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Dr Andrew Schofield BEng PhD

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About

Andrew Schofield's primary research is on functional aspects of the visual perceptio with an emphasis on textures, surfaces and shape. He also has interests in the effects of ageing on visual perception and the role of cortical hyper-excitability in abnormal visual functioning. He also builds computational models of human vision and designs computer vision algorithms.

Qualifications

BEng, PGDip, PhD

Biography

With a first degree in Electronics, a PhD in Communication and Neuroscience and a PG-Diploma in Psychology Andrew Schofield is a multidisciplinary thinker whose work crosses the boundaries between Psychology and Computer Science. After receiving his PhD Andrew completed a Research Fellowship in image processing at Brunel and then worked for a year in the Civil Service before returning to academia as a Research Fellow in Psychology at Birmingham in 1996. He has been at Birmingham ever since working his way to Senior Lecturer in 2006.

Teaching

Level 2 Visual Perception and Illusions

Director of BSc Psychology

Postgraduate supervision

Alice Cruickshank (graduated)

Peng Sun (graduated)

Dicle Dovencioglu

Giacommo Mazzilli

Research

Visual Perception

Human vision can process information conveyed by variations in 'first-order' image properties such as luminance, and 'second-order' (or texture) properties such as orientation and local contrast. The main focus of my research is to explore the properties of second-order processing in humans and the application of these findings to machine vision.

Local orientation is one of the main cues to surface texture. It seems that some cells in the visual system are sensitive to orientation-contrast and, during my PhD (1990-1993), I discovered that these cells can explain human performance in a number of texture related tasks.

In my work with Mark Georgeson (1996-1999) I looked at local contrast as a texture cue. We found that the processing of local contrast is essentially independent of the processing of luminance signals but that the two can combine to form / enhance useful image precepts such as depth from shading.

My most recent work has concerned the processing of different types of texture (eg orientation and local contrast). In particular I have been asking 'are different texture cues detected independently?' Results suggest that they are but only weakly as if there is one system that is designed to allow the cues to be detected independently but which does not ensure full independence. Once one goes beyond detection to look at texture processing at higher levels it is clear that the two cues do interact. For example adaptation after-effects such as the tilt after effect transfer between orientation and contrast cues.

I am also interested in how variations in texture affect our ability to perceive transparency and shading cues. It seems that changes in texture amplitude provide a key be which changes in shading across a texture are cued. If amplitude and shading are positively correlated one sees a single shaded surface. But when amplitude and shading are negatively correlated one sees a reflectance or material change. This work has been extended to produce a machine vision algorithm for separating illuminations changes from reflectance changes in images.

Collaborators / co-workers
Mark Georgeson, Frederick Kingdom, Tim Ledgeway, Gill Barbieri-Hesse, Tim Yates, Paul Rock, Alice Cruickshank, Peng Sun, Xiaoyue Jiang.

Links relating to my research

- Vision Laboratory (**www.vision.bham.ac.uk (http://www.vision.bham.ac.uk/)**)
- Birmingham Object Lighting Database (**www.bold.bham.ac.uk (http://www.bold.bham.ac.uk/)**)

Other activities

Chairman of the Applied Vision Association

College of Life and Environmental Sciences representative on Programme Approval and Review Committee

Publications

Dovencioglu, D.N., Welchman, A.E., Schofield A.J., (2013) Perceptual learning of second order cues for layer decomposition. Vision Research, 77, 1-9 (http://www.sciencedirect.com/science/article/pii/S0042698912003653)

Sun P., & Schofield A.J. (2012) Two operational modes in the perception of shape-from-shading revealed by the effects of edge information in slant settings. Journal of Vision, 12 (1): 12. doi:10.1167/12.1.12 (http://w.journalofvision.org/content/12/1/12.full)

Schofield, A.J., Rock, P.B., & Georgeson, M.A. (2011) Sun and sky: Does human vision assume a mixture of point and diffuse illumination when interpreting shape-from-shading? Vision Research, 51, (21-22), 2317-2330.

Jiang X., Schofield A.J., & Wyatt J.L. (2011), Shadow Detection based on Colour Segmentation and Estimated Illumination. Proceeding of the 22nd British Machine Vision Conference 2011 (BMVC2011), Jesse Hoey, Stephen McKenna and Emanuele Trucco, editors, BMVA Press, September 2011. doi:10.5244/C.25

Sun, P., Schofield A.J., (2011) The efficacy of local luminance amplitude in disambiguating the origin of luminance signals depends on carrier frequency: Further evidence for the active role of second-order vision in layer decomposition, Vision Research, 51, 496–507

Jiang, X., Schofield, A.J., Wyatt, J.L., (2010) Correlation-Based Intrinsic Image Extraction from a Single Image, in K. Daniilidis, P. Maragos, N. Paragios (Eds.) ECCV 2010, Part IV, LNCS 6314, pp. 58–71, Springer-Verlag, Berlin.

Schofield A.J., Rock, P.B., Sun P., Jiang, X, Georgeson M.A., (2010) What is second-order vision for? Discriminating illumination versus material changes, Journal of Vision 10(9): 2; doi:10.1167/10.9.2. (http://www.journalofvision.org/content/10/9/2.full)
Rothtein, P., Schofield, A, Funes, M.J., Humphreys, G.W., (2010) Effects of spatial frequency bands on perceptual decision: It is not the stimuli but the comparison. Journal of Vision 10(10): 25; doi:10.1167/10.10.25 (http://www.journalofvision.org/content/10/10/25.full)

Georgeson, M.A., Yates, T.A., & Schofield, A.J., (2009). Depth propagation and surface construction in 3-D vision. Vision Research, 49, 84-95.

Georgeson, M.A., Yates, T.A., & Schofield A.J., (2008). Discriminating depth in corrugated stereo surfaces: Facilitation by a pedestal is explained by removal of uncertainty. Vision Research, 48, 2321-2328.

Riddoch, M. J., Humphreys, G., Akhtar, N., Allen, H., Bracewell, R.M., Schofield, A. (2008). A tale of two agnosias: Distinctions between form and integrative agnosia, Cognitive Neuropsychology, 25, 56-92.

Schofield, A. J., Ledgeway, T., & Hutchinson, C. V. (2007). Asymmetric transfer of the dynamic motion aftereffect between first- and second-order cues and among different second-order cues. Journal of Vision, 7(8):1, 1-12 (http://www.journalofvision.org/content/7/8/1.full)

Schofield, A.J., Hesse, G., Rock, P.B., Georgeson, M.A. (2006) Local luminance amplitude modulates the interpretation of shape-from-shading in textured surfaces. Vision Research, 46, 3462-3482

Schofield, A.J., Bishop, N.J., and Allan, J. (2006) Oscillatory motion induces change blindness. Acta Psychologica, 121, 249-274

Cruickshank, A.G, and Schofield A.J. (2005) Transfer of tilt after-effects between second-order cues. Spatial Vision, 18, 379-398

Schofield, A.J, and Yates, T.A. (2005) Interactions between orientation and contrast modulations suggest limited cross-cue linkage. Perception, 34, 769-792

Schofield, A.J, and Georgeson, M.A. (2003) Sensitivity to contrast modulations: the spatial frequency dependence of second-order vision, Vision Research 43, 243-259

Georgeson, M.A, and Schofield, A.J. (2002) Shading and Texture: separate information channels with a common adaptation mechanism?, Spatial Vision, 16, 59-76.

Schofield, A.J, and Georgeson, M.A. (2000) The temporal properties of first- and second-order vision, Vision Research, 40, 2475-2487

Schofield, A.J. (2000) What does second-order vision see in an image', Perception, 29, 1071-1086

Schofield, A.J. and Georgeson, M.A. (1999), Sensitivity to modulations of luminance and contrast in visual white noise: separate mechanisms with similar behaviour, Vision research, Vol 39, 2697-2716.

Expertise

Human visual perception – how we see things: optical illusions, 3D vision, the perception of texture

Alternative contact number available for this expert: **contact the press office (http://www.birmingham.ac.uk/news/contacts/index.aspx)**