, the oil and gold rush. It is less known for its conference facilities. However, the news of successfully hosting CVPR in 2008 must have reached the organisers of the International Conference on Robotics and Automation (ICRA), and this year about 1600 robotics researchers cast anchor in Anchorage to celebrate 50 years of robotics. The conference was held in the week starting Monday, 3 May, wrapped by two days of workshops and tutorials, leaving three full days for the actual conference. In contrast with major vision events, every paper is presented orally, and no posters are shown. With 800 accepted submissions, the main conference needed 13 parallel tracks, with up to four technical sessions per day. Adding the keynotes and plenary talks, the days were chock full of scientific stimulation.

An acceptance rate of 42 per cent and purely oral presentations inevitably lead to a higher variance in quality of the papers. Together with the spread of interesting talks over several parallel sessions, this leads to fluctuations of large parts of the audience between the rooms. As the switch between talks was accounted for in a single minute, this resulted in a somewhat noisy atmosphere and certainly did not benefit the speakers. Topics varied from biologically inspired robots, mechanical actuators, route and action planning to traditional vision problems such as visual odometry, tracking, SLAM and surveillance, the latter including my own participation.



(left) Participant in the Planetary Contingency Challenge.  
(right) Aldebaran's Nao Robot is the Aibo replacement in the RoboCup. Even if this tiny humanoid for 12000 Euro does not qualify for child benefit it is a bargain.

Several conference awards went to vision papers. Hauke Strasdat, J.M.M. Montiel and Andrew Davison from ICL won in the category 'Best Vision Paper' for an analysis of speed and accuracy of filtering and bundle adjustment in monocular visual SLAM. Among the nominees were Rohan Paul and Paul Newman from Oxford with a spatial extension to the FABMAP algorithm, and David Lowe and his student with work on stereo for object recognition. Another award went to Paul Furgale and Tim Barfoot for "Visual Path

Following on a Manifold in Unstructured Three-Dimensional Terrain", which uses stereo data only to learn local submaps that are traversed backwards according to their topological connectivity, ultimately leading a robot back to its starting point. The Transactions on Robotics Best Paper award was on vision guided re-entry of space vehicles, again showing the omnipresence of vision in robotics. Furthermore, the award for pioneering work in engineering went to Ruzena Bajcsy, foremother of active vision. A part of her very short acceptance speech deserves special mention. She seemed especially pleased with the increase in female researchers during the last forty years. When she started, there was only one.



(left) Ruzena Bajcsy receives the 2010 Pioneer in Robotics and Automation Award. (right) Hauke Strasdat receives the Best Vision Paper Award.

The plenary talks and keynotes gave even more stimuli to the roboticists. Among the former, Professor Yoshihiko Nakamura from University of Tokyo gave an overview on anthropomorphism in robotics. In his presentation, he proposed that humans and robots need a common understanding of things, to help people accept and communicate with robots. This requires common values and reasoning methods, and he outlined his research in this direction. From the presentations listed in the book of abstracts, this was the only talk directly addressing artificial intelligence. The last plenary by Professor Raffaello D'Andrea was on automation of distribution warehouses using independently planning robots, now used by several companies in the United States. Whereas these units autonomously plan their route and replenish their energy in chargers, their intelligence would rate rather low in Professor Nakamura's classification.

The keynote speeches were in honour of the 50 years of robotics that passed since the conception of the first industrial robot by George Devol. The most relevant to the field of vision were Takeo Kanade's view on the development and future of robot vision and Sebastian Thrun's talk on machine learning in the field of robotics. Unfortunately, these great presentations were running in parallel and I could experience only the last slides from Dr Kanade. His talk culminated in "Takeo Kanade's Challenges and Opportunities", comprising four suggestions for vision research. He not only advocated

numerosity of input – he is currently building a 1000-camera capture room – but also model-based approaches and other ways to exploit constraints imposed by physics. Furthermore, the researcher should not be afraid of (apparent) NP-completeness of problems due to recent developments in parallel algorithms. Lastly, vision should be applied to new applications. He concluded his talk with an example for this last point, where he showed an application of multi-target tracking on a sample of stem cells, comprising thousands of targets with very indiscriminate appearances. This seemingly ‘standard’ application of computer vision proved to be of ultimate help to stem cell researchers, as they are now able to study cell movement with previously unthought-of detail.



Takeo Kanade (left) talking about not only two, but a thousand cameras, and (right) presenting his Computer Vision Challenges and Opportunities.

Sebastian Thrun, famous for winning the 2005 DARPA grand challenge, presented his recent work with Google. The street views collected comprise nearly a petabyte of data and will pose the world's largest SLAM problem once Africa, South America and Asia are fully covered.



Sebastian Thrun and Hugh Durrant-White after the keynote talk.

The database now contains around 300 million images, which equals roughly fifteen times the images a young adult has seen. He then posed his “Machine Learning Grand Challenge”, requiring that methods scale to large data sets in a computational way with constant time per item processed, and in an operational way that minimises manual labelling.

To the joys of conferences belong the reception and banquet. Whereas the reception was held very conventionally in the conference centre with a marvellous view over the mountain ranges encircling Anchorage, the banquet was highly linearised. All 1600 attendants of the conference were set into a train which took a five-hour tour into the mountains, to the nearest glacier. The advantage was ease of access to all participants and people flocked for discussions all along the train. After some hours on the way back, many researchers could be found sleeping in their seats, overwhelmed by the long day or the Alaskan beverages.



The linearised banquet carrier.

All these aspects made the ICRA conference definitely worth a visit for people from the field of computer vision. It is great to see how the maturity of vision makes a great addition to the sensors used in robotics, and how the use of machine learning makes the systems ever more versatile and robust. Whereas some of the vision papers presented could be called ‘applications oriented’ (see editorial 12/2009), it also shows how different technologies converge to achieve something much bigger. The setting of the conference was great, and wildlife could be found already on a cycle trip around Anchorage, making extensions to the conference stay very rewarding. It is one of the benefits of academia that it takes you places, as the journey there was very arduous, and it is questionable if Alaska belonged to the top travel targets of the attendees. Accessibility will be much better next year, as the following ICRA will be held from 9–13 May 2011 in Shanghai. Note that the paper deadline is 15 September 2010.



(left) Anchorage welcomed all conference attendees, human or not. (right) Wildlife abounds.

I would like to thank the BMVA for their generous bursary to support this journey.

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## BMVA Summer School 2010

An annual Summer School on computer vision is managed, arranged and publicised by members of the BMVA. Speakers on the Summer School are academic researchers or experienced practitioners from industry.

This year's Summer School will be held at the Digital Imaging Research Centre of Kingston University during 12–16 July 2009. The course is residential and will cost £500.

The course is intensive and is aimed at postgraduate students in the fields of Computer Vision, Pattern Recognition and Digital Imaging. The Summer School has been running for over a decade and is updated every year to ensure it covers the state of the art, broadens awareness of related research fields, and develops research skills.

This year's programme is as follows:

### *Monday 12 July*

Image Formation – Tim Ellis  
Colour Perception and Image Processing – Maria Petrou  
Posters

### *Tuesday 13 July*

Biological Vision – Keith May  
Low-Level Vision – Roy Davies  
Lab: Matlab – Barry Theobald  
Introduction to Quantitative Probability – Paul Bromiley  
Image Modelling – Simon Prince

### *Wednesday 14 July*

Local Feature Descriptors – Krystian Mikolajczyk  
Motion Tracking – Eng-Jon Ong  
Lab: OpenCV – Dimitrios Makris  
Shape and Appearance Models – Jim Graham  
Structure from Motion – Lourdes Agapito

### *Thursday 15 July*

Texture – Mike Chantler  
Machine Learning for Computer Vision – Toby Breckon  
Robot and Real-Time Vision – Andrew Davison  
From Lab to Real World – Andrew Fitzgibbon  
Summer School Dinner

### *Friday 16 July*

Performance Evaluation – Adrian Clark  
Vision Algorithmics – Adrian Clark

For further details and registration, please point your web browser at:

<http://bmvaschool.kingston.ac.uk/>

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## The Science Media Centre

I thought it would be useful if I reported on a meeting I recently attended arranged by the Science Media Centre. This organisation, funded by a range of worthy institutions including the Royal Institution and EPSRC, exists to try to ensure that scientists are able to provide accurate, evidence-based scientific information to the public. It does this in three ways: first, and most importantly, it maintains a categorised list of scientific authorities to whom the media are directed for information and opinions on situations. Second, it produces fact sheets on issues of topical interest (so journalists can't claim they haven't been told the basics); and third they organise seminars ('press briefings') to give journalists deeper understanding of matters of current import.

To support the entry of scientists into the media, they act as a cut-out to ensure that the scientists don't end up being cold-called by people claiming to be journalists when stories break, and provide training on how to deal with the press. The meeting I attended was of this type; it was most interesting, with a mixture of their officers, journalists and scientists, all talking about their interactions and expectations of other parties. Case

studies were presented, showing that as well as trying to fire-fight the instincts of the Daily Mail science correspondent, they can also facilitate longer-term, more positive stories. An example given was a recent overhaul of medics' prescribing training, initially occasioned by some over-reported comments by a senior academic physician. While the vast majority of the speakers are perhaps inevitably connected with human or environmental sciences, they were at pains to point out that they were also interested in technology and the physical sciences. As evidence of this, I note that Professor Sir Mike Brady is listed as a member of their Science Advisory Panel, and that their most recent press briefing concerns electric vehicles.

Their web-site ([www.sciencemediacentre.org](http://www.sciencemediacentre.org)) includes contact details for joining their source list. They were at pains to point out they do not merely want 'boring professors' to join the list. Perhaps because they do not naturally think in terms of signal detection theory, they did not explain explicitly which of the other three categories were preferred. However, I got the impression that this was meant to be a statement of indifference to academic rank rather than to the ability to hold attention. I suggest that as many BMVA members as possible should join up – regardless of whether they hold chairs (I don't think any of them are boring).

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## Book Review

### State-of-the-art techniques in image texture analysis

*Handbook of Texture Analysis*, Majid Mirmehdi, Xianghua Xie, Jasjit Suri (eds.), Imperial College Press, 2008, ISBN-13 978-1-84816-115-3 or ISBN-10 1-84816-115-8

It has been widely accepted by the computer vision and image processing community that textural information is an important feature in analysis of images for the purpose of segmentation, classification, and synthesis. However, how to generate image descriptors to represent textural information becomes vital and has been receiving significant interest from the research community. This book well presents techniques used in image texture analysis, from basics to the state of the art. The application areas covered in the book cross a wide range of image analysis, from microscopic images to satellite images, from classification to synthesis, and

much more. It is a good handbook for researchers in the area of computer vision and image analysis, and is also suitable for postgraduate teaching as a reference in courses on digital image processing related subjects. The collection of references at the end of each chapter is also invaluable for researchers surveying the literature.

The book is comprised of 13 chapters. Chapter 1 begins with a general introduction to texture analysis, in which a comprehensive review is conducted to some of fundamental techniques developed in the field. In Chapter 2, texture modelling and synthesis are presented, where texture modelling approaches are broken down into four classes, i.e. statistical, spectral, structural, and stochastic methods. Milestones in texture synthesis are reviewed in the order of the years when the algorithms were developed.

Chapter 3 presents novel texon-based representations which are suited to modelling the joint distribution of intensity values over extremely compact neighbourhoods. This resolves issues of texture classification from single images obtained under unknown viewpoint and illumination. In this chapter, the Microsoft textile database is used in testing. This is one of the first attempts at studying non-planar textures and therefore represents an important step in the evolution of the texture analysis problem.

It has been recognised that random textures are more difficult to deal with than regular textures. Chapter 4 develops a statistical model, called texems, to represent and analyse random textures. The model is learnt across scales and can characterise a family of images with similar visual appearance. Testing is conducted firstly for novelty detection in quality inspection, and then for general image segmentation.

A colour image segmentation framework is presented in Chapter 5. A compound image descriptor is developed to combine colour and texture information in an adaptive fashion. It has been successfully applied to the segmentation of natural images, medical imaging and product inspection.

The growth of computational power of desktop machines has permitted further advances in the theoretical study of 3D texture analysis. Chapters 6–8 in this book are dedicated to reflecting the extent of these advances. Chapter 6 develops a theoretical model of the surface-to-image function to show that sidelighting acts as a directional filter of the surface height function, and linear texture features may be expressed as functions of lighting slant and tilt angles. Chapter 7 discusses 3D image texture related to the illumination of rough surfaces, which provides cues about the light field and the surface geometry. Using image texture derived local

estimates of illumination orientation, the global structure of the illuminance flow for 3D objects is determined for many subsequent inferences from the image, such as shape from shading. Some interesting psychophysical studies are quoted in the research. In Chapter 8, texture-based appearance modelling is attempted. In contrast to traditional appearance models which may be constructed by simple shading models applied to known or estimated surface geometry, the newly developed approach is based purely on image texture as a function of viewing and illumination directions and is capable of recognising human skin with fine-scale geometric detail.

Taking video sequences that exhibit certain temporal regularity properties, Chapter 9 describes a modelling framework from which the global statistics of images are modelled with regard to ‘dynamic textures’, such as sea-waves, smoke, talking faces, flags in the wind. In Chapter 10, texture synthesis is revisited based on a hierarchical texture description. The composite texture model includes two levels, one for texture label maps, and the other containing subttextures. The synthesis starts by creating a virtual label map which is subsequently filled out by the corresponding subttextures.

Chapter 11 presents a detailed case study of the trace transform which consists of tracing an image with straight lines along which certain functionals of the image function are calculated. It firstly reviews the trace transform from a theoretical and application point of view, and then shows its implementation in practice. The concept of ‘triple feature’ is introduced and ensures that the algorithm is invariant to rotation, translation, scaling or affine transforms of the imaged object. The other case study is presented in Chapter 12 to address issues of face analysis using local binary pattern (LBP). LBP texture operator has become an extremely useful tool in various applications. In this chapter, the authors describe the way of easily deriving efficient LBP-based face descriptions which combine into a single feature vector of the global shape, the texture and eventually the dynamics of facial features. Excellent performance is demonstrated in the testing of face and eye detection, face recognition and facial expression analysis.

Chapter 13 overviews the area of image texture analysis, and lists 42 texture features available in the literature and popularly used in practice based on four categories, viz. statistical features, structural features, signal processing-based features, and model-based features. Brief feature extraction methods and their potential applications are also presented therein.

As mentioned in the preface, the works presented in this book are from some of the most prominent international researchers in the field of texture analysis. In reading

the book, especially for a new practitioner, it may be helpful to start with Chapter 13, with which a general picture would be drawn for image texture analysis. Based on this, readers could choose chapters which are interesting to read. I strongly recommend the book and hope that readers will find it as useful as I did while reviewing it.

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## Report on Aerial Image Analysis and Classification Meeting

This BMVA meeting was held on 12 May at the BSC in London, and was chaired by Toby Breckon from Cranfield University. It covered a wide variety of topics from object recognition through aerial image classification to vision-based vehicle control and showed utility of computer vision in different domains. Speakers discussed imagery issues considering platform (UAV, satellites) as well as the application of their research.

A lot of attention has been directed towards the semantic segmentation and classification techniques. The first speaker S. Klukner (Graz University of Technology) presented an urban environment classification method which uses low-level features and also height information; the descriptors represented by Sigma Points are classified using a binary tree forest. Another highlight of the program was the work presented by A. Clark (University of Essex) aiming towards the application of genetic programming for land surveillance methods so that it could be deployed by a non-technical person: the first few frames from a surveillance video would be used as training examples so that classification on the rest of the data could be achieved.

Apart from academic speakers there were three presentations given by the industry researchers whose work mostly focused on mosaicing and geolocation. E. Turkbeyler (Roke Manor Research) demonstrated the results of constructing a mosaic with moving track information shown on it, where the data was gathered from an airborne platform flying over an urban area. In addition the accuracy of the mosaic and movement map was shown to be improved by using GPS information. J. Morris (2D3) also touched upon the question of improving the geolocation accuracy by means of bundle adjustment and key framing for real time.

Finally a space-based application of image-based localisation was presented by A. Shaw (SciSys) – a balloon aerobot, with a target Martian deployment environment, needed autonomous navigation. This was achieved using techniques for constructing and updating a 3D model of the surface together with constant estimation of position so that only non-redundant information is transmitted further back to Earth.

Overall this meeting was very successful; it was an opportunity for sharing the ideas in the field of remote sensing and aerial surveillance. Although the use of small-scale UAVs as platforms for such image processing applications is a relatively new area, there have been a few successful demonstrations of its capability and strong possibilities for future progress. Certainly the community working in this area will grow over in the coming years, hopefully making it possible to organise future BMVA events to report advances in this domain.

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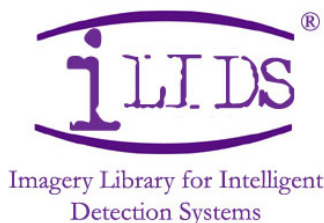
data. The first set of footage was released in 2006 and contains over 250 hours of annotated footage in specific scenarios. The following year, the HOSDB began to objectively evaluate the performance of commercially available video-based detection systems against these scenarios, establishing a performance standard. Additionally, a Multiple Camera Tracking Scenario was added to the library. This dataset comprises of 140 hours of footage across 5 cameras and comes complete with frame-based bounding box annotation.

The i-LIDS Team are busy preparing a new dataset concentrating on different imaging technologies for use with video analytics and hope to release these datasets later in 2010. We shall keep you up to date through the BMVA when this dataset is planned for release. For more information and for any questions about the project please email the team at [i-LIDS@homeoffice.gsi.gov.uk](mailto:i-LIDS@homeoffice.gsi.gov.uk) or leave a voice message at 01403 21 3823.

<http://scienceandresearch.homeoffice.gov.uk/hosdb/>

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## i-LIDS Datasets now cost 75% less!



The HOSDB has appointed a new distributor for its library of i-LIDS imagery datasets. The new distribution contract means that i-LIDS datasets are now available for a new significantly lower price, with one dataset now costing just £162. There is a further 10% discount to academic institutions and further discounts for orders of more than one dataset. Please visit [www.ilids.co.uk](http://www.ilids.co.uk) to find full price listings and to download an application form.

The i-LIDS (Imagery Library for Intelligent Systems) Project focuses on developing real world CCTV video footage that can be provided to researchers and commercial developers of video-based detection systems. Working in partnership with the Centre for the Protection of National Infrastructure (CPNI), the purpose of providing this data is to promote the innovation within these security applications and to allow systems to be developed using robust, real world

## Formatting Articles for BMVA News

The important thing to remember about formatting articles for BMVA News is that the *first* thing I do when I receive an article is to reduce it to text and pictures: I then reformat it by hand to get it into the proper house-style. So any effort authors put into formatting is entirely wasted. Well, that's the basic idea. However, it is good to ensure that the article is presented in a way that will please the author, so it can *also* be helpful to have a .pdf file showing the author's preferred layout.

The other factor is getting any pictures in the right format. Here I prefer to have undoctored .jpg files, which I can then trim and edit myself, to fit into the available space. It can be a pain to have .jpg files embedded in Word, as extracting them – e.g. for additional compression – can be tedious. So my ideal author is one who sends me plain text plus .jpg files, plus a .pdf file if there could be a risk of my misinterpreting what is wanted.

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## Summer School on Biometrics

The 7<sup>th</sup> International Summer School for Advanced Studies on Biometrics for Secure Authentication took place in Sardinia, Italy early in June. The school was hosted by hotel Capo Caccia, near Alghero, considered one of the most beautiful resorts in the Mediterranean Sea. The location of the hotel and the wonderful surroundings makes it a perfect place for a summer school.



View from Capo Caccia hotel

This year the focus of the school was on:

- how to exploit new technologies in forensics and in security application at a distance;
- identity management in new and emerging multimodal biometric technologies;
- standardisation, evaluation and assessment of biometric applications.

There were 46 pre-selected and highly motivated participants from more than 20 countries. The lectures were delivered by 20 well-known experts in the field of biometrics and forensics from academia and industry. The course provided an in-depth picture of the state of the art in biometric technology, from theoretical and practical points of view. However, the lectures were much more than literature reviews. Novel ideas and challenges were discussed and possible future directions were proposed. The lectures inspired many interesting and intellectually stimulating discussions outside the classroom. Industry and government perspectives on biometrics helped me to get a more comprehensive understanding of the field.

All participants had the opportunity to present their work in the form of a poster or oral presentation and to get a valuable feedback from experts.

The schedule was intense but the diverse range of topics combined with a number of leisure activities contributed to a very positive and worthy experience for everyone.



Boat trip around the island

Apart from the unique educational experience, the event proved to be a great networking opportunity. All PhD students and post-docs were encouraged to discuss collaboration with the lecturers. The lecturers could supervise the work at a distance or during short visits.



View of the bay where the hotel is situated

I learned a lot, established important contacts and had a great time. Therefore, I highly recommend the school to everyone working in the field of biometrics, especially students in the initial stages of a PhD.

Further information can be found on the school's official website, <http://biometrics.uniss.it/>.

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## The Imaging Science Journal – Call for Papers<sup>2</sup>

The Imaging Science Journal is published by Maney Publishing ([www.maney.co.uk](http://www.maney.co.uk)): the Editor-in-chief is Professor Ralph Jacobson, University of Westminster, UK ([ralph.jacobson@rps-isg.org](mailto:ralph.jacobson@rps-isg.org)).

*The Imaging Science Journal* covers exclusively both fundamental and applied scientific aspects of imaging. The content of the journal includes most areas of activity concerned with conventional, analogue chemical, electronic, digital and hybrid imaging systems. Within the context and scope of the journal the term imaging is taken to mean: the recording and visualisation of information extracted from radiation of any kind, emitted from, reflected by, or otherwise affected by an object.

Main areas of focus include:

- Aerospace imaging
- Colour reproduction
- Digitisation and storage
- Forensic imaging
- High speed imaging
- Holography and 3-D imaging
- Image quality
- Image security
- Machine vision
- Medical imaging

The journal publishes original research papers, critical assessments/reviews (4000–5000 words plus figures and tables) and technical notes (1000–1500 words and max. four figures and/or tables). All contributions are peer reviewed before publication.

Contributions to the journal should be submitted online at <http://ims.edmgr.com>.

View the Instructions for Authors via the journal home page at [www.maney.co.uk/journals/ims](http://www.maney.co.uk/journals/ims).

Contact Naomi Asantewa-Sechereh, Managing Editor ([n.asantewa@maney.co.uk](mailto:n.asantewa@maney.co.uk)) for more information.

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<sup>2</sup>I am including details of this journal because it will sometimes be relevant for machine vision – especially for those readers involved in novel image modalities – Ed.

## Books for Review

The following books are on offer for review. As always, they will be sent out on a first come–first served basis, so please contact me immediately if you would like to review either of them. (If you are doubtful, go for the *quick view* option, and then return the book to me if you feel you are unable to do the review after all.)

### Seeing

*Seeing – The Computational Approach to Biological Vision* by John P. Frisby and James V. Stone. MIT Press, second edition, May 2010, 576 pp., £38.95, paper, 978-0-262-51427-9

Seeing has puzzled scientists and philosophers for centuries and it continues to do so. This new edition of a classic text offers an accessible but rigorous introduction to the computational approach to understanding biological visual systems. The authors of *Seeing*, taking as their premise David Marr’s statement that “to understand vision by studying only neurons is like trying to understand bird flight by studying only feathers,” make use of Marr’s three different levels of analysis in the study of vision: the computational level, the algorithmic level, and the hardware implementation level. Each chapter applies this approach to a different topic in vision by examining the problems the visual system encounters in interpreting retinal images and the constraints available to solve these problems; the algorithms that can realize the solution; and the implementation of these algorithms in neurons.

*Seeing* has been thoroughly updated for this edition and expanded to more than three times its original length. It is designed to lead the reader through the problems of vision, from the common (but mistaken) idea that seeing consists just of making pictures in the brain to the minutiae of how neurons collectively encode the visual features that underpin seeing. Although it assumes no prior knowledge of the field, some chapters present advanced material. This makes it the only textbook suitable for both undergraduate and graduate students that takes a consistently computational perspective, offering a firm conceptual basis for tackling the vast literature on vision.

### Image Processing

*Image Processing: The Fundamentals*, by Maria Petrou and Costas Petrou. The second edition of this book has just been published by Wiley.

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## V&L Net: EPSRC Network on Vision and Language



V&L Net is an EPSRC-funded network that aims to create a forum for researchers from the Computer Vision (CV) and Natural Language Processing (NLP) fields to meet and exchange ideas, expertise and technology. The UK has some of the world's leading researchers in language processing and computer vision. V&L Net aims to tap this body of expertise to create new strategic partnerships aimed at narrowing the language-vision gap by developing the theory required for solutions to the difficult challenges posed by an increasingly multi-modal world.

The over-arching unifying goal in V&L Net is to create a new interdisciplinary vision-language research community. More specifically, the main objectives are:

1. to create a forum for researchers from computer vision and language processing to meet, exchange ideas and form new partnerships, where the forum has a real-world dimension in the form of events and meetings, as well as a virtual dimension in the form of online forums, tools and other resources;
2. to foster new interdisciplinary research targeted at bridging the semantic gap between language and image/video, and developing strategies for mapping between the two;
3. to pump-prime new collaborations between researchers (including industrial partners) aimed at producing project proposals on V&L Net topics by providing small-scale support for proposal development;
4. to engage leading researchers in NLP and CV in a road-mapping initiative and a series of white papers to provide guidance and direction to research efforts;
5. to create electronic tools to support the above, including a website, mailing list and diverse other resources.



V&L Net organisers Anja Belz and Dimitrios Makris pose at the kick-off meeting before engaging in serious analysis of the breakout session summaries.

A range of activities are planned, such as an annual meeting of the network, workshops and symposia on the synergy of the two research areas, research collaboration meetings, etc. At the same time, the network intends to develop the infrastructure that will support the joint activities of researchers from the two fields, such as a series of white papers, a mailing list, a repository of software tools and data, etc.

The network is managed by the steering committee:

#### Network Coordinators:

Anja Belz, University of Brighton  
Dimitrios Makris, Kingston University

#### Network Mentors:

Yiannis Aloimonos, University of Maryland, US  
Roy Davies, Royal Holloway, University of London  
Kathy McKeown, Columbia University, US  
Yorick Wilks, University of Sheffield

#### Other members (including co-opted members):

Darren Cosker, University of Bath  
Yannis Goulermas, University of Liverpool  
Frank Keller, University of Edinburgh  
William Smith, University of York  
Khurshid Ahmad, Trinity College Dublin, Ireland  
Mark Everingham, University of Leeds  
Katja Markert, University of Leeds  
Kalina Bontcheva, University of Sheffield

For up-to-date information and to apply for membership, visit <http://www.vlnet.org.uk/>

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## Temporal Pattern Learning and Recognition – Call for Participation

This one-day BMVA technical meeting will be held in London on 22 September 2010.

Chairs: Andrew Gilbert and Eng Jon Ong, University of Surrey

<http://www.bmva.org/meetings>

The learning of temporal-based patterns has seen a large increase in interest within the last few years. Significant interest has been driven through the potential in applications where major events can be detected by recognising specific actions or patterns, for example, the scoring of a goal, people hugging, or some furtive behaviour in a surveillance image. Additionally, there is increasing interest in expression and gesture recognition for use in affective computing systems. All these bring about the need for automatic video analysis and the recognition of events that are inherently temporal in nature.

Much of the progress has been made through incorporating ideas from single frame object recognition and adapting them for temporal-based action recognition. However this might not provide an optimal approach in terms of speed or accuracy. One exciting and relatively untapped area of research that may offer potential solutions to the above issues is that of data mining. Particularly useful to the task of learning and recognising temporal patterns is research in sequential pattern mining.

This meeting aims to highlight and thus seek papers on recent state-of-the-art learning and recognition methods of various types of temporal visual patterns (e.g. gesture, action recognition, etc. ...). In addition to this, we also seek work in the field of data mining, in particular that of sequential pattern mining for recognition of temporal patterns. Areas of interest include the following:

- Sequential Pattern Mining
- Feature Extraction for Recognition
- Gesture Recognition
- Automated Visual Lip-reading
- Activity and Action Recognition
- Gait Analysis and Classification
- Fusion methods for Recognition
- Facial Expression Analysis and Recognition
- Non-verbal Cue Analysis
- Sign-language Recognition
- Behaviour and Scene Analysis

Other topics within the broad domain of temporal pattern learning will also be considered for inclusion.

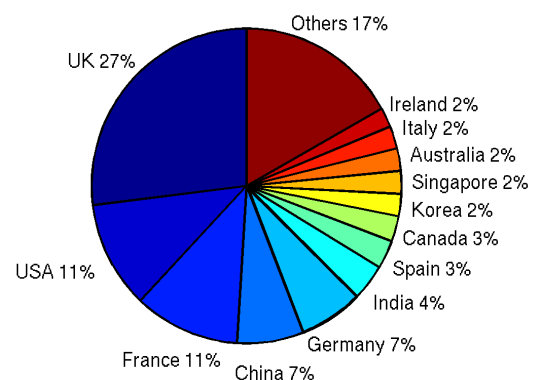
Please submit an extended summary of about one page A4 (max. 2 pages) – PDF preferred. Send Abstracts by email attachment (5Mb max.) to Andrew Gilbert by 14 July 2010.

Andrew Gilbert  
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## BMVC 2010 – Registration Open!

BMVC 2010 will provide an exciting programme, consisting of a tutorial, two keynote speeches, oral and poster presentations of accepted technical papers, and a postgraduate workshop for UK students.

The tutorial will take place on the morning of Tuesday, 31 August and will be delivered by Simon Prince of University College London on “Subspace methods and dimensionality reduction in computer vision”. Professor Martial Hebert from the Robotics Institute, Carnegie Mellon University, USA, will give a keynote speech on “Representations for object and action recognition”. Professor Jean Ponce of INRIA, France, will provide the other keynote speech on “Sparse coding and dictionary learning for image understanding”. All the oral presentations will be filmed and put onto the conference website. The posters will be displayed throughout the conference to provide ample opportunities to explore those of interest. The UK Postgraduate Workshop will follow after the main conference on 3 September.



The technical programme consists of 30 papers accepted for oral presentations and 86 papers for poster presentations. This gives BMVC 2010 an overall acceptance rate of 33%, or 8% for oral presentations from 345 submissions – an increase of 6% on the

submissions to last year's conference. Papers were submitted from all around the world: only 27% of them came from the UK, proving once again that BMVC is truly international! This is well illustrated by the graphic below.

Registration is already open. Final camera-ready submissions are due on Tuesday 27 July.

This year, BMVC is happening in the seaside town of Aberystwyth. Aberystwyth enjoys one of the most spectacular locations of any British university. It is set in beautiful unspoilt scenery on the shore of Cardigan Bay. The beach has consistently been awarded the EU blue flag for cleanliness. The landscape, flora and fauna in the Aberystwyth area are quite outstanding. Several sites of special scientific interests are close to Aberystwyth. Red kites regularly fly over the campuses and bottlenose dolphins can be seen offshore.

As well as being easy on the eye, the area provides a wide range of recreational activities and great days out. As a major tourist centre, Aberystwyth has a wealth of restaurants and good places to eat and plenty of general activities and facilities.



The above pictures are reproduced by permission of Janet Baxter and Aberystwyth University.

### UK Postgraduate Workshop

A 1-day student workshop is to be co-located with BMVC 2010 on Friday 3 September, immediately following the main conference. Three showcases will be given by Lubor Ladicky from Oxford Brookes University, Joe Kilner from Surrey University and Qi Pan from Cambridge University. For submission and other details, see the workshop website at <http://bmvc10.dcs.aber.ac.uk/index.php/workshop>.

More information about the conference can be found at <http://bmvc10.dcs.aber.ac.uk>.

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### Report on Microscopy Image Analysis for Biomedical Applications Meeting

On 21 April, a one-day BMVA symposium on Microscopy Image Analysis for Biomedical Applications was held at the BCS in London. In spite of the volcanic ash incident, a full room welcomed Darren Treanor, consultant pathologist at the Leeds Teaching Hospitals NHS Trust, who opened the meeting with an invited talk that provided a pathologist's perspective on image analysis, while emphasising the need for better bridges with computer scientists. This talk touched on such interesting aspects as lack of standardisation in the creation of virtual slides, varying quality of data used as ground truth, limited reliability of semi-quantitative algorithms, and problems associated with automatically generated mark-up images.

The afternoon session opened with a second invited talk, this time by Kate Lillard-Wetherell of Aperio Technologies, Inc., who offered a comprehensive overview of the application of Aperio image analysis products to different fields of research involving whole-slide imaging, such as neuroscience, oncology, ophthalmology, and the study of diabetes. The speaker described the evolutionary computation software system Genie Pro for automatically labelling regions of tissue and finding objects in whole-slide large-scale images.

Besides the two invited talks, the meeting included eight presentations, two of which addressed the detection of cell nuclei. Ji Wan Han (Cranfield University) applied SVMs to detect cell nuclei over varying densities, scales,

types and stains. The average detection rate (sensitivity) was about 90% and false positives corresponded to only 0.3% of the detected nuclei. In turn, Kamila Hussien (University of Oxford) described a technique to automatically segment nuclei of adherent cells from bright field microscopy images. The method used pre-segmented cell boundaries to constrain the search for nuclei, and applied Continuous Intrinsic Dimensionality to identify homogeneous nuclear regions.

Other talks focused on the detection of larger structures. Boguslaw Obara (University of Oxford) presented an algorithm for tracing curvilinear structures in live microscopy images. The tracing approach was based on the detection of local variations of intensity across the traced curve, and was tested for the detection of microtubules, characterisation of flagella in sperm cells, and modelling of fungal networks. Simon Li continued a strong presence from the University of Oxford, presenting a novel multi-region level set method for segmenting cells in a clump, which can operate in the absence of clear boundaries. The method used the watershed transform to obtain initial inter-cell boundaries based on the previously segmented nuclei in a clump, and then used a multi-phase level set to refine the boundaries. In turn, Vijayashankar Sethuraman (University of Nottingham) offered the sole incursion of the meeting into the plant kingdom, describing a method for segmentation and tracking of networks of *Arabidopsis thaliana* cells in confocal laser microscope images. The method combined recently developed network snakes with a multi-target particle filter-based tracker to efficiently track cell locations in the network of cells across successive image frames.

In addition to the talk by Sethuraman, two other interesting presentations discussed applications to confocal microscopy images. Eleftheria Panagiotaki (UCL) applied the marching cubes algorithm to construct detailed three-dimensional mesh models of tissue microstructures using Confocal Laser Scanning Microscopy images of brain white matter. The 3D mesh model was then used to synthesise diffusion MRI data through Monte-Carlo simulations. Mohammad A. Dabbah (University of Manchester) presented an automated system that detected nerve fibres from Corneal Confocal Microscopy images for quantification of Diabetic Peripheral Neuropathy. They developed a foreground-background dual model algorithm to identify the low-contrast fibrous structures by making use of the predominant local orientation of nerve-fibres.

Telmo Amaral (University of Dundee), reported on the analysis of breast tissue microarray spots subjected to nuclear immunostaining. The classification of spots into four main types was based on a bag-of-features

approach, whereas their scoring employed a pixel labelling technique followed by ordinal regression.

A poster session was held during the lunch break, featuring a total of ten posters representative of research groups across the whole of the UK (including England, Wales, Scotland, and Northern Ireland), and also from France and China. This session covered various topics of microscopy image analysis, including segmentation, detection, pattern recognition, and feature extraction, as well as an introduction to the OMERO platform for visualising, managing, and annotating biological image data.

In conclusion, the symposium has revealed the fast-growing research field of automated microscopy image analysis for biomedical applications by applying computer vision and machine learning techniques. It provided a very pleasant setting to promote informal contact within the community of researchers in the UK, with valuable glimpses from pathologists' and commercial perspectives, and we certainly look forward to future editions.

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## STOP PRESS

### Simple disguises can confuse face detection algorithms<sup>3</sup>

Student Adam Harvey has found that face detection algorithms can often be thrown off by using makeup or simple masks. For more details see:

[http://www.theregister.co.uk/2010/04/22/face\\_detection\\_hacking/](http://www.theregister.co.uk/2010/04/22/face_detection_hacking/)

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### Cause for celebration

It's BMVA's *China Anniversary*!

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<sup>3</sup> It often takes only a change of a girl's hairstyle to confuse me – Ed.