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Regular Agent Technologies for the Formation of Dynamic Profile

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Abstract

Constantly increasing number of information items (i.e. published or digital subjects) set the necessary goal to develop new approaches for filtering and structuring data. This paper describes agent-based approach that is used in Multi-agent information and analytical system (MIAS) developed at the National Research Nuclear University "MEPhI" in order to form a dynamic profile of the Human Brain Project, which includes general information, identification of funding, interrelation of subprojects and new technologies that are being developed in the course of the project. The MIAS support of object-oriented approach and international standards of linked data contributes to the development of future information systems that will enable forecasting on specific scientific field.

Keywords: agent, multi-agent system, Big Data, Data mining, retrieval system, information and analytical system, brain, neuroscience, neuroinformatics, modeling; simulation, supercomputing, human brain project, HBP, neuromorphics

1 Introduction

The emergence and development of various information systems made available a huge amount of information, which previously was impossible to obtain promptly. According to International Data

[*] Agents' functions classification within the system and development of agent search algorithms
[†] The automation of agent-based search for information on thematic area in the Internet task statement
[‡] Automotive retrieval of subordinate information from news messages algorithm development
[§] Development of scientific data visualization tools
[**] Development of the Russian and English thematic thesauruses for agent-based information retrieval
[††] Search for information on HBP and the compilation of the analytical paper
[‡‡] Development of a starting thematic thesaurus of neuromorphic technologies

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Corporation (IDC), the volume of generated data in 2012 comprised 2.8 zettabytes. Moreover, it is prognosticated the increase of information to 40 zettabytes by 2020.

In turn when the regular collection of data on a particular subject course is necessary, a number of difficulties emerged. They are associated with the fact that in modern automatic search systems which operates in dialog mode, users have to repeat multiply times the same actions. The use of agent-based systems can significantly reduce the time to perform such operations (Berners-Lee, Hendler, & Lassila, 2001).

In this article we will focus on the implementation of the regular agent technologies that are the basis for Multi-agent information analytical system (MIAS) on scientific and technological areas developed in National Research Nuclear University "MEPhI".

Regular agent-based technology is a sequence of actions aimed at regular release of information and analytical products.

This characteristic is necessary for the structuring of scientific and technical information in order to conduct information and analytical support to a large number of users, both collective and personal. The main types of documents resulting from the implementation of the regular agent technologies are:

1. Digest – a periodical published news and information for a certain period of time.
2. Dynamic profile (a profile on the object of interest) – a document describing the state of a dynamic object at different periods of time. Under the object of interest is understood a technology, project, organization, etc.
3. Semantic network is a graph where the vertexes are objects, and the arcs denote different types of relationships between objects (Artamonov, et al., 2014). For example, the hierarchical structure of the organization where vertexes are officials in the management system and the arcs the relations of subordination, etc.

2 Human Brain Project

The article discusses the example of the implementation of the regular agent technologies on the example of dynamic compilation of a dynamic profile of Human Brain Project.

The Human Brain Project (HBP) is a large ten-year scientific research which started on 1 October 2013, is a European Commission Future and Emerging Technologies Flagship. The project is largely funded by the European Union, included in the Seventh Framework Program (FP7). The project involves hundreds of scientists from 26 countries (Markram, 2012). HBP aims to create the world's first model of the rodent and human brain.

At the first stage, full information on the possible names of the project was revealed in dialog mode, namely: project title according to official sources, the project code, if it is available. The thematic dictionary was formed by project name – Key_Words “HBP”. Key words include all the possible spelling, such as Brain, Neuroscience, Neuroinformatics, Modeling, Simulation, Supercomputing, Medicine, Neuromorphics, etc. The resulting glossary consists of 23 terms that contain key words related to project and different project identifier, for example, contract numbers, etc.

The search of the information resources for inclusion in the route database sources (Ananieva, Artamonov, Galin, Tretyakov, & Kshnyakov, 2015) based on the compiled glossary was conducted. It was made in order to subsequent agents’ customizing. Approximately 18 information resources were found, which contain the information on the subject. Using identifiers as keywords allows to identify the maximally pertinent information, because they only characterize the form of the object.

At the second stage, agents were tasked to collect all the information from the open resources. To solve this problem agent-postman was used: which delivered all the textual information from the resource to a full-text database, where it occurs.