

CWI
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NEWS



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EDITORIAL

RESEARCH PROJECTS

The Assisting Computer - Research for a New Generation of Office Systems

GMD - In the office of tomorrow, the computer is to be used as a 'personal assisting machine' for people. Today's personal computers do not yet fulfill what their name promises. A really personal support should consider the specific task domain and the work style of the individual. What users require are 'Assisting Computers (AC)' which are adaptable to their needs and habits.

Currently GMD is planning its activities for the 90s. The Assisting Computer will certainly be one of the key projects to be conducted. The vision is a completely new generation of information technology based office systems whose service provision is adapted to the abilities and properties characterizing good human assistants without claiming to replace them.

The GMD experts design the Assisting Computer for knowledge workers, e.g. planners, managers, engineers or researchers, and to do so they try to learn as much as possible about the way in which human assistants provide their services.

The immediate support of creative activities by information technology involves many problems to be tackled by computer scientists. Research into many services to be provided by such support systems is already under way but their implementation is still far from being realized. Many performance and quality characteristics must still be defined precisely and developed.

Furthermore, with increasing independence of the computer in task accomplishment, research should also be increasingly concerned with the question for the limits of such a development. In any case, the responsibility for tasks delegated to the computer should lie with people. How to achieve this is to be investigated. In any case, the comparison with the human assistant should be applicable: in the end, control and responsibility lie with the superior and not with the assistant.

It is the aim of the Assisting Computer development to design an ensemble of support systems to be handled by the user in a uniform or at least similar way. The GMD experts divided the machine assistants roughly into three groups:

- the universal office assistant fulfilling general office functions,
- the domain assistant which is specifically tailored to the respective occupational group.
- the communication assistant supporting the knowledge worker in communicating with other persons within or outside the local organization.

The project will focus on distributed problem solving, automated planning and configuring, man-machine communication, knowledge representation and knowledge acquisition. Completely new computer support services will result from the first two areas; the activities in man-machine communication shall advance the quality of cooperative interfaces; the basis of the system will be new findings in knowledge representation and acquisition without which the overall goals of the project cannot be realized.

If we consider the volume of the tasks to be accomplished, it is not surprising that it is a long-term project with a time horizon of more than ten years.

INRIA - GMD - ISO LISP

INRIA and GMD participate to the project European Lisp System, which has been accepted as an Eureka Project at the Eureka Conference in Madrid on the 15th September 1987. The other participant is ILOG, the subsidiary of INRIA and CRIL, a French company specialized in Artificial Intelligence.

The project arose from the realization that :

- there is at the present time no strong European convergence of Lisp implementation ;
- the European market is thus much dependent of the American trends and forces ;
- there is no evidence that the present Common Lisp family of implementations ensures efficiency ;

The objectives within the context of this project are to create Lisp environment conforming to the ISO standard and offering the following features :

- efficiency of execution in interpreted and compiled modes ;
- total portability of both the language and the applications written with it ;
- simultaneous availability on most frequently used scientific computers by Lisps all over the world ;
- integration of high-level concepts (high-level error trapping, object oriented

mechanisms, ...) at the level of the kernel of the system ;

- extensibility (which was one of LE-LISP strong point) ;
- access to the advanced environment functions of modern scientific workstations.
- self-explainability and integrated tutorial package.

In order to achieve those results, the strategy of the project will be as follows :

- use as starting point, a kernel written in Lisp itself, augmented with the instruction set of a virtual machine taking into account the desired kernel-level features wanted. A Lisp compiler will be used to translate the kernel Lisp code into the sole language of the virtual machine.
- Transport the virtual machine and the kernel on the development machines of the partners, thus ensuring at an early stage of the project the portability of the final system and providing a common basis for further developments ;
- develop the High-Level Lisp environment above mentioned;
- provide ad-hoc transport tools as well as a validation kit ;
- transport the whole system on a wide range of scientific computers, thus ensuring an immediate availability of the system for most Lisp users.

A special attention will be paid to "ISO-LISP" compatibility issues and efficiency considerations during all the project.

TeleTrust - Trustworthy Electronic Communication

GMD - The aim of the GMD project TeleTrust is the trust-

worthy electronic communication. In cooperation with the software house mbp, Dortmund, GMD succeeded in improving the security of teletex communication. The outcome of the project is a product called TELETEX-CRYPT by mbp. It is easy to install on available personal computers and provides the following features:

- It enables the user to put an electronic signature to teletex documents thus establishing the authorship and intactness of the document beyond doubt.

- Teletex documents can be encrypted to secure the confidentiality required for the communication of sensitive data.

The teletex service is specifically tailored to the requirements of electronic business correspondence. Its characteristics are rapid data communication, reliable transmission, extensive character set and original layout. TeleTrust will add further characteristics, i.e. functions that are required for the trustworthy electronic communication.

TeleTrust helps avoid the following risks:

1. Electronic documents can be faked or distorted. Without the sender being aware of it, the recipient can modify an electronic letter after receipt and pretend that it is the received original. Even the sender him/herself can modify his/her copy and pretend that it is the very version sent to the recipient.
2. The authorship can be denied. The sender can pretend that s/he has never sent a letter. Somebody else must have done it using the name of the pretended sender. In this way, the sender could try to cancel a concluded contract (e.g. an order).

3. The authorship can be faked. The letter can show the signature of a third party not being aware of the letter. Thus, the actual sender wears the mask of somebody s/he pretends to be.

4. Data can be spied out. During the transport from the sender to the recipient, information can be accessed and copied by unauthorized persons. The term 'transport' refers not only to the transmission line, but also to the involved data terminal and transfer equipment.

The TeleTrust approach is based on the use of a public-key cryptosystem, the RSA algorithms named after the mathematicians Rivest, Shamir and Adleman. Within the cooperation with mbp, it was the task of GMD to make the mentioned cryptosystem practicable.

BABYLON - the Tool System for Expert Systems

GMD - Computer Scientists of the GMD Institute for Applied Information Technology have developed BABYLON, the tool system for expert systems. Currently a portation of the system to personal computers is under way. It will allow a universal use of the BABYLON method base. The expert system for investment counselling was presented as first large expert system on the IBM AT version of BABYLON. The IBM AT version is the first of a number of BABYLON portations to personal computers and workstations which show identical program code.

Many tools to be used for constructing expert systems provide a fixed set of formalisms and cannot be adapted to user requirements thus revealing their restrictions very soon: the tools cannot be tailored to the problem. Today most expert systems tools are developed on special-purpose

computers and have to be used on those computers although often not compatible with the user's current computing environment. Available software cannot be integrated and the tools and systems developed with their aid are thus not accepted.

What the user needs, is a tool which already contains powerful formalisms, but which is also easily extensible. Only such a tool will allow an optimum adaptation of the system to user requirements. The tool should be portable to other computers without requiring a reimplementation. This would allow the development of an expert system in an efficient environment and secure the use of the developed system on the desired hardware without requiring any modifications.

BABYLON is a hybrid tool system both for the design and the use of expert systems. It is a toolbox for configuring application-specific tools consisting of object-oriented Common-Lisp modules.

BABYLON provides full functionality and identical code in the interpreters on Symbolics, TI Explorer, Macintosh SE & II, IBM AT, Cadmus, EMS 58xx, MX 2 & 300 and VAX. Since three years, BABYLON has been evaluated and continuously extended for process control.

EXPLORA - a System for the Interpretation of Data

GMD - Experts of many domains often complain about the intransparent abundance of numerical data and tables they are confronted with, not least due to computerization. A help is now provided by a new GMD development: EXPLORA, the prototype of a knowledge-based system for the exploration of figures.

This system tackles a problem knowledge workers of all domains are increasingly faced with. The available numerical data are too extensive and too poorly structured for a quick identification of the substantial information so that they are buried somewhere on the desk. The currently widespread standard program packages providing traditional statistical methods identify only formal structures since they do not consider the context the figures originate from. The new development intends to unbury those numerical data to use the relevant information they hide.

It is the explicit aim of the statistics interpreter EXPLORA to support directly the content- and domain-oriented interpretation of the data by the system. For this purpose, the system should be provided with application-specific knowledge from the domain in question. The relevant context of the real system producing the data is therefore appropriately mapped onto the interpretation system. The terminology of the specific domain, the analysis objects, their properties and especially the goals of data analysis should be modelled in the statistics interpreter.

Systems of this type provide a completely new quality of support. They analyze the data to a greater extent than statistics systems do, they do not replace the human expert, but adapt their services to his/her requirements.

KRITON Supports Knowledge Acquisition for Expert Systems

GMD - The efficient and widespread use of expert systems is considerably restricted by the lack of methods and theories for knowledge acquisition. The Research Group 'Expert Systems' of GMD is currently working on a new

project to solve this problem. The system KRITON, named after an interlocutor of Sokrates, presents the first results of that work.

The most important questions KRITON is to help answer are as follows:

- How to gain knowledge for an expert system?
- How to avoid a subjective interpretation of the knowledge by the knowledge engineer?
- Which methods are suitable for supporting the life cycle of expert systems?
- How to make very large expert systems transparent?

Expert systems, in particular second generation systems, include a model of the expert's problem solving process in addition to the representation of the problem area. This model should not be limited to a superficial comparison of input and output, but should be able to answer questions for the motivation of individual problem solving steps to make the results of the expert systems more credible.

The process of knowledge engineering is therefore concentrated on the modelling of the expert's problem solving process.

The knowledge engineer tries to provide the expert system with the expert's knowledge. Manuals and background literature is analyzed, the expert is interviewed and observed during his/her work.

The knowledge acquisition system KRITON supports the creation of expert systems by automating some of the tasks described above. This leads not only to an increase of efficiency and methodology, but it also

avoids a wrong interpretation of the data by the knowledge engineer since the expert interacts immediately with the system and the knowledge engineers acts only as a mediator between the expert and the acquisition system.

L3 - a New GMD Operating System for the 90s

GMD - Based on advanced concepts, GMD experts have developed a new operating system: L3, a multi-user operating system, will meet the requirements for future-oriented microcomputer operating systems of the 90s.

With L3, GMD presents a unique microcomputer operating system. Operating systems have been gaining in importance since the advent of increasingly powerful microprocessors. The currently available operating systems cannot meet the requirements of advanced hardware. It is actually pure waste to use an operating system which does not fully exploit the hardware, comparable to a racing car going on country roads.

The operating system L3, however, is quite different. It was specifically constructed for one of the most advanced components of a computer: the Intel processor 80386. It uses the full performance of the processor thus turning a personal computer into a machine which is available for several persons simultaneously. Such multi-user systems based on microprocessors will be most popular in the next future. Nevertheless, L3 also allows the integration of available software. Users who have worked to date on the most famous operating system for personal computers, i.e. MS-DOS, can use their software also under L3 though enjoying all advantages of the new system. L3 will meet the operating system requirements for

computers of this size far into the 90s. L3 is a breakthrough to a new era of microcomputers.

SISAL - a Program for Computing Electronic Circuits

GMD - The computing of electronic circuits by mapping real behaviour onto a computer model, the so-called simulation, is steadily gaining in importance. Integrated circuit design would no longer be conceivable without this simulation since design errors have to be avoided as much as possible due to expensive and time-consuming prototype production. Also, inner-circuit measurements are very difficult in the case of integrated circuits.

Simulation is coming to dominate the experimental area more and more in the case of discrete circuits as well since a computer model is easily modifiable and the results are available more rapidly. Therefore, electrical simulation will also gain in importance in the case of non-integrated circuits. This applies, in particular, to the simulation of circuit behaviour in the time domain referred to as transient analysis. One of the main restrictions to a widespread use of the transient analysis is its high demand on computing time which may amount to several hours even for medium-sized circuits.

Based on work on integrated circuit design done in the project E.I.S., GMD has successfully developed and tested the experimental simulator SISAL. It was the aim to develop and test new methods which accelerate the process of the transient analysis on a computer. The basis was a recently developed method allowing a considerably more efficient computation for specific circuit types (MOS circuits). The simulator will be further developed in cooperation with CADLAB, a

joint venture of Nixdorf and the University of Paderborn.

The Program System TOP Reduces Transport Costs by Minimizing the Use of Vehicles

GMD - The Transport Optimization Program TOP developed in GMD is a program system allowing considerable savings in the transport sector. TOP enables the planner to plan routing and use of vehicles from the especially cost-efficient viewpoint of resource minimization. Since each vehicle not required cuts the costs far more considerably than 'saved' kilometres do. In addition, the saved resources can be used for other tasks. TOP is marketed by Lindenberg & Partner AG/Switzerland, a spin off enterprise founded by a GMD staffer and two Swiss partners.

TOP is not only a system for computation, but primarily a planning and decision system considering the application-specific requirements. Its scope of use is extremely large and reaches from the optimization of delivery services with daily changing requirements to the long-term planning of school buses, transport systems for handicapped people and public transportation. TOP is also a valuable aid to investigations into the planning of new traffic systems.

Multigrid for Hermes

CWI - In the summer of 1987, in CWI's Department of Numerical Mathematics, the research project *Multigrid for Hermes* was started. The research project is carried out in the framework of the aerothermo-dynamics programme of Avions Marcel Dassault - Bréguet Aviation.

In the period July 1, 1987 to December 31, 1987 the documentation of the basic multigrid method for the solution of the steady Euler equations, developed earlier in the Department, was finished [1]. A survey on multigrid methods was also published [2]. Further, as proposed, the steady Euler method was extended to a steady full Navier-Stokes method. The extended method was applied with success to some typical Navier-Stokes problems. The extension to full Navier-Stokes had its influence on both the discretization and solution method. For a detailed account of this, we refer to [3,4].

The work done in the period January 1, 1988 to June 30, 1988 was a direct extension of the work in the first half year. Investigated were a further convergence improvement and the extension to hypersonic speeds. For better convergence, the collective point relaxation method was replaced by collective line relaxation. For Euler flow computations, line relaxation appears to lead to a more efficient multigrid technique, whereas for Navier-Stokes it leads to a greater robustness. A detailed account of this is given in [5]. The extension to hypersonics was made for the Euler equations first. As was expected, in hypersonic flow computations Newton iteration, which is what we use, may easily fail. As a remedy, we developed a switched-relaxation-evolution technique. For a detailed account of this technique, we refer to [6].

References

(1) S.P. Spekreijse, *Multigrid Solution of the Steady Euler Equations*

(CWI-Tract 46, Amsterdam, 1988).

(2) P.W. Hemker and G.M. Johnson, in *Frontiers in Applied Mathematics* Vol. 3, edited by S.F. McCormick (SIAM, Philadelphia, 1987).

(3) B. Koren, in *Notes on Numerical Fluid Mechanics*, Vol. xx, edited by R. Jeltsch et al. (Vieweg, Braunschweig, to appear).

(4) B. Koren, in *Notes on Numerical Fluid Mechanics*, Vol. yy, edited by W. Hackbusch (Vieweg, Braunschweig, to appear).

(5) B. Koren, P.M. de Zeeuw, and P.W. Hemker, CWI-note NM-N8803 (1988).

(6) B. Koren, CWI-note NM-N8804 (1988).

Gothic

INRIA - In partnership with BULL S.A., INRIA is working since May 1987 on the project GOTHIC. The aim of the project is the implementation of a 3rd generation system based on the application of the "nested atomic multifunction" concept which generalizes the procedure concept. On the 14th of October 1988, the team conducted by Michel and Jean-Pierre Banatre presented the hardware prototype to a delegation from BULL headed by G. Roucairol, in charge of Research at BULL France. This prototype allows a continuous back-up of a program execution; it is then applied for fault tolerant systems.

JOINT ACTIVITIES

Foundation of the International Computer Science Institute in Berkeley

GMD - In future US and German computer scientists will be able to cooperate within the new International Computer Science Institute (ICSI) founded at the famous University of Berkeley, USA.

This research institute, which was opened officially on September 27, 1988, is to provide an innovative and competitive environment for research activities which will be of benefit to German universities, research institutions and industry.

The Institute shall facilitate:

- the cooperation of top scientists of the two countries,
- an extensive information transfer and the use of research and development results obtained in the United States;
- the return of German top scientists working in the United States;
- the advanced education of German junior scientists.

The location at the University of Berkeley allows a close cooperation with the University's Computer Science Department which will certainly stimulate to research activities yielding outstanding results and accelerate their implementation.

In the next future, the research activities of ICSI will concentrate on artificial intelligence and computer theory. It is intended to create the foundations for developing new structures for computer systems consisting of a multitude of processors. Three

teams are to be concerned with this subject. The first team will study the theory, the second team the scientific application to artificial intelligence and the third team will be concerned with the realization of such computer systems of massive parallelism. Further aspects to be investigated are data bases for robotics and very large computer networks.

The research projects are to be funded both by US and German bodies. In the Federal Republic of Germany, a group of sponsors has been established. Together with the Federal Ministry for Research and Technology, this group intends to pay about 6 million marks per year. The members of the group are GMD, Daimler Benz, Bertelsmann, Krupp, Mannesmann and Siemens as well as the President of the German Patent Office, Dr. Erich Häußner.

The GMD Computing Centre is the Central Node of the European Academic and Research Network (EARN)

GMD - A box of desk size located in the GMD computing centre in Bonn handles the major part of the electronic communication between academics of the Federal Republic of Germany and their colleagues all over the world: a medium-scale DP system, i.e. an IBM 4361, is the German central node of the European Academic and Research Network (EARN) and, in future, of the German Research Network (DFN). The German EARN node (DEARN) was moved from the Gesellschaft für Schwerionenforschung mbH (GSI) in Darmstadt to the GMD computing centre in Bonn.

With the installation of the EARN central node, GMD wants to support actively the conversion of the German

EARN to the internationally standardized OSI protocols used in the DFN and the transfer of the users to the DFN. A gateway installed in the DEARN host will convert the OSI standards to the standards applicable in the EARN BITNET.

These networks interconnect more than 2000 DP systems all over the world. More than 600 nodes are installed in Europe, a third of them in the Federal Republic of Germany. There are gateways to every other important network, i.e. interfaces which convert the standards of one network into those of the other network thus allowing a communication between the different networks.

Currently the central node handles about 40 billion information bits or 5 billion alphanumeric characters (bytes) per month, this would be a 200 m stack of written DIN A4 pages. The growth is about 80 % per year. Three fifths of the data volume is national communication, two fifths international communication.

There will be two international lines starting from the DEARN central node in Bonn:

- one to Montpellier in Southern France, from there to the USA (and via BITNET to Japan, Canada, Mexico and Australia), Spain, Portugal, France, Belgium, the Netherlands, Italy, Greece, Turkey, Israel and Ivory Coast;

- one to Geneva (CERN) with connections to Great Britain, Ireland, Austria, Denmark, Sweden, Norway and Finland.

Comett

INRIA - In the framework of the CEE project COMETT, INRIA has been charged by the CEE for the organization of a european version of a course on

"symbolic computation". The first edition of that course was organized by INRIA at Sophia Antipolis.

Esprit 2

INRIA - INRIA will participate :
 • to 18 ESPRIT 2 projects beginning in 1989 ;
 • to 11 Basic Research Actions (9 projects and 2 working groups).

The participation of INRIA has doubled between ESPRIT 1 and this second phase of ESPRIT. The budget will reach 30 mF per year. Half of which is being paid by INRIA.

INTERNATIONAL RELATIONS

Indian Research Minister in GMD

GMD - The Indian Minister for Research and Technology, Kocheril Raman Narayanan, paid a visit to GMD during his information trip through the Federal Republic of Germany. At the invitation of the German Federal Research Minister, Heinz Riesenhuber, Minister Narayanan visited a number of German research institutions to discuss the possibilities of an intensified cooperation between Indian and German researchers.

Friedrich Winkelhage, Member of the Executive Board, gave a brief overview of the scientific programmes of GMD. The presentation focussed on an introduction to the state of the art and objectives of the SUPRENUM project given by Ulrich Trottenberg, one of the heads of the GMD Institute for Foundations of Information Technology. Another subject of the information exchange were the scientific contacts with India which are especially good in the field of supercomputing. A three-years' project of the Indian

Electronics Ministry aiming at the development of a Cray-like parallel computer was also discussed.

From FORTRAN 77 to Fortran 88

GMD - The standardized programming language Fortran is currently undergoing the most radical and extensive change of its life cycle. Fortran experts from all countries, especially the members of the Working Group X3J3 of the American National Standards Institute (ANSI) and the Working Group 5 of the International Organization for Standardization (ISO) elaborated a new draft standard which was published for comment under the title 'Fortran 8x' early in 1988. The final version shall be available as next Fortran standard in 1989. By tradition, the successor of FORTRAN 77 is likely to be called Fortran 88.

ICOT board of directors

INRIA - Since 1986, INRIA has been entrusted, by the French Ministry of Foreign Affairs, with the responsibility for cooperation with Japan on Artificial Intelligence. In the framework of this program, INRIA has received on the 20th of October the board of directors of ICOT (Institute for new generation computer technology). In particular, members of the delegation, mainly composed of industrials, have been interested in INRIA's industrial relations and valorization techniques used by the institute.

Visits

INRIA - On the 20th of October, INRIA received Mrs. C. Glendey, who is in charge of the international department of NSF (National Science Foundation) in USA. INRIA has signed a collaboration agreement with NSF in 1987 to develop cooperative programs between

research teams in USA and in France. In the framework of this agreement, five projects have been already accepted, three other projects are under consideration and six projects are under preparation.

INDUSTRIAL TRANSFER NEWS

LE-LISP

INRIA - INRIA has just signed a license agreement with the LER, Laboratoires Electroniques de Rennes, a research laboratory of THOMSON CSF, for the port of LE-LISP system on TRANSPUTER. This port will be done within the framework of the Esprit Project PADMAVATI.

The system LE-LISP V.15.2 is being ported on the main workstations and microcomputers by the following companies and institutes :

- INRIA on VAX/UNIX, APOLLO/UNIX, PC.RT and SUN 3 ;
- ILOG on SUN 4 ;
- CRIL on APOLLO/AEGIS ;
- ACT on processors 80x86 and for PC/MACINTOSH ;
- BULL on DPX 1000, DPX 2000, DPX 5000 ;
- AMAIA on specialized add-on cards based on 80286 and 80386 ;
- SEMA METRA on HP 9000 (series 300) ;
- ENST on VAX / VMS

For further informations, please contact :

Laure Reinhart
INRIA
Domaine de Voluceau
Rocquencourt

B.P. 105
F-78153 Le Chesnay Cedex
Telephone: (33) (1) 39.63.55.11
Telefax : (33)(1)39.63.53.30

The fourth meeting of the club of the Porters and Distributors of LE-LISP took place at INRIA

Rocquencourt on the 6th September 1988. INRIA announced the deliverable of the version 15.22 at the beginning of 1989. The first version of ISO LE-LISP will be available mid 89.

MAILWAY

INRIA - The team led by C. HUITEMA (RESEAUX) at INRIA Sophia-Antipolis has developed a software interface between electronic mail on UNIX and mail delivery conforming to CCETT X 400 recommendations. This product, called MAILWAY, is now industrialized and commercialized by SYNC, which is a small french company at St-Etienne. Other license agreement should be signed in a near future by GOULD, MATRA DATA-SYSTEME and PHILIPS. INRIA also distribute MAILWAY to universities and public research centers.

802.3D

INRIA - The team SCORE of INRIA, led by G. Le Lann has studied a multiple access protocol called 802.3D, which consists of a deterministic version of Ethernet. Research in this domain was partly supported by French Navy and Ministeries in charge of Research and Industry. This protocol has been patented by INRIA in 1986.

To ensure the best transfert to industry, INRIA has launched a users club which brings together industrials, constructors and main users of realtime local area networks. The last meeting of

this club took place in Paris. This meeting has been organized by the company INTEL, which

presented its chips 82590/592 and 80C153 which implement a similar process to the process studied by INRIA. During this meeting the company APTOR also presented its recent products based on the 82580 and commercialized under INRIA license. More than 35 persons from 17 different companies were present at this meeting.

REDUCE and MAPLE

INRIA - INRIA has just signed a distribution agreement for MAPLE, with the university of Waterloo. MAPLE is a library of symbolic manipulation systems of more than 75.000 instructions, based on a small kernel of 200 ko. INRIA can provide MAPLE to public research institute or universities for the prize of 6.000 FF.

INRIA is also in charge of the distribution of REDUCE realized by Anthony Hearn, on the LE-LISP version. The translation of REDUCE in LE-LISP has been done at INRIA by A. Beges.

For any further informations and command, please contact :

Laure Reinhart
INRIA

Domaine de Voluceau
Rocquencourt
B.P. 105

F-78153 Le Chesnay Cedex
Telephone: (33) (1) 39.63.55.11
Telefax : (33)(1)39.63.53.30

LIVE IN THE INSTITUTES

Reorganization

CWI - As of September 1st, 1988, CWI has regrouped part of its research departments, reducing their number from 8 to 6. The former departments of

Pure Mathematics and Applied Mathematics, headed by Prof. Michiel Hazewinkel and Prof. Hans Lauwerier, respectively, are now united into a new department of *Analysis, Algebra and Geometry*, headed by Prof. Hazewinkel. Prof. Lauwerier will retire on December 1st, 1988. Similarly, the departments of *Mathematical Statistics and of Operations Research and System Theory*, headed by Prof. Richard Gill and Prof. Jan-Karel Lenstra, respectively, have been fused into one department of *Operations Research, Probability Theory, Mathematical Statistics and System Theory*, headed by prof. Lenstra. Prof. Gill has left CWI, to accept from September 1st, 1988, a professor-ship in Stochastics at the University of Utrecht.

In summary, CWI now has the following research departments (abbreviations in brackets are derived from the Dutch department names) and department heads:

. Analysis, Algebra and Geometry (AM), M. Hazewinkel;

. Operations Research, Probability Theory, Mathematical Statistics and System Theory (BS), J.K. Lenstra;

. Numerical Mathematics (NW), P.J. van de Houwen;

. Software Technology (AP), J.W. de Bakker;

. Algorithmics and Architecture (AA), L.G.L.T. Meertens;

. Interactive Systems (IS), P.J.W. ten Hagen.

People ...

GMD - Prof. Dr. Norbert Szyperski, Chairman of the

Executive Board of Mannesmann-Kienzle GmbH in Villingen-Schwenningen was appointed Chairman of the Supervisory Board of GMD by the German Federal Minister for Research and Technology, Heinz Riesenhuber. Szyperski succeeds Prof. Dr. Fritz-Rudolf Gntsch, head of the division 'Information and Production Technology; Living and Working Conditions; Scientific and Technical Information' of the Federal Ministry for Research and Technology who had been Chairman since 1973. With Szyperski, for the first time, a representative from industry has become Chairman of the Supervisory Board of the governmentally funded GMD.

GMD - Prof. Dr. Gerhard Seegmüller, Chairman of the Board of Directors of the Leibniz Computing Centre of the Bavarian Academy of Sciences and full professor at the University of Munich was appointed Chairman of the Executive Board of GMD. Seegmüller succeeds Prof. Dr. Szyperski who joined Mannesmann-Kienzle GmbH in Villingen-Schwenningen as Chairman of the Executive Board.

GMD - Dr. Carl Adam Petri, one of the heads of the GMD Institute for Foundations of Information Technology, was appointed honorary professor of the University of Hamburg. In addition, Petri was awarded the 1st class Service Cross of the Federal Republic of Germany. Both events recognize the outstanding and trendsetting research work in computer science done by Petri. Today there are thousands of publications worldwide which are based on Petri's ideas.

GMD - Prof. Dr. Ulrich Trottenberg, one of the heads of the GMD Institute for Foundations of Information

Technology and Executive Director of the SUPRENUM GmbH, was awarded one of the four 'Alexander von Humboldt Prizes for Scientific Cooperation Between Germany and France' of 1987. These research prizes were initiated by the French President and the German Federal Chancellor on the occasion of their 1981 summit. The prizes are awarded jointly by the French Research Ministry and the Alexander von Humboldt-Stiftung. They are intended for scientists contributing especially to the research cooperation of the two countries. The persons the prizes are awarded are entitled to conduct research of their own choice during a several months' stay in the other country.

INRIA - **William Jalby**, researcher at INRIA in the project CAPRAN (Parallel Architectures) conducted by A. Lichnewsky, has taken a professor position at Rennes University. W. Jalby will follow up collaborations with INRIA through the CAPRAN project and the project CALCPAR of J. Lenfant from INRIA Rennes.

INRIA - **Bernard Espiau**, head of the project "Robots perception and commands" has taken a position as detached the head of the "Institut Supérieur d'Informatique et d'Automatique (ISIA) at Sophia Antipolis. Patrick Rives, Daniel Simon and Jean-Jacques Borrelly, researches from B. Espiau's team, will participate to the PRISM Project conducted by D. Boissonnat at INRIA Sophia Antipolis.

INRIA - **Pierre Aigrain**, ex-Secretary of State for Research and President of the Scientific Council of INRIA, has been elected to the french Science Academy of Science, in the Physic Section.

INRIA - **B. Larrouturou**, Director of Research at INRIA Sophia Antipolis, has received

the prize PECCOT 88 of the Academy of Science. This prize is conferred each year to a young mathematician of less than 30. B. Larrouturou's works mainly relate to the modelization and mathematical analysis of combustion phenomenon.

INRIA - **H. Beresticky**, scientific adviser of the SINUS project, has received the prize CARRIERE 1988 of the Academy of Science.

Activities at CWI

CWI - With each activity we mention its frequency or dates and (between parentheses) a contact person at CWI. Sometimes some additional information is supplied, such as the location if the activity will not take place at CWI.

Seminar on Algebra, Geometry and Combinatorics. Irregular. (A.M. Cohen).

Friday 28 October: lecturers to be announced, Shult's work on odd coclique graphs.

Friday 16 December: Finite Geometry Day, expected lecturers Meixner (Justus Liebig Univ. Giessen), Thas (University of Gent), and Weiss (Tufts University, Boston).

Cryptography working group. (H. den Boer). The purpose is to follow and investigate recent developments on cryptography and its underlying mathematical theories. The group is currently studying the book Streamciphers by R.A. Rueppel.

Seminar Quantum Groups and Loop Groups. Fridays 4, 18 November, 2 December. (M. Hazewinkel, T.H. Koornwinder). Quantum groups is the topic of the morning sessions, while the connection between loop groups

and the KdV type equations will be discussed in the afternoon.

Progress meetings of the Analysis, Algebra and Geometry Department. Biweekly. (J. de Vries). Members of the department deal with new results and problems on the research topics of the department: algebra, discrete mathematics and computer algebra, analysis, algebraic mathematical physics, dynamical systems, cryptology, dynamical systems with stochastic perturbations, asymptotics and applied analysis, nonlinear analysis and biomathematics, image analysis.

Symposium in honour of H.A. Lauwerier on the occasion of his 65-th birthday. 9 December. 14.00 h. (N.M. Temme). Speakers: J. Grasman (Nonlinear Dynamics: Stochastic or Chaotic), N.M. Temme (ABC of Asymptotics), H.A. Lauwerier (Mathematics in Pictures). Study group 'Biomathematics'. Jointly with the University of Leiden. Bimonthly (O. Diekmann). Lectures by visitors or members of the group, especially on dynamics of structured populations.

Seminar on Image Reconstruction (J.B.T.M. Roerdink). Talks in the area dealt within the books:

(i) G.T. Herman (1980). Image Reconstruction from Projections (The Fundamentals of Computerized Tomography), Acad. Press.

(ii) F. Natterer (1986). The Mathematics of Computerized Tomography, J. Wiley and B.G. Teubner.

(iii) H. Stark (1987). Image Recovery (Theory and Application), Acad. Press. Sessions: 12/10 The mathematics of image reconstruction:

- an introduction, and Reconstruction algorithms by M. Zwaan; 26/10 Reconstruction of images by the method of convex projections, by H.J.A.M. Heijmans, Statistical and linear-algebraic image reconstruction methods by M.A. Viergever (University of Utrecht);
- 9/11 Geotomography and seismic signal processing, by J. van der Woude, Spatial statistics and Bayesian image analysis, with an example in tomography, by J.E. Besag (University of Durham); 23/11 Sampling and interpolation in Fourier reconstruction, and Severely ill-posed Radon problems by F. Natterer (Westfälische Wilhelms-Univ., Münster); 14/12 Limited data problems in medical imaging with applications to computed tomography and magnetic resonance imaging, and Eikonal approximation in ultrasound imaging by A. Louis (Technische Univ., Berlin).
- Study group on Image Analysis. Every three weeks. (R.D. Gill, J.B.T.M. Roerdink, H.J.A.M. Heijmans). Special themes are: image reconstruction (tomography etc.), mathematical morphology, the statistical analysis of images, stochastic geometry. The group is currently studying the book Stochastic Geometry and its Applications by W.S. Kendall & J. Mecke, Wiley/Academie-Verlag, Berlin, 1987.
- Lunteren Meeting on Stochastics. 14,15,16 November, De 'Blije Werelt', Lunteren. (R. Helmers). Invited speakers: P. Diaconis (Cambridge, USA), G.R. Grimmett (Bristol, UK), P. Jagers (Göteborg, Sweden), I. Johnstone (Stanford, USA), G. Letac (Toulouse, France), A.F.M. Smith (Nottingham, UK).
- System Theory Days. Irregular. (J.H. van Schuppen, J.M. Schumacher) In collaboration with research groups of some universities meetings of system theorists are organized with lectures by visitors (from abroad).
- Study group on System Theory. Biweekly (J.H. van Schuppen). The current topic is: Applications of graph theory in system theory. The subject is studied on the basis of various books and articles.
- Colloquium on Queueing Theory. Irregular. (O.J. Boxma).
- Study group Mathematical Programming. Weekly. The group discusses chapters from the book Theory of Linear and Integer Programming by A. Schrijver, Wiley, London, 1987.
- Colloquium Numerical Aspects of Vector and Parallel Processors. Jointly with the Universities of Amsterdam and Delft. Irregular. (H.J.J. te Riele). In the future attention will be paid to practical experience with numerical algorithms on well-accessible parallel systems (simulated or not). CWI-Shell colloquium Adaptive
- Grid Techniques. Biweekly. (J.G. Verwer).
- Post-academic Course on Modern Techniques in Software Engineering. Irregular. (P.R.H. Hendriks). Various lectures present modern techniques and methods for the construction of complex software systems. The course is meant for people with a background in computer science, who are or will be actively involved in the construction of those systems.
- Post-academic Course on PROLOG. 3,4,7,8,9 November. (P.J.F. Lucas). In this course, both the theoretical foundations of logic programming and the applications of the programming language PROLOG are discussed. The course is meant for researchers and engineers who consider using PROLOG in their projects.
- Post-academic Course on Artificial Intelligence. 23,24 November. (P.J.F. Lucas). In this introductory course, methods of knowledge representation, reasoning methods and programming languages of artificial intelligence are discussed. Attention will also be paid to historical, psychological and philosophical aspects, as well as applications (robotics, expert systems). The course is meant for people with a background in computer science; knowledge of artificial intelligence is not assumed. Post-academic Course on Algebraic Specifications. Irregular. (P.R.H. Hendriks). This course aims to be an introduction in the use of algebraic specifications. Attention will be paid to syntax and semantics of specifications, modularizing and implementation possibilities. The course is meant for people with a background in computer science, who are involved in the design and specification of software development.
- Process Algebra Meeting. Jointly with the Universities of Amsterdam and Utrecht. Weekly. (J.W. Klop) .NL The main topic is process algebra; attention will also be paid to abstract datatypes, specification languages and term rewriting.
- Project Research and Education in Concurrent Systems, REX. Series of lectures by E.-R. Olderog. Irregular. (J.W. de

Bakker). Many computing systems consist of components that work independently or concurrently, but also synchronize or communicate with each other from time to time. Conceptually, it is convenient to treat these systems and their components uniformly as concurrent processes. For the specification, verification and construction of concurrent processes different description methods have been developed, in particular Petri nets, algebraic terms as in CCS, CSP or ACP, and logical formulas of temporal or ordinary predicate logic. The last two lectures will be: 7/10 What is a good net semantics, and 14/10 Logic determines denotational semantics. Study group on Knowledge Representation. Biweekly. (P. Veerkamp). The aim of this working group is two-fold: (i) to study the past achievements in KR and (ii) to discuss the new developments. We expect that these studies and discussions will help us understand the current problems more clearly and hopefully lead to new, enlightening, and useful theoretical developments. We emphasize that this working group is supposed to conduct theoretical studies and we assume some maturity on the part of the participants.

MEETINGS

Siggraph

INRIA - From the 2nd to the 6th August 1988, the congress SIGGRAPH took place at Atlanta (USA). This congress is the most important one on the subject of vision and image in the world. Last results of INRIA in this domain have been shown on the ANL stand (ANL : Association Nationale du Logiciel).

AI 88

INRIA - INRIA was also present at AI 88, which took place at Tokyo in Japan, from the 4th to the 7th July 1988. INRIA activities in Artificial Intelligence and those of ILOG, the A.I. subsidiary of INRIA, have been presented to companies and researchers.

MNTS-89

CWI - In 1989, June 19-23, the International Symposium on the Mathematical Theory of Networks and Systems (MTNS-89), will be held in Amsterdam, The Netherlands.

The aim of the symposium is to offer mathematicians and engineers in system, control and circuit theory, a platform to discuss recent developments, to exchange new ideas and to analyse trends for further research. It also provides them with an opportunity to establish and maintain contacts with colleagues.

The scope of the symposium includes the research topics: System theory, Control, Circuit theory, Mathematics for control, system and circuit theory, and Specific applications.

International Symposia on the Mathematical Theory of Networks and Systems have been held biannually since 1973. MTNS-89 is the eighth symposium in this series.

The symposium is organized by Prof. M.A. Kaashoek, Dr. J.H. van Schuppen (CWI) and Dr. A.C.M. Ran, with support of CWI and the Vrije Universiteit (Free University) both located in Amsterdam.

To obtain the printed version of the First Announcement and Call for Papers, that contains instructions for authors of full

papers, posters, and organizers of special sessions, write to: Stichting International Symposium MTNS-89, c/o Bureau Congreszaken (Conference Service), Vrije Universiteit, P.O. Box 7161, 1007 MC Amsterdam, The Netherlands.

Traffic symposium

CWI - On October 12, CWI organized a symposium 'Planning and Control in Traffic'. About sixty participated. The main purpose of the symposium was to improve contacts between researchers and (potential) users of research results in the field. Such an activity fits in the general aim of CWI to improve knowledge transfer and to be alert on possible application of fundamental research results. The subject was chosen because of its general interest and because at CWI some projects concern traffic research.

The programme contained the following subjects:

Methodic problems in quantitative research of the future (M.F.A.M. van Maarseveen, TNO Delft);
Equilibrium theory in traffic networks (G.R.M. Jansen, Univ. Delft);
Three-dimensional assignment in the time-space for overloaded networks (R. Hamerslag, Univ. Delft);
The Eureka project CARMINAT (J. Mauge, Philips Consumer Electronics);
Stochastic models for road traffic (R.D. Gill, CWI);
International Developments (H. Neffendorf, MVA Systematica, UK).

CWI plans to organize such symposia on a more regular basis.

GMD Organizes the European Knowledge Acquisition Workshop 1988

GMD - Knowledge acquisition is considered the most crucial phase in knowledge engineering, the construction of expert systems. It decides on success or failure of the system, on short or long development time, on acceptance and usability. Nevertheless, there are neither elaborated theories nor recipes in this area. The number of international knowledge acquisition workshops intends to remedy that. The second European Workshop on Knowledge Acquisition for Knowledge-based Systems (EKAW) was organized by GMD in Bonn. It was the fourth workshop out of a number of workshops held all over the world. It was the aim of EKAW 88 to gather theorists and practitioners of this domain who were aware of the necessity of a methodical and systematic support of the acquisition and modelling process in the development of expert systems.

Theory of Distributed Systems

GMD - Not technology itself, but the organization of its practical use currently limits the utilization of distributed systems. On the occasion of a workshop held in K nigswinter near Bonn, an international group of experts discussed theoretical foundations and fundamental concepts for a better understanding of such systems. In the last years, so-called algebraic calculi, e.g. Millner's CCS and Hoare's CSP, have gained great importance for the description and analysis of distributed systems. The basic idea of these approaches is the modular description of systems by means of suitable composition operators. Such compositional calculi neglect however the

correct modelling of concurrency, it is mapped onto non-deterministic sequentialization.

The Petri Net Theory, however, provides a direct description of concurrency though compositional aspects have hardly been investigated to date. This has had a negative effect on the applicability of the nets. These two research trends, compositional approaches, on the one hand, precise description of concurrency as in Net Theory, on the other, have developed independently of each other though a combination of the two approaches might be quite promising.

In this situation, Ursula Goltz from the GMD Institute for Foundations of Information Technology together with Ernst R diger Olderog (University of Kiel) and Rob van Glabbeek (CWI Amsterdam) organized the 'Workshop on Combining Compositionality and Concurrency'.

First Workshop on Connectionism in GMD

GMD - The Gesellschaft für Informatik (GI), the International Computer Science Institute (ISCI, Berkeley) and GMD organized the first workshop on connectionism which gathered more than 80 experts mainly from the research area of artificial intelligence. It was the aim of this workshop to give a synopsis of different activities in this very young domain undergoing a rapid development. The unexpectedly large number of participants has shown the great interest in this new approach within artificial intelligence. This is also emphasized by the fact that the workshop decided to prepare the foundation of a Working Group 'Connectionism' within the Technical Committee 'Artificial Intelligence and Pattern Recognition' of the GI.

French-German Workshop on Parallel Computing and Its Applications

GMD - For extensive scientific numeric computations, fast vector and parallel computers and computing procedures tailored to this computer class have enormously gained in importance in the past years. GMD supports this development in the areas of hardware, system and application software by its substantial contribution to the German supercomputer project SURPENUM. The international exchange of ideas and results and the interdisciplinary cooperation of computer science, numerical mathematics and applicational sciences are of decisive importance to this new area of parallel computing. A joint workshop of GMD and SUPRENUM GmbH Bonn together with INRIA in Rocquencourt near Paris served this purpose.

The participating research groups presented the objectives and the state of art of their projects in discussions and lectures. In areas of hardware and system software, the SUPRENUM parallel computer, in particular, project conception, architecture and pre-prototyping, and the French workstation with vector unit (SPS7) were presented. Though originating from two quite different projects, the similarity of important hardware components was most remarkable and seems to be promising for a further cooperation in this field.

Strategic Research Workshop Sept. 22/23

CWI - On September 22 and 23, CWI organized in the seaside resort of Noordwijk a workshop 'Strategic Research in Computer Science and Mathematics'. Approximately 60 representatives of industry, government, large technical

institutes and the academic world participated.

The workshop was organized to discuss the period after the Dutch Government's Information Technology Promotion Plan (INSP). In this plan, which will cease after 1988, CWI received from 1984 on 2 million Dfl. annually (altogether 10 million Dfl.), in order to expand 'into a leading centre in the field of computer science research'. In the meantime INSP as well as CWI were evaluated by international committees. Their conclusion was that the INSP-funds were (very) well spent, but that this could only be considered as a first step and that ongoing stimulation was required.

At the workshop an important issue was the balance between fundamental and application-oriented research. At CWI this balance is sometimes seriously disturbed, as is the case in the department of Software Technology. On the one hand INSP gave a considerable impetus to the research in this department (CWI's relatively large participation in ESPRIT stems from this source), but on the other hand strategic research creates obligations which can damage the development of fundamental research. Something similar holds for the mathematical research at CWI: since there was not a special stimulation programme for it, its position was threatened by this considerable increase in computer science research. Both aspects were extensively discussed in Noordwijk.

Some conclusions, about which the participants agreed in broad outline, were:

- INSP was just a first step, which should be continued somehow;

- a strong point of CWI is the presence of mathematics and computer science under one roof;

- mathematical research is important, in particular in interaction with computer science research.

Visitors to CWI

CWI - Period July - September 1988 . With each visitor we mention his affiliation and (between parentheses) the visited CWI department and the title of a delivered lecture or a field of the visitor's interest.

A.M. Agogino & J. Cagan, University of California, Berkeley, USA (Dept. of Interactive Systems, 1st PRINCE: innovative design from first principles), 25 July.

R. Bolle, IBM Thomas J. Watson Res. Center, Yorktown Heights, USA (Dept. of Applied Mathematics, A connectionist framework for visual recognition), 5 September.

F.M. Callier & J. Winkin, Faculté's Universitaires de Namur, Namur, Belgium (Dept. of Operations Research and System Theory, On spectral factorization for multivariable distributed systems), 1 July.

J. Cannon, University of Sydney, Australia, (Dept. of Pure Math., Computer Algebra) 27 Aug-2 Sep. M.L. Eaton, University of Minnesota, Minneapolis, USA (Dept. of Math. Statistics, On the asymptotic distribution of eigenvalues of symmetric matrices), 27 July.

M. van Emden, University of Victoria, Canada (Dept. of Software Technology, Beyond LISP and PROLOG), 6 July.

P.A. Fuhrmann, Ben Gurion University of the Negev, Beer Sheva, Israel (Dept. of Operations Research and System Theory, Coprime, spectral and inner/outer factorizations for rational matrix functions; Bezoutians), 1 July.

N.A. Lynch, Electrical Engineering and Computer Science MIT, Cambridge, USA (Dept. of Algorithmics and Architecture, A theory for reasoning about atomic transactions), 5 September.

E.-R. Olderog, University of Kiel, BRD (Dept. of Software Technology, Nets, terms and formulas: three description methods for concurrent processes; Relating terms and nets; Relating formulas and terms), resp. 16,23,30 September.

C. Palamidessi, University of Pisa, Italy (Dept. of Software Technology, On the integration of logic and functional languages: flattening versus narrowing), 6 July.

R. Pike & K. Thompson, AT&T Bell Laboratories, Murray Hill, USA (Dept. of Computer Systems and Telematics, Plan 9 from Bell Labs), 2 September.

B. Reed, University of Waterloo, Canada (Dept. of Operations Research and System Theory, A semi-strong perfect graph theorem), 23 August.

D. Shmoys, MIT, Cambridge, USA (Dept. of Operations Research and System Theory, Approximation algorithms for minimizing maximum lateness on one machine), 14 July. R. Syski, University of Maryland, College Park, Maryland (Dept. of Operations Research and System Theory), 26-31 August.

H.R. Thieme, University of Arizona, USA (Dept. of Applied Mathematics, Semiflows generated by Lipschitz perturbations of non-density defined operators), 26 July.

H. Thorisson, University of Göteborg, Göteborg, Sweden (Dept. of Math. Statistics, On coupling), 12 July.

S. Tsur, MCC Austin, Texas, USA (Dept. of Software Technology, Compilation of rules containing set terms in a logic data language), 9 August.

W.E. Weihl, MIT Laboratory for Computer Science (Dept. of Algorithmics and Architecture, The impact of recovery on concurrency control), 1 July.

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Imprint

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Editors:

Centrum voor Wiskunde en Informatica (CWI)

Kruislaan 413

NL-1098 SJ Amsterdam

Telefoon (+31-20) 5924092

Gesellschaft für Mathematik

und Datenverarbeitung mbH (GMD)

Schloß Birlinghoven

Postfach 1240

D-5205 Sankt Augustin 1

Telefon: (02241) 14-0

Institut National

de Recherche

en Informatique

et en Automatique (INRIA)

Domaine de Voluceau - Rocquencourt

B.P. 105

F-78153 Le Chesnay Cedex

Telephone: (33) (1) 39635511

Editorial Staff:

Dr. Henk M. Nieland (CWI)

Dr. Siegfried Münch, Ursula Bernhard (GMD)

Laure Reinhart (INRIA)