Capstone

The Discriminability of Colored-Patterns: Less than Meets the Eye

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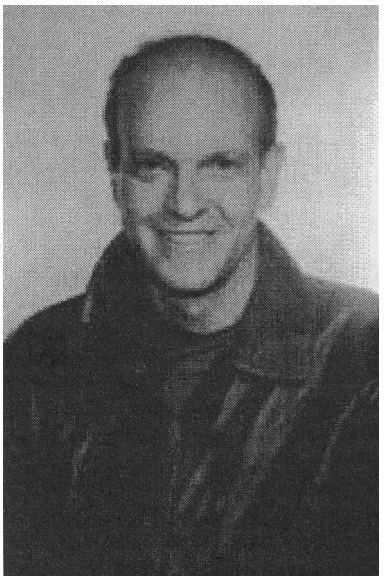

Color scientists and engineers have made significant progress in building perceptually-based measurement tools for evaluating color reproduction technologies. Much of the collected wisdom of color science is summarized in discrimination metrics (e.g., CIELAB) and color appearance models (e.g., RLAB, Hunt and Nayatani's work). These tools are useful for solving color imaging problems involving fairly large (2 degrees of visual angle) targets that are measured in paint, textile, and other manufacturing industries.

The rapid advances in digital imaging and computer graphics technology provides a new domain where color reproduction metrics are needed. Digital imaging technologies usually involve color images with a wide range of spatial structure, including large uniform areas and rapidly varying areas with fine spatial details. Existing color metrics were not designed for such images, and to extend the metrics we must re-think some of the fundamental issues concerning color color discrimination and appearance.

We have been working on extensions of color metrics based on two main principles. First, new metrics for digital color imaging should be backwards compatible with current color discrimination standards. Second, the new models should integrate the main visual phenomena that are widely used in digital imaging technologies, such as JPEG and MPEG. Probably the most important aspect of these digital imaging technologies is their reliance on the observation that color vision is very poor at moderate and high spatio-temporal frequencies.

My presentation will consist of (a) a brief summary of the intellectual foundations of our current metrics (b) demonstrations some of the principal phenomena that connect pattern and color, and (c) a description of some current attempts to merge models of color and pattern discrimination into new digital image metrics for color image reproduction.

Biographical Sketch

Professor Brian Wandell has been a member of the Psychology and Neuroscience Departments at Stanford University since 1979. His research includes the study of color appearance, surface and illuminant estimation algorithms, industrial applications of color science, and functional magnetic resonance imaging of brain activity. Wandell is a Fellow the Optical Society of America. He has served as an editor of *Vision Research*; he is the principal organizer of the *Smart Color* seminar series on color image systems engineering and a co-founder of the Image Systems Engineering Program at Stanford. Wandell is the author of *Foundations of Vision*, a textbook on Vision Science. Wandell won the 1986 Troland Research Award from the U.S. National Academy of Sciences for his work in color vision. (`http://white.stanford.edu/~brian`)