



[Volume XL-4](#)

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-4, 319-323, 2014
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-4/319/2014/
doi: 10.5194/isprsarchives-XL-4-319-2014

Extraction of Image Topological Graph for Recovering the Scene Geometry from UAV Collections

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Keywords: CUDA-SIFT, Topological Graph, UAV Collections, Image Matching, 3D Geometry

Abstract. This study was performed aiming to construct the scene geometry with a large set of unmanned aerial vertical (UAV) collections. By improving the popular structure from motion (SfM) algorithm, we focus on the efficiency improvement on procedures of both feature detection and image matching. Distinctive features are firstly detected with a CUDA based GPU accelerate technology under the basic of SIFT algorithm (CUDA-SIFT). And then, the image topological graph is computed by finding the conjunction relationship between UAV collections with the help of flight control data acquired by the UAV platform. Image matching will be guided by the computed image topological graph to solve the traversal matching problem. Experimental results show that CUDASIFT performs much better than the original SIFT algorithm on both efficiency and feature amount. Also, the topological graph of computed image limits the searching range for feature similarity computation, resulting in dramatic speed up. A final bundler adjustment is implemented in the procedure of scene geometry reconstruction, and the structural geometry as well as the coverage completeness is far more comparable to the SfM method.

[Conference Paper](#) (PDF, 612 KB)

Citation: Xu, Z., Wu, L., Chen, S., Wang, R., Li, F., and Wang, Q.: Extraction of Image Topological Graph for Recovering the Scene Geometry from UAV Collections, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-4, 319-323, doi: 10.5194/isprsarchives-XL-4-319-2014, 2014.

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