THE METHOD OF CONSTRUCTING THE MATHEMATICAL MODEL OF SUBJECT DOMAIN

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Keywords: attributive translation; a subject domain; semantic model; methodology of the structural analysis.

In article the problems of constructing the mathematical model of a subject domain are considered. Evolution of the information systems can be considered from the position of their influence on the organization: embedding of information system in a working business - form or change of it. The share of expenses for reception and processing of information in economy and public charges continuously grows. However many theoretical aspects connected with modeling the processes of automation are unexplored. The variant of modeling the subject domain from the positions of the methods which are taking into account the illegibility or uncertainty of descriptions of model of researched object is offered.

We live in the time of transition to information epoch, introduction of effective methods of management, difficult and quickly proceeding processes, changes of management methods not only in technological processes, but also in methods of managing the economic and social activity that became probable due to rough development of information technologies. As a result of universal information many functions of management are difficultly transferred under the control - organized the information systems using biological and computer technologies of processing information. Processing of information in similar systems became an independent scientific and technical direction. For the given systems the presence of technological sites with automatic, automated and intellectual management is typical.

Translation of the conditions of a practical task to the language of mathematical models was always difficult and frequently resulted in the loss of difficultly - formalized qualitative information. Many modern tasks of management simply may not be solved by classical methods because of a very big complexity of mathematical models. Computerization promotes the expansion of subject opportunities, sometimes qualitatively changing the contents of its activity. And this activity should be precisely determined and fixed for the subject like the automated system. The model covering information system may be submitted as Meta base which contains the information by each kind of account object. On the other hand, the information system may be submitted as the functional system - i.e. as set of functions. Thus, the purposes and restrictions may be given as fuzzy sets. The interrelation between them may be determined by the relation on the Cartesian product[1]. The fuzzy decision may be examined as some "instruction" which is an investigation of the discrepancy of objects formulation in view and restrictions, i.e. influence of the fuzzy purpose and fuzzy restriction on a choice of alternatives is characterized by their crossing which forms the fuzzy set of decisions.

Business is treated as the process examined as the functional model of real processes. It is the process examined as a set of consistently carried out chains of operations. It may be treated as the set of cooperating subsystems, i.e. as a discrete dynamic system changeable in space and time. The modeling of information system has the common philosophical basis. The philosophical concept most essential to modeling is the subject domain which may be determined as a mentally limited area of reality or the area of an ideal representations subject to modeling, consisting of objects taking place in the certain relations among themselves and having different properties. Thus property is understood as a prominent feature of an object for which estimation of the certain measure - a parameter of property which is characterized by the set of values is established. Thus, property of object is a reality, and a parameter is a subjective measure of this reality. The conventional formal definition of the concept of a sub-

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ject domain is absent at the moment. Definition of a subject domain as a part of the real world or set of classes of real objects subject to modeling, assumes modeling reflection with the purpose of studying under the certain corner of sight. This point of view itself enters into the concept of a subject domain. Therefore it is accepted to count the majority of researchers that the concept of a subject domain may not be formalized as initial concept. The model of a subject domain is our knowledge of a subject domain. At research of a subject domain the significant amount of information which has subjective character may be received. Its representation in natural language contains the illegibility or uncertainty which has no analogues in the language of traditional mathematics. It is necessary to take into account the following methodological aspect, by consideration of a subject domain as parts of the validity - ontology, and by consideration of a subject domain as knowledge about this validity - gnosiological. And as a result we have two various classes of models and a task of the search of conformity of the given models of the validity - model of the validity and model of knowledge about this validity.

The basic problem consists of not formalized process of modeling of a subject domain that makes impossible the application of the mathematical methods of the analysis of the properties of models of a subject domain, such as functional completeness and integrity. This puts a question on consideration of a task of modeling of a subject domain from positions of the methods which are taking into account illegibility or uncertainty of descriptions of model of researched object. To speak about a subject domain it is meaningful, if it has the certain semantic localization, for example in space and time or functional. Then construction of semantic model is reduced to formalization of logic relations. There are various methods of acceptance of the decisions, representing various ordering of examined decisions based on the same expert estimations. One of the basic complexities of the model development of subject domain is, that the number of probable variants of formalization of a subject domain is indefinite. The model adequately should display any subset (the variant of the formalization of subject domain), and process of modeling may have any idea, allowing to determine the value of any object of a subject domain by the implementation of any certain sequence of actions. One of such ideas - the method of syntactically-guided translation based on works of Noel Chomsky. According to Chomsky[2] semantic analysis consists of two steps - recognition of structure and construction of target actions on the basis of this structure. Thus, the mathematical approach allows to be limited to the set of chains which can be determined in some exact image. For the construction[3] it is necessary to have the algorithm which on the given grammar makes a conclusion produced by this grammar. Allocating objects in a subject domain, we receive, that each object is determined by final set of attributes, each attribute has the set of allowable values, and we have attributive broadcast grammar according to which the rules of attributes calculation are determined and the algorithm of an attributive tree of a conclusion may be constructed. D. Knut formalized similar ideas, having entered the concept of "attributive translation"[4]. Rules of grammar determine connections of these attributes, and calculation of values is determined by a tree of conclusion. All this allows to determine the semantics of language so that the value of any attribute, in any unit of a tree of a conclusion might depend on all tree arbitrarily, that any function which is determined on a tree of a conclusion from here follows, may be submitted as an attribute of any certain unit Instead of graphs for the representation of the structure of a subject domain it is possible to use the language of theory sets and lattices of their splittings. Each train of a database is the description of a condition of some elementary object. The subset of all trains similar to the given train concerning a chosen measure of similarity, is the representation of elementary object.

As a rule, the new object is compared to the already known objects, and its information model is formed as the set of comparison of information models with the known objects. Thus the model of a new subject domain for the given object will be under the construction on the basis of a subject domain of that object which became known to the first. As a result of knowledge of a subject domain including the given object, will be structured as the set of properties of the first allocated object and a sequence

of changes of subject domains of the subsequent objects. Let W be a researched subject domain of objects $W=\{w_1,...,w_n\}$. Frequently there are fuzzy concepts, but any information which has been written down in any formalized kind and submitted in memory of the computer is precise. Therefore the illegibility of knowledge or relations may be determined by the semantics of the information. The properties not included in allocated subject domains can be considered as a separate subject domain with special properties - an environment. Thus, any subject domain may be considered allocated since it cooperates with an environment. It agrees above told $w_{i+1}=F_i^W(w_i)$ where $F_i^W(w_i)$ is not a function in the usual sense, and determines the only probable conditions of a subject domain of one object on the basis of the difference from another. In this case the question is about the possible fuzzy connections between metaobjects.

The model of a subject domain is determined by the means of representation function and family of modeling functions. Let S be model of a subject domain of objects $F^M: W \to S$. The model (may be put to each object of a subject domain in conformity on the basis of function of modeling F^M) $r_i=F_i^M(w_i)$. Thus to each object $w_i \in W$ corresponds $r_i \in S$. Thus there should be a function $F_i^R(r_i)$ which unequivocally determines r_{i+1} on r_i, i.e. $r_{i+1}=F_i^R(r_i)$. It is obvious, that r_{i+1} may be determined on a chain $w_{i+1}=F_i^W(w_i)$ and $r_{i+1}=F_{i+1}^M(w_{i+1})$. After the made substitution we have $r_{i+1}=F_{i+1}^M(F_i^W(w_i))$. On the other hand there is, at least, one more chain $r_i=F_i^M(w_i)$ and $r_{i+1}=F_i^R(r_i)$ according to which, after the carried out substitutions it is received $r_{i+1}=F_i^R(F_i^M(w_i))$. Comparing the received results, we may draw a conclusion, that irrespective of, whether operation in a subject domain is executed all over again, and then the display to a model of a subject domain is made, or display to model all over again is made, and then in model of a subject domain the appropriate operation is executed, the result will be identical. Hence, for each fixed value i homomorphism and F_i^R is received. The table of the variables used for the description of objects of a subject domain usually exists in an implicit kind as the conventional set of characteristics of objects of a subject domain. It does not meet any concrete object from a subject domain, but only to all subject domains as a whole. The stage of constructing the semantic model of a subject domain can be determined as the formalization of the logic relations fixed in the description. It is possible to imagine the description of a subject domain on the basis of the table of variables as an n-dimensional cube. There are not all objects which may be described with the help of a set of the variables chosen for the description of objects of a subject domain. Thus, it is possible to describe the restrictions imposed on these objects. All this may be submitted by the system of equations - formalization of model of a subject domain where the crossing sets of semantic properties take place, subject domains of objects, in connection with prospective distributed.

The model of a subject domain S may be submitted as the metabase which contains the information on each element of the structure. On the other hand the subject domain W may also be submitted as a set. We shall enter a designation: P - set of properties determined by connections between the elements of the above mentioned sets. Then the interrelation between them may be determined by the relation on the Cartesian product $P \times S \times W = \{(p_i,r_i,w_i): : p_i \in P, r_i \in S, w_i \in W, i=1,...,n\}$. An accessory of an element where $p_i \in P, r_i \in S, w_i \in W, i=1,...,n$ to the given relation it is interpreted as follows: "the object of model of a subject domain r_i contains the information on property p_i of object of a subject domain w_i".

Information search of the model of a subject domain r_i appropriate to a concrete ele-

ment in object of a subject domain w_i. It is reduced to definition of the relation $R \subseteq S \times W$. Thus, it is possible to talk about any pair , $w_i \in W, i = 1,...,n$, that w_i is relevant r_i and the solution of a task of the relevance of the elements of sets S and W, is reduced to the definition of the relation $R \subseteq S \times W$. Thus for anyone , $w_i \in W$, $r_j \in S$, $w_j \in W$, $i, j = 1,...,n$ truly, that if and $r_i \subseteq r_j$ that is, all elements of object of model of a subject domain r_i contain in object of model of a subject domain r_j and all elements of object of a subject domain w_i contain in object of a subject domain w_j and $(r_i, w_i) \in R$ it is carried out $(r_j, w_j) \in R$. Except for an extreme case when the relation R is the Cartesian product $S \times W$, the relation includes not all probable trains from the Cartesian product. It means, that for each relation there is a criterion, allowing to determine, what trains are included into the relation and what are not present. Thus, each relation can put in conformity some logic expression P (a predicate of the relation R) dependent on the certain number of parameters and determining, whether the train will belong to the relation R (the accessory of a train to the relation is equivalent to the validity of a predicate) $(r_j, w_j) \in R \Leftrightarrow \{P\} = \{S, W, R\}$.

$(r_i \in S) \in R : r_i \in S$

Processing and representation of the information, with reference to stages of the examined process for quantity indicators of attributes, may be made by application of a direct method for one expert of construction of function of an accessory of the fuzzy set, for example offered Charles E. Osgood method of semantic differentials on the basis of set of estimations on scales[5]. Taking into account construction of a model as objects, each independent business - process may be examined as the detached part of information system[6]. Taking into account, that the system is shared into the information objects incorporated by semantic rules of interaction, it is possible to declare relative completeness of set of taken into account relations between elements of system which determine its behavior and are a subject of the analysis of functional reliability. Thus, relations between cooperating business - processes may be classified on the basis of mathematical rules precisely and fuzzily logic. The concept of construction of such system reflects actually modern strategy so-called CALS technologies and may be considered as the tool of increase of efficiency and quality since fully complies with spirit and principles of the international standards of series ISO-9000.

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Received for publication on 05.04.2010