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Comment

On the interpretation of complex network analysis of language Comment on "Approaching human language with complex networks" by Jin Cong, Haitao Liu

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After a rapid and successful development of the theory of complex networks at the turn of the millennium [1,2], attempts to apply this theory to a language analysis emerged immediately [3,4]. The first results seemed to bring new insights to the functioning of language. Moreover, some authors assumed that this approach can even solve some fundamental problems concerning language evolution [5,6]. However, after a decade of the application of complex network theory to language analysis, the initial expectations have not been fulfilled, in my opinion, and the need for a deeper, linguistically based explanation of observed properties has been still more obvious. Cong and Liu's review [7] can be seen as a successful attempt to clarify the main aspects of this kind of research from the linguistics point of view. However, I see two problematic aspects in their study relating to the nature of the character of explanation.

First, the authors try to interpret Saussure's conception of the language system as an approach which is consistent with the modern definition of system and, consequently, with the complex network approach. However, Saussure represents a radically different view of the system: according to him, there is an ideal, abstract system of language units and relationships among them (he calls it "langue"), on the one hand, and a manifestation of this ideal system in the reality (he calls it "parole"), on the other [8]. Therefore, Saussure is considered to be a successor of the Platonic tradition, in a more general view. To model language by the complex network, however, does not mean to model language system in Saussurean sense; the complex network is a model of empirically observable characteristics of language, not a model of any ideal, empirically non-observable system. This confusion can lead to a misinterpretation of the complex network approach, especially among linguists; the majority of them have been reluctant to leave the dichotomic, i.e. langue–parole, view of language, cf. a discussion on this topic, e.g. [9–13]. In other words, to present complex network approach to language analysis in the Saussurean sense is not only inappropriate from the theoretical point of view, but also with regard to the practical consequences, if the current state of linguistics is considered.

Second, the authors interpret complex networks as a model of human cognition (cf. "The four linguistic networks constructed in the present study (...) can be treated as models of how the knowledge of different levels (as sub-systems) of modern Chinese is represented in the human mind." [7, p. 13]). A more skeptical view would be appropriate, in my opinion, because of the lack of empirical evidence; without this evidence, this interpretation can rightfully be considered a speculation. Further, attempts to connect complex network properties to cognitive characteristics are

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also disputable. For instance, a spreading activation in a human mind is connected to a small-world topology of the network, by the authors. Further, it is stated that the small-worldness implies efficiency of communication between pair of vertices in the network. However, is it theoretically adequate to explain efficiency of communication between pair elements in the syntactic (or co-occurrence) network as representing the mind? If so, it must be explained and, ideally, proved empirically. One should bear in mind, however, that in this kind of networks (i.e. dynamic networks), the elements do not communicate (not even in a metaphorical way) among each other; the connection between each pair represents grammatical and/or semantic rules in language use. Moreover, the relationship between language use and human mind is a complex (and unexplored) research area and, consequently, the original assumption that the network, i.e. a model of language use, represents human mind seems to be too ambitious.

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