



<https://doi.org/10.48417/technolang.2023.04.03>

Research article

Anthropomorphic Metaphors as a Cognitive Model for the Conventionalization of Thought¹

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Abstract

The ability to think metaphorically in anthropomorphic domains served as a stimulus to look for ways of decoding such metaphors. The article presents a three-level classification of metaphors based on the degree of difficulty of their decoding. The typology is based on types of intelligence: flexible and crystallized. It includes non-figurative, basic intuitive, extended associative and nested multi-stage metaphors. The proposed approach allows one to discover the fundamental principles of the formation of linguistic meanings. The empirical invariant-component analysis of the polysemous substantive “a head” is presented from the standpoint of the anthropomorphic approach. By means of metaphor-clustering and the attendant reduction of the obtained semantic components the lexical invariant of this word is revealed. By considering similar analyses, it is concluded that the invariant-cluster approach is helpful in disclosing the way polysemous words are mapped in the lexicon. It is shown that anthropomorphic metaphors are interconnected by means of dominant invariant components which are formed over time in the individual's cognitive niche as a result of anthropomorphic thinking. They consolidate the semantics of polysemous words. As a result, the advantage of the invariant approach in describing the semantics of anthropomorphic metaphors can be demonstrated in comparison with the traditional one. It is concluded that the constant emergence of new anthropomorphic metaphors is carried out within the framework of invariant components. The conceptual processes and language use cannot be viewed and studied in isolation from human embodiment.

Keywords: Cognitive science; Anthropomorphic metaphors; Polysemous word; Semantic structure of the word; Semantics; Meaning

Acknowledgment: This work was supported by Russian Science Foundation (RSF). Link to information about the project: <https://rscf.ru/en/project/22-18-20022/>

Citation: Pesina, S. (2023). Anthropomorphic Metaphors as a Cognitive Model for the Conventionalization of Thought. *Technology and Language*, 4(4), 22-33. <https://doi.org/10.48417/technolang.2023.04.03>



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¹ This paper recapitulates and builds on previously published work regarding the classification of metaphors and their analysis in terms of lexical invariants (Pesina, 2023; Pesina, Kiseleva, et al., 2022; Pesina, Vinogradova et al., 2022). The focus here is on the implications of this analysis for an anthropomorphic approach.



УДК: 802.0 – 561.8

<https://doi.org/10.48417/technolang.2023.04.03>

Научная статья

Антропоморфная метафора как когнитивная модель конвенциализации мысли²

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Аннотация

Способность человека мыслить в антропоморфно и метафорически послужила стимулом к поиску путей декодирования метафор. В статье представлена трехуровневая классификация метафор по степени сложности их декодирования и типам интеллекта – гибкому и кристаллизованному. Типология включает безобразные, базовые интуитивные, развернутые ассоциативные и вложенные многоступенчатые метафоры. Предложенный подход позволяет раскрыть фундаментальные принципы формирования языковых значений. Он позволяет определять универсальные черты в семантике русского и английского языков, а также вскрыть общность фактов, которые раньше представлялись разрозненными. Представлен эмпирический инвариантно-компонентный анализ многозначного английского существительного “a head” с позиций антропоморфного подхода. Путем кластеризации метафор, редукции их семантических компонентов выявлен лексический инвариант данного слова. На основе результатов, полученных проведением подобных анализов, был сделан вывод о том, что выявление семантических инвариантов принципиально для определения механизмов и форм функционирования многозначных слов в лексиконе человека. Выяснилось, что антропоморфные метафоры связаны между собой посредством доминантных инвариантных компонентов, которые формируются с течением времени в когнитивной области индивидов в результате антропоморфного осмысления окружающей действительности. Лексические инварианты как пучки ядерных доминантных компонентов “скрепляют” семантику многозначных слов. В результате анализа лексики было продемонстрировано преимущество инвариантного подхода при описании семантики антропоморфных метафор по сравнению с традиционным. Сделан вывод, что постоянное появление новых антропоморфных метафор и процессы семиозиса осуществляются с участием инвариантных семантических компонентов. Когнитивные и языковые процессы невозможно рассматривать в отрыве от феномена человеческого воплощения.

Ключевые слова: Когнитивистика; Антропоморфная метафора; Многозначное слово; Семантическая структура слова; Семантика; Значение

Благодарность: Работа поддержана Russian Science Foundation, сокращенное наименование – RSF. Ссылка на информацию о проекте: <https://rscf.ru/en/project/22-18-20022/>

Для цитирования: Pesina, S. (2023). Anthropomorphic Metaphors as a Cognitive Model for the Conventionalization of Thought // Technology and Language. 2023. № 4(4). P. 22-33. <https://doi.org/10.48417/technolang.2023.04.03>



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² Данная статья резюмирует и развивает ранее опубликованные работы по классификации метафор и их анализу с точки зрения лексических инвариантов (Pesina, 2023; Pesina, Kiseleva et al., 2022; Pesina, Vinogradova et al., 2022). Основное внимание здесь уделяется последствиям этого анализа для антропоморфного подхода.



INTRODUCTION

Connectionist theory postulates that the human conceptual system functions in accordance with the principle of a semantic network with many inputs and outputs, and thus as a complex multi-level system of paradigmatic, syntagmatic, associative and other connections. It allows you to effectively navigate the environment, adapt to it and subsequently manage it. In terms of neurolinguistics, the operation with neural interfaces is carried out against the background of changes in neuroplasticity through the continuous formation of new neural circuits. It occurs with parallel deactivation of existing neural circuits (Brain, 1941/2007; Hecaen & Aphasie, 1969; Hoffmeyer, 2010; Hodges & Patterson, 1997; Marks, Stevenc, 1966).

In the process of mental and verbal activity, individual consciousness is equally prone to both generalizations and personal interpretation of incoming information, refracting the objective perception of the surrounding world. This is due to the desire to streamline the received connections under the influence of historical, socio-economic, cultural and other factors. And this creates the need for new nominations, that is, new processes of term-naming and types of noun-formation.

Technical and general progress continuously leads to the development of languages, the vocabulary of which can dynamically change by up to 30% over a century. The arsenal of nominative means available in the language plays a big role, since it makes it possible to fill lexical gaps. Languages in which word formation is poorly developed fill the gaps by adding new meanings to existing polysemous words. In parallel, restructuring processes are carried out within clusters of polysemous words. Thus, meanings perceived as the main ones lose the codes of direct meanings over time, becoming figurative (for example, in English the first meaning of “a coach” was *a carriage* and now – *a bus*).

The most common and frequent figurative meanings in polysemantics are metaphors and phraseological units. In modern cognitive science, metaphor is interpreted not only as a means of imparting special emotional and evaluative expressiveness to the statement, but also as a mechanism for generating new cognitive meanings (Falcum & Vicente, 2015). Among the main causes for an increase in the number of metaphors, is the creativity of the mind and imagination (for example, the appearance of the metaphor “stenka” – “wall” as in a wall of furniture, “dvoyka” – “a couple” as TV combined with tape recorder in the Russian language).

The metaphor serves as a tool for nominating new artifacts in any area of human activity. It is perhaps the only way to meaningfully define objects of a high degree of abstraction. Any paradigm shift towards the virtual construction of entities is characterized by a change in the vector of metaphorization towards the objectification of the world (Kostina et al., 2015).

FORMULATION OF THE PROBLEM

In recent years, the list theory of polysemy (sense enumeration lexicon hypothesis), criticized in the 1980s and 1990s, has unexpectedly received support. According to this theory, different representations of the meanings of a single word are stored in the mental



lexicon as a simple list of meanings. Well-known American psycholinguists claimed as a result of five experiments that the process of decoding polysemous words comes down to the selection from a list of meanings associated with a given word (Foraker & Murphy 2012; Klein & Murphy, 2001). Simple selection takes place as it does not matter whether the meanings have any semantic components in common. The experiments showed that there is no clear boundary between polysemy and homonymy and the difference in the storage and processing of this lexical information is not of serious importance. The authors claim that the time spent on determining the required meaning is approximately the same both within the structure of polysemous words and among homonymous variants (Klein & Murphy, 2001, pp. 266-276).

The results of these experiments actually cancel out many years of research in the field of “semantic compactness” of a polysemous word, conducted by scientists from the late 19th and early 20th centuries referring to “general meaning.” Later, within the framework of cognitive linguistics, the semantic commonality within the semantic structure of a word received other names – a content core, a semantic center, an invariant, etc.

Currently, the problems of recognizing the semantic unity of a polysemous word are becoming cornerstone in such cognitive scientific schools as procedural linguistics or computer semantics, experimental and cognitive semantics, not to mention neurolinguistics. The latter considers polysemy in connection with the study of problems of brain functioning (Carrera-Casado & Ferrer-i-Cancho, 2021; Holmes & Horrax, 1919; Kull, 2022; Matthiessen, 2022; Tur, 2020).

Our research shows that the effective decoding of metaphors, at least on the first level of complexity, can be carried out not in the traditional way through the main meaning, but through the proposed phenomenon of the existence in the mind of a dominant semantic network of basic nuclear components. These basic nuclear components eventually form a single lexical invariant. Awareness of the functioning of such a network of basic frequent components can help the user to quickly decode the metaphorical meanings through understanding the general meaning that unites the contextual implementations of all figurative meanings of a word. The invariant meaning is formed in ontogenesis over time as various actualizations of non-main meanings occur in certain contexts.

In applied linguistics, the definition of invariant cores would help eliminate the problems of translating metaphors and speed up the work on artificial intelligence in connection with solving the problem of semantic ambiguity.

OBJECTIVES OF THE STUDY

Within the framework of the problems posed, it is important to find the key to decoding basic intuitive metaphors. Under these conditions, it is necessary to learn to identify the common features that unite contextual implementations of figurative meanings of the same word. The purpose of the article is to demonstrate, within the framework of connectionist theory, the possibility of decoding basic intuitive metaphors based on a lexical network of dominant semantic features.



The task is to determine the semantic commonality that unites contextual implementations of figurative meanings of the same word. To do this, we use the concept of “lexical invariant” which is understood as an abstract lexical entity, a cluster of dominant semantic components, which in one of their configurations underlie all or a number of meanings of a polysemous word in accordance with the intuition of the average native speaker (Pesina, Yusupova, Kozhushkova et al, 2021; Pesina, Yusupova, Vinogradova et al, 2021).

The lexical invariant is derived from internal “intuitive contemplation.” The corresponding innate brain algorithms are activated which delineate the boundaries of the semantic structure of the word. So, at the linguistic level we are dealing with a bundle or cluster of semantic components, and at the psycholinguistic level we have a model of the functioning of words in the lexicon. Such an invariant model presumably has an innate character, since it illustrates the basic human ability to generalize (along with the abilities of association, categorization and conceptualization).

METHODOLOGY

The conscious use of lexical invariants makes it possible to see not only the “raw materials” from which a certain figurative meaning was formed, but also to understand the logic of the entire structure of word formation. The lexical invariant has a dynamic nature: it is formed through the repeated contextual use of metaphors. It enables effective communication and points to the existence of essential cognitive work to generalize and simplify the semantics of entire word structures

As an illustration of the functioning of the lexical invariant, an empirical invariant-component analysis of the polysemous English word „a leg“ is proposed. Using introspection, linguistic observation, the empirical invariant-cluster method, description and comparison, the dominant semantic components of the polysemous word structure will be identified. Semantic reduction will also be applied, which involves the consistent removal of trivial semantic components from the semantics of meanings.

In our analysis, we adhered to the following methodology for determining the lexical invariant of the polysemous word:

1. Formulation of the first meaning based on the most frequent dictionary definitions of several explanatory dictionaries of the English language. This is necessary in order to then compare the semantics of metaphors to the main meaning.

2. As the comparison is carried out on the basis of an invariant-component analysis of each of the metaphors, components of a trivial nature are consistently eliminated.

3. Further reduction of the word meaning: the identification of the most relevant dominant nuclear semantic components in the resulting interpretations of each metaphorical meaning. At the same time, we consistently reduce each interpretation to the minimum necessary bundle of nuclear components, necessary and sufficient to identify the specific metaphor.

4. Based on the identity of the core dominant semantic components included in the semantics of each metaphor, we group the latter into clusters. These clusters are



designed to simplify the decoding of metaphors, which are perceived in the lexicon as a single whole.

5. Based on the dominant semantic components identified in each metaphorical cluster, a lexical invariant is formulated, including core basic semantic components. The obtained dominant components in any of the configurations underlie all metaphorical meanings of a given polysemous word.

The metaphors considered for analysis belong to the class of basic intuitive anthropomorphic metaphors. They are perceived automatically, because people know what their bodies look like and how they function.

RESEARCH RESULTS

Below we present a classification of metaphorical meanings. The main criterion of the classification is the degree of difficulty of their decoding and the difficulty, in general, of recognizing them. Accordingly, metaphors are arranged according to the principle from simple to complex:

We distinguish four types of metaphors depending on their creativity and the participation of flexible or crystallized intelligence:

1) **non-imagery metaphors** are used without much cognitive effort. Employing the crystallized type of intelligence (Cattel, 1971) they are self-evident descriptions of everyday life:

to raise an issue/money, fall into ranks/want, fly into a range, meet the necessity/requirements, etc.

To this class belong most of the orientation metaphors in the classification of George Lakoff and Mark Johnson (Lakoff, 1987; Lakoff & Johnson, 1980): *I am feeling up, I have come down with the flu*, etc. We can add to it the mechanism “important is good, unimportant is bad”: *to sit at the head of the table*.

2) The second type of metaphors are **imaginative metaphors**, which, to the same extent as the first ones, are automatic and perceived instinctively, but are not devoid of imagery: *tooth of a comb/rake/saw/zip, mountain of butter/grain, branch of a business/family/road, head of a letter/stick/train*, etc. It is around these metaphors that many years of debate have been going on about the partial preservation or complete loss of imagery. We are on the side of (partial) preservation of imagery, since otherwise they would cease to be associated as secondary meanings and would leave the structure of the polysemous word. The process of understanding figurative metaphors involves a crystallized type of intelligence (Pesina, Vinogradova et al, 2022).

3) **Non-trivial** metaphors imply a significant distance between the source and target domains. They are fresh and are often perceived as a shock of recognition, since they contain a paradox as a search for similarities in dissimilar objects. This class of metaphors includes fresh structural, ontological, and polymodal (multimodal) metaphors. Both types of intelligence are used when decoding such metaphors.

4) **Complex multi-stage metaphors with several degrees of understanding** are viewed as multi-level acts of connection and dissemination of repeatedly reinterpreted information occurring in the process of text comprehension. This type of metaphor can



cover an entire literary work – a poem or prose – in its entirety. The perceived semantic information can be “packed” into a number of metaphorical images that interact with each other in a rather unusual way. New complexes are formed by successive association of barely compatible impressions.

Nested multi-stage metaphors represent a serious intellectual load on general perception, attention, and memory. This is perhaps the only way to capture and meaningfully define objects of a high degree of complexity, i.e., multi-level abstractions. A situation may arise where entire layers of culturally coded and ethically marked thinking, embodied in figurative Aesopian language, cannot be understood.

Within the framework of this article, we will dwell on the methods of interpreting figurative metaphors (the second type of our classification): *we sowed the wind, head of a flower, foot of a mountain, neck of a bottle, knee of a pipe*, etc. The crystallized type of intelligence (Cattell, 1971) usually presupposes verbal reasoning based on prior knowledge and the ability to derive secondary relational abstractions, using previously learned primary abstractions. Unlike the crystallized type of intelligence, flexible or fluid intelligence involves often nonverbal reasoning about new problems. Flexible intelligence is capable of “producing” knowledge that is different from the existing one, solving new thinking issues. It is associated with a number of learned critical skills such as understanding, interpretation, and learning ability.

We are referring to the so-called naive picture of the world of average native speakers. Very often it implies clip communication as a result of the lack of systematic literary reading skills and testing aimed at choosing the correct answer.

Our experimental data show that even the humanities do not always structure meanings: sometimes they are not aware of them, cannot interpret the meanings, and cannot connect existing metaphorical figurative meanings within one lexeme (Pesina et al., 2019). Meanwhile, in order to operate with the second and third class metaphors presented above, it is not enough to somehow apprehend and decode them; it is necessary to understand their functions and appreciate their advantage over a non-metaphorical nomination.

There is research on how developmental levels of crystallized and fluid intelligence influence metaphor processing. Thus, Trick and Katz (1986) found a positive correlation between people's scores on an analogical reasoning test and ratings of the understandability of metaphors. Research has shown that neither measures of vocabulary (crystallized intelligence) nor verbal-analogical reasoning ability was predictive of metaphor comprehension.

In contrast, other researchers suggest that both fluid and crystallized intelligence influence metaphor processing (Chiappe & Chiappe, 2007). In their studies, recipients who scored high on a working memory test on measures of vocabulary and print familiarity (crystallized intelligence) were faster at generating higher-quality interpretations of metaphors. Good working memory, as well as good levels of inhibitory control, predict accurate processing and interpretation of metaphors (Ackerman et al., 2005). These executive functions are associated with neuroplasticity and reflect the ability of excitatory and inhibitory neurons to create the necessary signaling circuits. This skill is closely related to the work of flexible intelligence.



CONCLUSIONS AND DISCUSSION

The proposed above lexical invariants can facilitate and speed up the understanding of the metaphor. The contextual metaphor implements one or several of the dominant semantic components of the lexical invariant. The lexical invariant is embodied in one of its combinatorial variants.

Let us illustrate what has been said by presenting the results of the analysis of the polysemous substantive “a leg.” Let us present the invariant components that hold together the semantics of this polysemous word or its lexical invariant: *a long straight, often lower and branching off part of an object which acts as a support, or a distinct portion or a stage between two stops or positions.*

This lexical invariant includes the most significant integral and differential semantic components. It is formed at the level of the language system through numerous contextual realizations of meanings (metaphorical ones). It is contrasted with the term “variant,” which functions at the speech level as a contextual implementation of an invariant. This opposition is built into the language-speech dichotomy (Kostina et al., 2015; Pesina, Yusupova, Kozhushkova et al, 2021).

To illustrate the functioning of the lexical invariant, we present the results of the empirical invariant-component analysis of the polysemous word “a leg.” All metaphorical meanings can be divided into five clusters. In each of the clusters, the configuration of semantic components is somewhat different. As a result of the analysis of 16 metaphorical meanings, the following groups of metaphors can be identified:

- *part of an object, long, straight, acts as a support* (leg of a triangle; leg of a divider/compass – side of a triangle other than base or hypotenuse);
- *part of an object, long, straight, branching off from the main object* (leg of a road (a way radiating from an intersection); leg of antenna (a branch or lateral circuit connecting a communication instrument with the main line); leg of a cricket field (the part of the field to the left of and behind a right-handed batsman and vice versa);
- *part of an object, long, straight, lower, acts as a support* (leg of a plant – the part of a plant stem between the base and the point from which branches arrive; leg of a table/chair/bed (the part of furniture that rests on the floor and helps to support its weight);
- *a distinct portion or a stage between two stops or positions, long, straight* (leg of a long journey/flight – one of the distinct portions or stages of any course or journey; that part of an air flight pattern that is between two successive stops or positions, or changes in direction);
- *part of an object, long, straight* leg of a football game/a dart match/races etc – a part of a game, a part of a race, or a game of a pair or series of games.

The Russian-language equivalent polysemous word “a leg” is not rich in metaphors and has less anthropomorphic force than the English one. There is actually only one frequent metaphor: leg of a chair. This word is rich in phraseological units: *вверх ногами* (upside down), *жить на широкую ногу* (to live on a wide/lordly leg – live richly), *to be on a short (friendly) leg* (in close, friendly relationships), etc.

The content of the following English meaning, found in the dictionary, is rather abstract: *something resembling or suggesting a leg in use, position or appearance;*



something resembling a support branch of a forked or joined object. This metaphorical meaning suggests a wide range of referents that fit the concept of a support or a long branch from something. This meaning indicates that over time, as metaphors are used, an individual develops a certain generalizing construct that increases the efficiency of his thinking.

Let us give similar meanings for other words:

“something resembling a hood in shape or use” (for the polysemous word “a hood”) (Collins, n. d. a),

“either end of something (such as a drum) whose two ends need not be distinguished” (for the polysemous word “a head”) (Merriam-webster, n. d)

“any projection resembling or suggesting a tooth” (for the polysemous word “a tooth”) (Collins, n. d. a),

“A series of closely linked or connected things” (for the polysemous word “a chain”), (Farlex, n.d.)

“a small piece of something (for the polysemous word “a knob”) (Longman, n. d.),

“something resembling a bridge in form or function” (for the polysemous word “a bridge”) (Princeton University, n. d.),

“a place where something [...] divides into two parts” (for the polysemous word “a fork”) (The Britannica Dictionary, n. d)

The more frequent a word is, the more reason to expect the emergence of expanded polysemy with a developed metaphorical system and a subsequent tendency towards broad meaning.

These metaphors involve the assimilation of objects nominated by metaphorical transfers to a wide range of referents. They represent a generalization of all metaphorical meanings and are formed on the basis of the frequent use of figurative meanings in the cognitive and semantic space. Such meanings open “carte blanche” for the nomination of any object or phenomenon that has any similarity with the lexical invariant. The lexical invariant is closer to the semantics of metaphors than the main meaning. The use of a lexical invariant allows one to avoid the comparison phase and directly decode the metaphor through the dominant nuclear features of the invariant. Since language has the property of economy, the functioning of such a content core, which covers, along with the main meaning, the entire semantics of the word, is effective and justified.

That is, the bundle of nuclear semantic components is capable of directly decoding metaphorical transfers, bypassing the first meaning. Based on this generalizing meaning and the analysis performed (only the results of invariant-cluster analysis are presented above), we clarified the dominant features included in the lexical invariant.

The metaphors that make up this polysemous word are anthropomorphic, i.e. the objects they nominate function in accordance with the image and structure of the human body, the way it functions and is designed. Native speakers perceive such basic intuitive metaphors instinctively and automatically, because they know how their body “works.”

Through metaphorical thinking and operating in domains “as if one object functioned or looked like another object,” in full accordance with the anthropic worldview, people adapt their environments to suit themselves. The world refracted by humans is reflected and embodied in the nuclear information formed behind the structure



of the word – in its lexical invariant. The latter operates at the background level, providing effective quick access to the semantics of a metaphor, strengthening the structure of the polysemous word, preventing it from falling apart into homonyms.

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Статья поступила 1 декабря 2023
одобрена после рецензирования 16 декабря 2023
принята к публикации 23 декабря 2023

Received: 1 December 2023
Revised: 16 December 2023
Accepted: 23 December 2023