Assessment of the bachelor thesis by Viktor Korotinskiy

Using Symmetries in Solving Minimal Problems in Computer Vision

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The goal of the thesis was to study symmetries in polynomial systems and the way how to use them to simplify the systems by substitutions. This is an interesting and important problem in computational algebraic geometry and in computer vision and robotics. Often, when formulating geometrical problems, spurious solutions are introduced due to the use of quaternions or other parameterizations that yield n-to-one representation of the problem. Recently, work by Larsson et al. has addressed this problem and demonstrated that some systems can be simplified by convenient substitutions. However, the work of Larsson et al. was not fully systematic and missed to refer to recent mathematical literature dealing with this topic.

The thesis presents three main contributions. First, the thesis reviews and restates results from recent mathematical literature. It presents the results in a way directly relevant to polynomial systems in computer vision. Secondly, a new method for finding symmetries under substitutions generated by diagonal matrices is described. Finally, a fully general method for finding symmetries generated by general linear substitutions is given. This is truly new result. It is also important that this method can be potentially further generalized to polynomial and rational substitutions. All three contributions of the thesis are going beyond standard BC theses by the result, by the methods used, as well as by the quality of the presentation.

Viktor Korotinskiy was a very motivated, capable, and hard-working student. We started our collaboration already during the first year of his studies by looking at a way how to approximate a matrix by a rational rotation matrix with a predefined precision and with simple fractions. Then, we moved to studying symmetries in polynomial systems. Viktor was able to grasp many non-trivial concepts from algebraic geometry and other branches of mathematics. We see in his thesis that he is capable of discovering new results and presenting them in fully professional way.

Viktor Korotinskiy presented a very professional research work and fulfilled all the goals set in the assignment. He mastered advanced techniques in the field and contributed by several new results.

I believe that this work is *excellent (A)*.

Prague, 10 June 2018

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