

When Does Surface Appearance Become Scale-Variant?

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Surface appearance (brightness and color) of an object in the scene depends on the properties of the surfaces surrounding the object (spatial induction). Size of the surrounding is one of the important influential properties. For example, a larger surrounding induces stronger contrast to the object than a smaller surrounding. Then would size-scaling of the scene alter the appearance? This question arises by acknowledging that scaling the entire scene changes the size of both the surrounding and the object, shifting the overall spatial frequency (SF) spectrum. We studied whether the appearance of a simple spatial induction display differs from its size-scaled version, when and why. We used a bar grating stimuli in which one half of the stimulus is comprised of grey bars alternating with lighter-than-grey bars and the other half with the same grey bars alternating with darker-than-grey bars (as in Helson, 1963). The grey bars on the two sides thus appeared different due to contrast (grey bars in lighter bars appears darker than those in the darker bars; for low SF gratings) or assimilation (grey in lighter appears lighter; for high SF gratings) induced by the inducing bars. The stimulus appearance in a certain size was compared with the identical stimulus in a different scale while contrast of the inducing bars (i.e. relative intensity of the inducing bars to the grey) and the grating SF varied. The appearance was altered for low contrast inducers for a relatively broad SF range, while, for high contrast inducers, there was no clear evidence of the scaling effect except for at the very high SF range. We explain these results in respect of the mutual induction between the inducing and the grey bars, discuss a potential neural mechanism, and compare the results with previous studies on the surrounding-size-dependent spatial induction and contrast constancy.

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