Finding generalised periodicities in words

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Pseudo-repetitions are a natural generalisation of the classical notion of repetitions in sequences. They are the repeated concatenation of a word and its encoding under a certain morphism or antimorphism (anti-/morphism, for short); a word that is a pseudo-repetition with respect to an anti-/morphism f is called f-repetition. In this talk we present solutions for the following problems:

- for a word w and an anti-/morphism f, decide whether w is an f-repetition;

- for a word w, decide whether there exists an anti-/morphism f such that w is an f-repetition;

- for a word w and a literal anti-/morphism f, decide whether w contains as a factor an instance of a given pattern involving a variable x and its image under f, i.e., $f(x)$.

- for a word w, a number k, and a literal anti-/morphism f, decide whether the word w contains an arbitrary f-repetition of exponent k.

The overviewed results generalise both the problem of deciding whether a word has a fixed repetitive structure (e.g., is it a cube?) or a palindromic structure, as well as the problem finding fixed repetitive structures (e.g., squares, cubes) inside a word and the problem of finding palindromic structures inside a word. For instance, we show how to detect efficiently in a word the existence of a factor of the form xx^Rxxx^R, or any other pattern of such type.

The papers on which this talk is based were written together with Paweł Gawrychowski, Dirk Nowotka, Robert Mercaş and Cătălin Tiseanu.

References

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