The right word in the left place: towards experimental poetics

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Abstract

Literary texts are believed to possess two defining characteristics: they use language in unexpected ways, and all of their elements are tightly interconnected and irreplaceable. We report the first results of a large-scale experiment quantifying these two notions of unpredictability and constrainedness. It is implemented as a word-guessing Web-based game in Russian. We find a clear distinction between poetry and prose: poetry has either increased constrainedness with approximately the same unpredictability, or (in case of avant-garde poetry) increased unpredictability with approximately the same constrainedness as prose. We further address the question of formal constraints (such as meter and rhyme) and argue that language requires a certain level of redundancy, but poetry shifts redundancy to the non-semantic domain, thus increasing the semantic capacity of its language.

Keywords: Literature, poetry, information, unpredictability

1. Introduction

What is the difference between a literary and a utilitarian text? There are many possible answers to this question, but there is also a common thread to a great many of them. In literary, especially poetic text, it seems, "the form" is more closely connected to "the content", up to the point of identity. This view is exemplified by Roman Jakobson's famous definition of the poetic function of language as a message's orientation towards itself [1]. This theoretical view is ultimately based on the intuitive perception of text as a closely knit fabric, where all elements are interconnected, so that none can be replaced or removed without altering the whole.

This view is so common that one can find literally dozens of quotations from various authors expressing it across ages and stylistic orientations: from the 18th century English Romantic William Blake's "Poetry admits not a Letter that is Insignificant" (from A Vision of the Last Judgment) to the 20th century Russian Avant-garde poet Daniil Kharms's "Every word must be mandatory" [2]. It is even expressed in the Russian proverb Iz pesni slova ne vykinesh’ (No word can be dropped from a song). The very method of close reading, emphasized by Russian Formalism and American New Criticism, among others, is essentially based on this notion of structural interconnectedness of all the elements of a literary text. Indeed, it would hardly make sense to give attention to minute details if one weren't convinced that they fundamentally matter.

Another assumption about a work of literary art is that it should involve unexpected, striking, surprising words, tropes, turns of phrase and subject, etc. It is typically accepted implicitly, but was made explicit by Viktor Shklovsky [3] in his theory of defamiliarization (ostranenie). The notion came to the foreground again in a different guise in the 1950s and 60s, when Shannon's information theory became popular. Since mathematical information is, in a sense, a measure of unexpectedness, many believed that literary texts can be rigorously proved to have higher information density than utilitarian texts. In fact, Shannon himself argued in his groundbreaking paper [4] that Joyce's Finnegans Wake "is alleged to achieve a compression of semantic content" compared to texts in Basic English because of its larger vocabulary and hence, lower predictability. Both Umberto Eco [5] and Yuri Lotman [6] (developing ideas of A.N. Kolmogorov, see Uspensky [7]) attempted to apply the ideas of information theory to literature.
2. Method

The experiment described here is based on the idea that both notions of interconnectedness and unexpectedness of the elements in a literary text can be subjected to a direct verification, at least on the level of individual words. Indeed, unexpectedness can be measured by the probability for a reader to guess an omitted word. As for interconnectedness, if the word in text is (perceived by the reader as) the most appropriate one, the reader should be able to easily tell the original word from any replacement, i.e. presented with the original word and a replacement, select the correct one.

This scheme was implemented in the form of a Web-based literary game in Russian (http://ygrec.msk.ru). The game contains two distinct text corpora. Results reported here were obtained with one of them, containing 3439 text fragments grouped in 33 categories (typically, by the author). The average length of a fragment is about 140 characters, roughly equivalent to four lines of iambic pentameter. Most fragments represent rhymed metrical poetry of the past two centuries, in a wide stylistic range: from classicist to avant-garde, from professional to amateur, from classical to contemporary. There are also three prosaic texts for comparison. Fragments are presented to the voluntary participants in trials of one of three types:

- type 1: fill in an omitted word;
- type 2: determine whether the highlighted word is original or replaced;
- type 3: select the original word from two alternatives.

Before this idea could be realized in practice, however, a way to automatically generate replacement words had to be found. Doing this manually could introduce an uncontrollable bias in replacement words induced by the experimenter's tastes. There is a simple solution though: we use incorrect guesses from trials of type 1 as replacements in trials of types 2 and 3. This ensures that replacements are valid candidates, since they were actually selected by the participants themselves to fit in the provided space. In order to additionally discourage careless answers, participants are awarded points not only for correct guesses, but also for incorrect type 1 guesses whenever the resulting replacement is accepted by another participant for the original word.

The “open” nature of the experimental procedure makes it possible to obtain large amounts of data necessary for statistical validity of the results: thus, by the summer of 2007, over 8000 participants collectively generated over one million data points. Of course, some difficulties are also introduced by this methodology; they are discussed in detail elsewhere [8].
It should be noted that, in contrast to statistical text analysis (e.g. Gasparov & Skulacheva [9]), our data do not characterize texts as such, but rather the reader's perception of them. In contrast to the psychological and psychophysiological methods, we do not attempt to determine the reader's overall emotional or physiological reaction to the text or aesthetic evaluation of it. On the other hand, our data provide a “high-resolution”, detailed view on the level of individual words, like statistical text analysis; and are essentially based on the reader's interaction with the text, similar to other empirical methods.

3. Results

The experimental results are viewed through the prism of two parameters: a) unpredictability (unexpectedness), which is a measure of how hard it is to guess an omitted word, and b) constrainedness (irreplaceability), which indicates how easy it is to distinguish the original word from a replacement. Unpredictability is defined as $U = -\log_2 p_1$, where $p_1$ is the average success rate in trials of type 1 (i.e. the probability to guess an omitted word, averaged over all fragments in a category). It can theoretically range from zero, if all words are guessed correctly, to infinity, if no words are ever guessed. Constrainedness is defined as $B = \log_2 p_3/(1-p_3)$, where $p_3$ is the success rate in trials of type 3. It can range from zero, if original words are not identified better than chance, to infinity, if all the original words are readily distinguished by the readers from any replacement.

![Fig. 2. A summary of experimental data.](image)

It turns out that the value of unpredictability alone does not distinguish poetry from prose: most poetry is about as (un)predictable as prose. Most poetry is, however, cleanly separated from prose by its higher constrainedness values, which shows that the feeling of “the right word in the right place” does have an objective basis. A special class of poetic texts, of avant-garde persuasion, has approximately the same constrainedness as prose, but differs from it by higher unpredictability.
Next, we address the problem of formal constraints, such as meter and rhyme in poetry. Obviously, they should make texts more predictable. However, our data show that poetry on the whole is not more predictable than prose. What is at play here is “poetic license”, the well-known phenomenon of relaxed syntactic and semantic constraints in poetry, which acts to increase unpredictability. It is already an interesting result that these two tendencies almost exactly compensate each other.

This effect can be further quantified by presenting unpredictability as a sum of metric and non-metric parts. The probability to guess a word is the product of the probability to guess its syllabic length by the probability to guess the word, provided its length is already known. Thus, metric unpredictability is calculated from the number of responses in trials of type 1 where the syllabic length is guessed correctly, even if the word itself is not. Non-metric unpredictability is calculated from the ratio of correct responses among the responses with the correct syllabic length.

As expected, the metric unpredictability of poetry is very low, i.e. word length is easily guessed, while in prose it constitutes the larger part of total unpredictability. However, the total unpredictability in poetry and prose is approximately the same, because the freedom of word selection and combination in poetry (“poetic license”) almost exactly compensates for the restrictions imposed by the meter. This contradicts expectations of some authors who approached the problem of literary text from information theoretical point of view and hypothesized that good poetry should be more unpredictable and thus more “informative”.

The question then arises: What is the role of formal constraints in poetry, if their effect on predictability is nullified anyway? We argue that this question can still be answered within the information theoretical paradigm, but in a different way. We propose that the natural language requires a certain level of redundancy (predictability), but poetry shifts it to the non-semantic areas such as rhythm, rhyme, and alliteration, thus freeing up the semantic capacity of the text. In other words, formal devices allow the poet to create texts that blatantly violate linguistic conventions, but are still accepted by the readers as coherent and convincing.

4. Conclusion

The experiment described in this contribution produced a very large and growing dataset of a novel kind. The collected data allowed us to test some of the fundamental intuitions about poetry, namely, that it arranges words in a tightly interconnected structure. We also proposed a new perspective on the idea that formal devices in poetry paradoxically increase its semantic capacity. Importantly, these conclusions are drawn from the analysis of readers’ interaction with texts, rather than from the analysis of the texts per se, or from the readers’ reports about their experiences with the texts. Finally, it should be noted that the potential this dataset holds is far from being exhausted by the first results presented here.

References


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