



FACULTY
OF MATHEMATICS
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Report on the doctoral thesis of
Kateřina Medková
Substitutive sequences and their properties

The thesis studies infinite words with small factor complexity. The low complexity imposes restrictions on the word in question and implies combinatorial properties which can be studied and used for various characterizations of corresponding classes. This kind of research is the mainstream in the field. On one hand, it has a long tradition, on the other hand it still provides rich material for new results, which the thesis well illustrates.

The thesis is based on five papers. Four of them are published in international journals which are standard publication venues for the research community (including two papers that are listed as submitted in the thesis). All those papers are coauthored by the supervisor and other coauthors. The fifth is a contribution in proceedings of the key international conference on Combinatorics on Words, where the applicant is the sole author. According to the thesis, all coauthors contributed equally to the publications, which overall creates a respectable publication record at the completion of Ph.D. studies.

Research papers are complemented with an extensive introduction to the field of research (Chapter 2) and a unified presentation of results from published papers (Chapter 3). The quality of this complementary sections is very high. It is very clearly written with almost no typos, which is quite unusual in this kind of “obligatory” material. This allows me the following two very small suggestions:

- On page 31, a comment on the symmetry of the relation “being associated with” could be added (see “and vice versa”), since the relation is apparently asymmetric.
- The remark “Let us emphasize that the shape II can be understood as a special case of the shape I . . .” on page 49 would better be illustrated by a picture.

A rich list of references is provided (and put in the proper context in the text). Altogether these chapters are a valuable standalone introduction to the field and its state of the art.

New results obtained in published papers extend the understanding of the repetitive structure of important classes of words, namely Sturmian words, Arnoux-Rauzy words, Complementary Symmetric Rote words. In particular, description of derivated words for these classes is provided in terms of their fixing morphisms. Several algorithms are presented for this purpose. In addition, the critical exponent, the recurrence function, and its dual non-repetitive complexity function, topics of the recent and current research, are studied for Arnoux-Rauzy words and Complementary Symmetric Rote words. (Let me remark that the non-repetitive complexity function was defined in 2012, and in 2007 it was shown that any real number greater than one can be a critical exponent.)

In conclusion, the thesis certainly meets its objective, and I recommend that Kateřina Medková is awarded the Ph.D. title.

Prague, August 7, 2020

Štěpán Holub