Guest Editorial: Colour in Vision Analysis

Lindsay MacDonald[1], Roger Bourdon[2] and Roy Davies[3]

[1]London College of Communication
[2]Colour Group GB
[3]Royal Holloway, University of London
`<macdonald@lcc.arts.ac.uk>`
`<roger.bourdon@which.net>`
`<e.r.davies@rhul.ac.uk>`

This issue of the Annals of the BMVA – the first – is devoted to a set of papers that emerged from a full-day symposium on aspects of colour in human and machine vision analysis organised jointly by the Colour Group (GB) and the British Machine Vision Association (BMVA). The meeting was held at the London College of Communication on Wednesday 14 June 2006, and was attended by approximately 45 people. The Co-Chairs were Professor Roy Davies (Royal Holloway, University of London), Professor Lindsay MacDonald (London College of Communication), and Roger Bourdon (Colour Group GB).

Any such meeting can only hope to bring together a limited number of speakers, and specifically those who had something new to say at the precise time of the meeting, and whose work was considered sufficiently cogent and relevant to its subject. *A fortiori*, any printed version can only bring together a subset of the work covered in the talks. However, in our eyes the resulting set of papers provides a useful snapshot of progress in this area as of the first half of 2006. It is interesting that the six papers included here show a wide range of aspects under the same general heading

Colour filtering: colour bleeding and related accuracy issues. Roy Davies presents a study of median filtering as a method of noise suppression in signal and image processing. When applying median filters to the three individual channels of an RGB image, so-called 'colour bleeding' may occur. A preferable alternative is the vector median filter (VMF), which uses a variant of the local median in which a vector is selected to minimise the sum of distances to all other vectors, an approach that trades colour accuracy against reduction of colour bleeding. The paper goes further and discusses use of the generalised median filter, which has the advantage of greater colour accuracy.

A hardware-independent colour calibration technique. Dimosthenis Karatzas and Sophie Wuerger note that most colour-normal human observers have no difficulty in adjusting a coloured light such that it appears neither red nor green, and neither yellow nor blue. Moreover, these hue judgements are not significantly influenced by language or age and individual differences in colour sensitivity are not reflected in the unique hue settings. The invariance of unique hue judgements can therefore be used to develop a colour calibration technique for display devices, eliminating the need for an external calibration standard or a measurement device.

Colour assessment in dentistry. Stephen Westland *et al*. describe a system for assessment of tooth whiteness, developed in collaboration with Colgate-Palmolive. The use of an imaging system to assess the efficacy of tooth-whitening products relies upon (i) precise, and preferably accurate, colorimetric measurements, and (ii) an appropriate whiteness scale. A series of psychophysical and modelling experiments has led to development of a new whiteness index for tooth assessment. Further applications in dentistry for the imaging system include the assessment of gingivitis and gloss.

Attention-based colour correction. Fred Stentiford and Adetokunbo Bamidele explain how the colour of illumination in a scene can have a dramatic affect on the performance of image retrieval systems, because different imaging devices produce widely different responses, whereas human vision possesses an ability to interpret scenes without being troubled by the brightness or colour of the illumination. They describe a new approach to illuminant estimation and correction for derivation of similarity estimates that are independent of illumination, based on the notion that colour constancy arises in human vision as a result of experiencing visual similarity rather than some absolute colour correctness.

Colour image segmentation using texems. Xianghua Xie and Majid Mirmehdi present two methods to perform colour image segmentation. These employ a generative 3D model based on the assumption that an image can be generated through an overlapped placement of a few primitive, exemplar image patches called 'texems'. Multiscale analysis is used in order to capture sufficient image features and pixel neighbourhood interactions without excessive computational cost. Experimental results on synthetic and real images are presented to demonstrate this as a promising approach providing an alternative to popular discriminative methods.

Fatal flaws: uncertainty in the interpretation of colour in CCTV images. Lindsay MacDonald describes how, in a sensational murder trial, the prosecution produced CCTV footage showing a car driving along the street in a city centre. Analysis of still image frames extracted from the sequence sought to answer the simple question "Is this car blue?" The answer turned out to be much more complicated than expected, and ultimately raised fundamental issues about uncertainty and the value of surveillance imagery. Specific issues were the non-uniformity of the scene illumination from multiple sources, gloss and directional reflectance of metallic-flake paintwork, poor performance of the camera, and losses within the CCTV recording system. These factors caused excessive degradation of the image in spatial resolution, colour fidelity, and noise.