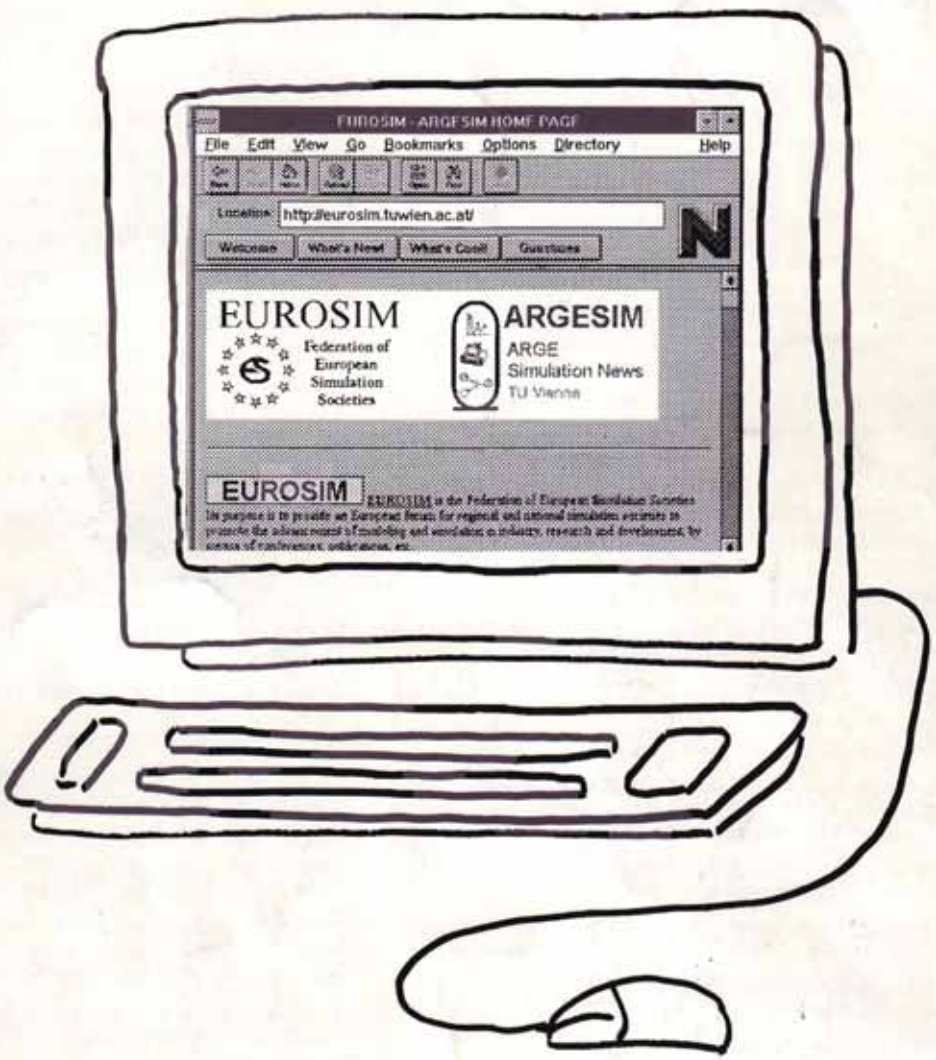
SIMULATION NEWS EUROPE

EUROSIM

ISSN 0929 - 2268



Number 13 March 1995

A EUROPEAN FORUM ON SIMULATION ACTIVITIES

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Readership Information

EUROSIM - Simulation News Europe is published on behalf of EUROSIM (the Federation of European Simulation Societies) three times a year by the "ARGE Simulation News", a non-profit working group. Circulation is 2100. EUROSIM - Simulation News Europe is distributed by all member societies to their individual members (as part of the membership services). It is also included in the scientific journal "Simulation Practice and Theory", published by Elsevier Science B.V.

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If you have any contributions, remarks, suggestions, etc. please contact the editors. Deadline for the next issue will be June 2,1995.

The production of the newsletter is financed by advertisements and grants covering current expenses for editing, running of the editorial office, promotion, and other editorial expenses.

EUROSIM - Simulation News Europe

Scope: Information on simulation activities, membership information for European simulation societies, comparisons on simulation techniques

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ARGE Simulation News

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ARGE Simulation News: Gröhrmühlg. 8, A-2700 Wiener Neustadt

Printed by: Elsevier Science B.V., Amsterdam, The Netherlands

ISSN 0929 - 2268

Editorial

In this issue of **EUROSIM - Simulation News Europe** we have given more room to a very interesting essay. Some of the material we received will be published in the next issue. A WWW(world wide web)-server has been set up for on-line information on EUROSIM activities. Parts of SNE will be provided on this server. Preparations for the EUROSIM '95 Congress are in progress. More details on poster and industry session as well as on tutorials are available now.

According to the usual scope you find in this issue news from EUROSIM, reports from EUROSIM member societies and from international societies, a book review, industry news, and a calendar of events. Solutions for the software comparisons and the parallel comparison complete the contents. We would like to thank all who have contributed to this issue.

F. Breitenecker, I. Husinsky

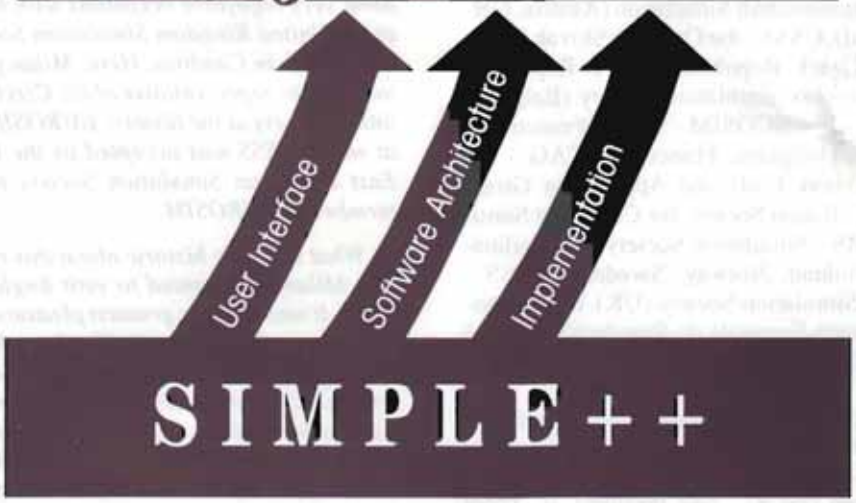
Aims and Scope

The journal EUROSIM - Simulation News Europe publishes information related to simulation. It is distributed to all members of all European member societies. It contains essays on simulation, reports from EUROSIM and from the European simulation societies, reports from international societies, presentations of simulation centres, industry news, book reviews, a calendar of events. A special series on simulation comparisons gives an overview on features of simulation software and hardware. All contributions are selected and may be edited by the editors of the newsletter.

Editorial Board of the European Simulation Societies:

The new Class of Simulation Software

»Full Object Orientation«



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Germany

AESOP

EUROSIM, the **Federation of European Simulation Societies**, was set up in 1989. The purpose of EUROSIM is to provide a European forum for regional and national simulation societies to promote the advancement of modelling and simulation in industry, research, and development.

At present EUROSIM has eight full members: ASIM - Arbeitsgemeinschaft Simulation (Austria, Germany, Switzerland), CSSS - the Czech & Slovak Simulation Society (Czech Republic, Slovak Republic), DBSS - Dutch Benelux Simulation Society (Belgium, The Netherlands), FRANCOSIM - Société Francophone de Simulation (Belgium, France), HSTAG - the Hungarian Simulation Tools and Application Group (Hungary), ISCS - Italian Society for Computer Simulation (Italy), SIMS - Simulation Society of Scandinavia (Denmark, Finland, Norway, Sweden), UKSS - United Kingdom Simulation Society (UK). Furthermore, AES - Asociación Española de Simulación (Spain) - joined EUROSIM as observer member.

EUROSIM is governed by a **Board** consisting of one representative of each member society. The Board elects officers, who are at present: F. Breitenecker (ASIM) - president, F. Maceri (ISCS) - past president, R. Zobel (UKSS) - secretary, L. Dekker (DBSS) - treasurer.

EUROSIM's journal **"EUROSIM Simulation News Europe" (SNE)** publishes information on simulation news in Europe and trends in simulation, including reports of EUROSIM's member societies. **"Simulation Practice and Theory" (SIMPRA)**, EUROSIM's scientific journal, publishes high quality contributions on modelling and simulation.

The next meeting of the EUROSIM board will take place on April 22, 1995 in North Berwick, U.K.

In Memoriam Milan Kotva,
Late Chairman,
Czech & Slovak Simulation Society

by Richard Zobel

As EUROSIM Secretary, I initially had correspondence with Milan Kotva in connection with the approach by what was then the Czechoslovak Systems Simulation Club in connection with membership of EUROSIM. I first met Milan in Prague in May 1991, when he gave me a lift in his car with Franticek Hauser to the Moravian Simulation Conference at Vsetin. The journey was very pleasant and we established during the journey what became both an excellent professional relationship and a good friendship.

I enjoyed the conference and made many friends. Subsequently, I met Milan at several simulation conferences and meetings. I remember well the ESM conference in Copenhagen, Denmark, and of course the 1993 Moravian conference in Olomouc. Later that year I had some very enjoyable occasions with Milan in England at the United Kingdom Simulation Society Conference at Keswick in Cumbria. Here, Milan played an important part as representative of the Czech & Slovak Simulation Society at the historic EUROSIM Board meeting at which CSSS was accepted as the first Central and East European Simulation Society to become a full member of EUROSIM.

What was also historic about this event was the fact that Milan had wanted to visit England for some 25 years. It was with the greatest pleasure that I met Milan in the bar of the Keswick Hotel on the evening of the initial gathering of the conference participants, where we shared a celibratery drink, together with his colleague Jaromir Luhan. Margaret and I were privileged to take Milan and Jaromir on a tour of the Northern Lake District, during which, at Milans request, we stopped for English cream teas and cakes.

It is with great sadness that I find myself writing an obituary for Milan. He will be missed very much by all his friends at the EUROSIM Board and in the Societies of EUROSIM, as much as he will be missed by all of his friends and colleagues in the Czech & Slovak Simulation Society to whom he gave so much.

EUROSIM WWW-Server

More than a year ago we decided to install a gopher server with information on EUROSIM, SNE, SIMPRA, etc. The recent development of compatible clients (Netscape, Mosaic, Cello) makes it now possible to connect to different types of servers (WWW - world wide web, gopher, ftp).

Furthermore, WWW and the HTML language became a common denominator for presentation of information within a net, allowing links to other servers of any kind. At the level of non-graphical representations there exist powerful clients like Lynx (so it makes sense to connect to a WWW-server from a site connected only with slow telephone lines).

Consequently we decided to set up a EUROSIM/ARGESIM WWW-server which will completely replace our gopher server until April 1995.

You may connect to this server with

<URL: http://eurosim.tuwien.ac.at/>

The home page (see part of it on the coverof this issue) gives short information on EUROSIM, the EUROSIM'95 conference, and on ARGESIM, referring to more detailed informaton.

Information on EUROSIM (general information, news, projects, etc.) will be prepared by us (ARGESIM), for the EUROSIM societies we will provide the most recent news from SNE. Societies may send other information which we will link into the system (pure ASCII text). If a society is running an information server, we can set a link to this server. We also welcome special home pages, if provided by a society.

Also the information on SNE, SIMPRA and ARGESIM will be prepared for WWW, the link to our software server `simserv.tuwien.ac.at` will be improved. We also welcome links to other WWW-servers.

The EUROSIM/ARGESIM-server is managed by S. Wassertheurer and W. Zeller from ARGESIM (Email: www@eurosim.tuwien.ac.at). As we are still working on setting up our WWW-server we welcome suggestions, hints, etc.

The **EUROSIM '95 Congress** will take place at
Technical University in Vienna, Austria
from September 11 - 15, 1995

The EUROSIM Simulation Congress is concerned with all aspects of computer simulation methodology and application.

Report on preparations:

The initial response to the congress announcements has been encouraging with many inquiries and with many offers of contributed papers.

We have distributed a First Call and a Second Call for Papers, and have spread information about the Congress via several journals and conferences and via Internet. Up to now (end of January) about **250 Reply Cards** and information requests reached us from many parts of the world (in alphabetical order): Austria, Australia, Belgium, Bulgaria, Canada, Czech Republic, China, Croatia, Denmark, Egypt, Finland, France, Germany, Great Britain, Greece, Hungary, India, Israel, Italy, Japan, Korea, Latvia, Moldavia, The Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, USA, Venezuela. The great majority of people interested plan to present a paper. Detailed information on the tutorials, hotel information, and registration forms are sent out now. Several companies have booked for the exhibition.

The deadline for submitting abstracts for presentations is already over (was March 15). You may may still participate in the poster session and in the industry sessions:

Poster Session:

We will arrange a special **poster session**, with no other sessions in parallel. Participants are invited to inform themselves on the posters in walking around in the poster/exhibition area, where the authors will give explanations. Due to sponsoring refreshments and a glass of wine will be provided - in order to stimulate contacts, etc. The abstracts of the posters will be published in a poster book. Abstracts for the posters (1/2 - 1 page) can be sent in until **June 15, 1995**. Information about acceptance will be sent until June 30, 1995. The abstract will be printed in the posterbook, if no replacement is sent before July 31, 1995.

Session "Simulation in Industry":

The industry session gives another opportunity to take part in the conference. The concept is:

- A special subject will be covered on one day. As a five day conference may be too long for participants coming from industry, this will allow to visit the conference only for one or two days.
- Each session will be organized by one or two responsible persons, who are responsible for the quality and who decide about acceptance of contributions individually.
- Speakers from industry or co-operating with industry should report about special projects done in or for industry.
- Speakers do **not have to publish** a paper in the proceedings. The session organizer is completely responsible for quality and suitability of the session. If a speaker **wants to publish** a paper it has to pass the paper review procedure. An abstract of the contribution may be published in the poster book (deadline July 31, 1995).

I. Bausch-Gall will organize a session on the topic *"Model Exchange, Simulator Backplane, VHDL-A"* for Wednesday, September 13th. A second session on *Mechatronics* is planned for September 14th. If you are interested to submit an abstract or to help with these sessions please contact. I. Bausch-Gall. For other sessions please contact the session organizers until June 15, 1995 (area of interest indicated):

I. Bausch-Gall, Wohlfartstraße 21b, D - 80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063.
K. Juslin, Techn. Research Centre of Finland, Tel: +358-0-4566422, Fax: +358-0-4550 115 (Power Systems, Energy Systems).
F. Lorenz, Centre SOCRAN, Ave Pré Aily, B-4031 Angleur, Tel: +32-41 6783 75, Fax: +32-41 6783 00 (Modelling, Bondgraphs).

D. Maclay, Cambridge Control, UK, Tel: +44-223-421 921, Fax: +44-223-421 921(Control Techniques).
D.P.F. Möller, TU Clausthal, Institut für Informatik, Erzstraße 1, D-38678 Clausthal-Zellerfeld, Tel: +49-5323 72 2504, Fax: +49-5323 72 3572 (Software, Hardware, Biomedicine).
D. Murray-Smith, Dept. Electronics and Electrical Engineering, Univ.Glasgow, Glasgow GL12 8LT, Tel: +44-41-330-5222, Fax: +44-41-330-4907 (Validation, Control, Parallelization).
P. Schäfer, Daimler Benz AG, Forschung und Technik, Postfach 2360, D-89013 Ulm, Tel: +49-731-505 23 26, Fax: +49-731-505 4108 (Simulators, Environments).
W. Smit, AKZO Nobel, Dept. Electronics, Vilberweg 76, 6824 BH Arnhem, The Netherlands, Tel: +31-85-664670, Fax: +31-85-664505 (Electronics).

User Groups and Tutorials:

The congress starts officially on Tuesday morning with the **Opening Session**.

On Monday User Group Meetings and Tutorials will take place. Up to now User Group Meetings for ACSL, MATLAB/ SIMULINK und GPSS/H are scheduled.

The **ACSL** User Group Meeting is planned to combine contributions from User Groups from Germany, France, UK and from USA (for information contact the congress organizers). **MATLAB** users may select an international meeting, a meeting of the German User Group, or a tutorial about "tips and tricks" in MATLAB/SIMULINK (for information contact P. Schmidt, FH Heidelberg, Tel: +49-6221-88-2821, Fax: +49-6221-88-3244). The **GPSS/H** User Group (P. Lorenz, Univ. Magdeburg, Tel: +49-391-5592-3534, Fax: +49-391-5592-2447) will concentrate also on animation with the new PROOF release, a tutorial on "Simulation and **Animation**" completes the offer about animation.

Two other tutorials deal with modeling and simulation of **discrete systems**: "Communications Network Planning Through Object-Oriented Simulation", "Object-Oriented Simulation of Discrete Systems" (mainly dealing with manufacturing processes). The tutorial "HDL-A -VHDL-based Analog and Mixed Signal Model Description Language" concentrates on the new **AHDL-standard**, the tutorial "Opto Electronic Processing & Networking" introduces the new **opto-electronic techniques** for networking and parallel computation.

Monday closes with a **Welcome Party** in a Wine Cellar, where participants may get into contact with each other.

Social Events

The scientific and the social events should create an atmosphere where simulationists (experts as well as newcomers) can exchange their problems, ideas and solutons, and make friends within the simulation society.

The highlights of the social programme are a typical *Heurigen Evening* (not of touristic style!) on Tuesday, an organ concert (Wednesday, late afternoon), and a Reception by the Mayor and a **Congress Dinner** in the Townhall. The congress ends with a closing session and a closing party on Friday afternoon.

Registration Fee:

The congress fee includes access to the scientific programme and a copy of the proceedings. It also includes the social events and a ticket for public transportation in Vienna during the congress, and some extras. A ticket for accompanying persons is available. It includes all social events, the ticket, and a guided walk in the city of Vienna.

Early registration (before May 15, 1995) for authors, members of EUROSIM member societies and sponsoring societies	ATS 3.700.-
for other participants	ATS 4.200.-
For late registration ATS 500.- will be added.	
Students (attendance only)	ATS 500.-
Accompanying Persons	ATS 1.300.-

Venue, Accommodation:

The congress will take place in the building "*Freihausgründe*", one of the main buildings of TU Vienna, located in the center of Vienna.

Austropa Interconvention has been entrusted to handle the reservation of hotel rooms (situated around the conference site) and offers an accompanying person's programme and post congress tours.

Congress Address:

EUROSIM '95
Computing Services / E020
Technical University of Vienna
Wiedner Hauptstr. 8-10
A - 1040 Vienna, Austria
Tel.: +43-1-58801-5386 or -5374 or -5484,
+43-664-3001725
Fax: +43-1-5874211
E-mail: eurosim95@email.tuwien.ac.at

On-line information is available on the EUROSIM information server: <URL: http://eurosim.tuwien.ac.at/>

F. Breitenecker, I. Husinsky
Organization Committee

Computer Science, Supercomputing and Biology-Bioinformatics

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Rheinau 1, D - 56075 Koblenz, Germany

Abstract

Computer science and biotechnology are important research fields. Moreover, in biology and computer science progress requires interdisciplinary activities. This paper demonstrates important interdisciplinary activities in this area of research. The term bioinformatics will be defined. Moreover, the main research fields and perspectives will be presented.
Key words: computer science, biology, biotechnology, bioinformatics, modelling and simulation

1. Introduction

A lot of research areas take advantage of the support and analysis computer systems can provide. However, 'visualization and animation' of analysis and design processes means the transformation of specific experiments into the computer system. In this case the computer allows modelling and simulation of specific aspects of the system and its environment.

Computer aided design methods are used in many technical research fields. A new research area in applicational computer science will spring up, if the development of computer aided processes includes new methods and concepts to solve specific problems. In this area a well known example is the aided design of integrated circuits. Today we can describe, model, simulate and optimize integrated circuits using specific computer systems.

The domain of application will be supported by the connection between computer science and specific technical research fields. Moreover, this could produce important innovations in the field of computer science. In this case methods of optimization, new methods for data representation methods, creative applications of computer graphics and new paradigms in the case of information processing are well known.

In the research field of biology the main task is to analyse living systems. Biological systems are complex and suited for the analysis by visualization and animation methods. Moreover, living systems represent complex and powerful information processing units, which were developed through evolutionary processes over millions of years. It is a popular idea to transfer analysed biological mechanisms into the field of technical information processing areas [1,2]. Today it seems to be possible that many products of biotechnological research will enter into competition with electronical products. However, progress in biotechnology will change our life style in the next century. The visualization of experiments in the field of biology will reduce costs and time of analysis. Moreover, experiments with animals and risky experiments will be reduced by use of computer simulations. Therefore, the symbiosis of computer science and biology has significance in the case of further economical and social development.

In the field of computer science and biology all activities of this interdisciplinary research area are called bioinformatics [3]. This definition expands related definitions. In the report of "Bioinformatics in Europe, Strategy for an European Biotechnology Information Infrastructure" (CEFIC, European Chemical Industry Federation, 1990) bioinformatics is defined as the "application of calculation, information- and communication technology into problems of biotechnology". This and other definitions do not contain the transfer of biological paradigms into computer science.

In this paper we will present actual tasks of the new research field of computer science and biology (bioinformatics). First we will present the main application areas of methods and concepts of computer science in biology. In the case of sequence analysis we will give a popular example. Secondly we will discuss the application of biological paradigms in the field of computer science. Finally, we discuss some important perspectives.

2. Applications of Computer Science in the Field of Biology

Methods and concepts of computer science are gaining more and more importance in the area of biology [3,4]. Hardware in combination with specific software and efficient algorithms is necessary to model complex structures, to simulate hypothetic systems, to control specific processes and to calculate, store and analyse biological data.

The main task of this interdisciplinary domain is to develop special analysis-tools in the field of biology. Today this is necessary because modelling, process

control, and the evaluation of experiments are complex. In section 3 this will be shown in the case of the human genome project [5]. The goal of this project is to sequence the complete human genome. All genetic units, which are sequenced, must be stored and worldwide data access must be available. In this area the main reason for the use of computer systems is the complexity of the genome which consists of $3*10^9$ base pairs (bp). The genome stores thousands of specific DNA (deoxyribonucleic acid) functional units, which represent special metabolic functions. Moreover, analysis of this DNA fragments in function and structure can only be done using efficient algorithms and supercomputers.

2.1 Modelling and simulation

Today in the workfield of biology the main task is to analyse biochemical mechanisms. This is done by observation, experiments, data collection and analysis of this data, which allow to deduce specific hypothesis. Complex systems can be analysed through specific abstractions into essential components of this system. These processes of abstraction produce a model, which can be interpreted as a specification for a simulation program. A model and its implementation as a simulator allows us to deduce hypothesis, which must be verified by specific experiments. Therefore, modelling and simulation represents a fundamental component of scientific tools, because virtual experiments can be realized. In the field of biological analysis modelling and simulation is not a new research field, because biomathematics and biophysics are well established. However, methods and concepts of computer science expand the workfield of modelling and simulation, because formal languages, automata, data structures, visualization and animation are suited in this domain of research.

In this sense modelling and simulation of cell differentiation processes present a popular example using formal languages. Lindenmayer defined specific parallel grammars, which are able to simulate such processes [6]. However, supercomputers and new methods of computer graphics allow impressive visualization and animation of Lindenmayer systems.

2.2 Expert systems

These are specific computer programs which simulate the knowledge of experts [7]. Such systems contain knowledge of rules and facts. Any user of an expert system is able to profit from the specific knowledge of this system. The main task of any expert system is to give specific advice. MOLGEN is a popular example in the field of molecular biology. This system was developed to model the Jacob-Monod regulation model and the regulation of the Trypthophan operon [8].

2.3 Data base system

In the field of biology the usage of modern techniques produces an exponential increase of biological data [4]. This data must be stored and analysed. Conventional methods are not sufficient to solve this task. Therefore, in the field of biology new methods of data representation which allow the comfortable worldwide data access are needed. This is the reason for developing specific software tools, which represent and analyse biological data. In section 3 important data base systems for nucleic acid sequences will be mentioned.

2.4 Graphical data processing

Computer graphics are useful to visualize complex processes in two or three dimensions. Thanks to the methods of computer graphics it is easy to visualize biological processes. A popular example in this case is the research field of molecular design [9]. The goal of molecular design is to realize the computer aided design of specific proteins, which will represent specific metabolic functions. Today it is known that the function of a molecule is based on its structure. Therefore, computer aided support and analysis of the structure of biomolecules are of great relevance. However, solving problems in the domain of prediction of molecular structure is extremely complex [9,10]. Scientists believe that solving this problem will take more than 20 years. Up until now nearly 350 different protein structures have been analysed using biochemical methods. Classical methods, which work on the basis of energy minimization or the simulation of molecular movements, are not useful for the prediction of the molecular structure, because complex biomolecules consist of millions of atoms. In the case of complex molecules the classical methods will fail, because the computational time increases in an exponential way depending on the number of atoms [9,10,11]. The research field of computer science presents a large field of techniques for solving these problems, for example specific methods of clustering, hierarchical methods and techniques of artificial intelligence. Neural networks, genetic algorithms and methods of pattern matching are applied in this field of research [2,3].

2.5 Information systems

Electronical networks realize the discussion within a circle of experts, which can be done immediately and also worldwide. In the field of biology the BIONET network is popular. Moreover, expert systems and data base systems are available via information networking. The implementation of integrative data base systems, which connect for example genes, enzymes and metabolic pathways, is in progress.

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integrated systems

2.6 Supercomputers

Unfortunately, in the field of biology many problems represent an enormous complexity in time (instructions per second) and space (memory space). Moreover, the exponential increase of biological data requires the use of supercomputers [4]. Many biologists do not realize that unsolvable and solvable problems, which represent an enormous complexity and are not practically solveable (intractable problems), still exist.

3. Example: Sequence Analysis and the Human Genome Project

A chemical sequence of molecular units is called a biomolecular sequence [12]. Amino acids of proteins and nucleotids of deoxyribonucleic acid (DNA or RNA) are popular biomolecular sequences. The basic unit of DNA (RNA) is called nucleotide, which consists of sugar, phosphor and a specific base unit (Adenine, Guanine, Cytosine or Thymedine). Since 1944 it is known that the DNA (RNA) represents the storage of the genetic information, which is coded by the linear sequence of the specific base units. Therefore, the genetic information can be interpreted as a string over the alphabet {A,T,G,C}. Each cell of a living system contains the entire genetic information (neurons are the exception). The sum of all genes is called the genome. The genetic information will control metabolism indirectly. Therefore, the information of specific genes (structure genes) will be copied (transcription process) and translated (translation process) into the language of peptides. Since 1966 the so called genetic code is known [12]. Triplets (three bases) will be translated into one amino acid. However, nature uses 20 different amino acids. Therefore, the genetic code is a degenerated code. Proteins could act as specific cell material or enzymes, which control metabolic processes. The analysis of biomolecular sequences can be divided into two main groups. Software must be developed to support

- the task of chemical and biological determination of the sequence of molecular units and
- the task of analysis of biological data.

The goal of the human genome project is to sequence the human genome, which consists of $3*10^9$ nucleotides, within the next 10 years [5]. This data corresponds to 400 books which consist of 1000 pages with the four letters A (adenine), T (thymedine), G (guanine) and C (cytosine). The first step is to divide the genome in small fragments. This can be done using specific enzymes, which are called restriction enzymes. These fragments can be sequenced automatically. This process produces a set of words formed from the alphabet {A,T,G,C}. However, it is necessary to rebuild the genome sequence (restriction card) using computer systems. The first sequenced data was managed by special filling cards [4]. But the progress in the field of sequencing biological structures led to the exponential increase of this data. Therefore, electronical data management was necessary. Today there are nearly 60 biological data base systems available. In the domain of nucleic acids (DNA, RNA) three systems are outstanding: EMBL (Heidelberg), Genebank (USA), and JJDB (Japan) [4]. In the case of protein sequences MIPS (München), SWISSPROT (Schweiz), and PIR (Japan) are of importance [4].

The amount of sequence data exceed the data of molecular structure. Nearly 40.000 protein sequences with 9 million amino acids are known. The nucleic acid data bases are more complex. However, the EMBL data base represents 72.481 sequence entries or 34.390.065 nucleic acids (release 31). These sets of data make plain that it is necessary to use methods and concepts of computer science to realize efficient sequence analysis.

4. Speed-up Discussion

Many relevant sequence analysis algorithms represent a polynomial complexity in time and space (for example: the time complexity of the prediction of the RNA secondary structure is n^3, where n describes the length of the sequence [15]). Many problems with polynomial time complexity can be transformed into the domain of practical solvable problems by using supercomputers, methods of automatic parallelization and efficient algorithms. Therefore, we have to use the algorithmical speed-up by the use of parallel algorithms and the multiprocessor speed-up by the use of massively parallel systems.

4.1 Speed-up methods

In the case of computer science there are four methods to produce speed-up values.

- Technology
  Progress in technology has produced a linear speed-up. Since 1950 it has been known that there is a speed-up factor of 10 after 5 years.
- Super Compilers - Vectorization
  Automatic parallelization is possible in the case of For and While loops. Vectorization is based on the methods of data parallelization. This method allows a significant speed-up, if the problem and the used computer system is suitable [16,17].
- Parallel Algorithms
  The parallel random access machine (PRAM) [18] and the cellular automata [19] are popular examples, which represent the parallelization of processes. The maximum speed-up of this kind of parallelization is n, where n describes the account of processes (processors). In this research field Amdahl postula-

ted his law, which says that the speed-up of the parallelization of processes is log (n).

- Alternative models of computation
  To transfer complex problems (exponential time/space complexity or more) into the domain of practically solvable problems, we have to design a new algorithm concept. Today heuristic concepts which produce approximative solutions are discussed. Genetic algorithms and neuronal networks are of interest [1,2].

4.2 Prediction of the RNA secondary structure

In this section we demonstrate that there are analysis problems, which are practically solveable, if we use modern methods and concepts of computer science. The complexity of the sequential algorithms to solve the prediction of the RNA secondary structure is n^3 in time and space [20]. This complexity could cause problems, because relevant sequences contain 10^4 - 10^5 bp. Therefore, it is necessary to compute 10^{12} (10^{15}) = I instructions. Table 1 shows the complexity of a processor which represents 10 MIPS. In the case of a linear speed-up value specific problems can be transferred into the domain of practically solvable problems (see table 1). Therefore, the algorithmic speed-up and the multiprocessor speed-up reduce the time complexity of the RNA folding problem from $O(n^3)$ to $O(n^3/K)$, where K is the number of processors.

O(n) \ n	500	2000	100000
n2	0.03 sec	0.2 sec	ca. 16 min
n3	12.5 sec	13.4 min	ca. 3 years
n3/k	ca. 0.2 sec. (<0.1 sec.)	12.5 sec (6.25 sec.)	ca. 18 days ca. 9 days

Table 1: The complexity of practical relevant sequence analysis problems.

It is important to note that the data base entries of EMBL e.g. are of length 200 - 3000 bp. Moreover, a eucariotic gene normally represents 2000 bp. Therefore, the methods of parallelization lead to a practical solution for many sequence analysis problems.

4.3 Tasks in the field of sequence analysis

The main task is to develop a new data base system. In this field of research the concept of object oriented data base systems is discussed. Moreover, it is necessary to develop and implement new and efficient sequence analysis algorithms. In this case the application of parallel systems is important. Therefore, heuristic methods and approximative methods are in use to solve complex sequence analysis problems.

Furthermore, computer scientists develop hardware components. In this field of research the development of a sequence-co-processor is popular. The main idea of this application is to implement complex sequence analysis algorithms in hardware [21].

5. Biology in the Field of Computer Science

Special methods, which were developed for the analysis of biological systems, found their application in specific domains of computer science. In this way the history of finite automata, cellular automata and Lindenmayer systems could be reduced to the modelling of biological systems. Moreover, specific transformations of analysed biological mechanisms of complex systems produced biological paradigms in the field of computer science. In this sense approximative methods as genetic algorithms and neural networks are discussed [1,2]. These new concepts are important in the domain of parallel computing, because they are based on the local communication principle. This is the reason for using these concepts in the case of massively parallel systems.

5.1 Indirect influence

For the analysis of biological systems it was (is) necessary to modify or define formal systems in the field of computer science. Some of these methods reached an independent state of development in the field of computer science.

- Finite automata
  In 1943 McCulloch and Pitts developed a new formalism in the case of modelling neural networks. They developed the finite mathematical system [22]. This system was expanded by Kleene when he defined the finite automata [23]. The finite automata is a fundamental theoretical method in the field of computer science. However, the lexical analysis of a compiler system is a popular example.
- Cellular automata
  Forty years ago Ulam and v. Neumann defined the concept of cellular automata [19] in the field of modelling neural networks and self-reproduction systems. Conway defined a popular cellular automaton which is called 'life game'. The cellular automaton was the first universal parallel computational model.
- Lindenmayer system
  Lindenmayer defined parallel grammars to describe and model cell differentiation processes [6]. Today such systems are used to produce complex structures in the field of graphical data processing.

5.2 Direct influences

In the field of computer science it is important to develop new algorithm concepts. Today we can see two areas of research, which are the theoretical approach and the experimental approach. The theoretical approach tries to develop new concepts which rise from

discussed methods. This allows the comparison of new and old models and the deduction of speed-up theorems. The experimental approach tries to postulate new methods, which represent approximative concepts and important ideas of these definitions based on the analysis of biological components.

5.2.1 Genetic algorithms

These are adaptive algorithms, which simulate the analysed evolutionary strategies [2]. In the domain of parallel data processing this method is of interest, because it can be implemented with the principle of local communication which is a basic element of massively parallel computation.

Genetic algorithms consist of a set of 'individuals' (population). Every individual is represented by a specific 'chromosome'. Each 'chromosome' represents a solution or strategy. The population will pass through a generation cycle which simulates evolutionary strategies like mutation, genetic operations and selection. The termination of a genetic algorithm is defined by two events:

- reaching the maximal generation rate or
- reaching a solution or strategy in the actual population which represents a local optimum.

5.2.2 Neural networks

These are massively parallel adaptive algorithms, which simulate the analysed functions of neural networks. A basic application was given by Hopfield and Tank [1]. In this approach the neural network topology is realized by specific nodes. These are amplifiers, which represent neural cells, resistances, which represent the connections between the neural cells, and condensators, which stabilize the tension of the neural cells.

The behavior of a neural network is defined by the behavior of the representing nodes. The behavior of such networks can be described by differential equations of their energy functions. For every problem it is possible to design a specific neural network with its own energy functions. It is the task to find stabile states in the neural network. This could be done by the differentiation of the energy functions.

6. Bioinformatics and Perspectives

In the case of the human genome project the perspectives using methods and concepts of computer science are impressive. The first step is to develop new data base systems and efficient analysis algorithms. The second step is to discuss the phenomena of gene regulation. The formal description of DNA structures in syntax and semantics will be important for simulation and deduction of hypothesis.

In the research field of computer science the perspectives are far reaching. In the field of 'molecular computing' analysis and formal description of the cell will produce important innovations. This may lead to new and efficient alternative computational models, which will expand the domain of practically solveable problems.

Moreover, biotechnology will gain ascendancy over the development of computer science. For example in the domain of biosensors or more hypothetically in the field of molecular chips we can await revolutionary effects [24,25,26]. A very important application of biotechnology will be the detection of genetic diseases. Therefore, theoretical methods and concepts must be developed. This new research field is called metabolic engineering.

6.1 Biosensors

The function of a biosensor is based on the interaction between biological and microelectronical components. Enzymes and antibodies are placed between the electronical circuit and a membrane. Antibodies and enzymes are able to come into a chemical reaction with the chemical substance the biosensor is due to control. In the membrane of the biosensor this chemical reaction induces a current, which will be measured by a microelectronical circuit and represents a measure of the concentration of the analysed substance.

A popular example for the application of biosensors is the measuring of penicillin molecules. This specific biosensor represents enzymes of penicillinase in its membrane. If penicillinase gets into contact with penicillin a chemical reaction is introduced which will release H^+ particles. This will induce a modification of the distribution of the charge to the membrane of the biosensor which will be measured by the microelectronic circuit.

6.2 Molecular Chips

In the field of molecular biology, researchers are discussing the realization of logical circuits through biomolecules. In this area of research it will be tested to implement the functional properties of a transistor by biomolecular features. The goal is to produce a molecular circuit. This will produce a maximum of minimalization in the case of chip design. Minimalization is a main problem in the field of chip design. Another challenge is to reduce the degree of heat of electronical circuits. Molecular chips will cancel this problem.

In 1974 A. Aviram and M. Rattner [26] presented a molecule which bore the features of a transistor. This molecule consists of a donator, an acceptor and an isolator. The donator is able to set electrons free (Tetracyanochuinodimethan TCNQ) and the acceptor is able to take up an electron. The isolator prevents the

overflow of electrons without needing to change the electrical field. The advantages of molecular chips are:

- minimization of the surface of the chip, the surface of a molecular chip will be $0.2*10^{-9}$m in the length and $0.1*10^{-9}$m in the width and $0.05*10^{-9}$m in height,
- the degree of heat will be no problem,
- biotechnological production of molecular chips is possible.

6.3 Metabolic engineering

The main goal of biotechnology is to modify the phenotype by recombination of the genotype using methods of molecular genetics. In this field of research theoretical problems must be solved. However, methods of molecular genetics allow to isolate, sequence, synthesize and transfer genes. Gene transfer can be realized using specific vector elements, which are virus and plasmid genomes. These methods do not allow exact modification of the genotype. The transfer of specific phenotyps and features into organisms can be realized using methods of gene recombination. In the first step specific genes, which represent the desirable phenotype (for example body length), must be isolated and integrated into a specific vector genome (e.g. Ti-plasmid). Gene transfer into the organism will be realized by infection of the vector molecule. Therefore, the recombinant will represent the corresponding phenotype of this gene. In this domain of research experiments using plants and animals are done successfully. A well known example is the so called 'super mouse' [12], which contains the growth gene of the rat. Expressing this gene the body length of the 'super mouse' is double the length of a mouse. A popular research field is to identify genetic defects which will produce metabolic diseases. It is the goal of human genetics to repair such defects using methods of biotechnology. The task is to identify and modify defect genes. However, in the case of experiments with rats gene defects could be repaired using methods of biotechnology.

The first step for the responsible use of these methods is the analysis of genetic maps and the progress of gene transfer methods. However, the main problem is the regulation of genetic activity. This is the reason that cellular control mechanisms are analysed in the field of molecular genetics and biotechnology. Metabolism represents a highly connected system of biochemical reactions, gene regulation mechanisms and cell communication processes. In this domain of research metabolic engineering is a new part of biotechnology [27]. The goal of metabolic engineering is to modify metabolic pathways or to create new metabolic pathways using methods of biotechnology and theoretical biology. This can be done adding substances, enzymes or genes. Therefore, the main task is to develop specific models and simulators, which will allow to modify and define new metabolic pathways. In the research field of modelling and simulation of metabolic processes rule based systems are useful [28]. Rules represent biochemical processes, gene regulation processes or cell communication processes which are connected together by their components. Using configurations potential metabolic states (concentrations of metabolites) can be derived. The actual cell state is defined by a set of metabolite concentrations. However, the actual cellular state will activate different rules. The action of such activated rules will produce new cellular states (derivation), which can be interpreted as specific successor states. The simulation of such rule based systems allows the implementation of interactive simulation environments. The user is able to modify the actual configuration and the rule set after every derivation step. The features of this system, which was implemented as a prototype at the university of Koblenz [29-32], allows the analysis and synthesis of metabolic processes.

7. Discussion

Methods and concepts of computer science are used in many working areas. In the research field of biology analysis of living structures is the main goal [12]. The classical methods of biology are observation, data collection, derivation of hypothesis and experiments. The stand of view is that new methods produce enormous data sets, which must be stored and analysed using computer systems. Moreover, experiments are becoming more and more complex. Therefore, a lot of experiments are planed and controlled using specific computer systems. The interpretation of experiments is also supported by the use of computer systems. In many cases experiments can not be done in practice. Therefore, simulation and modelling is important, which is not a new analyzing tool, but methods of computer science present new concepts and the application of graphical tools and supercomputers allow the visualization and animation of biological mechanisms [3,9]. Using these methods experiments in hypothetic space can be realized, which allow to deduce hypothesis. Therefore, in the research field of biology progress depends on the application of concepts of computer science. On the other hand the influence of biology is of interest in the research field of computer science. The history of computer science shows direct and indirect influence of biology. Direct means that computer scientists are looking for innovations which will help solving their problems. In this domain of research genetic algorithms and neuronal networks are popular. These new methods solve intractable problems by approximate strategies. Moreover, indirect innovations are visible. Analyzing the phenomena of gene regulation and neu-

ronal networks cellular automata, Lindenmayer systems and finite automata were defined.

The domain of these activities is called bioinformatics [3]. In comparison with the research field of bioinformatics in USA and Japan, the difference is that bioinformatics in Germany contains also the interaction of biology and computer science. In Germany connections between universities and research laboratories are just building up. Moreover, the German ministry for research and technology has developed a furtherance strategy in the domain of molecular biology, which is based on the computer aided analysis of biomolecular sequences, structures and processes. This concept was presented in September 1992 and is based on a budget of 36 million DM which will have a currency term of five years. Moreover, the German ministry for research and technology finances a project in the domain of evolutionary computation (12 million DM). A new concept in the domain of sequence analysis will be started.

The German Society of Computer Science responded to this situation. At the beginning of 1992 they founded a new working group which is called '*Informatik in den Biowissenschaften*' (GI-FG 4.0.2). The goal of this working group is to close the gap between computer science and biology which was emphasized by the ministry of research and technology. The goals of this working group are:

1. to involve biotechnology research and methods of computer science,
2. to develop new foundations, methods and tools to solve problems in the field of biology and
3. to increase the innovative interactions between biology and computer science.

However, this group has already organized different workshops and conferences. The first international conference of this group will take place in Leipzig 1996.

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ASIM

ASIM (*Arbeitsgemeinschaft Simulation*) is the association for simulation in the German speaking area. ASIM was founded in 1981 and has now about 680 individual members.

Report from ASIM

Industry sessions at EUROSIM'95 in Vienna: ASIM plans to organize special so-called **industry sessions** for the first time at the EUROSIM conference. The concept is:

- A special subject will be covered on one day. As a five day conference is too long for many participants coming from industry, this will allow to visit the conference only for one or two days.
- Each session will be organized by one or two responsible persons.
- Speakers should come mainly from industrial companies. They should only report from special projects done in or for industry.
  They do **not have to publish** a paper in the proceedings. The session organizer is completely responsible for quality and suitability of the session. If a speaker **wants to publish** a paper it has to pass the review procedure.
- The session should cover the complete day (at least 10 speakers). A round table discussion at the end of the day would help to collect results.

Dr. Ingrid Bausch-Gall will organize a session on the topic *"Model Exchange, Simulator Backplane, VHDL-A"* for Wednesday, September 13th. Please contact her if you are interested to submit an abstract for this session.

A second session on *Mechatronics* will be possibly organized by ASIM for September 14th. If you are interested to submit an abstract or to help with this session please contact Dr. Bausch-Gall as well.

It is planned to organize such **industry sessions** also at future ASIM conferences.

The next meeting of the ASIM board will be on April 4th, 1995 in Frankfurt. Please feel free to contact a member of the board if a special subject should be discussed.

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ASIM Meetings to come

March 22-23, 1995: Meeting of the working group *"Simulation in der Fertigungstechnik": Simulation - rechnerunterstützte kontinuierliche Verbesserung*. Contact: Prof. Kuhn (address see below)

March 27, 1995: *Simulationssoft- und Hardware zur Lösung technischer und produktionsorientierter Probleme*. Contact: Prof. Möller (address see below)

April 5-6, 1995: 8th Workshop *"Simulation und Künstliche Intelligenz"* TH Darmstadt. Contact: Prof. Szczerbicka (address see below)

September 11-15, 1995: EUROSIM Congress at TU in Vienna.

March 1996: *7. Ebernburger Gespräche*. Contact: Prof. Richter (address see below)

September 23-26, 1996: ASIM 96, *10. Symposium Simulationstechnik* in Dresden. Contact: Michael Schebesta, DUAL-ZENTRUM Dresden, Gillesstraße 2, D-01219 Dresden

Meetings with ASIM Participation to come

September 21-22, 1995: *Simulation und Simulatoren für den Schienenverkehr*, München. Conference Languages are German and English.

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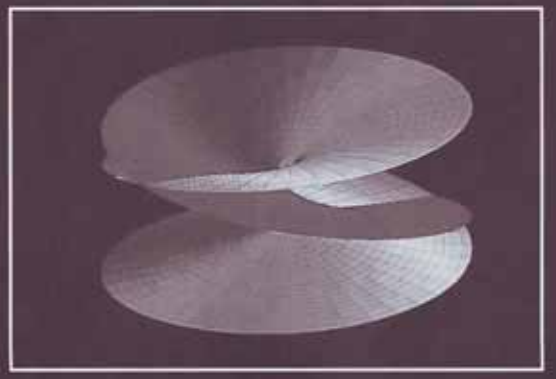

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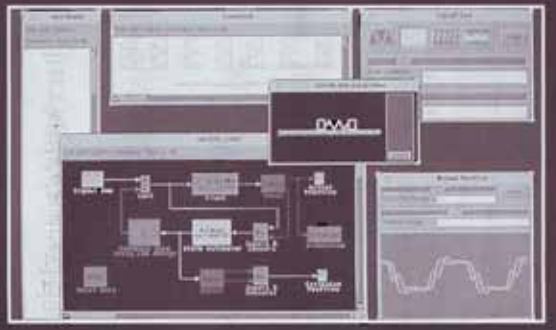

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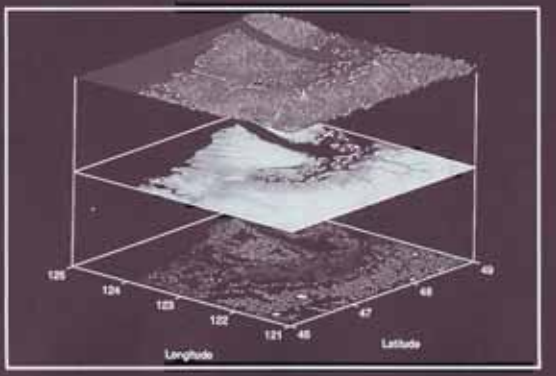

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Report on 9th Symposium on Simulation (ASIM 94), Stuttgart, Germany, October 10 - 13, 1994
by G. Kampe

This Symposium has been co-organized by two academic institutions in the Stuttgart region: University of Stuttgart and *Fachhochschule für Technik Esslingen*. It was the annual conference of ASIM, sponsored by GI (*Gesellschaft für Informatik*).

About 300 participants came to Stuttgart to select their menu of mainly application oriented presentations out of 5 parallel sessions. 124 papers had been carefully selected. Special emphasis was laid on such application areas as automotive systems, traffic, mechatronics, electronics, and production systems. Further topics were modelling, building services simulation, fuzzy logic, medical systems, and neural networks.

Five invited speakers focussed the interest on the following titles: Modelling and Simulation of Molecular-Genetic Processes, the Daimler-Benz Driving Simulator, Simulation of Chemical Process Control, Model-Interfaces of Simulation Programs, State-of-the-Art in Simulation in Russia. The 750 pages of the Proceedings reflect the broad range of simulation in theory and application, and re-present the current state-of-the-art in simulation. The Proceedings have been published by Vieweg Verlag, Wiesbaden, Germany.

At the first day of the symposium various user group meetings had been arranged: ACSL, GPSS, MATLAB, MATRIXx, SIMAN/CINEMA/ARENA. In three tutorials short courses were offered on Interactive Hardware-in-the-Loop Simulation, Simulation in Mechatronics, Simulation and Animation. During the symposium the participants could study advanced simulation tools "life" at the exhibition, where 18 companies presented their products.

One evening all participants travelled by metro to the Rems Valley Vineyards, where a visit of the caves and a typical swabian dinner had been prepared. Another evening had been reserved for a special tour to the Stuttgart Carl-Zeiss-Planetarium, where the chief-scientist explained and operated that rather complex galactic system simulator, which also serves as training facility for astronauts.

Thus the scientific as well as the social events created an atmosphere where simulation experts and simulation beginners could exchange their problems and solutions and make friends within the simulation society.

Working Groups

"Simulationsmethoden und Sprachen für parallele Prozesse"

Speaker: Dr.-Ing. Peter Schwarz, Fraunhofer-Institut IIS/EAS, Zeunerstraße 38, D-01069 Dresden, Tel: +49-351 4640 730, Fax: +49-351 4640 703, Email:schwarz@eas.iis.fhg.de
Vice-speaker: Dr. Hans Fuss, GMD, D-53731 St. Augustin, Tel: +49-2241 143 125, Fax: +49-2241 143 006, Email: fuss@gmd.de

"Simulationssoftware und -hardware"

The working group will meet on Monday, March 27th, 1995 with the topic *"Simulationssoft- und Hardware zur Lösung technischer und produktionsorientierter Probleme"* at IBM Deutschland Speichersysteme GmbH, Hechtsheimer Straße 2, D-55131 Mainz. The workshop will discuss the state-of-the-art of software tools for the solution of technical and manufacturing problems and of the appropriate use of distributed clusters of hard- and software.

Speaker: Prof. Dr.-Ing. Dietmar P .F. Möller, TU Clausthal, Institut für Informatik, Erzstraße 1, D-38678 Clausthal-Zellerfeld, Tel: +49-5323 72 2402 or 72 2504, Fax: +49-5323 72 3572
Vice-speaker: Prof. Dr. Felix Breitenecker, Technische Universität Wien, Abt. Simulationstechnik, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel: +43-1 58801 5374, Fax: +43-1 5874211, Email: fbreiten@email.tuwien.ac.at

"Simulation und künstliche Intelligenz"

The next meeting of the working group will be on April 5/6, 1995 at TH Darmstadt on the topic *"Virtuelle Realität in der Simulation"*.

Speaker: Prof. Dr.-Ing. Helena Szczerbicka, Universität Bremen, Fachbereich 3 - Informatik, Postfach 33 04 40, D-28334 Bremen, Tel: +49-421 218 7389 or 7390, Fax +49-421 218 7385, Email: helena@informatik.uni-bremen.de.

"Simulation in Medizin, Biologie und Ökologie"

Die Ergebnisse des 6. Ebernburger Gesprächs mit dem Schwerpunkt "Umweltsystemanalyse-Umweltinformatik" werden, wie bei den vorhergehenden Ebernburger Gesprächen auch, im Informatik-Bericht der TU-Clausthal veröffentlicht. Die nächsten Ebernburger Gespräche finden turnusgemäß im März 1996 statt.

Speaker: Prof. Dr. Otto Richter, TU Braunschweig, Institut für Geographie und Geoökologie, Langer Kamp 19c, D-38106 Braunschweig, Tel: +49-531 391 5627 Fax: +49-531 391 8170
Vice-speaker: Prof. Dr. Björn Gottwald, Universität Freiburg, Fakultät für Biologie, Schänzlestraße 1, D-79104 Freiburg, Tel: +49-761 203 289,1 Fax: +49-761 203 2894

"Simulation technischer Systeme"

The 1995 workshop is held at Deutsche Aerospace Airbus GmbH (DASA) in Hamburg on February 20 and 21, 1995. The interesting program includes a presentation of DASA on realtime simulation, contributions of many participants, and a visit of the production area of the Airbus A321. An ACSL user group meeting is organized on Monday morning, speaker and vice-speaker are elected at the meeting on Monday evening.

Speaker: Prof. Dr.-Ing. Gerald Kampe, FHT Esslingen, Flandernstraße 101, D-73732 Esslingen. Tel: +49-711 397 3740 or 3741, Fax: +49-711 397 3763, Email: kampe@fhti1.ti.fht-esslingen.de
Vice-speaker: Ewald Hessel, Hella KG Hueck&Co., Abt. EL-R, Werk II, Beckumer Straße, D-59552 Lippstadt, Tel: +49-2941 38 8572, Fax: +49-2941 38 8427

"Simulation in der Fertigungstechnik"

The next conference of the working group titled *"Simulation - rechnerunterstützte kontinuierliche Verbesserung"* will take place at the University of Nürnberg/Erlangen on 22nd and 23rd of March 1995. The main conference topics will be the users benefits and future aspects of simulation technology. The program includes different sections concerning *factory segmentation and organization, machines and facilities, interpretation methods and integration aspects of simulation methods in planning and operation*. During the conference the working group will organize a membership meeting.

For a program contact: Frau Dipl.-Ing. E. Stief, Universität Erlangen-Nürnberg, Lehrstuhl für Fertigungsautomatisierung, Egerlandstraße 7, D-91058 Erlangen, Email: stief@faps.uni-erlangen.de

Speaker: Prof. Dr.-Ing. A. Kuhn, Fraunhofer-Institut (IML), Joseph-von-Fraunhofer-Straße 2-4, D-44227 Dortmund, Tel: +49-231 9743 132, Fax: +49-231 9743 234

"Simulation in der Betriebswirtschaft"

The *"5. Symposium Simulation als betrieblische Entscheidungshilfe, neuere Werkzeuge und Anwendungen aus der Praxis"* takes place on March 13 - 15, 1995 in Braunlage.

Speaker: Prof. Dr.-Ing. W. Hummeltenberg, Universität Hamburg, FB Wirtschaftswissenschaften, Bundesstraße 55, D-20146 Hamburg, Tel: +49-40 4123 4023, Fax: +49-40 4123 6435

"Simulation von Verkehrssystemen"

The 1995 workshop is held at Universität Magdeburg on February 22 and 23, 1995. It is organized by Dr. Schulze of the *"Institut für Simulation und Graphik"*. The working group meets on Wednesday evening for a dinner. The program on Thursday includes 6 interesting talks and a closing discussion.

The working group will participate as well at a conference of VDI on *"Simulation und Simulatoren für den Schienenverkehr"* in München on September 21-22, 1995. Conference Languages are German and English.

Speaker: Karl-Heinz Münch, SIEMENS AG, Bereich VT2 SYS, Ackerstraße 22, D-38126 Braunschweig, Tel: +49-531 226 2225, Fax: +49-531 226 4305

Ingrid Bausch-Gall

CSSS

With deepest sorrow we have to announce to all his friends that on October 9, 1994 at the age of 61 years Ing. Milan Kotva, CSc., chairman of CSSS left us forever.

Milan Kotva was a long-serving General chairman of the CSSS Society organizing workshops and conferences and other activities connected with Modelling and Simulation in the Czech and Slovak Republics. He was also chairman of the committee for Technical Cybernetics at the Czech Technical Society. During his scientific career he published some 30 articles and reports about simulation systems, especially in the field of methodologies in simulation of systems and applications modelling and simulation in medicine. He was the main instigator of the admission of CSSS to EUROSIM and was also the organizer of the European Multiconference '95 in Prague.

The community of simulation workers in the Czech and Slovak Republics have lost their main organizer and representative.

Let us honour his memory.

The Czech & Slovak Simulation Society is organizing a **Memorial** to Ing. Milan Kotva, CSc., with the title "Advances in Simulation Models Creation and Exploitation". The Memorial will take place on April 18 to 20, 1995 at Zabreh na Morave. The organizers are Jan Stefan and Mikulas Alexik. The topics are: New Simulation Software and Hardware, Modelling and Simulation in Education, Simulation and Fuzzy Systems, Applications in Engineering, Natural Sciences, Biology, Medicine, Econometrics, etc. Information and application forms may be obtained from Jan Stefan (address see below).

The University of Transport and Communications in Zilina will organize on May 16 to 17, 1995 in Zilina the second international scientific conference **"Computer Simulation of Technological Processes in Railway Transport"** under the patronage of the rector of the university and the general director of the Slovak railways. The main topics are: Railway Network Simulation, Simulation of Technological Processes Performed in Railway Stations, Timetable Creation, Train Movement Simulation, Current Projects in this Field.

For further information contact: Ladislav Skyva, Faculty of Management Science, University of Transport and Communications, 010 26 Zilina, Slovak Republic, Tel: +42-89-54042, Fax: +42-89-54806.

Contact Addresses

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E-mail: Jan.Sefan@vsb.cz

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E-mail: alexik@uvt.utc.sk

Mikolas Alexik

DBSS

General Information

The Dutch Benelux Simulation Society (DBSS) was founded in July 1986 for the purpose of creating an organization of simulation professionals within the Dutch language area. DBSS has actively promoted creation of similar organizations in other language areas. DBSS works in close co-operation with the EUROSIM members, and is affiliated with SCS International and IMACS.

DBSS-Membership

Both corporate entities (companies, institutes, etc.) in the Dutch/Flemish area of Benelux and individuals from anywhere are welcome to join DBSS as full cor-

porate or individual members. They receive 3 copies per year, free of charge, of *EUROSIM - Simulation News Europe*. Elsevier Science B.V. offers them a discount on the subscription fee of the EUROSIM journal *Simulation Practice and Theory*. They enjoy reduction of the fees attending congresses, conferences, symposia organised by sister societies of EUROSIM.

The membership fee amounts to just Dfl. 50,- or Bfr. 900,- for individual and the double for corporate members. Those interested in joining DBSS are invited to write to:

Dutch Benelux Simulation Society Secretariat:
Computing Centre
P.O. Box 354, 2600 AJ Delft, The Netherlands
Tel. +31-15 78 5698, Fax: +31-15 78 3787
E-mail: Zuidervaart@rc.tudelft.nl

(Please mention your name, affiliation and address and indicate whether you are interested in individual or corporate membership).

Membership fee 1995

Members of DBSS are kindly requested to pay their membership fee for 1995 on giro-account 3582241, J.C. Zuidervaart, Leeuwerikplantsoen 27, 2636 ET Schipluiden, The Netherlands, mentioning: DBSS membership 1995.

Coming Events

June 10-12, 1996, the international EUROSIM Conference "HPCN Challenges in telecomp and telecom; parallel simulation of complex systems and large-scale applications" will take place in Delft, The Netherlands. This International Conference is organized on behalf of EUROSIM by the Dutch Benelux Simulation Society (see information on page 32).

J. Zuidervaart

FRANCOSIM

FRANCOSIM was created in 1991 and aims to the promotion of simulation in research, industry and university fields. It has members from large French companies and famous Belgian and French universities.

Its legal seat and postal address are:
FRANCOSIM, Maison de la Productique
F - 42300 Roanne

Contact in France:
Michel Lebrun or Nathalie Sarles
Phone: +33-77 70 80 80, Fax +33-77 70 80 81

Contact in Belgium:
Francis Lorenz, Centre SOCRAN
Ave Pré Aily, B-4031 Angleur
Tel: +32-41 67 83 75, Fax: +32-41 67 83 00

A new system of annual fee has been adopted for 1995:
Individual fee: FF 275,-
Group fee: FF 1000 - giving right to 5 names, information and papers being sent to each of them
Student fee: FF 50- giving right to receive EUROSIM news via the university

Please remember that your annual fees are our main financial income and do not forget to renew it for 1995.

Events to come:

1. Workshop on continuous event simulation system: Meetings take place at ESIEE school, Cité Descartes, 2, bd Blaise Pascal, Noisy le Grand, Tel +33-1 45 92 65 00, Fax +33-1 45 92 66 99, contact: Prof. Hamam Yskandar. The object is to continue an analysis of simulation tools features, to distribute it by the end of March. In September, the exploration and distribution of results is going to take place. Organisation of numerical benchmarks of solvers for ordinary differential equations and algebro-differential equations. Schedule: meetings will take place from 14h to 18h at ESIEE school on: March 27th, May 4th, June 8th (to be confirmed), September 14th.

2. "*Théorie et practique des logiciels de simulation des Mécanismes*": Case study with two software products: ADAMS and IPG MESA VERDE, April 6-10, Contact: Mr. Fayet, INSA de Lyon, Département Génie Mécanique Construction, 20 ave A. Einstein, F-69621 Villeurbanne cédex, Tel: +33-72 43 83 08, Fax +33-72 43 85 25.

3. Discrete event simulation systems: Visit of Professor Jerry Banks in Clermont Ferrand on March 24th in: Institute Francais de Mécanique Avancée, Campus des Cezeaux, F-63175 Aubiere, contact: Professor H. Pierreval, Tel: +33-73 28 80 00, Fax: +33-73 28 81 00. Any person wishing to attend this event may contact Prof. Pierreval for organisation details.

4. User groups: ACSL: the next meeting will be in September 95. Matrix-x: the meeting is scheduled for September as well. Details will be given in the next issue of SNE.

At the last Member Council, suggestions were made for the creation of a working group about "modeling and simulation teaching". Any person interested to be involved in the setting up of this group will be welcome and can contact us for this purpose.

Nathalie Sarles

HSTAG

HSTAG (Hungarian Simulation Tools and Application Group) established in 1981 is an association promoting the exchange of information within the community of people involved in research, development, application, and education of simulation in Hungary and also contributes to the enhancement of exchanging information between the Hungarian simulation community and the simulation communities abroad.

HSTAG as a co-sponsor with IMACS/Hungary participates in the organization of the *IMACS European Simulation Meeting on Simulation Tools and Applications* to be held in Gyor, Hungary (half way between Budapest and Vienna) in August 28-30, 1995. The scope of the Conference will include methodological questions, presentation of simulation software tools and specific application issues aimed at the solutions of practical problems in various fields. The official language of the meeting and of the proceedings will be English.

Contact Address:

Prof. Dr. András Jávor (Chairman)
KFKI Research Institute for Measurement and Computing Techniques
H-1525 Budapest, P.O.Box 49, Hungary
Tel: +36-1 1699499, Fax: +36-1 1695532
E-mail: h7023jav@ella.hu

ISCS

General Information

The Italian Society for Computer Simulation (ISCS) is a scientific non-profit association of members from industry, university, education, and several public and research institutions with common interest in all fields of computer simulation. Its primary purpose is to facilitate communication among those engaged in all aspects of simulation for scientific, technical or educational purposes.

The affairs of ISCS are directed by a Steering Committee presently consisting of the following persons:

Franco Maceri	(chairman)
Felice Cennamo	(vice-chairman)
Vincenzo Grassi	(treasurer)
Mario Savastano	(secretary)

Membership

At present ISCS counts 132 members: 6 institutional, 4 honorary, 120 regular and 2 affiliate.

Charges per annum are Lit. 30,000 for regular and affiliated members and Lit. 400,000 for institutional members.

Contact Address

ISCS
c/o Dipartimento Ingegneria Elettronica
Università di Roma "Tor Vergata"
Via della Ricerca Scientifica
I-00133, Roma, Italy
Phone: +39-6 7259.4477, Fax: +39 6 2020519
E-mail: grassi@info.utovrm.it

Activities

The new steering committee intends to promote the following activities:

1. The sponsoring of the "Seminario di Informatica", a periodic scientific seminar held at the University of Roma "Tor Vergata". Main topics are simulation, performance evaluation, parallel and distributed computing, and high speed networks.

2. The organization of Working Group meetings among ISCS members interested in the same simulation field, in order to provide a forum for presentation of results, exchange of ideas and scientific discussions. At present, the following Working Groups have been established: Simulation in Industry and Management, Simulation in Agriculture and Environmental Sciences, Simulation in Training and in Education, Simulation in Biology and Medicine, Simulation in Electrical Engineering, Concurrent and Distributed Simulation, Software and Hardware for Simulation, Expert Systems and Simulation.

3. The organization of Summer Simulation Schools (ISCS S3 activity) with the aim of extending the knowledge about simulation theory, tools, and applications. To this end, they should be mainly addressed to graduate and PhD students or young researchers working both in industry and academia.

Michele Colajanni

AES

AES, Asociación Española de Simulación (Spanish Simulation Society), is an Observer Member of EUROSIM.

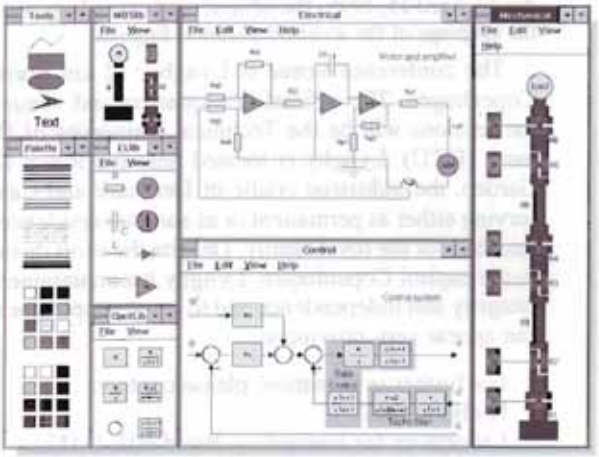
Contact Address: J.M. Giron Sierra
AES, Asociación Espanola de Simulación
Avda. San Luis 146, E-28033 Madrid, Spain
Tel: +34-1 394 43 87, Fax: +34-1-394 46 87
E-mail: gironsi@dia.ucm.es

Dymola

Dynamic Modeling Laboratory

four essential parts of object-oriented modeling

Dymola language promotes reuse of library models.
Dymodraw allows graphical model composition.
Dymosim for efficient continuous/discrete simulation.
Dymoview performs 3D animation and plotting.



Modeling of mechatronic system in Dymodraw.

Animation of simulation results in Dymoview.

Dymola™

Dynamic Modeling Language – translator:
- Automatic causality analysis
- Symbolic solution of equations and index reduction
- Solution of algebraic loops
- Automatic handling of time- and state events
- Output for Dymosim, ACSL, SIMNON, SIMULINK
- Generates Fortran or C routines

Dymodraw™

Dynamic Model Drawing:
- Graphical model editor and browser
- Drag submodels from libraries
- Parameter forms
- Connect graphically
- Icons – polygons, circles, text, color etc.
- Text editor for declarations and equations

Dymosim™

Dynamic Model Simulator:
- Handles ODE and DAE
- DASSL, LSODE, DOPRI, DEABM etc.
- Stiff models
- Linearization
- Proper treatment of time- and state events
- MATLAB interface

Dymoview™

Dynamic Model Viewer:
- 3D animation
- Boxes, spheres, cylinders – predefined visual classes
- Import of visual objects in DXF format
- Data from Dymosim, ACSL, MATLAB, Simnon
- Hidden surface removal, shading: special PC board
- Plotting

Additional information: Dr. Hilding Elmqvist · Dynasim AB · Research Park Ideon · S-223 70 Lund · Sweden
Phone: +46-46 182500 · Fax: +46-46 129879 · E-mail: Info@Dynasim.se
Available on PC/Windows and Unix/Motif.

Dynasim

SIMS

The Scandinavian Simulation Society, SIMS, has at present nearly 300 members from Denmark, Finland, Norway and Sweden. For 36 years SIMS has served as the regional society in Scandinavia, gathering individuals and organisations involved in simulation. The activities have been concentrated on arranging annual meetings and courses, delivery of information letters, and co-operation at European and international level in the field of simulation.

How to join SIMS

Just send an informal application or recommendation for membership to the SIMS secretariat:

SIMS
c/o Eija Karita Puska
VTT Energy, Nuclear Energy, P.O.Box 1604
FIN-02044 VTT, Finland
Tel: +358-0-4565036, Fax: +358-0-4565000
Email: eija-karita.puska@vtt.fi

SIMS'95 Simulation Conference in Lyngby, Denmark

The SIMS'95 Simulation Conference 'Simulation in Theory and Practice', will be held at the Technical University of Denmark, Lyngby (near Copenhagen), June 28-30, 1995. The aim of this conference is to cover broad aspects of simulation and scientific computation and will thus be of interest for model builders, simulator personnel, scientists, process engineers, mechanical engineers, vendors, etc. The scientific program will consist of technical sessions with submitted and invited papers, and is open for poster sessions and vendor demonstrations. A technical visit will be organized.

Conference Themes include, but are not limited to:Modelling Tools, Simulation Tools and Technology, Training Simulators, Real-Time Simulation, Oil- and Gas Reservoir Simulation, Process Plant Simulation, Simulation in Factory Planning, Simulation in Production Management, Simulation in Power Station Design, Simulation in Control Engineering, Simulation in Chemical Engineering, Simulation in Power Electronics, Simulation in Electronic Systems, Simulation of Marine Systems, Simulation of Energy Systems.

A large area will be available for demonstrations and exhibitions during the conference. Vendor demonstrations of commercial simulation systems are particularly welcome, as are poster presentations of simulation activities, commercial, non-commercial and student work. For demonstrations, video sessions, workshops or exhibitions in general, please contact the organizing committee.

The Program Committee consists of: Paul Rathje, DANFOSS A/S; Per Grove Thomsen, IMM,DTU; Peer Martin Larsen, STA,DTU; Niels Erik Larsen, SIMOS A/S; Stig Sand, Danish Maritime Institute; Kaj Erik Lindberg, LTT,DTU; Jan Reffstrup, LfE,DTU; Niels Houbak, LfE,DTU.

The Organizing Committee consists of: Paul Rathje, DANFOSS A/S; Peer Martin Larsen, STA,DTU; Niels Houbak, LfE,DTU.

The 500-word abstracts were already due January 17, 1995. The conference program and registration form will be published in March, 1995. Final versions of accepted papers are due by April 25, 1995. The official conference language and the language of the accepted papers is English.

The conference venue is Lyngby, 12 km north of Copenhagen. The official headquarters and venue for the sessions will be the Technical University of Denmark (DTU). Lyngby is located near the Royal Deer Garden, the industrial cradle of Denmark and Castles serving either as permanent or as summer residence for members of the royal family. Despite the short distance to the capitol Copenhagen, Lyngby has maintained its integrity and independence and to some people, the city can appear very provincial.

For further information, please contact:
Niels Houbak
Laboratory for Energetics, Build 403, DTU,
DK-2800 Lyngby, Denmark
Tel: +45-45933757, Fax: +45-45930663
Email: Niels.Houbak@lfe.dtu.dk

E.K. Puska

UKSS

UKSS95 Conference

The Society's second biennial national conference on simulation: UKSS95 is being finalised. It is being held between 19th-21st April 1995, at the Marine Hotel, North Berwick, Scotland. The 'Marine' is a Forte Heritage Hotel set in its own splendid grounds overlooking the golf course. North Berwick overlooks the Firth of Forth, and is a popular touring base, with many amenities. It still retains much of its ambience which made it an exclusive holiday retreat in the 19th Century. Delegates attending the Conference will find the Hotel spacious and comfortable giving them the feeling of 'getting away from it all'.

The program for the conference covers a wide range of both methodology and applications. Invited plenary speakers are Prof. Paul Luker (De Montfort University) who will be reviewing Continuous Simulation, and Prof. Ralph Huntsinger (California State University) who will be describing the McLeod Institute of Simu-

lation Science centers and the work that each is doing in the area of High Level Simulation Languages and Computer Simulation Environments.

If you are thinking of attending and would like to receive a registration form and details please contact the General Chair: Dr. Rob Pooley, Department of Computer Science, University of Edinburgh, Kings Buildings, Mayfair Road, Edinburgh, EH9 3JZ, U.K. (Fax: +44-794-833433, Email: rjp@dcs.ed.ac.uk) or the Progamme Chair: Prof. Russell Cheng, Institute of Mathematics and Statistics, University of Kent at Canterbury, Canterbury, Kent, CT2 7NF, U.K. (Fax: +44-227-475453, Email: R.C.H.Cheng@ukc.ac.uk). The Conference registration fee is 150 (GBpounds) for early registration, and is 170 (GBPounds) at the Conference. This includes lunches and the Conference Dinner.

Membership

The Society welcomes new members. The annual subscription is still only 20 GBpounds.

The Membership Secretary is
Mrs J. Elizabeth Rimmington,
Computer Centre, University of Brighton,
Moulescoomb, Brighton, BN2 4GJ, U.K.

Russell Cheng

Simulation of Continuous and Discrete Processes

COMETT Course
April 24 - 28, 1995, University of Glasgow

This course wthin the COMETT II program of the EU offers an introduction for engineers, scientists and interested people to modern methods for computer simulation of continuous and discrete processes. It is intended for participants with little or no previous knowledge of computer simulation methods but having a reasonably numerate background.

The course is an intensive course, consisting of introductury and special lectures and of guided and free exercises using simulation tools. The participants will receive various handouts and software demos and test versions. Lecturers are simulation specialists from University Glasgow, Technical University Clausthal, and Technical University Vienna.

Further information:
Prof. Dr. F. Breitenecker, Dept.Simulation Technique, TU Vienna, Wiedner Haupstraße 8-10, A-1040 Vienna
Tel. +43-1-58801-5374, Fax: +43-1-5874211,
E-Mail: fbreiten@email.tuwien.ac.at
Prof. Dr. D. Murray-Smith, Dept. Electronics and Electrical Engineering, Univ.Glasgow, Glasgow GL12 8LT
Tel: +44-41-330-5222, Fax: +44-41-330-4907,
E-Mail: D.Murray-Smith@elec.glasgow.ac.uk
Online Info: **<URL: http://eurosim.tuwien.ac.at/>**

CROSSIM

The Croatian Society for Simulation Modelling is co-operating in the conference **ITI '95**, 17th International Conference *Information Technology Interfaces*, Pula, Croatia, June 13-16, 1995.

ITI '95 is an annual international conference devoted to exchange of experience in research on computing, information systems, software engineering, artificial intelligence, modelling and simulation, information technology, statistics and related fields.

For information contact: Branka Radic, University Computing Centre, J. Marohnica bb, 41000 Zagreb, Croatia, Tel: +385-1 518 656, Fax: +385-1 518 451, Email: iti@srce.hr.

Contact Address:

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E-mail: vlatko.ceric@x400.srce.hr

LSS

LSS (The Latvian Simulation Society) was founded in 1990 as the first professional simulation organization within the republics of the former Soviet Union. Currently it consolidates about 40 members, mainly from the academic world. It reflects the fact that nowadays simulation activities in Latvia are concentrated mostly at universities. Namely, the level of these activities is traditionally high at the Riga Technical University and the Latvian University. Simulationists from exactly that universities in November, 1990 initiated setting up of the LSS. Later on they were joined by simulationists from the Riga Aviation University and, most recently, from the Latvian University of Agriculture.

At present the department of Applied Mathematics of the Riga Aviation Institute is interested in statistical aspects of simulation and modelling. The Institute of Informatics of the Latvian University of Agriculture uses simulation to design and investigate complex systems in agriculture (e.g., in food processing).

The current simulation activities of thr Department of Simulation and Modelling of the Riga Technical University will be reported in the next issue of SNE.

For further information please contact:

Dr. Yuri Merkuryev
President, The Latvian Simulation Society
Riga Technical University
1, Kalku Street
LV-1658 Riga, Latvia
Tel.: +371-2-324480, Fax: +371-8820094
E-mail: merkur@itl.rtu.lv

Y. Merkuryev

SCS

Report of 1994 Winter Simulation Conference

The 1994 Winter Simulation Conference, held December 11-14, 1994 in Orlando, Florida, continued the tradition of successful meetings. Sponsored by eight professional organizations, the conference is held annually in early December. At this year's gathering, over 660 attendees from industry and academia attended talks in three broad categories: applications, modeling/analyis methodology, and modelware/software. Hot topics included business process reengineering and manufacturing applications, although there was widespread attendance at methodology and software presentations as well.

Attendees also viewed the latest advances in simulation software displayed by more than 25 exhibiting vendors. WSC evening events featured an outdoor reception, hosted lakeside at the Walt Disney World Swan hotel; society and professional business meetings; and software vendor user meetings.

The 1995 conference will be held December 3-6 in Washington, D.C. For information related to submitting papers to WSC '95, contact David Goldsman (Program Chair) at the School of ISyE, Georgia Tech, Atlanta, Georgia, 30332; Tel: +1-404 894-2365; E-mail sman@gatech.edu.

Deborah A. Sadowski,
Systems Modeling Corp.

7th European Simulation Symposium, ESS 95
Erlangen - Nuremberg, October 25 - 28, 1995
Hosted by Friedrich-Alexander-University

Organized and sponsored by SCSI, The Society for Computer Simulation International, SiE Simulation In Europe.

Scientific Program: The 1995 SCSI European Simulation Symposium is structured around the following major themes: Simulation Methodology and Application * Computer and Telecommunications Networks * Dependability Evaluation * Analytical and Numerical Modelling Techniques * Simulation in Automation * Simulation in Business

Symposium: Mission Earth: Mission Earth is an Activity of the Society for Computer Simulation International. Its purpose is the identification and dissemination of the unique benefits of World Simulation as the prime tool for use in planning and monitoring a sustainable future for the World System.

Deadlines and Requirements: Extended Abstracts before **April 26, 1995**, Notification of acceptance or rejection will be sent by June 1, 1995, Camera-ready copy of the papers must be in by August 31, 1995.

Conference Information: Philippe Geril, address see below.

Letter from Philippe Geril[1]

Dear Simulationists,

It's been quite a while since you have seen this column from SCS. The intention is always there to write something but the work just seems to get the better of me. However, one of my New Year's resolutions has been to fill this column with each new edition of Simulation News Europe.

Last time, on SCS activities in Europe, we reported on the 1993 ESS in Delft. In between now and then a whole year of activities filled our calendar. For the first time SCS organised a conference on the use of simulation in concurrent engineering and electronics design automation (CEEDA'94). This first edition was held at the Haven Hotel in the lovely resort of Poole, the meeting rooms of which looked out on the windswept beaches and Poole harbour. Some 120 participants and 8 exhibitors converged on Poole from 14 countries for the 2 day conference. Under the tutelage of IBM and INTERGRAPH, the conference turned into a very intense scientific event with 87 presentations focusing on possible future developments in the field. In order to follow developments in the field, the CEEDA conference will be repeated on a yearly basis from 1996 onwards. The next CEEDA is scheduled for April 1996, and will be held at Robinson College in Cambridge.

The 1994 ESM, meanwhile, was organised at the Universita Politecnica de Catalunya under the excellent leadership of Prof. Rafael Huber and Prof. Antoni Guasch. This event turned out to be the biggest SCS conference in Europe since the ESM series was started in 1987. In total some 248 participants spent 3 jam-packed days of presentations (185 presentations in total) at the university. For me it was the first time, I could actually sit outside at a registration desk and not get wet or freeze to death, while registering people. The social programme, on the other hand made sure that all participants had the opportunity to get a good feel and to savour the atmosphere of Catalan hospitality, with a nocturnal city tour of all the spots Barcelona is famous for. The social event was held at the Palau de Pedralbas enlivened by a classical string quartet. At the 1994 ESM, the best paper award went to Helena Sczcerbicka and Michael Syrjakow, with their presentation" optimisation of Simulation Models with REMO. This being the second time within a span of 8 months that both authors captured this much vaunted European SCS prize, setting a target for all other authors to emulate.

August saw the birth of a first major new conference in the field of computer simulation, called CISS. (The First Joint Conference of International Simulation Societies). This event set up to wander the world combines the efforts of all known simulation societies in the world and to have them exchange simulation research results on a triennial basis. ETH Zurich was the venue of the first one with some 170 people taking part covering 17 simulation societies. The next one in the series is envisaged for 1997 at the Nanyang University of Singapore. For 2000, the venue the meeting is set to be held in San Diego.

SCS organises this year in Europe the following events:
April 11-12, MEDIACOMM 95, Southampton, U.K.
June 5-7, ESM95, Prague, Czech Republic
September 11-13, TECHNOMAN, Bruges, Belgium
ESS95, October 25-28, Erlangen, Germany

For further information on SCS activities in Europe, please contact: Philippe Geril, SCS, European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Belgium. Tel: +32.9.233.77.90, Fax: +32.9.223.49.41, E-mail: Philippe.Geril@rug.ac.be, Tel/Fax at home: +32.59.800.804. (HTML page will be available from end of February onwards).

Philippe Geril

[1] This report summarizes the events of the last year. Due to limited space part of this report will be published in the next issue

SiE

ESPRIT Basic Research Working Group SiE
(Simulation in Europe)

The Esprit Basic Research Working Group 8467 on "Simulation for the Future: New Concepts, Tools and Applications" with the acronym SiE-WG (Simulation in Europe - Working Group) started its EC-funded work officially on December 1, 1993; the duration of the working period is three years.

SiE has organized a 2-days Workshop on "Improving the Modelling and Simulation Process", which has been held on June 16-17, 1994 in Brussels. The purpose of the Workshop was to determine what topics future research in Modelling and Simulation should be focussed on. The final aim was to identify current problems and future solutions and to converge towards concrete suggestions and plans for joint basic research. The focus was on how to improve the modelling and simulation practice (and focus and bundle research) as to better serve the European industrial community. The workshop was built around three tracks: 1) Generic, Multi-paradigm Modelling, 2) Multi-language Modelling and Simulation, and 3) Modelling and Simulation Life-Cycle.

After the Workshop it was intended to prepare an extensive report in a couple of months. The first version of the complete report was finished mid January 1995, and sent to the European Commission, to all SiE-members and all members of the related Special Interest Group, for comment especially from the viewpoint of industrial applicability. The report is also sent to the holders of the SCS Chair in Simulation Sciences (University of Ghent, University of Salford (UK)) for comment. On the basis of the obtained comments, the report will be revised.

It was decided to start already with the treatment of the two other themes to be dealt with: theme 2 "New Application Areas, especially Underlying Techniques" and theme 3 "User-Simulator Interfaces". Issues of interest in theme 2 are parallel and distributed simulation, and simulation of multicomponent systems. It is felt that new and innovative applications could be based on multiple and co-operative agents and methods for direct mapping of multicomponent systems on highly parallel computers. Also, other sophisticated applications of parallel and distributed simulation are topics of consideration, e.g. in Distributed Interactive Simulation (DIS). The above-mentioned theme 3 "User-Simulator Interfaces" covers topics such as intelligent interfaces (knowledge-based systems and neural networks in simulation), scientific visualisation, animation and virtual reality systems.

It is intended to organize a workshop on the above themes 2,3 in April or May 1995.

Prof. Ghislain Vansteenkiste,
Prof. Eugene J.H. Kerckhoffs
(Chairmen of SiE)

SLOSIM

Activities

One of the beginning activities of our young organization is the presentation of modelling and simulation groups in Slovenia. The board discussed and proposed the following concept of presentation events:

General principles:

- 1. Presentation must be interesting for those dealing with modelling and simulation.
- 2. Presentation and the topics must be chosen so, that they are interesting for the majority of SLOSIM members, i.e. it must not be too specialized and theoretical.
- 3. Presentation should in the beginning part give an overall picture of the group, later it should be focused on modelling and simulation.

Concept of presentations:

- 1. The overall description of the group (location, units (e.g. laboratories), members of the group, activities (from the research and education point of view), important achievements (products, patents, papers, awards, Msc. and Phd. thesis, connections with domestic and foreign groups), projects, hardware and software equipment of the group.
- 2. Activities in the modelling and simulation area (methodologies, tools,...).
- 3. Examples, applications, case studies,...
- 4. What can the group offer to other groups in the sense of methodologies, tools, experiences...
- 5. Discussion about the group presentation.
- 6. Discussion about other society activities.
- 7. Visit of the laboratory, department, plant,...

Each such event will also be a topic for the SLOSIM board meeting.

The first presentation of this kind was held on October, 27, 1994 and presented the Laboratory for Simulation and Automatic Control (prof. R. Karba) Laboratory for Industrial Process Control (prof. D. Matko), Faculty of Electrical and Computer Engineering, University of Ljubljana. A report will be published in the next issue.

Further Events

SLOSIM is one of the co-operative societies in the organization of the IFAC meeting **International Workshop on Artificial Intelligence in Real-time Control.** The meeting will take place in Bled, Slovenia, from November 29 to December 1, 1995. It is sponsored by the International Federation of Automatic Control (IFAC) and cosponsored by IMACS and organized by the Automatic Control Society of Slovenia and the Technical Committee on Artificial Intelligence in Real-time Control.

Scope: This workshop is a continuation of a series of 5 very successful workshops and symposia in this field. The scope of this workshop includes the use of artificial intelligence in design, implementation, testing, maintenance, supervision and monitoring of real-time control systems. The objective of the workshop is to bring together control system specialists, artificial intelligence specialists and end-users. The technical program will include plenary survey papers, invited sessions and regular sessions. A small exhibition is foreseen.

Deadlines:

May 15, 1995	Submission of draft papers
September 1995	Notification of acceptance
October 15, 1995	Submission of final papers

Further information can be obtained from:
AIRTC 1995
Dr. Jus Kocijan
Faculty of Electrical and Computer Engineering
Trzaska 25, 61000 Ljubljana, Slovenia
E-mail: jus.kocijan@fer.uni-lj.si
Fax: 386 61 264 991, Tel.: + 386 61 1768 417

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Borut Zupancic

Turkish Simulation Society

The ESS Conference in October 1994 in Istanbaul functioned as the motor for setting up the Turkish Simulation Society. At present this society boasts 40 members, from academia and industry and up to date they have already had 3 meetings.

For more information on the society please contact

Professor Ali Riza Kaylan,
Bogazici University,
Dept. of Industrial Engineering,
80815 Bebek, Istanbul, Turkey
Tel: +90.212.263.1540 (ext. 2075),
Fax: +90.212.265.1800

USCS

The Ukrainian Society for Computer Simulation, recently founded, combines research activities and applications in many areas of smulation technique, e.g. : Simulation of continuous systems, Simulation of energy systems, Simulation of discrete systems, Simulation and computer supported planning, Methods and algorithms for distributed parameter systems, Simulation environments, Simulation in education.

The following institutes and departments joined USCS and organized the starting phase of the society: Institute for Cybernetics (Kiev), Institute for Simulation and Energy Techniques (Kiev), Institute for Conversion Problems and High Technologies (Kiew), the Universities Kiev, Donezk, and Charkov, the Technical Universities Donezk and Odessa, and the Politechnical Highschool Kiev.

Financial and organisatorial support for further acitivities is given also by the Federal Committee for Science and Technology. USCS intends to organize co-operation with EUROSIM and with ASIM.

President: Prof.Dr.-Ing. Anatolij Wezlan, Institute for Simuation and Energy Technique, Ukrainian Academy of Science of Ukraine, Kiev.
Vice President: Prof.Dr.-Ing.Vladimir Sviatnyi

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Book Review

Continuous System Simulation
D.Murray-Smith, Chapman & Hall,
London, 1995, 254 + x pages

This book provides an practical approach to modelling and simulation of continuous systems. It addresses people interested in an introduction to modern methods of computer simulation of continuous systems. It is intended mainly for readers with little or no previous experience of computer simulation methods but having a reasonably numerate background.

The book starts with an introduction to the principles of modelling and simulation methods. Then approaches for modelling are discussed: reduced and state-variable forms, transfer functions description, bond graph representations, block diagram methods, signal flow graph methods, and distributed parameter systems. The author concentrates also on the most fundamental divisions between linear and nonlinear models, and on time invariance.The following chapter gives a short overview about numerical methods. Numerical integration methods are briefly sketched, problems with stiff systems, with discontinuities, and with implicit structures are discussed from a practical view. The next chapter deals with modelling of sampled-data systems and with operator methods.

The presentation of simulation software starts with a chapter on the principles equation-oriented simulation software. The author sketches the CSSL'67 standard and the basic structure of CSSL languages. As example of a CSSL language the experimental language SLIM (Simulation Language for Introductory Modelling) is introduced. This language is provided with the book on a diskette, to be used on any DOS-based IBM-compatible personal computer. Most of the program examples and the case studies also can be found on the diskette. In the following examples of other simulation languages (CSSL IV, ACSL, DESIRE) show the common denominator of the CSSL-type languges.

The next chapter gives an overview on block diagram-oriented simulation tools. GUI's are briefly

sketched, and the relation of block diagram-oriented simulators (like XANALOG, MATLAB/SIMULINK, BIOPSI) to block diagrams in control technique. This part of the book closes with a chapter showing simple examples using common simulation tools (with SLIM models on diskette).

The next chapters present four simulation case studies, in order to highlight with non-trivial examples some of the problems that can arise in modelling and simulation.

The author is a well known specialist in validation of models and of simulation. Consequently, this book deals very seriously with validation - making the book an outstanding one amongst other good introductions to modelling and simulation. The author underlines that "the concept of garbage in, garbage out is true for simulation as much as it is of any other computer application", and concentrates on validation of models and of the simulation procedure itself. Consequently, parameter sensitivity analysis, methods for sensitivity co-system simulation, and internal verification and external validation are discussed.

The book concludes with a chapter on real-time simulation (dealing also with application in training and education) and with an outlook on the future sketching currend trends like AI in simulation and developments involving parallel structures and parallel hardware.

The book has to be highly recommended as introduction for students, engineers and scientist. But also the experienced "simulationist" may find valuable hints for solving certain problems.

F. Breitenecker

User Groups

First Meeting of the DSS/2 User Group

The software package DSS/2 is a common tool for solving problems in partial differential equations using the method of lines. A first meeting of users will take place at the Control and Mathematics Departments of the Faculte Polytechnique de Mons, Belgium, **June 28-30, 1995**.

The aim of the meeting is to provide a platform for discussions and presentations of DSS/2 applications and related problems. Plenary lectures will be given by Professor W.E. Schiesser (Lehigh University) who has developed DSS/2. Participants are invited to submit papers on DSS/2 applications and extensions.

For further information please contact:

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E-mail: vdw@autom.fpms.ac.be

Classes on Simulation

March 1995

28-29 ***Simulation mit SPICE***. München.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, D-80939 München, Germany, Tel: +49-89 3232625, Fax: +49-89 3231063

April 1995

5-7 **COMNET III**, CACI Training Course, Camberley, U.K.
Contact: CACI Products Division, Coliseum Business Centre, Watchmoor Park, Riverside Way, Camberley, Surrey GU15 3YL, U.K. Tel: +44-1276 671671, Fax: +44-1276 670677

24-28 **COMETT Course: Simulation of Continuous and Discrete Processes**. Glasgow, U.K.
Contact: Prof. Dr. D. Murray-Smith, Dept. Electronics and Electrical Engineering, Univ.Glasgow, Glasgow GL12 8LT Tel: +44-41-330-5222, Fax: +44-41-330-4907

25-26 ***MATLAB-Kurs***. München.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, D-80939 München, Germany, Tel: +49-89 3232625, Fax: +49-89 3231063

May 1995

2-4 CCG ***Kurs Simulation kontinuierlicher Systeme***. Oberpfaffenhofen, Germany
Contact: Carl-Cranz-Gesellschaft e.V., Postfach 11 12, D - 82234 Oberpfaffenhofen, Tel: +49-8153-28-2413, Fax: +49-8153-28-1345.

8-12 **MODSIM + SIMOBJECT**, CACI Training Course, Camberley, U.K.
Contact: CACI Products Division (see above)

September 1995

18-22 **COMETT Course: Simulation and Automatization**. Vienna, Austria.
Contact: Prof. Dr. F. Breitenecker, Dept.Simulation Technique, TU Vienna, Wiedner Haupstraße 8-10, A-1040 Vienna Tel. +43-1-58801-5374, Fax: +43-1-5874211

International Conference HPCN challenges in telecomp and telecom:
Parallel simulation of complex systems and large-scale applications
10 - 12 June 1996, Delft, The Netherlands
A EUROSIM Conference

Aim of the conference

In our lifetime an enormous revolution happens in the three dimensions of measurement, computing and communication. To have a lifetime global phone number, to get video and video printing on demand are coming under our reach. Add to this the developments in computing, as well as the developments in artificial intelligence and simulation, as they move towards becoming more powerful, intuitive and pervasive. The convergence of these technology trends is creating tremendous opportunities and new kind of products.

The High Performance Computing and Networking embedding measurement and control (extended HPCN) is going to require much more sharing of information and resources across commercial organizations.

This HPCN EUROSIM conference covers the categories: * High Performance Computing (HPC) * High Performance Networking (HPN) * High Performance Measuring, and sincerely invites people who try to get a profit with HPCN to be participant and -if possible- to submit a HPCN promoting paper.

Abstracts

You are invited to submit an abstract with a maximum of 2 pages before **1 May 1995**. Authors will be informed of the acceptance of their abstract before 1 **September 1995**. If you are interested in sending an abstract, please contact Congress Office ASD. The First Announcement/Call for Papers will be sent to you as soon as possible, containing the **Guidelines for authors**. The deadline for submission of your full paper is **1 January 1996**.

Exhibition

During the whole conference an exhibition, both commercial and scientific, will be organized. If you are interested to take part in this exhibition, please contact Congress Office ASD. They will send you detailed information on space, facilities and financial matters.

Second and Final Announcement

The Second and Final Announcement, with the registration form, contains detailed information concerning the scientific programme, hotel accommodation and will be issued in January 1996. Those who wish to receive this announcement are requested to contact Congress Office ASD.

On-line information

On-line information is available on:

<URL: http://www.twi.tudelft.nl/Conferences/ EUROSIM/ index.html>
<URL: http://eurosim.tuwien.ac.at>

Information and correspondence

Congress Office ASD
P.O. Box 40
2600 AA Delft
Tel: +31 15 120234
Fax: +31 15 120250
E-mail: HPCN-Eurosim@TUDelft.nl

Industry News

Powerful, Inexpensive New Scheduling Tool now on Market

Systems Modeling Corporation announced the release of PREACTOR 200, a powerful, yet low-cost, tool for finite capacity scheduling. PREACTOR 200 is a Windows-based scheduling system that can be configured for a wide variety of applications including: project management, job shops, and batch and process manufacturing. It can be used for projects ranging from short-term scheduling to project management to long-term planning. The package works as an electronic planning board and provides users with an easy interface for automatic scheduling, manual adjustments of schedules, and interactive changing of resource shift patterns. With PREACTOR, users can easily account for changes in demand such as new orders arriving, sudden changes in priority, and cancellation or completion of orders, as well as

changes affecting capacity such as bottlenecks, maintenance, breakdowns, sub-contractor activity, and under-utilized resources.

PREACTOR is equipped with an internal database that can be configured to meet users' specific needs and data structures. They also can incorporate information stored internally in systems such as sales order processing software or MRP systems. PREACTOR costs $3,900. PREACTOR 200 has been developed, marketed, and supported by a partnership between the CIMulation Centre, Ltd. of Chippenham Wilts, UK and Systems Modeling Corporation of Pittsburgh, PA.

Systems Modeling Corporation, 504 Beaver Street Sewickley, PA 15143 USA, Phone: +1-412-741-3727, Fax: +1-412-741-5635, E -mail: smcorp@mail.sm.com

Computerboards' ISA and PCMCIA Catalogs

ComputerBoards, Inc. of Mansfield, Massachusetts announces its 122-page Volume 7 catalog of hardware and software products for data acquisition. Accompanying this catalog is its companion Volume 8 featuring the widest variety of PCMCIA Type II cards available in the world. ComputerBoards pioneered PCMCIA technology for data acquisition and now offers this 34-page catalog of products.

Contact: Vincent Hebert, Marketing Communications, Phone: +1-508-261-1123, Fax: +1-508-261-1094

MODSIM III - The Object-Oriented Simulation Language

MODSIM III is CACI's complete rewrite of the MODSIM compiler. The MODSIM III environment was designed specifically for your successful development of advanced graphical, interactive, hierarchical models. It combines all the benefits of C++ with thirty-two years of experience with simulation going back to the still popular SIMSCRIPT II.5 language. Because MODSIM III generates readable C++, you can include C++ libraries in your model.

MODSIM III has the language constructs for capturing the behaviors of system components which have both concurrent and interacting behaviors in simulation time. It lets you build models that are hierarchical and interactive, allowing model users to monitor the simulation and interrupt it to change parameters. The model can be easily instrumented for statistics gathering. As animation can serve as both a debugging aid and an important vehicle for communicating results, the integrated graphics capability is essential. Selective run-time checking of object assessing, array bounds, and memory use are invaluable aids to software development.

Contact: Dominick Vigliotti, CACI Products Division, Tel: +44-43 670780, Fax: +44-43 670200.

Comparison 7 - ACSL

ACSL is a general purpose continuous simulation language that models systems described by time dependent, nonlinear differential equations and/or transfer functions. It runs on a wide range of computers, and programs created on one platform can be transferred to and run on any other platform.

Model description: The pendulum angular acceleration is calculated for both the nonlinear and linear models, with switch (RSW) to choose between them based on logical LINEAR. The SCHEDULE operator finds the point at which the pendulum hits the pin or loses contact from the pin and executes a DISCRETE section that adjusts the length of the string and the angular velocity and logs data for plotting. A second SCHEDULE operator finds the point at which the anglular velocity goes to zero and starts back in the positive direction. It executes a DISCRETE section that keeps track of the peak angle (i.e., largest negative value) during the run and logs data.

To solve the boundary value problem of task (c), logic in the TERMINAL section finds the peak angle (φ_{MN}), checks it against the desired peak, adjusts the initial conditions based on a specified gain, and sends control back to the INITIAL section to initiate another try. The iteration gain is calculated from energy considerations with damping neglected. Equating total energy, kinetic and potential, at the beginning and end gives:

$$mg\, l_z(1-\cos\varphi_z)+\frac{1}{2}m\, l_z^2\, \dot{\varphi}_z^2 = mg\,(l_z-l_p)\,(1-\cos\varphi_{MN})$$

Differentiating with respect to initial rate ($\dot{\varphi}_z$) and peak angle (φ_{MN}), we get:

$$m\, l_z^2\, \dot{\varphi}_z\, \Delta\dot{\varphi}_z = m\, g\,(l_z-l_p)\sin(\varphi_{MN})\,\Delta\varphi_{MN} \text{ and the gain: } \frac{\Delta\dot{\varphi}_z}{\Delta\varphi_{MN}} = \frac{g\,(l_z-l_p)\sin\varphi_{MN}}{l_z^2\,\dot{\varphi}_z}$$

Results: Task (a), The logic in the INITIAL SECTION allows to start from any initial position (fig. a).

Task (b): This model is programmed so that it can be run with either linear or nonlinear equations. For this study, data is collected from two runs and plotted together on the same plot. The differences between the two curves become distinguishable only by zooming in (fig. b).

Task (c): The logical SOLVE_MIN is set TRUE so that the iteration is started. The logged data are:

```
T 0.        FIDZDEG-10.0000000    FIMIN_DEG 5.5555E+33
T 0.        FIDZDEG-99.8192000    FIMIN_DEG-45.0904000
T 0.        FIDZDEG-124.5570000   FIMIN_DEG-74.8271000
T 0.        FIDZDEG-125.1080000   FIMIN_DEG-89.5926000
T 1.0000    FIDZDEG-125.1080000   FIMIN_DEG-89.9555000
```

The result $\dot{\varphi}_z$ = -125.108 deg/sec for a peak φ of -89.9555 deg is within the desired error criterion.

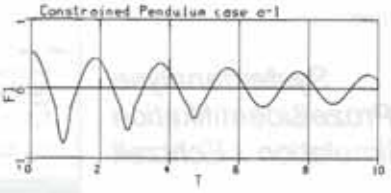


Fig. a

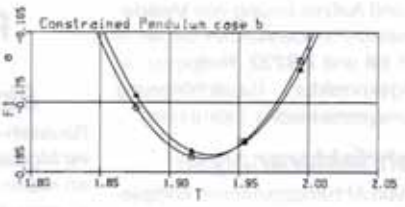


Fig. b

```
program comparison 7: Constrained Pendulum
 algorithm  ialg = 4;  cinterval  cint = 0.020
 maxterval maxt = 0.010; nsteps nstp = 1
 constant m = 1.02, g = 9.81, d = 0.02
 constant lz = 1.0,lp = 0.7
 logical linear, solve_min
 constant linear = .false., solve_min = .false.
initial
 constant fizdeg = 60, fidzdeg = 0.0, fipdeg = -30
 pi = 4*atan(1.0)
 iterate..continue
 fiz = fizdeg*pi/180; fip = fipdeg*pi/180
 fidz = fidzdeg*pi/180
 if((fiz - fip)*fip .le. 0.0) then ! initial length
     l = lz
 else
     l = lz - lp
 endif      ! initialise the minimum angular value
 fimin   = fiz
end ! of initial
derivative
 ! pendulum equations noninear/linear
 fiddn = -(m*g*sin(fi) + d*l*fid)/(m*l)
 fiddl = -(m*g*   (fi) + d*l*fid)/(m*l)
 fidd    = rsw(linear, fiddl, fiddn)
 fid     = intvc(fidd, fidz);  fi = integ(fid, fiz)
 schedule hit .xz. fi - fip
 schedule peak .xp. fid
 constant tstp = 9.99
 termt(t .ge. tstp)
end ! of derivative
discrete hit
 oldl = l
 if(fid*fip .gt. 0.0) then
     l = lz - lp
 else
     l = lz
 endif
 fid = fid*oldl/l
end ! of discrete
discrete peak
 fimin   = min(fi, fimin);  call logd(.false.)
end
terminal
 constant fimin_des_deg = -90, fimin_acc_deg = 0.1
 constant gainmx = 2
 if(solve_min) then
    fimin_deg = fimin*180/pi
    error_deg = fimin_deg - fimin_des_deg
    if(fimin .ne. fiz .and. abs(error_deg) &
          .gt. fimin_acc_deg) then
       gain = min((lz - lp)*g*sin(abs(fimin)) &
    /(lz*lz*max(abs(fidz), 1.0e-30)), gainmx)
       fidzdeg = fidzdeg - gain*error_deg
       call logd(.false.)
       go to iterate
    endif
 endif
end ! of program
```

Edward E.L. Mitchell and Marilyn B. Kloss, MGA Software, 200 Baker Avenue, Concord MA 01742 USA

Comparison 7 - Dymola

Short description

It is described how the constrained pendulum example can be solved within the equation-based object-oriented modeling environment Dymola.

In Dymola the model details can by formulated by ordinary differential equations and algebraic equations. The user needs not convert them to assignment statements. Discontinuities and instantaneous equations are allowed and properly treated by automatically generated event handling assignments in the simulation code.

Code can be generated automatically for different simulation environments, e.g. ACSL, Dymosim (DSblock), Simulink, and Fortran (DSblock).

Modeling

The Dymola code starts with the setting of the system parameters. Since the hit of the pin can be described by a state event, the event handling should be activated by the command "set Events on", i.e. logical expressions are transformed into state events.

The motion of the pendulum is given by the following equation

$$m\,l\,\ddot{\varphi} + d\,l\,\dot{\varphi} + m\,g\,\sin\varphi = 0$$

and also by the state condition: If φ is greater than φ_p the length of the pendulum is l_f, else it is $l_f - l_p$. This is directly the form to describe the model in Dymola (see Dymola code).

The model itself is instantiated by its system parameters. They describe the actual characteristics of the pendulum and the position of the pin. As outputs the angle φ and its first and second derivative in respect to time are selected. For the initialisation the logical variable `Start` is set to true.

After hitting the pin the angular velocity $\dot{\varphi}$ is defined with respect to the pin, else with respect to the suspension point. This means when φ gets smaller than φ_p and $\dot{\varphi}$ is negative (clockwise swing), the state $\dot{\varphi}$ is changing to $\dot{\varphi}\,\frac{l_f}{l_f - l_s}$. The inverse factor $\frac{l_f - l_s}{l_f}$ is used for the back swinging. The event is not performed during the initialisation phase (`START` = true). Again this is directly the form to describe it in Dymola. Note that the "when"-body is only evaluated when the "when"-clause becomes true.

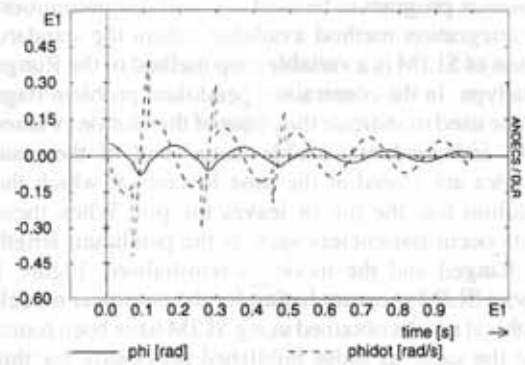
The partition command causes Dymola to generate the state space model of the system. The next commands in the Dymola code define the output file and the desired simulation environment.

In this example Fortran in DSblock format is chosen as output language for use within the ANDECS environment, where the simulations, linearisation and optimisation can be performed. Also ACSL and Dymosim simulation code could be generated, since both simulators support state events.

```
set
set Events          on
enter model
model pendulum
 parameter d = 0.2, g = 9.81, m = 1.02, lf = 1,
     lp = 0.7, phip = - 0.2618 (= -pi/12 )
 output  phi, phidot, phidotdot, l
 local   Start=true
 m*l*phidotdot + d*l*phidot + m*g*sin(phi) = 0
 phidotdot = der(phidot)
 phidot    = der(phi)
 l = if phi > phip then lf else lf - lp
 when (phidot < 0 and phi < phip)                ->
  or (phidot > 0 and phi > phip) then            ->
   init(phidot) = if Start then phidot else      ->
    (if phi < phip then lf/(lf-lp) * phidot      ->
     else                (lf-lp)/lf * phidot )
 endwhen
 new(Start) = False
end
partition
outfile pendel.f
language DSblock
output model
outfile
```

Validation

In this contribution only the modeling but not the simulation aspect is considered. Simulations and optimisations with Dymola-generated models can be performed in one of the above mentioned simulation environments. The following simulation was done within ANDECS, for $d = 0.2$, $\varphi_p = -\pi/12$, and $\varphi_0 = \pi/6$:



For further information or comments please contact: Dieter Moormann, DLR, German Aerospace Research Establishment, Institute for Robotics and System Dynamics, Oberpfaffenhofen, D-82234 Wessling, Germany, Email: Dieter.Moormann@dlr.de, Tel: +49-8153 28 2473.

Comparison 7 - SLIM

SLIM (Simulation Language for Introductory Modelling) has been developed specifically as a language through which newcomers to the field of continuous system simulation can be introduced to the principles of the subject. SLIM involves a subset of the 1967 CSSL recommendations and the syntax of the language appears to the user to be a reduced version of that found in many widely-used equation-oriented simulation tools.

The SLIM software consists of a language processor (written in FORTRAN 77) which is capable of translating and interpreting programs written using the SLIM instruction set. SLIM is simple to learn because of the limited range of options available. Although power has been deliberately sacrificed in SLIM to provide benefits in terms of ease of use, the software is sufficiently versatile to be able to handle a wide range of practical problems. SLIM was developed for a PC/DOS based environment but has been ported successfully to other platforms such as VAX/VMS and SUN/SunOS. SLIM has also been implemented on a Parsytec Supercluster parallel system involving T800 transputers with the Parix operating system.

Further details of the SLIM instruction set and examples illustrating the use of the software may be found in a recent textbook [1]. A version of SLIM for the PC/DOS environment is provided on diskette with that book.

The constrained pendulum example provides an interesting problem which involves a discontinuity. SLIM offers no state event handler but does allow the DYNAMIC segment and DERIVATIVE section of a simulation program to be used to detect discontinuities. The integration method available within the standard version of SLIM is a variable-step method of the Runge Kutta type. In the constrained pendulum problem flags must be used to indicate the phase of the motion. Values of the independent variable (time) and of the state variables are stored at the time instants at which the pendulum hits the pin or leaves the pin. When these events occur parameters such as the pendulum length are changed and the model is reinitialised. Figure 1 shows a SLIM program listing for the nonlinear model. Graphical results obtained using SLIM have been found to be the same as those published previously for this problem. The computer time to produce a results file for subsequent plotting was less than 2 sec. on a 486/33 PC for runs involving the sets of initial conditions and parameter values suggested for the comparison.

The linear and nonlinear models cannot easily be incorporated into the same SLIM simulation program. It is more straightforward to work with separate simulation programs for the two models and a SLIM program for the linear case would be similar in structure to that of Figure 1, but with a different expression used to define the variable DERIV2.

SLIM provides no special facilities for optimisation. Iterations and parameter loops can be programmed in the model description by jumping from the terminal segment of the program back to the initial segment. The optimisation task defined in this comparison problem can therefore only be solved using the type of approach suggested for the ACSL-based solution[2].

References:

[1] Murray-Smith, D.J. "Continuous System Simulation", Chapman and Hall, London, 1995.

[2] Breitenecker, F. 'Comparison 7 - ACSL', EUROSIM - Simulation News Europe, No. 8, p30, 1994.

```
C  Setting flags to indicate phase of motion
      IF(X10-PHIP)4,4,2
2     MARK=-1
      MARK1=-1
      AL=ALI
      GOTO 5
4     MARK=2
      MARK1=2
      AL=ALS
5     CONTINUE
7     T=T1
      DYNAMIC
        DERIVATIVE
          DERIV1=X2
          DERIV2=-(G/AL)*SIN(X1)-(D/AM)*X2
          X1=INTEG(DERIV1,X10)
          X2=INTEG(DERIV2,X20)
C  Check whether angle of string has reached
C  critical angle PHIP
          IF(X1-PHIP)20,20,30
C  Applies where the length is ALS (short)
20        MARK=2
          GOTO 32
C  Applies where the length is ALI (long)
30        MARK=-1
32      DERIVATIVE END
C  Output T, X1 and X2 to file (and screen)
          TYPE T,X1,X2
C  Test for time reaching TMAX
          IF(T-TMAX)33,33,12
C  Test whether pendulum has reached the
C  critical angle PHIP from either direction
33        IF(MARK-MARK1)40,37,35
C  Applies if the pendulum shortens
35        T1=T
          X20=X2*ALI/ALS
          MARK1=2
          MARK=2
          X10=PHIP
          AL=ALS
          GOTO 45
C  Applies if the pendulum lengthens
40        T1=T
          X20=X2*ALS/ALI
          MARK1=-1
          MARK=-1
          X10=PHIP
          AL=ALI
          GO TO 45
37      DYNAMIC END
45      GOTO 7
12      STOP
        END
```

Figure 1: Listing of part of a SLIM program for simulation of the constrained pendulum (nonlinear case).

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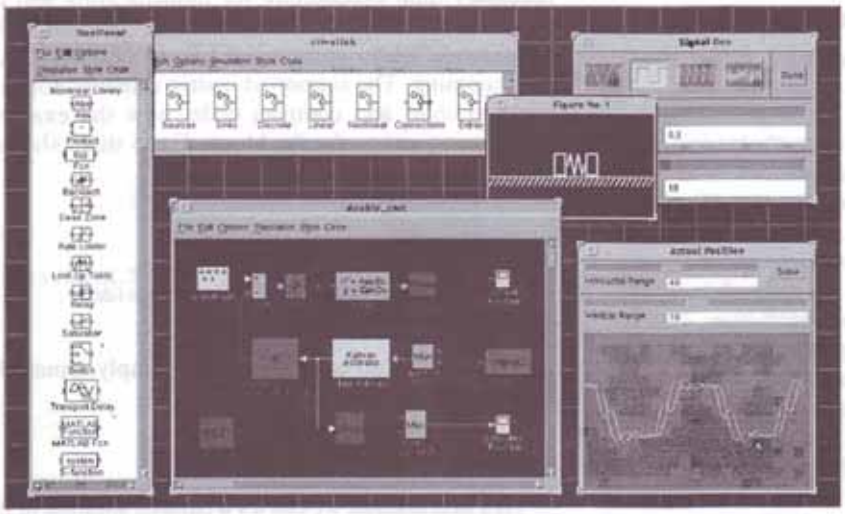

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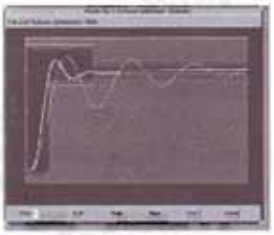

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Comparison of Parallel Simulation Techniques
Workstation Cluster / MATLAB / PSI

MATLAB is a general tool for mathematical and engineering calculations and visualisations. It is very well known and widely in use. Therefore a comprehensive introduction is not necessary. Although MATLAB is not a special simulation tool it is often used for small and medium simulation problems. In spite of its excellent features there are some lacking capabilities. One is distributed and parallel processing. In similar tools like Matrixx and CTRL-C we find the same lack, too. In order to overcome this lack some investigations were done at the University of Rostock and at the Fachhochschule Wismar. By the authors the C++ class library PSILIB for transport independent interprocess communication and process control between heterogeneous platforms was developed. This library considers not only standard UNIX derivatives, but also real time operating systems like OS9 and LynxOS. On top of this library common engineering standard tools with a C interface can be extended to programming environments for distributed and parallel applications. MATLAB performs this with its MEX interface. Today, there are of course a number of communication libraries with wider distribution, which can be used in the same way. A much more serious problem is the construction of a high level and easy to use interface within MATLAB to access a communication library via the MEX interface. We examined the two logical approaches shared and distributed memory. Physically both are implemented by message passing. For solving the tasks of this comparison we used the "Distributed Memory Interface". To give an impression of the interface handling the M-Code for the Monte-Carlo study is discussed in greater detail.

All test examples have been run on a cluster of 20 SUN Classic workstations under Solaris 2 connected via Ethernet (10 Mbit/s). Static load balancing was used exclusively.

a) Monte-Carlo Simulation: Only a task division into subtasks producing equal load is useful. That means for 1000 parameter variations 2, 4, 5, 8, 10, ... subtask are suitable. As can be seen in the table below, the resulting speed-up factor f grows almost linear with the number of subtasks M.

M	2	4	5	8	10
f	2.00	3.99	4.99	7.96	9.92

Due to the possible mixture of programming and interactive/interpretative execution in MATLAB the necessary time expenditure for implementing and testing a problem solution is very small compared with compilation based approaches like C or FORTRAN programming. The supported matrix oriented notation leads to short and compact code, how the example M-Function `ex1()` for the Monte-Carlo study shows.

```
function [xmean]=ex1(dd)
   t0=0; tf=2; h=0.001; x0=[0 0.1]';
   global d
   xmean=zeros((tf-t0)/h+1,1);
   for i=1:length(dd)
      x=rk4('mass_spring',t0,tf,h,x0);
      xmean=xmean+x(:,2)/length(dd);
   end
return
```

The experiment is carried out by simply typing the following lines.

```
dd=800+400*rand(1000,1);
x=ex1(dd);
plot(x);
```

As a first attempt we can try a parallel solution in the same manner. After starting `nslaves` MATLAB instances and generating damping factors, one column of the random matrix is put to each slave.

```
nslaves=10;
slaves=spawn(nslaves);
dd=800+400*rand(1000/nslaves,nslaves);
for i=1:nslaves
   put(slaves(i),dd(:,i))
end
```

Now each slave can settle its part of the whole task and the interactive experiment is finished by putting back the results from the slaves and calculating the average response.

```
aeval(slaves,'x=ex1(dd);')
x=0;
for i=1:nslaves
   x=x+putback(slaves(i),'x')/nslaves;
end
plot(x);
```

The experiment above is done in a parallel fashion without any programming! From such a successful test it is a close step to a real master/slave program.

Master M-File:

```
nslaves=10;
slaves=spawn(nslaves,'ex1_slave');
dd=800+400*rand(1000/nslaves,nslaves);
for i=1:nslaves
   put(slaves(i),dd(:,i))
end
x=0;
for i=1:nslaves
   x=x+get(slaves(i))/nslaves;
end
plot(x)
```

Slave M-File:

```
dd=get;
put(-1,ex1(dd))
```

Sometimes the SPMD (single program multiple data) paradigm is preferred. Although it is not particularly suitable in this example, because the problem is logically structured in a master/slave manner, it saves one processor for the same degree of parallelism.

SPMD M-File:

```
n=10;

if parent
   ids=myid;
   ids(2:n)=spawn(n-1,'ex1_spmd');
put(ids(2:n),ids))
dd=800+400*rand(1000/n,n);
   for i=2:n
     put(ids(i),dd(:,i)
   end
   dd=dd(:,1)
else %child
   ids=get;
   dd=get;
end

x=ex1(dd)/n;

if parent
 for i=2:n
   x=x+get(ids(i));
 end
  plot(x)
else %child
 put(ids(1),x)
end
```

b) Coupled predator-prey population: The SPMD paradigm was used and all five tasks were located on different processors. The communication interval was varied from c_{int}=h to c_{int}=20h.

c_{int}	h	2h	5h	10h	20h
f	0.70	0.98	1.90	2.77	3.71

Speed-up factors greater than one are not reached until c_{int} is greater than 2h.

c) Partial differential equation: The task was solved with a discretisation into N=800 lines using the SPMD paradigm. At first the number of parallel tasks M was varied from 2 to 16.

M	2	4	5	8	10	16
f	1.83	3.07	3.60	5.01	5.46	7.11

Then the communication interval was increased for M=8 tasks.

c_{int}	h	2h	4h	6h	8h
f	5.01	5.71	6.24	6.48	6.54

One reason for the relatively high speed-up factors compared with other solutions in this series is the slow implementation of the RK4 algorithm. Because there is no RK4 with fixed stepsize in MATLAB, it was implemented for the comparison in M-Code. The time needed by an experienced MATLAB user for implementing and testing the parallel versions with the "Distributed Memory Interface" is nearly the same as for the serial solution. Principles of the "Shared Memory Interface" and performance tests of both interfaces using PVM as alternative communication library will be published in the near future.

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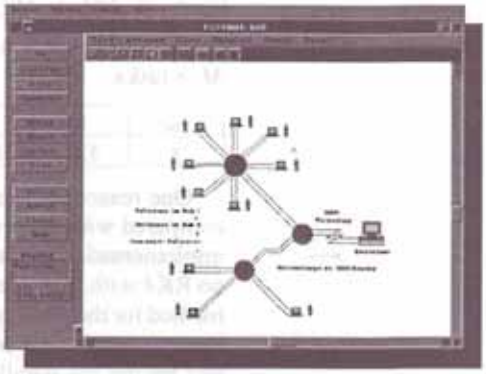

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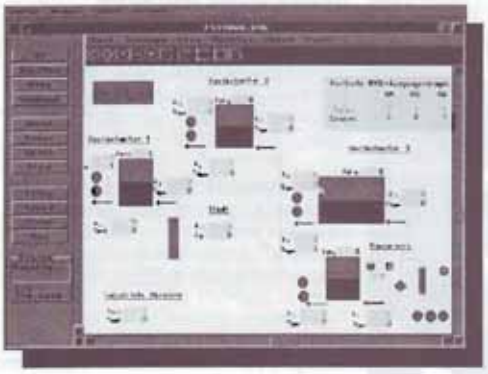

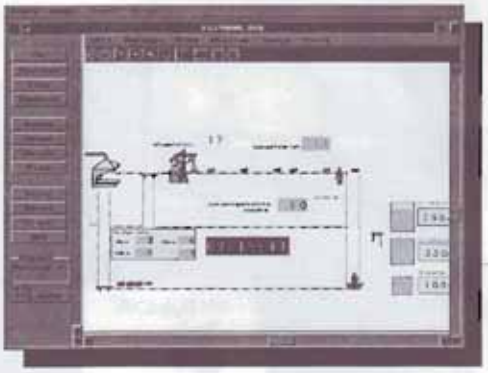

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Calendar of Events

March 1995

27 ASIM-workshop *"Simulationssoft- und Hardware zur Lösung technischer und produktionsorientierter Probleme"*. Mainz, Germany.
Contact: Prof. D.P.F. Möller, TU Clausthal, Institut für Informatik, Erzstraße 1, D-38678 Clausthal-Zellerfeld, Tel: +49-5323 72 2402 or 72 2504 Fax: +49-5323 72 3572

27 FRANCOSIM **workshop on continuous event simulation system**. Noisy le Grand , France.
Contact: Prof. Hamam Yskandar, Tel +33-1 45926500, Fax: +33-1 45926699

April 1995

5-6 **8th Workshop** *"Simulation und Künstliche Intelligenz"*, Darmstadt, Germany.
Contact: Dr. Gregor Lux, TH Darmstadt, FB Informatik, FG Praktische Informatik, Magdalenenstr. 11c, D-64289 Darmstadt, Tel: +49-6151 16 5110, Fax: +49-6151 16 5472, Email: lux@isa.informatik.th-darmstadt.de

6-10 *"Théorie et practique des logiciels de simulation des Mécanismes"*, Villeurbanne, Fance.
Contact: Mr. Fayet, INSA de Lyon, Département Génie Mécanique construction, 20 ave A. Einstein, F- 69621 Villeurbanne Cédex, Tél: +33-72438308, Fax: +33- 72438525

9-13 **28th Annual Simulation Symposium**. Phoenix, Arizona, USA
Contact: A. Ferscha, Inst. f. Angewandte Informatik, University of Vienna, Lenaugasse 2/8, A-1080 Vienna, Austria, Tel: +43-1 4086366 18, Fax: +43-1 4080450, Email: ferscha@ani.univie.ac.at

11-12 **Media** Comm 95. International Conference on Multimedia Communications. Southampton, U.K.
Contact: Philippe Geril, SCS European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, BelgiumTel.: +32.9.233.77.90, Fax: +32.9.223.49.41, E-mail: Philippe.Geril@rug.ac.be

18-20 **Memorial** to Ing. Milan Kotva: "Advances in Simulation Models Creation and Exploitation". Zabreh na Morave. Czech Republic.
Contact: Jan Stefan, FEI - VSB TU, tr. 17. listopad, CZ - 708 33 Ostrava, Porba, Czech Republic, E-mail: Jan.Stefan@vsb.cz

19-21 **UKSS95, United Kingdom Simulation Society Conference**. North Berwick, Scotland.
Contact: Mr. Rob Pooley, Department of Computer Science, University of Edinburgh, Kings Buildings,Mayfair Road, Edinburgh, EH9 3JZ, U.K., Tel: +44 31 650 5123, Fax: +44 31 667 720, Email: rjp@uk.ac.ed.dcs

27-28 *"Simulation - Anwendung und Nutzen"*. ASIM Workshop. Erlangen, Germany
Contact: Dipl.-Ing. Elke Stief, FAPS, Universität Erlangen-Nürnberg, Egerlandstr. 7-9, D-91058 Erlangen, Tel: +49-9131-85 7967, Fax: +49-9131-302528, Email: stief@faps.uni-erlangen.de

27-29 IASTED International Conference **Modelling and Simulation**. Pittsburgh, USA:
Contact: IASTED Secretariat - MS'95, 1811 West Katella Av., Suite 101, Anaheim, CA 92804, USA, Tel: +1-800 995 2161, Fax: +1-714 778 5463, Email: iasted@orion.oac.uci.edu

May 1995

1-5 **System Modelling Control**. Zakopane, Poland.
Contact: Beata Ostrowska, Institute for Computer Science, Technical University of Lodz, ul. Sterlinga 16/18, PL-90-217 Lodz, Poland, Tel: +42-329757, Fax: +42-368522, Email: beaostro@lodz1.p.lod.edu.pl

4 FRANCOSIM **workshop on continuous event simulation system**. Noisy le Grand , Fance.
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16-17 **"Computer Simulation of Technological Processes in Railway Transport"**
Contact: Ladislav Skyva, Faculty of Management Science, University of Transport and Communications, 010 26 Zilia, Slovak Republic, Tel: +42-89-54042, Fax: +42-89-54806.

16-20 **IMACS Conference on Applications of Computer Algebra**. Albuquerque, NM; USA
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22-24 **4th European Cars/Trucks Simulation Symposium**. Schliersee, Germany.
Contact: Moshe R. Heller, ASIMUTH GmbH, Planegger Str. 26, D-81241 München, Germany, Tel: +49-89-8345073, Fax: +49-89-8347575.

31-June 2
AARTC'95. 3rd IFAC/IFIP Workshop on Algorithms and Architectures for Real-Time Control. Ostend, Belgium.
Contact: BIRA Belgian Institute for Automatic Control, Desguinlei 214, B-2018 Antwerp, Belgium,
Tel: +32-3-2160996, Fax: +32-3-2160689, Email: 100045.2621@CompuServe.COM

June 1995

5-7 **European Simulation Multiconference ESM '95**. Prague, Czech Republic
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8 FRANCOSIM **workshop on continuous event simulation system**. Noisy le Grand , Fance.
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7-9 **IWANN'95**. International Workshop on Artificial Neural Networks. Torremolinos, Spain.
Contact: F. Sandoval, IWANN'95, Dept. Tecnologia Electronica, Universidad de Malaga, Plaza El Ejido, s/n, E-29013 Malaga, Spain Tel: +34-5 2131362, Fax: +34-5 2131447, Email: iwann95@ctima.uma.es

13-16 **ITI 95**. 17th International Conference "Information Technology Interfaces". Pula, Croatia
Contact: Branka Radic, University Computing Centre, J. Marohnica bb, HR-41000 Zagreb, Croatia, Tel: +385-1 518 656, Fax: +385-1 518 451, Email: iti@srce.hr

26-30 **IMACS-SAS '95**. 5th International IMACS-Symposium on System Analysis and Simulation. Berlin, Germany
Contact: Secretariat SAS '95, GMD FIRST, Rudower Chaussee 5, Geb. 13.7, D-12489 Berlin, Tel.: +49-30 6392 1814,Fax: +49-30 6392 1805, E-mail: sas95@first.gmd.de

26-30 **16th International Conference on Application and Theory of Petri Nets**. Torino, Italy.
Contact: Prof. Gianfranco Balbo, Dipto. di Informatica, Universita di Torino, Corso Svizzera 185, I-10149 Torino, Italy, Tel: +39-11-7429 211, Fax: +39-11-751603, Email: PN95@di.unito.it

28-30 **SIMS'95 Simulation Conference 'Simulation in Theory and Practice'**, Lyngby, Denmark.
Contact: Niels Houbak, Laboratory for Energetics, Build 403, DTU, DK-2800 Lyngby, Denmark, Tel: +45-45933757, Fax: +45-45930663, Email: Niels.Houbak @lfe.dtu.dk

July 1995

11-13 **LSS'95**. 7th IFAC/IFORS/IMACS Symposium on Large Scale Systems: Theory and Applications. London, U.K.
Contact: LSS'95 Secretariat, Control Engineering Centre, City University, Northampton Square, London EC1V 0HB, Tel: +44-71 477 8133, Fax: +44-71 477 8568, Email: lss95@city.ac.uk.

23-27 1995 **Summer Simulation Conference**. Ottawa, Canada.
Contact: SCS, P.O. Box 17900, San Diego, CA 92177, Tel: +1-619-277 3888, Fax: +1-619-277 3930, Email: scs@sdsc.bitnet

August 1995

21-23 **EANN 95**. International Conference on Engineering Applications of Neural Networks. Helsinki, Finland
Contact: EANN 95/SEA, Post box 34, FIN-20111 Turku 11, Finland, Email: eann95@aton.abo.fi

21-25 **14. Congres International de Cybernetique**. Namur, Belgium
Contact: International Association for Cybernetics, Palais des Expositions, av. Sergent Vrithoff 2, B-5000 Namur, Belgium, Tel: +32-81 735209, Fax: +32-81 742945, Email: Cyb@info.fundp.ac.be

28-30 **IMACS European Simulation Meeting on Simulation Tools and Applications**. Gyor, Hungary
Contact: A. Jávor, KFKI Research Institute for Measurement and Computing Techniques, H-1525 Budapest, P.O.Box 49, Hungary, Tel: +36-1 1699499, Fax: +36-1 169553, E-mail: h7023jav@ella.hu

September 1995

11-13 **TECHNOMAN**, Bruges, Belgium.
Contact: Philippe Geril, SCS, European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Belgium. Tel: +32.9.233.77.90, fax: +32.9.223.49.41, E-mail: Philippe.Geril@rug.ac.be

11-15 **EUROSIM '95 European Simulation Congress**. Vienna, Austria
Contact: EUROSIM95, Computing Services, Technical University of Vienna, Wiedner Hauptstr. 8-10, A-1040 Vienna, Austria. Tel: +43-1 58801 5386, 5484, 5374 Fax: +43-1 5874211, E-mail: eurosim95@email.tuwien.ac.at

12-15 XII. International Conference on **Systems Science**. Wroclaw, Poland.
Cotact: Prof. Jerzy Swiatek, Technical University of Wroclaw, Inst. of Control and Systems Engineering, Wybrzeze Wyspianskiego 27, PL-50-370 Wroclaw, Poland, Tel: +48-71 216226, Fax: +48-71 223664.

14 FRANCOSIM **workshop on continuous event simulation system**. Noisy le Grand , France.
Contact: Prof. Hamam Yskandar, Tel +33-1 45926500, Fax: +33-1 45926699

21-22 ***"Simulation und Simulatoren für den Schienenverkehr"***. München, Germany.
Contact: VDI-Gesellschaft für Fahrzeug- und Verkehrstechnik, Postfach 10 11 39, D-40002 Düsseldorf, Tel: +49-211 6214 264 or 523, Fax: +49-211 6214 163

25-27 **SAMO 95.** Theory and applications of Sensitivity Analysis of Model Output in computer simulation. Beligrate, Italy
Contact: A. Saltelli, T.P. 321, JRC -El, Ispra Site, I-21020 Ispra, Italy

October 1995

16-20 **BICSC'95**. 3rd Beijing International Conference on System Simulation and Scientific Computing. Beijing, China.
Contact: Prof. Zhang, Minglian, CASS, 37, Xueyuan LU, Beijing 100083, P.R. China, Tel: +86-1 2026677 4471, Fax: +86-1 2015347

26-28 **7th European Simulation Symposium ESS 95.** Erlangen - Nuremberg, Germany.
Contact: Philippe Geril, SCS, European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Belgium. Tel: +32.9.233.77.90, fax: +32.9.223.49.41, E-mail: Philippe.Geril@rug.ac.be

30-November 1
Making it REAL. CEAS Symposium on Simulation Technologies. Delft, The Netherlands.
Contact: Mrs. A. Bredt, P.O. Box 90502, 1006 BM Amsterdam, The Netherlands, Tel: +31-20 511 3651, Fax: +31-20 511 3210, Email: asbr@rdr.nl

November 1995

29-December 1
IFAC meeting **International Workshop on Artificial Intelligence in Real-time Control.** Bled, Slovenia.
Contact: AIRTC 1995, Dr. Jus Kocijan, Faculty of Electrical and Computer Engineering, Trzaska 25, 61000 Ljubljana, Slovenia, Tel.: + 386 61 1768 417, Fax: + 386 61 264 991, E-mail: jus.kocijan@fer.uni-lj.si

June 1996

10-12 **HPCN challenges in telecomp and telecom**: parallel simulation of complex systems and large-scale applications. The Netherlands.
Contact: Congress Office ASD, P.O. Box 40, 2600 AA Delft, The Netherlands, Tel: +31-15 120234, Fax: +31-15 120250.

July 1996

1-5 9th International Conference on Mechanics in Medicine and Biology. Ljubljana, Slovenia.

September 1996

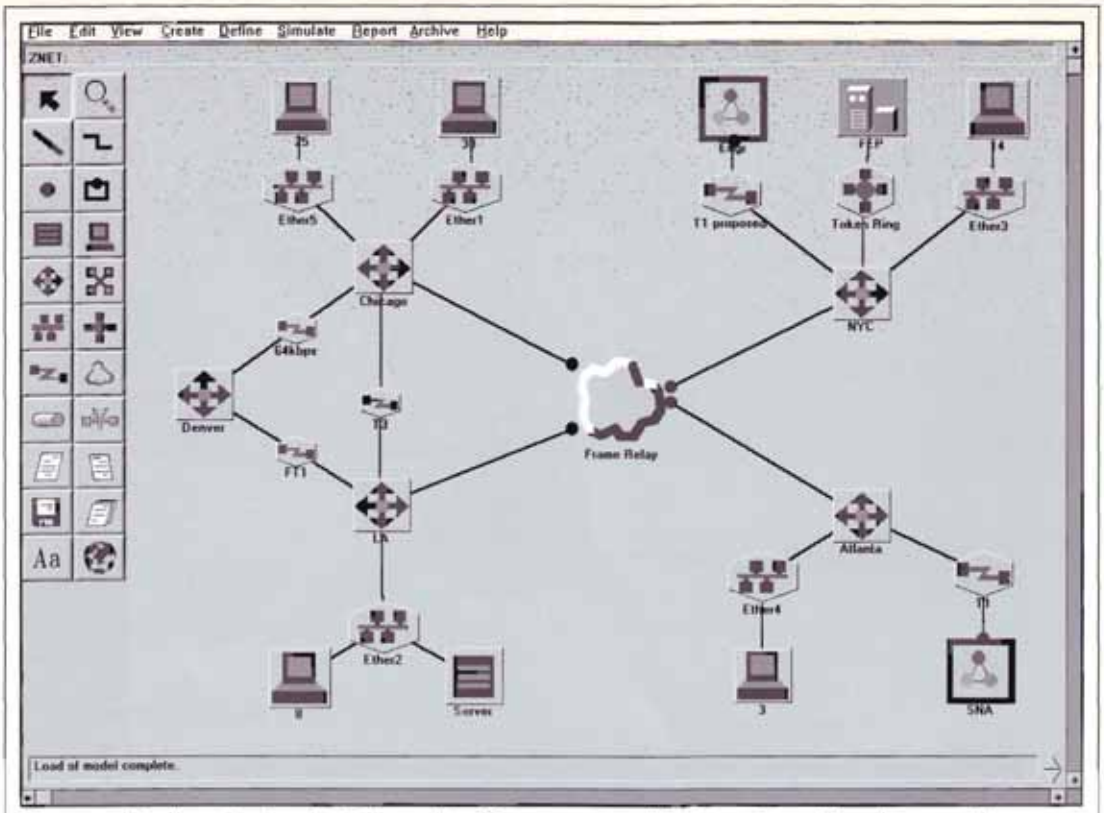
23-26 *ASIM 96, 10. Symposium Simulationstechnik*, Dresden, Germany.
Contact: Michael Schebesta, DUAL-ZENTRUM Dresden, Gillesstraße 2, D-01219 Dresden.

February 1997

2nd IMACS Symposium on Mathematical Modelling. Vienna, Austria.
Contact: Prof. I. Troch, TU Vienna, Wiedner Hauptsr. 8-10, A-1040 Vienna, Austria

April 1998

EUROSIM '98 European Simulation Congress. Finland



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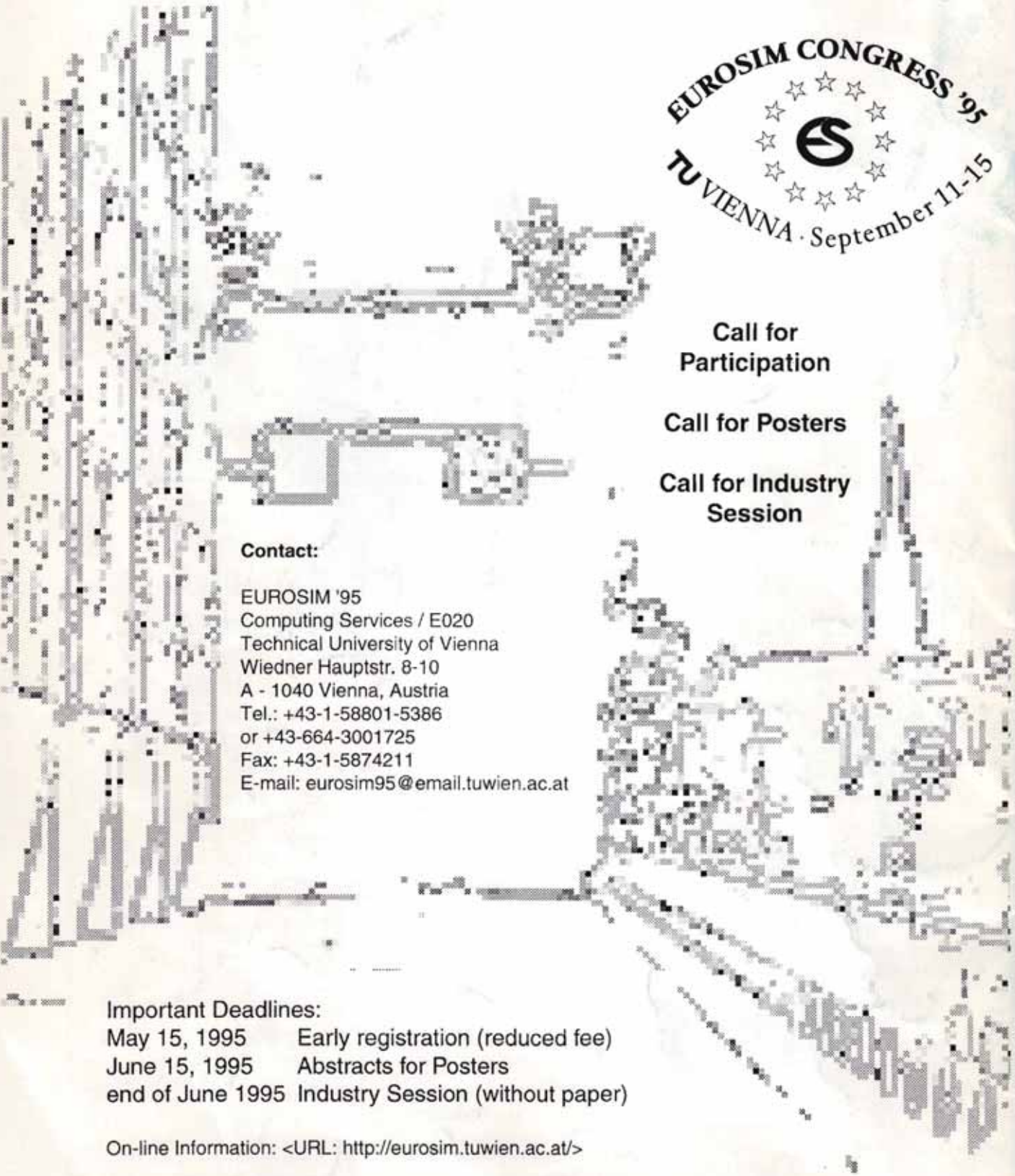

Call for Participation

Call for Posters

Call for Industry Session

Contact:

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Important Deadlines:

May 15, 1995	Early registration (reduced fee)
June 15, 1995	Abstracts for Posters
end of June 1995	Industry Session (without paper)

On-line Information: <URL: http://eurosim.tuwien.ac.at/>