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Basic Constructions of the Computational Model of Support for Access Operations to the Semantic Network

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Abstract

The paper considers the approach to solving the task of storing data in the Web environment using semantic networks (SN). The control over the access to SN is identified as a critical task. An approach to the solution based on the use of the controlling SN is proposed. The rationale for the approach involves developing a computational model for supporting the access operations. The construction of a model based on intensional logic is proposed. The basic logical constructions, necessary for building a model, are considered. The testing of the model’s constructions was performed when building the tools of semantic support for the implementation of the best available technologies (BAT).

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1 Introduction

As Web technologies are progressing [1], the task of developing the tools of organizing and storing data in the Web environment becomes increasingly significant. With the arrival of network technologies information objects appeared to be assigned to different users, who when hosting, searching and processing exploited, in general, different principles [2, 3]. The rigidly defined hierarchies, thus, are replaced by the network structures that determine the links of information resources, set in various ways. The links can occur on different grounds, which implies the need to process them in various ways, or to take into account the meaning of the data and their links during processing. Thus, the data acquire a semantic character.

One of the most important tasks in the processing of semantically oriented data is the maintaining of semantics in the course of working with resources. The resources, on the one hand, exist for a long time, which provides the possibility of their multiple use, on the other hand, they usually have a dynamic character, i.e., they can be modified, updated, etc. In the meantime it is possible to change both the data on individual facts, processes, and so on in the

area, and general semantic characteristics of the data. It is also possible to change both the data itself and the links. Changes in semantics can either maintain the logical continuity of the network, or violate it. By logical continuity in this paper we mean the preservation of a set of general constraints imposed on the network contents.

The development of support tools for network access operations involves the description of the semantics of a system of interconnected resources in a formalized manner, which brings to the need to introduce the concept of the semantic network (SN) as a formal analogue of the resource system [1, 4]. The capabilities of the network access tools and their constraints are expressed in the form of a model of access tools to the SN. The development of such a model as expected is to provide the possibility of constructing a semantically correct SN access support system, including the ability to set semantically coordinated access restrictions.

2 Task to develop a model of supporting the access operations

The need to support semantic integrity involves researching new models for presenting the network information and access to it. The resulting model potentially covers all the elements of the semantic network, and the appearing possibilities of manipulating the network can cause a violation of the information model consistency and, as a consequence, the destruction of the network integrity. To overcome this complexity it is required to restrict access to the semantic network in some regular way.

This paper proposes a solution for control access to the SN, based on the introduction of a metanet, which is a control semantic network. The proposed solution ensures homogeneity of representation of the problem-oriented and control structures of the SN, which reduces the scope of the software code of the supporting mechanisms and facilitates its maintenance.

The study of the characteristics of the access tools to the SN, which are essential for solving the problem of describing access restrictions, leads to setting the task of developing a model of supporting access operations to the SN, which provides the following possibilities:

- modelling the behaviour of various subjects, interacting with the SN, through the mechanisms of reference management [5];
- modelling the dynamics of interaction through the mechanisms of tracing the objects changes history [6];
- description of sets of access tools and their limitations for specific subjects in the form of specialized network objects - access policies to the system [7];
- providing the capability of specifying access operations and describing their execution.

An essential feature of the model ensuring the achievement of the planned characteristics is the possibility of its integration with the applicative computing system. The integration is achieved on the basis of the nesting lambda-calculus constructions into the supporting formal system and on the immersing the model implementation into the applicative environment.

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