BGMaker:Example-Based Anime Background Image Creation from a Photograph

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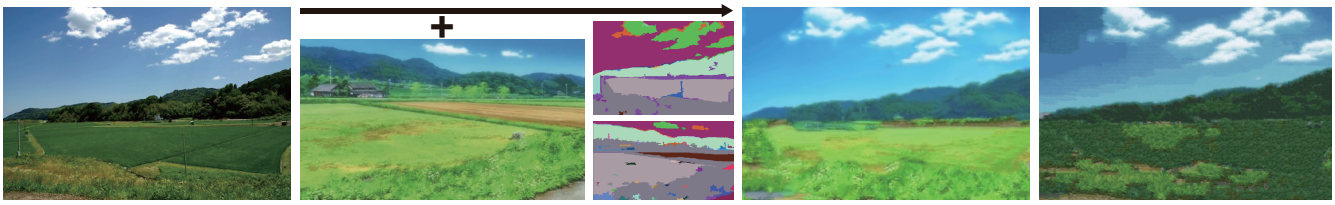

(a) Target Photograph (b) Source Anime Background (c) Correspondence Map (d) Our Result (e) [Efros et al. 2001]

Figure 1: *We transfer textures to a target photograph (a) from a source anime background image (b). We automatically establish a suitable region correspondence between the target and the source (corresponding target (c, top) and source (c, bottom) region filled with the same color). Our result (d) successfully resembles the painting style of the source anime background image as compared to the previous work (e).*

1 Introduction

Anime designers often paint actual sceneries to serve as background images based on photographs to complement characters. As painting background scenery is time consuming and cost ineffective, there is a high demand for techniques that can convert photographs into anime styled graphics. Previous approaches for this purpose, such as Image Quilting [Efros and Freeman 2001] transferred a source texture onto a target photograph. These methods synthesized corresponding source patches with the target elements in a photograph, and correspondence was achieved through nearest-neighbor search such as PatchMatch [Barnes et al. 2009]. However, the *nearest*-neighbor patch is not always the most *suitable* patch for anime transfer because photographs and anime background images differ in color and texture. For example, real-world color need to be converted into specific colors for anime; further, the type of brushwork required to realize an anime effect, is different for different photograph elements (e.g. sky, mountain, grass). Thus, to get the most suitable patch, we propose a method, wherein we establish global region correspondence before local patch match. In our proposed method, BGMaker, (1) we divide the real and anime images into regions; (2) then, we automatically acquire correspondence between each region on the basis of color and texture features, and (3) search and synthesize the most suitable patch within the corresponding region. Our primary contribution in this paper is a method for automatically acquiring correspondence between target regions and source regions of different color and texture, which allows us to generate an anime background image while preserving the details of the source image.

2 Our Approach

We automatically divide images into regions using the graph-cut based method. Each segmented region is one object and has one texture. Next, we establish correspondence between the source anime regions R^S and the target photograph regions R^T on the basis of the color and texture features. We compute mean of each region color $\boldsymbol{\mu}_{col}(R)$ and the Euclidian distance $||\boldsymbol{\mu}_{col}(R^T) - \boldsymbol{\mu}_{col}(R^S)||$ in the L*a*b* color space after fitting the color histograms of the two input images. To preserve local color features, we divide the pixels into ten color groups (black, gray, white, red, orange, yellow, brown, green, blue, and purple) based on the Basic Color Terms. Then, we fit the color of pixels belonging to the same color group. We also consider the LBP texture feature $\mathbf{F}_{lbp}(R)$ and the distance $||\mathbf{F}_{lbp}(R^T) - \mathbf{F}_{lbp}(R^S)||$ in order not to correspond significantly different texture regions (e.g. gradation, complexity). R^S corresponds to R^T such that

$$R^S = \arg\min_{R^S} ||\boldsymbol{\mu}_{col}(R^T) - \boldsymbol{\mu}_{col}(R^S)|| \quad \text{subject to } ||\mathbf{F}_{lbp}(R^T) - \mathbf{F}_{lbp}(R^S)|| < \gamma \tag{1}$$

where γ is the threshold. In this paper, $\gamma = 0.5$. Figure 1(c) shows that a suitable region correspondence is acquired. Finally, after fitting the histogram of corresponding regions, we synthesize the source patch to the target photograph using the multi-resolution synthesis technique. This technique can preserve source texture but lose target shape. Then, at a low-resolution, we only synthesize the pixels of a corresponding region in order to preserve target shape. At a high resolution, we synthesize the original patch in order to preserve source region boundary.

3 Results and Conclusions

The conversion result is shown in Figure 1 (d). Our method successfully resembles the painting style of the source anime background image while Efros' approach (Figure 1 (e)) mixes the source texture because only nearest-neighbor patches were selected. Moreover, we can input not only a photograph but also a movie as a target.

References

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