



Vision and Continuity Of Structure In Natural Images

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Abstract

There is renewed interest in coding by the human visual system of continuities that occur in natural images; once a key focus of the early 20th Century Gestalt School of Psychology. Researchers in anatomy, neurophysiology, computer science, and psychology, today combine their approaches to develop models of how continuities in natural images – through space, colour, shading, motion, and scale – are coded, interact, and are perceived. Primacy is often given to continuities, such as edges, texture, and contours, in image-plane space, and recent models of detection are based on work that demonstrates that neurons in visual cortex make use of long-range lateral connections that allow integration of information from far beyond the classical receptive field. I shall present psychophysical results on motion perception and contour perception in the image plane, and in the depth plane, and I shall show how these results converge with recent anatomical and physiological findings. I shall show how continuity in scale (resolution) in natural images can be considered as analogous to continuity in space, and is critical to coding in human vision. I make the claim that partitioning spatial structure in scale is a fundamental property of visual processing, and that it gives rise to an algorithm that allows units with relatively low dynamic range to code a wide range of intensity variation. I discuss the potential application of this algorithm to information and communications technology.

Biography

Dr. Anthony Hayes was on the psychology faculty at the University of Melbourne from 1992 to 2001 and at the University of Hong Kong from 2001 to 2007, and is currently in the College of Human Sciences at University College Dublin. He obtained his B.Sc. and Ph.D. from University of Western Australia. He has received numerous national and international awards and fellowships, including a European Programme for Research and Development of Information Technology Fellowship (Edinburgh), a Medical Research Council of Canada Senior Fellowship, and in 2007 a Science Foundation Ireland E.T.S. Walton Award (an international professorial award established in honour of the Irish Physics Nobel Laureate). Professor Hayes has been invited visiting professor and visiting scholar at Cambridge University, Cornell University, McGill University, Harvard University, and the Institute for Biophysics Beijing, Chinese Academy of Science.

The focus of Professor Hayes' research is the study of human vision: how we code images, how we use vision, and how understanding the mechanisms of vision can be harnessed for applications. His work, published extensively in the psychology and life sciences literature, has received well over 1,000 citations, and a number of his high-impact publications are considered to be of seminal importance.

~~~~~ All Are Welcome ~~~~~