

What's the semantic organization of human language?

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A Chinese semantic network with semantic (argument structure) annotation was built and investigated for finding its global statistical properties. The results show that semantic network is also small-world and scale-free but it is different from syntactic network in hierarchical structure and correlation between the degree of a node and that of its neighbors.

Language networks are small-world and scale-free, although they are built based on different principles. Similar global statistical properties shown by language networks are independent of linguistic structure and typology. So, do linguistic structures really influence the statistical properties of a language network? More concretely, does semantic or conceptual network have the same properties as a syntactic one?

Institute of Applied Linguistics at Communication University of China has shown that dynamic semantic network of human language is also small-world and scale-free but it is different from syntactic network in hierarchical structure and node's degree correlation. The study is reported in Volume 54, Issue 16 (August 2008) of the *Chinese Science Bulletin* because of its significant scientific value.

"Semantic networks, in particular, dynamic semantic networks based on real language usage, are useful to explore the organization of human semantic (or conceptual) knowledge and human performance in semantic or knowledge processing, helpful to develop better natural language processing system," noted principal investigator Haitao Liu, professor and director of Institute of Applied Linguistics at Communication University of China. "This research is the first paper to observe the dynamic semantic networks of human language."

The research built Chinese semantic network with semantic role annotation and explored its global

statistical properties. The method in this research can also be applied to other languages.

The study shows that the semantic network tends to create a longer path length between two nodes and a greater diameter than syntactic networks. That makes semantic network a poorer hierarchy. There is a weaker correlation between the degree of a node and that of its neighbors in a semantic network than that in a syntactic network. The disassortative property of a syntactic network can reflect the relation between content and functional words. As a result, the absence of functional words makes a flatter curve in semantic network. It is perhaps interesting to notice the similarity between syntactic and biological networks, which is demonstrating the biological foundations of language as claimed in biolinguistics. However, it needs much more explanations on why semantic network is less biological than syntactic network in the future.

Structurally, semantic network is more similar to conceptual network in the brain. Therefore the study is helpful for finding better statistical patterns to describe linguistic and cognitive universals from the viewpoint of complex networks.

More information: Liu H T. Statistical properties of Chinese semantic networks. *Chinese Sci Bull*, 2009, 54: 2781-2785, [doi: 10.1007/s11434-009-0467-x](https://doi.org/10.1007/s11434-009-0467-x)

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