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### Semantic and emotional paths of a literary work and its translations

Modern state-of-the-art algorithms to process words and sentences of natural languages make it possible to map each word of a literary work, in one way or another, into a real scalar or vector, and thereby the text is represented as a path in single- or multidimensional phase space. If one employs a word-to-vec or similar procedures, the texts are mapped into semantic paths; in doing so one may vary the dimension of the phase space. Hence, there are a number of semantic paths associated with a given literary piece. In the framework of another approach, one may map a word into its emotional characteristic, either negative or positive; the approach relies on expert assessments. The resulting series is what is known as an emotional path.

In any case, we may associate with a literary piece a number of single- or multidimensional series, which can be explored using numerous methods of time series theory. Apart from undoubted theoretical interest, such results can be used as an original way to assess a quality of literary work translations – to this end we compare characteristics of the paths associated with a given work and its translations. The present paper investigates chaotic properties of semantic and emotional paths of an original literary work and its translations for the Russian and English languages. In order to ascertain that the series in question are chaotic, we calculate the highest Lyapunov exponent for them using the Rosenstein method.

The choice of the languages is determined, apart from rich literary traditions, by qualitative difference in grammar structures: Russian is an inflected language, while in English inflections are rather rare; Russian is characterized by a flexible word order in a sentence, whereas word order in English language is strict, and rare exceptions are constrained by stringent rules.

It has been found that the overwhelming majority of the emotional and semantic paths are significantly chaotic, and the values of the highest Lyapunov exponents are essentially larger for the Russian language. Presumably, it may be attributed to a flexible word order. We compare characteristics of original pieces and translations for both *War and Peace* and *Anna Karenina* by Leo Tolstoy for the Russian language and for both *A Christmas Carol in Prose* and *David Copperfield* by Charles Dickens for the English language.