The Role of Different Local Information of Scenes in Human Color Constancy

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ABSTRACT. In a recent work (Gao et al., Color Constancy Using Double-Opponency, IEEE Trans on PAMI, 2015), we simulated the properties of a kind of double-opponent (DO) cells with concentric receptive field (RF) in the primary visual cortex (V1), and found that when the RF center and its surround receive unbalanced cone inputs, the outputs of DO cells could be used to accurately estimate the light source color. Computationally, unbalanced center-surround structure can emphasize the edge information of scenes. In this work, under the help of eye-tracker (Eyelink-2000, SR Research Ltd), we further investigated the role of different local information of scenes in human color constancy. For each of the 16 subjects, each of the 40 Mondrian images was displayed randomly on the screen; each image was displayed 10 times, illuminated (multiplied) with a light source of a random color. The subjects were asked to remove the illuminant color from the color-biased scenes by press the up- or down-arrow keys. In addition, free-viewing condition was introduced to act as control task. The results show that (1) more fixations are distributed around the local region edges, as suggested by our computational model mentioned above; (2) more fixations are located in the achromatic local regions (e.g., white or grey regions). In short, achromatic and edge information of scenes seem to contribute more for human color constancy. [Supported by grants of 973 Project #2013CB329401 and NSFC #61375115, #91420105]