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On the prospects of a logical-semantic approach to creating a code for artificial thinking

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Abstract: This article substantiates the practical possibility of modeling the information component of thinking using modern computer technologies, providing programmers with a code diagram of general artificial thinking for familiarization. The rationale for the approach is based on the ideas of the theory of knowledge, philosophy and methodology of language. Attention is paid to the discussion of some provisions of the criticism of artificial systems of thought.

Keywords: artificial thinking, logical-semantic approach, information modeling, philosophy of language, data processing, reality visualization, cognitive linguistics, generative linguistics, linguistic competence, informational modeling

In this article, we will attempt to discuss the prerequisites for possible explanations of artificial thinking mechanism from the standpoint of its connection with language and reality, in order to determine the logical-semantic approach to describing the architecture of the information model of thinking, justified by the modern level of linguo-philosophical knowledge.

These explanations and descriptions require some generalization of well-known linguo-philosophical paradigms and are aimed at the practical implementation of the proposed architecture in a real software product, and at a subsequent verification of its functionality.

We saw the task of linguistic knowledge in the era of the information revolution to provide programmers developing strong artificial intelligence technologies with the tools of linguistic philosophy. The solution to this problem is to substantiate the logical-semantic approach to the representation of the artificial thinking code diagram, the construction of which follows from the main well-known areas of linguistic theory and linguistic philo-

sophy, and to propose a namespace for variables, functions and modules that determine the content of the code both from theoretical positions and from positions of practical coding.

However, first, it is necessary to explain the basis of our approach to creating a model of artificial thinking, since there is a reasonable criticism of the possibility of the appearance of a thinking computer by linguists and philosophers we respect.

The sharpest and most just argument in this criticism is the description of the "Chinese Room" by J. Searle (1993: 3-66). From this follows the conclusion that it is impossible to get an idea of reality only by processing the data of the sign system. And indeed it is. However, we must remember that the year of the first publication of the "Chinese Room" is 1980, and the speed of data processing at that time did not allow digital imaging to be included in the fast processing process. Now, more than 40 years later, the speed of data processing allows processing the simultaneously presented sign of the language and the data of the surrounding visual world, which, in our opinion, is a key requirement for reflecting discourse. Visualization and/or replacing/supplementing it with the data of the surrounding reality solves the main task, which is predetermined by the theme of the "Chinese Room" – to connect the processing of the data of the sign and his designate. It is the process of generating the unity of the sign and his designat, which solves the problem of the "Chinese room", and, then, by this article we intend to initiate the usage of the information component of this unity in artificial thinking. Let us recall, in this regard, the key conclusions of Saussure's semiotics (1933: 55-197): language can be represented as a system of relational dependencies, and language is a system of conventional signs. The data processing of the sign system in the "Chinese Room", Searle spoke about, raises the problem of determining only relational dependencies and does not touch upon the issue of conventionality, since the conventional nature of the sign of a language has as its subject the unity of the signifier and the signified, while the relational nature of language has only a sign system as its subject.

Linking the processing of language and the visual part of reality into a single whole by means of simultaneously processed speech and visual signal, however, we immediately face the following justified criticism of any attempts to obtain artificial intelligence. These are the factor of "transcendence", in terms of Kant (1964: 585-695), and the factor of participation of "non-objectifying", in terms of Husserl (Prechtel 1999: 23-29), not substantiated by the reality of mental acts in human thinking, those are the subject of constant linguists disputes about the object of linguistic knowledge, rooted the unknowable part of brain activity. Brain processes are not directly observable, so there is no point in guessing about what is, in principle, inaccessible - this is the main thesis of antimentalist-minded descriptivists. Bloomfield believed that "the descriptive order of grammatical features is generated by the method of describing linguistic forms" (Bloomfield 1933: 213). To interpret the external behavior of an individual in terms of brain/psychic entities is to fall into a logically vicious circle: to explain the visible through an unknown cause. Authoritative representatives of analytic philosophy echo this argument: We "should never be concerned with reducing the one to the other, nor explaining the one in terms of the other. Philosophy is indeed purely descriptive" (Wittgenstein 1964: 18).

However, the mentalists were not powerless in solving this problem. It is known that the relatively recent cognitive trend in linguistics raised questions about what are the

general integral foundations of the processes of cognition and what manifestations of the unknowable part of thinking can be studied. Methods for detecting such grounds and fixing such manifestations are information-theoretic modeling. Moreover, the leading methodology of the cognitive sciences is the informational approach, which considers reality from the point of view of the information processes that take place in it, and "a person is understood as a thinking system in the world of information" (Baksanskii 2005: 82-83). Generative linguistics, which is a special object of our attention when constructing a code of artificial thinking, is also in dire need of mental reality, since it relies on the category of competence, in which mental states perform a causal or generative function in relation to observed communicative processes, and events, which include mental constructs can function as links in a causal chain. One of the leading theorists of rationalism, J. Katz, explains the essence of causal mentalism, emphasizing that "if the logical consequences of the model are consistent with the observed behavior of the system and would not do this without the hypothesis put forward, then the scientist has the right to say that the hypothesis explains the behavior of the system in terms of the observed, but a causally effective component" (Katz 1965: 128). The linguist builds a theory on the basis of a hypothetical conclusion about the characteristics of the mechanism underlying communication. Believing that the observed events of linguistic communication are a consequence of this mechanism, he proposes a theory about the structure of this mechanism and a causal chain connecting it with observed events to explain how these internal causes give rise to linguistic communication as their effect. The ability to model the informational part of thinking with modern computer tools brings to the fore not only information-theoretical modeling, which currently has a central place in the methodology of cognitive linguistics, but also practical information modeling, which expands the paradigm of cognitive knowledge: we get a methodological basis for explaining subjectively-oriented (anthropological factor) of ordinary cognition through agent-oriented (computer factor) cognition, implemented in a specific algorithmic code.

So, we are not going to model consciousness in order to create a mechanism of artificial thinking: its processes are not known. We are going to model thinking, and do it from the perspective of the information component of thinking. We must make several important explanations in this regard.

The first explanation is about the linguistic reflection of the non-objectifying component of human thinking by the code of artificial thinking. This component is assessments, desires, emotions, that is, intentional non-objectifying acts manifested in the signs of the language. At the same time, desires, emotions, assessments, as a meaningful result of these acts, are represented by a significant part of the human lexicon, that is, they are designated as any real object is designated, and their designation has the same conventional nature, any language sign has. A single apparatus of artificial thinking should not be endowed with complete information of human sensory perception or a mechanism of empathy. Not all of us are astronauts, but all of us, from a certain age, can use the word "weightlessness", operating with it with the proper level of relevance. The same can be said about the word "drugs" and many other words. Obviously, in the minds of not all people, the complete conceptual composition of the language is represented using sensory data at a non-objectifying level. But, however, all the richness of the native language

is available to the thinking of the native speaker of this language. How exactly does this happen? We conclude that it is possible for artificial thinking to objectify, for example, the concept of "pain" with discursive data of the corresponding behavior of its main user, as we do when linking the concept of "weightlessness" and the broadcast from the orbital station that we once saw.

The second explanation is about the role of the material basis for the production of the thought process. In our project, we proceed from the conclusions of the relativistic direction of linguistics and semiotics about the nature of the sign, the signified and their unity. The key role in the functioning of a linguistic sign is played not by its material basis, but by its distinctive meaning, manifested in its relationship with another sign and signified meaning. Illustrating the irrelevance of substance for the functioning of language as a structure, Saussure says that the replacement of wooden pieces by ivory pieces (substantial qualities) in chess is indifferent to the system. But, if you increase or decrease the number of figures (relational qualities), then this "will deeply affect the 'grammar' of the game". (Saussure 1933: 45).

The following explanation concerns the "question of truth", in terms of Tarski (1972: 136-145), the solution of which is important when operating with a conventionally justified sign of the language in order to implement the very mechanism of mental reaction to the current reality. "Existent substance and nomination", in the terms of Arutyunova (1976: 205-283), generated on the concrete-referential basis of the visual series, manifest "apodictic evidence" in terms of Husserl (Prechtel 1999: 37-40) of existence as an independent value/significance, in turn generate relation to the truth of subsequent processes of predication and identification. Both of the last mentioned processes are included in the function of generating data of a universal, and then an abstract reference, which is not directly related to the current composition of the incoming data. The concrete-referential basis of the processes of predication and identification in the discourse of visual content lays the foundation for the truth of thinking in general, which includes abstract concepts – ideas, that are not directly correlated with the surrounding visual reality. Thinking in general, in the context of the informational approach, can be understood as augmented reality, where the concrete-referential content of predicative constructions tied to apodictic evidence is filled with universal and abstract concepts used by thinking. The discourse itself at a certain stage in the development of thinking appears as an augmented reality in which the plan of content does not coincide with the plan of expression. However, this does not destroy the doxal nature of thinking, which permanently evaluates reality from the standpoint of truth.

The creation of a descriptive and explanatory basis for the general architecture of artificial thinking is aimed at revealing the content of the meaning formation process, what Chomsky (1968: 5) explains as "innate knowledge" in his theory of competence. We believe that the content of the process of meaning formation is represented by the predicative-discursive structure of data segmentation. For all data coming from the visual and speech stream, the code finds a place in the predicative part (Fig. 1), and in the discursive part of the structure (Fig. 2). This is the top level of data processing. It is preceded by the segmentation of visual stream data in the "Representamen" structure component in the phenomenological sense of Pierce (1953: 212), as that "information

about the essence that the phenomenon carries in itself" and speech stream data in the "Glossema" structure component in terms of Hjelmslev (1960: 66-337), as "the shortest unit of linguistic meaning" (Fig. 3). The work of these structures is ensured by the basic principle of the code functioning: the principle of cyclical movement of information. The principle of cyclic movement provides a constant flow of interpretive knowledge into the interpreted and vice versa. At the stage of movement from the visual-speech flow to the predicative-discursive structure, the knowledge previously accumulated in the areas of "Representamen" and "Glossems" is interpretive, and the new information at the stage of its segmentation in the current predicative-discursive data structure is interpretable knowledge. The signal of relevant segmentation of data in this structure is the discovery of the previously known environment of these data in the paradigmatic hierarchy of reality, built on the theory of "hard designators" Kripke (1986: 194-242) and in syntagmatic sequences. Otherwise, the code is forced to form a new knowledge paradigm, in which the new information will be relevant and will receive a new truth evaluation matrix. After the relevance has been verified, the new information has fulfilled its role as a signified (interpreted knowledge) and is ready for the role of a signifier (interpretive knowledge) before a new cycle. Thus, the generative essence of language competence described by Chomsky is implemented in the code.

In order to implement the proposed model, it is necessary to further develop specific technological operations. Thus, an essential technological aspect of cyclic information processing that requires further development is the description of the data that form the beginning of the cycle and the level of transformation of this data at the end of each cycle. For practical implementation in the code of the matrix of the truth, it is also necessary to further study the issue of the information technical division principles in accordance with the specified markers of doxality "fantasy (absence of doxality)–denial–doubt-assumption–belief–conviction–truth". If the first and last elements of the given scale can rely on a strict algorithmic procedure for the correspondence of the assessed information to the data that have received the status of interpretive, then the technological basis for determining the correspondence of the assessed information to the intermediate markers requires additional development.

The code diagram shows the process of initiating linguistic communication. Based on the current discourse, the code forms the target discourse, mobilizing, on the one hand, the data of the possible continuation of the current discourse with the data of discursive sequences and the paradigmatic hierarchy of the truth picture of the world, and, on the other hand, the data of discursive sequences of the modal-evaluative content of the main user and the paradigmatic hierarchy of his priorities. The transition formed by the memory data in the form of a discursive sequence from the current discourse to the target one forms the basis of the signified in the mental reaction.The current situation is only a new way of ordering the old, already existing material. This amazing thesis was once expressed by Marcel Proust, who said that when, for example, one reads his book, then "with the help of his book one reads oneself" (Proust 1927: 201).

The code diagram of artificial thinking, giving an answer to the question of how exactly a thought arises and develops in discourse, defines the basis of a software product with its namespace, the terminological essence of which we strive to convey to coding programmers.

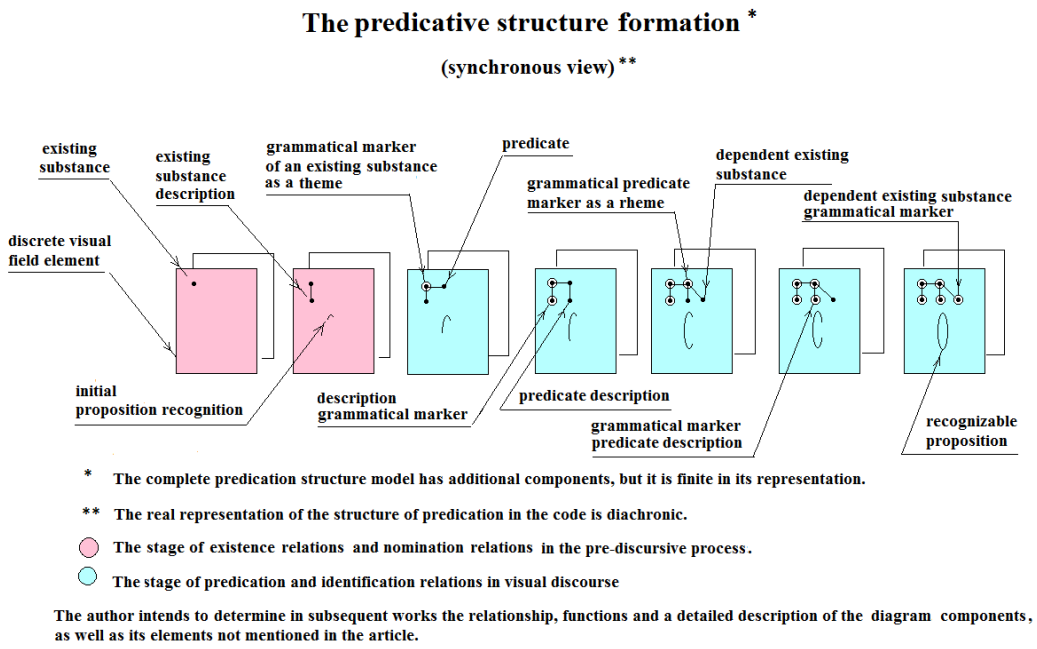

Figure 1. The predicative structure formation

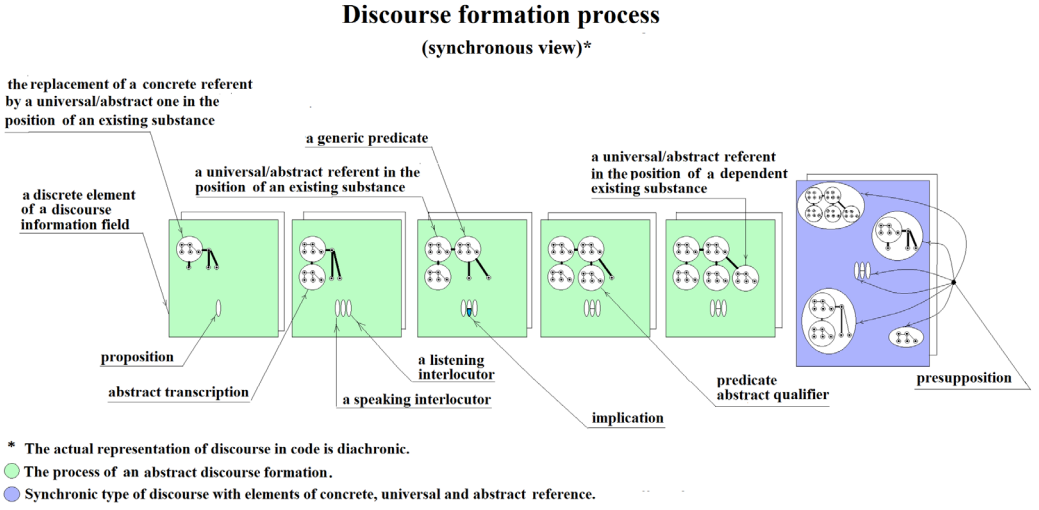

Figure 2. Discourse formation process

At this stage, the proposed model is theoretical in nature. For its implementation, it is necessary to confirm it with experimental results and a prototype, which is being worked on.

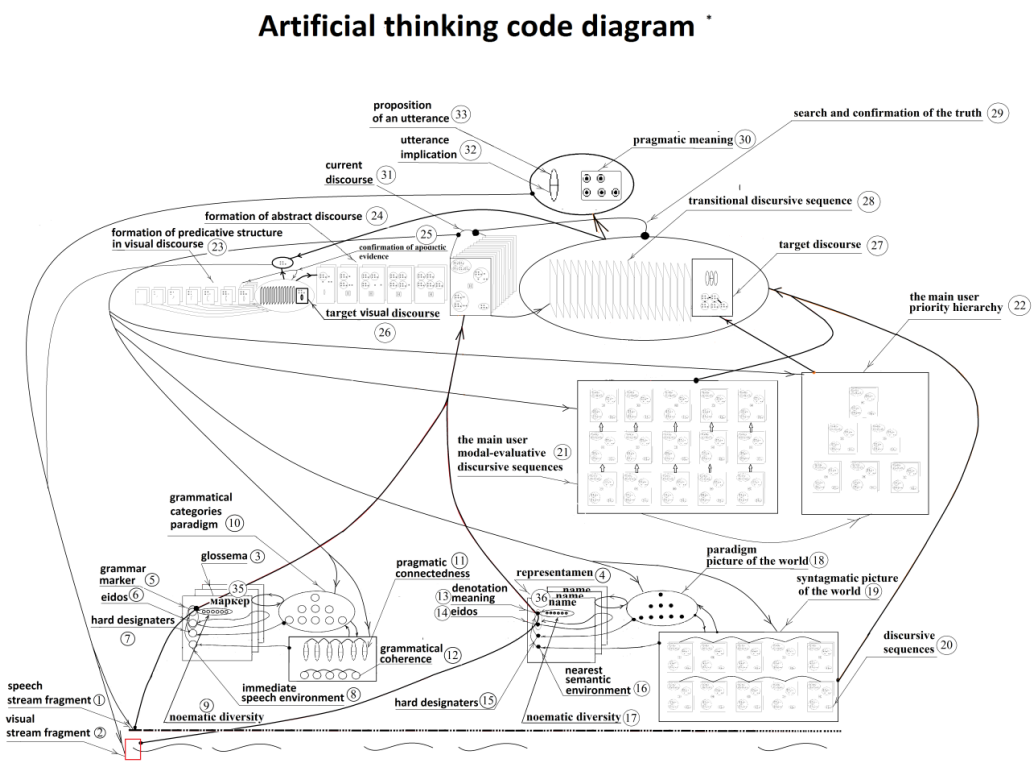

Figure 3. Artificial thinking code diagram

We believe that this diagram approximates our understanding of metalanguage, that is, that element of Kant's "a priori", Chomsky's ideas about the "linguistic innateness" of a person, which allow people to acquire any language as the basis of empirical knowledge. Taking as a basis Saussure's brilliant conclusion: "the whole linguistic mechanism revolves around identities and differences" (Saussure 1933: 109), we show how visually completely dissimilar things (visual data) acquire something in common, equivalent, which absolutely equalizes them, turns them into identity (certain component of predicative structures and discourse). In our view, this process realizes the emergence of linguistic value in the understanding of Saussure. The technology of building a presupposition of a holistic discourse is associated with the emergence of predicative structures, the components of which can themselves be expressed by predicative structures that do not have a formal visual connection with the current discourse, maintaining abstract concepts. We proceed from the fact that the holistic discourse of the ideal speaker/listener is abstract. The very formation of the presupposition of abstract discourse by predicative structures of visual

discourse, which previously realized the grammatical structure of the language, is based on the Sapir-Whorf hypothesis of recognizing the relationship between thinking and grammatical categories, on Whorf's statement that "the fundamental system of language (in other words, grammar) is not just a means of expression ideas, but a means of forming ideas" (Whorf 1956: 212-213), that is, a means of abstract thinking.

This article does not consider the ethical side of the model implementation. We consider the accumulation of data revealing the subtle psychological characteristics of each individual user to be a significant ethical problem associated with the creation of artificial thinking systems using the proposed model. Since it is in accordance with the identified aspects of the discursive behavior of an individual user that the proposed model can form the composition of interpretive data of the vocabulary of intentional content. Taking into account potential biases and social consequences of this factor requires separate coverage.

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