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MODELOWANIE WIEDZY W TEKŚCIE LITERACKIM: MODEL RAMKI M. MINSKY'EGO

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Adnotacja. W artykule omówiono modelowanie wiedzy w tekście artystycznym i przeanalizowano model ramki zaproponowany przez M. Minsky'ego. Pojęcie ucieleśnionego doświadczenia komunikacji/zachowania niewerbalnego służy do zilustrowania systemu powierzchniowych (semantycznych, syntaktycznych) i głębokich (tematycznych, narracyjnych) ramek w tekście artystycznym. Badanie dowiodło, że epistemologia związana z przetwarzaniem i strukturyzacją wiedzy jest związana z językoznawstwem, kognitywistyką, filozofią, psychologią, a zwłaszcza teoriami sztucznej inteligencji, które wykorzystują pojęcie ramki jako struktury reprezentacji określonej koncepcji w dyskursie tekstu literackiego. Celem artykułu jest ustalenie, że ogólna idea ramowej metody prezentacji wiedzy, sformułowana przez M. Minsky'ego, może być z powodzeniem wykorzystana nie tylko w odniesieniu do wizualnego postrzegania obiektów, ale jako narzędzie do modelowania wiedzy w kontekście znaczenia tekstu literackiego.

Słowa kluczowe: doświadczenie ucieleśnione, opracowanie dyskursu, znaczenie, ramka semantyczna, ramka syntaktyczna, ramka tematyczna, ramka narracyjna.

KNOWLEDGE MODELLING IN A LITERARY TEXT: THE FRAME MODEL BY M. MINSKY

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Abstract. The article deals with knowledge modelling in a literary text and analyses the frame model proposed by M. Minsky. The concept of embodied experience about nonverbal communication/behavior is used to illustrate the system of surface (semantic, syntactic) and deep (thematic, narrative) frames in a literary text. We argue that epistemology dealing with knowledge processing and structuring has close ties with linguistics, cognitive science, philosophy, psychology, and especially theories of artificial intelligence using the notion of frame being a structure that describes a model for representing some concept in a discourse of a literary text. The aim of the article is to show that general idea of the frame method of presenting knowledge formulated by M. Minsky may be successfully used not only in relation to the visual perception of objects but also as an instrument of knowledge modelling relating to the meaning of a literary text.

Key words: embodied experience, discourse processing, meaning, semantic frame, syntactic frame, thematic frame, narrative frame.

МОДЕЛЮВАННЯ ЗНАННЯ В ЛІТЕРАТУРНОМУ ТЕКСТІ: ФРЕЙМОВА МОДЕЛЬ М. МІНСЬКОГО

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Анотація. У статті розглядається моделювання знань у художньому тексті та аналізується фреймова модель, запропонована М. Мінським. Поняття втіленого досвіду про невербальну комунікацію/поведінку використовується для ілюстрації системи поверхневих (семантичних, синтаксичних) та глибинних (тематичних, нарративних) фреймів у художньому тексті. У дослідженні доведено, що епістемологія, яка має справу з опрацюванням

та структуруванням знання, є пов'язаною з лінгвістикою, когнітивною наукою, філософією, психологією та особливо теоріями штучного інтелекту, які використовують поняття фрейму як структури представлення визначеного поняття в дискурсі літературного тексту. Метою статті є встановити, що загальна ідея фреймового методу подання знань, сформульована М. Мінським, може бути успішно використана не тільки щодо візуального сприйняття об'єктів, але як інструмент моделювання знання у контексті значення літературного тексту.

Ключові слова: втілений досвід, опрацювання дискурсу, значення, семантичний фрейм, синтаксичний фрейм, тематичний фрейм, наративний фрейм.

Introduction. Epistemology as a science about the theory of knowledge, especially with regard to its methods, validity, and scope is fundamental for a number of related field of sciences such as linguistics, cognitive science, philosophy, and artificial intelligence theories. Philosophical studies are based on general metaphysical concepts in the form of theoretical and cognitive categories (truth, knowledge, consciousness, sensualism, rationalism). Linguistics examines the cognitive process in connection with language and speech both in literary texts and in real communication situations. Empirical and theoretical facts of cognitive linguistics serve as material for global theoretical and cognitive generalizations. Thus, frame model, developed by M. Minsky is the way to model and structure knowledge about real world, presented in a literary text by an author (for instance, we use the concept of nonverbal communication/behavior as embodied linguistic experience).

Frame model, as a general model of knowledge organization, is under the assumption of cognitive linguistics, which recognizes that the study of language is the study of language use, and that when a person is engaged in any language (speech) activity, he or she unconsciously uses a large number of cognitive and cultural resources, models, and frames, establishes multiple connections, coordinates large bodies of information, and involves creative mapping, rendering and processing the information. Language does not represent meaning in a literary text but it encourages its creative construction (Nadel, 2003: 1268). Grammar usage guides a person along rich mental paths, prompting him to perform complex cognitive operations.

The aim of the article is twofold: (1) to ground the connection of philosophy and cognitive linguistics based on theory of knowledge; (2) to reveal M. Minsky's frame model being realized in a discourse of a literary text.

Material and methods. Since the present article is analytical and theoretical research, it uses *literature review* to unfold the current state of knowledge, identify gaps in the literature, and build upon existing theories and findings; *conceptual framework* to structure graphically relationships and assumptions as to frame model; *comparative analysis* to compare theoretical insights with existing theories or alternative models; and *synthesis* to integrate findings from different sources and disciplines to develop a comprehensive understanding of the topic.

Results and discussion. Since philosophical knowledge includes a cognitive and reflective component, epistemology is an integrator and stimulator of philosophical creativity, providing a rational dialogue between sciences that study the cognitive process. From the end of the XIX century cognition falls into the focus of experimental psychology research conducted by W. Wundt. Cognitive science includes those philosophical studies that provide a theoretical understanding of cognition and consciousness problems (J. Fodor, D. Dennett, M. Boden). Psychologists have interpreted experimental results arguing that there are unconscious, unobservable cognitive processes that would explain what they observed. It was something akin to reasoning, classifying, and evaluating, but the speaker was not aware of it.

Problem of knowledge: philosophical and cognitive perspective. The essence of the study of cognition is the subject of philosophical consideration, which forms a worldview and methodological basis for the understanding of cognitive activity in any other field of scientific knowledge (Sharkey, 1986). In a general sense the theory of cognition is understood as a «philosophical theory about knowledge and patterns of human cognitive activity», «general knowledge about knowledge», or a reflection of the «second level», where not only the cognitive process is reflexively understood but where the knowledge is obtained during reflective analysis in individual cognitive disciplines («first level» reflection) (Geeraerts, 2010).

A rational understanding of any objective reality requires recourse to verbal and logical thinking, which is clearly (or implicitly) based on marginal categorical meanings. Therefore, we argue that the language of philosophical (epistemological) categories is a universal and general language that underlies all other languages of rational cognition: natural, artificial language, and the language of metaphors or symbols.

Cognitive science is the study of the possible cognitive architecture (representations and rules) and processes involved in understanding different parts of the world, including ourselves. The computational basis is an important cornerstone of the construction of the discipline, but it does not exclude the possibility of discovering new technologies and new metaphors for the study of the mind (Sharkey, 1986: 14). Cognitive science encompasses the fields of artificial intelligence, cognitive psychology, and cognitive linguistics. Natural language in various aspects of study is the factor that integrates the problems of linguistics within different sciences.

Language reflects thought at every level. The words in the speaker's vocabulary are a catalyst that can speed up the fixation of content, because one part of the brain is connected to another. Grammatical structures organize thoughts, outlining the ways in which their own «databases» are tested (Sharkey, 1986: 301). The structures of the stories or literary texts provide guidance at different levels, prompting the speaker to ask questions that are most appropriate in the given circumstances.

Looking at a person from the point of view of a computer, we cannot help but see that natural language is the most important «programming language». This means that much of our knowledge and skills are best expressed and understood by us in our natural language... «Natural language is said to be the first major original artefact,

and as we are gradually realizing that languages are machines, therefore natural language, controlled by brain, is our first invention of a universal computer. We may assert that language is not the thing we invented, but the essence we became, not the object we constructed, but a kind of existence we turned into» (Leiber, 1991: 8).

It is worth to note that unconscious mental states of individual «do not resemble words and pictures in a filing cabinet, being in their original form; rather, they are similar to words and images on a computer when they are not on the screen. Such mental states have a very different, immaterial, unconscious form, but they are still unconscious mental states, capable of acting like conscious mental states, even though at the time they are unconscious they contain nothing but neurobiological states and processes that can be described using neurobiological terms» (Searle, 1997: 121).

Wittgenstein's view of language is dependable of the views of philosophers and linguists who believe that natural languages are consistent and interpretable formal systems. His criticism of this view and the associated statement that consciousness is particularly private and fundamental thing inspired cognitive scientists (D. Dennett, N. Chomsky) to develop various ideas (Harre, 2002: 136).

Under idealistic and empirical tendencies in cognitive semantics, D. Geerarts studies the problem of radical subjectivism caused by cognitive semantics' adherence to the principle of internal realism: «I feel that the empirical approach makes stronger demands on semantics than the idealistic approach and provides a more detailed answer to Dilthey's problem. This is a good theoretical and methodical reason for placing the interpretive nature of linguistic semantics at the forefront of theoretical attention» (Geeraerts, 2010: 443-444).

Cognitive linguistic assumptions are unfolding on the creative basis of the meaning of discourse context (Fauconnier, et. al., 1994). Aspects of language and expression, which were often considered by cognitive linguists as the rhetorical periphery of language, for example, metaphor (Lakoff & Johnson, 2004) and metonymy (Panther & Radden, 1999) occupy a central place in cognitive linguistics. They are powerful conceptual reflections necessary for human thought, important for understanding not only poetry, but also science, mathematics, religion, philosophy of everyday communication and thinking.

Nonverbal experience as a frame model in a literary text. The possibility of identifying knowledge or embodied experience of nonverbal communication/behavior in the discourse of the literary text is determined by the fact that semantics reflects the main categories and structures of reality knowledge models (Winograd, 1976). When creating or decoding a text, it is not the language itself that is used creates, but the knowledge that is expressed and transmitted by this language (Minsky, 1974). The cognitive scheme or frame model of the embodiment of the nonverbal experience is based, first of all, on the perception of language units functioning in the discourse of a literary text. Language units denoting types of nonverbal communication and/or behavior are expressions of literary meaning, which is revealed within a frame model.

The concept of M. Minsky's frame model arises from the idea that approaches to the study of artificial intelligence and psychology were local and unstructured under practical or phenomenological use. M. Minsky noted that the «chains» of reasoning, language, memory and perception should have a clearer structure; their factual and procedural content has to be related to explain the power and speed of mental activity. The theories of intelligence/cognition are consistent with ideas of structuring «micro-worlds», «problem space», «theory of large structures» (Schank & Colby, 1973), which aim to establish a connection with linguistic structures.

The essence of the M. Minsky's frame approach is that when a person is faced with a new situation (or significantly changes his view of a problem), he/she selects *a frame structure / a model* from his/her memory – a familiar scheme in order to be able to adapt to reality, changing the details if necessary (Winston, 2016: 282). Therefore, the frame model is productive in terms of analyzing the nonverbal experience as one of the aspects of meaning of literary text, which is specified by linguistic units in the semantic space of the discourse through linguistic definition.

Contrary to the conditional nature of the comparison, M. Minsky generalizes the image of understanding language as parallel to visualization (Minsky, 1988: 250). Key words and ideas of discourse activate content structures got from memory by default. The general understanding of the discourse leads to the emergence of temporary formations that correspond to «deep structures» and can be regrouped during the dynamic development of the plot as the embodiment of the actions of the characters in the literary text.

Surface semantic frames focus on the action of the meaning of words; qualify and determine connections regarding the elements of the fictional world: nonverbal communication/behavior, characters and narrator, trajectory and strategy of plot development, goals, consequences and «side effects» of the presented topic. The frame model is productive in studying the phenomenology of «meaning». Speech activity in the discourse of literary text encompasses larger structures than grammatical frames, which blur the clarity of the syntactic and semantic dichotomy (Langacker, 1972). Words can directly characterize the speech situation in general, describe the nonverbal communication / behavior of the character, present the narrator's comment. This possibility connects speech with thinking processes.

Thinking in the psychological sense is never «a simple restoration of the past situation that arose as a result of the intersection of interests, but it is the use of the past in solving the difficulties posed by the present», that is, thinking is not reproductive, but constructive process. The «conceptual processor» uses the unfilled slots to find nonverbal communication / behavior information in the sentence to fill in the necessary gaps (Bartlett, 1967).

Surface syntactic frames. First of all, these are verbs and nouns: for instance, the verbs *said, say, tell, talk, speak, sound, voice* for paralanguage; verbs *go, come, walk, follow, turn* for kinetics are the most frequent in the literary texts revealing nonverbal communication/behavior. Consistency in prepositions and word order is important.

Since the meaning of an utterance is «encoded» in the positional and structural relations between words and in the choice of words, there must be processes of analyzing these relations during the construction of patterns that will directly reflect the meaning, that is, grammatical theories that schematically indicate important relationship between semantics and syntax (Minsky, 1974: 24). Characterization of voice or kinetic action in literary texts requires both a semantic designation (*said, go*) and a syntactic construction that expresses the character's emotions through syntactical meaning (*said loudly, go angrily*).

The theory of sentence analysis (case grammar) involves structures similar to frames; cognitive grammar operates with the concept of a construct in relation to the establishment of schematized grammatical connections (Fillmore, 1968). Centered mainly around the verb, the parts of the sentence are used to create a verb frame, according to the different ways the verb is combined with other parts of speech. Since sentences are built around verbs, verb frame structures are justified when analyzing linguistic expressions that represent nonverbal experience.

Verb-centric structures become subordinated or disappear in the discourse of literary text. Therefore, the synthesis of the verbal structure of nonverbal experience is a necessary, but it is a transitional stage in understanding the meaning of a whole literary text (Minsky, 1974: 29). Once the sentence is intelligible, the resulting semantic and syntactic formations must be transferred to the discourse level of the nonverbal communication/behavior frame to create a larger picture. The description of nonverbal action, which is the main thing in a specific sentence, plays an auxiliary role in characterizing the nonverbal communication/behavior of the characters in the general plot of the story.

Deep thematic frame. Topic, or theme, is a scene, an action, a characteristic of a character's nonverbal communication/behavior. The thematic frame determines the interaction between linguistic and non-linguistic representations – thinking, reasoning involve the transformation of knowledge about nonverbal communication/behavior into linguistic form or the words denoting non-verbal experience.

Frames related to the meaning of words (nouns or verbs) are the focus of a concentrated representation of knowledge about how different words denoting nonverbal experience are related to each other and how they function, actualizing the relevant topics and concepts of literary text. Mechanisms that could use these structures for thinking and speaking have advantages. A single statement can define terminals, attach subframes, apply transformations, or cause a replacement of frame in deep structure (Minsky, 1974: 31). Elements of the meaning of literary text – words denoting nonverbal experience – are understandable only when general linguistic meanings interact with implicit and explicit discourse «markers» that determine the terminal or sub-frame of the plot during its unfolding. The defined vocabulary actualizes the concepts that reveal the topics and/or themes of a literary text.

A deep narrative frame is a schematic form for typical narratives, explanations, and arguments related to the point of view (first or third person narrative) in relation to character speech/discourse of characters ↔ narrator speech/discourse of a narrator, the development and forming the plot. The interpretation of the words denoting nonverbal experience in the deep narrative frame turns out to be a reproduction of the thought and speech activity of the character in the forms of *direct, indirect* and *represented speech* and the narrative manner of the narrator. The words denoting nonverbal experience form «other people's speech», and therefore indicate a shift in the scientific focus of attention from «the study of speech in a literary text to the study of the thought and speech behavior of textual anthropomorphs, the sphere of their textual communication» (Bekhta, 2019: 75).

The purpose of the narrative frame is to help the reader to create a new thematic frame in his mind through the discourse actualization of linguistic means marking nonverbal experience. The discourse of literary text as a dichotomy between the discourse of the narrator and the characters can be represented by a frame script that covers the beginning (the reader knows little except that the narrative will unfold, but it sets him up for the introduction), middle part and the end (Phelan, 2007). The general frame of the story based on the dynamic embodiment of the plot has slots for words denoting nonverbal experience, characters, actions, main events and morals.

As the story progresses, information is passed to super-frames, creating or initiating a script. In some cases, it is possible to attach a subframe (a description of a character's nonverbal communication/behavior) to a terminal in a super-frame (Minsky, 1974: 30). Clauses can create relationships that restrict the union of existing terminals. The words denoting nonverbal experience are evident in the discourse as a system of frames (*semantic* ↔ *syntactic* ↔ *thematic* ↔ *narrative*) that unfold simultaneously «top-down» or «bottom-up». Each frame represents a component of the formation of the general meaning of the story and reveals a certain characteristic of the nonverbal experience in the discourse of a literary text (Figure 1).

Different frame systems represent different ways of using the same information: syntactic schemes guide the selection and composition of variable sentence frames; Linguistic structures denote nonverbal experience revealing the structure of frame systems. Such formations are associated with the choice, accents, or points of view, due to the author's stylistic language designations, the addition of sentence structures to thematic architecture and changes in general conceptual ideas, marking the transition to more complex discourse schemes for understanding the meaning of a literary text. Narrative frames of the literary text unfold «from the bottom to up» or «top-down» (words denoting nonverbal experience → grammatical constructions → textual topics/themes ↔ textual concepts).

Following M. Minsky, we assume that the reader possesses a number of frames of the story, connected to each other by search structures. First of all the reader tries to add new information to the current narrative frame, creating a so-called «error comment» in case of failure. This forces him to change the existing narrative frame.

The previous terminal membership can be valid if the new narrative frame has the same types of terminals. Nevertheless, if the early connections «do not work», the reader must create another narrative frame (Lee, et. al.,

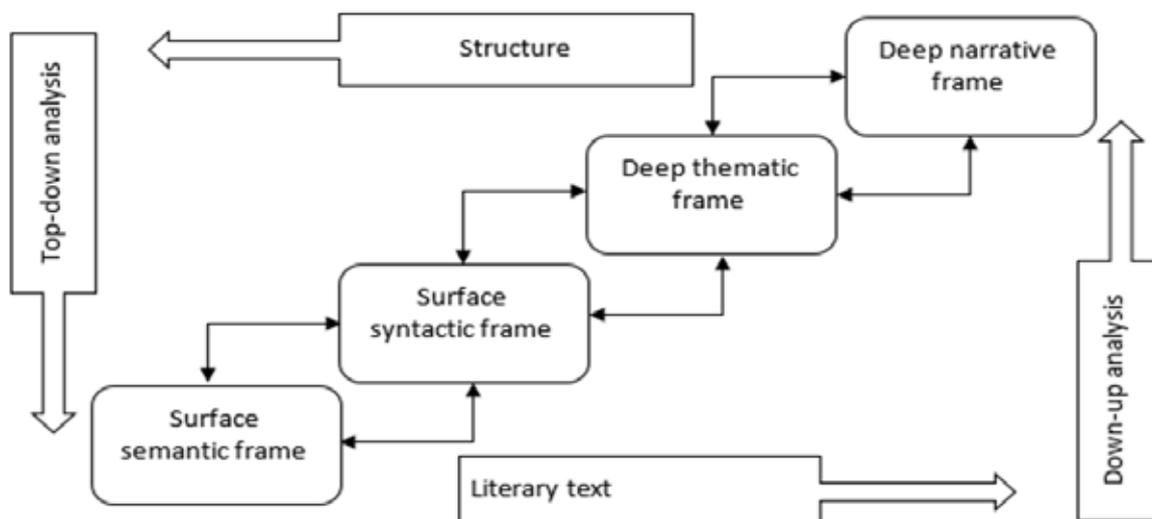


Figure 1. System of frames in a literary text

2018). If this new frame is not successful, then the reader constructs a fundamentally different narrative frame, which is a significant intellectual event, or he has to forget obscure connections. The embodiment of nonverbal experience form a frame covering nonverbal communication/behavior of the characters, forming its dynamics in the discourse of a literary text.

Nonverbal experience can be verbalized by all kinds of linguistic representations (not only by nouns or by verbs). The transitional semantic structure created during syntactic analysis (the «deep structure» of a sentence) is not identical to the larger (and «deeper») structure that is built up gradually in each fragment of coherent textual communication. Since such notions as time, cause, action and speech communicative acts are important in the discourse of literary text the author-narrator uses successive pairs of transformations that replace real-world situations with temporal or cause-and-effect relationships, reproduce the communication of the narrator and characters, which affects the perception of a literary text by a reader.

Conclusions. This study delved into the realm of knowledge modelling in literary texts through the lens of the frame model proposed by M. Minsky. By utilizing the concept of embodied experience to illustrate the system of surface and deep frames, we uncovered insightful connections between epistemology, linguistics, cognitive science, philosophy, psychology, and theories of artificial intelligence. Our findings demonstrate the adaptability and versatility of the frame method in representing not only visual perception of objects but also in capturing the intricate meaning within a literary discourse. The significance of this research lies in its interdisciplinary nature, bridging the gap between various academic domains and shedding light on the relationship between knowledge processing and the structure of language in literary contexts. The successful application of the frame model to analyse and model knowledge in a literary text highlights its potential contributions to multiple fields of study.

While this investigation has provided valuable insights, we acknowledge some limitations inherent in our approach. Future research can explore the extension of these ideas to different literary genres, languages, and cultural contexts, as well as delve deeper into the intersection of artificial intelligence frameworks and narrative understanding. In summary, our study establishes the value of incorporating the frame model in understanding the meaning and knowledge representation within literary texts in order to enrich comprehension of literary works and advance understanding of knowledge modelling in the context of human linguistic expression.

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