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Model of Conversion of Data Objects for Defining the Object-Relation Mapping

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Abstract

The paper considers the problem of building of the transformable object-relation mapping. It is offered to receive the decision by a semantic method in case of which the formal models of object system and relational system are considered and their interpretations are set. The transformation mappings are considered as a kind of mappings saving interpretations of the given form. Creation of model of converting of data objects on the basis of applicative computing systems is offered. On this basis the models can be received allow compositions of means of converting and also determination and check of global restrictions for the changes of data determined by the given set of methods of converting. Achievement of flexibility requires use parametrization of the considered construction.

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1 Introduction

Wide circulation of database systems (DB), on the one hand, and systems of the object-oriented analysis, design and programming, on the other hand, stimulates interest in development of means of their automated coordination. Creation of object-relational structures of mapping is represented to one of perspective methods. However maintenance of mappings which are scattered in a program code often requires the considerable efforts and carries to errors, especially if the DB scheme is rather big and intended for service of several systems. Therefore interest in methods of automation of support mappings of the specified kind is clear.

Both object and relational approach can be described in terms of different interpretations of processed data. Interpretations include both representation of data, and representation of the processing procedures, and also means of expression of the restrictions superimposed on data that in terms of the theory of a DB corresponds to a classical concept of a data model.

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Establishment of object-relational mapping corresponds to establishment of correlations of the appropriate interpretations. In the most general setting this task represents version of the task of establishment of equivalence of algorithms and therefore is algorithmically undecidable task. Therefore the specifications of the task allowing to select rather wide classes of special cases of establishment of the considered mappings are of the considerable interest[8].

The semantic characteristics of data, when organizing the interpretation of them, can be accounted in different way. It is possible to bind specific means of data interpretation control with conceptual classes, singled out in models, with frames and other conceptual essences. On this way, in particular, conceptual models can be built similar in features to classic means of object-oriented modelling [11]. It is also possible to use the model parametrization with the definition of tools for manipulating data, depending on the parameter or sets of parameters. Various methods of interpretation can also be connected with the peculiarities of the data model chosen for the presentation of data within a common conceptual model.

The more powerful and transparent mathematical model of the data is, the finer restrictions may be expressed, and the more uniform way of expression appears to be. Thus, in the case of network model of the data the limitations, as a rule, are associated with the selections in general graph, representing the semantic network, of subgraphs of a special type. In the case of a combination of several models of data, the selected methods of interpretation control may take into account the peculiarities of both models and the relationships between them.

Specific problems arise when working with the data within the Web-technologies [5]. Web-systems represent one of those classes of applications in which the data may be received from multiple sources. At the same time both the syntax characteristics of data and their semantic structure, generally speaking, are not harmonized with each other. The problems, appeared in this case, may be interpreted as limitation of interpretation of a specific type.

The rest part of the paper is organized as follows. The Section 2 defines the task of development of conversion of data object model. The Section 3 discusses approaches to the conversion of data object model and to the control of data interpretation depending on the characteristics of their organization by transformable mapping when it is possible. The Section 4 contains the problem definition (model of data interpretation). The lambda-algebras and lambda-models approach is given. The Section 5 discusses the prototype system supporting the object-relation mapping in a semantic network. In conclusion there is a brief discussion of the obtained results and the prospects of further work.

2 The task of development of conversion of data object model

The semantic network will be regarded as consisting of concepts and frames. We'll consider the primary concepts, among which we will highlight the general concepts and constants, and derivative concepts derived from the (previously defined) concepts and frames with the help of the operation of definition. Among the frames we'll allocate frames simple and complex frames received from the simple ones using operations with frames. The methods for determining the semantic network, including its formal model, are defined in details in [10, 5].

One of the basic operations with the semantic network is an operation of determination, which allow to consider the expressions, specified by the combination of constructions of semantic network, as atomic, i.e., similar to the primary ones. This operation can be considered as a variant of the abstraction of structures of semantic network. The network as a whole at the same time receives a character of multiply nested structure.