Assessment of the bachelor thesis by Pavel Trutman

Minimal Problem Solver Generator

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The goal of the thesis was to extend and improve the automatic generator of minimal problems in computer vision by Z. Kúkelová et al and, in particular, to understand and re-implement the state of the art F4 algorithm for solving multivariate polynomial systems by J.-C. Faugere.

The thesis presents several contributions. First, and most important, contribution is that it provides good understanding of the F4 algorithm. The strategy of polynomial generation of F4 was incorporated into the automatic generator and tested. An improvement in speed as well as in the reduction of the number of operations was presented on an interesting engineering problem. Secondly, automatic generator has been extended to be able to chain polynomial generations and reductions. Third, new improvement of polynomial reduction based on matrix reordering before Gaussian elimination, recently published by Kúkelová et al at ICCV 2014, has been implemented and tested. Finally, several other implementation updates have been done.

The first contribution of the thesis is clearly going beyond the standard BC thesis by the result as well as by the quality of their presentation. Understanding, implementing and transferring the ideas of F4 algorithm elsewhere required grasping concepts from algebraic geometry. This goes beyond the knowledge normally accessible to engineering students.

Pavel Trutman was a very motivated, capable, and hard working student. He has started working with me already after the first year of his study and has become an experienced researcher already when finishing his bachelor degree. I particularly value that he was able to master difficult and abstract language of modern applied algebraic geometry as used in works by D. Cox et al, T. Becker et al and J.-C. Faugere.

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

Prague, 15 June 2015

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