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Switching off brightness induction through induction-reversed images

Brightness induction is the modulation of the perceived intensity of an area by the luminance of surrounding areas. Although V1 is traditionally regarded as an area mostly responsive to retinal information, neurophysiological evidence suggests that it may explicitly represent brightness information. In this work, we investigate possible neural mechanisms underlying brightness induction. To this end, we consider the model by Z Li (1999 *Computation and Neural Systems***10**187-212) which is constrained by neurophysiological data and focuses on the part of V1 responsible for contextual influences. This model, which has proven to account for phenomena such as contour detection and preattentive segmentation, shares with brightness induction the relevant effect of contextual influences. Importantly, the input to our network model derives from a complete multiscale and multiorientation wavelet decomposition, which makes it possible to recover an image reflecting the perceived luminance and successfully accounts for well known psychophysical effects for both static and dynamic contexts. By further considering inverse problem techniques we define induction-reversed images: given a target image, we build an image whose perceived luminance matches the actual luminance of the original stimulus, thus effectively canceling out brightness induction effects. We suggest that induction-reversed images may help remove undesired perceptual effects and can find potential applications in fields such as radiological image interpretation.