



Agent Technologies for Polythematic Organizations Information-Analytical Support

Boris Onykiy^{*}, Alexey Artamonov[†], Anastasia Ananieva[‡], Evheniy
Tretyakov[§], Larisa Pronicheva^{**}, Kristina Ionkina^{††}, Alyona Suslina^{‡‡}

National Research Nuclear University MEPhI, Moscow, Russian Federation

bnonykij@mephi.ru, aaartamonov@mephi.ru, a_ananiva@bk.ru, evheniytretyakov@yandex.ru,
lvpronicheva@mephi.ru, ionkinakristina@gmail.com, suslinaalena@gmail.com

Abstract

Large scientific organizations, laboratories, departments and scientific groups exercise need in information support due to issues related to the navigation among huge amount of information in the Internet that is growing every day. 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” and addressed challenges in the information support that was encountered by our partners: the “Plasma Physics” Department, Department of “Laser physics”, laboratory “Photonics” and others. 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

1 Introduction

Nowadays scientific researches especially valuable not only for theoretical cases but also for practical ones. Various informational and analytical tasks, related to the control and management, require large amounts of information that why more and more industrial corporations support developing of experimental databases and it concerns not only experimental data, but also data associated with every activity of scientific organizations (Fedotov & Barahin, 2009). Also required information is scattered

^{*} The automation of agent-based search for information on thematic area in the Internet task statement

[†] Agents' functions classification within the system and development of agent search algorithms

[‡] Scenarios of information and analytical service development

[§] Automative retrieval of subordinate information from news messages algorithm development

^{**} Development of operational maps for situational analysis in various scientific and technological areas

^{††} Development of scientific data visualization tools

^{‡‡} Development of the Russian and English thematic thesauruses for agent-based information retrieval

over various networks. To solve problems related to gathering and filtering information on particular scientific scope the agent-based technologies are purposed (Berners-Lee, Hendler, & Lassila, 2001).

Multi-agent information analytical system (MIAS) on scientific and technological areas developed in National Research Nuclear University "MEPhI" in 2010. Some of the issues, that had to be solved during development of such system, are not fundamentally new, however, now they have to be solved for issues belonging to "Big Data" and "Data Mining" issues (Ananieva, Artamonov, Galin, Tretyakov, & Kshnyakov, 2015).

The work was carried out by the "Analysis of the competitive systems" department in cooperation with departments of Physics and laboratories that operate in developed and developing areas. These are such divisions of the National Research Nuclear University MEPhI as the "Plasma Physics" Department, Department of "Laser physics", lab "Photonics" and other partners.

The concept "agent" refers to a program that acts on behalf of the user in inner and outer networks in order to retrieve required information in compliance with assigned requirements.

2 Methodology

The Multi-agent information analytical system (MIAS) on scientific and technological areas is designed for three types of users; the first - organizations (universities, national research centers), large industrial companies that perform research and development on new technologies. These organizations require information support in many subject areas due to its multidisciplinary structure.

The second type of users are divisions of scientific and educational institutions, university departments, laboratories. This user type is characterized by narrow thematic focus on particular scientific scope. In this case, all other scientific and technical information coming into the organization is perceived as informational noise. So, this type of user has to define thematic orientation of all incoming information.

The third type of user – experts. In this case, the information system should serve the user in keeping with his individual interests, and this is one of the most challenging tasks in developing agent-based information analysis systems. The difficulty arose from the fact that the solution of a particular problem by an expert can be associated not only with the thematic direction of the unit in which he does job, but also be determined by other considerations. It is common knowledge, that good technological solutions are often found on the borders of several knowledge fields (Ananieva, Artamonov, Galin, Tretyakov, & Kshnyakov, 2015).

The basis of Multi-agent information analytical system on scientific and technological areas is "Three-tier agent-based model of scientific and technical information search and structuring", which includes the following levels:

- collecting information from reliable online sources;
- filtering and categorization;
- secondary filtering by personal dictionaries.

In accordance with the levels listed above managerial databases are:

• thematic route database that includes addresses to the Internet sources that are relevant to specific thematic areas;

- thematic thesauri database;
- personal dictionaries database.

Figure 1 presents the control loop of MIAS.

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