Unordered Multiple Image Matching by Using Descriptor Clustering

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Abstract: Multiple image matching is an important task in photogrammetry for tie point measurement in block adjustment or generation of point clouds. Numerous algorithms can be found in the literatures. SIFT, a 128-dimension vector consisted of the gradient statistics in each keypoint, is developed by Lowe (2004) and becoming a popular method for robust image matching approach for the decades. When it comes to multiple image matching, the descriptor is a proper way to match multiple image. By identifying keypoint's descriptor, it can determine whether these descriptors are corresponding to the same point. By comparing the Euclidean distance between these keypoints' descriptors, the corresponding keypoints in each images can be determined. Moreover, the SIFT descriptors of keypoints in all images can be employed to cluster the keypoints to establish the relationship of adjacent images (Chen and Chio, 2013). Therefore, it is possible to use the descriptor clustering for multiple image matching by assuming that keypoint descriptors of the same point from the different images will be clustered in the descriptor space. In other words, when all descriptors describe the same keypoint, the descriptors will be aggregated in descriptor space with a small region. In this study, adaptive K-means will be used to find all the possible clusters of descriptors automatically without any initial data. After all clusters are obtained, multiple image matching is also finished. The tests will be performed to prove the proposed idea is able to cluster the descriptors and to match keypoints among the corresponding images successfully.

KEY WORDS: SIFT, Multiple Image Matching, Adaptive K-means, Cluster