

Straightness, structure, and shadows

E. Adelson

Massachusetts Institute of Technology, Cambridge, MA, USA



D. Somers

Boston University, Boston, MA, USA

Abstract

Lightness illusions are generally strongest when there are multiple cues to activate the mechanisms of lightness constancy. By studying the illusions one can explore the constancy mechanisms. Various researchers have shown the importance of configural cues involving articulation, junctions, grouping, and penumbral blur. We have discovered a new cue: the amount of straightness or structure in a light-dark boundary. It seems that the visual system assumes that shadows (or other atmospheric changes) tend to be smooth, straight, and unstructured. To study this effect, we devised a stimulus based on a transparent plaid, in which the illumination interpretation ("shading") is placed in competition with the reflectance interpretation ("paint"). We manipulate the cues that encourage one or the other interpretation, and find that we can greatly enhance or reduce a lightness illusion embedded in the pattern. Bars that are crisply defined and zigzagged, wavy, or textured are apparently interpreted as paint rather than shading. Bars that are smooth, soft, or straight are attributed to shading rather than paint. In addition to establishing this cue, the new plaid stimulus offers a tool for studying a wide range of image manipulations. Finally, by combining multiple cues we are able to construct a lightness illusion that is stronger than any we have seen before.

History

Received December 15, 2000; published December 12, 2001

Citation

Adelson, E., & Somers, D. (2001). Straightness, structure, and shadows [Abstract]. *Journal of Vision*, 1(3), 204a, <http://journalofvision.org/1/3/204/>, doi:10.1167/1.3.204.

Keywords

None

On-Line Presentation

None

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