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## **REALIZATION OF THE SEMANTIC STRUCTURE OF THE NOUN 'WAY' IN THE TEXTS OF SCIENTIFIC AND TECHNICAL DISCOURSE**

*The presented article examines the extent of realization of the semantic structure of the English noun 'way', encountered in text corpora of various technical specialties. In our article, three corpora of this type are investigated: "Automation of heat and power processes", "Chemical engineering" and "Acoustics". The total volume of tokens amounts to 600 thousand units, which allows us to speak about a fairly high representativeness of the obtained results. The corpora were compiled on the basis of scientific articles on the relevant topics taken from scientific journals in the UK and the USA: for the texts in specialty "Automation of heat and power processes" Power, Power Engineering, Process Engineering; for the corpus "Chemical engineering" – Chemical Engineering Progress, Chemical and Process Engineering; for the corpus "Acoustics" – Journal of Acoustic Society of America, Journal of the Audio Engineering Society, Applied Acoustics, IEEE Transactions of Antennae and Propagation, Journal of the Society of America. The methods that were used to get the data were the following: contextual analysis to select the necessary linguistic units; comparative analysis to identify the relationship between the dictionary entry of the word 'way' and its functioning in the text corpora; statistical method for calculating the frequency of tokens in the studied texts, as well as for the further calculation of shares of this or that meaning in the total volume of realization of semantic structure, etc. The material for the analysis was: 1) definitions of the dictionary entry for the noun 'way', recorded in the Webster's Standard Dictionary; 2) lexical facts determining the functioning of this word in the text corpora of the three engineering specialties indicated above. By comparing these two linguistic resources, the goal formulated in the article and presented above was achieved. In addition to linguistic and lexicographic data, the facts of linguistic statistics were also described, which made it possible to determine the volume occupied in the semantic structure of the word 'way' by one or another lexical-semantic variant.*

**Key words:** dictionary definition, token, contextual analysis, lexical-semantic variant, discourse.

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## РЕАЛІЗАЦІЯ СЕМАНТИЧНОЇ СТРУКТУРИ ІМЕННИКА 'WAY' У ТЕКСТАХ НАУКОВО-ТЕХНІЧНОГО ДИСКУРСУ

У представленій статті розглядається ступінь реалізації семантичної структури англійського іменника 'way', що зустрічається в текстових корпусах різних технічних спеціальностей. У нашій статті досліджено три корпуси цього типу: «Автоматизація теплоенергетичних процесів», «Хімічне машинобудування» та «Акустика». Загальний обсяг слововживань становить 600 тис. одиниць, що дозволяє говорити про досить високу репрезентативність отриманих результатів. Корпуси складено на основі наукових статей відповідної тематики з наукових журналів Великобританії та США: для текстів зі спеціальності «Автоматизація теплоенергетичних процесів» *Power, Power Engineering, Process Engineering*; для корпусу «Хімічна інженерія» – *Chemical Engineering Progress, Chemical and Process Engineering*; для корпусу «Акустика» – *Journal of Acoustic Society of America, Journal of the Audio Engineering Society, Applied Acoustics, IEEE Transactions of Antennae and Propagation, Journal of the Society of America*. Для отримання даних були використані такі методи: контекстний аналіз для вибору необхідних мовних одиниць; порівняльний аналіз для виявлення зв'язку між словниковою статтею слова 'way' та його функціонуванням у корпусах текстів; статистичний метод для підрахунку частотності лексем у досліджуваних текстах, а також для подальшого підрахунку часток того чи іншого значення в загальному обсязі реалізації семантичної структури тощо. Матеріалом для аналізу стали: 1) дефініції словникової статті для іменника 'way', які зафіксовані у *Webster's Standard Dictionary*; 2) лексичні факти, що визначають функціонування цього слова в текстових корпусах трьох зазначених вище інженерних спеціальностей. Порівнянням цих двох лінгвістичних ресурсів була досягнута мета, сформульована в статті та представлена вище. Окрім лінгвістичних та лексикографічних даних, описано також факти лінгвістичної статистики, які дали змогу визначити обсяг, який займає в семантичній структурі слова 'way' той чи інший лексико-семантичний варіант.

**Ключові слова:** словникова дефініція, слововживання, контекстний аналіз, лексико-семантичний варіант, дискурс.

**Problem Statement.** The special interest in the problems of semantics in modern linguistics is a natural process associated with the development of science in general. As in other branches of knowledge, linguistic research strives to penetrate deeper into the essence of a phenomenon, to move from the directly observable features (sound, structure) to the unobservable ones (to the content of the language). The study of the semantic structure of a word is one of such kind of problems.

**Research Analysis.** The deep works can be noted that are of interest from the point of view of determining the semantics of vocabulary units implemented in texts, and subjected to not only lexical but also statistical analysis (Borisenko, 2018; Lyubymova, 2018;

Lubimova, 2018). The authors of these articles participated in studies devoted to the description of the semantic structure of several of the most frequent nouns functioning in texts referred to scientific and technical discourse (Pochtaruk, 2018; 2018; Pochtaruk, 2017). All of them were in one or another way related to the semantics of the word, i.e. the formation of semantic structures and their components. This article deals with the description of the contextual analysis of texts and, accordingly, the compilation of the semantic structure of the word 'way', which is characterized by average statistical parameters, i.e. its frequencies of use are recorded at an average level (from 99 to 10 tokens).

**The research goal** is as follows: to consider the implementation of the word 'why' the semantic struc-

ture in the texts included in the scientific and engineering discourse.

**Base Material Presentation.** The methodological basis of this study is the concept of the dichotomy “language – speech”, i.e. the understanding that any lexical unit of language should be reflected in speech and verified through speech. This also concerns such a phenomenon as the formation of the semantic structure of language and its reflection in speech. Therefore, to determine the extent to which the definitions of a word (in our case, the noun ‘way’), recorded in the standard dictionary, i.e. the language system, are realized in texts, i.e. in speech, the following methods were used: contextual analysis to select the necessary language units; comparative analysis to identify the relationship between the dictionary entry of a word (its definitions) and its functioning in text corpora; statistical method for calculating the frequency of use of a word in the studied texts, as well as for further calculation of the shares of this or that meaning in the total volume of the meaning realization of a word, etc.

The material for the study was the text corpora of three engineering fields. The corpora were compiled on the basis of scientific articles on the corresponding topics taken from scientific journals of Great Britain and the USA: for the texts in the “Automation of heat and power processes” specialty – Power, Power Engineering, Process Engineering; for the “Chemical engineering” corpus – Chemical Engineering Progress, Chemical and Process Engineering; for the “Acoustics” corpus – Journal of Acoustic Society of America, Journal of the Audio Engineering Society, Applied Acoustics, IEEE Transactions of Antennae and Propagation, Journal of the Society of America. Thus, the volume of the text corpus of each specialty was 200 thousand tokens, i.e. 600 thousand tokens of the total text volume.

The analysis of the semantic structure of the noun ‘way’ was carried out on the basis of a comparison of data from the standard explanatory dictionary Webster’s (Webster’s, 2007) and the collected factual material describing the functioning of this lexical unit in the text corpora of three technical specialties that are included in scientific and technical discourse – “Automation of heat and power processes” (AHPP), “Chemical Engineering” (CE) and “Acoustics” (A).

We should note that the system of definitions recorded in the standard Webster’s dictionary did not always coincide with the nomenclature of lexical-semantic variants (LSVs) of this word, which was determined using contextual analysis of text corpora. The fact is that the components were placed in accordance with their statistical parameters (Perebynis, 1985; Eaton, 1937), i.e. with a decrease in the frequency

of use of these components, while the system of definitions is given by the authors of standard dictionary quite arbitrarily, without taking into account the results of the examination of text corpora and the presentation of quantitative data. In addition, the article presents the LSV complexes that functions not in one corpus, but simultaneously in three ones, which, of course, which approves the reliability of the data presented.

The quantitative characteristics of this word in the three text corpora are as follows: F = 89 (AHPP); F = 97 (CE); F = 58 (A), where F denotes the frequency of occurrence of the word ‘way’ in the three text corpora.

A list of definitions of the word ‘way’ is presented, which is based on Webster’s Standard Dictionary. The consolidated list of dictionary definitions of possible lexical-semantic variants (LSVs) of this noun in English includes the following 12 units:

**1a:** a thoroughfare for travel or transportation from place to place; **b:** an opening for passage *this door is the only way out of the room*

**2:** the course traveled from one place to another : **ROUTE** *asked the way to the museum.*

**3 a:** a course (such as a series of actions or sequence of events) leading in a direction or toward an objective

*led the way to eventual open heart operations–Current Biography*

**b(1):** a course of action *took the easy way out;* **(2):** opportunity, capability, or fact of doing as one pleases *always manages to get her own way;* **c:** a possible decision, action, or outcome : **POSSIBILITY** *they were rude–no two ways about it*

**4 a:** manner or method of doing or happening *admired her way of thinking;* *also : method of accomplishing* : **MEANS** *that’s the way to do it;* **b: FEATURE, RESPECT** *in no way resembles her mother;* **c:** a usually specified degree of participation in an activity or enterprise *active in real estate in a small way;*

**5 a:** characteristic, regular, or habitual manner or mode of being, behaving, or happening *knows nothing of the ways of women;* **b:** ability to get along well or perform well *she has a way with kids a way with words;*

**6:** the length of a course : **DISTANCE** *has come a long way in her studies, still have a way to go;*

**7:** movement or progress along a course *worked her way up the corporate ladder;*

**8 a: DIRECTION** *is coming this way;* **b: PARTICIPANT** – usually used in combination *three-way discussion;*

**9:** state of affairs : **CONDITION, STATE** *that’s the way things are;*

**10 a: ways plural in form but sometimes singular in construction:** an inclined structure upon which a ship is built or supported in launching; **b: ways plural** : the guiding surfaces on the bed of a machine along which a table or carriage moves

**11: CATEGORY, KIND** – usually used in the phrase in the way of *doesn't require much in the way of expensive equipment*–Forbes

**12:** motion or speed of a ship or boat through the water.

The analysis of industry dictionaries and contextual analysis of the texts allows us to identify the LSVs that make up LSV system of the noun 'way', described on the basis of the aforementioned corpora. A location of definition 1a in the dictionary entry gives us the opportunity to conclude that Webster's dictionary "a thoroughfare for travel or transportation from place to place" is the etymologically original meaning of the noun in question. However, the context of the analyzed texts does not confirm this LSV, i.e. it is not only the least frequent element of the semantic structure formed on the basis of contextual analysis, but is also completely absent in the corpora under study.

The review of the texts shows that the meaning of the noun 'way', expressed by the definition 3b2 "opportunity, capability, or fact of doing as one pleases" in Webster's dictionary, can be correlated with the LSV 5 of the AHPP specialty, for example, "*For this reason we recommended addition of a 300,000-gal surge basin to store a portion of the air preheater or precipitator waste water while the cleaning is under way*". In the contexts of the CE and A corpora, this LSV is not actualized.

Furthermore, the meaning of definition 3c according to Webster's dictionary "a possible decision, action, or outcome : POSSIBILITY" is reflected in the LSV6 in the AHPP texts, for example, "*Chlorine is apparently on the way out as a water disinfectant for non-recirculating cooling systems*". This LSV is not confirmed by the contexts of the CE and A corpora.

The meaning of dictionary definition 4a "manner or method of doing or happening" is confirmed by the contexts of all three corpora under consideration in the form of LSV1, i.e. the most frequently used lexical-semantic variant, for example, "*The boiler-control system is designed to operate the boiler and its auxiliaries the way the designer intended the boiler to be operated*" (AHPP) (LSV1 "method"). "*There is another way of protecting steel surfaces other than by applying a paint system or high-built casting*" (CE) (LSV 1 "method"). "*One way to resolve these ambiguities is to transmit harmonic. i.e., a sequence of signals with different parameters*" (A) (LSV1 "method").

Further examining the meanings recorded in the Webster's Standard Dictionary and comparing them with the LSVs met in the three studied text corpora, we can come to the following conclusion. The meaning of the noun 'way', expressed by dictionary definition 6 according to Webster's "the length of a course : DISTANCE", completely coincides with LSV3 of the semantic structure of this noun in the texts of the AHPP, and LSV2 in the texts of the CE specialty. For example, "*In Section 1 of this report, we discussed how recording instrument have come a long way, from the wall-mounted black box enclosing a circular chart and an awkward-to-full-ink stylus*" (LSV3 "distance in the course of time" – AHPP specialty). "*The fabricator apparently close not to roll the tube to the tube sheet all the way to the weld for fear of cracking*" (LSV2 "distance in the course of time" – CE specialty).

In the texts of the specialty "Acoustics" this meaning of the word 'way' is not realized.

The meaning of definition 7 of the standard dictionary Webster's "movement or progress along a course" of the word 'way' is fully consistent with LSV2 in the text corpus "Automation of heat and power processes" (AHPP). For example, "*For high-pressure, drum-type boilers, the three-element controller, receiving inputs from steam-flow, drum-level, and feed-water-flow transducers, remain the way to go*".

The contexts of the text corpora of the specialties "Chemical Engineering" and "Acoustics" do not demonstrate this meaning of this dictionary definition.

The semantic meaning expressed by definition 11 of the word 'way' in Webster's dictionary "CATEGORY, KIND – usually used in the phrase in the way of..." found a match with LSV of the noun 'way' fixed in the AHPP corpus in LSV 11. For example, "... *the characteristics in the way of the device velocity* ...".

Thus, we can state that the meanings of the Webster's dictionary definitions 1a, 2, 3a, 3b(1), 4b, 4c, 5a, 5b, 8a, 8b, 9, 10a, 10b, 12 of the noun 'way' have lexical and syntactic compatibility that is not typical for the specialties "Automation of heat and power processes", "Chemical engineering" and "Acoustics" and are not implemented in the texts of these specialties, although it seems that in general the meanings 3c, 4b, 4c, 5a, 9 may well be used in other texts related to scientific and technical discourse.

The definition analysis of the word 'way' in the standard Webster's dictionary, which form the dictionary entry for this word, and a comparison of the set of these definitions with the results of a contextual analysis carried out on the basis of three technical text corpora: "Automation of heat and power processes", "Chemical engineering" and "Acoustics" show that



the smallest number of LSVs corresponding to dictionary definitions is observed in the “Acoustics” corpus – only two LSVs, united by one invariant (definition 4a “manner or method of doing or happening”; definition 5a “characteristic, regular, or habitual manner or mode of being, behaving, or happening”).

The LSV complex in the texts of the specialty “Automation of heat and power processes” has the largest number units taken into account in the dictionary entry of the word ‘way’. It is represented by six LSVs:

WAY 3b2 “opportunity, capability, or fact of doing as one pleases”

WAY 3c according to Webster’s dictionary “a possible decision, action, or outcome : POSSIBILITY”

WAY 4a “manner or method of doing or happening”

WAY 6 “the length of a course : DISTANCE”

WAY 7 “movement or progress along a course”

WAY 11 “CATEGORY, KIND –usually used in the phrase in the way of...”

And finally, the text corpus “Chemical engineering” demonstrates three LSVs corresponding to three definitions:

WAY 4a “manner or method of doing or happening”

WAY 6 “the length of a course : DISTANCE”

WAY 7 “movement or progress along a course”

We should note that the contextual analysis revealed the following lexicographic phenomenon: in addition to the definitions presented in Webster’s dictionary, which the authors used as the basis for the possible semantic structure of the word ‘way’, the lexical-semantic variants were discovered that are not taken into account in the Webster’s dictionary definition system. For example, LSV with the meaning ‘case’ “*In this way, handling is minimized and parts transfer through the production line is on inexpensive consumable pallets*” (“Chemical engineering”); “*However, in Norway is boiler or turbine control dependent on the data links or the plant computer*” (“Automation of heat and power processes”) and others. They represent new semantic nuances that are not reflected in the dictionary entry.

The authors also offer some statistical data, namely, the percentage share of meanings that occupy a certain volume of LSVs of the word ‘way’ of three specialties. First, the entire set of definitions recorded in the Webster’s standard dictionary is presented. Then, according to the numerical values that are already known from the contextual analysis of the text corpora, the percentage of a particular LSVs in the total volume of meanings was calculated.

Thus, the volume of different meanings in the specialty “Automation of heat and power processes” can be represented as follows: the meaning 3b2 “opportunity,

capability, or fact of doing as one pleases” occupies 69% of the entire structure as the most frequently used; three meanings – 3c “a possible decision, action, or outcome : POSSIBILITY”, 4a “manner or method of doing or happening” and 6 “the length of a course : DISTANCE” each occupy 8%; the 7<sup>th</sup> “movement or progress along a course” occupies only 4% of the entire volume of LSV. Here, only the LSVs recorded in the definitions of Webster’s dictionary were taken into account. Additional LSVs that were found in the text corpora and not taken into account in Webster’s dictionary were not included in the calculated volume of LSVs.

The volume of all LSVs recorded in the texts of the specialty “Chemical engineering” was calculated as follows. The largest share was occupied by the LSV, which in the standard dictionary corresponds to definition 4a “manner or method of doing or happening” – about 75%; LSV, corresponding to definition 6 “the length of a course : DISTANCE” – 20%; LSV, corresponding to definition 7 “movement or progress along a course” – 4.5%.

And finally, the semantic structure with the smallest number of LSVs of the specialty “Acoustics”, in which there is only one LSV with practically identical meanings, which, as already mentioned, were united by one invariant (definition 4a “manner or method of doing or happening”; definition 5a “characteristic, regular, or habitual manner or mode of being, behaving, or happening”). This meaning occupies the entire volume of the semantic structure, i.e. 100%.

**Conclusions.** 1. The results of the contextual analysis of text corpora of three technical specialties have showed a significant narrowing of the semantic structure of the word ‘way’ compared to the branched structure presented in the standard Webster’s dictionary, which confirms the opinion of many linguists about the possible significant reduction in the semantic activity of words of common vocabulary functioning in technical texts.

2. The hierarchies of LSVs of the word ‘way’, reflected in the text corpora of the three specialties and the definitions in Webster’s dictionary, do not coincide, which apparently expresses certain requirements formed in the technical concepts of the studied corpora over time. Apparently, for the authors of the texts under consideration, it is much more important to use another order of units of semantic structure than that presented in the standard dictionary.

3. Despite the significant reduction in the nomenclature of meanings of the word ‘way’ fixed in text corpora, some compensation for this units is observed, which is expressed in the presence of new LSV, i.e. the new elements of this structure that are not recorded in the standard dictionary.

4. The article presents not only the units of the word 'way' semantic structure, reflected in the standard dictionary Webster's, but also statistical data calculated by the numerical values of the frequency of use of different LSVs in the texts of three specialties. They present a complete picture of the proportional parts of the meanings of this word in the total volume of meanings.

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