Initial disparity estimation using sparse matching for wide-baseline dense stereo

Mustafa A., Kim H., Imre E., Hilton A. {a.mustafa, h.kim, h.imre, a.hilton}@surrey.ac.uk

Abstract

Triangulation based initialization method for dense disparity estimation from uncalibrated wide-baseline image pairs using sparse correspondences is proposed. The method includes: (a) sparse correspondence retrieval, (b) Delaunay triangulation and homography estimation, and (c) obtaining a dense initial disparity map to initialize dense stereo algorithms.
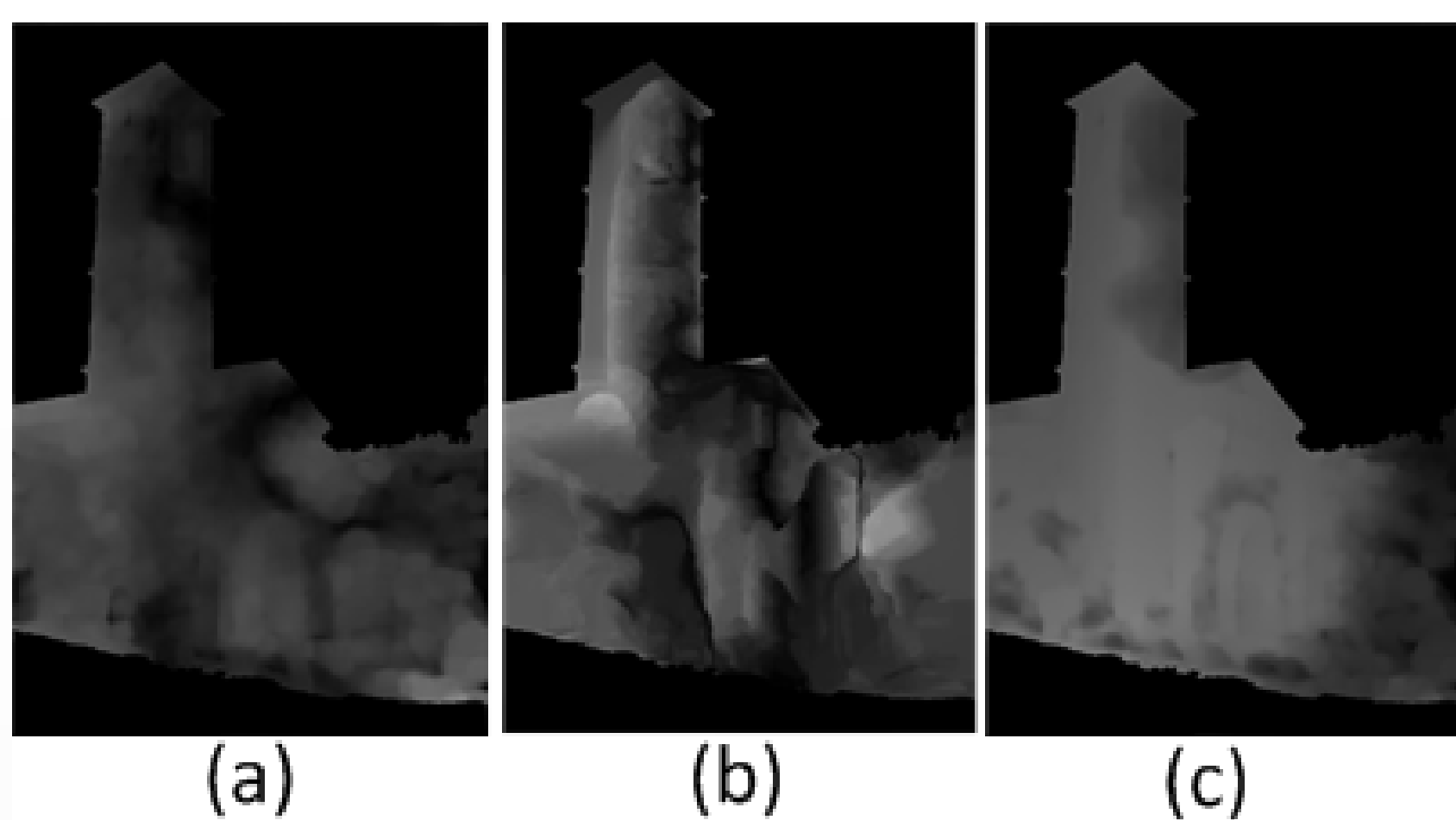
Problem Formulation

Existing stereo algorithms fail in the case of wide-baseline views due to the large disparity range. Comparative study of stereo matching for narrow-baseline views is presented in [1].

Method
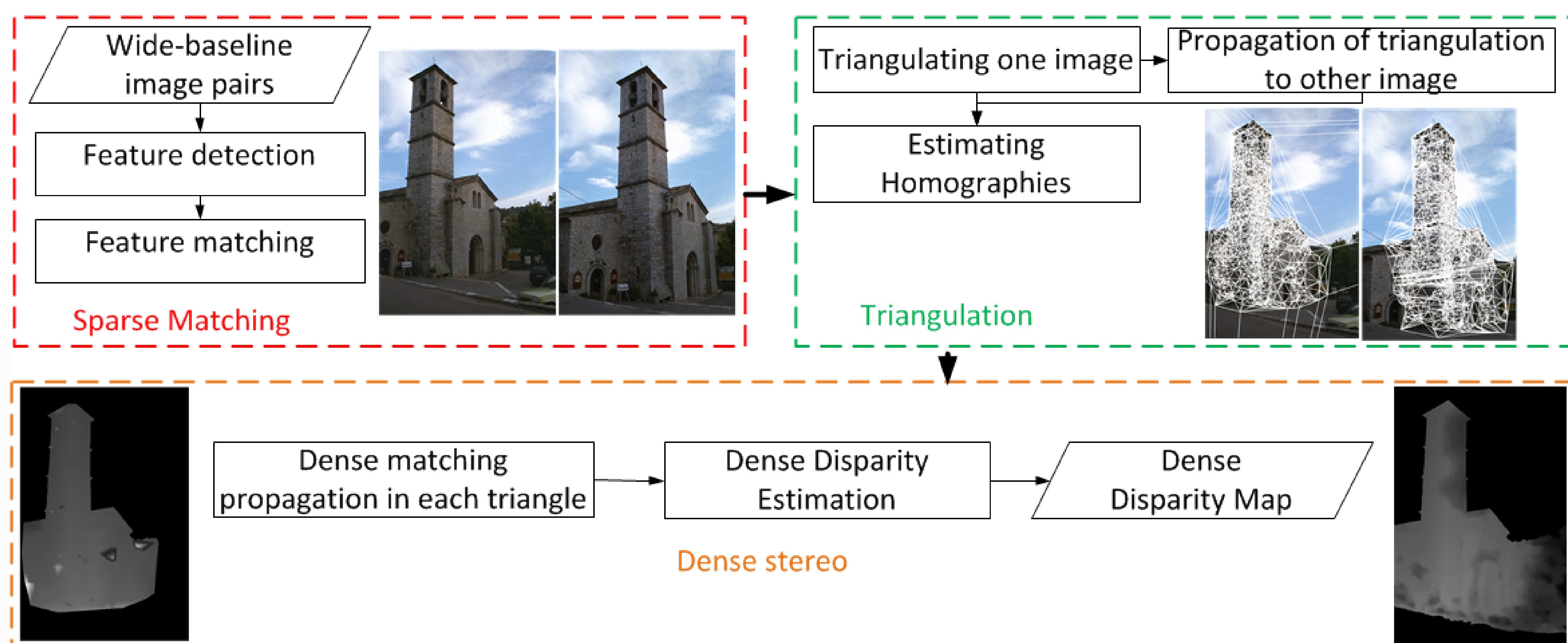
Dense disparity estimation using triangulation

Results

Dense disparity map for Valbonne: (a) BM with [2], (b) SGBM with [2] and (c) Proposed approach with [2]

Algorithm	BM	SGBM	Proposed
Time (ms)	329.106	415.031	197.086

Computational complexity for Valbonne

Conclusion and Future Work

Conclusion
- The approach has been evaluated on wide-baseline uncalibrated image pairs of various indoor and outdoor scenes.
- The proposed approach is faster and gives a better disparity map compared to the existing stereo initialisation approaches.

Future work
- Quantitatively evaluate the approach on other methods for refining the dense stereo like graph-cut or belief propagation based disparity refinement.
- Extend the approach for dense reconstruction of dynamic scenes.

References

[1] G. Farneback, Two-frame motion estimation based on polynomial expansion, in *13th Scandinavian conference on Image analysis*, 2003
[2] D. Scharstein, R. Szeliski, A taxonomy and evaluation of dense twoframe stereo correspondence algorithms, in *IJCV*, 2002

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