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Matrix-and-frame Methods as a Means of Structural and Semantic Systematization of Terminological Vocabulary

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1. INTRODUCTION

As is known, in the beginning of the 80s-90s, the use of patterns or frames prepared in advance was one of the popular means of simulating the process of building a text and making language units actual in AI and NLP systems. This means was prompted by the machine metaphor of man's intellect proposed in the period of the First cognitive revolution. The Second cognitive revolution of the 80s-90s has cast doubt on strong frame character of human thinking (Piotrovski 1975: 30-57; Oaksford, Chater 1991: 3 ff.; Harre 1993: 25-35; Hubey 2000, section 20). In response to those doubts, some developers of AI and NLP systems try to turn down the use of frame methods. This clearly demonstrates that for the present many of modern specialists in the field of computer linguistics and AI do not understand the essence of those barriers which separate human speech-thinking activity from the computer's "language" (Zaitseva, Kosarev, Romanov 2001:29-32; Zaitseva, Piotrovski 2001: 1036-1039; Zaitseva 2002a: 141-148). Efficiency of frame technology is supported by a long-standing experience of building industrial and experimental systems of machine translation (MT) and automatic annotating in the International Speech Statistics Group and commercial teams separating from that group in the 90s (Zaitseva 2002b: 134-146). Thus, by means of frames, standardized documents in the form of message "vessel – shore" are efficiently processed (Vertlib et al. 1983), patents are annotated and translated (Piotrovski, Beliaeva, Popeskul, Shingareva 1983: 216-219), standard articles of commercial contracts are processed well enough, telegrams are translated also (Zaitseva 2002b: 134-146), topic recognition of scientific and technical documents is carried out (Kolesnikova 1974).

Frames are built according to a traditional scheme, in which filled topical lines (lines of subject) are accompanied by blank spaces ("holes"), i.e. slots. Linguistic automaton (LA) (LINGTON) must insert rematic comments found in a text in these places. The task of the algorithmizer is to transfer indicators, revealing, with a fair degree of probability, those rematic fragments of a text, which comment topical lines corresponding to them, and transferring to the LA data base. The algorithm, calculating adequately probabilities communicative-and-semantic relations between topics given in advance in a frame and text fragments or their translations transferred to slots, permits LA not only to transmit the text meaning but gives the user some psycholinguistic comfort in the process of perceiving the machine annotation, translation, etc.

Let us consider a new approach to simulate text structure, which is the combination of a thesaurus description of vocabulary of a sublanguage and a set of text frames oriented to this sublanguage.

2. TECHNOLOGY OF FRAME BUILDING

First of all, text frames of a certain sublanguage are pattern micro-situations making it possible to organize normative translation of multi-component terminological word combinations and word forms. Realization of semantic and pragmatic rubrics of fragments of a special text by means of word combinations and word forms is a flexible means for machine translation.

In our case, the procedure of building frame matrices is as follows: rules of combining lexical units and forming terminological word combinations are taken away from a dictionary entry of each word form and transferred to standard patterns - frames which were implemented in advance. In other words, frame matrix forms in advance a normalized semantic-and-syntactic and morphological structure of an output text, and, as a result, its synthesis is greatly simplified. At the same time, the addressee thinks that a system tries to "understand" the meaning of the input text. The fact is that a scheme-skeleton to be built to describe an arbitrary single case and a set of proposed actions for standard units of a given class permits the information system to add new data to the data base.

Now let us consider the main aspects of the thesaurus-and-frame technology. First of all, a tree thesaurus, which is a mental model of a domain, is built. Terminological words and terminological word combinations are placed on thesaurus nodes, a code of a node is

attributed to each of them (see the description of thesaurus building based on revealing hierarchical and non-hierarchical relations between terminological meanings of the domain "Electronic Components" in the article: Zaitseva 2002). Then input frames - matrices (for example, for English word combinations) and output ones (for example, for Russian, French and other terminological word combinations) are created on the basis of the same domain. One and only one output matrix corresponds to each input matrix (not vice versa). On one hand, ratio of domain thesaurus nodes, i.e. regularity of the language system, is reflected in the sequence and codes of matrix slots; on other hand, rules of speech semantic-and-syntactical building of multi-components word combinations are implemented here. (Goncharenko, Shingareva 1984: 5-6; Beliaeva et al. 1985: 29-34; Metzig, Görz 1989: 300-301; Wettler 1989: 330-333; King 1989: 455-457; Lutz 1989: 467; Kuhlen 1989: 694; Yaschenko 1990: 24-31; Kostenko, Yaschenko 1992: 4-10).

Let us now try to formulate rules of speech semantic-and-syntactical building. They are deduced from prognoses of combinations of each lexical unit with the others, namely valences. Valence prognoses are determined by some thesaurus relations, hierarchical and non-hierarchical. Therefore, some speech rules are determined by the peculiarities of the organization of lexical units in the language system.

The basis to formulate the rules is founded on syntactical-and-morphological research carried out in the following directions:

1) definition of a position of dependent components with respect to the kernel as to their distributions in a big enough sample of texts;
2) determination of relators (paradigmatic and syntagmatic) and placement in a separate frame, special attention must be paid to prepositions;
3) determination of gender, number and case valence of the kernel and denoting lexical units.

Now let us consider the interaction of language-system regularities and system-speech rules in the organization of word combinations. Organization and functioning of English frame matrices and the corresponding Russian, French, Spanish, Italian and Rumanian ones, which organize terminological word combinations for of different types of thyristors in the terminological field "Electronic components", are

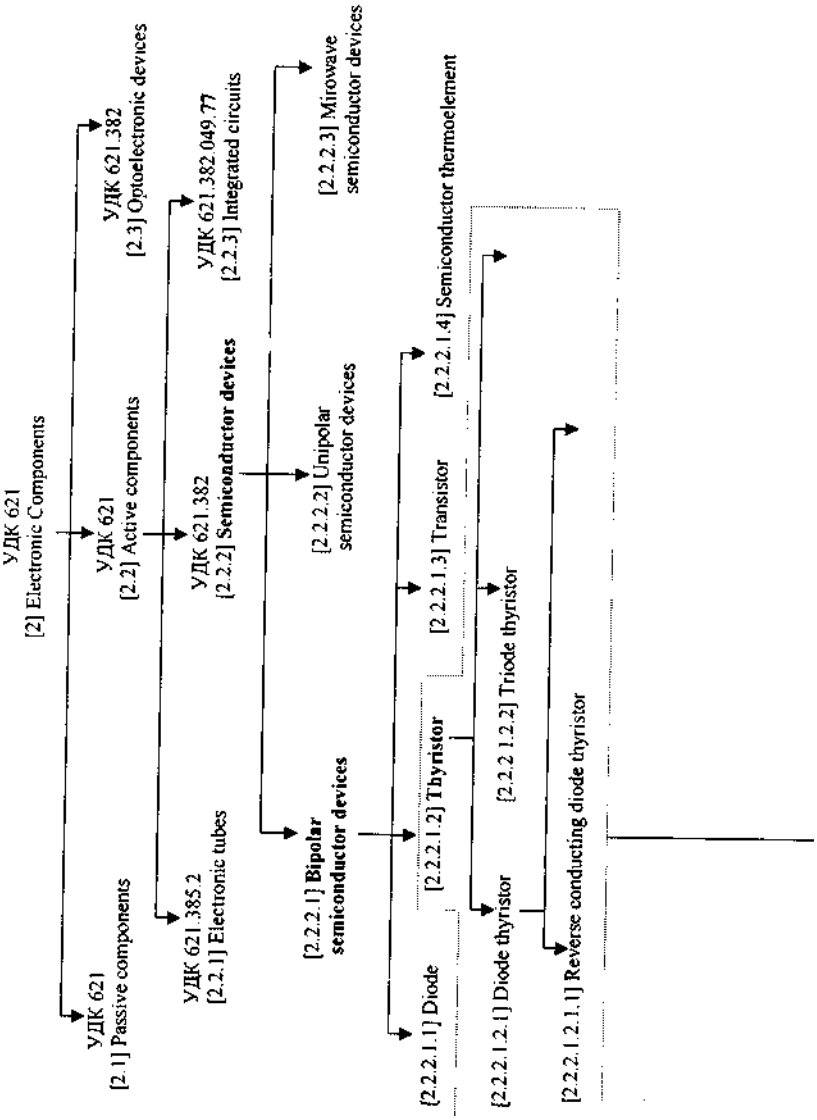
given in Fig. 1-5. Kernel noun (in our case, it is the name of the type of the semiconductor device), which is in the root or group of thesaurus tree, is placed in the central slot. It is accompanied by the corresponding thesaurus code. The other slots are filled with definitions, reflecting entities placed on the lower nodes of the branches going from the corresponding root, slots are filled in by one step. Each of the dependent components is accompanied with the code of the lower nodes of the thesaurus. In other words, vertical thesaurus multi-stepness of relations between terminological entities is transformed into their horizontal distribution in slots (Zaitseva 2002c: 33-46).

Each slot is oriented at a set of those lexical units which can be included in it according to thesaurus-paradigmatic and syntagmatic conditions of filling. Thus, language-system relations of a thesaurus and partially rules of speech semantic-and-syntactical building are reflected in the terminological word combinations. In other words, the synergetics of language and speech is implemented indirectly. Let us illustrate this procedure of filling slots with an example of English word combination *reverse conducting diode thyristor.*

First of all, the kernel of the word combination, i.e. *thyristor,* must be included in the central slot of the English matrix *"semiconductor device".* The corresponding equivalents of the English *thyristor* i.e. *мирисмор, thyristor, tiristor, tiristore, tiristor* are written in the central slots of the Russian, French, Spanish, Italian and Rumanian matrices.

Other components of English word combination are sequentially distributed in slots of dependent components, from the right to the left. In case of coincidence of the lexical-and-grammatical code of any terminological element with a code of some slot, the position of the terminological element is considered established, and the latter is placed in this empty slot of matrix.

Let us consider the position of the dependent components with respect to the kernel. This problem is solved by means of the distribution method, which, first of all, is based on hierarchical thesaurus relations. In our word combination, *reverse conducting diode thyristor* and its translated equivalents, pre- or post-position of dependent components, and also their combination are denoted by the position of these components in the thesaurus net (see Fig.6) and mainly by such hierarchical relation as "gender - species", " "source - derivative", "object - object property". Each of the denoting components only owns the slot intended for it.


УДК 621
[2] Electronic Components
УДК 621
[2.1] Passive components
УДК 621
[2.2] Active components
УДК 621.382
[2.3] Optoelectronic devices
УДК 621.385.2
[2.2.1] Electronic tubes
УДК 621.382
[2.2.2] Semiconductor devices
УДК 621.382.049.77
[2.2.3] Integrated circuits
[2.2.2.1] Bipolar semiconductor devices
[2.2.2.2] Unipolar semiconductor devices
[2.2.2.3] Mirowave semiconductor devices
[2.2.2.1.1] Diode
[2.2.2.1.2] Thyristor
[2.2.2.1.3] Transistor
[2.2.2.1.4] Semiconductor thermoelement
[2.2.2.1.2.1] Diode thyristor
[2.2.2.1.2.2] Triode thyristor
[2.2.2.1.2.1.1] Reverse conducting diode thyristor

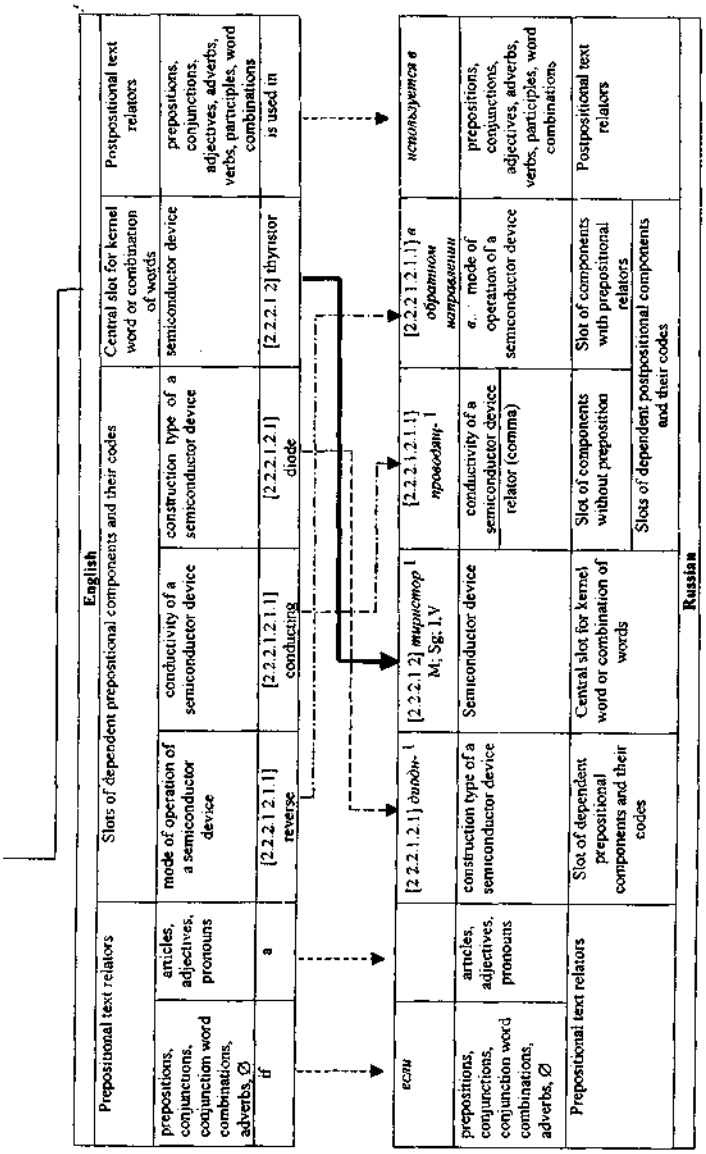


Fig 1 Fragments of terminological field "Electronic Components" with frame translation of a text in English to Russian

[1] The correct morphological presentation is provided with morphological algorithm.

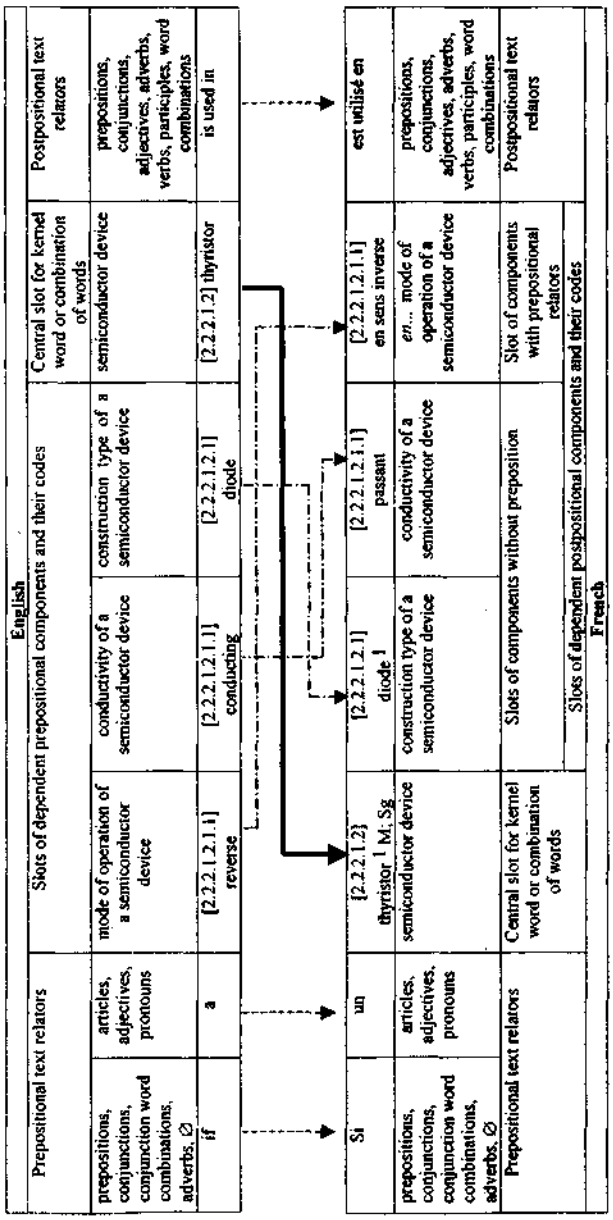


Fig.2. Fragments of terminological field "Electronic Components" with frame translation of a text in English to French.

[1] The correct morphological presentation is provided with morphological algorithm.

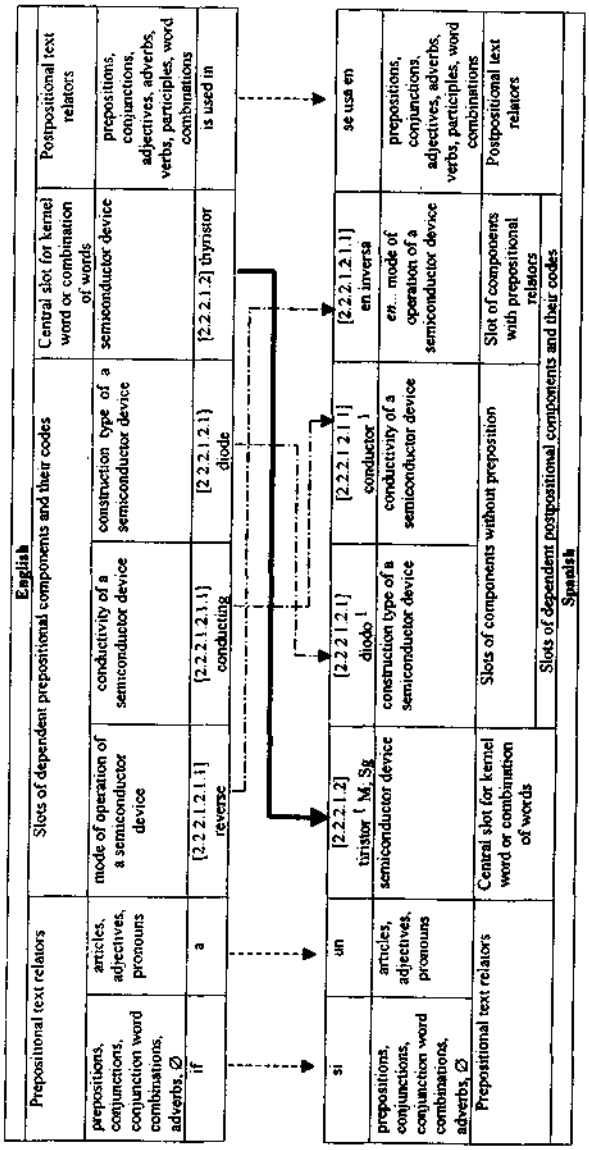
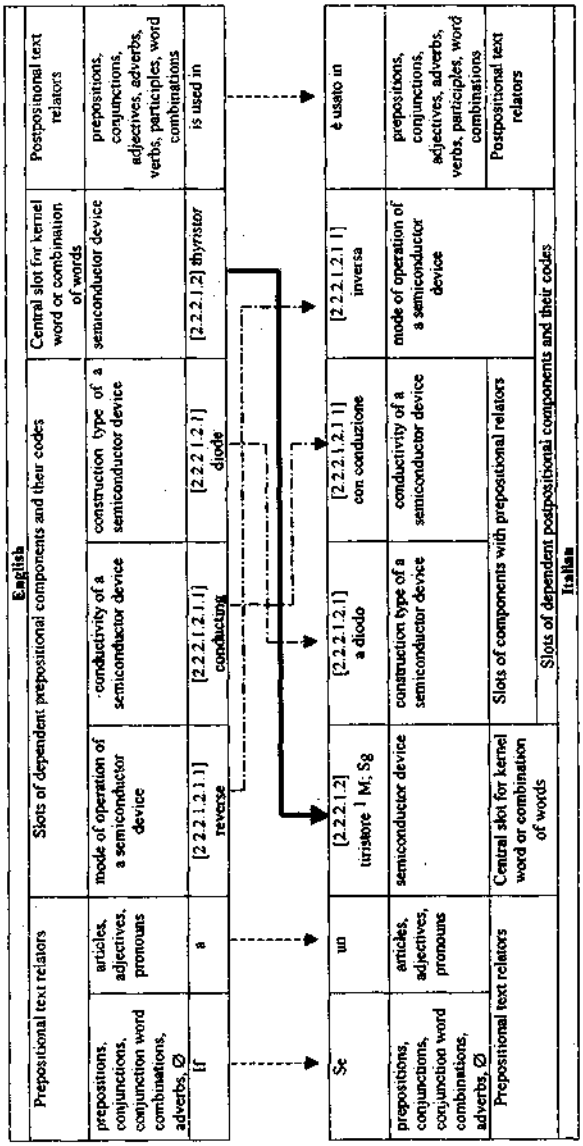


Fig. 3. Fragments of terminological field "Electronic Components" with frame translation of a text in English to Spanish.

[1] The correct morphological presentation is provided with morphological algorithm.


English
Prepositional text relators
Slots of dependent prepositional components and their codes
Central slot for kernel word or combination of words
Postpositional text relators
prepositions, conjunctions, conjunction word combinations, adverbs, Ø
articles, adjectives, pronouns
mode of operation of a semiconductor device
conductivity of a semiconductor device
construction type of a semiconductor device
semiconductor device
prepositions, conjunctions, adjectives, adverbs, verbs, participles, word combinations
If
a
[2.2.2.1.2.1.1] reverse
[2.2.2.1.2.1.1] conducting
[2.2.2.1.2.1] diode
[2.2.2.1.2] thyristor
is used in
Se
un
[2.2.2.1.2] tiristore [1] M; Sg
[2.2.2.1.2.1] a diodo
[2.2.2.1.2.1.1] con conduzione
[2.2.2.1.2.1.1] inversa
è usato in
prepositions, conjunctions, conjunction word combinations, adverbs, Ø
articles, adjectives, pronouns
semiconductor device
construction type of a semiconductor device
conductivity of a semiconductor device
mode of operation of a semiconductor device
prepositions, conjunctions, adjectives, adverbs, verbs, participles, word combinations
Prepositional text relators
Central slot for kernel word or combination of words
Slots of components with prepositional relators
Postpositional text relators
Slots of dependent postpositional components and their codes
Italian

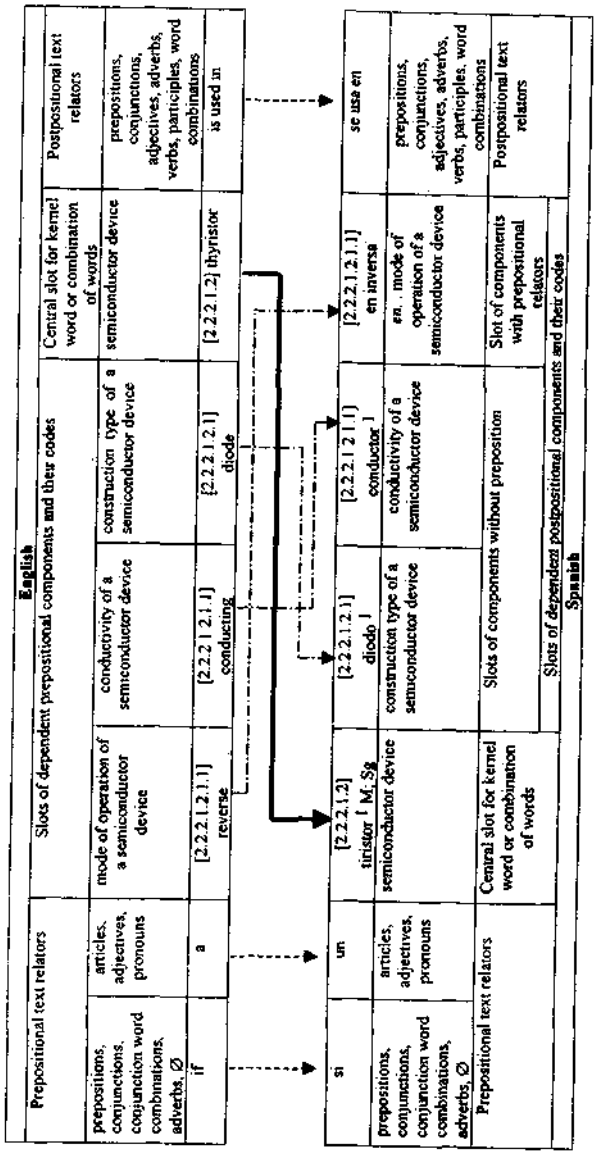
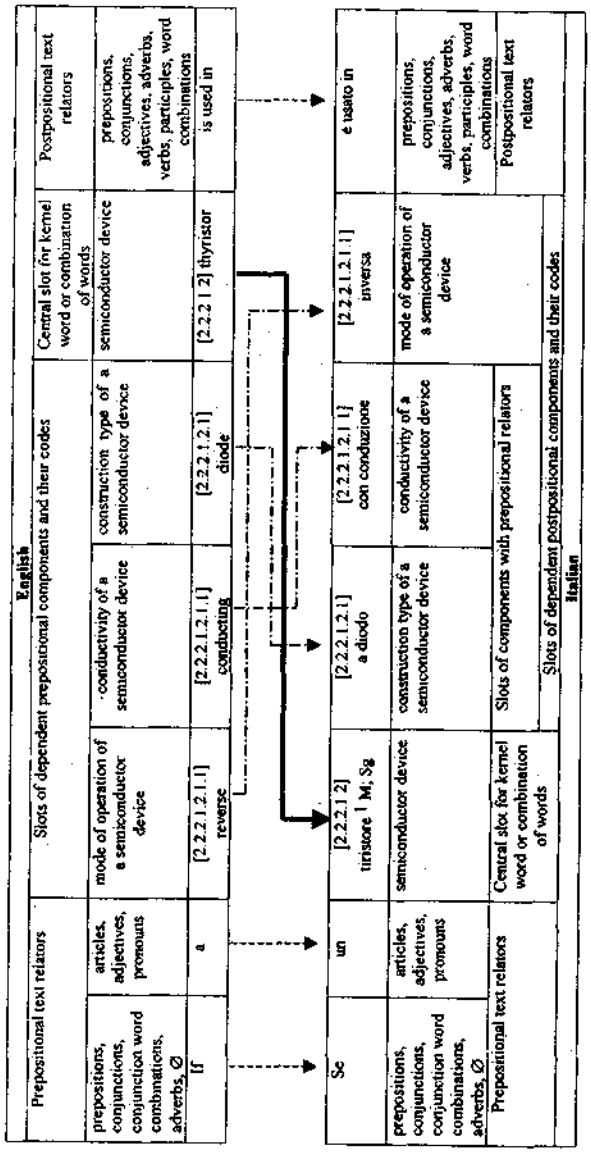


Fig.3. Fragments of terminological field "Electronic Components" with frame translation of a text in English to Spanish.

[1] The correct morphological presentation is provided with morphological algorithm.


English
Prepositional text relators
Slots of dependent prepositional components and their codes
Central slot for kernel word or combination of words
Postpositional text relators
prepositions, conjunctions, conjunction word combinations, adverbs, Ø
articles, adjectives, pronouns
mode of operation of a semiconductor device
conductivity of a semiconductor device
construction type of a semiconductor device
semiconductor device
prepositions, conjunctions, adjectives, adverbs, verbs, participles, word combinations
If
a
[2.2.2.1.2.1.1] reverse
[2.2.2.1.2.1.1] conducting
[2.2.2.1.2.1] diode
[2.2.2.1.2] thyristor
is used in
Se
un
[2.2.2.1.2] tiristore
M; Sg
[2.2.2.1.2.1] a diodo
[2.2.2.1.2.1.1] con conduzione
[2.2.2.1.2.1.1] inversa
è usato in
Prepositional text relators
Slots of components with prepositional relators
Postpositional text relators
Italian

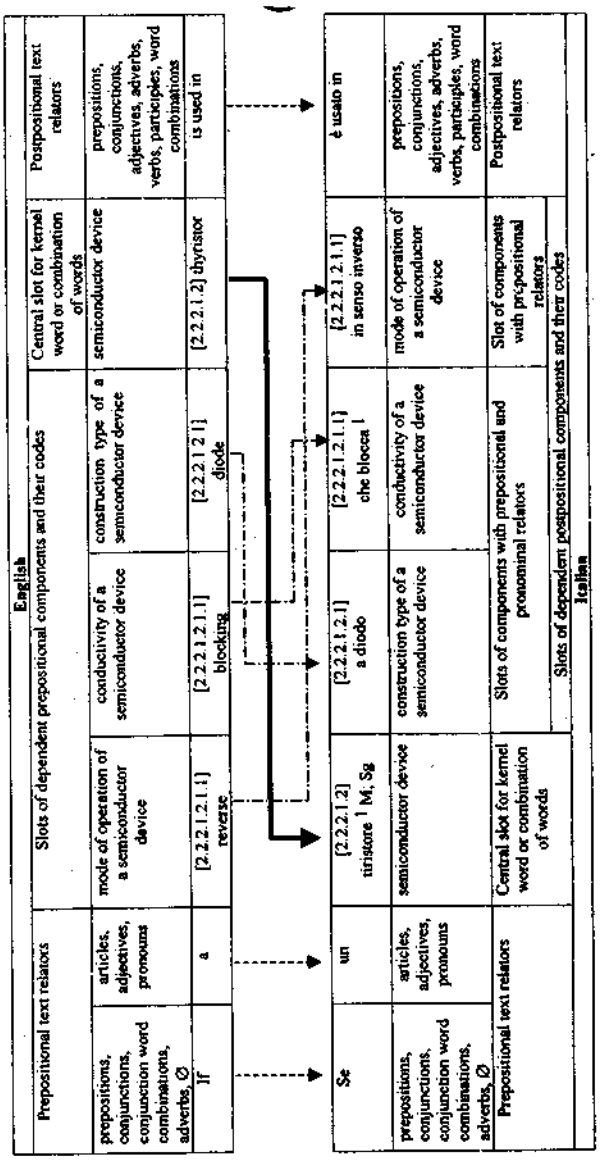
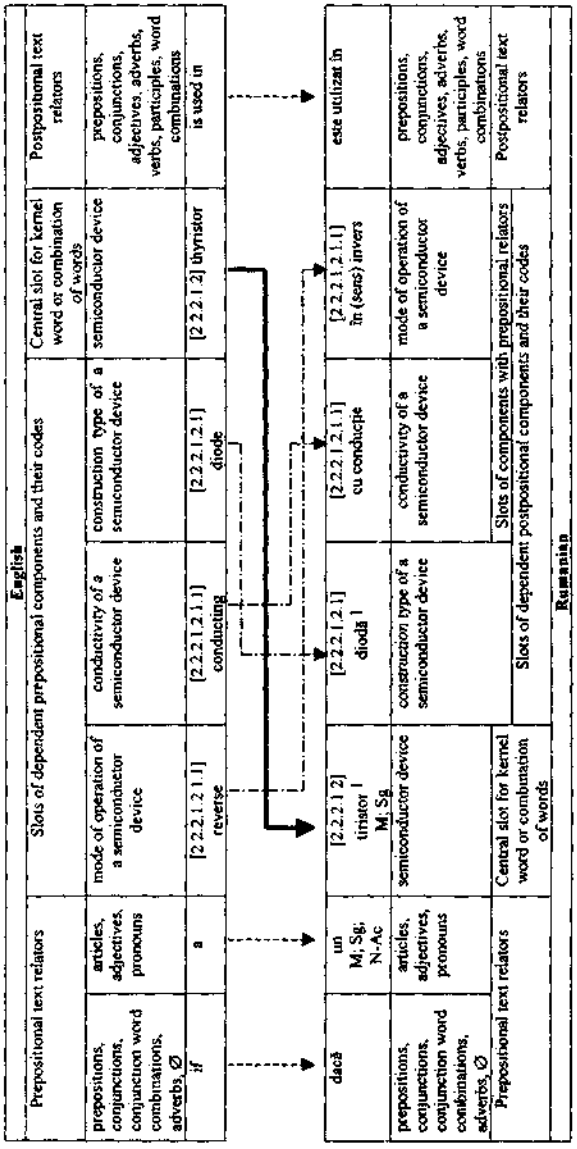
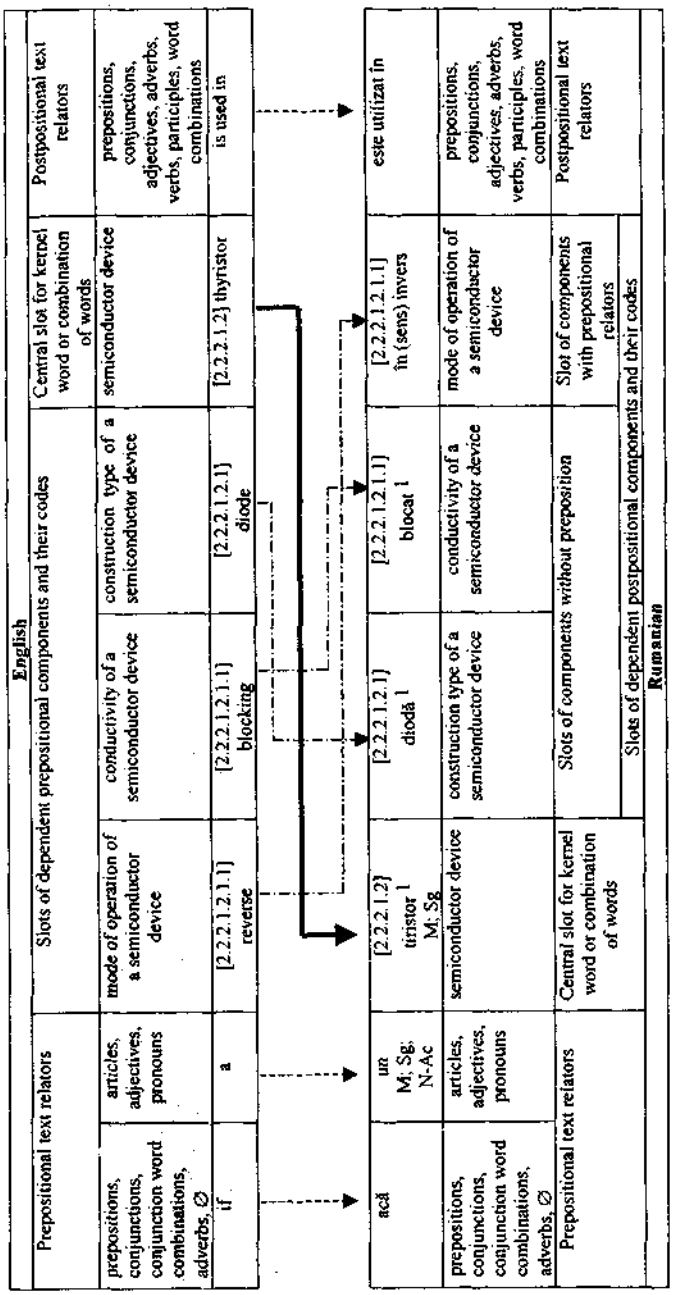


Fig. 4. Fragments of terminological field "Electronic Components" with frame translation of a text in English to Italian.

[1] The correct morphological presentation is provided with morphological algorithm.

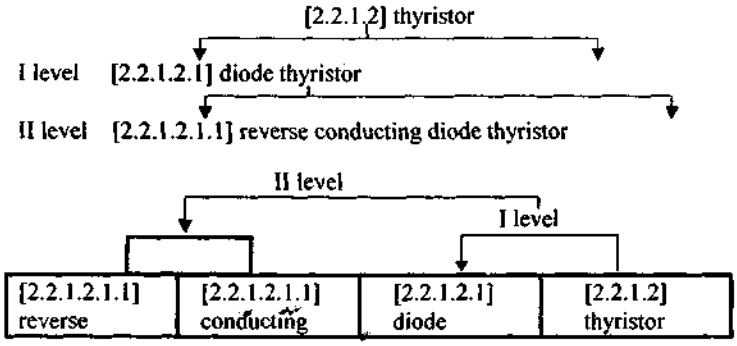

English
Prepositional text relators
Slots of dependent prepositional components and their codes
Central slot for kernel word or combination of words
Postpositional text relators
propositions, conjunctions, conjunction word combinations, adverbs, Ø
articles, adjectives, pronouns
mode of operation of a semiconductor device
conductivity of a semiconductor device
construction type of a semiconductor device
semiconductor device
propositions, conjunctions, adjectives, adverbs, verbs, participles, word combinations
if
a
[2.2.2.1.2.1.1] reverse
[2.2.2.1.2.1.1] conducting
[2.2.2.1.2.1] diode
[2.2.2.1.2] thyristor
is used in
Romanian
dacă
un M; Sg; N-Ac
[2.2.2.1.2] tiristor I M; Sg
[2.2.2.1.2.1] diodă I
[2.2.2.1.2.1.1] cu conducție
[2.2.2.1.2.1.1] în (sens) invers
este utilizat în
Prepositional text relators
Central slot for kernel word or combination of words
Slots of dependent postpositional components and their codes
Slots of components with prepositional relators
mode of operation of a semiconductor device
Postpositional text relators



English							
Prepositional text relators		Slots of dependent prepositional components and their codes				Central slot for kernel word or combination of words	Postpositional text relators
prepositions, conjunctions, conjunction word combinations, adverbs, ∅	articles, adjectives, pronouns	mode of operation of a semiconductor device	conductivity of a semiconductor device	construction type of a semiconductor device		semiconductor device	prepositions, conjunctions, adjectives, adverbs, verbs, participles, word combinations
if	a	[2.2.2.1.2.1.1] reverse	[2.2.2.1.2.1.1] blocking	[2.2.2.1.2.1] diode		[2.2.2.1.2] thyristor	is used in
acă	un M; Sg; N-Ac	[2.2.2.1.2] tiristor [1] M; Sg	[2.2.2.1.2.1] diodă [1]	[2.2.2.1.2.1.1] blocat [1]		[2.2.2.1.2.1.1] în (sens) invers	este utilizat în
prepositions, conjunctions, conjunction word combinations, adverbs, ∅	articles, adjectives, pronouns	semiconductor device	construction type of a semiconductor device	conductivity of a semiconductor device		mode of operation of a semiconductor device	prepositions, conjunctions, adjectives, adverbs, verbs, participles, word combinations
Prepositional text relators		Central slot for kernel word or combination of words	Slots of components without preposition			Slot of components with prepositional relators	Postpositional text relators
			Slots of dependent postpositional components and their codes				
Rumanian							

Fig.5. Fragments of terminological field "Electronic Components" with frame translation of a text in English to Rumanian.

[1] The correct morphological presentation is provided with morphological algorithm.



6. Dependence of frame valencies on hierarchical thesaurus relations

Again pay attention to the fact that superposition of relations in thesaurus takes place quite often. Cf.

1) "*gender - species*"

Eng. thyristor → diode thyristor → reverse conducting diode thyristor

Fr. thyristor → thyristor diode → thyristor diode passant en sens inverse

Sp. tiristor → tiristor diodo → tiristor diodo conductor en inversa

It. tiristore → tiristore a diodo → tiristore a diodo con conduzione inversa

Rum. tiristor → tiristor diodă → tiristor diodă cu conducţie în (sens) invers

Rus. тиристор → диодный тиристор → диодный тиристор, проводящий в обратном направлении

2) "*source –derivative*"

Eng. thyristor ↔ reverse conducting diode thyristor

Fr. thyristor ↔ thyristor diode passant en sens inverse

Sp. tiristor ↔ tiristor diodo conductor en inversa

It. tiristore ↔ tiristore a diodo con conduzione inversa

Rum. tiristor ↔ tiristor diodă cu conducţie în (sens) invers

Rus. тиристор ↔ диодный тиристор, проводящий в обратном направлении

In the second word combination of each pair, there is a concept (reverse conducting diode; diode passant en sens inverse; diodo conductor en inversa; a diodo con conduzione inversa; dioda cu conductie in (sens) invers; *диодный, проводящий в обратном направлении),making it* derivative from the kernel word form, where this concept is unavailable.

3)*"object -property of an object"* (see Table 1).

Table 1: Relation "object - property of an object"

Language	Object	Property of an object	Complex term
Eng.	Thyristor	diode	diode thyristor
Fr.	Thyristor	diode	thyristor diode
Sp.	Tiristor	diodo	tiristor diodo
It.	Tiristore	a diodo	tiristore a diodo
Rum.	Tiristor	diodă	tiristor diodă
Rus.	тиристор	диодный	диодный тиристор

When analyzing a number of similar word combinations, the use of the distribution method makes it possible to fix the position of the dependent components. Thus, the analysis of the English word combinations *diode thyristor, triode thyristor, reverse blocking diode thyristor, reverse conducting diode thyristor, reverse blocking triode thyristor, reverse conducting triode thyristor* et al. lets us conclude that the lexical elements *diode* or *triode* move aside the elements *reverse blocking, reverse conducting* from the kernel. Therefore, the syntactic place of the elements *diode* or *triode* is the first one from kernel.

Syntactical analysis of Russian and Rumanian word combinations is performed out in a similar manner.

As is known, when forming word combinations, their word forms are organized in a certain syntactical sequence which is dictated by the lexical-and-semantic and grammatical valence rules inherent in this language.

The matrix frame must be organized according to these rules. Thus, the analysis of the example *reverse conducting diode thyristor* demonstrates that in the English word combination, the kernel component occupies the extreme right position, while the attribute words are placed in the pre-position (see Figs. 1 and 6). In other words, word combinations are sequentially organized according to the scheme "denoting + denoted",

based, first of all, on the gender-species relation. Therefore, it is possible to conclude that the kernel component to be denoted has a left valence.

French, Spanish, Italian and Rumanian word combinations are built in reverse order: the kernel occupies the extreme left position, and the attribute words are placed in the post-position .In other words, here we have the scheme "denoted + denoting". The kernel component has the right valence (see Fig. 2 - 5).

Due to its inflected character, the Russian language surrounds the kernel to be denoted by an adjective attribute in the pre-position and a substantive uncoordinated attribute in the post-position. Thus, the kernel component has two valences, (see Fig. 1). Cf. (denoted kernel - the subject - is picked out by bold font) *динамическое* ***сопротивление*** *в открыто состоянии, эффективная индукционная* ***площадь*** *входного контур управляющего тока, полевой* ***транзистор*** *с изолированны затвором, полевой* ***транзистор*** *с затвором на основе перехода отпирающее* ***напряжение*** *на управляющем электроде, остаточно* ***напряжение*** *при нулевом магнитном поле.*

However, the kernel in the English language can have two valences as in Russian or the extreme right valence as in Romanic languages and in Russian. Such a relation of the denoted component and the denoting one is implemented by means of prepositions *of, for, by* et al. Cf.. (the kernel component is highlighted bold):

Eng. - critical **rate** of rise of off-state voltage
Fr.- **vitesse** critique de croissance de la tension á 1'état bloqué
Sp. - **velocidad** critica de crecimiento de la tensión de estado bloqueado
It.- **velocità** critica di salita allo stato di blocco
Rum.- **viteză** critică de cre°tere a tensiunii în starea "blocat"
Rus. — *критическая* ***скорость*** *нарастания напряжения в закрытом остоянии*

Eng.- ionizing **energy** of donor
Fr. **- energie** d'ionisation d'un donneur
Sp. **- energia** de ionización de un donador
It. **- energia** di ionizzazione di un donatore
Rum. **- energie** de activare a unui (nivel) donor'
Rus. — ***энергия*** *ионизации донора*

Eng. **- frequency** of unity current transfer ratio
Fr. **- fréquence** du rapport de transfert unité de courant
Sp. **- frecuencia** de relación de transferencia unidad de corriente
It. **- frequenza** del rapporto di trasferimento dell'unità di corrente

Rum. -*frecvenÞã* a factorului în curent unitate
Rus. - ***частота*** *единичного коэффициента передачи по току*

It may be observed that among six compared languages the process of building frames is implemented easier in English language due to scantiness of its morphological means.

Romanic and Russian equivalents can be supplied with additional morphological and syntactic indications, namely with prepositions, gender endings, number, case. Among the six compared languages the latter indication is typical of the Rumanian and Russian languages. Note the fact that case valence of a noun means the ability of a word to govern other words. Governing may require prepositions or no prepositions at all. In connection with this, a question arises about the place of certain components in syntactically correct word combinations.

Binary frame combinations of the input and output languages (see Figs.l through 5) are used in MT systems for complex terminological word combinations and also as patterns for manual translation. The rules of frame organization of the above word combination *reverse conducting diode thyristor* and its translation into the Russian and Roman languages make it possible to use this matrix for translating similar four-component word combinations *reverse conducting triode thyristor, reverse blocking diode thyristor, reverse blocking triode thyristor.* However, it is necessary to do more precise definition for the two latter word combinations: in case of translating into Italian (Fig.4) and Rumanian (Fig.5): it is necessary to build a special matrix with the input word combination *reverse blocking diode thyristor.* The fact is that the target Italian and Rumanian equivalents differ slightly from the seemingly similar Italian and Rumanian word combinations - the equivalents of the English word combination *reverse conducting diode thyristor.* These distinctions consist in using or not using prepositional relators (in Italian and Rumanian) and pronominal ones (in Italian), replacing the noun form with a verb form (in Italian), an adjective with a word combination (preposition + noun + adjective) (in Italian), a noun with a preposition or participle (in Rumanian). Cf.

1) Eng. - reverse conducting diode thyristor
It. - tiristore a diodo *con conduzione inversa (preposition + noun + adjective)*
Rum.- tiristor diodă *cu conducÞie* în (sens) invers *(preposition + noun)*

Eng. - reverse conducting triode thyristor
It. - tiristore a triodo *con conduzione inversa*
Rum. - tiristor triodă *cu conducÞie* in (sens) invers

BUT:

2) Eng. - reverse blocking diode thyristor
It. - tiristore a diodo *che blocca in senso inverse (relativepronoun + verb + noun word combination with preposition)*
Rum. - tiristor diodă *blocat* în (sens) invers *(participle)*

Eng. - reverse blocking triode thyristor
It. - tiristore a triodo *che blocca in senso inverse*
Rum. - tiristor triodă *blocat* în (sens) invers

3. CONCLUSION

Methods of structural-and-semantic analysis of terminology, namely thesaurus and frame, described in this paper, are used to solve both pure linguistic tasks (for example, translation) and language engineering tasks, first of all automatic processing of scientific and technical texts. Their combination permits to decrease a barrier between the artificial computer language and the natural language

Matrix-and-frame approach per se is not new. However, the use of frames to actualize word combinations, i.e. the transitional stage from the language algorithm to the text algorithm, is a new step in the development of terminology.

Complementarity of thesaurus and frames built for different languages help us solve one of the tasks of comparative-and-typological term studies, namely a task of regularity of terminologies of different languages and translating the terms. Frames, reflecting specific national characters of the terminological systems, increase the probability of providing regular means of term production that is typical of terminology of certain domains and languages.

The proposed thesaurus-and-frame technology of translating word combinations can be checked for various sublanguages. Besides, not only Indo-European languages but languages of differing structures belonging to other families can be chosen as input and output languages in typical frames.

Main conventional signs and abbreviations

→ - relation "gender - species" in thesaurus
→ - relation "source - derivative" in thesaurus
→ - translation of central slot
→ - translation of dependent prepositional components
→ - translation of dependent postpositional components
→ -translation of text relators

M - masculine gender; Sg - singular number; I - nominative case; V - accusative case, N-Ac - nominative-accusative case (in Rumanian).
AI - artificial intelligence
NLP - Natural Language Processing
MT - machine translation
LA - linguistic automaton - LINGTON
NTI - Journal (In Russian)
CompLing - Computational Linguistics (Komputerlinguistik). An International Handbook on Computer Oriented Language Research and Applications. Berlin - New York: Walter de Gruyter, 1989.

REFERENCES

Beliaeva L.N., Matorina L.V., Piotrovski R.G., Yaschenko T.V. Semantic modules in the MP system. *NTI.* Issue 2. 1985. N 7. p. 29-34 (In Russian).

Goncharenko V.V., Shingareva E.A. 1984. *Frames to Identify Meaning of a Text.* Kishinev. Shtiintza, (In Russian)

Harré R. 1993. Emotion and Memory: The Second Cognitive Revolution. *Mind and Language.* Vol. 8, no. 1. p. 25-30.

Hubey M.H. Mathematical Foundation of Linguistics. München: *LINCOM Handbooks in Linguistics,* 2000. (Sections: 20, 24, 40)

King M. Simulation of Language Understanding: Semantic Models and Semantic Interpretation. *CompLing.* p. 440-459.

Kolesnikova V.V. 1974. Linguistuc problems of automatic recognition of meanining of English scientific and research texts. Dissertation abstract of candidat of philological sciences. L.: *LOIA,* (In Russian).

Kostenko Y. V., Yaschenko TV. Matrix methods as universal means of categorical-semantic systematization of terminological vocabulary. *NTI,* Issue 2. 1992.' 12. p. 4-10. (In Russian)

Kuhlen R. Information Retrieval: Verfahren des Abstracting (Information Retrieval: Methods of Abstracting). *CompLing.* p. 688-697.

Lutz H.D. Inferenzen in sprachverstehenden Systemen (Inferences in Language Understanding Systems). *CompLing.* S. 460-470.

Metzig D., Görz G. Rolle und Funktionen von Netzwerken in der Computersimulation von Sprache (The Use of Networks in Computer Simulation of Language). *CompLing.* S. 290-310.

Oaksford M. and Chater N. 1991. Against Logicist Cognitive Science. *Mind and Language..* Vol. 6, no. 1. p. 1 -38.

Piotrovski R.G. 1975. Text - machine - man. L.: Nauka, (In Russian)

Piotrovski R.G., Beliaeva L.N., Popeskul A.N., Shingareva E.A. 1983. Two-language annotating and abstracting. Itogi nauki i tekhinki. Issue *INFORMATIKA, M.: VINITI* Vol. 7. p. 165-245. (In Russian)

Vertlib A.I., Zhidovnikov A.F., Petrov A.N., Piotrovski R.G., Turkin B.N., Chaikovskaya I.I. 1983. Some problems of developing linguistic support of a system of speech identification for flying control specialists for Administration of flights. Strukturnaya i prikladnaya lingvistika. Mejvuz. sbornik. L., *Izdatelstvo Leningradskogo Unversiteta,* Issue 2. p. 146-154. (In Russian)

Wettler M. Wissenrepräsentation: Typen und Modelle (Knowledge Representation: Typen und Models). *CompLing.* S. 317-335.

Yaschenko T.V. Matrix methods of automatic identification and translation of complex English scientific and technical terms in Russian. *NTI.* Issue.2.1990. N11.p.24-31 (in Russian).

Zaitseva N. Yu. Special texts and their terminology in man-machine communication. Izvestiya Rossiyskogo Gos. Pedagogicheskogo universiteta imeni A.I.Herzena. ' 2: Gumantarnuye i obschestvennuye nauki. *Nauchnij Jurnal.* SPb., 2002a. p. 141-148. (In Russian)

Zaitseva N.Yu. Frame as means of increasing "intellect" of systems of automatic processing of special texts and their terminology. Semanticheskaya organizatsiya i interpretatsiya diskursa. Mejvuz. sbornik nauchnyh trudov. Krasnodar. *Izdatelstvo KGU.* 2002b. p. 134-146. (In Russian).

Zaitseva N. Thesaurus and Frame as Modern Instruments for Improving the "Intelligence" of Information Systems. *International Journal of Translation.* Vol.14. ' 2. July. 2002c. p. 33-46.

Zaitseva N.Yu., Kosarev Y.A., Romanov Y.V. Problems of simulating speech-and-thinking activity of a man. *NTI.* Issue 2.' 4. 2001. P. 29-32 (In Russian).

ZaitsevaN.Yu., Piotrovski R.G Identification and understanding of speech in Russia and abroad. *Vestnik Rossiyskoi Akademii. Vol.* 71. ' 11. 2001. p. 1036-1039. (In Russian)

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