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Deadline for the next issue will be January 29, 1998.

Editorial

More and more classical analytical frameworks and symbolic methods become now suitable for computer simulation. The idea of hybrid modelling essentially stimulates new modelling techniques. Methods and algorithms from soft computing influence the development of simulation techniques. Furthermore, modelling and simulation penetrates all application areas, where many efforts for computational engineering, computational biology, computational physics etc. are met.

Consequently **EUROSIM - Simulation News Europe** (SNE) reports and underlines these developments in the November issue

- by an excellent essay discussing advantages of different model regimes as possible approach for hybrid modelling (see also title page),
- by presenting Markov chains as an analytical tool for discrete systems in a comparison solution and in a contribution on linear system solving,
- by discussing different methodologies and modelling approaches in solving the EUROSIM comparison C7 (constrained pendulum), among them hybrid modelling approaches,
- by going beyond simulation, presenting groups, books, journals not directly related to "classical modelling and simulation", but emphasising on the aforementioned areas.

We are working on an automated evaluation of the different solutions of all comparisons by means of a database. During this process more and more solutions of the already 135 solutions published in this journal will become available on the web (<http://eurosim.tuwien.ac.at/comparisons/>).

We currently offer SNE as PDF-file on the world-wide-web, where also parts of the contents may be found archived and evaluated (comparisons, book reviews, list of essays, simulation centres etc.). Nevertheless we think that our readers still appreciate the printed version, perhaps to be read during Christmas holidays in front of an open fire – we wish you a Merry Christmas and a successful New Year.

It is time to make plans about attending the EURO-SIM Congress 98 which will take place in Helsinki, Finland, April 14-17, 1998. See information on page 6. For more details please contact the organizer.

We would like to thank all who contributed to this issue.

F. Breiteneker, I. Husinsky

SIMPLE++

Applications

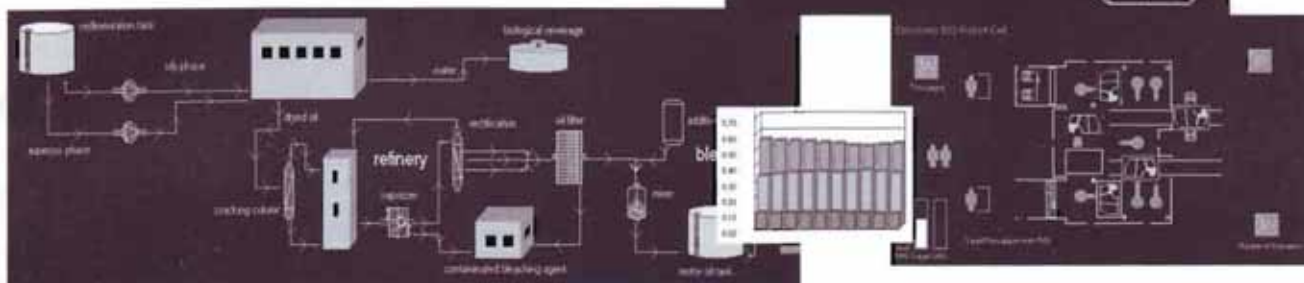
SIMPLE++

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- Transportation
- Services, Utilities
- Warehousing, Logistics

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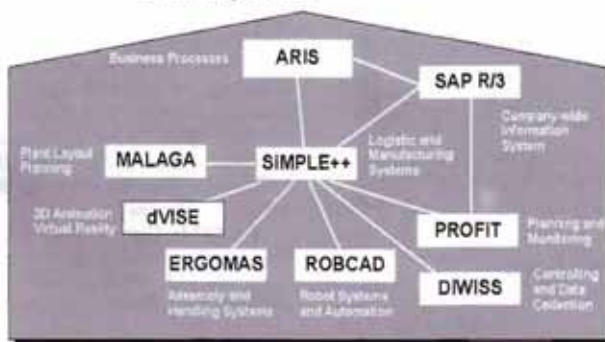


Key Features

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Readership Information

The journal *EUROSIM - Simulation News Europe* (abbreviated SNE) is published three times a year (March, July, November) by ARGESIM (ARGE Simulation News), a non-profit working group. SNE is the membership newsletter for the EUROSIM societies (EUROSIM is the Federation of European Simulation Societies), and in general SNE is a newsletter on simulation activities in Europe. Circulation is 3000.

SNE is distributed by most EUROSIM member societies to their individual members as part of the membership services. At Congresses, Conferences, within Societies and Groups working in the area of Modeling and Simulation and within Software User Groups the journal spreads information on news and developments on modeling and simulation. Societies and Working Groups may give bulk orders (special rates are available).

SNE can be ordered by subscription from ARGESIM, based on a one year's subscription, on an anytime start basis.

In addition SNE is available in the world-wide-web as PDF-file, where also parts of the contents may be found archived and evaluated (address: ARGESIM's WWW-Server at <http://argesim.tuwien.ac.at/sne/>).

If you have any contributions, remarks, suggestions, etc. please contact the editors per mail, fax, or email. Deadline for the next issue will be **January 29, 1998**.

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

Aims and Scope

The journal *EUROSIM - Simulation News Europe* (abbreviated SNE) publishes information related to modelling and simulation.

SNE's aims are: to inform about new developments in simulation methodologies, applications and software and hardware for modeling and simulation, to report news from European simulation societies and European simulation events (emphasizing SNE's role as *newsletter* of EUROSIM and of the European simulation societies) and from international simulation societies and working groups all over the world.

SNE contains news on EUROSIM, on the EUROSIM societies, on other international simulation societies and groups (and societies from related areas), on software user groups, on simulation centers, and contains a comprehensive calendar of events (congresses, conferences and workshops on modeling and simulation and related areas) and of classes on modeling and simulation.

SNE publishes essays dealing with new developments in a particular area and reports on software and hardware developments, new applications and new methodologies and their applications. The section on industry news contains the latest news available through press releases and announcements. Furthermore, there are book reviews and book news.

A special series on simulation comparisons (EUROSIM comparisons) gives a comprehensive overview on features and developments of simulation software and hardware, in-

cluding parallelization techniques. These comparisons are also becoming standard benchmarks for simulation programs.

SNE is a printed journal as well as an electronic journal. A database (ARGESIM database) works as input server for structured information on the ARGESIM/EUROSIM WWW server. The database contains information about the EUROSIM comparisons (definition, solutions and evaluations), conferences, classes and books. A calendar of events and courses is available via WWW. EUROSIM/ARGESIM's WWW server can be found at <http://eurosim.tuwien.ac.at/>.

All contributions are selected and may be edited by the editors of the journal.

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EUROSIM'98 CONGRESS

The 3rd International Congress of the Federation of EUROpean SIMulation Societies
April 14-17, 1998, at Helsinki University of Technology, Espoo, Finland

Call for Papers

All topics related to Modelling and Simulation are considered for full papers, short papers, and just in time posters. Posters and demonstrations may also be provided as an addition to a paper presentations. Courses and user group meetings are supported during the last two days of the meeting. Special emphasis will be addressed to following topics:

Use of Modelling and Simulation for CAE Purposes
Processes, Pulp and Paper Engineering, Power Production, Electrical Engineering and Control Engineering

Modelling and Simulation Software, and Evolving Standards
Languages and Tools, especially the MODELICA language, User Interfaces and Virtual Reality

High Performance Computing and Networking in Simulation
Computational Fluid Dynamics, Parallel Processing and Networking, Visualisation of Results

Use of Simulation for Training, Education and Entertainment
Instructor, Teacher, Trainee, Student, and User Experiences of Simulation as a Tool

Modelling and Simulation as a Science
Fundamentals, New Developments and Research. A special session will be arranged on Hybrid modelling

European Simulation Congress Each Third Year: EUROSIM'98 is the third conference of the Federation of European Simulation Societies. It brings together people from different organisations, interest groups and regional societies each third year to promote the advancement of modelling and simulation in industry, research, education, and development.

Post Congress Events: The Conference is combined with events such as: simulation courses, user group meetings, technical tours, and visits. Options to visit St. Petersburg, Tallinn or Stockholm will be provided for. For skiing enthusiasts a tour is arranged to the snowy Northernmost parts of Finland, although spring has readily arrived in Southern Finland.

Final Deadlines

Full Paper Abstracts. Early Registration to Congress, hotels, and tours starts	December 15, 1997
Short Paper Abstracts Deadline. Full paper notification	January 15, 1998
Full Paper Submission. Short Paper notification	February 16, 1998
Short Paper Submission. Poster Paper Deadline. Late Registration starts	March 16, 1998
Main Scientific Congress and Exhibition	April 14-15, 1998
Courses, Users' Group Meetings, tours, and visits	April 16-18, 1998

Abstracts: One full page abstract made according to the printing instructions to be sent preferably by email or by fax.

Papers: The papers shall be sent as complete WORD documents including pictures and figures in the same file in accordance with typing instructions. Full papers are 4 to 8 full pages, Short papers are 2 to 4 full pages and Posters are 1 full A4 page. Paper contributions should arrive at the latest 24:00 on the deadline day as Uuencoded email attachments and as in due time mailed diskettes. Paper Acceptance Notification will be made by email in three weeks after the receipt of paper.

Typing instructions: The paper page according to size A4 should have following set-up: Margins: Top 2.0 cm, Bottom 3.0 cm, Left 2.0 cm, Right 2.0 cm, Header 0.8 cm and Footer 0.8 cm. Font: Times New Roman, Font size 11 for normal text and headers, 14 for title, 9 for references and author affiliation, Title and main headers bolded, Sub-headers Italic, Title, Authors, Affiliation centred, Headers left aligned, Text justified to both sides, Equation numbers in parenthesis and right aligned. References in squared brackets. A single line distance between texts and headers.

Correspondence: Please send all correspondence if possible by email to EUROSIM98@vtt.fi, or by ordinary mail to EUROSIM'98, P. O. Box 1301, FIN-02044 VTT, Finland, or by fax to: +358-9-456 6752. For up-to-date information visit <http://www.vtt.fi/aut/tau/network/eurosim/eurocall.htm>

Accepted full papers, short papers and posters will be published in separate congress proceedings, subject to payment of congress fee. Publishers and software vendors are invited to present their products at the exhibition area and in a special session. They may arrange for the distribution of their own material.. Ensure that we know what information you need. You will get it in due time by providing us your email address: **JOIN OUR MAILING LIST NOW.**

The EUROSIM'98 Simulation Congress is organised by SIMS - Scandinavian Simulation Society in co-operation with the other EUROSIM member societies and Sponsoring Societies. The International Scientific Advisory Committee is formed by the board members of EUROSIM.

*General congress chair: Kaj Juslin,
President of EUROSIM, email: Kaj.Juslin@vtt.fi*

Towards Grey Box Modelling and Identification – Operating Regimes and Multiple Models

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Complex Problems, Divide and Conquer

Technological development is steadily increasing the complexity of process plants, vehicles and other engineered systems, and economical and environmental constraints are raising the awareness of the need for practical approaches which can be used to aid engineers to better understand and perform such complex modelling tasks. Furthermore, in model based techniques for control, optimization and supervision, efficient development of models is recognized as the main bottleneck.

Highly complex systems are characterised by a large number of components which are strongly coupled and have a wide operating range, among other factors. The principle of incompatibility of Zadeh (1973) tries to make the implications of complexity more precise: *As the complexity of a system increases, our ability to make precise and yet significant statements about its behaviour diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics.* A consequence of this principle is that one should perhaps look for other model representations and tools that can make use of less precise system knowledge than traditional approaches to modelling in order to make the modelling process more cost efficient.

In everyday life, as well as in solving engineering problems, the standard approach to complex problem solving is the divide-and-conquer strategy: *A complex problem is somehow partitioned into a number of simpler subproblems that can be solved independently, and whose individual solutions yield the solution of the original complex problem.* The key to successful problem solving with this approach is to find suitable axes along which the problem can be partitioned. Here we will focus on one approach to the decomposition of modelling problems that has recently attracted significant attention, namely operating regime decomposition.

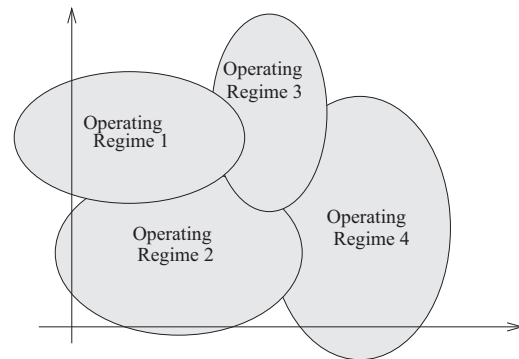


Figure 1: The operating range of a complex system is decomposed into a number of operating regimes. These can then be used to represent the system using associated simple subsystems.

Operating Regime Thinking

The core of the operating regime approach is to make use of a partitioning of the operating range of the system in order to develop a model, cf. Figure 1. The operating regime approach thus leads to multiple model approaches, where different local models are applied under different operating conditions. The supervisor will coordinate the local models. This coordination may include selection of a single one, or combining the actions or parameters of a number of local models.

The operating regimes can often be characterised by different sets of phenomena or behaviours of the system. The rationale behind this approach is basically that the development of local models is simpler because the interactions between the relevant phenomena in each operating regime are simpler locally than globally. For instance, if the system phenomena or behaviour change smoothly with the operating point, then a linear model will always be sufficient locally by making each operating regime sufficiently small, even though the system may contain complex nonlinearities when viewed globally. Other motivations for operating regime approaches include:

- The model structure is easy to understand and interpret, both qualitatively and quantitatively, and the approach has its roots in traditional engineering methods.
- Various types of knowledge can be incorporated and integrated within the framework, including qualitative knowledge, empiricism, measured data and available models. Operating regime based modelling is closely related to grey-box modelling.
- Reduced computational complexity compared to other nonlinear methods.

Any model will have a limited range of operating conditions in which it is sufficiently accurate or performs sufficiently well in order to serve its purpose. This range may be restricted by several factors such as validity of linearisation, modelling assumptions or experimental conditions. A model that is useful in a region less than the full range of operating conditions is called a local model, as opposed to a global model which is useful over the full range of operating conditions. Of course, the ultimate goal is a global model. However, in some cases it may be beneficial to achieve this goal by developing a number of local models.

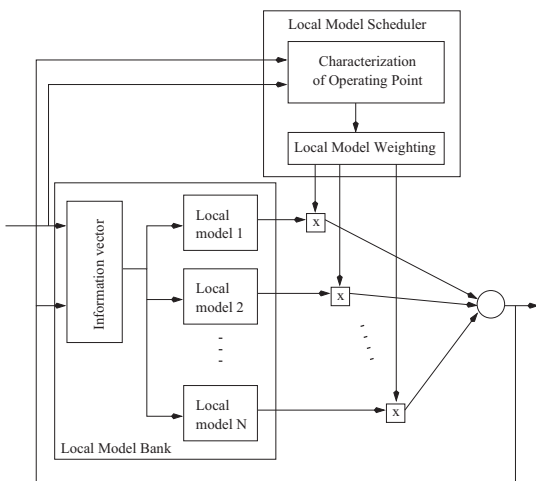


Figure 2: The model consists of a Local Model Bank and a Local Model Scheduler that assigns weights to each local model as a function of the operating point. The global model output is the result of a weighting of the local model outputs.

The basis of the framework is a decomposition of the system's full range of operation into a number of possibly overlapping operating regimes, as illustrated in Figure 1. In each operating regime, a simple local model is applied. These local models are then combined in some way to yield a global model, see Figure 2. Hence, model development within this framework typically consists of the following tasks:

- Decompose the system's full range of operation into operating regimes. This task includes a definition of the full operating range, as well as the identification of variables that can be used to characterise the operating regimes.
- Select simple local model structures within each operating regime. These structures will often be determined by the relevant system knowledge that is available under different operating conditions, as well as the intended purpose of the model.
- The local model structures are usually parameterised by certain variables that must be determined.
- A method for combining the local models into a global one must be applied. Numerous approaches exist, and can be characterised according to deterministic vs. stochastic assumptions, soft or hard partitions etc.

For practical problems it will not always be easy to find a natural sequence in which these tasks should be approached. Several iterations of the same tasks are usually needed before a satisfactory model is found.

Example: Modelling a batch fermentation reactor

Consider a chemical reactor where a set of chemical reactions take place. A mechanistic model typically consists of mass and energy balances. The structure of the balance equations can typically be developed quite easily. The main problem of modelling such systems is to specify how the reaction-rates, mass-transfer coefficients, enthalpies and other model variables depend on the system's state. This typically requires a good understanding of the reaction kinetics, thermodynamics, fluid dynamics, mass- and heat-transfer phenomena present in the reactor. If such knowledge is unavailable and only

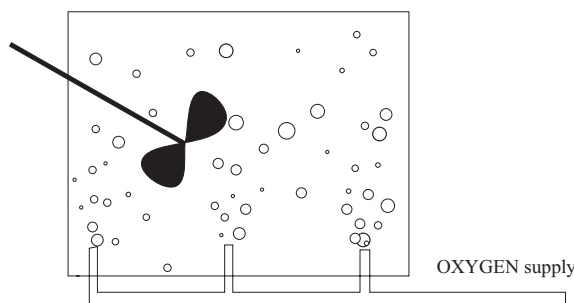
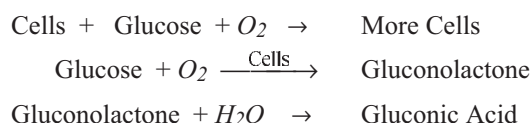


Figure 3: A fermentation reactor.

qualitative knowledge about these phenomena is present, the use of operating regime based approaches can be used to formulate a semi-mechanistic model of the reactor. To illustrate this, let us consider a specific reactor, namely a semi-batch fermentation reactor where the fermentation of glucose to gluconic acid takes place, Figure 3.

The main overall reaction mechanism can be described by



The first reaction is the reproduction of cells, consuming the substrate glucose and oxygen. The second reaction is the production of Gluconolactone, again consuming glucose and oxygen. This reaction is enzyme-catalyzed by the cells, while the final product, gluconic acid, is formed by the last reaction.

Let x be the state vector that contains the compositions of cells, glucose, gluconolactone, gluconic acid, and oxygen. A mass balance can be written in the form

$$\dot{x} = r(x, T, pH) + q(x) \quad (1)$$

where $r(x, T, pH)$ is a vector of reaction rates, $q(x)$ is a vector of flow-rates that describes the uptake of oxygen, and T is temperature. An examination of the reaction mechanism (Johansen 1994) reveals that the operation of the reactor can naturally be decomposed into four operating regimes:

1. **Initial regime** when it is the number of cells that limits the chemical reactions. Only the first reaction will be significant.
2. **Growth regime** when all reactions proceed at a high rate, limited only by the oxygen supply. All reactions will be significant.
3. **Growth termination regime**, characterised by shortage of glucose which limits the reaction rates.
4. **Termination regime** when all glucose-consuming reactions have terminated, and it is only the production of gluconic acid that is significant.

These operating regimes can for instance be characterised in terms of glucose and oxygen concentrations, see Figure 4. Within each operating regime the dynamics of the reactor can be described by linear differential equations with high accuracy, if the dependence on temperature and pH are neglected. Otherwise, one must decompose the regimes further on the basis of these variables, or apply nonlinear local models which take these dependencies into account.

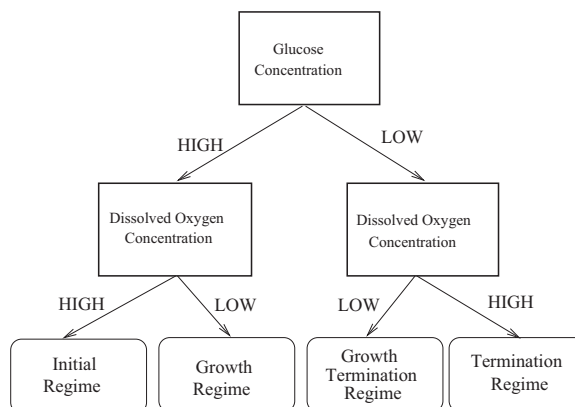


Figure 4: Operating regimes for batch fermentation reactor.

Similarly, the flow-rate term q in (1) can also be decomposed. The uptake of oxygen will depend on the oxygen concentration, stirring and other fluid dynamics phenomena that in turn may depend on the concentration of cells, since it affects the viscosity and other key properties.

ORBIT – Operating Regime Based Modelling and Identification Toolkit

An overview of the ORBIT software environment can be seen in Figure 5. ORBIT is implemented in MATLAB (version 4.2 and 5.0). The ORBIT core contains the graphical user interface (GUI), parameter and structure identification algorithms and model validation algorithms, model database management, application programmers interface (API), as well as interfaces to various generic MATLAB tools and toolboxes. ORBIT can support a wide range of model representations, including NARX (Nonlinear Autoregressive with eXternal input), NARMAX (Nonlinear Autoregressive Moving Average with eXternal input) and non-linear state-space models based on local models. However, only the NARX representation is currently implemented as part of the standard model representation library. The advanced user is free to include customised or generic model representations in this library by programming the required MATLAB functions. ORBIT models and ORBITcd controllers can be made available as SIMULINK S-functions and blocks for simulation. Using the built-in code generation facility, models and controllers can be exported as C-functions for real-time application or simulation. For real-time application of ORBIT models and controllers in languages other than C, one can develop MATLAB scripts that code the model parameters into the required programming lan-

General Information: EUROSIM, the **Federation of European Simulation Societies**, was set up in 1989. The purpose of EUROSIM is to provide a European forum for regional and national simulation societies to promote the advancement of modelling and simulation in industry, research, and development. EUROSIM members may be regional and/or national simulation societies. Full membership and observer membership are available.

At present EUROSIM has ten full members and one observer member: ASIM - *Arbeitsgemeinschaft Simulation* (Austria, Germany, Switzerland), CROSSIM - Croatian Society for Simulation Modelling (Croatia), CSSS - Czech & Slovak Simulation Society (Czech Republic, Slovak Republic), DBSS - Dutch Benelux Simulation Society (Belgium, The Netherlands), FRANCOSIM - Société Francophone de Simulation (Belgium, France), HSS - Hungarian Simulation Society (Hungary), ISCS - Italian Society for Computer Simulation (Italy), SIMS - Simulation Society of Scandinavia (Denmark, Finland, Norway, Sweden), SLOSIM - Slovenian Simulation Society (Slovenia), UKSIM - United Kingdom Simulation Society (U.K.). AES - Asociación Española de Simulación (Spain) is observer member.

EUROSIM is governed by a **Board** consisting of one representative of each member society, plus the organizer of the last EUROSIM Congress (past president) and the organizer of the coming EUROSIM Congress (president). The Board elects officers, who are at present: K. Juslin (SIMS) - president, F. Breitenecker (ASIM) - past president, R. Zobel (UKSIM) - secretary, L. Dekker (DBSS) - treasurer.

Towards co-operation in the field of simulation

SCS and EUROSIM have signed a co-operation agreement. According to the lines of this agreement a Liaison Committee to promote the co-operation was established July 17, 1997, during the SCS Summer Conference in Arlington, Virginia. The presidents of EUROSIM and SCS agreed upon that the chairman of the committee for the first two years period should be from the EUROSIM side, and they jointly appointed the first Liaison Committee, where Kaj Juslin (chair) and Dietmar Möller both represent EUROSIM, and Axel Lehman and Alexander Verbraeck both represent SCS.

The new committee had its first meeting and concluded the very fruitful discussions to three concrete proposals regarding Publications, Conferences, and Smaller Meetings:

1) Publications

It was proposed that the scientific journals of both societies should be available for both EUROSIM and SCS members at favourable terms: The publisher of the EUROSIM journal, "Simulation Practice and Theory" (SIMPRA), will contact the SCS office regarding an offer to provide their relevant simulation journals for the same rate to SCS members as to EUROSIM members according to following terms:

- The subscriptions are for personal member use only, and the issues may not be redistributed via libraries etc.
- The publisher takes care of the mailing of the issues to the individual members but expects that the organisations collect the subscription fees from their members and provide the publisher with address labels each time an issue is published.
- The publisher invoices the organisations for these subscriptions.

SCS will prepare a corresponding offer for EUROSIM regarding "TRANSACTIONS of the Society for Computer Simulation International".

2) Conferences

The EUROSIM Congress is arranged every three years in Europe. To avoid undesirable competition between the 1998 meetings already planned for, the EUROSIM Congress in April 1998 in Helsinki and the SCS Multiconference in June 1998 in Manchester, should concentrate on different tracks.

Regarding 2001, the year of the following EUROSIM Congress, it was proposed that there would not be arranged any SCS Multiconference in Europe that year and the SCS European office would be fully involved in the organization work of the EUROSIM Congress, supposed to be hosted by DBSS, the Dutch Benelux Simulation Society.

3) Smaller Meetings

Also joint actions and help to organize smaller meetings and events are called for in Europe, e.g. to arrange the first simulation meetings at local level, and to promote simulation both as science and engineering tool.

The Liaison Committee agreed to work for that at least the main simulation events in Europe would be co-sponsored by both EUROSIM and SCS. The first step is reached if both organizations put into practice the three above proposals.

*Kaj Juslin
President of EUROSIM*

guage and format. Local model parameters can also be interchanged with other MATLAB tools, including the MATLAB Control Toolbox, Signal Processing Toolbox, and LMI Toolbox. An application programmers interface (API) allows other MATLAB programs to access the ORBIT model database. ORBIT is extendible, i.e. its core model representation and functions are documented.

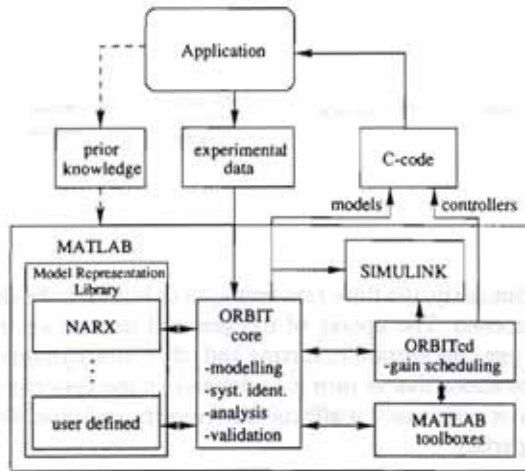
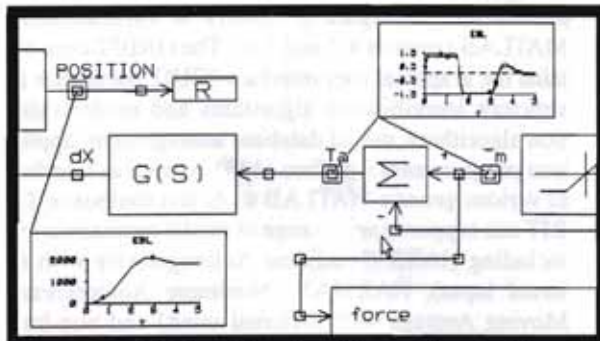


Figure 5: The ORBIT/ORBITcd software environment implemented in MATLAB.

For more details on the multiple model approach, including application examples, see (Murray-Smith and Johansen 1997, Johansen and Foss 1997a, Johansen 1994, Hunt et al. 1996, Takagi and Sugeno 1985). The ORBIT software is described in (Johansen and Foss 1997b).

References

- Hunt, K. J., J. C. Kalkkuhl, H. Fritz and T. A. Johansen (1996). Constructive empirical modelling of longitudinal vehicle dynamics with local model networks. *Control Engineering Practice* 4, 167-178.
- Johansen, T. A. (1994). Operating regime based process modeling and identification. Technical Report 94-109-W. Dr. Ing. thesis. Department of Engineering Cybernetics, Norwegian Institute of Technology, Trondheim, Norway. http://www.itk.unit.no/SINTEF/ansatte/Johansen_Tor.Arne/driving_taj.ps.gz.
- Johansen, T. A. and B. A. Foss (1997a). Operating regime based process modeling and identification. *Computers and Chemical Engineering* 21, 159-176.
- Johansen, T. A. and B. A. Foss (1997b). ORBIT - operating regime based modeling and identification toolkit. In: *Preprints IFAC Symposium on System Identification, Kitakyushu, Japan*. pp. 961-968.
- Murray-Smith, R. and Johansen, T. A., Eds. (1997). *Multiple Model Approaches to Modelling and Control*. Taylor and Francis, London.
- Takagi, T. and M. Sugeno (1985). Fuzzy identification of systems and its application to modeling and control. *IEEE Trans. Systems, Man, and Cybernetics* 15, 116-132.
- Zadeh, L. A. (1973). Outline of a new approach to the analysis of complex systems and decision processes. *IEEE Trans. Systems, Man, and Cybernetics* 3, 28-44.



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

Report from ASIM

ASIM-Membership Meeting (*Mitgliederversammlung*)

The next ASIM's general assembly will take place on November 12th, 1997, 18.00 at Westfalenhalle Dortmund, during the ASIM conference. All ASIM members are invited to come to the assembly, independent of conference participation. An invitation to this meeting is included in the *ASIM-Nachrichten*, which accompany this mailing for ASIM members.

ASIM'97 in Dortmund November 11 - 14, 1997

The annual ASIM Conference is organized this year in Dortmund by the *Fraunhofer Institut für Materialfluß und Logistik* on Nov. 11 - 14, 1997. The meeting is accompanied by a large exhibition on simulation tools.

Highlights of the conference are:

- 6 Invited Papers
- 115 contributions in parallel sessions
- Exhibition on software tools
- 11 Tutorials on methods, software, applications etc. on Tuesday, November 11, 1997
- Meetings of 4 User Groups of Simulation Tools on Tuesday, November 11, 1997
- Social program with Welcome Cocktail, Reception in the *Wenkerkeller* and Visit of the Brewery Museum, theater performance *Theater Olpketal – Bruno "Günna" Knust: Dortmund Revue*
- Excursions to *Lehrbergwerk Recklinghausen*, *Casino Spielbank Hohensyburg*, *Deutsches Bergbau-Museum Bochum*, and *Planetarium Sternwarte Bochum*.

A detailed program can be found in the *ASIM-Nachrichten* 3/97, mailed with this SNE to all ASIM members, and on the WWW: <http://argesim.tuwien.ac.at/asim/asim97/>.

The ASIM Board will meet on November 11th during this conference. Please contact speaker or vice speaker if there are any open issues to discuss.

ASIM'98 (*12. Symposium Simulationstechnik*) is planned for September 15-18, 1998 in Zurich, Switzerland. Contact: Dr. Veronika Hrdliczka. A first Call for Papers will be mailed to ASIM members end of November.

Contact Addresses, Information

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WWW Information, Membership Service:

<http://argesim.tuwien.ac.at/asim/>

ASIM Meetings to come

November 11-14, 1997: ASIM'97, *11. Symposium Simulationstechnik*, the annual ASIM conference, detailed information see above.

February 16-17, 1998: 8th Working Group Conference of the ASIM Working Group "*Simulation in Produktion und Logistik*", Berlin, Germany. Contact: M. Rabe.

March 2-3, 1998: *Treffen der Fachgruppe "Simulation Technischer Systeme"* at FH Heidelberg. Contact: Dr. Ingrid Bausch-Gall.

March 4, 1998: Meeting of the Working Group "*Simulationssoftware und -hardware*" in Magdeburg. Contact: Prof. Breiteneker.

March, 29-31, 1998: Meeting "Tools for Environmental Modelling and Simulation", 8th Workshop of the Working Group FG9, Witzenhausen. Contact: Rolf Grützner.

April 21-22, 1998: Workshop SIWIS-98 – *Simulation in Wissensbasierten Systemen*, Paderborn. Contact: Prof. Szczerbicka.

September 15-18, 1998: ASIM'98, 12. *Symposium Simulationstechnik*, Zurich, Switzerland. Contact: Dr. Veronika Hrdliczka.

March 8-10, 1999: Seventh symposium "Simulation for managerial decision support – new tools and approaches in practice" in Braunlage. Contact: Prof. Hummeltnerberg.

September 21-24, 1999: ASIM 99. 13. *Symposium Simulationstechnik*, Weimar. Contact: Prof. G. Hohmann, Bauhaus-Universität Weimar, D-99421 Weimar, Tel: +49-3643 584 250, Email: hohmann@informatik.uni-weimar.de

ASIM'2000 will be held at the Ebernburg castle in September 2000.

Meetings with ASIM Participation

November 20-21, 1997: 5. *Workshop Sichtsysteme – Visualisierung in der Simulationstechnik*, Wuppertal

March 5-6, 1998: SV'98 – Simulation and Visualisation, Magdeburg

June 16-19, 1998: ESM98, 12th European Multi-conference, Manchester, U.K.

Contact addresses see Calendar of Events

Working Groups (*Fachgruppen* FG)

"Verteilte Systeme und parallele Prozesse" (FG 1)

Speaker: Dr.-Ing. Peter Schwarz, Fraunhofer-Institut IIS/EAS, Zeunerstr. 38, D-01069 Dresden Tel: +49-351 4640 730, Fax: +49-351 4640 703, email: schwarz@cas.iis.fhg.de

Vice-speaker: Dr. Hans Fuss, GMD, D-53731 St. Augustin Tel: +49-2241 14 3125, Fax: +49-2241 14 3006, email: fuss@cartan.gmd.de

"Simulationssoftware und -hardware" (FG 2)

The working group deals with software tools and in general with modelling approaches and their comparison. In co-operation with ARGESIM (EUROSIM comparisons) and other groups benchmarks, tests and other comparisons tools for simulators, environments, but also for modelling approaches and modelling methodologies are investigated. At present a project is run for an automated evaluation of the EUROSIM comparisons via a database.

Furthermore, the group concentrates on new methods from soft computing in modelling and simulation (fuzzy systems, neural nets, genetic algorithms etc.) and on WWW-based simulation.

The strategy of the group is to have meetings combined with e.g. other ASIM working groups, simulations groups and/or to combine meetings with other conferences. In 1998 a one-day meeting of the working group will take place on March 4, 1998 in Magdeburg, preceding the conference SV'98 - Simulation and Visualisation (March 5-6, 1998, University Magdeburg). The meeting will concentrate on

- methods for comparing simulators and simulation environments and modelling tools,
- WWW-based simulation – where also the outcome from the Int.. Conference on Web-Based Modeling and Simulation (San Diego, Jan. 11 - 14, 1998) will be discussed,
- spreadsheet based simulation.

On the occasion of this meeting Speaker and Vice Speaker will be elected.

Speaker (prel.): Prof. Dr. Felix Breitenecker, TU Wien, Abt. Simulationstechnik, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel: +43-1 58801 5374, Fax: +43-1 5874211, email: Felix.Breitenecker@tuwien.ac.at

Vice-speaker (prel.): Prof. Dr.-Ing. Dietmar P.F. Möller, TU Clausthal, Institut für Informatik, Erzstraße 1, D-38678 Clausthal-Zellerfeld, Tel: +49-5323 72 2402, 2504, Fax: +49-5323 72 3572, email: moeller@informatik.tu-clausthal.de

"Simulation und künstliche Intelligenz" (FG 3)

The next meeting of the working group, the Workshop SIWIS-98 – *Simulation in Wissensbasierten Systemen*, will be held in Paderborn, April 21-22, 1998 (see also <http://www.uni-paderborn.de/fachbereich/AG/agklblue/workshops/>).

Speaker: Prof. Dr.-Ing. Helena Szczerbicka, Universität Bremen, Rechnerarchitektur und Modellierung, Fachbereich 3 - Informatik, Postfach 33 04 40, D-28334 Bremen, Tel: +49-421 218 7389 or 7390, Fax +49-421 2187385, email: helena@informatik.uni-bremen.

Vice-speaker: Dr. Thomas Uthmann, Johannes-Gutenberg-Universität Mainz, Institut für Informatik, Staudingerweg 9, D-55099 Mainz, Tel: +49-6131 39-3610, Fax +49-6131 39-3534, email: uthmann@informatik.uni-mainz.de

"Simulation in Medizin, Biologie und Ökologie" (FG 4)

The ASIM Fachgruppe "Simulation in Medicine, Biology and Ecology" held its biannual Meeting at the Castle of Ebernburg in Bad Münster am Stein Ebernburg from April 17-19, 1997, together with FG2 and FG3. The idea behind was to expand the knowledge transfer between the different ASIM Working Groups, in order to stimulate interdisciplinary discussion which is one of the most important link to find out more suffi-

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The 8th Ebernburg conference is planned to be held in April in the year 2000. In between the Working group has its next meeting during the annual ASIM Conference, in November in Dortmund. During the Meeting at Dortmund it will be decided where the 1998 meeting should take place.

Speaker: Prof. Dr.-Ing. Dietmar P.F. Möller, TU Clausthal, Institut für Informatik, Erzstraße 1, D-38678 Clausthal-Zellerfeld, Tel: +49-5323 72 2402, 2504, Fax: +49-5323 72 3572, email: moeller@informatik.tu-clausthal.de

Vice-speaker: Prof. Dr. Otto Richter, TU Braunschweig, Institut für Geographie und Geoökologie, Langer Kamp 19c, D-38106 Braunschweig, Tel: +49-531 391 5627, Fax: +49-531 391 8170

"Simulation technischer Systeme" (FG 5)

ASIM-Mitteilungen Nr. 57 with a report and most of the presentations of the Rostock meeting are now available and can be ordered from Dr. Ingrid Bausch-Gall. The price is DM 30,00 (plus shipping and handling).

The next FG5 meeting will be at FH Heidelberg on March 2 and 3, 1998, hosted by Prof. Peter Schmidt. Monday afternoon invited talks are planned for simulation in hydraulics, simulation in development of car equipment, simulation in industry in Heidelberg, and others. For Tuesday specialized so-called "*Arbeitsgespräche*" are scheduled to allow thorough expert discussion of special tasks. Subjects to be discussed include: simulation in electronics, simulation of hydraulic systems, application of state machines, new aspects of simulation in control and simulation in education. A first invitation for this meeting will be sent with this mailing to all ASIM members or is available from the speaker.

Speaker: Dr. Ingrid Bausch-Gall, BAUSCH-GALL GmbH, Wohlfahrtstraße 21b, D-80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063, email: 100564.302@compuserve.com

Vice-speaker: Ewald Hessel, Hella KG Hueck&Co., Abt. EL-R, Werk II, Beckumer Straße, D-59552 Lippstadt, Tel: +49-2941 38 8572, Fax: +49-2941 38 8427, email: hessel@hella.de

"Simulation in Produktion und Logistik" (FG 6)

The last working group meeting took place on June 11th, 1997, at the Fraunhofer Institute for Materialflow and Logistics, Dortmund, Germany. Topics were the production of the book titled *Anwendungsorientierte Fallbeispielsammlungen*, the revision of the *ASIM-Mitteilungen Nr. 7a Leitfaden für Simulationsbenutzer* and the organization of the 8th Working Group Conference. The book and the *ASIM-Mitteilungen Nr. 7a* will be published in autumn 1997; you can order them during the ASIM'97 in Dortmund.

The next biannual Working Group Conference of the ASIM Working Group "Simulation in Production

and Logistics" will be held on February 16 -17, 1998 in Berlin, Germany. It will be organized by Dipl.-Phys. Markus Rabe, Fraunhofer Institute for Production Systems and Design Technology (IPK), Berlin. The Working Group Conference is a forum for users, suppliers and researchers. Suppliers will present their latest products in an exhibition during the conference. Conference language is German. For detailed information about the conference and about the exhibition please contact: Markus Rabe, Fraunhofer Institut für Produktionsanlagen und Konstruktionstechnik (IPK), Pascalstr. 8-9, D-10587 Berlin, Fax: +49-30-3932 503, email: Markus.Rabe@ipk.fhg.de, WWW: <http://www-plt.ipk.fhg.de/ASIM-Fachtagung/>.

For detailed information about the activities of the working group please refer to <http://www.asim-pl.uni-kassel.de> or contact Mrs. Dipl.-Inform. Sigrid Wenzel, Fraunhofer-Institut für Materialfluß und Logistik, Joseph-von-Fraunhofer-Straße 2-4, D-44227 Dortmund, email: wenzel@iml.fhg.de.

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

Vice-speaker: Prof. Dipl.-Ing. Adolf Reinhardt, Universität Gesamthochschule Kassel, Fachbereich 15, IPL, Kurt-Wolters-Str. 3, D-34125 Kassel, Tel.: +49-561 804 2693, Fax: +49-561 804 2330, email: fps@hrz.uni-kassel.de

"Simulation in der Betriebswirtschaft" (FG 7)

On March 3rd to 5th the Sixth Biannual Symposium "Simulation for managerial decision support – new tools and approaches in practice" has taken place at the Maritim Hotel Braunlage (Harz Mountains) in co-operation with the German Society for Operations Research (DGOR) and the Society for Computer Science (GI). Experts and professionals from industry, science and public services met to increase the exchange of experience on the application of simulation in business administration and neighbouring fields. The about 40 participants came from Austria, Germany and Switzerland.

The 23 papers of the symposium covered the following areas: basics (2), training and manoeuvre (2), simulation tools (3), optimal decision making (4), applications to environmental planning and health insurance (2), simulation in stock-keeping and logistics (2), distributed simulation in the building industry (1), production planning and control (8). Compared to the preceding symposiums, the emphasis has been drifted from tools to applications. The main topics have been simulation for business process redesign and flexible production planning and control. The peripheral highlight of the symposium has been the excursion to the mining museum "*Lautenthals Glück*" in the Harz Mountains. The excellent picture given by our pit-



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forewoman and her introduction into four centuries of ore mining with direct experience has left enduring impressions with all participants. The papers given at the symposium are published in proceedings (in German) which can be ordered as long as in stock from the vice-speaker.

The seventh symposium "Simulation for managerial decision support – new tools and approaches in practice" is announced for March 8th to 10th of 1999 at the traditional place in Braunlage. For further information please contact Prof. Dr. Biethahn.

Speaker: Prof. Dr. W. Hummeltenberg, University of Hamburg, Institute for Computer Science in Business Administration, Max-Brauer-Allee 60, D-22765 Hamburg. Tel.: +49-40/41 23-40 23, Fax: +49-40/41 23-64 41, email: wi@mba.uni-hamburg.de.

Vice-speaker: Prof. Dr. Biethahn, Georg-August-University of Göttingen, Platz der Göttinger Sieben 5, D-37073 Göttingen.

"Simulation von Verkehrssystemen" (FG 8)

The contributions of the last meeting of the working group are published as *ASIM-Mitteilungen Nr. 55* and can be ordered from Dr. Bausch-Gall. An informal meeting is planned.

Speaker: Andre Graber, CSC Ploenzke, Binzmühlestr. 14, CH-8050 Zürich, Tel: +41-1 302 23 23, Fax: +41-1 303 11 80, email: agraber@csc.com

Vice-speaker: Thomas Schulze, Univ. Magdeburg, Fak. f. Informatik, Universitätsplatz 2, D-39108 Magdeburg, Tel: +49-391 5592 2017, Fax: +49-391 5592 164, email: tom@isg.cs.uni-magdeburg.de

"Simulation in Umweltsystemen" (FG 9)

The annual workshop of the working group was successfully held on June 5th and 6th, 1997 in Oldenburg at the OFFIS-Institute. It was the 7th workshop. The local organization was realized by Prof. Sonnenschein, University of Oldenburg and OFFIS. The main topics of this workshop were: individual oriented modelling and simulation in ecological applications (autonomous agents), coupling of information systems (geo-information systems), simulation systems, model documentation systems, hydrological and groundwater simulation, and some further applications in the environmental domain (e.g. sustainable production processes). About 22 speakers informed about models, results of simulation experiments, methods, software architectures and tools concerning the main topics. A round table discussion was oriented to the problems of model validation, verification and accuracy. Most of the papers will be published in "Scientific Reports of the Research Center Karlsruhe".

A social event in the evening gave all participants the chance for intense conversation and personal contacts.

The workshop was well accepted by the about 55 participants from Germany and Switzerland.

During the workshop the speaker and two vice speakers were elected. Prof. R. Grützner was re-elected as the speaker and Dr. H.B. Keller and Dr. J. Wittmann are the vice speakers. Prof. Grützner reported that the working group now is fully linked to ASIM (*Fachausschuß 4.5*) and to the Special Group (*Fachausschuß FA 4.6*) "Environmental Informatics" of the German Informatic Society (GI). That means that this working group will join most of the specialists which are working in environmental modelling and simulation including software developing. The state of the art in this domain is summarized by the working group and will be published as book in autumn 1997 by the Vieweg Verlag.

Next year, the 8th workshop will be held on March 29th until 31st, 1998 at the University of Kassel in the small town Witzenhausen nearby Kassel. The main topics will be: software support for the modelling process, coupling of information systems with simulation systems and modern simulation methods and applications.

For detailed information please have a look at the WWW-pages of the working group (http://www.informatik.uni-rostock.de/FB/Praktik/Mosi/ak5/ak_info.html) or contact the speakers.

Speaker: Prof. Dr. habil. Rolf Grützner, University of Rostock, Dept. of Computer Science, WG Modeling and Simulation, Albert-Einstein-Str. 21, D-18056 Rostock, Tel: +49-381 4983369, Fax: +49 381 4983426, email: gruet@informatik.uni-rostock.de

Vice Speakers: Dr. Hubert B. Keller, Research Center Karlsruhe GmbH, Institute of Applied Informatics, P.O. 3640, D-76021 Karlsruhe, Tel.: + 49 7247 825756, Fax.: + 49-7247 825756, email: keller@iai.fzk.de

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CROSSIM

CROSSIM (The Croatian Society for Simulation Modelling) was founded in 1992 in Zagreb. CROSSIM is a non-profit society with the following main goals: promotion of knowledge, methods and techniques of simulation; establishment of professional standards in simulation; development of education and training in simulation; organization of professional meetings and publishing in the field; co-operation with similar domestic and international institutions. Since April 1997 CROSSIM is a full member of EUROSIM.

Membership

CROSSIM currently has 64 individual members. The annual membership fee is the equivalent of 8 German marks for regular members, and 2 German marks for students.

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Activities

- Co-organizing the 20th International Conference "Information Technology Interfaces" ITI '98, to be held in Pula, Croatia, from June 16-19, 1998. The conference has traditionally a strong modelling and simulation session. Information about the conference can be found on the Web address: <http://www.srce.hr/iti/>.
- Regularly organizing a simulation seminar held at the Faculty of Economics, University of Zagreb.
- Work on scientific projects in discrete and continuous simulation, and applications of simulation in such diverse fields as engineering, economy, medicine, ecology etc.
- Publication of papers in international and domestic journals and conference proceedings.
- Preparing publication of a booklet about the CROSSIM society.
- It is a special pleasure to announce that Mrs. Vesna Bosilj Vuksic, the CROSSIM vice-president, has

successfully defended her Ph.D. thesis on "Graphical, Object-Oriented Simulation Modelling of Business Processes" at the University in Zagreb in July 1997.

Information Technology Interfaces ITI '97 Conference

The International conference on *Information Technology Interfaces* (ITI) is traditionally held in Pula, Croatia. The conference is a meeting of researchers in computer science, information systems, operations research and statistics. The conference is organized by the University Computing Centre of Zagreb, Croatia.

The 19th International Conference on *Information Technology Interfaces ITI '97* was held on June 17-20, 1997. Chairman of the International Program Committee was Prof. Damir Kalpic from Faculty of Electrotechnics and Computing, University of Zagreb, while the International Program Committee included about 30 members. The conference was sponsored by IMACS (International Association for Mathematics and Computers in Simulation) and SCS (The Society for Computer Simulation International). Co-operation institutions of the conference include ARGESIM (Technical University of Vienna), CROSSIM (Croatian Society for Simulation Modelling), as well as a number of international universities, schools and departments.

The topics of the ITI '97 conference were *Application of Information Technology; Artificial Intelligence and Expert Systems; Biometrics; Computer Systems and Networks; Data Analysis and Statistics; Information Systems and Databases; Mathematics and Computation; Modelling, Simulation and Optimization; Multimedia; Software Engineering and Programming Languages*. The conference received 93 papers written by 176 authors from 21 countries: Algeria, Argentina, Austria, Brazil, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Macedonia, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, The Netherlands, UK and USA. All submitted papers have been reviewed by at least two independent referees. The conference proceedings contain 81 accepted papers.

Invited speakers for the ITI '97 conference were L. Billard (USA), I. Bratko (Slovenia), I. Futo (Hungary), B. Gavish (USA), D. K. Hammer (The Netherlands), J. Skorin-Kapov (USA) and A. Smailagic (USA). A panel discussion about *Basic Education vs. Job Training: Exchange of Experiences* was organized during the conference, attracting a lively evening discussion. Two other events included in the conference were: 4th Meeting of Researches in Biometrics, 2nd School of Biometrics and CEEPUS Summer School. A book exhibition and software and hardware presentations were also organized.

The ITI conference has a traditionally strong simulation session. Some of the ITI conference invited speakers in the field of simulation were Robert Sargent (Syracuse University - USA), Andrew Seila (University of Georgia, Athens - USA), Ray Paul (Brunel University - UK), Mike Pidd (Lancaster University - UK), Andras Javor (KFKI Research Institute, Budapest - Hungary), Felix Breitenacker (Technical University Wien - Austria), Ivan Futo (Applied Logic Laboratory, Budapest - Hungary) and Brian Dangerfield (University of Salford - UK).

Best papers from the ITI conference are selected for publication in the following journals: *Computing and Information Technology* and *Mathematics and Computers in Simulation*, either in the form of special issues or regular papers.

Information about the ITI conference can be found on the conference Web site <http://www.srce.hr/iti/>. The Conference secretariat can be reached on the email address iti@srce.hr.

EUROSIM members are invited to attend the jubilee 20th International Conference on *Information Technology Interfaces ITI '98*. We believe that *ITI '98* will bring a growth in quality and abundance of the conference activities and an increase in the number of participants.

V. Cerić

CSSS

General Information

CSSS (The Czech and Slovak Simulation Society) has about 75 members in 2 groups connected to the Czech and Slovak national scientific and technical societies. The main objectives of the society are: development of education and training in the field of modelling and simulation, organizing professional workshops and conferences, disseminating information to its members about modelling and simulation activities in Europe, informing the members about publishing in the field of modelling and simulation.

Past Events

The international workshop "**Modelling and Simulation in Management and Control**" was successfully held on October 6-8, 1997 in Sulov, Slovak republic. 30 participants from the Czech and Slovak republics attended the workshop and 23 papers were presented at the workshop. The chairman of the workshop was Prof. M. Alexik. At the workshop there was a very good working atmosphere. The CSSS Board had its annual session. Important topics of the meeting were: the decision about the contact persons for co-operation with EUROSIM and SCS, a report about the information gained at the EUROSIM board meeting in Kewstich (April 97), collaboration with and financing of Simulation News Europe and SIMPRA. An interesting point

was the creation of a (financial) grant for young members of CSSS whose contributions will be accepted at EUROSIM'98 in Helsinki. Also activities for the years 1998 and 1999 were discussed. One topic was, what kind of information will be presented on the WWW home page of CSSS. The WWW address will be published in the next issue.

Coming Events

The 32nd International Conference on "**Modelling and Simulation of Systems**" (MOSYS'98) will take place on May 5-7, 1998 in the old Moravian city Bystrice pod Hostínem, Czech Republic. The chairman of the international organizing committee is Dr. Ing. Jan Štefan. One of the topics will be "Simulation Case Studies", for example from biology and biotechnology, automatic control, ecology, electronics, hydrodynamics, medicine, telecommunication, transport systems and manufacturing systems.

The 20th International workshop "**Advanced Simulation of Systems**" (ASIS) will be held on September 15-17, 1998 in the capital of Moravia, Brno, Czech republic. Chairperson of the workshop is Dr. Ing. Zdenka Rabová, TU FEI Brno, Božetechova 2, Czech republic.

The scientific conference with international participation "**Electronic Computers & Informatics**", with a section on Modelling and Simulation, will be held September 23-25, 1998 in Herlany, Slovak republic. Chairman is Dr. Ing. Milan Sujanský, Technical University Kosice, Slovak republic.

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M. Alexik

DBSS

General Information

The Dutch Benelux Simulation Society (DBSS) was founded in July 1986 in order to create an organisation of simulation professionals within the Dutch language area. DBSS has actively promoted creation of similar organisations in other language areas. DBSS is a member of EUROSIM and works in close co-operation with the other members and is affiliated with SCS International and IMACS.

Steering Committee

Chairman	A.W. Heemink, Delft University of Technology
Vice Chairman	L. Dekker, Delft University of Technology
Member	W. Smit, AKZO NOBEL
Secretary/Treasurer	J.C. Zuidervaart, Delft University of Technology

DBSS-Membership

Both corporate entities (companies, institutes, etc.) and individuals are welcome to join DBSS as full corporate or individual member.

The contribution is divided in two options:

- I. Dfl. 75,- individual member or Dfl. 150,- institutional member, which means that you will receive the newsletter Simulation News Europe three times a year.
- II. Dfl. 150,- individual member or Dfl. 250,- institutional member, which means that you will receive the Journal Simulation Practice and Theory eight times a year.

Becoming member of DBSS includes automatically being member of EUROSIM, the overall organisation of European Simulation Societies.

DBSS members enjoy reduction of the fees attending the "EUROSIM events" which include congresses, conferences, symposia, workshops etc.

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

Dutch Benelux Simulation Society
Secretariat: Computing Centre, P.O. Box 354
2600 AJ Delft, The Netherlands

Tel.: +31-15-2785698, Fax: +31-15- 2783787
email: Zuidervaart@rc.tudelft.nl

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

Coming Events

DBSS will organise during the first two days of the EUROSIM 98 Congress (organised by the SIMS society in Helsinki, Finland, April 14-17, 1998) a parallel session with the provisional title "The impact of HPCN on parallel simulation".

The provisional scientific committee for this session: J. Bruin, Corporate Communication TNO, NL; L. Dekker, TU Delft, NL; J. Halin, ETH Zürich, Switzerland; A.W. Heemink, TU Delft, NL; J. Keane, University of Manchester, UK; H.X. Lin, TU Delft, NL; E. Shapiro, USA; W. Smit, AKZO NOBEL, NL; J.C. Zuidervaart, TU Delft, NL.

For this session we invite those people to submit abstracts, who have relevant experience in the application of High Performance Computing (HPC) to simulation of complex systems. The abstract should describe the benefits and/or shortcomings of existing HPC-systems as well as with respect to modelling of the simulated system.

The author has to specify the necessary properties (functional characteristics) of (future) parallel computer systems in order to facilitate maximally modelling and simulation. On the other hand also contributions that describe new modelling techniques for optimal use of existing (and future) HPC and related communication systems are welcome. We encourage a broad variety of types of applications.

For further information, please contact the EUROSIM '98 congress office: P.O. Box 1301, FIN-02044 VTT; fax: +358 9 456 6752; email: eurosim98@vtt.fi

One day symposium Neural Networks

This symposium will take place in January 1998 and not as announced before in the autumn of this year. The programme of this symposium will be mailed to the DBSS members in November. Those interested to organize a DBSS event, are kindly requested to write to the secretary.

J.C. Zuidervaart

FRANCOSIM

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

During the academic year 1996/1997 two events were organised by FRANCOSIM:

MOSIM'97 - *Systèmes de Production et de Logistique*. This event took place at INSA ROUEN on June 6th and 7th. It was organised by the "discrete events systems pole" of FRANCOSIM in collaboration with the AFCET association and dealt with the various aspects of modelling of discrete events systems in research and industry.

2AO-96 - *Computer Aids in Control Systems Design*. This event took place at ESIEE, Noisy le Grand on November 28th and 29th. It was organised by the "continuous systems pole" of FRANCOSIM and dealt with the various aspects of tools and methods for the use of computers in the design and implementation of control systems.

BioMedSim'99

1st Conference on Modelling and Simulation In Biology, Medicine and Biomedical Engineering
20-22 April 1999, ESIEE Noisy-le-Grand, France

FRANCOSIM will organise this EUROSIM event in April 1999. This is the first of a series of conferences to be held once every 2 years. Its object is to group researchers and developers in the fields related to the modelling in living systems and in associated technical fields.

The conference will consist of several tracks related to the following themes:

- Mathematical problems from biophysics, biochemistry, biotechnology, bioengineering
- Mathematical modelling in biology, ecology and medicine
- Protein structure and genetic modelling
- Information systems, knowledge based systems, knowledge engineering and intelligent data processing, program packages and problem solving environments supporting biological and medical applications
- Mathematical immunology, mathematical neurophysiology, mathematical ecology, population dynamics, enzyme kinetics
- Mathematical models for solving typical biomathematical problems
- Diagnostic aids in medicine and biology
- Monitoring and signal processing (ECD, Respiration signals, ...)

- Modelling, design and control of assistance devices
- Image analysis and diagnosis
- Biomechanics: Study of motion, of material deformation, of flow within the body and in devices, and the transport of chemical constituents across biological and synthetic media and membranes (heart, artificial heart and valves, kidneys and artificial kidneys, muscles and muscular motion, ...)
- Techniques and tools used to gain a comprehensive and integrated understanding of the function of living organisms ranging from bacteria to humans (cell modelling, ...)
- Development of dynamic mathematical models for drug administration

Place: ESIEE, Noisy-le-Grand. The conference site is on the Parisian public transport, near Euro Disney.

Important Dates:

1st call for papers	15th of November 1997
2nd Call for papers	1st of February 1998
Deadline for extended abstracts	15th of June 1998
Notification of acceptance	15th of October 1998
Deadline for final papers	15th of January 1999
Conference	20-22 April 1999

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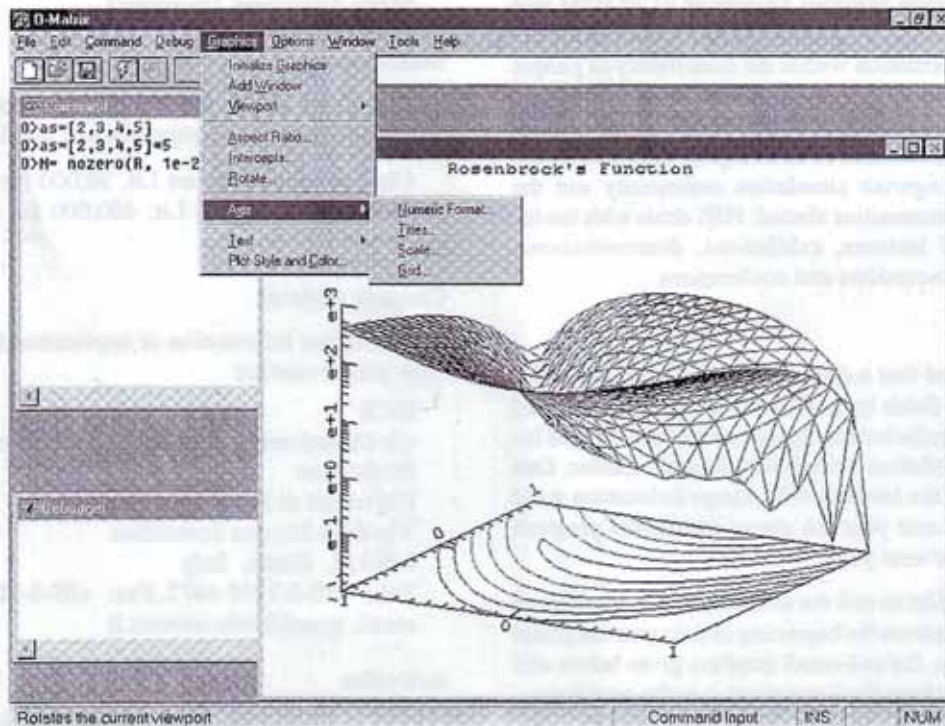
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Y. Hamam

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HSS

General Information

The Hungarian Member Society of EUROSIM was established in 1981 as an association promoting the exchange of information within the community of people involved in research, development, application and education of simulation in Hungary and also contributing to the enhancement of exchanging information between the Hungarian simulation community and the simulation communities abroad. HSS deals with the organization of lectures, exhibitions, demonstrations, round table discussions and conferences.

Activities

It is planned that a demonstration on problem solving in various fields by artificial intelligence controlled simulation is to be held in the International McLeod Institute of Simulation Sciences Hungarian Center. Due to the fact that the Institute will change its location at the beginning of next year the above mentioned program will take place next year.

We would like to call the attention of our friends and colleagues that from the beginning of next year the postal address, phone, fax and email numbers given below will be changed and we shall announce it in the next issue.

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András Jávör

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 persons involved 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:

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

Membership

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

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

Contact Address

For further information or application for membership, please contact:

ISCS
c/o Dipartimento di Informatica, Sistemi e
Produzione
Università di Roma - Tor Vergata
Via della Ricerca Scientifica
I-00133, Roma, Italy
Tel.: +39-6-7259 4477, Fax: +39-6-2020519
email: grassi@info.utoverm.it

Activities

The steering committee of ISCS is presently involved in the organization of **ISCS'97**, the annual conference that this year will take place in Napoli, December 16, 1997. Topics of interest for the conference are methodological and application aspects of simulation. They include

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
Simulation in medicine
Artificial intelligence and simulation

Interested authors should submit 4 copies of an extended abstract (two pages in A4 format) of their paper by November 5, 1997, to the following address.

Segreteria ISCS'97
Dipartimento di Informatica
Università di Roma - Tor Vergata

c/o Prof. Vincenzo Grassi
Via della Ricerca Scientifica
I-00133, Roma, Italy
email: grassi@info.utovrm.it

Electronic submission of the extended abstract (plain text ASCII only) is accepted. Papers may be written in Italian or English. In the submission, the corresponding author and his postal and email address should be clearly indicated.

Notification of acceptance will be sent by November 20, 1997, and camera-ready copies (max. six A4 pages) will be strictly due by December 10, 1997. All accepted papers will be published in the conference proceedings. A limited number of papers will be selected by the Scientific Committee for possible publication in the *Journal Simulation Practice and Theory*.

For further information please contact Prof. Mario Savastano (iscs@nadis.dis.unina.it) or connect to: <http://russell.ce.utovrm.it/~ISCS/>

Notices to ISCS members:

The annual meeting of ISCS members is scheduled to be held on December 1997 in Napoli on occasion of the ISCS'97 Conference.

M. Colajanni

SIMS

General information

SIMS is the Scandinavian Simulation Society with members from the four Nordic countries Denmark, Finland, Norway and Sweden. The SIMS history goes back to 1959. SIMS' matters are taken care of by a board, the ombudsman and the treasurer. SIMS' board has eight members – two from each country. The annual meeting takes place in connection with the conferences. Usually the board meets a second time per year. The bylaws are written in Swedish and have recently been proposed updated.

How to join SIMS?

From 1996 the basic membership is free. You may register as a member by sending a mail with personalia to the address

sims@ecy.sintef.no

As a member you will receive invitation to the conferences and other information related to simulation. You will also get a discounted conference fee on the SIMS conferences.

Individual subscriptions for a discounted price to *EUROSIM - Simulation News Europe* and *Simulation Practice and Theory* are available.

For more information visit the Internet address **<http://www.itk.ntnu.no/SINTEF/sims.html>**

SIMS Annual Conference

The 1997 annual meeting of SIMS was held in Espoo, October 2 - 4, at the Hanasaari Cultural Centre, immediately after the CSNI specialist meeting on Simulators and Plant Analyzers. More than 100 simulationists from 16 countries visited the Hanasaari Island during the week.

The 1998 annual meeting of SIMS will be arranged in connection with the EUROSIM'98 Congress at Helsinki University of Technology, April 14 - 17, 1998, in Finland.

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Torleif Iversen

SLOSIM

The Slovenian Society for Simulation and Modeling has currently 86 members, both from Slovenian Universities and from industrial companies.

Recent Activities

SLOSIM was one of the co-operative societies in the organization of the traditional **Electrotechnical and Computer Conference ERK'97** in Portoroz, Slovenia (Adriatic Coast). The conference took place from September 25 to 27, 1997. There were more than 200 papers presented.

The program consisted of 3 invited lectures, 31 conference sessions, 3 student sessions and several panel discussions. A video conference, on which several foreign institutions participated, also took place. The session part consisted of 29 sessions from the following subjects: Electronics (2 sessions), Telecommunication (3), Automatic control (3), Simulation (1), Power engineering (4), Measurement (4), Computer science (4), Artificial intelligence (1), Robotics (1), Pattern recognition (5), and Biomedical engineering (2). For the first time two sessions with advances in engineering education were organized. Special student sessions with 13 papers also took place.

SLOSIM was responsible for the session entitled Simulations, Modelling, Identification. 7 papers covered areas of modelling and simulation methods, tools and applications with continuous as well as with discrete event approach.

The regular annual assembly of SLOSIM is planned for the beginning of November. On this meeting some changes in the statutes should be accepted in order to fit the rules to the new Slovenian regulations. A lecture of prof. Raimond Hanus from the Free University of Brussels is foreseen.

Members of SLOSIM are kindly invited to participate to the most important event in 1998 – the EURO-SIM Congress, Helsinki, April 1998 – see announcement in this issue).

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slosim@fe.uni-lj.si

Borut Zupancic

UKSIM

General Information

The UK Simulation Society has about 80 members throughout the UK from both universities and industry. It is active in all areas of simulation and holds a biennial conference as well as regular smaller meetings and seminars.

One-Day meetings

The society is holding a series of one-day meetings. On the 26th September, Nottingham Trent University hosted "Visualisation '97" - a one-day workshop on display visualisation. The next meeting takes place on 7th November, 1997 and is called "Lattice and Discrete-Particle Based Simulations". The seminar will cover the modelling and simulation of a number of complex physical phenomena, such as fluid flow dynamics and stress induced crack growth, using novel, but conceptually simple, mathematical devices such as colliding hard-particles or Hookean springs arranged on a regular lattice. The place is the HEAP lecture theatre of the University of Derby, Derby, England. Other one-day seminars are planned throughout 1998.

European Simulation Congress

On 21st June, 1998, the University of Manchester celebrates the fiftieth anniversary of the first stored-program electronic digital computer. The ability to store and run any program put in by a user set this machine apart from all the special purpose computing machines that had gone before and made it a Universal Machine, the first computer as we know it today.

The European Simulation Multiconference (ESM'98) is one of the major international conferences on simulation and it will be hosted by the University of Manchester in June 1998. The conference will be held over a 4-day period from June 16th - 19th to coincide with the fiftieth anniversary celebrations. This year, in addition to covering the normal topics ranging from simulation algorithm design through to applications across a range of diverse domains, there will be a special History of Simulation track reflecting the role that simulation has played in design over the years.

More information on this conference is available from Richard Zobel at rzobel@cs.man.ac.uk.

Membership Membership of the UK Simulation Society is very good value at only £20 per year including a subscription to Simulation News Europe. For more information, contact the Membership Secretary,

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Fax: +44-171-320 1717
email: gjones@lgu.ac.uk

Gary J. Gray

European and International Societies

SCS (The Society for Computer Simulation International)

The SCS European Office (in co-operation with the SCS European Council) continues to organize high-quality international scientific conferences on computer simulation and related fields. For many of our conferences both written Proceedings and CD-ROMs are provided. In the following we summarize our forthcoming events until July 1998. We ask your special attention for the fourth conference: ESM98, which is embedded in the celebrations of the 50th anniversary of the world's first operational stored program computer!

1. ESS97 (9th European Simulation Symposium & Exhibition) Passau, Germany, October 19-23, 1997.

General Chair: Winfried Hahn (University of Passau), General Program Chair: Axel Lehmann (University of the Federal Armed Forces Munich).

The conference is centered around three main themes: Simulation in Industry, Simulation in Engineering and Simulation Methodology. Tutorials and exhibition will be organized. There will be meetings of the SCS European Council as well as the European Conference Board.

2. EUROMEDIA98 (2nd EuroMedia Conference) Leicester, UK, January 5-7, 1998.

General Chair: Marwan Al-Akaidi (De Montfort University, Leicester), General Program Chair: Alexander Verbraeck (Delft University of Technology), Honorary Chair: Eugene Kerckhoffs (Delft University of Technology).

The 1998 SCS EuroMedia conference will bring together three individual subconferences: WEBTEC, MEDIATEC and COMTEC, culminating in an applications subconference (APTEC) on the last conference day. EuroMedia is a scientific event, and focuses on the exchange of new technology, methods, tools, and applications in the wide field of Multimedia Information and Communication Technology. The WEBTEC subconference focuses on new developments with respect to Internet, Intranet, HTML, and WWW. The MEDIATEC subconference looks at new developments in multimedia technology. The COMTEC subconference covers different types of communication technology utilising both fixed and mobile infrastructures. The APTEC subconference shows how effectiveness and effi-

ciency of individuals and public and private organisations can be improved using telematics, advanced communications, and multimedia technology.

3. ECEC98 (the 5th European Concurrent Engineering Conference) Erlangen-Nuremberg, Germany, April 26-29, 1998.

General Chair: Uwe Baake (Daimler-Benz), General Program Chair: Richard Zobel (University of Manchester). This conference is sponsored by Daimler-Benz AG, Research and Technology, Stuttgart, Germany.

The aim of ECEC98 is to provide European researchers with a forum where they can discuss the latest developments linked to Concurrent Engineering (CE). ECEC98 aims to identify the progress that has been made in CE over the last year. It helps the dissemination of information and exploitation of results from research and technical developments, and provides a forum for the exchange of experiences in developing and implementing CE-based solutions across a wide spectrum of manufacturing and engineering industries. The conference is targeted at industrial enterprises, industrial associations, universities and research institutes.

4. ESM98 (the 12th European Simulation Multiconference), embedded in the programme of events to celebrate the 50th Anniversary of the World's First Stored Program Computer ("Manchester Baby"). Manchester, UK, June 16-19, 1998

DON'T MISS THIS; THIS IS SOMETHING TO REMEMBER!

General Chairmen: Richard Zobel (Manchester University, UK), Paul Luker (De Montfort University, UK) General Program Chairmen: Dietmar Möller (Claus-thal University, Germany), Roy Crosbie (Calstate University Chico, USA).

On June 21st 1948 the world's first stored program computer, the "Manchester Baby", successfully ran its first program and the computer age was born. The major scientists behind the project were: Prof. Sir Frederic Williams (1911-1977) and Prof. Tom Kilburn (born 1921). The last fifty years have seen a computer revolution with incredible changes in the way we work, play and communicate. It all began in Manchester! To celebrate the golden anniversary of the birth of the "Baby" a replica is being built which will be officially switched on during a week of celebrations, starting June 15th, 1998. During this week a diverse range of events is planned, including international computer-oriented conferences, a concert, school events, lectures and, of

course, an Official Birthday Party which will be celebrated at the Bridgewater Hall Manchester on Wednesday June 17 1998. The magnificent programme of the Official Birthday Party includes a talk of professor Kilburn on the events in Manchester in 1948 and 1949.

The 12th European Simulation Multiconference ESM98 (with participation of ASIM) is part of the programme of events in the above-mentioned week of celebrations. Four days providing a range of themed "tracks" in selected areas of computer simulation together with an industrial exhibition. Topics cover the tools and methodologies of simulation, and many specialist applications such as military, medical, artificial intelligence, robotics and education. Because of the 50th anniversary of the "Baby", a special invited session will be organized on the history, trends and future perspectives of computer simulation. The major topics of the conference are: - Simulation Tools and Methodology - Simulators, Real-Time Simulation, Distributed Simulation, HLA, Military Simulation - Simulation in Medical Informatics and Health Care - Simulation in AI and Robotics - Simulation in Education; McCleod Centres - Simulation in Multibody Systems - Simulation in Operations Research - Analytical and Numerical Modelling Techniques - History of Simulation (invited; one of the invited talks is by Prof. Eugene Kerckhoffs and Prof. Ghi Vansteenkiste together: "Looking back to a period of 25 years simulation in Europe") - Student Papers - Partner for Projects sessions.

For more details on the above conferences, please contact: Philippe Geril, SCS European Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Belgium, Phone: +32.9.233 77 90; Fax: +32.9.223 49 41, email: philippe.geril@rug.ac.be or look to our Website: <http://hobbes.rug.ac.be/~scs/>

SCS Publishing House

The SCS Publishing House publishes high-quality scientific books on computer simulation and related fields in the series "Advances in Simulation" and "Frontiers in Simulation" (editors-in-chief: Eugene Kerckhoffs, Axel Lehmann, Henri Pierreval, Richard Zobel).

For more information, please contact: Rainer Rimane, University of Erlangen-Nuremberg, Institute of Mathematics IV, Martensstrasse 1, D-91058 Erlangen, Germany, Phone / Fax: +49-9131 66247, email: rimane@informatik.uni-erlangen.de

*P. Geril, E.J.H. Kerckhoffs, R. Rimane
Executive Directors SCS European Office*

IMACS

Report of the 15th IMACS International World Congress on Scientific Computation Modelling and Applied Mathematics, Berlin, Germany, 24-29 August, 1997

IMACS (the International Association for Mathematics and Computers in Simulation) brings together scientists from a wide range of research fields worldwide, as the World Congress in Berlin this year demonstrated very clearly. Over 800 papers were presented with participants from around 63 countries attending. Talks were held in the Berlin HILTON Hotel and in the Berlin-Brandenburg Academy of Sciences, both located at the attractive Gendarmenmarkt Square in central East Berlin.

The conference was sponsored by the German Research Foundation (DFG) and the Encyclopedia of Life Support Systems (EOLSS). It was hosted by the Research Institute for Computer Architecture and Software Technology (GMD FIRST) of the German National Research Centre for Information Technology (GMD). Achim Sydow from the Department of Systems Analysis and Simulation at GMD FIRST, who is also the Vice President of IMACS, acted as Congress General Chair. Co-hosting the conference was the German Computer Society (GI). Co-sponsors were GAMM (International Association of Applied Mathematics and Mechanics), IEEE (Institute of Electrical and Electronic Engineers), IFAC (International Federation for Automatic Control), IFIP (International Federation for Information Processing), IFORS (International Federation of Operational Research Societies) and IMEKO (International Measurement Confederation).

The official congress programme was opened on Monday, August 25 at the "Schauspielhaus" concert hall with welcoming addresses from Achim Sydow (Congress General Chair), Robert Vichnevetsky (President of IMACS) and Dennis Tsichritzis (President of GMD).

Eberhard Diepgen, the Mayor of Berlin, invited congress participants to a reception at the Townhall where he spoke of Berlin's role as an international gathering point for culture and science. Social events also included a banquet at the Berlin HILTON Hotel, a twilight riverboat tour along the canals of the inner city with an informative guide, and an organ concert at the French Cathedral in Gendarmenmarkt Square.

The conference proceedings were published in 6 paper volumes (I. Computational Mathematics, II. Numerical Mathematics, III. Computational Physics, Chemistry and Biology, IV. Knowledge-based Systems and Computer Science, V. Systems Engineering, VI. Application in Modelling and Simulation). The complete proceedings are also available as CD rom.

Please also pay a visit to our web site at URL: <http://www.first.gmd.de/imacs97/>

LSS

The Latvian Simulation Society is organising, in co-operation with the Society for Computer Simulation International (SCSI), the international workshop **"Modelling and Simulation within a Maritime Environment"** (September 6 - 8, 1998, Riga, Latvia).

The workshop will deal with various aspects of modelling and simulation for maritime applications. It is aimed to discuss the role of simulation in increasing efficiency of maritime operations, and to share already existing experiences in that area. The list of conference topics includes (but is not limited to) modelling and simulation activities along the following main lines: Container Terminals, Harbour Management, In-Harbour Traffic Control, Maritime Traffic Control, Multimodal Transportation, Naval Architecture, Naval Training Equipment, Navigation Line Management, Safety in Maritime Environment, Ship Building.

The workshop will be hosted by the Riga Technical University, the largest technical university in Latvia, that was founded in 1862, and was at that time the first technical higher school in the whole Russian Empire. Currently it incorporates 8 faculties with the total number of about 7.000 students, and is a basic institution for LSS.

Riga, the capital of Latvia, is a nice, old town situated near the Baltic Sea. The first information of Riga relates to 1198. Now there are about 900.000 inhabitants in the city. Its architecture reflects many styles and epochs, from medieval Gothic and Roman to the tall modern buildings. There are many beautiful buildings in Riga, made in the Art Nouveau style. Riga is also a major port city, with the passenger and commercial harbours. The last one comprises one of the biggest container terminals on the Baltic Sea.

Those interested in submitting abstracts for the workshop please contact

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Yuri Merkuryev

Call for Nominations for the INFORMS College on Simulation LIFETIME PROFESSIONAL ACHIEVEMENT AWARD

The Institute for Operations Research and the Management Sciences (INFORMS) College on Simulation has established its Lifetime Professional Achievement Award. The purpose of this award is to recognize major contributions to the field of simulation that are sustained over a professional career, with the critical consideration being the total impact of those contributions on computer simulation. An individual's contributions may fall in one or more of the following areas:

- contributions to research,
- contributions to practice,
- dissemination of knowledge,
- development of software or hardware,
- service to the profession, and
- advancement of the status or visibility of the field.

Given at most once a year, this award consists of a plaque and reasonable travel expenses incurred by the recipient in attending the presentation ceremony during the Spring 1998 INFORMS Meeting in Montreal, Canada.

Anyone is eligible to win the award, and the award may be received posthumously. Nominations may be submitted by anyone (including self nominations), but they may not be made anonymously. The burden of offering evidence of merit falls on the nominator. Each nomination should include:

- the nominee's complete resume;
- a clear-cut, comprehensive description of the nominee's major contributions to the profession, with complete supporting documentation; and
- at least three letters of endorsement providing evidence of the significance and magnitude of the nominee's professional achievements.

Nominations for the award must be received by the chair of the award selection committee no later than December 20, 1997:

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Comparison of Simulation Software

Comparison 2 - SLX

SLX is the new very general discrete event simulation language from Wolverine Software Corporation. SLX is textual-based and runs by compiling a model. In principle, SLX is a C-like programming language with features for event scheduling and object-oriented modules, all within a developing environment. SLX may be used on a very basic C- or assembler-like level, or at a high level with predefined modules etc. Interestingly, GPSS/H can be implemented within SLX-blocks as well as runtime commands. At present a relatively stable beta version of SLX is available (PC, Windows95 and NT).

The development and simulation environment (fig.1) is suited for modelling, compiling, testing (tracing) and experimenting: at the top there is a log window, where all reports are written (from compiler, from simulator) etc., then at the left objects and entities (in SLX they are called "pucks") are displayed in windows, together with their status, etc. Their location in the model description (big window at the right) can be found by a simple mouse click).



Model Description:

The whole model is combined of different object classes representing resources, conveyors, etc. One type of class represents the pallets in the model. It is characterised by individual job type indicators and indicators for routing. Another type of class models a conveyor segment where one pallet can be placed. Also the workstations are represented by one class type (model window in fig. 1) which is instantiated by parameterising the class by the workstation type.

The main procedure of SLX activates all the workstations and the pallets running on the belt. It prints out the statistic variables into the log window.

The model is simulated as closed system in the following way: a pallet with a ready job arriving at station A1 is unloaded (which takes 7.5 s, and where statistical results are sampled), and then reloaded again with a new job (taking again 7.5 s).; now the pallet starts a new cycle. As given in the definition, workstation A6 substitutes the workstations A3 to A5: a pallet stays in this station until all work from A3, A4 and A5 is done.

Queue lengths and properties can be determined exactly by commands included in SLX, e.g.: `a3_queue.size` returns the current number of pallets inside the queue.

The following model code shows how complex rules are formulated in SLX. Here the case of merging two belts (where pallets leave a station and enter the transport belt) is considered (pallets from stations get higher priority).

Pallets coming from a working station:

```
a1_coming = TRUE;
wait until (a1_2_a2a 3);
advance 0.4/conveyor_speed;
++ a1_2_a2a;
advance 2;
a1_coming = FALSE;
```

Pallets coming from the transport belt:

```
wait until (not a1_coming and a1_2_a2a 3);
++ a1_2_a2a;
advance 0.4 / conveyor_speed;
```

Results:

Building the model took about 8 hours for a sufficiently experienced SLX user. The different experiments are performed by alternating the number of pallets, i.e. generating different numbers of instances of the specific class. The following table shows the accumulated results from the log-window from one simulation run.

Number of pallets	Number of jobs	Average time (s)
20	1752	402.827
40	1737	795.293
60	1717	1174.161

A simulation run took 1.50 s for 20 pallets up to 5.22 seconds for 60 pallets (PC Pentium 133).

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Comparison 4 - Tiny

The Language (Simulation System): Tiny is a simple system for a discrete-event simulation, suitable both for event-scheduling and process-interaction oriented paradigms. Model implementation is object-oriented as a set of instances of classes that co-operate in order to fulfil the task. Two types of model components can be distinguished: *static* (called *entities*) and *dynamic* (called *transactions*).

The simulation system Tiny was originally designed for educational purposes in a course Modelling and Simulation at Slovak University of Technology in Bratislava. As the name suggests, the most important design goals were simplicity and source code readability. Only a simple textual user interface is provided in the basic version. However, good debugging possibilities are built-in, serving both for model validation and to help the user to gain a deep insight into the implementation of a simulation system. Careful design allows easy extendibility – the system functionality was tailored for particular application areas, and/or equipped with a sophisticated user interface.

Tiny is packed to a C++ library, ported to MSDOS, Unix and Win32 environments. It is freely available (with source code) from <http://www.dcs.elf.stuba.sk/~distsys/tiny.html>

The Model: The process oriented approach was chosen to implement Comparison 4: five instances of *CPhilosopherProcess* class are used to model five philosophers and five instances of *CChopstick* class – it is derived from *CSemaphore* class to seize a chopstick without busy waiting – implement the chopsticks. The following strategies were used for seizing the chopsticks:

- left-hand side one first then the right-hand side one (LEFT_RIGHT),
- order of seizing chopsticks is random (RANDOM),
- one of the philosophers takes the right-hand side chopstick first (ASYMMETRY).

The first two solutions may cause a deadlock of the system. In order to solve the problem a special *CWaiterProcess* class instance is used that periodically checks his customers and asks one of the gentlemen (randomly chosen) to put the chopstick back if deadlock occurred (all philosophers are in IDLE state). The third solution is deadlock-free because of asymmetry of seizing the chopsticks.

Implementation Issues (selected parts): The following is a declaration of a *CChopstick* class that models a chopstick. The methods *Seize* and *Release* are used by

philosophers to manipulate chopsticks. The method *CancelSeize* is used by the waiter to inform the philosopher that he cannot take the second chopstick and that he should put the first one back.

```
class CChopstick : public CSemaphore{
protected:
enum { FREE, SEIZED, PUT_BACK} m_state;
public:
BOOL Seize(); // returns FALSE if a try was not
successful
void Release(); // puts the chopstick back on the
table
BOOL CancelSeize(); // makes Seize method to fail
};
```

The following code presents a part of the philosopher's method *body()* :

```
FirstFork()-Seize(); // he always succeeds to take
the first one
hold(T_WAIT_FOR_A_WHILE);
if(!SecondFork()-Seize()) { // deadlock!!!
FirstFork()-Release(); // put it back & wait
hold(T_TRY_IN_A_WHILE);
continue;
} // now the philosopher has both chopsticks
FirstFork()-Release(); SecondFork()-Release(); //
put them back
...
```

The methods *FirstFork()* and *SecondFork()* are responsible for selecting the order of seizing forks – they implement a particular seizing strategy. The next code represents a fragment of the *CWaiterProcess*'s *body()* method:

```
for(;;) { // do forever
hold(T_I_AM_BACK);
for(int i = 0; i < NUM_PHILOSOPHERS; i++)
if(!Philosophers[i]-IsIdle()) break;
if(i == NUM_PHILOSOPHERS) { // deadlock!!!
// choose a victim
CPhilosopherProcess * ph =
Philosophers[rndgen.irandom(0,
NUM_PHILOSOPHERS-1)];
// let him put the chopstick back
ph-IsGrabbingChopstick()-CancelSeize();
} // end if
} // end for
```

The Results: The table shows the total number of philosophers fed within a time of 300000 units and the number of deadlocks solved (pseudo-random generators were used with the same seed for all strategies in order to achieve comparable results):

Strategy	Fed philosophers (total number)	Deadlocks solved
LEFT_RIGHT	14720	20
RANDOM	21856	9
ASYMMETRY	21624	0

As can be seen, the ASYMMETRY solution is a good "compromise" – it does not require a deadlock detection and the number of served philosophers is reasonably high. The LEFT_RIGHT strategy is the worst – it requires deadlock detection and the philosophers spend too much time waiting for both forks.

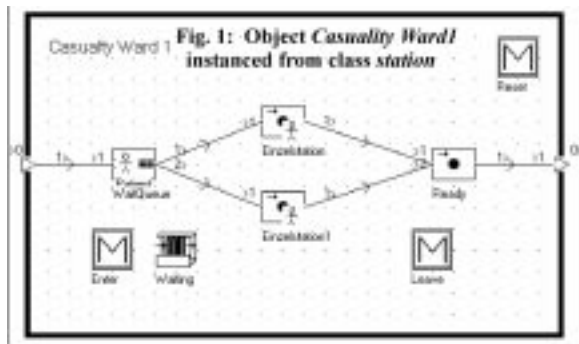
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Comparison 6 - SIMPLE++

SIMPLE++ is a simulation environment for fully object-oriented, graphical and integrated modelling, simulation and animation of discrete systems and business processes. It is mainly used for analysis of discrete processes, esp. for flexible assembly systems.

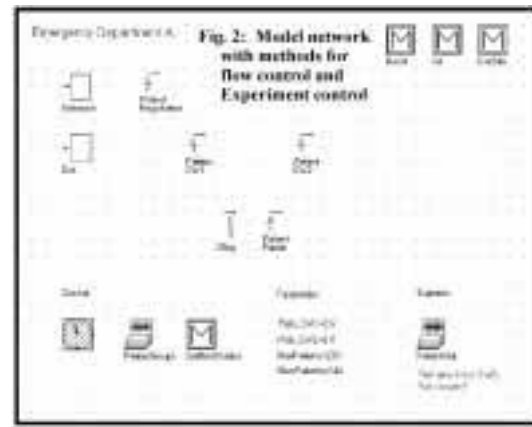
Model description: SIMPLE++ indeed provides fully object-orientated modelling for discrete processes. Predefined classes allow to instance objects representing resources, entities, arbitrary stations etc. The methods defined in the classes become after instancing e.g. algorithms for flow control, statistical observations or overall planning. Expert users may define themselves new classes of any kind. The overall model – again an instanced object – consists of a network of objects together with control mechanisms (instanced from methods). Generally, a model may be set up "classically" by dragging and dropping stations (instancing objects) and combining the network (parameterising the overall model object) or by making (extensively) use of the object-oriented paradigm – as followed in this comparison solution.

Basic module of the model to be developed is a general class *station* representing arbitrary treatment stations. From this class the registration station, the casualty wards, the X-ray room and the plaster room are instanced by inserting the doctors, the equipment etc. – (instanced objects from the predefined class *Single-ProcStation*), as shown in fig. 1.



Entrance station and *Exit* station generate the inflow of patients or observe (statistically) leaving patients, resp. (both based on classes). Each patient is represented by a movable unit *Patient* (instanced from the predefined SIMPLE++ class *Lot*) identifying the patient characterising the treatment job by attributes: *Patient_ID*, *Type* of treatment sequence, *Step* – the current stage of treatment sequence, and *Treated_by* pointer to doctor/person (single station) the patient is currently serviced by.

The overall model *Emergency Department* is represented by a network of stations (instanced objects) together with controlling algorithms (methods), parameterising modules, data modules and statistical data sampling (fig. 2). Again this network is an object instanced from a general class with methods for experiment control. SIMPLE++ offers local and global control of entity flow and resource status. In this model the flow of the patients through the system is controlled locally by the *Enter* and *Leave* methods for the flow in the stations and globally by the method *GetNextStation* (taking data from the data module *Patient_Groups*) for the flow between stations.



Results: The three tasks are represented by three instances of the general model class. The statistics in the table result from a sample of five simulation runs each.

Task a) gives an average treatment time of 391,2 min (250 observed patients).

In **task b)** the queue in casualty ward 2 exceeds 20 patients most of the time, so the doctors are "exchanged" almost all the time, resulting in a significantly longer treatment time (obviously caused by the "unexperienced" doctor in the casualty ward 1). The exchange of doctors is controlled by an extension of the methods in this station.

Task c) Reduced treatment times for patient groups 2 and 4 and slightly increased treatment times for patient groups 1 and 3 result in a reduced treatment time, compared to experiment a. Here only data in a global method have to be changed.

Treatment times	Task a Avg/Dev	Task b Avg/Dev	Task c Avg/Dev
Patient Group 1	221.9 / 108.9	228.6 / 113.6	198.0 / 112.1
Patient Group 2	146.9 / 93.7	150.2 / 96.7	153.3 / 95.4
Patient Group 3	245.6 / 98.1	261.8 / 111.1	195.2 / 112.9
Patient Group 4	142.4 / 97.3	147.2 / 102.2	146.7 / 99.6
Patient	177.0 / 108.7	182.2 / 114.1	168.8 / 106.9

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Comparison 7 - MATLAB/SIMULINK

Modelling of analog computer type

MATLAB is a widely used software tool based on numerical vector and matrix manipulation. SIMULINK is MATLAB's extension for block-oriented graphical modelling and simulation of continuous systems.

Model Description: SIMULINK 1.3 - used for this solution - offers no efficient features for describing, locating and handling state events. Users are obliged to use "tricky circuits" from the "old analogue times". The model of the pendulum is built up by only few standard SIMULINK blocks (fig. 1), while the conditions and calculations for switching the length, calculating the new velocity at a hit and resetting the integrator for $d\phi$ and the determination of the initial conditions take more than 70% of the model (fig.1). The basic idea is: the length of the pendulum can simply be controlled with a SWITCH-block depending on the position of the angle ϕ . In order to detect the hit crossing a MEMORY-block compares the actual length of the pendulum and the length of it in the previous integration step. If these values are different, the pendulum is hitting or leaving the pin, and the integrator for $d\phi$ has to be resetted with a new velocity. This new velocity can be calculated easily, but a complex logic has to decide i) whether a change from long to short pendulum or vice versa takes place, and ii) whether the initial value ϕ_{i0} has to be forwarded to the integrator or not. Unfortunately all these calculations are done all the time, although necessary only at $t=0$ and when hitting or leaving the pin.

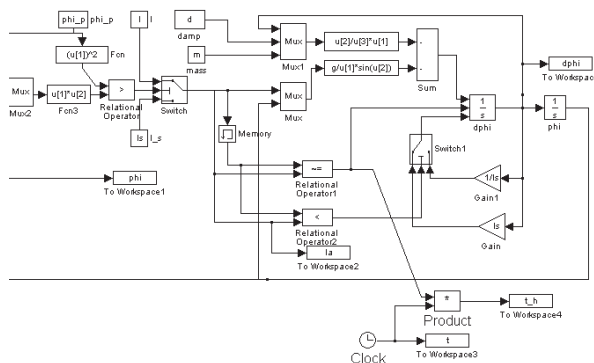


Fig. 1: SIMULINK diagram for model pendulum

Task a. The model is executed from the MATLAB level. First initial values and parameters are set, and after model execution results (fig. 2) are plotted from the workspace:

```
g = 9.81; m = 1.02; l = 1.0; lp = 0.7; ls = 1-lp;
d = 0.2; phi_p = -pi/12; phi0 = pi/6; dphi0 = 0;
open_system('pendulum');
options(1) = 1.e-9; % relative error
options(2) = 1.e-5; options(3) = 1.e-2; % min./max.stepsize
rk45('pendulum',[0 10],[1],options);
plot(t,phi,'w-',t,dphi,'w-',[0 10],[phi_p
phi_p],'w-','t,la','w-'); ... plot format, legend, etc.
...
```

The time instants of the hits were logged by a time vector (t_h): multiplying the `clock` value with the signal from the hit-crossing-block gives a vector of the hit times or zeros, resp. (fig. 1). So the hit times can be printed by `t_h(find(t_h))`.

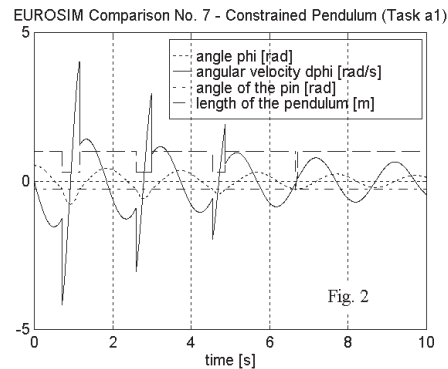


Fig. 2

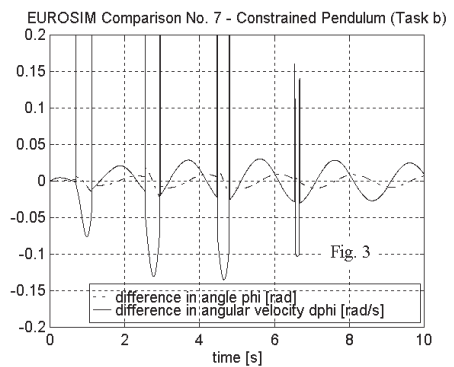


Fig. 3

Task b. Comparing nonlinear and linear behaviour (replacing in the model $\sin(\phi)$ by ϕ) in principle can either be done by running the two models in parallel calculating the difference in SIMULINK, or by running the models sequentially calculating the difference in MATLAB. Here the first method produces fig. 3.

Task c. For solving the boundary value problem the Optimization Toolbox of MATLAB is used. The model is extended by a STOP-Block that finishes the simulation when the value of $d\phi$ gets zero. The model execution has to be formulated as a function with $d\phi$ as input parameter, so that it can be called by the `fzero` function of the toolbox, which tries to find the desired goal $\phi - \pi/2 = 0$:

```
task_c.m:
clear all
g = 9.81; m = 1.02; l = 1.0; lp = 0.7; ls = 1-lp;
d = 0.2; phi_p = -pi/12; phi0 = pi/6;
disp('Desired dphi0 is:');
dphi0=fzero('task_c_f',-2)
```

```
task_c.f.m:
function phi_stop = task_c_f(x)
open_system('pend_c');
options(1) = 1.e-9; options(2) = 1.e-5;
options(3) = 1.e-2; options(6) = 0;
set_param('pend_c','/','dphi','INITIAL',x);
rk45('pend_c',[0 10],[1],options);
phi_stop=phi+pi/2;
```

Starting `fzero` produces the following result after 116 iterations: $d\phi_{i0} = -2.18485500000000$

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Comparison 7 - MATLAB/SIMULINK

Modelling with separate consecutive models

MATLAB is a widely used software tool based on numerical vector and matrix manipulation. SIMULINK is MATLAB's extension for block-oriented graphical modelling and simulation of continuous systems.

Model Description: In this solution the movement of the constrained pendulum is seen as movement of two pendulums (a long one and a short one), which are processed in sequence. The event that the long pendulum hits the pin and the short pendulum leaves the pin is the interface between the two movements. Long and short pendulum are modelled in SIMULINK 1.3 within one model description (fig. 1). Only few blocks are necessary to model the pendulum's behaviour, and a STOP-block signals when the pendulum hits or leaves the pin, so that the simulation stops. The logic for this condition is rather complex to describe, because several possibilities have to be taken into account (depending on the initial values, on the position of the pin and whether it is a new start or whether the movement starts after a hit or leave).

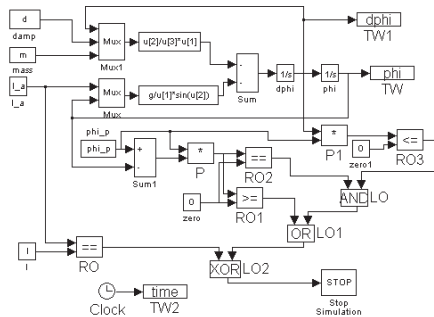


Fig. 1: SIMULINK diagram for model pendulum

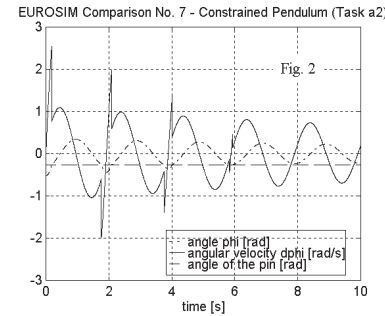
At the MATLAB level a script file first sets the initial values, decides which pendulum to start with, and starts a loop execution of pendulum, where after the execution (simulation until hit or leave) the new initial velocities are calculated (m-file `task_a2`).

Task a. The two experiments are described by an m-file, using different initial values. Task a1) is performed by m-file `task_a1`, which plots the results from the workspace at the end (fig. 2).

Task a2.m:

```
g = 9.81; m = 1.02; l = 1.0; lp = 0.7; ls = l-lp;
d = 0.1; phi_p = -pi/12; phi0 = -pi/6; dphi0 = 0;
open_system('pendulum');
if ((phi0-phi_p)*phi_p)<0 % choosing the starting length
    l_a = l; else l_a = ls; end
options(1) = 1.e-9; % relative error
options(2) = 1.e-5; options(3) = 1.e-2; % min./max.stepsize
t=0; rk45('pendulum', [t 10], [], options);
phi0=phi(length(phi));
dphi0=dphi(length(dphi));
t=time; t_h=t(length(t));
phis=phi; dphis=dphi;
while t(length(t))<10
    t_h=[t_h; t(length(t))];
```

```
if phi_p*dphi0>0 dphi0=dphi0/ls*l; l_a=ls;
else dphi0=dphi0/l*ls; l_a=l; end
rk45('pendulum', [t(length(t)) 10], [], options);
phi0=phi(length(phi)); dphi0=dphi(length(dphi));
phis=[phis; phi]; dphis=[dphis; dphi];
t=[t; time]; end
plot(t,phis,'b',t,dphis,'r',[0; 10],[phi_p; phi_p], 'm');
```



Task b. The comparison of the nonlinear and the linear model (where $\sin(\phi)$ is replaced by ϕ) is done by running the two models sequentially and calculating the difference in MATLAB. Interpolation is necessary, because of the different sample time instants caused by the variable step size algorithm. Suppose that results are stored in `phis` and `phis_lin`, then interpolation (and plotting) is done by the following command:

```
plot(t,phis-interpl(t_lin,phis_lin,t,'spline'),'b',...
    t,dphis-interpl(E_lin,dphis_lin,t,'spline'),'r');
```

Of interest are the different time instants when nonlinear and linear pendulum hit or leave the pin. During the simulation in the loop the termination time instant of each run (i.e. the time where the pendulum hits or leaves the pin) is sampled in the vector `t_h=[t_h; t(length(t))]` and `t_h_lin` resp., which can be displayed after the comparing run by

```
disp('          non-linear          |          linear')
t_h=[t_h(2:length(t_h)) t_h_lin(2:length(t_h_lin))];
Hits occurred at times
non-linear          linear
0.70147007439638    0.70171593982658
1.13172227687368    1.12935702785921
2.56391444779253    2.55134596411558
2.95746692528156    2.93750878282544
4.50938487523803    4.49010740435657
4.81175495596007    4.79538193770868
```

Task c. For solving the boundary value problem the model is extended by a STOP-block finishing the simulation when the pendulum reaches the velocity $d\phi=0$. A binary search in MATLAB (`task_c.m`) iteratively determines the angular velocity, making use of a simplified script file for the model execution (`task_c_f`, maximal one hit).

```
task_c.m:
g = 9.81; m = 1.02; l = 1.0; lp = 0.7; ls = l-lp;
d = 0.2; phi_p = -pi/12; phi0 = pi/6;
aim = -pi/2; left = -3; right = -1;
dphi0 = left; task_c_f; left_res = res;
dphi0 = right; task_c_f; right_res = res;
while right-left>200*eps
    new = (left+right)/2; dphi0 = new; task_c_f
    if sign(res)==sign(right_res) right=new; Right_res=res;
    else if sign(res)==sign(left_res)
        left=new; left_res=res;
    else left=new; right=new; end; end; end
disp('Desired dphi0 is:');
format long dphi0=(left+right)/2
```

After 47 iterations the result is $d\phi_0 = -2.18469928866723$.

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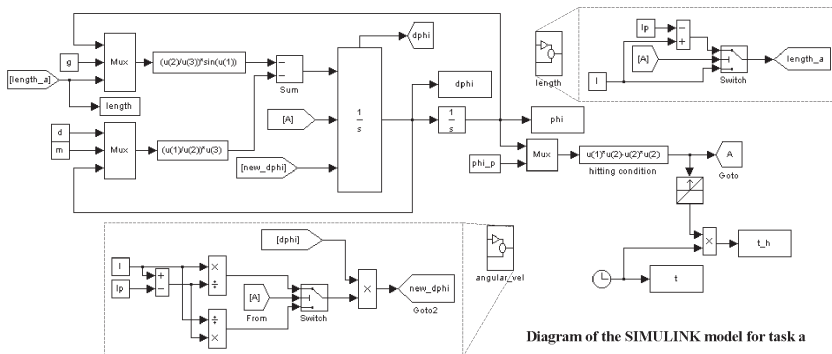
Comparison 7 - MATLAB/SIMULINK

Modelling with Event Detection Features

MATLAB is a widely used software tool based on numerical vector and matrix manipulation, SIMULINK is MATLAB's extension for graphical modelling and numerical simulation of dynamic systems. SIMULINK 2.x offers now features for locating events – used in this solution.

Model Description: The model is implemented using standard SIMULINK blocks (fig. 1). A HIT-crossing-block now available in SIMULINK 2 determines the time instants when the pendulum hits or leaves the pin more precisely. This block uses a numerical method for detecting the state event, depending on the chosen integration algorithm. The discontinuous change of the angular velocity in case of a hit is implemented by resetting the integrator for dphi. This reset is triggered by a zero crossing of the hitting condition. Submodels using Goto- and From-blocks for input and output calculate the new angular velocity (angular_vel) and the actual length of the pendulum (length, fig. 1) perpetuously. The submodel for changing the velocity makes use of the new state-port output of the integrator in order to avoid an algebraic loop that would result by feeding back a state. On the one hand the perpetual calculation of the new velocity and length causes a slower execution of the model, on the other hand the correct values are always available and no further calculations (blocks) are needed for decisions at time $t=0$.

All calculations were done with the integration algorithm ODE45 (Dormand-Prince) and a maximum step



size of 0.01. With a larger maximum step size the algorithm detects only three or even two hits instead of four.

Task a. The model is executed from the MATLAB level, where also the initial values are set and the results are plotted (fig. 2). The time instants of the hits were logged by a time vector (t_h): multiplying the `clock` value with the signal from the hit-crossing-block gives a vector of the hit times or zeros, respectively. So the hit times can be printed by `t_h(find(t_h))`.

Task b. The comparison of the nonlinear and the linear model is done by using a second model, where $\sin(\phi)$ is replaced by ϕ . The models are run sequentially, and would unfortunately produce data at different time instants because of the variable step size algorithm. In order to calculate the difference correctly, interpolation is necessary, which may be done e.g. in SIMULINK using the automatic interpolation of time dependent variables coming from the MATLAB workspace: the first, nonlinear model writes the states to workspace variables, and the second, linear model reads these values back, interpolates automatically for every time instant and calculates the difference between the nonlinear and the linear states, writing the results back to MATLAB to be plotted there (fig. 3).

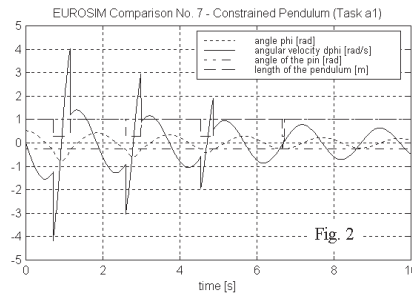


Fig. 2

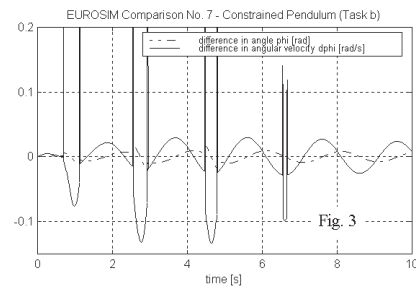


Fig. 3

Task c. For solving the boundary value problem the Optimization Toolbox is used. The model is extended

by a STOP-Block that finishes the simulation when the value of $d\phi$ changes the sign. The model execution has to be formulated as a function with $d\phi$ as input parameter, so that it can be called by the `fzero` function of the toolbox, which tries to find the desired goal $\phi - \pi/2 = 0$. This gives $d\phi_0 = -2.18695129972634$.

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Comparison 7 - MATLAB/SIMULINK

Modelling with Discrete Section Features

MATLAB is a widely used software tool based on numerical vector and matrix manipulation, SIMULINK is MATLAB's extension for graphical modelling and numerical simulation of dynamic systems and offers now (V 2.1) state event handling and discrete event formulation by means of conditionally executed submodels.

Model Description: The system is modelled using standard SIMULINK blocks and the new SIMULINK 2 features for conditionally executed submodels and the HIT-crossing-block for locating state events (fig. 1). This block determines the time instants when the pendulum hits the pin quite precisely. By means of triggered or enabled submodels *discrete sections* and *initial sections* can be implemented. The discontinuous change of the velocity is handled by the submodel *calculations at hit*, which represents a discrete section and is triggered by the output port of the hit-crossing block (i.e. only at a hit). This signal also triggers a reset of the integrator for $d\phi$, which gets the new initial values from this *discrete section*. The *initial section* determining the initial length of the pendulum (depending on the positions of the pin and the pendulum) is implemented by the enabled submodel *calculate initial length*, which is processed only if the enabling signal is non-zero (here by a NOT clock statement). All calculations were done with the integration algorithm ODE45 (Dormand-Prince) and a maximum step size of 0.01. With a larger maximum step size the algorithms detect only three or even two hits instead of four.

Task a. The model is executed from the MATLAB level, also the initial values are set and results are plotted (fig. 2) there. The time instants of the hits are logged by placing a To Workspace-block into the submodel Hit times triggered by the output port of the HIT-crossing block, thereby logging only the desired time instants:

Task a1: 0.70345948576220; 1.15177970759669;
2.59041798757767; 2.99052905658756; 4.54274139054867;
4.86748779384872; 6.64870714050849; 6.72038416645951;
Task a2: 0.18737822409146; 1.75878578528730;
2.09119539420816; 3.74905893941607; 4.01830420187044;
5.81353341413994; 5.94162109802878

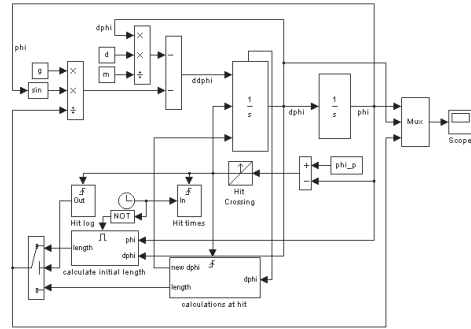
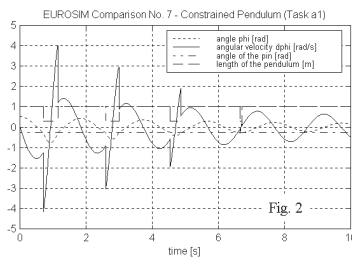


Fig. 1: Diagram of the SIMULINK model for task a

Task b. The comparison of the nonlinear and the linear model is done in SIMULINK using a second, linear model ($\sin(\phi)$ replaced by ϕ) running in parallel (fig. 3, results see fig. 4). It should be mentioned, however, that now two hit-crossing-blocks determine the hits of the linear and the nonlinear pendulum, so that the discretisation is finer, which may produce slightly different results compared with models run separately.

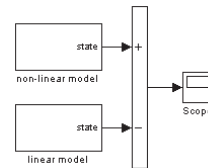
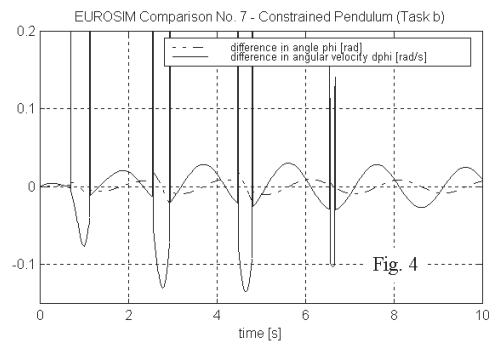


Fig. 3: Diagram of the SIMULINK model for comparison of linear and nonlinear behaviour (with submodels)



Task c. The boundary value problem can be avoided by a time transformation with reverse time so that only an initial value problem has to be solved. The time transformation can be "simulated" in this model by changing the sign of the damp factor and using the desired results ($\phi = -\pi/2$, $d\phi = 0$) as initial values. The model is extended by a STOP-block that stops at the proposed initial angle of $\phi = \pi/6$ (met more accurately by using another HIT-crossing-block). Thus an angular velocity of $d\phi_0 = -2.18469928771792$ can be determined.

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Comparison 7 - MATLAB/SIMULINK

Modelling with Events in Stateflow

MATLAB is a widely used software tool based on numerical vector and matrix manipulation, SIMULINK is MATLAB's extension for graphical modelling and numerical simulation of dynamic systems. STATEFLOW extends MATLAB's and SIMULINK's capabilities for handling discrete events (described as finite state machine) in simulation.

Model Description: As the stateflow machine allows to handle discrete events in parallel to the simulation by various types of triggered synchronization, it can be used to describe, schedule and perform constructs like *initial section* and *discrete sections*, used in this solution for handling the state events.

The SIMULINK model (fig. 1) sends all necessary information to the stateflow machine, which provides the actual length of the pendulum and the new angular velocity of the integrator for $d\phi$, when a reset is triggered by the HIT-crossing-block. This block is also necessary to determine the time instants of the hits more exactly. The *initial section*-part (fig. 1) of the stateflow machine determines the initial conditions of the model precisely, taking into account even special situations like $\phi_0 = \phi_{pin}$. In the *discrete section*-part (fig. 1) the calculation of the new length and velocity is done: the conditions for a hit are checked at

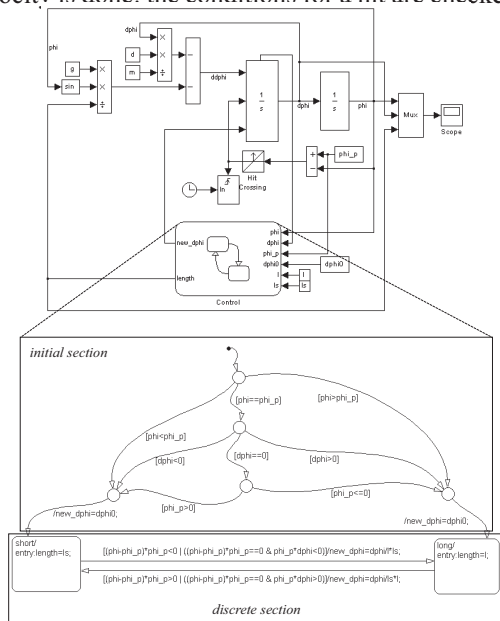
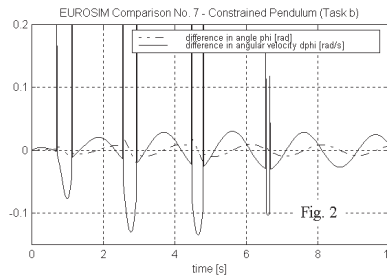


Fig. 1: SIMULINK diagram with Stateflow-machine

every time step of the integration algorithm, the calculations are done only in case of a hit.

All calculations were done with the integration algorithm ODE45 (Dormand-Prince) and a maximum step size of 0.01. With a larger maximum step size the algorithms detect only three or even two hits instead of four.

Task a. The model is executed from the MATLAB level, where also the initial values are set, creating exact results for both task a1 and task a2.



Hit times in task b, logged by a To Workspace-block placed in a triggered submodel (fig. 1):

nonlinear model	linear model
0.69485080978453	0.69202334008965
1.12809805305682	1.12054472938687
2.55297893509149	2.54086045794526
2.94619417379638	2.93179914919390
4.48469674247148	4.46575548321125
4.80972431157690	4.79078611143718
6.55976278154626	6.53205756093048
6.67094522634266	6.65299544895466

Task b. The comparison of the nonlinear and the linear model is done by using a second model, where $\sin(\phi)$ is replaced by ϕ . The models are run sequentially, and would unfortunately produce data at different time instances because of the variable step size algorithms. In order to calculate the difference correctly, interpolation is necessary, which may be done e.g. in SIMULINK using the automatic interpolation of time dependent variables coming from the MATLAB workspace: the first – nonlinear – model writes the states to workspace variables, and the second – linear – model reads these values back, interpolates automatically for every time instant and calculates the difference between the nonlinear and the linear states, writing the results back to MATLAB variables to be plotted there (fig. 2).

Task c. For solving the boundary value problem the model is extended by a STOP-block finishing the simulation when the pendulum reaches the velocity $d\phi = 0$. A binary search in MATLAB (task_c.m) iteratively determines the angular velocity of $d\phi_0 = -2.18469928866723$.

```
task_c.m:
clear all
g = 9.81; m = 1.02; l = 1.0; lp = 0.7; ls = 1-lp;
d = 0.2; phi_p = -pi/12; phi_0 = pi/6;
aim = -pi/2; left = -3; right = -1;
dphi_0 = left; sim('pendulum_c',[0,10]);
res=phi-aim; left_res = res;
dphi_0 = right; sim('pendulum_c',[0,10]);
res=phi-aim;right_res = res;
while right-left>200*eps
    new = (left+right)/2; dphi_0 = new;
    sim('pendulum_c',[0,10]); res=phi-aim;
    if sign(res)==sign(right_res)
        right=new; right_res=res;
    elseif sign(res)==sign(left_res)
        left=new; left_res=res;
    else left=new; right=new;
end; end
disp('Desired dphi_0 is:') format long dphi_0=(left+right)/2
```

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Comparison 10 - Simplex II

1) Concurrent access

The dining philosophers model is eminently suitable for testing the expressiveness of a model specification language. The issue at stake in this scenario is how to control concurrency.

The problem manifests itself in some everyday situations e.g. when two people meet at a door and both want to get through at the same time. In system-theoretic terms, both are accessing the same resource at the same time. Since only one can have access we need a decision procedure to determine who gets access to the resource first - i.e. who can go through the door first.

The same situation occurs in the dining philosophers problem with the forks as the free resources and the hungry philosophers concurrently trying to take the forks in order to start eating (see figure 2).

2) Model structure using Simplex II

One appealing approach is to construct the model such that each philosopher and each fork position becomes a component in its own right - this makes it also very easy to then use the notion of classes for further modelling.

The next decision to make in our model is to view each fork as a mobile object which can be moved from its position on the table to the philosopher who uses the fork. One can then argue that such a model structure ensures the highest possible similarity between the real system and the model, and that we do not just use variables.

In SIMPLEX-MDL there is a strict distinction between the so-called base components and structural components. The base components describe the model parts together with their dynamic behaviour. The structural components define how base components are connected to one another. Figure 1 shows the structural component of the problem space assuming the model design has been done as described above.

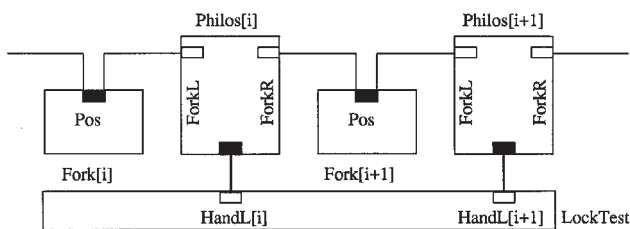


Figure 1 Model Structure

As can be seen (Fig 1) the item *Pos* in the component *Fork* is connected to items *ForkR* and *ForkL* respectively, in the adjacent philosopher components. The forks get moved along these connections when the appropriate conditions are satisfied. Syntactically, the connections are of the form:

```
Fork[2].Pos -->
Philos[1].ForkR
```

```
Fork[2].Pos -->
Philos[2].ForkL
```

3) Internal Component Structure

Each component is an executable object in its own right and it carries knowledge about its behaviour independently from other components.

Figure 2 shows a partial description for the dynamic model of a philosopher. If the philosopher is hungry and has a fork in each hand then it is allowed to make a state transition from *hungry* to *eating*.

```
WHENEVER (State="hungry")
AND (NUMBER(HandL)=1)
AND (NUMBER(HandR)=1)
DO
    TNext^ := T + TEat;
    State^ := "eating";
    DISPLAY("T=%f: Phil. %d goes
into state eating\n",T,
PhilNum);
END
```

Figure 2: Partial description of the dynamic model of the philosopher component

The model structure depicted in figure 1 resembles the real system very closely. The textual specification in figure 2 represents the internal structure in a very straightforward fashion.

This is to satisfy the requirement that real system and system model should be structurally similar and that they should also exhibit conceptual vicinity - the user should recognise the structure of the real system immediately when analysing the model.

For a detailed description of the model and its components see Schmidt, B.; Das 5-Philosophen-Problem: Die Spezifikation mit Simplex-MDL; SiP Heft 3, 1996

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Comparison 10 - MATLAB

MATLAB is a widely used software tool based on numerical vector and matrix manipulation. Markov chains are a classical method for describing e.g. finite automata. These are systems that may have only a finite number of states, and the changing of the states can be described by probabilities. The actual state (finite) of the system is given by the *state variable* $s(t)$, the probabilities p for states in the next (discrete) time step are given by the *probability matrix* $A=(a_{ij})$, with:

$$p(s(t+1)=j|s(t)=i)=a_{ij}$$

Model Description: For identifying all possible states of the system, first the possible states of an individual philosopher are considered. They are *thinking* (T), *waiting for the left chopstick* (L), *waiting for the right chopstick* (R), and *eating* (E). Five philosophers theoretically would result in 4^5 different possible combinations of these states. Many of these combinations are no valid states. The number of states can be further reduced by using cyclic and symmetric changing. Thus we get only 18 different states, which are: TTTTT, ETTTT, ETETT, ERTTT, ERTET, ERRTT, ERRRT, ETTTL, ERTTL, ETETL, ETTTEL, ETERL, ERTLE, ERRTL, ERRRL, ELETLE, ELERL, RRRRR (=deadlock).

The values of the probability matrix are of course combined probabilities for the behaviour of each philosopher, provided he has a choice what to do, i.e. if he is eating or thinking, so he can stop or continue. If he is waiting for a chopstick at the moment, what will happen next depends on his neighbours.

The state *eating* in this case is a memoryless state (in contrast to discrete event simulation). Looking at an eating philosopher, we do not know when he started eating, but we know that when he started eating, a time for eating was fixed in $[1, 10]$, uniformly integer distributed. Suppose now that the chosen time was n , then he will move through n different states *eating*. In sum there are 55 different states *eating*, of which 10 are succeeded by the state *thinking*, so the overall probability for an individual philosopher to stop *eating* is $10/55$. The same arguments go for *thinking*.

Task i: The expectation value $E(t) = \sum_{t=1}^{\infty} t \cdot \left(\frac{45}{55}\right)^{t-1} \cdot \frac{10}{55}$

for *eating*, *thinking*, and *waiting for the left chopstick* is 5.5. The expectation value for *waiting for the right chopstick* can be obtained by using formulas for conditional probabilities and expectation values, giving 8.9404. The handling of simultaneous access is automatically given by the choice of the states.

Task ii: A deadlock (state 18, RRRRR) can only be reached from state 1 (TTTTT). Let t_{dead} be the time when a deadlock occurs. So the upper right element of the matrix A^t contains the probability

$p(t_{dead} \leq t) = p(s(t) = 18)$ that a deadlock occurred in the first t steps. The probability that a deadlock occurs exactly at time t is the probability that a deadlock occurs in the first t steps but not in the first $t-1$ steps: $p(t_{dead} = t) = a_{1,18}^{(t)} - a_{1,18}^{(t-1)}$, with $(a_{ij}^{(t)}) = A^t$.

This probability distribution of t_{dead} allows to calculate the expectation value and the standard deviation of the deadlock time, but only with a very high computational effort. This effort can be reduced significantly in two steps. First, it is only necessary to calculate the upper right element of A^t , which is done by eigenvector decomposition (with standard MATLAB features). Second, the Markov chains usually reach some kind of steady state after an initial phase. In this case, where state 18 (RRRRR, deadlock) is a so-called sink, the probability distributions of the other states become virtually time-independent after a certain time t_{steady} : $p(s(t) = i | (t) \neq 18) = const. \forall t \geq t_{steady}$, so that

$$p_{dead} := p(s(t+1)=18 | s(t) \neq 18) = \\ = p(s(t)=1 | s(t) \neq 18) \cdot a_{1,18} = const. \quad \forall t \geq t_{steady}$$

This allows to calculate very easily for $t \geq t_{steady}$ the probability that a deadlock occurs at time t :

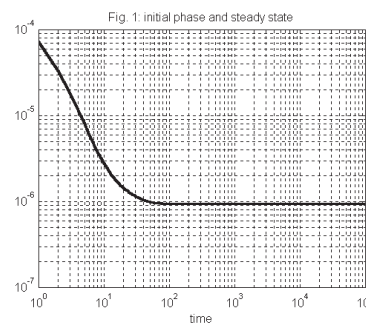
$$p(t_{dead}=t)=p(s(t_{steady})\neq 18)\cdot(1-p_{dead})^{t-(t_{steady}+1)}\cdot p_{dead}$$

Consequently only the first t_{steady} powers of the matrix A have to be calculated. This time instant can be determined now by checking in the time domain

$$p_{dead} = \frac{p(t_{dead} = t+1)}{p(s(t) \neq 18)} = \frac{a_{1,18}^{(t+1)} - a_{1,18}^{(t)}}{1 - a_{1,18}^{(t)}}$$

MATLAB computation results in fig. 1 for p_{dead} over t , giving a sufficient estimation for $t_{steady}=1000$. Thus a probability distribution for the deadlock time can be determined using standard MATLAB features:

expectation value μ :	1	057	587.417	747	350
standard deviation σ :	1	538	683	582.035	948 000



The analytical method used in this solution can solve almost all tasks of this comparison, only the overall waiting times (task i) cannot easily be determined. Additionally this

method gives opportunity of an exact calculation of the "mean" time and deviation for the deadlock. It should be noted that with the presented Markov chain model also simulation in the time domain can be performed.

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The Modeling Language Modelica Now Defined

Technical Committee One of EUROSIM, which has worked on designing a unified object-oriented language for physical systems modeling, Modelica, finished the first phase on September 30, 1997 after one year of intense work. There have been 8 design meetings and TC1 now consists of 15 members from 13 organizations in 6 countries.

The result is a modern object-oriented language allowing non-causal modeling with true equations and discrete events. Work is now changing focus to the design of standard model libraries and function libraries. Several Modelica based tools are under development. There are also activities on writing books on the Modelica language and on Modelica libraries.

There is a great need to package model knowledge in a high-level language and in such a way that reuse and exchange is possible and practical. The members of TC1 hope that the Modelica language will serve as such a language and become a de-facto standard for reuse and exchange of complex physical models.

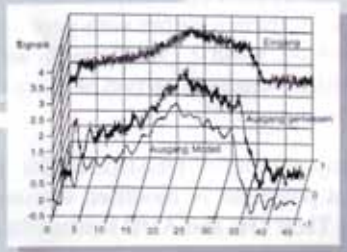
Information about the Modelica development and the Modelica language definition is available on the world-wide-web: URL: <http://www.Dynasim.se/Modelica/>. A mail server is available to register as a member of the *Modelica Interest Group* and to broadcast information to other members.

Dr Hilding Elmqvist, committee chairman, Dynasim AB, Research Park Ideon, S-223 70 Lund, Sweden, Phone: +46-46-182500, email: Elmqvist@Dynasim.se

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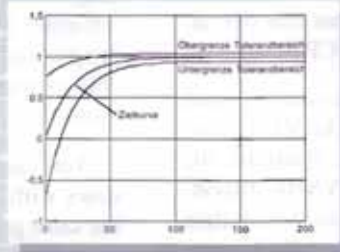


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Full-speed Dynamic-system Simulation: Preempting the CPU Under Windows 95

DESIRE Simulation Preempts the CPU Under WINDOWS 95

DESIRE/N96T is a new simulation environment which *combines user-friendly Windows 95 operations with full DOS-like execution speed*. As in earlier DESIRE (Direct Executing Simulation in Real time) programs [1,2] DESIRE/N96T interactively controls complete simulation studies with an *experiment-protocol interpreter*, which also sets parameters and initial conditions. A very fast *runtime compiler* compiles the time-critical simulation-run code into memory when the experiment protocol calls for a simulation run. Translation delays are negligible (0.1 sec) even for large programs, so that Pentium-optimized machine code appears to execute immediately.

Under Windows 95, moreover, *DESIRE preempts the CPU and suspends all other tasks to produce full-screen time-history graphs in bright colors just as quickly as an old-fashioned MS-DOS program would*. Note that other Windows tasks suspend *only* during the simulation run proper. During experiment-protocol operations, and particularly while you edit or debug a simulation, multiple windows for multiple editors, file-manager shells, graphics screens, and/or other programs can be opened and manipulated. DESIRE/N96T runs equally well under Windows NT, but that operating system will not let you preempt the CPU.

Either way, DESIRE execution is necessarily much faster than block-diagram interpreters like VISSIM or MATLAB/SIMULINK. On a 90-MHz Pentium, the Computer Simulation Society's PHYSBE blood-circulation benchmark needed 0.5 seconds to simulate one heartbeat under VISSIM, with 2nd-order Runge-Kutta integration and 0.005 sec integration time steps. DESIRE needed only 0.03 seconds. It is fair to say, though, that these systems show different graphics. VISSIM produced a system block diagram and simple animation as well as a time-history graph.

Interactive Windows Operations: Multiple Editor Windows Compare And Run Different Models

Figure 1 shows the *Command Window*, which accepts keyboard, function-key, and mouse-click commands to start, stop, and debug simulations; a *DESIRE Editor Window*, and two Explorer Windows which list user programs, help screens, and notebook files. Editor

Windows have normal Windows menus and toolbars for loading, saving, and editing programs. But it is even more convenient to drag-and-drop programs from an Explorer Window, or to double-click on files to open them in multiple Editor Windows.

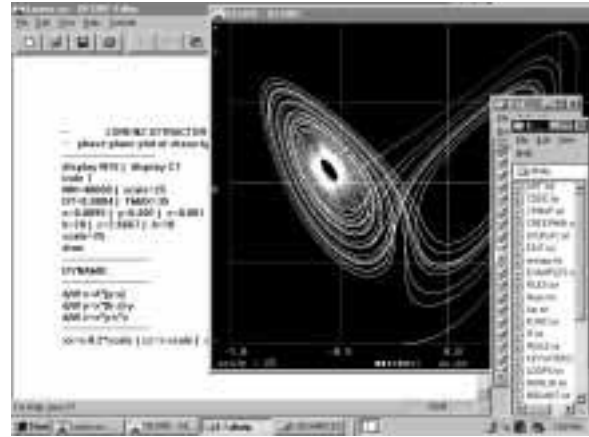


Figure 1. Initial DESIRE screen showing the Command Window with graphics, a DESIRE Editor Window, and two scrollable Explorer windows with a selection of source-code files and help files. You can drag these files into the Editor Window, or double-click to open them in multiple Editor Windows.

When you are satisfied with the program lines in an Editor Window, click **OK** or **ADD** to transfer or add them to your simulation program. A mouse click in the activated Command Window then immediately compiles and runs your simulation program. Simulation graphs first appear as a full-screen display, but typing Alt-enter lets you view them together with your edited program text, as in Figs. 1 and 2. Windows 98 will be able to display multiple windows on two or more CRT monitors.

You can have any number of DESIRE Editor Windows with different programs or modified versions of the same program. Their **OK** and **ADD** buttons then let you *select and combine different programs and/or program lines for quick comparisons of simulation results*.

Programming Your Own Custom Dialog Windows

Simulation experiments typically require *repeated interactive changes of just a few program lines*. Such lines often assign data values, but they can also specify different functions, submodels, differential equations, or input and output files. While it is easy enough to modify a program in the main Editor Window, it is nice to avoid repeated scrolling through large programs.

For this reason, *DESIRE lets you program your own special dialog windows*, which display selected pro-

gram lines for editing (Fig. 2) and can also contain comment lines for user instructions, examination questions, etc.

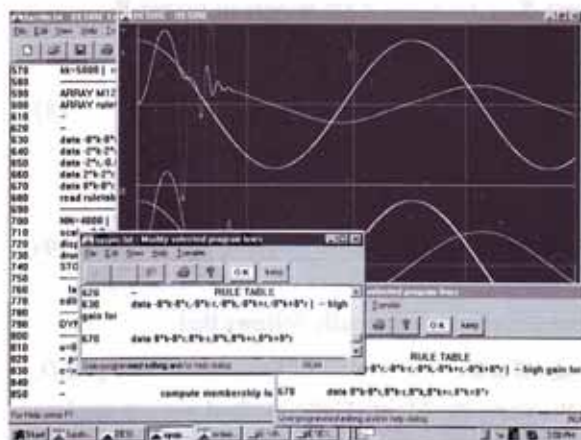


Figure 2. This Windows 95 display shows time-history displays for a fuzzy-logic-controlled servo together with several special Editor Windows. Different rule-table selections permit modifications and immediate comparison of different model designs.

Applications and Textbooks

DESIRE solves up to 6000 ordinary differential equations in scalar and/or matrix/vector form, using fixed- and variable-step Runge-Kutta integration rules; or up to 100 differential equations with variable-step/variable-order Gear and Adams integration. DESIRE/NEUNET simulates multiple neural networks and fuzzy logic controllers (Fig. 2), which can be combined with simulations modeling, say, a process plant involving up to 6000 differential equations. Two textbooks [1,2] fully describe DESIRE programming and applications and include fully operational student versions of the program. The student versions differ from the full professional versions only in the size of the data area (5 instead of 6000 differential equations, smaller neural networks).

References

1. Korn, G.A.: *Interactive Dynamic-system Simulation under Microsoft Windows 95 and NT*, Gordon and Breach, London, 1998 (in print).
2. Neural Networks and Fuzzy-logic Control on Personal Computers and Workstations, MIT Press, Cambridge, MA, 1995.

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On Linear Equations and Markov Chains

Application of the Monte Carlo method
in the simulation of stochastic processes

Linear Equations: In general Markov Chain Monte Carlo (MCMC) methods to solve n by n systems of linear equations $\mathbf{B}\mathbf{x} = \mathbf{f}$ are not competitive with classical numerical methods. Still, there are some situations where the MCMC methods can be successfully used:

- The size of matrix \mathbf{B} is very large ($n > 10^3$) and a rough estimate of \mathbf{x} is required.
- When we are interested to estimate only a few of the elements of \mathbf{x} .

Here we follow Rubinstein [7]. Let us consider a system of simultaneous linear equations written in matrix form $\mathbf{B}\mathbf{x} = \mathbf{f}$.

where the column vector \mathbf{x} is to be found and the square matrix $\mathbf{B} = \|b_{ij}\|_1^n$ and the column vector \mathbf{f} are given.

Introducing $\mathbf{B} = \mathbf{I} - \mathbf{A}$, where \mathbf{I} is an identity matrix, system (1) can be written as

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{f}. \quad (2)$$

$$\text{Suppose } \max_i \sum_{j=1}^n |a_{ij}| < 1; \quad i = 1, 2, \dots, n. \quad (3)$$

Under this assumption we can solve (2) by applying the following recursive equation:

$$\mathbf{x}^{(k+1)} = \mathbf{A}\mathbf{x}^{(k)} + \mathbf{f}. \quad (4)$$

Assuming $\mathbf{x}^0 \equiv \mathbf{0}$ and $\mathbf{A}^0 \equiv \mathbf{I}$, we have

$$\mathbf{x}^{(k+1)} = (\mathbf{I} + \mathbf{A} + \dots + \mathbf{A}^{k-1} + \mathbf{A}^k) \mathbf{f} = \sum_{m=0}^k \mathbf{A}^m \mathbf{f}.$$

Taking the limit, for \mathbf{B} nonsingular,

$$\lim_{k \rightarrow \infty} \mathbf{x}^{(k)} = \lim_{k \rightarrow \infty} \sum_{m=0}^k \mathbf{A}^m \mathbf{f} = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{f} = \mathbf{B}^{-1} \mathbf{f} = \mathbf{x}, \quad (5)$$

we obtain the exact solution of \mathbf{x} .

As we can see from the text above Rubinstein [7] – in order to find the exact solution \mathbf{x} – is assuming (3) is true and \mathbf{B} is nonsingular. We are now going to show that if condition (3) is true then \mathbf{B} is nonsingular. This means that MCMC methods for solving systems of linear equations never fail because of condition (3). On the other hand in general we can use condition (3) as a test for the singularity of square matrix \mathbf{B} .

Theorem 1: Let $\mathbf{B} = \mathbf{I} - \mathbf{A}$, where \mathbf{I} is an identity matrix, $\mathbf{B} = \|b_{ij}\|_1^n$ and $\mathbf{A} = \|a_{ij}\|_1^n$ are square matrices. If

$$\max_i \sum_{j=1}^n |a_{ij}| < 1, \quad i = 1, 2, \dots, n, \quad (6)$$

where $|\cdot|$ denotes the absolute value, then $\det \mathbf{B} > 0$ and matrix \mathbf{B} is nonsingular.

Proof:

$$\det \mathbf{B} = (1 - a_{nn}) \det B_{nn} - \sum_{j=1}^{n-1} (-1)^{n+j} a_{nj} \det B_{nj}, \quad (7)$$

where B_{nj} , $j = 1, \dots, n$ are minors of matrix \mathbf{B} .

It can be easily shown that

$$\frac{|\det B_{nj}|}{|\det B_{nn}|} < 1. \quad (8)$$

Now we can rewrite (7) in this form

$$\frac{1}{\det B_{nn}} \det B = 1 - a_{nn} - \sum_{j=1}^{n-1} (-1)^{n+j} a_{nj} \frac{\det B_{nj}}{\det B_{nn}}. \quad (9)$$

From (6), (8) and (9) finally follows that

$$\det \mathbf{B} > 0. \quad Q.E.D.$$

By using the Monte Carlo method we can explore the set over which the theorem is to be tested in an efficient manner:

Algorithm 1:

Input: N - number of random numbers with uniform distribution $U(0,1)$, n - dimension of matrix \mathbf{B} .

Output: message " $\det \mathbf{B} \leq 0$ ".

```

For k = 1 to N
  For i, j = 1 to n
    aij ← U(0,1)
    sgn ← U(0,1)
    if (sgn < 0.5) then
      aij = - aij
    endif
  next i, j
  if (maxi ∑j=1n |aij| < 1) then
    if (det B ≤ 0) then
      message "det B ≤ 0"
    endif
  endif
next k

```

The theorem has been tested for $N = 1000000$ and $n = 3$.

The message " $\det \mathbf{B} \leq 0$ " never appeared.

References

1. Fishman, G. S.: Monte Carlo: concepts, algorithms, and applications. Springer, 1996.
 2. Hammersley, J. M. and Handscomb, D. C.: Monte Carlo Methods. Chapman and Hall, 1964.
 3. Knuth, D.: The Art of Computer Programming: Semi-numerical Algorithms. Vol.2, 2nd ed., Addison-Wesley, 1981.
 4. Pllana, S.: Primjena metode Monte Carlo u simulaciji stohastičkih procesa s pomoću racunala: Magistarski rad. FER Sveučilište Zagreb, 1997.
 5. Press, W. H. and Teukolsky S. A. and Vetterling W. T. and Flannery B. P.: Numerical Recipes in FORTRAN: The Art of Scientific Computing. Cambridge University Press, 1994.
 6. Ripley, B. D.: Stochastic Simulation. John Wiley & Sons, Inc., 1987.
 7. Rubinstein, R. Y.: Simulation and the Monte Carlo method. John Wiley & Sons, Inc., 1981.
 8. Tanner, M. A.: Tools for statistical inference: methods for the exploration of posterior distributions and likelihood functions. Springer, 1996.
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Presentation of Simulation Centres

Cranfield College of Aeronautics

The College has been involved with the simulation of aerospace vehicles for a great many years. In the early 80's ACSL was adopted for teaching and research and is still used today along with Simulink and Matrix_x. In recent years three important activities have been the development of the Aerosim package for Rapid Data Limited and the design and development of two real time simulators, one for unmanned and one for manned air vehicles.

Uninhabited Air vehicle (UAV) Simulator

This has been developed under contract from the UK Defence Evaluation and Research Agency. The original impetus was to produce a low cost (PC based) simulator to prove the concept of a mechanically simple but intelligent UAV in the reconnaissance role. Using a novel set of navigation algorithms, the aircraft carries a camera and must keep a moving target under constant observation regardless of the target's speed and the wind.

The simulator has to produce a representative video output and provide the operator with the means of directing the observation. The concept is that the operator decides what he wants to look at and the aircraft solves the piloting, navigation and camera pointing problems. The video output is produced using a digital terrain database and "target" models which are rendered by Primary Image (PI) graphics cards. The operator has touch screens which display both the camera output and an electronic map of the operating area. The entry or modification of a flight plan is achieved through touches on the map screen and touches on either the map or video screens can be used to select points to observe. In a typical sortie the aircraft follows a pre-planned route with the operator causing it to divert from the plan to observe points of interest. Once an observation is complete, and, if required, the target logged and plotted on the map, a further screen touch returns the aircraft to its planned route.

The simulator has a full flight model of a real UAV and partial simulation of the ground to air communication links plus an atmospheric turbulence model and a GPS position fixing noise model.

The initial work demonstrated very clearly that a mechanically simple but very intelligent reconnaissance UAV could be operated very easily by one per-

son. Recent research has investigated the operator's requirements for aircraft performance information, and the use of menus and soft keys to select functions and record target information. It has shown how little the operator needs to be concerned with either flying the aircraft or pointing the camera. He needs and has no direct control of these activities and therefore needs very little information about them other than that which is intuitively present in the video output.

A Modular Real-time Engineering Flight Simulator

This simulator is based on standard PCs connected via Ethernet and iterates at 50 Hz. The Ethernet architecture simplifies the integration of software written in various programming languages for a range of platforms. The objective is to provide a rapid prototyping environment to develop and evaluate flight control laws, avionics systems and aircraft displays. The simulator consists of off-the-shelf hardware modules including a 32 channel I/O card, a custom sound card, a Primary Image P10 image generation system and SVGA displays. Software modules have been developed for a range of flight modules and aircraft displays for civil and military aircraft. The simulator incorporates a standard navigation database and software modules for avionics systems and weather models. The simulator software is written in the Modula-2 programming language.

The engineering flight simulator is used for a range of applications to support postgraduate teaching and research including development of flight control laws for future civil aircraft, evaluation of Traffic Collision Avoidance Systems (TCAS), evaluation of synthetic vision Head-Up Displays (HUDs), integration of Terrain Reference Navigation systems, development of sensor models and human factors studies in pilot performance. In addition to the provision of an instructor station to control and monitor simulator exercises, a real-time data monitoring facility is provided to record and display flight data during evaluations. Future developments include a helicopter flight model, evaluation of military HUD formats, integration with real-time MatLab and evaluation of algorithms and displays for Future Air Navigation Systems (FANS).

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CWI (Centre for Mathematics and Computer Science), Amsterdam

The institute: CWI is a research institute for mathematics and computer science, founded in 1946 with the dual purpose of carrying out fundamental research as well as making advanced scientific methods available to society. These two objectives are still the driving forces of CWI's activities. The budget of the institute shows a 70% direct contribution from the Dutch national science organization NWO, whereas the remaining 30% comes from various sources including programs at the national and European levels, and contracts with industry. There are four departments; most of the research in connection with simulation takes place in the Department of Modeling, Analysis, and Simulation (MAS). Simulation research within MAS is concerned with ordinary and partial differential equations, implicit differential equations, stochastic differential equations, and mixed continuous/discrete systems.

Environmental modeling and porous media: One of the main themes in the MAS department is environmental modeling and porous media research. The research group, headed by Jan Verwer, is in particular concerned with ordinary and partial differential equations, describing fluid flow, transport of pollutants and chemical and bio-chemical processes. These differential equations lie at the heart of simulation models used in atmospheric air quality modelling, in surface water and groundwater water quality modeling, and in porous media research directed for example at enhanced oil recovery. The research projects cover a wide range of scientific activities, ranging from fundamental mathematical and numerical analysis of differential equations and development of new computational techniques for use on vector/parallel and massively parallel computers and heterogeneous networks (HPCN), to implementation of fully integrated models and application to real life problems.

More information is available at http://dbs.cwi.nl/cwwi/owa/cwwi.print_clusters?ID=1.

Implicit differential equations: Under the direction of Piet van der Houwen, a long-term research project is carried out at CWI concerning the development of parallel software for solving a large variety of initial-value problems for ODEs and DAEs. A start with the development of such software was made in 1994. The two main software products produced so far are the code PSIDE (Parallel Software for Implicit Differential Equations) and the CWI Test Set. Both are fully documented in the PhD theses of Wolter van der Veen and

Jacques de Swart which were prepared at CWI. PSIDE is designed with parallel computers in mind and is not just a parallel implementation of an existing code. The current status of PSIDE is that by using more processors, it beats the state-of-the-art solvers in terms of wall-clock time, because the state-of-the-art solvers have little scope for exploiting parallel computer architectures. At the same time, the class of problems that can be solved is larger. The CWI Test Set contains about 15 real-life problems partly contributed by the international ODE-DAE community. It serves as a tool for testing ODE-DAE software, is available via World Wide Web (<http://www.cwi.nl/cwi/projects/IVPtestset.shtml>), and is very easy to use. To perform a test run, one only has to download the desired problem, solver, and the interface (or driver) between problem and solver.

Discontinuous dynamical systems: Dynamical systems that show both discrete and continuous features occur frequently. For instance, think of processes that are connected to programmable logic controllers or other discrete devices. Other examples are processes in which transitions occur that are very fast with respect to the time scale of interest. In the past, various methods have been used to enable differential equation solvers to handle mode switches; it is generally agreed however that a fully satisfactory approach is still lacking. A research project at CWI is concerned with the modeling of discontinuous dynamical systems. Efforts have been undertaken to obtain a complete semantics for discontinuous systems specified in the so-called complementarity format; this includes the development of algorithms for mode determination and re-initialization. Documentation is available at http://dbs.cwi.nl/cwwi/owa/cwwi.print_projects?ID=11.

Simulation in finance: Simulation techniques are an important tool in the analysis of the complicated contracts (options, swaps, and so on) that are nowadays used by financial institutions. Applications include both the determination of fair prices for contracts and the analysis of risk in a given portfolio. The problems that arise here can be written as integration problems over domains whose dimension can be in the hundreds or thousands; simulation methods are the only way to solve such problems. Research at CWI considers both the Monte Carlo methods and their deterministic variants, the so-called quasi Monte Carlo methods. The research aims at improving the performance and widening the scope of these methods. More information is to be found at http://dbs.cwi.nl/cwwi/owa/cwwi.print_projects?ID=14.

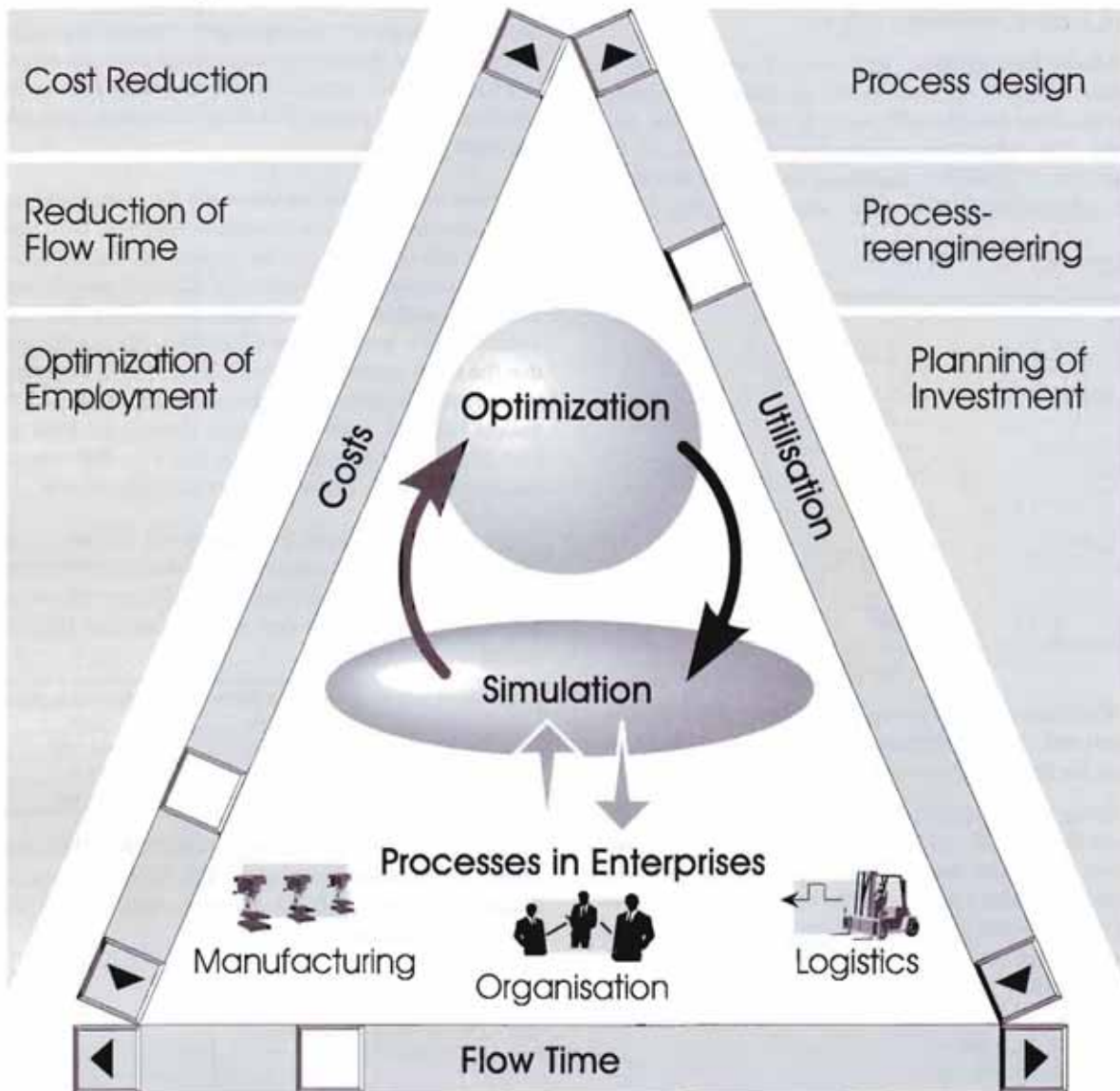
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Book Reviews

Neural Networks and Their Applications

J.G. Taylor (ed.)

John Wiley & Sons, Inc. 1996

ISBN 0-471-96282-1, 293+xxvii pages

Neural Networks and Their Applications gives an overview over the wide area where neural networks can be used. The contributions included in this book were presented at the joint workshop on Adaptive Information Technologies in 1995. In 19 chapters various problems are introduced and solved by using different kinds of neural networks, in order to give examples of the power of neural networks for solving problems. Also hybrid systems are dealt with in two papers, where neural networks are used together with genetic algorithm, expert systems, and fuzzy logic for short.

Each chapter gives a short but precise introduction in the problem, if necessary together with a detailed description of the mathematical background used. Next, if the specific neural network is a special one, it is explained in more detail. Different kinds of graph representations help the reader to understand the problem, the working of neural networks and the results. Many of the papers include a detailed reference list for additional information.

Reading the book requires at least a basic knowledge of neural networks and a higher level of mathematical or statistical knowledge. Most of the papers help to receive additional information for research in the specified field by detailed reference lists.

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An Introduction to the Mathematics of Biology (With Computer Algebra Models)

Edward K. Yeagers, Ronald W. Shonkwiler,

James V. Herod

Birkhäuser, Boston, 1996

ISBN 0-8176-3809-1, 417 pages

This book is intended to present the domain of mathematical biology not merely as the intrusion of one science into another, but as a unity of its own. Both the biology and the mathematics are equal and complete and they flow smoothly into and out of one another.

The book starts with a motivation of the linkage of both sciences and shows the principles of modelling in biology and the interpretation of the results. Also a

short survey of different mathematical tools (probability, statistics, regression, differential equations, matrix analysis) is given. The book does not offer the mathematical theory, but solution methods and their realizations using the computer algebra system *Maple*.

The remaining chapters are a collection of models in different fields of biology. First the Darwinian model of evolution, the cell structure and the principles of living systems are introduced. Then different models of population growth are presented including the exponential model, the logistical growth and predator-prey systems (Lotka-Volterra models). In addition models of the age-structure of populations (Von Foerster equation) are included. The following chapters introduce the mathematics of diffusion modelled as a random walk and Fick's laws of diffusion. Furthermore the biological disposition of drugs and inorganic toxins is presented using compartment models. The chapter of neurophysiology describes the structure of a neuron and the principles of an action potential and synapses. The Hodgkin-Huxley model and the Fitzhugh-Nagumo model for the action potential are presented. Then models of chemical reactions and enzyme kinetics follow.

The last but one chapter is about the HI-virus and AIDS. The interaction between the HI-virus and the human organism are described in a very detailed way. A model of the interaction between T-cells and the HI-virus and a model with a mutating virus is shown. Also a probabilistic model for the prediction of the onset of AIDS is included. The book ends with a chapter about classical genetics. Both the asexual cell reproduction (mitosis) and the sexual reproduction (meiosis and fertilization) are described and Mendel's investigations and the Hardy-Weinberg principles are included.

The target group are mathematicians who are interested in biological applications and who want to get a first insight of mathematical biology. No prior study of biology is necessary, because every chapter starts with a detailed description of the biological facts that are necessary for understanding the models.

In summary the book deals with models in different fields of biology, which are hardly connected with each other. It gives a survey of the possible applications of mathematics in biology and presents the standard models, but does not go very much into details.

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Road Vehicle Automation II – Towards System Integration

Edited by Christopher O. Nwagboso

John Wiley & Sons, Chichester, England, 1997

ISBN 0 471 96726 2, 611+xxiv pages

This volume contains the proceedings of the 2nd International Conference on Road Vehicle Automation (ROVA '95), held at Vehicle System Research Centre, School of Engineering, Bolton Institute, Bolton, UK, 11th -13th September, 1995. It consists of about 56 papers, containing the results of various researches, system implementations, applications and developments in vehicle system automation.

Topics covered in this volume include (numbers of papers in brackets): * Advanced Vehicle Control (7) * Simulation and Modelling (9) * Automotive Sensors and Mechatronics (5) * Telematics for System Control (5) * Computer Vision and Image Understanding (8) * Neural Network and Fuzzy Logic (5) * Navigation, Route Guidance and Tracking (5) * Autonomous Vehicles (3) * Intelligent Vehicle Systems (4)

The sections entitled "Simulation and Modelling" and "Sensors and Mechatronics" consist of an interesting mix of papers where simulation is employed in various applications. For example, simulation models are used to improve and optimize the combustion process in engines, to study handling and braking behavior of vehicles and to investigate active suspension systems and transient ride performance. Furthermore, in a number of papers in the other sections, simulation is addressed or used as an investigation tool.

The section "Advanced Vehicle Control" presents papers on new technologies, so-called "smart systems". A control concept for cars moving in convoys, electronic control of continuously variable transmissions and advanced vehicle chassis control are a few examples that show how the future of transportation systems might look like.

Altogether twelve sections (nine of them are mentioned above) give an up-to-date overview on recent development and ongoing research in the field of road vehicle systems.

The information contained in this volume is certainly a valuable source of reference to practising engineers, researchers, managers and academics in the field of road vehicle automation and intelligent transportation systems. A list of contributors and also a subject index facilitate the use of this volume.

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Gestion de flux en entreprise - Modélisation et simulation (in French)

J.-F. Claver, J. Gélénier and D. Pitt

Hermès (Paris), 1997. 160 p.

ISBN 2-86601-575-4

One of the very few books in French dealing with simulation for industry and services. Too many companies in France ignore the possible benefits of simulation. "*Gestion de flux en entreprise*" (Flow Management in the Enterprise) shows in what ways standard static decision-making techniques are not appropriate, and promotes the modelling/simulation approach to understand and solve problems, and reactively test new ideas.

The book is written in a clear and direct style, understandable by all readers, and is divided into three parts. In the first part, the authors present an array of industrial problems, and illustrate with many examples the way of studying these problems with modelling and simulation. It shows the interest of simulation, as compared to other tools for decision-making. The second part discusses in a more technical tone what are modelling and simulation, related concepts, tools, and functions. In the last part, the reader will find a factual guide for managing a simulation project.

The approach presented is modern, and applicable in industry as well as in services. It is relevant to managers and engineers in all fields, in order to help them enhance their decision-making process and possibly start using simulation.

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Atomic and Ion Collisions in Solids and at Surfaces

Roger Smith (editor)

Cambridge University Press, 1997

ISBN 0 521 44022 X hardback, 309 pages

This book has been written by a group of seven authors in a quite successful attempt to cover the broad field of theory and computer simulation and its applications in particle solid interactions. This covers the field of interaction of energetic particles with energies from less than an eV up to MeV with solid surfaces, including sputtering, ion implantation, penetration and mixing. The book will be of interest to graduate students and researchers who want to learn about the present status of computer codes and techniques used in atomic

collisions of particles with solids, i.e. if a solid is bombarded by atoms or ions. It should however not be considered as a textbook for someone who has no prior knowledge in computer simulation.

This book is also worth reading for anyone interested in computer simulations of thin film growth and indeed in the application section a few selected models for deposition and crystal growth are discussed. Also potential applications of the techniques discussed in this book exist in the area of surface science and in industrial techniques as ion implantation in semiconductors and nanotechnology.

Roughly half of the book is devoted to theory. The book starts with a discussion of basic binary collisions of atoms. All the relevant potentials from simple two-body potentials up to modern many body potentials are discussed thoroughly. Next inelastic energy losses in collisions (electronic stopping) are discussed followed by transport models to derive energy and range distributions of ions penetrating a solid. In further consequence distribution of the deposited energy, which eventually will lead to mixing and particle emission (sputtering) is dealt with.

In the simulation part of the book the two main program groups used in this field are discussed: binary collision codes (BC) often also referred to as Monte Carlo Codes as well as Molecular Dynamics Codes (MD). The differences between them and their respective advantages and disadvantages are discussed. However, the main emphasis in the book is on MD simulations, which become more and more the dominant codes in this field, if one is interested in more detailed information on particle solid interactions, than simple sputtering yields or ion penetration depths.

Applications are given throughout the book and in a special section at the end, where mainly results from research work of the authors are given, discussing ejection of particles under ion bombardment, scattering and radiation damage up to fullerene and cluster bombardment of solids.

In summary this is an excellent book for anyone who has some prior knowledge of computer simulations and is interested in doing work or wants to know the present status of work in the field of particle solid interactions. In this respect it can be also considered as a good reference book with sufficient references given at the end of each chapter leading to the original work.

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Modern Heuristic Search Methods

V.J. Rayward-Smith, I.H. Osman, C.R. Reeves and G.D. Smith (eds.)

John Wiley & Sons, Inc. 1996

ISBN 0-471-96280-5, 294+xvi pages

This book is an outcome of the meeting on "Adaptive Decision Technologies", held in spring of 1995, intended to give an overview of modern heuristic optimisation methods. The book is not simply the conference proceedings. It comprises a specially written introductory chapter and a carefully reviewed selection of extended versions of the best papers presented at the meeting.

Section one provides the fore-mentioned short introduction to optimisation in general by explaining basic techniques, from combinatorial optimisation over neighbourhood search to genetic algorithms.

Sections two and three present the individual contributions. Section two, which contains 5 chapters, introduces more detailed ways to optimise.

The third section includes applications and case studies in optimisation. It deals e. g. with "Local Search for Steiner Tree in Graphs", it includes also a short comparison of some evolutionary optimisation methods. At the end a chapter discusses genetic based learning systems.

This book includes only little of mathematical formulas and some computational algorithms in general for describing genetic algorithms and other topics. It is recommended for novices without regarding the research or industrial background, where optimisation is used. Also the very detailed and large reference list at the end of each chapter has to be underlined.

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Modelling and Performance Evaluation of ATM Technology.

Proceedings IFIP TC6 "International Workshop on Performance of Communication Systems"

Martinique, January 25-27, 1993

ISBN: 0 444 81512 0, 489+ix pages

This volume contains the proceedings of an International Workshop on modelling and performance issues of ATM (Asynchronous Transfer Mode) networks. The next generation Information Highways will be based on ATM networks. Despite the tremendous progress in the

development of ATM technology, there are still many problems to resolve. The papers were organized around seven groups.

The reader can find a large variety of interesting developments in the performance analysis of ATM networks. These Proceedings can be strongly recommen-

ded to specialists in performance evaluation and also to simulation people.

A detailed review can be found on the SNE WWW server at <http://eurosim.tuwien.ac.at/sne/reviews/>.

*T. Sommer, Institute of Communication Networks,
Vienna University of Technology
email: Thomas.Sommer@tuwien.ac.at*

News on Books and Journals

CMSE – Computer Modeling and Simulation in Engineering

Computer Modeling and Simulation in Engineering is a new, international, peer-reviewed journal emphasizing the application of modeling and simulation techniques to resolve real industrial problems and improve product and process design. Reflecting new trends for research and development funding, **Computer Modeling and Simulation in Engineering** publishes application-oriented papers with direct appeal to the practicing engineer in an industrial and/or product-development environment. Articles originate from research that is strategic, purposeful, and aligned with today's exigency.

Editor:
S.N. Atluri, Georgia Institute of Technology, Atlanta

Subscription information and sample copies:

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Thousand Oaks, CA 91359
Tel.: +1-805-499 0721
Fax: +1-805-499 0871
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<http://www.sagepub.com/ssp/>

Journal of Computing and Information Technology

The *Journal of Computing and Information Technology* (CIT) is an international journal covering the theory, practice and methodology of computer science and engineering, modelling and simulation, and information systems. Special attention is paid to educational, social, legal and managerial aspects of computing. In this respect the CIT journal fosters exchange of ideas, experience and knowledge between regions with different technological and cultural background, in particular in Central and Eastern Europe and Mediterranean.

The journal is publishing original scientific and professional papers, short notes, review articles and surveys, as well as book reviews. Both theoretical and practical papers, and especially case studies describing the application and critical evaluation of the theory, are welcome. English version of papers previously published in some other language will be taken into consideration if they are of interest to a wider community.

Specific areas of interest include theory of computing, numerical and symbolic computing, artificial intelligence, image processing, pattern recognition, robot vision, real-time systems, operating systems, software engineering, networking, interfaces and multimedia, strategic management, database systems, decision support systems, security, discrete and continuous simulation, computational statistics, natural language processing and computational linguistics.

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Individual Subscription Orders: <http://eurosim.tuwien.ac.at/sne/subscribe.html>

The CIT journal is published quarterly. Four volumes of the journal have been published by now, and in 1997 Volume 5 will be completed.

The Editor-in-Chief of the journal is Prof. Vlatko Ceric from the Faculty of Economics, University of Zagreb, Croatia. Editors are Prof. Slobodan Ribaric, Dr. Dean Rosenzweig, Dr. Robert Manger and Dr. Sven Loncaric, all from the University of Zagreb. Associate Editor is Prof. Ivan Futo from ML Consulting & Computing Ltd., Budapest, Hungary, while Assistant Editor is Mrs. Vesna Hljuz Dobric from the University of Zagreb. The Editorial Board includes over 20 experts from Europe and North America.

The CIT journal is abstracted/indexed by Computer and Control Abstracts, Computer Literature Index, Information Store, Current Index to Statistics, Bulletin d'Information-Newsletter, Zentralblatt für Mathematik/Mathematic Abstracts (and MATH database), CompuScience Database on STN International and Internet, INSPEC, LISA and PASCAL.

Associate Editor, as well as several members of the Editorial Board (Felix Breiteneker, Georgios Doukidis, Andras Javor, Ray Paul, Jerzy Rosenblit and Andrew Seila) are internationally recognized simula-

tion experts. Editor-in-Chief, Prof. Vlatko Ceric, is also working in the area of simulation modelling.

The journal has published papers in the simulation area and related fields. Some of the topics of these papers are simulation modelling using hypercards, simulation software for manufacturing environments, microprocessor architecture simulation, gaming simulation environments and applying intelligent tutoring to gaming simulation.

In one of the next issues CIT will publish an invited paper about the EUROSIM federation and its activities, written by the former EUROSIM president Prof. Felix Breiteneker. The CIT Journal is also preparing several special issues devoted to Emerging Technologies, Computers in Education, and Biomedical Image Processing and Analysis.

We invite EUROSIM members to send articles to the CIT journal. Information about the journal as well as instructions to authors can be found on the CIT Web site: <http://www.srce.hr/cit/home.html>.

The CIT editorial office can also be contacted via email cit@srce.hr, phone +385 1 6165 592 or fax +385 1 6165 591.

Industry News

Rapid Data distributes O-MATRIX

Rapid Data Ltd has signed a distribution agreement with Harmonic Software, Inc. of Seattle, WA, which gives Rapid Data exclusive rights to market their O-MATRIX (R) software and all side products (Kalman Filter, Signal Processing, etc.) in all countries in Europe except Austria and Turkey.

O-MATRIX is a very powerful and complete analysis and visualisation software which has received excellent reviews since its official release, from commercial and educational establishments alike.

O-MATRIX offers a high-performance environment for the development of fast-executing applications. The O-MATRIX language and built-in functions are optimized to provide significantly better execution performance than similar analysis packages for a fraction of the price. The price of a single licence is stlg100.00

for universities and stlg299.00 for commercial organisations.

For technical information, performance comparisons and a free demonstration system, you are invited to visit our Web Site on <http://www.radata.demon.co.uk>, or to contact us at the address below.

Rapid Data Ltd, 266 Amelia House, Crescent Road, Worthing, West Sussex BN11 1RL, Tel: +44 1903 821, Fax: +44 1903 820 762, email: ali@radata.demon.co.uk, Web Site: <http://www.radata.demon.co.uk>

Taylor ED-Developer

F&H is introducing a whole new range of Windows95/ Windows NT software products based on a new concept called **Taylor Enterprise Dynamics**. One of the first products in this range is Taylor ED-Developer. It is aimed at those who want to develop and

market their own products or want to incorporate the technology in their existing products. Taylor ED-Developer is typically designed for developing such applications as modelling, simulation, control, visualisation, scheduling and workflow management for use in business, manufacturing or logistics. Taylor ED-Developer will be available from December 19, 1997.

Taylor Enterprise Dynamics is based on a radically new software concept developed by F&H based on more than 10 years of simulation experience. The kernel is a modelling system in which everything (products, equipment, information and even the application itself is represented by one single entity: the Atom. Every atom is associated with 4 dimensions (x,y,z, time) and a definition of its behaviour. Furthermore every atom can contain other atoms. This simple, elegant concept allows the user to model any real world system and its dynamic behaviour in detail without using workarounds or abstractions. The model is executed by a Runner, which can server as a simulator or a controller.

For more information contact: F&H, Maliebaan 88, 3581 CX, Utrecht, The Netherlands, Tel.: +31-30-2311211, Fax: +31-30-2333962.

AutoSimulations Releases Simulation Product Upgrade, AutoMod 8.5

AutoSimulations announces the availability of AutoMod 8.5, its 3-D graphical simulation tool used for modelling complex manufacturing and material handling systems.

The latest enhancements to AutoMod 8.5 updates conveyor capabilities and resources making simulation modelling easier and more accurate. Conveyor enhancements include i) Photoeyes for controlling the distribution and routing of parts, ii) Motors - for starting, stopping and regulating conveyor sections and transfers, iii) Entity Actions include rotation, translation and scaling of specific entities, and iv) System Templates for quick creation of conveyor system (from sections, stations and photoeyes). The new version of-

fers an improved interface to AutoStat, Autosimulations' statistical analysis software.

For additional product information or purchase inquiries, contact Sandy Richards at +1-801 298-1398 ext. 312 or by e-mail at info@autosim.com.

Cimtechnologies Releases FactoryCAD 5.0

Cimtechnologies released in July 1997 FactoryCAD 5.0 in conjunction with the release of AutoCAD 14. FactoryCAD is designed by industrial engineers to draw and manage industrial facilities through AutoCAD customisation. FactoryCAD contains commands and block libraries developed specifically for industrial facilities, including cranes, racks, conveyors, structural elements, machines, and industrial equipment in 2D and 3D.

FactoryCAD's enhanced layer editor now displays layer names and descriptions based on AIAG and industrial standards. Users can specify layer prefixes and suffixes and modify layer files to meet drawing standards. Powerful layer aliasing allows users to assign aliases to AutoCAD layers for easier layer control and reference.

FactoryCAD advanced features include tools for area and rack packing. Area space routines draw area borders on standardised layers and automatically label hatch areas. Cost estimation and equipment database routines are also available. FactoryCAD works with AutoCAD 13 or greater.

System requirements include a compatible PC with 486DX or higher CPU, 32 megabytes of RAM, Windows 95 or NT, 20 MB of free hard disk space, and a CD ROM.

For more information on Cimtechnologies' FactoryCAD 5.0, contact Helena Poist, Director of Marketing, at +1 515 296-9914 or at helena@cimtech.com.

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Individual Subscription Orders: <http://eurosim.tuwien.ac.at/sne/subscribe.html>

Classes on Simulation

November 1997

- 4-6 **COMNET III Course.** Sweden
Contact: CACI Products Division, Suite 11, Coliseum Business Centre, Riverside Way, Camberley, Surrey GU15 3YL, UK, Tel: +44 1276 671 671, Fax: +44 1276 670 677
- 7 **COMNET Predictor.** Sweden.
Contact: CACI Products Division
- 12-14 **SIMPROCESS Course.** Camberley, U.K.
Contact: CACI Products Division
- 18-19 **MATLAB-Kurs.** Munich, Germany.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, D-80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063, email: 100564.302@compuserve.com
- 19-21 Three days training : "**Learning Simulation with Extend**" (in French or English) for people wanting to learning the concepts related with modelling and simulation through the use of the simulation environment Extend. In Lyon (France). Also available on-site.
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51
- 24 **COMNET Predictor.** Camberley, U.K.
Contact: CACI Products Division
- 24 **Effektive Simulation von Schaltnetzteilen.** Munich, Germany.
Contact: BAUSCH-GALL GmbH
- 25 **Effektive Regelung von Schaltnetzteilen.** Munich, Germany.
Contact: BAUSCH-GALL GmbH
- 25 *Seminar aus Modellbildung und Simulation "Modellbildung und Simulation metabolischer Systeme und des Herzkreislaufsystems - Präsentation eines Beratungssystems für Bypassoperationen".* TU Vienna, Austria
Contact: ARGESIM, TU Wien, Abt. Simulationstechnik, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel: +43-1 58801 5374, Fax: +43-1 5056849, Email: argesim@argesim.tuwien.ac.at
- 25-27 **COMNET III Course.** Camberley, U.K.
Contact: CACI Products Division
- 27 One day seminar : "**Understanding simulation**" (in French) for managers and engineers wanting to know what simulation is about. In Lyon (France).
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51

December 1997

- 2-3 **Simulation mit SIMULINK.** Munich, Germany.
Contact: BAUSCH-GALL GmbH
- 3-5 **Micro Saint Course,** RDL, Worthing, UK
Contact: Rapid Data Ltd., Amelia House, Crescent Road, Worthing, West Sussex, BN11 1RL, UK, Tel: +44-1903 821266, Fax: +44-1903 820762, email: info@radata.demon.co.uk
- 4 **Objektorientierte Modellierung mit DYMOLA.** Munich, Germany.
Contact: BAUSCH-GALL GmbH

- 9 **COMNET Predictor.** Frankfurt, Germany.
Contact: CACI Products Division
- 10 One day seminar : "**Simulation and kanban**" (in French) for understanding the benefits of simulation in kanban-related applications. In Lyon (France).
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51
- 10-12 **COMNET III Course.** Frankfurt, Germany.
Contact: CACI Products Division
- 15 **COMNET Predictor.** Paris, France.
Contact: CACI Products Division
- 16 *Seminar aus Modellbildung und Simulation "Kontinuierliche Modellbildung und Simulation in der ACSL-Umgebung".* TU Vienna, Austria
Contact: ARGESIM, TU Wien
- 16-18 **COMNET III Course.** Paris, France.
Contact: CACI Products Division

January 1998

- 13 *Seminar aus Modellbildung und Simulation "Symbolic Computation in der Simulationstechnik".* TU Vienna, Austria
Contact: ARGESIM, TU Wien
- 21-23 Three days training : "**Learning Simulation with Extend**" (in French or English) for people wanting to learning the concepts related with modelling and simulation through the use of the simulation environment Extend. In Lyon (France). Also available on-site.
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51

February 1998

- 2-4 Three days training : "**Simulating bulk flows**" (in English) for experienced simulation persons confronted to high rate flow processes. In Lyon (France).
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51

March 1998

- Seminar aus Modellbildung und Simulation "Modellbildung und Simulation in der MATLAB/SIMULINK-Umgebung".* TU Vienna, Austria
Contact: ARGESIM, TU Wien
- 5 One day seminar : "**Simulation and kanban**" (in French) for understanding the benefits of simulation in kanban-related applications. In Lyon (France).
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51
- 26 One day seminar : "**Understanding simulation**" (in French) for managers and engineers wanting to know what simulation is about. In Lyon (France).
Contact: Jacqueline Gélinier, 1Point2, Tel.: +33 4 78 23 16 51

April 1998

- 1-3 Three days training : "**Learning Simulation with Extend**" (in French or English) for people wanting to learning the concepts related with modelling and simulation through the use of the simulation environment Extend. In Lyon (France). Also available on-site.

Calendar of Events

November 1997

- 11-14 **ASIM 97. 11. Symposium Simulationstechnik.** Dortmund, Germany
Contact: Dipl.Inform. Sigrid Wenzel, Fraunhofer IML, Joseph-von-Fraunhofer-Str. 2-4, D-44227 Dortmund, Tel.: +49-231-9743 237, Fax: +49-231-9743 234, Email: wenzel@iml.fhg.de
- 20-21 **5. Workshop "Sichtssysteme - Visualisierung in der Simulationstechnik".** Wuppertal, Germany
Contact: Dr. R. Möller, BUGH Wuppertal, Fachbereich 13, Lehrstuhl für Automatisierungstechnik, Fuhlrottstraße 10, D-42119 Wuppertal, Tel.: +49-202-439-2945, Fax: +49-202-439-2944, Email: gi@Ifa.uni-wuppertal.de, WWW: <http://welfad.elektro.uni-wuppertal.de/gi>

December 1997

- 7-10 **WSC'97.** 1997 Winter Simulation Conference. Atlanta, GA
Contact: Barry L. Nelson, Northwestern University, Dept. Industrial Engineering and Management Sciences, 2225 N. Campus Drive, USA-Evanston IL 60208-3119, Tel.: +1-847 491 3747, Fax: +1-847 491 8005, Email: nelsonb@random.iems.nwu.edu, WWW: <http://www.wintersim.org/>
- 8-11 **MODSIM 97.** International Congress on Modelling and Simulation - IMACS. Hobart, Tasmania
Contact: MODSIM 97 Congress Secretariat, attn. Dr. A. David McDonald, PO Box 1538, c/- CSIRO Marine Laboratories, AUS-Hobart Tasmania 7001, Tel.: +613-6232-5482, Fax: +613-6232-5000, Email: MODSIM97@ml.csiro.au, WWW: <http://www.ml.csiro.au/modsim97/>
- 16 **ISCS'97.** Napoli, Italy
Contact: Vincenzo Grassi, Università di Roma "Tor Vergata", Dipartimento di Informatica, Sistemi e Produzione, I-00133 Roma, Tel.: +39-6 7259 4477, Fax: +39-6 2020519, Email: grassi@info.utovrm.it

January 1998

- 5-7 **EUROMEDIA '98.** Multimedia, Telematics Conference. Leicester, U.K.
Contact: Philippe Geril, SCS European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Tel.: +32-9 233 77 90, Fax: +32-9 223 49 41, Email: Philippe.Geril@rug.ac.be, WWW: <http://hobbes.rug.ac.be/~scs/>
- 11-14 **International Conference on Web-Based Modeling & Simulation.** San Diego, CA USA
Contact: Paul A. Fishwick, Dept. of CISE, University of Florida, Room 301, CSE Building, USA-Gainesville, FL 32611, Tel.: +1-352-392-1414, Fax: +1-352-392-1414, Email: fishwick@cise.ufl.edu, WWW: <http://www.cise.ufl.edu/~fishwick/webconf.html>

February 1998

- 16-17 **ASIM-SPL'98.** 8th ASIM Working Group Conference "Simulation in Produktion und Logistik". Berlin, Germany
Contact: Markus Rabe, FhG-IPK, Pascalstraße 8-9, D-10587 Berlin, Fax: +49-30-3932503, Email: Markus.Rabe@ipk.fhg.de, WWW: <http://www-plt.ipk.fhg.de/ASIM-Fachtagung/>

- 18-20 **MIC'98.** 17th IASTED International Conference on Modelling, Identification and Control. Grindelwald, Switzerland
Contact: IASTED Secretariat, Suite 101, 1811 West Katella Avenue, USA-Anaheim, CA 92804, Tel.: +1-714-778-3230, Fax: +1-714-778-5463, Email: iasted@cadvision.com, WWW: <http://www.iasted.com/>

March 1998

- 2-3 **ASIM-ST'98.** Treffen der ASIM Fachgruppe "Simulation Technischer Systeme". Heidelberg, Germany
Contact: Dr. Ingrid Bausch-Gall, BAUSCH-GALL GmbH., Wohlfahrtstraße 21 b, D-80939 München, Tel.: +49-89-3232625, Email: 100564.302@compuserve.com
- 4 **ASIM-SSHW'98.** Treffen der ASIM-Fachgruppe "Simulationssoftware und -Hardware". Magdeburg, Germany
Contact: Prof. Dipl.-Ing. Dr. Felix Breitenecker, Technische Universität Wien, Abt. Simulationstechnik / ARGESIM, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel.: +43-1-58801-0, Email: Felix.Breitenecker@tuwien.ac.at, WWW: <http://argesim.tuwien.ac.at/asim/sshw/>
- 5-6 **SV 98.** Simulation und Visualisierung. Magdeburg, Germany
Contact: Inst. f. Simulation und Graphik, Otto-von-Guericke Universität Magdeburg, Postfach 4120, D-39016 Magdeburg, Tel.: +49-391-67-12858, Fax: +49-391-76-11164, Email: tagung@isg.cs.uni-magdeburg.de, WWW: <http://isgnw.cs.uni-magdeburg.de/~pelo/MConf/98e.htm>
- 29-31 **ASIM-UMW'98.** Workshop der ASIM-Fachgruppe "Simulation in Umweltanwendungen". Wittenhausen, Germany
Contact: Prof.Dr.habil. Rolf Grützner, Universität Rostock, FB Informatik, Albert-Einstein-Str. 21, D-18051 Rostock, Tel.: +49-381-4983369, Fax: +49-381-4983426, Email: gruet@informatik.uni-rostock.de, WWW: http://www.informatik.uni-rostock.de/FB/Praktik/Mosi/ak5/ak_info.html

April 1998

- 1-4 **CESA'98.** 2nd IMACS International Multiconference on Computational Engineering in Systems Applications. Nabeul-Hammamet, Tunisia
Contact: CESA'98 Secretary, Ecole Centrale de Lille, BP 48, Cite scientifique, F-59651 Villeneuve d'Ascq Cedex, France, Tel.: +33-32033-5499, Email: cesa98@ec-lille.fr, WWW: <http://www.ec.lille.fr/~cesa98/>
- 14-18 **EUROSIM '98.** 3rd EUROSIM European Simulation Congress. Helsinki, Finland
Contact: EUROSIM'98, Congress Secretariat, P.O.Box 1301, FIN-02044 VTT, Fax: +358-9-456 6752, Email: eurosim98@vtt.fi, WWW: <http://www.vtt.fi/aut/tau/network/eurosim/eurocall.htm>
- 14-17 **EMCSR 98.** 14th European Meeting on Cybernetics and Systems Research. Vienna, Austria
Contact: EMCSR98 Secretariat, Österr. Studiengesellschaft f. Kybernetik, Schottengasse 3, A-1010 Wien, Austria, Tel.: +43-1 53532810, Fax: +43-1 5320652, Email: sec@ai.univie.ac.at, WWW: <http://www.ai.univie.ac.at/emcsr/>

21-22 **SIWIS-98.** Workshop "Simulation in Wissensbasierten Systemen" der ASIM-Fachgruppe "Simulation und Künstliche Intelligenz". Paderborn, Germany
Contact: Prof. Dr. Helena Szczerbicka, Rechnerarchitektur und Modellierung, Univ. Bremen, D-28334 Bremen,
Email: helena@informatik.uni-bremen.de, WWW:
<http://www.uni-paderborn.de/fachbereich/AG/agklbue/workshops/>

26-29 **ECEC98.** 5th European Concurrent Engineering Conference. Erlangen-Nuremberg, Germany
Contact: Philippe Geril, SCS European Simulation Office, University of Ghent, B-Ghent, Tel.: +32-9 233 77 90, Fax: +32-9 223 49 41, WWW: <http://hobbes.rug.ac.be/~scs>

May 1998

05-07 **MOSYS'98.** Modelling and Simulation of Systems. Bystrice pod Hostinem, Czech republic
Contact: Jan Stefan, FEI - VSB TU, CZ-Ostrava Poruba,
13-16 **MS'98.** IASTED Int. Conf. on Modelling and Simulation. Pittsburgh, USA
Contact: IASTED Secretariat, Suite 101, 1811 West Katella Avenue, USA-Anaheim, CA 92804, Tel.: +1-714-778-3230, Fax: +1-714-778-5463, Email: iasted@cadvision.com, WWW: <http://www.iasted.com/>

June 1998

16-19 **ESM '98.** 12th European Simulation Multiconference. Manchester, U.K.
Contact: Philippe Geril, SCS European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Tel.: +32-9 233 77 90, Fax: +32-9 223 49 41, Email: Philippe.Geril@rug.ac.be, WWW: <http://hobbes.rug.ac.be/~scs/>
16-19 **ITI'98.** 20th International Conference Information Technology Interfaces. Pula, Croatia
Contact: J. Marohnica, University Computing Centre, HR-10000 Zagreb, Croatia, Tel.: +385-1-616-5591, Email: iti@srce.hr, WWW: <http://www.srce.hr/iti>
22-27 **ECMI 98.** 10th Conference of the European Consortium for Mathematics in Industry. Göteborg, Sweden
Contact: ECMI 98, School of Mathematical and Computing Sciences, Göteborg University, S-412 96 Göteborg, , Fax: +46-31-161973, Email: ecmi98@math.chalmers.se, WWW: <http://www.mathg.chalmers.se/ECMI98/>

September 1998

6-8 **SCSI workshop "Modelling and Simulation within a Maritime Environment"**. Riga, Latvia
Contact: Prof. Dr. Yuri Merkuryev, Dept. Modelling and Simulation, Technical University, 1 Kalku Street, LV-Riga, Latvia, Tel.: +371-7324480, Fax: +371-7820094, Email: merkur@itl.rtu.lv
15-18 **ASIM'98.** 12. Symposium Simulationstechnik. Zürich, Switzerland
Contact: Dr. Veronika Hrdliczka, ETH Zürich, Institut f. Werkzeugmaschinen u. Fertigung, Tannenstr. 3, CH-8092 Zürich, Tel.: +41-1-632 5252, Fax: +41-1 632 1125, Email: hrdliczka@iwf.bepr.ethz.ch
15-17 **ASIS.** Advanced Simulation of Systems. Brno, Czech republic
Contact: Dr.Ing. Zdenka Rabova, TU FEI Brno, Bozotechova 2, CZ-Brno,
30-October 2
IEE International Conference on SIMULATION.
Contact: Mrs. Hudson Louise, IEE Conference Executive, Email: lhudson@iee.org.uk

December 1998

13-16 **WSC'98.** 1998 Winter Simulation Conference. Washington, D.C.
Contact: John Carson, AutoSimulations, 1827 Powers Ferry Rd., Bldg. 17, Suite 100, USA-Atlanta, GA 30339, Tel.: +1-770-955-1501, Fax: +1-770-955-1592, Email: johnc@autosim.com, WWW: <http://www.wintersim.org/>

January 1999

4-8 **PACAM VI.** 6th Pan American Congress of Applied Mechanics. Rio de Janeiro
Contact: Email: pacam99@civ.puc-rio.br, WWW: <http://www.am-stanford.edu/SteeleGroup/PACAMVI/>

March 1999

08-10 **7th Symposium "Simulation for managerial decision support"**. Braunlage, Germany
Contact: Prof.Dr. Wilhelm Hummeltenberg, Universität Hamburg, Institut für Wirtschaftsinformatik, Max-Brauer-Allee 60, D-22765 Hamburg, Tel.: +49-40-4123 4023

April 1999

20-22 **BioMedSim'99.** 1st Conference on Modelling and Simulation in Biology, Medicine and Biomedical Engineering. Noisy-le-Grand, France
Contact: Prof. Dr. Yskandar Hamam, ESIEE, Computer Control Laboratory, 2 Bld Blaise Pascal, F-93162 Noisy le Grand, Tel.: +33-1 45 92 66 11, Fax: +33-1 45 92 66 99, WWW: <http://www.esiee.fr/~hamamy/bioconf.html>

September 1999

14-16 **ElectrIMACS.** Conferenece on Electrical Machines, Converters and Systems. Lisbon, Portugal
Contact: Prof. Antonio Dente, Dept. Engenharia Electrotecnica e de Computadores, Seccao de Maquinas Electricas, Av. Rovico Pais, P-1096 Lisboa Codex, Tel.: +351-1-8417435, Fax: +351-8417167, Email: edentepc@alfa.is.utl.pt
21-24 **ASIM 99.** 13. Symposium Simulationstechnik. Weimar, Germany
Contact: Prof. G. Hohmann, Bauhaus-Universität Weimar, D-99421 Weimar, Tel: +49-3643 584 250, Email: hohmann@informatik.uni-weimar.de

EUROSIM - Simulation News Europe

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

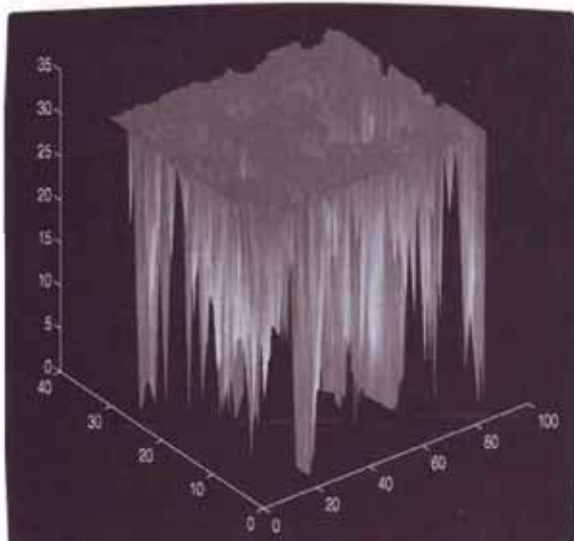
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Dieser Oberflächenplot zeigt Stoßbeschädigungen einer Hubschrauber-Verbundwerkstoffstruktur. Zur Automatisierung zerstörungsfreier Prüfens klassifizierte die MATLAB Neural Net Toolbox Echos von Ultraschallsignalen. Die Daten wurden freundlicherweise von McDonnell Douglas unter einem AATD contract zur Verfügung gestellt.

DIE SPRACHE DER INGENIEURE

MATLAB—eine leistungsfähige, schnelle, interaktive Software—ist das beste Bindeglied zwischen Forschung und technischer Ausführung.

MATLAB ist eine Programmierungsumgebung für die Entwicklung von Algorithmen, Simulation und Analyse mit Visualisierung, numerischen Berechnungen und einer technischen Sprache.

MÄCHTIG FÜR UNTERSUCHUNGEN UND PROTOTYPING

In MATLAB werden Aufgabenstellungen und Lösungen so formuliert, wie es in der Mathematik üblich ist—ohne eine Zeile C oder FORTRAN Code zu schreiben.

Hunderte mächtiger Funktionen, die auf Effizienz und Zuverlässigkeit optimiert sind, sind mit einer leistungsfähigen und intuitiven Programmiersprache gekoppelt.

FACHWISSEN IN MATLAB VERFÜGBAR

Toolboxen bieten eine große Auswahl an optimierten Funktionen für Datenreduktion, Analyse, Modellierung und Systementwurf.

Mit den MATLAB-Toolboxen, die von anerkannten Fachleuten entwickelt werden, können erprobte, dem neuesten Wissensstand entsprechende mathematische Vorgehensweisen erlernt und auf eigene Aufgabenstellungen angewandt werden.

VISUALISIERUNG KOMBINIERT MIT MÄCHTIGEN ANALYSEFUNKTIONEN

Leistungsfähige objektorientierte Grafik erlaubt interaktive Analyse und dynamische Modellbildung. Die umfangreichen Visualisierungsfunktionen umfassen 2-D, 3-D und 4-D Darstellung sowie Beleuchten von Oberflächen und Schattieren.

Hinter vielen technologisch fortschrittlichen Entwicklungen steht die Sprache der Ingenieure und Wissenschaftler:

MATLAB



McDonnell Douglas verwendet MATLAB zur Entwicklung von automatischen zerstörungsfreien Prüfprozessen für Hubschrauber, wie z.B. den Longbow Apache

MATLAB für ingenieur- technische Aufgaben

MATLAB

MATLAB Compiler

MATLAB C Math Library

MATLAB C++ Math Library

Anwendungs-Toolboxen für:

Signalverarbeitung

Reglerentwurf

Financial Engineering

Bildverarbeitung

Datenanalyse & Modellbildung

ENTWICKLUNG VON MATLAB-PROGRAMMEN UND STANDALONE-ANWENDUNGEN

Umfangreiche GUI-Entwicklungswerkzeuge erlauben das individuelle Gestalten interaktiver MATLAB-Anwendungen.

Man kann MATLAB mit C und FORTRAN Programmen linken, Toolboxen einbeziehen, Daten mit anderer Software austauschen und MATLAB als ein Analyse- und Visualisierungs-Werkzeug einbauen.

Mit dem neuen MATLAB Compiler und der C Math Library lassen sich automatisch MATLAB-Algorithmen in standalone Programme umwandeln.



WEITERE INFORMATIONEN...

Nehmen Sie mit uns Kontakt auf, und fragen Sie nach kostenlosen, technischen Unterlagen zur MATLAB-Produktfamilie:

Tel.: 089/995 901 0

Fax: 089/995 901 11

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