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# Histogram Equalization-Based Color Image Processing in Different Color Model

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**Abstract.** In this paper, we propose an intensity preserving histogram equalization algorithm which enhances contrast of color images. Image enhancement is an important issue which is to meet human visual perception. Fuzzy theory is used for improving histogram equalization. Simulation results show that certain color space gives the best subjective and objective results than the others.

**Keywords:** image enhancement, color image, histogram equalization, color space.

## 1 Introduction

Image enhancement is an important issue which is to meet human visual perception [1]. Currently image enhancement is broadly used for different image processing files [2-5]. The main goal of image enhancement is to improve the edge contrast of image and video.

In this paper, an intensity preserving and contrast enhancing histogram equalization algorithm is proposed for different color space images [6-9]. RGB color space is widely known, and we assume there are four other color spaces, LAB, YIQ, YCbCr, and HSV. Then, we apply our proposed method in the intensity channels.

The remainder of the article is organized as follows. Short introduction of color space and the proposed method are introduced in Section 2. Experimental results are shown in Section 3 to compare the performance. Section 5 gives the conclusion and remarks.

## 2 Proposed method

The RGB color space is an additive color model where three color (R (red), G (green), and B (blue)) lights are complemented together in a single way to reconstruct a wide array of possible visible colors. On the other hand, the reverse model is CMYK (cyan, magenta, yellow, and key) color model which is a subtractive color model for

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color printing purpose. Although RGB model is widely used, we also use other color spaces such as LAB, YCbCr, YIQ, and HSV [10].

Figure 1 shows the block diagram of the intensity preserving image enhancement process for LAB, YCbCr, and YIQ color spaces.

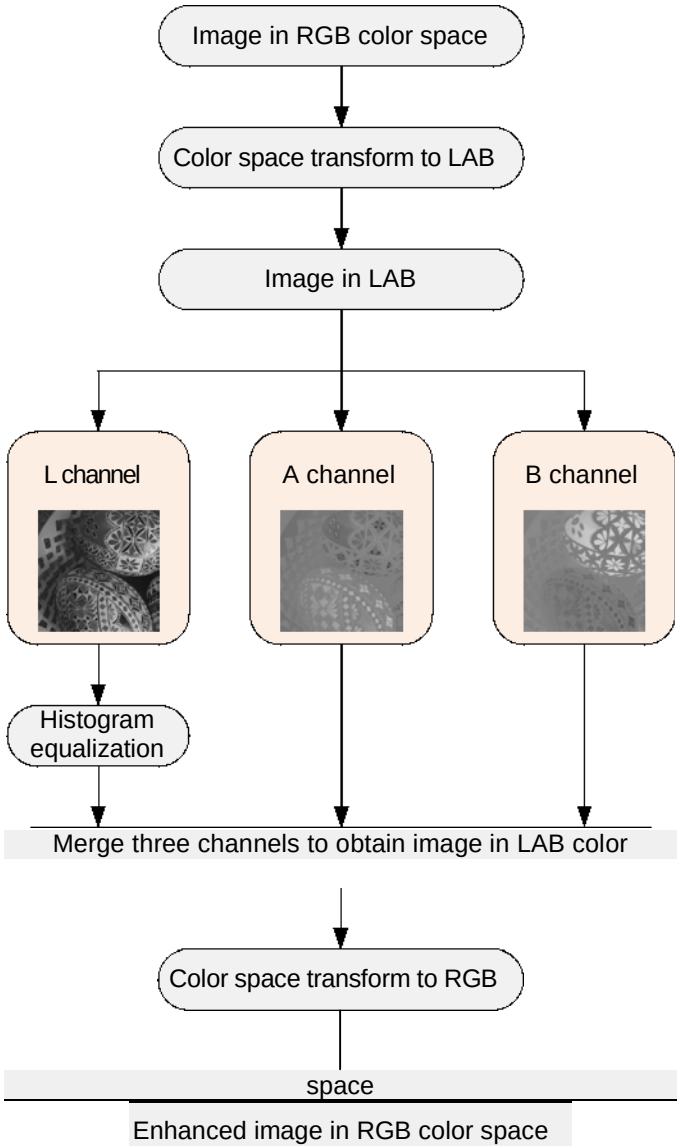
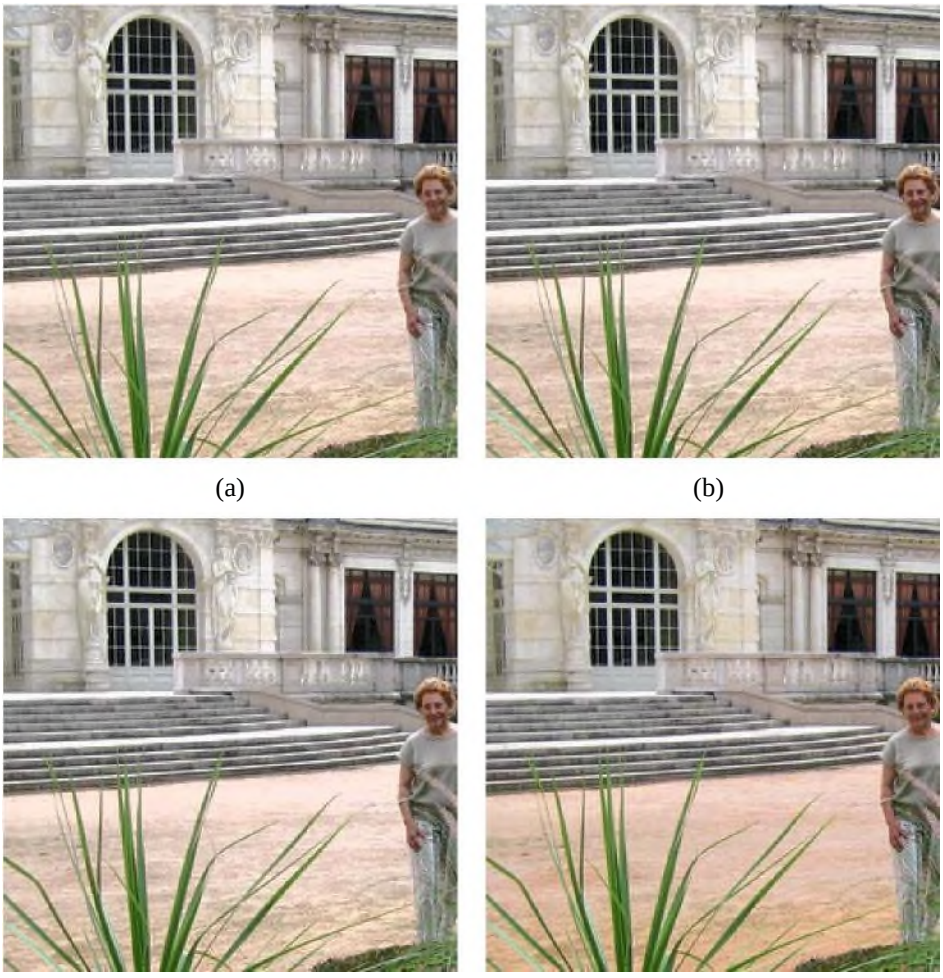



**Fig. 1.** Block diagram of the intensity preserving image enhancement procedure of LAB color space.

## 3 Experimental Results

This section gives subjective performance comparison. We have four color spaces, i.e., LAB, YCbCr, YIQ, and HSV. We tested color spaces on LC dataset [11]. Figure 2 show visual performance comparison.



(a) (b)

(c) (d)

**Fig. 2.** Visual performance comparison on four color spaces for LC #113 image. (a) LAB color space, (b) YCbCr color space, (c) YIQ color space, and (d) HSV color space.

## 4 Conclusions

An intensity preserving and image enhancement algorithm was presented in this paper. It is found in visual performance comparison that the HSV color space yields better performance than the other color spaces.

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