# Nonlinear local-pixel-shifting color constancy algorithm

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## Abstract

Most color constancy algorithms implement a color correction process that performs globally for the entire input pixel image. This process leads to a saturation problem and overcorrected images, especially in overexposed regions, thereby resulting in contrast inconsistency and incorrect true-color image objects. Each pixel in an input image should have a different correction range value. Pixels with high probability to be saturated or overcorrected should not be treated similarly as pixels with low probability. Thus, this study proposes a new color correction algorithm that aims to reduce the effects of the saturation phenomenon and overcorrected color images while enhancing the image contrast. To achieve this objective, the proposed algorithm consists of two main processes, namely, color correction and contrast enhancement. A shifting process is nonlinearly applied to each pixel in a 2D two-channel CIELAB color space. Each pixel has a different corrected rate depending on the adaptive limit value and the reference point. Subsequently, the global and local contrast corrections are executed on the $L$ channel to enhance the image contrast. Qualitative and quantitative results on 653 outdoor; 818 indoor; and 1394 underwater images show that the proposed algorithm outperforms several state-of-the-art algorithms in producing enhanced color constancy and contrast. The proposed algorithm also reduces noise effects and improves the details of an image without creating unnatural and inaccurate color constancy.

**Keywords** Color correction · Color constancy · Nonlinear pixel shifting · Contrast Enhancement · Adaptive limit