

A. Supplementary Appendix

In this appendix, we provide details on the implementations used in the experiments.

A.1. Implementations of the Methods

Compared Methods To keep the maximum number of feature points to 1000, we sort the detected feature points according to their respective response scores and keep the best 1000. Details for the implementations of the compared methods are as follows:

- *ORB* [32]: OpenCV library – <http://opencv.org/downloads.html>
We used nFeatures=1000, nLevels=3, and default values for other parameters.
- *BRISK* [22]: Provided by the authors – <http://www.asl.ethz.ch/people/lestefan/personal/BRISK>
We used threshold of 20, with default values for other parameters.
- *FREAK* [2]: Provided by the authors – <https://github.com/kikoht/freak>
Default parameters were used.
- *SURF* [6]: OpenCV library – <http://opencv.org/downloads.html>
Default parameters were used.
- *LIOP* [42]: VLFeat library – <http://www.vlfeat.org/>
Default parameters were used.
- *SIFT* [25]: OpenCV library – <http://opencv.org/downloads.html>
Default parameters were used.
- *MROGH* [14]: Provided by the authors – <https://github.com/bfan/MROGH-feature-descriptor>
Default parameters were used.
- *sGLOH* [7]: Provided by the authors – <http://www.math.unipa.it/fbellavia/htm/research.html>
Default parameters were used.
- *KAZE* [3]: Provided by the authors – <https://github.com/pablofdezalc/kaze>
Default parameters were used.
- *EF* [48] and *BiCE* [47]: Provided by the authors – http://research.microsoft.com/en-us/um/people/larryz/edgefoci/edge_foci.htm
Default parameters were used.
- *Daisy* [47]: Provided by the authors – <https://github.com/etola/libdaisy>
Patches were extracted to be four times the scale, which was the value authors used in [48]. Other parameters are set to default values.
- *VGG* [34]: Provided by the authors – http://www.robots.ox.ac.uk/~vgg/software/learn_desc/
Patches were extracted with the VLFeat library, with a relativeExtent of 7.5, which is the same as what *SIFT* uses. We use the pre-learned model learned with the *liberty* dataset from [34], as the other two datasets are partially included in our test set.

Our Methods

We used the Python Theano library [5] for implementation – <http://deeplearning.net/software/theano/>