

ERCIM NEWS

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EDITORIAL



Dennis
Tsichritzis
Director of GMD
(Photo: Münch,
GMD)

SPECIAL :

User Interface and Multimedia 7

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Next Issue:

Activities in Software Quality
Principles and Techniques

This issue is about Multimedia. Rather than talking about GMD and the restructuring that takes place here it is more interesting to discuss Multimedia. Scientific issues should be more interesting to the readers than managerial issues.

What is Multimedia? Most computer scientists define it as "data, text, voice, pictures and ... sometime soon we will deal with video". A better definition coming from a real media person is "anything with more than seven cables". The reason that the latter definition is better is that it emphasises the real problems. The real problems are not about how to attach voice or picture frames to text or data. They are about all the difficult interface and synchronisation problems that come when video and computer technology meet. In undiplomatic terms "if you can't handle video then you are not dealing with the important problems".

Why is Multimedia important? There are many answers, intellectual, scientific, economic, etc. Intellectually, Multimedia is important because it brings closer computer science to real creative persons, i.e., artists. Scientifically, it is important because it is a melting pot of ideas coming from the logic oriented world of Computer Science and the imagination oriented world of video and film making. Economically, it is important because it is an economic sector in-between two different economic sectors: Information Technology and Media. Usually the in-between economic sectors expand faster than any one of the constituents.

What can we do in Multimedia? First, we need to be honest. We don't know very much about media. There is a whole world out there who are experts. We need to have a close cooperation with them to understand what they need. The end-users are not only clerks or engineers but artists and kids. In addition, most people watch television and films every day with spectacular side effects. It is difficult to do much better or much different. We should concentrate on what we can do best, i.e., tools. As amateur video artists we cannot be very successful. As tool makers for video artists we can do better. We should not also forget that cost and ease of use are as important for tools as functionality.

How do we start in Multimedia? It used to be the case that you needed many millions \$ to put together a media lab. It is still the case if you need top quality. Many ideas, however, can be tried out on lower quality but adequate equipment. You can start up a small media lab with \$ 100,00 – \$ 200,000 which is a reasonable budget for most Information Technology Research Labs. The equipment is heterogeneous and there are many interface problems but it can be done. At the end please count the cables. You will understand the proposed definition of Multimedia. What kind of research is meaningful? This is the hardest question. It is indispensable to have a lab and it helps to have an application in mind. Then we need much imagination. The motto should be "you see what you imagine". So close your eyes and start imagining.

Dennis Tsichritzis

The Foundation of Research and Technology – Hellas joins ERCIM



by Costas Stephanides and Panos Constantopoulos

The Foundation of Research and Technology – Hellas (FORTH) was invited to join ERCIM at the last Directors Meeting in Lisbon last November. The institute will formally become a member at the next ERCIM Meeting which will be hosted by CNR in Pisa at the end of May (see article on p. 5).

FORTH is a centre for research and development supervised by the Ministry of Industry, Energy, Commerce and Technology (General Secretariat of Research and Technology) of Greece. FORTH was formed in November 1987, when the Research Centre of Crete (founded in 1983) was merged with Institutes from Patras and Thessaloniki. Today, FORTH is the second largest research centre in Greece consisting of the Institute of Computer Science (ICS), the Institute of Applied and Computational Mathematics (IACM), the Institute of Electronic Structure and Laser (IESL), the Institute of Molecular Biology and Biotechnology (IMBB), all based in Heraklion; the Institute of Mediterranean Studies (IMS), based in Rethymnon; the Institute of Chemical Process Engineering (CPERI), based in Thessaloniki and the Institute of Chemical Engineering (ICE/HT), based in Patras.

FORTH carries out basic and applied research, develops applications and provides services. Currently, FORTH employs 51 full-time scientific personnel with doctoral degrees, 38 visiting researchers, 120 research and technical staff, while more than 310 graduate and

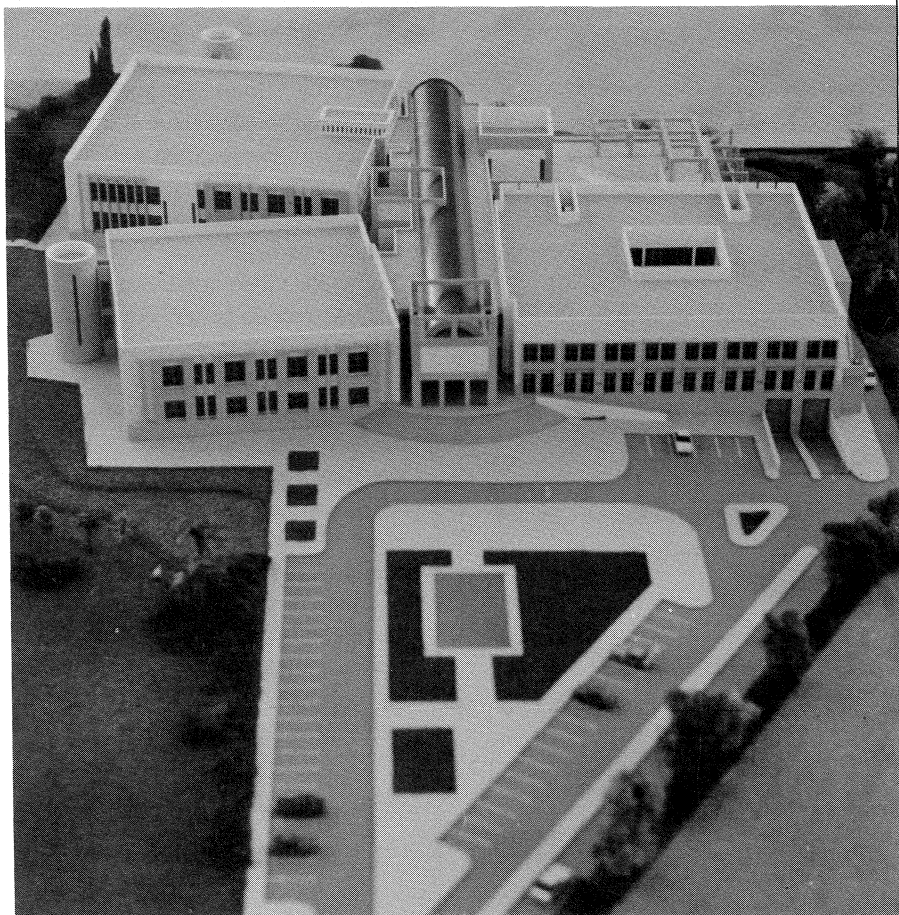
undergraduate students participate in the activities of the various Institutes through scholarships.

Funding for FORTH is provided through the overseeing Ministry's budget, as well as from non-governmental sources. Over 65% of FORTH's budget, which was at 10 MECU in 1991, comes from competitive European research programmes.

The principal objectives of FORTH are to promote basic and applied research in

areas of scientific and technological importance, characterised also in terms of their strategic value or impact on the national economy. FORTH's activities are also intended as a catalyst in the process of regional development through the application of high technology, the provision of educational and training services, and the development of "Science and Technology Parks".

FORTH's Institutes provide a research infrastructure and, in addition to their sci-



A model of the new FORTH building to be completed in 1993. (Photo: FORTH)

entific staff, employ faculty graduate and undergraduate students in their projects, thus supporting and complementing University research and education. Furthermore, FORTH's Institutes offer educational seminars to professionals and high school students.

Since its inception, FORTH has developed cooperation with other Universities, Research Centres, and companies, as well as with Greek scientists living in Europe or North America, thus establishing a continuous exchange of scientific ideas and technology transfer. FORTH participates in a number of projects within the European Framework Programme for R&D and other national and international programmes.

The Institute of Computer Science

The particular objectives of the Institute of Computer Science (ICS) are: to conduct research in Informatics, where the research directions are chosen with a preference for applied research, so as to serve the immediate and long-term needs of Greece, following the modern trends of technology; to play a catalytic role in the development of the Greek Informatics Industry (services, application development, software production, and hardware construction); and to effectively contribute to the systematic introduction of Informatics in the national economy.

Current R&D activities include the areas of Information Systems, Software Engineering, applications of Artificial Intelligence, Digital Image Analysis and Computer Vision, Digital Communications, Network Management, Parallel Architectures and Distributed Systems, Decision Support Systems, Computer Architectures and VLSI design, Computer Aided Design, Medical Informatics, and Rehabilitation Tele-Informatics.

ICS employs a full-time scientific and technical staff of 40, and offers scholarships to over 120 graduate and undergraduate students, who participate in its R&D activities. Furthermore, ICS employs 12 faculty members of the Department of Computer Science, University of Crete. ICS has been very active in European competitive R&D programmes and currently participates

in a number of projects in the ESPRIT, RACE, AIM and TIDE programmes, the Mediterranean Integrated Programme for Informatics, the Science for Stability Programme, STRIDE, etc.

A modern infrastructure has been created at ICS with a series of well equipped laboratories, where powerful workstations are connected through local area networks with very large file servers and are gatewayed to international networks. ICS is the official Greek node for BITNET (EARN) and INTERNET (ITEnet, EUnet), providing an international electronic networking service to the Greek research community at large. ITEnet in particular, which is FORTH's integrated network providing very high speed local area connectivity (FDDIs), is expanding very fast and is expected to cover soon all major Greek cities providing fast access (64kbps) to advanced services. ■

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ERCIM Advanced Courses

Beginning – 1992: ERCIM Advanced Training Programme

by **Annick Theis-Viemont**

6 – 10 April

Partial Differential Equations and Group Theory – New perspectives in Computer Algebra and Engineering Sciences.
GMD – Germany

Lecturers: J.F. Pommaret (ENPC-France), G. Carra Ferro (University of Catania-Italy), P. Gragert (University of Twente- the Netherlands), P. Kersten (University of Twente- the Netherlands), F. Schwarz (GMD- Germany), T. Wolf (University of London- Great-Britain)

Keywords: Ordinary differential equations, partial differential equations, theory of systems of PDE, linear and non-linear systems of PDE, Lie pseudogroups, Differential Galois Theory.

12 – 14 May

High Performance Microprocessors.
Rocquencourt – France

Lecturers: F. Bodin (INRIA Rennes/IRISA - France), J.C. Delgado (INESC -Portugal), D. Etiemble (Universit Paris XI - France), W. Giloi (GMD - Germany), W. Jalby (INRIA Rennes/IRISA - France), G. Kissin (CWI - the Netherlands),

Keywords: Basic concepts of RISC architecture, memory hierarchies, super-scalar, superpipeline, trends in VLSI technology, RISC versus vector processors, future generation of transputers.

12 – 15 May

Principles and practice of advanced user-interfaces.
Abingdon – Great-Britain

Lecturers: L. Barfield (CWI - the Netherlands), T. Berlage (GMD - Germany), A. Chauffaut (INRIA Rennes/IRISA - France), P. ten Hagen (CWI - the Netherlands), R. van Liere (CWI - the Netherlands), S. Pemberton (CWI - the Netherlands), M. Prime (RAL - Great-Britain), M. Spenke (CWI - the Netherlands), J. van der Vegt (CWI - the Netherlands).

Keywords: Principles, tools and techniques for programming user interfaces, user interface design of graphics, ergonomic and cognitive aspects of pictorial information, object-oriented programming techniques, user interface management systems, scientific visualization.

29 June - 8th July

Distributed Systems.
Estoril – Portugal

(See announcement on next page for details)

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LISBOA '92: An Advanced Course on Distributed Systems

by Paulo Veríssimo

The Advanced Course on Distributed Systems has been held four times so far, in June or July: in Tromsø, Norway (Arctic'88), at Cornell, USA (Fingerlakes'89), in Italy (Bologna'90) and in Japan (Karuizawa'91). This year it will take place in Estoril, near Lisbon, Portugal from 29 June to 8 July 1992. The course is organised by INESC and sponsored jointly by INESC, ERCIM and the DCSA ESPRIT Research Network.

The objective of the course is to familiarise practitioners and researchers with key issues in distributed systems. The lectures will discuss the fundamental problems of the area, review known solutions and paradigms, and show how to apply known theoretical results to the design of practical systems. Lisboa'92 lecturers are internationally-known researchers whose interests and experiences span the full range of distributed computing.

Format

The course will be organised as a series of daily lectures with several discussion sessions. The discussions will permit small groups of attendees to interact directly with lecturers, either to focus on issues that arise during the lectures or to pursue other topics of interest to the group. Attendees are assumed to have a familiarity with basic operating systems concepts.

Lecturers

Prof. Ozalp Babaoglu, Universita di Bologna, Prof. Hermann Kopetz, Technical University of Vienna, Dr. Butler W. Lampson, Digital Equipment

Corporation, Prof. Sape J. Mullender, Universiteit Twente, Prof. Roger M. Needham, Cambridge University, Prof. Mahadev Satyanarayanan, Carnegie Mellon University, Prof. Fred B. Schneider, Cornell University, Dr. Michael D. Schroeder, Digital Equipment Corporation, Prof. Sam Toueg, Cornell University, Prof. Paulo Verissimo, INESC - Technical University of Lisboa, Prof. William E. Weihl, MIT Laboratory for Computer Science.

Course Outline

The course will start with a general introduction and will deal with the following areas: fundamental concepts, communication, services, security, fault tolerance, transactions, data storage, methodology, and distributed systems architecture.

Deadlines

The number of participants is limited, so early registration is advised. The summer time is a high season in Estoril-Cascais. There will be a limited number of places secured at hotels on a first-come-first-served basis.

The pre-registration deadline, for ERCIM students, is March 22. Registrations beyond April 19 will be accepted at an increased entrance fee.

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ERCIM Database Workshop: Updates and Constraints in Advanced Database Systems

by Patrizia Asirelli

It is proposed to hold the next ERCIM Research Workshop on Advanced Database Systems in Pisa, 28-30 September 1992. The event will be organised jointly by three CNR Institutes: CNUCE, IASI and IEI. The Workshop will regard all aspects of updates and constraints in advanced database systems, from theoretic to implementation issues and including questions concerning transactions.

This will be the third issue of this series which began at RAL, UK, May 1991, and was then held at CWI, NL, October 1991. Continuing the tradition, it will be essentially a three-day working meeting; participation is limited to researchers from ERCIM Member Institutes. It has been decided to limit to five the number of representatives from each institute; within this limit an Institute can also invite external collaborators. The participants will be further integrated by one or two leading experts in the field.

All attendees are requested to participate actively in the workshop and to give a talk. There will be two types of presentations: long and short ones. The former will be of one hour and will concern the in-depth discussion of research results, providing also the opportunity for ample interaction with the other participants. Short presentations will mainly report on-going projects or significant applications; they will last 15 minutes and will be essentially informative.

A paper is required for both types of presentation. The papers will appear in the preprints which will be distributed at the workshop. Final revised versions of the papers, which take into account the results of the meeting, will be requested for the Proceedings to be published after the Workshop.

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The leaning tower of Pisa

Next ERCIM Meeting at IEI-CNR in Pisa, Italy

by Giorgio P. Faconti

Continuing in the tradition of encouraging the exchange of ideas and experiences between researchers working on similar topics in the different ERCIM member institutes, the next Workshops will be organised by the CNR Informatics Institutes in Pisa from 21-22 May 1992. Participation is also expected from external collaborators from universities and industry working with ERCIM members.

There will be three separate workshops on the following themes:

- Numerical Linear Algebra
- Software Quality Principles and Techniques
- Theoretical and Experimental Aspects of Knowledge Representation

Directors and Steering Committee Meetings will also be held in parallel with the Workshops.

Numerical Linear Algebra

The Workshop on Numerical Linear Algebra will be coordinated by Mauro Leoncini, IEI-CNR. A main topic will be parallelism in numerical linear algebra computations, with emphasis both on the parallel complexity of numerical problems and on the real parallel implementation of the algorithms. Typical subjects will include algorithms and data structures for the solution of dense and sparse linear systems, parallel complexity of matrix and polynomial computations, eigenvalue computations, distributed algorithms for linear algebra computations.

Software Quality Principles and Techniques

The Workshop on Software Quality Principles and Techniques will be coordinated by Antonia Bertolino and Mario Fusani, IEI-CNR. The purpose of the workshop is to determine the maturity and usefulness of the SQ area by dis-

cussing recent advances in the field. Presentations will regard quality metrics and usage of data from the field, environments and tools, concurrent application testing and inspecting, enforcing quality practice and management, standards and certification.

Theoretical and Experimental Aspects of Knowledge Representation

The Workshop on Theoretical and Experimental Aspects of Knowledge Representation will be coordinated by Carlo Meghini and Fabrizio Sebastiani, IEI-CNR. Papers will stress the formal and/or pragmatic value of the presented knowledge representation formalisms, rather than dealing with the specific applications (e.g. expert systems) obtained using such formalisms. Typical topics will include the theoretical and/or experimental aspects of non-monotonic reasoning, inheritance reasoning, representation of propositional attitudes, representation of temporal knowledge, philosophical foundations of knowledge representation, computational complexity of logics for knowledge representation.

For further information on the scientific programmes, please apply directly to the coordinators of each workshop, whereas any general enquiries concerning the local organisation should be made either to Giorgio Faconti, CNUCE-CNR, Chairman of the ERCIM Workshops Organisation in Pisa, or to Manuela Mennucci, ERCIM Secretary at IEI-CNR, at the following address:

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DIDOT Project Program for 1992:

by Roger Hersch, Didot Project Partner

The acronym, Didot, stands for the Digitising and Designing of Type and is the name of the CEC COMETT II program. The purpose of the Didot project is to design, implement and evaluate a European curriculum for digital typography. As part of the CEC Comett Didcot project on Digital Typography, a series of seminars and short courses are organised for 1992.

15 – 16 May 1992:

Educational Approaches to the Design and Production of Digital Type. Schule für Gestaltung, Basel.

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18–22 May 1992:

Digitalization of Characters, Logotypes, Ligatures and Contextual Characters. Ecole Estienne, Paris.

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6–10 July 1992:

Introduction to Computer Aided Type Design. IRISA, Rennes.

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24–28 August 1992

Didot-Works Typographic Seminar. URW, Hambourg.

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The Human Capital and Mobility Programme

by Alain Michard, Manager of
ERCIM

While writing this paper, the Human Capital and Mobility Programme is planned to be launched within the next few days. This CEC Programme will last for three years, with a total budget of 490 MECUS. From the non-official information that we have at present, the Programme is likely to include the following four action lines:

1. Postdoctoral Fellowships:

Fellowships for high-level training and specialisation in all scientific disciplines, are mainly intended for young postdoctoral fellows from EC, EFTA and selected Eastern European countries. Applications from predoctoral fellows in the field of engineering may also be accepted. Fellowships are in principle awarded for a two-year period. In the event that the fellow comes from a lesser-privileged country in Europe, a third period of one year, to be spent in the country of origin, may be considered. Fellowships shall be awarded following any of two selection procedures:

- i) The first involves a single call for proposals and is addressed to individuals who want to visit a laboratory of their choice located in another European country, in order to participate in a well-defined research project under the guidance of a qualified senior scientist.
- ii) The second selection procedure involves a double-call scheme. The first call for proposals is addressed to established research teams, working on a well-defined research project under the guidance of a qualified senior scientist, that are willing and able to receive and train a fellow through his/her full participation in that particular project. Once these teams have been selected, a second call for proposals will be addressed to individuals interested in joining any of these preselected research teams. Networks offering coordinated training programs (see below) can also receive fellows under this modality. Special fellowships will also be available to well-qualified senior scientists willing to spend some time in a laboratory located in a less-privileged

country.

2. Networks:

A network gathers European research teams working on a definite scientific topic using common or complementary approaches, either experimental or theoretical. Networks can be established and apply for funds to carry out any of the following activities:

- i) Coordination of their current research activities through meetings, exchange of information, software, experimental tools or resources. These networks should include at least five laboratories in three different countries. Special care should be exercised to include teams from lesser-privileged regions in Europe in the network. These networks may offer a co-ordinated training program, and act as host organisations for the Fellowship programme.
- ii) Specific research projects in which the cooperation of several European research teams is shown to be necessary for a successful outcome of the project. Funds requested to carry out these projects may include actual research costs (consumables), staff specifically hired for the project (but not fellows specified in item 1), and travel expenses. Networks applying for specific research projects should be of size judged optimal for efficient scientific cooperation.

3. Large-scale installations:

This is in fact a follow-up of a previous action already supported by the CEC under the STIMULATION and SCIENCE Plans.

4. Euroconferences:

The objective of this action is to enable young scientists to participate actively in very important high-level Conferences. Selected conferences will be sponsored by the EC, and will offer financial support to young researchers, especially those coming from the lesser-privileged countries in Europe.

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User Interface and Multimedia Activities in the ERCIM Institutes

by Nuno Guimarães

The broad spectrum of research activities that falls under the topic "User Interfaces and Multimedia" has been the concern of several groups at INESC. The recent ERCIM Workshop on User Interfaces (UI) and Multimedia (MM), held in Lisbon, in November, allowed a limited, but yet significant, number of researchers of the ERCIM institutes, to get some insight of the activities being carried out.

Examples of on going projects are User Interface Development Systems or, more generally, Interactive Tools (INGRID), Hypertext and Hypermedia toolkits and applications, Models and Architectures for Graphical systems and applications, Animation, CAD and Image Processing.

Perspectives and Challenges

Our perspective of the research directions in these areas is closely related with some of the conclusions drawn at the

Lisbon Workshop. Generally speaking, we can formulate a set of important questions that concern researchers and developers:

How do we make a language out of multimedia?

User Interfaces as a research area is mainly concerned with improving communication between users and machines. Multimedia provides technologies that allow more versatile communication including voice, gesture or pattern recognition, together with the traditional keyboard\display devices. The integration of these mechanisms and devices is a challenge. Multimodality is the term adopted in the research community to name this challenge.

How do we build better, more adaptive and responsive UI's?

This question addresses the architectural and design issues that have to be handled in building interactive systems. Much of the challenge in this area is in the defi-

inition and implementation of more powerful tools, software architectures and user interface models.

How do we structure the media ?

Computing systems are now able to store, represent or transmit multiple kinds of media. Again, these multiple media are parts of a language, as for example, when composed in a document, or hyperdocument. Hypermedia tries to structure pieces of heterogeneous media to achieve effective communication.

How do we prove things about User Interfaces?

The role of formal specifications and verification is as important in the construction of user interfaces as in any other field of computer technology. The same consideration applies to multimedia, with the added features of time and synchronisation.

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Multimedia Document Modelling at IEI-CNR

by Carlo Meghini

The last ten years have seen the growth of a research area which unites the disciplines of information retrieval and multimedia document management. The on-going research activity in this area at IEI-CNR is here briefly described.

A multimedia document model can be seen as consisting of three major components. The first component, the syntactic model, is a model of the structure of documents, seen as aggregates of interrelated objects which may be of dif-

ferent kinds: data, text, image, graphics, or audio objects. The second component is the semantic model, that is a symbolic, more specifically propositional, representation of the contents of documents along with the relationship between the syntactic model and these contents. The third component of the model is the relevance function, a mapping from user information requests into sets of documents.

The definition of a syntactic document model was a major concern of the MULTOS Project, an ESPRIT I Project in which a system for filing and retrieving documents has been designed and prototypically implemented. On the basis of the MULTOS experience, we now propose a multilevel model as the syntactic model; this model allows multiple representations of a document, categorised as layout, logical and conceptual representations, and based on the classical constructs of semantic data models, i.e. objects and abstraction mechanisms.

We have now begun to study the other two components of a multimedia document model: the semantic model and the relevance function. Our approach is to define a logic with an associated theory of uncertainty for representing and reasoning about the contents of multimedia objects. The inference relation of the logic should capture, via interaction with the user, the notion of relevance of a set of documents to an information need (effectiveness of retrieval), and should be computationally tractable (efficiency of retrieval).

The components of the model must finally be integrated into a coherent framework. The most promising candidate is again an object-oriented model that preserves the object view of documents and embodies retrieval in the form of inference.

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Methodologies for the Development of a Correct Specification of Hierarchical Interaction Devices

by Giorgio P. Faconti

The area of interactive computer graphics that couples graphics with the notion of interacting agents is still an almost virgin territory if we consider the small amount of research carried out in the field starting from a sound formal approach. At CNUCE, research in this area has resulted in the definition of a formal model of hierarchical interaction devices based on a set of building blocks to which composition operators may be applied.

There are two main motivations behind these studies: on one side, it is widely recognised that the actual input model from which interactive graphics is developed does not satisfy the requirements of modern user interfaces; on the other, the functionality provided by the toolkit approach of window systems does not fit the framework of advanced computer graphics.

A number of issues were raised during the three ERCIM meetings held in 1991 on this subject, regarding the key questions of the concurrency, extensibility and configurability of logical interaction devices.

The hierarchical input model satisfies both the extensibility and configurability issues and addresses the problem of

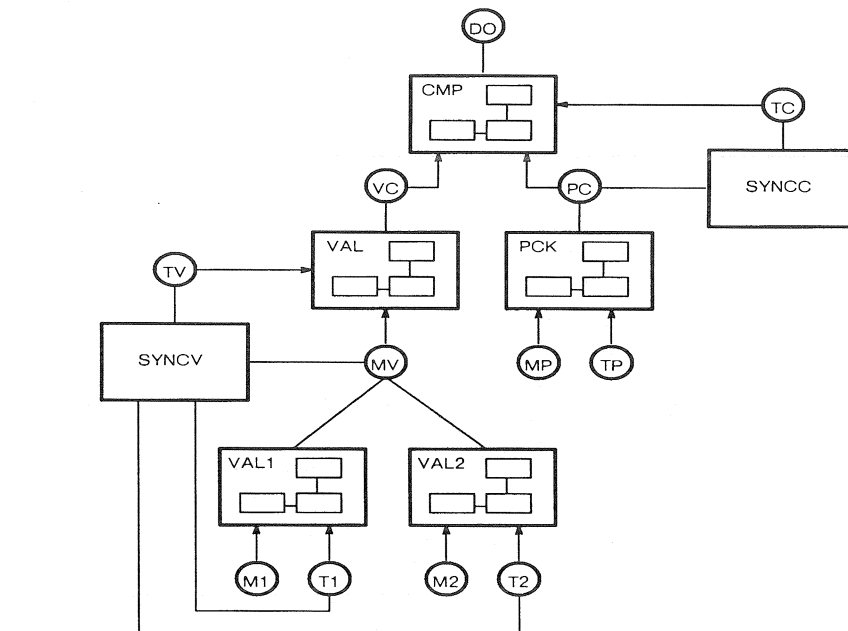


Figure 2: Visual description of a cluster

multi-threaded dialogues by explicitly considering parallelism and concurrency among devices in a hierarchy.

A hierarchical interaction device, or cluster, results from the composition of logical interaction devices (LIDs) for which the measure or trigger at a particular level in the hierarchy derives from values generated lower down in the hierarchy. Composition rules are defined that make it possible to verify the consistency and operability of a composed interaction device when operating following the component LIDs default behaviour. Specific processes, called synchronisers, are used to constrain the interactions occurring

among LIDs in order to provide different interaction techniques for the same cluster.

In order to investigate their interaction properties, clusters are described using the LOTOS notation; the resulting specification is then checked using the LITE tools (a software engineering environment for LOTOS developed within the Lotosphere ESPRIT project by our colleagues working in the field of Formal Description Techniques). In order to hide the complexity of LOTOS, research is actually under way with the aim of automatically generating a cluster's specification from a visual language based on a free hand graphics editor and on a parser able to perform syntax and static semantics checking of a drawing from the definition of a Picture Layout Grammar. Figure 1 shows the overall process of generation of executable code starting from the graphics editor. Figure 2 gives an example of a visual program describing a hierarchy of LIDs with synchronising processes.

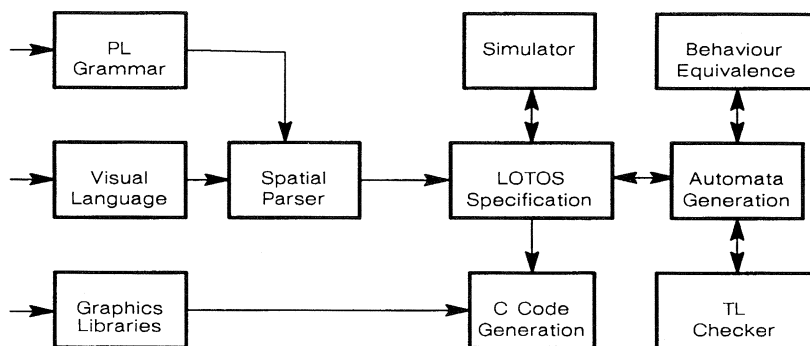


Figure 1: Development environment for hierarchical interaction devices

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CWI's Multimedia Research focuses on Synchronisation

by Dick Bulterman

CWI's multidisciplinary research project on multimedia systems studies the impact of multimedia information processing on the user and system facilities provided within a computing environment. While the most visible aspect of this study is the integration of "new" media (such as video, audio, images, drawings and enhanced text) into a conventional workstation, the longer term goal is the investigation of generalised data description and manipulation facilities required for processing all types of time-dependent information.

Within the broader study of multimedia systems, the initial focus of our work has been the study of synchronising independent multimedia data streams. This means considering, say, a TV news presentation as a collection of independent audio, video, graphics and text channels rather than as a single composite data item. Synchronisation is an interesting problem for at least two reasons. First, it lies at the heart of manipulating independent sets of time-based data. And second, it is a problem that can (and must!) be addressed at several different functional levels – such as the architecture, operating system and user interface levels – if flexible multimedia support is to be provided.

At present, there are four projects at CWI that investigate complementary aspects of the multimedia problem:

Multimedia Kernel Systems:

This project investigates operating systems and architectural support for implementing synchronisation of multimedia data. It builds upon work done earlier at CWI on the Amoeba distributed operating system, and is concerned with the functional partitioning of multimedia support across a set of distributed multimedia workstations.

Heterogeneous Multimedia Documents:

This project investigates the user-level structuring of transportable multimedia documents. Two main goals are

- 1) to find intermediate document representations that facilitate the implementation of multimedia documents across a set of heterogeneous workstations, each with different multimedia capabilities, and
- 2) the definition of document "filters" that dynamically adapt one component representation to another.

Real-Time Data Synchronisation:

This is a new project to investigate data structure and output model support for synchronising spoken audio information with graphics-based lip movements. Its focus is on the study of the primitive lip positionings required to model the (visual) production of human speech. These models will then be used to automatically synchronise the presentation of audio and visual speech information.

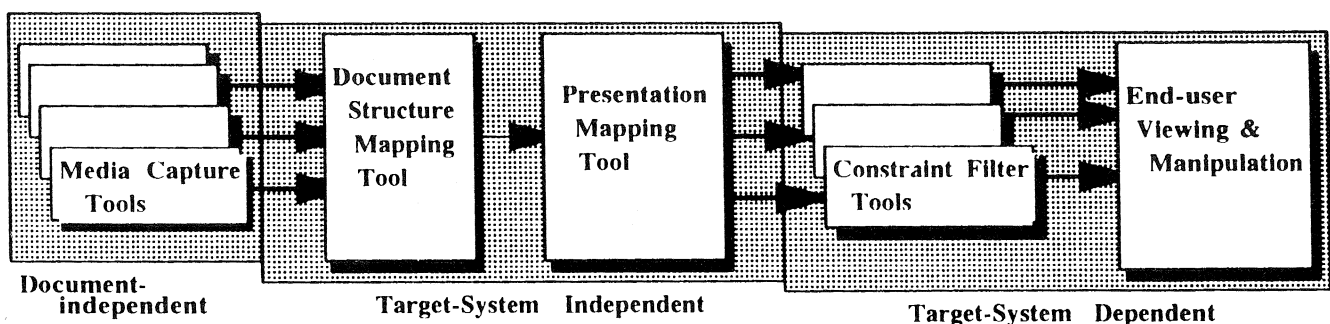
Hyper-Based Multimedia Information Structures:

This is a new project that will investigate the integration of hyperdata structures (such as those found in hypertext systems) with multimedia data streams. In particular the impact of manipulating temporal data in a non-sequential manner will be studied. The initial investigation environment will be the support of a "management game" problem, in which information concerning the operation of a business system is maintained in a knowledge base as a collection of hyper-structured multimedia data fragments.

The projects described above are being investigated across the CWI departments of Computing Systems and Telematics, Interactive Systems, Numerical Mathematics, and Algorithmics & Architecture. In addition, several external research institutions and corporations participate in the project via joint research agreements.

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The general elements of the multimedia problem can be connected into a pipeline in which information flows from one stage to the next on its way from document definition to final document viewing. At CWI, different groups will combine their expertise in systems architecture, operating systems, distributed databases, user interface design and interactive systems to address different parts of the pipeline process.



User Interface and Multimedia Research at INRIA

by Jocelyne Nanard

Research in User Interface and Multimedia at INRIA started in the early 1976's with the Kayak project which aimed at designing a personal workstation for office automation and multimedia document production.

It has resulted in laying the foundations and orientations of research in User Interface and Multimedia at INRIA, mainly concerning:

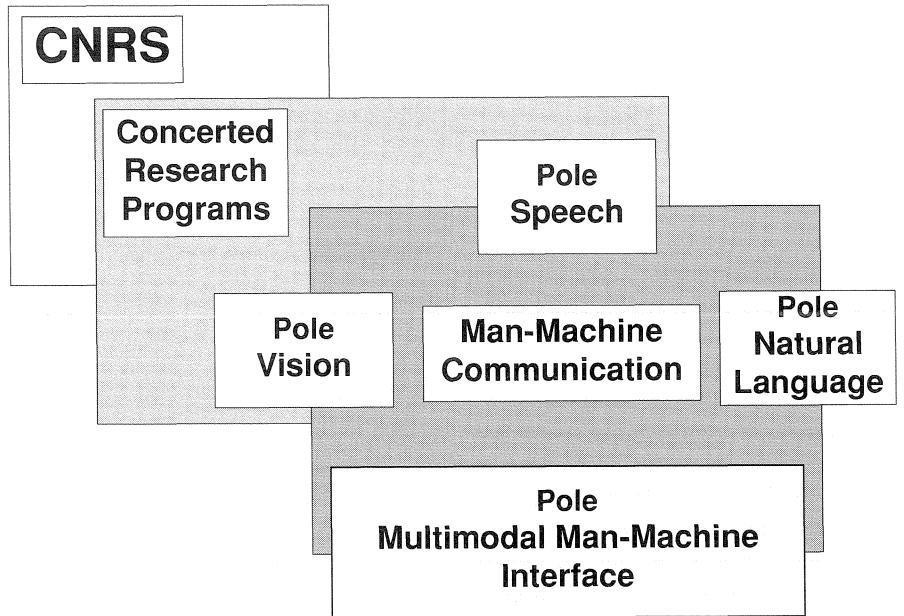
- Multimedia and multimodal interaction
- Platforms for construction of interactive and multimedia systems
- Software architecture for the User Interface
- Systems for Multimedia document production.

Many projects are engaged in the European projects ESPRIT II and EUREKA:

- Multiworks (Multimedia workstation),
- ROARS (Multilocutors technologies and continuous speech analysis in oral dialogue systems)
- MMI2 (Multimodal Interface for Man-Machine Interaction with KBS)
- ESF (European Software Factory).

At the national level, INRIA cooperates with the pole "Multimodal Man-Machine Interface" of CNRS's Concerted Research Program "Man-Machine Communication". This pole is concerned with the integration of multiple modalities (speech, natural language, computer vision, graphics,...). Several experimental multimodal platforms are currently developed in order to study realistic architectures for multimodal interfaces.

The national IHM workshop on Man-Machine Interface Engineering has the



INRIA's connections with national projects

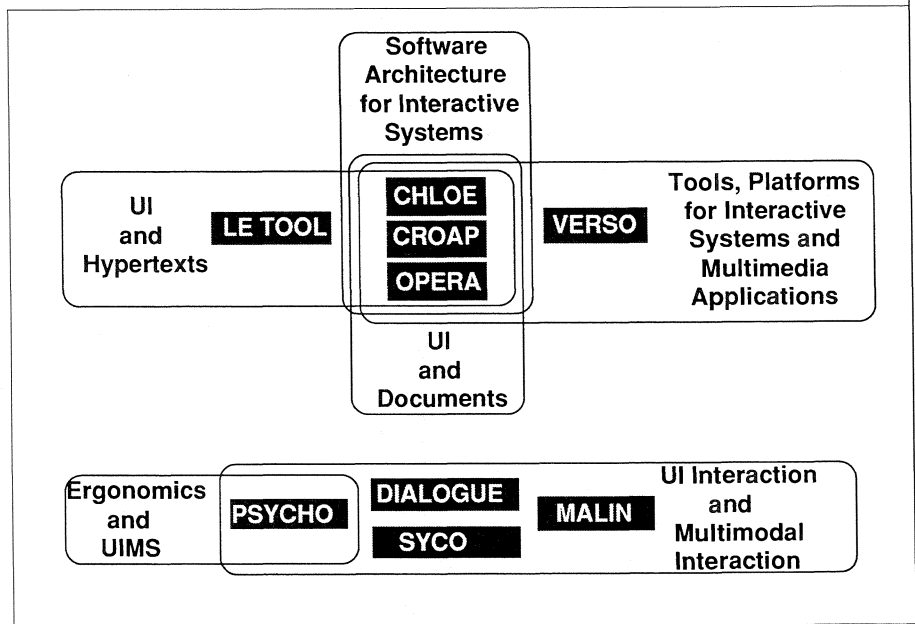
scientific sponsoring of INRIA and is co-organised by numerous French laboratories: LIS (Toulouse), CRIN (Nancy), LGI, ICP (Grenoble), ECL (Lyon), LRI (Orsay), LIRMM (Montpellier), ENST (Paris). These labs are also jointly involved in the scientific program of the "Interface to real and virtual worlds" conference devoted to Man-Machine Communication, which took place at Montpellier (France) in March.

At the ERCIM Workshop on User Interface and Multimedia at Lisbon (Portugal), two interesting approaches to User Interface were emphasised: the use of ergonomics to design and produce user in-

terfaces, and the use of active documents and hypertext for user interface integration. Three technical presentations were given:

- "User Interface and Multimedia technologies in the Multiworks project" by A. Rizk
- "A taxonomy for Multimedia and Multimodal User Interface" by J. Coutaz
- "Referring in a Man-Machine Multimodal dialogue" by L. Romary, also presented in this issue.

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Overview of INRIA projects in User Interface (UI) and Multimedia (MM) research.

IMIS

User Interface Toolbox

by Ulrich Hoppe and Bernd Kostka

As a contribution to the EC project IMPACT/MITI, which was launched in January 1990 with a duration of two years, a "User Interface Toolbox" (Tb) was developed at GMD-Institute for Integrated Publication and Information Systems. The aim of the overall project is to provide an "Intelligent Multilingual Interface System" (IMIS) to European hosts and databases, which can also be installed on a personal computer to access different databases on different hosts in a uniform way.

The interface will offer alternative modes to search in four European languages (English, French, German, and Spanish). It will guide users intelligently and help them to initially construct and to reformulate queries in accordance with their information needs.

Once the search is well defined, the software automatically logs on to a relevant database; in the first release 24 general technology and environmental databases will be accessible.

The User Interface Toolbox consists of a library of objects and functions to be used by application programmers. To assure wide availability and maximal portability they are written in C and built upon X-Windows and OSF/Motif.

The Tb was mainly designed to fulfil the following demands:

- provide a set of primitives and methods for generating the user interface and the control structure in a consistent way
- provide a set of tools for easy integration of simple help facilities
- provide specific input/output routines necessary to support any required
- type of user interaction with the IMIS-components
- provide functions for an easy switch-

- ing between interaction languages
- in order to support multilingual user interfaces

The aim was, on the one hand, to reduce the complexity of OSF/Motif programming for the application programmer and, on the other hand, to augment the Motif functionality according to special necessities, e.g. by introducing new compound objects. The Tb consists of user interface objects and functions. Currently, there are some 30 different Tb objects available; they range from labels and buttons to multiple choice panels and help windows. In order to create the desired user interface, application programmers can use some 90 Tb functions and define their own object-specific callback functions to interface to the application program.

Two measures have been taken to support multilingual user interfaces:

Firstly, it is possible to split the resource definition files (containing "canned text" to be displayed) into language-specific and common (i.e. language-independent) resource files. All resources defined in language-specific resource files can be changed using only one function call. This makes it possible to change the interaction language of the entire user interface at once.

Secondly, text input and output is possible in a uniform way for all four mentioned European languages. Text input by users (i.e. typing into a text editor) can be done uniformly in any of these languages, independent of the keyboard at hand.

The current version 1.1 of the Tb has recently been shipped to the IMIS project partners. The Tb runs both on 386 PC's (in the SCO Open Desktop environment) and on Sun-3 and Sun-4 workstations.

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Project OPERA: Electronic Documents

by Vincent Quint

Project Opera is concerned with electronic documents, their representation in computer systems and the techniques for processing them.

The main goal of the project is to design new document models which can represent not only the logical organisation of documents, but also their graphical aspect and content, as well as the relationships that exist between these three levels of representation. Such models also include links between documents or parts of documents, so that they can represent usual documents and hypertexts as well. Structured elements contained in documents, such as tables, equations or drawings are also taken into account in these models.

A further objective is the development of editing techniques for implementing the document models. The high level of abstraction of these models makes sophisticated manipulation of documents possible, and a large part of the activity of the project is dedicated to the development of new tools for editing documents. A major issue in editing tools is the user interface: the project aims to use abstract documents as a way to communicate between applications and users.

The project has developed an editor for structured documents called Grif, which is based on a high level document model. This model will be extended for use in hypertexts and for compatibility with the SGML standard. At the same time that the editor evolves towards integrating these extensions, it will provide an open architecture such that many applications may take advantage of structured editing techniques. The Grif prototype developed in the project has been industrialised and extended for Unix workstation by Grif S.A., an INRIA spinoff.

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Communicating Concepts in an On-line Public Access Catalogue

by M. Bruna Baldacci

As is well known, the effectiveness of information retrieval in an On-line Public Access Catalog (OPAC) greatly depends on the user's ability to express his/her information needs in the language used by the indexers to represent the information contents of the documents. An OPAC with a very friendly interface toward both indexers and users has thus been developed with the aim of improving the information retrieval function. The OPAC has been designed so that the indexers can control and coordinate their document indexing, and the users, who express their queries in natural language, are also made acquainted with the language used by the indexers.

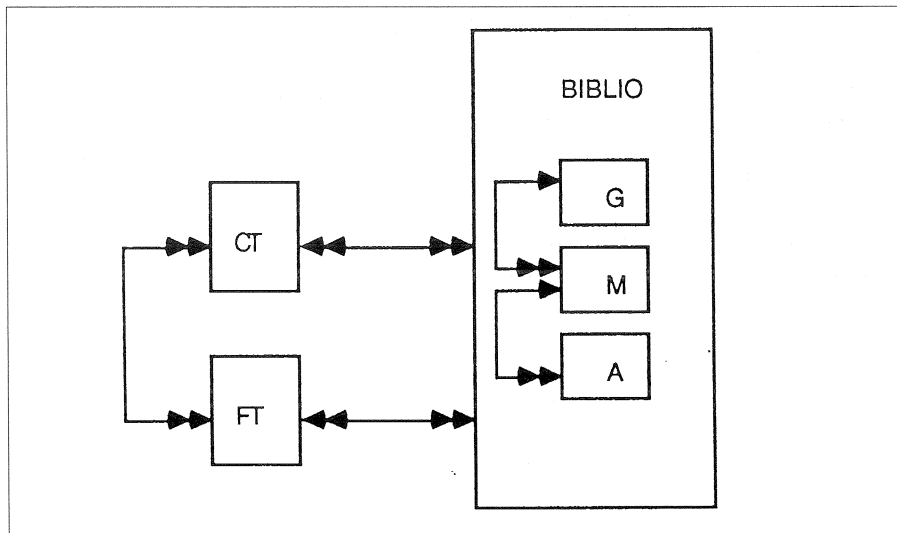
The OPAC is integrated in the ATLAS system, a prototype library automation system developed in a collaboration effort between Pisa University, IEI-CNR, and Bull Italia S.p.A. The prototype was completed in 1988 and is now successfully working at Pisa University, connecting the libraries of the Economic and the Social Sciences Departments, and also the city public libraries, through a "star" network.

Below, we briefly describe the primary mechanisms of the interface which manage the OPAC indexing and the information retrieval functions.

Semantic information structuring

The semantic contents of each document are represented by the indexer using free terms which are associated with a higher-level controlled language term (possibly a classification code of a general or specialised classification scheme) to assign a context to the free terms. The relations between document representations, free terms and their contexts are shown in the figure, where FT and CT are the dictionaries of the free and controlled terms, respectively, and BIBLIO is the bibliographic file in which docu-

ments are described at the General, Monograph and Analytic levels. Connections between FT and CT associate those free terms and controlled terms which have been assigned to the same document.



The relations between document representations, free terms and their contexts

The indexing function

During indexing, the FT and CT dictionaries and their relations are created and updated in a controlled fashion by the OPAC interface, as follows. When an indexer enters a new free term, the interface selects any "similar" free terms, according to a given selection algorithm, from the appropriate dictionary and displays them to the indexer so that he/she can indicate a possible alternative choice. If one of the displayed terms is chosen, the interface lists the higher level term(s) already associated to this term. If no similar term exists, the interface asks the indexer to input the context to which the newly entered free term belongs, and then displays all the free terms which have already been associated with that context.

The retrieval function

The OPAC interface guides the user to direct his/her efforts toward exploring

and selecting concepts represented by the indexers rather than trying to translate his/her needs into matchable queries. The interface asks the user to express his/her needs in natural language and then displays all the free terms that are similar to the user query. If the user selects one or more of the displayed terms, the interface asks if associated terms should be displayed so that the user can find other possible relevant terms. If no similar term exists in the FT dictionary, the interface asks the user to input the term of the controlled language which best

represents his/her research field, and then displays all of the free associated terms.

The above steps are organised in a more articulated, friendly user/system dialogue.

Possible future developments

Contacts are in course with the local UNESCO-Isis software agency in order to enrich the CD-ISIS system with a user interface based on the system/user interaction already experimented in the OPAC of the ATLAS prototype. We welcome cooperation with ERCIM groups in the field of library automation with the aim of submitting a joint proposal to the CEC Library Programme. ■

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Implementing a User-friendly Conceptual Access to CNR Research Project Descriptions

by Paola Venerosi

The CNR Special project "Trasferimento delle tecnologie dei Progetti Finalizzati" was set up in 1988 with the aim of diffusing information on CNR research activities and promoting co-operation and synergetic enterprises within the R&D community. In 1991, the Project supported about 53 working groups throughout Italy. At IEI, a working group has the task of designing and implementing a user-friendly interface which interacts with a conceptual representation of CNR research projects in the computer science area.

The first step was to analyse the use of an indexing language to represent the contents of a research project. Our aim was to develop an interface module providing a variety of hierarchical index "views" in which the nodes represent concepts and the links represent the relationships between the concepts. This easily understood structure permits the user to browse comfortably.

Organizing the unstructured free-term terminology employed in the project documents in order to define a search strategy was difficult; it appeared far more profitable to organise the free-terms into a controlled, structured and well-known classification scheme. The top two levels of the ACM Computing Reviews Scheme met our purpose and were adopted to constitute the frame with which the free terms could be associated. The conceptual subdivision of computer science topic areas was thus efficiently expressed and the hierarchical organisation inside the subdivision maintained, allowing general and specific queries from the controlled language to the free-term level. Data suitable for semantic retrieval were considered separately, thus enlarging the document description elements.

In 1990-1991, an end-user interface was designed to allow interaction with the project data. A menu-driven interface allows the user to operate on homogeneous data either by information content or by functions to be performed using different information retrieval techniques. The system, called PROGEST, runs under DOS on dBASEIII plus. Deterministic retrieval is executed by relational DBMS functionalities while two complementary search methods, i.e. full-text retrieval and indexing language searching, have been developed for semantic retrieval. A browsing strategy has been implemented to allow users to search through the graph of index associations. An extended indexing implementation, increasing the expressive RDBS power, was essential to support the non-traditional application.

A revised version of PROGEST was then developed in a hypertext environment. Our scope was to increase the graphical expressivity of the interface, maintaining most of the above functionalities. The system is developed in Hypercard Apple using the Hypertalk language. The prototype has a two level structure. At the first level, we have a hypertext document base composed of all research project documents. At the second level, two linked hypertext objects enabling IR functions are implemented: the first contains a controlled and structured indexing language representing the content of the research projects, and the second contains a set of structured images representing the geographic location of the CNR research centres. Both operate on the document base by means of a navigational technique. A switching system is provided linking the different levels and introducing the user into the hypertext environment to access information and view documents.

■
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User Interface and Multimedia at INESC

by Nuno Guimarães

User Interfaces and Multimedia is a growing area at INESC. One reason for this growth is the evolution of current computing systems with respect to improved interactive capabilities. New technologies raise new questions and justify new answers. A second reason is the pervasiveness of high quality user interfaces, and multimedia facilities, in current computing systems. We believe that high quality user interfaces and multimedia have a qualitative impact in the role of future organisational systems and critical information systems.

INESC has its own attempts to answer the questions related with the User Interface and Multimedia technologies. Some examples are described below. INGRID (Interactive Graphical Interface Designer) is a tool that supports interactive creation of user interfaces. It adopts the object oriented paradigm and stresses the need for openness. The kernel components of INGRID are a C++ runtime support system (ICE) and a user interface toolkit (4D) designed to encapsulate external tools.

The H4D is an extension of the 4D toolkit to support the development of Hypermedia applications. The main features of the toolkit are the strong encapsulation of the storage systems like indexed Unix files or object oriented distributed platforms (COMANDOS), a high degree of transparency to representation systems, and the compatibility with the INGRID architecture. Continuous media and synchronisation is also a concern. The development of a toolkit for manipulating continuous media is under way. Special attention is given to standards like HyTime.

COMICS

One of the most relevant (in our perspective) observations of the ERCIM Workshops held in Lisbon in November 1991, was the realisation of the relation between the three different areas: User Interfaces and Multimedia, Distributed Systems and Decision Support Systems. The convergence of research directions in the three areas, supplemented by contributions of social sciences, is leading to an important activity, designated by Computer Supported Collaborative Work, or, more generally, Organisational Computing. What is then the role of User Interfaces and Multimedia in this context?

Our approach is materialised in the COMICS project. COMICS stands for Computing for Organisations with Multimedia, Intelligent and Collaborative Systems. The COMICS project was conceived to bring together advanced research and development in the areas of Distributed Systems, Information Systems, and Interactive Systems. Support and use of multimedia is envisaged in any of the three areas. Intelligence is also considered in several areas, from information retrieval to domain specific tools for organisational design and specification.

Much of the research directions defined in the context of this project, are evolutions of the current developments described above. INGRID is a tool for interactive programming. In spite of a good deal of interpretive functionality, it lacks an effective binding to knowledge bases. This knowledge is the core of high level constraint based programming, a paradigm that is required for the tools supporting organisational computing. User interface frameworks like the 4D toolkit, or its extensions (H4D), have to become aware of the multiuser nature of future interactive systems and applications.

Other research directions of the project fall out of the specific area of User Interfaces and Multimedia, such as efficient and flexible group communication and synchronisation paradigms, or powerful IR mechanisms able to cope with scale and multimedia.

Organotics

User Interfaces and Multimedia is definitely a fundamental component of computing systems. The impact of the technologies will be more significant in the context of multidisciplinary approaches. We believe that the advance of organisational systems or, as we dare to call it, Organotics, is a major challenge and a wise investment of the knowledge in User Interfaces and Multimedia.

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Visual Languages at CNUCE: G-LOTOS Formal Definition and Tools

by Tommaso Bolognesi and Diego Latella

The activity currently in course at CNUCE aimed at the definition of a graphical syntax for the LOTOS language is outlined.

In 1989, LOTOS (Language of Temporal Ordering Specification) became an ISO (International Standards Organisation) standard specification language. Although LOTOS was mainly designed for the specification of communication protocols, the expressivity and abstraction levels offered by the language are such that it can be used for specifying a wide variety of systems where concurrency, data exchange, reaction to external events and non-determinism are relevant aspects of behaviour.

In 1987, a joint ISO-CCITT effort was started for the definition of a graphical

syntax for LOTOS, called G-LOTOS, which is expected to become an addendum to the LOTOS standard by 1992.

The main objectives of the G-LOTOS activity are:

- to make LOTOS specifications more readable and more appealing to the reader's intuition;
- to facilitate teaching and promotion of the language, by attracting the interest of those who are not comfortable with the algebraic notation of the textual syntax;
- to provide the basis for the development of advanced, user friendly, LOTOS tools.

Three fundamental aspects of this effort in which CNUCE has actively participated are briefly mentioned below.

1. Identification of an adequate set of graphical representations for the LOTOS constructs. Preference has been given to symbols that can be easily drawn by hand (e.g. boxes and arrows); some choices were determined by the answers to an international questionnaire promoted by CNUCE.

2. Formal definition of the graphical syntax. Two alternative approaches have been evaluated: the definition of two "unparsing" functions for deriving concrete textual and graphical representations from a common abstract syntax, and the usage of an attribute grammar and an extended BNF form for the definition of the G-LOTOS constructs, of the topologic relations among their parts, and the translation into textual LOTOS.

3. Experimentation with graphical editors. Five G-LOTOS syntax-driven editors have been developed and evaluated and are based on existing meta-tools with graphical capabilities (GRASPIN, LOGGIE, GIGAS, GREEN, the O-O approach).

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Dynamic Gesture Machine

by Monica Bordegoni

The Dynamic Gesture Machine is a suite of software modules which allow the wearer of a VPL DataGlove to demonstrate a series of hand gestures, and then use those gestures as input to another application.

The VPL DataGlove is an instrumented glove which can be used to provide real-time information about the wearer's hand movements. The system uses the bend values of optical fibres to recognise the 10 joint angles of the fingers (two joints per finger), and uses a Polhemus device attached to the back of the glove to recognise six degrees of freedom (position of the hand in 3D space, plus pitch, yaw and roll).

A "pose" is a static configuration of the hand, characterised by the 10 finger joint bending values and three orientation angles (pitch, yaw and roll). "Dynamic gestures" are characterised by a sequence of

poses in some given time over some trajectory in 3D space.

The Gesture Machine system comprises two main modules: the "Learning Module" (which allows users to define and store their gesture models) and the "Recognition Module" (which recognises these taught gestures).

The architecture of the Recognition Module is shown in the figure. The Gesture Machine reads the raw values sent by the Data Glove Server, processes them and, when the initial pose of any taught gesture is recognised, sends an event to the X Server containing information about those poses. The Recognition Module algorithm uses parameters set by the application to determine the required accuracy of the match and which categories of gesture should be recognised. A gesture is recognised if its confidence factor (the percentage of matched poses out of the total number of poses) is reached. Information about the recognised gesture can then be given to the application.

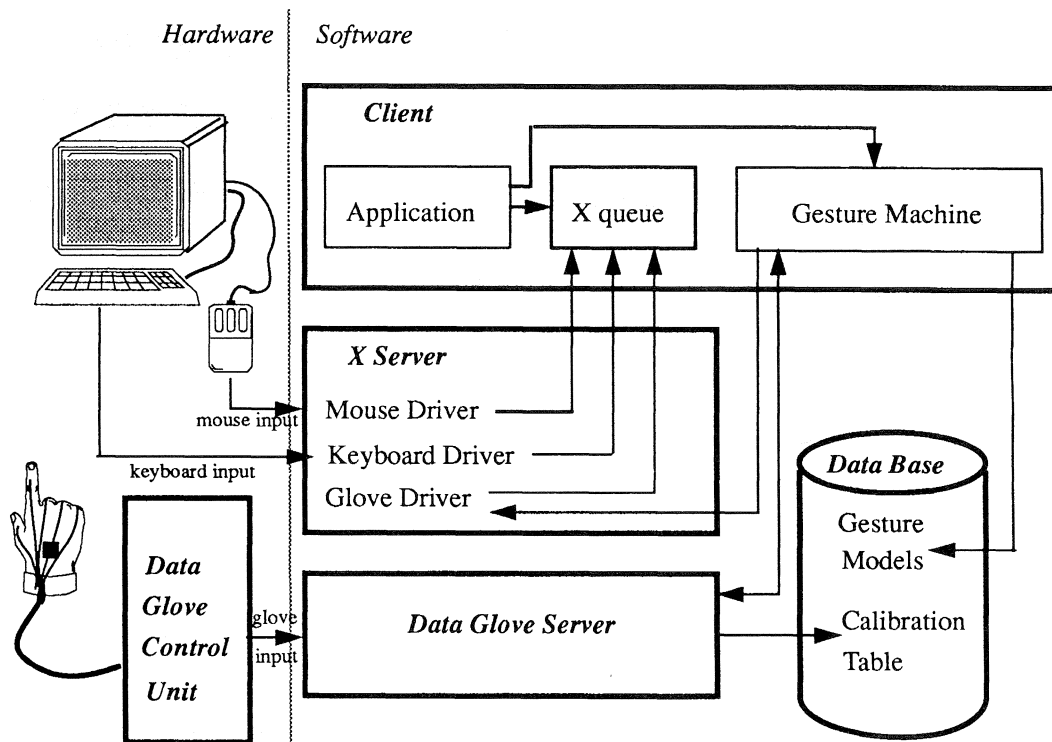
During development of the Gesture Machine and its recognition algorithm, feedback to the user is given via a graphical display. This allows the user to see if any gesture is in the process of being

recognised, the sequence of poses in each of these gestures and their confidence factors. By studying this experimental feedback, much can be learned about how gestures deteriorate with time and familiarity, and also what graphical/audio feedback is helpful to users of such systems.

With the increasing use of Virtual Reality and other highly complex 3D graphical manipulation applications, the use of gesture is becoming more important since it provides the user with a very natural and intuitive interface. The work described here is part of an on-going study at RAL into the use of gesture as part of a computer interface. The Gesture Machine was developed during a 6 month ERCIM fellowship in the Informatics Department at RAL. A report on this work is in the process of being written and will be available after February 1992 from RAL or the ERCIM secretariat.

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Architecture of the recognition model of the Gesture Machine.



Adding External References to Multimedia-mail

by Klaus Hofrichter

Communication in the future world will include multimedia information. The project deals with the impact of this development in the mail context and a practical approach for handling the problems with existing communication facilities is investigated.

The storage problem

Today's Desktop Workstations, such as Macintosh or NeXT, offer the capability of multimedia information processing. Not only text but graphics, sound and other information types can also be created, viewed and manipulated. With the coming-up of multimedia information in the electronic mail context, storage and transfer problems are encountered due to the significant amount of data used for multimedia documents. One of the major

"features" of multimedia information is the significant need for memory, most of the mail-routers do not have the capability of handling this amount of data in one block. The brief discussion below introduces a way for managing the problem using existing mail applications. The system currently under development uses the NeXT-step Environment, X.400, Distinguished Object References (DOR) and Referenced Data Transfer (RDT).

The external references approach

The introduction starts with a description of an electronic mail scenario. The picture illustrates the complete system.

An author composes the multimedia document and decides to send this document to a receiver. The local mail-application checks the memory needed for the mail and asks the author if he wants to use an external reference for the memory intensive parts of the mail. These parts will be replaced with an external reference, which is somehow a kind of pointer to data stored on a local multimedia storage system, where the original data is stored. The remaining mail-body (with textual information, external references and layout-data) is not changed and can reach the receiver via the standard mail system. The receiver checks the mail and decides which parts of the external in-

formation are relevant and processable on the receivers machine. At this stage, an automatic process starts communicating with the authors storage system and then transfers the data.

The major drawback of this procedure is the delay between the receivers selection of the external references and the presentation time. However, there are a number of important advantages, such as:

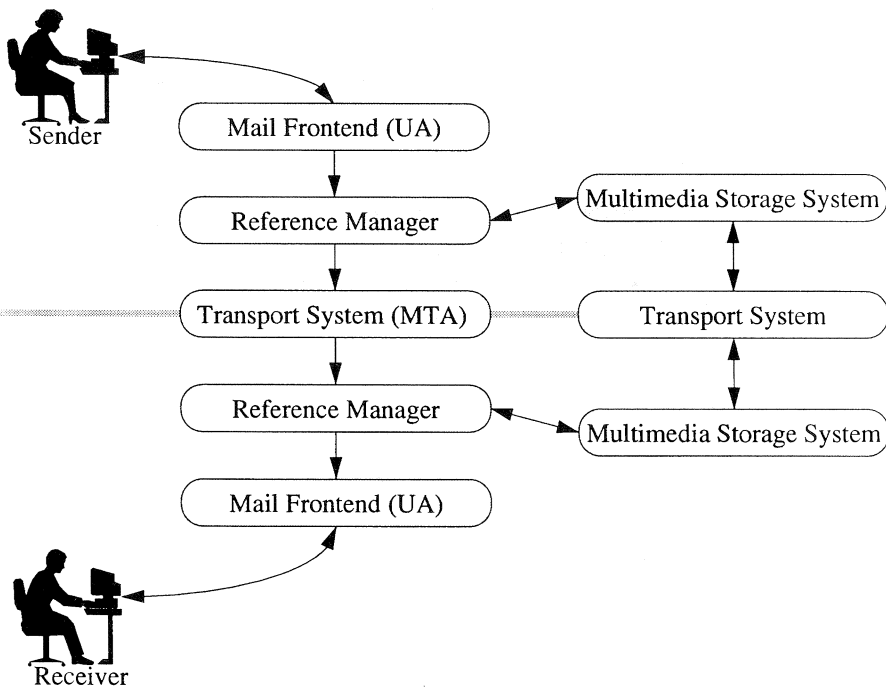
- Only relevant data, selected by the receiver, is transferred.
- Layout data and textual information are accessible early.
- Different transfer mechanisms for the mail body and the multimedia information are possible; on-line transfer of continuous media can even be considered.
- Storage Systems can offer a conversation service for different data formats.
- There is no need for senders to be knowledgeable about the receivers data-processing capabilities.
- Most of the steps can be done automatically.

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Reference in a Multimodal Environment

by Laurent Romary

We are concerned with problems related to the design of man-machine multimodal dialogues. More precisely, we are tackling the issue of referring thanks to different communication modes such as Natural Language and a designation mode (in short: Designation). Our research in the Dialogue project at the CRIN/INRIA Lorraine has first been motivated by our participation in the Multiworks Esprit II project, which has led to the design of a natural interface for a Multimedia editor called Multicard (Bull).



External reference in a mail system

Let us first give some essential definitions concerning the concepts of multimedia and multimodal systems. From our point of view, we can say that a computer is multimedia or deals with multimedia information as far as it handles different types of information without trying to have a precise idea of the internal structure of this information. Conversely, when we speak of multimodal information, we mean that the computer and the user exchange information they both understand (i.e. to which they can react/answer in the right way). In this situation, there is real communication between the two entities, which is why we can speak of a dialogue.

The actual application we have in hand, Multicard, is an interesting one for several reasons. Firstly, the associated task is rather simple since it essentially consists of creating and modifying objects which are to form the final multimedia document. At present, the different commands are available to the user by means of a classical Macintosh-like interface that the dialogue has to make more user-friendly. In addition, from the user point of view, there are many different types of objects to be created and modified, and thus, the dialogue with the machine is not that simple since it necessarily requires negotiation to determine the actual objects over which the current operation is to be performed.

Our main conclusion is that even if, at first sight, dealing with a multimodal dialogue seems quite a great bulk compared to Natural Language dialogue, it appears that most of the knowledge that we have at our disposal can be extended to form a coherent description of the phenomena involved in such dialogues. Such models are necessarily based on inter-disciplinary research coming from linguistics and computer science, but also from ergonomics.

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MERIT: Multimedia Extensions of Retrieval Interaction Tools

by Ulrich Thiel

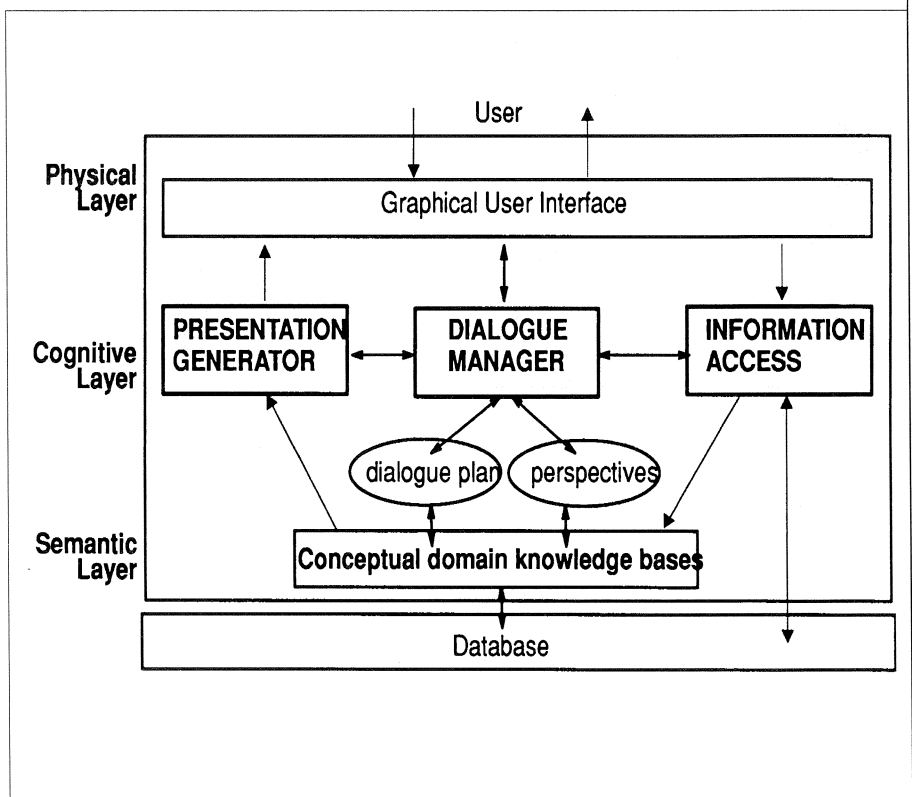
The development of knowledge banks and object-oriented data banks with semantic schemata requires new approaches to the design of user interfaces for these systems. Due to the intensive interrelation between the information objects, the stored structures often show such a high degree of complexity that traditional query languages cannot provide an adequately flexible way of handling the structures. As an alternative, we propose a user interface which supports the exploration of a relevant part of the knowledge base.

Synopsis

MERIT ("Multimedia Extensions of Retrieval Interaction Tools") offers access to an EC data-base covering research programmes, projects and consortia in the field of information technology. The system features graphical presentations of retrieval results, employs interactive maps to display geographical data, and can provide scanned-in pictures. In order to enable the system to comment on critical dialogue situations, eg. if the chosen presentation form's capacity is exceeded by the amount of data to be displayed, we are adding the text generation component developed in the KOMET department to the MERIT architecture.

Querying the database

Once a concept is selected to define the global topic, the user can proceed by posing a query. Thus, the global topic can be restricted according to the user's interest by stating attribute restrictions which determine a subclass of instances of the chosen concept. For this purpose a form sheet is provided. Each line of this form sheet represents a restriction requiring certain attribute values. If the constant field is left empty, the attribute



The Architecture of MERIT

is neglected. If all restrictions are fulfilled for a given instance, then this instance belongs to the set of responses.

Navigating in knowledge presentations

Taking into account that information seeking interactions are not determined by a predefined, standardised task structure, but by individual strategies of users to which the system should adapt, we use a "case-based" approach to user guidance. MERIT employs a Dialogue Manager that consists of several components: a retriever selecting the most appropriate dialogue plan from a knowledge base of case-based dialogue plans according to the user's goals; a modifier that adapts the chosen plan to the user's goals by replacing objects and adding or deleting dialogue steps and, as a further component, a corrector, which handles subdialogues about (the system's) 'misconceptions' interactively, if the user doesn't accept the offered information. The storer is responsible for updating the plan knowledge base.

Stating restrictions in the query form sheet allows to access instances of the abstract concept which comply with the user's demands. In the knowledge base the relevant instances are linked to other objects by semantic relations. This allows to select fragments of the knowledge base varying considerably in extent. MERIT shows the presentation variants of the retrieval result as a hypermedium, i.e. the visualisations of the knowledge base are constructed as cards within a stack. The presentation component of MERIT employs a set of generic forms (graphs, tables, lists etc.) which allow for an adequate visualisation. The way a user can navigate through the knowledge base follows thematic patterns determined by a transition network. A dialogue step is initiated by an input and corresponds to a state transition. The input may either be a query (filling out a query form sheet) or a mouse click on one of the buttons which are installed on the current presentation.

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GMD Research on Adaptive Multimedia Support Systems

by Gernoth Grunst

The Human Computer Interaction research group in the Institute for Applied Information Technology of the GMD is involved in several research projects concerned with the development of cognitive adequate support systems. For different domains the necessity of nontextual help concepts has been empirically identified. In the domain of spreadsheet calculations the support environment HYPLAN has been developed. In a second domain, medical diagnoses based on ultra-sound examinations, multimedia illustrations turned out to be even more crucial. For a context sensitive critique and multimedia help system backing cardiological diagnoses (COCARD) the multimedia part is actually in a developmental stage.

HYPLAN

The support environment consists of two modules forming an adaptive multimedia help system backing spreadsheet calculations within Excel™ for the Macintosh™:

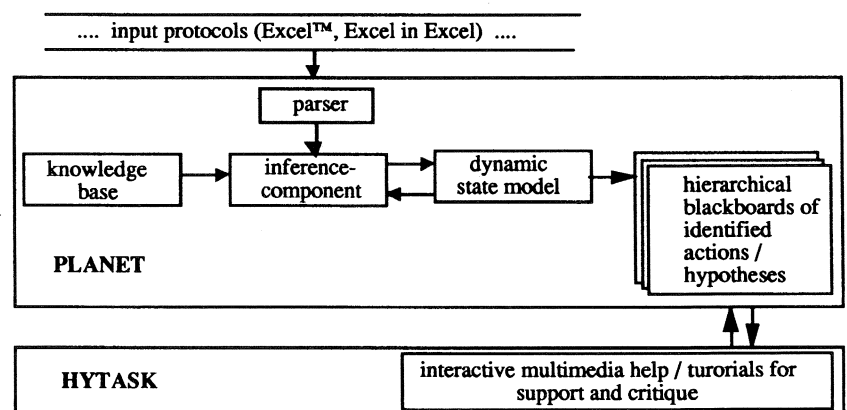
- HYTASK (HYpermedial TASK support), a multimedia tutorial and help system. This includes a network of hypertexts and animations explaining characteristic tasks for knowledge workers using spreadsheet calculation.
- PLANET (PLAn recognition through activated task NETs), a knowledge

based plan recognition system evaluating protocols of Excel™ operations. PLANET identifies realised work steps and infers actual aims of the user on various task levels. An access to the HYTASK help environment is formed according to the inference results.

The configuration allows to answer un-specific help requests with focused support access. Furthermore certain patterns of error messages lead to active aid, while suboptimal executions of some tasks are responded by a critique component presenting smoother solutions.

The usefulness of the entire system depends on the relevance of the plans considered. Thus empirical detection of crucial and notorious problems in the use of spreadsheet calculations has been a basic requirement for the developments. The contents covered are derived from the work domain of knowledge workers casually using spreadsheet calculation.

Support is given through multiple means of orientation: texts, graphics, interactive animations and spoken comments. Suitable scopes of application for the different communicative media were identified and evaluated in empirical studies. The cognitive reconstruction of the orientation effects were based on audiovisual recordings of system use supporting authentic work with Excel™. In order to stimulate an immediate understanding of misconceived details a scenic presenta-



The HYPLAN support environment

tion of relevant operations accompanied by verbal comments about reasons and pitfalls turned out to be most efficient. The transfer of imparted concepts to analogue task contexts can mainly be assisted through visualisations and metaphorical descriptions of the application's functioning.

COCARD

As in HYPLAN the concept integrates multimedia documents and interfaces with a knowledge based context evaluation system triggering active support. The objective is to identify and provide necessary help during ultra-sound examinations of children with congenitally heart diseases. The technical target system is the Sonotron 800 ultra-sound device with an integrated Macintosh computer.

The approval and thereby the performance of the support environment depends on its smooth integration into the normal work flow. In order to avoid extra feeding of data into the expert system module (resident in the Macintosh) an integrated protocol concept will supply the inference module with pertinent input information. Identified contradictions and gaps in a diagnosis are criticised by a watch dog module. Missing analytical steps will be notified. Illustrations showing the necessary work steps, their rationals, and types of ultra-sound images to be expected are linked to the comments.

The presentation of help information at the interface has to consider the actual work scenario. Thus multimedia concepts such as graphics, animations, and spoken comments are used to refer to the respective type of real world scenario. The support environment has to enable and to invite the user to "move" intuitively through familiar contexts providing timely cues leading to relevant information. Multi media orientation concepts thus improve the transfer of symbolic advice to actual work contexts. They are used to show how and why to do certain work steps, and how things should look like.

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GMD Releases Version 2.1 of the GINA Application Framework

by Michael Spenke

GINA is an object-oriented application framework based on OSF/Motif for the construction of graphical user interfaces. Release 2.1 for Common Lisp is now publicly available. GINA is used at several academic and commercial sites in Europe and the USA. It includes a class library, an interactive interface builder, and extensive documentation. A C++ version of the class library is also available.

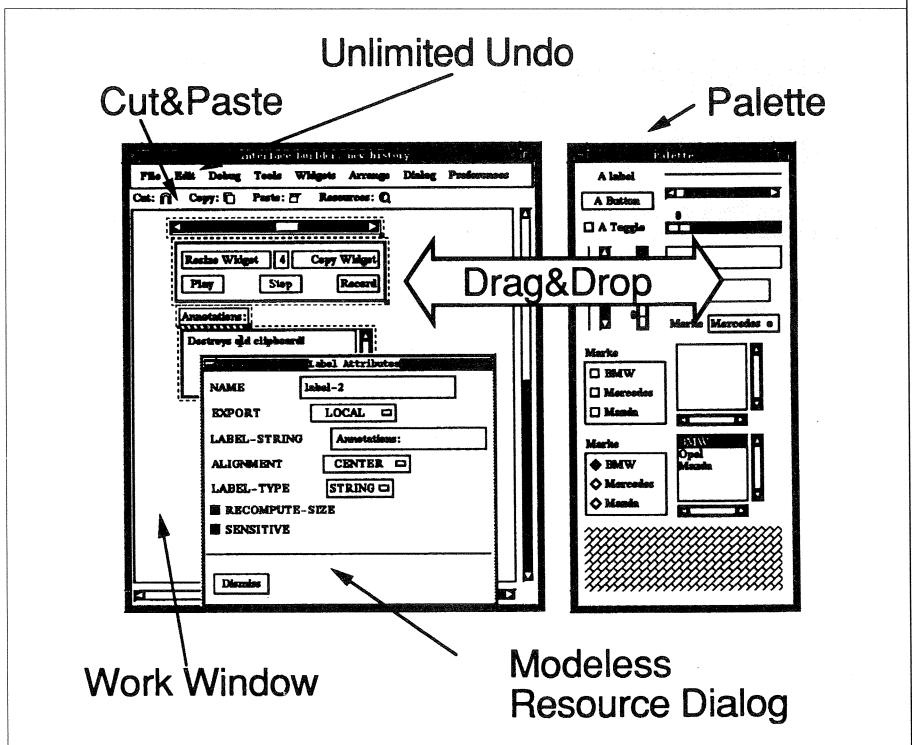
GINA is the user interface technology of the key project "Assisting Computer" which comprises a major part of the research activities in the GMD-Institute for Applied Information Technology. Future plans include enhancing GINA with more intelligent user support facilities.

Applications are created by defining subclasses of GINA classes and adding or overriding methods. The standard functionality of a typical application, such as saving and loading documents, is already implemented in GINA. For example, applications inherit an unlimited undo/reredo mechanism. Only the differences to the standard application have to be coded. In addition to the widgets provided by OSF/Motif, GINA supports individual graphics and direct manipulation with semantic feedback.

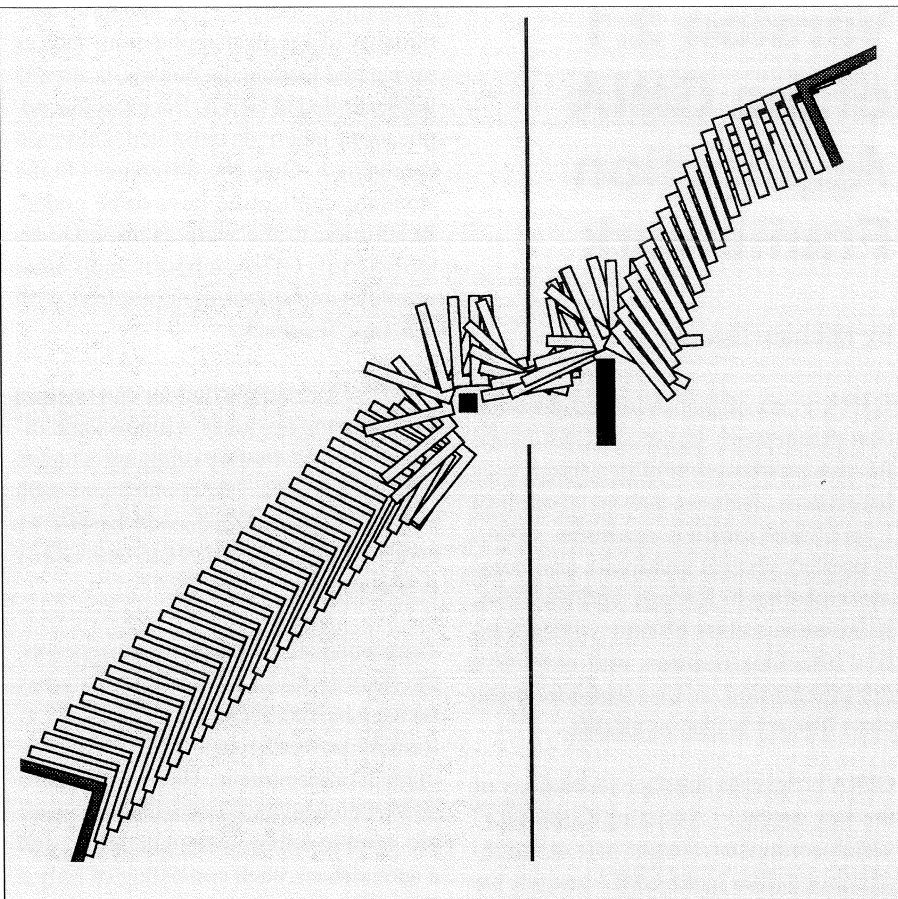
The GINA interface builder can be used to design the layout of windows and dialog boxes by directly dragging widgets onto a work area. The resources of each widget can be modified, and Lisp or C++ code to be used in connection with GINA is generated.

The combination of framework concepts, the flexible Motif toolkit, and the interactive Lisp environment leads to an extremely powerful user interface development environment. There is already a dozen demo applications including a simple graphic editor, a bitmap editor, and a spreadsheet, each consisting of only a few pages of code.

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The GINA Interface Builder



A motion for a two-dimensional robot through a narrow gap

Geometry, Robotics and Computer Graphics

by Mark Overmars

In robotics there is a tendency to design robots that behave in an increasingly autonomous way. Such a robot has to plan its tasks without human interference. An important aspect of this task planning is the planning of motions that avoid collisions with objects in the workspace or with other robots. The design of algorithms that compute such motions is one of the prime topics in the PIONIER project "Computational geometry and its application".

The project is performed at the University of Utrecht (department of computer science) and is financed by the Netherlands Organisation for Scientific Research (NWO), the Foundation for Computer Science in the Netherlands (SION) and the University of Utrecht. The project, as part of NWO's PIONIER Programme, runs for five years (1991-1996) and is presently staffed with 7 researchers. The many international contacts include participation in the ESPRIT BRA Programme (until March 1992 in nr. 3075 ALCOM, (Algorithms and Complexity)).

The motion planning problem can be formalised into a geometric problem: A configuration of the robot can be considered as a point in some 3- or higher-dimensional configuration space that contains all possible placements for the robot. The obstacle objects can be transformed into forbidden regions in this configuration space. The motion planning problem now asks to compute a path from an initial

placement to a new placement in the configuration space that does not cross any forbidden region. This path will correspond to a motion of the robot that avoids contact with the obstacles. Solving this geometric problem requires techniques from discrete geometry, spatial data structures, and geometric algorithms, which are combined in the research area called "computational geometry".

No generally applicable motion planning algorithms exist to date. The problem has only been solved for very specific cases. Known solutions are either too complex and time consuming or tend to fail in particular situations. Our aim is to combine existing approaches and apply computational geometry theory in order to design correct and practical solutions. This requires both theoretical and experimental research.

A second area to which we try to apply techniques from computational geometry is computer graphics. Computer graphics deals with the display of geometric data (e.g. a description of a building). Realistic images require many geometric operations to be performed, such as for example the removal of invisible pieces of objects. Most current approaches perform these tasks in an "image space" manner by computing for each pixel in the image the required information. Such techniques are limited in their applicability and normally require special hardware. We study "object space" techniques that compute the required information in a geometric form. The output of such methods is not an image but a description of the visible scene. Such techniques are much more flexible. Again we perform both theoretical and experimental research to design both correct and practical methods.

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CNR's participation in the ESPRIT Basic Research Action: PDCS

by Lorenzo Strigini

The Predictably Dependable Computing Systems (PDCS) Basic Research Action was first presented to the readers of ERCIM News in the September 1991 issue, on the occasion of its 2nd Open Workshop. PDCS aims at making the development of dependable computing systems a more systematic, predictable, and thus cost-effective process than it is today.

The project puts special emphasis on:

- i) extending and refining the use of quantitative (probabilistic) methods, both in the evaluation of products and as a basis for design decisions, and
- ii) an integrated, system-oriented approach to the different aspects of dependability (e.g., reliability, security, etc.), the different threats (e.g., physical faults and design faults), and the phases of the product life cycle (from requirement specifications to design and evaluation).

The goal is to allow a systematic engineering process from clearly stated dependability requirements, through design decisions and trade-offs to product validation. By contrast, current practice resembles more a piecemeal application of disparate techniques, without an overall engineering approach.

PDCS (started in May 1991) has already produced more than 70 publications in refereed conferences and journals, and demonstrated some tools supporting the methods investigated. Among the topics covered there are dependability requirements, issues of fault tolerance and real time (from the points of view of both design and evaluation), modelling and evaluation of reliability, availability and security.

The CNR team in PDCS, based at IEI in Pisa, has contributed mainly in the field of fault tolerance. Techniques for tolerating physical hardware faults are well established in industrial practice; on the other hand, techniques for tolerating design faults are still employed only in restricted sectors, with little theoretical basis. We have investigated design methods which take into account the possibility of both physical faults and design faults, and software design schemes for controlling the added complexity caused by software redundancy. Other issues of special interest to us are the specification of dependability requirements and the achievement and validation of the "ultra-high" dependability levels required in some current applications.

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Operating System L3

by Jochen Liedtke

Version 2.2 of GMD's PC operating system L3 was released and shipped by GMD's commercial partner ERGOS to about 200 end users in June 1991. At the same time the revised L3 kernel (Version 3.0) became operational in GMD. Its main advantages are extremely fast IPC (inter process communication) and the new concept of Clans & Chiefs for supporting security.

An example for the new IPC performance: Transferring a short message (8 bytes) from a sender task (user mode) to a different receiver task (user mode) on the same computer costs:
Compaq 386 (25 MHz): 27.2 μ s
Tandon 486 (25 MHz): 13.3 μ s

The concept of Clans & Chiefs allows a flexible but secure user definable control of process interaction. Applications lie in the fields of protection, remote com-

munication, debugging, event tracing, emulating system environments and even process migration. The concept is implemented in L3 Version 3.0. Based on clans some applications dealing with remote message handling and multi-level security are under development.

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Performance Evaluation in Distributed Systems

by Philippe Nain

The quantitative modelling of distributed and parallel systems is currently spawning a new theory of *discrete event dynamical systems*. The Performance Evaluation Group at INRIA-Sophia Antipolis (MEVAL team) focuses on two formalisms that are part of this theory: queueing networks and stochastic Petri nets. Two complementary approaches are used: (i) the development of stochastic mathematical models and their analytical or numerical solution, and (ii) simulation.

The research of the project covers fundamental aspects of the stability of strongly synchronised dynamical systems and the computation of their main performance measures (response time distribution, buffer occupancy, throughputs, etc.), the quantitative behaviour of parallel programs on multiprocessor systems, the load balancing for interconnection networks (e.g., Banyan networks), the analysis of distributed algorithms (e.g., the two-phase locking algorithm for a distributed database, election algorithms on a ring of processors, multiaccess protocols for communication networks), the study of polling phenomena arising in local area networks (e.g., token ring, teletext), the schedul-

ing in fault-tolerant and real-time systems, the derivation of extremal scheduling of parallel processing with and without real-time constraints, the scheduling and the mapping of tasks to multiprocessor systems, as well as control and optimisation issues (e.g., optimal resource allocation with and without constraint).

MEVAL is actively participating in the Distributed Algorithms activity of the C³ group (a French working group focusing on Concurrency, Communication and Coherence issues in distributed systems). Concerning the simulation activity, MEVAL is interested in the parallelisation of the traditional discrete event simulation and its implementation on distributed systems such as networks of Transputers. The group is also developing new simulation techniques including sensitivity analysis (e.g., based on rare perturbation analysis) and simulation through recursive evolution equations. Prototypes are being implemented on a SIMD architecture (Connection Machine).

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Structural Mechanics at CNR

by Giuseppe Pasquinelli

The research activity of the Structural and Solids Mechanics Group at CNUCE is focused on the development of models to describe the elastic-plastic behaviour of materials. These models are used in algorithms for the integration, by the Finite Element Method, of the equation of motion of solid structures. The main goal of this research activity is the simulation of some metal-forming process, such as steel sheet deep-drawing, and a collaboration has been activated with other research groups operating at ENEA (Bologna) and CSM (Rome).

The simulation of a metal-forming process requires research into at least two distinct and complementary topics. The first of these is the constitutive law of the material, i.e. how stress develops, at a particular point, as a response to the deformation experienced by that point during the motion. The second topic concerns the correct formulation of the boundary value problem and regards:

- the equilibrium equation for the finite deformation case,
- the kinematic constraints and the load prescription,
- the modelling of the contact and friction conditions at the interface between a deformable body, representing the workpiece, and the rigid surfaces, representing the punch and the die.

In the field of the constitutive laws, a general model for an elastic-plastic solid undergoing arbitrarily large deformations has been established rigorously, starting from fundamental axioms like the second principle of thermodynamics and the principle of objectivity. Some restrictions have been considered for the admissible set of deformation histories, so that the characteristic behaviour of metals can be modelled, and an ordinary differential equation system has been set up to describe the constitutive response.

A model of plastic anisotropy is now under study, in which the von Mises yield surface is deformed from the spherical shape to an ellipsoidal one in the deviatoric stress space.

With reference to the boundary value problem, an incremental equilibrium equation, which takes finite deformations and motion dependent loads into account, has been formulated in the actual reference system. An algorithm to manage the constraint set arising from the contact conditions has also been developed.

The problem of frictional forces is now being studied.

The model of the constitutive response and the algorithm for the integration of the equation of motion have been implemented into an in-house developed FEM code called NOSA, whose results appear very promising when compared

with experimental data and with the results obtained by widely known commercial codes.

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The // Project: Structural and Semantic Parallels in Natural and Programming Languages

by Jan van Eijck

Methods and techniques used in the analysis of natural languages and of programming languages are mutually applicable in a number of areas. This observation forms the basis of a joint Dutch research effort in which CWI collaborates with the Universities of Utrecht and Amsterdam. The project started in April 1991 and runs over four years. It is funded by NFI, the Dutch agency coordinating interdisciplinary research in computer science.

In the project, research on structural and semantic parallels in natural language and programming language analysis will cover the following areas:

- Structure and processing of texts and programs
- New directions in semantic representation
- Non-standard reasoning and knowledge representation
- Language analysis and complexity theory

An explicit goal of NFI-projects is the formation of a nucleus of young researchers in a promising interdisciplinary field. At the moment, four researchers are employed full-time in this project (popularly known as the // Project) and participation of short-term guest researchers is incorporated. The project also organises workshops on relevant areas. The first workshop, on "Logic and the Flow of Information", was held in Amsterdam, December 13 - 15, 1991. The list of invited speakers included John Etchemendy, Dov Gabbay, Peter Gärdenfors, Dexter Kozen, Larry Moss, Vaughan Pratt and Dana Scott.

In the // Project, CWI collaborates with the University of Utrecht (Department of Philosophy, section Applied Logic, and Faculty of Linguistics and Literature, OTS, section Computational Linguistics) and the University of Amsterdam (Department of Mathematics and Computer Science, section Logic and Theoretical Computer Science). Research directors are Johan van Benthem (Amsterdam), Jan van Eijck (coordinator, CWI and Utrecht), Theo Janssen (Amsterdam), Michael Moortgat (Utrecht and CWI) and Albert Visser (Utrecht).

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INRIA joins Project VAP: Planetary Autonomous Vehicle

by Jean-Daniel Boissonnat

The three INRIA projects, PRISME, PASTIS and ROBOTVIS, all from Sophia-Antipolis, have recently joined the VAP project of CNES (French National Space Agency). The main French Robotics laboratories (LAAS, CERT, IMAG and INRIA) are in-

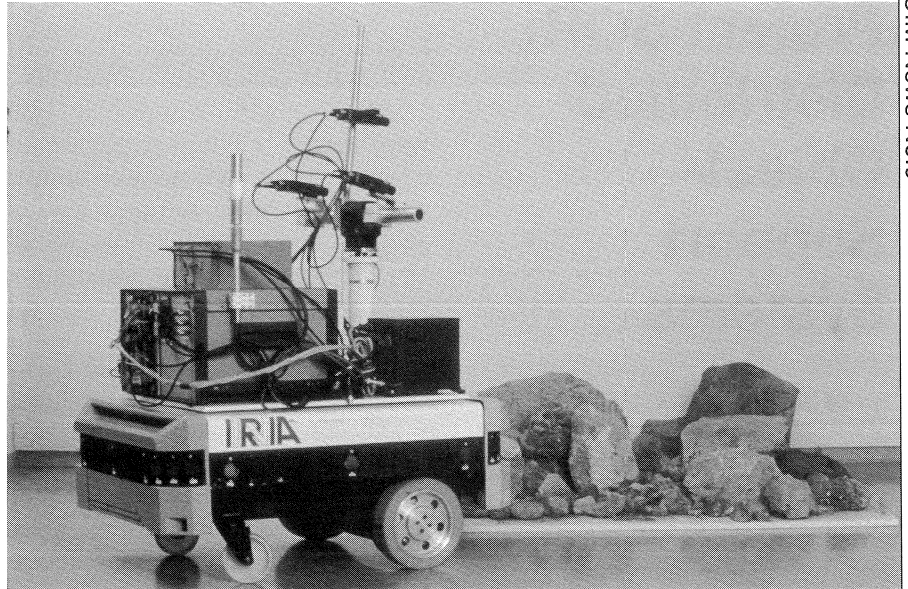


Figure 1: An INRIA mobile robot driven by the DMA vision machine (Depth and Motion Analysis), developed within the ESPRIT1 Project 940. (Photo: INRIA)

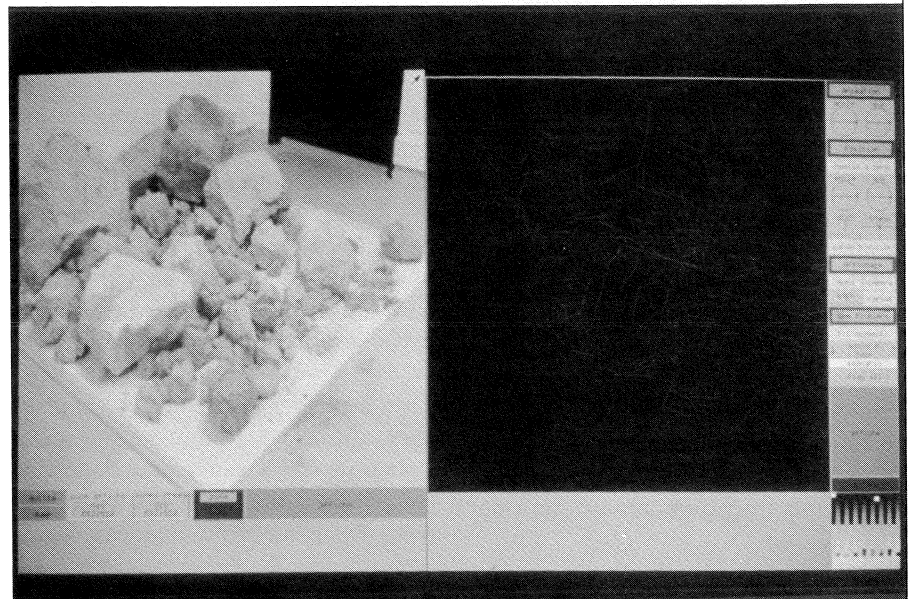


Figure 2: Image of the scene reconstructed in 3D. (Photo: INRIA)

involved in this project. The objective of the VAP project (Véhicule Autonome Planétaire) is to create french know-how for the realisation of a autonomous planetary robot which will be sent to Mars towards 1994 in cooperation with the Americans or the Russians.

As the transmission time is very long (one hour on average), it is out of the question that the engine be commanded from earth, hence the necessity for autonomy. The vehicle consists of a mobile all-terrain robot (probably with

wheels) equipped with a manipulator arm. Navigation is done using a model of an approximate terrain, obtained by satellites and devices launched by the vehicle itself. The manipulator arm will be responsible for collecting samples of Martian soil which will be brought back to earth.

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Project SOR: Distributed Object- Support Systems

by Marc Shapiro

The general theme of this project is operating system support for object-oriented systems, in particular in distributed environments. Two systems have been developed: SOS and COOL. In addition work has been done on structuring operating systems, especially virtual memory support, and OS support for distributed garbage collection.

Work is currently underway on two projects: BOAR, a library of universally-useful distributed abstractions; and Soul, a high-performance object-support operating system framework.

“Fragmented Objects” (FOs) are a key concept for structuring distributed systems as objects. The abstract view of a FO is a single, shared object; its distribution is hidden to clients. In the concrete view, the FO designer controls the distribution of data and function and of the communication between its fragments.

FO programming is supported by the FOG language, an extension of C++, and by BOAR, a toolbox of predefined FOs. The FOG compiler ensures distributed type-safety of both the external and internal interfaces, verifies the encapsulation of FO instances, and automatically generates whatever coercions are necessary for marshalling/unmarshalling between layers.

BOAR is a library of pre-defined, universally-useful distributed abstractions. BOAR provides the designer of a distributed service predefined FO types encapsulating various implementations of commonly used abstractions necessary for structuring distributed applications. In general, all connective FO types implementing the same abstraction have the same public interface. This allows a FO designer to switch easily from one implementation to another.

The SOS system supports both fragmented and local (“elementary”) objects, object migration, persistent objects, dynamic linking, and arbitrarily complex user-defined objects (written in C++ or FOG). Migration and storage preserve the data, the structure, and *the type* of the object: SOS maintains “prerequisites”, allowing the C++ run-time to implement dynamic type checking and linking. SOS system services are structured as FOs. They include: a distributed object manager, a user-centered name service, a storage service, a communication service (supporting a library of protocol object types: datagrams, RPC, multicast, atom-

ic multicast, etc.). Applications built using SOS include a multimedia document manager and a UIMS.

COOL (a joint project with Chorus-systèmes for SEPT) is also an object-support OS. It is less ambitious and more efficient than SOS. Here objects are supported by a manager implemented as a kernel server above the Chorus microkernel. COOL was developed specifically for the SEPT “Cidre” application of intelligent circulating documents.

The new project, Soul, concentrates on *high performance support for objects*. This project (which is co-ordinated with Chorus-systèmes’ COOL-2 project) comprises the following items:

- Designing and implementing the new kernel abstractions best suited to object support: grouping arbitrary kernel resources into a single “team” resource; generalized upcall hooks to manage teams according to high-level semantics.
- Pursuing high performance through primitive mechanisms closely adapted to the needs of object-oriented applications and subsystems: kernel-supported, lightweight, location-independent references and garbage collection; simple, efficient, uniform, location-independent invocation, along the lines of Bershad’s LRPC and URPC.

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TECHNOLOGY TRANSFER

Planning and Supporting Research Network Activities

by Laura Abba

The research network infrastructure team of CNUCE (RIRR) was established to satisfy the computer networking goals of the CNR research community.

This has been achieved by improving access to and interaction with research tools (supercomputers, databases, specialised

software); by improving interaction and collaboration among researchers (large file transfers, real time remote access to computers, electronic mail, etc.); by improving connections to new sites, and providing new services and connections with other networks. The major node of the CNR network is managed at CNUCE; RIRR is responsible for proposing the developments, technical choices, as well as managing the CNR network.

The CNR network is integrated with the Italian research network, GARR, which was set up under the Ministry for the Universities and for Scientific and Technological Research (MURST). The GARR network is currently conducted by the founder organisations: three public research institutions, CNR, ENEA (National Agency for Alternative Energy) and INFN (National Institute for Nuclear Physics), and by four consortia offer-

ing computer resources to Italian universities: CINECA, CILEA, CSATA and NIC. The aims of GARR are to connect the Italian research and academic networks and to coordinate international connections. The backbone of the network supports different communication protocols such as IP, DECnet, SNA and X.25; this last protocol carries the traffic destined for the European backbone IXI activated by the Eureka-COSINE project.

An extension to the backbone is now planned to connect new sites to the primary sites.

CNUCE has been managing the Italian connection to the EARN Network since 1984. Central EARN administrative and technical services are handled by the IBM computer located at CNUCE and CNR maintains the international link from Pisa to CNUSC in Montpellier. CNUCE was also one of the first European sites connected to ARPA-INTER-

NET (from 1986). Today the CNR network uses the TCP/IP as the main protocol to transport network services (electronic-mail, file transfer, information services and remote access to computer resources).

CNUCE has been active in promoting the adoption of the standard protocol ISO-OSI; early in the eighties, it started an experimental project to create an OSI network (OSIRIDE). Under the auspices of CNR, CNUCE now supports the Italian participation in the COSINE project and will also participate in the CEC Value project in order to develop OSI X.500 Directory Services for the GARR network.

Members of the RIRR staff participate in technical working groups at a national (GARR technical working group) and at an international level (RIPE, EARN, RARE, COSINE), offering their expertise in the following network fields: de-

sign, implementation and management of data networks, cooperation with telecommunication and computer industries, architectures (DECNET, SNA, TCP/IP, OSI) and services (electronic-mail, on-line information and directories, database access, micro-mainframe access, etc.).

Recently CNUCE has been involved in a project funded by UNESCO to improve the data network access and services among the academic and research institutions in Africa. RIRR personnel will have a major role in selecting low cost and robust solutions suitable to meet conditions of telecommunications in African countries and to participate in technology transfer and training activity. ■

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INTERNATIONAL RELATIONS

CWI explores relations with Taiwan

by Henk Nieland

Taiwanese scientists are interested in contacts with CWI and vice versa. In order to make this interest more substantial, professor Bertrand I-Peng Lin of the National Taiwan University at Taipei visited CWI last year.

Professor Lin, a mathematician by training, is head of the department of Computer Science and Information Engineering and a coordinator in Taiwan's National Science Council (NSC). Areas of common interest include subjects in basic mathematics and software technology. Professor Lin also had discussions with directors of Academic Computing Services Amsterdam (SARA), the Dutch Foundation for Computer Science (SION) and the Dutch Academic Computing Facilities' Network (SURFNET). This visit was preceded by a visit to CWI

in 1989 by professor Hsien-Chung Meng, director of NSC's Frankfurt-based European Office, and a trip to Taiwan by CWI's scientific director professor Cor Baayen in the summer of 1990. ■

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Chinese-Franco Cooperation

by Pierre Népomiastchy

Following the visit of Hubert Curien, French Minister of Research and Technology, to China last year, it was decided in December 92 to re-establish scientific cooperation between China and France in the domains of biology, environment and applied mathematics. ■

The applied mathematics program (which includes computer science) is chaired by Alain Bensoussan, President of INRIA. The priority themes in this program are: applied mathematics, computer-aided-manufacturing, artificial intelligence, and medical applications in computing. The first activity of the program will be to organise a workshop in Peking this year which will serve to evaluate potential Chinese fellows and which will include a day for exchanging ideas on technology transfer and setting up of enterprises. ■

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CALL FOR PAPERS

ECHT'92: European Conference on Hypertext

Milano, Italy, 30 Nov. - 4 Dec. 1992

by Jocelyne Nanard,
Marc Nanard and
Anne-Marie Vercoustre

ECHT'92 is the second in a series of European conferences on Hypertext and Hypermedia, alternating with the U.S. based HYPERTEXT'xx conferences coordinated by ACM SIGLINK. ECHT'92 is a major event where researchers, software developers and users can meet around the theme of Hypertext and Hypermedia. The broad applicability of Hypertext and Hypermedia as a primary technology in many domains, and its efficiency as an information integrator, has led to an increase in interest from industry as well as recognition from academia over the last five years.

Suggested topics:

Hypertext and Hypermedia:

- Applications
- Modelling and design
- Development methodologies and tools
- Responsive interfaces
- Evaluation
- Systems software technologies
- Authoring

Hypertext-Hypermedia in connection with:

- Operating Systems
- Data Base Management Systems
- Object-Oriented Systems and languages
- Knowledge Systems
- Information retrieval
- Software engineering
- Cooperative work
- Fiction

Program committee:

B. Akscyn (USA), P. Baird (UK), M.

Bernstein (USA), P. Brown (UK), T. Seng Chua (Singapore), R. Cordes (FRG), F. Garzotto (I), N. Guimaraes (P), F. Halaz (USA), H. Ishii (Japan), P. Kahn (USA), J. Leggett (USA), D. Lucarella (I), N. Meyrowitz (USA), J. Nielsen (USA), T. Oren (USA), A. Rizk (F), D. Schwabe (Brazil), N. Streitz (FRG), A. M. Vercoustre (F), J. Walker (USA), N. Yankelovich (USA) (To be extended)

Contributions:

Full papers (<6000 words) should be submitted in five copies. A separate cover page must contain title of paper, name(s), affiliation and complete mailing address (incl. phone, telefax, e-mail) of the authors, together with an abstract (about 200 words) and keywords (from three to five). Proposals for panels should contain topic of the panel, its content (<1000 words), names and affiliation of proposer and contributors, a brief characterisation of their background and experiences relevant to the panel. Proposals for videos, demos and posters presentations should be submitted in the form of an extended abstract, describing the content and also the relevance for the conference. Details about the equipment necessary should also be provided. Proposals for tutorials should describe the content of the course and its format (1000-2000 words), should identify the target audience, the level of expertise required, and the length (1 or 2 half days). Qualification and profile of the tutor(s) should also be included.

All contributions should be sent to:

Enza Caputo
Politecnico di Milano,
Dipartimento di Elettronica,
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Deadlines:

4 May 1992 - Submission deadline
6 July 1992 - Notification of acceptance.
1 September 1992 - Final copy of papers

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Conference on Theorem Provers in Circuit Design

Nijmegen, The Netherlands, 22 - 24
June 1992

by Raymond Boute

Mechanised theorem proving tools are essential in supporting the ever increasing use of formal methods in the design of digital systems. This role of theorem provers will be the focus point at the International Conference on Theorem Provers in Circuit Design: Theory, Practice and Experience. The conference will take place on 22-24 June 1992 in Nijmegen, The Netherlands, and is sponsored by IFIP TC10/WG 10.2 and the Dutch National Facility for Informatics (NFI). The conference includes a one-day tutorial on June 22.

The emphasis will be on the support of formal methods by theorem proving tools rather than on theoretical foundations. Topics of interest include background philosophy, design and development, evolution and evaluation through use. Practical questions like the *Why, Which, When* and *How* of a theorem prover will be addressed. Of equal importance is the migration path of a theorem proving tool and the associated technology into current digital engineering practice. The intended audience includes workers in the field of hardware verification as well as practising digital designers. Three prominent researchers in the field of machine-assisted verification will give invited lectures: Mike Gordon (Cambridge University), Warren Hunt (Computational Logic Inc.) and Dave Musser (Rensselaer Polytechnic Institute).

The conference is organised by the Computer and Communications Systems Group of the University of Nijmegen, The Netherlands.

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PACTA 92: Parallel Computing and Transputer Applications 1992

Barcelona, Spain, 21 - 25 September 1992

by Terry Mawby

The 4th International Conference in Transputer Applications will take place in Barcelona, 21-25 September 1992, and is being run by the RAL based Transputer Initiative sponsored jointly by the UK Science and Engineering Research Council and the UK Department of Trade and Industry. It forms part of a larger conference called PACTA92, which is co-sponsored by ERCIM.

The Conference will provide a state-of-the-art coverage of current parallel computing theory and practice in the various fields of science and technology. The practical applications of transputers and other parallel computing architectures such as shared memory vector multiprocessor computers, distributed memory multiprocessor computers and array processors will feature predominantly.

Papers will address: CAD/CAM, Computational Mechanics & Engineering, Continuous & Discrete Simulation, Educational Software, Image Processing, Graphics, Hardware Emulation, Industrial Inspection, Molecular and Particle modelling, Networking, Operating Systems, Programming Tools, Real-time Control and Signal Processing.

A series of technical sessions are planned each initiated by a distinguished contributor who will describe particular advances in the subject of the session or give a critical overview of the current state. These presentations will be complemented by a number of contributed papers.

The Conference will be supported by an Exhibition of parallel computing hardware and software; at the time of writ-

ing, eight major companies have already booked (and paid for!) exhibition space.

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Centro Internacional de Metodos
Numericos en Ingenieria
Modulo C1, Campus Norte UPC
Gran Capitan, s/n
08034 Barcelona, Spain.

IWMM: International Workshop on Memory Management

St Malo, France, 16-18 Sep. 1992

by Yves Bekkers

High level languages, like Lisp, ML, Scheme, Smalltalk, Modula-3, C++, Prolog, constraint languages, etc., rely heavily on a very important feature of their runtime systems, namely Memory Management (MM) of dynamically allocated storage. Techniques, such as static program analysis, are also designed to improve the efficiency of implementations. Both static and dynamic MM, depend on the language they have been designed for. However, the problems which are handled and solved by MM are very general and it is worth looking at them as fundamental problems with general solutions. This three-day workshop offers an opportunity to bring together communities of researchers working on a common problem but with different backgrounds and approaches.

Suggested topics:

- Garbage Collection (GC)
- Incremental GC
- Parallel, real-time GC
- Compile time GC
- Conservative GC
- Correctness and analysis
- Environment structures
- Register allocation
- Static/Dynamic MM
- Explicit / Implicit MM

- Backtracking mechanism and MM
- Laziness and MM
- Constraints and MM
- Persistence of objects and MM
- MM for parallel languages
- MM on distributed systems
- Hierarchical memories and MM
- Hardware and OS support for MM
- Integrating GC with existing environments

Program committee :

J. F. Bartlett (USA), Y. Bekkers (F), H. Boehm (USA), M. Bruynooghe (B), J. Cohen (USA), B. Lang (F), D. A. Moon (USA), C. Queindec (F), D. Sahlin (S), T. Yuasa (J)

Organisation:

The workshop is organised by INRIA Rennes. In cooperation with ACM SIG-PLAN. The workshop will be limited to about 60 participant to encourage discussion. Springer Verlag is planning to publish the proceedings of the workshop in it's LNCS series.

Contributions:

Five copies of the paper should be sent to Yves Bekkers at INRIA, Rennes. Submission should include the title and authors' name(s), address(es), phone number(s), FAX number(s) and E-mail address(es) if available. An abstract and a list of key words should be included. Original papers should not exceed 6000 words including references; survey papers should not exceed 7000 words. Abstracts should not exceed 200 words.

Deadlines:

27 March 1992 - Submission deadline
29 May 1992 - Notification of acceptance
27 June 1992 - Camera-ready papers due

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RISE Project Next CASE meets at GMD

by Bernd Krämer

The Research Institute of Software Engineering, RISE, is located in Tokyo and was founded in 1988 as a public service corporation. Its major activities include the investigation of international trends in software engineering and the promotion of related research and development.

The basic idea underlying RISE's activities is to encourage and support international exchange and collaborative research projects with research institutions and researchers in the software engineering field. International symposia and dedicated publication media serve the dissemination of ideas, future research methods, and other results of RISE research.

Next CASE is a new RISE project. It is a three years project that started in July 1991 and focuses on trends in research directions of the next generation of CASE tools. Technical objectives of the project are:

- the identification of a potential Next Generation CASE paradigm,

- the exploration of ways to achieve the envisioned paradigm,
- the development of state-of-the-art reports of supporting technologies, and
- an outline of major research problems.

The first meeting of the group was held October 29, 1991 in GMD. The primary concern of this event was to make the group members known with each others research work and discuss and assess the collaboration procedure. Each of the 4 Japanese and 2 German researchers who attended the meeting gave a one-hour presentation on his particular research topic. These presentations tackled some important application areas and covered a wide range of active software engineering research areas including

- Rule-Based Software Process Modelling and Support,
- Qualitative Parameter Tuning Methodologies for Synchronized Queueing networks,
- CASE Technology for Formal Methods,
- Knowledge Support for Dynamic Railway Traffic Rearrangement,
- Object-Oriented Methods for Performance Design, and
- Object-Oriented Techniques for Real-Time Systems Analysis and Design.

By the end of each year the group mem-

bers will submit their detailed research reports to RISE, where they will be assembled and published. One or two further project meetings every year serve for obtaining feedback on the progress made by each team, identifying new research directions in CASE methodologies, and exchange preliminary research results. The expenses for these meetings are covered by a grant provided by RISE to each group member.

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ALCOM: 2nd seminar on Algorithms and Complexity

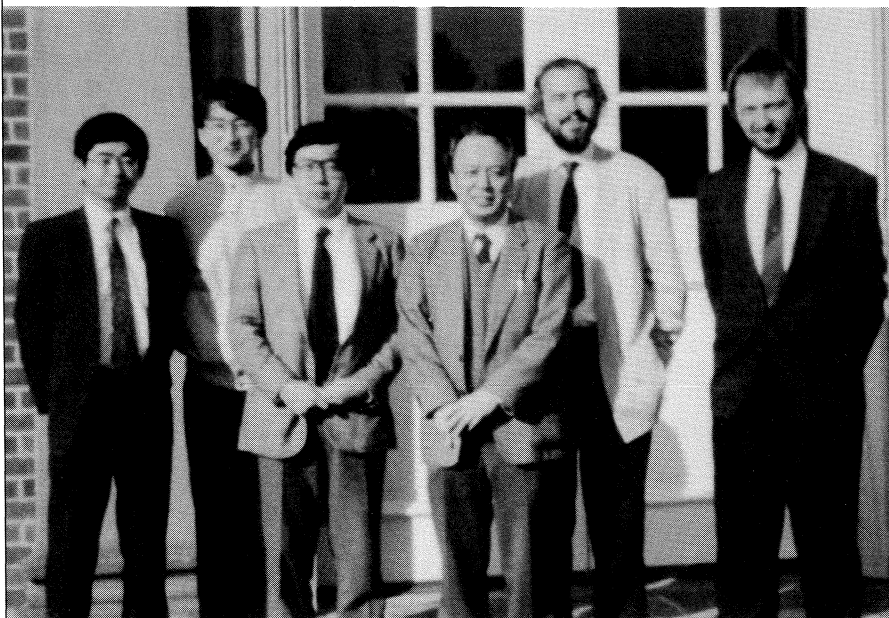
by Jean-Daniel Boissonnat

The second general seminar of the ESPRIT-BRA project ALCOM (Algorithms and Complexity) was held in Nice from 3 to 5 June last year.

This seminar was organised by the INRIA project PRISME (Programmation des Robots Industriels et des Systèmes Manipulateurs Evolués). The ALCOM project gathers twelve European teams, among which 2 from INRIA: PRISME at Sophia-Antipolis and ALGO (ALGORITHMS) at Rocquencourt. The project is divided in 7 research domains: data structures, algorithmic geometry, algorithms for graphs, probabilistic methods, parallelism, distributed algorithms, and theory of complexity.

One of the main consequences of ALCOM is the introduction of a European research network in algorithmics, resulting in a freely distributed journal, called Algorithms Review, bi-annual seminars, schools and regular collaboration.

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The members of the Next CASE project at GMD. (Photo: GMD)

11th Benelux Meeting on Systems & Control

by Henk Nieland, CWI

The annual Benelux Meeting on Systems and Control brings together researchers in the areas of system theory and control engineering from Belgium and The Netherlands to discuss the state of the art. The 1992 meeting, attended by some 200 researchers, took place from 4 to 6 March in Veldhoven (The Netherlands).

Prof. B.A. Francis (University of Toronto, Canada) gave two keynote addresses on Sampled Data Systems. Prof. C.V. Hollot (University of Massachusetts, Amherst, USA) did the same on Stability Criteria of Kharitonov Type. A mini-course on Image Processing and Multi-dimensional Systems was given by dr. R.L. Lagendijk (image identification and filtering) and dr. P. Rocha (models for multi-dimensional systems), both from the Technical University Delft.

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Transputers: the Celtic Connection

by Raymond Fawcett

The Third International Conference and Exhibition on Applications of Transputers (conveniently abbreviated to TA91) was hosted in Glasgow by the University of Strathclyde between 28 and 30 August 1991. Nearly 500 delegates and visitors from all parts of the world attended the event. The annual conference and exhibition series incorporating TA91 was launched by the Transputer Initiative which is coordinated at RAL and is sponsored jointly by the UK Science and Engi-

neering Research Council and the UK Department of Trade and Industry.

The TA91 conference covered a wide range of transputer applications spanning leading edge topics still within academic research to final systems already in use within industry. Three particularly strong strands emerged in image processing, signal processing and real time control. End application areas included medicine, manufacturing, civil and mining engineering with forays into more commercial data processing realms such as databases. The emphasis of papers varied from the purely hardware to the purely software with all the options in between. The size of systems ranged from small applications using a handful of transputers to an industrial fault tolerant radar signal processing array using up to 4000 transputers.

The most unexpected feature of the exhibition was the presence, in a large stand, of Texas Instruments. The company had decided to make TA91 the venue for the European launch of its new C40 transputer-like chip. This important development means that a major (American) chip manufacturer has now given its firm commitment to the transputer approach to parallel processing and has endorsed the pioneering (European) work of Inmos. Other exhibits covered compilers and libraries, multi-transputer systems for scientific and engineering applications, and end application products such as virtual reality.

Some TA91 statistics are worth noting. There were 11 invited and 135 submitted conference papers including 57 papers from 23 countries outside the UK. A total of 40 companies took stands at the exhibition. The conference attracted 380 delegates, of whom 94 were from outside the UK, while a further 100 visitors attended the exhibition only.

The proceedings of the TA91 conference are published under the title "Applications of Transputers 3" by IOS Press, Van Diemenstraat 94, 1103 CN Amsterdam, The Netherlands.

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SRDS-10: Tenth Symposium on Reliable Distributed Systems

by Luca Simoncini

The theme of SRDS is reliability in distributed applications, distributed operating systems, and distributed databases. The symposium took place in Pisa from 30 September to 2 October last year. This is the first time that this well established symposium, sponsored by the IEEE Computer Society - Technical Committee on Distributed Processing, has been held outside the US. Other sponsors were AICA, Tandem of Italy, Olivetti System and Networks, Ansaldo Trasporti, and CNR.

SRDS-10 was organised in nine sessions: checkpointing and logging algorithms, real-time, backward recovery schemes, replication and parallelism, dependability modelling, work in progress, dependability assessment, agreement and garbage collection, and a special session on the industrial approach to dependability in distributed systems. There was also a Panel Session on transparency and fault-tolerance in distributed system and Professor Brian Randell, University of Newcastle upon Tyne, UK gave a keynote speech on "European Research in Distributed Computing Systems". 80 participants, mainly from Europe but also from overseas, attended the meeting and the discussion was particularly lively.

The proceedings can be obtained from either the IEEE Computer Society or from Luca Simoncini.

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Australian-German Cooperation in Software Engineering

by Bernd Krämer

The Australian-German bilateral collaboration in Software Engineering started in 1991 as a result of initial contacts made during an Australian Mission on Software and Microelectronics to Europe in May 1990.

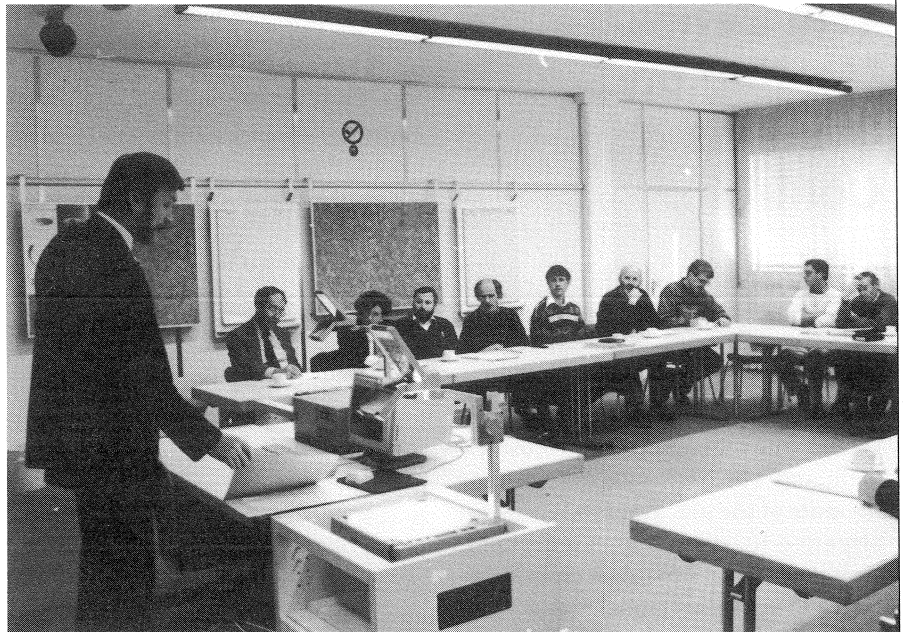
Based on joint scientific interests of software researchers at different sites in Germany and Australian Mission members, a collaborative program in the area of software engineering was designed. The program was structured around three workshops aiming at the outline of research plans and the definition of several projects involving research teams from both countries.

The first workshop was then held in Noosa, Australia, in February 1991. The work was organised around the following three themes that were discussed in three parallel working groups:

- Software Engineering Environment Architectures,
- Object-oriented Specification, Design, and Programming Methodologies and Tools,
- Data Management for Distributed Environments.

The Second Workshop was held in Bad Honnef and GMD's location in Sankt Augustin from 18-22 November 1991. Eight Australian researchers representing five universities (in Adelaide, Brisbane, Canberra, Sydney) and two research organisations, CSIRO and DSTO, and eight German researchers from FAW Ulm, FZI Karlsruhe, GMD and the Universities of Aachen and Dortmund attended the workshop.

The first three days were mainly dedicated to work in the three parallel working groups formed during the first workshop. A major outcome of these work-



Dr. Hans-G. Klaus, director of GMD-International Department, presents history of Australian-German cooperation in IT research to the Australian scientists. (Photo: Münch, GMD)

ing sessions were proposals for collaboration activities in all three areas. Their focus is on concrete technical work including the integration of existing research prototypes, the exploration of interconnection and interoperability strategies, and joint case studies. The activities rely heavily on exchanges of tools developed by participating groups and exchanges of project staff for short-term and long-term visits.

Day four and the morning of day five was reserved for tool demonstrations at GMD. Seven prototype systems were presented:

- The MultiView integrated programming environment (University of Adelaide) provides the programmer with a variety of program representations that are maintained and kept consistent by a set of concurrently executing view processes.
- UQ2 is a programming environment under development at the University of Queensland; it supports both fine and coarse grain cooperation of environment tools.
- The Merlin environment from the University of Dortmund gave an example of a process-centred environment; such environments provide support for guiding, controlling, and partly automating software development processes; Mer-

lin supports process modelling based on a mixture of Horn rules and production rules.

- The ProM prototype served to illustrate executable software process infrastructure relying on Petri net based models of such processes; the demonstrator was built in GMD on top of the Design/ML tool.
- The STONE demonstrator tool illustrated the user interface of a CASE environment framework built by a BMFT-funded joint national project.
- GRASPIN, a Petri net based specification environment, is an outcome of an ESPRIT I project; it supports the construction and validation of distributed-systems specifications.

An open forum was held on the afternoon of the last day, at which the results of this workshop were presented to an invited public. The presentations were well received. During the final discussion the researchers were encouraged to design larger bilateral projects. They should be guided by a convincing theme or vision of mutual interest, such as tele-cooperation in software development, and be embedded in strategic projects of the participating institutions. ■

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New Monopolies for Writing Programs

by Steven Pemberton

As part of a European tour, Richard Stallman (MIT) visited CWI at the end of June last year and lectured on the new developments in patents and copyright law in the USA, and how they are being applied to software, not only on the internal workings of programs, but even on the 'look and feel' of the programs when they are being used.

He reported how these developments threaten the freedom of programmers to continue doing their work, and how a new law passed by the European Community seems to make even data formats, protocols and programming languages subject to copyright.

Stallman is most famous for his work as author of Emacs, one of the most widely-used and imitated text editors, as founder of the Free Software Foundation, a group dedicated to the production of a freely copyable version of Unix called GNU, and as founder of the League for Programming Freedom. In 1990 he received a MacArthur Foundation fellowship; he also received the 1990 ACM Grace Hopper Award for his work on Emacs.

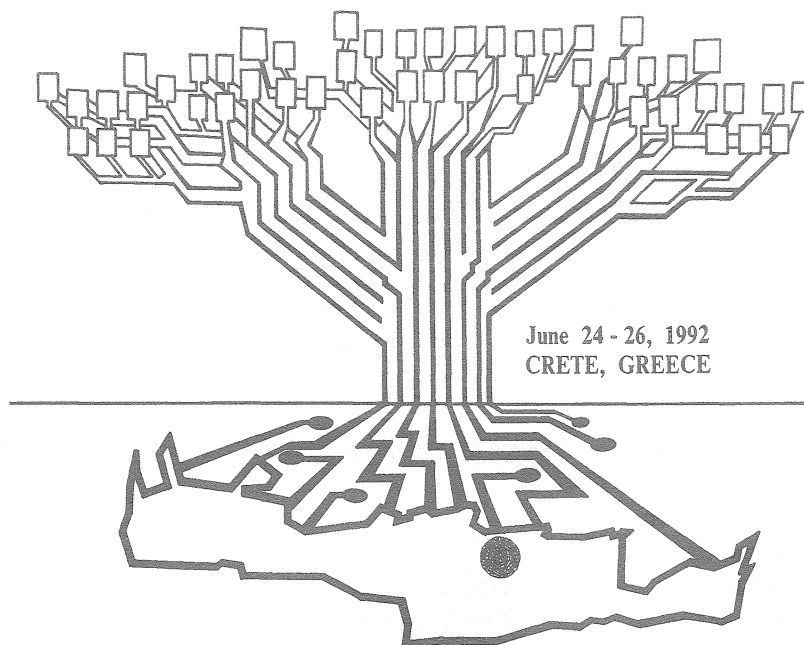
The lecture provoked a lot of interest in The Netherlands, not only amongst computer scientists and programmers, but in general: he was interviewed by three national newspapers, one paper even placed the item in the main news section, and two computer magazines. After CWI he went on to a meeting with representatives of the main political parties in the parliament building in The Hague.

The text of his lecture is available to interested parties, either on paper or by email.

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A three day course on Communication Networks: from ETHERNET to ATM

Heraklion, Greece, 24- 26 June 1992



This course provides an overview of the operating and design principles of communication networks. The course stresses descriptions of operating principles over formulation. It is of interest to communication engineers who desire a self-contained and up-to-date overview of this important technology.

Course Outline:

Communication Networks
Open Systems Interconnection (OSI)
IEEE 802 Standards
Network Management
Overview of High-Speed Networks
Optical Transmissions
Design of Large Switches
Performance Evaluation of Networks

Organisation:

The course is organised in the framework of the CEC Sprint program through MITOS SA, a spinoff company of the Foundation for Research and Technology

– Hellas (FORTH). FORTH is the second largest research centre in Greece with seven institutes, among which the Institute of Computer Science (ICS) is a prominent institute very active in CEC projects (ESPRIT, AIM, DRIVE, RACE, etc.).

General Information:

The course will be held at an attractive holiday resort beach hotel near the Town of Heraklion which combines excellent conference facilities and holiday sport activities.

The tuition fee is US\$ 560, including a complete set of course notes. Hotel accommodation per person for three nights is US\$ 240 (Beb & Breakfast) and US\$ 300 (Half Board).

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CNR – The CNR “Finalized Project” in Telecommunications has decided to install an experimental Metropolitan Area Network based on Distributed Queue Dual Bus (DQDB) technology in Pisa. Luciano Lenzini, CNUCE-CNR, will be in charge of the MAN which should be operational by the end of the year; it is expected that the first applications will be in the medical sector.

GMD – **Prof. Dr. Radu Popescu-Zeletin**, Head of the GMD Research Center for Open Communication Systems (FOKUS) in Berlin, was appointed "Senior Member" of the Institute of Electrical and Electronic Engineers, Inc., (IEEE), New York. This honorary title is held by only about 8% of the over 300,000 members of the IEEE.

INRIA – A delegation of 8 Japanese participated in the Franco-Japanese round table on electronics, which took place in Paris on 4-5 November 1991. They visited INRIA-Rocquencourt on 6 November.

RAL – The Knowledge Engineering Group welcomes **Mr. Yoshio Matsuno**, who joined as a visiting researcher. He has been developing knowledge-based control systems for his firm, Mitsubishi Materials, and he will be staying at RAL until the end of the year.

INRIA – A cooperation agreement between the University of Maryland at College Park (USA) and INRIA was signed in December last year. The themes relate to: Engineering Information Systems, Computer-Aided Design of Automatic

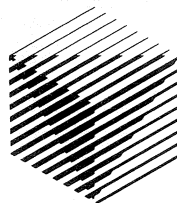
Control Systems, Computer and Communications Networks, Computer Integrated Manufacturing, Robotics, Image and Speech Processing, Parallel and Distributed Algorithms, VLSI Systems, Artificial Intelligence, ...

GMD – **Dr. Dr. Norbert A. Streitz**, head of the division on Publication and Hypertext Systems in the GMD-Institute for Integrated Publication and Information Systems at Darmstadt, was appointed as Vice Chair of the Executive Committee of the recently established ACM special interest group, SIGLINK, which covers the field of hypertext and hypermedia systems. He is in particular, responsible for the European activities and their coordination with activities in North-America.

ERCIM NEWS

European Research Consortium for Informatics and Mathematics

ERCIM



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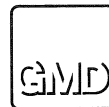
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