Ailamazyan Program Systems Institute of the Russian Academy of Sciences

Ailamazyan Program Systems Institute of the Russian Academy of Sciences (Ailamazyan PSI RAS) is one of the leaders of Russian science in the field of modern information technologies.

The Institute was established in 1984 as a branch of the Institute for Cybernetics Problems of the Academy of Sciences of the USSR according to the decree of the government of the USSR aimed at development of computer engineering and informatics in the country. In 1986 it was reorganized into the Program Systems Institute of RAS of the USSR. Today PSI RAS is notable for its acknowledged achievements in the field of artificial intelligence, high-end computing (supercomputers), technologies for building regional telecommunication networks, distributed information systems.

Ailamazyan Program Systems Institute of RAS includes five research centers which employ 300 researchers and developers, among them one Academician (Full Member of RAS), one Corresponding Member of RAS, 18 Doctors of Sciences, 24 PhDs. The major part of the PSI RAS staff is young talent and innovative people. Young specialists are, for the most part, Ailamazyan Pereslavl University graduates.

The Program Systems Institute initiated establishment of a scientific-educational center on its own base that is unique for Russia, including:

- Ailamazyanl International Children's Computer Center;
- Ailamazyan University of Pereslavl — the first university in a small town of Russia,— was founded in 1993 by Ailamazyan Program Systems Institute of RAS.

Research Center for Multiprocessor Systems

- Supercomputer and software for multiprocessors.
- Functional programming, super-compilation and meta-computation theory, methods of their application in practical programming. Technologies for regional computer networking.

➲ *http://skif.pereslavl.ru/psi-info/rcms/index.en.html*

Artificial Intelligence Research Center

- Methods for intellectual systems to represent and acquire knowledge. Methods for semantic search and analysis of semi-structured information. Dynamic intelligent systems. Software tools to build dynamic systems using expert and empirical knowledge. Methods of intelligent control over complex systems behavior in a dynamic environment. Software tools for managing complex movements and procuring secure convergence and concatenation of complex technical objects. Bit-parallel algorithms and computational structures.

➲ *http://skif.pereslavl.ru/psi-info/airec/index.en.html*

Medical Informatics Research Center

- Information technologies of patient care and diagnostics support. Modeling of activity of patient care and diagnostic institutions. Conceptual models of a standard electronic medical record using specific methods of representing application domain. Conceptual models of medical information visualization. Implementation of the standard INTERIN medical information system for a large health organization.

➲ *http://skif.pereslavl.ru/psi-info/interin/index.en.html*

System Analysis Research Center

- Mathematical models and optimal processes in systems consisting of a great number of individually uncontrolled elements (in macrosystems). Study of extreme performance of thermodynamic and microeconomic systems in the category of finite-time processes. Study of convolution equations in the complex domain and of convexity of sets in the direction. Differential invariants construction for linear differential equations and nonlinear 2d-order and 3d-order equations.

➲ *http://skif.pereslavl.ru/psi-info/sarc/index.en.html*

Ailamazyan Program Systems Institute of the Russian Academy of Sciences

Control Processes Research Center

❍ Extension principle in control theory. ❍ Algorithms and software tools for modeling and control. ❍ Hybrid control systems. ❍ Geometric control theory. ❍ Mathematical methods of fluctuation control. ❍ Optimization of aircraft manoeuvres. ❍ System analysis of regional development strategies. ❍ Innovative processes control.

➲ *http://skif.pereslavl.ru/psi-info/cprc/index.en.html*

Applied achievements

The INTERIN PROMIS is an integrated distributed information system for medical institutions. It is an integrated information and functional environment unifying elements of different medical information system categories. The system provides information support for all divisions of a medical institution from documents circulation and fiscal accounting to clinical records about a patient, integration with medical equipment and decision-making support.

SKIF and SKIF-GRID projects of the United State of Russia and Belarus. They represent series of high-performance computing systems, software (including T-system, software for supercomputers realizing the concept of "automatic dynamic program parallelization") and application systems for them.

20 installations of SKIF supercomputers have been made, 6 among them appeared in the Top500 list of supercomputers. The most important current project is development of the SKIF supercomputer series 4 – SKIF-Aurora. The project is conducted by an R&D alliance of Eurotech company, Ailamazyan PSI RAS, RSC SKIF company. The Ailamazyan PSI RAS contribution is development of the following key technologies and subsystems:

❍MPI 2.0 support for original interconnect (60 Gb/s) with 3D torus topology
❍Hybrid computing — combining standard i86-64 CPUs and FPGA-based accelerator
❍Sensor and management network — SKIF-ServNet
❍Monitoring and management system — SKIF-Mon

On the left: module and rack of SKIF-Aurora 4/N (24 Tflops per rack).
On the center: SKIF-Aurora 4/W (40 Tflops per rack)
On the right: SKIF-Aurora@SUSU

Applied Intelligent Systems

❍**ISIDA-T** — intelligent system for data retrieval and their text-based analysis;
❍**ACTIS** — automatic text information classification system;
❍**MIRACLE** — tools for construction of intelligent dynamic systems;
❍**SND** — continuous diagnostics system for diesel equipment using Artificial Intelligence methods.

System of Telecommunications in Pereslavl-Zalessky (ST Botik)

The system provides affordable high-speed connection to the Internet for the enterprises, institutions and citizens of the town (1000 Mbit/sec on the backbone and 10 to 100 Mbit/sec at the subscriber's end). More than 2200 subscribers (organizations and persons), over 5000 computers (the population of Pereslavl-Zalessky is 46 thousand people) have been connected up, the network area is 20x20 km. Suggested standard engineering solutions of ST Botik for building economically efficient urban telecommunications systems for science and education have gone through a long period of exploitation in the telecommunications system of Pereslavl region (ST Botik), and demonstrated high reliability, excellent characteristics at the lowest possible costs.

Engineering solutions of ST Botik for building efficient urban computer networks have been introduced in many regions of Russia and CIS countries (www.samal.kz —A lmaty, Kazakhstan; www.urbannet.ru — Moscow; www.aviel.ru — Ramenskoye district, Moscow, and others).

Director of the Ailamazyan PSI RAS
Sergey M. Abramov
Doctor of Theoretical Computer Sciences,
Corresponding Member of the Russian Academy of Sciences

Ailamazyan Program Systems Institute of the RAS,
Pereslavl-Zalessky, Yaroslavl Region, Russia, 152021
Tel/Fax: +7 (48535) 98064 E-mail: psi@botik.ru
Web-site: http://skif.pereslavl.ru/psi-info/index.en.html