Scientific Journals
Maritime University of Szczecin

Zeszyty Naukowe
Akademia Morska w Szczecinie

2013, 35(107) pp. 90–96
ISSN 1733-8670

2013, 35(107) s. 90–96

Methods of extension of abilities of text models' semantic analysis

Yury Korostil[1], Olga Korostil[2]

[1] Maritime University of Szczecin
70-500 Szczecin, ul. Wały Chrobrego 1–2, e-mail: j.korostil@am.szczecin.pl
[2] Academy Printed, Lwow, Ukraina
e-mail: korostil@voliacable.com

Key words: models, interpretation, semantic parameters, extension, semantic dictionaries

Abstract
Methods of extension of abilities of semantic analysis of text models by introduction of additional semantic parameters, which come out of basic semantic parameters are researched. The structural components of models are reviewed and they are a base on which methods of extension of abilities of of text models analysis are researched. Basing on use of structural components of text models external semantic parameters are introduced, which also extend abilities of analysis of those models.

Introduction

Text model (TM_i) describes object which is hard or impossible to be described by formal means of existing mathematical theories. This is caused by fact that relevant means require from object such level of its abstract representation that the last one is so distorted, that loses key features, determining its nature. As such objects are proposed social objects (SO_i), which represent separate population groups. Models, used in that case are text descriptions of relevant SO_i in normalized form, which have definite structure and are implemented on selected natural language of user. Obviously TM_i must be used to solve tasks, related to SO_i. To some of those tasks are related the following ones: task of control of objects of SO_i by external controlling factors, task of interaction of TM_i and respectively SO_i, with each other, task of detection of information about state of SO_i and transmission of such information to external factors, task of organization of new SO_j from separate SO_i etc.

All introduced above tasks can be implemented only in case if there is some controlling factor. Such controlling factor in that case can be text information stream (IP_i), formed on language used for description of TM_i. It is known that any action on one or another object should at least lead to temporary or permanent change in relevant object. In case of action of IP_i on TM_i, such change is in extension of TM_i by text from IP_i, which can be coordinated or not coordinated with TM_i. In first case can take place controlling action of IP_i on TM_i, which is implemented immediately. In second case controlling action will be implemented basing on use of a number of coordinating transformations. Factors which create IP_i can be other TM_i, or some abstract sources of IP_i, structure of which from the point of view of this research will be ignored.

Methods of implementation of controlling actions on models

Let's review in details mechanisms, implementing controlling actions on TM_i basing on preset IP_i. Controlling action must be characterized by some targets, tightly related to TM_i, as a controlling object. Such targets can be following effects of action of IP_i on TM_i: change of state of TM_i, activation of TM_i relatively to other TM_j, activation of output of data about current state of TM_i.

The simplest action of some IP_i on SO_i and, respectively, on TM_i can be an action, aimed on change of current state of relative SO_i and TM.

At the level of external representation, formally such action can be described by correlation in which we will operate models TM_i and IP_i:

$$(IP_i \to TM_i) \to [(IP_i \cup TM_i) = TM_i^*]$$

Change of state of TM_i as a result of action of IP_i on TM_i is implemented by semantic synthesis of text, which is located in IP_i, and text, which describe SO_i and is represented as model TM_i. Synthesis of two text objects, formed according to grammar rules of selected natural language must consider syntax of relevant grammar which we will mark $\Gamma(M_i)$, syntax rules, defined in $\Gamma(M_i)$ we will mark as γ_i. As it is known, grammars of most of languages are based on some classification of separate words, which define their grammar types [1]. Syntax rules define allowed methods of mutual location of words of different type during forming of separate phrase φ_i. Types of separate words are defined basing on corresponding dictionaries, containing description of their interpretation. So, we can assert that classes of words, or their types are determined only basing on semantic interpretation and by grammar rules $\gamma_i(x_{i1}, \quad, x_{in})$, where x_{ij} – separate word. For conduction of more complete analysis of text descriptions in which can be detected some peculiarities and details, characterizing relevant SO_i, it is necessary to introduce not only semantic parameters but also methods of determination of their numeric values. Basing on use of such concepts we can implement not only qualitative analysis of text descriptions but also their numerical analysis which significantly extend relevant analytical possibilities. Such approaches are recently [2, 3]. According to information about such parameters we can place among them: semantic value of separate words (σ^Z), semantic controversy, determined at least by two words or two phrases (σ^S), semantic conflict, determined in framework of limitations for σ^S (σ^K), semantic superfluity (σ^N), semantic insufficiency (σ^D).

Presented above semantic parameters can have some numeric values, determined basing on usage of numeric values of basic semantic parameter, which is σ^Z. Numeric values for σ^Z are determined basing on accepted definitions with use of semantic dictionaries (S_C), which contain text descriptions of interpretation of all words x_{ij}, phrases φ_i, sentences ψ_i and other grammar structures, described in S_C by individual interpretation. It is obvious that semantic value can be determined also basing on expert mechanisms, in which take part experts in subject areas W_i. Example of such definition of numeric value of basic semantic parameter σ^S could be definition, basing on data, presented in [4].

Definition 1. Amount of semantic value σ^Z is determined by frequency of relative word x_{ij} being used in text descriptions, which are TM_i, and describe some subject area.

In case of use of such method of determination of $\sigma^Z(x_i)$, the last during process of functioning of some system $STM_i[TM_{i1},...,TM_{in}]$, which correspond to W_i, can change. As $\sigma^Z(x_i)$ can change with time, then it is necessary to implement some period of functioning of whole system $STM_i[TM_{i1},...,TM_{in}]$, to which belongs current set of text models. Such period we can suppose to be equal to ΔT_i and it will be determined by set of changes in STM_i, which are functionally bind with each other. Value σ^Z is determined basing on following correlation:

$$\sigma^Z(x_j) = \alpha\left\{\forall x_i \in [W_i = \{TM_{i1},...,TM_{in}\}]\left[\sum_{i=1}^{m}\delta(x_i)\right] / \left[\forall x_j \in S_C\left[\sum_{j=1}^{m}\delta(x_j)\right]\right]\right\}$$

where: x_i – word or other separate semantic entity for which is determined semantic value, $\delta(x_i)$ – delta function equal to 1, if x_i takes place in relevant element. Sum placed in denominator determines general number of different x_i, which are located in S_C and are presented there once. Sum, placed in numerator determines number of cases of usage of x_i in TM_i, which in interval ΔT_i form system $SM_i[TM_{i1},...,TM_{in}]$. So, $\sigma^Z(x_i)$ takes value in range, first point of which is 0, when numerator is equal to zero and it means that x_i, which is in S_C is not used in $SM_i[TM_{i1},...,TM_{in}]$. Following special point of the range is equal to 1, which means that x_i is used in $SM_i[TM_{i1},...,TM_{in}]$ as frequent, as number of different elements in S_C. Theoretically, after $\sigma^Z(x_i) = 1$ value $\sigma^Z(x_i)$ can grow to infinity, but transition of $\sigma^Z(x_i)$ over 1 means that in $SM_i[TM_{i1},...,TM_{in}]$ can appear anomaly. So, we can write down: $\sigma^Z(x_i) = [0,1,\infty]$.

Value of derivative semantic parameters, which are σ^S, σ^K, σ^N and σ^D, is determined in different works taking into account peculiarities, researched in those works. Generally, σ^S is determined as absolute value of difference between two neighbor x_i and x_j semantic values. Value σ^K is determined as amount of closeness of semantic values x_i and x_j, which in some extent is semantic extension for σ^S. Values σ^N and σ^D are derivative from σ^S and σ^K, as the last ones can be determined only starting from phrases φ_i and φ_j, if they are semantically personalized, or are not separate elements in S_C. It is obvious that σ^N and σ^D can be determined between separate sentences ψ_i and ψ_j. At quality level, $\sigma^N(\varphi_i, \varphi_j)$ means that φ_i and φ_j have equal medium amounts of semantic value or takes place $s\sigma^Z(\varphi_i) = s\sigma^Z(\varphi_j)$ and functions, describing change of value $\sigma^S(\varphi_i)$ and $\sigma^S(\varphi_j)$ are equal. Semantic inadequacy, in framework of this work, has more specific interpretation. For convenience, we will call semantic parameters σ^S and σ^K as first derivative semantic parameters and parameters σ^N and σ^D we will call second derivative semantic parameters. Semantic inadequacy σ^D between two phrases φ_i and φ_j will take place in case when is performed following correlation:

$$\sigma^D(\varphi_i, \varphi_j) := \\ = \left[\sigma^S(\varphi_i) = \sigma^K(\varphi_j)\right] \& \left[\sigma^S(\varphi_j) = \sigma^K(\varphi_i)\right]$$

Calculation of value $\sigma^D(\varphi_i, \varphi_j)$ requires more strict definition of value boundaries for $\sigma^S(\varphi_i)$ and $\sigma^K(\varphi_j)$. Definition of those boundaries requires direct interpretation of corresponding values, which is closely related to tasks, for solving which is used σ^N and σ^D.

Coming out of fact, that TM_i is itself a text representation of information in normalized form, which describes relative SO_i in part connected to tasks of control of SO_i, then control information must represent itself also text form in normalized view, which contains description of those changes relative to characteristics of relevant SO_i. Obviously different text streams have different control action or different control efficiency. Such efficiency, depending on content of text stream IP_i and character of description of control information are determined in boundaries, one of which determines negative influence of IP_i on SO_i, which is reflected in changes in SO_i, which amplify resistance to relevant control actions up to the boundary, determining complete acceptance of relevant action by SO_i. Obviously such changes are reflected in relevant text descriptions of models TM_i, which describe relevant SO_i. In that case, lower boundary we will determine by such situation, IP_i does not lead to any changes in SO_i. In framework of such approach, control action of IP_i is guided on real SO_i object, but is reviewed in framework of its influence on model TM_i. One of main theses or suppositions basing on which are formed models like TM_i is as follows. Mechanism of perception of mt_i, or other information by separate persons which form some social object SO_i, and forming general reaction SO_i on information, which came into SO_i is made basing on analysis of semantics, reflected in text description of relevant IP_i. If we use concept about semantic parameters, which characterize relevant texts and in one or another way reflect semantics of such text, then we can say that value of meaning of somehow determined semantics of texts in general and text describing TM_i, from one side and text, which must lead to changes in objects from other side which is located in IP_i, can be correlated and then there will be no controlled changes in SO_i. If semantic parameters which characterize IP_i and relevant TM_i, which describe SO_i, have preset level of incoherence on all or separate parameters, then such incoherence can lead to changes in semantics of relevant text description TM_i, which can reflect change of position relative to one or another factor of physically present object SO_i in general and also relevant changes of positions of separate members, forming relevant object SO_i. Physically or psychologically it is reflected in making one or another decision on relevant changes by each member of SO_i and changing decisions in framework of whole SO_i. Modeling analysis of information, received by SO_i from IP_i is, in framework of this work, in analysis and calculation of values of semantic parameters of TM_i, which they took after adding to relevant TM_i of text information from IP_i. So, accepting or not accepting one or another change in characteristics, describing SO_i as TM_i, is determined by dependencies between semantic parameters in TM_i and received additional texts from IP_i. Qualitatively described possibility is based on following provisions.

Provision 1. Semantics of text descriptions reflect physical nature of relations between separate person and community SO_i to factors, reflected in framework of TM_i as text on natural language of consumer.

Provision 2. To conduct analysis it is necessary to be able to characterize relevant parameters by different numeric values, principles of determination of which would be common for all components, included in to analysis.

Provision 3. Text descriptions TM_i and IP_i must have common subject area in framework of which we can review processes, characterizing their dependencies and such subject area must be described on such level of formalization, which is used for description of text models TM_i and information streams IP_i.

To increase efficiency of analysis of texts in TM_i, it is necessary to characterize they functionally by wider set of semantic parameters comparing to mentioned above which reflect mostly semantic relations or semantic links between elements of TM_i, in framework of the model or in framework of IP_i.

Let's accept that subject area independent of if it can change or evolve, is itself a basic system of semantic relations and is a base for determination of numeric values of semantic parameters for all TM_i, which are formed and function basing on relevant description of subject area $W_i(PO)$. Let's accept that $W_i(PO)$ during analysis of interacting TM_i and information streams IP_i is not changed and is static. Mentioned above semantic parameters we will call a group of internal parameters, used only for researching semantic relations inside models or information streams.

To group of external parameters we will bring parameters, describing semantic relations between elements of separate objects like TM_i and IP_i and elements of description of subject area $W_i(PO)$, in framework of which are researched systems of models TM_i and IP_i. Group of external semantic parameters is marked as π with relevant upper index. Example of minimal set of such parameters could be parameters, analogical to parameters from group σ, to which we will bring: semantic inconsistency, (π^S), semantic conflict, (π^K), semantic excessiveness (π^N), semantic insufficiency (π^D).

On demand, range of semantic parameters of groups σ and π will be extended. Before we review qualitative description of semantic parameters of group π, we need to review forms of representation or formal description of subject area $W_i(PO)$. Main component, used to describe set of elements $W_i(PO)$ is semantic dictionary S_C [5]. There can be used a variety of such dictionaries and each of them has its own specifics.

Obviously, bringing separate word to one or another group or class is based on interpretation of those words, which is generally accepted for all languages as words mean one or another entity of some objective reality according to different alphabets, used in relevant languages. Formally, such dictionaries are described as following correlations:

$$S_C^i = x_{i1} := \langle \alpha_{11} .. \alpha_{1m} \rangle \langle p_{11}, ..., p_{1n} \rangle$$

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

$$x_{in} := \langle \alpha_{n1} .. \alpha_{nk} \rangle \langle p_{n1}, ..., p_{nm} \rangle$$

where x_{ij} – identifier, which is itself a word, used to mark some entity from $W_i(PO)$, described as normalized text on selected language, α_{ij} – word, which is itself an element of description of text interpretation, describing semantics of word identifier x_{ij}, p_{ij} – numeric value of parameter, used for description of word x_{ij}. Obviously, in framework of S_C must be used following limitations.

Limitation 1. In text description of interpretation of word x_{ij} cannot be used word x_{ij}, which formally is described by correlation:

$$\forall (x_i \in S_C) [(x_i : \langle \alpha_{i1} .. \alpha_{im} \rangle) \rightarrow x_i \notin \{\alpha_{i1}, ..., \alpha_{im}\}]$$

Limitation 2. If in S_C for x_i and x_j takes place correlation $i < j$, then x_j cannot be included into text interpretational description of word x_i.

Formally, this limitation is described by following correlation:

$$\forall (x_i, x_j) \{(i < j) \rightarrow [x_j \notin j(x_i)]\}$$

where $j(x_i)$ – is shortened markup of text interpretational description of word x_i, which is formally described as:

$$j(x_i) = x_i : \langle \alpha_{i1}, ..., \alpha_{in} \rangle \langle p_{i1}, ..., p_{im} \rangle$$

Obviously, those limitations don't deal with numbers p_{ij}, as they in framework of $j(x_i)$ cannot be used without relevant α_{ij}, which is supplemented in fact by relevant p_{ij}, if this is required by attached to α_{ij} semantics.

Limitation 3. Each type S_C^i, in framework of system of description of subject area $W_i(PO)$ has some priority, determined by semantics, basing on which is extracted relevant group or class of words.

On quality level this means that the highest priority can have semantic dictionary, describing subjects, or S_C^{IP}, following level priority has semantic dictionary, describing verbs S_C^{ID} and so on. Priorities can be set independent of interpretation of classes of words in some language.

Methods of structuring components, describing systems, basing on use of text models

Each social object functions in framework of some environment to which it is bound and generally, such environment determines character and regularity of functioning of SO_i in general and its components. So, to describe SO_i by text models (TM_i), data about environment are used, which we will call subject area of interpretation of text models.

Beside semantic dictionaries (S_C^K) of different types, to describe subject area ($W_i(PO)$) a number of components is used, allowing reflection of structure $W_i(PO)$. Element, reflecting structure $W_i(PO)$ is a functional semantic dictionary, in which are described all functional dependencies, determined in $W_i(PO)$ and accepted as permissible. Such dictionary (S_S^F) describes functions specifically and does not conform with mathematical concepts of functional relations which are described in visible or invisible form, in tabular form or in other forms, used in mathematics [6, 7]. Formally, fragment of such dictionary is written down as:

$$S_S^F = \varphi_1^* : \langle x_{1i} * \ldots * x_{1k} \rangle$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$\varphi_m^* : \langle x_{mi} * \ldots * x_{mg} \rangle$$

where φ_i^* is fragment or set of fragments from $W_i(PO)$, which is formed out of elements $W_i(PO)$, listed in brackets. As in that case we talk about environment, which is not subject for strict formal description, where strict means use of formal mathematics, then relevant relations are specific and are described by text phrases and dictionary S_S^F describes only those elements from $W_i(PO)$, which have some relations with each other. Dictionary S_S^f describes some list of relations, which take place in $W_i(PO)$, which is formally described as:

$$S_S^f = f_1^* : \langle x_{1i} j(f_{1i}) x_{1k} j(f_{1k}) \ldots j(f_{1n}) x_{1n} \rangle$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$f_m^* : \langle x_{mi} j(f_{mj}) \ldots\ldots j(f_{mk}) x_{mk} \rangle$$

where $j(f_{ij})$ – text description of relations between components, placed on both sides of the description. Despite mathematical concepts of functional relations, prototype of identifier presented in mathematics by i.e. variable y, when $y = f(x_i, x_j)$, in case of S_S^f such identifier is component x_i from subject area, or some phrases, allowing personal interpretation if relevant components or phrases are included into some model TM_i. Other difference between relations in $W_i(PO)$ and mathematical concepts about functional dependencies is that in most cases it is enough to have relations between arguments and information about type of relations, described by relevant text interpretation $j(\varphi_i)$. Text description of such relation in framework of functioning of TM_i is used to form new fragments of text descriptions, if it is not preconditioned by process of solving task, implemented in TM_i. In that meaning, despite mathematical concepts of functional dependencies, there can be no determination of numeric values, basing on such dependencies in framework of use of relevant functional relations, describing $W_i(PO)$ at all.

Generally, we can formally describe subject area of interpretation as:

$$W_i(PO) = \Phi\left[S_C^K, S_S^F, S_S^f\right], \text{ де } S_C^K = \left\{S_C^{KP}, S_C^{KD}, \ldots\right\}$$

We will not review structure S_C^K as it is determined by priority levels for separate S_C^{KI}, and sequence of words usage in phrase or sentence is determined by grammar rules. More detailed we will review relations between S_S^F, S_S^f and S_C^K, in general. As it goes out of interpretation of elements S_S^F, this dictionary describes only fact of existence of relations between elements from S_C^K first of all with elements from S_C^{KP}, as words of that type due to their semantic value for $W_i(PO)$ have higher priority. As texts, formed in framework of TM_i and information streams (IP_i), have normalized form, then it means that rules γ_i from grammar Γ are narrowed conditions for forming normalized texts. Well known fact is that any sentence is structured from the point of view of semantic value of words. There is no place for situation when in sentence or phrase that all words are semantically equal. In cases when semantic equity between two or more words takes place, each of those words either has its own priority or is semantically abnormal. Such priorities can be determined by different classes S_C^{KP}.

Let's review dependencies between S_S^F and S_S^f in framework of description of $W_i(PO)$, structure of which is determined by function Φ. As for SP_i and, correspondingly, for TM_i most semantically important is fact of presence of dependency between different elements x_i and x_j, and possible amount or type of such dependency are derivative and not always obligatory to conduct analysis of TM_i, then dictionary S_S^F is supposed to describe fact of existence of such dependency. For social environments it is typical that for forming some conclusions or forming some results of functioning of TM_i, is much more important qualitative evaluation of such dependencies between separate objects SO_i and SO_j, then their numeric evaluation. So, in many cases of analysis, conducted in framework of TM_i, it is enough to use S_S^F. Dictionary S_S^f contains descriptions of function types, binding different components from $W_i(PO)$ between each other. Such function types allow to perform numeric evaluation of consequences of existence of one or another links between elements x_i and x_j. Difference which is specific for $W_i(PO)$ of type SO_i, between S_S^F and S_S^f is in fact, that for all structural elements from S_S^F of type $x_i * x_j$ in S_S^f can exist equivalent fragments $x_i j(f_i) x_j$. This means that in $W_i(PO)$ between x_i and x_j can exist links, which are not subject for numeric analysis. Dependencies between separate dictionaries in $W_i(PO)$ can be described as following schema, which determines transition from one to another from the point of view of their semantic coherence. Such schema can be presented as following correlation:

$$S_C^K\left(S_C^{KP} \to S_C^{KD} \to \ldots \to S_C^{KI}\right) \to S_S^F \to S_S^f$$

This schema reflects natural status when we talk about objects like SO_i. First of all, to determine description of fragment from SO_i as tm_i from TM_i, it is necessary to determine elements which in relative TM_i must be reflected. Such elements are presented in S_C^K. As all other models, the last one should have some structure, determining relations between elements. Set of possible relations between elements is described by dictionary S_S^F. If relations between x_i and x_j require numeric analysis and due to their semantic interpretation it is possible, then relevant types of relations are described in dictionary S_S^f.

One of extensions of known semantic parameters [8, 9] are semantic external parameters, marked as π. External semantic parameters are assigned to conduct analysis of separate fragments TM_i with fragments, described or additionally formed in $W_i(PO)$. Semantic dictionary S_S^F, describing $W_i(PO)$, is itself a set of descriptions of possible fragments, existing in $W_i(PO)$ at current moment. As $\sigma^S(\varphi_i)$, where φ_i phrase is itself medium value of controversy level which is characteristic for separate phrase φ_i, then π^S will characterize controversy level between φ_i from TM_i and element from S_S^F, which describe separate phrases, taking place in $W_i(PO)$. This means that phrase, scheme of which is presented in S_S^F is used in TM_i with such adequacy level to phrase from S_S^F, which is determined by value of generalized controversy between φ_i from S_S^F and φ_i from TM_i. Formally, this can be described by following correlation:

$$\pi^S\left(\varphi_i^{TM}, \varphi_i^{SF}\right) = \left|\sigma^S\left(\varphi_i \in TM_i\right) - \sigma^S\left(\varphi_i^* \in S_S^F\right)\right|$$

In framework of definition $\pi^S(\varphi_i^{TM}, \varphi_i^{SF})$ it is necessary to set method of selection of φ_i^{SF} for relevant φ_i^{TM}.

In framework of separate φ_i^* from S_S^F their possible structures are generalizing. Generalization means that in framework of φ_i^* from S_S^F generalized phrase can be presented as:

$$\varphi_i^* : \left\langle x_{ij} * \left[x_{ik} \vee x_{ig} \vee \left(x_{i5} \,\&\, x_{i4}\right) * \ldots * x_{im}\right]\right\rangle$$

where fragment $x_{ik} \vee x_{ig} \vee (x_{i5} \,\&\, x_{i4})$ is itself a combined element of possible phrase. This means that φ_i^* reflects some schema from which can be formed a number of phrases. Obviously any φ_i from TM_i must not be completely equal to schema φ_i^* in general or with its fragment. So, we can suppose that $\sigma^S(\varphi_i^* \in S_S^F)$ in framework of complete schema has its own level of semantic controversy which is determined like σ^S for $\varphi_i \in TM_i$. On content level $\pi^S(\varphi_i, \varphi_i^*)$ determines level of semantic controversy between phrases from TM_i and phrases, described in $W_i(PO)$ in S_S^F and are at current moment of time t_i a basic schemas of phrases of subject area. Obviously, S_S^F can, in process of functioning of system $SM_i = \{TM_{i1},...,TM_{in}\}$, change, but those aspects we will not review as the period of intactness of basic elements S_S^F, S_S^f and S_C^K determines level of stability of subject area of interpretation $W_i(PO)$.

Concerning parameter π^K, as external semantic parameter – it is by its nature is similar to π^S. So, we will not review it in details, and only write down method of representation π^K as following correlation:

$$\pi^K\left(\varphi_i^{TM}, \varphi_i^{SF}\right) = \left|\sigma^K\left(\varphi_i \in TM_i\right) - \sigma^K\left(\varphi_i^* \in S_S^F\right)\right|$$

Let's mention that $\sigma^S(\varphi_i^* \in S_S^F)$ and $\sigma^K(\varphi_i^* \in S_S^F)$ for S_S^F are calculated similar to σ^S and σ^K for $\varphi_i \in TM_i$, based on usage of concept of semantic value $\sigma^Z(x_i)$ of separate element x_i from dictionary S_S^F.

Regarding parameters of external semantic excessiveness π^N and external semantic excessiveness π^D, then due to the fact that parameters σ^N and σ^D are also determined basing on usage of direct or indirect parameters or characteristics of descriptions $W_i(PO)$, represented as dictionaries $\{S_C^K, S_S^F, S_S^f\}$, then we will not review this parameter in details. Regarding semantic uncertainty, then σ^N, appears in case, when $\sigma^S(\varphi_i)$ exceeds preset threshold determining maximum value of σ^S. π^N determines that semantic controversy $\pi^S(\varphi_i, \varphi_i^*)$ exceeds maximum level of its value. That means that $\pi^N(\varphi_i, \varphi_i^*)$ determines level of inconformity of formed in framework of TM_i phrases φ_i of subject area of interpretation $W_i(PO)$. This fact can have different nature and respectively different explanations. From one side, this can mean that $\varphi_i \in TM_i$ is too different from phrases, allowed in $W_i(PO)$, but from the other side, this can mean that $\varphi_i \in TM_i$ inputs significantly new aspects about concepts, formed in $\{S_C^K, S_S^F, S_S^f\}$ about $W_i(PO)$. To solve this alternative can be used methods of analysis of evolution processes [10, 11]. Formally, expression for determination of value π^N can be written down in following way:

$$\left\{\left|\sigma^S\left(\varphi_i\right) - \sigma^S\left(\varphi_i^*\right)\right| > \Delta\sigma^S\left[W_i(PO)\right]\right\} \to \pi^N\left(\varphi_i, \varphi_i^*\right) = \left|\sigma^S\left(\varphi_i\right) - \sigma^S\left(\varphi_i^*\right)\right| \quad (1)$$

External semantic inadequacy $\pi^D(\varphi_i, \varphi_i^*)$ can have different variants of qualitative interpretation. This is explained by fact, that excessiveness means absence of some factor or attribute, and ways to supplement relevant fragment φ_i can differ. For example, one way of interpretation of $\pi^D(\varphi_i, \varphi_i^*)$ can be inadmissibly big value of relevant level of semantic conflict $\sigma^K(\varphi_i)$ and $\sigma^K(\varphi_i^*)$, which can have the following explanation. Level of proximity of semantic values can appear due to fact that in relevant phrases φ_i and φ_i^* are not used elements, which together with relevant elements of phrases will lead to reduction of level of semantic conflict. Such interpretation is closer to term of excessiveness. Other interpretation of the cause of appearance of excessiveness can be in following. It is known that σ^K, which is accepted to be determining for σ^D means, that neighbor words can have too similar semantic values. In that case we can eliminate one of exceeding words in φ_i and, respectively, value σ^K of the new pair of neighbor words will decrease, or at least change. In that case, value $\pi^D(\varphi_i, \varphi_i^*)$ means unacceptably high level of conformity of $\varphi_i \in TM_i$ and $\varphi_i^* \in S_S^F$. This means that in framework of TM_i phrase φ_i is used, formed in such a way, that it semantically conflicts with descriptions in $W_i(PO)$, as it is enough close to semantics φ_i^* from $W_i(PO)$ or some other φ_j^* from $W_i(PO)$. For TM_i this means forming in TM_i phrase, which relatively to $W_i(PO)$ is not determined. Such uncertainty can be eliminated by excluding from φ_i of some neighbor component, due to which phrase φ_i can reduce. Formally, expression determining value π^D can be written down as follows:

$$\left\{\left|\sigma^K(\varphi_i)-\sigma^K(\varphi_i^*)\right|<\Delta\sigma^R[W_i(PO)]\right\}\rightarrow$$
$$\pi^D(\varphi_i,\varphi_i^*)=\left|\sigma^K(\varphi_i)-\sigma^K(\varphi_i^*)\right| \quad (2)$$

In correlations (1) and (2) we could substitute internal semantic parameter $\sigma^S(\varphi_i^*)$ and value $\sigma^K(\varphi_i^*)$, with relevant external parameters $\pi^K(\varphi_i, \varphi_i^*)$ and $\pi^S(\varphi_i, \varphi_i^*)$, as $\sigma^K(\varphi_i^*)$ relative to TM_i is external, as $W_i(PO)$ is external environment, in which function systems TM_i and IP_i.

Conclusions

To ensure higher adequacy of description of SO_i by text models, in this work extension of parameters is proposed, including semantic parameters, which allow conduction of analysis of TM_i paying more attention to peculiarities, conditioned by SO_i. So is developed number of external semantic parameters, describing relations between separate objects of modeling system and TM_i. Extension of semantic parameters is in introduction of parameters, extending possibilities of interpretation of the modeled objects. For example, usage of such parameter as semantic excessiveness allows reflection of objects parameters exceeding the existing threshold of subject area description. This is typical for social objects, which during their functioning exceed frames of possibilities, existing currently in description of functioning subject area.

Are developed and researched structures of components, which are not included into TM_i, to which belong dictionaries of various types, which describe subject area, made of modeling objects and their groups.

Are researched dependencies between separate components, included into modeling system, which allows reflection of additional dependencies, taking place in systems SSO_i.

References

1. GALPERIN I.R.: Text as object of linguistic research. M.: Knizhny dom «LIBROCOM», 2009.
2. AFANASYEVA O.Y-Y.: Methods of semantic transformations in steganosystems. Scientific digest “Modeling and Information Technologies”, IPME NAS of Ukraine, Kiev, 56, 2010, 188–196.
3. AFANASYEVA O.Y-Y., DURNYAK B.V.: Research of semantic parameters, used in graphics. “Scientific digest”, IPME NAS of Ukraine, Kiev, 34, 2007.
4. AFANASYEVA O.Y-Y.: Connection of steganographic parameters with parameters of graphical images. Scientific digest “Modeling and Information Technologies”, IPME NAS of Ukraine, Kiev, 31, 2006.
5. DEZA E., DEZA M.: Encyclopedia of distances. M.: Nauka, 2008.
6. SIZIKOV V.S.: Mathematical methods of measurement results processing. SPb.: Politehnica, 2001.
7. PETROV Y.P., PETROV L.Y.: Unpredictable in mathematics and its relation to accidents and disasters. SPb.: “BHV-Peterburg”, 2005.
8. SHAROV A.A.: Concept of information in theory of categories. Scientific digest “Semiotics and information”, 8, 1977, M.: VNIITI, 167–178.
9. POGOSYAN E.M.: Theory of automatic synthesis of concepts. Scientific digest “Semiotics and information”, 8, 1977, M.: VNIITI, 125–152.
10. MACDONNELL G.: Analysis of algorithms. Active education approach. M.: Technosfera, 2009.
11. BECK T.: Interaction of coefficients of mutation, selection and self adaptation in genetic algorithm. Dortmund University, Germany, 1992.