

Assessment of the master thesis by Filip Šrajer

Image Matching for Dynamic Scenes

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The goal of the thesis was to develop image matching for dynamic scenes with multiple moving objects. This is a difficult and still unsolved problem in computer vision. The main difficulties are related to (i) varying size of the moving objects, (ii) frequent degeneracies due to object planarity, and (iii) ambiguities in interpretation of multiple independently moving planar objects vs. single rigid moving object.

The thesis presents three main contributions. First, it builds image matching on fast construction of matched sets that can be explained by homographies. Secondly, it studies the constraints on homographies generated by a single moving rigid object as well as the related degenerate situations. Finally, it presents a complete system for image matching of multiple images incorporated in a complete structure from motion pipeline.

The thesis is going beyond the standard master thesis by the result as well as by the quality of its presentation. Using the homographies as a basis for matching of dynamic scenes addresses one of the main difficulties following from limited size of objects. The analysis of compatibility of homographies induced by a single moving object reveals that it is impossible to distinguish this case from special motions of multiple planar objects. This is a truly new result that has not been known before and which sheds more light on the matching problem. Last but not least, the amount of work spent on implementing a full structure from motion pipeline could constitute a full thesis on its own.

Filip Šrajer was a very motivated, capable, and hard working student. He has started working with me after the first year of his bachelor studies and has become an experienced researcher already when finishing his bachelor degree. This has been elevated to another level of quality in the last few years. He spent time at ETH Zurich, INRIA Paris and in Microsoft Research and become a fully professional researcher.

Filip Šrajer presented an excellent work and fulfilled all the goals set in the assignment. He mastered advanced techniques in the field and contributed by truly new results. Therefore, I recommend grade the thesis by the *excellent grade*.

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