

INédit



The Newsletter of the French National Institute for Research in Computer Science and Control

NEW DYNAMISM FOR RESEARCH

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Engineering and Scientific
Computing: New Trends

i **INRIA Rhône-Alpes, one of the institute's five units, acts as a cross-roads between scientists and end-users. By setting up on a new site, it has taken on a new surge of energy after three years of existence.**

INRIA Rhône-Alpes inaugurates its new building at the beginning of this year. 170 people work at Montbonnot, with others at Gières, Saint-Martin-d'Hères and Lyon. 300 people from various organizations (INRIA, CNRS, Imag, ENSL, INPG, and Fourier, Mendès-France and Savoy Universities) contribute to the activity of this research unit. Their work centres around three poles: communicating informatics, intelligent machines, and modelling and scientific computing.

The unit associates its regional academic partners with most of its activities. The industrial partners such as Xerox, Bull,

Schneider Electric, Hewlett Packard and SGS Thomson Microelectronics also collaborate on a number of their research projects. In the wing of the building devoted to communicating informatics, the Opera project, for example, dreams up tools for structured electronic documents, including multimedia documents. To this end, its members participate in the works of the W3 Consortium, which includes 156 organizations and enterprises. The Sherpa project applied its skills in knowledge databases to help companies to build their "corporate memory" using the Web technology.

In the second wing, researchers are interested

in robotics, problems of 3D visualization, bio-mechanics, virtual reality, etc. The area of transportation is directly concerned. Active within the Praxitèle consortium, the Sharp project participates in the development of "individual public transportation". It tackles the automation of several driving functions: the beginnings of an automatic pilot! Researchers are also involved in human robotics. Realization of walking robots, applications to sports, especially for mountain activities (collaboration with Salomon...), are on the menu.

Their team spirit is demonstrated in the areas of modelling and scientific computing. Modelling complex systems should allow to master critical industrial systems. This modelling calls upon ever-increasing powers of computing and therefore the use of parallelism (cf. page 3). Modelling, robotics, and systems: these technologies constantly open new horizons. INRIA Rhône-Alpes scientists will be part of this exciting adventure. ■

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CNRS: Centre national de la recherche scientifique
ENSL: Ecole normale supérieure de Lyon
Imag: Institut d'informatique et de mathématiques appliquées de Grenoble
INPG: Institut national polytechnique de Grenoble



► Network Security

Since this last November, Bull has been distributing SafeWeb. This product was developed by SafeTech, a mixed Bull-INRIA team. It guarantees the permanent access to a Web server. In case of failure, SafeWeb automatically passes the control to a second machine, in a transparent manner for the user. SafeTech's technology is based on specialized software modules. Each one fills a precise function in terms of fault tolerance. New products will soon be available for the supervision of networks, NFS servers or DBMS. ■

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ELECTRONIC PUBLISHING

► Amaya for the Web

Amaya is an authoring environment for the Web. In addition to its browser function, it allows for editing in WYSIWYG mode, and remote publishing. It uses the latest recommendations of the W3 Consortium (W3C): HTML 3.2 and CSS-1 style sheets. The most recent version of the publisher, which has an improved interface, includes a spelling checker. The sources of this software are available in a complete version for UNIX. The Windows version will be available sometime in 1997. ■

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ROBOTICS

► Underwater Intelligence

'Union' aims to increase the autonomy of underwater remotely operated vehicles. Problems of dynamic modelling and control for the stabilization of the vehicle which is endowed with a manipulator arm, utilization of sensors information for the inspection of pipelines in offshore industry, programming, etc. have been treated. Results from simulations and on-site experiments have validated theoretical developments. Financed by the European programme Esprit, 'Union' brings together seven Spanish, English, German and French research groups. A video and a research report presenting the results of the project are available. ■

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URBAN TRANSPORTATION

► Cars - at your Service

Praxi is born. Developed by INRIA, in partnership with the RATP (Paris Regional Transportation Authority), EDF, and Andruet SA, Praxi is the incarnation of a new concept: individual public transportation. The ambition of this mini-vehicle is to be used in pedestrian districts to improve mobility and to allow the extension of these spaces. The originality of the project is that INRIA has developed tools to simulate the management of the fleet. A single control centre can manage the return of all empty vehicles in real time. Consequence: vehicles can be abandoned at any point and can be made available at any other point. Let's be off! ■

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A DOCTOR IN-HOUSE

INTERVIEW

Mohamed Zait works in the United States. He belongs to the team that develops the Oracle database management



Mohamed Zait: "The doctorate: methodology, creativity and specialization."

system (DBMS). His work concerns more precisely the optimizing and parallelizing layers of the system, a subject directly related to his thesis which he defended in 1994, on "The optimization of relational requests for parallel execution". His thesis director was Patrick Valduriez, head of the Rodin research project. Each year, nearly 600 students prepare their theses within the context of an INRIA research project.

INédit : What have you been doing since you finished your thesis?

Mohamed Zait: Three months after I defended it, I left for the US to do post-doctoral studies for a year at IBM's Almaden (California) research centre. I worked in the group that develops the data mining technology. At the end of the post-doc, I was recruited by this centre to work in a new group involved in the development of applications around this technology. Six months later, I moved on to work for Oracle, where I have been since April 1996. There, I work on the development of the Oracle DBMS, and more precisely on the optimization and parallelization layers of the system.

INédit : In what way did your doctorate offer an advantage to the enterprise which hired you?

M.Z.: Contrary to French enterprises, North American companies recruit largely PhDs for

the technologies and product development that are at the heart of their corporate strategy. Research and innovation are essential to remaining in a very dynamic and competitive market. The only way to last is to move forward, to innovate. In this sense, the doctorate is an advantage since it demonstrates methodology, creativity, specialization, etc.

INédit : In the beginning of your thesis, did you wish to work in research or in enterprise?

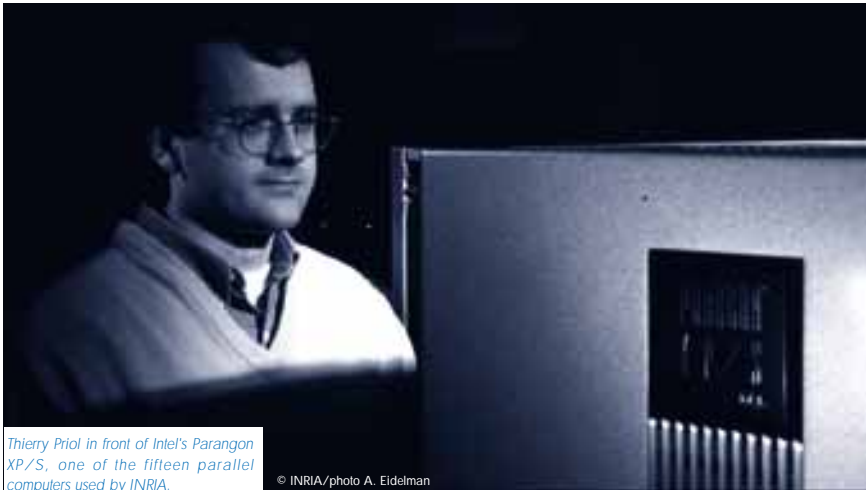
M.Z.: I had no preference. I thought – and I remain convinced – that France offered few possibilities for PhD graduates. On the other hand, the American market shows a strong demand which is why I chose to do a post-doc in the US after my thesis. ■

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PARALLELISM: FASTER AND STRONGER,

BY THIERRY PRIOL

Several areas of application can benefit from the power of parallel computing (chemistry, databases, multimedia...). INRIA leads important works in the area of parallelism. The objective is to accomplish ever more complex operations in a minimum of time.



Thierry Priol in front of Intel's Paragon XP/S, one of the fifteen parallel computers used by INRIA.

© INRIA/photo A. Eidelman

From the simulation of flows around an aeroplane to molecular modelling, the need for scientific computing is constantly increasing. Complexity and computing time are the two major challenges facing scientists as well as manufacturers. To deal with this, it is necessary to resort to parallelism. A problem that required a day of computing can now be treated in an hour.

INRIA is one of the main European research centres in the area of parallel computing. Since 1987, nearly forty INRIA research projects include parallelism: design of parallel architectures, operating systems, compilation, tools for parallel program development and performance evaluation, and a large spectrum of applications (human genome mapping, image processing and synthesis...).

INRIA's activity in the field of parallelism is measured by the number and the diversity of machines made available to researchers of the institute, but also to its partners. Its fifteenth and most recent parallel computer, an experimental Cenju-3, has been obtained by a collaboration agreement with Nec. Three teams will lead new research in the area of the design of programming environments. The Caps project is devoted to the creation and realization of a mechanism for sharing virtual memory, allowing the distribution of the memory to be hidden. This will make the programming of the computer simpler. The Pampa research project, specializing in HPF (High Performance Fortran)

compilers, will evaluate, in collaboration with Caps, the quality of the code produced by the compiler developed by Nec for the Cenju-3. Finally, several codes will be integrated into the FEEL programming environment, developed by Nec for applications using the technique of finite elements. These codes (generation of 2D meshing and domains decomposition) have been developed by researchers in the Gamma project.

INRIA is also increasingly present in European projects involving parallel processing. In 1996, its research projects include seven contracts financed in the framework of the HPCN (High Performance Computing and Networking) Programme. The institute participates along with Simulog in a technology transfer node (TTN ProHPC), the objective of which is to encourage industry to exploit HPCN technology.

Finally, INRIA is member of ORAP (*Organisation associative du parallélisme*) which aims to promote coherent projects on an international and national level. It also belongs to Rapid, a network of research centres. Its goal is to promote the development of parallel applications in industry. To make processors work together, and help organizations and enterprises collaborate: who wouldn't jump at going parallel? ■

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INRIA IN BRIEF

► NEW PROJECT

INRIA ROCQUENCOURT

•Loco: Constraint Logic Programming (joint project with the University of Orleans)

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► NOMINATIONS

As of January 1, 1997, the management of the institute consists of four people. Alongside **Bernard Larrourou**, chairman and managing director, **Laurent Kott** has been appointed general delegate for technology transfer, **Gilles Kahn**, chief scientist and **Hervé Mathieu** deputy managing director. A graduate of the École centrale de Paris, H. Mathieu joined INRIA's management team last November. For the past five years, he has been director of research and doctoral studies at the École nationale des ponts et chaussées (Engineering school). A new management for development and relations with industry is now in place. **L. Kott** is the interim director and **Gérard Giraudon** is the deputy director.

► DISTINCTION

François Bertault has received an honourable mention in two of the categories of the contest held in connection with the Graph Drawing 1996 conference at Berkeley. F. Bertault is a doctoral student in the Eureka project and grant-holder at the Charles Hermite Centre. The drawings that earned him this distinction were realized using the Cgraph program that he developed.

► RESEARCH GROUPS

The 'Programming' research group (GDR *Programmation*) held its annual meeting in Orleans last November. The GDR of CNRS (French National Scientific Research Centre) includes teams working on various themes. The GDR *Programmation* is structured around six poles related to programming. Its activity goes from the design and implantation of languages to the certification of programs. INRIA projects involved in this GDR include Coq, Cristal, Croap, Eureka, Lande and Loco.

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ENGINEERING AND SCIENTIFIC COMPUTING: NEW TRENDS

telecommunications, transportation, energy, environment, space... What major evolutions await in scientific computing and its applications? The last Eccomas conference allowed 700 participants from 43 countries to respond to this question.

Several sectors have seen increased activity, such as: multiphase or free surface flows; the modelling of complex processes in material science; and the development of mathematical models and tools to describe multiple scale phenomena. In addition, the coupling between mathematical modelling and optimization and control processes is becoming generalized. Added to the improvement in modelling and optimization tools, this new approach allows researchers to go beyond small laboratory-scale models for full-scale prototypes. In terms of the future, it appears that competitiveness will depend on the robustness of the future algorithms (decision algorithms), that allow the management of increasingly complex systems. Finally, studies on solvers – already very present in industry – and the development of mathematical models remain major activities.

Mechanical sciences are still a preferential area for the application of scientific computing. However, it is beginning to spread to new sectors: material science, chemistry, biology, immunology, image processing, etc. Watch this space! ■

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BOOK

EPIPOLAR GEOMETRY IN STEREO, MOTION AND OBJECT RECOGNITION:

A UNIFIED APPROACH

Gang Xu et Zhengyou Zhang*

Kluwer Academic Publishers, 1996, 313 pages

The objective of this book is to resolve concrete problems in vision by allowing readers to adapt results to their own problems. It offers a complete approach to the epipolar geometry of cameras, taking into account perspective and affine projection models. It presents robust techniques for the determination of fundamental matrices from images and describes the utilization of epipolar equations in a large spectrum of problems in computer vision (non-calibrated stereoscopy, recognition and location of objects, etc.). ■

*Zhengyou Zhang is a researcher at INRIA Sophia Antipolis (Robotvis project).

CONFERENCE

FRACTALS IN ENGINEERING

This conference will be held in Arcachon (France), June 25-27, 1997. Its goal is to bring together researchers working in all areas of fractal analysis. The scope encompasses recent theoretical advances as well as industrial applications. The first and second symposia were most successful in stimulating relations between the academic and private sectors. The third one should renew this experience. Two thematic sessions are scheduled per day. Each will be introduced by an invited lecturer who has a didactic approach allowing a formal introduction for non-specialists. Several 25-minute periods of contributed talks will follow. A poster session will also be organized. ■

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INRIA ORGANIZES

CONFERENCES

► Scientific Computing for the 21st Century

Tours (France)
May 5-7, 1997
Tel.: +33 1 39 63 50 53
CS21-Roland@inria.fr

► Tableaux '97

Analytic Tableaux and Related Methods
Pont-à-Mousson (France)
May 13-16, 1997
Tel.: +33 3 83 59 20 15
lab97@loria.fr

► JICAA '97

Journées ingénierie des connaissances et
apprentissage automatique
Roscoff (France)
May 20-22, 1997
Tel.: +33 2 99 84 72 51
Elisabeth.Lebret@inria.fr

► Tools '97

Modelling Techniques and Tools for
Computer Performance Evaluation
Saint-Malo (France)
June 2-6, 1997
Tel.: +33 2 99 84 72 51
Elisabeth.Lebret@inria.fr

► PNPM '97

Petri Nets and Performance Models
Saint-Malo (France)
June 2-6, 1997
Tel.: +33 2 99 84 72 51
Elisabeth.Lebret@inria.fr

► ACM Symposium

Computational Geometry
Nice (France)
June 4-6, 1997
Tel.: +33 4 93 65 78 64
Monique.Simonetti@inria.fr

► PEPM '97

ACM SIGPLAN Conference on Partial
Evaluation and Semantics-Based Program
Manipulation
Amsterdam (Netherlands)
June 12-13, 1997
Tel.: +33 2 99 84 72 51
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► Fractals in Engineering

Arcachon (France)
June 25-27, 1997
Tel.: +33 1 39 63 50 53
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All the tutorials and conferences
are on the Web site:
[http://www.inria.fr/
Colloques/cours-col-eng.html](http://www.inria.fr/Colloques/cours-col-eng.html)

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