

BMVA News

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

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Editor: Professor Roy Davies
Department of Physics
Royal Holloway, University of London
Egham, Surrey, TW20 0EX
tel: +44(0)1784 435064
email: e.r.davies@rhul.ac.uk

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

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 10 September 2014.

whereas the human baby is unable to focus its eyes properly for over a week or to understand much of what it is seeing for well over a month. Second, for quite some time it seems only to focus on faces at a distance of around 40 cm, and there is little evidence that its vision is anything other than 2D: probably it has no concept of the 3D world for something like 2 months. Apparently, it first consolidates its 2D vision and then gradually enlarges the depth at which it sees and recognises things. It seems to me that vision develops for a considerable time under weak perspective projection (PP), gradually increasing depth and scaling, still under weak PP, until stereo vision is activated quite late in the day, only moving on to full PP at 3–4 months.

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Baby Eva grappling with full perspective projection at 15 weeks

Editorial: *Binocular Vision – from Impediment to Advantage*

Having recently had the good fortune to be able to watch the development of a tiny child from birth to almost five months, and having had more time to wonder about it than I had even for my own children, I have found it all extremely fascinating. First, many mammals can stand on their own feet and understand the world within minutes of being born,

At the same time I find myself wondering how much of all this is hard-wired in advance and how much is learnt as time goes on. Babies have a narrow field of attention and a short span of concentration, but importantly saccades are there from the beginning – so they are hard-wired, but are rather randomly activated. In fact a lot of what a baby sees and does appears to be random. Limbs move erratically, with sudden bursts of kicking and arm-waving, but even at 4 months the baby seems to have little knowledge that it is the owner of these excrescences and has extremely limited control over them. Indeed, the reality is that it gradually has to learn to correlate limb movements with what it sees, and these movements need to be random to maximise the rate of learning. In fact, it is obvious that if the limbs didn't move

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at all, correlations couldn't be made and learning would be impossible, but how obvious is it that random movements lead to optimal learning? Well, actually certain artificial neural networks are normally initialised randomly and of course RANSAC also incorporates random learning. However, strategic would be better than random if the right strategy could be found (though there is always the possibility that it would appear random to an observer!).

Interestingly, in the brain everything is done by hard wiring, with learning being achieved by adjusting neuron wiring – old connections being broken, new ones generated – so what is the difference between hard and soft wiring? Probably, gross brain structures are nearly unchangeable – such as the optic nerves, the layers of the visual cortex, the lateral geniculate nucleus, and so on. So saying that saccades are hard-wired is not inconsistent with their being implemented by permanent structures such as the frontal eye field (FEF) of the visual cortex.

The other thing that is wondrous is the baby's capability for rewarding adults by smiling at them from about 6 weeks onwards. However, babies are quite indiscriminate about whom they smile at, and maybe they are not recognising faces so much as *detecting* them, and smiling at any face that presents itself! It could be that this is a hard-wired response that ensures that they are properly cared for by anyone available in the tribe. And why would an adult bother with an infant unless there is such a reward? Odd that I never feel I am being controlled or manipulated by a baby of that age: it is only later on that it throws toys out of the pram to attract attention and becomes a potential bother.

Meanwhile, am I right that babies don't master stereo vision until later? Here I can only speculate that so much of 3D vision is achievable without binocular vision that it is something the baby mind can manage without for quite some time. Indeed, considering the complexity of the connections needed to compute depth information, it is arguably an impediment to have to cope with such computations, and better to defer that aspect for a month or two. In fact, I have long wondered whether binocular vision is much of an advantage for computer vision. While binocular vision is a great help to the adult for examining nearby objects, it is of little use to cricketers or tennis players who have to react to an oncoming 100 mph ball when it is 20 yards away – before it leaves the bowler or the racquet: after that moment it is already too late for a conscious response to be made.

Examining the matter further, I wonder whether it was an accident that the first animals had two eyes: why for example did they have two lungs and one heart, or two kidneys and one liver, other than because of the vagaries of evolution? Nevertheless, perhaps the real reason for having two eyes was because of the need for redundancy to provide a measure of protection against injury. Anyway, there must have been a battle to overcome the confusion caused by two slightly differing images. At that stage the confusion would have been more important than the potential gain that subsequently emerged by capitalising on the by then available matched pair of channels.

Professor Roy Davies
Editor, BMVA News
email: e.r.davies@rhul.ac.uk

BMVC 2014 – Call for Participation



The British Machine Vision Conference (BMVC) is one of the major international conferences on machine vision and related areas. Organized by the BMVA, the 25th BMVC will be held at the University of Nottingham, UK, 1–5 September 2014. Professors Luc van Gool (ETH Zürich, CH) and Fei-Fei Li (Stanford University, US) will be giving keynote speeches on 2 and 3 September respectively.

Authors are invited to submit full-length, high-quality papers on topics in image processing and machine vision. Papers covering theoretical and/or applied work on computer vision are invited. All papers will be reviewed double blind, normally by three members of our international programme committee. Reviews will judge submissions on originality, empirical results, quality of evaluation, and presentation.

Topics include, but are not limited to:

- Statistics and machine learning for vision
- Stereo, calibration, geometric modelling and processing
- Face and gesture recognition
- Early and biologically inspired vision
- Motion, flow and tracking
- Segmentation and grouping
- Model-based vision
- Image processing techniques and methods
- Texture, shape and colour
- Video analysis
- Document processing and recognition
- Vision for quality assurance, medical diagnosis, etc.
- Vision for visualization, interaction, and graphics
- Object detection and recognition
- Shape-from-X
- Video analysis and event recognition
- Illumination and reflectance.

Note that BMVC is a single-track meeting with oral and poster presentations and will include two keynote presentations and two tutorials.

Workshops

Two workshops will be organised during BMVC 2014 – the Doctoral Consortium and the second Large Scale Visual Commerce workshop. For full details of these, see the BMVC 2014 website.

Key dates

14 July	Deadline for camera-ready versions of papers
1–4 Sept	Conference
5 Sept	Workshops

Organising Committee

BMVC 2014 is hosted by the Computer Vision Laboratory (CVL) at the University of Nottingham.

- General chairs: Dr Michel Valstar, Dr Andrew French, Professor Tony Pridmore
- Conference Management Chair: Dr Susannah Lydon
- Student Workshop Chair: Dr Peter Blanchfield
- Web Chair: Dr Michael Pound.

Further details of all aspects of the conference can be found on the BMVC 2014 website:

<http://bmv2014.cs.nott.ac.uk/>

Dr Michel Valstar
University of Nottingham
email: michel.valstar@nottingham.ac.uk

BMVA Distinguished Fellow 2015 – Call for Nominations

The BMVA Executive Committee seeks nominations for the *Distinguished Fellow 2015* award. This prestigious award is given to one person only each year in recognition to his/her services to the British Machine Vision community. The nominees must be distinguished researchers, based in the UK, who have contributed significantly to the field of research and the reputation of the British Machine Vision Community both nationally and internationally. Nominations, *with a few lines of rationale*, should be sent to Professor Roy Davies, Chair of the Distinguished Fellow Award Panel, by 1 September 2014.

Professor Roy Davies
Chair, Distinguished Fellow Award Panel
email: e.r.davies@rhul.ac.uk

Travel Bursaries for International Conference Attendance

The BMVA provides a number of travel bursaries for student members of the BMVA who are research students at UK institutions to present their work at significant international conferences within the BMVA's remit. The maximum amount of a bursary is £750. In return for the bursary, students are asked to write a conference report for BMVA News – most of the conference reports you read in these august pages are from students who have received bursaries – or do some work for the BMVA website. Details on eligibility and the application procedure are outlined on the BMVA website.

Dr Adrian Clark
BMVA Chair
email: alien@essex.ac.uk

Success at Manchester University!

Researchers at the University of Manchester have been awarded Leverhulme Trust funding for “Quantitative Use of Pattern Recognition in the Analysis of Complex Data Distributions”. This is a 3-year research project for applying pattern recognition systems to complex data, including planetary image analysis and mass spectra. The team includes lead Investigator Dr Neil Thacker; co-investigators Professor Jamie Gilmour, Dr Adam McMahon and Dr Katherine Joy; and two full-time research associates including Dr Paul Tar and another soon to be appointed. Preliminary work was previously funded by the STFC, in the form of a PhD Studentship for Paul Tar, where the problem of making quantitative measurements from planetary images was addressed.

Pattern Recognition (PR) has developed alongside modern computing and the increasingly large datasets being generated in our digital age. A significant part of PR is the process of assigning pre-learned categories to individual datum using a classifier trained on representative samples. Examples include voice recognition and object detection. Many scientific data analysis tasks appear to be amenable to these techniques. When used for quantitation, i.e., recognising then counting objects, PR can be viewed as an estimation process. However, PR differs from conventional statistical estimation in important ways. In particular, statistically based techniques, such as model fitting, provide outputs additional to the estimated parameters. These outputs include parameter error covariances and goodness-of-fit measures. Error covariances are considered essential for the scientific use of data, e.g. for plotting error bars and informing the appropriateness of further manipulations. Goodness-of-fit measures are also essential for checking that models are sufficiently describing target data. Neither error covariances nor estimated parameters can be trusted unless a suitable goodness of fit is achieved. In contrast, PR techniques are generally assessed via Receiver Operating Characteristic curves (ROC) constructed using reference datasets. These empirically quantify identification and misidentification rates, allowing the performance of alternative methods to be ranked (such as Support Vector Machines or Random Forests). However, there are problems using this information when interpreting scientific measurements where error covariances and goodness of fits are more appropriate.

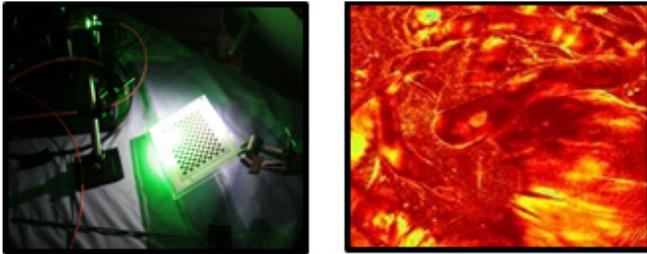
The broad goals of the new Leverhulme funded project are to derive error covariances, goodness-of-fit measures and other tools to facilitate the quantitative extraction of various measurements from planetary images and mass spectra. This includes the counting of impact craters and the analysis of planetary terrains, and also the decomposition of mass spectra into their constituent components. Those interested in following the team's progress will find regular updates via the Tina Vision website www.tina-vision.net and also on the project Facebook page: www.facebook.com/maptheplanetproject.

Dr Paul Tar
Manchester University
email: paul.d.tar@gmail.com

Upcoming BMVA Technical Meetings and Calls

- Surgical Vision and Biophotonics, 15 October, Chairs: Danail Stoyanov (UCL), Dan Elson (Imperial). This call appears below.
- Robotic vision, 3 December, Chairs: Marco Paladini and John Illingworth. This call appears below.
- Face Recognition, 28 January, Chair: Michel Valstar.

Surgical Vision and Biophotonics, Wednesday 15 October 2014



Chairs: Danail Stoyanov (UCL), Dan Elson (Imperial).

Imaging is a critical element of modern surgical practice for both diagnosis and interventional treatment. With the increasing prevalence of minimally invasive surgical techniques, a wide spectrum of imaging methods is used to look at the internal anatomy and interrogate the interaction between light, sound, radiation and tissue. The acquired information presents diverse computational challenges for modelling, processing, fusing and understanding surgical images.

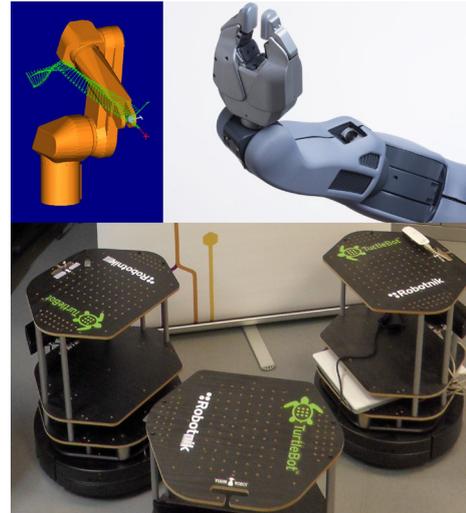
To promote this emerging synergy between biophotonics, optical imaging and computer vision within the context of surgery, we invite abstracts in the following areas:

- Quantitative endoscopy and surgical vision
- Non-rigid structure from motion
- Reconstruction, inference and signal enhancement
- Image-based tissue characterization for diagnosis and function
- Novel biophotonic imaging techniques
- Multimodal image-registration for intra-operative guidance
- Robot-assisted imaging and image-guided robotics
- Advanced intra-operative surgical visualisation

We wish to promote an active discussion between multi-disciplinary researchers with short presentations and ample time for questions. This is an emerging field and the interaction of computer science, physics and medicine will be an exciting event for all participants.

Call for Participation: Please submit an extended summary or abstract of work. Contributions should be sent to danail.stoyanov@ucl.ac.uk before 15 July.

Vision for Robotics, Wednesday 3 December 2014



Chairs: Marco Paladini and John Illingworth
Keynote speakers: Andrew Davison and Bruno Siciliano.

Industrial robots have traditionally relied on a highly constrained environment. Recent advancements in computer vision processing are opening up industrial and service robot applications for unstructured environments. The challenges we face are reliability, speed of execution, and safety. Computer Vision plays an increasingly important role in industrial robotics applications such as sorting, picking, packaging and assembly, in addition to providing fundamental robot capabilities such as SLAM, obstacle avoidance, and hazard detection commonly used in mobile robots, autonomous cars, service robots and aerial vehicles.

The aim of this meeting is to bring together researchers and practitioners, from both industry and academia, interested in advancing vision systems for robotics applications. Submissions are welcome in all related topics, including but not limited to:

- Robot-mounted sensor calibration
- Vision-guided robot control (visual servoing)
- Object detection and 6 DoF localisation
- Object grasping and Bin picking
- 3D models for grasping
- Motion planning and obstacle avoidance
- Mapping and navigation
- Integration with other sensors (e.g. Force-Torque, IMU, GPS, ...)
- Dynamic environments, real-time obstacle avoidance.

Call for Participation: All those interested in presenting material at this meeting are invited to submit a paragraph describing their topic to marco.paladini@ocado.com for consideration by 30 July.

For more details, check out the BMVA meetings website: www.bmva.org/meetings

Dr Andrew Gilbert
University of Surrey
email: a.gilbert@surrey.ac.uk

2nd Edition of Dictionary of Computer Vision and Image Processing

The second edition of this well-known dictionary has recently been published and will doubtless prove valuable for many readers of BMVA News. The authors of this edition are Robert B Fisher, Toby P Breckon, Kenneth Dawson-Howe, Andrew Fitzgibbon, Craig Robertson, Emanuele Trucco and Christopher KI Williams. The work was published by John Wiley & Sons in December 2013, and has 382 pages, the cost of the paperback being £28-00. Full details appear on the website at:

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1119941865.html>

The main changes in the second edition are:

- 1000 new terms, to a total of more than 3500
- citations to sources for further reading for most terms
- availability as an ebook
- an enhanced ebook with approximately 50 videos.

Written by leading researchers, the 2nd Edition of the Dictionary is a comprehensive and reliable resource which now provides explanations of over 3500 of the most commonly used terms across image processing, computer vision and related fields. It offers clear and concise definitions with short examples or mathematical precision where necessary for clarity that ultimately makes it a very usable reference for new entrants to these fields at senior undergraduate and graduate level, through to early career researchers to help build up knowledge of key concepts. As the book is a useful source for recent terminology and

concepts, experienced professionals will also find it a valuable resource for keeping up to date with the latest advances.

Professor Roy Davies
Editor, BMVA News
email: e.r.davies@rhul.ac.uk

The BMVA Thesis Archive

If you've taken a look at the BMVA website recently, you'll see that there are quite a few doctoral theses there. The BMVA is happy to archive and make available any such theses as a service to the research community, the only requirement being that the thesis was written at a UK university.

If you're a student, please consider contributing your thesis to the archive; and if you are a supervisor, there is no better way of advertising your suitability as a supervisor than your students' theses! The information we need is not onerous; for details, see:

<http://www.bmva.org/theses:top>

Finally, note that theses do not have to be contributed immediately after the examination; we recently added one to the archive a decade after it was examined.

Dr Adrian Clark
BMVA Chair
email: alien@essex.ac.uk