False Color Adjustment for a Medication Image Retrieval System in Mobile Environments

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Abstract. A major difficulty in using a color model based image retrieval system is false color effect caused by different light conditions, which makes the degradation of the true color of the image and disrupt image retrieval rate. The medication image retrieval system based on HSV color mdoel and shape classification also has same problem especially when the query images are captured by a camera attached on a smart phone. Such problem can be resolved by using white balancing technique which adjusts false color information due to background light variations. Once RGB color model is converted to YC_bC_r and top 5% of luma(Y) are considered as reference white pixels. RGB components of the color image are adjusted so that these reference white pixels are to the gray level of 255. The experimental results prove that the color adjsustment is efficient for developing a mobile medication image retrieval system.

Keywords: medication image retrieval, HSV color model, shape matching, white balancing.

1 Introduction

The identification of medications is an important issue for healthcare community, particularly for senior peoples who take many different medications and have difficulties to identify them properly. Most of current Web-based retrieval systems basically use text-based retrieval of the medication images. Even though there are increasing demands for retrieving image based on visual information, there are a few trials to develop a web-based interface which takes seniors need into account for resolving such difficulties [1,2,3]. The authors presented a contents-based medication image retrieval system based on HS color information and the shape signature of the medication [4]. The developed medication image retrieval system searches a desired image by two phases: shape classification and color histogram matching between query and database images. The shape classification is done by using the signature of the shape, which reduces the domain of the database image. Subsequently, a finally

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matched medication image is retrieved based on HS color components from a specific shape class of the medication. The developed system shows some efficiency and convenience to retrieve images by using medication image itself. However, one problem to be resolved is how to compensate the surrounding light variation which causes the side effect of changing color of the medication captured by a camera especially when the system is adapted to a smart phone application.

In this work, we present a way to compensate the false color of the medication image caused by surrounding light condition when the photo is taken. The white balancing as a preprocessing step for developing the image retrieval system is an appropriate solution for adjusting false color.

2 Proposed Approach

The existence of too many similar medication images in shape and color makes difficult to identify a medication by only a single feature from the medication. To resolve such difficulty, we design a hybrid approach to retrieve a medication based on shape and color features. First, we classify the medications by shape of the images. In the second phase, we identify them by color matching between a query image and pre-classified images. For the shape classification, the shape signature, which is unique shape descriptor of the medication, is extracted from the boundary of the medication. Secondly, H and S components from HSV except luminance are used to retrieve a most similarly matched medication image from each class of the medication classified by shape feature. The white balancing of the original image is done before extracting the color or shape feature from the original image as illustrated in Fig. **1.**

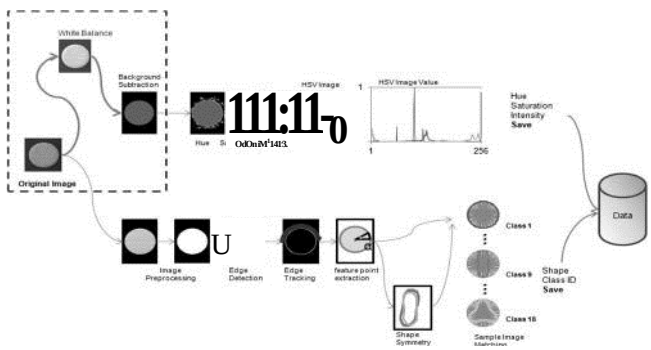

Fig. 1. Overall steps for designing a medication image retrieval system with false color compensation

Using following steps, we can obtain a modified image with white balancing.

C) Convert RGB to $YCbC_r$ and obtain luminance Y as follow:

$$Y = 0.3xR + 0.59\ xG + 0.11xB$$

C) Assign maximum Y value to " ", and minimum Y value to " ".

C Define top 5% of the Y value as reference white pixels.

$$reference\ white = v_{max} \quad (v_{max\ Ymin} \times 0.05$$

® Obtain average values of *R,G,B* of pixels in the range of the reference white, respectively.

© Obtain the ratios of R_{raa}, , *Gratio* , *Bratio* individually

$Rratio\ 255 \div R_{avg}, G_{rafi^\circ} = 255 \div G_{rafi^\circ}, B_{,,fi^\circ} = 255 \div B_{avg}$

© Obtain new R_a, , G_{new}, A_m, values by multiplying *R,G,B* with *Rratio, Gratio*

B ratio •

Fig 2 shows that the color adjusted image is obtained by applying white balancing algorithm to an originally taken by a camera. Once original input color image has been adjusted in preprocessing then the color and shape features are extracted from the modified image.

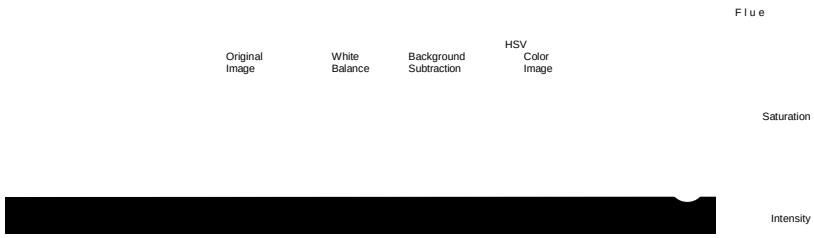

Fig. 2. False color adjustment before extracting color components

3 Experimental Results

Fig 3 illustrates some results of adjusting color with the white balancing technique.

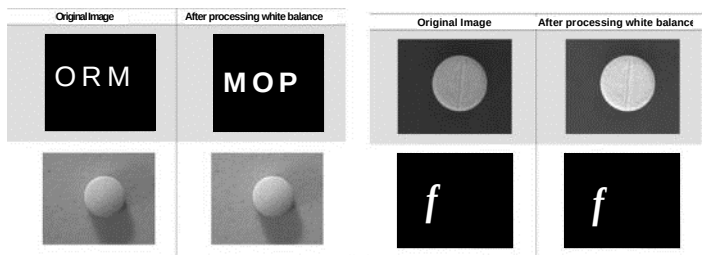

Fig. 3. Experimental results for applying the proposed method to input images

Fig 4 shows medication image retrieval results when both originally captured images and color adjusted images as query images. We obtained a query image using Samsung Galaxy Tab for retrieving the most similar images from a medication image database.

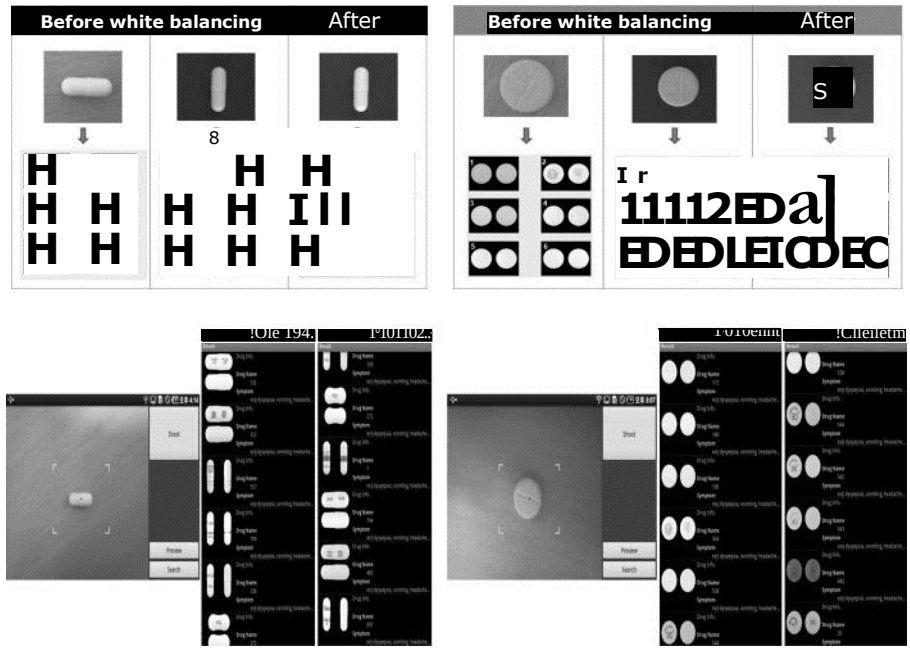

Fig. **4.** Results of retrieved images after applying color balancing to query images

4 Conclusion

In this paper we introduce a false color adjustment with white balancing technique to obtain an enhanced query image when the medication image retrieval system is developed. From the experiments, we can prove that the proposed preprocessing step can compensate for false color effect caused by background light variation during taking a medication image. Consequently, it can improve the successful image retrieval rate in contents-based medication image retrieval system.

References

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