

Referee's report on the master's thesis of Martin Raška

The thesis of Martin Raška is on the multidimensional continued fractions, their relation, and their application to the number fields. The latter is not surprising (but far-reaching), due to the rich history of periodic continued fractions, solutions to Pell's equations, and the corresponding real quadratic fields. In the multidimensional case, the integer geometry plays an integral role and has a more prominent discrete geometry flavour. The topic has a rich history, perhaps starting with F. Klein, and the "modern" take was influenced by V. Arnold. It is an active research area with many open problems.

In this thesis, the student tackles two questions. One is about the realisation of certain convex polyhedrons as faces of multidimensional continued fractions (in Theorem 3.3.2), and then relations for a quadrilateral to be realised as a face of a two-dimensional continued fraction (Theorem 3.3.6). The second question is regarding the periodic multidimensional continued fractions and connecting two ways of representing them via matrices and number fields.

The thesis is self-contained. Sections 1 and 2 introduce all the necessary tools from algebra, number theory, and integer geometry. The student does a great job at that, making sure everything is well defined and giving plenty of examples. Furthermore, the thesis contains original results, specifically the above-mentioned theorems in Section 3. Lastly, the last section is presented well and touches on the state-of-the-art in the area, which the student presents with ease. It is an advanced topic, as it requires reasonable knowledge of algebraic number theory (which is taught at the master's level) and integer geometry (which has to be independently studied). Mathematically, the results in the thesis are correct. Besides a really minor number of typos, it is exceptionally well written and presents results clearly and originally. Furthermore, it proves new results and deserves, in my opinion, the top mark (výborně). Therefore, I recommend the thesis be defended as a master's thesis. I recommend grade 1.

Pavlo Yatsyna

Date