Dear Editor,

We write to submit a manuscript entitled “TITLE” for consideration as an article in the journal of vision.

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. To understand the computation that lead to constancy, we have taken a supervised learning approach. We have used a biologically-inspired supervised learning method to identify receptive fields that are optimal to estimate luminance of an object under naturalistic variations in the color of the object, its surround and the light sources illuminating it. We show the estimation can be made to within 13% RMSE. This paper makes two significant advances:

First, supervised learning requires a large database of well labelled images, but a largescale database of naturalistic images, labeled with the spectral properties of the objects and illuminants, is not available. For this, we developed a software that generates multispectral image of naturalistic scenes. This software has the ability to precisely control various aspects that define a natural scene and can be used to generate databases of naturalistic images with information about the geometrical and spectral features of objects in every pixel of the image. Moreover, the software provides the option 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 on these images, we identified receptive fields that are optimal to estimate the luminance of an object in a naturalistic scene. We show that the optimal receptive fields 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,

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