Color Improves Edge Classification

Camille Breuil[1,2], Ben J. Jennings[3], Simon Barthelmé[1], Nathalie Guyader[1] and Frederick A. A. Kingdom[2]
1 Université Grenoble Alpes, France
2 McGill Vision Research, Montreal, Quebec, Canada
3 Centre for Cognitive Neuroscience, London, UK

Our visual environment contains both luminance and color (chromatic) information. Understanding the role that each plays in our visual perception of natural scenes is a continuing topic of investigation. In this study, we explore the role that color cues play in a specific task: edge classification. Despite the complexity of the visual world, humans rarely confuse variations in illumination, for example, shadows, from variations in material properties, for example, paint or stain. This ability to distinguish illumination from material edges is crucial for determining the spatial layout of objects and surfaces in natural scenes. Color is believed to be a useful cue to this categorization, given that most color changes tend to be material in origin, whereas luminance changes tend to be either material or illumination in origin. We conducted a psychophysical experiment that required subjects to classify edges as "shadow" or "other," for images containing or not color information. We found edge classification performance to be superior for the color compared with grayscale images. We also defined machine observers sensitive to simple image properties and found that they too classified the edges better with color information. Our results show that color acts as a cue for edge classification in images of natural scenes.