High-level Segmentation and Temporal Coherence for Image-Based rendering

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Context and Research Goal

In recent work in our group, we have developed an Image-Based Rendering algorithm allowing free viewpoint navigation [1]. This method is based on the oversegmentation of each input image (into superpixels) so that when synthesizing a new view, all depth boundaries are preserved. Novel views are created by blending warped superpixels the 4 closest input views (see figure below and [1]). Unfortunately, the use of superpixels alone can be insufficient, since there is no correspondence between superpixels in the different input images, and there is no concept of a higher level segmentation into homogeneous regions or "objects". In addition, there is no temporal coherence of warped superpixels.
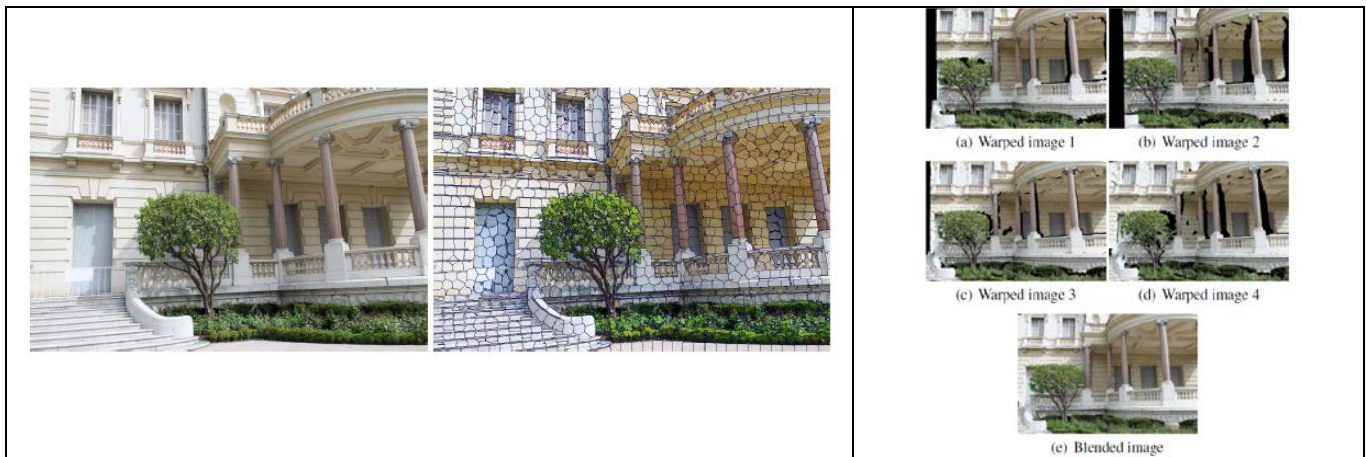

Fig.1: The input images (left) are oversegmented into superpixels (middle). The superpixels are then warped into the novel view, blended from the 4 closest views (right).

Approach

In this internship we will investigate alternative segmentations which encapsulate higher-level regions, and use them to improve our image-based rendering algorithm. Examples of such segmentations include [2, 3, 4]. We will develop a "soft" labelling of coherent regions using such techniques, which will be guided by the oversegmentation we have computed. The warp and blending steps of our algorithm will be adapted to take into account this higher-level segmentation (e.g., that of [4]) and use the temporal coherence properties offered by methods such as [2]. These improvements will greatly improve the results of our image-based rendering approach, eliminating several signficiant visual artifacts.

Requirements

The successful candidate should have taken courses in computer graphics and/or computer vision.

Situation

The internship will take place at INRIA Sophia Antipolis,
on the beautiful French riviera. INRIA provides a student
stipend/salary of up to 1100 euros per month to cover living
expenses.

The project will start in March 2014, for 5 to 6 months.

References

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Julien Fauqueur Gabriel Brostow Roberto Cipolla, *ICCV 2007*
http://www0.cs.ucl.ac.uk/staff/G.Brostow/labelProp/fauqueur_iccv07_object_label_propagation.pdf

[3] Segmentation and recognition using structure from motion point clouds.
Brostow, G. J., Shotton, J., Fauqueur, J., & Cipolla, R.
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Shotton, J., Johnson, M., & Cipolla, R. (2008, June). In *Computer Vision and Pattern Recognition, 2008. CVPR 2008. IEEE Conference on* (pp. 1-8). IEEE.
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