

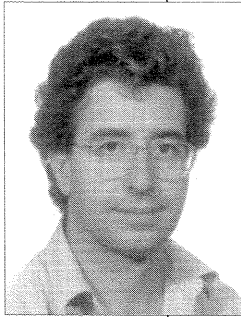
# ERCIM NEWS

European Research Consortium for Informatics and Mathematics

Number 17

April 1994

## EDITORIAL



**We see ERCIM as an organisation to foster high quality European research, says Pere Brunet, President of the AEDIMA Scientific Board**

### *SPECIAL :*

Human Computer Interaction... 8

## C O N T E N T S

|                            |    |
|----------------------------|----|
| Editorial                  | 1  |
| Joint ERCIM Actions        | 2  |
| The European Scene         | 6  |
| Research Activities:       |    |
| Human Computer Interaction | 8  |
| Other Activities           | 20 |
| Technology Transfer        | 26 |
| International Relations    | 30 |
| Events                     | 31 |
| In Brief                   | 34 |

### *Next Issue:*

Domain Knowledge for Information Systems

AEDIMA joined ERCIM at the meeting held at Roros, Norway last May. As an organisation, AEDIMA is somewhat different to the other ERCIM partners: instead of being a national research institute, AEDIMA (The Spanish Association for Informatics and Applied Mathematics) is a consortium of eleven Spanish universities and four research institutes of the CSIC (the Consejo Superior de Investigaciones Cientificas).

The reason for this particular AEDIMA structure is that, unlike other countries, Spain has no national research institute for IT and Mathematics. In Spain, nationally funded research in ERCIM areas of interest is mainly conducted by universities and CSIC institutes. These have technology transfer links to Spanish industry. ERCIM membership will enable Spanish research groups to improve communication with their European colleagues, and as a by-product will also lead to improved internal research links. The particular structure of AEDIMA is an organisational challenge, and will require the design and implementation of effective methods for efficient communication and information exchange between AEDIMA organisations and ERCIM. AEDIMA will probably adapt ERCIM initiatives in this area, to mutual benefit.

We see ERCIM as an organisation to foster high quality European research in information technology and applied mathematics. Both aspects - high quality and European cooperation - are fundamental from our point of view. Due to the prestige and experience of its partner institutes, ERCIM must define aims and strategies, and work on developments that increase the level of European research in the fields of IT and applied mathematics. There is also another aspect: Europe is a rich ensemble of countries and cultures which is now engaged in the common project of building a unified European identity. What we need are positive actions that go across the present frontiers, which promote joint research initiatives and which lead to defining common research policies. Basic actions include support for mobility programmes, and building an infrastructure for cooperative research work across Europe. ERCIM must have a fundamental role in the definition of this European research infrastructure due to the number, quality, and geographical coverage afforded by its partners. Initiatives like the EDGE proposal, focusing on advanced communications and their application to cooperative R&D for industry, are essential for Europe and need to be carried out by organisations with the scientific capacity of ERCIM.

Promotion of European research in ERCIM areas of interest must be done in close cooperation with industry. This is particularly true in Spain with its large number of Small and Medium Size Enterprises (SMEs) which would certainly profit from a cooperative European research infrastructure. AEDIMA's aim is to work in this direction, for the promotion of high-quality European research with national Small and Medium Size Enterprises.

**Pere Brunet**

# VTT becomes ERCIM's 11th Member Institute

by Päivi Johansson

**VTT is the Finnish acronym for the Technical Research Centre of Finland. With a personnel of 2,600, VTT is the biggest research organisation in the Nordic countries. VTT Information Technology is one of the nine research institutes of VTT and performs R&D in the fields of information systems and software technology, including applications, as well as in telecommunications and communications technology. It has a staff of nearly 200, and is located in Southern Finland: in the Helsinki area and at Tampere.**

The Technical Research Centre of Finland (VTT) was founded in 1942. It carries out R&D and testing services for industry and the public sector. VTT operates independently but reports to the Finnish Ministry for Trade and Industry.

The R&D work aims at developing new and competitive products, producing more efficient and environmentally safer industrial production processes, and promoting the exploitation of IT. VTT's research is concentrated on nine key areas: electronics, automation, chemical technology, biotechnology and food research, energy, manufacturing and building technologies, communities and infrastructure, and information technology.

Collaborations are underway with industries, universities, other research organisations and institutions working in the public sector. VTT actively participates in a number of important international research programmes. Evidence of VTT's research work can be seen in the approximately 2,000 publications which appear annually, and also in the significant number of product and software prototypes and approximately 50

patent applications made each year. About ten new companies are founded every year as a direct result of VTT research activities.

## VTT Information Technology

VTT Information Technology is a very young research institute. VTT was reorganised at the beginning of 1994 and its 34 laboratories were restructured into nine new research institutes. Research groups from the former Information Processing, Telecommunications, Medical Engineering and Graphic Arts Laboratories, focussing on IT research, were merged into VTT Information Technology.

VTT Information Technology has a staff of 200 researchers working in R&D in the fields of information systems and software technology with applications, as well as telecommunications, multimedia and communications technology. The Institute is located in the Helsinki area and in Tampere.

The goal of the Institute is to help Finnish companies benefit from the rapid

progress of IT and telecommunications, and to support the presence of high-technology manufacturers in the international markets.

## Operations Management

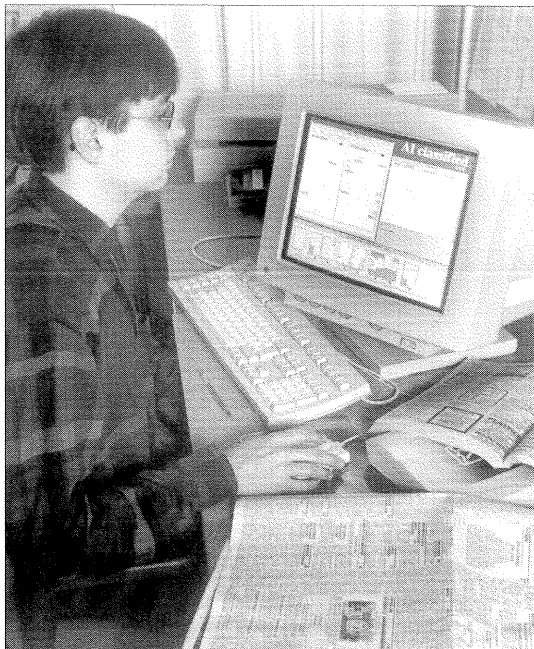
Research and software development is focused on the development and production of information systems and software for the management of production and service processes. The key areas are interactive technologies, optimization and simulation techniques, transaction processing and the management of information resources.

An example is the management system for wood procurement for a Finnish company working in the forest industry, Enso-Gutzeit. The system integrates general maps, roads, a database of positional entities as well as heuristic optimization and search algorithms for transport control. It helps Enso to reduce transport and storage costs, and to supply the logs to the production plant at the right time.



The head office of the Technical Research Centre of Finland in Espoo

The yellow pages of telephone directories in Britain are produced by Pindar Infotek Ltd using VTT's knowledge based pagination system. This system, the winner of the 1992 U.K. Manufacturing Intelligence Award, is also suited for the pagination of classified and displayed ads in newspapers and magazines.



### Knowledge Engineering

Knowledge-based methods, such as knowledge representation, modelling and mathematical problem solving, are being studied and are applied in product development. One application is the pagination system for the yellow pages of telephone directories, which has been supplied to Pindar Infotek Ltd and is used to produce all the yellow page directories in the U.K. The system won the 1992 UK Manufacturing Intelligence Award.

### Software Development

VTT also promotes the export of competitive Finnish software by developing methods and tools for software product development and for the transformation of potential software innovations into commercial products.

An application in this field is RiskTool, a tool for the risk analysis of software products developed in the MERMAID project of the Esprit II programme.

### Medical Informatics

Another major application area is that of information systems for health care services: solutions are studied to manage health care data and medical knowledge, supporting the networking and standardization of information systems, and the adoption of computerized medical records, decision-making and home care.

### Multimedia Applications

VTT Information Technology is active in multimedia R&D. Methods and techniques for the storage, use and transfer of multimedia information are studied and networked multimedia applications and software are produced, using graphical user interfaces in PC, Macintosh and UNIX environments and integrating these with ISDN, LAN and ATM networks. Application fields include remote operations and teaching, home care of the elderly and the handicapped, as well as industrial maintenance and video con-

ferencing. The SGML standard for electronic documentation is being studied. Industrial applications range from the publishing industry to medical documentation.

One of VTT's key areas is high-quality image processing. Quality control of colour and video images, as well as image transfer and archiving are studied.

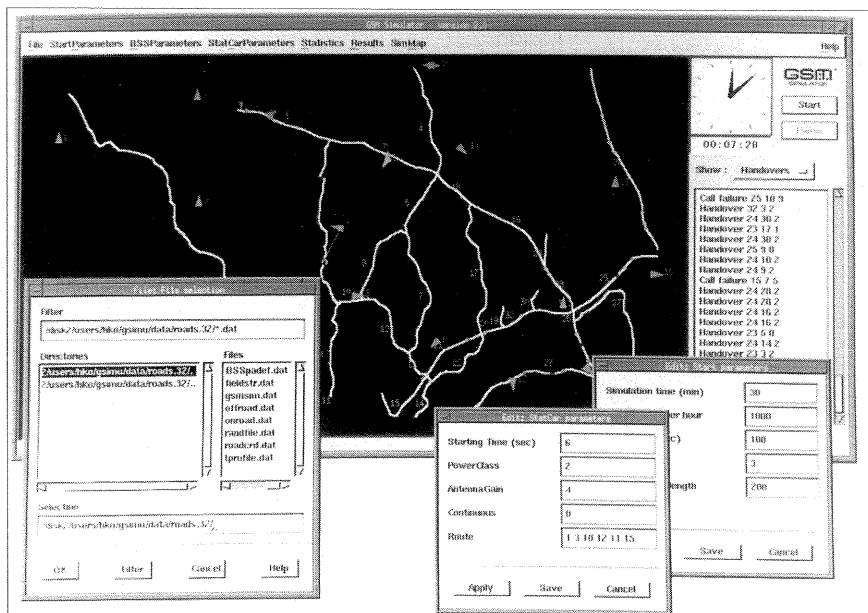
### Telecommunications

VTT is involved in R&D in communication protocol software, network management, design software for mobile networks, and models for radio wave propagation. Broadband communications, including performance analyses of broadband networks, bus technology for high

speed transmission and digital signal processing are key areas in this field. Radio and microwave technologies are studied to develop components, equipment and systems for the telecommunications and space industries as well as for the armed forces.

### European Projects

VTT Information Technology participates in a number of international research programmes, such as ESPRIT, RACE, ESA, Cost, CEPT, COMETT, AIM, TIDE, CEN and Biomed.



Developed in cooperation with Telecom Finland, this simulator of GSM mobile communication network helps to decide the location and overlap of base stations, and to optimize the network's parameters

### VTT Information Technology in brief:

- a research institute of the Technical Research Centre of Finland (VTT)
- founded: 1.1.1994
- total budget: ECU 12 million
- staff: 200
- location: Espoo, Tampere

**Please contact:**  
**Seppo Linnainmaa,**  
**VTT Information Technology**  
**Tel. +358-0-456 6041**  
**E-mail: seppo.linnainmaa@vtt.fi**  
**or:**  
**Päivi Johansson,**  
**VTT Information Technology**  
**Tel. +358-0-456 5936**  
**E-mail: paivi.johansson@vtt.fi**

## ERCIM - former Soviet Union Initiative

by Michiel Hazewinkel

**In 1992 and 1993 ERCIM applied for funds for the scientific support of scientists in the former Soviet Union (fSU) to INTAS and its predecessor in such matters, CODEST. INTAS is a special body created for this purpose by the European Union. The first application was partially successful (90kECU); the final decision for the second one has not yet been received.**

The grants given by the EU are mainly meant to help fSU scientists do research in mathematics and computer science while remaining in the fSU. The aid takes the form of small grants to carry out research which is also of interest to one or more of the ERCIM partners. Special contracts to carry out specific tasks at a rate of 150 ECU per month for a period of one or two years are envisaged.

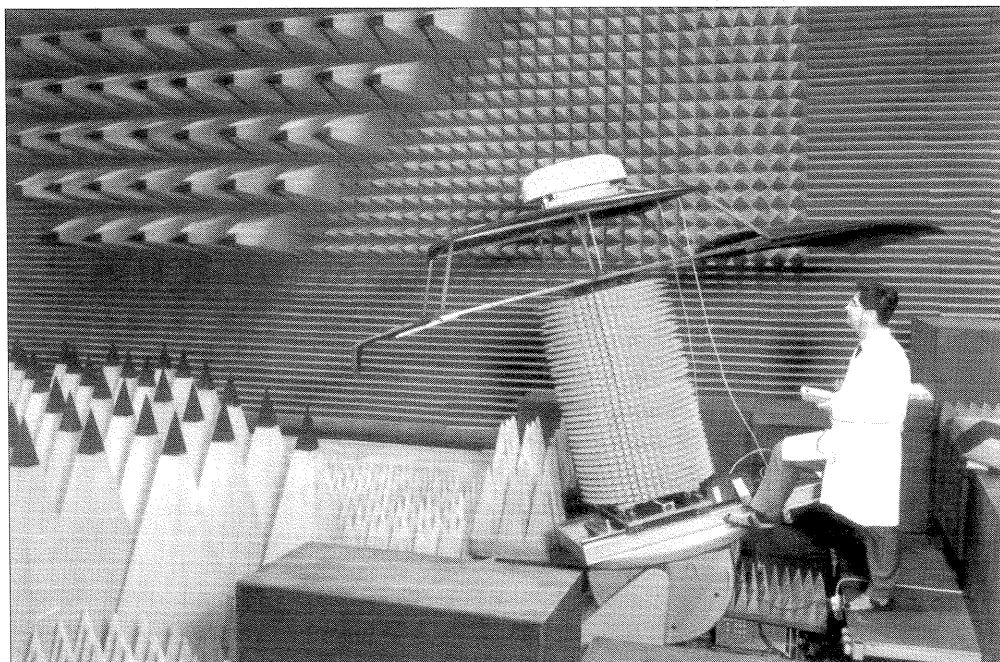
More precisely, ERCIM intends to set up a network of centres, well equipped with state-of-the-art computing and communication facilities, to which the ERCIM grantees will have access. Negotiations

are under way to establish the first, and for the time being only, such centre in Moscow. The computing equipment for this centre (mainly workstations) will be donated by the ERCIM partners GMD, INRIA, RAL and CWI, so that practically all the funds granted so far can be used for the actual support of scientists.

A third proposal, to be submitted in April, will quite possibly be followed by a fourth one later this year. A task-force has been set up for the ERCIM-fSU initiative. Its current members are listed below. All other ERCIM partners are - once again - cordially invited to appoint a member to this task-force.

It should be noted that in this context the term fSU does not cover all former Soviet republics. In particular, the Baltic states are excluded. They come under another EU support initiative: PECO and its successor Copernicus.

**Please contact:**  
**Michael Agi - GMD**  
**Tel: +49 2241 14 2672**  
**E-mail: agi@gmd.de**  
**or: Michiel Hazewinkel - CWI**  
**Tel: +31 20 592 4204**  
**E-mail: mich@cw.nl**  
**or: Mike Jane - RAL**  
**Tel: +44 235 44 5628**  
**E-mail: mrj@ib.rl.ac.uk**  
**or: Pierre Nepomiastchy - INRIA**  
**+33 139 635 646**  
**E-mail: pnepo@inria.fr**



**Antenna measuring in  
the echo-attenuated  
chamber at VTT**

# ERCIM Workshops in France

In Fall 1993, INRIA hosted a number of ERCIM Workshops which were located at different sites throughout France. Here below we give brief reports of two of these Workshops, both held in Nancy, 2-4 November.

## Multimodal Human-Computer Interaction

36 European researchers, mainly from ERCIM Institutes, attended this workshop. Participants presented their current research in five sessions:

- Taxonomies and design guidelines
- Modes and multimodality
- Users and multimodal HCI
- Applications and implementations
- Formal models and tools for designers.

The main topics discussed were: taxonomic frameworks; experimental studies on modality usage; dialogue modeling for advanced interactive systems; implementations of new user-oriented communication modes (pen-based expression, natural language, gesture); automatic synthesis of multimodal presentations; early attempts at formalizing multimodal interaction.

Despite the tight schedule discussions between presentations and in the concluding session were very lively, and enlightening complementary views on multimodality were exchanged. Participants were particularly interested in basic issues and especially communication and interpretation in multimodal contexts, i.e. how information can be communicated in different modalities, how these modalities interact, and how they can be integrated. Communication was always a central issue, whether between people, between people via

machines, or between people and machines. Whilst discussions suggested a common understanding of the distinction between "multimedia" and "multimodality", the question of what a modality really is turned out to be controversial. However, there was general agreement that a medium can be used for different modalities.

The tentative conclusions resulting from comments received from participants after the workshop are summarized below:

On taxonomies: Some progress has been made in the theory of output modalities, much less for input modalities: output modalities are described at a high level of abstraction, whereas input modalities are usually associated with very low level concepts (i.e. devices). There is a clear need for joint work on input/output taxonomies, with a view to integrating them into a unified framework. A coarse-grained task concept is also needed since the evaluation of the effectiveness of a modality should be task-based.

On the combination of modes: With respect to input modalities combining spoken natural language and gestures, it emerged that the use and role of natural language (via deictics mainly) vary according to users' interaction strategies: command (or "make do" strategies) vs. direct action (or "do" strategies). Designers should be aware of this result.

On human factors: Experimental studies are needed for better understanding of behaviours and preferences as regards multimodality usage, although the generalization of such empirical results could be risky.

On applications: The problem of identifying those applications that require multimodality was debated, but no clear conclusions were drawn. However, the advantages of multimodal HCI were illustrated for specific applications and mode combinations through demonstrations of prototype implementations: for instance, speech and direct manipulation as an input modality for expressing simple queries or commands, natural lan-

guage and graphics as an output modality for route description.

On models and formalisms: Formal descriptions are needed for the design of multimodal interactive systems. Progress in this area is hindered by the lack of meaningful conceptual models for multimodal interaction.

Participations expressed their intention to maintain the contacts established during the workshop and a mailing list is to be circulated to encourage further exchanges of information and ideas. Revised versions of the presentations will soon be published as an ERCIM Workshop Report.

**Please contact: Noëlle Carbonell - INRIA-Lorraine**  
Tel: +33 83 59 20 32  
E-mail: carbo@loria.fr

## Development and Transformation of Programs

The workshop gave 35 European researchers, including member from seven ERCIM Institutes, the opportunity to present their recent theoretical and experimental work on program and specification construction. The following topics were covered:

- logic programming
- program refinement
- formal transformations or derivation rules
- development strategies
- the program transformation process
- reuse and adaptation of programs
- tools and environments to support program transformations.

Programming and specifying is a difficult task due to the number of complex problems and formalisms to be mastered. There are many steps between the expression of an informal problem and the identification of an efficient solution. Divide-and-Conquer strategies have been devised to help in the construction of correct programs. In the 1970's, Burstall and Darlington developed the unfold-fold

method for program development, allowing programs to be transformed using correctness-preserving transformations. In the CIP project, methods were developed to proceed from non-operational specifications to operational ones. The unfold-fold method was extended by more complex transformation rules that often concentrate several steps in one unfold-fold development. However, these approaches do not reduce the number of existing formalisms or problem complexity. They express rules for deriving programs from programs or from formal specifications but little attention is given to specification elaboration. Recent work attempts to state precisely how formal reasoning techniques can assist specification development.

In recent years, much progress has been made in the design of languages. The workshop covered a wide range of topics with the presentation of different formalisms and frameworks to express methods and program development. It was very difficult to focus the discussion due to the variety of formalisms. From the animated discussions, it appeared that a primary preoccupation of the domain concerns the expression of the development itself rather than the product, using skeletons, transformations, rules or operator development. The main questions to be addressed now concern the kind of development process that should be modelled and the tools that are needed to support this process.

The general feeling was that the success of ERCIM workshops of this type depends on the fact that they provide informal meeting-places to exchange viewpoints, discuss new ideas, and establish new collaborations, rather than being just another conference.

The Proceedings of the meeting are now available as an ERCIM Workshop Report.

**Please contact:**  
**Jeanine Souquieres - INRIA-Lorraine**  
**Tel: +33 83 59 20 12**  
**E-mail: souquier@loria.fr**

## THE EUROPEAN SCENE

# MULTEXT – Multilingual Text Tools and Corpora

by Jean Véronis

**The MULTEXT project is part of the CEC Linguistic Research and Engineering Programme. It seeks to contribute to the development of generally usable software tools for text corpora manipulation and analysis and to create multilingual text corpora with structural and linguistic markup. It will attempt to establish conventions for the encoding of such corpora, building on and contributing to the preliminary recommendations of the relevant international and European standardizing initiatives. MULTEXT will also work towards establishing a set of guidelines for text software development. The results, namely corpus, related tools, specifications and accompanying documentation, will be made freely and publicly available.**

Researchers from two ERCIM partners (AEDIMA: Dept. Filologia, Universitat Autònoma and Fundacion Bosch Grimpera, Universitat Central, Barcelona; CNR: Istituto di Linguistica Computazionale, Pisa) attended the Kick-off meeting of MULTEXT, held in Aix-en-Provence, 20-21 January 1994. The other academic partners in the project are: CNRS, Aix-en-Provence (Coordinator); ISSCO, Genève; HCRC, University of Edinburgh; Arbeitsbereich Linguistik, Muenster University; STT, University of Utrecht.

Six major European companies are also involved in the project as industrial partners: EUROLANG-SITE and Rank Xerox Research Center, France; Siemens Nixdorf-CDS, Spain; Nixdorf Informationssysteme AG and CAP debis Systemhaus KSP, Germany; Digital Equipment B.V., The Netherlands. They will contribute to the specification and development of the basic tools and provide a first indication of the downstream exploitability of these tools by using them as a basis for building several high-level NLP applications.

At the outset of the project, the consortium will undertake to analyse, test and extend the SGML-based recommendations of the Text Encoding Initiative (TEI)

on real-size data, and gradually develop encoding conventions specially suited to multilingual corpora and the needs of NLP and MT corpus-based research. To manipulate large quantities of such texts, the partners will develop conventions for tool construction and use them to build a range of highly language-independent, atomic and extensible software tools.

These specifications will be the basis for the development of two major software resources, namely (a) tools for the linguistic annotation of texts (e.g. segmenters, morphological analysers, part of speech disambiguators, aligners, prosody taggers and post-editing tools) and (b) tools for the exploitation of annotated texts (e.g. tools for indexing, search and retrieval, statistics).

By using the emerging software tools, the consortium plans to produce a substantial multilingual corpus, including parallel texts and spoken data in six EC languages (English, French, Spanish, German, Italian and Dutch). The entire corpus will be marked for gross logical and structural features; a subset of the corpus will be marked and hand-validated for sentence and sub-sentence features, part-of-speech, alignment of parallel texts and speech prosody. All markup will comply to the TEI-based corpus encoding conventions

established within the project. The corpus will also serve as a testbed for the project tools and a resource for future tool development and evaluation.

An application programming interface will facilitate the coupling of the progressively refined software and data components with existing language application systems or prototypes. In particular, the industrial partners plan to develop extraction software for lexical and terminological information to complement and improve their Terminology Management, Information Retrieval or Machine Translation systems. Some effort will also be devoted to a prototypical application for testing and comparing successive versions of an MT system.

**Please contact:**

Jean Véronis - Laboratoire Parole et  
Langue-CNRS  
Tel: +33 42 20 43 56  
E-mail: veronis@grtc.cnrs-mrs.fr

**Integrating Reliable Distributed  
Computing and Framework  
Technology**

# ADVANCE - Development of Concurrent Engineering Systems.

by Jörg Kaiser

A future key application for computers will centre around integrated information systems in the area of concurrent engineering in computer integrated manufacturing including computer aided design. GMD is involved as the contracting partner in the new ESPRIT project ADVANCE which aims at supporting concurrent engineering applications by exploiting framework technology and open distributed processing.

ADVANCE brings together the achievements of IT projects from disjoint EC research programmes and combines them into a unique infrastructure which is exploited by management and design applications of industrial enterprises. ADVANCE is closely related to, and will complement, the framework and tool products and the strategic research of the industrial technology providers. Application toolsets tend to be marketed as integrated tools from different sources. A vehicle for this integration is given by the framework technology. ADVANCE will introduce innovative models and mechanisms to guarantee data consistency and run-time dependability in a distributed cooperative environment typical of manufacturing industries, thereby bridging the conflict between decentralized information and the demand for a consistent, integrated view of the design and management process. Much emphasis in ADVANCE is given to a careful requirements analysis and evaluation by the industrial partners. Therefore, the project is organized around a well balanced group of research institutes (GMD, Trinity College, Dublin), IT-providers (Siemens Nixdorf Informationssysteme, Software and Systems Engineering Ltd., Dassault Electronique) and end users from the electronic (Philips) and automotive (Shorts) industries. The results are intended to be directly exploited in existing commercial products.

The project will provide enhanced basic services to support the framework and tool developer, and to provide the additional functionality demanded by users of concurrent engineering applications. Important requirements from the user's point of view are the ability:

- to make the data available to those that need it when they need it;
- to make traceable changes to the data;
- to provide secure access to shared data;
- to be able to easily upgrade or modify the infrastructure;
- to support forthcoming standards.

From the technical point of view, the basic services will include: mechanisms to support high availability of design data; a distributed, cooperative action concept encompassing multiple, heterogeneous databases; an object-oriented data and programming model; awareness support and intertool communication. These important basic functions will be integrated in a framework giving the users a uniform interface to data and services to manage and control the cooperative process.

Within the scope of ADVANCE, the Responsive Systems Research Division in the GMD Institute for System Design Technology is pursuing an innovative approach towards a cooperative action concept, combining approaches from operating systems, programming languages and databases. Controlled access to shared data in a cooperative environment and the necessary run-time dependability are the primary targets of the research activities. The work is based on successful contributions to the ESPRIT project COMANDOS; our distributed transaction monitor Relax is part of the Comandos Reference Platform.

**Please contact:**

Jörg Kaiser - GMD  
Tel: +49 2241 14 2323  
E-mail: kaiser@gmd.de

# Human-Computer Interfaces: Activities within ERCIM Institutes

by Noëlle Carbonell

**Present research on user interfaces and Human-Computer Interaction (HCI) is increasingly drawing upon the knowledge acquired by the social sciences on human cognitive behaviour and capabilities. During the eighties, specialists in human factors became involved in the design and life cycle of standard computer applications for knowledgeable as well as for inexperienced users. Recent advances in technology and AI techniques contributed to the development of new interdisciplinary collaborations, namely with cognitive psychology and linguistics. These emerging trends are reflected in research activities on human-computer interfaces under way in ERCIM institutes.**

The development of applications involving domain-specific human competence led to a significant change in the sharing out of tasks and initiatives between users and computer systems: the computer, a mere executant of well defined functions in the eighties, is now considered as an expert system that should assist users with little computer-literacy in performing complex tasks, such as diagnosis or decision-making. In this context, the following issue becomes crucial: what information should the system impart to the user so that the latter can supervise the system's activity efficiently, achieve his/her goals and, possibly, acquire domain knowledge while working?

Several research groups in different ERCIM institutes address this question. Within the framework of an Esprit 3 project ('I-SEE'), researchers at RAL collaborate with ergonomists on the design of a flexible, user-adapted explanation component for a knowledge-based diagnosis system. The present research activity of the 'Human-Computer-Interaction' group at GMD is focused on

the design of "enabling systems", that is cooperative systems with domain-specific competence that users can learn on demand during ongoing use. "User-sensitive help" is studied at SICS by the 'User Adaptive Communication Methods' group, from both the empirical and technical points of view. In some applications, a new input modality can provide efficient user support. For instance, the 'Computer Graphics and CAD' group at INESC is developing "intuitive 3D interactive design" environments. Their experimental prototype is capable of constructing 3D representations from 2D drawings, for users unfamiliar with the mathematical concepts involved in solid modelling. The approach relies on concepts from the "cue theory of visual perception".

In addition, thanks to scientific and technical advances, numerous new input/output devices are now available to user interface designers, as well as new classes of interactive applications, such as Computer Supported Collaborative Work (CSCW) and multimedia document manipulation.

To be successful, research projects on user interfaces for CSCW applications require the regular participation of specialists in social sciences, since the main function of these interfaces is to promote flexible communication and efficient cooperation between distant users. Groups at GMD, INESC and SICS actively collaborate with such specialists. The European 'COMIC' project (Esprit-BRA), in which GMD participates, is a good example of successful interdisciplinary research in this area. In the context of multimedia applications, user-centered design is confronted with specific difficulties, both ergonomic and technical. At present, navigation through multimedia data represents a human factors key-issue in the design of browsers. This problem is tackled by researchers at CNR (ITIA) within the framework of an Esprit

3 project called 'Interactors'. The contribution of RAL members to another Esprit 3 project addresses more technical aspects, namely access to distributed heterogeneous multimedia data sources. Current research on human-computer interfaces at CWI aims at creating windowing computer environments providing users with some of the functionalities of Unix pipes, such as facilities for exchanging objects between applications.

The development of new interactive devices and techniques is also a powerful incentive to research on multimodality. The last ERCIM Workshop on Multimodal HCI (Nancy, November 1993) demonstrated the scientific dynamism of ERCIM partners in this domain, and illustrated the diversity of present research directions. Researchers at FORTH are currently defining equivalents of visual modalities for blind users. The 'Dialogue group' at INRIA, in close collaboration with linguists and ergonomists, investigates the potentials of spoken natural language combined with gestures as a suitable modality for novice or occasional users. At SICS, several research projects on human-computer interfaces involve natural language processing, including the Dilemma project which is presented in the Technology Transfer Section. Multimodal possibilities of pen-based systems are investigated at GMD.

Finally, rigorous conceptual approaches are still needed for the design and development of user interfaces implementing these new forms of human-computer interaction. 'Interactionally Rich Systems' (IRS), a project founded by the CEC Human Capital and Mobility Program, aims at defining an enhanced interaction model that will act both as a reference and an inspiration to designers and developers. Researchers at CNR participate in this project.



At the moment, HCI appears as a rapidly evolving many sided research area capable of motivating fruitful scientific exchanges and collaborations among ERCIM partners. Further workshops could prove useful for transforming present informal exchanges into actual, possibly institutional collaborations.

**Please contact:**  
**Noëlle Carbonell -**  
**CRIN-CNRS & INRIA-Lorraine**  
**Tel: +33 83 59 20 32**  
**Fax: +33 83 41 30 79**  
**E-mail: carbo@loria.fr**

## Multimodal HCI activities at INRIA- Lorraine

by the 'Dialogue' Group

**"Talking to computers" is a long-standing, widespread dream, which may become true in the near future thanks to recent significant advances within research areas such as natural language modeling and continuous speech recognition. In the context of multimodal HCI, speech associated with gestures seems even more attractive. Issues relating to the integration of this promising form of multimodality into human-computer interfaces are being investigated at INRIA-Lorraine.**

In the context of multimodal HCI, spoken natural language utterances associated with designation and demonstration gestures may prove easier to interpret than exclusively oral or gestural indications, due both to the redundancy inherent in the joint use of spontaneous speech and gestures, and to the complementary expressive powers of these two communication modes. Users may well be attracted to this new form of multimodal expression, and prefer it to direct manipulation and menu systems, in-as-much

as it offers a means for more flexible and natural human-computer communication, thus promoting richer interaction and reducing interface learning.

We are currently investigating this promising form of multimodality from both an ergonomic standpoint and an engineering viewpoint.

With the collaboration of ergonomists and cognitive psychologists, we have conducted several empirical studies in order to determine how people actually use speech, or speech combined with gestures, for interacting with application software. Our aim is to model users' behaviour and strategies from empirical data rather than from a priori anthropomorphic knowledge on human communication. Our approach is based on the 'Wizard of Oz' experimental paradigm which involves the simulation of user interface functionalities by human experts.

We are now attempting to design a tractable artificial multimodal language that could win users' acceptance thanks to the implementation of an accurate model of the use of spontaneous speech and gestures in the context of human-computer communication.

The integration of natural language into user interfaces requires a good understanding of some basic linguistic phenomena. We have specifically tackled the issue of reference by means of NL expression possibly combined with demonstration gestures. We have thus proposed a unified framework for the interpretation of NPs (definite, indefinite, demonstrative and pronominal) occurring in an NL discourse, evidencing their intrinsic discriminative nature. This formal model can be applied to the analysis of discourse structure as well as to the interpretation of multimodal utterances. More precisely, we are currently studying two specific aspects of multimodal reference, object designation and spatial reference. We propose a semantics for demonstration gestures which is compatible with the general framework that we have proposed for reference (esp. demonstrative NPs) and which brings out the global and local features involved in the gestural selection of a group of ob-

jects. For spatial reference, we introduce the notion of frame, which gathers all the elements necessary for a proper interpretation of utterances conveying positional information.

This research activity has motivated our participation in two national basic research projects (supported by CNRS), on human-computer dialogue and cooperative computer systems, respectively. Two prototypes for specific applications have been developed: one within an Esprit 2 project ('Multiworks'), the other within an industrial research contract (with Thomson SINTRA) supported by the DRET Agency (Direction des Recherches, Etudes et Techniques, French Ministry of Defense).

**Please contact:**  
**Jean-Marie Pierrel**  
**Tel: +33 83 59 20 01**  
**E-mail: jmp@loria.fr**  
**or Noëlle Carbonell**  
**Tel: +33 83 59 20 32**  
**E-mail: carbo@loria.fr**  
**or Laurent Romary**  
**Tel: +33 59 20 37**  
**E-mail: romary@loria.fr**

## Hyperbrowser: a Tool for Navigating within a Multimedia User Interface for Real Time Applications

by Monica Bordegoni  
and Caterina Rizzi

We describe a tool that is being developed in order to provide and manage facilities for navigating through sets of multimedia objects defining the user interface of a system. Our efforts have been concentrated on designing some

high-level functionalities to specify the user interface structure and on finding appropriate strategies to support users in browsing through large graphic structures.

One of the research topics being addressed by the KAEMaRT group (Knowledge Aided Engineering and Manufacturing and Related Technologies) working at ITIA-CNR, in Milan, is the problem of navigation through a hypermedia structure. Hyperbrowser, a tool that has been designed to navigate through a system's user interface is now being developed as part of the ESPRIT III Project: Interactors. As this project addresses real-time systems, the multimedia objects that we consider consist of panels containing a visual presentation of machine tools on a shop-floor, a video monitoring the state of the machine tools, etc.

Hyperbrowser consists of two sets of procedures. The first, known as Specification HyperBrowser, provides functionalities to define the connections between the user interface panels, i.e. to specify the hypermedia structure of the system. The structure consists of a free graph, in which a panel is associated with a node, and nodes are connected by means of hypermedia links, named hyperlinks. Given two panels, a hyperlink can be drawn from an object within one panel (the starting anchor) to the other panel (the ending anchor). A set of panels, usually logically related, can be grouped in order to define a subgraph. This facility is useful for a better understanding and organization of the overall structure. Paths can be defined to enable the user to jump more quickly to another panel. Figure 1 shows how a path is defined. A name and an icon are associated with a panel, a subgraph, or a path, in order to retrieve them more easily.

A second set of procedures, called Navigation HyperBrowser, allows users to navigate within the defined user interface structure. This part of the tool provides navigation functionalities to help users to find their directions without getting lost within the hypermedia structure. It displays a map that shows a subgraph tree highlighting the current subgraph,

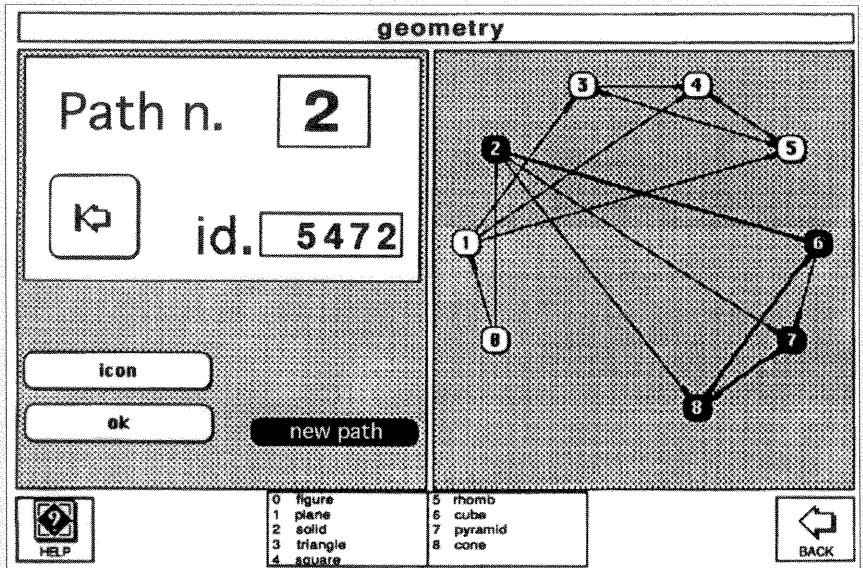


Figure 1 - Definition of a new path linking some nodes of graph

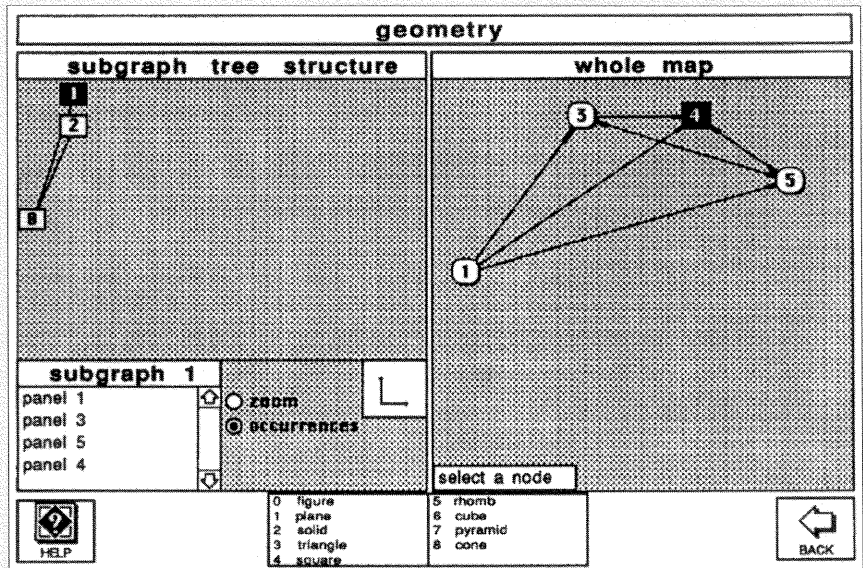


Figure 2 - The right side shows an example of a whole map; node 4 expanded into a subgraph tree structure is shown on the left.

and the list of panels belonging to it. The user can either choose to view complete maps showing all the nodes of the current graph and highlighting the current node, or local maps, highlighting the current node and showing the set of nodes that can be reached from it. An example of a complete map is shown in Figure 2. The tool also provides a tool-tray containing a set of iconic panel representations (called bookmarks), whose visual features provide cues for the panels, and a tool-tray containing some landmarks, a set of special icons to recall some special panels, subgraphs or paths. The tool automatically stores a record of all nodes

of the graph that have been visited, so that particular paths can be reselected as and when required.

Please contact:  
 Monica Bordegoni - ITIA-CNR  
 Tel: +39 2 70638088  
 E-mail: mb@kaemart.itia.mi.cnr.it

# Interactionally Rich Systems

by Giorgio P. Faconti

**Interactionally Rich Systems (IRS) is a three year project founded by the CEC within the Human Capital and Mobility Programme. Its main goal is to examine the potential of new interaction devices and techniques to support interactionally rich systems, to explore their scope over a range of application and cognitive domains, and to attempt to systematise these findings in an enhanced interaction model that will act both as a reference and an inspiration to designers and implementers. It is thereby hoped to reduce the distance between human capabilities and the capacities of computer systems.**

Much research and development is currently directed at achieving systems that are computationally intensive, i.e. provide a greater range and depth of functionality. With common existing interaction devices, such as mouse, keyboard and screen, and typical soft objects, such as windows, icons and menus, many systems begin to seem interactionally impoverished in comparison with their computational functionality - the input and output devices are a bottleneck in the communication between user and computer.

With technical advances and reductions in computing costs, a new range of input/output devices and techniques are becoming available. This increases the possibility of creating systems that are interactionally rich enough to match their underlying functionality. So far, the potential of these new interaction devices and techniques has only begun to be exploited in entertainment and control systems, and in particular control systems that require near symbiotic man-machine relationships, such as aircraft piloting. It is to be hoped that they can be equally successful in application domains that are traditionally considered to be less interactionally intensive, for example database or scientific visualisation

However, current development of the use of enriched interaction is very much ad hoc and there is little systematic grounding or guidance. Consequently, as for general system development, there is a strong requirement for a rigorous software engineering approach in the exploitation of these new devices. A major methodological problem that such a software engineering approach faces with respect to interaction is that the level of abstraction and the principle of device independence that software engineering conventionally demands clash with the detailed description of the pragmatics and ergonomics of particular interaction devices which appear to have a strong bearing on the cognitive success of their use. A second problem is that conventional specifications of interactive systems often make a radical split between input and output. These are often viewed as separate domains, and their interaction is left to the particular application's semantics.

The Interactionally Rich Systems (IRS) project suggests that resolution of these two problems may converge in a layered architecture for user interface management, in which a hierarchy of agents, handling both input and output at various levels of abstraction or particularity, mediate the interaction between user and computer.

An important tool used by the project is formality and, consequently, formal questions of interactionally rich systems are explored with the aim of improving and ensuring their usability and of proving properties of interactive behaviour that require more than just the logical integrity of the system. We argue, therefore, that a model for interactionally rich systems must not only be rigorously defined such that it can be used for specification or reference, but it must also incorporate user-oriented or cognitively-based principles that can be used to constrain or guide user interface design towards usable solutions.

The project is led by CSD - University of York and includes IFI - Free University of Berlin (Germany), DAP - Cork (Ireland), ISG - University of

Magdeburg (Germany), RAL (UK) and CNR-CNUCE (Italy).

Please contact:  
**Giorgio P. Faconti - CNR-CNUCE**  
 Tel: +39 50 593 241  
 E-mail: faconti@cnuce.cnr.it

## New Research Directions of the Human-Computer-Interaction Group at GMD

by Christoph G. Thomas and Peter Wisskirchen

**People must be able to deal with new technologies, new methods, and fluctuating requirements very quickly. To succeed in this constantly evolving world, a better integration of learning and working is required. With respect to computer technology, flexible, intelligent, and cooperative systems with domain competence must be developed which can be learned, experimented, and extended during ongoing use - in other words, systems in which users can learn on demand.**

An innovative form of technological environment in the learning on demand area is offered by enabling systems. Such systems are characterized by a new form of cooperation between the user and the computer: users and computers are partners in the task-at-hand, bringing complementary strengths and weaknesses to the job. It is important not to restrict these ideas to single user systems but also to include and support cooperative work between several users. From a technical point of view, there is a tendency to build up this kind of system using multi-media technology and, in particular, interactive computer animation.

Our group is now focusing its research activities on these ideas. One of the challenges facing us is the design of user interfaces with significant imaginative qualities. New metaphors are needed and will have to be evaluated. One new metaphor that has been proposed is known as the scenic interface. The scenic interface concept leads to the design of virtual mini-worlds (including embedded intelligent agents) based on mixed-initiative dialogs. In this context, human-computer communication can be compared to interactive movies or scenes, where the user is the main actor in a specific context or problem domain. Thus, the development of new ergonomic design criteria focusing on the dramaturgic aspects of an interface will become increasingly relevant.

Our research work is based on a demand-driven design-evaluation-redesign cycle. Experimental prototypes play a dominant role as vehicles for integrating relevant concepts in the ergonomic discussion, and can be seen as a means of communication allowing us to gain a deeper insight into user needs concerning existing but (as yet) untailored technical possibilities. We have:

- to identify the potential benefits of multimedia, e.g. interactive animation;
- to develop and evaluate new presentation and interaction techniques;
- to design new interface tools supporting new scenarios through an integration of graphical UIMS and current animation systems;
- to extend the usability of these tools, so that not only programmers but also designers, artists, and end-users in general can use them easily;
- to define evaluation methods and ergonomic criteria for the new types of interfaces implemented in our prototypes.

The following projects are under way:

**DIVA:** development of a virtual office scenario supporting cooperation between several users in rooms containing people, documents, archives, and meeting facilities.

**SCENE:** development of a multi-media enabling system for tutoring medical staff.

**IDA:** development of a multi-media enabling system supporting user interface designers.

**DRIVE:** knowledge based navigation and interaction within realistic 3D worlds.

In addition, we are working with new multi-modal systems (e.g. pen-based systems, data gloves, stereo glasses), trying to integrate these facilities into our enabling environments.

**Please contact:**  
**Peter Wisskirchen - GMD**  
**Tel.: +49 2241 14 2315/2316**  
**E-mail: wisskirchen@gmd.de**

## Interoperability and User Interfaces

by Steven Pemberton

**The Interoperability Project at CWI looks at the 'big picture' of the workings of applications throughout a computing environment, both from the user's viewpoint, and from the implementation viewpoint.**

Traditional user interface practice examines the user's demands of, and interactions with, a single application: first a task and requirements analysis, then a pilot implementation, then user testing leading to iterative design and implementation.

While this is good practice in as far as it goes, it often sells the user short since one seldom spends long stretches working with a single application; far more usual is a pattern of rapid and frequent swapping between different applications, for whatever reason.

Consequently, the restriction of task analysis and user testing to single applica-

tions can be characterised as unrealistic: the analysis should ideally be done at the global computing environment level, to include inter-application effects.

Another consequence for the user of this isolation of applications from each other is that it is very difficult to exchange data between applications: each application typically has its own data formats and in most computing environments today if you can import data from another application at all, then it is usually at a very low-level, such as importing the bit map of a drawing into a word-processor.

■ Ideally, you want the equivalent of Unix pipes, where applications can be chained together, each processing the output of another, and passing the result on to the next, making one large application out of several smaller ones. Alas, this sort of action is more or less impossible in current windowing environments.

On the basis of these and other considerations, the Interoperability project at CWI has performed an analysis of user requirements at the environment level, and has designed a software architecture that reduces many of the problems of current windowing computing environments.

The classic architecture is one of isolated applications, each duplicating much of the work that the others do, and cooperating with each other only if the programmer has taken the (large) effort of programming it out (via Publish and Subscribe, or whatever mechanism the system supplies). In this traditional architecture, applications can loosely be divided into three parts: the user interface, managing all interaction with the user; data management, ensuring the data is read from and written to disk; and the true functionality, doing whatever it is that the program is actually meant to do. Typically this last part, the functionality, is only a tiny fraction of the whole; in other words, programming applications involves writing far more code that can be classified as "administrative", than truly functional code.

The architecture we have designed separates these three parts out, and only

leaves the true functionality in the domain of the application; the user interface and data management are dealt with entirely by the kernel of the system. This has a number of advantages, for the user and the programmer alike.

For the user, there is far more consistency between applications, and since the application does not have to bother with data formats and interaction with other applications' data objects, it is simple to exchange objects between applications while still keeping the objects' structure and semantics.

For the programmer there is of course very much less work, with certain big gains, such as unbounded undo being supplied by the system's data manager so that all applications get undo for free, and not having to bother with catching events from the user interface anymore.

A pilot implementation, the Views System, has shown us that these ideas are realistic. One of our current projects is applying these ideas to the design and implementation of a system of interactive books. These are computer-based books where, for instance, the information can be displayed in different ways, the material can be presented in different orders, cross-references are easier to follow, definitions are much easier to find, and examples and exercises can be altered to see the effect of the changes. The pilot implementation is for an interactive book about Lie algebras, in col-

laboration with mathematicians at the CWI as part of a nationally funded project; the final product will include an architecture for interactive books in general, with an authoring system.

Steven Pemberton is Editor-in-Chief of the ACM SIGCHI Bulletin (The Special Interest Group in Computer-Human Interaction).

**Please contact:**  
**Steven Pemberton - CWI**  
**Tel: +31 20 592 4138**  
**E-mail: Steven.Pemberton@cwi.nl**

**user population includes people with different cultural, educational, training and employment backgrounds, novices and experienced computer users, the very young and the elderly, and people with different types of disabilities. Thus, it has become increasingly important to design human-machine interfaces, that not only support more efficient and effective user interaction, but also address the individual end user needs, requirements and expectations.**

One of the domains of tele-informatics research and development at ICS-FORTH concerns the development of methodologies, tools, applications and services which support the socio-economic integration and independent living of disabled and elderly people. Of particular importance and relevance in this domain are those issues related to human-computer interaction, i.e. rendering the user interface accessible and usable also by users with functional impairments. Our work in this domain is mainly collaborative, involving other European partners from the research community, academia, industry, rehabilitation centres, user organisations, etc, and follows two parallel approaches. The short term approach is to adapt the user interfaces of existing commercially available applications and user interface environments, in accordance with the particular end user needs and requirements. The longer term approach is to provide the necessary methodologies and tools that would facilitate the development of user interfaces concurrently accessible by both able and disabled users.

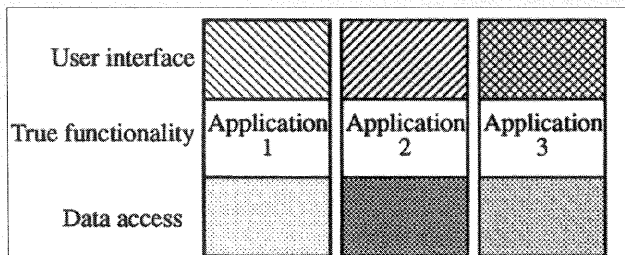
A typical example is the provision of accessibility to blind users in a graphics-based environment. It is widely appreciated that the evolution of User Interface software technology towards more visually oriented concepts and visual interaction techniques is presenting serious problems to blind people, preventing or limiting the accessibility of computer-based systems. In this respect, work is being done to resolve existing problems, and also to ensure the accessibility of future interactive applications by blind users.

## Towards User Interfaces accessible to All

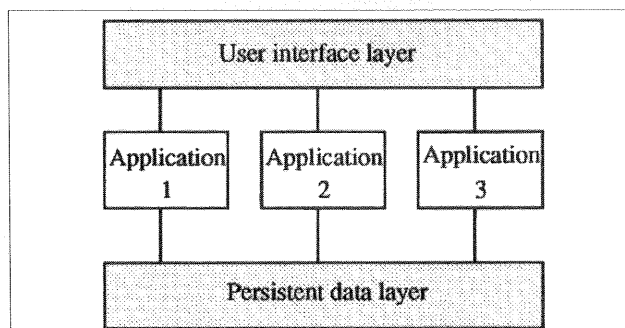
by Constantine Stephanidis

**The proliferation of computer-based systems and applications in every walk of life and the anticipated widespread use of emerging telematic services has introduced new dimensions to the issue of human-machine interaction, necessitating the design of interfaces accessible and usable by a diverse user population with different abilities, needs, requirements and preferences. This**

**Traditional application architecture: applications exist in relative isolation**



**Views architecture: user interface and data-management are handled by the system**



The short term approach in this context, concerns the implementation of specific adaptations on top of the X WINDOWING SYSTEM, while the long term approach deals with the development of a User Interface Management System which will enable the design and implementation of User Interfaces concurrently accessible to sighted and blind users (the HOMER system). Both approaches also deal with the problem of designing appropriate non-visual interaction techniques. These activities are carried out in the framework of the GUIB project, which is partially funded by the TIDE programme of the Commission of the EU (DG XIII). Partners in the GUIB consortium are: IROE-CNR (Italy), FHP (Germany), IFI (Germany), FORTH-ICS (Greece), RNIB (UK), TUB and FUB (Germany), VUB (Belgium), VTT (Finland).

Regarding adaptations for the X WINDOWING SYSTEM, accessibility to window management facilities (e.g. system menus, icons for X-clients, etc) and text-based information within the overall environment has been achieved, while current developments are directed at providing access to more syntactic information (e.g. a hierarchy of interaction objects for a particular client, classes of objects and associated attributes, etc.). More specifically, the approach followed adopts the 2-dimensional visual spatial metaphor as the basis for the non-visual reproduction of the hierarchical structure of interaction objects; the graphical environment is properly translated into a textual representation which is provided in tactile form. Non-visual interaction techniques have been introduced, employing new tactile devices which incorporate mouse substitutes, speech output, auditory cues and 3D audio techniques. A flexible tool has also been built for configuring the way in which the various clients will be made accessible to blind users (e.g. selecting I/O devices, shortcuts and key bindings, style of presentation, dialogue with the blind users, etc.).

The long term approach aims at enabling the adoption of different metaphors for blind users and at facilitating the introduction of alternative (heterogeneous)

interactive techniques to be employed for the non-visual User Interface. For example, blind users have some difficulties with windows or popup menus; the utilisation of advanced interactive techniques based on 3D graphics and Virtual Reality technology makes conventional adaptation techniques even less promising. Consequently, the unification of visual and non-visual User Interfaces, both at the design and the implementation stage is the proposed solution. The concept of Dual User Interfaces has been introduced to serve the needs of both blind and sighted users. The specification of the User Interface is facilitated through a powerful language which supports different levels of abstraction and enables the description of Dual User Interfaces.

Another activity is dealing with the development of a model-based framework for the design of user interfaces for future broadband network services. This framework models important issues of user interface design by capturing and integrating, in a set of theories/models, knowledge about application/service semantics, user abilities, interaction media/modalities and devices. Based on this set of models, reusable elements provided by a user interface run-time model are configured and interconnected to a final runtime system. Supporting a range of different potential designs, this framework promotes an iterative and exploratory user interface development which takes into account the end-user motor, sensory and cognitive abilities, thus, ensuring the accessibility of future broadband network services for people with special needs. This activity is carried out in the framework of the IPSNI-II project (R2009), which is partially funded by the RACE programme of the Commission of the EU (DG XIII). Partners in the IPSNI-II consortium are: IROE-CNR (Italy), KUL (Belgium), CSELT (Italy), FORTH-ICS (Greece), IRV (The Netherlands), University of Dundee (UK), VTT (Finland).

**Please contact:**  
**Constantine Stephanidis - FORTH-ICS**  
**Tel: +30 81 226487**  
**E-mail: cs@ics.forth.gr**

## I-SEE: Knowledge Based Explanation of Information Systems

by Simon Lambert

**The Knowledge Engineering Group at RAL is involved in an ESPRIT III project called I-SEE dealing with knowledge-based explanation of information systems, an important functional aspect of human-computer interaction.**

RAL's partners in the I-SEE project are Syseca (France), British Maritime Technology (UK), Lyonnaise des Eaux-Dumez (France) and CNAM (France). Two applications are provided by the user partners, one a knowledge-based system for diagnosis of sewage plants, the other a modelling package for marine pollution. The aim of I-SEE is to enhance these two systems with explanatory facilities, and to produce a generic toolkit for explanation.

From the early days of knowledge-based systems, it has been recognised that explanation facilities ease human-computer interaction by improving the acceptability, effectiveness and efficiency of the use of systems. It was found that simple rule-tracing approaches were of limited usefulness, being more suitable as debugging aids for the developer. I-SEE is founded on a number of principles which go well beyond the earlier approaches and hold out great potential for exploitation:

- a broad range of subjects for explanation: not just a system's line of reasoning, but also explanation about the objects in the domain, about appropriate user inputs, spontaneous explanation of user errors, etc.;
- the use of knowledge-based reasoning to detect the user's information needs

and to construct plans which will address those needs;

- user modelling to represent the user's expertise, knowledge and priorities and to tailor the explanations accordingly;
- the use of models of the domain (e.g. sewage plants) and of the system itself (e.g. the procedure of diagnosis) to provide the foundation for explanations.

This last point is particularly important. It has commonly been thought that knowledge-based systems must be built from the start with domain and system knowledge explicitly represented, in order to provide satisfactory explanations. The I-SEE approach holds out the prospect of "retro-fitting" existing applications (not necessarily knowledge-based) with explanatory facilities; this approach has great exploitation potential.

**Please contact:**  
**Simon Lambert - RAL**  
**Tel: +44 235 44 5716**  
**e-mail: scl@inf.rl.ac.uk**

## Interaction and Multimedia at INESC

by Nuno Guimaraes

The "Multimedia and Interaction Techniques" group at INESC is responsible for research and development in the Human Computer Interaction and Multimedia areas. The group, born officially at the beginning of 1990, has travelled through areas like User Interface Management Systems, Application Builders, Hypertext and Hypermedia, Multiuser Interfaces, and Computer Supported Cooperative Work (CSCW). These areas have evolved in a context of complementarity with groups in different disciplines, notably distributed systems. In these last one to two years, the evolution of research directions in the HCI area has been driven by a strong awareness of the need for convergence towards promoting fertile application areas.

The keyword for most of the research efforts currently being carried out by the Multimedia and Interaction Techniques group at INESC is Organisational Computing. What does this mean? Broadly speaking, and without attempting to redefine any notion in academic terms, the objectives of the group are to carry out research in tools, systems, and artifacts that contributes to improving the working environments of current organisations, both in terms of their efficacy and quality.

This main drive is reflected in the reasoning framework behind individual research efforts. Significant examples are:

### • Interactive and Intelligent Tools for Description Analysis and Specification

Existing interactive tools for these purposes, such as User Interfaces, lack semantic knowledge about the domain of specification. Rules, constraints, and general knowledge representations have to be plugged to interactive front-ends so that these can be made aware of the domain being described, analyzed or specified. New requirements are defined for these interactive tools, like the evolution of the notion of semantic feedback. An example of application is the intelligent description of organisations in terms of static structure and dynamic behaviour.

### • Group Decision Support Systems

A subset of the CSCW work is related with decision support. Decision and facilitation are issues that have been addressed by social scientists, resulting in the introduction of specific methods and techniques. Once these methods and techniques are applied in a computer supported workplace, new issues like telepresence, coordination, or group feedback become highly relevant.

### • Multimedia and Hypermedia Information Management.

An important effort is being made in the design and construction of tools to take advantage of the new multimedia infrastructures that are becoming available.

The specific interests of the group fall in the areas of mechanisms and techniques for accessing multimedia information (video and audio), digesting (not raw compression) and structuring multimedia information, and integrating loosely coupled hypermedia information bases. Applications of the results are envisaged for providing enhanced support for meetings, presentations, recordings of organisational activities, and so on.

### • Visualisation Techniques for Large Information Spaces

The application of interactive technologies to large organisations requires efficient and flexible mechanisms for browsing and navigation. These mechanisms are based on structured manipulations of graph-like structures, including composition facilities, intelligent (see point 1 above) filtering, and 3D and animation techniques. Generic tools that include these mechanisms require extended flexibility for specifying visualisation and interaction models.

A lot of these efforts are condensed in a project with a wider scope, called Orchestra (Organisational Change, Evolution, Structuring and Awareness). This project aims at developing a flexible platform to satisfy the requirements of current organisations, and includes research and development activities in the areas of distributed systems, information bases, workflow, communications, and social sciences.

**Please contact:**  
**Nuno Manuel Guimaraes -INESC**  
**Tel : +351-1-3100230**  
**E-mail :**  
**nmg@inesc.pt**  
**nmg@research.att.com**

# Natural Cooperation Support - The COMIC Project after the first Milestone

by Wolfgang Prinz

**The consideration of natural circumstances in the design of systems for the support of cooperative work (CSCW systems) constitutes the major focus in the ESPRIT basic research project COMIC. The project, whose acronym stands for "Computer Based Mechanisms of Interaction in Cooperative Work", is currently entering its second phase. COMIC, managed by Tom Rodden from Lancaster University, looks back on a successful year of joint interdisciplinary exchange and development of ideas describing requirements for future systems.**

The project is divided up into 4 work packages. The first one investigates the role of organisational structures and their representation as a factor of cooperation. At GMD we feel that it is essential that the often complex interrelating perceptions and activities which make up cooperation and which are strongly influenced by the given organisational settings are investigated and modelled in order for CSCW applications to succeed. In fact, this is the problem domain of an object oriented organisational information system, developed at the Institute of Applied Information Technology, called TOSCA. This system enables the dynamic modelling of organisational entities ranging from structural objects like departments, projects and groups to atomic objects like documents and the corresponding relations between these entities. This information platform will be used in the project as a testbed for the prototyping of models that have been developed so far.

The second work package tackles the problem from a methodological point of view by investigating these spatial, temporal and social states as "foreign societies", hence applying strategies from traditional ethnography in requirements analysis. This interdisciplinary approach has already been successfully tested by the Lancaster project members in a UK investigation of the cooperative aspects of air traffic control management.

The question of defining a description language for cooperative interaction mechanisms forms the third work package of the COMIC project. Here again, the social sciences input forms the major basis for the results that have been achieved so far. Kjeld Schmidt from Riso National Laboratory puts it this way: "While systems, more often than not, have been used in cooperative work settings and even, as in the case of systems that are part of the organisational infrastructure, have been used by multiple users, the issue of supporting the articulation of cooperative work by means of such systems has not been addressed directly and systematically as an issue in its own right."

The capabilities of different techniques and paradigms in interface design for CSCW applications is the focus of interest in the fourth COMIC work package. Here the issues range from management of attention and communication by means of virtual reality techniques to the provision of information about the cooperative setting by means of special CSCW metaphors such as shared objects or common artefacts.

In all work packages, the problem of providing the users with an implicit awareness about the state of the work and the current activities has been identified as a central common issue. In a natural cooperative situation, each member of a work group experiences directly what happens in their own environment. In a work group where the members interact by means of information systems, the experience of changes needs to be modelled in a similar way. As a first step towards reaching this goal, GMD is developing a CSCW specific event mechanism. The central part of this model consists in the

modelling of events similar to the corresponding notion in natural language. Instead of explicit requests for notification about events, as is usually the case in traditional centrally managed event systems, the presence, i.e. distribution of events, is determined by semantic proximity of the objects in the environment. Examples of proximity in this context are: documents that belong to the same activity, source files that make up a library, forms that belong to the same procedure, paragraphs or graphics that construct a (hyper-) document, or messages that have been exchanged by a computer-supported communication. In this way it is possible to derive a notion of "nearness" in cooperative object spaces, which is a fundamental prerequisite to dynamically model notification services that provide the user with awareness about the state of affairs while at the same time prevent information overloading.

The results that have been achieved so far consist of a detailed examination of requirements from technical and social science standpoints together with strategies to solve these problems. Besides the CSCW event model, a language for describing mechanisms of interaction and a spatial model for managing communication in virtual spaces as well as a CSCW specific object model have been proposed. In the next phases of the project, some demonstrators of these concepts will be implemented on top of existing design platforms. These systems include the distributed multi-user virtual reality platform DIVE, that has been developed by SICS, and the object oriented organisational information base TOSCA from GMD. Large scale distributed CSCW systems evaluation will be performed by joining the European ATM pilot project.

**Please contact:**  
**Wolfgang Prinz - GMD**  
**Tel: +49 2241 14 2730**  
**E-mail: wolfgang.prinz@gmd.de**



# User Adaptive Communication Methods

by Annika Waern

**The UACM group at SICS focuses on the development of adaptive interface systems. Adaptive interfaces are such that they adapt to the task to be performed as well as to the user who is performing it. They are particularly interesting for complex applications where it is difficult for the user to understand how to handle the program.**

The implementation of adaptive interfaces requires both good development methods that focus on the user requirements, as well as advanced techniques and algorithms that achieve the necessary adaptiveness. The UACM group at SICS is unique in adopting an approach that combines empirical methods for design and evaluation with the development of advanced algorithms and techniques for implementing system adaptiveness. The group's work is inherently cross-disciplinary in nature, and concerns aspects of computer science, system science, linguistics and cognition psychology. Group members have backgrounds in all these fields.

UACM has chosen to study these research topics in the first place in the context of intelligent help. This is one of the most important as well as promising applications for adaptive interfaces. Due to the intense research activity in high-speed communication and distributed computation at SICS, the study of Computer Supported Cooperative Work (CSCW) applications will become increasingly central to the group's work.

The group has been involved recently in several international cooperations, most notably the Prometheus initiative (Pro-Art) and the KADS-II ESPRIT project. The Pro-Art project concerned methods and techniques for route-guidance communication, based on knowledge about human description and understanding of route information. The KADS-II project

aimed at developing a comprehensive, model-based methodology for KBS development, Common-KADS. UACM developed the modelling framework for agent and communication modelling. The main uses of these models are to describe users and user-system communication, and their construction methods have been defined such that they integrate human factor engineering methods into the Common-KADS methodology.

The group's main current undertaking is an all-Swedish project in collaboration with Ellemtel Utvecklings AB called "Plan- and User- Sensitive Help, PUSH". The goal of this project is to combine enhancements of present techniques for adaptive help with empirical studies evaluating the technical solutions developed so far. The project is conducted in a consortium with Ellemtel Utvecklings AB, Ericson Telecom AB, Stockholm University/KTH and Linköping University. In the CSCW area, the group is currently involved in a project which focus on adaptive filters for mail and news messages, and is carried out in cooperation with DSV, Stockholm University, and other university partners. Lesser efforts in the CSCW area focus on the development of human factors analysis methods for groupware.

**Please contact:**  
Annika Waern - SICS  
Tel: +46 8 752 1500  
E-mail: annika@sics.se

## Intuitive 3D Interaction

by Vasco Branco

**We describe IDeS, an interactive, intuitive and flexible system for 3D modeling now under development at the INESC Computer Graphics & CAD Group in Porto.**

Research at INESC in the area of Intuitive 3D Interaction is motivated by the fact that the creation of a 3D shape using CAD tools, namely solid model-

ers, is difficult and time-consuming. One of the main problems is that these systems are separate from the conceptual stages of design, perhaps the most important in any product development cycle.

Our goal is to find solutions that can help modify this situation and permit designers to use CAD systems as powerful tools for creative work. We have thus defined a strategy aimed at the development of new interactive techniques for 3D modeling starting from hand drawing. We are now finishing a first prototype of a system called IDeS (Intuitive Design System) that tries to combine simplicity and intuition while drawing with useful features of solid modelers, for example, boolean operators (union, difference, intersection). IDeS works within conventional workstation environments (i. e. with 2D interactive devices).

Visual perception cue theory has been of great help in identifying the kind of information IDeS must offer to the user at each stage, so that he can "feel his way" within a 3D workspace. This is very important when the user wants to draw on the surface of a model or modify the position and orientation of models inside a 3D scene. Perspective, shading and shadows, texture, motion and reference frames are the cues (known as pictorial cues) that we have used in our experiments.

IDeS has the basic functionalities of a solid modeler. The main difference is that the system works on the basis of data captured from users' drawing actions in only one perspective/axonometric view.

In general, users can work with IDeS as if they were drawing with a pencil. People usually look at a perspective/axonometric drawing and "see" a 3D shape. IDeS tries to behave in the same way, i.e. the user draws in 2D and the system reconstructs a 3D model. This is the most natural way to provide 3D model input in a CAD system. But the user can also invoke typical 3D construction commands, such as solid primitives, extrusion, revolution, etc. In this case, the user's drawing actions will be interpreted by the system according to the se-

mantics of the command, as soon as sufficient information has been drawn. For example, for an extrusion, the user only needs to draw (2D) a polygon and a line; the system will do the rest. If a 2D drawing is directly made over a 3D model's surface, it can be used to create a new feature in the model (perhaps to open a hole), since it is combined with the appropriate boolean operator. After a drawing has been finished the user must tell the system if it is to be interpreted as a 3D view of an object or not.

In IDeS, we are also developing an interactive method to convert from free-hand drawings to more rigorous drawings/models. The user informs the system what he/she has drawn. For example, a circumference drawn freehand can be converted to a circle or to a sphere by invoking the appropriate command in "explain" mode.

The system can thus be used in a extremely natural way. Most of the time, the user's drawing is very intuitive. There is no need to give particular help to non specialists, except for those who have very little idea of how to draw at all.

We have used the IDeS prototype to test our ideas for sketching 3D models on the basis of hand drawing actions. The system has been experimented by architects and designers; their reactions have been very positive and stimulating. We are now turning our attention to 3D input devices and Virtual Reality, because we think that they can provide an adequate environment for conceptual design, and in particular for tasks such as "virtual clay modeling".

**Please contact:**  
**Vasco Branco - INESC**  
**E-mail: vab@basinger.inescn.pt**

## The IntFilter Project

by Jussi Karlgren

**The IntFilter project investigates the functionality of filtering tools: software which assists users to structure and control an information flow by providing help over the entire spectrum from decision support to autonomous decision making. The aim is to give the recipient more control: to redress the imbalance between sender and recipient inherent in group communication systems.**

### • Group Communication Systems

Group communication systems such as electronic mail and computer mediated conferencing systems are spreading rapidly as they are being adopted by corporations and government agencies. They are seen as effective means for fast coordination, dissemination and retrieval of information. However, although such systems have specific advantages, their increased usage has also evidenced some unforeseen problems. An obvious one is that of information overload.

The information overload stems from the fundamentally different relationship between the costs of the sender of information and those of the recipient in comparison with other media. Electronic group communication systems shift virtually all power and initiative from the recipient to the sender. Once the sender has created the information, the cost (in both money and effort) of sending it to many rather than to few recipients is very low. If this information is sent to people who have not requested it, or have no need for it, they are the ones who have to bear the costs of disposing of it.

### • Filtering criteria

The aim of the IntFilter project is to build "intelligent" filters that will work with multiple knowledge sources. For this purpose, we conducted a pilot study of experienced Usenet News users to deter-

mine what criteria users use today, and would wish to use in the future.

### • Message categorization

Messages can be categorized by several criteria. Typically, texts are categorized for probable content by keyword occurrence. Messages can also be processed for tentative identification of genre. The information used for filtering is simple textual data: word occurrence in text or header fields, average word length, average sentence length, part-of-speech information, and other easily obtainable data, as well as data typical of newsgroup messages rather than texts in general: dialog or comment structure, length of message, proportion of quoted material, length of signature field.

Evaluation of these criteria is based partly on statistical data as well on the results of the study of experienced users mentioned above. The identification of text genres in the USENET News conference is now being studied. We also intend to experiment on data extracted from other users' profiles.

### • Newsgroup categorization

Newsgroups can also be partitioned nicely into categories following several criteria: name, number and activity of participants, internal dialogue structure, the charter and distribution of the newsgroup, the nature of the newsgroup hierarchy, and the characteristics of the messages.

### • GHOSTS - a functioning prototype

A basic prototype filter for Usenet News messages, GHOSTS, has been built as a framework for further extensions in the project. It incorporates a simple filtering engine and a graphic newsgroup browser, and has been built with maximum modularity, reusability, portability, and extendability in mind. At the moment, only simple word occurrences in the header fields and the body of the text are examined, but we will extend the functionality. We are evaluating the GHOSTS system with experienced Usenet News users.

## • Intelligence

The project will be extended to investigate the utility of learning mechanisms that observe user behaviour and suggest new rules, and also to learn to weigh the multiple knowledge sources available automatically. However, the primary objective is simply to build a tool that will give users more and better information for their decision making, rather than build a system capable of making autonomous decisions.

### Please contact:

**Jussi Karlgren - SICS**  
 Tel: +46 8 752 1500  
 or: **Jacob Palme - Stockholm University**  
 Tel: +46 8 16 20 00  
 E-mail: [intfilter@sics.se](mailto:intfilter@sics.se)

# Consistently Presenting Multimedia Information from Heterogeneous Data Sources

by Mike Wilson

**The MIPS project (Multimedia Information Presentation System) is about locating, accessing, retrieving and presenting multimedia based information which can be stored in remote databases.**

It is currently possible with commercial PC products to retrieve information from databases and documents across networks as text, relational tables, images, sound or video. These can be presented through tools in commercial windowing systems for users to read, or cut-and-paste into multimedia documents.

Unfortunately, only a few different data sources can be used; individual queries

must be specified for each data source rather than a single query to retrieve information from them all, while the presentation tools each occupy a different screen window using proprietary presentation styles dependent on the source format of the information.

The second currently available form of presenting multimedia information is by authoring it in a proprietary tool into discrete documents or hypermedia networks which users can browse. However, users have no access to documents outside the hypermedia network and are tied to proprietary representation formats.

The MIPS project seeks to combine the best of these two approaches and thereby overcome the problems of each. MIPS is a presentation tool incorporating an access mechanism to distributed heterogeneous data sources. Therefore, it provides access to databases and document stores. It includes a conceptual model of the domain covered by the data sources encoded in a Knowledge Based System which supports access to multiple data sources from a single user query. The data that is returned from the different data sources will not be presented in different windows for each source, but will be combined together into a single hypermedia document for presentation. The information will not have to be presented in the storage format since it will be handled by a Knowledge Based information design system which will tailor it to the needs of individual tasks and users.

When the information is retrieved it can be included in an existing hypermedia web that will grow with the addition of new information. The web expansion requires a clear description of the semantics of the information that is provided by the conceptual model of the query in the domain. It also requires expertise in designing the web additions that are created by the information design system using the conceptual model of the query.

The hypermedia web is not tied to individual producers' proprietary representations since the data and the structure of the web are separated. The data is stored in any format that can be presented. This

freed it from format constraints, and allows it to be used in many hypermedia documents, or even by completely different applications. The format used to store the web structure, avoiding proprietary representations, is the ISO HyTime standard based on SGML.

The MIPS system is being developed within an Esprit III project (p6542) in which the Rutherford Appleton Laboratory are developing the heterogeneous database access mechanism and the KBS conceptual domain model and information design system. An initial demonstrator of the overall system is being developed to promote the Greek islands for tourism.

### Please contact:

**Michael Wilson - RAL**  
 Tel: +44 235 44 66 19  
 E-mail: [mdw@inf.rl.ac.uk](mailto:mdw@inf.rl.ac.uk)

## KL-Magma 2: A Knowledge Representation System

by Amedeo Cappelli

A knowledge representation system prototype, **KL-Magma 2**, has been implemented at the Institute for Computational Linguistics, Pisa. The system is composed of a series of integrated modules designed to facilitate the construction and use of knowledge bases. It provides the user with representational tools to structure the knowledge of any domain. A module containing an ontological reference scheme describes a network of relationships between concepts. Starting from any node in the network, the user can also access a lexical archive that contains all terms, with their relative definitions, describing a specific conceptual field.

The knowledge representation language used in **KL-Magma 2** is a member of the family of hybrid systems and consists of a terminological and an assertional component. The terminological part is used to define generic concepts, representing classes of objects, while the assertional part defines individual concepts, representing single objects. The structures of the terminological part serve to specify the properties of the generic concept being defined. An inheritance mechanism is implemented. The subconcept inherits the properties of a superconcept, even if these are not expressly declared. Relationships existing between the properties of the generic concept can also be indicated and are known as structural descriptions. The structures of the assertional part serve to define individual concepts by specifying the values assumed by the properties of the corresponding generic concept.

The language is based on an intentional semantics and its functions are interpreted on a universe of structured objects. In other words, a generic concept is de-

noted by its properties. This differs from the extensional approach where a generic concept is denoted by the set of its instances.

The expressive power of the language has been further increased in order to account for other conceptual facts, such as recursive definitions or definitions expressed by procedures, as shown in the following two examples.

Let us imagine that we define the concept rational-being having just one first-name, one surname, and one birthdate. We can then define a clause which, given a rational-being and today's date, calculates the age by using the terminology data and the pre-defined predicate subtraction; obviously this clause may also be applied to subconcepts of rational-being, thus realizing the inheritance of the clause among the concepts of the terminology.

In the case of recursive definitions, let us imagine a generic concept binary-tree in which the nodes contain a whole number as information and the branches are, in turn, binary-trees. We can thus define a clause which, given a whole number and a binary-tree, constructs a tree which has at its root that number, and as subtree, both on the right and the left, the previous tree as its argument. A semantics for recursive definitions has been formally specified.

The ontological module guides the user in knowledge acquisition and structuring by suggesting hypotheses on the description of concepts and their possible relationships. At present, it contains a collection of concepts, organized in a semantic network which classifies a vast portion of reality. This leads to a taxonomy which maps possible relationships between concepts and the most plausible elements of their structure. The ontological module can be directly queried using the knowledge representation language.

The lexical archives are based on Hypertext technology. There are various search modes. Queries can be made to obtain the definition of a word, its immediate superordinates, or the entire re-

lated conceptual hierarchy expressed within the whole archive. All lexical items directly linked with a concept expressed in the ontology can be searched.

Please contact:  
Amedeo Cappelli - ILC-CNR  
Tel: +39 50 560481  
E-mail: sistemi@vm.cnuce.cnr.it

## NeuroCOLT - Working Group on Neural and Computational Learning

by Henk Nieland

**NeuroCOLT is a European Working Group established for three years (1994-1996) in the framework of the ESPRIT BRA programme. Its activities cover three areas: (1) the foundations of learning, (2) the algorithmics of learning, and (3) neural networks and continuous complexity theory.**

The aim of the NeuroCOLT Working Group is to develop a fundamental understanding of learning and of when and how it can be implemented algorithmically. Particular classes of adaptive systems studied include neural networks with discrete and continuous activations, genetic algorithms and other paradigms.

In the field of the foundations of learning, particular attention will be given to:

- representational issues
- non-binary valued learning
- the influence of different probability distributions governing data occurrence
- learning via queries
- relations between different frameworks.

Furthermore, in view of the crucial role of a compact data description, the Minimum Description Length (MDL) prin-

ciple will be studied in connection with genetic programming, as well as Bayesian and stochastic methods for structural induction.

Studies in the algorithmics of learning include:

- neural learning for continuous and other networks, also within the framework of agnostic on-line learning
- algorithmic implications of the MDL approach and of genetic programming
- a principled analysis of Bayesian and Constraint Networks, in connection with allowing the model structure to respond to the data.

Many of the neural networks used in practice have weights and inputs that are allowed to vary in the set of real numbers. The computational power of these networks cannot be studied with classical complexity theory, which does not consider sets of real numbers. Recently, a new theory of computability and complexity over real numbers has begun to be developed. In this area the Working Group has two objectives:

- to further develop a Continuous Complexity Theory over the reals
- to characterize the computational power of models derived from continuous and other networks.

The following sites are participating in NeuroCOLT: RWTH Aachen, CWI, Univ. Pompeu Fabra Barcelona, Tech.Univ. Graz, Univ. Helsinki, Univ. London (School of Economics and Royal Holloway), ENS de Lyon, Univ. Milan, and Univ. Mons. Coordinator of the NeuroCOLT Working Group is John Shawe-Taylor (Royal Holloway). Each of the three work areas has a separate manager:

- Foundations of Learning: Paul Vitányi (CWI/University of Amsterdam)
- Algorithmics of Learning: Michel Cosnard (Ecole Normale Supérieure de Lyon)
- Neural Networks and Continuous Complexity Theory: Felipe Cucker (Universitat Pompeu Fabra, Barcelona).

NeuroCOLT's organisational activities include:

- group research visits to collaborating sites focussing on a particular topic
- an annual week-long meeting (London in December 1994, Barcelona probably in late 1995, and possibly Helsinki in late 1996)
- organisation of an international conference EuroCOLT II in 1995 on these topics.

Moreover, a Working Group Technical Report Series will be established, administered from the coordinating site at Royal Holloway, University of London, and - after approval - made publicly available on a remote ftp anonymous access site. Intended publication topics include:

- New equivalences in PAC-Learning and predictability
- Complexity issues in discrete Hopfield networks
- Neural networks and complexity theory - a survey
- Mapping Bayesian networks to Boltzmann machines
- A string learning algorithm based on the MDL principle
- Learning decision trees using geometric concepts
- Model selection and neural networks
- On the relations between discrete and continuous complexity theory
- Automatic grammar induction using MDL
- FALS: Finite Automaton Learning System
- Learnability of graph concepts
- Combinatorial hypercube problems relevant to learning.

**Please contact:**

**John Shawe-Taylor - Royal Holloway, Univ. London**

**Tel: +44 784 443 430**

**E-mail: john@dcs.rhbnc.ac.uk**

**or: Paul Vitányi - CWI and Univ. Amsterdam**

**Tel: +31 20 592 4124**

**E-mail: paulv@cwi.nl**

**or: Michel Cosnard - Ecole Normale Supérieure de Lyon**

**Tel: +33 72 728 037**

**E-mail: Cosnard@lip.ens-lyon.fr**

**or: Felipe Cucker - Univ. Pompeu Fabra, Barcelona**

**Tel: +34 3 484 9664**

**E-mail: cucker@upf.es**

## Proper pronunciation of names ensured by ONOMASTICA

by Georg Ottesen

**It is often difficult to find the proper way of pronouncing names of people or places. If this is sometimes a problem within in a single country, the task becomes quickly irresolvable when working across country and language boundaries.**

ONOMASTICA is a research project launched by CEC. The aim is to establish a multi-language pronunciation rules and a pronunciation dictionary of proper names and place names. This dictionary, accessible in a data network, will provide automatic conversion from text to speech to give the right pronunciation of names and places in a number of European languages. The project actually includes 11 languages, and several hundred thousand names from each language will be entered into the database.

The results from this project will yield better quality for speech recognition systems, and systems using synthetic speech, when names of people and places are a major part of the information.

Telephone companies will be a main customer for this new service. Automatic systems for telephone number information can be established. Inverse number information (which subscriber has telephone number xxxx ?) can also be made easily accessible. Telephone companies in the different partner countries are therefore involved in the project, providing lists of names and statistics of the frequency of occurrence of different names.

SINTEF DELAB is in charge of the Norwegian part of this project, and senior scientists and students from the Lin-

guistics Department of the University of Trondheim have been hired to work with the transcription of names provided by Norwegian Telecom.

**Please contact:**  
**George Ottesen - SINTEF DELAB**  
**Tel: + 47 73 59 26 48**  
**E-mail: georg.ottesen@delab.sintef.no**

# Automatic Partitioning of Data Parallel Programs for Distributed Memory Multiprocessors

by Thomas Brandes

MIMD architectures with distributed memory are the kind of parallel machines that are scalable and can be used for a wide range of scientific applications. Normally these architectures are programmed with explicit message passing between the processes. As the message passing programming model is very error prone and difficult to use, many efforts have been made to offer other programming models that are easier to use.

The High Performance Fortran Forum has defined language extensions and modifications for Fortran to overcome these difficulties by supporting data parallel programming. This kind of programming can be defined as single threaded, global name space, and loosely synchronous parallel computation. The new language allows code tuning for various architectures and should guarantee top performance on MIMD and SIMD computers with non-uniform memory access costs.

The High Performance Fortran Forum has also a European counterpart organized by Clemens-August Thole, GMD.

The parallelization tool Adaptor (Automatic Data Parallelism Translator) makes it possible to translate data parallel programs to message passing programs already now. It transforms data parallel programs written in Fortran 77 with array extensions, parallel loops, and layout directives to parallel programs with explicit message passing. Adaptor is a big package that consists of:

- interactive source to source transformation tool XAdaptor
- distributed array library (DALIB)
- documentation files in Postscript format,
- example programs

The source language of ADAPTOR can be defined shortly in the following way:

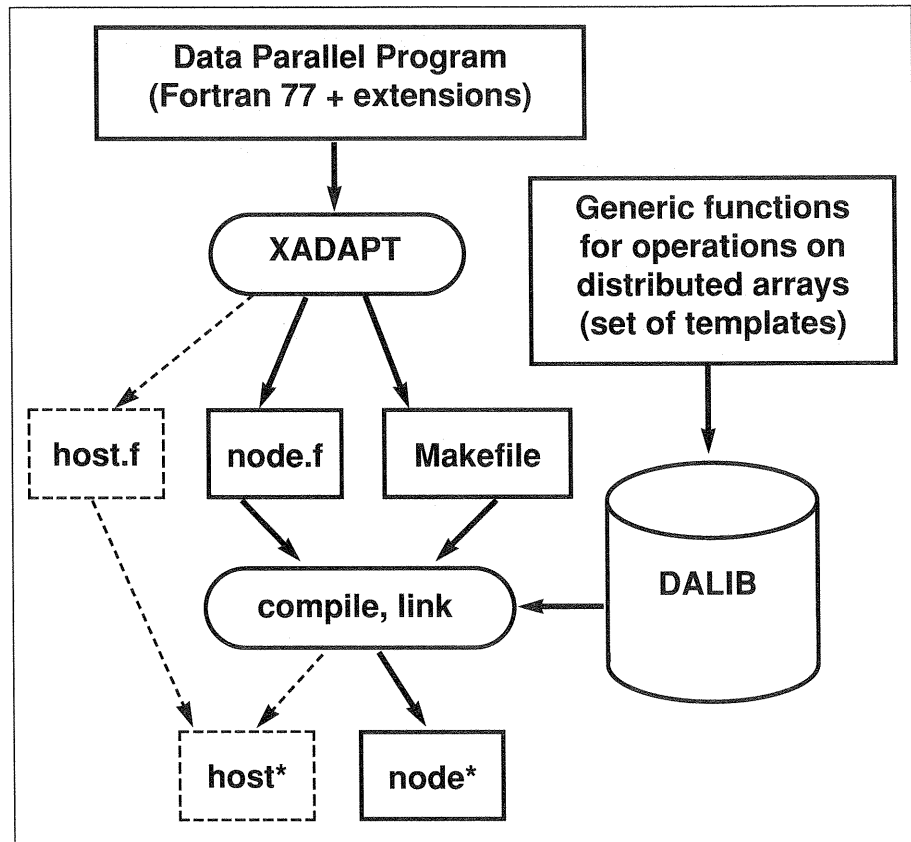
- Fortran 77 with some restrictions,
- with many array extensions of Fortran 90 (inclusive dynamic arrays and intrinsic functions for arrays),

- with some features of Connection Machine Fortran (timing, random numbers),
- with layout directives to specify the data distribution.

ADAPTOR is not a compiler but a source to source transformation that generates Fortran 77 host and node programs with message passing. The new generated source codes have to be compiled by the compiler of the parallel machine. The following parallel machines are supported:

- Alliant FX/2800
- iPSC/860
- Net of Sun 4 Workstations (based on PVM)
- Net of IBM Risc Workstations (based on PVM)
- Parsytec GCel Meiko Concerto

The software packages, documentation files in PostScript, and a number of example programs are available via "anonymous ftp" from: ftp.gmd.de (129.26.8.90) in subdirectory gmd/adaptor



ADAPTOR: System Overview

In the GMD, the tool will be used to develop optimization strategies for High Performance Fortran mappers in cooperation with NA Software, Liverpool, and to develop and test MIMD extensions that could be part of the next version of High Performance Fortran.

Please contact: **Thomas Brandes - GMD**  
Tel: +49 2241 14 2492  
E-mail: brandes@gmdzi.gmd.de

## Hellenic ESPRIT Special Actions

by **Yannis Vassiliou, George Kakouros, Pandelis Papadopoulos, Eleni Petra and Spyros Sarantopoulos**

**The Hellenic Esprit Special Actions were issued under the specific research and technological development programme in the field of information technologies, ESPRIT.**

FORTH is the organization managing the Special Actions in Greece as the prime contractor in all projects. The launching of the Special Action projects is followed by an open call for proposals and an evaluation of the submitted proposals by international experts. The projects started in July 1993 and are expected to end in December 1995.

Following are the common objectives of the two Hellenic Special Actions:

- integrate existing technologies and available results from ESPRIT and other R&D programmes.
- intensify the cooperation between universities, research organisations and the local industry
- stimulate the users' involvement in the development and the testing of technology.

The two areas in which the programme is carried out are:

- Multimedia systems and
- Computer Integrated Manufacturing and Engineering (CIME).

With the view to enlarge the potential participation of organisations in European R&D in the Multimedia field and to increase their ability to make more effective use of the results, the Hellenic Multimedia Action focuses on integrating existing technologies and available results from ESPRIT and other programmes of the European Commission, and thus, to demonstrate the power of Multimedia systems through pilot applications in Advanced Vocational Training, Tourist Information Systems and the presentation of Cultural Heritage.

Additionally, the ESPRIT Special Action in the area of CIME aims to support and promote the introduction and use of CIME technologies and methods in the Greek industry, by providing the means of diffusion of CIME technology in the Greek industrial environment, developing production and quality control systems, both for the Greek industry and large Greek manufacturing organisations.

## The ESPRIT Special Action for Greece in the Multimedia field

by **Yannis Vassiliou**

**The ESPRIT Special Action for Greece in the Multimedia field is a concerted initiative of the European Commission in cooperation with FORTH to support and promote the introduction and use of Multimedia technologies and methods in the Greek industry**

Four of the main fields of applications are:

- Advanced Vocational Training.
- Tourist Information Systems
- Preservation of Cultural Heritage
- Computer Integrated Manufacturing and Engineering

### Advanced Vocational Training

The objectives of the Hel-MME Training Action are to demonstrate the power of Multimedia systems in professional training and to contribute to improvements in the training of personnel in order to support the acceleration of the country's economy. Two projects were selected and are briefly presented:

#### 1. Multimedia training in banking

The aim of the project is to develop three training courses in Multimedia using DVI technology. Specifically the three titles to be produced on CD-ROM are :

- Customer-Oriented System
- Accounting and Financial Principles
- Financial Management

The Multimedia course material will be employed in the training of about ten thousand bank employees. DVI technology is selected as a set of video processors and software that give interactive Multimedia developers the ability to create a digital Multimedia platform. The dissemination activities scheduled by the Hellenic Bank's Association will develop the desired seeding effect.

The participants in the project are: National Bank of Greece, Siemens-Nixdorf, Ethnodata, TDES, ATC, Eurotech Consultants, and the Hellenic Banks' Association.

Contact point:

National Bank of Greece  
Mr. Yannis Zafiroopoulos  
Tel. + 30. 1. 3211970,  
Fax. + 30. 1. 3211479

#### 2. A Hypermedia courseware development tool for the financial sector

Computer Based Training (CBT) based on the most recent technological breakthroughs, offers a high-impact, efficient,

versatile and reusable method for continuous education. This project will capitalise on the new, exciting capabilities offered by the Multimedia/Hypermedia technology. The project aims at CBT for financial institutions and is divided in two parts:

The first part is concerned with the design and development of a software tool that will enable the creation and maintenance of Multimedia training courseware by integrating existing technologies and R&D results from other related research projects.

The second part of the project is concerned with the development of courseware for the banking sector by employing the software tools developed in the first part. The course will provide a step-by-step method whereby employees in the banking sector will be presented with the latest techniques and methods in the corresponding subjects. A trainer will interact with the courseware in a user-friendly manner and be presented with concepts, models of operation, and advice on how to act, while also be prompted for answers in the test cases.

The project participants are: Epsilon Software, Centre for Financial Studies, Egnatia, Bank, Macedonia Thrace Bank, and Piraeus Bank.

Contact point:  
Epsilon Software  
Mr. Dimitris Gritsis  
Tel. +30.1.9421707,  
Fax. +30.1.9427719

### **Tourist Information Systems**

The objectives of the Hel-MME Tourist Action are the enhancement of the quality of the services provided by the tourist industry and to increase its productivity by reducing the information retrieval cycle, as well as the generation of new business opportunities within Greece and abroad, on the basis of the existing tradition in tourist activities involving important human capital.

Two projects are under Hel-MME Tourism:

#### **1. A Multimedia tourist information on line system**

The project constitutes a co-ordinated effort by which travel agencies from all over the world can effectively present travel packages to potential visitors. Its prime objective is to facilitate the sale abroad of tourist packages centred around holidays in Greece and through its rich and friendly interface, attract potential customers from the higher income brackets. Multimedia presentations will be used, combining data in various forms, to deliver a wealth of information in an attractive and effective way.

The system will consist of a number of interlinked modules, namely a Multimedia database on CD-ROM with a hypertext interface, a holiday planner, based on updatable databases and a human interface. The completed system will have multilingual capability, giving the user the option to select the language of the presentation, and will be initially implemented in two languages. It will be installed in offices world-wide.

The participants in the project are: Knowledge, S.A., Databank S.A., Epsilon Software S.A., MUSIC - Technical University of Crete, Hotelair, National Technical University of Athens, Travelplan S.A., and Multimedia Systems Center.

Contact point:  
KNOWLEDGE S.A  
Mr. Minas Karatzoglou  
Tel. +30. 61-223644,  
Fax. +30.61-277008

#### **2. Integrated Multimedia tourist information system**

This project proposes the application of Multimedia technology to tourist information and takes advantage of a successfully completed project application partly financed by the "STAR" programme of the Commission, by the name "AEGEAN SYSTEM".

The project "IMTIS - AEGEAN II" will concentrate only on "Multimedia" tourist information and marketing, building up on the experience gained by the pilot application of the "AEGEAN SYSTEM".

More specifically the project proposes a network of multimedia units located on three islands (Chios, Samos, Lesvos) and a database server located in the University of the Aegean at the Department of Business Administration at Chios island interconnected through an X.25 network (for the purposes of the project, three Multimedia units will be developed).

The system will present multilingual information about the selected islands in a very simple, user friendly Multimedia environment. (Greek and English will be employed)

At the same time the unit will allow for reservations in associated hotels by any user (information for over 25 hotels in the pilot phase will be included).

The project participants are: University of Aegean, Enalme S.A., Byte S.A., NTO of Northern Aegean, Tourist Information Bureau, Union of Hotels of Chios, Aspacia Hotel, Miniotis Tours, Ionia Touristiki, Chandris Hotels, Erytha Hotel, Delfinia Hotel, and Diana Hotel.

Contact point:  
UNIV. OF AEGEAN  
Prof. Nikolaos Litinas,  
Tel. +30.1 6424402,  
Fax. +30.1. 6436456

This is the first of two articles. The second is on "Preservation of Cultural Heritage" and "Computer Integrated Manufacturing and Engineering" in the next issue.

**Please contact:**  
**Yannis Vassiliou - FORTH-ICS**  
**Tel: +30 1 7245324**  
**E-mail: yannis@ics.forth.gr**



# DILEMMA - a Tool for Rapid Manual Translation

by Jussi Karlgren

**There have been a number of attempts towards developing a fully automatic text translation system in order to replace the human translator. By contrast, little work has been put into building tools to aid the human translation process.**

SICS, the Swedish Institute for Computer Science, and Scandface, a language technology and translation company have cooperated to build Dilemma, a computational tool studied to assist the human translation process. The tool is intended to help translators achieve both higher productivity and better quality in their work by presenting them with terminological information extracted from previous translations. The Dilemma system has been demonstrated to and used by professional translators with promising results.

The production of actual text is a smaller proportion of the translation process than may be realized at first. About the same amount of work needs to be put into each of the following stages:

- preparation
- text production
- proofreading

Each stage has its own specific problems, but some of the tasks are similar throughout the entire process. In the Dilemma project, we have focused on building a tool that will assist the translation process throughout all three stages.

The data Dilemma uses - as do human translators - are "bitexts", i.e. previously translated pairs of source and target texts in the same domain as the text to be processed. The general idea is to extract terminological information from bitexts in order to ensure term consistency and accuracy in the translation which is often, e.g. in technical and legal text, a quality criterion, and also to reduce the decision load of the translator, which is always a productivity criterion.

## Bilingual Context Display

A typical question for a translator to ask in the most noticeable phase of the trans-

lation process, i.e. when producing actual text, is how a word or phrase has been used or translated in previously processed texts. Dilemma displays the given word or phrase in its contexts, both original and translation. The translator can use the tool to check for usage conventions that are unfamiliar, unexpected, infrequent, or very recent.

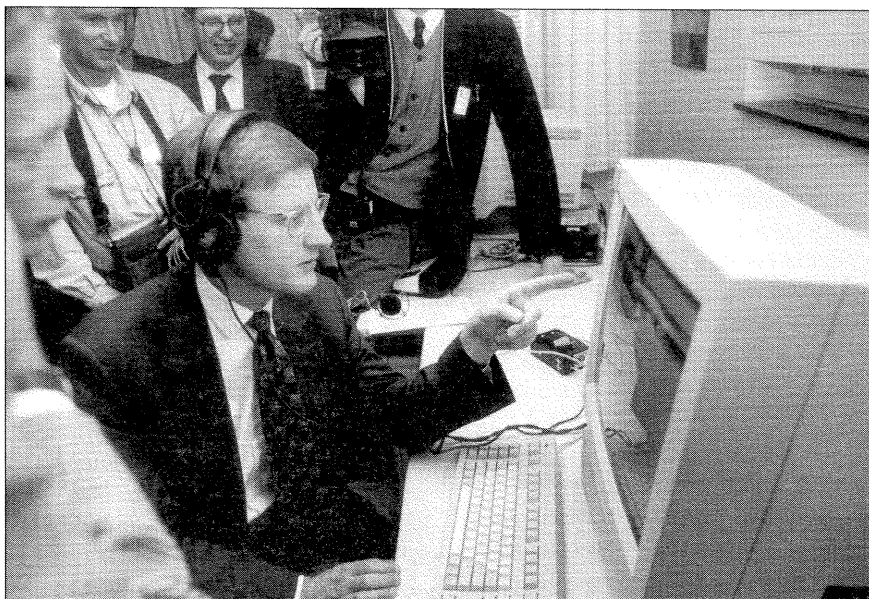
## Interactive Translation - N-Best Word Translation

By analysing the text elements, Dilemma can attempt the translation of a given word. In interactive mode, the translator is currently given a list of candidate translations from which to make his choice.

If used as a tool by translators, text editors, or terminologists when preparing a text for translation, Dilemma produces a list of tentative translations for every word in the source text. Further manual processing will produce a text- and domain-specific word and phrase list, and eventually, with the aid of further tools now under development, translation drafts or raw translations.

Dilemma has been implemented in C++ and runs under Microsoft Windows on a personal computer. The system is currently being evaluated and tested by translators working on the translation of large amounts of legal documents concerning the impending referendum on the entry of Sweden into the European Community.

**Please contact:**  
**Jussi Karlgren - SICS**  
**Tel: +46 8 752 1500**  
**E-mail: dilemma@sics.se**  
**or Bengt Wahrolin - Scandface**  
**Tel: +46 8 654 49 40**



**Swedish Prime Minister Carl Bildt tests automatic translation during his visit to SICS in February. The Prime Minister's visit also included SISU and RIT right after he announced a forthcoming one billion SEK investment in electronic highways. (Photo: Lars Rosengren, Reportagebild)**

# German Government to Use GMD Planning Model

by Hermann Quinke

**Tax and transfer laws have reached such a high degree of complexity that it is impossible to evaluate proposed or enacted amendments without appropriate simulation models. GMD's Institute for Applied Information Technology now has a number of micro-simulation models ready that, due to their excellent predictive quality, are increasingly being used by German ministries when preparing new laws.**

In the GMD project "Mikro Simulation Models for Legislative Planning", efforts are concentrated on micro-models for the analysis of tax and transfer laws. These models operate on the basis of a random sample of taxpayers and transfer recipients. They allow detailed investigations of the effects of alterations to the law, with an analysis of winners and losers. The aim is to further increase the reliability of estimates when laws are changed, and improve the conditions for rational discussion of alternatives.

For example, for years, quantitative planning (budget, draft, alternative calculations) in the Federal Ministry of Education and Science in the western German states has been based on the BAFPLAN-System for the analysis of the federal training assistance act, developed and still regularly serviced by GMD's Institute for Applied Information Technology. The model has been constantly updated in recent years and the forecasting errors have thus been kept within reasonable bounds. The model did capture the financial effects of a major reform, which came into force at the end of 1990.

The database of the simulation model for personal income tax used in the Ministry of Finance is also based on GMD research work. This model is one of the

most intensively used quantitative analysis instruments of the German government. Very recently, it has been used for estimates and distribution analyses in connection with a one-off tax surcharge levied to assist the eastern German states.

GMD has developed a typical case model (ASA) for the analysis of the various pension schemes in Germany for the Ministry responsible for social security. The major conceptual modelling problem is that the level of pensions depends on the working life of the pensioner and not just on the situation in a given year as is the case with taxes and transfers. This makes the problem of designing an appropriate parameterization of work histories and pension regulations and the development of user interfaces inherently more difficult.

One general problem when constructing micro-simulation models is the access to confidential data. Due to the strict data protection regulations in Germany, it is impossible to obtain the necessary data base, i.e. a sample of tax returns. What is available instead is a large amount of aggregate data from the income tax statistics. The problem was solved by deriving a synthetic (artificial) sample from the aggregate data. Using simulated annealing techniques it was possible to construct a database of synthetic tax returns that is consistent with a large amount of aggregate tables. It was proved that, roughly speaking, this technique did not cause any artificial correlations in the sample that were not already contained in the aggregate data. These synthetic microdata now form the basis of the microsimulation model used in the Federal Ministry of Finance. Important cost estimates of tax changes depend on it, e.g. the cost estimates of the recent changes in the German tax schedule.

The two most important tasks for the project are to improve the use of micro-simulation models in the future. Firstly, for casual users in the public administration, the user interface and the presentation of results has to be made more intuitive by utilizing the potentials of GUI and multimedia. Secondly, because major partners in the German Ministries will move to the new capital Berlin, the application of

modern CSCW techniques will be necessary in order to guarantee close cooperation between model developers and model users. ■

**Please contact:**  
Hermann Quinke - GMD  
Tel: +49 2241 14 2727  
E-mail: hermann.quinke@gmd.de

## V2 - The VML-based Video Server

by Thomas Rakow

**The V2-Server manages video clips for applications like multimedia retrieval systems and hypermedia authoring systems. The server is a simple demonstrator of the object-oriented database management systems (DBMS) VODAK developed at GMD-Institute for Integrated Publication and Information Systems (IPSI). An advantage of the server is that it is using an object-oriented and distributed DBMS for program development in the case of heterogeneous and distributed storage mediums which are typical for multimedia systems.**

In 1990, V2-Server was the first multimedia application of IPSI's experiment is-News (Individualized Science News). This first version was developed as an application program on top of a relational DBMS. The laser disk player was controlled by a separate control program and remote access was implemented by using the distributed window environment. The current version allows to access video-clips by simply sending methods to a selected video clip in one program.

The VODAK database schema defines common structure and behaviour for video application classes and their instances in VODAK's own programming language VML. Every video clip references a playing device which implements VML operations to select, display and control a video clip. These operations

call external functions to control a laser video disk by using a workstation's serial interface. The playing device and the user may reside on different nodes (workstation/server approach).

In the future, methods will be developed to support "copy and paste" of multimedia objects, including digital video clips, support synchronization, and integrate VML transaction management which is especially designed for object-oriented and distributed DBMS's.

Due to the write once - read many (WORM) property of the laser disc, the current implementation supports only retrieval of videos but no update. Therefore, transaction management is not included. Additionally, indexing is not implemented yet

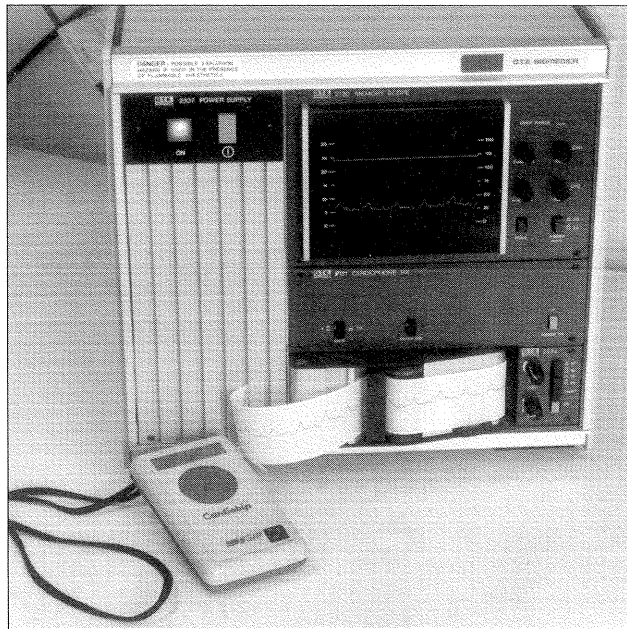
**Please contact:**  
**Thomas C Rakow**  
**GMD**  
**Tel: +49 6151 869 944**  
**E-mail: rakow@gmd.de**

## Telemedicine in Electrocardiographic Analysis

by Remo Bedini

**Since 1970, the Institute of Clinical Physiology (IFC-CNR), Pisa, has been heavily engaged in telemetry applications, with especial reference to the transmission of the electrocardiogram. In particular, the Institute has been involved in the development and testing of portable devices for emergency use and has contributed to the definition of international standards for the transmission of the computer electrocardiograph.**

The electrocardiogram provides very important clinical information for the study of cardio-vascular pathologies and some of the earliest experiments in telemetry



**Portable system for ECG monitoring in the home**

regarded the remote transmission of electrocardiographic (ECG) signals. The first systems were generally constituted by simple radio frequency (RF) carriers modulated in amplitude (AM) or frequency (FM) by the amplified ECG signal. AM or FM radio receivers were used to decode the RF and reproduce the original ECG. The employment of the public switched network meant that it was possible to develop more sophisticated devices for remote ECG monitoring in the home, and a first portable telemonitor system was implemented by IFC in collaboration with ESAOTE Biomedica SpA, Florence. Using the same technology in combination with a technique developed to transmit the high frequency pacemaker wave form, special instrumentation was also implemented for at home monitoring of pacemakers. In the mid '80s, a microprocessor controlled device for emergency use was designed and patented. The system, "Cardiobip", produced by ESAOTE and commercially distributed by the Italian telephone company SIP, is now used for tele-Holter analyses; operated by the patient, it digitally records short term ECG traces in the home and transmits the information to the clinic through the telephone by FM modulation of an acoustic carrier.

While the low cost of the technology used in these "analogic" systems has permitted the development of simple but effective portable devices, invaluable in emergencies, they cannot be considered

reliable for diagnostic purposes because of the intrinsic noise level of the switched telephone network. In fact, whereas the quality of the ECG signal is generally satisfactory for rhythm analysis, contour analysis requires a very high reproduction fidelity, especially if the system provides automatic interpretation of ECGs under rest conditions.

For these reasons, over the last ten years, systems have been implemented that use a digital transmission of the recorded ECG. In the last five years, international standards for the numerical processing and transmission of electrocardiographic signals have been agreed, i.e. the CEC Programmes in which IFC has participated: Common Standard for Interpretative Electrocardiography (CSE) and Standard Communications Protocol for Computerized Electrocardiography (SCP-ECG), or the CEN activity that produced the norms on the Standard Communications Protocols for Computer-Assisted Electrocardiography. Digital transmission overcomes the problem of signal distortion in analogic telephone transmission, and automatic contour analyses can be performed on the acquired ECGs. In addition, the use of numerical techniques permits data compression of the digitized samples, and the entire 12 lead ECG information normally necessary for an effective rest ECG diagnosis can be transmitted rapidly, through the public telephone network.

These new techniques have been studied in a cooperation between IFC and ESAOTE for the development of integrated systems for the complete digital treatment of the ECG, from its acquisition to its transmission and its automatic interpretation. In particular, a new ECG telemonitoring system has been developed in a special project for Cardiology sponsored by the Ministry for Scientific Research; IFC is responsible for supervising the design of the system and its implementation by ESAOTE. The system has been tested technically by IFC and also clinically in hospital units and ambulances. It consists of a PC-based central station and remote terminals communicating through the public telephone network. The central station is equipped with a digital modem for asynchronous data transmission (typically at 2400 baud rate) and a standard telephone. Some portable, battery operated devices provide the remote electrocardiographs and contain three trace electrocardiographs with an LCD large size graphic screen and a thermal ECG printer; a keyboard and a modem complete the system that is connected to the telephone line by an acoustic coupler, and to the phone handset or the telephone plug by a galvanic coupling. The system provides an User Friendly Interface both at the central station and at the remote terminal. Voice communication is also available.

Examples of other recent research at IFC include: the use of modern fiber optic telephone networks for signal and image transmissions; the implementation of a distributed data base for Rehabilitation in the context of the CEC project AIM (Advanced Informatics in Medicine); the development of integrated palm top systems for the remote analysis of fetal ECGs; non-invasive blood pressure monitoring and studies on ischemia in animals.

Future applications in telemedicine will depend on the use of new wide band public telephone networks such as the ISDN (Integrated Signal Digital Network) or the future ATM (Asynchronous Transmission Management). The implementation of devices using high integration techniques such as SMD (Surface Mounted Devices) and/or the imple-

mentation of specific functions on monolithic integrated circuits will allow the construction of fully portable devices for personal use (periodic check-ups or emergency signalling) managed by an integrated telemedical organisation. ■

**Please contact:**  
**Remo Bedini - IFC-CNR**  
**Tel: +39 50 553600**  
**Email: bedini@nsifc.ific.pi.cnr.it**

## Minimum Circulation of Railway Stock

by Lex Schrijver

**We describe some research in progress at CWI, performed for Nederlandse Spoorwegen (Dutch Rail) to determine the minimum circulation of train-units needed to execute a set timetable with given bounds on demands and capacities. In the case of more than one type of unit, we have applied techniques of polyhedral combinatorics. As an example, the hourly train service run on the Amsterdam-Vlissingen route was considered.**

A train is taken to mean one or more coupled units, with the potential for a change of composition at certain intermediate stops. In each train there are 1st class and 2nd class seats. The weekday timetable for the Amsterdam-Vlissingen route, with the two major intermediate stops at Rotterdam and Roosendaal, and the expected number of passengers for the separate 1st and 2nd class sections, served as input for the problem: What is the minimum amount of rolling-stock needed to perform the service so that there are enough seats at each stage? This can be described as a minimum-cost circulation problem, i.e. a special case of an integer linear programming problem.

First we considered a single type of two-way train-unit, with three carriages, a total of 38 1st class and 163 2nd class seats, and a driver's cab at each end. Units

can be coupled together, up to a maximum of five. Coupling/uncoupling of units can take place at all four stations and the number of units staying overnight at one station should be constant during the week. The problem mentioned above is solved by constructing a (directed) network (see Figure) in which any possible routing of rolling-stock is described as an integer-valued circulation obeying, for any arc, a given lower bound (and an upper bound of five). The number of units deployed is given by the total flow on the four 'overnight' arcs, and this is the number that needs to be minimized.

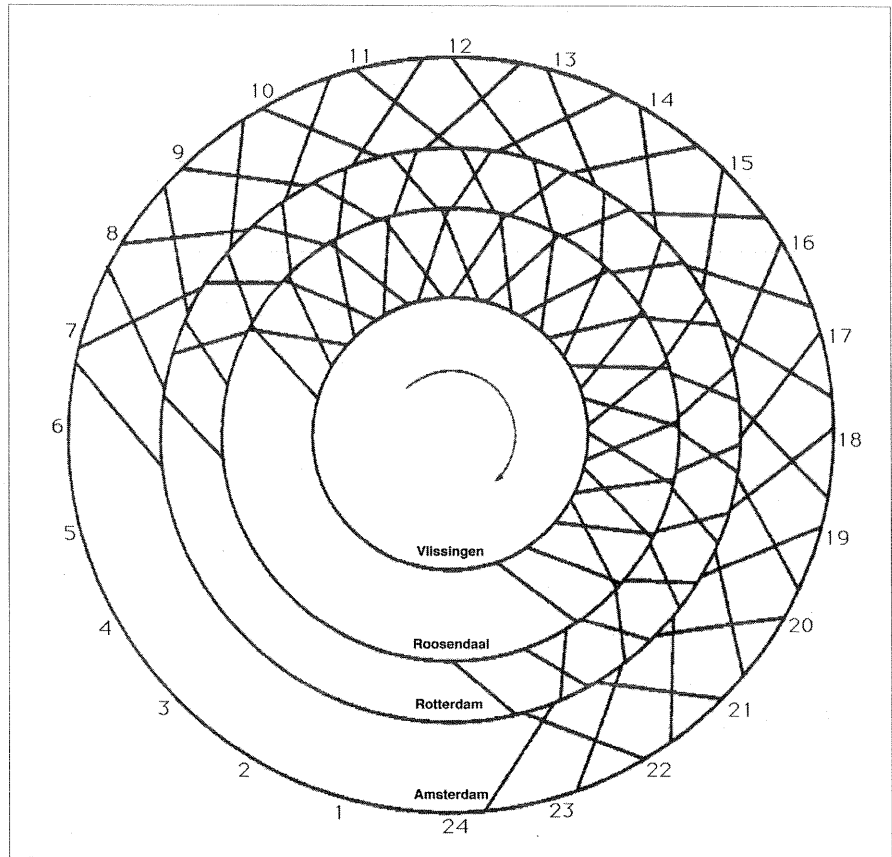
Implementation of standard flow algorithms gives solutions of the problem (for the above data) in about 0.05 CPU seconds on an SGI R4400. It turns out that 22 units are required for the Amsterdam-Vlissingen route.

This model can easily be modified and extended, for example by requiring the daily amount of carriage-kilometres to be minimized or by considering networks of lines. Fast solutions are still possible in such cases; the reason is that, with a single type of unit, optimum solutions are automatically integer-valued if the input data are integer-valued.

If there is more than one type of unit that can be coupled together, we have to consider a 'multi-commodity circulation' model. The method developed at CWI to solve this problem involves polyhedral combinatorics. American researchers have recently employed this technique to solve very large scale traveling salesman problems. Considered as an integer programming problem, the solution with the CPLEX package would require a running time of several hours in the two type case, due to the fact that integer programming is inherently difficult (NP-complete). However, by exploiting the techniques of polyhedral combinatorics, a substantial speed-up was achieved and, with CPLEX, we now obtain a solution to the Amsterdam-Vlissingen problem in 1.58 CPUseconds. Compared with the one type case, the possibility of having two types decreases the total number of train-units needed (19 instead of 22).

We also considered more extensive problems requiring more complicated models and techniques. Restrictions such as the requirement that in any train journey between Amsterdam and Vlissingen, at least one unit should make the whole trip, and that fresh units may only be coupled onto the front, and laid-off units only uncoupled from the rear, makes the order of the different units in a train a significant factor. This does not fit directly in the circulation model described above, and requires an extension. The method we have developed for Dutch Rail to date is based on introducing extra variables, extending the network described above and utilizing some heuristic arguments; this yields a running time (with CPLEX) of about 30 CPUseconds for the Amsterdam-Vlissingen problem.

Please contact:  
**Lex Schrijver - CWI**  
 Tel: +31 20 592 4087  
 E-mail: lex@cw.nl



Directed network (all arcs oriented clockwise) describing traffic flow on the Amsterdam – Vlissingen route

INTERNATIONAL RELATIONS

# GMD takes over Convenorship of RARE WG-SEC

by Klaus Truoeel

GMD has taken over the convenorship of the Working Group of Security Technology (WG-SEC) of RARE, the association of the European academic research networks. The overall objective of this group is to promote the

implementation of security services in European networking, especially through pilot projects. WG-SEC had its first meeting in Pisa, Italy, together with the European Network Service Conference.

Klaus Truoeel, member of the Darmstadt Institute for Telecooperation Technology of GMD, is the convenor of this new working group of RARE, which has its origin in the former WG8 of RARE, operational at the time of the COSINE Specification Phase.

The objectives of this group are to act as a focus for user requirements for security technology and secure applications. Pilot services that demonstrate the viability of security techniques will be pro-

moted, i.e. techniques for authentication, identification, confidentiality, and mechanisms for establishing hierarchies of certification authorities.

Among the high priority work items are

- Promotion of the establishment of a security infrastructure for RARE, i.e. implementation, deployment, management and support of hierarchies of Certification Authorities, definition of security policies and of the structure of a generic Certification Authority tree;
- Promotion of pilots of Privacy-Enhanced Mail (PEM) based on X 400-88/P1 security extensions and on Internet PEM, and study of the problems of

compatibility between the security enhancements of both networking "worlds".

RARE WG-SEC plans to adopt mainly the results of the PASSWORD project of the CEC VALUE II programme.

Please contact: Klaus Truoen - GMD  
Tel: +49 6151 869 700  
E-mail: truoen@gmd.de

## German-Canadian Cooperation in the Field of Quality of Service Architectures for Distributed Systems

by Martin Brachwitz

Identical interests and goals in the field of research should not lead to rivalry but rather provide a source of cooperation for making better use of resources. It was for this reason that the System Engineering and Methodology research section of GMD's Research Centre for Open Communication Systems in Berlin initiated a cooperation with the Centre for Advanced Studies (CAS) of IBM Canada, Toronto. Both CAS and the GMD research section are involved in projects relating to the specification and measurement of quality in distributed systems.

Guest speakers at the international IFIP Conference, ICODP '93, hosted in September 1993 by the GMD research section System Engineering and Methodology were Jacob Slonim, head of CAS,

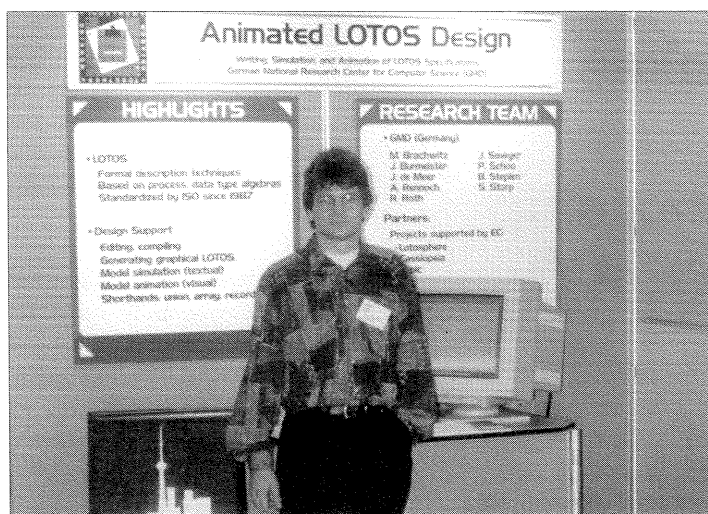
and Mike Bauer, head of the Computer Science Department at the University of Western Ontario. Jacob Slonim examined the problems of integrating network components and network-independent telecommunication services. The "middleware" is currently missing for integrating services and thus for providing these on heterogeneous networks.

The "CASCON" Conference organized by IBM in October 1993 was attended by employees of GMD who were invited to present the results of their research work to a broad sweep of North America's scientific world. A lecture by Jan de Meer on the theme of Quality of Service (QoS) discussed how model implementations of protocols in multimedia services can be made compatible with corresponding field implementations in order to obtain reliable information on the quality of services. This allows performance measurements on models to be transferred to field implementations. A workshop devoted to the subject of technology transfer clarified how standardization organizations could bridge the gap between research and industry. In parallel to the conference lectures, the latest developments in the field of visualization tools for protocol specifications were demonstrated by Martin Brachwitz at a separate demo stand. These tools can be used to represent the dynamic behaviour of distributed systems as early

as the specification stage through movements of graphic objects.

Within the framework of the German-Canadian cooperation programme, the GMD research section also enjoys a close working relationship with the Universities of Ottawa and Montreal. Hafid Abdel Hakim from the University of Montreal is currently working in Berlin as a guest scientist and is researching into QoS architecture as part of the RACE project TOPIC. The area of cooperation is concentrated here on developing tools for testing the conformity of service qualities in telecommunication networks. Bernard Stepien from Ottawa visited Berlin in December 1993 in order to share his knowledge of formal methods with scientists working on the further development of visualization tools.

Please contact: Martin Brachwitz - GMD  
Tel: +49 30 25499 242  
E-mail: brachwitz@fokus.gmd.de



**Martin Brachwitz at the stand of GMD's Research Centre for Open Communications during the IBM Conference in Toronto**

CALL FOR PARTICIPATION

## ESA'94 - 2nd Annual European Symposium on Algorithms

Utrecht, The Netherlands,  
26-28 September 1994

The symposium covers all research on algorithms and their analysis relative to the fields of theoretical computer science, discrete applied mathematics, and all other areas of algorithm-oriented research and its applications.

### Topics:

Papers in the following areas will be particularly discussed:

- Graph and Network Problems
- Computational Geometry
- Algebraic Problems and Symbolic Computation
- Combinatorial Optimization
- Neural and Genetic Computing
- Pattern Matching
- Cryptography.

Applications to concrete problems in science and industry, as well as the implementation of algorithms in real-world problems, will also be addressed. The programme committee is chaired by Jan van Leeuwen (Department of Computer Science, Utrecht University, e-mail: jan@cs.ruu.nl). The proceedings will appear in the series Lecture Notes in Computer Science of Springer-Verlag. ESA'94 is supported by the European Association for Theoretical Computer Science.

**Please contact:**  
Marko de Groot - Utrecht University  
Tel: +31 30 53 4095/1454  
E-mail: marko@cs.ruu.nl

## WDAG-8 - 8th International Workshop on Distributed Algorithms

Terschelling, The Netherlands  
29 September - 1 October 1994

The workshop covers the entire area of distributed algorithms and is scheduled to immediately follow the ESA'94 Symposium (see previous announcement). Papers are solicited describing original results or authoritative tutorial surveys in all areas of distributed algorithms and their application.

### Topics:

Topics include but are not restricted to:

- Algorithms for Control and Communication
- Fault-tolerant Algorithms
- Network Protocols
- Protocols for Real-time Systems
- Issues in Asynchrony, Synchrony and Real-time
- Algorithms for Managing Replicated Data
- Distributed Database Techniques
- Mechanisms for Security in Distributed Systems
- Selfstabilizing Algorithms
- Algorithms for Changing Network Topologies
- Wait-free Algorithms
- Techniques for Systems Design and Analysis
- Combinatorial and Optimization Algorithms
- Distributed Graph Algorithms
- Intermediate between Parallel and Distributed

The workshop is co-chaired by Gerard Tel (Utrecht University) and Paul Vitányi (CWI/Amsterdam University). The proceedings will appear in the series Lecture

Notes in Computer Science of Springer-Verlag. Previous workshops were held at Ottawa (1985), Amsterdam (1987), Nice (1989), Bari (1990), Delphi (1991), Haifa (1992) and Lausanne (1993).

**Please contact:**  
Gerard Tel - Utrecht University  
Tel: +31 30 53 4113  
E-mail: gerard@cs.ruu.nl  
or: Paul Vitányi - CWI/Amsterdam University  
Tel: +31 20 592 4124  
E-mail: paulv@cwi.nl

CALL FOR PAPERS  
Sponsored by ERCIM

## Eurographics Workshop on Animation and Simulation

Olslo, Norway  
17-18 September 1994

The Eurographics workshop on Animation and Simulation has become an international forum of high quality for exchanging experience and knowledge between people representing the animation and simulation communities on the general themes of modeling, animation, motion control, simulation and visualization of dynamic scenes. The main topics of the workshop are:

- hardware and software for animation
- motion control
- physically based modeling
- simulation of dynamic natural phenomena
- animation languages and systems
- character animation, human animation, synthetic actors
- behavioural animation
- animator interface
- flight and driving simulators

- real time animation/simulation
- graphical simulation
- motion blur and temporal antialiasing
- temporal coherence
- cooperation between motion analysis and motion synthesis

#### Contributions:

Authors are invited to send four copies of an extended abstract (4-6 pages) to the workshop secretariat). Abstracts submitted after the deadline will still be considered, but will have a lower priority for inclusion in the programme.

#### Deadlines

- 1 May: submission of extended abstract (see contact address)
- 1 June: notification of acceptance
- 15 July: full papers

The workshop will be held at SINTEF in Oslo (Norway) just after the annual Eurographics Conference. The local organizer is Morten Dehlen (Morten.Dehlen@si.sintef.no). Non-presenters are welcome but the workshop is limited to about 50 participants. Full versions of all papers will be published as Eurographics Technical Report and distributed among the participants as workshop proceedings. The workshop is an activity of the Eurographics Working Group on Animation and Simulation.

#### Please contact:

**Olov Fahlander, Dept of Electrical Engineering Linköping University, S-58183 Linköping, Sweden**  
 tel : +46 13 28 13 63  
 fax : +46 13 13 92 82  
 E-mail: olov-f@isy.liu.se

CALL FOR PAPERS

## 9th Eurographics Workshop on Graphics Hardware

Oslo, Norway, 12-13 September 1994

The Eurographics Hardware Workshop has become an established yearly forum where leading researchers and practitioners in the field of graphics hardware come to present and discuss their work. It witnessed the early evolutions of graphics technology from vector to raster graphics, then to voxel machines, which combine support for curves, surfaces, and volume data, and finally to multi-media systems, which combine graphics and video. The hardware spectrum has expanded towards new technologies and is heavily exploiting a variety of multi-processor architectures. Yet, despite an explosion of innovations, the challenges imposed by the graphics complexity of industrial models or the performance requirements of virtual reality offer tremendous opportunities for further research.

Contributions are invited in all aspects of computer graphics hardware, and architectures.

#### Topics include:

- Graphics hardware accelerators
- Silicon compilers for graphics hardware
- Graphics hardware simulators
- Performance measurement
- Hardware support for meshing and triangulation algorithms
- Pixel operations and deep frame buffer techniques
- Rasterizer performance and accuracy
- Multi-processor architectures for graphics

- Shared and distributed memory models
- Load balancing in graphics systems
- Expansion and acceleration of shading models
- Space, screen, and model partitioning
- Photorealism support
- Hardware assist for animation
- Hardware support for texture mapping techniques
- Hardware support for image composition and volume rendering techniques
- Video support and multimedia
- Hardware support for level of detail techniques, trimmed surfaces support, and virtual reality support
- Hardware support for voxel and oct-tree rendering, direct rendering of CSG and other CAD representations
- Architectures for voxel graphics

#### Contributions

Authors are requested to send four copies of the full paper (up to 20 pages) to Wolfgang Strasser or, for North American authors, to Jarek Rossignac. Papers will be reviewed for the workshop. The accepted papers will be printed before the workshop as an EG Technical report. Best papers of the workshop will be considered for a special issue of the ACM Transactions on Graphics devoted to Graphics Hardware.

#### Deadlines:

- 2 May: submission of workshop papers
- 15 June: Notifications of acceptance
- 15 August : Final workshop paper

#### Please contact:

**W. Strasser, Wilhelm-Schickard-Institut fuer Informatik/GRIS, Universitaet Tuebingen, Auf der Morgenstelle 10, C9, 72076 Tuebingen**  
 Tel: +7071/29-63 56  
 Fax: +7071/29-54 66  
 E-mail: strasser@gris.informatik.uni-tuebingen.de  
 or  
**Jarek Rossignac, IBM Research, J2-C03, P.O. Box 704, Yorktown Heights, NY 10598**  
 Tel: +914-784-7630  
 Fax: +914-784-7667  
 E-mail: jarek@watson.ibm.com



CALL FOR PAPERS

## Eurographics Workshop on Graphics and Visualization Education (GVE)

Oslo, Norway, 10-11 September 1994

Following the education workshop held in Barcelona at Eurographics'93 a 2-day Workshop on Graphics and Visualization Education will be held Saturday and Sunday before the Eurographics'94. The main purpose of this workshop is to provide an international forum to present, discuss and evaluate some issues concerning the Graphics and Visualization Education. It seeks to bring educators from different countries and cultures to present their approaches and results on defining the curricula and applying teaching/training methods to Graphics and Visualization. The workshop will offer both invited and refereed papers, group discussions and plenary discussions. To improve the discussion, the number of papers will be limited to the best and most significant for the workshop. A second purpose for this workshop is the establishment of a Eurographics Working Group on Education. During the last workshop held in Barcelona it was found this need and the advantages of a close collaboration with the Education Group of the ACM-SIGGRAPH.

### Topics:

- Curriculum for computer graphics and visualization
- Different approaches to teaching graphics and visualization
- Assignments in graphics courses

- Use of multimedia in education
- Teaching/Training material in computer graphics courses
- Exchange of education resources between different countries
- Perception as a topic in graphics courses
- Visualization/Simulation of graphics algorithms
- Use of graphics to visualize specific applications

The discussion during the Workshop will be continued in the context of the new Eurographics Working Group on education.

### Contributions :

Authors are invited to send position papers presenting experiences, results and new developments related to the topics of the workshop. The authors should submit 4 copies of the position papers (up to 15 single sided pages, 10000 words, 200 word abstract) to one of the Co-Chairs. The position papers will be reviewed by the Programme Committee. We may need to set a limit on the number of participants. The best papers will be published in proceedings or journal form.

### Deadlines:

- 15 May: submission of papers
- 30 June: Notification of acceptance
- 31 July: Final version of papers

### Please contact:

Lars Kjeldahl, Numerical analysis and Computing Science - NADA, Royal Institute of Technology - KTH, S - 100 44 Stockholm SWEDEN

Tel: +46 8 790 8159

Fax: +46 8 790 0930

E-mail: [lassekj@nada.kth.se](mailto:lassekj@nada.kth.se)

or  
Jose Carlos Teixeira, Grupo de Metodos e Sistemas Graficos, Dep. Matematica - Universidade de Coimbra, Apartado 3008, 3000 Coimbra - PORTUGAL

Tel: +351 39 28097/8/9

Fax: +351 39 32568

E-mail: [teixeira@mat.uc.pt](mailto:teixeira@mat.uc.pt)

CALL FOR PARTICIPATION  
Sponsored by ERCIM

## Eurographics Workshop on Design, Specification, Verification of Interactive Systems

Carrara, Italy, 8-10 June 1994

Making systems easier to use implies an ever increasing complexity in managing communication between users and applications; an increasing part of the application-code is devoted to the user interface. In order to manage this complexity, it is very important to have tools, notations, and methodologies which support the designer's work during the refinement process from specification to implementation.

The purpose of the workshop is to review the state of the art in this area. The different existing approaches will be compared in order to identify the principal requirements and the most suitable notations, and to indicate the most suitable results.

### Topics:

- Foundations and Reference Models for Interactive Systems.
- Verification of user interfaces, application of theorem-provers.
- Methodologies for abstract design, comparative studies of methods/description techniques.
- Specification of human-computer interaction, multi-modal user interfaces and virtual realities.
- Design of Graphics Systems and Window Systems.

- Formal description of users' related properties.
- Model-based user interface software tools.

**Please contact:**

**Fabio Paterno, CNUCE-C.N.R.,**  
Via S. Maria 36, 56126 Pisa, Italy;  
fax: +39 50 589354.  
E-mail: [paterno@vm.cnuce.cnr.it](mailto:paterno@vm.cnuce.cnr.it);

## Summer School on Numerical Parallel Algorithms

Peñíscola, Spain, 30 May-3 June

The design of efficient parallel algorithms for numerical problems is crucial to the full exploitation of current and future multi-processor technology in many scientific and engineering applications. This school will present advanced material on models and techniques for algorithm design and complexity analysis and

illustrate their application to a number of basic numerical problems.

**Topics:**

- Overview of the theory of parallel computations:
- Bulk Synchronous Parallel Computing
- Parallel iterative methods for linear systems, eigenvalues, and singular value decomposition

Additional guest lectures as well as research presentations by participants will be scheduled. The school is target to Ph.D. students and young researchers.

**Please contact: Dr. Bruno Codenotti, IEI-CNR, Via S. Marina 46, 56126 Pisa, Italy**  
Tel: +39 50 593 475  
Fax: +39 50 554-342  
E-mail: [codenotti@iei.pi.cnr.it](mailto:codenotti@iei.pi.cnr.it)

## IN BRIEF



**Prof. Franco Denoth**  
(Photo: CNR)

**CNR - The elections to renew the eleven National Advisory Committees**, which control and supervise the funding and coordination of CNR research activities for each separate scientific discipline, were held throughout Italy on January 10 and 11. **Prof. Franco Denoth** (IEI-CNR) was elected to the Committee for Physics as representative of the area for Informatics. Once the new Committees have been formally approved, the members of the four Interdisciplinary Committees, which are responsible for overseeing those activities that require a combination of expertise from different domains, will be nominated. It is expected that Franco Denoth will be chosen to represent the Committee for Physics in the Interdisciplinary Committee for Information Sciences and Technology. ■

**GMD - The ECCO-Achievement Award**, the first prize of the IBM European Cluster and Parallel Consortium, was awarded to the GMD Institute for Algorithms and Scientific Computing at the SUP'EUR 93 congress in Vienna, September 1993. An independent international jury gave the prize to Ute Gärtel, Wolfgang Joppich, Anton Schüller, Horst Schwichtenberg, Ulrich Trottenberg and Gerd Winter for their contribution "Parallel and Cluster Computing on IBM Systems for Weather Prediction and Related Models: IFS and ASMG". Thus, after winning the second

and the third prize in the Mannheim SuParCup'93 competition (see ERCIM News 15), this was the third time that scientists of the institute, under the leadership of Ulrich Trottenberg, received an international award for their scientific work in 1993.

**GMD - Prof. Ulrich Trottenberg**, General Director of the GMD Institute for Foundations of Information Technology, has been appointed Chairman of the Advisory Council of the newly founded "Karl F. Gauss Center for



**Winners of the ECCO-Achievement Award: from left to right Horst Schwichtenberg, Gerd Winter, Ulrich Trottenberg, Ute Gärtel, Anton Schüller, Wolfgang Joppich** (Photo: Münch, GMD)

Scientific Computation", for a term of five years. This research centre is funded jointly by the Minerva Foundation (a subsidiary of the Max Planck Institute) and the Weizmann Institute, Israel. The



**Prof. Ulrich Trottenberg**  
(Photo: Münch, GMD)

research work is focused essentially on the development of high-speed, numerical methods for resolving complex problems using the multilevel principle. Examples of important application fields include computational chemistry, computational fluid dynamics, geology, meteorology and climate research. The centre also provides the infrastructure required for bilateral and international cooperation, and in particular for an exchange of expertise and scientists between Germany and Israel. An Advisory Council, consisting of three German and three Israeli members, has been set up to provide advice in defining the objectives and fields of research of the new research centre.

**CWI - The Interdisciplinary Centre for Complex Computer facilities of Amsterdam (IC3A)** was formally established mid-February, when the Netherlands Organization for Scientific Research (NWO) signed a cooperation agreement with the University of Amsterdam (UvA). A major aim of IC3A - a joint initiative of UvA and CWI - is to keep The Netherlands in the international HPCN race (High Performance Computing & Networking) by serving as a platform for multi-disciplinary cooperation with other research institutions as well as with national and foreign industries. A new generation of massively parallel computer systems, with hundreds of processing units, plays a pivotal role here. IC3A already has a few of such systems (Meiko and Parsytec) at its disposal. The importance of this research field is stressed by NWO's National Priority Programme on Massively Parallel Computation (MPC), to be started shortly. CWI has selected HPCN/MPC research as one of its main targets for the coming years. CWI's director Gerard van Oortmerssen serves as a board member in IC3A.

and responsible for telecommunications in Portugal. During the Prime Minister's second visit to INESC (the first took place in 1987), the official delegation was shown round the INESC buildings and attended a number of hardware/software demonstrations. The visitors were particularly interested in the work of the technology transfer centres, where efforts are concentrated on exporting the results of INESC R&D activities to industry. The aim of this governmental visit to INESC was to evaluate its capacities as a platform of competence in the information technology and telecommunications sectors. This is to be seen as part of a political programme directed at optimising the existing capacity for modernising the economy within the Regional Development Plan, and also at enhancing and upgrading human resources. The objective is to reinforce competitive economic factors in order to be able to raise living standards in Portugal.


**INESC - The Portuguese Prime Minister, Prof. Cavaco Silva**, paid a visit to the Lisbon offices of INESC on 22 February in the company of Mr Ferreira do Amaral, Minister for Public Works, Transport and Communications,

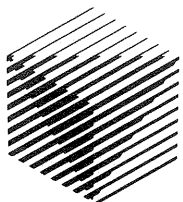
## ERCIM NEWS

*If you wish to receive any of the last issues, please circle the number, fill in your name and address, and return to:*

**ERCIM,  
B.P.105,  
F-78153 Le Chesnay, Cedex,  
France**

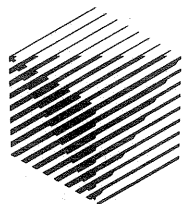
- No.10 – Special: Software Quality, Principles and Techniques
- No.11 – Special: Numerical Linear Algebra
- No.12 – Special: Network Management
- No.13 – Special: Parallel Architectures
- No.14 – Special: Software Reuse
- No.15 – Special: Large Scale Scientific Computing
- No 16 – Special: Databases

Address:  \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**European Research Consortium for Informatics and Mathematics**

**ERCIM**



The European Research Consortium for Informatics and Mathematics (ERCIM) is an organisation dedicated to the advancement of European research and development, in the areas of information technology and applied mathematics. Through the definition of common scientific goals and strategies, its national member institutions aim to foster collaborative work within the European research community and to increase co-operation with European industry. To further these objectives, ERCIM organises joint technical Workshops and Advanced Courses, sponsors a Fellowship Programme for talented young researchers, undertakes joint strategic projects, and publishes workshop, research and strategic reports, as well as a newsletter.

ERCIM News is the in-house magazine of ERCIM. Published quarterly, the newsletter reports on joint actions of the ERCIM partners, and aims to reflect the contribution made by ERCIM to the European Community in Information Technology. Through short articles and news items, it provides a forum for the exchange of information between the institutes and also with the wider scientific community.

|   |  |   |  |
|---|--|---|--|
|   | Central Editor:<br>Carol Peters (CNR)  | E-mail:<br>carol@vm.iei.pi.cnr.it   | Telephone:<br>+39 50 593 429   |
| Central Office:<br>ERCIM<br>Domaine de Voluceau<br>Rocquencourt<br>B.P. 105<br>F-78153 Le Chesnay Cedex<br>FRANCE | Local Editors:<br>Werner Behrendt (RAL)<br>Lars Bergman (SISU)<br>João Bilhim (INESC)<br>Truls Gjestland (SINTEF)<br>Päivi Johansson (VTT)<br>Siegfried Münch (GMD)<br>Pierre Népomiaschty (INRIA)<br>Henk Nieland (CWI)<br>Carol Peters (CNR)<br>Constantine Stephanidis (FORTH)<br>Miguel Delgado (AEDIMA) | wb@inf.rl.ac.uk<br>lars@sisu.se<br>jafb@eniac.inesc.pt<br>truls.gjestland@delab.sintef.no<br>paivi.johansson@vtt.fi<br>siegfried.muench@gmd.de<br>pierre.nepomiaschty@inria.fr<br>henkn@cw.nl<br>carol@vm.iei.pi.cnr.it<br>cs@csi.forth.gr<br>mdelgado@ugr.es | +44 235 44 5281<br>+46 8 752 1613<br>+351 1 572 895<br>+47 73 59 26 45<br>+358 0 456 5936<br>+49 2241 14 2303<br>+33 1 39 63 5646<br>+31 20 592 4092<br>+39 50 593 429<br>+30 81 22 64 87<br>+34 58 24 40 94 |
| Lay-out<br>Peter Kunz   |  |   |  |

**AEDIMA**



**FORTH**



Asociacion Española de Informatica y Matematica Aplicada

Centrum voor Wiskunde en Informatica

Consiglio Nazionale delle Ricerche

Foundation of Research and Technology - Hellas

Gesellschaft für Mathematik und Datenverarbeitung mbH

UPC  
Av. Gregorio Marañon, s/n  
E-08028 Barcelona

Kruislaan 413  
NL-1098 SJ Amsterdam

IEI-CNR  
Via S. Maria, 46  
I-56126 Pisa

Institute of Computer Science  
P.O. Box 1385  
GR-71110 Heraklion, Crete

Schloß Birlinghoven  
P.O. Box 1316  
D-53731 Sankt Augustin

Tel: +34 3 401 72 89  
Fax: +34 3 401 62 10

Tel: +31 20 592 9333  
Fax: +31 20 592 4199

Tel: +39 50 593 400  
Fax: +39 50 554 342

Tel: +30 81 22 93 02  
Fax: +30 81 22 93 42

Tel: +49 2241 14 -0  
Fax: +49 2241 14 2889



**DRAL**

**SICS**



Institut National de Recherche en Informatique et en Automatique  
B.P. 105  
F-78153 Le Chesnay

Instituto de Engenharia de Sistemas e Computadores  
Rua Alves Redol 9  
Apartado 10105  
P-1017 Lisboa Codex

Rutherford Appleton Laboratory  
Chilton  
DIDCOT  
GB-Oxon OX11 0QX

Swedish Institute of Computer Science  
Box 1263  
S-164 28 Kista

Stiftelsen for Industriell og Teknisk Forskning ved Norges Tekniske Høgskole  
SINTEF DELAB  
N-7034 Trondheim

Technical Research Centre of Finland  
VTT Information Technology  
P.O. Box 1200  
SF-02044 VTT

Tel: +33 1 39 63 5511  
Fax: +33 1 39 63 5330

Tel: +351 1 310 0217  
Fax: +351 1 572 897

Tel: +44 235 82 1900  
Fax: +44 235 44 5385

Tel: +46 8 752 1500  
Fax: +46 8 751 7230

Tel: +47 73 59 26 00  
Fax: +47 73 59 43 02

Tel: +358 0 456 6041  
Fax: +358 0 456 6027