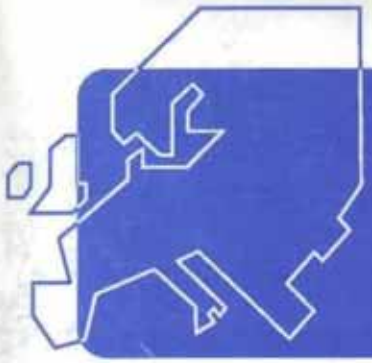
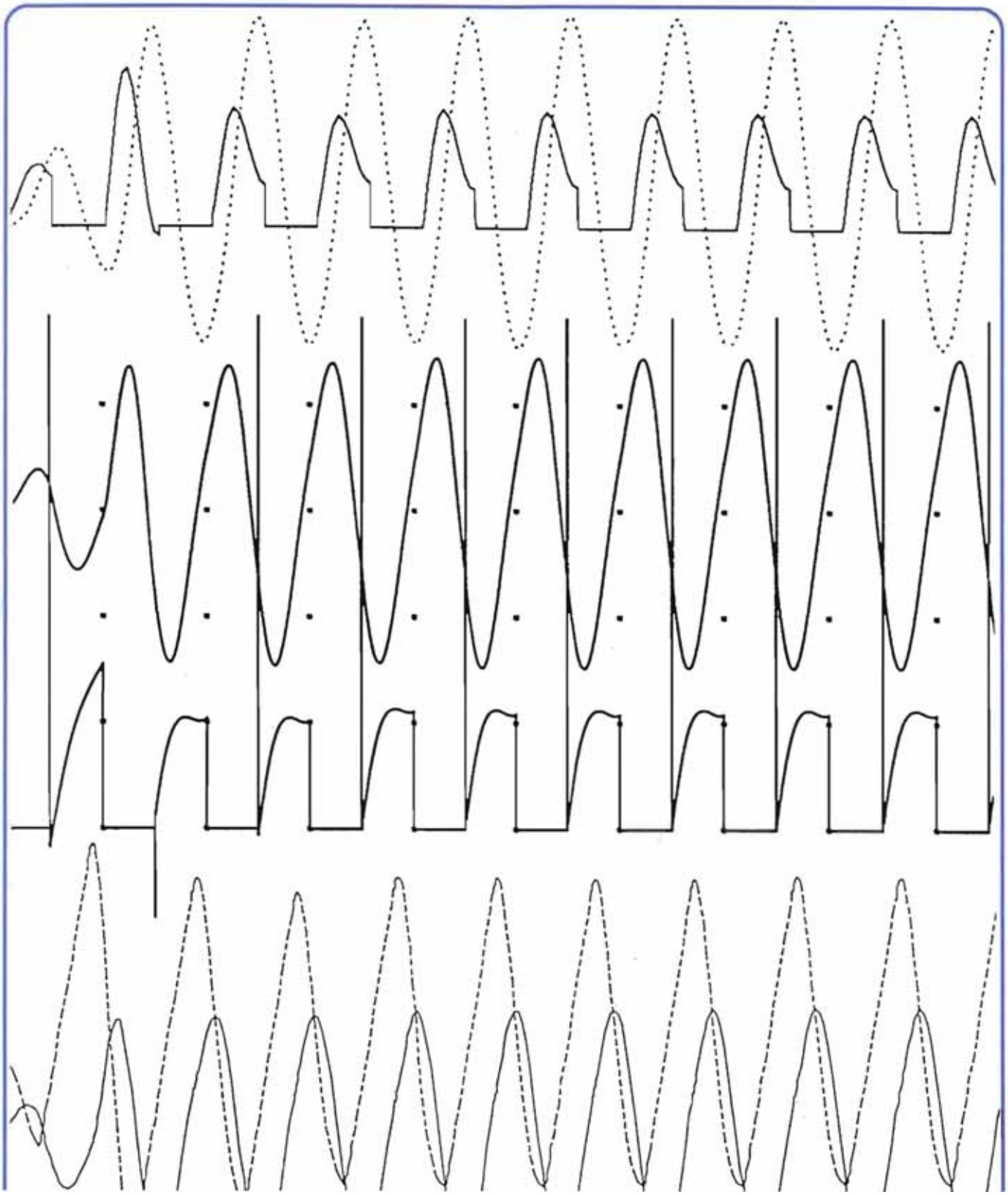


EUROSIM
Simulation News Europe

Number 5 A European Forum on Simulation Activities July 1992



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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 2300. EUROSIM - Simulation News Europe is distributed by all member societies to their individual members (as part of the membership services). In order to promote the idea of simulation in Europe, EUROSIM - Simulation News Europe is distributed to institutions, libraries, and specific persons dealing with simulation, furthermore to simulation groups in the former East European countries. These activities are possible through advertisement sponsoring. Beginning in 1993 regular subscriptions will be possible for an annual fee. For subscriptions, extra copies, product announcements and other organizational affairs please contact the editors.

Editors: Prof. Dr. Felix Breitenecker,
Mrs. Irmgard Husinsky

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Editorial

The idea of the newsletter **EUROSIM - Simulation News Europe** is to promote simulation in Europe by dissemination of information related to simulation.

Following this purpose we publish essays on simulation, reports from EUROSIM and the founders of EUROSIM (the European simulation societies), reports from international societies, presentations of simulation centers, industry news, book reviews, discussion forum, calendar of events, etc. Furthermore a series on software comparisons tries to give an overview on features of simulation languages.

This issue announces a preliminary program for the main EUROSIM event in 1992, the EUROSIM '92 Congress in Capri. We will be there and hope to meet many of our readers. An essay reports on a study about the awareness of simulation in the manufacturing industry of the U.K.

Our regular sections inform about the activities of the European simulation societies, providing information for their members. We are glad to see the rapid growth of FRANCOSIM and the foundation of CROSSIM, the Croatian simulation society, and the Spanish Simulation Society AES.

The summarizing study on simulation activities in the former GDR is continued. We received an interesting contribution for the discussion forum.

For the software comparisons we again received a number of solutions with new tools. Comparison 5 (Two State Model) turns out to be a very tough test on discontinuity treatment. You can still send in solutions for the previous comparisons, there are several software tools that have not yet been introduced.

Due to the success of our newsletter and the increasing workload we will have to reorganize our publishing structure in autumn. The newsletter will appear in March, July, and December each year. Regular subscriptions for people who are not members of simulation societies will be possible.

We say "thank you" to all authors who contributed to this issue. All readers are kindly invited to send letters, comments, suggestions or contributions to one of the editors. Deadline for the next issue will be November 10, 1992.

F. Breitenecker, I. Husinsky

EUROSIM - Simulation News Europe

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

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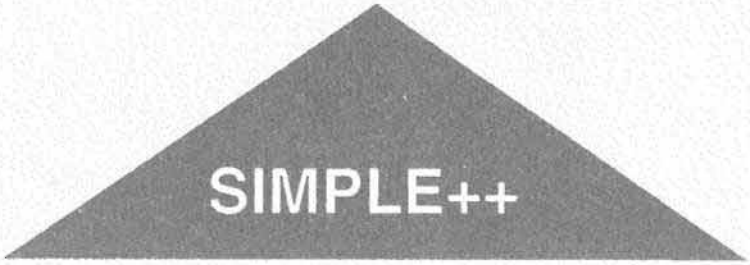

"Next Generation of Simulation Software"?

"SIMPLE++ marks the next Generation of Simulation Software" was said by many visitors during the first public presentation from 21st - 29th January 1992 on the IFM '92 (International Fair of Logistics) in Basel, Switzerland. The very positive response is based on significant enhancements in productivity, user-friendliness, application-variety and implementation-technique seeing SIMPLE++.

SIMPLE++ is the right solution if simulation is needed in industry and research. Special features are offered for the manufacturing industry. SIMPLE++ covers all applications in Production, Materialflow, Transportation and Logistics. SIMPLE++ is available on all popular workstations with UNIX/X-windows, PC's with SCO-UNIX/X-windows and Apple Macintosh with AUX. Several customers have bought SIMPLE++ already. It is safe to buy SIMPLE++ because solid concepts of the successful predecessor SIMPLEmac are used in a refined and generalized way.

Main Features of SIMPLE++

- fully object-oriented
- implemented in C++
- powerful graphical user-interface
- integrated, non-procedural enviroment (e.g. modelling simultanesly to animation)
- complete set of basic-elements to build user-definable application-elements without programming
- graphical definition of control-structures
- decision-tables and/or control-language
- separation of material- and information-flow
- powerful and flexible information-management
- inheritence, hierarchy
- sensor-actor-concept
- interfaces: ASCII-files, CAD, DBMS

SIMPLE++ was developed by AESOP and the Fraunhofer-Institute for Production and Automation (IPA-FhG), both in Stuttgart, Germany.

Wanted !! Business-Partners Wanted !!

Would you like to sell and/or provide simulation-services with SIMPLE++ ?
We are seeking Business-Partners in two categories:

Your Profile in Sales & Marketing

- experience in the successful selling of complex application-software to the manufacturing-industry
- Simulation Software extends/ completes your current product-portfolio (e.g. Object-Management, CAD/CAM, Planning and Control of Production, Warehouse/Logistic-systems)
- several people in sales or acquisition
- UNIX-platform for product demonstration

Your Profile in Simulation-Services/Studies

- engineering/consulting company planning Production-, Materialflow-, Warehouse-, Logistics-Facilities
- Simulation knowledge is available or will become an attractive business for growth or diversification
- you may use other simulation-software
- at least one dedicated person for simulation
- UNIX-platform for using SIMPLE++

If you do not have a similar profile to that described above or you are not actually interested in a new relationship please forward this offer to appropriate addresses or just give us a hint. Thank you !

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EUROSIM News

EUROSIM, the Federation of European Simulation Societies was initiated 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.

The following national and regional simulation societies founded EUROSIM: ASIM - Arbeitsgemeinschaft Simulation (Austria, Germany, Switzerland), DBSS - Dutch Benelux Simulation Society (Belgium, The Netherlands), FRANCOSIM - Société Francophone de Simulation (Belgium, France), ISCS - Italian Society for Computer Simulation (Italy), SIMS - Simulation Society of Scandinavia (Denmark, Finland, Norway, Sweden), UKSS - United Kingdom Simulation Society (UK). President is Prof. F. Maceri (ISCS).

The main event this year will be the (triennial) EUROSIM Simulation Congress, organized by ISCS this time. Please find information below and on page 12.

EUROSIM SIMULATION CONGRESS

Capri, Italy, September 29 - October 2, 1992

This international congress is organized on behalf of EUROSIM by the Italian Society for Computer Simulation (ISCS) in co-operation with ASIM, DBSS, FRANCOSIM, SIMS, UKSS and with the moral sponsorship of EEC, SCSI, CASS, CSSS, CNR.

Conference Chairman: F. Maceri (Italy)

Organizing Committee: F. Maceri, F. Cennamo, M. Colajanni, V. Grassi, M. Lembo, M. Savastano

Invited speakers: Ennio Cascetta (Università di Napoli, Italy), Francois E. Cellier (University of Arizona, Tucson AZ, USA), Roy E. Crosbie (California State University, Chico CA, USA), Granino A. Korn (University of Arizona, Tucson AZ, USA), Ramana Reddy (West Virginia University, Morgantown WV, USA), Pasquale Scandizzo (Università di Roma "Tor Vergata", Roma, Italy), William E. Schiesser (Lehigh University, Bethlehem PA, USA)

Venue: The Congress will take place on the Island of Capri, Italy. The Congress sessions will be held at the Grand Hotel Quisisana, from September 29 to October 2, 1992.

Related events (tentative schedule):
ACSL User Group Meeting (September 28)
ISCS Annual Meeting (September 29)
Giorgio Savastano Award (September 30)
ESPRIT Session on Simulation (September 30)
Dynamics Meeting (October 1)

Preliminary Program

Monday, September 28

Welcome Cocktail

Tuesday, September 29

9:00 Welcoming Speeches
9:30 Invited Speaker
11:30 Parallel Sessions: Simulation Tools and Languages, Parallel and Distributed Simulation, Simulation in Electronics and Control
16:00 Parallel Sessions: Simulation Tools and Languages, Simulation in Factory and Automation, Simulation in Electronics and Control
18:00 Parallel Sessions; Simulation in Business and Management, Simulation in Factory and Automation, Simulation in Electronics and Control

Open Air Dinner

Wednesday, September 30

9:00 Invited Speaker
11:00 Parallel Sessions: Simulation in Computer Systems and Network, Simulation Methodologies, Simulation in Electronics and Control
16:00 Parallel Sessions: Simulation in Computer Systems and Network, Parallel and Distributed Simulation, Simulation in Electronics and Control
18:00 Parallel Sessions: Simulation in Environmental and Biological Systems, Parallel and Distributed Simulation, Simulation in Electronics and Control

Conference Banquet

Thursday, October 1

9:00 Invited Speaker
11:00 Giorgio Savastano Award
11:30 Parallel Sessions: Simulation in Construction and Transportation, Simulation Methodologies, Simulation in Education and Training
16:00 Parallel Sessions; Simulation Tools and Languages, Simulation Methodologies, Meetings
18:00 Parallel Sessions: Simulation in Electrical Engineering and Energy Systems, Simulation in Environmental and Biological Systems, Meetings

Entertainment

Friday, October 2

9:00 Invited Speaker
11.00 Parallel Sessions: Simulation in Construction and Transportation, Simulation in Environmental and Biological Systems, Simulation in Electrical Engineering and Energy Systems
16:00 Parallel Sessions: Simulation in Construction and Transportation, Simulation in Environmental and Biological Systems, Simulation in Education and Training

For further information see also page 12.

A Well-kept Secret? Simulation in Manufacturing Industry Reviewed

Brian Hollocks
BUSINESS SCIENCE, 12A Wolverton Close, Ipsley, Redditch, Worcs. B98 0AR, UK. Tel: +44-527-27998

Manufacturing industry across Europe is under mounting competitive pressure. The emergence of new technologies and operating practices is further increasing the pace of change. Against this background, decision support tools have much to offer in raising the leverage of industrial decision makers on the issues that they face. Simulation should be a particularly valuable approach in such circumstances.

The simulation technique has been available for 35 years or more and numerous software packages are actively marketed; but *is* it being employed? To what extent is it in active use in manufacturing industry? Is it showing benefit? If so, is anything holding back its wider use? In 1991, these questions prompted a study of UK manufacturing industry (sponsored by the Department of Trade and Industry), focusing on Operations (Discrete-Event) Simulation. The Study consisted of a number of complimentary investigations, including: (a) a cross-section of UK manufacturing sites regarding simulation use or awareness, (b) UK Higher Education institutions concerning teaching and research in simulation, (c) in-depth inquiry of specific users to examine current practice (and validate conclusions from the main inquiry), and (d) professional institutions and trade organisations regarding the presence of simulation in their activity (and to validate other results).

The cross-section of manufacturing sites identified a penetration (ie simulation in current use) of around 9%, widespread over a range of job titles. Considering the length of time that the technology has been available, the apparent commercial activity, and comparison with at least one later technique, MRPII, this figure is extraordinarily low - unless simulation is, in fact, of limited value. However, amongst users the benefits of simulation were found well worthwhile. The majority of companies adopting simulation did so with specific objectives and, of these, only 8% believed that those objectives had not been met, at least substantially. A 92% satisfaction rate is extraordinarily high! Perhaps, then, a low penetration is explained by the scope of benefits being limited, either in nature or in industrial sector or company size?

Users could each name up to seven benefits that they had experienced. The highest perceived benefits (each claimed by 70%-80% of users) were risk reduction, operating cost reduction, lead time reduction, and greater understanding. The in-depth inquiries reported comments such as "without simulation we would fail to be competitive" and "it paid for itself within its first application". From two to six application areas could be quoted by each user (in a total collectively of 14 areas). The most common applications were plant layout and utilisation, material control, manning levels, and plant loading/scheduling. The application areas identified were not peculiar to particular industrial sectors or to large companies but shared widely, including Small and Medium sized Enterprises (SMEs).

What *is* significant is that less than 30% of the sites were even demonstrably aware of the technique (and this 30% included the users and ex-users). Amongst SME sites the proportion was lower still. By comparison, the awareness of MRPII in the UK is around 80%. Of sites investigated 4% were identified as ex-users. Further questions revealed that this was not due to dissatisfaction with the results of their past experience but to the belief that the companies did not at that time have suitable applications. This also suggests a limited awareness.

Beyond the "obstacle" of low awareness, the other obstacles specifically identified by users included: a lack of appropriate skills or training, difficulties in obtaining data, senior management awareness, and model building speed. Questioned regarding the key issues for the next five years, the sites aware of simulation (not just users) identified wider understanding and awareness, management commitment, and education and training. Those aware of simulation but not (yet) users identified as the reasons similar issues plus the cost of simulation software.

The inquiry into Higher Education identified 100 courses teaching simulation (61 undergraduate, 39 postgraduate). However, the majority of these were within what can be regarded as related specialisms (Operational Research/Management Science, Computer Science, Mathematics/Statistics) with relatively limited impact on potential "client areas", for example Business Studies or Finance. Of those in industry aware of simulation, only 22% claimed to become aware at university/college. A very wide range of teaching time, and correspondingly therefore level and content, was assigned to the courses (2-72 hours), with teaching constrained by a shortage of appropriate skills.

In simulation research, 33 institutions were identified as having current or recent work in the field. The focus was predominantly direct applications, with limited fundamental research in either technology or methodology. There was no overall theme or focus to the research. Simulation is evidently most often used as a tool to investigate other areas. However, academics in the field agreed that there were many areas where research could prove fruitful, but again constrained by available skills. The reviews of practice and of professional institutions and research associations validated the findings on use, awareness, benefits, and skills. The author has received comments from workers in the field elsewhere in Europe to the effect that the picture is similar in their countries.

The Study recommended actions including: regional support centres, review of educational programmes (in particular, manufacturing management and engineering), and a national framework for research. The author has, subsequent to the Study, secured support for that framework and research proposals are now being developed within it. In the UK Study it was calculated that the more widespread use of such simulation technology could benefit UK manufacturing industry of the order of £300 M per annum. On a European scale that is around ECU 2.5 Billion per annum! In a competitive world this is a technology worth pursuing.

ASIM

ASIM (Arbeitsgemeinschaft Simulation) is an association for simulation in the German speaking area. ASIM was founded in 1981 and has now about 650 individual members.

Reports from ASIM

The ASIM board met on April 2nd, 1992 in Berlin to discuss current affairs. Main subjects of the meeting were: report of the speaker, report from the working groups, EUROSIM, 8th *Symposium Simulationstechnik* in Berlin 1993 and organizational matters.

The next meeting of the board will be on November 16th, 1992 in Frankfurt. Please contact a board member if you think a subject should be discussed at that next meeting.

On April 3rd the program committee of the 8th *Symposium Simulationstechnik* met to prepare this conference. The first call for papers has been mailed already. Please contact a member of the board if you need further copies of this first call for papers. A second call for papers will be mailed in autumn to all ASIM members.

A new working group "*Simulation von Verkehrssystemen*" has been founded on July 2nd/3rd in Xanten. Speaker is J. Uthoff, GSSE. All ASIM members have been invited to that meeting by a separate mailing mid of June. With the invitation a questionnaire on further interest on this working group has been mailed. Please contact Dr. Bausch-Gall, if you are interested in a copy of the questionnaire. A report on the foundation will be in the next issue of this journal.

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ASIM Meetings to come

February 1993: Conference on "*Simulation und Fabrikbetrieb*" in Aachen, organized by the Working Group *Simulation in der Fertigungstechnik*. For more information contact Prof. Dr. A. Kuhn.

September 28-30, 1993: *8. Symposium Simulationstechnik* in Berlin. This is ASIMs 1993 German speaking conference. For more information contact Herrn Peter Schäfer, DAIMLER-BENZ AG, Forschungsinstitut, Alt-Moabit 91b,W-1000 Berlin 21. A first call for papers can be obtained as well from Dr. Bausch-Gall.

Other meetings with ASIM participation

August 25-28, 1992: 4th International Symposium on Systems Analysis and Simulation. See also page 20.

Information from GI

ASIM as organisation is a member of *Fachbereich 4* of *Gesellschaft für Informatik* (GI), the German Association for Computer Sciences. ASIM is the so called *Fachausschuß 4.5 Simulation*. More information on GI and membership in GI can be obtained from Dr. Bausch-Gall. In the following you find a introduction of the working group "Computer Science and Biology" of GI. One of the aspects of this working group is as well the field of simulation.

Goals and perspectives of the working group GI - FG 4.0.2 "Computer Science and Biology"

GI founded a new working group in the area of biology and computer science. This is an important step in the field of interdisciplinary research which will lead to progress in computer science and biology.

Methods and concepts of computer science are gaining more and more importance in the area of biology. Hardware in combination with specific software based on efficient algorithms is necessary to model complex structures, to simulate hypothetic systems, to control specific processes and to calculate, store and analyse biological data. Moreover, the influence of biological knowledge is increasing in the research field of computer science, as the development of special tools for analysis of biological components has produced new concepts in computer science. The finite automata (Kleene), the cellular automata (V. Neumann) and the Lindenmayer systems are important examples for formalisations to model biological components. Until now these concepts have been used to model and simulate biological processes in the area of biology. Moreover, these formalisations found their specific applications in the area of computer sience. Specific transformations of analysed biological mechanisms have produced biological paradigms in the area of computer science. In this case neural networks and genetic algorithms are being discussed at present.

The foundation of this working group in GI is a step to close the gap between the research field of computer science and biology, which was declared in the program "*Biotechnologie 2000*" by the German government.

The goal of this working group is to combine computer science and biology with the following main points:

1. to bring together all existing groups

2. interlocking of modern biological research and methods and concepts of computer science

3. developing new methods, concepts and tools in the area of biology

4. reinforcements of the innovative reciprocal actions

In this sense the first workshop (language is German) will take place at the University of Bonn on 15/16 February 1993. This workshop will focus on the applications of methods and concepts of computer science in the area of biology. Moreover, innovative effects of analysed biological mechanisms will be discussed.

Information: Dr. Ralf Hofestädt, University Koblenz-Landau, Dept. Computer Science, Rheinau 3-4, W-5400 Koblenz. E-Mail: hofestae@infko.uni-koblenz.de

Reports from the Working Groups

Working Group "Simulationsmethoden und Sprachen für parallele Prozesse"

Report on the 8. Workshop "Simulation Methods and Languages for Distributed Systems and Parallel Processes"

The workshop was held in the newly formed FhG-Institute for Integrated Circuits (former ZKI) in Dresden on April 27-28, 1992 by the Working Group 1.1 in ASIM in co-operation with GMD and FhG/EAS represented by Dr. H. Fuss and Dr. P. Schwarz.

One reason for selecting this pretty town as the venue was to foster Simulation/Informatics in the Eastern part of Germany and to bring together scientists and practitioners from both parts of our country to enhance co-operation. It showed however that scientific/technical/professional relations across the former 'iron curtain' had already developed more or less sufficiently; different general circumstances are of major importance now.

The organisational scheme of the workshop is traditionally kept free of money transfers: no fee for participation, no costs for proceedings for the participants - everything is paid by the annual ASIM membership fee (DM 30.-) or by third parties.

Thanks to the local organizer, Dr. P. Schwarz of FhG/EAS Dresden, there was a distinct emphasis on hardware simulation this year. The workshop was well attended and presentations of high technical quality were given. The sometimes extensive discussions were outspoken and free and helpful to both the speakers and the audience.

The revised proceedings (extended abstracts of the talks) will appear as volume No. 29 of the ASIM series 'Reports from the working groups'.

Following is an excerpt from the List of Contents:

Post H.U., TU Berlin; Schwarz P., FhG Dresden: *Parallele Mehrebenensimulation*

Rissiek W., Univ. Paderborn: *Parallele Simulation bipolarer Schaltungen bei Anwendung des Waveform-Relaxations-Algorithmus*

Lanchès Ph., Baitinger U.G., Univ. Stuttgart: *Eine parallele Testumgebung für die verteilte Logiksimulation*

Simic N., Post H.U., TU Berlin: *Paralleler Mehrebenen-Logik-Simulator (PMLS) mit integrierter Timing-Ebene*

Donath U., FhG-IIS Dresden: *Deadlock-freies konservatives Verfahren zur parallelen Logik-Simulation*

Scheschonk G., CIT Berlin: *Simulation zur Planung und Leistungsanalyse von Systemarchitekturen*

Reus Th., Univ. Frankfurt: *Entwurf, Implementierung und Analyse von parallelen Algorithmen mit Hilfe von Wellen*

Luksch P., TU München: *LDSIM: Logiksimulation auf Multiprozessor-Systemen*

Eichhorn K., Schlegel P., TU Chemnitz: *Beiträge zur Entwicklung eines parallelen Logiksimulators mit adaptiven Eigenschaften*

Bauer H., TU München: *Verteilte ereignisgesteuerte Simulation mit der Time-Wrap-Methode*

Jakob Chr., SIEMENS-NIXDORF Berlin: *Anwenderbezogene Architekturen bei Mehrsprachensimulatoren*

Klucker, GfP Hamburg: *Zentrale Auslieferung eines chaotischen Lagers*

Ahrens K., Inst. SoftW-Technik; Fischer J. Humboldt-Universität Berlin: *Objektorientierte Programmierung und next event Simulation mit strongly typed Sprachen.*

Lehrenfeld G., Univ. Paderborn: *Eine verteilte Implementierung von 'Flat Concurrent Prolog' auf Transputer-Netzwerken*

Weiß M., Univ. Mannheim: *Hierarchische Simulation lokaler Realzeitnetze*

Jobmann M., TU München: *Konzepte der Prozeßkommunikation in ILMAOS*

Tarchanjan A., Jobmann M., TU München; Vindeby P. SIEMENS München: *Simulation einer Kommunikations-Infrastruktur für verteilte Multimedia-Anwendungen*

Frank M., TU Dresden: *2-Ebenen-Konzept der objektorientierten Beschreibung paralleler Prozesse.*

Kirchner Chr. Univ Passau: *Modellierung und verteilte Simulation digitaler Systeme*

Speaker of the working group: Dr. Hans Fuss, GMD-F1, Postfach 1240, W - 5205 St. Augustin 1. Tel: +49-(0)2241/14-2778, Fax: +49-(0)2241/14-2889

Working Group "Simulationssoftware und -hardware"

Speaker of the working group: PD Dr. J. Halin, ETH Zürich, Institut für Energietechnik, Clausiusstrasse 33, CH-8092 Zürich. Tel: +41-(0)1/256-4608, Fax: +41-(0)1/262-2158

Working Group "Simulation und künstliche Intelligenz"

The ASIM working group "Simulation and Artificial Intelligence" held its fifth workshop on May 7 and 8, 1992 at the Fraunhofer Institute for Material Flow and Logistics, Dortmund. The program included contributions from a variety of applications, tool demonstrations and a survey lecture on recent trends in qualitative simulation. As in all previous workshops, discussions were very intense and fruitful. Object oriented approaches and qualitative simulations were the central topics.

As the speaker of this working group I wish to thank all participants for their co-operation and in particular the hosting institute for giving us the opportunity to hold the workshop.

The workshop proceedings will be published by ASIM in autumn 1992 as "*ASIM Mitteilungen Nr. 30*". Next year's workshop will be held in spring 1993 in Karlsruhe together with the working group "Simulation Hard- and Software". This workshop will concentrate on optimisation techniques. Further details will be announced later in this journal.

Speaker of the working group: Dr. Johannes Krauth, BIBA, Bremer Institut für Betriebstechnik und angewandte Arbeitswissenschaft, Postfach 33 04 40, W-2800 Bremen 33. Tel: +49-(0)421/218-4431

Working Group "Simulation in Medizin, Biologie und Ökologie"

In 1992 the 5th workshop "Advanced Simulation in Medicine, Biology and Ecology" was organized by the Working group 4.5.2.1 of ASIM. The workshop was held from 26th to 28th March 1992 at the old castle of Ebernburg, Bad Münster am Stein. The 55 participants of the workshop came from Austria, Germany, Switzerland and Great Britain.

Application of recently developed mathematical theories of dynamical systems in medicine, biology and ecology, parameter estimation, expert systems, Fuzzy-Logic, genetic algorithms, Lindemayer systems, cognitive systems, cell kinetics and environmental interactions were the topics of this meeting.

The main lectures were given by Prof. Dr. A. Schöne about Fuzzy-Logic, Dr. A. Fischlin about terristic ecosystems and Prof. Dr. D. Pfeiffer about Point Processes.

Without doubt, the diversity of the workshop program will appeal to the interdisciplinary research activities in this working group in the field of analysis and simulation of dynamical bioprocesses. Therefore the workshop was divided into the sections Medicine with 8 lectures, Biology with 4 lectures, Ecology with 12 lectures and Methodology with 3 lectures.

The proceedings of the workshop will be published in the series "*Informatik-Berichte 92/1*" of the Department of Computer Science of the Technical University of Clausthal. There is a limited amount of the proceedings available on request.

The participants of the workshop stayed in the old castle of Ebernburg. The workshop was opened Thursday evening by a welcome reception in the pleasent atmosphere of the castle with the Ebernburger Venion dinner. During the reception a tasting of Nahe wines was offered. Friday evening a banquet of the most honorable knighthood was given in the stimulating atmosphere in the knight's hall of the old castle of Altenbamberg. The 5th workshop was the 8th annual meeting of the working group since 1984, when the ASIM working group was founded. The 9th annual meeting of the working group is planned to be held at Bonn in Spring 1993.

Speaker of the working group: Prof. Dr. Dietmar P.F. Möller, TU Clausthal, Institut für Informatik, Erzstr. 1, W-3392 Clausthal-Zellerfeld, Tel. +49-(0)5323/722402 or 722504, Fax +49-(0)5323/723572

Working Group "Simulation technischer Systeme"

Report on the 9th Workshop Simulation of Technical Systems, March 9-10, 1992 Paderborn University

The ASIM working group "Simulation of Technical Systems" held its annual spring workshop on March 9-10, 1992. About 60 participants from industry, universities and research centers met at the Institute for Control Engineering at Paderborn University.

In the morning of the first day, two user group meetings had been organized: German SPICE user group (Hans Gall) and German ACSL user group (Irmgard Husinsky).

The workshop program was divided into 4 sessions:

1. Reports from the Institute for Control Engineering

At first a survey was given on current activities of the institute, e.g. control of biosystems. Then a report dealt with decentralized simulation of dynamic systems, applied to the extrusion of plastic material. Finally a project of biotechnical system simulation for the design of process control concepts was presented. Later on a visit of the institute's labs gave an interesting insight into the development of experiments and computerized equipment.

2. Reports from Hella Company, Lippstadt

The first contribution showed the company's broad range of development and production for automobile applications. The following report presented methods of modelling and simulation in automobile electronics. Further papers dealt with control system design and simulation, numerical calculation of magnetic fields and simulation of headlights.

3. Simulation of Electrical Circuits

The modelling of power transistors for use in SPICE was discussed. The optimization algorithms for circuit design with HSPICE were explained. Then a comparison of SABER and SPICE features was presented. The last paper in the session dealt with time saving simulation of reflection and crosstalk on printed circuit boards.

4. Further Papers from ASIM Members

In this session the broad spectrum of technical system simulation was obvious: application of order reduction methods in chemical system simulation with FSIMUL; simulation and optimization of a steering rack; simulation environment for differential equation solvers in ODEPACK; hardeware-in-the-loop simulation for ABS system design; modelling concepts in analogue simulation; definition and use of physical units in the simulation language SIMUL_R; the block oriented graphic simulation environment SIMULAB for MATLAB; comparison of performance of continuous system simulation software.

The workshop dinner allowed fruitful discussions in the pleasant atmosphere of a Paderborn inn. The workshop was sponsered by the HELLA Company, Lippstadt.

Extended abstracts of this workshop (*ASIM-Mitteilungen Nr. 28*) are available from ASIM or from the speaker of this working group.

Speaker of the working group: Prof. Dr.-Ing. Gerald Kampe, FHT Esslingen, Flandernstraße 101, W - 7300 Esslingen. Tel: +49-(0)711/394-258 or 266

Working Group "Simulation in der Fertigungstechnik"

Der Arbeitskreis "Simulation in der Fertigungstechnik erarbeitet im Rahmen mehrerer Arbeitsgruppen ein "Handbuch Simulationstechnik", das als ein Leitfaden zur Simulationstechnik aufgebaut wird und sich inhaltlich in einen Anwendungsblock, der die unterschiedlichen Einsatzfelder der Simulation beschreibt, einen Methodenblock, der auf die methodische Vorgehensweise bei der Durchführung von Simulationsstudien eingeht, und einen Block, der sich mit Sonderaspekten der Simulationstechnik beschäftigt, gliedert. Ein Abstimmungsgespräch der Arbeitsgruppen-Obleute fand am 25. Juni 1992 in Dortmund statt. Die Fertigstellung des Handbuches ist für Dezember 1992 geplant, sodaß das Buch auf der nächsten Fachtagung "Simulation und Fabrikbetrieb" in Aachen vorgestellt werden kann. Der Veranstaltungstermin "Simulation und Fabrikbetrieb" ist aus terminlichen Gründen in den Februar 1993 verschoben worden.

Speaker of the working group: Prof. Dr.-Ing. A. Kuhn, Fraunhofer-Institut, IML, Emil-Figge-Straße 75, W-4600 Dortmund 50. Tel: +49-(0)231/9743-130, Fax: +49-(0)231/9743-211

Working Group "Simulation in der Betriebswirtschaft"

Speaker of the working group: Prof. Dr.-Ing. W. Hummeltenberg, Universität Hamburg, FB Wirtschaftswissenschaften, Bundesstraße 55, 2000 Hamburg 13. Tel: +49-(0)4123-4023.

I. Bausch-Gall

Latest News

AES

General Information: AES, Asociacion Espanola de Simulacion (Spanish Simulation Society), was formally established on May 21, 1992 in Malaga. Its primary goal is to facilitate communication and co-operation between spanish groups and individuals interested in simulation. Other aims are to increase contacts with the international simulation community and to promote the use of simulation in industry.

Steering Committee: At present, there is a temporary steering committee responsible of starting AES activities and promotion. It consists of the following persons: Antoni Guasch, Jose M. Giron, Jesus Criado.

Next activities: In the fall semester it is planned to organize a one day meeting in Madrid to examine the use, needs and experiences of simulation in industries in Spain as well as the state of the art in research centres and Academia. The goal is to identify specific interest areas in which the AES can play an active role. The meeting is sponsored by the Directorate of Robotics, Control and Industrial Processes of the Spanish Ministry of Industry.

Membership: The annual fee for regular members is 5000 pts and for institutional members 50000 pts.

Contact Address: AES, Departament ESAII, Universitat Politecnica de Catalunya, Diagonal 647 - 2 planta, E-08028 Barcelona, Spain. Tel: +34-3-4016544, Fax: +34-3-4016600 e-mail: guasch@esaii.upc.es

DBSS

DBSS Membership

Individuals (in particular Dutch speaking ones) and institutes etc. from the Benelux countries, interested or active in the field of simulation, can become DBSS member. Membership fee (per annum) is:

- personal member:
  50 guilders or 900 Belgium francs
- institutional member:
  100 guilders or 1800 Belgium francs

DBSS members receive "EUROSIM-Simulation News Europe" and can benefit in many cases from special discounts on conferences, meetings, organized by DBSS or other member societies of EUROSIM, IMACS and SCS.

Contact Addresses

Those interested to become a member of DBSS are invited to write to the acting secretary:

ir. J. C. Zuidervaart
Rekencentrum, Delft University of Technology
P.O. Box 354
2600 AJ Delft, The Netherlands

(Please mention your name, affiliation and address, and indicate whether you are interested in the personal or institutional membership).

The membership fee should be paid to:

Giro account 3582241
J.C. Zuidervaart
Leeuwerikplantsoen 27
2636 ET Schipluiden
The Netherlands

with the mention: DBSS membership.

If you changed address or your address is incomplete, please inform the acting secretary. If you are interested to contribute in future activities of DBSS or if you have ideas in this respect, please contact the acting secretary. Do you have information for 'EUROSIM-Simulation News Europe', please send it to the acting secretary.

Coming events

July 2nd, 1992, DBSS organizes a one-day symposium entitled "Massive Parallel Processing". Speakers are e.g. from Arcobel bv, Oss; Shell Amsterdam; Thinking Machines, Cambridge M.A.; CONVEX Computer bv Utrecht; Cray Resaerch, Rijswijk.

If you wish more detailed information about this symposium please contact the DBSS secretariat

J.C. Zuidervaart

FRANCOSIM

FRANCOSIM, *Société Francophone de Simulation* (French Speaking Simulation Society), aims to the promotion and development of simulation models, tools and methods as well as related techniques, in all human activities and notably in industry, research and education, and this especially in the international French speaking community.

Membership

FRANCOSIM came to existence almost one year ago and today it has 105 regular members and 2 honorary members. The annual charge is FF 250.

Contact Address

For further information, please contact

Mrs. Fourneyron:
Tel. +33-77 71 20 00
Fax: +33-77 72 52 99

or Mr. Lebrun:
Tel. +33-77 70 80 80
Fax: +33-77 70 80 81

at the legal seat:

FRANCOSIM
Maison de la productique
F - 42300 Roanne, France

Organization

FRANCOSIM has three functioning working groups:

1. Simulation of production systems

The person to contact is:

Eric Marcon
IUT de Maintenance Industrielle
Rue Albert Thomas
F - 42300 Roanne
Tel: +33-77 44 89 28

2. Simulation of multibody systems

Marc Alirand
Société IMAGINE
Esplanade Diderot
F - 42300 Roanne
Tel: +33 77 70 80 80

3. Simulation and bond graphs

Michel Lebrun
Société IMAGINE
Esplanade Diderot
F - 42300 Roanne
Tel: +33 77 70 80 80

Working Group Activities

1. Simulation of production systems:

The first meeting was held in Paris on April 9th. 30 people were present and greatly appreciated the quality of the conference. It was also a good opportunity to have contact with FRANCOSIM members coming either from industry or university, from all parts of France.

The wish was expressed to hold regular meetings (one every 2 months) and many of the participants are prepared to speak at the coming meetings.

2. Simulation of multibody systems:

A three day seminar was held in Roanne on May 4 to 6: "Computational Methods in Multibody System Dynamics". The international character of this meeting contributed to the quality of the scientific and human exchanges. Professor Wittenburg, University Karlsruhe, Dr. Führer, DLR Oberpfaffenhofen, and Dr. Eich represented Germany. Dr. Yen, CADSI Oakdale, represented the USA. Most participants were French, the University of Mons in Belgium sent a delegate too.

3. Simulation and bond graphs:

A Bond Graph Club was created a few years ago in France with Professor Jean Thoma as chairman. Its aim is to promote and develop the bond graph tool in the field of research and education. Several summer schools on bond graphs were organized with the participation of speakers coming from all over the world. A partnership agreement has been signed with FRANCOSIM and the Bond Graph group can now be considered as a working group of FRANCOSIM. A winter school is going to be organized in January 1993 in Roanne. Further information will be given in the next issue of EUROSIM - Simulation News Europe.

Meetings to come

On June 18th the second meeting of the group "Simulation of production systems" will take place in Lyon. The subject will be: "A methodology to build simulation models". The theme was chosen by the participants of the first meeting in Paris and four conferences are going to be held.

On October 23rd the working group will restart its activities after the holiday break. The subjects to be discussed will be chosen on June 18th.

On October 29th a one-day workshop in Liège (Belgium) on "Simulation - Outils Modernes de Développement" will be co-organized by FRANCOSIM and AIM. It aims at establishing the state-of-the-art in simulation code generators. Most of the speakers come from industry.

FRANCOSIM Annual Meeting:

FRANCOSIMs annual meeting will be held on **July 25 in Lyon.**

A new board of directors will be elected and the mayor developments for 1992-1993 will be discussed. We hope to see many members to bring new ideas and express their opinion about the past twelve months.

F. Lorenz

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

G. Iazeolla	(chairman)
F. Cennamo	(vice-chairman)
V. Grassi	(treasurer)
M. Colajanni	(secretary)

Membership

At present, the membership situation is the following: 118 members, 5 of which are institutional and 4 are honorary, 107 are regular members and 2 are affiliate ones.

Charges per annum are Lit. 20,000 for regular and affiliated members and Lit. 350,000 for institutional members.

Contact address

For further information or application for membership, please contact:

ISCS
c/o Dip.to di Ingegneria Elettronica
Università di Roma "Tor Vergata"
Via della Ricerca Scientifica
I-00173, Roma, Italy
Tel: +39-(0)6-725944.77/.78/.86
Fax: +39-(0)6-2020519
E-mail: IAZEOLLA@IRMENEA.BITNET

Activities

The ISCS is currently involved in the organization of the **4th European Simulation Congress, EUROSIM '92,** which will take place in Capri, Italy, from September 29th through October 2nd, 1992.

This international congress is organized on behalf of EUROSIM by the ISCS in co-operation with ASIM, DBSS, FRANCOSIM, SIMS and UKSS.

We have received about 150 papers mostly from Europe. The Scientific Committee has selected about 100 of them on the extended abstract basis. A final review of the full papers will take place after June 30.

The program is organized in ten sessions a day: the invited talks are in the first session of each morning; the author presentations (about 20 minutes each) are divided in three parallel sessions; several related events are also included in the program. For **preliminary program** see page 4.

Exhibitors will have two sections: one for commercial demonstrations and one for posters. Moreover, we are examinating the possibility of organizing an exhibitor presentation session.

Main Topics:
Simulation tools and languages
Simulation methodologies
Simulation in computer systems and networks
Simulation in electronics and control
Simulation in electrical engineering and energy systems
Simulation in education and training
Simulation in business and management
Simulation in construction and transportation
Parallel and distributed simulation
Simulation in factory and automation
Simulation in environmental and biological systems

Invited Speakers:
Ennio Cascetta (Università di Napoli, Italy), Francois E. Cellier (University of Arizona, Tucson AZ, USA), Roy E. Crosbie (California State University, Chico CA, USA), Granino A. Korn (University of Arizona, Tucson AZ, USA), Ramana Reddy (West Virginia University, Morgantown WV, USA), Pasquale Scandizzo (Università di Roma "Tor Vergata", Roma, Italy), William E. Schiesser (Lehigh University, Bethlehem PA, USA)

Social Events:
September, 28: Welcome cocktail
September 29: Open Air Dinner
September 30: Conference Banquet
October 1: Entertainment

Related Events (tentative schedule):
ACSL User Group Meeting (September 28)
ISCS Annual Meeting (September 29)
Giorgio Savastano Award (September 30)
ESPRIT Session on Simulation (September 30)
Dynamics Meeting (October 1)

A strong recommendation: register early and reserve now your room because the congress period is high season in Capri.

Registration: Early registration fee (before August 31, 1992) is 300 ECU for authors and members of ASIM, DBSS, FRANCOSIM, ISCS, SIMS, UKSS, SCSI, 350 ECU for other participants. After August 31, 1992 registration fee will be increased by 50 ECU.

Payment can be made in ECU or in Italian Lire, free of bank charges:

by cheque payable to EUROSIM, to be mailed to: Banca Popolare dell'Irpinia, Capri agency, Account no. 6989, Via Camerelle 26, I - 80100 Capri, Italy

by money transfer payable to: Banca Popolare dell'Irpinia, Capri agency, Bank SWIFT Code IRPBIT3A, Account no. 6989/EUROSIM

Official travel agent: Agenzia Tiberio, Capri, Tel: +39-81 8370244, Fax: +39-81 8378933.

Congress Secretariat:
Mrs. Antonella Di Chiara
Dept. of Civil Engineering
University of Rome "Tor Vergate"
Via della Ricerca Scientifica
I - 00173 Roma, Italy
Tel: +39-6-72594575, Fax: +39-6-72594586

M. Colajanni

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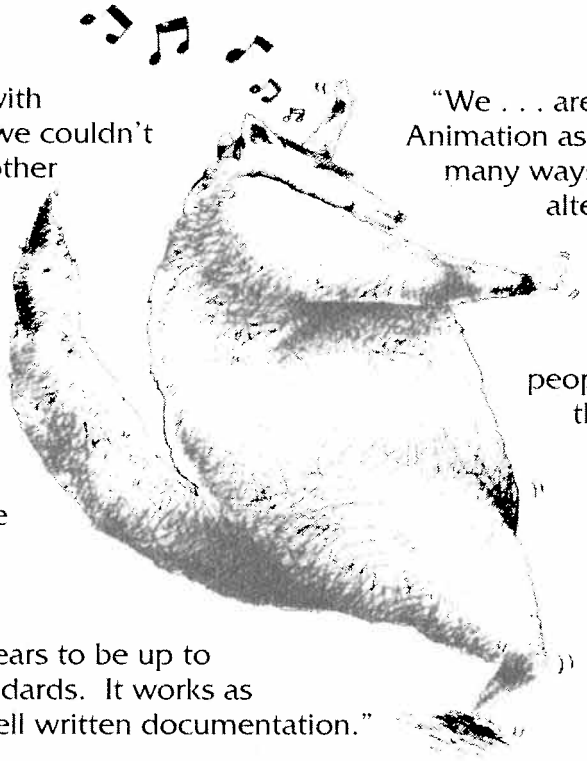

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– GPSS/H user

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UKSS

United Kingdom Simulation Society

Report on Meeting in Edinburgh 5th May 1992

A highly successful meeting on object oriented simulation was held in Edinburgh on Tuesday 5th May 1992. A small but very interested audience heard presentations on a number of different aspects of object oriented methods. The programme for the day included the following:

"Supporting Object Oriented Simulation in C++" by Trevor Miles of Simulation Analysis Systems Ltd.

"Graphical Interfaces to Object Oriented Simulation" by Peter Hughes of Medicum Ltd.

"An Object Oriented Simulation Environment with Graphical Input" by Richard N. Zobel of Manchaster University

"General Structure for Object Oriented Environments for Re-Use" by Rob Pooley of Edinburgh University

"An Object Oriented Hierarchical Simulator for Computer Architectures" by Sandy Robertson of Edinburgh University

"Using Object Oriented Tools for Parallel Computers" by Neil Skilling of Edinburgh University.

In addition to these presentations the meeting included an informal demonstration of some object oriented planning tools. UKSS is grateful to Rob Pooley of the Department of Computer Science at Edinburgh University for making the local arrangements for this interesting and useful meeting.

Report on ESM-92 Multi-Conference at York

The Multi-Conference was organised by SCSI and co-sponsored by UKSS, EUSC, EUROSIM, JSST and CASS. There were 151 presentations including 6 invited speakers, poster sessions, and technical sessions for vendors. The General Chairman for the Multi-Conference was Professor John Stephenson of the University of Bradford while Dr. Richard Zobel (UKSS Chairman) acted as Programme Chairman. The Conference topics were:

Aerospace Simulation
Simulation Methodology and Practice
Simulation in Society
Simulation of Electronic Circuits and Systems
Industrial Simulation and Simulators
Simulation in Energy

The exhibition was well supported by industry which also benefitted from well-attended vendor presentation sessions, a feature of the conference which will undoubtedly be included in future events.

Social highlights included a private visit to York Minster on the Monday evening to hear an illustrated lecture on the Bradford Organ Sythesiser which is currently replacing the pipe organ whilst refurbishment takes place. The conference dinner was held on the platform of the new wing of the York Railway Museum and was preceded by a walk around the exhibits with wine and an excellent brass band.

The prize for best paper was awarded to Soeman Takakuwa of Tokyo University for his contribution "Machine Loading and Analysis of a Machine/Measuring Type of Flexible Manufacturing System". The prize was a free registration to any forthcoming SCSI Conference and was presented by Dr. Richard Zobel, the general programme chairman.

UKSS Conference

The first conference to be organised by the newly independent UKSS will be held on September 13-15, 1993 at the Keswick Hotel, Keswick-on-Derwent, Cumbria.

The conference will cover all aspects of simulation and its applications and will include an exhibition, vendor presentations and poster sessions. Papers from Continental Europe, North America and the Far East are particularly welcome. The first call for papers will be published in the next issue of EUROSIM - Simulation News Europe.

Keswick is in the northern part of the Lake District, a beautiful scenic area famous for its lakes and mountains. The weather in September is often dry and settled with good daytime temperatures, ideal for walking, cycling and hiking. Come to the UKSS Simulation Conference and have a few days vacations in beautiful Lakeland.

D. Murray-Smith

SIMS

The Scandinavian Simulation Society, SIMS, has about 250 members from Denmark, Finland, Norway and Sweden. For more than 30 years SIMS has served as the regional simulation society in Scandinavia, gathering individuals and organizations 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.

SIMS 92 Simulation Conference on Simulation of Chemical and Power Plant Processes and Annual meeting of SIMS were held in Lappeenranta, Finland, June 10-12, 1992.

The members of the SIMS board are at present:

Torleif Iversen (chairman)	Norway
Eija K. Puska (secretary)	Finland
Lars Lidner (treasurer)	Sweden
Odd Falmyr	Norway
Mats Johnsson	Sweden
Sakari Kaijaluoto	Finland
Erik Mosekilde	Denmark
Paul Rathje	Denmark

HOW TO JOIN SIMS ?

If you or some of your Nordic colleagues are interested in simulation but are not yet a member of SIMS, then just send an informal application or recommendation for membership to the SIMS secretariat:

E.K. Puska, Technical Research Centre of Finland,
P.O.Box 208 (Tekniikantie 4), SF-02151 Espoo, Finland,
Tel.+358 0 4561, Fax: +358 0 456 5000

M. Hänninen

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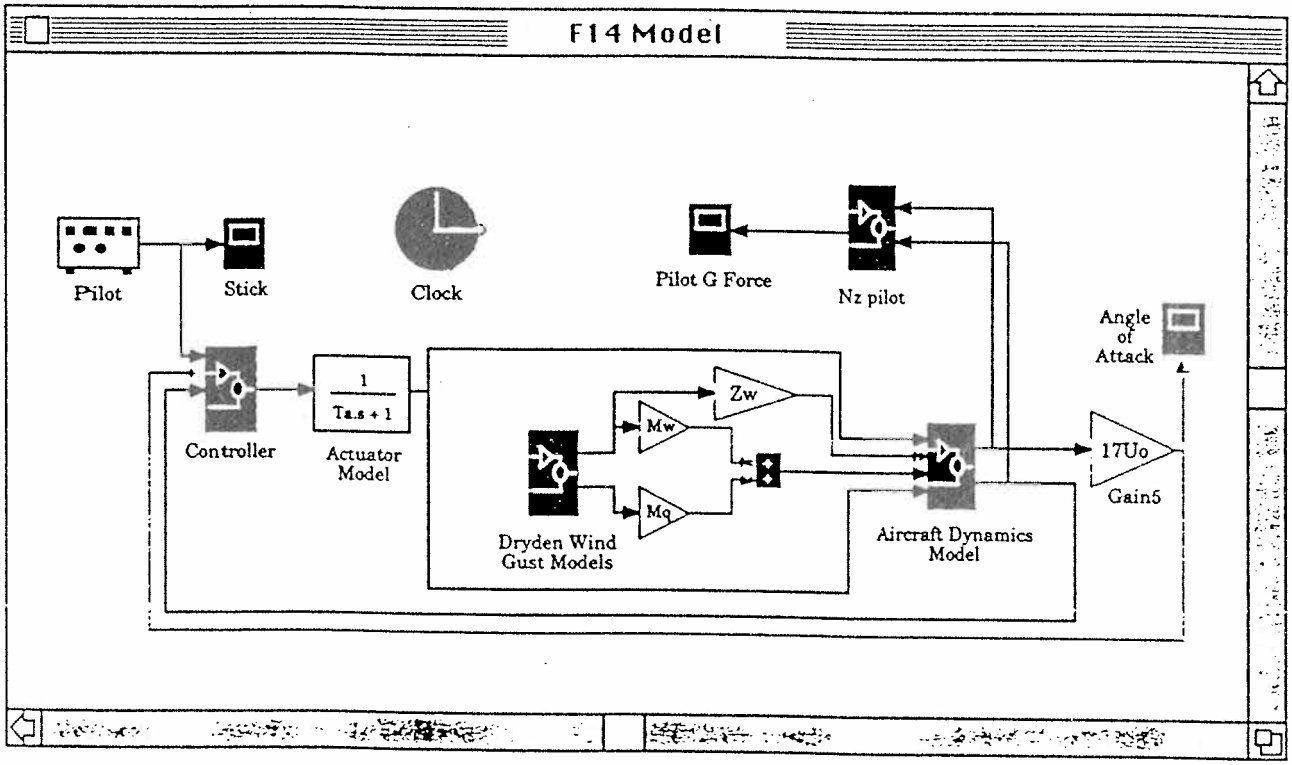

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RAPID DATA

CROSSIM

The Croatian society for simulation modelling CROSSIM was officially founded on March 28, 1992 in Zagreb. The elected officers of the society are:

Chairman:	Professor Vlatko Ceric
Vice-chairman:	Dr. Tarzan Legovic
Treasurer:	Zoran Bekic, M.Sc.
Secretary:	Jadranka Bozikov, M.Sc.

The Society currently has 25 members from various parts of Croatia (Zagreb, Rijeka, Split, Varazdin). Among them are several members of international Academies of Sciences and Arts, members of Editorial Boards of international journals, Chairmen of Program Committees of international conferences, authors of textbooks and numerous papers in recognized international journals, heads of research groups with intensive international co-operation etc. The current effort of the Society is to attract more users of simulation and some institutional members.

We want to emphasize once more our gratitude for the support which we received from our colleagues from EUROSIM. Our special thanks go to Prof. Dr. Felix Breitenecker from the ASIM society who provided us valuable moral and material help during a long period of time.

CROSSIM will in the near future seek a full membership in the EUROSIM federation, as an official simulation society of an independent state which is a full member of the United Nations since May 1992. We already got the proposal to be affiliated with the Society for Computer Simulation.

CROSSIM society is, by its Statutes and Bylaws, a non-profit society with the following main goals:

- promotion of knowledge, methods and techniques of simulation,
- promotion of application of simulation and exchange of information between all interested parties,
- establishment and maintenance of professional standards in the field of simulation,
- promotion and development of education and training in simulation,
- dissemination of information on simulation for professional and general public, organization of professional meetings and publishing of professional publications in the field,
- development of co-operation with similar domestic and international institutions.

Some of the activities of the Society in 1992 are:

- Co-organization of the 14th International Conference "*Information Technology Interfaces IT '92*" which will be held in Pula from 15 - 18 September 1992. The conference will have the simulation session, several international invited lecturers in the field of simulation, and the round table on "EUROSIM Federation and its activities" where the guests will be Prof. Felix Breitenecker and Mrs. Irmgard Husinsky, the editors of EUROSIM - Simulation News Europe.
- Co-organization (in the moment informally) of the *2nd Operations Research Conference in Croatia*, to be held from 5 - 7 October 1992 in Rovinj.
- Simulation seminar which is regularly held in the Faculty of Economics, University of Zagreb. The guest speaker in June 1992 will be Prof. John Bernardo from the University of Kentucky.
- Co-operation in founding the new international journal Computing and Information Technology, to be launched from 1993.
- Work on several scientific projects in discrete and continuous simulation, and applications of simulation in such diverse fields as engineering, economy, medicine, ecology etc.
- Publications (one simulation textbook in Croatian in press, papers in international and domestic journals and conference proceedings).
- Contacts with the Croatian Manager Association (having about 1700 members) in order to support education and problem solving in the decision-making area.

Any information about the CROSSIM society may be obtained from

Professor Vlatko Ceric
Chairman of CROSSIM
Faculty of Ecconomics
University of Zagreb
Kennedyjev trg 6
41000 Zagreb Croatia
Tel: +38 41 231 111
Fax: +38 41 235 633
E-mail: vlatko.ceric@uni-zg.ac.mail.yu

V. Ceric

CSSS

Czech & Slovak Simulation Society

Since its birth CSSS is a part of both the Czech and Slovak Scientific and Technological Society for Applied Cybernetics and Informatics (CVTS AKI and SVTS AKI). Through these societies CSSS is connected to the Czech and Slovak Unions of Scientific and Technological Societies to which it could no doubt affiliate independently, however without the right to participate in the general assembly, without financial participation in eventual profit of the Unions, etc. The condition of CSSS membership is therefore the membership in one of the two AKI societies and also CSSS by-laws closely follow the by-laws of AKI societies. The April 1992 general assembly of the Czech AKI society adopted the final text of the by-laws in which there were included among other things two interesting changes concerning the membership. Since April 22, 1992 the CSSS membership is open not only to:

- citizens of the Czech Republic and Slovak Republic
- foreign nationals living permanently on the territory of the CSFR

but newly also

- foreign nationals with Czech or Slovak nationality even if they do not live in the CSFR
- legal subjects of a non-political nature active on the territory of the CSFR.

In this way CSSS has more conformed to the philosophy of other European simulation societies associated in EUROSIM as it now enables simulationists to associate not only on the regional but also on the language principle. With regard to the economic situation and principal transformation of the economic system in the CSFR simulation is at present - though it, of course, sounds paradoxical and viewed from perspective it is indeed paradoxical - at the periphery of interest of the decision making sphere. A similar situation is in research and education where large changes occur, too. The membership of professional firms and companies dealing with simulation software or simulation studies in the CSSS could strengthen the position of this Society in its effort to revitalize simulation in the CSFR.

The CSSS general assembly which took place in May 1992 approved the change of the vice-chairperson. Doc. Ing. Ruzena Apalovicová, CSc. who held the position up to now resigned because of the extreme work load in her new job. On her place is now a renowned Slovak simulationist Doc. Ing. Mikolás Alexík, CSc. The new CSSS contact address in Slovakia is now:

Mikolás Alexík
Katedra technickej kybernetiky
Vysoká skola dopravy a spojov
Velky diel
CS - 070 26 Zilina
Tel.: +42.89.54042

M. Kotva

Hungarian Simulation Group IMACS/Hungary

In accordance with our intentions to promote international contacts in the field of simulation on the one hand and involve young scientists and students in the research work, thereby also providing them the possibility to give account on their achievements in form of lectures, a graduate student from the Netherlands, the Delft University of Technology, Silvia de Beer, who stayed in the framework of a scholarship with our research group for 9 months, gave a lecture in April in the House of Techniques, organized by our society.

The lecture given was titled "Numerical Petri Nets and Some Questions of the Implementation in the CASSANDRA Simulation System". Following the seminar a lively discussion took place. The event was a conclusion of a successful work undertaken within the scholarship and a positive step enhancing our contacts with the Dutch university. This work also provided basis for her thesis in informatics. We do hope that this will be followed by further similar events.

Prof. Dr. András Jávor
Chairman of IMACS/Hungary
KFKI Institute for Measurement and Computing Techniques
P.O. Box 49,
H - 1525 Budapest
Tel: +36 1 1699499
Fax: +36 1 1553894

A. Jàvor

European Simulation Council (EuSC) Regional Council of SCS

The European Simulation Council is a Regional Council of SCS (the Society for Computer Simulation) and covers the geographical area of (Western and Eastern) Europe. The proposal to establish this Council has been accepted and approved by the SCS Board of Directors in its annual meeting of July 18, 1990 (Calgary). The formation of the European Simulation Council was intended to provide SCS members in Europe with the same basis of support and representation in the SCS bodies as members in the US, Canada and (formerly) UK. Similar actions are also under consideration for other parts of the world (outside USA and Canada) where SCS membership levels are growing (e.g. Pacific RIM).

The formation of EuSC has had and will have the following advantages:

(i) provide a more effective interface between SCS Headquarters and the European Office as well as the SCS membership in Europe,

(ii) give European members of SCS the same access to representation in the SCS Board of Directors as those in US, Canada and (formerly) UK,

(iii) allow the formation of local chapters of SCS members,

(iv) facilitate the interaction of SCS members in Europe with existing technical activities based in the US and the formation of new technical activities in Europe based on common interests.

There exists a Steering Committee of EuSC. Currently, the officers are:

chairman:	Dr. Eugene J.H. Kerckhoffs (Delft, The Netherlands)
vice-chairman:	Dr. Axel Lehmann (Munich, Germany)
secretary/treasurer:	vacancy
members:	Dr. A. Guasch (Barcelona, Spain), Dr. J. Potucek (Prague, Czechoslovakia), R. Rimane (Erlangen, Germany), Dr. Yuri Merkuryev (Riga, Latvia), H. Weigl (Vienna, Austria).

On the basis of its membership EuSC is entitled to have 5 representatives in the SCS Board of Directors. Currently (i.e. in the Fiscal Year 91/92) the directors are: Dr. Axel Lehmann, Dr. Eugene Kerckhoffs, Dr. Jiri Potucek, Rainer Rimane and Dr. Richard Zobel (UK). Dr. Gh. Vansteenkiste (Belgium) is the Vice-President Europe and as such a member of the SCS Executive Committee.

All European SCS members are automatically members of EuSC. In addition to these voting members, EuSC has nonvoting affiliate members who are not SCS members; they pay a membership fee of $ 5 per annum.

EuSC is involved in the organisation of both European SCS Conferences that take place every year: the European Simulation MultiConference ESM (June) and the European Simulation Symposium ESS (October/November). During the ESM the Annual Meeting of the Council is held, and during the ESS an Organisational Meeting. During the foregoing ESM92 (York, UK, June 1-3, 1992) an important so-called Blue Sky Meeting has been held in which the profile and policy of the European SCS part has been considered. In addition to the above mentioned major conferences, EuSC is involved in the organisation of smaller local scientific events (e.g. a Seminar by Dr. Wolfgang Kreutzer from the University of Canterbury, New Zealand, in Delft, the Netherlands, April 21, 1992).

Those interested to become an affiliate member of the Council or to be actively involved in the activities of the Council are invited to contact the SCS European Office or the Council's chairman Dr. Eugene Kerckhoffs (address is on the cover page of the Journal).

E. Kerckhoffs

Foundation of Special Interest Group "Simulation in Europe" (SiE) in the framework of EC Research and Educational Programmes

Dr. K.C. Varghese (Commission of the European Communities, Directorate General XIII / Telecommunications, Information Industries and Innovation), **Dr. G.C. Vansteenkiste** (University of Ghent, Belgium, chairman SiE) and **Dr. E.J.H. Kerckhoffs** (Delft University of Technology, the Netherlands, secretary SiE) have taken the important initiative to found the Special Interest Group "Simulation in Europe" (SiE). Special Interest Groups are Working Groups within the framework of the EC ESPRIT programme to promote specific areas in Information Technology.

In the first instance, a kernel group has been formed that in addition to the three above persons consists of Dr. S.E. Sand (Danish Maritime Institute, Copenhagen, Denmark), Dr. E. Vergisson (Solvay, Scientific Computer Centre, Brussels, Belgium), B. W. Hollocks (AT&T ISTEL, Redditch, England), and R. W. Sierenberg (Sierenberg & de Gans bv, Waddinxveen, the Netherlands). In the second instance, a platform of some 25 (mainly industrial) people Europe-wide is being formed to initiate the Group's future activities.

The aims of the new Special Interest Group SiE are the following:

1. Examine the use, needs and experiences of simulation in industries in the EC member countries as well as in the ESPRIT and other EC projects. Specific interest areas will be therefore identified (like generic tools, human-computer interfaces, etc.). Report the results.

2. Provide an adequate standardization of the tools offered by simulation based on classification and taxonomy, in order to support its role of interfacing and integration with the ongoing developments (promote modularity among tested subcomponents).

3. Propose initiatives leading to increasing awareness of simulation and a well co-ordinated dissemination of knowledge.

4. Ensure the rapid and consistent dissemination and exploitation of new research ideas by means of selected workshops, symposia and tutorials.

5. Disseminate the knowledge and expertise available with the international and national Simulation Societies active in Europe. (This knowledge and expertise has been put down in many books, conference proceedings and directories.)

The Special Interest Group SiE covers especially the following subdomains of interest within the computer simulation field:

- Man-machine: languages, environments, interfaces, graphics, animation.

- Integration: integrating simulation with DBMS, graphics, expert systems, neural networks; integration in industrial developments.

- Standardization: classifications, taxonomies (with respect to end users, IT industry, and academics; take into account application areas, roles, tools, methods, techniques, benefits, obstacles); standards; generic tools and approaches (especially application driven).

- High-performance computing: supercomputing, parallel simulation, special-purpose simulators.

- Applications: engineering, ill-defined systems (e.g. environmental), training (simulators).

A first meeting of only the kernel group was held in Brussels on January 14, 1992. It was decided to organize soon a second meeting where representatives of EC projects should be invited to inform about simulation aspects in their projects. This 2nd meeting of SiE was held in Brussels on May 14, 1992. Some 35 delegates attended the meeting coming from all over Europe (the EC member countries Belgium, the Netherlands, UK, Germany, Denmark, France, Italy, as well as one delegate, Dr. F. Breitenecker, from Austria). The delegates were on personal title, or on behalf of the EC, industrial companies, EC projects (such as ESPRIT, DELTA, ERASMUS), Professional Societies (such as SCS, EUROSIM, IEEE, IMACS, IBPSA), and universities or academic research centres. All institutions involved were selected to have activities where computer simulation plays a major role.

Meeting of the Special Interest Group SiE , Brussels, May 14, 1992

The major part of the presentations covered ESPRIT projects (such as a.o. Supernode, KBS Chip, Old-Views) and DELTA projects (such as DISCOURS). The representatives of the projects were asked to introduce the project highlights and to stress the computer simulation aspects.

A special report was presented by Brian W. Hollocks (AT&T ISTEL, UK), who informed the meeting on the results of his study "The use of simulation in manufacturing in the UK". The study was to evaluate the extent and nature of the use of simulation in the UK industry, the value and potential value of the approach to that industry and the market factors influencing its wider use.

After the presentations an evaluation was made. It appeared that in the average the following items should have more special interest:

- standards

- interfaces

- ease of use, advanced environments

- methodology, validation

- high-performance computing, parallel simulation.

In addition to these points of interest it was noticed that SiE could stimulate many possible actions (such as publications, Magazines, Newletters, Conferences, on-line databases, publicity boards, help desks, electronic bulletins, workshops, working groups, etc.). The further policy is to concretize the above points of interest more in detail and to define priorities, and eventually to match these to concrete actions. This is the challenge for the next meeting(s) of SiE.

The meeting was closed by a presentation on the recently introduced VALUE Programme of the European Communities, reflecting Information Dissemination Policy and Activities. Extensive information was given on the Central Dissemination Services provided in this programme. It should be studied how these can be used in the SiE activities.

The next meeting is planned to take place in the last week of October 1992. Those wishing to attend this meeting are kindly requested to write to the SiE secretary (Dr. Eugene J.H. Kerckhoffs, Delft University of Technology, Fac. of Technical Math. & Informatics, Julianalaan 132, 2628 BL Delft, the Netherlands, Fax: +31-15-787141). Attendance is on personal invitation only.

E. Kerckhoffs

IMACS

IMACS sponsors the "4th International Symposium on System Analysis and Simulation" to be held in Berlin, August 25 - 28, 1992. The participants of the conference have the opportunity to hear about recent research results in the field of computational system analysis and simulation by distinguished keynote papers, standard papers about a broad range of special problems, workshops and exhibitions.

The keynote speakers are

P. Borne (University Lille): Stability Analysis and Synthesis of Non-Linear Systems with Constraints on State Variables and Control Inputs

F. Breitenecker (Technical University Vienna): Modern Trends in Simulation Technique and Simulation Software

L. Dekker (Delft University): Generalization of the System Concept Steady State

O. I. Franksen (University of Denmark, Lyngby): The Geometry of Logic. From Truth Tables to Nested Arrays.

D. Greenspan (University of Texas, Arlington): Molecular and Quasimolecular Modelling of Solids and Fluids

U. Kulisch (University Karlsruhe): Vector Processing and Simulation from the Mathematical Point of View

A. Lehmann (Military University Munich): Knowledge-based Systems in Simulation - Trends and Applications

D. J. Murray-Smith (University of Glasgow): Problems and Prospects in the Validation of Dynamic Models

M. G. Singh (University of Manchester): Complex Systems Analysis for Managerial Decision Support in a Competitive Business Environment

U. Trottenberg (GMD, St. Augustin): Methodological Approaches in High Performance Scientific Computation

Three Workshops on important topics are held:

How Can Industry Benefit from Array-Based Logic? (Moderator: O. I. Franksen, Technical University of Denmark, Lyngby)

Environmental Monitoring - A Major Task (Moderator: P. Gössele, Technical University Berlin)

Requirements and Computer Implementation Aspects to Apply Meteorological Models for Forecasting of Air Pollution, Operational Management, and Urban Planning (Moderator: A. Sydow, GMD - FIRST Berlin)

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Reception by the Senate of Berlin (Säulenhalle of the Red Town Hall), Banquet in typical Berlin manner (Rixdorfer Bräuhaus), Organ Concert (church St. Marien)

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A. Sydow, GMD-FIRST, Berlin

Discussion Forum

This section is intended to stimulate discussion between readers. Below we repeat the letter initiating a discussion on simulation results. Please formulate your opinion on this topic and send it to the address given below. Reactions that are of general interest will be summarized and published in the next issues. Furthermore we invite all readers to start another discussion by sending a letter to the editors.

Wanted: Unexpected Results
or: **Simulation or Common Sense: Who is right?**

Probably every practitioner in the field of simulation has already faced the following situation: He has modelled a system using a computer based simulation tool, and after running it he realizes that the results are completely different from what common sense would expect. Now what to do?

On one hand everybody knows that it is very easy to build erroneous models, but on the other hand the dynamic behaviour of complex systems is not easily understood by common sense, and at least unexperienced users are likely to make wrong predictions. In fact even experts do so, and this is the reason why simulation is used at all. Nevertheless, the conflict is there and requires a solution other than just to say "The computer always is right". What we need is a method to show where the error is. To our knowledge no formal procedure exists, so for the moment we have to learn by examples.

We would therefore invite readers to send us examples of cases where you have faced this situation, and how you have solved it. And we are interested in both solutions: the simulation results were wrong, or the results expected by the user were wrong. (I do not say this implies the other part is right, it may as well be wrong, too). If we can find a number of good examples where simulation has proven the opinion even of experts wrong, we can use these examples to demonstrate the power of simulation and to create a wider market for it. The other examples may help us to improve further simulation practice, which may in the end also lead to an increased demand. So please share your experience; send a description of your model, the calculated and the expected results, and tell us how you have come to a conclusion. Please direct your answer to

J. Krauth, BIBA, Bremer Institut für Betriebstechnik und angewandte Arbeitswissenschaft, Postfach 33 05 60, W - 2800 Bremen 33.

For Discussion Forum in EUROSIM - Simulation News Europe

by Milan Kotva, Czech&Slovak Simulation Society

ad: Wanted: Unexpected Results
or: Simulation or Common Sense: Who is right ?

In my opinion, the raised question touches the heart of systems simulation and its theory. 15 years ago, the endeavour at answering this question induced the predecessor of Czech&Slovak Simulation Society - TS for Systems Simulation of the Committee for Applied Cybernetics - to analyze and consecutively discuss it in depth. In conclusion, an agreement was adopted on understanding the notion "simulation of systems" as a specific form of the process of cognition in the wider sense of the word and as the method of experiments with a simulation model in the narrower one [1]. The experiments with a simulation model can replace in the cognition process the formerly used so called "thought model experiments" (which seems to be the procedure the author of the raised question had in mind under the term "common sense"), and we consider just this replacement to be the specifity of systems simulation as the form of cognition process. Naturally, the application of systems simulation is indicated in particular when the "thought model experiments" can be realised - because of the complexity and/or extent of the given problem - only in a simplified way and/or for specific situations only, or cannot be accomplished at all. Hence, the occurence of conflicts between simulation model and common sense would be limited by this fact. On the other hand, the problems of testing the correctness of the simulation model (i.e. verifying the correspondence of the model to the current ideas about the simulated system and about the laws of its motion[1]) and above all of testing its validity (i.e. verifying the correspondence between the model and reality) gains therefore the upper hand. The common sense (thought model experiments) has its certain role in both of mentioned testing activities, but in quite another position than it has in the raised question. Such a question can be only propounded when the "truthfulness" of the simulation model was not (for the time being) verified, or in the case that we want (with regard to the relative truthfulness of the human cognition) to deepen our cognition. Nevertheless, there is sole rightful arbiter for deciding "who is right: common sense or simulation model" which is the simulated reality.

The applications of systems simulation can be divided into two basic groups - those used in design of objects and those used in investigation of reality. The sequence of activities in the course of testing the simulation model validity is at the design of objects quite different from the procedure which should be used at application of systems simulation to investigation of reality. This distinction results from the fact that the object being designed in principle does not exist when we synthesize the simulation model and that this

1 What we have in mind here is "motion" as a philosophical category including any change, not only a mechanical displacement.

model can be therefore confronted with the real object not until the design is realised at least as a function sample or a prototype. From this sight, simplest are the cases when partial objects employed in the project are for us - from the given point of view - "white-boxes" (however, such cases are scarcer than it might seem when observing some of designers, particularly in non-technical fields). The idea of the simulated (projected) system is in such an event created by means of deductive procedures and the conflict between simulation model and common sense can occur above all in consequence of the following reasons:

1. There is some incorrectness in application of deductive procedures; hence, the failure is in our idea (project) of the system.

2. The simulation model is incorrect, i.e. it does not correspond to our idea (project) of the simulated system and its motion.

3. Our (or opponent's) common sense misjudges.

4. The partial objects employed in the project are in fact for us rather "grey" than "white boxes" - however, this is just another story.

In short, if the common sense is in the right, then either some incorrectness in the simulation process is culpable or the simulation model is not true, although we made light of it (can be seen from the premise of "white-boxes"). Nevertheless, even if we take the falsity of simulation model to heart no other solution exists than either to realize a function sample or a prototype trying by means of it to discover the cause of model falsity or to study the partial objects with the purpose to turn them into really "white-boxes". However, both of these approaches lay rather in the domain of investigation than of design of objects.

When investigating a real object, the idea about the simulated system is created not only by means of deductive procedures based on hitherto scientific knowledge and theories (inclusive refuted hypotheses) but - and above all - by means of inductive reasoning based on data hitherto obtained from the given object (or partial objects) observation and measurement under native or experimental conditions. The correctness of the simulation model can or rather should be tested by comparing the model with the above mentioned sources of our idea about the simulated system (particularly with data) on the one hand, and on the other hand with the results of thought model experiments based on this idea if there is an opportunity to realize such experiments even though in a simplified way and/or for specific situations only. If the conflict between simulation model and common sense occurs (and at the same time the other tests are O.K.), it is of necessity to continue as mentioned here after.

Especially in such non-technical domains as biology, ecology, medicine, sociology and other social sciences, where the inductive factor of creating the idea about the system under study dominates, the model is very often understood as the mere interpretation of empirical data. It is true, that the "correct" model should interpret "truthfully" the hitherto obtained data (see above) but this fact does not mean at all that the model is also "truthful". This statement can be used in this phase of systems simulation process only in the sense that the model "truthfully" represents our idea about reality from the given point of view. However, this idea has for the time being the character of a mere hypothesis.

Nevertheless, it is surprisingly often possible to meet the case when a simulation model, the correspondence of which to the hitherto obtained data was verified, is without further tests considered and unfortunately also used as a model the validity of which (correspondence to the reality) was completely verified. The authors of such models argue as follows:

1. The experiment with the simulation model $\mathcal{M}$ provided the result $\mathcal{R}$.

2. $\mathcal{R}$ corresponds to the hitherto obtained data $\mathcal{R}'$.

ergo:

3. The simulation model $\mathcal{M}$ is valid (truthful).

or in more common terms:

From $\mathcal{M}$ follows $\mathcal{R}$ [2]
$\mathcal{R}$ is true
——————————— (1)
ergo: $\mathcal{M}$ is true.

Using the "plain (but not common) sense", this scheme seems to be self-evident. However, such a conclusion cannot be in fact derived because of the properties of material implication. Therefore, it is evident, that the results of experiments with a model being verified in such a way might be in contradiction with the common sense of somebody who has another idea about the investigated system than the author of the model. From the essence of inductive reasoning it follows that quite different ideas can be derived on the basis of the same data (the more so on the basis of different data). On top of it, none of these ideas must be "truthful". Hence, the simulation model representing our idea about the system under study has to be understood as a hypothesis as well as the idea, which should be verified just by means of simulation experiments.

The basis for scientific verification of hypotheses consists in the question "what else should be (or on the contrary - should not be) observable if the hypothesis is true". As far as the hypothesis is represented by the simulation model (and the "correctness" of the model, i.e. its correspondence to the hypothesis, is verified), then it is possible to use just the simulation experiments for answering this question. The record of every (or of representative) simulation experiment should be then compared - naturally if possible - to the outcome of an adequate experiment with the real object. If the model forecast shows true probabilistic reasoning which proceeds inductively (cf.[2]) could be applied:

2 By using the expression "from $\mathcal{M}$ follows $\mathcal{R}$" instead of the usual "if $\mathcal{M}$, then $\mathcal{R}$" which is used in formal logic for coupling the statements $\mathcal{M}$ and $\mathcal{R}$ with the character of so-called material impication, we want to indicate that we have in mind here not only a formal connection but also a substantial connection between the contents of these statements, i.e. "from the premise $\mathcal{M}$ follows the consequence $\mathcal{R}$".

From $\mathcal{M}$ follows $\mathcal{R}$
$\mathcal{R}$ is true
---
ergo: the probability that $\mathcal{M}$ is true scales up (2)

To put it less exactly and more subjectively - confirming results of an experiment increases our conviction that the simulation model (the premise) is truthful. It is obvious, that a single step is not sufficient for hypothesis verification. Hence, the set of couples "simulation experiment - experiment on real object", as extensive as possible, should be collected. The scheme (2) also specifies the significance of "truthful" interpretation of hitherto obtained data in the course of testing the model correctness - such a "truthful" interpretation represents the first, but only the first step to the verification of model validity. At once, it is possible to imagine what should be understood under the term "the relative truthfulness of the human cognition" as well as "the relative truthfulness of the simulation model".

If the forecast shows false or - with regard to some problems with experimentation, observation and/or measurement on the real object - probably not true the basic deductive scheme of probabilistic reasoning

From $\mathcal{M}$ follows $\mathcal{R}$
$\mathcal{R}$ is not true
---
ergo: $\mathcal{M}$ is not true

or its weakened form

From $\mathcal{M}$ follows $\mathcal{R}$
$\mathcal{R}$ is probably not true
---
ergo: the probability that $\mathcal{M}$ is true scales down

should be applied.

The second positive role of "common sense" in systems simulation should be mentioned just here. The direction of changes in the level of probability (or of our conviction), that the simulation model is truthful, is objective, while the magnitude of these changes is appreciated only subjectively. Nevertheless, it seems to be possible to infer that our conviction about the model truthfulness increases very considerably just when the outcome of a simulation experiment appearing as a surprise or even as a nonsense - in short, at variance with "common sense" - turns up to be truthful because it corresponds to the results of a subsequent experiment on the real object (in more detail see e.g. [3]). In this phase of systems simulation process it is therefore advisable to look for such conditions under which "unexpected results" can be obtained.

The answer to the question "simulation or common sense: who is right?" is cardinal for model validity testing and can be obtained only by "asking" reality. However, if experiments on the real object are out of question (because of technical, safety, financial, humanistic etc. reasons) the raised question changes to the query about the right to employ unverified (hypothetical) simulation models. In addition, there is a consequential matter - if there exist any other chance at all to verify the model in such a situation[3]. In my opinion, both questions can be answered - under certain conditions - in the affirmative (see e.g.[4]).

The points at issue of the clash between common sense and simulation model, of the right to employ hypothetical models, of the distinctions in relevance of these problems in the design on the one hand and in the investigation of objects on the other, etc., cannot be fully discussed in such a brief essay. In the past, the authors of these reflections had very limited possibilities of publishing and of participating in international conferences. For this reason only certain fragments can be found in specific papers similar to the already cited ones (e.g.[5]). The full text of the "general theory of systems simulation" based on understanding systems simulation as a specific form of cognition process is available only in lecture notes published (in Czech) in 99 copies [6].

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3 This is the fact, which limits in a high degree a very frequented assertion that the advantage of systems simulation resides in the feasibility to replace the experiments on the real object - we should inquire in the concrete case about the guaranty that the model will produce the same outcome as it would be obtained when experimenting on real object.

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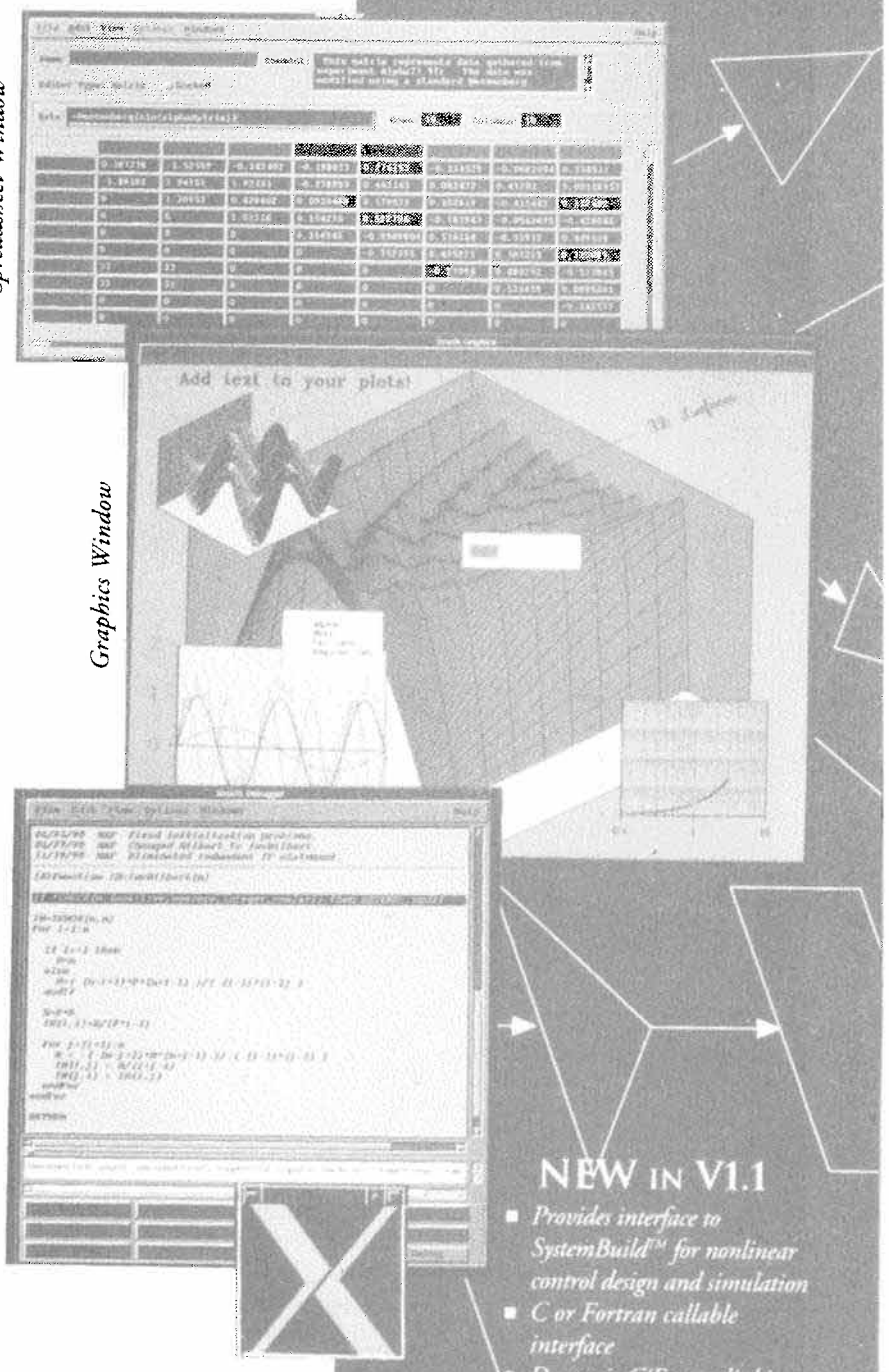

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Activities in Modelling and Simulation in the New Federal States of Germany

Part II

A first survey of simulation activities in the New Federal States of Germany was given in the last issue of the "EUROSIM Simulation News Europe", Number 4, March 1992. This paper represents more details of the working results and working fields of the research teams in the New States.

The facts reported here are based on an interview with about 30 simulationists and research teams. Because the persons included in this interview didn't give an answer to all questions, we find some gaps of information in the following representation.

Supplementary to this publication there are other papers, which give a survey of simulation activities, e.g. HEHL91 and SCHW90.

University of Rostock

Department of Biology, WG Theoretical Ecology; Doz. Dr. habil. U. Vietinghoff and 2 co-workers

Working results: Modelling and simulation projects of the ecological system in the Greifswalder Bodden a part of the Baltic Sea, using the simulation system SONCHES (WENZ90); Validation of the simulation results of the simulation of the ecosystem "Greifswalder Bodden" by measurement data; Automatical measurement of data for the model validation and the biological research.

Fields of present and future work: Continuation of the work under the grant of the *Umweltbundesamt* and the BMFT.

Education: Modelling/simulation for biologists.

Department of Computer Science; WG Modelling/ Simulation; Prof. Dr. habil. Rolf Grützner and 6 co-workers

Working results: Definition of a special class of higher Petri-Nets, the M-Nets for modelling of discrete systems, e.g. computer systems, control systems, manufacturing systems and others. Implementation of the M-Net based simulation system MARS. Simulation of communication nets for chemical plants, of manufacturing systems in the ship building industry and of computer systems. Simulation of ecosystems.

Fields of present and future work: under the grant of the *Deutsche Forschungsgemeinschaft*: modelling and simulation of ecological systems; research in the field of simulation, computation environments and in the fields of modelling methods and architectures of simulation systems; user interfaces for simulation systems.

Co-operation: University of Hamburg; University of Kaiserslautern.

Education: modelling/simulation for students of the computer science department, about 100 students annually; there is realized a specialization in modelling/simulation for students of the computer science department, about 12 - 15 students annually.

Technical University of Dresden

Institute of Feinwerktechnik, WG Technique of Construction. Doz. Dr. rer. nat. E. Seydel

Working results: Modelling and simulation of a lot of different technical driving systems; Data base managment systems for design data and experimental results; intelligent model synthesis; Implementation of an interactive simulation system for IBM mainframes (ESER) ERS and of the simulation system USAN5 for PC (included is a model base).

Fields of present and future work: Multi-level modelling of robust driving systems under consideration of an on-line coupling with real systems for signal analysis and parameter identification. FEM, roboter driving systems.

Co-operation: Siemens (integration of USAN with a multi-body simulation); Carl-Zeiss Jena; MBB-Bremen (simulation of space robots).

Education; Modelling/simulation for about 100 students annually.

Institute of Hydrobiology, Doz. Dr. habil. F. Recknagel

Working results: Implementation of the expert system DELAQUA for water protection. Coupling of DELAQUA with the ecological simulation model SALMO and connection with a geographical information system for water protection. Implementation of a knowledge based user interface for SALMO.

Fields of present and future work: design and implementation of simulation tools for the water protection (e.g. in catchment basins); fuzzy modelling for water protection; knowledge based geographical information systems for water protection, especially drinking water.

Co-operation: NEXUS GmbH Dortmund; RWTH Aachen

Education: Training in modelling/simulation is part of the subject "mathematical ecology".

Faculty of Computer Science; Institute for Applied Informatics; WG Control Systms. Prof. Dr. habil. M.Frank and 3 co-workers

Working Results: Theoretical and practical research in the field of architectures of simulation software for discrete systems. Application of GPSS and SIMDIS (GDR version of GPSS). Implementation, extension (graphical model input, interactivity, animation), and application of the simulation system TOMAS (there exist a lot of applications of TOMAS).

Fields of present and future work: object-oriented design of simulation software; integration of modelling and simulation in complex CIM-systems.

Education: intensive training of students in modelling/simulation.

Faculty of Computer Science; Institute of Operating and Communication Systems; WG Performance Analysis. Doz. Dr. habil. K. Irmscher and 5 co-workers

Working results: Development and Implementation of software tools for the performance analysis of computer systems (including computer networks) based on the queueing theory. These tools are: BNETD (IBM main frame), LANEX, DIMPES (PC-version), SIMQC (simulation of extended queueing systems). Tools for computer aided design of LAN and for the performance management of LANs.

Fields of present and future work: queueing theory, stochastic Petri-Nets; object-oriented and knowledge-based simulation; application of the implemented tools in research projects of the university and the industry.

Co-operation: RWTH Aachen; University of Stuttgart; GMD St. Augustin.

Education: Intensive training in the field of modelling /simulation of discrete systems, queueing theory, performance analysis of computer systems and knowledge-based modelling.

Institute of Manufacturing Informatics; WG Modelling/ Simulation. Prof. Dr. habil. W. Krug and 8 co-workers.

Working results: Design and implementation of the software tool MOSAIK. This is a tool for modelling, simulation and optimization of automatic manufacturing systems (4th generation of simulation systems).

Fields of present and future work: design and implementation of simulation systems and methods for optimization; research in the field of architecture of systems for simulation and optimization; simulation of CIM- and manufacturing systems.

Education: There is a training in the field of modelling/simulation for about 200 students annually.

Fraunhofer-Institute for *"Automatisierung des Schaltkreis- und Systementwurfes"* (FhG-EAS), Dresden

(former a part of an institute of the academy of science of the GDR). WG Simulation, Dr. P. Schwarz and 6 co-workers

Working results: Implementation of the multi-level-simulator KOSIM. Application of KOSIM in the microelectronic industry and in the university research. Use of parallel computers (transputers) for simulation.

Fields of present and future work: multi-level-simulation for electronical and electrical systems; system simulation, register-transfer-simulation, Petri-Nets, logic simulation, electrical network analysis.

Co-operation: Technical University of Berlin; University of Frankfurt; Cadlab Paderborn; and others.

Humboldt-University of Berlin

Department of Computer Science; Institute of Software; WG System Analysis. Prof. Dr. habil. G.Schwarze and 7 co-workers.

Working results: Design and implementation of methods, tools, and software systems for the design and the analysis of distributed systems, specified by formal specification languages (e.g. SDL, LOTOS). Implementation of tools for model transformation (e.g. graphical model descriptions into language descriptions). Design and implementation of an object-oriented simulation system using C++, based on the process scheduling strategy.

Fields of present and future work: research in the architecture of simulation systems; automatization of generation of graphic modelling editors; design of tools for the object-oriented specification, implementation; and test of distributed software systems, based on object-oriented SDL; parallel simulation.

Technical University of Chemnitz

Department of Electrical Engineering; WG High Performance Electronics. Prof. Dr. habil. M.Kronberg and 2 co-workers

Working results

Design and implementation of models and simulation software for the static, electric and thermic behaviour of diodes. Design of new methods for the state-oriented modelling of semi-conductor based devices of the high performance electronic. Implementation of models for diodes and other electrical devices (e.g. transformers, electrical networks)

Field of present and future work : design of simulation tools for multi-language models; modelling of the electric and thermic behaviour of high performance moduls.

Co-operation: with the industry; University of Paderborn.

Education: in modelling/simulation, about 25 students annually.

Research Group: Manufacturing Planning and Simulation. Doz. Dr. habil Ch. A. Schumann and 2 co-workers

Working results: Comparison of the practicability of simulation systems for the use in manufacturing simulation. Simulation of different manufacturing systems. Implementation of MOSYS for the manufacturing planning.

Fields of present and future work: Simulation of manufacturing and logistic systems.

Co-operation: TU Berlin, RWTH Aachen.

Education: in modelling/simulation, about 60 students annually.

Technical University of Magdeburg

Institute of Simulation and Graphics; Prof. Dr. habil. P.Lorenz and 9 co-workers

Working results: no declaration.

Fields of present and future work: modul-oriented simulators; object-oriented simulators; simulation and animation; modelling of the stress of individuals in the working process.

Education: in modelling/simulation; about 100 students annually.

Technical College of Leipzig

Department of Automation; Institute of Control and System Theory. Prof. Dr. habil. H.Ehrlich and 2 co-workers

Working results: Design of generalized concepts for the modelling of automatization systems, based on logic and dynamic subsystems. Modelling of dynamic subsystems in the state space and of the logic subsystems using Petri-Nets. The structure of the dynamic subsystems is controlled by the logic systems. Implementation of the simulation system SIZU for dynamic subsystems with a variable structure.

Fields of present and future work: hybride logic-dynamic automatization systems.

Education: in the modelling/simulation, about 80 students annually.

Department of Automation; Institute of Control and System Theory. Doz. Dr. habil. G.Stein and 3 co-workers

Working results: Implementation of software tools for the design and the simulation of control systems - teachware system CADCS.

Fields of present and future work: research in control of systems with variable structure; development of teachware for such systems.

Education: see information of Prof. Ehrlich

Institute of Process Control; WG Modelling. Dr. R. Müller and one co-worker

Working results: Implementation of the interactive simulation system ISIKS/V.4.2 and of a real-time simulation system as a modul of a knowledge based control system. Concept of a distributed simulation system and a proto-type implementation.

Fields of present and future work: real-time simulation for process control and fault recognition, work will be continued.

Education: subject: real-time simulation and process control, about 35 students annually.

Potsdam-Institute of *Klimafolgenforschung*

Dr. rer.nat. V.Wenzel

Working results: Design and implementation of the simulation system SONCHES. SONCHES is a tool to do simulation experiments with ecological system models (e.g. agrarian, aquatic, and forest systems). There is a lot of national and international applications of SONCHES. Implementation of special models (competition of sea-weed and bacteria, cattle model for meat and milk production).

Fields of present and future work: extension and improvement of SONCHES; coupling of SONCHES with an environment information system.

College for Architecture and Construction, Weimar

Faculty of Mathematics and Computer Science, Dr. habil. G. Hohmann and 2 co-workers

Working results: Design and implementation of net-based simulation systems. The base are higher Petri-Nets (e.g. evaluation-Nets). Simulation tools are: ENETZ, MOSINET. Application of these tools in the simulation of manufacturing systems. Implementation of graphic user interfaces.

Fields of present and future work: structure of net-based simulation systems; graphic user interfaces for simulation.

Co-operation: University of Oldenburg, Gesamthochschule Kassel, University Koblenz-Landau.

Education: in modelling/simulation; about 30 students annually.

Technical College of Ilmenau

Institute of Economics, Doz. Dr. habil. K. Gröpler and 2 co-workers

Working results: Research in knowledge-based systems and the integration of planning and simulation systems. Implementation of the simulation tool PROSIM for capacity and time planning in manufacturing systems.

Fields of present and future work: control and simulation of manufacturing systems; knowledge-based controlling of manufacturing systems: distributed knowledge-based planning of manufacturing systems and simulation.

Co-operation: European business School Oestrich-Winkel; FhG-IPA Stuttgart; CIM-Center of Technology Transfer Suhl.

Education: in modelling/simulation, about 35 students annually.

Literature

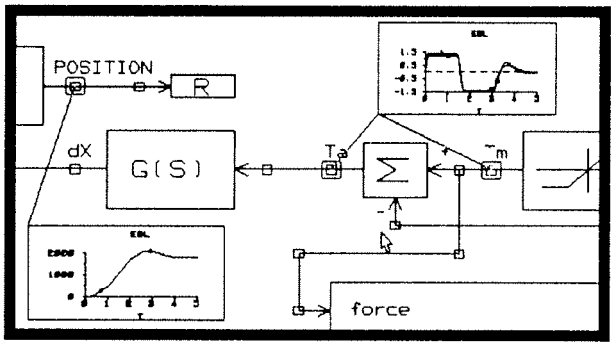
HEHL91 Herbert,A.; Hohmann, R.; Lorenz, P.: Simulationssoftware in der DDR.ASIM - Mitteilungen aus den Arbeitskreisen, Heft 22; 6.Workshop Simulationsmethoden für verteilte parallele Prozesse.1990; ed. H.Fuss, ASIM 1991

SCHW90 Schwarze, G.: Digitale Simulation: Konzepte - Werkzeuge - Applikation. Akademie Verlag Berlin, 1990

For more information on publications please contact the author.

Prof. Dr. habil. Rolf Grützner, University of Rostock, Department of Computer Science, Albert Einsteinstr. 21, D-O-2500 Rostock.

ESL: THE LANGUAGE OF SIMULATION



With over seven years development maturity, ESL is **THE** simulation language for advanced applications.

Developed with the support of the European Space Agency and used on several advanced projects, ESL offers a full range of simulation facilities.

Whatever your process, if it can be modelled, it can be simulated by ESL.

* Advanced language features for handling continuous mathematical models with discontinuities.

* Advanced graphical interface for generating simulation models and displaying results.

* Interpretive running for checking, or compiled Fortran 77 code for optimum performance.

* Hardware support includes PC-AT, SUN and DEC workstations, IBM RS6000, VAX, Prime and Gould Minicomputers.

* Low cost evaluation copies available.

* Regular seminar and training course programme.

* Alternative textual or pictorial block model definition.

For more information contact:-

Dr J L Hay

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Simulation Activities in the Control Group of the Department of Mechanical Engineering at the Ruhr-University of Bochum

The Control Group (*Lehrstuhl für Regelungssysteme und Steuerungstechnik*) within the Department of Mechanical Engineering at our University, together with two other groups, belongs to the Institute of Automation. The control group is essentially engaged in fundamental control engineering education of all mechanical engineering students of our Department. Moreover, we offer advanced courses on several topics of control for those students specializing in control engineering and automation. Besides several other interests and activities of our group, simulation is a very important issue both in education, research, and consulting engagements.

Our simulation activities began in the early seventies with two fully equipped EAI 2000 linked to a PDP 11/23. In parallel with analog simulation in these "old days", we early started with digital simulation and developed the very first version of our simulation language then written in assembly language. Later, it was rewritten in FORTRAN 77 and again and again improved (today it is written in C). During the analog times, we executed many simulation studies for large industrial systems such as blast furnace supply installations, compressor stations for chemical engineering plants, hydropower plants, etc. Today, the analog computers are no longer used for this kind of studies but only for education purposes. The students have to carry out simulation of one and the same problem both on the analog computer and digitally. Today, we run our simulation studies mainly on PC's by means of our FSIMUL language.

Our main simulation tool is the FSIMUL package written in C. FSIMUL is an interactive block oriented package for simulation of dynamic systems and logic circuits. At present, about 120 block operations are available. The number of block inputs is generally not limited; it is also not limited how many times one certain operation is used. Examples for firmware: Besides all usual operations there are noise generators, time delays, controller functions, function generators, three-dimensional performance graphs, polynomials, blocks for parameter estimation, optimization, all logic functions, A/D- and D/A-converters, etc., facilities to read in matrices, to create user-defined macros, to read in measurement data form files and to simulate in different calculation levels. The program creates block diagrams of the simulated system. The output is either to files or/and to graphic display, printer, or plotter. The user's guidance is performed comfortably by windows, pull-down menues, and on-line help features. FSIMUL is in use at many schools and universities as well as by several industrial firms.

Current research and developing activities related to simulation are focused both on transputer based and PC-based parallelization of FSIMUL, continuing the development of a large library of software tools for control systems design, order reduction methods, parameter estimation methods, etc. As mentioned before, we are permanently engaged in industrial simulation studies as well as teaching simulation principles to students.

Professor Dr. K. H. Fasol

Responsible for FSIMUL: Dr. B. Gebhardt, Department of Mechanical Engineering, Control Group, University of Bochum, Geb. IB 3 , P.O.B. 102148, D-W-4630 Bochum 1, Germany Tel.: +49-(0)234-7004060 Fax. : +49-(0)234-7094155

Book Review

This section will provide readers with detailed information on new books on modelling and simulation. The books will be reviewed in detail. Because of the scope of this newsletter also non-english books will be reviewed. We ask our readers the following:

- If you are the author of a book or know an author please send the book to the editors to be reviewed (ask the author to send the book).
- If you have studied a new book please send a detailed review to the editors.
- If you are willing to review a book please contact the editors to set up a review staff.

G.A. Korn "Neural Network Experiments on Personal Computers and Workstations"

MIT Press, Cambridge MA, 1991

The book includes a disc with a classroom version of DESIRE/NEUNET for PC's. Especially for beginners it is nice to study the different types of neural network experiments and use the programming language to see the results of small problems immediately.

After short explanations about anatomy and physiology of the "biological neuron" the artificial neuron is introduced. The artificial neuron is similar to the real one, however, it obeys to simpler mathematical descriptions. Thus, it is possible to use the parallel working concept of the brain also in computer technology to make a lot of time consuming tasks, e.g. pattern recognition, more effective. The aim of the book is to explain generally used neural network models and to give instructions for programming such models with DESIRE/NEUNET in order to simulate their reactions.

DESIRE/NEUNET is well suited for such neural network experiments, which uses vector and matrix operations intensively. Moreover, integration of (initial value-) ordinary differential equations is possible. Thus, DESIRE/NEUNET seems to be a powerful tool for modeling the biological situation, too. Unfortunately, the classroom version of DESIRE/NEUNET is very restricted concerning the number of components. Therefore, even some of the relatively small examples of the book cannot be reproduced, e.g. a program for a biological clock cannot be executed because it is only allowed to use two integrator elements.

F. Rattay, Technical University Vienna

Comparison of Simulation Software

EUROSIM - Simulation News Europe started a series on comparisons of simulation software. Based on simple, easily comprehensible models special features of modelling and experimentation within simulation languages, also with respect to an application area, shall be compared.

The idea has become quite successful. Here we would like to thank all the authors who took the challenge and the time, solved the problems, documented them and sent in their contributions.

Up to now the following comparisons have been defined:

Comparison 1: Lithium-Cluster Dynamics under Electron Bombardment, November 1990

Comparison 2: Flexible Assembly System, March 1991, comments July 1991

Comparison 3: Analysis of a Generalized Class-E Amplifier, July 1991

Comparison 4: Dining Philosophers, November 1991

Comparison 5: To State Model, March 1992, revised July 1992

We invite all institutes and companies developing or distributing simulation software to participate in this comparison. Solutions of comparisons 1, 2, 3, and 4 described in the previous issues will still be published.

Please, simulate the model(s) and send a report to the editors in the following form (on diskette, any word processing format, or per e-mail):

- short description of the language
- model description (source code, diagram, ...)
- results of the tasks with experimentation comments max. 1 page A4

For publication in EUROSIM - Simulation News Europe all contributions that exceed one page will be modified by the editors to fit into one page.

We also invite you to prepare demo programs, test versions, and animations on diskette and to make them available for interested persons. Please send diskettes to the editors first.

The series will be continued with about two comparisons a year. Preliminary evaluations of the comparison results are also planned.

Comparison 5: Two State Model

Comparison 5 has to be revised due to wrong numbers given for tasks c) and d). Please note that in task c) the time for the last discontinuity has to be changed, and consequently the final value for y_1. In task d) the value for parameter c_2 in state 2 has to be changed. For more information see also comparison 5 solution with SIL, page 38.

In many engineering problems simulation models turn out to be discontinuous. That is, the solution itself is continuous, but either the first or higher order derivatives have jumps. Discontinuities may occur either at specific time points or when certain conditions are satisfied.

When a discontinuity has been passed, not only the model may be changed, but also the function that determines the location of the discontinuity. Consequently, if this discontinuity is not correctly modelled and determined, respectively, the results may go wrong qualitatively.

This example tests the ability of the simulator to handle discontinuities of the forementioned type in a satisfactory way. The problem is as follows

$$dy_1/dt = c_1 * (y_2 + c_2 - y_1)$$

$$dy_2/dt = c_3 * (c_4 - y_2)$$

This ODE system is essentially a simple linear stiff problem with exponential decays as analytical solution. One of these is a very rapid transient, and the stationary solution of the slow decay varies from the two states of the model. This actually "drives" the model (and the discontinuity).

Parameters c_1 and c_3 remain unchanged during simulation: $c_1 = 2.7E\text{-}6$, $c_3 = 3.5651205$.

The model operates in two states:

c_2 is 0.4 and c_4 is 5.5 when the model is in state 1 (also the initial state). The initial values are $y_1(0) = 4.2$ and $y_2(0) = 0.3$. The model remains in state 1 as long as $y_1 < 5.8$. The choice of c_2 and c_4 ensures that y_1 will grow past 5.8.

When the model switches to state 2, parameters c_2 and c_4 change to $c_2 = -0.3$ and $c_4 = 2.73$. The model remains in state 2 as long as $y_1 > 2.5$. When passing this instance the model switches back to state 1; the choice of c_2 and c_4 ensures that this will happen.

The time interval is 0 to 5.

The tasks to be performed are:

a) Plot y_1 as function of time.

b) Printout the time for every located discontinuity and the final value $y_1(5.0)$.

c) Repeat question b) for the true relative accuracy varying between 10^{-6}, 10^{-10}, 10^{-14}.

Analytical solution values can be found, so for comparison we state that the last discontinuity occurs at time 4.999999646 and the $y_1(5.0)$ value should be approximately 5.369. If the last discontinuity is not located, the previous ones are not found with adequate accuracy. The value of $y_1(5.0)$ also reflects the accuracy of the locations of the discontinuities and any value between 5.8 and 5.1 can be expected.

d) Change the state 2 parameter values of c_2 to -1.25, c_4 to 4.33 and the condition to $y_1 > 4.1$ and rerun a) and b) with a true relative accuracy of 10^{-11}.

Niels Houbak, Technical University of Denmark, Laboratory for Energetics, Building 403, DK-2800 Lyngby.

Comparison 1 - EXTEND

Description of EXTEND

EXTEND is a general purpose simulation system supporting both continuous and next event modeling. It is library-based and uses a block diagram approach to modeling. You can use libraries of pre-built blocks to set up models with no programming or you can use MODL (a built-in modeling language) to modify existing blocks or create new ones. One of the EXTEND's built-in libraries is the Generic library, which contains general purpose continuous modeling blocks. The blocks can be grouped by their function: basic math, accumulators, decisions, data input/output, data conversion and model debugging.

In version 1.1 EXTEND doesn't support hierarchical modeling. EXTEND runs on Macintosh computers.

EXTEND™ is a product of Imagine That Inc., 151 Bernal Road, Suite 5, San Jose, CA 95119, USA.

Model descripton

The model is described by blocks of EXTEND's Generic library.

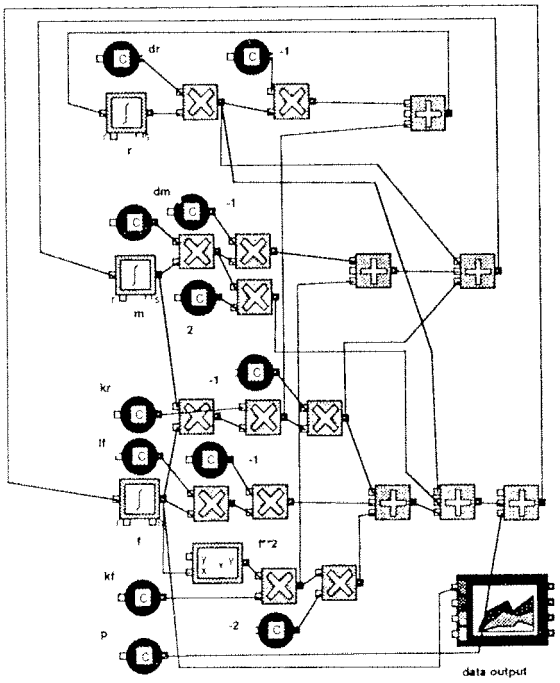


Figure 1

Results

All calculations were done using a Macintosh IIfx.

a) comparison of integration algorithms: The built-in Integrate block of the Generic library supports only two integration methods.

parameter lf= 1000

integration alg.	number of steps time (0,10)	comp. time (min)	numerical
Euler (improved)	10.000	0.5	unstable
Euler (improved)	12.000	1.0	stable
Trapezoidal	20.000	1.45	unstable
Trapezoidal	30.000	2.30	stable

b) variation of parameter lf

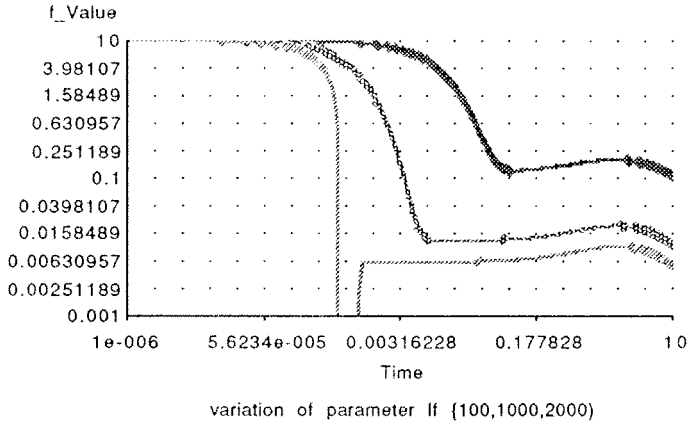


Figure 2

The top curve represents the response for parameter lf=100, with the lower curves showing corresponding results for lf=1000 and 2000 (numerically unstable).

c) calculation of steady states (lf=1000, improved Euler method, number of steps=10000): Figure 3 shows the results of the steady state investigation during constant bombardment (lower curve p(t)=1.0E4) and without bombardment (p(t)=0, numerically unstable).

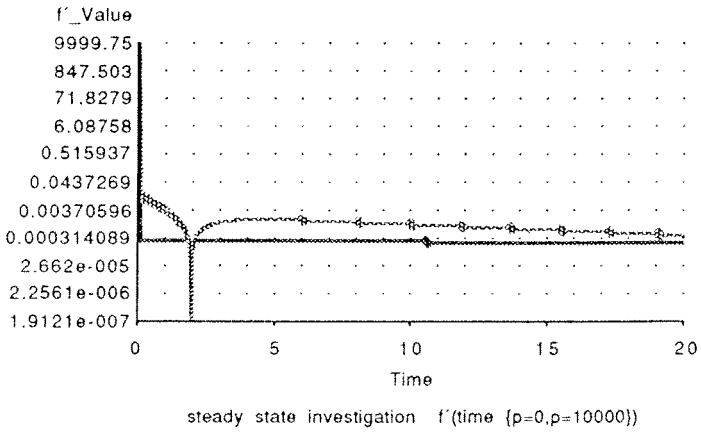


Figure 3

Thorsten Pawletta, Universität Rostock, FB Informatik, Albert-Einstein-Str. 21, D-O-2500 Rostock, Germany; Tel.: +49-(0)381 44424 169;
e-mail: pawel@informatik.uni-rostock.de

Comparison 1 - "I Think"

Description of "I Think"

"I Think" is a special simulation system supporting system dynamic modeling. You use only a lot of pre-built entities, such as

- converter (constant, built-in item, algebraic equation, graphical function)
- stock (various accumulators - reservoir, queue, conveyor, oven)
- flow (empties into or drains)
- connector (links entities together)

to set up continuous or discrete models. The modeling is supported by 55 built-in items. For defining the experimental process there are four graph types and identical table types.

Graph types:

- time series (graph with multiple variables and time on "x" axis)
- scatter (a "variable 1" versus "variable 2" plot)
- sensitivity (single variable, multiple runs; input parameters "attached")
- comparative (multiple runs on the same axis)

The graphical model layout can be used for "thermometer" animations. "I Think" allows a fast model construction. The flexibility is limited, because it has not any slot to a modeling or programming language. "I Think" runs on Macintosh computers and is a trademark of High Performance Systems Inc.

Model description

The model is described by items of "I Think" (figure 1) and their parametrization (figure 2).

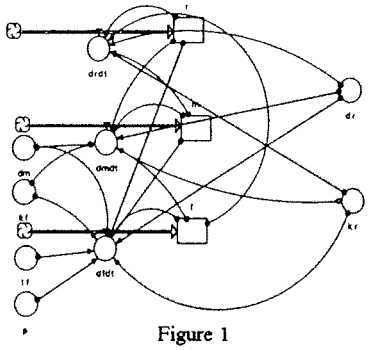


Figure 1

```
f(t) = f(t - dt) + (dfdt) * dt
    INIT f = 9.975
    INFLOWS :
    dfdt = dr*r+2*dm*m-kr*m*f-2*kf*f*f-lf*f+p

m(t) = m(t - dt) + (dmdt) * dt
    INIT m = 1.674
    INFLOWS:
    dmdt = dr*r-dm*m+kf*f*f-kr*m*f

r(t) = r(t - dt) + (drdt) * dt
    INIT r = 84.99
    INFLOWS:
    drdt = -dr*r+kr*m*f

dm = 1
dr = 0.1
kf= 0.1
kr = 1
lf = 1000
p=0
```

Figure 2

Results

All calculations were done using a Macintosh IIfx (4 MB RAM, without numeric coprocessor).

a) comparison of integration algorithms: "I Think" supports three integration methods.

parameter lf= 1000, p=0

integration alg.	step width	comp.time (min)	numerical
Euler	1.0E-3	3	unstable
Euler	1.0E-4	7	stable
Runge/Kutta 2	1.0E-3	3.20	unstable
Runge/Kutta 2	1.0E-4	9	stable
Runge/Kutta 4	1.0E-3	4	unstable
Runge/Kutta 4	1.0E-4	12	stable

There are no possibilities to switch off a minimum animation component. That is the reason for the high values of computing time.

b) variation of parameter lf: Runge/Kutta 4; step width=1.0E-4; time interval (0,3)

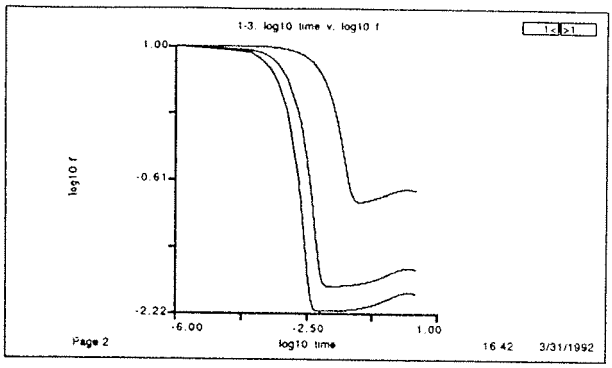


Figure 3

The top curve represents the response for parameter lf=100, with the lower curves showing corresponding results for lf=1000 and lf=2000.

c) calculation of steady states: (lf=1000, Runge/Kutta 4; step width=1.0E-3)

Figure 4 shows the results of the steady state investigation during constant bombardment (curve 2, p(t)=1.0E4) and without bombardment (curve 1, p(t)=0, numerically unstable).

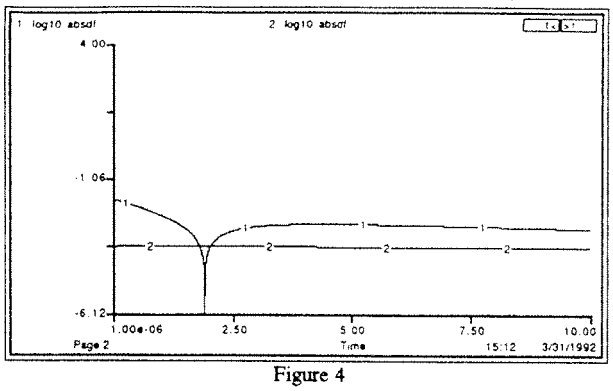


Figure 4

Thorsten Pawletta, Antje Möller, Universität Rostock, FB Informatik, Albert-Einstein-Str. 21, D - O - 2500 Rostock, Germany; Tel.: +49-(0)381-44424 169; e-mail: pawel@informatik.uni-rostock.de

Comparison 1 - ACSL

ACSL is a general purpose continuous simulation language. It models systems described by time dependent, nonlinear differential equations and/or transfer functions. Linear analysis capabilities (Bode, Nichols, root locus, eigenvalues, for example) are available at runtime.

ACSL runs on personal computers, workstations, mainframe computers, and supercomputers. Programs created on one platform can be transferred to and run on any other platform.

Program: ACSL provides a wide choice of integration algorithms, both fixed and variable. The Gear's stiff algorithm is chosen as the model default in the ALGORITHM statement. The allowable error in the integration calculation is set in the XERROR statement.The model parameters are defined in CONSTANT statements with values as given in the example definition. The rate equations are integrated with the INTEG operator to obtain r, m, and f. Runs are terminated when the logical argument (in this case a time condition) to the operator TERMT becomes true.

We would like the sample points to be exponentially spread in time; i.e., more points to be clustered at smaller times to produce equal separation on a logarithmic scale. Thus, the sample points should be given by:

$$t_o,\ t_o(1+K),\ t_o(1+K)^2,\ \ldots\ t_o(1+K)^n$$

The communication interval (cint) is obtained by calculating a Δt of:

$$\Delta t_n = t_o(1+K)^{n+1} - t_o(1+K)^n = t_n K$$

In order to get ten samples per decade, we make:

$$(1+K)^{10} = 10 \quad \text{or} \quad K = 10^{1/10} - 1$$

Since T starts off at zero, we limit the communication to some minimum (and some maximum) value as shown in the last equation in the program.

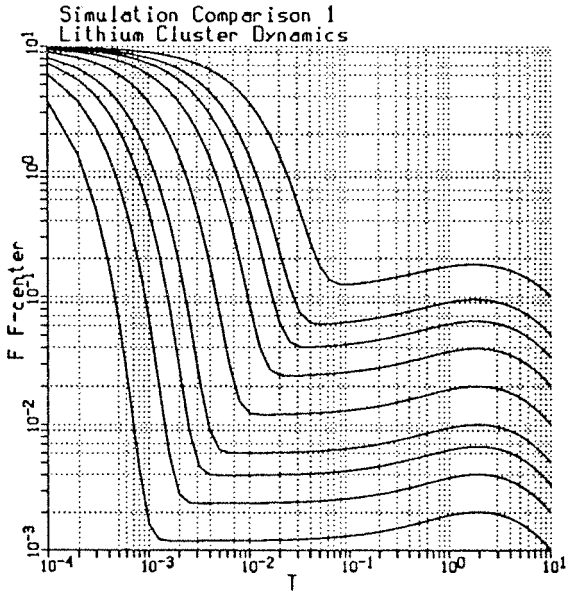
```
PROGRAM simulation comparison 1
   !-----------select Gear's stiff integrator by default
   ALGORITHM  ialg = 2
DYNAMIC ; DERIVATIVE
   !-----------define initial conditions
   CONSTANT   fz = 9.975    , mz = 1.674
   CONSTANT   rz = 84.99
   !-----------define rate coefficients
   CONSTANT   kr = 1.0      , kf = 0.1
   CONSTANT   lf = 1000     , dr = 0.1
   CONSTANT   dm = 1.0      , pc = 0.0
   !-----------integrate
   r    = INTEG(-dr*r + kr*m*f, rz)
   m    = INTEG(dr*r - dm*m + kf*f*f - kr*m*f, mz)
   f    = INTEG(dr*r + 2*dm*m - kr*m*f - 2*kf*f*f - lf*f + pc, fz)
   !-----------define very small absolute error; first
   ! mentioned state extablishes the default.
   XERROR r = 1.0e-8
   !-----------define stopping condition
   CONSTANT   tstp = 10.0
   TERMT(t .GE. tstp, 'Stopped on time limit')
END ! of DERIVATIVE
   CONSTANT    cintmn = 0.0001, cintmx = 0.2
   !-----------log-log plots with equal points/decade
   CONSTANT    pointsperdecade = 10
   cscale = 10.0**(1.0/pointsperdecade) - 1.0
   cint   = BOUND(cintmn, cintmx, t*cscale)
END ! of DYNAMIC
END ! of PROGRAM
```

Results: A summary of the integration action during the run for all variable step algorithms shows the number of times each state controlled the step size, the number of Jacobian evaluations, and the number of LU decompositions during the run. The cpu time required for a 10 second run with l_f of 1000 is determined by setting the algorithm and running the model interactively at runtime.

ALGORITHM	MicroVAX	Sun 4
Adams-Moulton (variable order)	388.85	20.63
Gear's stiff (variable order)	1.99	0.15
Euler (1st order)	8.43	0.47
Runge-Kutta 2nd order	11.48	0.63
Runge-Kutta 4th order	16.70	0.85
Runge-Kutta-Fehlberg 2nd order	13.37	0.84
Runge-Kutta-Fehlberg 5th order	11.01	0.76

Parameter sweep: Next, the integration algorithm is set back to the model default (Gear's stiff) and a parameter sweep of l_f from 100 to 10000 is executed. The results are plotted on a log-log plot with the command:

```
ACSL> PLOT/XLOG/XLO=0.0001/XHI=tstp &
      f/LOG/TAG='F-center'
```



Steady state: Steady state conditions (when the derivatives are zero) are evaluated in ACSL with the runtime command:

```
ACSL> ANALYZE /TRIM
```

For this model, the steady state at p_c of zero (no bombardment) and 10000 (constant bombardment) are evaluated and the values of r, m, and f are extracted with the DISPLAY command.

pc	r	m	f
0	-1.7E-7	-1.1D-10	2.5E-12
10000	1000	10	10

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

Comparison 1 - STEM

Short description of STEM

STEM, Simulation Tool for Easy Modelling, is a general purpose simulation package for MS-DOS machines. Models have to be specified in a Model Specification File, containing the model equations. This Model Specification file is translated by STEM to a Turbo Pascal program and compiled with Borland's Turbo Pascal compiler. The resulting executable file is a menu-driven interactive program with facilities for simulation, calibration, printing, graphical and numerical presentation of results. It is possible to run a model under batch-file control. External data (ASCII or Lotus 1-2-3) can be used in the simulation. For calibration of model parameters a target function must be specified, for instance the difference between simulated data and external data. A large set of standard functions is avaliable, if this should not be enough one can add self-programmed Turbo Pascal functions.

Model description

In a STEM model variables are divided in groups, each with their own properties. In this model you can find constants c[ ], states s[ ] with derivatives d[ ] and auxiliaries a[ ]. Running a model, each group is presented in a window on the screen. Comments can be displayed running the model. Graphical windows can be defined also.

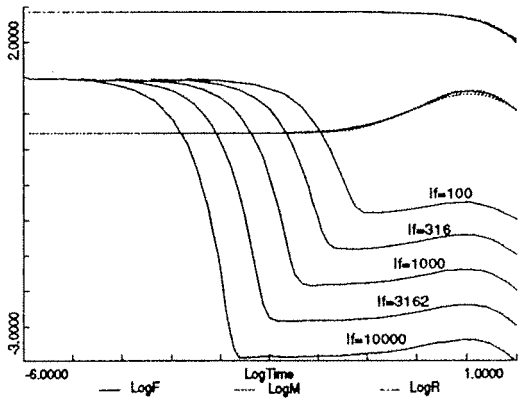
```
Environment
    BegValue= 0              (* initial value of independent variable *)
    EndValue= 10             (* end value of independent variable *)
Declaration
    Measurement              (* no external data *)
    Constants                (* constants used in program *)
      c[R0]= 84.99           ! starting value for s[R]
      c[M0]= 1.674           ! starting value for s[M]
      c[F0]= 9.975           ! starting value for s[F]
      c[Dr]= .1   ! rate for decay of R-center into M-center and F-center
      c[Dm]= 1    ! rate for decay of M-center into two F-centers
      c[Lf]= 1000! loss of F-centers at surface
      c[Kr]= 1    ! formation rate of R-center out of M-center and F-center
      c[Kf]= .1   ! rate for formation of M-center out of two F-centers
      c[P]= 0                ! electron bombardment
    Zerostate                (* initial conditions *)
      s[Time]= BegValue      ! independent variable
      s[R]= c[R0]     ! concentration of aggragates with three F-centers
      s[M]= c[M0]     ! concentration of aggragates with two F-centers
      s[F]= c[F0]            ! concentration of F-centers
Model                        (* the model-equations *)
    a[dRdT]= c[Kr]*s[M]*s[F] - c[Dr]*s[R]    ! net formation of R
    a[dMdT]= c[Kf]*sqr(s[F]) - c[Dm]*s[M]    ! net formation of M from F
    d[R]= a[dRdT]
    d[M]= a[dMdT] - a[dRdT]
    d[F]= c[P] - a[dRdT] - 2*a[dMdT] - c[Lf]*s[F]
Output(* output-variables *)
    a[LogTime] = Conditional(s[Time]>0,log10(s[Time]),-MaxFloat)
    a[LogR]= Conditional(s[R]>0,log10(s[R]),-MaxFloat)
    a[LogM]= Conditional(s[M]>0,log10(s[M]),-MaxFloat)
    a[LogF]= Conditional(s[F]>0,log10(s[F]),-MaxFloat)
Minimization(* no calibration-criteria *)
UserDefined(* no userdefined functions *)
```

Results

a) Comparison of integration algorithms. The system was simulated over a period of 10 seconds using nine different integration algorithms available in STEM. Computation times for a 20 MHz 80386 system with 387 coprocessor are presented in the table below. Simulation is carried out with an absolute error of 0.001 and a relative error of 1E-6. All integration methods use variable step size, Gear and Adams also variable order. Writing of results to screen and disk is minimized. Times are calculated using a Pascal function in the Userdefined block (not presented above).

algorithm	computation time (seconds)
Gear's stiff, variable order	0.50
Adams-Bashforth-Moulton, variable order	41.03
Runge-Kutta-Fehlberg, order 1(2)	18.84
Runge-Kutta-Fehlberg, order 2(3)	11.54
Runge-Kutta-Fehlberg, order 3(4)	10.27
Runge-Kutta-Fehlberg, order 4(5)	10.82
Dormand-Prince, order 5(4)	13.45
Runge-Kutta-Fehlberg, order 5(6)	13.30
Runge-Kutta-Fehlberg, order 7(8)	20.98

b) Parameter sweep. This task, changing constant c[Lf], may be performed manually running the model, or in a STEM-batch file. STEM produces the following figure varying Lf from 100 to 10000. The (logarithmic) values of F, M and R-centres are displayed against (log) Time.



c) Steady state calculation. STEM can solve the states for all derivatives equal to zero. With lf = 1000, the results are:

p	R	M	F
10000	1000	10	10
0	0	0	0

More information about STEM and a demonstration disk with this model is available with:

Diederik Waardenburg, ReMeDy Systems Modelling, P.O.Box 11019, 7502 LA Enschede, The Netherlands. E-Mail: REMEDY@UTWENTE.NL

Comparison 3 - STEM

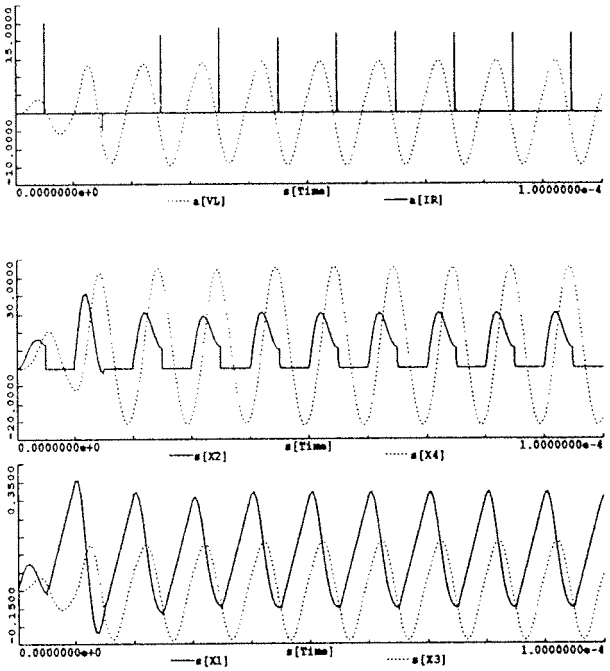
STEM, Simulation Tool for Easy Modelling, is a general purpose simulation package for MS-DOS machines based on Turbo Pascal. A short description of STEM is given in this issue of EUROSIM with comparison 1.

Model description: In a STEM model, variables are divided in groups, each with their own properties. In this model you can find constants c[ ], states s[ ] with derivatives d[ ] and auxiliaries a[ ]. Running a model, each group is presented in a window on the screen. Note the use of comments, these can be displayed running the model. The numbers with the variable names, as in c[L1:-1] are the format used to display results running the model. A negative number is used for scientific format.

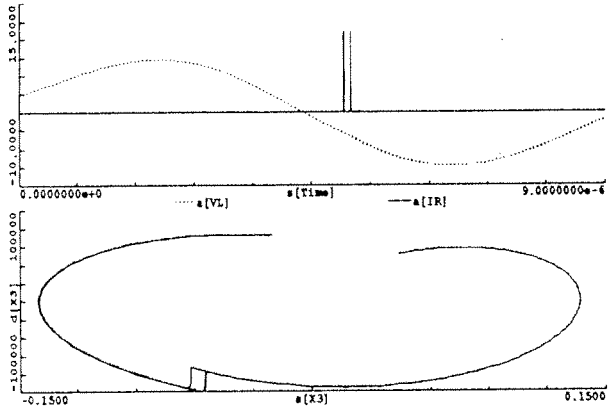
```
Environment
    BegValue= 0              (* initial value of independent variable *)
    EndValue= 1E-4           (* end value of independent variable    *)
Declaration
    Measurement              (* no external data *)
    Constants                (* constants used in program *)
      c[VDC]= 5              ! [volt]
      c[L1:-1]= 79.9E-6      ! [henry] Coil 1
      c[C2:-1]= 17.9E-9      ! [farad] Capacitor 2
      c[L3:-1]= 232E-6       ! [henry] Coil 3
      c[C4:-1]= 9.66E-9      ! [farad] Capacitor 4
      c[RL]= 52.4            ! [ohm] Resistor
      c[ROn]= 5E-2           ! [ohm] On-resistance
      c[ROff]= 5E6           ! [ohm] Off-resistance
      c[TRF:-1] = 1E-15      ! [sec] Rise/fall time
      c[Period:-1] = 10E-6   ! [sec] Period
      c[X10]= 0              ! [amp] Initial current of Coil 1
      c[X20]= 0              ! [volt] Initial voltage of Capacitor 2
      c[X30]= 0              ! [amp] Initial current of Coil 3
      c[X40]= 0              ! [volt] Initial voltage of Capacitor 4
    Zerostate                (* initial conditions *)
      s[Time:-1] = BegValue  ! [sec] Independent variable
      s[X1]= c[X10]          ! [amp] Current of Coil 1
      s[X2]= c[X20]          ! [volt] Voltage of Capacitor 2
      s[X3]= c[X30]          ! [amp] Current of Coil 3
      s[X4]= c[X40]          ! [volt] Voltage of Capacitor 4
Model                        (* the model-equations *)
    a[R]= CalcR(s[Time])     ! [ohm] Time-dependent resistor
    d[X1]= (-s[X2]+c[VDC])/c[L1]
    d[X2]= (s[X1]-s[X2]/a[R]-s[X3])/c[C2]
    d[X3]= (s[X2]-c[RL]*s[X3]-s[X4])/c[L3]
    d[X4]= s[X3]/c[C4]
Output                       (* output-variables *)
    a[IR]= s[X2]/a[R]        ! Current in switch resistor
    a[VL]= s[X3]*c[RL]       ! Output voltage
Minimization                 (* no calibration-criteria *)
Userdefined
function CalcR(T:float):float;
begin
 T := frac(T/c[Period])*c[Period];
 if T < c[TRF] then
  CalcR := c[ROn] + (c[ROff] - c[ROn])*RelToRange(T,0,c[TRF])
 else
  if T < c[Period]/2 then CalcR := c[ROff]
  else
   if T < c[Period]/2 + c[TRF] then
    CalcR := c[ROff] + (c[ROn] - c[ROff])*
          RelToRange(T,c[Period]/2,c[TRF] + c[Period]/2)
   else CalcR := c[ROn]
end;
```

The values for the time-dependent resistor are calculated with a Userdefined Turbo Pascal function CalcR, using the STEM function RelToRange. A data file could also have been used for this resistor. The rest of the model specification is clear.

Results: The following figures give the results of a simulation for IR and VL and for the states. The simulation was performed with a relative error of 1E-4 and an absolute error of 1E-4. The calculation time of the simulation was about 25 seconds on a 20 MHz 80386/7, where more than half of the time was spent on numerical and graphical output.



For task c), the variation of the rise/fall time TRF, as initial solution the following values are used: X1 = 0.2611, X2 = 0.0108, X3 = 0.04445 and X4 = -14.3706. The IR and VL results and the phase plane curves are displayed in the next figure. For TRF = 1E-7 the curves are different from the other three curves, where TRF has values of 1E-15, 1E-11 and 1E-9.



More information about STEM and a demonstration disk with this model is available with:

Diederik Waardenburg, ReMeDy Systems Modelling, P.O.Box 11019, 7502 LA Enschede, The Netherlands. E-Mail: REMEDY@UTWENTE.NL.

Comparison 4 - SIMUL_R

1. The Language

SIMUL_R is a compiling simulation language for continuous and discrete systems, the discrete part is called PROSIMUL_R. The system offers graphical and textual modelling, using one or more models in one simulation program. Examinations are done by using menus and/or a strong runtime interpreter.

The interpreter allows the usage of loops, command files (recursive, too) and arbitrary expressions with assignments and displaying. A special feature are user defined functions, which enable the user to add new commands to the system (commands for steady state, zero search, continuous and discrete optimization, statistical evaluations are available as well).

A huge graphical library supports among others moving plots, 3D-plots, niveau lines, cross plots, animation for both continuous and discrete systems.

SIMUL_R is an open system as it allows data input and output from and to other systems, including user input during simulation (by keys or graphical) as well as hardware in the loop. PROSIMUL_R only knows one resource: the station.

2. The Model

A process oriented approach has been used to implement comparison 4: one station each for the states of meditation and eating (in one macro), 5 stations implementing the resources (the chopsticks) and one as queue. The philosophers are modelled as entities.

Three different ways of seizing the chopsticks are used (as three models in one PROSIMUL_R program) and shown in Figure 1 (part of the macro for n=1,..,5): taking first the left, then the right chopstick; taking one of them and then the other; waiting till both are available.

```
" take left chopstick first "
   #SEIZE (chopstick#n #,queue)
   #SEIZE (chopstick#next_n #,queue)

" take left or right chopstick first "
   #SEIZEM ff(stick,queue,1,chopstick#n #,chopstick#next_n #)
   #A(0)=swi(stick==chopstick#n #,chopstick#next_n #,chopstick#n #);
   #SEIZE (((int)#A(0)),queue)

" take both chopsticks at once "
   #SEIZEM all(1,queue,chopstick#n #,chopstick#next_n #)
```

Fig. 1

Depending on the distributions for meditation and eating time (e.g. exponential with mean 4 and 1, respectively) deadlocks may occur in the first and second cases.

For avoiding deadlocks, a so-called "deadlock checker" is used in three further examinations with the same kinds of seizing as above: a SIMUL_R DO-block, invoked at each event point, checks a deadlock condition (each philosopher is hungry and takes at the same time one chopstick).

If the condition is true, the checker (maybe the butler of the philosophers, who has a better overview of the whole situation) takes away a chopstick from one philosopher and puts it back on the table. The philosopher then waits a short time and tries to get it again (but in the mean time another one has taken it and started to eat).

This can be easily implemented by a WAIT_EVENT command (waiting for the stick to be free or a flag - "giveback_chopstick" - to become true) and the DO-block listed in Figure 2.

```
DO {
 if (currently_eating==0 && sta_seized[chopstick1]
                && sta_seized[chopstick2]
                && sta_seized[chopstick3]
                && sta_seized[chopstick4]
                && sta_seized[chopstick5]) {
   giveback_chopstick=TRUE; }
} ;
```

Fig. 2

3. The Results

Figure 3 shows the mean utilization of the queue of philosophers waiting for a chopstick (the last approach is the best) and the times needed to finish 10.000 meals.

algorithm	queue util.	time 10.000 meals
left chopstick first, then the right	0.44	11.165
one of the sticks first, then the other	0.49	11.280
wait for both chop sticks	0.35	10.998

Fig. 3

Figure 4 shows the animation screen. The animation disk is available on request.

For information and comments, please phone or fax or write to *SIMUTECH, Hadikgasse 150, A-1140 Vienna, Austria. Tel: +43-(0)222-894 75 08; Fax: +43- (0)222-894 78 04.*

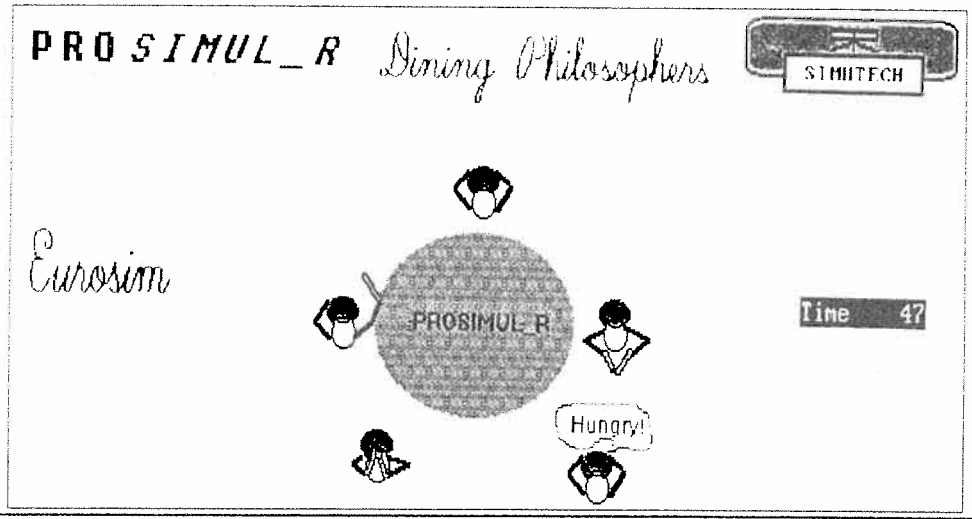


Fig. 4

Comparison 5 - SIL

The SIL system is primarily intended for solving either static or continuous dynamic simulation models. The input language is equation oriented and has facilities for defining both ordinary differential equations (ODEs) as well as differential algebraic equations (algebraic loops) and implicitly given ODEs.

The SIL language also supports the definition of discontinuities in a model; that is, a model may contain several states and under some user given conditions the model switches from one state to another. Since many real models are discontinuous much effort has been invested in making the passing of the discontinuities as efficient and robust as possible. Both 'the standard' IF_THEN_ELSE construction and the one using the SWITCH variable as in the comparison will cause the integration routine to locate the discontinuity by interpolating the solution. The use of a SWITCH variable allows the discontinuity function to change when the state of the model is changed. The discontinuity locating algorithm is also invoked when using SIL for solving discrete systems (difference equations). The SIL system is described in details in Houbak (1990).

Notice the following details in the SIL model below: 1)The $TITLE line sets the title on all output, 2) the $DEBUG line ensures that the position of each discontinuity is printed in the output file (*.LST), and 3) in the state 2 switch condition the comparison operator is 'reversed' for obvious logical reasons.

```
$TITLE=My discon. test.
$DEBUG,2
BEGIN
(*  Declare parameters, variables, derivatives etc *)
PARAMETER c1(2.7E6), c3(3.5651205);
VARIABLE y1(4.2), y2(0.3), c2, c4;
DERIVATIVE Dy1(y1), Dy2(y2);
SWITCH relay(ON);      (* Make state 1 initial  *)
TIME t(0:5);
(* Set for stiff method and pure relative error  *)
METHOD := 139;
ABSERROR:=1.0E-40;  RELERROR:=1.0E-10;
IF relay THEN
     BEGIN    (*  State 1  *)
     c2 := 0.4;   c4 := 5.5;
     relay := y1 < 5.8   (*  The switching condition  *)
     END
ELSE
     BEGIN    (*  State 2  *)
     c2 := -0.3;   c4 := 2.73;
     relay := y1 < 2.5    (*  The other switch cond.  *)
     END;
(*  The differential equations   *)
Dy1 := c1*(y2 + c2 - y1);
Dy2 := c3*(c4 - y2);
(*  Specify output   *)
WRITE(y1, y2);
END.
```

Figure 1: The SIL model.

Figure 2 shows a dump of the graphic display obtained from running the above SIL model. This answers question a). The compile time is 2 seconds and the solution time is approximately 25 seconds on a PC with a 16 MHz 80386/ 80387 processor.

Table 1 shows the position for each of the 5 discontinuities obtained from solving the problem with 3 different accuracies. Notice that in the 1.0E-6 case the last discontinuity is not located; this of cause is seen to have much influence on the y1(5.0) result. With an accuracy requirement of 2.0E-7 the last discontinuity was located. Since the SIL system uses 64 bit reals (accuracy 15 to 16 digit), the 1.0E-14 requirement is too hard. The table therefore shows the results for a relative tolerance equal to 4.0E-14.

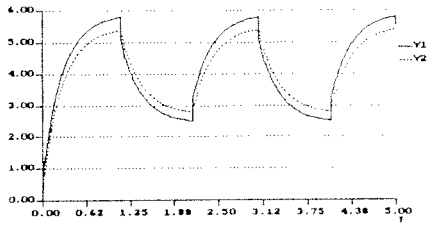


Figure 2: Screen dump showing solution to question a)

Tol.:	1.0E-6	1.0E-10	4.0E-14
#1	1.108292863E+00	1.108306168E+00	1.108306168E+00
#2	2.129676824E+00	2.129685353E+00	2.129685355E+00
#3	3.054149711E+00	3.054152903E+00	3.054152907E+00
#4	4.075533674E+00	4.075532089E+00	4.075532094E+00
#5	-	4.999999638E+00	4.999999646E+00
Y1(5.0)	5.80000E+00	5.36373E+00	5.36931E+00
# STEPS	193	264	355
CPU-time	10.43	21.20	34.50

Table 1: Results for question b)

Due to a minor program bug, the values for #5 and consequently Y1(5.0) mentioned in the original formulation of the problem are wrong. The values given as the 4.0E-14 results are correct within the digits displayed. The number of integration steps and the CPU time spent on solving the problem are also shown.

Question d) can be solved by changing a few constants in the above SIL model. The results are in the below figure 3.

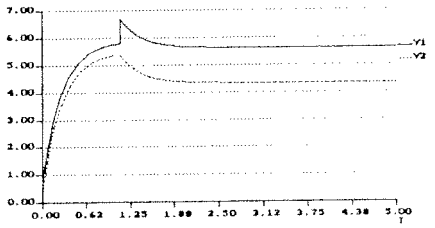


Figure 3: The solution to question d)

The constant C_2 in the original formulation should have had the value -1.3. With that value though, the distance between succeeding discontinuities will be less than 0.001. In practice, this makes the problem unsolveable. With the value C_2 = -1.25 the solution in the below figure 4 can be obtained.

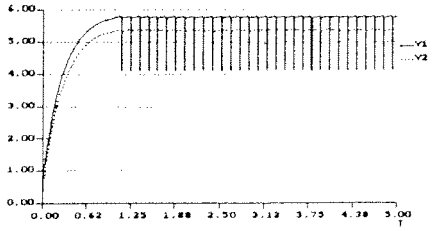


Figure 4: Solution with corrected value of C_2.

Reference: Houbak, N.: SIL - a Simulation Language, Users Guide. Lecture Notes in Computer Science, Vol 426, 1990. Springer Verlag.

Comparison 5 - STEM

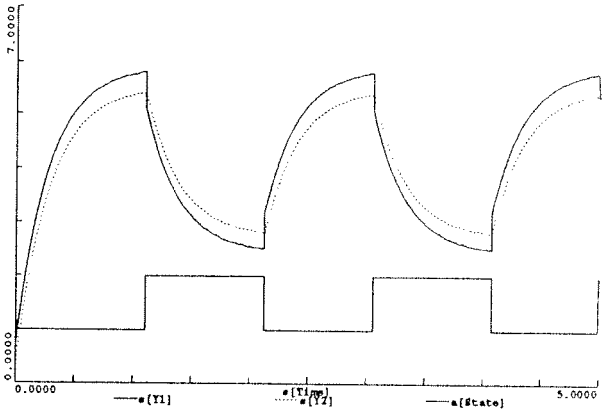
STEM, Simulation Tool for Easy Modelling, is a general purpose simulation package for MS-DOS machines based on Turbo Pascal. A short description of STEM is given with the comparison 1 solution in this issue.

Model description: In a STEM model, variables are divided in groups, each with their own properties. In this model you can find constants c[ ], states s[ ] with derivatives d[ ] and auxiliaries a[ ]. Running a model, each group is presented in a window on the screen.

```
Environment
    BegValue= 0              (* initial value of independent variable *)
    EndValue= 5              (* end value of independent variable *)
Declaration
    Measurement              (* no external data *)
    Constants                (* constants used in program *)
      c[C1]= 2.7E6
      c[C21]= 0.4            ! C2 in state 1
      c[C22]= -0.3           ! C2 in state 2
      c[C3]= 3.5651205
      c[C41]= 5.5            ! C4 in state 1
      c[C42]= 2.73           ! C4 in state 2
      c[Sw2_1]= 2.5          ! value of s[Y1] to switch from 2 to 1
      c[Sw1_2]= 5.8          ! value of s[Y1] to switch from 1 to 2
    Zerostate                (* initial conditions *)
      s[Time]= BegValue
      s[Y1]= 4.2
      s[Y2]= 0.3
      a[State]= 1            ! state of the system: 1 or 2
      a[PrevState] = 1       ! previous valid state of the system
      a[PrevT]= s[Time]      ! previous time of model block evaluation
Model                        (* the model-equations *)
    a[CurrState] = Conditional(a[PrevT]s[Time],a[PrevState],a[State])
    if NOT Jacobi then
      a[State]= Conditional(a[CurrState]<1.5,
                  Conditional(s[Y1]<c[Sw1_2],1,2),
                  Conditional(s[Y1]>c[Sw2_1],2,1))
     a[C2]= Conditional(a[State],<1.5c[C21],c[C22])
     a[C4]= Conditional(a[State],<1.5c[C41],c[C42])
     d[Y1]= c[C1]*(s[Y2]+a[C2]-s[Y1])
     d[Y2]= c[C3]*(a[C4]-s[Y2])
     a[PrevT]= s[Time]
Output                       (* output-variables *)
    a[PrevState]= a[State]
Minimization                 (* no calibration-criteria *)
Userdefined                  (* print functions *)
```

The variable a[CurrState] in the Model block contains the last valid value of the State. CurrState is reset to a[PrevState] when the current value of Time is smaller than PrevT, the Time of the previous Model block evaluation. This can occur when the integration method has rejected the last integration step and decreases the stepsize. CurrState is used to detect the State change. This must not happen when calculating the Jacobian, needed by the Gear integration method. Pascal functions in UserDefined print the Time and Y1 values when the State changes and when the EndValue is reached (not printed here).

Results: The following figure gives the results of a simulation for Y1, Y2 and State. The simulation was performed with the Gear stiff integration method. The calculation time of the simulation, RelError = 1E-10, was about 15 seconds on a 20 MHz 80386/7, where one third of the time was spent on numerical and graphical output.

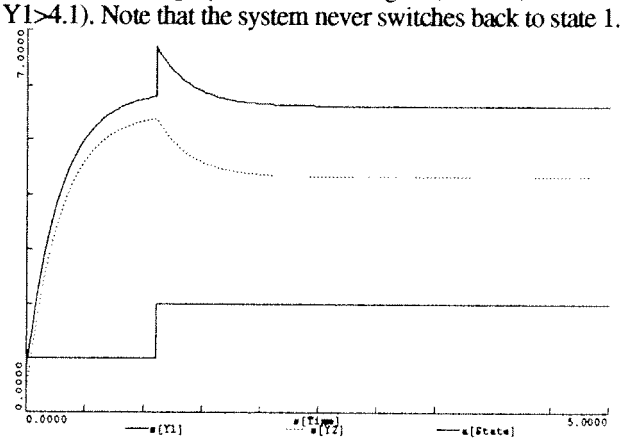


The next table contains the answers for task b) and c), the variation of relative accuracy. The Real Answer is calculated with the analytical solution. With relative error 1E-6, the last discontinuity is not found, this one lies beyond 5 - 1E-6. The found times of the discontinuities and final value at t = 5 are as follows:

	Correct Answer	Error 1E-6	Error 1E-8	Error 1E-10
#1	1.10830616777	1.10830856138	1.10830594501	1.10830616372
#2	2.12968535515	2.12969783471	2.12968506608	2.12968534803
#3	3.05415290700	3.05418004366	3.05415230156	3.05415289634
#4	4.07553209438	4.07557249937	4.07553142945	4.07553208039
#5	4.99999964622	not found	4.99999861278	4.99999962873
Y1(5)				
	5.369312123	5.79998147568	5.11652708040	5.35688875528

The true relative error is 10 to 100 times larger than the specified error. An error smaller than 1e-10 could not be used, because the used integration method then needs steps smaller than 5e-15, the numerical error of the coprocessor.

For task d), other values of C2, C4 and Sw2_1, the simulation is displayed in the next figure(C2=1.3, C4=4.33, Y1>4.1). Note that the system never switches back to state 1.



Variation of the relative error gives the same first discontinuities as for a), the final values at t = 5 are:

	Correct Answer	Error 1E-6	Error 1E-8	Error 1E-10
#1	1.10830616777	1.10830856140	1.10830594501	1.10830616372
Y1(5)				
	5.63000100885	5.63000406483	5.63000100344	5.63000100872

More information about STEM and a demonstration disk containing this model is available with:

Diederik Waardenburg, ReMeDy Systems Modelling, P.O.Box 11019, 7502 LA Enschede, The Netherlands. E-Mail: REMEDY@UTWENTE.NL

Twenty-fifth Anniversary

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FAX: (704) 525-2880

Calendar of Events

July 1992

27-30 **1992 Summer Computer Simulation Conference**. Reno, Nevada.
Contact: B. O'Neill, SCS, P.O. Box 17900, San Diego, CA 92177. Tel.: +1-619-277 3888, Fax: +1-619-277 3930.

August 1992

18-20 **IFAC/IFORS/(IFIP)/(IIASA) Symposium "Modelling and Control of National Economies"**. Beijing, China
Contact: Prof. Jong-Ming Wu, Dept. of Computer Science and Techn., Beijing Information Technology Institute, Beijing, China

19-21 First International Conference on **Intelligent Systems Engineering**. Edinburgh, UK
Contact: ISE 92, Conference Services, The Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, UK, Tel: +44 (0)71 240 1871 222, Fax +44 (0)71 497 3633.

22-26 **IFAC/IFORS Symposium "Large Scale Systems: Theory and Applications"**. Beijing, China.
Contact: Prof. Bao Liu, Inst.of Systems Engineering, College of Engg., Tianjin University, Tianjin, China

23-25 **IFAC Workshop "Distributed Computer Control Systems" (CDDS 92)**. Beijing, China.
Contact: Prof. Bing Zhong Gong, POB 927, Beijing 10080, China

25-28 **4th International Symposium on Systems Analysis and Simulation**. Berlin, Germany
Contact: Conference Secretariat SAS 92, WGMA, Chamber of Technology, Clara-Zetkin-Straße 115-117, O-1086 Berlin,Germany. Tel: +37-2 2265 218, Fax: +37-2 2265 256

26-28 **IMACS RM2S '92 Kobe**. Kobi, Japan.
Contact: Prof. S. Tsafestas, Intelligent Robotics and Control Unit, Computer Science Division, National Technical University of Athens, Zografou I5773, Athens, Greece, Fax: +30-1-7757504

27 - September 2

4th International Symposium on Systems Analysis and Simulation. Berlin, Germany.
Contact: Conference Secretariat SAS 1992, Clara-Zetkin-Str. 115-117, O - 1086 Berlin.

September 1992

2-4 9th IFAC Workshop on **Control Applications of Optimization**. München, Germany
Contact: Dr. Dieter Kraft, Fachhochschule München, Dachauerstr. 98b, D-8000 München 2. Tel: +49-(0)89 1265 1108, Fax: +49-(0)89 1265 1392,
email: kraft@maschinenbau.fh-muenchen.dbp.de

2-4 **International Conference on Control: Modelling, Computation, Information**. Manchester UK.
Contact: Dr.R.P. Jones, Department of Engineering, University of Warwick, Coventry CV4 7AL, U.K.

3-5 **IFAC Workshop "System Structure and Control"**. Prag, CSFR.
Contact: Dr.S. Kubik, Inst.of Inf. Theory and Automation, Pod vodarenskou vezi 4, CS-1182 Prague

IFAC Symposium "Low Cost Automation". Vienna, Austria.
Contact: Prof.W. Kopacek, c/o ÖPWZ, Rockhgasse 6, A-1014 Vienna, Austria

7-10 **Aerospace Vehicle Dynamics and Control**. Cranfield Institute of Technology, UK
Contact: Miss Pamela Irving, Conference Officer, The Institute of Mathematics and its Applications, 16 Nelson Street, Essex SS1 1EF. Tel: +44-(0)702) 354020, Fax: +44-(0)702 354111.

15-18 **"Information Technology Interfaces" ITI '92**. Pula, Croatia.
Contact: Branka Radic, University Computing Centre, Engelsova bb, 41000 Zagreb, Croatia, Tel: +38-41 510 099, Fax: +38-41 518 451

21-25 **PACTA '92**. International Conference on Parallel Computing and Transputer Applications. Barcelona, Spain
Contact: Centro Internacional de Metodos Numericos en Ingeneria, Modulo C1, Campus Norte UPC, Gran Capitan, s/n. E-08034 Barcelona. Tel: +34 3 205 70 16, Fax: +34 3 401 65 17, E-mail: cimne@etseccpb.upc.es

29 - October 2

EUROSIM '92. EUROSIM Simulation Congress, Capri, Italy.
Contact: Mrs. Antonella Di Chiara, Dept. of Civil Engineering, University of Rome "Tor Vergata", Via della Ricerca Scientifica, I - 00173 Roma, Italy, Tel: +39-6-72594575, Fax: +39-6-72594586, Telex: 622302 ROMCIV I

October 1992

20-23 **2nd International Conference on System Simulation and Scientific Computing**. Beijing, China.
Contact: Prof. Chen, Zong Ji, Dept. of Control Engineering, Beijing University of Aeronautics and Astronautics, Beijing 100083, China, Fax: 86-1-2015347, Telex: 222700 BUAA CN.

29 FRANCOSIM Workshop on **"Simulation - Outils Modernes de Développement"**: Liège; Belgium.
Contact: Mme Lacrosse, AIM, Rue Saint Gilles 31, B-4000 Liège, Tel: +32-41 22 29 46

November 1992

5-7 **SIMTECH 92: Simulation Technology Conference International 1992**. Houston, Texas.
Contact: Mary Lou Padgett, Auburn Univ., 1165 Owens Road, Auburn, AL 36830, Tel: +1-205-821 2472.

6-8 **ESS 92 European Simulation Symposium**. Dresden, Germany.
Contact: Philippe Geril, European Simulation Office, University of Ghent, Coupure Links 653, B - 9000 Ghent, Belgium. Tel/Fax: +32-91 23 49 41

9-11 SiSy b/e/m 92 - **8th Prague Symposium on Computer Simulation in Biology, Ecology and Medicine**. Prague, Czech and Slovak Federative Republic.
Contact: Milan Kotva, Zeleny pruh 32, CS-147 00 Praha 4, Czechoslovakia; Tel: +42.2.7992145; fax: +42.2.763211 or +42.2.7992318.

December 1992

7-11 **IMACS Symposium on Scientific Computing and Mathematical Modelling**. Bangalore, India.
Contact: Prof. S.K. Dey, Department of Mathematics, Eastern Illinois University, Charleston, IL 61920, Fax: +1-217-581 5188.

13-16 **Winter Simulation Conference WSC' 92**. Arlington, VA, USA.
Contact: WSC '92, c/o EPIC Management, Inc., 8720 Red Oak Boulevard, Suite 224, Charlotte, NC 28217 USA, Tel: +1-704-529 1725, Fax: +1-704-525 2880

January 1993

3-7 **International Conference on Scientific Computation and Differential Equations**. Auckland, New Zealand.
Contact: Dr. John Butcher, Dept. of Mathematics and Statistics, University of Auckland, Auckland, New Zealand.

17-20 **1993 International Conference on Bond Graph Modeling and Simulation**. San Diego, CA, USA.
Contact: F.E. Cellier, Dept. of Electr. and Computer Engr., University of Arizona, Tucson, Arizona 85721. Tel: +1-602-621 6192, Fax: +1-602-621 8076, E-mail: Cellier@ECE.arizona.edu

February 1993

15-16 **"1. Fachtagung Bioinformatik Bonn"** by GI-FG 4.0.2 (Informatik in den Biowissenschaften) and Institut für Informatik (Universität Bonn). Bonn, Germany
Contact: Dr. Ralf Hofestädt, Uni Koblenz-Landau, Fachbereich Informatik, Rheinau 3-4, D-5400 Koblenz, E-mail: hofestae@infko.uni-koblenz.de.

Conference on "Simulation und Fabrikbetrieb" by ASIM working group "Simulation in der Fertigungstechnik". Aachen, Germany
Contact: Prof. A. Kuhn, Fraunhofer-Institut, IML, Emil-Figge-Straße 75, W - 4600 Dortmund 50, Tel: +49-(0)231 7549 130, Fax: +49-(0)231 7549 211.

April 1993

5-7 **Tooldiag '93,** International Conference on Fault Diagnosis. Toulouse, France
Contact: Secretariat Tooldiag '93, CERT-DERA, 2, avenue Edouard Belin, BP 4025, F - 31055 Toulouse CEDEX

27-29 **VIDEA 93**. Visualization and Intelligent Design in Engineering and Architecture. Southampton, UK
Contact: Sue Owen, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, Hants SO4 2AA, UK, Tel: +44-(0)703 293223, Fax: +44-(0)703 292853

May 1993

17-20 **5th International Symposium on Modelling and Simulation of Systems**. Olomouc, CSFR
Contact: Jan Stefan, Department of Computer Science, Technical University of Ostrava, tr. 17. listopadu, CS-70833 Ostrava.

June 1993

1-4 **5th Symposium on Modelling and Simulation of Systems MOSIS '93**. Olomouc, Czechoslovakia
Contact: Jan Stefan, Chairman of MOSIS 93, Technical University of Ostrava, Department of Computer Science, tr. 17. listopadu, CS-708 33 Ostrava, CSFR

16-18 **QUARDET '93**. II IMACS International Workshop on Qualitative Reasoning and Decision Technologies. Barcelona, Spain
Contact: N. Piera-Carrete, Facultat de Informatica de Barcelona, Dept. de Mathematica Aplicada II, Pau Gargallo 5, E - 08028 Barcelona

September 1993

28-30 **ASIM 93. 8th Symposium Simulationstechnik**. Berlin, Germany.
Contact: P. Schäfer, DAIMLER-BENZ AG, Forschungsinstitut, Alt Moabit 91 b , W - 1000 Berlin 21.

Classes on Simulation

In this section professional classes on simulation and modelling will be announced. Please send information on classes to be published here to the editors.

September 1992

9-11 **Comnet II.5 (WAN Communication Simulation)**, CACI Training Course, Camberley, UK
Contact: CACI Products Division, Suite 11, Coliseum Business Centre, Watchmoor Park, Riverside Way, Camberley, Surrey GU15 3YL, UK, Tel: +44 276 671 671, Fax: +44 276 670 677

14-16 **Simulation und Modellierung mit ACSL** (in German), Munich, Germany.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, W-8000 München 45, Tel: +49-(0)89 3232625, Fax: +49-(0)89 3231063

22-23 **Simulation mit SPICE** (in German), Munich, Germany
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, W-8000 München 45, Tel: +49-(0)89 3232625, Fax: +49-(0)89 3231063

23-25 **Modelling & Simulation Shourt Course** (ACSL), Eastbourne, UK.
Contact: Rapid Data Ltd., Crescent House, Crescent Road, Worthing, West Sussex BN11 5RW,UK.

23-25 **Simscript II.5 (Discrete Event Simulation Language)**, CACI Training Course, Camberley, UK
Contact: CACI Products Division, Suite 11, Coliseum Business Centre, Watchmoor Park, Riverside Way, Camberley, Surrey GU15 3YL, UK, Tel: +44 276 671 671, Fax: +44 276 670 677

28-30 **Modsim II (Object Oriented Simulation Language)**, CACI Training Course, Maastricht, the Netherlands
Contact: CACI Products Division, Suite 11, Coliseum Business Centre, Watchmoor Park, Riverside Way, Camberley, Surrey GU15 3YL, UK, Tel: +44 276 671 671, Fax: +44 276 670 677

December 1992

1-2 **Simulation mit SPICE** (in German), Munich, Germany
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, W-8000 München 45, Tel: +49-(0)89 3232625, Fax: +49-(0)89 3231063

Industry News

This section is intended to inform readers about new simulation products and activities from companies related to simulation. Companies are invited to send contributions (10 to 20 lines) to be published here to the editors of EUROSIM - Simulation News Europe.

DynaSIM AB - A New Company Developing Advanced Modeling Tools.

DynaSim AB has recently been formed in Lund, Sweden. The company will develop software tools for modeling and simulation of large dynamical systems.

The founder of the company is Dr. Hilding Elmqvist. Elmqvist developed the first version of the simulation program SIMNON, up to now sold worldwide. Elmqvist's Ph. D. thesis contains the design of a novel object-oriented model language called Dymola. Elmqvist has then been involved in design and implementation of tools for realization of industrial control systems. DynaSIM will be oriented towards software development. It relies on partners for sales and marketing. The first product will be Dymola, which uses new, powerful methods for symbolic model manipulation. Dymola transforms models to formats suitable for many different simulation programs, such as Simnon, ACSL and Desire and to Fortran subroutines according to DSblock (developed by DLR, Germany). Dymola is a general purpose continuous modeling language. It is suitable for modeling of mechanical systems, electrical systems, thermo-dynamical systems, chemical systems, etc.

For information contact: DynaSIM AB, Sunnanvägen & J, S - 22226 Lund, Sweden Tel: +46 46 323850, Fax: +46 46 323850 E-mail: Elmqvist@gemini.ldc.lu.se

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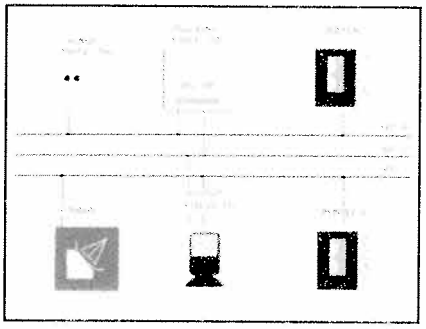

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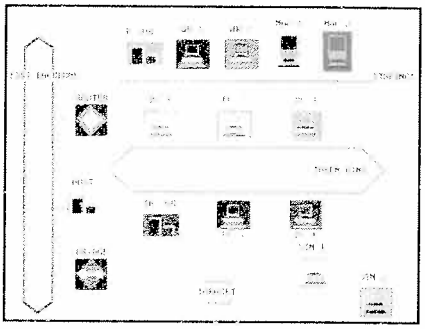
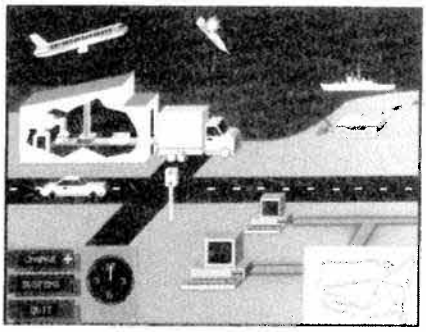


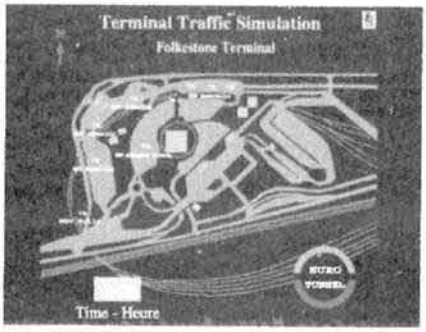
Predict LAN performance. You graphically define your network of stations and gateways interconnected by LAN's. Animation follows immediately—no programming.

SIMSCRIPT II.5



A widely used programming language for development of process-oriented models. This English-like language, with built-in graphics, is in use at 5,234 sites worldwide.

MODSIM II



A new object-oriented programming language with built-in graphics. It incorporates the key elements of modern software engineering: block structure, modularity, and strong typing.

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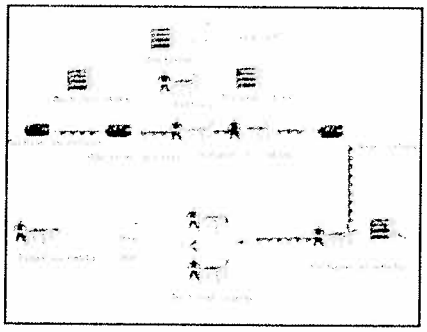

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For further information, please contact:

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