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  What is second-order vision for?

  Humans are sensitive to modulations of luminance (first order) and texture contrast (second order) and there is a body of evidence to suggest that detection of these stimulus types is separate even though the two cues do interact in early vision. Models for the detection of second-order stimuli propose considerable extra neural hardware on top of that required for first-order vision. Such expense suggests that second-order cues should provide useful information in the natural environment and exploration of natural scenes suggests that first- and second-order signals are indeed uncorrelated over an ensemble of images using a signed metric (Schofield,Perception, 29,1071 1086, 2000). However, they are correlated on an unsigned metric suggesting that they frequently occur together (Johnson & Baker,JOSA-A, 21, 913 925, 2004). Further, first- and second-order cues tend to be positively correlated when textured surfaces are shaded or fall into cast shadows. This suggests that the relationship between the two cues types might be used to determine the origin of luminance changes in terms of illumination versus reflectance changes. Thus second-order vision could enable layer segmentation; the separation of illumination and reflectance. I will present experimental data and computational models in support of this idea and show how second-order cues can be combined with other cues to perform layer segmentation in a computer vision application.

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