

# Information Systems for Popularization of Scientific and Knowledge-based Software

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**Abstract** — The article discusses problems of public awareness about scientific and knowledge-based software, the absence of a public repository of software and databases developed by research institutes and universities. The article presents the information system that provides support for scientific software developers – the Foundation of Algorithms and Programs.

**Keywords** — information systems, scientific software catalogization.

## I. INTRODUCTION

EFFECTIVE tools for promotion of scientific and research activities are publications in journals with high impact factors, presentations on conferences, etc. However, these tools are not enough to promote scientific developments to potential consumers and commercial organizations. Researchers should conduct activities aimed at presentation the utilization of their scientific results, demonstration of developed software and databases and its application value. The implementation problem of scientific and knowledge-based software is well known for those who developed such software, and for those who would like to use ready-made software products. It is necessary to provide an access for potential clients and customers to information about scientific developments, to have constantly expanding storage, (repository) for databases and knowledge-based software. Repository can be called a register of software products, which has a search facility, verification, tracking of changes and additions, with access to all the resources of the register using the unified command means, in other words, the repository directories.

## II. SOFTWARE REPOSITORIES IN THE WORLD

Here are some examples of repositories with software products that exist in different countries:

- Venezuela, Repositorio Nacional de Aplicaciones (RNA) [1]. The RNA seeks to be a collaborative space of reference, where applications tools and IT projects, that are developed under free software and open standards of value, which are of interest to the Public Administration and organized communities, are promoted. The RNA has a wide range of benefits oriented to: downloading, publishing and collaborative development of applications, monitoring of projects, provision of centralized access to applications available, and encouraging of collective management of knowledge.

- In the European Union the most known project is Open Source Observatory [2] - a community for exchanging information, experiences and best practices around open source solutions for use in public administrations. It helps to find open source software made available by other public administrations, and solves issues related to development.
- GitHub [3] is a very large code host with over 31 million repositories. Every repository comes with the same powerful tools. These tools are open to the community for public projects and secure for private projects.
- SourceForge [4] is one of the main resources for open source software development and distribution. Developers on SourceForge create powerful software in over 430,000 projects.
- Savannah [5] is the software forge for people committed to free software. It hosts free projects that run on free operating systems and without any proprietary software dependencies. Its service runs with 100% free software, including itself. Savannah aims to be a central point for development, maintenance and distribution of official GNU software. In addition, for projects that support free software but are not part of GNU, it provides [savannah.nongnu.org](http://savannah.nongnu.org).
- NASA Open Source Software [6] - NASA conducts research and development in software and software technology as an essential response to the needs of NASA missions. Under the NASA Software Release policy, NASA has several options for the release of NASA developed software technologies. These options now include Open Source software release. The motivations for NASA to distribute software codes open source are to increase NASA software quality via community peer review.

## III. FOUNDATION OF ALGORITHMS AND PROGRAMS

The most significant among these resources in Russia is the Foundation of Algorithms and Programs of the SB RAS (FAP SB RAS) [7], which carries out the registration, cataloging programs and databases developed by scientists - with scientific, technical, organizational and educational purposes. FAP SB RAS repository compares favorably with the fact that it not merely registers programs and databases, but also provides them information support, makes available the catalog of registered programs and

databases for any Internet user. FAP SB RAS information system (<http://fap.sbras.ru>) includes the basic subsystems, services and integrated in the specialized subsystem problem.

The basic services of FAP SB RAS information system are administration services (management of users, groups of users and their access rights, authorization and authentication of users, news subsystem, the electronic documents management service, the search subsystem).

The specialized subsystem integrated into FAP information system is the subsystem of information support of the Foundation activity, providing assistance for the process of the registration of software and databases in the Foundation.

The main goals of FAP SB RAS activity are:

- Organization of the registration process, cataloging and promotion of software and databases developed in scientific institutes and other applicant organizations.
- Creation of the centers of competence for technical and consulting support of the most significant knowledge-based software and applications.
- Creating the system of coordination and cooperation in order to ensure competitiveness of free and open source scientific software.

Any registered user may submit application for registration of program or database to the Foundation. Currently, all software and databases are included in the Foundation with aim of information support - the catalog includes information on the software, including contact data of the developers. Access to information about all registered software is free.

The members of the Coordinating Committee (the expert group on the corresponding direction) carry out an examination of quality of the software and databases. They decide on the inclusion of the software in the Foundation Directory. Topics of the registered software and databases are very diverse: simulation systems, bioinformatics, molecular biology, oil chemistry, seismic data analysis, modeling of processes in the atmosphere, parallel computing, educational software and much more. Among the most significant software registered in the catalog of FAP SB RAS, are the following:

- The RuSat (Rapid Unified Satellite Aerodynamic Tool) [8] is the software system for computation of spacecraft aerodynamic characteristics in free-molecular (altitudes higher than 200 km) and transitional (altitudes 50-200 km) regimes. Its architecture is designed to provide integrated automation of computational process. The results of numerical simulation (shown in Figure 1) are used in spacecraft design process, during spacecraft operation, for analysis of environmental effects after unsuccessful launch

or abnormal reentry. Developed at ITAM SB RAS, RuSat has incorporated well-tried and proven solutions from long experience of creation and supporting of such systems. RuSat software system is currently used by some of spacecraft engineering organizations.

- UDG-generator [9] – this software provide the new method that can speedup simulation of wireless sensor networks or ad hoc networks. Performance improvement has been achieved by fast generating of pseudo-random UDG graphs with prescribed properties. Numerical results (shown in Figure 2) demonstrate that the proposed method achieves an essential computational cost reduction in comparison with the standard approach.
- The WinALT [10] is a simulation system of fine-grain algorithms and structures. The graphic subsystem (shown in Figure 3) along with its usual function such as visual representation of source, intermediate and resulting data in a model, iconic view of tool and services, multiwindow document interface implements a number of specific functions. Among such functions the construction of graphic images for commands and the visualization of their application can be listed. The language subsystem supplies a user with the set of tools for construction of the textual part of model: the statements of a structured programming language like Pascal, the means for creation of libraries and finally the most important ones, the tools for concise representation of distributed in space parallel computations.

There are some completed software products among the registered designs, which now can be used to solve actual problems. At the demonstration site of the Foundation [11] can be seen the work of some of those programs - for example, GALA-2.0 - a package for solving linear algebra with guaranteed accuracy estimate.

In the directory of informational passports you can find detailed information on the appointment of software and databases, their functionality, creation tools, etc. Thus, in addition to the catalogization of software, Foundation performs another function - popularization of software, provide information to potential users.

#### IV. CONCLUSION

The development of similar storage facilities for high-tech and knowledge-based software and databases could be the missing link between the science and the applications, this problem is often discussed in recent times. The competence centers in the individual areas of researches can be created on the basis of thematic repositories to support the development of high-tech software, demonstration of its work, customer support [12].

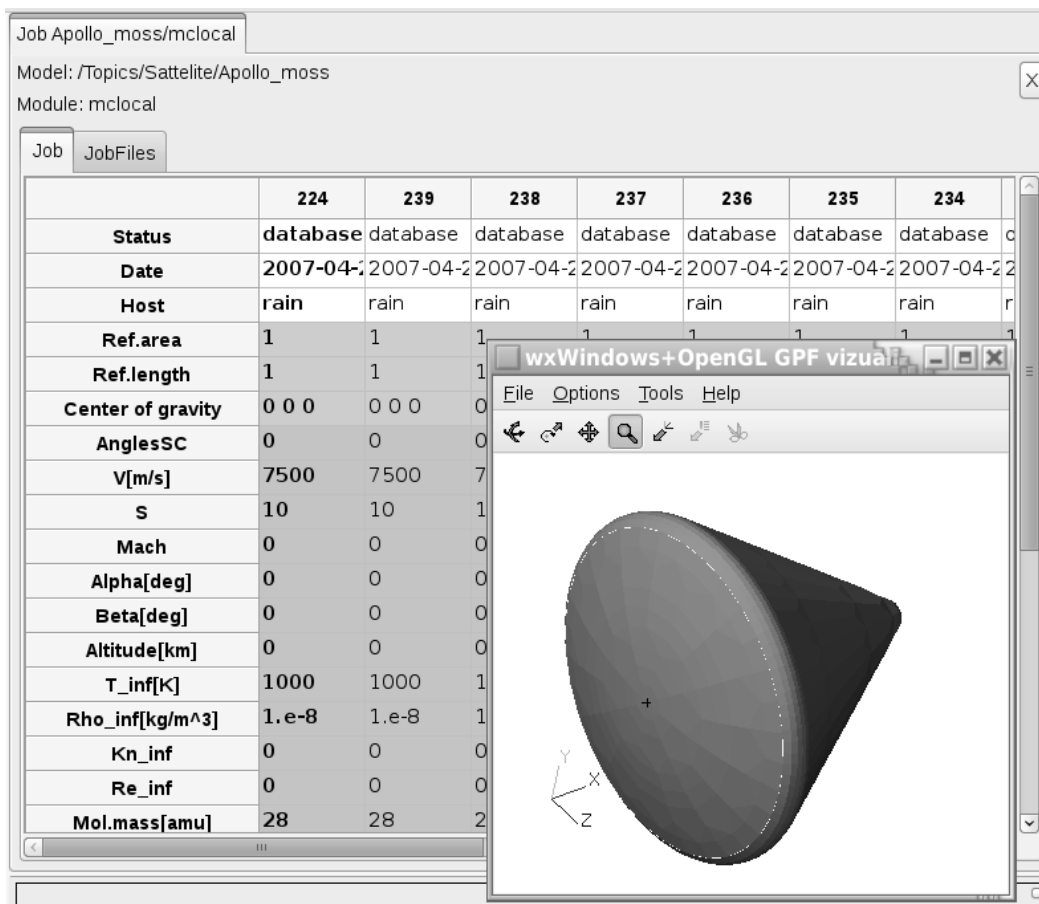


Fig. 1. The RuSat (Rapid Unified Satellite Aerodynamic Tool) graphic user interface

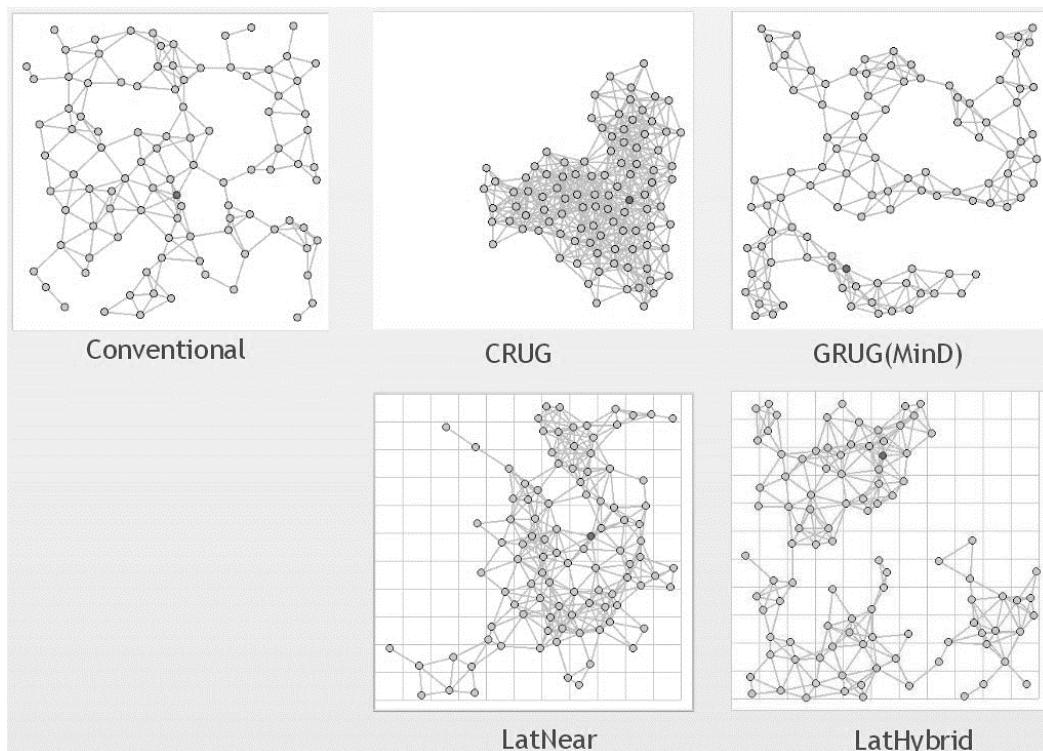


Fig. 2. The comparative analysis of the generator work results (generation of pseudo-random UDG graphs with prescribed properties)

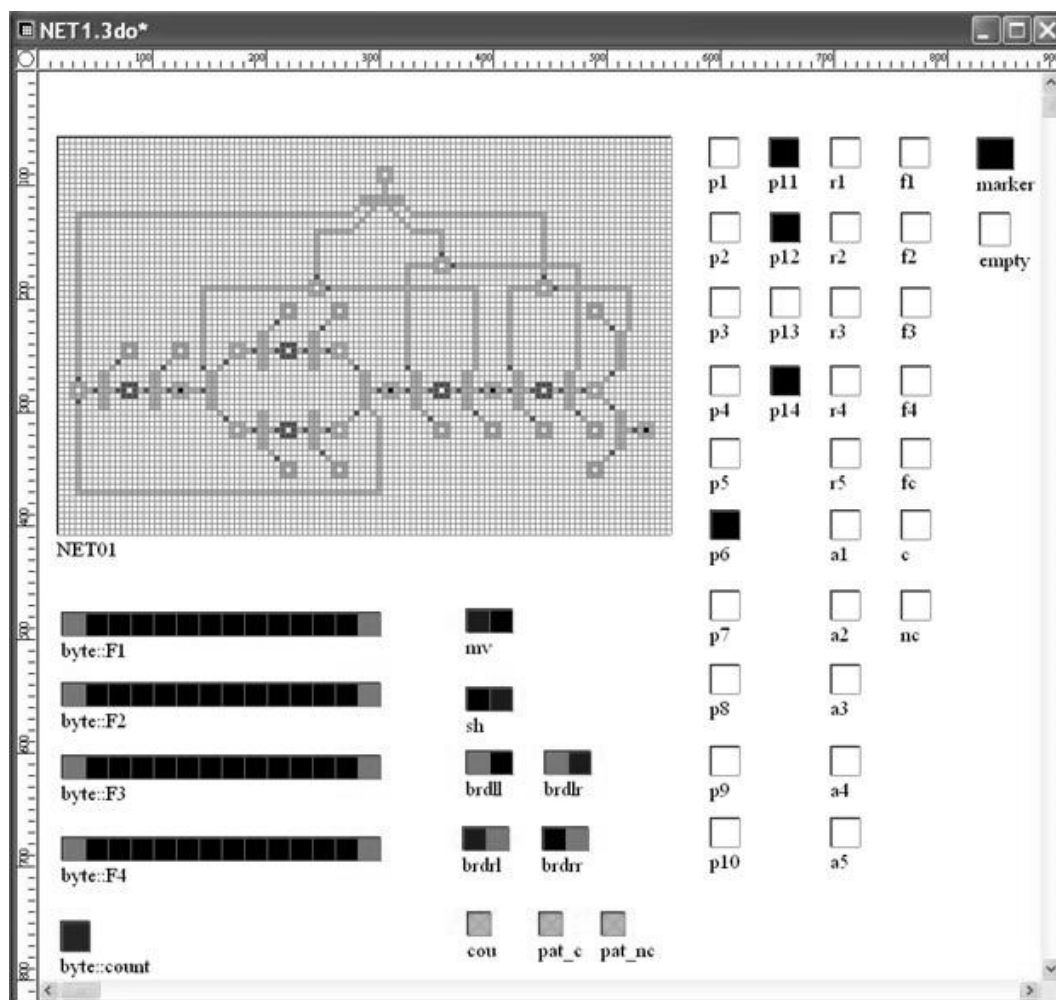


Fig. 3. The WinALT graphic subsystem

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- [3] GitHub - <https://github.com>
- [4] SourceForge - <https://sourceforge.net>
- [5] Savannah - <http://savannah.gnu.org>
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