Stereoscopic Architectural Image Inpainting

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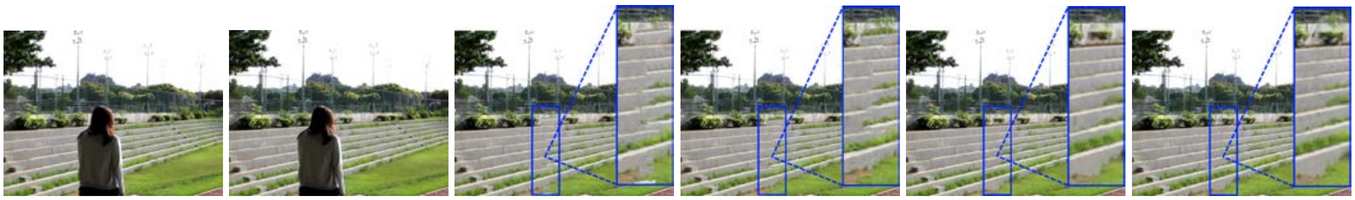

(a) (b) (c) (d) (e) (f)

Figure 1: *Stereoscopic image inpainting.(a)(b) Original input images. (c)(d) Results by [Wang et al. 2008] (e)(f) Our results.*

1 Introduction

Example-based image inpainting is widely used to fill in the holes caused by removing foreground objects in an image, but artefacts usually appears during the inpainting process. Criminisi et al. [2003] determined patch filling orders at missing region boundary by measuring the surrounding known pixels and isophote strength. Wang et al. [2008] used stereo images with corresponding disparity maps as input. They took advantage of the two-view and disparity information to produce a more reasonable result than those by single-view methods. Darabi et al. [2012] enriched the patch search space with additional geometric and photometric transformations.

We present an automatic image completion method for stereoscopic architectural images. We take advantage of two-view information to reduce obstacle pixels and preserve parallax consistency. The vanishing point and lines in the scene are used for perspective correction. The obstacles in the corrected scenes are then inpainted by the proposed structure-enhanced patch searching. The experiments shows that our method can reduce artefacts for architectural scenes.

2 Our Approach

In the beginning, we use the warping framework in Stereoscopic Inpainting [Wang et al. 2008] to decrease obstacle pixels and check the consistency of inpainting results. After the warping and filling stage, there are still missing pixels in stereo images that cannot be seen in both views. The perspective artefacts result from an oblique viewpoint to a target facet. To preserve perspective properties during inpainting, an automatic perspective correction mapping matrix is calculated by estimating the vanishing point and vanishing lines of the main building in the images. Based on the rectified images, we then extend the priority filling method with structural enhancement searching.

The whole process can be split into a two-step iterative algorithm. First, we find the contour $\delta\Omega$ of the target region Ω and calculate the priority value of each patch $\Psi = \{\Psi_p | p \in \delta\Omega\}$. The one with the highest priority value will be filled first. Once the target patch Ψ_t is determined, we search for a source patch Ψ_s to fill the unknown pixels in Ψ_t. The process continues until there is no pixel in Ω. A conceptual image is shown in Figure 2. Considering only the texture similarity may sometimes copy unexpected patches, such as Ψ'_s. Since the vanishing lines have been rectified, we further utilize the aligned horizontal structure to assist patch searching. We calculate the vertical distances between candidate patches and rectified horizontal lines. This new penalty term is combined into the patch searching priority. Please refer to our demo for more results.

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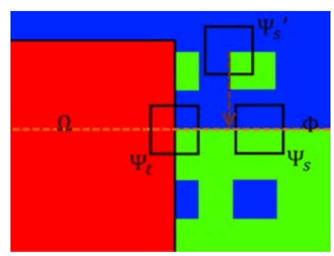

Figure 2: *Structure-enhanced patch searching.*

Acknowledgements

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References

CRIMINISI, A., PEREZ, P., AND TOYAMA, K. 2003. Object removal by exemplar-based inpainting. In *Proc. IEEE Conf. on Computer Vision and Pattern Recognition*, vol. 2, II–721–II–728.

DARABI, S., SHECHTMAN, E., BARNES, C., GOLDMAN, D. B., AND SEN, P. 2012. Image Melding: Combining inconsistent images using patch-based synthesis. *ACM Trans. Graphics 31*, 4, 82:1–82:10.

WANG, L., JIN, H., YANG, R., AND GONG, M. 2008. Stereoscopic inpainting: Joint color and depth completion from stereo images. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition*, 1–8.