DISSIPATIVE STOCHASTIC DYNAMIC MODEL OF LANGUAGE SIGNS EVOLUTION

Poddubny V., Polikarpov A.[1]

Tomsk State University, 36, Lenina Av., Tomsk, 634050, Russia, +7(3822)529-496, pvv@inet.tsu.ru
[1]Lomonosov Moscow State University, Leninskie Gory, Moscow, 119899, Russia, +7(495)939-3178, polikarp@philol.msu.ru

It is known [1] that the life cycle of the language sign from the moment of sign's appearance up to the moment of its disuse is defined by two processes: by (1) the process of the sign polysemy growing (determined by sign's acquisition of new, as a rule, gradually more abstract meanings), and by (2) the process of the gradual loss of earlier gained meanings (the process begins from meanings which are the least abstract ones). The ability of the sign to produce new meanings is called *associative-semantic potential* (*ASP*) [1]. ASP is measured by the maximum amount of possible meanings acquired by a sign during all its life-span. The first process is gradually slowing according to the growing volume of ASP already spent. The second process begins with some lag with respect to the first one and runs similarly, but more slowly. The difference between amount of meanings gained by a sign and amount of lost meanings to the given moment of a time, forms the size of the *actual sign polysemy*, i.e. the amount of living sign meanings to this moment of time. The curve of the evolution of this process in time is a unimodal curve with a maximum displaced to the beginning of the process. Assumingly, signs in language differ by the value of their ASP according to the exponential distribution law. This should lead to some specific configuration of the curves of signs' polysemy evolutions.

Dictionaries or text bodies of that or another language at present contain the statistics of the momentary polysemy distribution of whole ensemble of signs. The next question appears: what mathematical model of the process of the language sign evolution forecasts the momentary polysemy distribution, identical to the empirical distributions, got, for instance, from representative explanatory dictionaries?

We offer the dissipative stochastic dynamic model of the language sign evolution, satisfying to the principle of the least action, one of fundamental variational principles of the Nature. The model conjectures the Poisson nature of the birth flow of language signs and the exponential distribution of their ASP. The model works with stochastic difference equations of the special type, resulted from the principle of the least action for dissipative processes. The equation for momentary polysemy distribution drawn from our model do not differs significantly (by Kolmogorov-Smirnov's test) from empirical distributions, got from 5 main Russian and English explanatory dictionaries and 3 Russian semantic textual vocabularies.

References

1. *Polikarpov A.A*. A System-Quantitative Approach in Linguistics // Schools in Philology and their Role in Systematization of Scientific Studies. – Smolensk: Majenta Publishers, 2007. – Pp. 35-59.