ON THE ROLE OF CORRESPONDENCE NOISE IN HUMAN VISUAL MOTION PERCEPTION

S N SHAFIULLAH

PhD

UNIVERSITY OF BRADFORD

2008

On The Role Of Correspondence Noise In Human Visual Motion Perception

A systematic study on the role of correspondence noise affecting
Dmax and Dmin, using random dot kinematograms:
A psychophysical and modelling approach.

Syed Nadeemullah SHAFIULLAH

Submitted for the degree of Doctorate of Philosophy

Bradford School of Optometry and Vision Science
UNIVERSITY OF BRADFORD

2008

Syed Nadeemullah SHAFIULLAH

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Keywords

Correspondence noise, Dmax, Dmin, Coherence thresholds, information limit, receptive fields, under-sampling.

Abstract

One of the major goals of this thesis is to investigate the extent to which correspondence noise, (i.e., the false pairing of dots in adjacent frames) limits motion detection performance in random dot kinematograms (RDKs). The performance measures of interest are Dmax and Dmin i.e., the largest and smallest inter-frame dot displacement, respectively, for which motion can be reliably detected. Dmax and threshold coherence (i.e., the smallest proportion of dots that must be moved between frames for motion to be reliably detected) in RDKs are known to be affected by false pairing or correspondence noise. Here the roles of correspondence noise and receptive field geometry in limiting performance are investigated. The range of Dmax observed in the literature is consistent with the current information-limit based interpretation. Dmin is interpreted in the light of correspondence noise and under-sampling. Based on the psychophysical experiments performed in the early parts of the dissertation, a model for correspondence noise based on the principle of receptive field scaling is developed for Dmax. Model simulations provide a good account of psychophysically estimated Dmax over a range of stimulus parameters, showing that correspondence noise and receptive field geometry have a major influence on displacement thresholds.