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SEMANTIC ANALYSIS AND SYNTHESIS IN THE AUTOMATIC ANALYSIS OF THE TEXT

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Abstract:

Introduction. *In the information-search engine, semantic analysis and synthesis occupy a leading place. When we say automatic semantic analysis, using specially developed linguistic algorithms, we understand a set of methods and techniques that can be used with sufficient accuracy to express the meaning of random speech in a natural language with the help of a rigorous, accurate tool that is carried out on a computer. Highlighting the importance of the semantic analyzer in the information search engine, it is first of all associated with the study of the process of semantic analysis and synthesis in the automatic analysis of the text, the elimination of its problems.*

Research methods. *The direct semantic analysis and synthesis method were used to cover the importance of semantic analysis and synthesis in the automatic analysis of text. Through this, their leading position in the automatic analysis of the text was manifested. Because initially the morphological and syntactic analysis of the text is carried out, and then the semantic analysis is performed. Semantic analysis works with meaning. Moreover, semantics is closely related to philosophy, psychology and other sciences, in addition to knowledge of the structure of the language. In semantic analysis, it is necessary to take into account both the social and cultural features of the native language. The process of human thinking, the means of expressing ideas, is a difficult process to formalize language.*

Results and discussions. *Automatic semantic analysis is one of the urgent and complex tasks of computer linguistics. Semantic analysis and synthesis are of great importance in the automatic analysis of the text. In the information-search system, linguistic analysis of the text, semantic analysis and synthesis in automatic analysis will be based on the perfection of the process, semantic search in the ISS and the solution of its problems will be based on the clarification of the semantic analyzer function, the formation of the future SemA (semantic analyzer). In order for the SemA to work, the process of semantic analysis and synthesis should be systematically adjusted at the beginning of the ISS. The creation of linguistic supply of the Uzbek*

language SemA, the semantic analyzer and its position in the information search engine directly depend on the importance of semantic analysis and synthesis in the automatic analysis of the text. The creation of new methods of semantic analysis of texts is relevant in solving such problems as machine translation of computer linguistics, text classification. At the same time, it is also important to develop new tools for automating semantic analysis.

Conclusion. *In the information-search system, it is important to systematically establish the process of semantic analysis and synthesis. Automatic text analysis and synthesis plays an important role. Because both the theoretical and practical development of computer linguistics provides the basis for the creation of effective machine translation systems aimed at the realization of human needs. Semantic analysis is the most complex line of automatic text analysis.*

Keywords: *computer linguistics, corpus linguistics, information search engine, semantic analysis and synthesis, natural language, linguistic analysis, morphological analysis, syntactic analysis, TextMining, thesaurus, ontology, linguistic processor, semantic analyzer, "Lexicograph", Google, Bing, search engines*

Introduction. Corpus linguistics, which emerged in world linguistics in the 1960s, created a new methodological basis for speech practice, research priorities. The corpus of language and the science associated with it, that is, corpus linguistics, is a new direction that has rapidly entered the field of linguistics and language teaching methodology in the late twentieth and early twenty-first centuries. The creation of the language corpus and the development of corpus linguistics is one of the most important issues in the field of linguistics, language teaching methods. Modern conditions of language activity include not only the study of speech patterns, but also individual chronological cases, the systematization of speech practice. Given the fact that corpus linguistics as a metalinguistic tool can build, use language methodology and linguistic interpretation of speech - to solve "old" and "new" language problems using computers, the creation of linguistic support of language corpus determines the relevance of the topic.

In world linguistics, in the late nineteenth and early twentieth centuries, corpuses began to be created to conduct linguistic research or often to solve practical problems (e.g., to calculate the frequency of language units). With the invention and widespread use of computers for corpus linguistics, a new stage of development began, and the analysis of how corpus corporations differed from existing ones not only in storage format but also in size. In the field of computational linguistics, the creation of multi-purpose corpus, improvement, enrichment, expansion of existing corpus is one of the pending issues.

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LINGUISTICS

Corpus linguistics is an independent branch of computer linguistics; it deals with the development of the general principles of the construction and use of the linguistic Corpus (text corpus) with the help of computer technology. Under a linguistic corpus or (text corpus), a collection of philologically competent language information that is read, combined, tagged, formatted in a large-scale machine created to solve specific language problems is understood.

Today, corpus linguistics is often understood as a relatively new approach to the study of the use of language in "real life" with the use of computer and electronic corpus in linguistics. Corpus linguistics has at least two characteristics to be able to claim an independent position:

1) the nature of the oral material used;

2) specific features of the tools.

If the syntax, semantics sections of linguistics, as well as the direction of sociolinguistics are aimed at describing or evaluating the structure of a language or linguistic use, then corpus linguistics is a broader concept, a methodology that can be used in many aspects of linguistic research. Experts sometimes refer to corpus linguistics as "a set of methods in different areas of linguistic research".

Corpus linguistics is interested in automatic analysis of the text. It covers a number of types of analysis, including automatic analysis of text. We aimed at analyzing the role, function and problems of the semantic analysis and synthesis process in the automatic analysis of the text. Indeed, in order to highlight the importance of the semantic analyzer in the information search system, which is a important issue in Uzbek computer linguistics, it is necessary to first study the issue of semantic analysis and synthesis.

The linguistic analysis of the text in the information-search engine. In order to formulate, understand the query in artificial form, issues such as the analysis of the sentence in natural language, synthesis (SQL, SPARQL, search queries, etc.), the translation of the sentence from one natural language to another natural language (machine translation system), the functions of the semantic analysis of the text – Text Mining, the semantic classification of text resources are of practical importance. Observations indicate that the linguistic analysis of the text includes:

1) morphological analysis: determination of morphological features; defining the morphological polysemanticism;

2) definition of lexical forms of words;

3) syntactic analysis;

4) segmentation of sentences;

5) establish connections between words;

6) semantic analysis;

7) determine the meaning of words and phrases;

8) discursive analysis;

9) establish relationships between expressions.

The basis of the analysis system is the representation of the analyzed text model in the form of a semantic network. This eliminates any influence, specific features of a particular natural language. But in order to reach the level of text semantics, it is necessary to analyze it at the previous levels - morphologically, syntactically. Therefore, textual information is processed step by step in the analysis module:

1) morphological and syntactic analysis;

2) semantic analysis.

It turns out that initially morphological and syntactic analysis, then semantic analysis is carried out. Because without morphological and syntactic analysis, it is impossible to make a semantic analysis of the text. After all, semantic analysis deals with meaning, content, a specific idea.

Methods and materials. The implemented method of analysis of textual information was first proposed by L.V. Sherba, Z.M. Tsvetkova, V.I. Notkina and developed by V.V. Milashevich, E.P. Gredina [20].

I.V. Smirnov shows the following as semantic models:

1) lexical semantics - interpretation of words;

2) distributive semantics - the meaning expressed by the combination of words with other words;

3) “meaning-text” model;

4) semantics of expressions;

5) model of semantic frames [16].

The models of semantics shown are important for the functioning of the semantic analyzer. Because the semantic analyzer is a tool that works with the word meaning.

G.S. Osipov groups semantic roles as follows:

1) subject - component of prediction (research showed perspective);

2) object - affected (research direction selected);

3) directives - direction of movement (to go to Germany);

4) starting point of ablative movement (to leave the room);

5) locative - a component with a location value (troops are concentrated in the territory of Baghdad);

6) causative - cause (hypertension leads to arterial injury);

7) result - consequence (hypertension led to damage to the arteries) [14].

In our opinion, the Uzbek language semantic analyzer also works directly taking into account the above situations, carries out semantic analysis. Because these properties are combined and serve to clearly indicate the semantic sign.

L.Yu. Shipitsina shows the steps of automatic text analysis as follows:

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1) graphemic analysis: delimitation of words, sentences, paragraphs and other text elements (for example, excerpts from a newspaper);

2) morphological analysis: determination of the initial form of each of the words used in the text and the morphological features of this set of words;

3) syntactic analysis: determining the grammatical structure of sentences in the text;

4) semantic analysis: determining the meaning of phrases [21].

All types of text linguistic analysis are important in the information search system. Each analysis has its own function and purpose. In an information search system, the activity of each process is important for a perfect linguistic analysis of the text. While qualitative semantic analysis is required, morphological and syntactic analysis in ISS is also required to be perfect. Because language levels are so closely intertwined, one cannot fully express their potential without the other.

The problem of semantic analysis and synthesis in automatic analysis. Before talking about semantic analysis, it is necessary to dwell on the word semantics. Semantics determines the meaning of a word, its proper use in its place. The term semantics (Greek semantikos - denoting, expressing) in the narrow sense is the whole content, meaning, information, expressed through language or any of its units (word, grammatical form of the word, phraseology, phrase, sentence). Department of linguistics, which studies the meaningful side of different language units in a broad sense; semasiology. Some lexical items denote concepts, and these concepts can only be expressed by complete sentences and their combinations. Consequently, the object of study of semantics is also essentially a complete, independent system of meanings of words and sentences. The semantics as a science began to develop in the second half of the nineteenth century and has gone through several stages that still differ qualitatively from each other.

The semantic model includes the word, its definition, combination with other words, phrase and sentence structure.

The semantic analysis is a complex mathematical problem, the solution of which is applied in the process of creating artificial intelligence and is complicated by the need to process natural language. The difficulty is that the computer does not know how to correctly interpret the images that a person transmits using symbols. Qualitative semantic analysis data can be used in sales, demand analysis of goods, and automatic translation systems.

Currently in the international market there are many software tools that analyze the text from the point of view of semantics. Among the local programs, it is worth noting the" AOT "and "Semantic Analyzer". They are groups that allow you to build a syntactic-semantic network of text. Foreign IBM Text Miner is a powerful tool for text analysis that allows you to search for keywords and create text annotations.

Russia's Yandex news system allows you to automatically group data into information items and create articles based on a cluster of documents. The Info Stream service provides access to operational information, taking into account the semantic closeness of documents. In addition, there is a Summly aggregator purchased by Yahoo! in March 2013, but this program is not used at all for processing texts in Russian [11]. However, existing software systems do not completely solve the problem of semantic analysis. This is due to the complexity and uncertainty of solving the problem of semantic analysis of different texts.

A series of semantic analyzes that work online [25; 26; 27; 28; 29], it is possible to perform a direct semantic analysis of the unit through these programs. Existing semantic analyzes differ from each other in terms of search engine, structure, object, and material.

It seems that semantic text analysis has become a much more relevant topic in recent years. The development of information resources on the Internet has repeatedly exacerbated the problem of news loading. At the beginning of the 21st century, the number of pages on the Internet exceeded 4 billion; exceeding 7 million every day. Unstructured data constitutes the most information, so many organizations and individuals [22] are interested in effective technologies for automated semantic analysis of textual information presented on a website presented in natural language.

The automatic text analysis consists of a series of complex operations. As a result of automatic analysis of the text, its data becomes a lexeme-morphological, syntactic and semantic representation that the computer understands. Automatic text analysis and synthesis is important. Because the development of both theoretical and practical aspects of computational linguistics lays the foundation for the creation of effective machine translation systems aimed at realizing human needs.

The semantic analysis is the most complex area of automatic text analysis. In this case it is necessary to establish semantic connections between words to combine different linguistic expressions in the text.

At the heart of semantic analysis lies the assertion that the meaning of a word is not an elementary semantic unit. It is divided into more elementary meanings - units of semantic language vocabulary. These units of semantic language are specific atoms from various combinations that form “molecules” from the real words of natural language [2].

Results. The particular semantic analysis solves the problem of homonymy that arises in the automatic analysis of all language levels:

1. Lexical homonymy: the correctness of a sound and or spelling in words that do not have elements of common meaning.

2. Morphological homonymy: homonymy of affixes.

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3. Lexical-morphological homonymy (the most common type of homonymy): the coincidence of two different lexeme word forms.

4. Syntactic homonymy: a syntactic structure with multiple meanings [4].

The semantic analysis module consists of the following two classes: Dictionary Op and Semantic Analysis. Dictionary Op is a static class that is responsible for interacting with the dictionary of semantic analysis. Semantic-Analysis performs the analysis of the received sentence, then returns the semantic network.

Semantic synthesis is the transition of a phrase to its semantic syntactic structure; transition from syntactic structure to a chain of lexical and grammatical features of word forms expressing a phrase; transition from lexical-morphological description to real word form [21].

The National Corpus of the Russian Language [31] now has a inquiry system based on lexical and semantic features aimed at partially semantic identification of corpus texts. The text marking is done automatically using Semmark up (author A.E. Polyakov) according to the semantic dictionary of the corpus. Because manual processing of semantically labeled texts takes so much time, semantic homonymy is not removed in the corpus: polysemous words are given several alternative sets of semantic properties.

The semantic symbols are based on the Russian word classification system adopted in the lexicographical database developed since 1992 in the Department of Linguistic Research of VINITI RAN under the direction of E.V. Paducheva, E.V. Rakhilina. The vocabulary for corpus needs has been considerably expanded, the content of semantic classes enriched; improved, word formation features added.

The semantic dictionary is based on the morphological dictionary of the DIALING dial system (total volume is about 120 thousand words), which is an extension of the Russian grammatical dictionary by A.A. Zaliznyak. The current version of the semantic dictionary includes important parts of speech, including noun, adjective, number, noun, verb, and adverb. As noted, a semantic classification has been made in the “Lexicograph” [32]. This project was first born in 1990 with the idea of S.A. Krylov to create a bibliographic database on lexical semantics. This idea intrigued a group of linguists and gradually turned into the idea of creating a database on lexical semantics that could be a working tool for the lexicographer.

The project "Lexicographer" was first developed by I.G. Kustova, V.E. Paducheva, V.E. Rakhilina, R.I. Rozina, S.Yu. Semyonova, M.V. Filipenko, N.M. Yakubova and T.E. Yanko. Initially, the words are divided into thematic groups - body part, car, organization, etc. (for names) or action, emotion, creation, possession, & etc. (for verbs). But later the authors of the idea became interested in the semantic classes of the word.

The difference between a database and traditional dictionaries is that the meaning of different words must be the same. The classical method of semantic description of word combinations is mainly tested in verbs, so special attention is paid to verbs. The system of "Lexicograph" was understood as a tool of theoretical semantics and was considered as a certain stage in the formation of meaning.

To describe the semantics of the verb on the site, you can find information about the principles adopted in it and find publications of project participants based on working with a "Lexicograph".

In the automatic processing of natural language, attention must first be paid to the perfection of semantic analysis.

The creation of new methods of semantic analysis of texts is relevant in solving problems of computer linguistics, such as machine translation, text classification. However, the development of new tools for automating semantic analysis is also important [3].

Although some scientific and technical ideas in the field of text processing are well developed, many problems of semantic analysis remain unresolved.

Semantics is closely related to philosophy, psychology, and other sciences in addition to knowledge of the structure of language. Semantic analysis should also take into account the social and cultural characteristics of the mother tongue. The process of human thinking, the means of expressing ideas, is a difficult process to formalize language. Therefore, semantic analysis is rightly the most important complex stage of automatic text processing.

To date, most researchers have worked on the meaning of the text. Of these, I.A. Melchuk [13] introduced the concept of lexical function, developed the concepts of syntactic and semantic valences, and considered them in the context of the explanatory-combinational dictionary, which is a model of language. He showed that the meanings of words are not directly related to the reality around them, but are consistent with the speaker’s thoughts on this fact. V.S. Rubashkin and D.G. Lakhuti [12] emphasized the importance of a more syntactic relationship hierarchy for the effective operation of the semantic analyzer. The linguist E.V. Paducheva [15] suggests considering thematic classes of words. She advances the analysis of verbs that carries the basic semantic load.

The logical models of thought expression are very important. For example, the semantic language proposed by V.A. Tuzov [18] contains formulas of predicative logic. In the future, the direction of creating such semantic languages will play an important role in the development of scientific thinking.

The semantic inquiry in ISS and its problems. The semantic search is performed through semantic analysis. The more perfectly the semantic analysis is developed, the more effective the inquiry will be. The implementation of semantic analysis depends

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directly on the linguistic resources. Lexical resources include dictionaries, thesauruses, and ontologies. Dictionary is the most traditional form of lexical information: they differ in units (usually a word or phrase), structure, and vocabulary (dictionary of terms of specific fields, dictionary of general lexicon, dictionary of synonyms and paronyms, etc.) [4].

More complex types of lexical resources are thesaurus and ontologies. Thesaurus is a semantic dictionary, i.e. a dictionary in which the semantic relationships of words - synonyms, associations are presented. An example is the information-inquiry thesaurus RuTez, which covers the socio-political lexicon for the Russian language [9]. The concept of ontology is closely related to the concept of thesaurus [17]. Ontology is a set of concepts, objects of a specific field of knowledge, aimed at multiple uses for different tasks. Ontologies can be created based on existing word combinations in a language. In this case they are called linguistic ontologies. A similar linguistic ontology is the WordNet [30] system, which is a large lexical source containing english words. It contains nouns, adjectives, verbs, adverbs, and their several types of semantic connections.

The semantic component can be implemented on the basis of ontology. It is necessary to define concepts appropriate to text resources to implement this approach; to determine the formal structure of the content of text resources for each class.

Semantic analysis can also be done on the basis of a formal semantic approach. In this case, the value of the sentence is expressed using a mathematical formula. The semantic component is based on the results of semantic and syntactic analysis of the text and has a character describing the syntactic structure of each sentence [8].

Discussions. M. Abjalova's article "The systems of auto-linguistic processing of texts" [1] spoke about the systems of automatic editing and analysis of texts. The author discusses spell checking system (spell-checker visual spell checker) spell checker), orthographic check (Speller), lemmatization, stemming, “Tokenization”, parser (parse-analysis). She does not dwell on semantic analysis.

The semantic inquiry is a method and technology of inquirying for the meaning of a word or text. To improve inquiry results, the user’s inquiry goal must be clearly stated. Special technologies are used to perform semantic inquiry in the network. The semantic inquiry takes into account the context of the information, the location and purpose of the user inquiry, synonyms, generalized and specialized query, query language, and other features that allow to obtain the relevant result [10].

The semantic inquiry technology is considered as an adjunct or alternative to traditional types of information inquiry. A number of major inquiry engines, such as Google and Bing, use some elements of semantic inquiry.

The purpose of semantic inquiry is to identify the user's goal and provide him or her with the most relevant results. The semantic inquiry originated from a semantic network (website) built on ontologies. With the popularity of semantic networks, the amount of data for inquiry engines has also increased. Almost anything related to queries or sites can be considered as part of the semantic field relevant to inquiry results. The semantic inquiry depends on both the semantic definition of the websites and the amount of semantic information it requires. In 2013, the first major breakthrough in semantic inquiry technology was the "Hummingbird" algorithm [24]. Using this algorithm, "speech search" was used.

The following are shown as semantic inquiry features in sources [24]:

1. Processing of morphological differences.
2. Work with the meanings of synonyms.
3. Processing of generalizations.
4. Development of a conceptual package.
5. Processing the knowledge base.
6. Processing queries and questions given in plain language.
7. Ability to identify the most relevant sentence.
8. Ability to work without relying on statistical data, user behavior, or other artificial means.
9. Ability to determine the results of its activities.

The inquiry engines face many problems when performing SS (semantic inquiry). In particular, to determine exactly what the user meant when entering a search query, i.e., whether a word or phrase has multiple meanings in different contexts. The semantic inquiry cannot help solve problems that cannot be solved by computer. The semantic inquiry takes into account not only the context but also the analysis of other factors. The smart inquiry engines take into account a number of aspects in order to receive the desired search queries, including:

1. Current situation. If the presidential election is over and someone is looking for "Who's the new president?", the semantic inquiry should understand the query and provide relevant information based on the news.

2. User location. If a user wants to get information about the weather and searches for "How is the weather now?", the semantic inquiry should provide results based on their location during the query.

3. Variation of words in semantic inquiry. The semantic inquiry must take into account the linguistic features of the query (case, number, time).

4. Synonyms. A semantic inquiry system must also ensure that synonyms are understood and that the words being searched are conveyed through their meaning. For example, for "highest peak" or "highest summit" queries, the answer should be the same.

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5. General and specialized inquiries. The semantic inquiry engines need to determine the relationship between general and specific queries and provide relevant results. In particular, the network includes information on general health issues and "diabetes". If someone is requesting information about a health condition, the semantic inquiry should include references to both sources.

6. “Simple language” for queries. Some users do not know how to query to get the desired response. For example, they ask for "Time in Tashkent", to which most inquiry engines refer to the sites "Time" and "Tashkent". The smart inquiry engines immediately provide information about the current time in Tashkent.

While Google uses some elements of semantic inquiry, it is not a pure semantic inquiry engine. However, there are a number of advantages to semantic inquiry on Google. The optimized semantic inquiry engine returns a result based on various factors rather than the meaning of the query words.

The semantic inquiry result is related to:

1. With millions of other people sending the same queries.
2. With time, seasonal and weather trends related to this query.
3. Habitat with specific inquiry trends.

Each byte of data is processed in such a way as to provide relevant results for inquiry engine indexes and the simplest query. Based on the aggregated data of millions of users, the inquiry engine algorithm is able to understand what they want. The inquiry engines collect a large amount of information from each query. Google and other inquiry engines use information about the time spent searching to provide the best inquiry results on a site. We can get some of this information through Google search and Google Analytics.

Conclusion. In conclusion, the automatic semantic analysis and inquiry are considered to be one of the most demanding and complex tasks of computer linguistics. As seen, semantic analysis and synthesis play an important role in the automatic analysis of text. Improving the linguistic analysis of the text in the information retrieval system, the process of semantic analysis and synthesis in automatic analysis, semantic inquiry in ISS and solving its problems will help to define the role of semantic analyzer, create SemA (semantic analyzer) in the future. For SemA to work, the process of semantic analysis and synthesis in ISS must first be systematized. The creation of the linguistic support of the Uzbek language SemA, the definition of the semantic analyzer and its place in the information retrieval system directly depends on the importance of semantic analysis and synthesis in the automatic analysis of the text. The linguistic support, on the other hand, consists of a set of language tools used at different stages of the creation and use of a data processing system (DPS) to increase the efficiency of developing and maintaining human-computer communication.

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