EUROSIM

SCS EUROPE

# SIMULATION NEWS EUROPE

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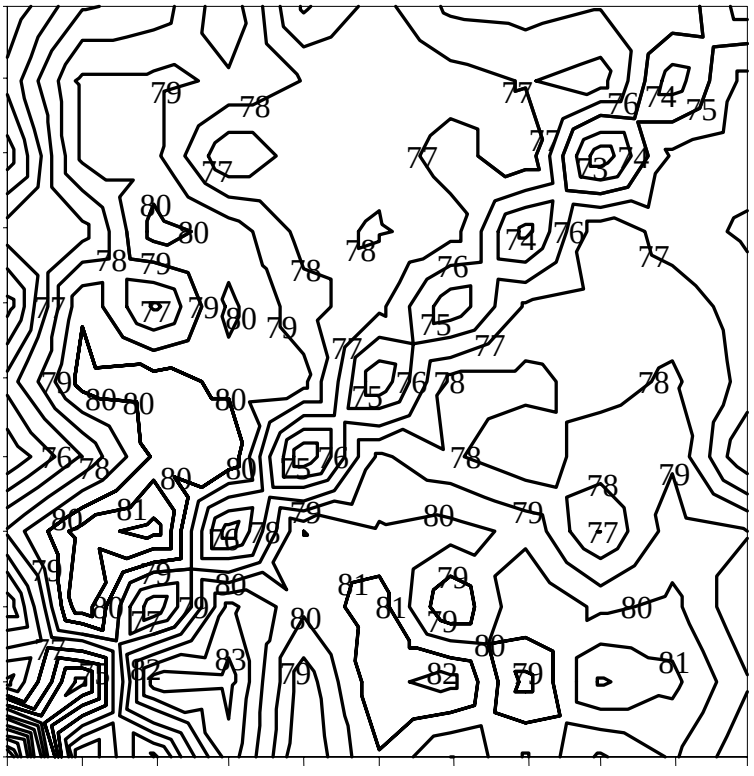

Number 26

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A EUROPEAN FORUM ON SIMULATION ACTIVITIES

AN ARGESIM PUBLICATION

# Contents



# Editorial

*We are pleased with the many positive comments and reactions to Simulation News Europe (SNE), number 25, introducing new aspects of modelling and simulation, extending the range of society reports, and being official membership journal for EUROSIM as well for SCS Europe.*

*We welcome new contributing societies: IIE, the Institute of Industrial Engineers, will inform about its activities in modelling and simulation. ROMSIM, the Romanian Simulation Society, a new Observer Member of EUROSIM, will report regularly on its activities.*

*The last issues were distributed to User Groups, e.g. for MicroSaint or MATLAB). This issue puts special emphasis on ACSL (Advanced Continuous Simulation Language), that turns 25 next year. Several articles report on ACSL and ACSL solutions of all the continuous comparisons are documented in this issue, which will be distributed to European ACSL User Groups.*

*Also the series on Software Development is continued with contributions on modelling standardisation (Modelica), vector compiler for neural nets, and modelling aspects of rotor-stator contact problems.*

*We continue to be open for new subjects and areas related to modelling and simulation. The essay on Monte Carlo simulations shows the use of computer algebra systems or general purpose mathematical analysis tools for modelling and analysing event processes and queuing processes. The contour plot on the title page is taken from this paper.*

*We thank all authors for their contributions, feedback, and support.*

*F. Breitenecker, I. Husinsky*

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Editor-in-Chief: Felix Breitenecker
Associate Editor: Mrs. Irmgard Husinsky


**Address:** SNE-Editors/ARGESIM
c/o Dept. of Simulation Techniques
Vienna University of Technology
Wiedner Hauptstr. 8-10
A-1040 Vienna, Austria
Tel: +43-1-58801 11452, 42014
Fax: +43-1-58801 42098
email: sne@argesim.org
WWW: http://www.argesim.org/sne/


**Deadline for the next issue** will be October 2, 1999

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# An Approach to Monte-Carlo Simulation for Reliability and Maintenance Problems

Colin G. Black
Mathematics, Science and Computing Centre
Ngee Ann Polytechnic
Clementi Road, Singapore
bcg@np.edu.sg

**Abstract**

*This paper describes an approach to event-driven Monte-Carlo simulations that can be applied to reliability and maintenance problems for engineering systems. The approach has been implemented using the Mathcad software package as a platform. An example is presented where the approach is applied to a production-line system. The example shows how the reliability of all or part of the system can be determined as a statistical distribution. The usage of the approach to optimize time intervals for preventive system maintenance is also discussed.*

## 1. Introduction

Monte-Carlo simulation [1] is a technique widely used by researchers to obtain insight into systems whose elements contain uncertainty and which do not lend themselves easily to direct analysis. The approach relies on repeating an experiment (i.e. ”spinning the Monte-Carlo roulette wheel”) many times in order to gain some insight into the likelihood of obtaining various responses from the system.

Those aspects of the system which are subject to uncertainty are described by a suitable statistical distribution, such as a Weibull or Normal distribution [2]. The combined effect of many system elements, however, can generally be modeled using a Normal distribution (defined by a mean value and a standard deviation). This assumption is valid, irrespective of the nature of the individual element distributions, and follows from the central-limit theorem of statistics [2].

## 2. Simulation Approach

There are several main features to the approach presented here for event-driven system simulations.

Firstly, a system is defined in terms of event variables. These binary event variables have the value 1 if active or 0 if inactive, at time t. The simulation commences at time t=0 and proceeds in discrete time steps until the end time for the simulation. At any given time, an aspect of the system performance will be a function of all the event variables.

The time to an event (or between events) can be *fixed, uncertain* or *conditional*. The duration of an event can also be *fixed, uncertain* or *conditional*. *Fixed* times and fixed durations are specified before the simulations. *Uncertain* times and *uncertain* durations are defined by statistical distributions. *Conditional* events are logical Boolean statements, defined in terms of other events. A system is thus described in terms of events which can have aspects of certainty, uncertainty and conditionality.

Another feature of the approach given here is the incorporation of an additional ”loop” into the simulation. This ”loop” is over and above the two loops associated with time (for each simulation run) and run number. This loop represents the systematic variation of one or more of the model parameters within the simulation. This allows for the optimization of some aspect of the system with respect to these model parameters. In the example presented later, the effect on the expected output of a production-line for various intervals of preventive maintenance is explored.

Another feature of the approach given here relates to the software platform on which it is implemented. The software platform used is *Mathcad* [3]. *Mathcad* is a powerful general-purpose mathematical analysis tool. The body of the simulation approach was implemented using its programming features. Output data from the simulation can be analyzed, post-processed and graphed using *Mathcad's* data and graphical features. A significant advantage of using *Mathcad* is that it dispenses with the need to purchase specialized and expensive proprietary simulation software. Moreover, the analyst is not restricted to the limitations of a particular simulation package. Ad-hoc changes can be made with relative ease in order to change some aspect of the simulation model, or to obtain some aspect of the system performance as output for analysis.

## 3. Simulation Output

In general, output from the simulations will include information on the overall system performance as well as on individual aspects of the system. For a production-line, for example, one thing of interest to an analyst will be the expected output over a period of time (e.g. 90% of full capacity). Another thing of interest may be the fraction of time a particular machine in the production-line is down (e.g. 5% of the time).

These values will be estimated as statistically expected values (i.e. mean values) and will be reported together with error bounds (i.e. standard deviations) for the estimates. Both the number of simulation runs, and the time length of each simulation run, must be sufficiently large so as to ensure that the output data have relatively small standard deviations. Estimates with a relatively large degree of uncertainty will be of little use. It is this aspect of the Monte-Carlo approach that is the most problematic. For some systems, lengthy and time-consuming runs need to be performed in order to obtain meaningful results. With increasing computing power, however, this problem will tend to diminish.

## 4. Simulation Example

The simulation approach is presented here using a production-line system. An outline of the system model is shown below in Figure 1.

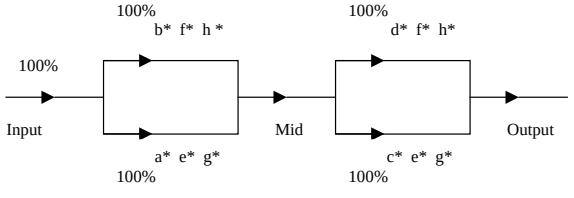


Figure 1: Production-Line-System

The system contains four machines situated on the four branches as shown. Each machine has the capacity to cope with 100% throughput. The two branches represent a built-in over-capacity of the system to cope with the failure or shutdown of one of the machines on each branch. For example, if machine 1 becomes inactive, but machine 2 is active (i.e. on standby) then the throughput of the system remains at 100% capacity. A machine can be inactive either through failure (typically characterized by uncertainty) or through periodic preventive (characterized by certainty).

For the system simulation, the failure of machines 1 to 4 will be represented by the events ***a, b, c*** and ***d*** respectively. Each of these events will be assigned statistical distributions which model the times to failure [4]. The duration of each failure (i.e. the length of time for repair and detection) will also be modeled by statistical distributions. Weibull distributions are used to model the times between failure for ***a, b, c*** and ***d***. A shape parameter of 1 is used for all four events, whilst events ***a*** and ***c*** have a mean time to failure of 50 days; and events ***b*** and ***d*** have a mean time to failure of 25 days. In other words, the back-up or standby branches (i.e. ***b*** and ***d***) are less reliable than the branch used in normal operation of the system (i.e. ***a*** and ***c***). Normal distributions are used to model the duration of the failures. A mean value of 15 days and a standard deviation of 1 day is used for all four events.

It is further assumed that for machine 1, the failure (represented by event ***a***) or the shutdown (e.g. for preventive maintenance, described later using event ***g***) has consequences for the operation of machine 3, and vice versa. For example, because of the proximity of machine 1 to machine 3, access to one machine for repair or maintenance can only be achieved when the other member of the pair is also shut down. In other words if machine 1 is inactive, then machine 3 must be inactive also, and vice versa. The same type of mutual dependency also exists between machines 2 and 4. The conditional events: ***e*** and ***f***, model these two mutual dependencies.

It is not possible to assign a physical location in the scheme given above for the two *conditional* events: ***e*** and ***f***; they can, however, be conceptually placed on the branches as shown above. (This conceptual placement of the *conditional* events assists in defining the system performance index described later.)

Event ***g*** represents the periodic preventive maintenance of machines 1 and 3. Event ***h*** represents the same for machines 2 and 4. Events ***g*** and ***h*** occur at predetermined times and are of fixed duration. The effect of varying these time intervals for preventive maintenance will be explored, and an optimal maintenance strategy will be sought. A fixed value of 1 day is used for the duration of all preventive maintenance activities.

A further important feature of the simulation model for the system given above relates to the effect of the preventive maintenance on the system behavior. Following preventive maintenance, the onset of failure is further ”delayed” by ensuring that the next time to fail-

ure (e.g. event ***a***) is generated at the end of the corresponding preventive maintenance period (e.g. event ***g***). This models any benefits that may be gained by attempting to prevent failure through preventive maintenance rather than managing it once it has occurred.

It should be noted, however, that excessively regular preventive maintenance may result in a greater drop in system performance than if no preventive maintenance at all was carried out. This is because the downtime associated with the preventive maintenance activities may outweigh any other benefits.

## 5. Simulation Results

Some brief results will be presented here in order to give an indication of the type of analysis which can be performed.

An index of overall system performance with respect to a nominal 100% capacity is defined in terms of the binary variables ***a, b, c, d, e, f,*** and ***g***:

*Mid = Max[**Ca***(1-**a**)*(1-**e**)*(1-**g**) , **Cb***(1-**b**)*(1-**f**)*(1-**h**)]*
*Output =*
*Mid*Max[**Cc***(1-**c**)*(1-**e**)*(1-**g**) , **Cd***(1-**d**)*(1-**f**)*(1-**h**)]/100*

where ***Ca, Cb, Cc*** and ***Cd*** are the capacity values for the four branches; in this example, they are all assigned the value 100%.

For the results presented here, 30 simulations, each of length 2000 time units (i.e. days) are performed for each preventive maintenance strategy. In this example, a preventive maintenance strategy represents a combination of fixed times between maintenance for events ***g*** and ***h***. An expected value of the system performance index will be obtained for each preventive maintenance strategy. This represents an estimate of the reliability of the system for the maintenance strategy currently in operation.

For comparison with the main results, the system is also tested for the case where no preventive maintenance at all is carried out. That is, all machines are run until they fail, and are only then repaired. The expected value of the system index in this situation (together with estimated standard deviation) is as follows:

*No preventive maintenance:*
*Expected Performance Index = 71.85% (2.94%)*

When the system is subject to preventive maintenance, a matrix of expected performance indices is obtained for different combinations of maintenance intervals corresponding to event ***g*** and ***f***. A corresponding matrix of standard deviation values is also generated. The matrix of performance indices is presented below in Figure 2.

The same information is presented below in Figure 3 as a contour plot, where the contours represent lines of equal reliability:

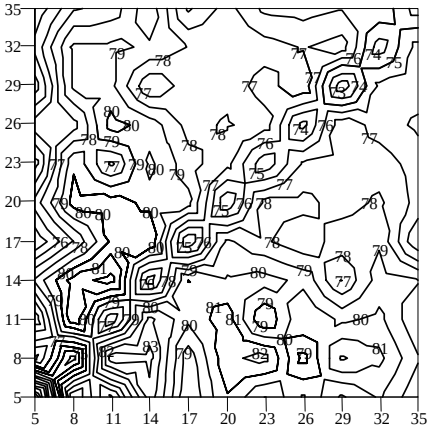


Figure 3: Contour Plot for % Performance Indices

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 64.85 | 79.33 | 74.28 | 78.22 | 74.15 | 76.39 | 73.55 | 76.49 | 73.47 | 75.36 | 74.18 |
| 81.01 | 73.55 | 81.89 | 81.5 | 76.98 | 80.4 | 79.86 | 76.62 | 79.23 | 79.22 | 76.89 |
| 76.83 | 83.55 | 76.16 | 82.42 | 80.27 | 80.48 | 76.82 | 80.41 | 79.21 | 80.05 | 77.38 |
| 82.67 | 83.35 | 82.24 | 75.39 | 80.89 | 79.71 | 80.21 | 79.59 | 76.09 | 78.84 | 79.71 |
| 78.09 | 78.39 | 80.24 | 81.02 | 74 | 79.38 | 78.39 | 77.62 | 77.47 | 77.98 | 75.81 |
| 80.91 | 81.73 | 81.55 | 80.13 | 79.21 | 74.07 | 77.34 | 78.12 | 77.64 | 77.96 | 77.43 |
| 78.95 | 82.37 | 78.01 | 80.39 | 78.15 | 78.32 | 74.24 | 77.5 | 76.53 | 77.5 | 75.73 |
| 81.07 | 78.63 | 81.02 | 79.71 | 77.26 | 78.33 | 77.15 | 73.63 | 77.85 | 76.93 | 75.58 |
| 78.87 | 82.13 | 79.77 | 76.98 | 78.59 | 77.57 | 77.38 | 77.73 | 72.26 | 77.5 | 75.94 |
| 80.11 | 81.27 | 80.26 | 79.49 | 78.85 | 78.18 | 77.56 | 76.51 | 76.3 | 73.48 | 75.8 |
| 78.23 | 79.1 | 78.03 | 79.09 | 75.03 | 76.69 | 76.52 | 75.82 | 76.52 | 76.45 | 73.51 |

Figure 2: Matrix of % Performance Indices for (***g, h***) in days

From the results it can be seen that with the exception of excessively frequent maintenance (i.e. every 5 days), preventive maintenance always results in a better reliability of the system than if none was carried at all. As the frequency of preventive maintenance decreases, the figures are seen to move towards the value for no preventive maintenance (e.g. every 35 days), and the benefits to the system performance or reliability become less apparent.

The "valley" which can be seen in one of the diagonals of the expected system performance matrix can be easily understood. It corresponds to all four machines being subject to preventive maintenance at the same time. Consequently, the system will definitely have periods when there will be absolutely no throughput.

Using the above information, the optimal maintenance strategy is found to be approximately every 14 days for ***g*** (i.e. for machines ***a*** and ***c***, and noting that 14 days is selected in preference to 11 days, because the difference between the two figures is minute); and approximately every 8 days for ***h*** (i.e. for machines ***b*** and ***d***). The ratio of these two figures (approximately 2) reflects the known fact that machines ***a*** and ***c*** are more reliable than machines ***b*** and ***d***, where their ratio of mean times to failure is also 2.

With the above selected optimal maintenance strategy, the performance index and calculated standard deviation is as follows:

*With selected preventive maintenance strategy:*
*(Optimal) Expected Performance Index = 83.35% (2.22%)*

In reality, the benefits of regular preventive maintenance may also be offset by the costs incurred for the maintenance. The optimization procedure given above can be extended to include any such considerations. In addition, for the above simulations it has been assumed that preventive maintenance will restore the machines to a state which is as "good as new".

There may also be a degradation of machine reliability due to aging [4]; this could also be incorporated into the simulation, and corresponds to making the expected times between failures themselves functions of time.

The expected performance index, together with the estimated standard deviation, allows the analyst to make probabilistic statements about the likely performance of the system. For example, the optimal maintenance strategy selected above gives a mean or expected performance for the system of 83.35% of its nominal full capacity, with a standard deviation of 2.22%. These figures define the Normal distribution for the system performance. There is a probability of the order of 0.05 (i.e. 5%) that the actual performance of the system will be less than 80% of full capacity. There is a similar probability that the actual performance of the system will exceed 87% of full capacity. These probabilities for values between 80% and 90% are graphed below in Figure 4. (It is worth pointing out that this type of analysis is carried out with ease using *Mathcad*).

## 6. Conclusion

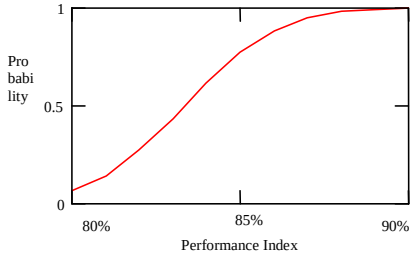


Figure 4: Probability of System Index below Indicated Value

Event-driven simulations of complex engineering systems subject to uncertainty can be performed using the approach described above. The approach can be implemented using a relatively inexpensive software platform, namely *Mathcad*; this package can also be of benefit in the post-processing and subsequent analysis of the results obtained.

As demonstrated by the example given here, the approach can be used to optimize important system parameters, and can be of assistance in developing strategies, for example in the area of preventive maintenance. The approach also produces results which allow the analyst to make probabilistic statements about the likely system performance.

This paper emphasized the application of the approach to reliability and maintenance problems, but is also likely to be of use in other areas which can be similarly modeled using event-driven simulations.

### References

[1] Pat Macaluso, "Learning Simulation Techniques on a Microcomputer Playing Blackjack & Other Monte Carlo Games", TAB BOOKS Inc., USA, 1983.

[2] George R. Cooper and Clare D. McGillem, "Probabilistic Methods of Signal and System Analysis", Oxford University Press, 3rd Edition, 1999.

[3] *Mathcad*. Website: http://www.mathsoft.com/mathcad/

[4] Michael Pecht (Editor), "Product Reliability, Maintainability and Supportability Handbook", ARINC Research Corporation, CRC Press, USA, 1995.

A Mathcad program template is available from the author.

# EUROSIM
# the Federation of European Simulation Societies

**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 three observer members: 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), PSCS – Polish Society for Computer Simulation (Poland) and ROMSIM (Romanian Society for Modelling and Simulation) are observer members.

The EUROSIM Congress is arranged every three years in Europe. The 4th EUROSIM congress will take place in Delft, The Netherlands, June 26-30, 2001.

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).

At the EUROSIM'98 Congress the Board elected new officers for a three years period beginning on July 1, 1998: L. Dekker (DBSS) – president, K. Juslin (SIMS) – past president, A. Javor (HSS) – secretary, Y. Hamam (FRANCOSIM) – treasurer.

EUROSIM societies are offered to distribute to their members the news journal *Simulation News Europe* (SNE) as official membership journal. Furthermore members can subscribe the scientific journal *Simulation Practice and Theory* (SIMPRA) at a significantly reduced price.

## Letter of the President

*April 19, 1999 several EUROSIM meetings have taken place in Paris, France, before the first BioMed Sim conference, organised by our member society FRANCOSIM.*

*We are happy to announce that the EUROSIM Board agreed to give ROMSIM (Romanian Simulation Society) the observer status.*

*On February 9, 1999 a cooperation agreement has been signed between the Japanese Simulation Society and EUROSIM. Also a liaison committee has been established. From the side of JSST Shoji Shinoda is member, from the side of EUROSIM J. Halin and Y. Hamam.*

*April 15, 1999 a delegation of the Chinese Association for System Simulation has visited Delft. The CASS delegation comprises prof. Wang Xingren (President of CASS), prof. Li BoHu (member of the CASS Board), prof. Liang Bingcheng, dr. Gao Dongrui and dr. Li Zeyong from the Beijing Simulation Center. Both sides agree to intensify the cooperation, for example – through exchange of information (publications, SIMPRA journal and CASS journal), – CASS plans to send frequently delegations to EUROSIM societies. In the summer of this year they planned a visit of a delegation to the Delft University of Technology, – joint organization of international conferences. EUROSIM is involved in the 4th International Conference on System Simulation and Scientific Computing (BICSC'99) and CASS is willing to cooperate with EUROSIM in the EUROSIM 2001 congress. Furthermore the possibility has been discussed of publishing a special issue of the coming BICSC '99 conference in SIMPRA.*

*The initial period of the liaison committee between SCSI and EUROSIM will be finished after July 17 this year. The Board agreed on two new candidates from the side of EUROSIM: H. Pierreval (FRANCOSIM) and J. Halin (ASIM).*

*In Paris also the candidature of FRANCOSIM, as organizer of the triannual congress in 2004, has been approved. Prof. dr. Y. Hamam has become the President Elect. There was also decided in Paris, that the President Elect becomes automatically member of the Executive Board, in order to make profit of the experi-*

*ence of the Past President and the President. The Czech and Slovak society informed the Board that they like to be the candidate for the triannual congress after 2004.*

*Furthermore there was discussed the investigation of electronic publishing of SIMPRA as well as the investigation with respect to a merger of SIMPRA with the SCSI journal Transactions.*

*In the last issue of SNE it is mentioned that EUROSIM is governed by a Board. However, there are two Boards, the Board of Directors and the Executive Board. Once a year, both Boards have a meeting. In between the daily affairs are governed by the Executive Board. At the occasion of a triannual EUROSIM congress, both Boards are elected for the next period. Members of the Executive Board are the President, the Past President, the President Elect, the Secretary, the Secretary to the President, the Treasurer, a member on behalf of the SIMPRA journal and a member on behalf of the newsletter SNE.*

*In the last issue of SNE it is indicated, that SNE has also become the newsletter of members of SCS Europe. We feel happy that SNE is becoming also available for other simulation societies and individuals and we would like to thank the SNE editors for their work they are doing. What we want to confirm is, that SNE remains the official newsletter of EUROSIM and EUROSIM is the official and sole owner of SNE. However, the front page of this last issue of SNE may give a wrong impression.*

*For this reason, in order to avoid misunderstandings, we contacted the SNE editors and asked them to change the front page of the newsletter in the following way:*

*A European Forum of Simulation Activities*
*a EUROSIM publication*
*published by ARGESIM.*

*For more news about the EUROSIM'2001 congress, see the DBSS corner.*

*The next EUROSIM meetings will take place in June next year in Prague.*

*L. Dekker, President*

Further information about EUROSIM can be found on the EUROSIM WWW Server:

http://www.eurosim.org/

## Agreement between ARGESIM and EUROSIM

**With respect to: News Journal "Simulation News Europe" (SNE) and WWW-Server for EUROSIM**

Journal / Newsletter "Simulation News Europe"
Publication rate: Three times per year
Published by ARGESIM
Circulation of printed SNE: 2000 - 2500
Editors: F. Breitenecker, I. Husinsky; ARGESIM
SNE information is also structured in the EUROSIM WWW-Server
Aims and Scope of SNE, see SNE 19, p.4

Both partners agree upon the following:

- EUROSIM will use the newsletter SNE as the official newsletter for EUROSIM. It is recommended that all member societies use the newsletter as part of the personal membership, but this is not obligatory.
- EUROSIM will provide information for the SNE publication regarding EUROSIM affairs and the EUROSIM member societies will provide information on the member societies' activities. EUROSIM and the member societies will nominate societies editors, who are responsible for collecting and forwarding the societies' information to the SNE editors.
- EUROSIM and its societies will provide additional information for the WWW-Server or will provide links to society information on the Web
- ARGESIM will individually manage and invoice the orders for SNE from the EUROSIM societies (bulk orders). Societies may choose between bulk mailing and individual mailing. For societies which do not include SNE in the membership, a reduced individual subscription will be offered.
- ARGESIM additionally will manage and invoice the orders for the subscription of EUROSIM's scientific journal "Simulation Practice and Theory" (costs covered by ARGESIM).
- ARGESIM guarantees the maintenance of the EUROSIM WWW-Server. The contents for the server are taken from the current SNE issue. Additional information may be sent in, or links may be set to the societies' servers.
- *... some financial details ...*

Vienna / Helsinki, March 31, 1998

K. Juslin, EUROSIM President
F. Breitenecker, ARGESIM President

## ASIM

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

**ASIM'99**
***13. Symposium Simulationstechnik***
**September 21-24, 1999, Weimar**

The next ASIM conference will be in Weimar at the Bauhaus-Universität. Local organizer and chair of the program committee is Prof. G. Hohmann.

The interesting program is now finished. It includes three user's group meetings, tutorials, six invited speakers, a workshop, a so-called "*Praxisforum*", parallel sessions and poster sessions, which cover a wide variety of subjects.

The social program is very promising.

The conference will be accompanied by an exhibition of simulation software.

More details about the conference and the preliminary program can be found in the *ASIM-Nachrichten* and at http://www.asim-gi.org/asim99/.

**Membership Meeting with Elections**
***Mitgliederversammlung***

An ASIM membership meeting (*Mitgliederversammlung*) will take place on Wednesday, September 22, evening at the ASIM conference in Weimar. You do not have to register for the conference to participate at that meeting. This year the ASIM Board will be elected. For a detailed invitation see *ASIM-Nachrichten*, July 1999.

**ASIM 2000**

ASIM 2000 will take place from September 18 - 20 at University of Hamburg. Conference chair is Prof. Dietmar Möller.

For the first time the SCS-ESS conference will be at the same location directly after the ASIM conference from September 20 - 22.

On September 20th both conferences will be held at the same location. This will allow ASIM members to participate at both conference or at least meet international friends or visit SCS sessions on the joint day. One major social event will be held on September 20th.

**From the Board**

We are looking for a location for ASIM 2001. If you are interested to organize the conference, please contact Ingrid Bausch-Gall or Felix Breitenecker for further information.

The ASIM Board met in April at the new institute of Prof. Möller at Universität Hamburg. Main discussion points were: Program of the conference in Weimar, conference in Hamburg, book series, working groups. ASIM future and ASIM change in structure was discussed only shortly. The Board decided to meet on June 11, 1999 in Kassel for a special meeting to discuss this important issue.

**Contact Addresses**

**Austria, payment issues and membership administration:**

Prof. Dr. Felix Breitenecker
Technische Universität Wien, Abt. Simulationstechnik
Wiedner Hauptstraße 8-10, A-1040 Wien
Tel: +43-1 58801 11452
Fax: +43-1 58801 42098
email: Felix.Breitenecker@tuwien.ac.at

**Germany:**

Prof. Dr. Dietmar Möller (Speaker)
Universität Hamburg, FB Informatik
Vogt-Kölln-Str. 30
D-22527 Hamburg
Tel.: +49-40 42883 2438
Fax: +49-40 42883 2206
email: Dietmar.Moeller@informatik.uni-hamburg.de

or

Dr. Ingrid Bausch-Gall (Vice Speaker)
Wohlfartstraße 21b, D-80939 München
Tel: +49-89 3232625
Fax: +49-89 3231063
email: BauschGall@compuserve.com

**Switzerland:**

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

**WWW-Information:**

http://www.asim-gi.org/

**Electronic Mail:**

info@asim-gi.org (for information)
admin@asim-gi.org (for adminstration)

**ASIM Meetings to come**

For further information contact the speakers of the working groups or one of the contact persons above.

**September 21-24, 1999:** ASIM '99, *13. Symposium Simulationstechnik*, Weimar.

**February 21-22, 2000:** Meeting of the working group "*Simulation Technischer Systeme*" in Esslingen. For more Information contact Prof. Gerald Kampe or the speaker of the working group.

**March 8-9, 2000:** 9th Conference of the working group "*Simulation in Produktion und Logistik*" (FG 6), Berlin.

**March 13-15, 2000:** Seventh symposium "Simulation for Managerial Decision Support – New Tools and Approaches in Practice" in Braunlage, Harz.

**April 2000:** Meeting of the working group "*Simulation in Biologie, Medizin und Ökologie*".

**September 18-20, 2000:** ASIM'2000 will be held at Universität Hamburg

**Conferences with ASIM Participation**

**September 20-22, 2000:** ESS at Universität Hamburg

**EUROSIM 2001**

ASIM is – as all other EUROSIM societies – co-organiser of the EUROSIM Congress 2001, scheduled for the last week in June 2001 in Delft.

ASIM is now very concerned about the fact that there could not be found an agreement between DBSS, the organising society, and SCS Europe, with respect to a joint congress with ESM 2001 (also to be held in June 2001, prel. in Prague). ASIM is afraid that again a senseless competition will arise. Therefore ASIM has suggested two alternatives:

i) The EUROSIM Congress 2001 should be held in September 2001 – all previous (exept one) EUROSIM Congresses and European Simulation Congresses (ESCs) have been in September/October. A big advantage was that many EUROSIM societies had skipped their annual meetings, so that many particpants for the congress could be expected (preferred alternative).

ii) ASIM has previously underlined that as conference location for the EUROSIM Congress also Prague would be a very interesting place (SNE 22). As the ESM 2001 is scheduled to be held at Prague, ASIM suggests to have the Congress jointly with the ESM at Prague, organised by DBSS and CSSS.

## Working Groups (Fachgruppen FG)

**"Verteilte Systeme und parallele Prozesse" (FG 1)**

Actual information may be found in the WWW: http://www.eas.iis.fhg.de/asim/ws99/

For more information, please contact the speaker of the working group.

**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@eas.iis.fhg.de

**"Simulationssoftware und -hardware" (FG 2)**

The working group held a meeting jointly with FG5 "*Simulation technischer Systeme*" in March 1-2, 1999. The meeting was hosted by RWTH Aachen. Following the new ideas of the working group, the afternoon on March 1, 1999 was dedicated to symbolic computation in simulation, especially in simulation of technical systems.

Felix Breitenecker opened the session with an overview on the structure of CAS (Computer Algebra Systems), comparing also the most used systems Mathematica and Maple. Stefan Braun from Visual Analysis Munich followed with a very interesting contribution on industrial application of CAS; this contribution really showed that CAS may enrich the analysis methods of simulation study essentially. Finally, Andreas Himmeldorf (Scientific Computers Aachen) showed the capabilities, applications and interfaces of the CAS Maple.

On March 2, 1999, in parallel to the "*Arbeitsgespräche*" (see report of FG5), the evaluation of the ARGESIM Comparisons was presented (online via WWW).

It is intended to have in 2000 again a meeting jointly with another group. In autumn1999 there will be an informal meeting on the occasion of the EUFIT conference in Aachen (September 13-16).

**Speaker**: Prof. Dr. Felix Breitenecker, TU Wien, Abt. Simulationstechnik, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel: +43-1 58801 11452, Fax: +43-1 58801 42098, email: Felix.Breitenecker@tuwien.ac.at
**Vice-speaker**: Dr. Thomas Schulze, Univ. Magdeburg, Inst. f. Techn. Informationssysteme, Universitätsplatz 2, D-39106 Magdeburg, Tel: +49-391 67-12017, email: tom@isg.cs.uni-magdeburg.de

**"Simulation und künstliche Intelligenz" (FG 3)**

**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.de
**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)**

**Speaker**: Prof. Dr. Dietmar Möller, Universität Hamburg, FB Informatik, Vogt-Kölln-Str. 30, D-22527 Hamburg, Tel.: +49-40 42883 2438, Fax: +49-40 42883-2206, email: Dietmar.Moeller@informatik.uni-hamburg.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)**

The annual meeting of this working group has taken place at RWTH Aachen (Karman Auditorium) on March 1st and 2nd. It was joined from workung group FG2 with interesting contributions. More than 60 participants visited this meeting which was perfectly organized by Prof. Dr. Rake (IRT, *Inst. f. Regelungstechnik*) and his assistant Florian Dietz. The program included presentations from the IRT, three parallel talks ("*Arbeitsgespräche*") about automatization, application of state machines and test of control systems in automotives. Topic of the last session was the application of computer algebra systems for engineering tasks (Prof. Breitenecker).

During the common meeting of the members of both working groups the activities at ASIM'99 in Weimar and the future of ASIM and its working groups were discussed.

At night most of the participants traditionally met at the typical Aachen restaurant, *Aachener Braustuben*, and discussed till late in the night.

The first presentations of the second day concerned modeling and model description languages. The languages Modelica (Dr. Otter, DLR) and VHDL-AMS, (W. Commerell, FH Ulm) have been presented. Subject of the next parallel sessions were VHDL-AMS, hydraulic systems and evaluation of the ARGESIM comparisons via internet.

After two further presentations (Dr. Westerkamp: *Kosimulation Software/Hardware*, H.M. Ritt, IRT: *Simulation eines Erwärmungsprozesses beim Thixiforming*) the meeting ended with a short summary from the speaker and Prof. Rake. The report of this meeting will appear as *ASIM-Mitteilungen*.

The working group FG5 will participate in the ASIM'99 conference in Weimar with a *"Praxisforum"* (simulation of electronic systems) and with a session on simulation of control systems in automotive.

The next meeting has been planned for February 21st and 22nd, 2000 at FH Esslingen and will be organized by Prof. Kampe.

Since February the working group has its own internet-homepage for actual information, directly accessible via the ASIM-homepage (http://www.asim-gi.org/fg5). Additional news can be found in the *ASIM-Nachrichten*.

**Speaker**: Ewald Hessel, Hella KG Hueck & Co, ABt. EE-83, Werk 2, Beckumer Str., D-59552 Lippstadt, Tel: +49-2941 38 8572, Fax: +49-2941 38 8427, email: hessel@hella.de
**Vice-speaker**: Dr. Achim Wohnhaas, debis Systemhaus GEI, Kfz-Elektronik, Fasanenweg 9, D-70771 Leinfelden-Echterdingen, Tel: +49-711 972 5333, 2508, Fax: +49-711 972 1913, email: achim.wohnhaas@debis.com

**"Simulation in Produktion und Logistik" (FG 6)**

The last working group meeting took place on February 22, 1999 in Kassel. One important topic was the election of the speaker:
a) speaker: Mrs. Dr. Sigrid Wenzel, Fraunhofer Institute for Materialflow and Logistics, Dortmund, Germany
b) vice speaker: Mr. Hans Joachim Gora, Adam Opel AG, Rüsselsheim, Germany.

The next event arranged by the working group is the working group meeting on June 9th, 1999, at Adam Opel AG, Rüsselsheim, Germany. The 9th Working Group Conference will be held on March 8 - 9, 2000 in Berlin, Germany. It will again be organized by Dipl.-Phys. Markus Rabe, Fraunhofer Institute for Production Systems and Design Technology (IPK), Pascalstr. 8-9, D-10587 Berlin, Fax: +49-30-39 32 503, email: Markus.Rabe@ipk.fhg.de. The conference will be a platform for users, vendors and researchers in the field of simulation. Applications for example are production, organization structures, staff deployment, production systems and logistics. For the first time the conference languages will be German and English.

For detailed information about working group activities please refer to http://www.asim-gi.org/fg6/ or http://www.asim-pl.uni-kassel.de or contact Mrs. Dr. Sigrid Wenzel by email: wenzel@ iml.fhg.de

**Speaker**: Mrs. Dr. Sigrid Wenzel, Fraunhofer Institute for Materialflow and Logistics, Joseph-von-Fraunhofer-Str. 2-4, D-44227 Dortmund, Germany, Tel. +49 231- 9743-237, Fax: - 234, email: wenzel@iml.fhg.de
**Vice-speaker**: Mr. Hans Joachim Gora, Adam Opel AG, ITDC-Manufacturing Engineering, Strategies & Planning, D-65423 Rüsselsheim, Germany, Tel.: +49 6142 7-72164, Fax -61763, email: hans.joachim.gora@de.opel.com

**"Simulation in der Betriebswirtschaft" (FG 7)**

**Speaker**: Prof. Dr. W. Hummeltenberg, University of Hamburg, Institute for Computer Science in Business Administration, Max-Brauer-Allee 60, D-22765 Hamburg. Tel.: +49-40-4123-40 23, Fax: +49-40-4123-64 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)**

**Speaker**: Dipl.Ing.Andre Graber, Drusbergstr. 39, CH-8703 Erlenbach, Tel: +41-1 9120640, Fax: +41-1 9120641, email: a.graber@ bluewin.ch
**Vice-speaker**: Dr. Thomas Schulze, Univ. Magdeburg, Inst. f. Techn. Informationssysteme, Universitätsplatz 2, D-39106 Magdeburg, Tel: +49-391 67 12017, email: tom@isg.cs.uni-magdeburg.de

**"Simulation in Umweltanwendungen" (FG 9)**

For detailed information see the WWW pages of the working group: http://www.informatik.uni-rostock.de/FB/Praktik/Mosi/FG/ 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-18059 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 825730, email: keller@iai.fzk.de
Dr. Jochen Wittmann, University of Rostock, Dept. of Computer Science, Chair: Modelling and Simulation, Albert-Einstein-Str. 21, D-18059 Rostock, Tel.: +49-381 4983368, Fax.: +49-381 4983426, email: wittmann@informatik.uni-rostock.de

*Ingrid Bausch-Gall*

## 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; cooperation with similar domestic and international institutions. From April 1997 CROSSIM is a full member of EUROSIM.

**Membership**

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

**Contact Address**

Vesna Bosilj Vuksic
Faculty of Economics, University of Zagreb
Trg J.F.Kennedy-a 6, HR-10000 Zagreb, Croatia
Tel: +385-1 2383 333
Fax: +385-1 2335 633
email: vbosilj@efzg.hr

**Activities**

- Co-organizing a conference on *Models in Science, Technology and Society*, Zagreb, February 25, 1999.
- Co-organizing the 21st International Conference *"Information Technology Interfaces" ITI'99*, Pula, Croatia, June 15-18, 1999.
- Co-organizing the *Second European Ecological Modelling Conference,* Pula, Croatia, September 20-24, 1999.
- 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.
- The first WWW site in Croatian devoted to simulation was developed at the Faculty of Electrical Engineering and Computing. Its address is: http://www.rasip.fer.hr/nastava/mis/
- Initial WWW site of the society is: http://rudjer.irb.hr/~crossim/
- The CROSSIM e-mail distribution list at the Computing Centre of the Univ. of Zagreb serves as a communication medium among members. To subscribe please send to LISTPROC@CARNET.HR a line of text (leave an empty subject line) SUBSCRIBE CROSSIM *your name* and *surname*. To send e-mail to all members at once just send an e-mail to: CROSSIM@CARNET.HR

*V. Bosilj Vuksic*

## AES

**Contact Address**

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

## CSSS

### General Information

CSSS (The Czech and Slovak Simulation Society) has about 90 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, organising 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. Since 1992 CSSS is a full member of EUROSIM.

### Past Events

The 33rd International Conference on "Modelling and Simulation of Systems" (**MOSIS'99**) was successfully held on April 27-29, 1999, in Roznov pod Radhostem, Czech republic. The chairman of the international program committee was Dr. Ing. Jan Stefan. The Conference was connected with two Workshops: workshop ISM'99 – Modelling of Information System and workshop MANAM'99 – Modelling in Manager Works. The Proceedings of the Conference and Workshops have four parts and 926 pages, with 105 reviewed papers. Some 130 participants from Czech republic, Slovakia, Latvia, France, and Great Britain attended the workshop. During the workshop the meeting of CSSS was held.

The 6th International Symposium "Railways on the edge of third millennium" (**ZEL'99**) was held in Zilina, Slovak republic on May 27-28, 1999. One of the interesting points in topic was "Modelling and Simulation for Planning and Process Supervision on Railway". Some 115 participants from Slovakia, 35 from Czech republic and 40 from Sweden, Austria, Holland, Germany, Poland and Hungary attended the workshop.

### Coming Events

The **21st International Workshop "Advanced of Simulation Systems" (ASIS'99)** will take place in the Moravian town Krnov, Czech republic on September 14-16, 1999. The chairman of the international organising committee is Dr. Ing. Jan Stefan. Main topics: Modelling and Simulation in Education; Simulation Tools; Parallel and Distributed Simulation; Simulation in Hydrodynamics; Simulation in Ergonomics; New Modelling Paradigms.

The **3rd International Workshop "Modelling and Simulation in Management Informatics and Control" (MOSMIC'99)** will take place in Zilina-Sulov, Slovak republic on October 5-7, 1999. The chairman of the international program committee is Prof. Mikulas Alexik. Main topics: Management Process Modelling and Simulation; Modelling and Simulation of Communications Processes (Traffic, Transport, Telecommunications); Simulation of Control Systems; Hybrid Techniques of Simulations; Information Systems Modelling. More information: http://frtk.utc.sk/

The **34th International Conference on "Modelling and Simulation of Systems" (MOSIS 2000)** will take place on May 2-4, 2000 in the Czech republic. The chairman of the international program committee is Dr. Ing. Jan Stefan. For more information please contact: jan.stefan@vsb.cz.

### Contact Addresses

Jan Štefan
FEI - VŠB TU
tr. 17. listopadu
CZ-708 33 Ostrava Poruba, Czech republic
email: jan.stefan@vsb.cz

Mikuláš Alexík
University of Zilina
dept. Technical Cybernetics
Velky Diel
SK-010 26 Zilina, Slovak republic
Tel: +421-89 54042
Fax: +421-89 54806
email: alexik@frtk.utc.sk

*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 cooperation with its members and is further affiliated with SCS International and IMACS.

**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, and the newsletter Simulation News Europe three 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.

For institutional members counts that they can join national "DBSS events" with three persons against the reduced fee.

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

Dutch Benelux Simulation Society
Mrs. Marja Dekker-Genemans
Noordeindseweg 6
2651 LE Berkel en Rodenrijs, The Netherlands
Tel: + 31-10 51 12714
Fax: +31-10 51 13883
Email: L.Dekker@pa.twi.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).

The Steering Committee consists of the following members:

| | |
|---|---|
| A.W. Heemink (TU Delft) | Chairman |
| L. Dekker | Vice-Chairman |
| M.J. Dekker-Genemans | Secretary |
| W. Smit (AKZO NOBEL) | Treasurer |
| Th.L. van Stijn (Ministry of Public Works/RIKZ) | Member |

**Past Events**

**Symposium Simulation of Business Economical Models:** On April 13, 1999 the Faculty of Economics of Erasmus University Rotterdam organized a one-day symposium on Simulation of Business Economical Models under the auspices of the Dutch Benelux Simulation Society (DBSS). Organizer and day chair was Dr. Henk de Swaan Arons from Erasmus University Rotterdam. One-day symposia organized by DBSS are usually oriented towards the field of engineering. Simulation however is not restricted to engineers. It is also a heavily used tool in other fields such as Business Economics. Examples of simulation applications are human resource management, workflow management, marketing, and logistics. Enough reasons for DBSS to devote its symposium to this field of application.

The first speaker in the morning program was Prof.dr. Cees van Halem who is a managing director of OASIS (a Dutch management IT consulting company), who discussed how simulation is used as a tool in the development of business strategies. He illustrated his talk with various examples taken from his consultancy experience. Mr. Hillen, the second speaker, is a co-founder of F&H Simulations, and as one of the present directors he is responsible for the development of the Taylor discrete simulation packages which are used worldwide. In his talk Mr. Hillen outlined a future simulation environment that can no longer be considered as merely a stand-alone decision support tool but more as an integrated operating system. The afternoon program was completely devoted to a number of cases. For OASIS Mr. Heuvelmans presented a case in the field of personnel management (reorganizing an organization under strict constraints) and Mr. Gillissen presented a strategy model for a housing development organization. Both cases were implemented in Powersim. For F&H Simulations ir. Moens presented a number of cases (for instance, logistic problems) carried out with Taylor ED, F&H's newest simulation tool. By inviting speakers from consultancy or software companies, one takes the risk that their presentations can easily degenerate to sales talk. The speakers on this symposium, however, resisted this natural instinct and presented the audience a broad view on the application of Simulation in the field of Business Economics.

**General Meeting DBSS:** The General Meeting of the DBSS has taken place Tuesday April 13, 1999. The minutes of this meeting will be mailed to all the members.

**Visit CASS:** On April 15, 1999, a delegation of the Chinese Association for System Simulation visited Delft (see also letter of the President). The President of CASS, prof. Wang Xingren, proposes the DBSS to sign an agreement between DBSS and CASS. The DBSS is preparing a draft agreement and we will keep our members informed about the results. In July another delegation of CASS will visit Delft, a.o. to discuss cooperation in research.

**Coming Events**

## EUROSIM 2001 Congress

### SHAPING FUTURE WITH SIMULATION

The congress, organised by the Dutch Benelux Simulation Society, will take place at the Delft University of Technology, The Netherlands, week **26-30 June, 2001**. A first call for papers and the website are under preparation. The website will become accessible during the summer, the first call for papers will be mailed by regular mail and in electronic form in the fall of this year. The second conference on Modelling and Simulation in Biology, Medicine and Biomedical Engineering, organised by our member society FRANCOSIM, will be incorporated in the 2001 EUROSIM congress programme.

In the last issue of SNE, March 1999, we informed the readers about the discussions with SCS Europe BVBA, in order to investigate the possibility of combining their yearly ESM conference with the triannual EUROSIM congress. Please find below the final report of the DBSS treasurer on the cooperation talks between SCS Europe BVBA and DBSS.

With reference to our meeting in Delft on April 1, 1999, where the DBSS council met with Mr. Kerckhoffs (SCS Europe) and where we discussed the possibilities of a joint congress of Eurosim and SCS Europe for the Eurosim 2001 congress, we arrived at the following conclusions:

Given the openness between both parties, and despite the eager willingness of both parties to find a common ground, it has been decided not to organize a joint congress. Some reasons we openly discussed are: DBSS is a volunteer organization and, with help of the TU-Delft Congress Office, can realize organization costs that are far lower than if SCS BVBA acts as organizing body of the Eurosim 2001 congress. This is clear, because SCS BVBA is a professional organization, which has to earn at least their burning-rate. Since DBSS is a volunteer organization with a proven track record (Eurosim conferences in 1994 and 1996), it is easier for them to find additional sponsoring opportunities and guarantees. DBSS likes to offer a fee to participants as low as possible. In our comparative budgets, we could formulate – Mr. Geril of SCS-Europe was very instrumental in this – we found that the break-even point in number of participants is far lower if DBSS acts as organizer than if SCS BVBA acts as organizer. So, the financial risk is lower with DBSS. Besides, the participation fee is NLG 100 to 150 lower with DBSS as organizer! Some concern rose in regard to the staffing of SCS BVBA. Basically, Mr. Geril is the only and very capable person of organizing such a happening as the Eurosim 2001 Congress, but there is no fallback position. DBSS has sufficient back-up available.

It was clearly stated in the meeting that there is not any problem to cooperate scientifically. Many reviewers, topics, etc. are of mutual interest. Moreover, there is willingness and preparedness to help each other. And, as far as DBSS is concerned, we like to continue the open cooperation we enjoy with SCS and her members. The sole reason for not having a joint organization of the Eurosim 2001 Congress is a financial one. During the talks, Mr. Kerckhoffs addressed the organization of a combined conference by ASIM and SCS BVBA in 2000, where both partners combine the scientific part, but have separate budgets. This is a possibility to consider, since DBSS has reserved the TU-Delft location for one full week, and depending on the results of our enquiry, we will organize a 3 or 4 days event.

For all information on EUROSIM 2001 by regular mail, electronic mail or fax, please contact:

EUROSIM 2001 Organisation
c/o Mrs. T. Tianova
Delft University of Technology
Faculty of Information Technology and Systems
P.O. Box 5031
2600 GA Delft, The Netherlands
Fax: +31-15 2787209
email: EUROSIM2001@pa.twi.tudelft.nl

If you need information by telephone please contact:
Marja Dekker, Tel: +31-10 5112714
or Arnold Heemink, Tel: +31-15 2785813

http://ta.twi.tudelft.nl/PA/Eurosim2001/index.html

*Marja Dekker-Genemans*

## FRANCOSIM

FRANCOSIM was created in 1991 and aims to the promotion of simulation and research, in industry and academic fields. It has members from large French companies and members of Belgian and French universities. FRANCOSIM operates two poles:

**Modelling & simulation of continuous systems**

This pole has organised in April the BioMedSim99 conference. More information on this conference may be found in this issue.

Contact:
Prof. Y. Hamam
Groupe ESIEE
Cité Descartes, BP 99
2 Bd. Blaise Pascal
F-93162 Noisy le Grand, Cedex, France
Fax: +33-1 45 92 66 99
Tel: +33-1 45 92 66 11
email: hamam@esiee.fr
http://www.esiee.fr/~hamamy/

**Modelling & simulation of discrete events systems**

Contact:
Professor Henri Pierreval
IFMA, Campus des Cezeaux, BP 265
F-63175 Aubiere, Cedex, France
Tel. +33-4 73 28 81 06
Fax. +33-4 73 28 81 00
email: pierreva@ifma.fr

**FRANCOSIM Contact**

Michel Lebrun (Président)
Imagine (SA)
5, rue Brison
F-42300 Roanne, France
Tel : +33-4 77 23 60 30
Fax: +33-4 77 23 60 31
email: imagine@amesim.com

Contact in Belgium:

Francis Lorenz (vice-président)
Centre Socran, Parc Scientific
Ave. Pré-Aily
B-4131 Liège
Tel: +32-4 367.83.75
Fax: +32-4 367.83.00
email: lorsim@lorsim.be

*Y. Hamam*

## 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**

At the Simulation Laboratory of the Department of Information Management on the Faculty of Economic and Social Sciences of the Technical University of Budapest a series of lectures on various aspects of simulation is held on a regular basis for students, academics and external experts of various fields. In these lectures different simulation tools and fields of applications are dealt with.

We are co-operating in the organization of several international simulation conferences, as the 4th Beijing International Conference on System Simulation and Scientific Computing, Beijing, P.R. of China; European Simulation Multiconference, Warsaw, Poland; 21st International Conference on Information Technology Interfaces, Pula, Croatia; Modelling and Simulation of Systems (MOSIS'99), Roznov pod Radhostem, Czech Republic.

Beyond these we are also involved in the organization of the Summer Computer Simulation Conference, Chicago, Illinois, July 11-15, 1999. Within this conference Prof. Jávor is the chairman of the track KBS and AI.

**Contact Address**

Prof. András Jávor, Ph.D., D.Sc.
Technical University of Budapest
Faculty of Economic and Social Sciences
Department of Information Management
Muegyetem rkp. 3.
H-1111 Budapest, Hungary
Phone: +36-1 4631987
Fax: +36-1 4634035
email: javor@eik.bme.hu

*András Jávor*

# ISCS

## General Information

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

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

| | |
|---|---|
| Giuseppe Iazeolla | chairman |
| Mario Savastano | vice-chairman |
| Vincenzo Grassi | treasurer |
| Vittorio Cortellessa | secretary |
| Pasquale Daponte | committee member |
| Franco Maceri | retiring chairman |

## Membership

At present ISCS counts 129 members: 13 institutional, 4 honorary, 110 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 Ingegneria Informatica
Università di Roma "Tor Vergata"
Via di Tor Vergata
I-00133 Roma, Italy
Phone: +39-6 7259.7380 -.7381
Fax: +39-6 7259.7460
email: {grassi,cortelle}@info.utovrm.it
http://remlab.dis.unina.it/iscs/iscs_hp.htm

## Activities

The steering committee of ISCS announces that the annual conference **ISCS'99** takes place at University of Rome "Tor Vergata", Engineering Campus, on June 15th, 1999.

The conference involves a plenary session with 14 contributed talks selected by the Scientific Committee composed of: G. Iazeolla (Chairman), F. Maceri, University of Rome "Tor Vergata"; F. Cennamo, University of Naples; L. Donatiello, University of Bologna; P. Daponte, University of Naples; V. Grassi, A. Leonardi, University of Rome "Tor Vergata"; M. Colajanni, University of Modena and Reggio Emilia; R. Vaccaro, University of Naples; V. Cortellessa, A. D'Ambrogio, R. Mirandola, University of Rome "Tor Vergata"; M. Savastano, National Research Council, Naples.

The accepted contributions cover several topics, including theory, tools and applications. Persons interested to contact an author or receive a copy of the proceedings can ask the ISCS secretariat. Papers are either in English or in Italian language:

M. Giorgi, L. Pasini, "*Costruzione e simulazione di un algoritmo per il rilevamento e l'elaborazione dei dati relativi al flusso di traffico veicolare in un canale di scorrimento*"; V. Britti, D. D'Ambrosio, S. Di Gregorio, S. Gabriele, "A cellular model for soil erosion by rainfall"; A. Messina, E. Sconiers, "Methodological considerations on the use of simulation tools in the early phase of the development of next generation air defense systems"; G.M. Amendola "*Applicazione delle reti neurali alla simulazione del potenziale di risorse umane nel contesto di organizzazioni: prospettive e limiti*"; E. Kindler "*Simulazione dei sistemi che contengono elementi simulanti*"; E. Di Nardo, E. Pirozzi, A.G. Nobile, L.M. Ricciardi, "Evaluation of upcrossing first passage time densities for normal processes via a simulation procedure"; M. Abundo "On first-passage-times for one-dimensional jump-diffusion processes"; L. Grusovin, A. Matta, M. Peron, T. Tolio, "Simulation applied to the design of an automated hospital laboratory"; A. Anglani, A. Grieco, M. Pacella, Q. Semeraro, T. Tolio, "*Analisi comparata delle metodologie per lo sviluppo di modelli di simulazione ad oggetti*"; E. Di Giampaolo, F. Bardati, M. Sabbadini, "*Simulazione elettromagnetica di ambienti complessi mediante ray-tracing*"; P. D'Ambra, S. Filippone, "A parallel version of KIVA-3 software for numerical solution of reactive flows in engine applications"; F. Quaglia, "Stretching checkpoint intervals in optimistic simulators with high variance of event granularity"; K. Tomaseth "A modeling tool for biomedical systems"; E. Casalicchio, "*Analisi di algoritmi di rimpiazzamento per cache di web server*".

## Notices

The annual meeting of ISCS members is scheduled to be held in Rome on the occasion of the ISCS'99 Conference.

We recall that an **electronic mailing** list has been constituted for persons interested in the ISCS activities. In order to be included in such list, it suffices to send an email message (Subject: ISCS mailing list) containing name, affiliation and address (surface and electronic) to the following address:

cortelle@info.uniroma2.it

To spread information to the Italian simulation community, you are invited to send email messages to cortelle@ info.uniroma2.it and they will be forwarded to all the addresses of the mailing list.

*Vittorio Cortellessa*

## PSCS

### General Information

PSCS (The Polish Society for Computer Simulation) was founded in 1993 in Warsaw. PSCS is a scientific, non-profit association of members from universities, research institutes and industry in Poland with common interests in a variety of methods of computer simulations and its applications. At present PSCS counts 195 members.

The affairs of the PSCS are directed by the board of second cadence consisting of the following persons: Roman Bogacz - President, Leon Bobrowski - Vice President, Romuald Kotowski - Vice President, Zenon Sosnowski - Secretary, Zygmunt Strzyzakowski - Treasurer, Edward Kolodzinski, Bogdan Lesyng, Andrzej Tylikowski.

### Activities

The main activities of the PSCS are annual conferences known as "PSCS Workshops on Simulation in Research and Development". The third PSCS Workshop was organised in 1996 by Prof. Leon Bobrowski in Wigry and there were about 80 participants. The fourth PSCS Workshop was organised in 1997 by Prof. E. Kolodzinski in Jelenia Gora. The last workshop took place on October 7-9, 1998 in Jelenia Gora, Poland. ulation tools. The proceedings of the Fourth PSCS Workshop on "Simulation in Research and Development", R.Bogacz and E. Kolodzinski (Eds.), Warsaw, 1998, ISBN 83-902146-2-8, are in Polish. The price is 20,- PLN.

### Coming Events

The **sixth PSCS Workshop on Simulation in Research and Development** will be organised in Bialystok and Bialowieza on August 25-27, 1999 by Prof. L. Bobrowski: e-mail: ptsk99@ ii.pb.bialystok.pl

### Contact Address

Prof. Roman Bogacz
The Polish Society for Computer Simulation
c/o IPPT PAN
Ul. Swietokrzyska 11/21
PL-00-049 Warszawa, Poland
Tel.: +48-22 826 98 00
e-mail: rbogacz@ippt.gov.pl

*Z. Sosnowski*

## ROMSIM

Professor Len Dekker, the President of EUROSIM, informed us that during the EUROSIM meeting in Paris, April 19, 1999 ROMSIM has been accepted as observer society, as a first step to become a EUROSIM society. Due to this new status of our society we appreciate that it is necessary to inform the international community of specialists in modelling and simulation about our society and its activities.

*ROMSIM - ROmanian Society for Modelling and SIMulation,* has been founded in 1990 as a non-profit society devoted to both theoretical and applied aspects of computer modelling and simulation of systems. At the beginning the number of founder members was fourteen but in the last years the number of members has increased to over hundred, both from Romania and the Republic of Moldavia.

During its existence ROMSIM has developed specific activities as information of its members about new methods and results in modelling and simulation and about the calendar of international events in modelling and simulation, but also on related fields as system theory and its applications (with particular reference to large scale and complex systems, knowledge-based systems, neural and fuzzy systems), control systems theory and its application. As a result of the activities developed by ROMSIM some members of the society developed models' libraries for computer simulation and control with applications in different fields: ecological systems and environmental protection, electrohydraulic control systems, macroeconomic systems etc.

But the main effort of ROMSIM has been the organisation of its own scientific events and/or the support of some other scientific events organised by other societies. We will present briefly these activities.

In 1991 ROMSIM organised the Workshop: *Modelare si simulare / Modelling and Simulation*, Bucharest, September 25-26, 1991. A number of over 50 contributions have been presented by ROMSIM members. A round table titled "Perspectives of modelling and simulation of systems" has been organised. Selected papers have been published in the Romanian Journal of Informatics and Automatics. Over 100 participants attended.

In 1993 ROMSIM organised the Workshop: *Simulare si Simulatoare / Simulation and Simulators,* Bucharest, November 10-11, 1993. A number of 20 selected contributions have been presented by ROMSIM members. An exhibition of simulation programs has been organised. A round table titled: "Simulation and

Decision" has taken place. A visit to *SIMUL-TEC* (a firm for simulators) has been organised. Presented papers have been published in the Romanian Journal of Informatics and Automatics. Over 100 attendants participated.

ROMSIM members have participated at the 2nd triennial EUROSIM Congress, September 11-15, 1995, organised by ASIM - *Arbeitsgemeinschaft Simulation,* in Vienna. An important number of ROMSIM members have participated at this event, presenting their contributions in computer modelling and simulation.

We mention also the participation at the 3rd triennial EUROSIM Congress, April 14-15, 1998 organised by SIMS - *Scandinavian Simulation Society* at the Helsinki University of Technology, Espoo, Finland. At this Congress ROMSIM has been represented by a single participant, the undersigned of this presentation. He has presented a contributions.

Some ROMSIM members have also participated at the IMACS Congress '97 in Berlin, Western Multi Conference '99 in San Francisco, ENVIROSOFT'96 Conference in Como, European Control Conference-ECC '93 in Groningen, ECC'95 in Rome and will attend ECC'99 in Karlsruhe. Some ROMSIM members organised Invited Sessions at these Conferences.

In 1998, together with the Research Institute for Informatics and the Operational Research Society, ROMSIM has organised the Seminary: *Calculul de Inalta Performanta / High Performance Computing,* Bucharest, June 17-18, 1998. A number of 16 contributions have been presented by ROMSIM members. Two round tables have been organised, under the title: "High Performance Computing". Over 60 attendants participated.

ROMSIM members have participated at the seminary on *Fuzzy Systems*, organised regularly each week, at the Research Institute for Informatics, Bucharest, from 1995.

ROMSIM helps the organisation of the 4th triennial EUROSIM 2001 Congress in Delft, distributing to the members news about the Congress, presenting some contributions and organising 1-2 sessions related to the topics of the Congress.

ROMSIM is interested to co-operate with all member societies of EUROSIM but also with international societies, in the realisation of European projects and /or organising of scientific events, e.g. Workshops dedicated to precise subjects in computer system analysis, modelling, simulation and control, with application in such fields as: biology, ecology and environmental protection (relate for instance to: European River Deltas ecosystems, Black Sea ecosystem, air quality control in the big cities), but also in other fields like electro-hydraulic systems, macroeconomic systems etc.

**Contact Address**

Florin Stanciulescu
National Institute for R&D in Informatics
Averescu Avenue 8-10
RO-71316 Bucharest, Romania
email: sflorin@u3.ici.ro
www.roearn.ro/infoeco/

*Florin Stanciulescu*

## 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 the board, the ombudsman and the treasurer. SIMS' board has two members from each Nordic country. SIMS' annual meeting takes place at local conferences or in connectionwith international simulation conferences arranged in the Nordic countries.

**SIMS'99 Conference:** The 1999 annual meeting of SIMS will be arranged in the surroundings of Linköping in Sweden by Prof. Peter Fritzon from Linköping University. For more information visit the Internet http://www. ida.liu.se/~pelab/SIMS99/

**How to join SIMS:** You may register as a member of SIMS by sending your application with your personalia to the address: sims@vtt.fi. SIMS' members will receive information on simulation conferences, courses and other related events. SIMS' members will get discounted fees on conferences arranged by SIMS, EUROSIM or SCS, and subscriptions at discounted prices on the news journal *Simulation News Europe* and the scientific journal *Simulation Practice and Theory*.

**Contact Address**

Esko Juuso
University of Oulu
Control Engineering Laboratory
Linnanmaa
FIN-90570 Oulu, Finland
Tel +358-8 553 2463
Fax +358-8 553 2466
email: esko.juuso@oulu.fi

# SLOSIM

**General Information**

SLOSIM (Slovenian Society for Modelling and Simulation) was established in 1994 and became a full member of EUROSIM in 1996. It has 89 members from both Slovenian universities, institutes and industry as well and aims at the promotion of modelling and simulation in industrial and academic environments and to facilitate communication among corresponding groups.

**Contact Address**

Borut Zupancic, president of SLOSIM
Faculty of Electrical Engineering
Trzaska 25, SLO - 1000 Ljubljana, Slovenia
Tel: +386-61 1768 306,
Fax: +386-61 1264 631
email: borut.zupancic@fe.uni-lj.si
slosim@fe.uni-lj.si

**News**

SLOSIM is a co-operative society in the organisation of the traditional Electrotechnical and Computer Science Conference **ERK'99** in Portoroz, Slovenia, on the Adriatic coast (September 23-25, 1999) and is responsible for modelling and simulation sessions. So modellers and simulationists are kindly invited to send a camera-ready paper before July 20, 1999 to:

Andrej Trost
Faculty of Electrical Engineering
Trzaska 25
1001 Ljubljana, Slovenia

A Call for papers has already been sent to our members. More information can be found on
http://www.ieee.si/erk99/

On May 20, there was a regular group presentation meeting at the Jozef Stefan Institute, Group for Computer Automation and Control. Several industrial applications including also topics such as fault detection and diagnosis and wastewater treatment with emphasis on modelling and simulation problems were described. A short description of this group will be given in the next issue of SNE.

At this occasion there was also the first meeting of the new SLOSIM board. The discussion was focused on the future activities. The SLOSIM representative in EUROSIM gave a short report from the EUROSIM board meeting in Paris in April.

*B. Zupancic*

# UKSIM

**General Information**

The UK Simulation Society has about 80 members throughout the UK from both Universities and industry. UKSim is active in all areas of simulation and regularly holds a national conference as well as one-day meetings and seminars. Recruitment has been identified as a priority and it is hoped that the membership will increase significantly in the future.

**Fourth United Kingdom Simulation Society Conference**

The fourth UKSim conference took place in St. Catherine's College, Cambridge, England on April 7-9th, 1999 and was very successful. There were many delegates from both industry and academia, and several from overseas including a visit from the Chinese Systems Simulation Society (see below). Cambridge proved to be an excellent venue. A walking tour organised for the delegates was a popular diversion from simulation matters for a couple of hours.

Thirty-five papers were presented including three invited presentations. The simulation topics dealt with were varied however there were many thought-provoking simulation application papers including some strong papers on Business Process Simulation, hardware-in-the-loop simulation and distributed simulation. Professor Les Hatton of the University of Kent was invited to talk about "The Influence of Software Defects on Simulation". His presentation generated much discussion during the conference on software reliability (and unreliability).

The conference received a delegation from the Chinese Association for Systems Simulation (CASS). Professor Bo Hu Li of the Beijing University of Aeronautics & Astronautics (BUAA) is vice-president of CASS. He gave a stimulating presentation on the history of computer simulation in China and current research activities throughout that country. The president of CASS, Professor Wang Xingren, also attended the conference. Professor Wang Xingren is the Director of Advanced Simulation Technology Lab in the Dept of Automatic Control, Beijing Uni of Aeronautics & Astronautics. It is hoped that the visit will strengthen links between the Chinese Systems Simulation Society and UKSim.

Adrian Cook of the Department of Computing, Nottingham Trent University, won the prize for best student paper for "Review of the Evaluation of Flight Simulator Visuals by Neural Networks".

A full version of this paper and others from the conference can be seen at the UKSim web-site at http://ducati.doc.ntu.ac.uk/uksim/.

**New Committee**

The following committee members were elected at the AGM

| | |
|---|---|
| Chairperson | Russell Cheng |
| Secretary | Gary Gray |
| Treasurer | Barrie Thomson |
| Membership Secretary | Gwyn Jones |
| International liaison representative | David Al-Dabass |
| Additional committee members | Richard Cant |
| | Vlatka Hlupic |
| | Alex Orman |
| | Stewart Robinson |
| | Alan Stevens |
| | Richard Zobel |

**Simulation Workshop**

A one-day workshop entitled "Current Trends in Simulation Software" is scheduled for 13th July, 1999 at the Department of Information Systems and Computing at Brunel University in West London. Please contact Vlatka Hlupic (Vlatka.Hlupic@brunel.ac.uk) for more information.

**Membership**

Membership of the UK Simulation Society is very good value at only £20 per year and includes a subscription to Simulation News Europe and reductions at EUROSIM and SCS events. For more information, contact the Membership Secretary:

Dr. Gwyn Jones
Dept. of Computing and Information Systems
London Guildhall University
100 Minories
London EC3N 1JY
Tel: +44-171 320 1716
Fax: +44-171 320 1717
email: simsoc@bwthyn31.freeserve.co.uk

*Gary J Gray*

## 1. About SCS and SCS Europe

SCS is the international, multidisciplinary forum dedicated to research, development, and applications of simulation. Since its founding in 1952, the Society for Computer Simulation's membership roster has been made up of engineers, scientists, managers, business professionals, students, and educators. A very diverse field, whose interests include: artificial intelligence, microcomputers in simulation, methodology and validation, supercomputers, and more. In 1985 SCS International started a European Office at the University of Ghent, Belgium. In 1994 the SCS European Office was changed into SCS Europe BVBA, which now is the organisational and financial body behind the SCS European Council (established in 1991). SCS Europe BVBA also includes the SCS European Publishing House. SCS Europe BVBA organizes international scientific conferences on computer simulation and related fields. On a yearly basis, it takes care of the "European Simulation Multiconference" ESM, the "European Simulation Symposium" ESS, and two smaller conferences: the "European Concurrent Engineering Conference" (ECEC) and the "Scientific Conference on Web Technology, New Media, Communications and Telematics" (Euromedia). SCS Europe BVBA is also involved in the organization of local workshops. It should be stressed that all these activities are in close cooperation with the SCS European Council.

## 2. Resignation of the SCS European Councils Chair

Recently Dr. Alexander Verbraeck resigned as the chairman of the SCS European Council. He was no longer able to combine this task with his job as Associate Professor at Delft University of Technology, in which he has to manage various big research projects. On this place we want to thank Alexander for the really tremendous work he has done for the SCS European Council from 1994 on, when he became the Councils chair. Alexander was not only the formal chairman of the Council, but he acted also as secretary, WEB manager, assistant and adviser for Executive Director Philippe Geril of SCS Europe BVBA, trouble shooter, and so on, and so forth. Thanks again, Alexander!

## 3. Foregoing SCS Events

Since the appearance of the previous SNE we have had four SCS events:
MESM'99 (1st Middle East Workshop on Simulation and Modelling), March 1-2, Amman, Jordan;
ECEC'99 (6th European Concurrent Engineering Conference), April 21-23, Erlangen-Nuremberg, Germany;
Euromedia'99, April 25-28, Munich, Germany;
ESM'99 (13th European Simulation Multiconference on Modeling & Simulation: a Tool for the next Millennium), June 1-4, Warsaw, Poland.

MESM'99 was attended by approximately 40 participants; the Proceedings (edited by M. Al-Akaidi and B. Honary, ISBN 1-56555-164-8, 100 pages, 17 papers) are still available.

ECEC'99 was attended by approximately 55 participants; the Proceedings (edited by U.F. Baake and R.N. Zobel, ISBN 1-56555-170-2, 280 pages, 49 papers) are still available for sale.

Euromedia'99 was attended by approximately 50 participants; the Proceedings (edited by W. Hahn, E. Walther-Klaus, and J. Knop, ISBN 1-56555-169-9, 255 pages, 43 papers) can still be ordered.

ESM'99 was attended by approximately 190 participants; the Proceedings are in two Volumes (Vol. 1, edited by H. Szczerbicka, ISBN 1-56555-171-0, 703 pages, 87 papers; Vol. 2, edited by H. Szczerbicka, ISBN 1-56555-172-9, 545 pages, 92 papers) can be ordered.

## 4. Coming SCS Events

For our coming events, please have a look to our Website:

http://hobbes.rug.ac.be/~scs/

or contact:

Philippe Geril
SCS Europe BVBA
University of Ghent
Coupure Links 653
B-9000 Ghent, Belgium
Phone: +32.9.233 77 90
Fax: +32.9.223 49 41
e-mail: philippe.geril@rug.ac.be

The Call for papers for ESS'99 (Erlangen, Germany, October 26-28) has already been distributed (deadline for proposals: June 15, 1999). W.r.t. conferences, see also point 6.

## 5. SCS European Publishing House

As a part of SCS Europe BVBA, the SCS European Publishing House publishes high-quality scientific books on computer simulation and related fields. In the framework of an agreement between SCS and ASIM it is decided to publish from now on our books in the series "Advances in Simulation" and "Frontiers in Simulation" together, i .e. as products of the European Publishing House & Argesim; the chief editors of both series are: Prof. Felix Breitenecker, Prof. Gerald Kampe, Prof. Eugene J. H. Kerckhoffs, Prof. Axel Lehmann, Prof. Dietmar P. F. Moeller, Prof. Henri Pierreval, and Dr. Richard Zobel. For more information or to order books, please contact:

Rainer Rimane
University of Erlangen-Nuremberg
Institute of Mathematics IV
Martensstrasse 1
D-91058 Erlangen, Germany
Phone + Fax: +49.9131.66247
e-mail: rimane@informatik.uni-erlangen.de

or have a look to the above-mentioned SCS Europe BVBA Website.

## 6. SCS Conference Board and Council Board Meetings , June 4, 5 in Warsaw

The SCS Conference Board had a meeting on Friday, June 4 and 5 (immediately after the ESM'99) in Warsaw. Because of the resignation of Alexander Verbraeck as SCS European Council's chair, this meeting was chaired by the Council's past-chair Eugene Kerckhoffs. On the agenda was of course the vacation of chairman. Further, general conference items such as lessons learned from ESM'99, conference preplanning, the maintenance of our conference matrix with a.o. topics and numbers of papers submitted per topic in the past, quality of conferences, and cooperation with ASIM and EUROSIM w.r.t. conferences. Finally, the progress of preparation and scheduling of next events were discussed, such as the 11th ESS 1999 in Erlangen (Germany), the 14th ESM 2000 in Ghent (Belgium), and the 12th ESS 2000 in Hamburg (Germany).

Some remarkable results of the discussions were:

- A new Conference Board chairman was elected, who at the moment of writing this must still formally accept to take the position. The Conference Board chair will coordinate, through the conference chair(s) and the BVBA, the organisation of the two major annual conferences ESM and ESS. The Conference Board chair will also represent the SCS Europe at the annual SCS Conference Board meetings in the USA.
- Unfortunately, ESM 2001 cannot be combined with the Eurosim Congress 2001 (to be held in Delft, the Netherlands) because of financial reasons. ESM 2001 will be organized in Prague, but such that the overlap of topics in both conferences is tried to be as small as possible.

The SCS European Council Board met on Saturday, June 5 in Warsaw. Also this meeting was chaired by the Council's past-chair Eugene Kerckhoffs. Important agenda point of course was the vacation of the position of chair of the Board. Further topics of discussion were the Council's infrastructure, conferences, PR and publicity, and the Publishing House. A new Conference Board chairman was elected for a period of three years. At the moment of writing this he must still formally accept to take the position. The new Council chair is expected, among others, to

- improve the Council's infrastructure and set up better contacts between the Council's Board and the Council's members (SCS members residing in Europe).
- set up a Council's budget and prepare formal Board elections.
- cooperate with the Conference Board chair and the SCS Europe BVBA.
- take care of the Council's publicity and its relationships to other societies such as ASIM and the Federation of European Simulation Societies (EUROSIM).

*P. Geril, E.J.H. Kerckhoffs, R. Rimane Executive Directors SCS Europe BVBA*

Prof. dr. ir. Eugene J.H. Kerckhoffs, Technische Universiteit Delft, Fac.ITS /TWI, Zuidplantsoen 4, 2628 BZ Delft, The Netherlands, Tel : +31-15 278 1315, Fax: +31-15 278 7141,
e-mail: E.J.H.Kerckhoffs@cs.tudelft.nl

## SIGSIM

### General Information

The Special Interest Group for Simulation (SIGSIM) is an international professional organization in the area of modeling and computer simulation. The organization's members represent an extremely cross-disciplinary set of professions where modeling and simulation are applied. SIGSIM is actively involved in promoting technical advances in the field and supporting educational activities that expand the use of M&S in engineering, scientific, and management fields.

### Regular Activities

SIGSIM is a cosponsor of the Winter Simulation Conference (WSC) and the Parallel and Distributed Simulation Workshop (PADS). Additional information on the WSC is available on the web at http://www.wintersim.org/

SIGSIM maintains a web page at http://www.acm.org/sigsim/ where current news, links to conferences, electronic publications, and special activities are maintained. SIGSIM also sponsors a mailing list for simulation professionals which is open to all interested parties. Instructions for subscribing to the mailing list are available on the web page.

### Special Activities

SIGSIM has created a Web-Based Distinguished Lectureship Series. This consists of audio and video recordings of presentations by and interviews with some of the most prominent people in the field. The multimedia presentations will be accessible to SIGSIM members via the web page listed above. The first of these lectureships is an interview with Phil Kiviat, Sterling Software Inc., one of the early pioneers of discrete event simulation. This interview is now available via the web page in RealVideo format. The second lecture is a narrated slide presentation by Paul Fishwick, University of Florida, in RealMedia format.

### Contact Addresses

Roger Smith, SIGSIM Chair
BTG Inc.
3481 Woodley Park Place
Oviedo, Florida 32765, USA
smithr@modelbenders.com

Ernest Page, SIGSIM Vice Chair
MITRE Corporation
7525 Colshire Drive
McLean, Virginia 22102, USA
epage@mitre.org

### Membership

SIGSIM has approximately 700 members distributed among 50 countries around the world. Annual membership fees are $45, or $22 when accompanied by membership in ACM. Members receive the CD-ROM version of the *Proceedings of the Winter Simulation Conference*, the paper version of the *Proceedings of the Parallel and Distributed Simulation Workshop,* registration discounts on SIGSIM sponsored conferences, and access to the Distinguished Lectureship Series on the SIGSIM Web page. Additional membership information is available from:

ACM European Service Centre
108 Cowley Road
Oxford, OX4 1JF, UK
+44-1865-382-338
acm_europe@acm.org
http://www.acm.org/sigsim/

*Roger Smith*

## LSS

The Latvian Simulation Society is organising, in cooperation with SCS Europe, Liophant Simulation Club, Genoa and Latvian Centres of the SCS McLeod Institute of Simulation Sciences, and Department of Production Engineering of the University of Genoa, the **International Workshop "Harbour, Maritime & Logistics Modelling and Simulation"** (September 16-18, 1999, Genoa, Italy).

For detailed information about the workshop please refer to http://st.itim.unige.it/hms99/

### Information and Contact Address

Prof. Yuri Merkuryev
LSS President
email: merkur@itl.rtu.lv
Phone +371-7089514
Fax +371-7089513

## JSST

### Introduction to JSST

JSST, The Japan Society for Simulation Technology, (http://wwwsoc.jsst.oc.jp/) was established under its present name in 1981. It was originally created as the Society of Analog Technology of Japan in 1961 by about 150 engineers and scientists who were interested in analog computers. The establishment of the Society was therefore originally intended to form a forum for the exchange of information about analog computer technology and its applications. With the advent of digital computers, which were becoming an important tool for simulation and widening the field of applications, and with the increase of the number of the members, the Society was renamed. The JSST is a registered society, recognized by the Science Council of Japan. There are about 700 active members including corporate and student members. The members of the Society come from both industry and academia, who are not only simulation engineers and scientists for system analysis and modeling, simulation language, process simulation, traffic and environmental simulation, but also those for the numerical or computational simulation. The JSST provides a forum for the exchange and the dissemination of information of wide-spread topics of simulation technology from hardware to software, including the following activities:

### 1) Publications

The JSST publishes the quarterly journal "Simulation", which counts the 18th volume this year. It contains explanation articles and news on hot topics relating to simulation technology as well as reviewed papers of original contributions. Two proceedings of the Simulation Technology Conference and the Computational Electromagnetics and Electronics Symposium are published annually. The Society published the three volumes of books for simulation technology from Corona-sha publisher, Tokyo. Now the publication of Computational Electromagnetics and Electronic Engineering Series of 14 volumes is on the way from Morikita-shuppan Publisher, Tokyo.

### 2) Meetings

The JSST provides two annual meetings: Simulation Technology Conference (18th this year), Computational Electromagnetic and Electronics Symposium (20th this year).

### 3) Seminars and Field Trips

A seminar on a particular topic is regularly held prior to the Symposium. Field trips which are to visit the facilities and sites technically interesting to the members are planned a few times a year.

### 4) Exchange of Information and Cooperation with Oversea Societies

The JSST has an agreement with EUROSIM to strengthen the relation. The JSST is now a cooperating society for IMACS 2000. The JSST has a close contact with KSS (Korean Simulation Society), and CASS (Chinese Association for System Simulation) and joint international conferences are planned.

The Society had its first international conference, **JSST Conference on Recent Advances in Simulation of Complex System**, Tokyo in 1986. The conference was co-sponsored by SCS (The Society for Computer Simulation), IMACS (International Association for Mathematics and Computer in Simulation) and IACM (International Association for Computational Mechanics). The second international conference is planned to be held in Tokyo in the year of 2000.

The JSST is co-sponsoring national and international conferences and symposia. Under the auspices of the Society, some research committee meetings are regularly operated on specialized topics which include accuracy-guaranteed simulation technique and automatic design of multi-dimensional mobile information network.

The membership is encouraged to apply, though the instruction of the Society is japanese. In the following the names of some of our directors to be contacted are given:

Director of Foreign Affairs: Prof. Dr. S. Shinoda
(shinoda@elect.chuo-u.ac.jp)

Director of Planning and Management:
Prof. Dr. T. Kagawa (kagawa@pi.titech.ac.jp)

Director of General Affairs: Prof. Dr. S. Takaba
(takaba@cc.teu.ac.jp)

President: Prof. Dr. Y. Kagawa
(kagawa@ calc.elec.okayama-u.ac.jp)

### Contact Address

c/o JSST Office, Tokyo
Ms. N.Sawada
Simul@pp.iij4u.or.jp
Tel : +81-3 3239-4738
Fax : +81-3 3239-4714
http://wwwsoc.nacsis.ac.jp/jsst/

*Yukio Kagawa*

## IMACS

### 3rd MATHMOD Vienna

The international symposium on **Mathematical Modelling** will take place during February 2-4, 2000 at Technical University Vienna.

Scientists and engineers using or developing models or interested in the development or application of various modelling tools will find an opportunity to present ideas, methods and results and discuss their experiences or problems with experts of various areas of specialization.

The scope of the conference covers theoretic and applied aspects of the various types of mathematical i.e. formal modelling (equations of various types, Petri nets, bond graphs, qualitative and fuzzy models etc.) for systems of dynamic nature (deterministic, stochastic, continuous, discrete or hybrid with respect to time etc.). Comparison of modelling approaches, model simplification, modelling uncertainties and the impact of items such as these on the problem solution, validation, automation of modelling and software support for modelling etc. will be discussed in special sessions as well as applications for control, design or analysis of systems in engineering and other fields of application.

The scientific program will be highlighted by the following invited lectures (prel.): Modelling Dynamical Systems Using Manifest and Latent Variables (J. C. Willems, Univ. Groningen, The Netherlands); Reverse Engineering in Modelling and Simulation (D. Murray-Smith, Univ. Glasgow); Soft Computing in Modelling and Simulation (NN).

Proceedings of the Conference will be available at the begin of the conference (price included in Conference fee). It is also planned to have a poster session, whereby poster abstracts will be published in a reviewed poster book.

Presentations of software and a book exhibition will be organized. The social program will include a Welcome Party, a Heurigen Evening and a Reception (included in conference fee).

Conference Fees: Members of IMACS and cosponsoring societies Euro 300.-; Non-Members Euro 330.-; Students Euro 70.-; Accompanying Persons Euro 90.-.

Organizer: Division for Mathematics of Control and Simulation (E114/5) at Vienna University of Technology.
Chair of IPC: Prof. Dr. Inge Troch.
Information: Prof. Dr. Inge Troch
Vienna University of Technology
Wiedner Hauptstrasse 8 - 10, A-1040 Vienna, Austria
Tel: +43-1 58801 11451, Fax: +43-1 58801 11499
email: inge.troch@tuwien.ac.at

Web site:
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## INFORMS College on Simulation

The INFORMS College on Simulation is organized and operated exclusively for educational and scientific purposes:

a) to encourage the development and dissemination of knowledge in the area of simulation; and

b) to promote communication and interaction among individuals and organizations who share an interest in simulation.

### INFORMS-CS Establishes Simulation Archive

The INFORMS-College on Simulation (INFORMS-CS) recently established a Simulation Archive at North Carolina State University. Acting on behalf of INFORMS-CS, James R. Wilson formally inaugurated this archive by contributing to it a copy of the final program of the 1967 Conference on Applications of the General Purpose Simulation System. While serving as program chair of the Twenty-Fifth Anniversary Winter Simulation Conference (WSC) in 1992, Dr. Wilson was given this document by Harold Hixson, the general chair of the 1967 predecessor of WSC.

Contributions to the Simulation Archive are requested. In particular, the Archivist seeks letters, memoranda, publications, and memorabilia of all kinds that are relevant to the history of the field of computer simulation, including the history of related professional societies. Substantial contributions to the Simulation Archive are expected in the near future, and the goal is that this collection will become an important resource for individuals interested in the history of simulation technology.

Contributions may be sent to:

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More information on the North Carolina State University Libraries Engineering and Technology Collections Initiative is available on the web:
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*James R. Wilson, Industrial Engineering Dept., North Carolina State Univ., Raleigh, NC 27695-7906, USA, jwilson@eos.ncsu.edu*

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*Heather Sutton, IIE Solutions, 25 Technology Park, Norcross, GA 30092 USA, Tel.: +1-770-449-0461, ext. 136, Fax: 770-263-8532, http://www.iienet.org*

## Comparison 1 – DESIRE/2000

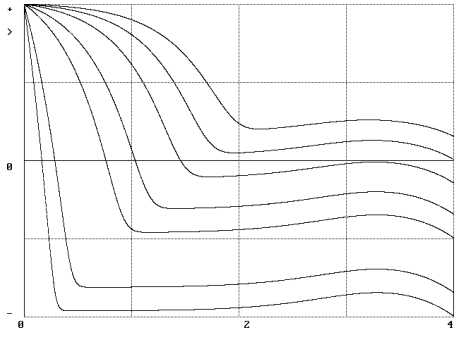
### Numerical Approach - Parallel

The new DESIRE/2000 simulation package for Windows 95, 98, NT, and 2000 solves up to 10,000 first-order differential equations with fixed- and variable-step Runge-Kutta rules, or 200 differential equations with variable-order/variable-step Gear and Adams rules.

The main purpose of this study is to show the time savings obtained through **model replication**. Instead of running this familiar simulation 7 times with different parameter values, we replicated the model 7 times with 7 different parameter values.

Here is the complete commented DESIRE/ 2000 code:

```
-- parameters (all models)
ln10 = ln(10)| loge = 1/ln10
kr = 1 | kf = 0.1 | dr = 0.1 | dm = 1 | p =0
irule 16 | ERMAX = 0.00001
-- GEAR integration
t0 =  3  |  --      shift log time scale
TMAX = 1 + t0 | NN = 6000 | DT =  0.0001
scale =  2
-- set display colors
display N15 | display C15 |
-- declare arrays containing state variables
-- and defined variables for 7 different models
STATE r[7], m[7], f[7]
ARRAY lf[7], A[7], B[7], F[7]
-- set parameters and initial values
-- for the 7 models
data 50,100,200,500,1000,5000,10000 | read lf
for k = 1 to 7
  f[k] = 9.975 | m[k] = 1.674 | r[k] = 84.99
  next
-- now a single simulation run exercises all 7
-- models and plots graphs for 7 experiments!
drun
--
DYNAMIC
--
Vector A =  kr * m * f - dr * r
--  we precompute these for speed!
Vector B =  kf * f * f - dm * m
tt =  ln10 * (10^(t - t0))
--  NOTE:  logarithmic time scale
--  7 times 3 differential equations
Mat d/dt r =  A * tt
Mat d/dt m =  (B - A) * tt
Mat d/dt f =  (p - lf * f - A - 2 * B) * tt
--  log/log display
Vector  F =  loge * ln(f) + 1
dispt F[1], F[2], F[3], F[4], F[5], F[6], F[7]
```




We obtained solutions with LSODE-type Gear and Adams integration, using chord-differenced Jacobian approximation and also chord-diagonal Jacobian approximation, which is only slightly faster. The variable-step/variable order Adams integration was not faster and required a smaller relative-error bound to reduce noise for $l_f > 1000$.

133-MHz Pentium, Windows 95, 7 solutions for 7 $l_f$ values

| | | |
|---|---|---|
| 7 runs (no vector compiler) | 3.2 sec (display ON)<br>0.46 sec/solution | 2.2 sec (display OFF)<br>0.31 sec/solution |
| 1 run (vector compiler) | 1.4 sec (display ON)<br>0.2 sec/solution | 0.6 sec (display OFF)<br>0.09 sec/solution |

400-MHz Pentium, Windows 98, 7 solutions for 7 $l_f$ values

| | | |
|---|---|---|
| 7 runs (no vector compiler) | 1.5 sec (display ON)<br>0.21 sec/solution | 0.8 sec (display OFF)<br>0.11 sec/solution |
| 1 run (vector compiler) | 0.8 sec (display ON)<br>0.11 sec/solution | 0.2 sec (display OFF)<br>0.03 sec/solution |

Compared to the repeated-run solution, model replication with the new vector compiler improved the computing time by about a factor of 2 with the display on (1.4 sec) and by about a factor of 4 with the display off (0.6 sec). Compilation required about 10 msec.

Model replication is clearly overkill for such a small problem. Realistic DESIRE/2000 applications might replicate, say, 25 nonlinear random-input differential equations 500 to 1000 times to produce Monte Carlo statistics or generate method-of-lines solutions of partial differential equations, neural networks, or fuzzy logic.

**Additional Results**: Variable-step integration sets the lowest (most conservative) DT value for all 7 replicated-model solutions, which wastes some time. Model replication also worked with simple fixed-step Runge-Kutta integration, but solution took much longer:

$2^{nd}$-order RK, 7 solutions in one run

| | |
|---|---|
| DT = 0.000005<br>(note that we use logarithmic time) | 16.3 sec (display ON) |

$4^{th}$-order RK, 7 solutions in one run

| | |
|---|---|
| DT = 0.00001<br>(note that we use logarithmic time) | 17.6 sec (display ON) |

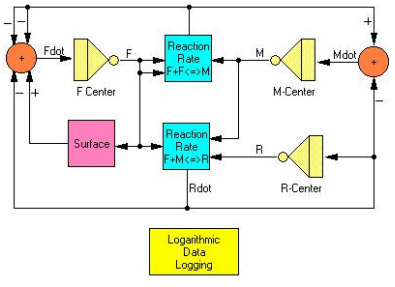
DESIRE has no special steady-state finder.

*Granino A. Korn, G.A. and T.M. Korn, Industrial Consultants, 7750 South Lakeshore Road, #15, Chelan, WA 98816, USA,*
http://members.aol.com/gatmkorn/

## Comparison 1 – ACSL Graphic Modeller
### Numerical Approach

The Advanced Continuous Simulation Language (ACSL) consists of a family of software products for the modeling, analysis and visualization of systems described by time dependent, nonlinear differential equations or transfer functions. ACSL products run on personal computers and Unix based computer systems. The ACSL Graphic Modeller (GM) provides for graphically describing and organizing models in terms of graphical blocks which may consist of standard blocks (supplied with GM), user defined blocks which are defined graphically in terms of other blocks and user defined blocks which are defined in terms of ACSL script.

**Program**: This model was implemented at one graphical level (not a hierarchical model) by using two standard GM blocks (*Integrator* and *Summer*) and three user defined blocks (*Reaction Rate*, *Surface* and *Data Logging*). The advantage of this graphical organization is that it is easy to visualize that three components (the *Integrator* blocks) are involved in two reactions (the *Reaction Rate* blocks) while one of the components is also involved with some dynamics at the *Surface*.




The *Reaction Rate* block is constructed to accept three inputs (the concentrations of the two components and the aggregate) and to produce one output (the reaction rate of the aggregate). The equation inside each Reaction Rate block is the same:

```
Rate = K*A*B - D*AB
```

**K** is the reaction rate constant for the creation of aggregate **AB** from its components **A** and **B**. **D** is the reaction rate constant for the decay of aggregate **AB** into its components **A** and **B**.

The *Surface* block uses the concentration of one component (the F-centers) to model the rate of formation of defects due to electron bombardment (**Pc**) and evaporation (**Lf**):

```
Rate = Pc - Lf*F
```

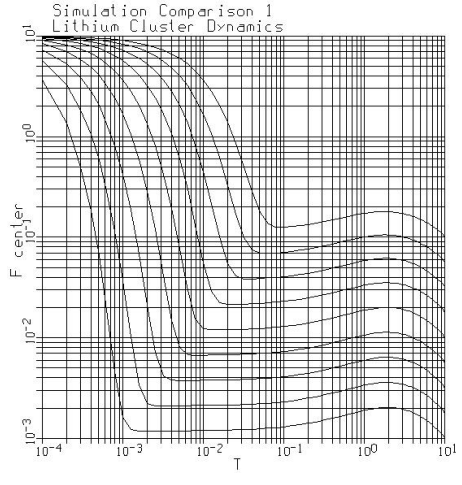
The *Logarithmic Data Logging* block dynamically computes ACSL's communication interval time (**Cint**) in order to provide a uniform distribution of data points on a log-log plot:

```
Cint = Bound(Min, Max, T*Scale)
```

**Results**: The computer time required to a ten second run with **Lf** of 1000 is presented for a 233 MHz Pentium II MMX laptop with 128 MB of RAM. The computer times are generally too small to measure and have a significant quantization effect due to the low resolution of the PC clock.

| Algorithm | Computer Time (seconds) |
|---|---|
| Adams-Moulton (Variable Step, Variable Order) | 0.17 |
| Gear's Stiff (Variable Step, Variable Order) | 0.05 |
| Euler (Fixed Step, First Order) | 0.06 |
| Runge-Kutta (Fixed Step, Second Order) | 0.06 |
| Runge-Kutta (Fixed Step, Fourth Order) | 0.11 |
| Runge-Kutta-Fehlberg (Variable Step, 2nd Order) | 0.06 |
| Runge-Kutta-Fehlberg (Variable Step, Fifth Order) | 0.06 |

The results of the parameter sweep of **Lf** from 100 to 10000 are shown on a log-log plot generated by ACSL's `PLOT` runtime command.




Steady state conditions are generated by ACSL's `ANALYZE /TRIM` runtime command. For this model, the steady state is computed for **Pc** of zero (no irradiation) and **Pc** of 10000 (constant irradiation). The values of **R**, **M** and **F** are extracted with the DISPLAY runtime command.

| Pc | R | M | F |
|---|---|---|---|
| 0.0 | 7.1E-8 | 3.3E-10 | -3.2E-12 |
| 10000.0 | 1000.0 | 10.0 | 10.0 |

*Joseph S. Gauthier, AEgis Research Corporation, 6703 Odyssey Drive, Suite 103, Huntsville, AL 35806, USA. www.ACSLsim.com acsl@aegisrc.com*

## Comparison 2 – ARENA

### Application / Process-oriented modelling approach

ARENA, a product of Systems Modeling Corporation, is the successor of SIMAN. It is an application for Windows 95 and Windows NT operating systems for discrete simulation. It offers the comfort of a graphical user interface of a windows application. ARENA is a simulation environment for process oriented simulation and animation of discrete processes, esp. for flexible assembly systems. It offers three possibilities for modelling: ARENA templates (aggregated networks of SIMAN blocks), SIMAN blocks, and Visual Basic; FORTRAN and C code can be implemented. For modelling all possibilities can be combined.

**Model Description:** ARENA offers a wide range of templates representing resources, servers, conveyors etc. These are several basic SIMAN blocks combined to a more complex structure. They can be included in the model and parameterised. ARENA provides these templates in panels which can be attached to the model. A model is set up by dragging the modules needed into the model window, parameterising them via dialog boxes and building connections between them.

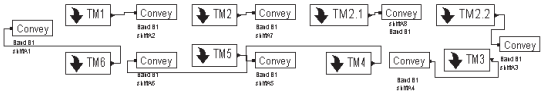



Fig. 1: Top level

The flexible assembly system consists of eight almost identical subsystems (fig. 1), each representing one assembly station and two conveyors running in parallel to the station. Here each of the subsystems was implemented using SIMAN blocks. Just the server template was used to model the individual assembly stations and the conveyor template for the conveyors of the system. The complex logic of the assembly system had to be implemented with SIMAN blocks (fig. 2).


Fig. 2: Server template with routing back to conveyor (SIMAN blocks)

The routing decisions are done locally for each of the assembly stations on entry (fig. 3). The palettes were modelled as entities. These entities carry attributes telling whether an object is on the palette and which stations this object has to pass.

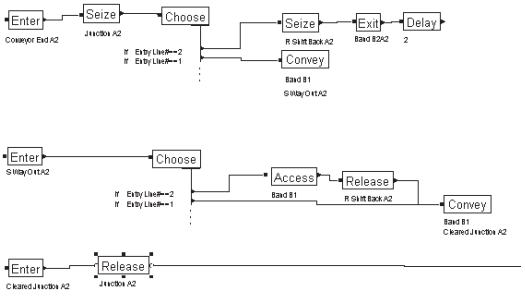



Fig. 3 SIMAN blocks for complex logic of routing into a subsystem

Choose blocks check these attributes each time a pallet attempts to enter a subsystem (fig. 3). If the attributes show that it has not been in there yet, it is allowed to enter. If not it has to continue on the conveyor to the next station.

**Results:** The system is observed for a simulation time of eight hours. The optimal number of pallets in the system is to be found such that the number of completed jobs reaches a maximum. Since ARENA does not offer an optimisation tool, a parameter study was made for the number of pallets in the system. The results are shown in the following table.

| Number of pallets | Number of jobs | Average Troughput Time (s) |
|---|---|---|
| 12 | 960 | 360 |
| 13 | 1397 | 310,6 |
| 14 | 1440 | 297,2 |
| 15 | 1440 | 299,8 |
| 16 | 1440 | 319,9 |
| 17 | 1440 | 339,9 |
| 18 | 1440 | 359,8 |
| 20 | 1440 | 400 |
| 40 | 1440 | 784,7 |
| 60 | 1439 | 1139,9 |

From the results it can be seen that there is no significant difference concerning the number of jobs done, in letting 20, 40 or 60 pallets circulate through the system. The explanation is simple: Station A2 is by far the station with the longest operation time. 1440 is the maximum number of parts to be processed during eight hours. This optimum is reached and a higher number of processed parts would indicate that the model is wrong. However, there are some significant differences in the average through-put time: The larger the number of pallets in the system, the higher is the average throughput time. Consequently, an optimum can be reached at least by using 14 pallets (maximal throughput of jobs, minimal throughput time).

*Shabnam Michèle Rahmi, Joachim Scheikl, ARGESIM/ SIMTECH, Dept. Simulation Technique, TU Vienna, {joxg, shabi}@osiris.tuwien.ac.at*

## Comparison 3 – ACSL
### Dynamic Function Approach

We solved comparison 3 using ACSL Math. We used almost the same model as described in the solution of Ed Mitchell in SNE No. 4, March 1992, as we think this is the right way to write this model.

ACSL supplies also implicit integration algorithms for DAE problems, as they often occur in circuit simulation. Yet, this example was broken down to a purely linear model, so we used Gear's stiff, which is supplied in ACSL with IALG=2.

**ACSL model:**

```
Program Comparison 3
   cinterval cint = 1.d-7
   algorithm ialg = 2
   minterval mint=1.d-15
   constant tend = 99.9d-6
   variable t,tz=0.d0
! TRF = 1.d-9 for the first runs
   table onoff,1,5 ...
     /0., 1.d-9, 5.d-6, 5.001d-6, 10.d-6, ...
     5.d-2, 5.d+6, 5.d+6, 5.d-2, 5.d-2/
   derivative
      constant L1 = 79.9d-6, C2 =17.9d-9
      constant L3=232.d-6, C4 = 9.66d-9
      constant RL = 52.4, VDC = 5.
      constant period = 10.d-6
      R = onoff(mod(t,period))
      constant x1z = 0.d0, x2z=0.d0
      constant x3z=0.d0, x4z=0.d0
      IR = x2/R; VL =X3*RL; VL3 = x3z
      x1 = integ((-x2 + VDC)/L1,x1z)
      x2 = integ((x1-x2/R-x3)/C2,x2z)
      x3d= (x2-RL*x3-x4)/L3
      x3 = integ(x3d,x3z)
      x4 = integ(x3/C4,x4z)
      termt(t.ge.tend)
   end ! derivative
end!program
```

Simulation studies were performed in ACSL Math. By a `!!` before the command, ACSL Math allows direct access to the ACSL runtime environment. For more comfort, as parameter studies or comparisons with measurement results, ACSL Math enhances this environment by a MATLAB-like programming language. All computations were done on a 66 MHz Pentium.

ACSL Math commands:

```
clear all; close all
%Load ACSL model into ACSL Math
load @file=c3_1.prj @format=model
```

**Task a and b)** with ACSL Runtime commands:

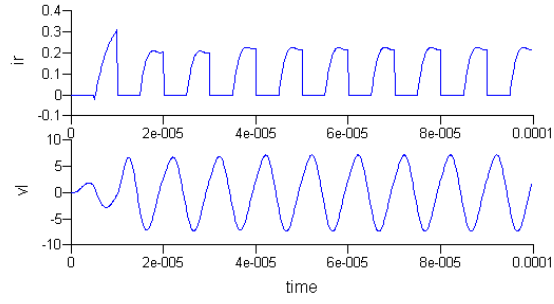
```
!! prepare /all
!! analyze /eigen
```

Result: Complex eigenvalues in ascending order:

```
   REAL         IMAGINARY       FREQUENCY    DAMPING
1 -625.783000
2 -113039.000   +/-658352.000   667986.0     0.169223
4 -1.1173E+09

TEND=1.d-6
% start simulation and show time used
!! spare$start$spare
!! analyze /eigen
```

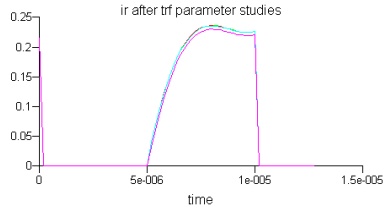
Result: Complex eigenvalues in ascending order:

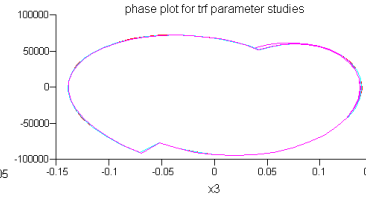
```
    REAL         IMAGINARY       FREQUENCY    DAMPING
1 -58228.4000   +/-532750.000   535923.0     0.108651
3 -54708.2000   +/-1.0408E+06   1.04E+06     0.052491

% compute simulation until 1.e-5
TEND=99.9d-6
!!start

% Plot generated in ACSL Math
subplot(2,1,1);
plot(_t,_ir);xlabel(time);ylabel(ir)
subplot(2,1,2);
plot(_t,_vl);xlabel(time);ylabel(vl)
```




**Task c)** Parameter Studies and Parametric Plots. Parameters of the ACSL-model are in capital letters. `!!` indicate ACSL runtime commands, other code is ACSL Math

```
TEND=99.9e-6
trf=[1.d-15, 1.d-11, 1.d-9, 1.d-8, 1.d-7];
tt=[]; x3=[]; x3d=[]; ir=[]; vl=[];
!!REINIT
CINT=2.d-7; TEND=12.9e-6, TZ=0.d0
for i=1:length(trf)
   ONOFF(7)=trf(i);
   ONOFF(9)=5.d-6+trf(i);
% run ACSL model with these parameters
   !! start
   tt   = [tt _t];
   x3   = [x3 _x3];
   x3d  = [x3d _x3d];
   ir   = [ir _ir];
   vl   = [vl _vl];
end
figure; plot(tt,ir);
title('ir after trf parameter studies')
xlabel('time');ylabel('ir')
figure; plot(x3,x3d);
title('phase plot for trf parameter studies')
xlabel('x3');ylabel('x3d')
```




*Dr. Ingrid Bausch-Gall, Wohlfartstr.21b, D-80939 München, Tel: +49 - 89 323 2625, Fax: +49 - 89 323 1063, email: BauschGall@compuserve.com*

## Comparison 3 – ACSL
### Hybrid Approach

**The Simulator.** ACSL is a continuous CSSL-type simulator with graphical and textual user interface. Models are translated into a FORTRAN program and compiled. ACSL Math is a powerful environment for experiments, pre- and post-processing, and for graphical output, following the standard of MATLAB languages. From ACSL Math arbitrary ACSL simulations can be called, linked, combined.

**Model Description:** The model approach used in this solution divides the system into four different ones, describing the rise-, the off-, the fall- and the on-period. For each subsystem a parameterised ACSL model is used (parameterisation of R(t) by a linear function `rt`). The following ACSL model descriptions make use of the vector integration capabilities of ACSL (`intvc`). While the system matrix `a(l,k)` gets values from ACSL Math, the resistance is calculated in ACSL as linear function (including also the special case of a constant):

```
program c3
dimension x0(4), x(4), a(4,4), b(4), dx(4)
constant ir=0., vl=0., vl3=0., tend=0.,rt=0.
constant vdc=5., l1=79.9e-6, c2=17.9e-9;
constant l3=232.0e-6, c4=9.66e-9,  rl=52.4;
constant ialg=2, cint=0., rstart=0.,rende=0.
dynamic
 derivative
  procedural
   rt=(rstart*(1-t/tend)+rende*(t/tend));
   a(2,2)=-1/(c2*rt);
   do label k=1,4
    dx(k)=b(k); do label l=1,4
          dx(k)=dx(k)+a(l,k)*x(l);
   label: continue; end
  x=intvc(dx,x0);
  ir=x(2)/rt; vl=x(3)*rl; vl3=dx(3);
  termt (t .ge. tend)
 end; end; end
```

The model is called subsequently from ACSL Math, setting different values for *R(t)*, and handing over the states and the simulation time from one subsystem to the other.

Remark: For the on- and off-period analytical solutions can be found. But due to the stiffness of the system, these analytical solutions are so badly conditioned that it is better to solve the equations numerically with an algorithm for stiff systems.

**Results task a:** First in ACSL Math parameter values are initialised and the system matrices for on- and off-period (ACSL Math variables `Aon`, `Aoff`) are calculated (assigned). Then the commands `eig(Aon)` and `eig(Aoff)` calculate the eigenvalues in ACSL Math:

```
       -625.7828          on-period
-1117317594.4106
-    113038.8149 + 658352.2205i
-    113038.8149 - 658352.2205i

-54708.2024651 + 1040797.1978548i    off
-54708.2024651 - 1040797.1978548i    period
-58228.4186099 +  532750.1924060i
-58228.4186099 -  532750.1924060i
```

**Results task b:** Simulation in the time domain is now a periodical loop over the four periods, expressed in ACSL Math simply by

```
while t(1)<100e-6
 rise; off; fall; on; end
```

For example, the m-file **`rise`** assigns appropriate values to the system matrix and to the resistance, before the simulation run is called by switching to ACSL with `!!start`. At the end the "prepared" (stored) values are stored back into ACSL Math variables:

```
A=Aon; B=b; X0=x(:,1); TEND=trf; CINT=trf/2;
RSTART=ron; RENDE=roff;                 m-file rise
!!prepar t,x,ir,vl,vl3; !!start
n=length(_t); t=[_t(n:-1:1)'+t(1) t];
x=[_x(n:-1:1,:)' x]; ir=[_ir(n:-1:1)' ir];
vl=[_vl(n:-1:1)' vl]; vl3=[_vl3(n:-1:1)' vl3];
```

The other models differ only in the calculation of R(t), e.g:

```
A=Aon; B=b; X0=x(:,1);                  m-file off
TEND=p/2-trf; CINT=(p/2-trf)/20;
RSTART=roff; RENDE=roff; ...........
```

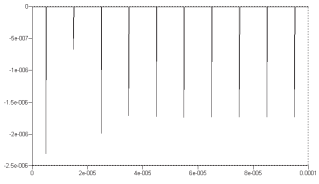


fig. 1: IR plotted over t

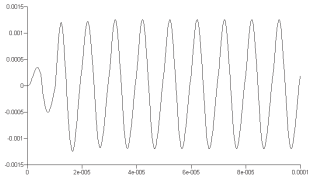


fig. 2: VL plotted over t

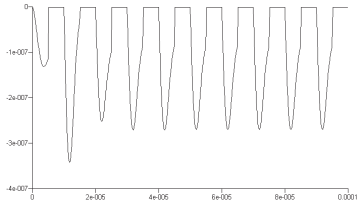


fig. 3: $x_2$ plotted over t

**Results of task c:** Using the results (final values) from the previous run as initial values, the following ACSL Math commands perform four simulation runs in a loop, varying the parameter `trf`. But only with `trf=1e-7` the results did vary significantly from the others:

```
x0=x(:,1); ir=0; vl=0; vl3=0; il3=0;
for trf=[1e-15 1e-11 1e-9 1e-7]
   x=x0;    t=0;
   while t(1)<9e-6;
     rise; off; fall; on; end
   n=length(x(3,:)); il3=[x(3,1:n-1) il3];
end
n=length(il3); plot(il3(1:n-1),vl3(1:n-1))
```

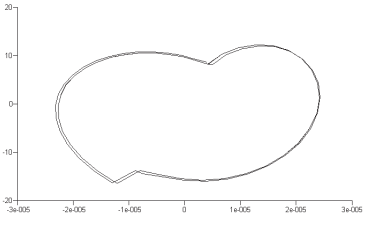
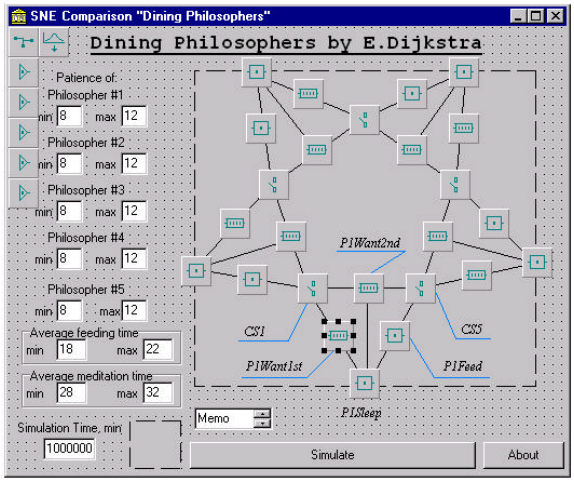


fig. 4: VL3 plotted over IL3=$x_3$

*M. Lingl, F. Breitenecker, ARGESIM/SIMTECH, Dept. Simulation Technique, TU Vienna, Wiedner Hauptstr. 8-10, A-1040 Vienna, email: mlingl@osiris.tuwien.ac.at, Felix. Breitenecker@tuwien.ac.at*

## Comparison 4 – Delsi
### Simulation Approach

The solution of the "Dining Philosophers" comparison is developed with help of the discrete-event simulation system *Delsi 1.0*, by Softland, 1998-1999. *Delsi* is a set of components for Borland Delphi, intended for simulation of queueing systems. The components correspond to the units of the queueing system such as generator queue, server, storage, gate, etc., which process and route the transactions. The user algorithms for the processing and routing are implemented as standard component events assigned at the design time in the Delphi environment. The combination of *Delsi* simulation opportunities with the power of Delphi creates a powerful and flexible framework for fast building applications for simulation. More information about *Delsi* is available at http://www.softland.rv.ua/delsi.




The **structure of the model** is shown in the design-time form in the figure. Philosophers are implemented as transactions, which move through the structure of states implemented as *Delsi* components, which process and route the transactions. The state transition diagram is performed as a star. Each of its rays corresponds to one philosopher, numbered from 1 to 5 clockwise.

We suppose that initially all philosophers meditate. For the first philosopher (on the bottom in the figure) the meditation is modeled by the *TServer* component named *P1Sleep*. After meditation the philosopher tries to seize the left stick. Because the left neighbor may seize the stick, our philosopher is first going into waiting state (*TQueue* component *PlWant1st)*. If the stick is free the philosopher immediately seizes it. The sticks are implemented as *TGate* components. After the transaction entering we *lock* the gate to avoid its seizing by another philosopher. After seizing the left stick the philosopher tries to seize the right stick. In this moment we need to identify the transaction, because two philosophers may use the same stick. We route transaction using its ID, in our case, to wait for the right stick. The waiting is implemented as the *TQueue* component *P1Wait2nd*. If the right stick is free, the philosopher immediately seizes it. Otherwise he waits until the second stick becomes free, or the limit of waiting time (*patience*) is exhausted.

The second event is introduced as a mechanism for avoiding deadlock (when all philosophers have seized the left stick and try to seize the right one). To avoid deadlock each philosopher waits for the right stick for the limited period of time, called *patience*. After patience exhausting, the philosopher frees the left stick and then meditates again in *P1Sleep*. To avoid secondary deadlock the patience period should be randomized.

The right stick is implemented as *TGate* component *CS5*. Seizing the right stick means locking the gate CS5 and routing the transaction according to its ID. At this moment both sticks are seized. After that the philosopher begins eating. This state is modeled by the *TServer* component *P1Feed*. After eating the philosopher releases both sticks and goes for meditation (unlocking gates *CS1*, *CS5* and passing the transaction to *P1Sleep)*. That is the end of the cycle of philosopher's states. The cycle for other philosophers is the same.

The simulation **experiments** have been done for the following three cases.

**Case 1.** The parameters are deterministic. They correspond to the ratios when resources are in the balance with needs. Meditation time: 30 min, Eating time: 20 min, Patience limit: 10 min

**Case 2.** The parameters are uniformly distributed. The resources are in deficit but allphilosophers have equal opportunities. Meditation time: [5...10] min, Eating time: [28...32] min, Patience limit: [8...12]min

**Case 3.** Time parameters are uniformly distributed. The resources are in deficit. The first philosopher is privileged. He has better opportunities due to a long period of patience. Meditation time: [5...10] min, Eating time: [28...32] min, Patience limit: [998...999] min for the first philosopher, [8...12] min for other philosophers.
The modeled time for all cases is 1000000 min.

For the first and second cases, the percentage of time spent in eating is about 2/5 for all philosophers. For the third case, the percentages are the following.

```
Philosopher 1:    0,46627549502612
Philosopher 2:    0,352505735577585
Philosopher 3:    0,366832617533979
Philosopher 4:    0,374189351361431
Philosopher 5:    0,1406703783936392
```

It is interesting that the losses of usual philosopher are as less as he is closer to privileged one against an hour hand.

*German A. Golushko, Private Enterprise Softland, Kn.Olga Street 8, Rivne, Ukraine 266023, e-mail: german@mail.rv.ukrtel.net, Artem S. Perekresny, Computer Division, Rivne City Administration, Soborna Street 12a, Rivne, Ukraine 266000, e-mail: artem@city-adm.rv.ua*

## Comparison 5 – ACSL
### Analytical Approach

**The Simulator.** ACSL is a continuous CSSL-type simulator embedded into an environment with textual modelling (ACSL Model), with graphical modelling (Graphic Modeller), and with a powerful runtime system ACSL Math. ACSL Math is a system of matrix-language type which is able to run ACSL models and to perform pre- and post-processing of input and output data. In ACSL Math linear models may be handled directly by means of matrix manipulations.

**Model Description.** The capabilities of ACSL Math were used to solve the system analytically and to calculate the times of the discontinuities. First a representation of the solution is calculated using eigenvector theory, resulting in formulas for the solutions $y_1(t)$, $y_2(t)$. Then the switching time instants are calculated by inverting the equation $y_1(t) = 5.8$, in order to change the parameters $c_2$ and $c_4$.

Based on this principle, the file `model.m` contains the model description by commands for calculating the solutions in the time domain: while-loops determine the switching points as described before and calculate in between-values by evaluating the solution formulas:

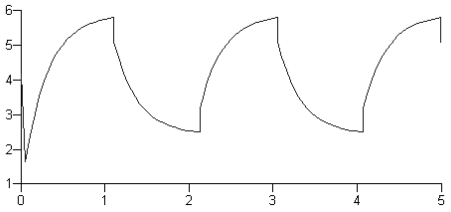
**file model.m**

```
b=[c1*c2(1) c1*c2(2); c3*c4(1) c3*c4(2)];
state=1; A=[-c1 c1; 0 -c3];
[V,D]=eig(A); Vinv=inv(V);
lambda=diag(D); Ainv=inv(A);
y=[4.2; 0.3]; t=0; disc=0;
while t(1)<5
   c=-Ainv*b(:,state);
   he=Vinv*(y(:,1)-c);
   h=he./[exp(lambda(1)*t(1));
          exp(lambda(2)*t(1))];
   yh=h'.*V(1,:);
   dyh=lambda.*h'.*V(1,:);
   d=t(1)+0.5;
   e=[exp(lambda(1)*d);exp(lambda(2)*d)];
   y1=yh*e+c(1)-bed(state); dy1=dyh*e;
  while abs(y1/dy1)>eps | abs(y1)>eps
   d=d-y1/dy1;
   e=[exp(lambda(1)*d);exp(lambda(2)*d)];
      y1=yh*e+c(1)-bed(state); dy1=dyh*e;
   end
   d=d-y1/dy1;
   if d>5; d=5;
   else
      if disc==0; disc=d;
      else; disc=[disc d];end; end
   tn=[d:-(d-t(1))/20:t(1)]; t=[tn t];
   e=[exp(lambda(1)*tn);
   exp(lambda(2)*tn)];
   y=[[(h'.*V(1,:)*e)+c(1);
      (h'.*V(2,:)*e)+c(2)] y];
   state=3-state;
end
```

**Results tasks a, b.** Using the model description in `model.m` the following commands set the parameters and calculate the results for the tasks:

**file task_ab.m**

```
clear all;
eps=1e-12; c1=2.7e+6; c3=3.5651205;
c2=[0.4 -0.3]; c4=[5.5 2.73];
bed=[5.8 2.5];
model; plot (t,y(1,:)); disc; y(1,1)
```




The discontinuities occurred at times:

```
1.1083061677711, 2.1296853551547,
3.0541529069957, 4.0755320943793,
4.9999996462203
```

The final value y(5) is `5.1000002899683`.

**Results task c .** The m-file `task_cm` calls the model in a loop, varying the accuracies:

**File task_c.m**

```
clear all
c1=2.7e+6; c3=3.5651205; c2=[0.4 -0.3];
c4=[5.5 2.73]; bed=[5.8 2.5];
for eps=[1e-6 1e-10 1e-14]
   disc=0; model; disc'; y(1,1)
end
```

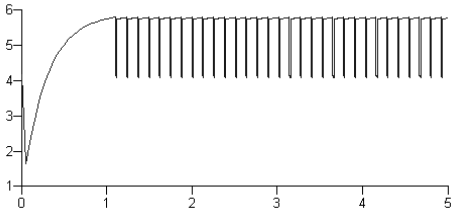
For the true relative accuracy varying between $10^{-6}$, $10^{-10}$, $10^{-14}$, the final values are `5.1000002899586`, `5.1000002899683`, `5.1000002899683`.

**Results task d.** As the model description is parameterised appropriately, only re-running of task a) b) is necessary, setting different values for the parameters $c_2$ and $c_4$ and for the switching conditions (in variable `bed`).

**File task_d.m**

```
clear all
eps=1e-11; c1=2.7e+6; c3=3.5651205;
c2=[0.4 -1.25]; c4=[5.5 4.33]; bed=[5.8 4.1];
model; plot (t,y(1,:)); disc'; y(1,1)
```

There are many discontinuities, the last one being detected at `4.9364639072000`. The final value y(1) is `5.7804025205618`. The model gives the following plot results:




**Remark:** It has to be noted that the analytical approach is more efficient than the numerical one. The numerical approach would solve the differential equations numerically, by trying to find the switching time instants by a state event finder. Although ACSL provides a powerful state event finder, the numerical approach gives inaccurate results because of the iterative character.

*M. Lingl, F. Breitenecker, ARGESIM/SIMTECH, Dept. Simulation Technique, TU Vienna, Wiedner Hauptstr. 8-10, A-1040 Vienna, email: mlingl@osiris.tuwien.ac.at, Felix. Breitenecker@tuwien.ac.at*

## Comparison 7 – ACSL
### Segmented Modelling Approach

ACSL is a classical continuous CSSL-type simulator, developed since the 80ties. Nowadays ACSL offers also a convenient runtime environment of matrix language type) and a Graphic Modeller**.** Graphic models are translated to textual models (ACSL Model, with full variety of sections), to be compiled later on, using FORTRAN. The Graphic Modeller allows a broad variety of modelling techniques. Basis of modelling are blocks, either ACSL Blocks or Compound Blocks. While ACSL Blocks consist of ACSL Model textual code, Compound Blocks may contain ACSL Blocks as well as Compound Blocks again. Blocks are identified by icons, and there are "racks" of predefined basic blocks such as integrator, summer, etc. Output and input ports of blocks may be named additionally, and – of big importance for state events – blocks may be linked with a special model section (default `DERIVATIVE`, but also `DISCRETE`, `INITIAL`, etc.).

**Model Description:** The structured graphic model (fig. 1) consists of four blocks. The Compound Block `NONLINEAR PENDULUM` describes the pendulum's motion by standard blocks inside (fig. 2).

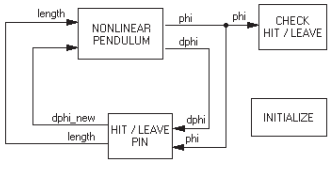



fig. 1

The ACSL Block `CHECK/HIT LEAVE` schedules the event of hitting or leaving the pin using ACSL code:

```
! CHECK HIT / LEAVE
SCHEDULE  hit .XZ. (phi-phip); GLOBAL phip
```

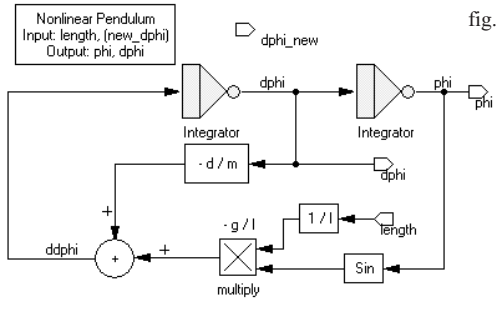



fig. 2

The ACSL Block `INITIALIZE` fixes initial values and schedules the event-block for determining the initial length of the pendulum. The block `HIT/LEAVE PIN` models the change of length and angular velocity as discrete event by linking the block to a `DISCRETE SECTION` named `hit`:

```
! Initialize
CONSTANT phi0=0.3, ll=1, ls=0.3, phip=0.3
SCHEDULE  hit  .AT. 0.
GLOBAL ll, ls, phip, phi0
! CHECK HIT / LEAVE - INIT
IF (t .EQ. 0 ) THEN  ! Initialize
  signphip = SIGN(1., phip)
  length = RSW((phi0-phip)*signphip .GE. 0,ls,ll)
ELSE ! Update length and dphi
  swil = (phi-phip)*SIGN(1.,phip) .GE. 0
  length = RSW (swil, ls, ll)
  dphi_new = RSW (swil, dphi*ll/ls, dphi*ls/ll)
ENDIF
GLOBAL phip, ls, ll, phi0
```

**Results. Task a)** ACSL makes use of an efficient event finder, which determines the hits iteratively (fig. 3, task a-ii). The model blocks communicate either by wired inputs and outputs (with local names for basic blocks), or by global variables. In the version used it is relatively complicated to set initial values and gains from outside, especially to blocks like integrators. Consequently, for the following tasks a more flexible implementation was used, whereby the Compound Block for the pendulum's motion was replaced by an ACSL block with textual code and global variables for the initial values.

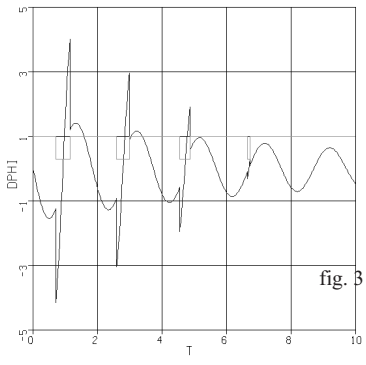



fig. 3

**Task b)** Nonlinear and linear model were described "in parallel". The basic model (fig. 1) was copied and slightly changed, and both models were put into submodels giving the angles for calculating the difference (fig.4). Of interest are the logged time instants for the events, which clearly differ:

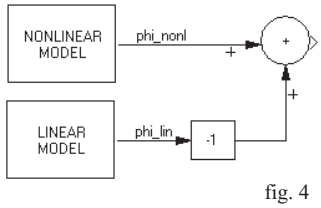



fig. 4

| Nonlinear Model | Linear Model |
|---|---|
| 0.6948507953576 | 0.6920233252220 |
| 1.1280980292485 | 1.1205447058297 |
| 2.5529788811510 | 2.5408604030056 |
| 2.9461941113819 | 2.9317990863259 |
| 4.4846966472331 | 4.4657553873837 |
| 4.8097242094708 | 4.7907860077940 |
| 6.5597626401332 | 6.5320574222774 |
| 6.6709450858390 | 6.6529953051872 |

**Task c)** The boundary value problem can be easily solved by transforming time from *t* to = - *t* (simply changing sign of the damping factor!). Now simulation runs backwards from initial values `phi=` /2 and `dphi=0` until `phi=phi0`, giving the desired value of `dphi0= =-2.18469928866723`. For this purpose the basic model (fig. 1) was extended by an event which more exactly terminates the simulation if the initial angle is reached.

*F. Breitenecker, ARGESIM/SIMTECH, Dept. Simulation Technique, TU Vienna, email: Felix.Breitenecker@tuwien.ac.at*

## Comparison 9 – ACSL
### Data Model Approach

ACSL is a classical continuous CSSL-type simulator. Models may be defined by means of equations in ACSL Model or graphically by means of blocks in the Graphic Modeller. ACSL models are compiled, using FORTRAN. Simple experiments may be done in ACSL's runtime interpreter, experiments of any kind may be done in ACSL Math, an environment of matrix language type.

**Model description.** Fuzzy controllers may either be implemented (and also simulated) directly as algorithms, or by means of pre-calculated nonlinear multidimensional table functions. This solution follows the second approach. First in an ACSL model the fuzzy control surface is calculated as array. The results are stored in the ACSL Math environment and fed back as table function into an ACSL model of the two-tank system. For calculation of the control surface also ACSL Math could be used directly, but in ACSL Model calculations are much faster. In the following the essential parts of the ACSL model are shown calculating the control surface as array. As ACSL offers no special module for fuzzy controllers, the control rules have to be programmed directly in the DISCRETE section:

```
program c9surface
dimension s(41,41)
! Membership functions as tables
table nlx1, 1, 4 / 0., 35., 40.0,  70.0, &
table p1x1, 1, 6  ex2 = -70.; l=1
  next..continue;  k=0; end
dynamic;  termt ( t .ge. tend); end
discrete controller
 interval ts = 1.75
 x1=t; k=k+1
! here calculation of defuzzification, inference
! and defuzzification
! Control surface as array s
s(k,l)=u
end
terminal; ex2=ex2+3.5; l=l+1;  goto next
 done..continue; end; end
```

**Results Task a)** The model above is used to generate the 3-dimensional surface of the fuzzy controller FC1 and FC2, resp., on a 41 x 41 grid. The surface is then plotted in AMATH (see fig.1) by a standard command. Times for computation on a Pentium 300, 64 MB, are $ta_{FC1}$=0.31 and $ta_{FC2}$=0.36, resp.

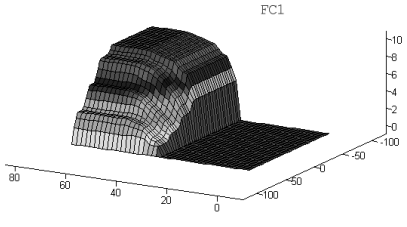



fig. 1: Controller surface of FC1

**Results Task b, c.** For simulation of the system now a relatively simple model can be used:

```
program c9system
table fuzzy, 2, 1001, 1001 / 1001*0.,
                  1001*0., 1002001*0. /
dynamic; derivative
  x1mx2 = x1 - x2;
  if ( x2 .lt. 16.0) then r = r1 ......
  f  = 0.06624*v1 * sqrt(abs(x1mx2)) *
   sign(1.0, x1mx2)
  x1 = integ ( 0.067 * u - f, x10)
  x2 = integ(f-0.0605 * r * v2 * ax2, x20)
  ex2   = x2s - x2
discrete controller
interval ts = 1.
u=fuzzy(x1, ex2)
end; end; end
```

In AMATH now first the model for calculating the control surface is run, then the surface is stored into an AMATH array, to be used as two-dimensional table function in the following run of the system's model:

```
load(@file='c9surface.prx',@format='model')
!!start
f=S;
load(@file='c9system.prx',@format='model')
for i=0:1000
  FUZZY((1001*i+1):(1001*i+1001))=f(:,i+1);
end
!!prepar t,x1,x2,u; !!start
```

Simulations of the whole system (task b) with FC1 and FC2 (see fig. 2) result in $tb_{FC1}$=1.49 and $tb_{FC2}$=1.52, resp. (ratio ~0.98). Implementing weighting rules is simply done by multiplying with a rule matrix, giving $tb_{FC3}$=1.51.

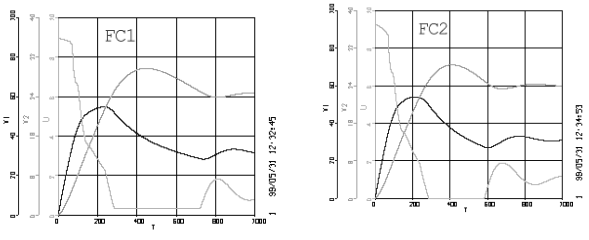



fig. 2: Results of task b (41x41 grid)

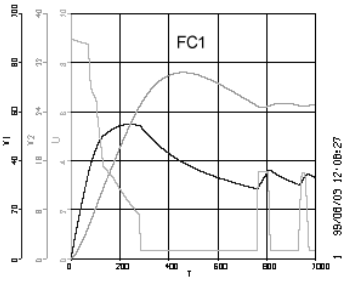



fig. 3: Results with a 501x501 grid

Clearly the results depend on the discretisation of the grid of the control surface. Using a 41x41 grid does not (!) give the same results as a directly programmed controller. Experiments have shown that with a grid size > 500 (fig. 3) almost the same results are obtained as by using a directly programmed controller.

*N. Popper, M. Lingl, F. Breitenecker, ARGESIM/ SIMTECH, Dept. Simulation Technique, TU Vienna, Wiedner Hauptstr. 8-10, A-1040 Vienna, email: {npopper,mlingl}@ osiris.tuwien.ac.at, Felix.Breitenecker@tuwien.ac.at*

## Comparison 11 – ACSL

### Full Hybrid Model Approach - Environment Level

ACSL is a widely used, compiler-based simulation language for continuous models with textual and graphical model description. It provides explicit and implicit integration algorithms and (beside others) event handling features. ACSL Math is a convenient experimentation environment for ACSL with numerous analysis and graphical tools. It is based on MATLAB-like syntax. Switching between different simulation models is an easy task with the ACSL Math `load` command. This feature can be used to implement a "Full Hybrid Model Approach" by loading and unloading models with different numbers of states depending on actual conditions during a simulation run.

**Model description (Task a):** The mathematical model for the three-axis SCARA robot has three degrees of freedom (DOF). Consequently, there is one 3-DOF-model (full model), three 2-DOF- and three 1-DOF-models, i.e. altogether 7 different models.

The following abbreviated `DERIVATIVE` Sections show the essentials of two different reduced model descriptions. Example 1 is an implicit 2-DOF-model for a motion of the two revolute joints. Example 2 is an explicit model for the vertical DOF `q3` of the robot hand.

```
DERIVATIVE ! Begin Model scara_110_imp
ma11 = th1+2*th2*c2+th3; ma12 = ...
b1 = t1+th2*(2*dq1*dq2+dq2**2)*s, b2 = ...
residdq1 = ma11*ddq1 + ma12*ddq2 -b1
residdq2 = ma21*ddq1 + ma22*ddq2 -b2
dq1, ddq1 = IMPLC(residdq1, dq10)
dq2, ddq2 = IMPLC(residdq2, dq20)
q1 = INTEG( dq1, q10); q2 = ...
END ! Derivative Model scara_110_imp
DERIVATIVE ! Begin Model scara_001_exp
b3 = t3-m3L*g
ddq3 = b3 / ma33
dq3 = INTEG(ddq3, dq30)
q3 = INTEG( dq3, q30)
END ! Derivative Model scara_001_exp
```

Since ACSL allows implicit and explicit model descriptions the full model and the reduced models can be programmed both ways and can be used even alternately when switching models.

**Point to Point Control (Task b):** Servo motors and controllers can be easily implemented by standard modelling features of ACSL. To take advantage of the hybrid model approach, the position errors have to be monitored and evaluated by the ACSL `TERMT` command. After reaching the target position for a particular joint, the simulation is halted and control is returned to ACSL Math. Depending on which axis caused the termination the matching reduced model is loaded and initialized. Simulation then continues for the drives that are still in motion. Figure 1 shows the time history for the joint angles, composed from results of three subsequently executed models.

Computation time is reduced to approximately 45% by this approach since the reduced models are executed faster due to the smaller number of DOFs.

```
load @file=scara_111_exp @format=model
 !!prepare t,q1,q2,q3
 start
.......
if (halt == 100 & explicit)
  load @file=scara_011_exp @format=model
elseif (halt == 010 & explicit)
  load @file=scara_011_exp @format=model
 .......
end
```

| Model Description | Implicit | | Explicit |
|---|---|---|---|
| Integr. Algorithm (Stepsize 0.005 s) | RK-4 `IALG=5` | DASSL `IALG=10` | RK-4 `IALG=5` |
| Rel. CPU-time Full Model | 1.0 | 0.86 | 0.12 |
| Rel. CPU-time Subset Models | 0.45 | 0.39 | 0.05 |

Computation times on a HP715/100, ACSL Vers. 11

**Obstacle avoidance (Task c):** To detect a state event the SCHEDULE operator is used in ACSL which starts an iterative state event locating routine and finally executes a DISCRETE Section. For collision avoidance a generic SCHEDULE command is used in the ACSL model description and the actual state event to be checked for is selected via the index variable `ichk`.

```
chkvar(1)=d-dcr; chkvar(2)=h
SCHEDULE event .XZ. chkvar(ichk)
```

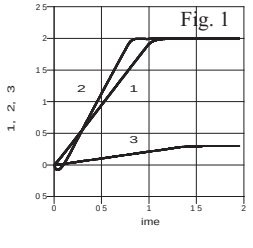
If the value of the checked variable `chkvar(ichk)` crosses zero the DISCRETE Section `event` is triggered and the simulation run is terminated:

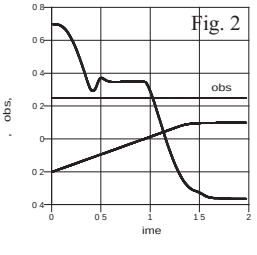
```
DISCRETE event ; TERM(.true.) ; END
```

On return from a simulation run an ACSL Math script has to check the termination condition and to start suitable script files, either to load another (reduced) model or to take precautions for obstacle avoidance.

```
while (time < tend)
 !! START
 collect_data  % script to save prepared data
 if (halt  > 0)
  select_model % script to load new model
 elseif (h  < 0)
  handle_event % script to avoid obstacle
 end
end
```

Figure 2 was plotted using ACSL Math. It shows that the x-position of the tool tip does not cross the obstacle border line until the tool tip height has reached a positive height above the obstacle.




*Horst Ecker, Institute for Machine Dynamics and Measurements, TU Vienna, Wiedner Hauptstraße 8-10, A-1040 Vienna/Austria, email: horst.ecker@tuwien.ac.at*

# ACSL - DBIG

**German-speaking ACSL User and Interest Group**
***Deutschsprachige ACSL-Benutzer- und Interessentengruppe***

Aims and scope of ACSL-DBIG are the dissemination of information about ACSL (Advanced Continuous Simulation Language).

After a "Sleeping Beauty"-period the group has started activities again. The break in the activities was caused by the fact that for two years there was no support in Europe and that MGA developed ACSL into a different direction. Now the developer, Joe Gauthier, "has returned to the roots of ACSL", concentrating on ACSL's role as very fast simulator in the area of mechatronics. Furthermore, BAUSCH-GALL GmbH took over the support in Germany, and partly in Europe.

Information on the user group may be found at the WWW address http://www.argesim.org/acsl/, where the welcoming table summarises the aims and activities:

| | |
|---|---|
| Allgemeine Information | General Information |
| Neuigkeiten, Projekte | News, Projects |
| Treffen | Meetings |
| ACSL-Demos, ACSL-Lösungen der ARGESIM Comparisons | ACSL-Demos, ACSL-solutions of the ARGESIM Comparisons |
| Mitgliedschaft in der ACSL - DBIG | Membership in ACSL-DBIG (online) |
| Mitgliederservice (Datenänderung, Mitgliederliste) | Membership Service (list of members) |

Amongst others, the "revival" of the group starts with a User Group Meeting in September 1999 and with a comparison project:

**ACSL User Goup Meeting**, Tuesday, Sept. 21, 1999, 16.00, on the occasion of the ASIM annual conference in Weimar.
Preliminary program:
Development of ACSL (Joe Gauthier, AEgis)
New Support in Europe / Germany (I. Bausch-Gall, BAUSCH-GALL GmbH)
Applications (R. Hohmann, Uni Magdeburg; F. Breitenecker, TU Wien, et al.)

**ACSL Comparison Project:** In co-operation with ARGESIM and with the ASIM FG "*Simulationssoftware und –Hardware*" solutions of the ARGESIM comparisons are prepared, using the new features of ACSL and following different approaches. By means of ACSL's environment ACSL Math there is now a broad variety of new approaches possible, e.g. hybrid approaches, analytical approaches, etc.

This issue of SNE shows the first results of this project, 7 solutions to the comparisons may be found here. For instance, the solution of C9 shows the capabilities of ACSL for fast table function handling and how now table functions can be managed from the ACSL Math environment (without using FORTRAN !), the solution of C11 makes use of a full hybrid approach to robot dynamics (different degrees of freedom), and the solution of C5 shows, how linear systems can be handled analytically in ACSL Math. This issue of SNE will be distributed to all members of the User Group (about 130), and to about 300 people having shown interest in ACSL, and to all users in Germany and partly in Europe.

Furthermore the contribution "Programming aspects of rotor-stator contact problems" by H. Ecker, p. 50 shows advantages of ACSL simulations and Joe Gauthier sketches the future of ACSL on page 48.

In order to stimulate new activities, we search people who are willing to work in the user group – please contact us:

ACSL-DBIG:

Dr. Rüdiger Hohmann, Otto-von-Guericke Universität Magdeburg, Institut für Simulation und Graphik, Universitätsplatz 1, D-39016 Magdeburg, Tel: +49-391 67 12017, email: Ruediger.Hohmann@Informatik.Uni-Magdeburg.de
Prof. Dr. Felix Breitenecker, Abt. Simulationstechnik, Technische Universität Wien, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel.: +43-1 58801 11452, Fax: +43-1 58801 42098, email: Felix.Breitenecker@tuwien.ac.at
Dr. Ingrid Bausch-Gall, Wohlfartstraße 21b, D-80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063 email: BauschGall@compuserve.com

**Some remarks:** The ACSL Web Site has been moved to www.acslsim.com (previously www.mga.com). Please make a note of this.

When searching for information about ACSL on the web, in order to prepare an updated list of links, we found also other meanings of the abbreviation ACSL:

- ACSL – ACSL-Allied Computing Services Limited 1985
- ACSL – American Computer Science League

*R. Hohmann, F. Breitenecker*

# Classes on Simulation

**September 1999**

13-14 ***Kurs MATLAB.*** Munich, Germany.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, D-80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063, email: BauschGall@compuserve.com

14-15 ***Einsatz von MATLAB in der Regelungstechnik.*** Aachen, Germany.
Contact: Scientific Computers, Franzstr. 107-109, D- 52064 Aachen, Tel.: +49-241- 47075-0, Fax: +49-241- 44983, email: info@scientific.de

13-30 **Summer School: Modelling and Simulation in the Social Sciences.** Lecturers: Nigel Gilbert (University of Surrey at Guildford, UK), Klaus G. Troitzsch, Michael Möhring, Elke Mentges (Universität Koblenz-Landau, D).
Contact: Klaus G. Troitzsch, Tel.: +49-261-287-2643, Fax +49-261-287-2642, e-mail kgt@informatik.uni-koblenz.de, WWW: http://www.uni-koblenz.de/~kgt/SICSS/ModSimNew.html

28-29 ***Einsatz von Simulink in der Regelungstechnik***. Aachen, Germany.
Contact: Scientific Computers

**October 1999**

4-6 ***Simulation mit SIMULINK.*** Munich, Germany.
Contact: BAUSCH-GALL GmbH

7 ***Kurs MECHMACS***. Munich, Germany.
Contact: BAUSCH-GALL GmbH

18-19 ***Filterentwurf mit QuickFil***. Munich, Germany.
Contact: BAUSCH-GALL GmbH

19-20 ***Simulation von Zustandsautomaten mit Stateflow***. Aachen, Germany.
Contact: Scientific Computers

20-22 **Micro Saint Course.** Worthing, U.K.
Contact: Rapid Data Ltd

28 ***Seminar Simulation mit ACSL***. TU Vienna, Austria
Contact: ARGESIM, TU Wien, Abt. Simulationstechnik, Wiedner Hauptstraße 8-10, A-1040 Wien, Tel: +43-1 58801 11452, Fax: +43-1 58801 11499, email: seminar@argesim.org

**November 1999**

15-16 ***Kurs MATLAB.*** Munich, Germany.
Contact: BAUSCH-GALL GmbH

16-17 ***Einsatz von Matlab in der Regelungstechnik***. Aachen, Germany.
Contact: Scientific Computers

22-24 ***Simulation mit SIMULINK***. Munich, Germany.
Contact: BAUSCH-GALL GmbH

30-December 1
***Einsatz von Simulink in der Regelungstechnik***. Aachen, Germany.
Contact: Scientific Computers

**December 1999**

14-15 ***Simulation von Zustandsautomaten mit Stateflow***. Aachen, Germany.
Contact: Scientific Computers

16 ***Seminar Simulation und Planung von Abfallbehandlung***.
TU Vienna, Austria
Contact: ARGESIM

# Software Development

## The Modeling Language Modelica

A unified object-oriented language for physical systems modelling, Modelica, has been designed by the "Technical Chapter on Modelica" within the Society for Computer Simulation International and "Technical Committee One" of EUROSIM. After fifteen meetings during two years, the specification of Modelica was ready in December 1998. Modelica based tools and libraries are now available.

The result is a modern object-oriented language allowing non-causal modelling with true equations and discrete events. Object oriented modelling supports hierarchical structuring, reuse and evolution of large and complex models independent from the application domain. Non-causal, equation-based modelling has shown be much more convenient, less error-prone and giving more efficient simulation compared to the traditional modelling methodology, block diagrams with input/output blocks.

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 the Modelica Design Group hope that the Modelica language will serve as such a language and become a defacto 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:

www.Modelica.org

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, SE-223 70 Lund, Sweden, Phone: +46-46 182500, email: Elmqvist@Dynasim.se*

## A Novel Vector Compiler for Monte Carlo Studies, Neural Networks, Fuzzy Logic, and Partial Differential Equations

The new DESIRE/2000 simulation package for Windows 95, 98, NT, and 2000 solves up to 10,000 first-order differential equations with fixed- and variable-step Runge-Kutta rules, or 200 differential equations with variable-order/variable-step Gear and Adams rules. A novel loop-unrolling vector compiler lets you combine nonlinear scalar and vector equations, which can include vector/matrix transformations and shifted vectors.

DESIRE/2000 conveniently solves simple differential-equations systems for teaching. But professional users can easily simulate complicated plants or physiological models controlled with multiple neural networks and/or fuzzy logic. Models can even include partial differential equations. As an entirely new feature, DESIRE/2000's loop-unrolling vector compiler produces Monte Carlo statistics on hundreds of replicated models simulated in a single computer run. Multiple windows and compilation well within 100 ms let you see the results of interactive model changes without distracting delays.

More specifically, DESIRE/2000's fast runtime vector compiler permits a number of entirely new, very powerful modeling operations. Specifically,

**Vector y = f(x, z, alpha, ... )** compiles into
**y[i] = f(x[i], z[i], alpha, ...) (i = 1, 2, …, n)**

**Mat d/dt x = f(x, y, alpha, …)** compiles into
**d/dt x[i] = f(x[i], y[i], …) (i = 1, 2, …, n)**

where **x**, **y**, **z**, … are **n**-dimensional arrays (vectors), and **alpha** is a scalar. *DESIRE/2000 vector expressions can be nonlinear, contain unlimited nested parentheses. Scalars can be expressions containing literal numbers as well as symbolic variables.* As an example,

**Vector y = (1 – v) * (cos(alpha * z * t) + u)** compiles into **y[i] = (1 - v[i]) * (cos(alpha * z[i] * t) + u[i])**

The runtime-compiled vector operations are fast because they **cause no runtime loop overhead** (loop-unrolling compiler). They have significant applications:

1. You can take Monte Carlo statistics on hundreds of *replicated models* with random inputs and/or parameters *in a single computer run*, e.g.
   **Mat d/dt x = xdot**
   **Mat d/dt xdot = - w * x + cos(b * t) + a * ran()**
   **DOT nmeansquare = x * x**

2. Any vector in a **Vector** or **Mat d/dt** operation can be a matrix-vector product **A * v**, where **v** may be defined by another **Vector** assignment. This is used to model control systems. e.g.
   **Mat d/dt x = A * x + B * u**
   **Vector y = C * x + D * u**

3. Neural networks are easily modeled in the same matrix/vector notation. Here is the complete DYNAMIC program segment for a backpropagation network:
   **x1[1] = ran()** | -- random input
   **target = 0.4 * sin(4 * x[1])** | -- desired output
   **Vector v = tanh(W2 * x)** | -- two network layers
   **Vector y = W3 * v**
   **Vector error = target - y** | -- error backpropagation
   **Vector vdelta = W3% * error * tri(v)**
   -- tri(v) is faster than 1 - tanh2(x)
   **DELTA W2 = lrate2 * vdelta * x!**
   **DELTA W3 = lrate3 * error * v**

4. Any vector in a **Vector** and **Mat d/dt** operation can be an *index-shifted vector* **u{m}** with components **u[1 + m]**, **u[2 + m]**, ... Originally designed to model recurrent neural networks and predictors, index shifting also neatly models finite differences for *interactive method-of-lines solutions of partial differential equations*:
   **Mat d/dt u = udot**
   **Mat d/dt udot = a * (u{-1} – 2 * u + u{1})**
   (method of lines for wave equation **ut =** $\mathbf{u_{xx}}$)

   **u** and **udot** are arrays of **n** nodes. Pre-written macros conveniently implement higher-order difference approximations for the space derivatives. To account for the boundary conditions in such problems, DESIRE/ 2000 accepts subscripted differential-equation state variables, as in
   **d/dt u[14] = a * sin(w * t)**

   Systems of partial differential equations modeling, say, a heat exchanger combine seamlessly with ordinary differential equations representing plants and controllers.

### References


[1] Korn, G.A.: Interactive Dynamic-system Simulation with Windows 95 and NT, Gordon and Breach, 1998.

[2] Korn, G.A.: Neural Networks and Fuzzy-logic Control on Personal Computers and Workstations, MIT Press, 1995.



*Granino A. Korn, G.A. and T.M. Korn Industrial Consultants, 7750 South Lakeshore Road, #15, Chelan, WA 98816, USA, http://members.aol.com/gatmkorn/*

## A Glimpse of AEgis's Vision for the Future of ACSL

ACSL (the Advanced Continuous Simulation Language) turns 25 next year. If you stop to think about it, this longevity is a remarkable accomplishment for any computer language considering the staggering pace of technology today. Some of the credit for ACSL's longevity can no doubt be attributed to the fact that ACSL is based on the CSSL (Continuous System Simulation Language Standard) established by the CSSL Technical Committee of the Society for Computer Simulation. From this CSSL standard, ACSL has become the enduring standard for continuous simulation, worldwide.

As AEgis moves forward with the development of the full line of ACSL products, first and foremost, we will continue to guard ACSL's reputation for quality, reliability, performance, and the power to handle everything from the simplest models to the largest models on earth. However, we don't plan to stop there. With the leadership and full support of AEgis Research, we have embarked on a very aggressive development plan to improve ACSL and the host of other products that round out the ACSL product family.

Recognizing the importance of standards to ACSL's long history, our first development thrust will be further standardization. First, without abandoning the enduring ACSL standard, our future development plans will seek to allow for other computer "language standards" to better coexist with ACSL. Support for representing parts of ACSL models in languages such as C, C++, Java, SPICE and VHDL-AMS are all being investigated. Second, our plans also call for opening up the target language for translated ACSL models to include C and C++. This will make ACSL models more flexible in today's diverse simulation environments. Third, we also plan to open ACSL up to popular "data standards" used throughout the simulation community. Future development will allow ACSL to tap into databases from various sources by recognizing standard file formats for both import and export. Fourth, we are implementing additional graphics standards for plotting, animation and graphic modeling which will open up a whole new realm of ACSL data visualization. Finally, we are implementing documentation standards that will allow ACSL to recognize the benefits of hypertext (e.g. HTML) and portable documentation (e.g. PDL) formats in representing model descriptions.

Our second development thrust deals with the area of distributed simulations. AEgis Research has long been recognized for expertise in the field of distributed simulations and we have had extensive involvement in developing the DIS (Distributed Interactive Simulation) and HLA (High Level Architecture) standards. AEgis Research has recently capitalized on this experience by introducing a new line of software products called HLA Lab Works that facilitates working with and implementing distributed simulations in various HLA environments. We have already demonstrated how easy it is to use HLA Lab Works and ACSL together to develop very complex distributed simulations that work across complicated computer networks. We are now investigating other enhancements that will add even greater flexibility in using these two product lines together in a more coordinated fashion to simplify the design and implementation of highly complex distributed simulations.

Finally, the third thrust of our development plan deals with the enhancement of existing ACSL features and the addition of important new features that will further improve the overall usability of the full line of ACSL products. A sampling of the projects we are currently working on include further enhancing ACSL's debugging tools to allow users to debug straight from the ACSL Graphic Modeller and extending ACSL's error checking to include an option for extensive runtime error checking. We are also working on adding other exciting features that will provide tools for encryption of proprietary ACSL models and better configuration management of graphical models developed in the ACSL Graphic Modeller. We are revising the handling of ACSL parameters (constants) and implementing the concept of user defined "cases" to allow for better model management and we are working on adding a new tabular function manager to speed up model development.

We have just completed the first AEgis release of ACSL along with versions of the rest of the ACSL product line. With this release (ACSL Version 11.6) all ACSL products are certified Y2K compliant. Version 11.7 will follow this summer and Version 12.0 is slated for the first quarter of 2000. So as you can see, the development team here at AEgis Research is very busy improving the functionality and usability of the entire line of ACSL products. This is by no means a complete picture of all the things the ACSL development team is working on, but we thought that it was important to share with you a glimpse our vision for the future of the ASCL family of products. ACSL truly has a bright future at AEgis Research and we are excited to be in a position to bring a whole new realm of functionality and usability to the ACSL user community.

*Joseph S. Gauthier, AEgis Research Corporation, 6703 Odyssey Drive, Suite 103, Huntsville, AL 35806, USA, www.ACSLsim.com, acsl@aegisrc.com*

## Programming aspects of rotor-stator contact problems

Discontinuous dynamical systems, also referred to as hybrid systems, are frequently encountered in today's application of numerical simulation. Nevertheless, they are also a field of ongoing research, see [1, 2], since there are still open questions to be answered.

This contribution has its origins in hands-on simulation experience of magnetically supported rotors that have intermittent contact with the emergency bearing [3], but rotor-stator contact can occur in almost any kind of rotating machinery. In a more general view this topic also includes the free 2D-motion of a mass within boundaries, also known as "generalized billiard-problem". Therefore the following discussion is kept as generic as possible. Figure 1 shows a schematic diagram of a typical rotor-stator configuration as addressed in the following section.

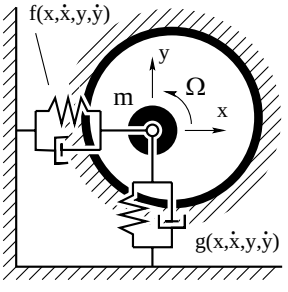



Figure 1: Schematic of the investigated system

### Model description

A rather simple mathematical model for the continuous part of the plane motion of a rotor in two axes is given by a set of second-order differential equations

$$m\,\ddot{x} = f(x,\dot{x},y,\dot{y}) + m\,e\,\Omega^2\cos\Omega t \qquad (1)$$

$$m\,\ddot{y} = g(x,\dot{x},y,\dot{y}) + m\,e\,\Omega^2\sin\Omega t \qquad (2)$$

Functions *f* and *g* basically represent damping and restoring forces acting from the shaft and/or the bearings on the rotor mass *m.* The mass rotates with an angular speed Ω and an unbalance excitation force is generated by an eccentricity *e* of the mass center. Frequently, a simplified linear and uncoupled system can be used. However, in applications like magnetically supported rotors the fully nonlinear system with coordinate coupling in both axes has to be considered [3].

Coding of Eqs. (1) and (2) is an easy task in a programming environment for continuous simulation. For such problems equation-based languages are as well suited as simulators with block-oriented graphical input. Advanced simulation languages offer both methods and even permit the two methods to be combined.

To model the rotor-stator contact different mathematical formulations are in use, mainly depending on the local contact stiffness. In case of a high contact stiffness between rotor and stator an impact model with zero time contact is appropriate. If the contact stiffness is less high and/or the duration of the contact is not negligible a spring-damper model has to be used.

The choice of the contact model also results in different methods of implementation in a simulation program. For a spring-damper contact model the system parameters for the restoring and damping forces are discontinuous at the beginning and at the end of the contact. During contact the set of differential equations can become stiff and might require also a change of the integration parameters and/or the routine. The impact model imposes an even larger discontinuity on the mathematical system. Simulation has to be interrupted and the change of momentum of the rotor has to be calculated, based upon Newton's impact law. This method was used by the author in [3] and will be addressed in further comments on the contact problem.

Programming features for discrete event scheduling and handling are helpful for both types of contact models and determine whether a simulation language is convenient to use for such problems.

### Numerical stability

Numerical problems are frequently encountered when simulating discontinuous systems [1]. Narrow windows of periodic, quasi-periodic and chaotic solutions are a challenge for every simulationist. For the rotor-stator contact problem self-similarity and multiple coexisting stable solutions have to be added to the list of numerical difficulties.

Numerical stability is essential when dealing with this type of problem. Double precision arithmetic and a variety of reliable integration algorithms to choose from are basic necessities for a successful simulation. However, success or failure also depends on a capable algorithm to handle discontinuities. With reference to [1, 3], the rotor-stator contact problem cannot be simulated without precise recognition of the occurrence of a contact. The state event has to be located and integration terminated exactly at the instant of impact. Then the impact model equations can be evaluated and integration is restarted with newly set initial conditions.

Attempts by the author to speed up execution time by sloppy handling of the rotor-stator impact event were punished by unreliable or wrong results. However, "right" or "wrong" results aren't that easy to separate for a numerically challenging system. Therefore a reliable implementation of an event handling algorithm (e.g. [4]) also can save a lot of time and makes life definitely easier.

**Execution time**

Since discontinuous systems can exhibit various kinds of nonlinear phenomena a thorough investigation of numerical results is mandatory. Obtaining a non-periodic solution after a simulation run always raises the question whether the considered period of time was sufficiently long enough. Increasing simulation time to allow slowly decaying transients to vanish is usually worth a try. Another approach is to vary initial conditions in order to start close to an expected but not known periodic solution (if there exists one at all). Once a periodic solution is found, basins of attraction for initial conditions and system parameters are of vital interest. Even on a high-end computer such investigations are rather CPU-time consuming tasks although a rather simple model is used. From the author's experience only compiler-based simulation languages can compete in applications like this.

Typically any advantage in computational speed is traded in by the user for either a longer period of simulation time, a higher resolution of results from parameter variations or a more complex model. With the goal in mind to get better and more reliable results execution time is always important. Since we are dealing with CPU-hours (not minutes or seconds) any avoidable inefficiency would mean a waste of valuable time.

**Postprocessing**

Plotting time series of the rotor position is not feasible for many thousand simulation runs. Even plots of the steady state rotor orbit as shown in Fig. 2 are not an adequate representation for that much output.

A more concise result is given e.g. by a diagram of the position of rotor-stator contact vs. the excitation frequency, see Fig. 3. In this diagram periodic solutions at a certain frequency are represented by one dot for single-contact solutions and a corresponding number of dots for multi-contact solutions.

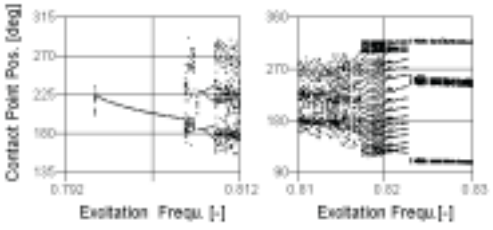



Figure 3: Bifurcation diagram of rotor contact position versus excitation frequency

Nonperiodic solutions can be identified by a high number of scattered points at a specific frequency. Poincaré sections are a similar method to condense information, see [3]. A versatile and fast postprocessor is necessary to analyse and extract the relevant information from the data obtained by numerous simulation runs. ACSL and ACSL Math [4] were used to generate Fig. 3. During each simulation run the angular position of a contact point on the stator was stored in an array. By plotting the last thirty entries for each run with ACSL Math the contact point-map was obtained. More complex numerical post-processing can be necessary for other representations (e.g. Poincaré sections).

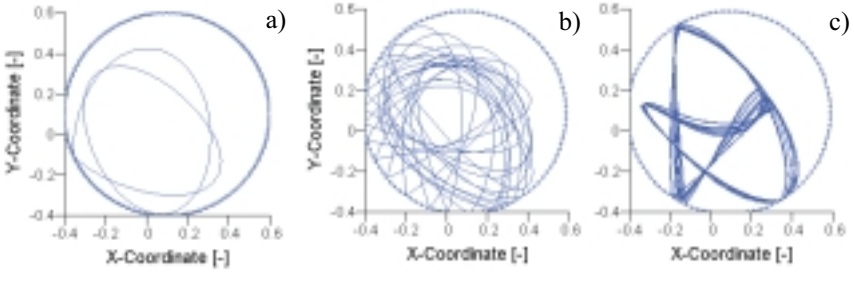
**References**


[1] P.G. Thomasson, Discontinuous Systems or Ripples in the Ether. Simulation News Europe No. 23, July 1998.

[2] J.M. Schumacher, Declarative, Equation-Based Modeling of Hybrid Systems. Simulation News Europe No. 23, July 1998.

[3] H. Ecker, Nonlinear stability analysis of a single mass rotor contacting a rigid backup bearing. Proc. of Euromech Colloquium 386, Dynamics of Vibro-Impact Systems, Loughborough, UK, Sept. 1998.

[4] MGA Software, ACSL Ref. Manual and ACSL Math User's Guide, Concorde, MA, 1996.


Figures 2 a, b, c: Different kinds of periodic and quasi-periodic orbits


*Horst Ecker, Institute for Machine Dynamics and Measurements, TU Vienna, Wiedner Hauptstr. 8-10, A-1040 Vienna / Austria, email: horst.ecker@ tuwien.ac.at*

Here reports on new conferences related to modelling and simulation are published. Information and reports on other conferences may be found within the societies' reports.

## BioMedSim'99

Y. Hamam – conference organizer
Groupe ESIEE, Cité Descartes, BP 99, 2 Bd. Blaise Pascal, F-93162 Noisy le Grand CEDEX, France, email: hamam@esiee.fr

The first Conference on Modelling an Simulation in Biology, Medicine and Biomedical Engineering, BioMedSim'99, was held at ESIEE, Noisy-le-Grand, France, on the 20th - 22nd of April. It is the first of a series of conferences to be held once every two years. These conferences are intended to be an opportunity for researchers and industrials to present fundamental work and applications in the fields related to the modelling and simulation in living systems.

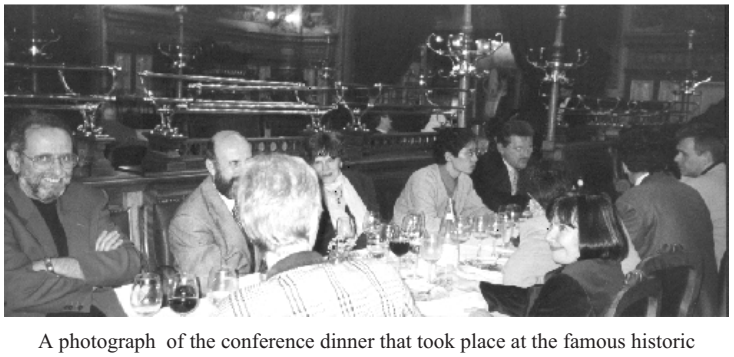
As both biological and mathematical aspects are involved the organisers expect that this series of conferences will offer researchers and developers in both fields an opportunity to meet, exchange information and establish contact.

Though it was held for the first time, twenty six papers of a very good quality were presented. The models presented were very wide: models of biological systems, medicine, ecology, medical devices, immunity and cancer models. Most of the models were of the dynamic type. Several papers were presented by teams with both biologists and physicians together with engineers or applied mathematicians.

This conference grouped researchers from Australia, Austria, Bulgaria, Croatia, The Czech Republic, Estonia, France, Finland, Hungary, Japan, The Netherlands, Russia, The Slovak Republic, Slovenia, Sweden, Switzerland, UK, USA. Many promising contacts were established between researchers from these countries.

The conference has illustrated the need for a forum at the European level for researchers in the field of modeling applied to medicine and biology.

The next conference will take place in June 2001. The organizers hope that the 1st conference opens the way to a richer 2nd version of this conference with more participants.



A photograph of the conference dinner that took place at the famous historic restaurant "The Train Blue" at the Gare de Lyon in Paris

## First IIE Simulation Solutions Conference

Excitement was in the air as 175 simulation practitioners converged in March for the first annual IIE Simulation Solutions 99 Conference in Mesa, Arizona. "It was energized," said Khaled Mabrouk, chairman of the simulation skills development track and next years general chairman. "There was a tremendous amount of information exchanged. You had a lot of people who were brand new who were just asking a lot of questions, learning more about simulation, and getting some good ideas on how to get started. In the past those people would have had to self-learn a lot."

The Simulation Solutions conference spotlights the ways engineers can use simulation in business, a growing trend in the field of simulation. "We're seeing an expansion in the use of simulation in smaller or medium-sized organizations," Mabrouk noted. "And we're also seeing an expansion of simulation outside of traditional manufacturing into a wide variety of service applications. Those definitely showed at the conference."

These facts were also underlined by two overview lectures, introducing simulation projects abroad: Simulation in Mexico (J. R. Villalobos, Arizona State University) and Simulation in Europe (F. Breitenecker, Vienna University of Technology).

The organisers were pleased that 16 exhibitors presented their simulation systems or offered consulting for simulation studies:

- Anderson Consulting (Consulting)
- AutoSimulations (AutoMod)
- CACI Product Company (COMNET, SIMPROCESS, MODSIM, SIMSCRIPT)

- Deneb Robotics (digital manufacturing software, Virtual Collaborative Engineering environment)
- Engineering Animation (VisFactory)
- F & H Simulations (Taylor ED)
- Imagine That (Extend)
- Micro Analysis & Design (Micro Saint)
- Micrografx (iGrafx)
- ProModel (ProModel)
- Scitor (Process X)
- SILMA (PILOT Line / Cell / Yield)
- Simulation Modeling Services (Consulting)
- Systems Modeling (Arena)
- Union Pacific Technologies (Consulting, information systems mainly for rail industry)
- Visual Thinking (SIMUL8)

Participants took a little time off for fun, enjoying a hockey game and morning hikes during their conference stay. "People loved the Mesa area, and the weather was just unbelievable," said IIE interim Director of Continuing Education Ellen Vagner. "But people were so excited about the conference that we didn't really lose many people to the outside world."


Vagner hopes to double the number of conference sessions next year, and she anticipates many more exhibitors. Look for more information about next year's simulation conference in upcoming issues of IIE Solutions.

*Heather Sutton, IIE Solutions, 25 Technology Park, Norcross, GA 30092 USA, Tel.: +1-770-449-0461, ext. 136, Fax: 770-263-8532, http://www.iienet.org/*

# Simulation Centers

## Biomedical Simulation at the Austrian Research Centers Seibersdorf

In 1996 a new subdivision *Medical and Rehabilitation Engineering* had been established at the Austrian Research Centers Seibersdorf (ARCS). Today this workgroup, which has a technical, medical as well as a pedagogical background and is temporary extended by high qualified foreign researchers, e.g. Hertha-Firnberg-Fellows, is one of the leading centres for medical research, development and transfer of technology in Austria, especially in the area of applications for handicapped people.

The main research interest of the *Medical and Rehabilitation Engineering* group is the modelling and simulation of biomedical processes for teaching, diagnosis and therapy purposes. Beside a qualitative and quantitative description of the physiological dynamics or functions the development of user-friendly software packages is major aim. Solutions are realised either by individually programmed software or by using state-of-the-art tools.

Modelling and simulation of the human arterial and respiratory system are examples of current projects. Embedded expert systems for controlling the mathematical model, for automation of the parameter identification and for the processing of simulation experiments provide an easy access to the model for the user.

The strength of the group is the capability to bridge the gap between the high sophisticated university research, the in-dustrial commercial aims and the individual needs of the users like handicapped people, their caretakers and the physicians. This is achieved by cooperation with universities, industrial and clinical partners.

*For further information contact: ARCS Ges.m.b.H., Medical and Rehabilitation Engineering, Dr. Johann Krocza, Prof. Dr. Stephan-Koren Str. 8/3, A-2700 Wiener Neustadt, Austria, Phone: +43-2622 6929010, Fax: +43-2622 2285917,*
*email: johann.krocza@integranet.at*

**Handbook of Simulation:**
**Principles, Methodology, Advances, Applications, and Practice**
**Edited by Jerry Banks**
**Wiley-Interscience Publishers**
**ISBN 0-471-13403-1**

The *Handbook of Simulation* is a gold mine of information on simulation techniques and applications. At 835 pages, two inches thick, and four pounds in weight there is plenty of room for detail on the twenty-five subjects covered. Edited by Jerry Banks at Georgia Institute of Technology, the list of chapter authors reads like a Who's Who of simulation researchers and practitioners. Banks has recruited Alan Pritsker to write the chapter on Principles of Simulation Modeling; Pierre L'Ecuyer on Random Number Generation; Osman Balci on Verification, Validation, and Testing; Richard Fujimoto on Parallel and Distributed Simulation; and a host of others.

The book primarily addresses the discrete event simulation community with lots of applications to manufacturing and communications. In that respect there are similarities in content to *Simulation Modeling and Analysis* by Averill Law and W. David Kelton (Mc Graw Hill, 1991). But the *Handbook* provides more detail in the areas where the books overlap. However, as a handbook, the material is not organized to serve as a textbook for college classes as is Law & Kelton. There is also a strong resemblance to the annual program of the Winter Simulation Conference. That conference provides a great deal of introductory material for new practitioners and the *Handbook* attempts to capture that material in several chapters. Thomas Schriber's "How Discrete-Event Simulation Software Works" and Jerry Bank's "Software for Simulation" are regular WSC presentations that are included in the *Handbook*. Other chapters are revisions of papers from past sessions at WSC. Simulation professionals who are not able to attend the Winter Simulation Conference and are given to self-study will find the *Handbook* an excellent substitute for those conference presentations. In many cases the handbook chapters provide more detail than the original conference papers.

The book is grouped into five major sections:
- Principles
- Methodology
- Recent Advances
- Application Areas
- Practice of Simulation

The Principles section contains two chapters – Principles of Simulation by Jerry Banks and Principles of Simulation Modeling by Alan Pritsker. Both provide an excellent introduction to the subject as well as valuable lessons from years of experience in the field. The definition of general principles in this field is something that has been lacking for years. These two chapters may encourage others to distill their experience into similar guidelines to help new practitioners and researchers.

The Methodology section includes chapters on Input Data Analysis, Random Number Generation, Random Variate Generation, Experimental Design, Output Data Analysis, System Comparison, Simulation Optimization, and Verification and Validation. Each of these authors provides an excellent introduction to their topic followed by an in-depth discussion of that area.

The Recent Advances section includes Object-Oriented Simulation, Parallel and Distributed Simulation, and On-line Simulation. Each an excellent introduction to the ideas in the field.

Application Areas includes chapters on manufacturing, the automobile industry, logistics, transportation, healthcare, the service industry, military applications, computer and communications systems, and scheduling. These areas parallel the application areas covered at WSC.

Practice of Simulation includes Guidelines for Success, Managing the Simulation Project, How Discrete-Event Simulation Software Works, and Software for Simulation. Each of these is an excellent view into the practical uses of simulation, including their inner workings.

Overall, the *Handbook of Simulation* provides excellent coverage of the field and is a valuable reference from which to draw. At $125.00 many will find it out of their financial reach. But, when compared to the price of attendance at a professional simulation conference, it is a great bargain. For professionals who own several linear feet of the dark blue Proceedings of the Winter Simulation Conference, I would suggest placing the Handbook on the same shelf as a convenient summary of some of the best material from those proceedings. Those who do not participate in that conference can use this book as an abridged substitute.

*Roger Smith*
*smithr@modelbenders.com*

**Generalized Characteristics of First Order PDEs – Applications in Optimal Control and Differential Games**
**Arik Melikyan**
**Birkhäuser 1998**
**ISBN 3-7643-3984-5, 310+xiv pages**

This monograph is concerned with the treatment of nonlinear first-order PDEs, which either have a non-smooth generalized solution and/or non-smooth left-hand side function of PDE. The main topic is the extension of the notion of the method of characteristics by introducing singular characteristics and the use of it for the constructions in the following three cases: a) the generalized viscosity solution is non-smooth while the Hamiltonian may be either smooth or non-smooth; b) the solution is smooth but the Hamiltonian is non-smooth; c) the PDE is the quasi linear second order Euler equation of variational problem with non-smooth solution.

The book is organized in nine chapters. The first one gives a short introduction into the methods of singular characteristics in smooth problems form the classical Cauchy problem to problems with movable boundary. In the second one the notion of singular characteristics is applied in the theory of viscosity solutions. The next three chapters (3-5) give a survey of first order PDEs in control theory and the applications for differential games on Riemannian manifolds and surfaces with non-unique geodesics. Chapter 6 is concerned with the analysis of smooth solutions to first order PDEs with non-smooth Hamiltonians and in chapter 7 the ap-plication of the method of singular characteristics to the shock wave decay in solutions of nonlinear first order PDEs are demonstrated. This is followed by the suggestion of the application of the new method to second order PDEs (Euler equation for variational problems) in chapter 8. The last chapter – the appendix – describes some fundamental theorems necessary for the analysis of the method of singular characteristics.

Although the book gives a very fast introduction into the method of characteristics for solving first-order PDEs it is recommended that the reader has some basic knowledge in this field. Most of the theorems and the proofs concerning either the analysis or solving methods of the PDEs are illustrated with figures for a better understanding. Every chapter is followed by a number of exercises so the book may be a basis for a course on the method of singular characteristics.

*Ch. Almeder*
*calmeder@osiris.tuwien.ac.at*

**Computational Conformal Mapping**
**P. Kythe**
**Birkhäuser, Boston 1998,**
**ISBN 0-8176-3996-9, 462+xvii pages**

Rapid development of electronic memory storage media and CPU clock frequencies in the past two decades merely seemed to reduce the pertinence of conformal mappings, in fact the complexity of problems posed in numerical analysis and the power of modern computers are increasing in the same way, which implies that the conformal mapping still persists as a powerful tool for solving i.e. boundary value problems. The text is dealing with constructive numeric aspects of such functions which map onto the upper complex plane and onto the unit circle respectively.

A historical survey to the progresses made in theory of conformal mappings and an introduction to some "classical" mappings are followed by constructive techniques: minimum principles and methods applying integral equations. Numerical examples complete the discussions related to complex domains bounded by smooth curves. However, topics arising with respect to polygonal bounded regions are in our opinion treated insufficiently, the more so as mapping such domains is in practice of superior interest. A few visualizations of obtained *numerical* results would be – not only in the context last mentioned – indeed desirable.

The skilled structured texture of theory makes this book recommendable not only for students and persons concerned with diverse applied sciences, but it is also suitable to accompany appropriate lectures. Examples without their solutions complete the book.

*H.J.Dirschmid*
*hjdir@osiris.tuwien.ac.at*

***Lineare Regelsysteme; Eine Einführung mit Matlab***
**Adolf H. Glattfelder / Walter Schaufelberger**
**vdf Hochschulverlag AG an der ETH Zürich, 1997**
**ISBN 3 7281 2275 0, 271 pages, (in German)**

Based on an introductory undergraduate course for engineering students this book gives an introduction to linear control theory. The text is accompanied by numerous examples and MATLAB scripts that can also be downloaded from a www-server (http://www.edf.ethz.ch).

The book starts off with the development of mathematical models of systems and the analysis of their properties. Frequency and time domain methods are presented respectively. Subsequently common design concepts (Lead-Lag, ZN, CHR) for controllers are presented and demonstrated. The last third of the book presents design of state variable feedback systems, observability and usage of an observer for control.

Throughout the book various advanced concepts are mentioned but not presented in detail. This provides references for further reading.

*J. Scheikl*
*joxg@osiris.tuwien.ac.at*

**Simulation for the Social Scientist**
**Nigel Gilbert, Klaus G.Troitzsch**
**Open University Press 1999**
**ISBN 0-335-19744-2, 273 + x pages**

The book is divided into nine chapters, starting with an introduction in using simulation to understand and explain social phenomena and an overview of the history of social simulation.

Chapter 2 is about the use of computer simulation as a method of social research. It sets out a general methodology for simulation, outlining the typical stages through which simulation models pass.

The remainder of the book considers seven approaches to simulation: system dynamics and world models, microanalytical simulation models, queuing models, multilevel simulation, cellular automata, distributed artificial intelligence and learning, and evolutionary models.

Each of these approaches is dealt with in one chapter, all of them following the same format: a summary of the approach, including an introduction to its historical development; a description of a representative software package supporting the approach; an explanation of the process of model specification, coding, running a simulation and interpretation of the results; and a description of examples of the approach to be found in the research literature. Each chapter concludes with an annotated bibliography.

This book is aimed primarily at scholars and postgraduates in the social sciences and gives a good overview of the common approaches to social simulation, opening a wide field for interested readers by its extensive bibliography. Novices in the world of Simulation will find it a helpful tool.

*Shabnam Michèle Rahmi*
*e9425764@fbma.tuwien.ac.at*

**An Introduction to Numerical Methods in C++**
**B. H. Flowers**
**Oxford University Press, Oxford, 1996**
**ISBN 0-19-853863-4**

Numerical computing uses different fields: computer programming and numerical mathematics. Most beginners in numerical computing have to get different introductory books for each of those fields.

The most often used language in numerical computing is FORTRAN. The main reason for this is tradition: most people doing numerical computing have some basic knowledge in it and a lot of numerical packages have been written in that language. But its age shows and it doesn't suit modern software engineering concepts like object-oriented programming.

This book is an introduction to numerical computing. As an implementation language it uses C++. The advantage is that the beginner is introduced to a modern, object-oriented programming language.

The book starts with two chapters about the basics of C++. This part is not an introduction to computer programming but an introduction to the particularities of C++. The next chapter gives an introduction to the "theory of numerical computing" (ie. errors, rates of convergence). After a chapter about finding the roots of non-linear equations two chapters about the object-oriented features of C++ follow. The next two chapters discuss integer arithmetics and random numbers. After a chapter that implements vectors and matrices (the tools of every self-respecting numerical program) a number of chapters about numerical algorithms follows: solution of linear equations (direct and iterative), matrix eigenvalue problems, interpolation and data fitting, differentiation and integration, orthogonal polynomials, differential equations and Fourier analysis. Between these chapters there is a chapter about errors in matrix manipulation, a chapter about graphics (needs Turbo C++) and a chapter about recursive data types.

The book gives a good introduction numerical computing but naturally doesn't cover the field completely. It uses C++ in an intelligent way: features that are useful for numerical computing (e.g. operator overloading for an understandable program notation) are used, features that slow programs down (e.g. virtual functions) are avoided. This publication is recommended to anyone who starts in the field and doesn't have to program in FORTRAN. It is also useful for those already working in the field, who don't know C++ and want to learn it because it shows "how to do it the C++-way".

*B. Gschaider*
*bgschaid@ws1.atv.tuwien.ac.at*

**Geometric Modelling**
**G. Farin, H. Bieri, G. Brunnett, T. DeRose (eds.)**
**Springer 1998**
**ISBN 3-211-83207-6**

In this book nineteen papers of the third Dagstuhl workshop on Geometric Modelling give a state-of-the-art survey of relevant problems and issues in modelling, CAD/CAM, scientific visualization and computational geometry. The Dagstuhl workshops are now clearly established as one of the essential meetings in Geometric Modelling. In fact, the nineteen papers are presented by international experts and treat the following topics:

- surface design and fairing
- subdivision schemes
- variational design
- NURBS
- reverse engineering
- physically-based modelling
- medical imaging

This book covers mathematical aspects in Geometric Modelling as well as different technical applications, several techniques in visualization of geometric objects. New Developments, as establishing applications of mathematical theories in Geometric Modelling are presented, e.g. applications of Wavelets or multiresolution meshes. But the main topics are classical curve, surface and solid modelling. Most of the papers concerning curve and surface fitting are constructed on the basis of B-Splines and Bezier Curves, the main visualization techniques.

I would like to refer to a selection of papers in this volume. "Interrogative Visualization" by C.L. Bajaj, "Optimal Degree Reduction of Free From Curves" by G. Brunnet and T. Schreiber, "Geometric Design of Rational Bezier Line Congruences and Ruled Surfaces Using Line Geometry" by Q.J. Ge, B. Ravani, "Shape Improvement of Surfaces" by S. Hahmann, "A Quadratic-Programming Method for Removing Shape-Failures from Tensor-Product B-Spline Surfaces" by P.D. Kaklis and G.D. Koras to "Degree Reduction of B-Spline Curves" by H.J. Wolters, G. Wu and G. Farin. Technical applications are presented e.g. in the paper "The Shape Parametrisation of an Aircraft Engine Nacelle an Pylon" by M.I.G. Bloor and M.J. Wilson. Each paper is presented by giving an abstract and a short list of key words which are important in that paper. It is easy to get a brief overview of the topics the papers deal with.

So this book may be recommended to experts in geometric modelling. Without being familiar with the major techniques in geometric modelling this book is not useful. It is not suited as an introduction to this area. But it gives a good review of the actual state of research in the field of Geometric Modelling. Therefore this book will mainly be used by researchers in this field.

*Michael Wibmer*
*mwibmer@osiris.tuwien.ac.at*

**Geometrical Optics and Related Topics**
**Editors: Ferruccio Colombini and Nicolas Lerner**
**Birkhäuser Boston**
**Series: Progress in non-linear differential equations and their applications**
**Vol 32, 1997, 376 pages, ISBN 3-7643-3958-6**

This book contains research papers which were presented at a meeting held in Cortina, Italy in late 1996.

Topics of the 14 papers are: Blowup of small data solutions of quasi linear equations in 2-D, concentration effects in critical nonlinear wave equations, lower semicontinuity of weighted path length in BV, time decay of $L^p$ norms, Sobolev embeddings in Weyl-Hörmander calculus, the Cauchy problem for systems of conservation laws, a class of hyperbolic systems (existence and singularities), a class of solvable operators, uniqueness of the Cauchy problem, non-linear wave diffraction, caustics for dissipative semi-linear oscillations, geometric optics and the bottom of the spectrum, hypoellipticity for infinitely degenerate elliptic operators and regularity of solutions to characteristic boundary value problem for symmetric problems.

The book is by no means an introduction to the field. The articles describe the state-of-the-art and give some new results. It is therefore only recommended to those with a strong interest in the field. The emphasis of the book seems to be more on the "related topics" than on "geometrical optics".

*B. Gschaider*
*bgschaid@ws1.atv.tuwien.ac.at*

**Modelling Finanicial Derivatives with Mathematica**
**William Shaw**
**Cambridge University Press 1998**
**ISBN 0-521-59233-X**

This book is mainly for financial engineers who are interested in the mathematical background of derivative assets. They should be used to PDEs and calculating with rather complex formulas. Even though it goes deep into mathematics it is not written for mathematicians or programmers. None of the financial terms are described anywhere. A large knowledge of financial engineering is absolutely necessary for reading this book.

As the title suggests the author uses Mathematica for doing all the programs. His main reasons for this choice are the easy way of programming and the availability of complex functions as well as the facilities for visualisation. For those who are not used to write programs in Mathematica there is a short but good introduction at the beginning of the book.

This issue is neither about creating new models or their mathematical formulation, but how to implement them in a way which provides accuracy and how to work around fundamental problems, like getting more than one implied volatility.

This last point is one of the author's major concerns. How to get stable and plausible results from complex calculations. He tries to open the reader's eyes for conceptual problems like models which work fine for nearly every possible values of parameters but which return unuseable results at certain problematic points.

After an introduction into the mathematical theory he shows ways how to implement many financial products in less or even none problematic ways and how to interpret the results for prices and other interesting things like the greeks.

The author also compares different simulations like trees or the Monte Carlo Simulation to get the prices.

As mentioned above this book is written for financial engineers having some background knowledge about mathematics and writing programs. It is not written for people only interested in the theory behind but for those who want to implement a tool which works without problems and delivers the exact results, useable as a benchmark for other programs as well as as basic for financial decisions.

*G. Grohal*
*e9302121@stud1.tuwien.ac.at*

***Mathematica – kurz und bündig [Medienkombination]*** **(in German)**
**Stephan Kaufmann**
**Birkhäuser 1998**
**ISBN 3-7643-6008-9, 199 pp.**

This book provides an efficient and comprehensive overview on the main aspects and concepts in Mathematica. Basic features and concepts are descri-bed for the matters of symbolic and numeric calcu-lations, graphics and programming. The book is accom-panied by a CD containing the complete contents of the book and therefore offering the possibility of directly experimenting with Mathematica features on the basis of the given examples. Still, if you don't have Mathematica installed on your computer the contents of the CD (especially to see the coloring of graphics, ani-mations, etc.) can be accessed with the program Math Reader (which also is included with the CD).

A more detailed book review in German language can be found in *ASIM-Nachrichten* 2/99.

*K. Seits*
*kseits@osiris.tuwien.ac.at*

**Network Performance Modeling and Simulation**
**Edited by J. Walrand, K. Bagchi and G.W. Zobrist**
**Gordon and Breach Science Publishers**
**OPA Amsterdam B.V. 1998**
**ISBN 90-5699-596-0**

This book describes the application of sophisticated mathematics in the most crucial fields of network technology. The practical field covers a type of video conferencing system as well as most routing solutions and much more. In addition, the book has an extensive coverage of network performance theory. Readers will find topics, which are mathematically related, interesting and comprehensible.

Tutorials on topics such as network topology, routing algorithms, methods for reduction on generalised stochastic petri nets, traffic models, models for protocols and reliability theory are discussed.

A communication network simulation environment, MPEG-video system, Ethernet traffic, WWW-traffic are treated. Advanced queuing systems are dealt with. An evaluation of two process-architectures is given.

Those with a fundamental knowledge of petri nets, queuing systems and stochastic theories will find it easier to follow the book. Each chapter contains a reference list, which the author recommends for prior and subsequent reading.

*W. Garn*
*wgarn@osiris.tuwien.ac.at*

**Topics in Nonlinear Analysis**
**J. Escher, G. Simonett (editors)**
**Birkhäuser Basel, 1999**
**ISBN 3-7643-6016-X, 744 +x pages**

Volume 35 of the series "Progress in Nonlinear Differential Equations and their Applications" is an anniversary volume dedicated to Prof. Herbert Amann (currently teaching in Zurich) on the occasion of his sixtieth birthday. The book contains a compilation of 31 research papers contributed by distinguished and accomplished mathe- maticians which intend in this way to pay tribute to his influence in various fields of modern analysis.

The papers are principally of theoretical interest, the subjects dealt with are spread from theory of function spaces, quasilinear parabolic systems, nonlinear elliptic boundary value problems and abstract evolution equations to questions of Fourier analysis, fixed point theory and fluid dynamics.

This book is recommendable for readers interested in the state-of-the-art of modern analysis and in current questions of research arising in this area.

*M. Holzinger*
*mholz@argesim.tuwien.ac.at*

# Industry News

**Simulation Dynamics' SDI Supply Chain Delivers Innovations for Analyzing and Improving Supply Chain Management**

Simulation Dynamics announces the release of SDI Supply Chain, the first simulation product designed for analyzing and improving supply chain activities. SDI Supply Chain provides a software tool to study the impact of changing demand, logistic decisions, and production policies on key system performance measures. SDI Supply Chain is being used to model the dynamics of a complete supply chain from source to user, along the entire Plan, Source, Make and Deliver process. A company's supply chain is an intricate production system that constantly changes over time. Improvements in a company's supply chain save both time and money. In order to make improvements to a supply chain, a manager needs to understand the variability inherent in all parts of the process.

SDI Supply Chain allows users to design, analyze and study areas such as supply chain capacity issues, bottleneck identification, logistic deployments, resource deployment, system velocity, and reliability.

SDI Supply Chain is available immediately as a part of SDI Industry Pro. SDI Industry Pro is available for Windows 95/98 and Windows NT. The cost is $3,495.00. For more information and a demonstration please visit www.simulationdynamics.com.

**Rapid Data add Easy-Fit and Lindo to their Portfolio**

Rapid Data, the European Scientific Software and Related Services vendor, have recently added the following products to their portfolio:

- Easy-Fit: Excel-based user-friendly software for Parameter Estimation of ODE, PDE, DAE, PDAE and Laplace-based systems

- Lindo: Software for solving linear, integer and quadratic optimisation systems, where models are expressed in a simple and straightforward equation style. Also incorporates advanced features for goal programming and parametric analysis.

Rapid Data have also recently signed an agreement with Manfred Sultz of Stuttgart-based KH Consulting for collaboration in discrete-event simulation for the Health Care industry in Germany, using the Micro Saint package which is already heavily used in the Health sector in the UK.

Contact Rapid Data for further information on +44 1903 821 266, info@radata.demon.co.uk, www.radata.demon.co.uk.

**New ACSL Release Now Available**

The first ACSL release from AEgis is now available. This is the first ACSL release to be certified Y2K compliant. This release will also bring customers on all supported computer platforms up to date with the latest version of all products in the ACSL family. For the first time, all products will be distributed as one CD with all documentation. Products will also be available for download from our ftp site. Contact acsl-sales@aegisrc.com for more information. The current set of ACSL releases is:

- ACSL Sim 11.6.1 – Language translator, runtime library, builder and front end
- ACSL Open API 11.6.1 – Application Program Interface (API) for simulations
- ACSL Realtime 11.6.1 – For time critical, hardware-in-the-loop simulations
- ACSL Graphic Modeller 4.7.1 – Graphical modeling and simulation analysis
- ACSL C-Code 4.7.1 – Generate C code for embedded processors
- ACSL Math 2.3.1 – Numerical analysis and visualization
- ACSL Optimize 2.3.1 – Optimization and parameter estimation

Contact: AEgis Research Corporation, 6703 Odyssey Drive, Suite 103, Huntsville, AL 35806, USA, www.ACSLsim.com, acsl@aegisrc.com

**CAN Configuration in Simulink**

To connect your controller prototyping systems and tests systems to the CAN bus, dSPACE, Paderborn, now introduces their new CAN board. The DS4302 CAN Interface Board is equipped with four channels and can be entirely configured graphically in MATLAB/Simulink.

The new CAN interface board is a member of dSPACE's modular system family. Four independent CAN controllers on one board according to CAN 2.0A/B ensure that up to four CAN channels can be set up simultaneously. The different transceivers for each channel guarantee the highest flexibility possible. From the low-speed comfort bus to RS485 up to hard real-time communication - all possible applications areas can be covered.

To free the user from tediously programming the CAN controller, the board can be completely configured in a Simulink block dia-gram with the help of Real-Time Interface. A CAN message is defined simply by connecting the corresponding block from the CAN block library with the Simulink model. All kinds of configurations such as setting up messages, reading out time stamps and setting terminators can be performed in a dialog-based manner. This is also true for the numerous interrupt possibilities this interface offers. All message configurations can even be read in CANalyzer format.

The proportion of CAN-based communication is increasing rapidly, especially in the fields of automotives and automation. As a consequence, CAN has established itself as a cost-effective standard in the automotive field for data exchange between electronic control units (ECUs) and sensors/actuators.

Contact: Kerstin Salerno, dSPACE GmbH, Technologiepark 25, D-33100 Paderborn, Germany, Tel. +49 5251 163813, Fax +49 5251 161981913, e-mail: ksalerno@dspace.de

**Silux**

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email: info@silux. com


## Simulation Practice and Theory

Simulation Practice and Theory (SIMPRA) is EUROSIM's scientific journal, published by Elsevier Science B.V.

It publishes high quality contributions on modelling and simulation.

Forthcoming papers SIMPRA (status May 23, 1999)

W. Borutzky, Supporting the generation of a state space model by adding tearing information to the bond graph (in bond graph special issue).

I.E. Madu, Ch.N. Madu, Design optimization using signal-to-noise ratio.

L. Moreno et al, Patient centered simulation tool for aiding in hospital management.

G. Dauphin-Tanguy, A. Rahmani, C. Sueur, Bond graph aided design of controlled systems (in bond graph special issue).

J.M. Bahi, Ch.J. Michel, Simulations of asynchronous evolution of discrete systems.

V. Cortellessa, G. Iazeolla, Performance analysis of optimistic parallel simulations with limited rolled back events.

M. Sorli, L. Gastaldi, E. Codina, S. de las Heras, Dynamic analysis of pneumatic actuators (in bond graph special issue).

M. Metzger, A comparative evaluation of DRE integration method for real-time simulation of biological activated slodge processes.

L. Boeszoermenyi, A. Stopper, Semi automatic parallelization of object oriented simulations.

R.F. Ngwompo, S. Scavarda, Dimensioning problems in system design using bicausal bondgraphs (in bond graph special issue).

It is the intention to publish this year a special issue entitled "Bondgraph Practice". The first guest-editor of this special issue if prof.dr. J. Thoma, the second guest-editor is prof.dr. J. Halin.

WWW information: http://www.elsevier.nl/locate/simpra/

Submissions of manuscripts should be sent to:
Prof. Dr. L. Dekker
Noordeindseweg 61
2651 LE Berkel en Rodenrijs, The Netherlands


## Fuzzy Sets and Systems

Since its launch in 1978, Fuzzy Sets and Systems has become a leading journal in this important field. The primary purpose of this international journal is to improve professional communication between scientists and practitioners who are interested in, doing research on, or applying fuzzy sets and systems. From 1999 on, the journal has the advantage of increased journal expertise with a new editorial structure:

Editors-in-Chief: D. Dubois, H. Prade (Toulouse) (following the past Editor-in-Chief H.-J. Zimmermann, Aachen).

In order to support an extended area of theory and application, new areas and responsible editors have been chosen. Of interest for simulation people are the following areas:
Artificial Intelligence; H. Berenji (USA) – Learning, Ll. Godo (Spain) – Approximate reasoning and knowledge-based systems

Information Processing: M. Gil (Spain) – Statistics and data analysis, R. Krishnapuram (USA) – Classification and image processing, F. Petry (USA) – Fuzzy databases and information retrieval

Fuzzy Systems: R. Kruse (Germany) – Fuzzy modelling and neuro-fuzzy systems, H. Verbruggen (The Netherlands) – Fuzzy Control

Decision and Optimisation Sciences: R. Slowinski (Poland) – Decision analysis, J. Verdegay (Spain) – Combinatorial optimisation and genetic algorithms, H. Tanaka (Japan) – Fuzzy mathematical programming)

Applications: W. Pedrycz (Canada) – Engineering applications, B. Türksen (Canada) – Measurement of fuzzy sets, production research, K. Hirota (Japan) – Industrial applications T. Yamakawa (Japan) – Fuzzy hardware

Fuzzy Sets and Systems is abstracted / indexed in: ACM Computing Reviews, Current Index to Statistics, Engineering Index, INSPEC Abstracts, ISI Current Contents, Mathematical Reviews, Science Citation Index, Statistical Theory and Method Abstracts.

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## ARGESIM

**ARGE Simulation News (ARGESIM)** is a non-profit working group disseminating information on simulation, organising activities in the area of modelling and simulation (e.g. courses, comparative studies), publication of journals and books in this area, and providing the infrastructure for the administration of **EUROSIM** and **ASIM** activities.

In detail, ARGESIM organises and performs:

- Publication of the journal **Simulation News Europe (SNE)**,
- Production of SNE, distribution service for EUROSIM societies and individual subscription service,
- Publication and production of the Book Series **ARGESIM Reports** and (together with ASIM) of the Series ***Fortschrittsberichte Simulation***,
- Comparison and evaluation of simulation tools (**ARGESIM Comparisons** on Simulation Software and Parallel Simulation Techniques),
- Support of EUROSIM and ASIM administration,
- Running a WWW-Server on activities of EUROSIM and EUROSIM members, on ARGESIM and ASIM activities,
  http://www.argesim.org/
  http://www.asim-gi.org/
  http://www.eurosim.org/
- Organisation of seminars and courses on modelling and simulation, e. g. within EU programs or in cooperation with the McLeod Institute of Simulation Science (**MISS**),
- Organisation of "*Seminare über Modellbildung und Simulation*" at Vienna University of Technology,
- Support and Maintenance of Simulation Software at Vienna University of Technology.

ARGESIM's publication ***Simulation News Europe*** (SNE) is now distributed to the following societies and individuals:

- EUROSIM societies (official news journal for members of EUROSIM societies)
- SCS Europe (official news journal for members of SCS Europe)
- Simulation Software User Groups
- Simulation-related groups (SIGSIM, INFORMS, etc.)
- Insitutes / Persons concentrating esp. on Modelling and Simulation
- Individual subscriptions

ARGESIM's **Comparisons of Simulation Tools and Simulation Technique** are based on simple, but significant models, they are testing up to three features, and they are easy to reproduce. The comparisons not only concentrate on simulation software, but also on different approaches for modelling and simulation, e.g. by means of analytical methods or methods of soft computing. This issue shows how different approaches can be – using the same simulator. We are planning to set up a comparison on software and modelling techniques for neural net modelling, and performance comparisons of mathematical algorithms (FFT, pattern recognition, etc.).

### Information, Orders

ARGESIM, c/o Dept. Simulation Technique,
Vienna University of Technology
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### Individual Subscription for *Simulation News Europe*

Most of the simulation societies distribute SNE to their members as part of the membership service, if covered by the membership fee.

An individual subscription for SNE is offered, which is open to anybody interested in the journal:

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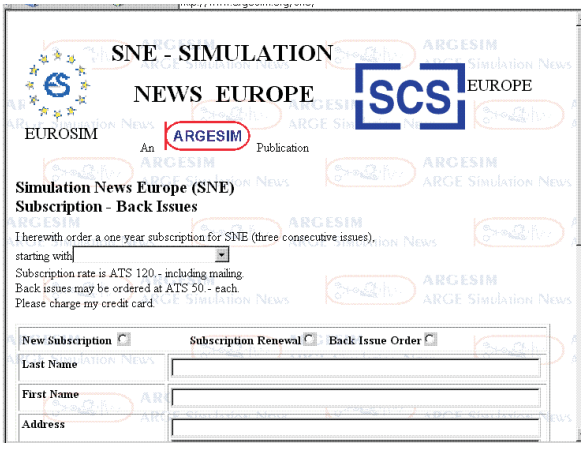

# Calendar of Events

**July 1999**

11-15 **SCSC'99**. Summer Computer Simulation Conference. Chicago, USA
Contact: SCS International, Tel.: +1-619-277 3888, email: info@scs.org, WWW: http://www.scs.org/

**August 1999**

25-27 **6th PCSC Workshop on Simulation in Research and Development**. Bialystok, Poland
Contact: Prof. L. Bobrowski, email: ptsk99@ii.pb.bialystok.pl

29-31 **Intl. Workshop on Advanced Simulation and AI**. Bucharest, Rumania
Contact: Philippe Geril, SCS Europe, 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/

31-September 3
**ECC' 99**. European Control Conference. Karlsruhe, Germany
Contact: Prof. Paul M. Frank, Gerhard-Mercator-Universität, GH Duisburg, FG Mess- u. Regelungstechnik, Bismarckstr 81, D-47048 Duisburg, Tel.: +49 211 6214 224, Fax: +49 211 6214 161, email: gma@vdi.de, WWW: http://ecc99.uni-duisburg.de/

**September 1999**

1-3 **IASTED AMS'99.** Int'l Conf. on Applied Modelling & Simulation. Cairns, Australia
Contact: IASTED Secretariat, #80, 4500 16th Avenue NW, Calgary AB, T3B 0M6 Canada, email: calgary@iasted.com, WWW: http://www.iasted.com/

06-10 **PaCT-99.** 5th Intl. Conference Parallel Computing Technologies. St. Petersburg, Russia
Contact: http://www.pact.sscc.ru/conference/pact99/

13-16 **EUFIT.** 7th European Congress on Intelligent Techniques and Soft Computing. Aachen, Germany
Contact: EUFIT'99, c/o ELITE Foundation, Promenade 9, D-52076 Aachen, Tel.: +49-2408 6969, Fax: +49-2408 94582, email: eufit@mitgmbh.de

14-16 **ASIS'99.** 21st Intl. Workshop Advanced Simulation Systems. Krnov, Czech rep.
Contact: Jan Stefan, FEI -VSB TU, Ostrava, tr. 17. listopadu, CZ-70833 Ostrava Poruba, , email: Jan. Stefan@vsb.cz

16-18 **Intl. Workshop on Harbour, Maritime & Logistics Modelling and Simulation**. Genoa, Italy
Contact: Philippe Geril, SCS Europe, 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://st.itim.unige.it/hms99/

20-24 **2nd European Ecological Modeling Conference**. Pula, Croatia
Contact: Vesna B. Vuksic, University of Zagreb, Faculty of Economics, Kennedyjev trg 6, HR-10000 Zagreb, Tel.: +385-1-2383 333, Fax: +385-1-2335 633, email: vbosilj@efzg.hr

21-24 **ASIM'99.** *13. Symposium Simulationstechnik*. Weimar
Contact: Dipl.-L. Christine Rieger, Bauhaus-Universität Weimar, Coudraystraße 13, D-99421 Weimar, Tel.: +49-3643-584251, Fax: +49-3643-584280, email: christine.rieger@uni-weimar.de, WWW: http://www.uni-weimar.de/veranst/asim.html

23-25 **ERK'99.** Electrotechnical and Computer Science Conference. Portoroz, Slovenia
Contact: Baldomir Zajc, Faculty of Electrical Engineering, Trzaska 25, SLO-1001 Ljubljana, email: baldomir.zajc@fe.uni-lj.si, www: http://www.ieee.si/erk99/

**October 1999**

**SIMS'99**. SIMS Annual Conference 1999. Linköping, Sweden
Contact: P. Fritzin, WWW: http://www.ida.liu.se/~pelab/SIMS99/

5-7 **MOSMIC'99.** 3rd Intl. Workshop Modelling and Simulation in Management Informatics and Control. Zilina
Contact: Prof. Mikulas Alexik, University of Zilina, Dept. Technical Cybernetics, Velky Diel, SK-01026 Zilina, Tel.: +42-189-54-042, Fax: +42-189-54-806, email: alexik@frtk.utc.sk

6-8 **MOSIM'99.** The Second French Conference on MOdelling and SIMulation. Annecy, France
Contact: Georges Habchi, LLP/CESALP-ESIA, 41, avenue de la Plaine, F-74016 Annecy Cedex, Tel.: +33-4 50 66 60 80, Fax: +33-4 50 66 60 20, email: mosim99@esia.univ-savoie.fr, WWW: http://www.univ-savoie.fr/mosim99/

19-21 **BICSC'99.** 4th Beijing International Conference on System Simulation and Scientific Computing. Beijing, China
Contact: Zhang Minglian, Chinese Association for System Simulations (CASS), CN-Beijing, , email: simu@ns.dept3.buaa.edu.cn, WWW: http://ns.dept3.buaa.edu.cn/bicsc/bicsc99.htm

26-28 **ESS '99.** 11th European Simulation Symposium. Erlangen-Nuremberg, Germany
Contact: Philippe Geril, SCS Europe, 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/

**November 1999**

4-7 **EMBEC'99.** European Medical & Biological Engineering Conference. Vienna, Austria
Contact: Prof. Dr. Wolfgang Schreiner, University of Vienna, Dept. Of Medical Computer Science, A-1090 Vienna, , WWW: http://www.univie.ac.at/EMBEC99/

**December 1999**

5-8 **WSC'99.** Winter Simulation Conference. Phoenix, Arizona
Contact: Talley Management Group, Inc., Meetings Department, .Tel.: +1-609-423-7222, Fax: +1-609-423-3420, email: meetings@talley.com, WWW: http://www.wintersim.org/

**January 2000**

23-27 **WEBSIM 2000**. Intl. Conference on Web-based Modelling and Simulation. San Diego, USA
Contact: WWW: http://www.isima.fr/andre/websim2000/

**February 2000**

2-4 **3rd MATHMOD.** International Symposium on Mathematical Modelling. Vienna, Austria
Contact: Prof.Dr. Inge Troch, Technische Universitaet Wien, Wiedner Hauptstrasse 8-10, A-1040 Wien, Tel.: +43-1-58801-11451, Fax: +43-1-58801-11499, email: inge.troch@tuwien.ac.at, WWW: http://simtech.tuwien.ac.at/3rdMATHMOD/

14-17 **IASTED Int'l Conf. on Modelling, Identification and Simulation.** Innsbruck, Austria
Contact: IASTED Secretariat, #80, 4500 16th Avenue NW, Calgary AB, T3B 0M6 Canada, email: calgary@iasted.com, WWW: http://www.iasted.com/

21-22 **Meeting of ASIM-FG "*Simulation Technischer Systeme*". Esslingen,** Stuttgart, Germany
Contact: Prof.Dr.Ing. Gerald Kampe, FHT Esslingen, Flandernstraße 101, D-73732 Esslingen, Tel.: +49-711-397-4221, Fax: +49-711-397-4212, email: gerald.kampe@fht-esslingen.de

**March 2000**

8-9 **9th Conference of ASIM FG "*Simulation in Produktion und Logistik*".** Berlin, Germany
Contact: Dipl.Phys. Markus Rabe, IPK Berlin, Pascalstraße 8-9, D-10587 Berlin, Tel.: +49-30-39006-248, Fax: +49-30-3932503, email: markus.rabe@ipk.fhg.de

13-15 **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, Fax: +49 40 4123 6441, email: wi@mba.uni-hamburg.de

**April 2000**

**Ebernburg Conference**. ASIM FG "*Simulation in Medizin, Biologie und Ökologie*". Ebernburg, Germany
Contact: Prof.Dr. Dietmar P.F. Möller, Universität Hamburg, FBInformatik, D-22527 Hamburg, Fax: +49-40-42883 2206, email: dietmar.moeller@informatik.uni-hamburg.de

**May 2000**

2-4 **MOSIS'2000.** 34th Int. Conference on Modelling and Simulation of Systems. Czech Republik
Contact: Jan Stefan, FEI -VSB TU, Ostrava, tr. 17. listopadu, CZ-70833 Ostrava Poruba,email: Jan.Stefan@vsb.cz

**June 2000**

**ESM 2000**. 14th European Simulation Multiconference. Ghent, Belgium
Contact: Philippe Geril, SCS Europe, 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/

**August 2000**

21-25 **IMACS Congress 2000.** 16th IMACS World Congress. Lausanne, Switzerland
Contact: Prof. Robert Owens, IMACS Congress 2000, DGM - IMHEF - LMF, Swiss Federal Institute of Technology, CH-1015 Lausanne, , Fax: +41-21-693-3646, Email: robert.owens@epfl.ch, WWW: http://IMACS2000.epfl.ch/

**September 2000**

18-20 **ASIM / ESS'2000.** *14. Symposium Simulationstechnik* together with European Simulation Symposium. Hamburg, Germany
Contact: Prof.Dr. Dietmar P.F. Möller, Universität Hamburg, Inst. f. Informatik, Vogt-Kölln-Strasse 30, D-22527 Hamburg, Tel.: +49-40-, Fax: +49-40-42883 2206, email: dietmar.moeller@informatik.uni-hamburg.de

20-22 **ESS 2000.** European Simulation Symposium. Hamburg, Germany
Contact: Philippe Geril, SCS Europe, 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/

**June 2001**

26-30 **EUROSIM'2001.** European Simulation Congress. Delft
Contact: Mrs. T. Tianova, Delft University of Technology, Faculty of Information Technology and Systems, P.O. Box 5031, NL-2600 GA Delft, , Fax: +31-15-2787209, email: eurosim2001@pa.twi.tudelft.nl

*Simulation News Europe*

*Scope: Information on simulation activities, membership information for European simulation societies and SCS Europe,comparisons on simulation techniques*

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### EUROSIM

**EUROSIM:** (prel.) Felix Breitenecker, Dept. of Simulation Techniques, TU Vienna, Wiedner Hauptstr. 8-10, A-1040 Vienna, Tel: +43-1-58801 11452, Fax: +43-1-58801 42098, email: Felix.Breitenecker@ tuwien.ac.at

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

**ASIM:** Ingrid Bausch-Gall, Wohlfartstraße 21b, D-80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063, email: BauschGall@compuserve.com

**CROSSIM:** Vesna Bosilj Vuksic, Faculty of Economics, University of Zagreb, Trg J.F.Kennedy-a 6, HR-10000 Zagreb, Croatia, Tel: +385 1 2383 333, Fax: +385 1 2335 633, email: vbosilj@efzg.hr

**CSSS:** Mikuláš Alexík, University of Zilina, dept. Technical Cybernetics, Velky Diel, SK-010 26 Zilina, Slovak Republic, Tel: +42-189 54042, Fax: +42-189 54806, email: alexik@frtk.utc.sk

**DBSS:** Marja Dekker-Genemans, Noordeindseweg 61, 2651 LE Berkel en Rodenrijs, The Netherlands, Tel: +31-10 51 12714, Fax: +31-10 51 13883, email: L.Dekker@pa.twi.tudelft.nl

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**ISCS:** Vittorio Cortellessa, Dipartimento di Informatica Sistemi e Produzione, Universitá di Roma Torvergata, Via di Tor Vergata, I-00133 Roma, Tel: +39-6-72597381, Fax: +39-6-72597460, email: cortelle@info.uniroma2.it

**PSCS:** Zenon Sosnowski, Technical University of Bialystok, Dept. of Computer Science, Tel: +48-85-7428206, Fax: +48-85-7422393, email: zenon@ii.pb.bialystok.pl

**SIMS:** Esko Juuso, University of Oulu, Control Engineering Laboratory, Linnanmaa, FIN-90570 Oulu, Finland, Tel +358 8 553 2463, Fax +358 8 553 2466, email: esko.juuso@oulu.fi

**SLOSIM:** Borut Zupancic, Faculty of Electrical Engineering, Trzaska 25, SLO-1000 Ljubljana, Slovenia, Tel: +386-61 1768 306, Fax: +386-61 1264 631, email: borut.zupancic@fe.uni-lj.si

**UKSIM:** Gary J. Gray, Dept. Computing Science, University of Glasgow, Glasgow G12 8QQ, Scotland, email: gjgray@connectfree.co.uk

### SCS Europe

E.J.H. Kerckhoffs, Delft University of Technology, Fac.ITS /TWI, Zuidplantsoen 4, 2628 BZ Delft, The Netherlands, Tel : +31 15 278 1315, Fax : +31 15 278 7141, email: E.J.H. Kerckhoffs@cs.tudelft.nl

### SIGSIM / ACM

Roger Smith, STAC Inc., 3481 Woodley Park Place, Oviedo, Florida 32765 USA, email: smithr@modelbenders.com

## Aims and Scope

The journal *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 and from international simulation societies and working groups all over the world. SNE is the official membership journal of EUROSIM and SCS Europe.

SNE contains news on EUROSIM, on the EUROSIM societies, on SCS Europe, on SIGSIM/ACM, on other international simulation societies and groups, and on software user groups.

SNE publishes essays and short technical notes dealing with new developments in a particular area and reports on software and hardware developments, new applications and new methodologies and their applications. SNE presents simulation centers and announces simulation events and classes in a calendar of events. The section on industry news contains the latest news available through press releases and an-nouncements. There are book reviews and book news.

A special series on simulation comparisons gives a comprehensive overview on features and developments of simulation software and hardware, including parallelization techniques. These comparisons are also becoming standard benchmarks for simulation programs.

SNE is a printed journal as well as an electronic journal. ARGESIM's WWW server can be found at http://www.argesim.org/sne/. All contributions are selected and may be edited by the editors of the journal.