Dear Editor,

We write to submit a manuscript entitled “TITLE” for consideration as an article in the journal of vision. In this paper, we study luminance constancy using a biologically inspired supervised learning algorithm.

Color constancy, the ability to stably perceive the color of an object under variations in its surround, is a significant invariance detection ability of our visual system. But, little is known about the mechanism through which constancy can be achieved. To understand such mechanism, we have taken a novel supervised learning approach. First, we have developed a software that can generate large databases of multispectral images of naturalistic scenes. Then, we use these images in a biologically inspired supervised learning method to identify the receptive fields that are optimal to achieve constancy. We have used this approach to study luminance constancy under naturalistic variations in the scene.

This paper makes the two significant advances:

One, we develop a software to generate multispectral image of naturalistic scenes with the ability to precisely control the various aspects that define a natural scene. This software gives the ability to generate large scale databases of well labeled naturalistic images. Moreover, it gives the ability to systematically vary one or several aspects of a scene, thus allowing us to study the effect of each aspect individually and in combination. We envision that this software would be useful in study of color constancy, and vision in general.

Second, using a biologically inspired learning algorithm we identified receptive fields that are optimal to estimate the luminance of an object in a naturalistic scene, thus providing insight to the mechanism of luminance constancy. Using this approach, we learnt that the receptive fields that are optimal for luminance constancy have a center surround structure with emphasis on the L and M cones of the retinal mosaic. This is consistent with prior work on luminance constancy and shows the power of the approach developed in this work.

Color constancy is one of the several invariance detection problems the visual system solves. An understanding of its mechanism can provide insights to other invariance detection problems. We hope that the approach developed in this work and the insights gained from studying luminance constancy will be of interest to others researchers in vision.

Sincerely,

Vijay Singh

Nicolas P. Cottaris

Benjamin S. Heasly

David H. Brainard

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