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## In Pursuit of the Functional Definition of a Mind: The Inevitability of the Language Ontology

### У пошуках функціонального визначення розуму: неминучість онтології мови

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Київська обл., 08401*Original manuscript received December 18, 2017**Revised manuscript accepted February 15, 2018***ABSTRACT**

*In this article, the results of conceptualization of the definition of mind as an object of interdisciplinary applied research are described. The purpose of the theoretical analysis is to generate a methodological discourse suitable for a functional understanding of the mind in the context of the problem of natural language processing as one of the components of developments in the field of artificial intelligence. The conceptual discourse was realized with the help of the author's method of structural-ontological analysis, and developed in the mainstream of the system-methodological tradition of the school of G.P. Shchedrovitsky and intended for descriptive research of subject areas of interdisciplinary objects of scientific study. As a result of the structural and ontological analysis of the super-system, the relevant place and role of the*

*directly studied system (mind) are determined, and its primary process and material are localized and structural and functional connections are described. At the basic level, the mind is conceptualized as an energy process unfolding in a spatio-temporal environment and accompanied by archetypal structuring of neural impulses into images. The genesis of the system is separately analyzed by constructing a structural-ontological matrix that reflects the initial stage of the development of the mind. The primary process is concretized with the help of hetero- and homeostatic dichotomy, and also the most significant features of the consistent transformation of the material of the system and its ascent to verbal morphology are described. The structural-ontological comparison of the functioning of the verbal intelligence with the preverbal level has been carried out. The transformation of neural impulses of needs into words, as verbal units fixing semiotic values is analyzed. Structural-ontological connections that determine the reactive and prospective characteristics of the functioning of the system are disclosed. The position of the chronological primacy of «semiotic readiness» for language with respect to the debut of the latter as an information-sign model of the environment is argued. The hypothesis of domination at the initial stage of the development of the mind of exopsychic functions over endopsychic ones is formulated. The theoretical substantiation of the hypothesis of the inevitability of the ontology of language in the functional understanding of the mind is given, corresponding structural and ontological arguments are given, including those based on the ideas about the information relationship between affects and needs, according to the views of P.V. Simonov. The arguments are presented in favor of the non-alternative methodology of A. Turing in studies of artificial intelligence.*

**Key words:** *mind, functional definition, natural language processing, ontology of language, artificial intelligence, system, genesis, structural ontology.*

## **Introduction**

Definition of a mind in sphere of scientific research (SR) continues to be relevant conceptual problem. The absence of a unique reasonably good understanding of *mind*, *conscience* or *intelligence* (henceforward – synonyms). It gives further impetus for the progress in the field of the so-called «**weak**» or «**narrow**» **artificial intelligence** (ANI).

Applied repertoire of ANI is getting through the life of the modern human. ANI offers new solutions and degrees of freedom which determine correspondent trends in social infrastructure, industry and logistics, global and local economics, policy, military affairs and many other fields. For the past decade general notable successes of

ANI contrast with disparate prospects of **artificial general intelligence (AGI)** creation which are still hot and discussed among experts.

In our point of view, the root factor in the multi-vector nature of disagreements over AGI is the broad conceptual-semantic entropy of basic definitions of intelligence (Legg & Hutter, 2007). Substantial heterogeneity of theoretical concepts used for these definitions. Mismatched methodology of fixation, collection and processing of empirical data. The modern philosophical generalization of existing ideas about the mind (for example, Searle, 2004) does not provide an opportunity for the operational use of definitions in the development of software designs of AGI. Obviously, the procedure for quantifying philosophical ideas is difficult because of the implicit idiosyncrasy of the corresponding meanings, the mosaic of which forms one or another definition of the mind. Many components of such mosaics are still intuitive and / or internally contradictory, not coordinated.

The same argument concerns various and numerous attempts to formulate the definition of the mind, relying on reductive methodology. It is notorious that the existing local models of the mind (cognitive, cybernetic, behavioral, neuro-physiological, biological, sociological, etc.) do not stand the test by validity criterion, at least at the level necessary for AGI creation. In this regard, sounded at the dawn of the emergence of AI in the 1950 optimism of the well-known English statistician: Kendall Maurice: «We should not invoke any entities or forces to explain mental phenomena if we can achieve an explanation in terms of a possible electronic computer» (cited by Furnham, 2008), remains a methodological maximum, to the comprehension of which we will return at the conclusion of this article.

Some progress in developing a common denominator for understanding of intelligence the methodology of *functionalism* has brought (Levin, 2017), the concept of which stands a competitive alternative to the identity theory of mind, behaviorism, and other areas of the philosophy of mind. In our opinion, modern functionalism is in a state of potentially productive crisis and rethinking its own theoretical and methodological ideas. This is evident in a wide-ranging scientific discussion (Båve, 2017; Bealer, 1984; Bealer, 2001; Endicott, 2011; Gillett, 2002, etc.), which looks as sharp and principled, so creative and promising.

An applied request on a theory of consciousness suitable for the creation of a AGI remains unsatisfied, and this causes, or at least contributes to, the effect of «shifting the motive to the goal» (Leontev, 1978). Namely, in the absence of a functional definition of the mind, researchers shift their attention to a structurally more «shallow» notion – an *intelligent agent*.

«We define AI as the study of agents that receive percepts from the environment and perform actions. Each such agent implements a function that maps percept sequences to actions, and we cover different ways to represent these functions, such as reactive agents, real-time planners, and decision-theoretic systems. Explain the role We of learning as extending the reach of the designer into unknown environments, and we show how that role constrains agent design, favoring explicit knowledge representation and reasoning» (Russell & Norvig, 2010: 8).

On the one hand, such agent-based reductionism sets the vector of approach to the problem of AGI «below-up», from a specific intellectual function to intelligence *per se*. On the other hand, the question of whether the dialectical transition of the number of intellectual functions to the quality of reason is possible in principle or whether agent reductionism is fraught with an endless increase in the number of various solutions in the field of research and development? However, even in the positive case, the problem of determining the mind will remain relevant, albeit a posteriori.

We associate the perspectives of a whole, holistic understanding of the mind with a systematic comprehension and ordering of ideas about its functions. For this purpose, in this article, we propose a structural analysis of that ontology, part of which, and at the same time, the derivative of which is the mind. We tried less as to determine how much to conceptualise the intellect than as an object of interdisciplinary applied research. In the proposed conceptualization, we paid special attention to the thesis of the «inevitability of language», arguing reasonably that *natural language processing* (NLP) is not only one of the leading problems on the way to the creation of AGI (Yampolskiy, 2013), but also deserves the status of a system-determining factor in this issue.

### **Techniques and methodologies of research**

From the point of view of the hypothetical-deductive methodology, any *scientific definition* (further – definition) reflects the subject field of

the corresponding sphere of knowledge that encompasses the studied range of phenomena, appearances, events, interactions, connections, transformations, regularities, features, etc. In fact, the subject field of scientific discipline is a mosaic woven from the corresponding definitions (conceptualizations). Therefore, the formulation of the definition can be represented as the process of segregation of a particular concept from the subject field of knowledge.

For these purposes, we used the author's method of structural-ontological analysis, which relies on the tradition of the system methodology of G.P. Shchedrovitsky (1966, 1982, 1995). Initially, the method was developed as a tool for the practical solution of the methodological task of localizing the subject area of various psychological studies, but it was also successfully tested in interdisciplinary studies (Shymko, 2016, 2018). Appropriate procedural features and terminological nuances are disclosed in these publications. Here we emphasize that this method allows, first of all to disclose and systematize the concept of the subject field of the phenomena under investigation with a complex hierarchical structure. Secondly, the construction of visual-graphic matrices envisaged by the method is conditioned not only by considerations of simplicity, clarity and obviousness, built-up concepts. But also serves the purpose of overcoming the problem, accurately formulated by J. Lacan as a «wall of language» (Lacan, 2006).

### **Results and discussions**

As already noted, for the purposes of a functional description of the mind, we used the structural-ontological method. As part of the system methodology, at the primary stage of the study it assumes the definition of the place and role of the system (mind) in the system of a higher order (super-system). This procedural step is fraught with considerable risks, because reductionism is given right here. For example, the description of the mind, as a phenomenon, the genesis and functioning of which occurs in a social environment is fraught with a slide into sociology. Specifying the super-system, we introduce restrictions, one-sidedness and prejudice, originally contained in the idea used for the concretization. The formulation of even the most abstract ideas can not be deprived of one degree or another of concretization, which is due to the function of language and its nature. In a sense, any knowledge is

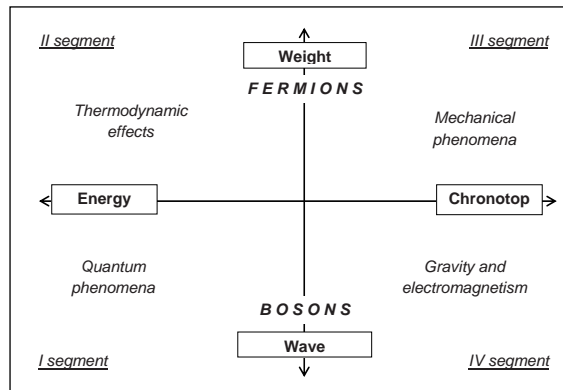
reductive. Therefore, the decrease in the degree of reductionism in the system description is seen in the maximally justified (for each particular study) expansion of the ontological boundaries of the super-system.

As for the systemic study of the mind, the separation of the super-system is a task that can be solved quite arbitrarily in connection with the known epistemological problem of the *cognizability of the world*. Given the fact that any knowledge is a product of the activity of the mind, it is simply not possible to go beyond it and take an «over-position». This problem remains a classic subject of lengthy philosophical and scientific rhetoric, avoiding which, we propose the following. Identify the subsystem with the *environment*, understanding the latter as widely as possible. Thus, the place of the supersystem occupies an *objective reality*, the ontology of which is reflected in the notions of the space-time continuum (chronotope), matter and fundamental physical interactions.

An analysis of the current scientific understanding of these categories (Hawking, 1988; Hawley & Holcomb, 2005; Scheck, 2013; Sidharth, 2010; Wudka, 2006 etc.) unequivocally suggests that it is advisable to consider the expansion of the universe from the state of the so-called singularity as a *primary process* (Shchedrovitsky, 1995; Shymko, 2016) of the super-system. This process is represented by a dichotomy of parameters – *energy* and *chronotope*, which are reflected on the horizontal axis of the structural-ontological matrix. The vertical axis represents the *material* (Shchedrovitsky, 1995; Shymko, 2016) of the super-system, which, in the case under consideration, is physical matter. It is represented by a dichotomy substance-field with qualitative characteristics – *mass* and *wave*, respectively (fig. 1).

Segmental identification and subsequent analysis of the matrix allows structurally differentiate the ontological field of the supersystem and check the current methodological inference for the possible presence of errors in the criteria of completeness and logical consistency. So, as you can see, the schematization of the super-system covers currently known types of matter (substance – 2 and 3 segments; field – 1 and 4 segments) and fundamental interactions (weak and strong nuclear interactions – 1 segment; gravitational and electromagnetic – 4 segment). Mass particles (fermions) occupy the upper half-plane of the matrix, where the mechanical and thermodynamic (including chemical) effects are logically placed. Massless bosons are consistently present on the lower half-plane, ensuring the operation of the corresponding

fundamental interactions. In turn, the distribution of types of fundamental interactions is logically consistent with their qualitative characteristics. For example, the radius of gravity and electromagnetism is not limited. While the analogous parameter of weak and strong nuclear interaction ( $10^{-18}$  and  $10^{-15}$  m, respectively) can be neglected, taking into account not the quantitative character of the structural-ontological matrix. We omit the routine enumeration of other similar arguments (here and in other schematizations) from considerations of conciseness of the text of this article. Thus, the above arguments indicate the completeness and internal consistency of the mapping in the matrix of the morphology of the supersystem, which allows us to proceed to the next procedural step of the structural-ontological method.

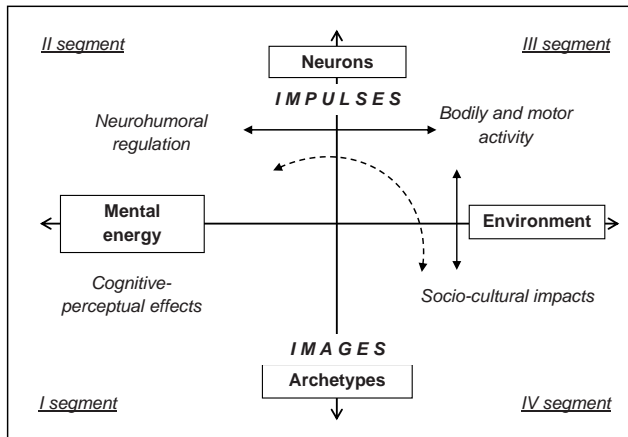


**Fig. 1.** *Structural-ontological matrix of the super-system*

Developing the system concept of the mind, the functional characteristics of which are given by the super-system, we specify the primary process and the material of the system. This step is still carried out in the paradigmatic framework of functionalism, while also being guided by the natural scientific principle of similarity (Bridgman, 1937; Sedov, 1959) and relying on the principle of parallelism in the form and content of thinking (Shchedrovitsky, 1995). This allowed us to form a structural-ontological matrix, concretizing the primary process and material of the system, proceeding from the functional characteristics of the mind. Thus, the horizontal axis reflects a dichotomy: *mental energy* (mind as an energy phenomena, in the physical sense) and environmental filling of space-time (hereinafter – the *environment*),



in which the genesis and functioning of the mind is realized (fig. 2). The functional logic of this dichotomy is embodied in the dialectical opposition of process and image, which fundamentally characterizes the nature of the mental (Leontev, 1978).



**Fig. 2.** *The basic structural-ontological matrix of the system*

Image processing is a system-forming function of the mind, which determines the morphology of the system, by transforming its material (the vertical axis in fig. 2). Thus, the materiality of the mind is represented by two dichotomous aspects: 1) neural processing of physical stimuli initially provided by the environment; 2) the formation of relevant images through archetypes – the mechanisms of ordering and structure formation of mental content (Jung, 1981). At the same time, we recall that in the concept of Jung it is necessary to distinguish the archetype from the archetypal image. Archetype is a mechanism of organizing the psychic experience dialectically opposed to instinct, which metaphorically designated by Jung as the «axial system of a crystal». The archetypal image is the result of such an organization (Jung, 1981).

The essence of segments is concisely reflected in their names (fig. 2). Since this article is of a conceptual nature, here we do not dwell on the detailed disclosure of segments. We only note that each structural component of the matrix reflects the corresponding function of the mind. At the same time, any of the proposed functions can be structurally-ontologically differentiated into smaller composite functions,



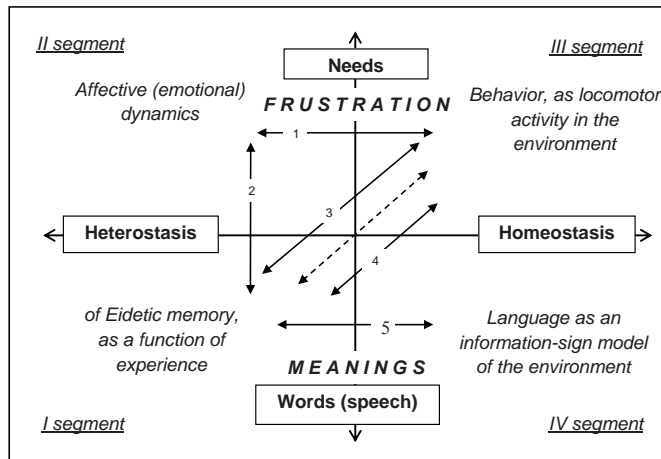
which must be taken into account in further studies and applied developments. It should also be noted that these functions are due not only to the content side of the segments, but also to direct and reverse intersegmental connections and interactions (which encompass the entire matrix), both direct and indirect.

In order not to clutter up the drawing, we gave only one graphic example of such connections and interactions (solid and dashed lines in fig. 2, respectively), where the body-motor activity can be either a product of the response of neurohumoral dynamics, or the result of socio-cultural restrictions or stimulations. The latter, in turn, mediating the body-motor segment, can affect neurohumoral parameters and vice versa. This structural-ontological matrix is designated by us as a basic one, since it reveals the system in its initial (starting) state. This state is equivalent to the human psyche, which is at the earliest stage of its development. The genesis of the mind is accompanied by quantitative changes and qualitative transformations, the conceptual features of which were revealed by the two following matrices.

In order to consider the development of the system, it is necessary to clarify the visualization of the primary process. So, in the basic matrix (fig. 2) we used the dichotomy of *psychic energy – the environment*, widely understanding the latter, as the fullness of space-time by potentially interacting with the mind objects. However, any external influence is mediated by internal conditions (Rubinstein, 1957), which, in essence, are part of the ontology of the mind. The objective environment is always subjectively present in the equation of the mind, which responds to the need for interaction with the environment by the formation of the *adaptation* function. In turn, this function is a manifestation of such a qualitative characteristic of the system, as *homeostasis* (Cannon, 1932). On the other hand, the unfolding of the system in the process of development suggests another (complementary to homeostasis) mode of functioning as *heterostasis* (Selye, 1974). Thus, the primary process of the system is appropriate to present as a homeostasis-heterostatic dichotomy (fig. 3).

The foregoing view of the positioning of the primary process makes it logically necessary that the system material be appropriately objectified. Thus, the neuron-impulse response of the material appears as a sphere of needs and, as a consequence, the emerging frustration states. On the other hand, the structure-forming action of archetypes

ensures the ordering of the experience with the crystallization of the corresponding values (meanings) into words, as speech units (fig. 3). However, it is important to note that the material obtains these properties not simultaneously, but in the process of a complex genesis that proceeds discretely.



**Fig. 3.** *Structural-ontological matrix of the system. Stage of development*

Thus, the activity of the developing system is initially concentrated in the 2<sup>nd</sup> and 3<sup>rd</sup> segments of the matrix and is associated with the affective and motor-motor aspects of experiencing frustrations and meeting needs (line 1, fig. 3). This is accompanied by activation of perception and memorization of actual images (segment 1, fig. 3), the synthesis of which is the result of the structuring work of archetypes. These images are differentiated according to the criteria of localization of «triggering» stimuli to «internal» (line 2, figure 3) and «external» (line 3, figure 3), being prototypes of endopsychic and exopsychic ones. Functions of mature mind, respectively. Already at this stage of the structural-ontological analysis of the system it is obvious that the localization of the *ego*, as a functional operator of the mind, is connected with segment 1 (fig. 3). Among other things, this localization makes it possible to shed light on the structural and ontological dynamics of the experiencing and observing *ego* functions traditionally identified and studied in psychoanalysis (Freud, 1961; McWilliams, 2011 etc.). However, consideration of this and other issues would go beyond the

scope of this paper. In this context it should be noted that the perception of internal and external stimuli (line 2 and line 3, respectively, fig. 3) is also associated with a prospective function of the mind, as will be discussed later.

As we have just demonstrated, schematically presented in fig. 3, the material (in the form of a *demand* dichotomy – *words*) reaches the level of verbal organization of the experience not immediately. The primary process unfolds spirally along the «triangular trajectory» (lines 1, 2, 3, fig. 3), gradually increasing the amplitude of the legs of this structural-logical triangle. In our opinion, this preverbal phase has the following target determination. This «buildup» is the development of cognitive-perceptual characteristics of the eidetic function of the mind to the level necessary for the processing of images having a grammatical structure (words). It is significant that the mastery of the language occurs on the basis of the specific and the particular to the abstract and general. First, the mind takes possession of separate undifferentiated elements of oral speech (words and sounds), later there is the ability for elementary oral vocabulary and phraseology and only after that grammatical speech is formed and readiness for the development of writing appears.

As you can see, the achievement by the material of the level system of verbal organization, on the one hand, requires a certain degree of differentiation of the function of processing abstract figurative models (segment 1, fig. 3). The source of these models is the socio-cultural environment that interacts with the mind through the *language* (line 5, fig. 3). The availability of this component of the ontology of the environment, again, opens with the growth of the process capabilities of the eidetic function. Thus, the appearance of a system of verbal content in the morphology signifies the attainment of a qualitative moment by the mind in its development. Namely, the verbalization of the mind is connected with quantitative and qualitative transformation. On the other hand, this transformation is a non-alternative necessary condition for the further development of the mind and the transition of the system to a mature level of functioning, as will be demonstrated by us later. This nodal point of the ascent of the developing system to verbal morphology lies at the basis of our thesis about the *inevitability of the ontology of language*.

Developing this thesis, on the basis of a comparison of the repertory latitude and the structural-target complexity of the adaptive behavior

of humans and animals, one can theoretically assume the following. The verbalization of the mind is not only possible with the increasing ability of the mind to abstract, it (verbalization) is appropriate given the physical limitations of the information-computational capabilities of the mind. Despite serious optimism of researchers in this issue (Bartol, Bromer, Kinney etc., 2015), it is necessary to take into account that the system's processing involves not only the capture, fixation, storage and reactivation of relevant data, but also a whole cluster of other functions – analysis, comparison, synthesis, modeling, forecasting, etc. At the same time, questions concerning the speed and quality of simultaneous execution of such operations in different environmental conditions and the states of the system itself remain, mainly, open. Our idea boils down to the fact that the language is the functional tool that allows you to «compress» (conceptualize) the processed data, thereby speeding up and optimizing the work of the mind.

Another facet of the above idea is related to the specifics of the process of signification. According to our understanding of the structural ontology of the mind (fig. 1–3), the neural impulses from the *matter* plane are transformed by archetypes into a plan *field*, forming a value whose essence should be understood primarily ontologically and, secondarily, in the semiotic terms. It is important to take into account that, neuron-impulse effects (generating values, as ontology) have a temporal localization, conditioned by the objective properties of the chronotope. Thus, ontological significance has a fixed «lifetime», which causes the possibility of its processing only on here-and-now basis. That is, the primary process of the system, functioning within the framework mentioned above, of the «triangular trajectory» (lines 1, 2, 3, fig. 3) limits the mind to reactivity properties. For the appearance of prospectivity, the mind needs a semiotic mechanism that fixes the meaning and ensures the possibility of its re-actualization (through the memory function) without the appropriate neuron-pulse stimulation. It is noteworthy that such a prospectivity in children is found in the preverbal phase of development, which was experimentally confirmed by Piaget (1926, 1928, 1952). This indicates the «semiotic readiness» of the child present before the development of the ability to perceive the environment through language. Thus, language is not represented as a foreign sign mechanism, which is «imposed» by the environment, but

rather as a mechanism for the development of the inherent function of the mind with the help of appropriate environmental stimulation.

For an explanatory and specified commentary on this idea, let's use the central formula of the information theory of emotions proposed by Simonov (1991):  $E = -N * (Ia - In)$ , where E is the emotion; -N – actualized need, Ia – necessary information (to meet the needs) and In – existing (perceived) information. Depending on the ratio of necessary and existing information, the modality of emotional experience is determined. At the same time, the adaptive function of the mind (homeostasis) is subject to such a target determination, which in the framework of the Simonov model can be represented as  $In > Ia$ . Obviously, achieving such a relationship is impossible without the prospectivity of the mind, and its ability to anticipate (heterostasis). The mere possibility of the transition from reactivity to prospectivity is ensured by the semiotics of the language, which allows (similarly to computer technology) to operatively implement «data buffering» in speech. This also allows the mind to move from ascertaining to anticipation and planning. It is also logical to assume that the prospective function (Ia) and the perception function (In) have a single structural-ontological basis (lines 2 and 3, fig. 3).

As noted above, «semiotic readiness» is present at the pre-verbal stage, structurally-ontologically coinciding with the perception of extrinsic stimuli (line 3, figure 3). However, it qualitatively transforms with the mastering of the language, naturally accompanied by the same qualitative transformation of perception of the environment (line 4, fig. 3). In this case, the perception of internal stimuli (line 2, fig. 3) remains outside the structural and ontological space of this qualitative transition. Thus, the appearance of verbal quality in the material of the system sets the impulse for the development of exopsychic functions, figuratively speaking, leaving endopsychic functions aside this process. We believe that this feature causes a relatively late (in the development of the mind) appearance of the ability to reflect, which realizes itself by the principle of exopsychic, turned inward. This requires high differentiation of exopsychic, to achieve the necessary level of which reflection, mainly, is carried out indirectly and post factum (in the form of perception and comprehension of the objectified effects of interaction with the environment). In addition to the temporal and sequential features of the system development, this reasoning provides the basis

for a rethinking of the thesis of the autonomy and equivalence of such ontological categories of psychic energy as extraversion and introversion (Jung, 1923).

Returning to Simonov's information formula, let's pay attention to the fact that emotional dynamics (segment 2, fig. 3), reveals not only the role of the indicator of the status of prospective function (negative emotions, as a signal about the deficit of **In**). But also acts as a functional regulator, ensuring the interaction of regimes such as *reactivity* and *prospectivity*. Thus, the role of neurohumoral regulation (segment 2, fig. 2) and, as a consequence, affective dynamics (segment 2, figure 3) in the nonverbal and verbal functional regimes of the mind, as well as in the etiology of the language per se, is actualized. In our opinion, for this the neurohumoral-affective factor should not be viewed in an emotional manner, but in the context of experience, as a structural and dynamic phenomenon (Vasilyuk, 1991).

At the end of the main material of the article, we will return once again to the position of Maurice Kendal about the inexpediency of explaining the mind through any concepts or phenomena, provided there is the possibility of explanation with the help of computer terminology. First, such a hypothetical explanation would correspond to the dotted line on the structural-ontological matrix we examined (fig. 3) and would not disclose the integrity of the mind, but would only reflect a certain functional facet of the intellect. Secondly, this is only hypothetical, since any explanation is part of an extensive ontology of the mind that has a complex hierarchical structure. As far as the existence of an explanation outside the language is unthinkable, so illusory, in our opinion, is the assumption that the computer language has some kind of its own ontology. Artificial languages, including mathematical ones, are sign systems, created and functioning according to the principle of «compressing» conceptualizations (see the thesis above in this article), which are the basis of natural language. Therefore, we believe that NLP is a system-forming problem in AGI development. In this connection, the methodology of Turing (1950) remains a non-alternative approach to verifying success on this path.

### **Conclusions and prospects**

In this article, the results of conceptualization of the definition of mind as an object of interdisciplinary applied research are described.

The purpose of the theoretical analysis is to generate a methodological discourse suitable for a functional understanding of the mind in the context of the problem of natural language processing as one of the components of developments in the field of artificial intelligence. The conceptual discourse was realized with the help of the author's method of structural-ontological analysis, and developed in the mainstream of the system-methodological tradition of the school of G.P. Shchedrovitsky and intended for descriptive research of subject areas of interdisciplinary objects of scientific study.

As a result of the structural and ontological analysis of the super-system, the relevant place and role of the directly studied system (mind) are determined, and its primary process and material are localized and structural and functional connections are described. At the basic level, the mind is conceptualized as an energy process unfolding in a spatio-temporal environment and accompanied by archetypal structuring of neural impulses into images. The genesis of the system is separately analyzed by constructing a structural-ontological matrix that reflects the initial stage of the development of the mind. The primary process is concretized with the help of hetero- and homeostatic dichotomy, and also the most significant features of the consistent transformation of the material of the system and its ascent to verbal morphology are described. The structural-ontological comparison of the functioning of the verbal intelligence with the preverbal level has been carried out. The transformation of neural impulses of needs into words, as verbal units fixing semiotic values is analyzed. Structural-ontological connections that determine the reactive and prospective characteristics of the functioning of the system are disclosed. The position of the chronological primacy of «semiotic readiness» for language with respect to the debut of the latter as an information-sign model of the environment is argued. The hypothesis of domination at the initial stage of the development of the mind of exopsychic functions over endopsychic ones is formulated. The theoretical substantiation of the hypothesis of the inevitability of the ontology of language in the functional understanding of the mind is given, corresponding structural and ontological arguments are given, including those based on the ideas about the information relationship between affects and needs, according to the views of P.V. Simonov. The arguments are presented in favor of the non-alternative methodology of A. Turing in studies of artificial intelligence.



Formulating the prospects for further steps, we would like to note two points. The first one is an extended, deep description of the structural-ontological matrices proposed in this work, as well as the process of the primary development of the system. This work, by virtue of the extraordinary information saturation and content-structural complexity of the interdisciplinary subject under study, can not objectively be satisfied (by the criterion of completeness) within the framework of a brief scientific report and requires scales commensurate with the volume of monographic research. For example, outside the framework of the current article, there remains a detailed description of the composition of segments and a list of intersegmental relationships in matrices, which directly determines the completeness of the functional opening of the mind and its features – structural, genetic, transformational, and others. The second promising moment we associate with the continuation, begun in this article, the presentation of the results of the author's analysis of the development of the system and the achievement of its condition, conditionally designated by us, as a *mature stage*. The highlighting of the structural and ontological features of this stage presupposes a description of the nuances of differentiation of the primary process and the further transformation of the material of the system in the direction of the morphology of the mind, including such components as reasoning, discourse, value determination, worldview, creative activity, etc.

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## **АНОТАЦІЯ**

У статті викладено результати концептуалізації поняття розум, як об'єкту міждисциплінарного прикладного дослідження. Ціль проведеного теоретичного аналізу – генерування методологічного дискурсу, придатного функціонального осмислення розуму в контексті проблеми обробки природної мови, як однієї з складових розробок у сфері штучного інтелекту. Реалізацію концептуального дискурсу здійснено за допомогою авторського методу структурно-онтологічного аналізу, якій розроблено в руслі системно-методологічної традиції школи Г.П. Щедровицького задля потреб дескриптивних досліджень предметних областей міждисциплінарних об'єктів наукового вивчення. В результаті структурно-онтологічного аналізу надсистеми, визначені відповідні місце і роль системи, що безпосередньо вивчається (розум), а також локалізовані її первинний процес та матеріал, описані структурно-функціональні зв'язки. На базисному рівні концептуалізовано розум як енергетичний процес, який розгортається в просторово-часовому середовищі та супроводжується архетиповим структуруванням нейронних імпульсів у образи. Окремо проаналізовано генезис системи за допомогою побудови структурно-онтологічної матриці, яка відображає ініціальну стадію розвитку розуму. Первинний процес конкретизовано за допомогою гетеро- та гомеостатичної

дихотомії, а також описані найбільш суттєві особливості послідовної трансформації матеріалу системи та її розвитку в напрямку вербальної морфології. Проведено структурно-онтологічне порівняння функціонування вербального розуму з довербальним рівнем. Проаналізована трансформація нейронних імпульсів потреб в слова, як мовленнєві одиниці, що фіксують семіотичне значення. Розкриті структурно-онтологічні зв'язки, які зумовлюють реактивні та проспективні характеристики функціонування системи. Наведено аргументацію позиції щодо хронологічної первинності «семіотичної готовності» до мови по відношенню до її дебюту, як інформаційно-знакової моделі середовища. Сформульовано гіпотезу домінування на початковому етапі розвитку розуму екзопсихічних функцій на ендопсихічними. Наведено теоретичне обґрунтування гіпотези щодо неминучості онтології мови в функціональному осмисленні розуму, викладені відповідні структурно-онтологічні аргументи, які, в тому числі, спираються на погляди щодо інформаційного взаємозв'язку між афектами і потребами, відповідно до поглядів П.В. Симонова. Висловлені аргументи на користь безальтернативності методології А. Тюрінга щодо досліджень штучного інтелекту.

**Ключові слова:** розум, функціональне визначення, обробка природної мови, онтологія мови, штучний інтелект, система, генезис, структурна онтологія.

**Шимко Віталій. В поисках функционального определения разума: неизбежность онтологии языка**

#### **АННОТАЦИЯ**

В данной статье изложены результаты концептуализации понятия разум, как объекта междисциплинарного прикладного исследования. Цель проведенного теоретического анализа – генерирование методологического дискурса, пригодного для функционального понимания разума в контексте проблемы обработки естественного языка, как одной из составляющей разработок в сфере искусственного интеллекта. Реализация концептуального дискурса осуществлена с помощью авторского метода структурно-онтологического анализа, разработанного в русле системно-методологической традиции школы Г.П. Щедровицкого и предназначенного для декриптивных исследований предметных областей междисциплинарных объектов научного изучения. В результате структурно-онтологического анализа надсистемы, определены соответствующие место и роль непосредственно изучаемой системы (разума), а также локализованы ее первичный процесс и материал, описаны структурно-функциональные связи.

На базисном уровне разум концептуализован как энергетический процесс, разворачивающийся в пространственно-временной среде и сопровождающийся архетипическим структурированием нейронных импульсов в образы. Отдельно проанализирован генезис системы с помощью построения структурно-онтологической матрицы, отражающей инициальную стадию развития разума. Первичный процесс конкретизирован с помощью гетеро- и гомеостатической дихотомии, а также описаны наиболее существенные особенности последовательной трансформации материала системы и ее восхождения к вербальной морфологии. Проведено структурно-онтологическое сравнение функционирования вербального разума с довербальным уровнем. Проанализирована трансформация нейронных импульсов потребностей в слова, как речевые единицы, фиксирующие семиотические значения. Раскрыты структурно-онтологические связи, обуславливающие реактивные и проспективные характеристики функционирования системы. Аргументирована позиция хронологической первичности «семиотической готовности» к языку по отношению к дебюту последнего, как информационно-знаковой модели среды. Сформулирована гипотеза доминирования на начальном этапе развития разума экзопсихических функций над эндопсихическими. Приведено теоретическое обоснование гипотезы неизбежности онтологии языка в функциональном понимании разума, приведены соответствующие структурно-онтологические аргументы, в том числе опирающиеся на представления об информационной взаимосвязи между аффектами и потребностями, согласно взглядов П.В. Симонова. Высказаны аргументы в пользу безальтернативности методологии А. Тюринга в исследованиях искусственного разума.

**Ключевые слова:** разум, функциональное определение, обработка естественного языка, онтология языка, искусственный интеллект, система, генезис, структурная онтология.