Renovation in Color Transfer to Minimize Artifacts by Example-Based Video Processing Approach

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Abstract- *Nowadays, humans are habitual to the new era of digital technology. The world of photography and movies is more influenced by digital technology. Human are mostly interested in high resolution imaging and clarity of images/videos. Out of any possible methods of image processing, users are mostly interested in changing image's appearance by changing its tone or mood. As we are aware that, color of an image has large impact in its appearance, removing undesirable parameters of colors became essential to improve image quality. Interactive tools such as photoshop are less effective in reducing undesirable parameters of an image. Proposed method does sound processing to remove such artifacts effectively.*

Keywords- Artifacts suppression, Color Fidelity, Example-Based, Frame separation, Integrated Color Mapping

I. INTRODUCTION

In previous approaches almost in last some decades appreciable development has been observed in the area of color transfer. Some of them to be mentioned here include classical histogram matching, statistical transfer [2], dimensional probability density function transfer [3], gradient-preserving transfer [4], non-rigid dense correspondence transfer [5], and progressive transfer [6]. These methods to transfer color information are effective in their targets, still, they would sometimes produce visual artifacts, such as color bleeding effect, Grain Effect, Loss of details in the image or color fidelity related issues. In this proposed technique we are mainly focused on maintaining the color harmony between images and reducing the color distortion with a unique approach known as iterative integrated color mapping algorithm, as well as extension of color transformation technique for video processing. This technique is efficient in reducing the color distortion increasing the color appearance in a sound manner. In the section (I) we have the block diagram and description, in next two sections, section (II) and section (III) design and methodology of the ICM algorithm, in section (IV) we have results and finally in section (V) the conclusion.

II. BLOCK DIAGRAM/ OVERVIEW

As per the previous approach multiple manipulations detailing technique is used to transfer the color from example-based base image to the input or target image. This method is mainly composed of a calculating the histogram of reference as well as input, Edge-preserving algorithm and multilevel processing for preserving the details in the input image. Color component manipulation of image is most performed common operation in image modification. Several photoshop users use photo editing tools to adjust color appearance of image manually, but still there is high demand of automatic color appearance, owing to the inherent complexities to handle critical structures ubiquitous in natural images. Despite the fast development in color transfer field in last decade, methods include such as classical matching of histogram algorithm, statistical transfer approach, probability dimensional density function, gradient preserving transfer, dense correspondence transfer approach (non-rigid), progressive transfer etc.

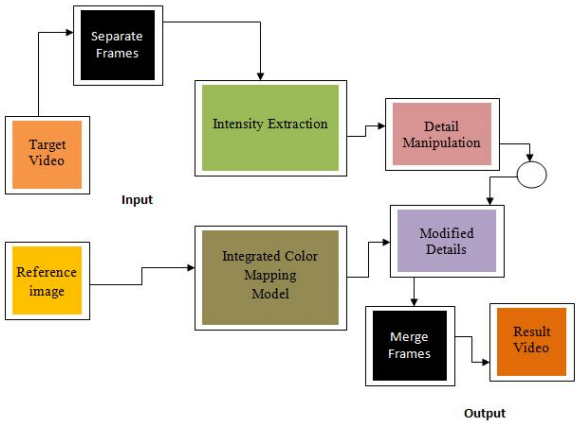

Fig. 1. Block diagram of the system

Though, these methods are proved effective in the color information transferring, they would eventually produce visual deficiencies, focusing basically to the logically incompatible roles of color distribution retention and image component distribution. Taking Fig. 1 as an example, because of considerable difference in the intensity distribution between the base image and the input images, unsatisfactory transferred result was produced, with pointable artifacts as follows,

a) Color distortion effect: In this case some unexpected or disharmonious colors appear which is not having relation with base image.

b) Grain effect: This kind of phenomenon appears due to rise in the noise level of the picture below the stretched mapping. Commonly, it looks like noise or irregularities in the blocks.

c) Loss of details: The fine details in the target input image are skipped after application color transfer. This is one kind of compromise for a color transfer.

In ideal case, color transfer between target and base images would satisfy the following goals,

1) Color fidelity: It is of huge importance to get the equicolor distribution in the input image as compared to that of the base image.

2) Grain parameter suppression: Input image should not contain any visual deficiencies (grain/blocky elements)

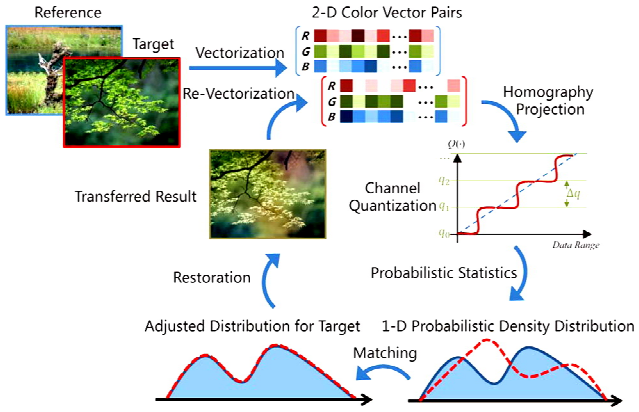

Fig. 2.The probability-based color distribution mapping with minimizing K-L distance

II. DESIGN/ METHODOLOGY

A) Multi scale detail manipulation scheme

Details in the original target should be preserved after the transfer. Actually, details often correlate to the style appearance, and this characteristic is significant to the color-related applications. Since we have incorporated the self-learning filtering scheme into the color mapping, we can exploit its property of edge-preserving decomposition to extract the details while compensating or enhancing them in the transferred output. In proposed framework, -levels details d^k are obtained by iteratively applying the self-learning filtering scheme. The sigmoid function is further brought to avoid the hard clipping that would occur when the detail levels are significantly boosted. To sum up, the multi scale detail manipulation scheme is formulated as,(3)

$$M(d^k,\lambda)=\begin{cases}\frac{1}{k}\sum_i^k d^k, & \lambda=1,\\ \sum_i^k \frac{1}{(1+e^{-\lambda d^k})}, & \lambda\neq 1,\end{cases} \quad (1)$$

$$D_{\mathrm{NKL}}=\left(D_{\mathrm{KL}}-D_{\mathrm{KL}}^{\min}\right)/\left(D_{\mathrm{KL}}^{\max}-D_{\mathrm{KL}}^{\min}\right). \quad (2)$$

Where S (g, t) and M (d, λ) denote the self-learning filtering operator and detail manipulation operator, respectively. With this unified framework, we achieve proposed aforementioned goals seamlessly, including grain suppression, color fidelity and detail preservation. The pseudo code of proposed approach is given in Algorithm 1.

$$\min D_{\mathrm{NKL}}\left(\rho\left(S(\hat{g},t)+M(d,\lambda)\right)\|\rho(r)\right), \quad (3)$$

IV. RESULT

A. Image Color Transfer approach

In the proposed algorithm we have mostly concentrated on the suppression of artifacts in the target image/ video. We tried our best in improving parameters such as, “Color Harmony” and “distortion”. We need to improve the harmony i.e. to reduce in harmony of color appearance & To Reduce The Color Distortion,

Fig. 3.(A) Target Image, (B) Reference Image, (C) Output By Rienhard’s Approach, (D) Output By Mkl Approach, (E) Output By Icm Approach, (F) Output By Ours

In Fig 3, the target image (a) is modified by color transfer from reference image (b). The output image results by using different techniques i.e. (c) Rienhard's method, (d) MKL method , (e) ICM method are compared as shown in fig. The color distortion and in harmony in color appearance are well modified in proposed framework as shown in fig (f).

Fig. 4. Target Image, Reference Image, (A) Output By Rienhard's Approach, (B) Output By MKL Approach, (C) Output By ICM Approach, (D) Output By Ours

The results for parameters Harmony (Color Harmony), Color Distortion could be compared in tabular values as follows,

Table No I: Comparison between the values of parameters got by using previous methods and proposed method. All the parameter values are decreased to a considerable measure

Method Adopted	Color Harmony	Color Distortion
1) Rienhard's Method	25.0762	0.6062
2) MKL Method	23.4388	0.5036
3) ICM Regrain Method	24.1784	0.4328
4) Proposed Method (ICM)	23.0334	0.4324

B. Video color transfer results

Example based image color transfer technique is applied to a target video to get an output with modified color transfer through each frame of video to be processed. The final output after application of ICM method can be given as follows.

V. CONCLUSION

Example based image color transfer technique is applied to a target video to get an output with modified color transfer through each frame of video to be processed. The final output after application of ICM method can be given as follows,

Fig. 5.Resulted video after video color transfer technique

Removing discrepancies in a color image by considering example based base image. Suppression of artifacts like color in harmony, loss of details, color distortion can be overcome by using video color transfer technique

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