SIMULATION NEWS EUROPE

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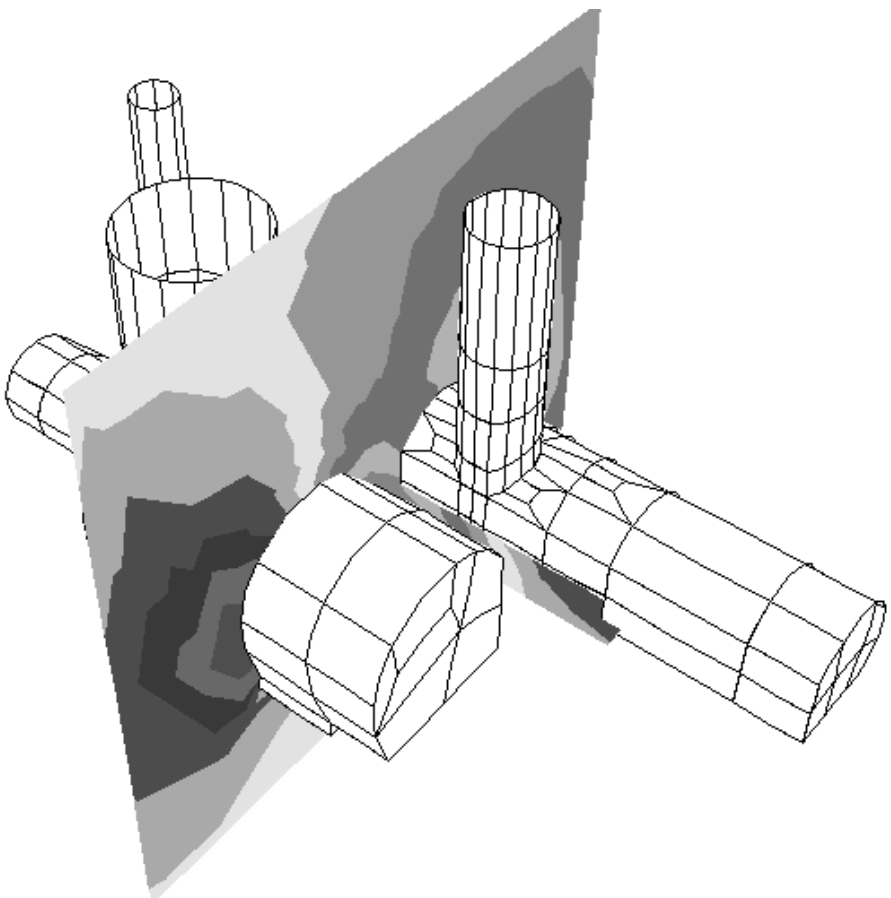

Number 24 November 1998

A EUROPEAN FORUM ON SIMULATION ACTIVITIES

In this issue ...

Editorial

The last decades have seen an enormous and interesting development in the area of tools for computer simulation. New concepts are introduced rapidly. This issue starts a discussion on where simulation is going in the future. An essay on modern methods in a promising application field and a historical paper of a simulation pioneer illustrate this aspect. Our next issue (SNE 25, March 1999) will concentrate on soft computing, continuing the discussion.

The contribution about numerical simulation in tunnelling on page 45 underlines the importance of finite elements methods (FEM) and algorithms for modelling and simulation. Although FEM are dealt with in many areas, they belong in principle to modelling and simulation with PDEs, a core subject of simulation techniques. The title page shows tunnels and the pressure distribution in the surrounding rocks.

Another seven comparison solutions have been prepared for this issue. Work is going on on the evaluation database. The current results are posted on the WWW server at www.argesim.org/comparisons/. Also here a trend to non-classical simulation approaches can be seen, not only numerical solvers for ODEs and numerical schedulers for event lists are used.

Last but not least we start a search for websites. We will publish the addresses of websites of interest for the simulation community (see page 58). If you have seen an interesting site, please let us know.

Thank you for all your contributions, feedback, and support.

F. Breitenecker, I. Husinsky

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new !

Deadline for the next issue will be February 5, 1999

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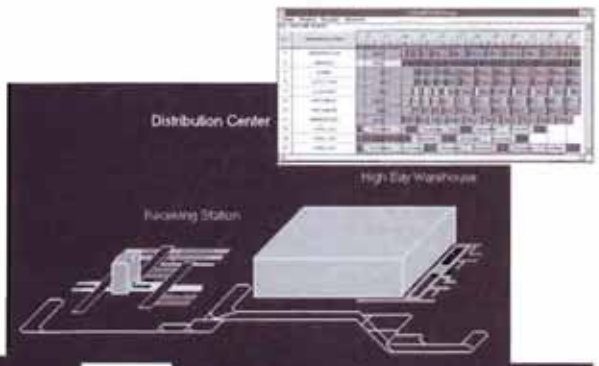

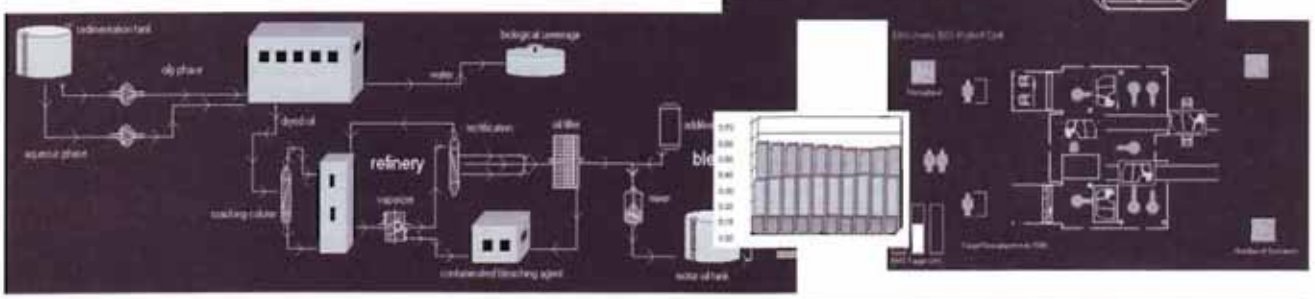

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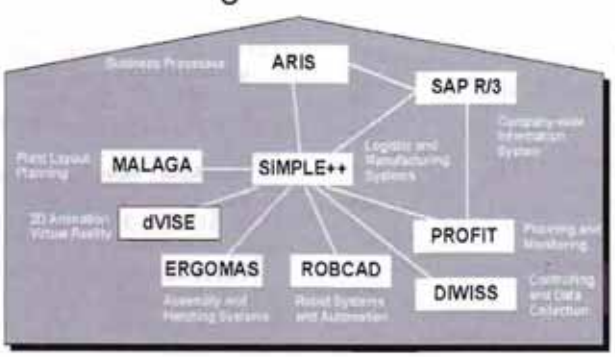

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Contents

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Please contact them if you have contributions concerning a particular society.

SIMULATIO QUO VADIS

Interesting phenomena may be met in today's simulation landscape, surprising facts show up e. g. at simulation conferences: concentration on the "kernel science" and negligence of application and of "non-kernel concepts".

Most of the speakers at simulation conferences underline how important simulation is, and how successful, necessary, and effective the use of simulation in application is.

But, there are less contributions, less speakers, at conferences, and most of them are not really dealing with applications.

An honest look at the development of the simulation societies, and at the distribution of SNE, shows that the "core of pure simulationists" is becoming smaller. (We are happy to be able to compensate this development by distributing SNE to groups being not mainly hard simulationists.)

But – visiting an application conference, or a conference emphasising on not purely simulation-oriented methodology, lets the simulationist meet with colleagues he has not met for a long time. Simulationists before, they went to another area, and modelling and simulation plays a second role for them.

The auditor at a simulation conference hears the claims for changes in the paradigms, more or less concrete. Such a phrase looks on the one hand like advertising (usually) a new methodology (and there in 90% the new methodology of soft computing), and on the other hand it is very vague.

The auditor also hears the sentence "to bridge the gap between theory and application" contradicting the fact that reviewing processes for the selection of papers become more strict and – unfortunately in consequence – support theoretical aspects of "kernel modelling and simulation".

How to turn around the steering wheel to another direction ?

In principle, simulationists tend to classify simulation systems into systems governed by differential equations, and into systems governed by discrete event scheduling formula, and only few believe in the existence of combined simulation, some believe in a certain application oriented methodology (circuit analysis, etc.).

Other concepts, like data base (evaluation), neural nets, etc. are more or less seen as interesting and helpful, but only supporting methods.

Do for us "kernel simulationists" these concepts play only the second role, while for application people they play a major role ?

How do people in the application area work: they are searching for a modelling concept hopefully resulting in answers to a priori formulated questions. The concept used may base on differential equations, but also on relational databases, etc. And many concepts – not only differential equations and discrete event formula – have found support by software systems.

In this issue we present two essays, of different kind from essays in previous issues. The essays are intended to start a discussion about development of modelling and simulation.

R. Hofestädt and co-workers report on new ways in *Modelling and Simulation of Gene Regulation and Metabolic Pathways*, on the occasion of an international conference, where modelling and simulation is embedded into intelligent data base management. Development in this area seems to be controlled by new methodologies developed in this area, and not by methodological development in "kernel modelling and simulation".

This contribution underlines that methodological and theoretical development is found in application !

In the second essay, G. A. Korn – the protagonist for the simulationist of our generation – summarises his view on the development in modelling and simulation. The essay goes back to the SCSB Pioneers and Peers Conference in Orlando, Florida, 1988, and was published again on the occasion of Korn's Anniversary in March 1998 (see report in SNE 23, page 60).

The interesting fact is, that – although Korn wrote this summary 10 years ago – in kernel modelling and simulation nothing really new has happened. Does Korn include also the end and stagnation of a development ?

An answer may depend on the view. It is really surprising to read how Korn stimulated new developments by unconventional methods, how he aimed for the missing link, and how he believed in very early stages in new developments. It has to be mentioned that Korn implemented modelling concepts with neural nets at a time when most simulationists had a suspicious view on

this new concept. And Korn does not call the contribution "40 Years of Development in Computer-Aided Modelling and Simulation", he calls it "40 Years of Computer-Aided Experimentation" – aiming for results and not for installation of a fixed concept.

His view and conclusion can also be interpreted as invitation and challenge to cope with the new developments, and to wake up from a long sleep.

Korn cites Lao Tse and Korzybski with the warning, not to replace too many real laboratory experiments with simulation. Believing in modelling and simulation in only one (or two) concepts, and persevering in these concepts underlines this warning and discredits the importance of modelling and simulation.

How to turn around the steering wheel to another direction ? Is it really necessary, not only to claim for new paradigms, but also to introduce them – equally entitled with classical concepts ?

The essays in this issue are intended to start a discussion about the trends in modelling and simulation, to initiate discussions for changes in the paradigms, to think over new concepts for simulation conferences.

The observations and opinions outlined in this contribution are partially personal interpretations, and it would be of interest whether other simulationists did the same observation, have the same opinion.

We would be very glad about any reactions, comments etc. with respect to all questions raised here, to be published in our discussion corner.

The next SNE issue will concentrate on the new methods of soft computing, stimulating the discussion and checking the efficiency and advantages of these new methods. We intend to continue this "special issue policy" in 1999, not only concentrating on soft computing, but also on symbolic methods, databases, etc.

F. Breitenecker

Modeling and Simulation of Gene Regulation and Metabolic Pathways

June 21-26, 1998
International Conference and Research Centre for Computer Science
Schloss Dagstuhl, Saarland, Germany

Julio Collado-Vides, Ralf Hofestädt, Michael Mavrovouniotis and Gerhard Michal

The second Dagstuhl seminar for *Modeling and Simulation of Gene Regulation and Metabolic Pathways* was held from June, 21 to 26, 1998. It was a multidisciplinary seminar with 59 participants from 15 countries. Schloss Dagstuhl workshops in general emphasize computer science, and we are delighted to focus on the rapidly developing links between biosciences and computer sciences. The 1998 meeting is a sequel to the 1995 Dagstuhl seminar on the same topic. Both were generously supported by grants from the Volkswagen Stiftung and the European Community (TMR Grant).

The availability of a rapidly increasing volume of molecular data enhances our capability to study cell behavior. In order to exploit molecular data, one must investigate the link between genes and proteins; the link between protein structure and protein function; and the concerted effects of many proteins acting on, and interacting with, the mixture of small and large molecules within a cell. This last step is the study of gene regulation and metabolic pathways which was the topic of the Dagstuhl seminar.

The molecular data must be stored and analyzed. Database systems for genes and proteins (EMBL, GENBANK, PIR, SWISS-PROT) offer access via internet. In the research field of molecular biology this technique allows the analysis of metabolic processes. To understand the molecular logic of cells we must be able to analyze metabolic processes in qualitative and quantitative terms. Therefore, modeling and simulation are important methods. They influence the domain of medicine and (human) genetics – the microscopic level. Today integrative molecular information systems which represent different molecular knowledge (data) are available. The state of the art is shown by P. Karps system EcoCyc, which represents the metabolic pathways of E. coli. For every gene or protein within a specific metabolic pathway, EcoCyc presents the access to all corresponding genes and/or proteins. Moreover, the electronical information system KEGG represents all biochemical networks and allows the access to the protein and gene database systems via metabolic pathways. However, both systems are based on the idea of

the statical representation of the molecular data and knowledge. The next important step is to implement and integrate powerful interactive simulation environments which allow the access to different molecular database systems and the simulation of complex biochemical reactions.

Molecular information systems for gene regulation and metabolic pathways were one topic of the Dagstuhl seminar. The idea was to discuss the progress of this research field and the integration of the molecular database systems in combination with simulation tools. The organisers of the seminar invited colleagues, who presented their ideas through 42 talks and computer demos.

More than 30 years ago Gerhard Michal started to collect all biochemical reactions. His classification is presented by the Boehringer pathway chart. This data collection was extended by the KEGG research group, which implemented the first electronical representation of this data in 1996. Nowadays all biochemical reactions are available via internet using the KEGG system. KEGG represents links to molecular database systems for genes, proteins, and enzymes, which are elements of metabolic pathways. Thus a link to the EMBL database systems represents more information about a specific gene, and a link to the SWISS-PROT system represents more information about the protein (enzyme). Regarding the KEGG system the representation of quantitative data and kinetic data is not available today. Furthermore, additional to the molecular data (genes, proteins, and pathways) the first molecular information systems are available which represent data of the cell signals. Besides the Japanese Cell Transduction Database the GENENET database system is available. Taking regard to both molecular information systems this can be interpreted as the first scientific step in which cell reaction processes are surveyed from the gene regulation process to the cell communication.

For molecular biology the phenomena of gene regulation is the main question. The systematic discussion of this question is based on the electronical representation of the molecular knowledge, which allows the complex analysis of this data. For that reason specific database systems are implemented (OperonDB, TRANSFAC and TRRD). These database systems represent all known operons and the transcriptional factors for E. coli (OperonDB) and eukaryotic cells. Today, two research fields based on this data are supported: The prediction of promoter sequences and the modeling of gene regulation. The prediction of promoter sequences is of importance, because the promoter is the starting signal for a structure gene which represents the genetic information. The human genome project will sequence the whole genome until the year 2004 (64 * 10**9 base pairs). The next step is to calculate the corresponding genetic map. Therefore, sequence pattern matching algorithms must be developed and implemented. In addition modeling and simulation of gene regulation processes will support the systematic analysis of the metabolic pathways.

John Reinitz opened the seminar. He presented ideas about modeling of genetic factors and analyzed the process of segment determination in Drosophila through numerically inverting a chemical kinetic equation which describes the regulatory circuitry and accounts for the synthesis rate, diffusion, and decay of gene products. The molecular mechanisms of gene regulation were presented by *Edgar Wingender*. During the last decade he has been analyzing the molecular mechanisms of eukaryotic gene regulation and has been collecting all transcriptional factors which can be found using his database system TRANSFAC. The prediction of promoter sequences based on this data was one important topic of the gene regulation session. *Julio Collado-Vides, Gary Stormo*, and *Thomas Werner* showed algorithms for the detection of promoter sequences for E. coli and eukaryotic cells. The molecular mechanisms of the cell death were discussed by *Dominique Bergeron*, and *Luiz Mendoza* talked about complex metabolic networks.

The modeling of regulatory networks belongs to the topic of Biophysics and Biomathematics. Moreover, discret models are developed using methods of Bioinformatics. At the beginning of that session *Jay Mittenthal* presented the metabolic pathway of the Pentose Phosphat Cyclus. *Gerhard Michal* is the creator of the Boehringer pathway chart which inspired many of us to pursue databases and integrative methods for the study of the metabolism. In his talk he discussed a brief overview of the issues surrounding the development of graphical representations and displays of metabolic pathways and other biological information. In the case of analytic models *Michael Savageau* introduced a model which allows the simulation of complex kinetic effects. Using graph theoretical methods *Michael Kohn* discussed his model for the simulation of metabolic networks. *Stefan Schuster* outlined several powerful methods for determining key features of a metabolic pathway or network. He showed how conservation relations may be identified and how elementary biochemical routes (and hence the spectrum of behaviors of the biochemical network) may be determined. Further he outlined the principles of metabolic control analysis and its extensions.

A new grammatical model for the analysis of complex metabolic processes was presented by *Simone Bentolila*.

Another topic of the seminar were molecular database systems. At the beginning of this session *Thomas Mück* discussed new topics in the research field of database systems and *Vladimir Babenko* introduced new techniques for the integration of molecular database systems. *Minor Kanehisa* showed the pathway database system KEGG and discussed further applications. *Fedor Kolpakov* demonstrated the database system GENENET, which is similar organized to the Japanese database system for Cellular Signal Transduction, which was presented by *Takako Takai-Igarashi. Rolf Apweiler* talked about the SWISS-PROT database, and *Daniel Kahn* demonstrated a new database system for the integration of protein knowledge. One important application of this molecular data is the diagnosis of metabolic diseases. In the case of inborn errors *Manuela Prüss* introduced the database system MDDB.

The final topic of the seminar was the integration and simulation of metabolic networks. The first generation of powerful simulation environments for the metabolic network control was discussed. These tools work using the biochemical data and diverse models which were presented in the sessions mentioned before. *Pedro Mendes* demonstrated his simulation environment GEPASI, which allows the analytical modeling of the metabolic processes. A first information system based on the integration of molecular databases and a grammatical simulation environment was introduced by *Uwe Scholz* and *Ralf Hofestädt*. Finally, an expert system for the modeling of metabolic processes was presented by *Jaime Lagunez*.

Concluding remarks

It is not sufficient to know what each protein or gene does in the cell (it usually catalyzes or regulates a biochemical reaction), but one must also decipher what they are all doing together (they form pathways of elaborate transformations and regulatory networks). In order to decipher the metabolic pathways that define the behavior of the cell as a whole, one must use information on single-protein activity. But there is also information flow in the reverse direction: The position and role of an enzyme in the metabolic network provides crucial insights and hypotheses for its genetic regulation and its relationship to other proteins. Genes and proteins are routinely sequenced and stored in database systems. Data on biochemical pathways has been systematically collected for the last three decades (in pictorial and text form), and the accumulation of such data has increased dramatically in recent years (and shifted to computational representations). The systematic use of collected data is also continually making advances. Methods for computational modeling and simulation are made feasible by the availability of data and are driven by the need to understand the behavior of complex biological systems. The integration of information, especially combinations of genes, enzymes, and metabolic pathways will be necessary in the study of biological regulatory structures, which usually involve multiple facets, components, and scales of action. Database systems and powerful models are already available, and the first practical simulation tools are implemented based on powerful theoretical methods. These information-integrative activities will become increasingly shed light on the biochemical mechanism of life.

The actual questions of the seminar were focused by the final discussion which concluded that: The number of molecular database systems is increasing. Moreover, these systems are available via internet. The now available accessing techniques are www links to the relevant molecular database systems, which support the navigation through the molecular data. However, this data must be available for further analysis processes. The detection of promoter structures is one actual example, which shows also the algorithmic problems of this research field. Besides the algorithmic analysis, modeling and simulation based on this molecular data are of importance. Different tools are developed and implemented. However, the selection of the model depends on the actual question. The main task for the next years is the integration of the database systems and the simulation environments, which will allow the simulation of complex metabolic networks.

Acknowledgement

The organisers thank the Volkswagen Stiftung and the European Community (TMR Grant) for its generous financial support.

Further information about the Dagstuhl seminar:
http://wwwiti.cs.uni-magdeburg.de/iti_bm/dagstuhl/

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40 Years of Computer-Aided Experimentation

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Abstract

Simulation, or experimentation with models, accounts for an enormous amount of computer and engineering time. A gallery of more-or-less historical photographs of anlaog, hybrid and digital simulation hardware highlights a 40-year design effort trying to make such experiments quite fast, very convenient and, above all, interactive.

Introduction

I have a nice set of historical pictures for this presentation. The Society for Computer Simulation, much dedicated to eating and drinking, encourages non-technical as well as technical reminiscences, but I would not want to re-repeat too many oft-told tales. Instead, this report will try to *trace the development of interactive, computer aided experimentation with models*. This is not a scholarly study, and so has no bibliography (which would be long, dignified, and rather useless).

Like many others, I met simulation in the U.S. Navy. I was fortunate to serve at the wellspring of computer simulation: Admiral de Florez's Special Devices Division (now the Training Devices Center, and still at it). Their work revolutionized occupational training. And they initiated the big early simulation-hardware projects: CYCLONE (Reeves analog computers), TYPHOON (only RCA's addition of chopper stabilization to d-c amplifiers made early analog computation viable!) and the now better-remembered WHIRLWIND at MIT, a house-sized 16-bit digital simulator about as powerful as an IBM PC. WHIRLWIND pioneered core memories and much else; which reminds me that, last year, I met a Ph.D. student of Computer Science who did not know what a core memory was (he had never seen one).

I stayed in the aircraft industry; Sperry, Curtiss-Wright, Boeing, and Lockheed. Except for one discrete-event simulation of the entire U.S. air defense (in 1951 machine language!), I simulated dynamic systems. Early missile engineering was a sort of large educational effort, where largely inexperienced engineers and managers learned about controls, transducers, and guidance from others who knew just a bit more. Pre-war engineers had lacked mathematics; now some electrical engineers learned *only* mathematics. Large engineering projects tried to find specialists to deal with truly unknown situations. Computer simulation was, perhaps necessarily, often welcomed as a substitute for theoretical expertise and, worse, for physical engineering experience. I vividly recall the control experts' disbelief when telemetry indicated that real missiles are not model rigid bodies (they bend!), and the real shock of the "pogo" effect caused by un-modelled fuel sloshing.

Interactive Experimentation and the Difference Analyzer

Simulation is, simply put, experimentation with models. Computers can, for better or worse, easily implement very complicated models. The main features of computer-aided experimentation are *high speed*, to let you try many ideas quickly; and a *friendly interface* which lets you experiment without worrying about the computer as such. Graphics terminals, workstations, and personal computers now do this quite well.

This was not always true. My first missile models ran on electromechanical analog computers. Public-address amplifiers drove a-c servos. I invented the Difference Analyzer, which had no servos; an operator nulled potentiometer outputs to predict trajectories. I was enthusiastic enough to claim "even a ... yes, even a monkey can solve differential equations with this machine".

It is unwise to brag. For there lived in the city of Columbus, Ohio, a vigorous, bright, and amiable monkey named "Rector Magnificus", presumably after the title given to Central European university presidents. With many (but not all) of his co-monkeys in Columbus, Rector lived in the zoo, on a comfortable monkey island surrounded by a water-filled moat. Right there, he acquired a measure of local fame by pulling the plug which held the water in the moat. After an eventful two-day chase through the residential neighborhoods surrounding the zoo, Rector and most of his cohorts were again accounted for, and ready for new deeds.

So, unfortunately, was Curtiss-Wright's PR man. He called me in person. "Doctor, please be ready at noon tomorrow. I arranged for the famous monkey to run your Difference Analyzer – you said he could do it! – we hope for seven reporters." I was not pleased. I called the Chief Engineer. I said "... conceivably creditable PR, but perhaps not all the angles ... is it truly advisable to have the public associate CW technical management with ...". The Chief put both feet on the monkey business, thus stabilizing the situation.

Interactive Experimentation on Analog Computers

From 1947 to perhaps 1970, *analog and hybrid computers* dominated aerospace (and other) simulation. Parallel operation of many analog integrators, multipliers, etc. was the only way to get enough speed. At least for small models, *analog computers also permitted far better user interaction than the digital computers then available*.

You could easily *change model parameters* (if you found the potentiometer); and see the results (if you found the trace on the stripchart recorder). To *change the model* you moved patchcords, which were truly related to the signal flow in your model. Large models (many aerospace simulations involved hundreds of amplifiers on multiple consoles), though, did not exactly ease such intuitive overview. Patchbays resembled the exposed entrails of a mastodon. A large database of past stripchart records was a – well, it was hard to access. First coefficient setting and then patching was given digital supervision. Stripchart records languished in nicely labeled file cabinets. And a new computer run might require *rescaling*, a wholly awful job.

Hybrid Computers

Analog computers do not take kindly to the multi-argument aerodynamic-function generation needed for flight simulation. Moreover, ballistic-missile guidance is more accurate than analog computation (although this can, really, be mitigated with clever perturbation techniques). The early 1960s, then, saw attempts to insert digital computers – which by now were a bit faster - into analog differential-equation-solving loops via huge-kluge signal converters. Such *hybrid computers*, with their elaborate interfaces, inaccurate analog computation, and sampled-data time-delay errors, neatly combined the disadvantages of both analog and digital machines. But they were, once again, the only way to do important work. In particular, they helped to get us to the moon.

Repetitive and Iterative Analog/Hybrid Computers Experimenting with Multi-Run Statistics

Early on, George Philbrick invented *repetitive analog computers*. A CRT displayed repeating, fast-time-scale simulation runs. Solution curves changed immediately when you changed the potentiometer settings for, say, servo damping. This was, and still is, a very neat technique for interactive parameter adjustment.

Next came *patched digital logic*, which could start and count computer runs, reset and sample variables, and effect small interconnection changes. Such logic could respond to analog-computer results via comparator readings and thus permitted *iterative analog computation*. This could be exceedingly clever, permitting e.g. automatic parameter optimization; but patched-logic programming is complicated and thus found only limited practical application.

Extra-fast analog computation has intriguing possibilities, especially when a small digital computer (rather than patched logic) is used to control iteration of fast analog runs. D.M. MacKay and M.E. Fisher tried repetition rates as high as 100,000 simulation runs per second, looking for applications where speed could substitute for accuracy. This failed; such experiments were, mainly, pretty demonstrations without valid quantitative results. But at more realistic frequencies (100 to 1000 runs/sec), S. Giser and his associates, first at MIT and then commercially, used repetitive analog computers to find *statistics* over 100 to 1000 sample runs of a random process (e.g. control-system or communication-system operation with noise). With really fast analog circuits, you can

1. *interactively observe results of parameter changes on statistics, such as mean-square errors or correlation functions*, and
2. *quickly cross-plot or iteratively optimize statistics* (e.g. servo mean-square error) by running consecutive samples of 100 to 1000 simulation runs.

Hybrid computers designed for this type of operation became a specialty of our laboratory at the University of Arizona. To obtain 0.1 per cent half-scale errors at 10 KHz, we lowered operational-amplifier impedances dramatically (1000 Ohms and 0.1 to 1 microfarad compared to the 0.1 to 1 Megaohms and tiny integrator capacitances of earlier repetitive computers). More difficult was the development of the *10-nanosec* integrator switch timing needed for errors below 0.1 per cent at 10 KHz.

We developed very fast feedforward amplifiers, multipliers and function generators and, significantly, packaged computing elements to plug directly into patchbays without wiring. We learned the hard way: our 100 MHz (0 db) operational amplifiers reproduced digital-circuit noise with brilliant high fidelity, and bone-dry Arizona has no grounds - only antennas (the remedy was balanced ECL). ASTRAC II and LOCUST would do, say, *one million* 16-differential-equation simulation runs to set 4 parameters optimizing a 500-run mean error *in 5 minutes*; or optimize a non-statistical *200-parameter* problem in a comparable time period.

Smaller fast machines were unequalled for teaching random-process theory, where, again, they permitted *interactive experiments with statistics*: this produces real intuitive insight into the behavior of random processes. Our new high-speed analog/hybrid circuits

adapted well to real-time instrumentation and control; Burr-Brown hired our student designers as fast as they graduated. But fast analog computers are not really accurate enough for most routine simulation, where 0.1 per cent errors might accumulate into unpredictable disasters.

Interactive Digital Simulation

Even slow analog computers are not quite accurate enough, although modern solid-state circuits do not need the constant readjustment of older machines. Resistances are easily kept within 0.01 per cent at d-c, but plastic-dielectric integrator capacitances cannot even be *measured* within 0.01 per cent (C. Single developed a clever compensation technique permitting integration within 0.01 per cent anyway, but this was never used commercially). One analog-computer manufacturer went (literally) bankrupt when the first large customer acquired instruments sufficiently accurate to check dynamic accuracy.

By 1967, digital computers had improved. FORTRAN was over ten years old, and dynamic-system simulation languages now relieved users of the need to look at integration code (integration errors, though, still hide below the surface, like analog phase errors used to). Now *minicomputers* brought digital computation out of the computing-center closet, bringing hopes of hands-on, interactive digital computation. Max Palevski (Scientific Data Systems) test-flew a console for on-line simulation with the SDS 9300, and S. Schlesinger proposed a larger computer with an early CRT display.

These developments inspired the University of Arizona's NSF-funded Project DARE (Differential Analyzer REplacement). Looking at early minicomputers, I (wisely) passed up the 12-bit DEC PDP-8 for an 18-bit PDP-9. This was 20 years ago: a core-memory-equipped, capitals-only, alphanumeric CRT terminal cost us $ 5000. We developed, built, and programmed a vector-type monochrome graphics system and, in case of VIP visits, made an old color TV into a color graphics display by turning it on its side, so that analog comparators sampling the scan lines would brighten time-history points.

In a truly remarkable Ph.D. dissertation, John Goltz wrote (1) the DARE I simulation language (which in some ways improved on the then-new CSSL specifications); (2) real CRT screen editor using a linked list of lines, 18 years before Borland established this technique in their Editor Toolbox; and (3) a command interpreter/operating system for console operation, file manipulation, and completely automatic calls to compiler and linker. The laboratory was organized as a pyramid of graduate students supervising other student projects, and I always suspected that Goltz also wrote maybe one-third of the other programs going on at the time.

To impress students (and project sponsors) with the new ideas, we built a sky-blue triple-CRT console. A big rotary switch selected integration rules (an idea borrowed from Max Palevski). To make former analog users comfortable, we had beautiful lighted tablet switches marked RESET, COMPUTE, HOLD, and also COMPILE. I was sensitive to the compilation/linking delay even then and so provided a pattern of little lamps blinking to reassure waiting users.

The complete DARE I system was presented at the 1969 Fall Joint Computer Conference. At a time when most user/computer intercourse was still via punched cards, you could enter and screen-edit simulation programs in a fairly natural language (much like today's ACSL). There was no need at all to know FORTRAN, but the system would automatically translate and link any FORTRAN or assembler procedure you might want to include. You pushed the COMPILE button and waited for a READY light; you could then enter parameters (the system would remind you of missing ones), push COMPUTE to see the simulation output on the CRT, and repeat the process.

A Missing Link

Here, then, was the long-dreamt-of interactive digital system, but our undergraduates were not impressed. They felt – and stated – that this was the natural way computation *ought* to be in the first place. Later interactive DARE systems dropped the expensive special-purpose console and adopted mass-produced PDP-11s and commercially available graphics. Even our first system accepted changed numerical parameters without recompilation. *Still, there was a missing link*. Again, and again, and again, interactive users had to interrupt their model experiments, and their train of thought, to wait for compiling and linking after even the smallest change in the model *equations*. You may want to make *a hundred* such changes in course of a day; the repeated delays are distracting and annoying (especially when the compiler grinds for 40 seconds and then says MISSING EQUAL SIGN ON LINE 109).

Interpreted BASIC avoids compilation altogether. I wrote BDARE in BASIC; you enter simulation programs interactively and execute directly on PDP-11s, timeshared DEC-10s, and even Apples. But such systems run at a snail's pace: *an interpreter re-translates every statement* for each pass through the integration loop (between 200 and 20,000 times!). This is hardly the way to go, even on a fast computer. Incrementally

(i.e., line-by-line) compiled BASIC is a little better, but still not as efficient as a true compiler language; it has never really caught on. But late-model *compiled* BASIC systems for personal computers (Microsoft QUICKBASIC, Borland TURBO BASIC), and the similar Borland TURBO PASCAL 4.xx have excellent screen editors and compile directly into memory at a good clip. They also permit separate compilation of canned integration and library routines and could produce systems for more-or-less-interactive simulation. But a different approach *combines interpretation and compilation* with true serendipity.

A New Approach

In a 1977 thesis, S. Conley wrote a BASIC-type interpreter which set model parameters and then *called a built-in compiler* to translate the differential-equation-solving code, which could execute quickly. To simplify compilation, MICRODARE I specified models in terms of fixed-point analog-type blocks (integrators, summers, etc.) implemented with canned threaded-code procedures. Such block-diagram languages, essentially make you do a first compiler pass by hand. The compiler had so little work that its delay was not noticeable: MICRODARE I executed immediately, and at one-half assembly-language speed. Faster versions of MICRODARE I and II later used a *microprogram* for each analog block and actually obtained twice machine-language speed.

Since the pleasures of block-diagram programming wear off quickly, I now wrote a fixed-point small *equation-language* compiler, which still managed to produce one-half machine-language speed (MICRODARE III and IV). Fixed-point MICRODARE IV was used as a very fast simulation system in industry, and, with NSF support, also in a multi-processor, multi-task system for laboratory automation: note that software for real and for simulated experiments is quite similar. In 1982, EARLY DESIRE (Direct Executing Simulation in REal time) added grown-up floating-point, equation-language simulation and a set of precompiled integration routines.

Translation and Execution Speed

EARLY DESIRE was still written in PDP-11 assembly language, which condemned it to die slowly with an obsolescent machine. At this point (1983), we did not know whether portable high-level-language code for a runtime compiler could be acceptably fast on the small computers beginning to appear on many desks.

A year's work resolved this problem. Three different mini-compilers written in portable (well, more or less portable) PASCAL for H. Vakilzadian's DESIRE P and my DESCTOP and ENHANCED DESIRE systems are *faster* than EARLY DESIRE's assembly-language compiler. An 18^{th}-order flight simulation compiles in under 0.2 seconds on a 10 MHz AT clone, so that simulations really seem to execute immediately on a typed RUN command. In fact, DESIRE systems do not even bother to store compiled programs, but simply recompile source programs when they are needed again. Translation is fast because the compiler's job is simple: it only translates derivative expressions into stack-machine code. IBM-compatible PCs with different math coprocessor chips or cards merely require new compiler code generators and some new library functions.

In the End

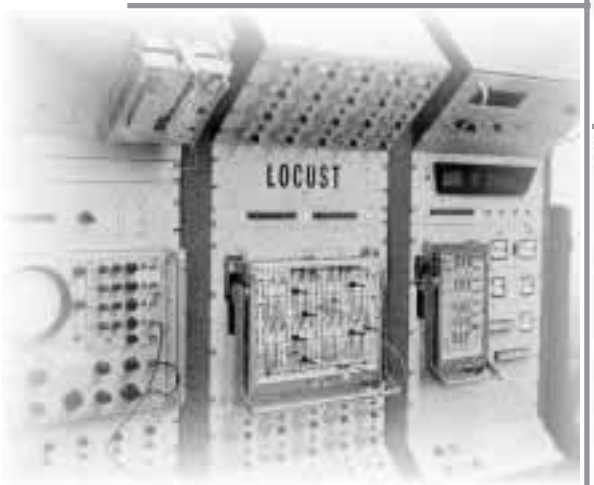
The simulation-protocol interpreters were, next, made into general-purpose math facilities (complex numbers, matrices, FFTs), with screen editing, command shells, and other features, but I have described all this elsewhere in awe-inspiring detail. This software also runs on timeshared VAXes or MICROVAXes, but I much prefer PCs; isn't timesharing much like making love over a telephone line ? *An inexpensive 16 MHz 80386/80387 clone, runs simulations substantially faster than a VAX 11/780 or MICROVAX II under VMS*, and cache-equipped 20 MHz 386s with Weitek coprocessors will match MICROVAX III speed. Minicomputers still have better disks and better system software than PCs, but this is changing and, in any case, has little if any impact on simulation.

Even potent minicomputers like the MICROVAX III cannot match analog-computer speed for large real-time simulations. That requires special accessory processors (Applied Dynamics International AD-100, FORTRAN-running array processors), or a superminicomputer capable of parallel processing. Note, in passing, that such systems, too, could benefit substantially from a good *interpreter* program running an interactive experiment/report-writing simulation protocol.

To sum up, 40 years' progress has made interactive simulation quite fast and really convenient. Simulation has long been less costly than most real experiments. Now, 800 dollar PC clones have made respectably-sized simulations so very accessible, inexpensive, and persuasive that I would like to conclude, not for the first time, with a word of caution. You must take all experiments on *models* with a grain of salt and insist constantly on model validation. The great Lao Tse and the renowned Korzybski have said it in chorus: anything which can be expressed as a simulation model cannot possibly be the real thing. In particular, it would be a serious mistake to replace too many real student laboratory experiments with simulations.

Photographs from SIMULATION, November 1982

Analog/hybrod computation was in full swing (1964-1967). The digital-computer-controlled ASTRAC II introduced such innovations as new fast feedforward amplifiers, low computing impedances, faster electronic switching, and computing elements plugged directly into the back of a shielded patchbay.



In 1967, LOCUST's 40 100-MHz (0-db) amplifiers produced full 10 V, 30 mA output at 10 MHz and could solve up to 16 nonlinear differential equations 4000 times per second.

This homemade 1960 100-volt machine combined Beckman and Systron-Donner amplifiers and multipliers and an Electronicc Associates patchbay.

This carefully designed 1958 dual analog computer used Philbrick 100-volt amplifiers and triangle-averaging multipliers.

Early DESIRE

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 news journal of EUROSIM.

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 announcements. 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.

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 two 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) and PSCS – Polish Society for Computer Simulation (Poland) are observer members.

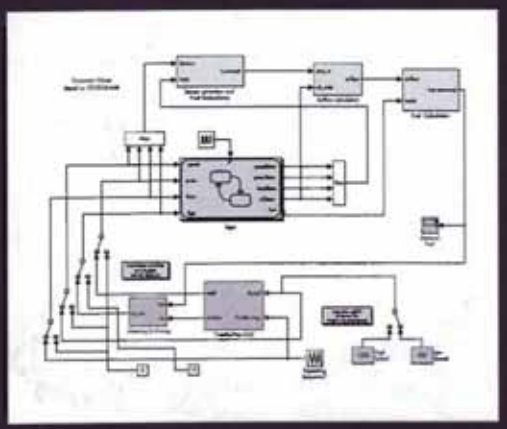
The EUROSIM Congress is arranged every three years in Europe. EUROSIM'98 took place in Helsinki, April 14-17, 1998. The 4th EUROSIM congress will take place in Delft, The Netherlands, June 26-30, 2001.

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 year period beginning on July 1, 1998: L. Dekker (DBSS) – president, K. Juslin (SIMS) – past president, A. Javor (HSS) – secretary, Y. Hamam (FRANCOSIM) – treasurer.

Further information can be found on the EUROSIM WWW Server:

`http://www.eurosim.org/`



Das Bild oben zeigt ein Modell für eine Einspritzanlage in Simulink und stellt die Möglichkeit dar, ereignisorientierte Blöcke aus Stateflow mit dynamischen Blöcken in einem Modell zu verbinden.
Mit dem Real-Time Workshop und dem Stateflow Coder kann aus einem solchen Modell automatisch ANSI-C-Code generiert werden. Durch die offene Architektur des Real-Time Workshop ist es möglich, diesen Code auf unterschiedlichster Echtzeit-Zielhardware (DSP-Boards, Microcontroller etc.) zu implementieren.

MATLAB 5

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ECHTZEIT PER MAUS-KLICK!

Simulink-Modelle für Echtzeitimplementierungen in C-Code übersetzen.

Echtzeit- und Stand-alone- Simulation.

Mit dem vom Real-Time Workshop erzeugten Code können sowohl Stand-alone Simulationen mit maximaler Geschwindigkeit als auch Hardware-in-the-Loop-Simulationen im Echtzeitbetrieb durchgeführt werden.

Rapid Prototyping.

Die automatische Codegenerierung und Automatisierung von Kompilieren, Linken und Laden gibt Ihnen eine sehr schnelle und effiziente Möglichkeit, den grafisch entwickelten Algorithmus direkt in Verbindung mit der Zielhardware zu testen und zu optimieren.

Unterschiedliche Zielhardware.

Der Real-Time Workshop ermöglicht durch seine offene Architektur Echtzeitimplementierungen auf unterschiedlichsten Zielplattformen, vom Microcontroller über PCs bis hin zu verschiedenen DSP-Boards.
Die Besonderheit für die Microcontrollerimplementierungen ist die Generierung eines rein integerbasierten C-Codes mit dem CONTI-Tool, ohne daß sich der Benutzer mit Skalierungen und Wertebereich-einschränkungen befassen muß.

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ASIM

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

ASIM'98, Zurich

In 1998 the annual ASIM Conference was held in Zurich, Switzerland, from September 15 to 18.

It was organised by M. Engeli and V. Hrdliczka from the Institute of Manufacturing Technologies and Machine Tools at the Swiss Federal Institute of Technology Zurich (*ETH Zürich*).

More than 200 participants came to the main building of the University of Zurich, where the Conference and the accompanying Exhibition took place. The Tutorials and User Group Meetings, which are traditionally held on the first day of the symposium, the "*Praxis-Forum*" about control systems for motor vehicles, the workshop about the VDI-guidelines "Simulation for the flow of material and logistic" and last but not least more than 100 interesting contributions of a high level attracted a great number of participants – about 50% from industry. Beside the proceedings summarising the accepted papers proceedings for accepted poster contributions were also produced. The invited speakers covered a wide field of simulation – from projects in the machine tool industry to virtual men and women, from simulation in finance to traffic simulation.

D. Möller and F. Breitenecker congratulate V. Hrdliczka

The social programme with concerts, sightseeing tour, museum and a typical Swiss dinner guaranteed a nice atmosphere and the success of the conference.

At the end, D.P.F. Möller, ASIM speaker, congratulated the organisers on a successful conference.

The aims of the conference, an exchange of experience between research people and an increasing acceptance of simulation by industry people were definitely fulfilled.

A longer report on this conference may be found in the November issue of *ASIM Nachrichten*, the German supplement to SNE.

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

The next ASIM conference will be in Weimar at the *Bauhaus-Universität*. In 1999 Weimar will be the cultural capital of Europe and will celebrate the 250th anniversary of Goethe.

Local organizer and chair of the programme committee is Prof. Dr. G. Hohmann. All aspects of modelling and simulation will be addressed:
* Modelling and Simulation Methods
* Simulation Hardware and Software, Simulation Tools
* Applications

Deadline for abstracts will be February 1, 1999.

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http://www.uni-weimar.de/veranst/asim.html

An invitation and call for papers is mailed to ASIM members with this SNE issue.

ASIM/ESS 2000, Hamburg

Both societies, ASIM and SCS Europe, decided for a closer co-operation in the field of simulation in Europe. To speed up this co-operation, in 2000 a joint conference will be organised, the ASIM/ESS 2000 Conference. This conference will be held from September 18 to 23, 2000 at the University of Hamburg. ASIM and SCS Europe designated Prof. Dr. D.P.F. Möller, Computer Science Department, University of Hamburg, as General Conference Chair of ASIM/ESS 2000.

This conference is aimed to bring together simulation in practice and in theory. Therefore workshops will be organised having hands-on-tools, industry plenaries as well as academic plenaries will be held, telematic possibilities will be introduced for education and application.

Moreover ASIM and SCS agreed on supporting conferences of each society, like the ESM in Manchester in 1998, the ECEC 1999 in Erlangen, the WCSS 2000 in Vancouver, the ESS/ASIM 2000 in Hamburg, the ESM 2003 in Vienna etc.

For more information please contact: Prof. Dr. D. P. F. Möller, University of Hamburg, Dept. Computer Science, Vogt-Kölln-Straße 30, D-22527 Hamburg, Fax: +49-40-5494 2206, email: moeller@informatik.uni-hamburg.de

Merge of ASIM and SCS Book Series

ASIM offers a book series on simulation in conjunction with *Vieweg Verlag*, Wiesbaden, called "*Advances in Simulation Technique*", having 10 books available at the moment and a second book series "*Reports in Simulation*" published by ARGESIM Vienna, having 7 books.

Due to the more intensive co-operation between ASIM and SCS Europe, the ASIM Board and BVBA, which handles the SCS Europe book series activities, agreed to co-operate in book series in Europe. This agreement was figured out at a meeting of both parties during the ESM 1998 at Manchester and confirmed by an ASIM Board meeting and an SCS and BVBA Board meeting this year.

Now it can be stated that the European simulation community will be supported in publication activities under the guideline "one face to customer" with three series, the "*Frontiers in Simulation*" series, the "*Advances in Simulation*" series and a third free area series. With this challenge we start bringing the European simulation activities a little bit closer together.

Information on this series will be available from the Executive Editor Dr. Rainer Rimane, University of Erlangen-Nürnberg
or from the new Chief Editors
Prof. Dr. F. Breitenecker, TU Wien,
Prof. Dr. G. Kampe, FH Esslingen,
Prof. Dr. E. Kerckhoffs, TU Delft,
Prof. Dr. A. Lehmann, Univ. d. Bundeswehr München,
Prof. Dr. D. P. F. Möller, Univ. Hamburg,
Prof. Dr. Pierreval, IFMA Aubiere,
Dr. R. Zobel, University of Manchester.

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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.

February 22, 1999: Meeting of the working group *"Simulation in Produktion und Logistik"* at Dortmund.

March 1-2, 1999: Meeting of FG 5 *"Simulation Technischer Systeme"* and FG 2 *"Simulationssoftware und -hardware"* at RWTH Aachen.

March 3, 1999: Workshop of FG 1 *"Simulation paralleler Prozesse"* in Magdeburg.

March 14-16, 1999: *"Werkzeuge für Modellbildung und Simulation in Umweltanwendungen"* in Koblenz.

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

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.

From 1999 on together with SCS series "Advances/Frontiers in Simulation"

ASIM - Buchreihen / ASIM Book Series

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- A. Kuhn, S. Wenzel (Hrsg.); Simulationstechnik 11. Symp. Dortmund, 1997

Schwerpunkte / Topics:

- Statusberichte über Simulation in den ASIM Fachgruppen / Status reports
- Allgemeine Monographien / General monographies
- Proceedings der ASIM Tagungen / Proceedings of the ASIM conferences

Reihe/Series **Fortschrittsberichte Simulation**

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- P. Acel; Methode zur Durchführung betrieblicher Simulationen - Effiziente Optimierung der diskreten Simulation
- M. Kinder; Stochastische Simulation biotechnischer Prozesse - Entwurf von Filtern und Reglern
- M. Lingl; Hybrid Modelling Approach in Discrete, Continuous, and Combined Simulation (geplant für Ende 1998 / to appear at the end of the year)

Schwerpunkte / Topics:

- Spezielle Monographien (Dissertationen, ...) / Special monographies (PhD-thesis, ...)
- Erweiterte Berichte der ASIM Fachgruppentreffen / ASIM Workshop proceedings
- Handbücher für Simulationssprachen / User Guides for simulation languages

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- A. Kuhn, M. Rabe (Hrsg.); Simulation in Produktion und Logistik
- K. Mertens, M. Rabe (Hrsg.); Erfahrungen aus der Zukunft

Bestellungen, Informationen für Autoren / Orders:

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Email: 100564.302@compuserve.com

Ab 1999 zusammen mit den SCS-Reihen "Advances/Frontiers in Simulation"

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

September 18-23, 2000: ASIM/ESS 2000 will be held at Universität Hamburg.

Meetings with ASIM Participation

March 5-6, 1999: *Simulation und Visualisierung '99,* Magdeburg.

April 7-9, 1999: UK Sim 99. Fourth United Kingdom Simulation Society Conference, Cambridge, U.K.

February 2-4, 2000: 3rd MATHMOD, International Symposium on Mathematical Modelling. Vienna.

For contact information see calendar of events (page 57).

Working Groups (*Fachgruppen* FG)

"Verteilte Systeme und parallele Prozesse" (FG 1)

The main topics of the working group "Distributed Systems and Parallel Processes" are all modelling and simulation aspects :

- description methods and languages,
- parallel and distributed simulation,
- partitioning for parallelization,
- performance analysis,
- distributed computer systems,
- communication and synchronization principles.

The next activity will be a workshop on March 3, 1999 in Magdeburg/Germany. For more information see also *ASIM Nachrichten*, which are mailed to ASIM members with this SNE issue.

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)

At present the working group is concentrating on evaluation of software tools and is acting as "service group" for the application-oriented working groups of ASIM.

Both tasks will be dealt with at the next joint working group meeting (together with working group "*Simulation Technischer Systeme*") in March 1999, in Aachen. There, in a plenary session an overview on concepts and applications of Computer Algebra Systems (Maple, Mathematica, etc) will be discussed, and in an "open" parallel session evaluation and WWW-documentation of the *ARGESIM Comparisons on Simulation Software and Simulation Techniques* will be presented. For participants online access to this documentation and evaluation will be provided.

An invitation will be mailed with this SNE to the ASIM members, further information and program updates may be found on WWW: http://www.asim-gi.org/fg_sshw

Furthermore, the working group is co-organiser of the seminar series "*Seminare aus Modellbildung und Simulation*" at Vienna University of Technology.

These seminars deal with developments in simulation technique and simulation software (hybrid simulation, soft computing) as well as with applications (environmental systems, physiological systems). The ERUDIT seminar (December 4, 1998) starts a new cooperation with groups concentrating on soft computing techniques: ERUDIT is the *European Network for Fuzzy Logic and Uncertainty Modeling in Information Technology* of the EU Programme *DG III Industry – Esprit*.

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 11499, 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)

The working group had its last meeting at the castle of Ebernburg in spring 1997. The main topic was *Soft Computing: a paradigm change in simulation in medicine, biology and ecology*. The Proceedings of the meeting are in preparation and will be available end of this year. The next Ebernburg Conference was decided to be held in April 2000. The working group has annual meetings and presentations during the ASIM Annual Simulation Conferences.

Speaker: Prof. Dr.-Ing. Dietmar P.F. Möller, University of Hamburg, Dept. Computer Science, Vogt-Kölln-Straße 30, D-22527 Hamburg, Fax: +49-40-5494 2206, email: 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 5927, Fax: +49-531 391 8170, email: O.Richter@tu-bs.de

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Für Hardware-Entwickler

Ein völlig neuartiges Softwarepaket, das die Technologie der Co-Simulation nutzt, um Schaltungsentwürfe im Zusammenhang mit Netzwerken oder verteilten Systemen zu überprüfen.

Die Fähigkeit von OPNET, Netzwerke exakt zu simulieren, erlaubt den Hardwareentwicklern, realitätsnahes Netzwerk-Verkehrsaufkommen und Protokolle als Stimulus ihrer Schaltungsmodelle einzusetzen. Das Ergebnis ist eine schnellere, präzisere und leistungsfähigere Testumgebung für Schaltungsentwürfe in VHDL und VERILOG. Integriert mit ModelSim von Mentor Graphics.

Software mit Zukunft

scientific COMPUTERS

Scientific Computers GmbH
Franzstr. 107-109, 52064 Aachen,
Tel.: 0241/47075-0, Fax: 0241/44983,
eMail: opnet@scientific.de, Web: www.scientific.de

MIL3
Modeling Technologies for the Third Millennium

"Simulation technischer Systeme" (FG 5)

This working group will have its next meeting on March 1st and 2nd, 1999, at RWTH Aachen. The meeting will be co-organized by Prof. Rake (IRT).

Some of the topics are VHDL-AMS, simulation of hydraulic systems, modeling with state machines and simulation of control systems. The working group "*Simulationssoftware und -hardware*" (FG2) will join the meeting with a session about tools and industrial applications of computer algebra systems and an "open" demonstration session on evaluation of the ARGESIM comparisons. Furthermore FG5 will organize a *Praxisforum* for simulation in electronic design. Additionally some contributions from the automotive industry are planned, and a meeting of the SPICE user group.

The working group will participate actively at the ASIM conference in Weimar. For more information see the *ASIM-Nachrichten* mailed with this SNE issue.

Speaker: Ewald Hessel, Hella KG Hueck&Co., Abt. EL-R, Werk II, Beckumer Straße, D-59552 Lippstadt, Tel: +49-2941 38 8572, Fax: +49-2941 38 8427, email: hessel@hella.de
Vice-Speaker: Dr. Achim Wohnhaas, debis Systemhaus, Project Division, Fasanenweg 9, D-70771 Leinfelden-Echterdingen, Tel: +49-711 685 5626, Fax: +49-711 685 5710, email: awohnhaa@debis.com

"Simulation in Produktion und Logistik" (FG 6)

The last working group meeting took place on June 24th, 1998 in Dortmund, Germany. Topics were the organization of the 9th Working Group Conference, planned in spring 2000, and the presentation of the Demonstration Center *Simulation in Production and Logistics* which was established as a Fraunhofer co-operation of nine Fraunhofer institutes and made their business to support and propagate simulation technology in production and logistics. Proceedings can be ordered from Dr.-Ing. S. Wenzel (Fax: +49-231-9743 234, email: wenzel@iml.fhg.de).

The different usage of the term "reference model" in simulation lead up to a discussion about the definition of this term. A working team of the ASIM working group decided to solve this problem by clearly defining this term and showing different examples of reference models base on the new definition. The results will be published as a book titled *"Referenzmodelle für Simulation in Produktion und Logistik"* in 1999.

The next event organized by the ASIM Working Group will be the working group meeting on February 22th, 1999 in Kassel, Germany. One important topic will be the speaker election.

The 9th Working Group Conference will be held on March 8 - 9, 2000 in Berlin, Germany. It will be again 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.

For detailed information about working group activities please refer to http://www.asim-pl.uni-kassel.de or contact: email: wenzel@iml.fhg.de

Speaker: Prof. Dr.-Ing. A. Kuhn, Fraunhofer-Institut für Materialfluß und Logistik, Joseph-von-Fraunhofer-Straße 2-4, D-44227 Dortmund, Tel: +49-231 9743 132, Fax: +49-231 9743 234
Vice-speaker: Prof.Dipl.Ing. Adolf Reinhardt, Universität Gesamthochschule Kassel, Fachbereich 15, IPL, Kurt-Wolters-Str. 3, D-34125 Kassel, Tel.: +49-561 804 2693, Fax: +49-561 804 2697, email: fps@hrz.uni-kassel.de

"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)

The next workshop of the working group will take place on March, 14th, 1999 to March,16th, 1999 at the University of Koblenz. The main topics are:

- modelling, model description, object oriented modelling concepts
- integrated assessment of environmental systems
- applications of modelling and simulation to environmental systems.

There are also plans for a round table discussion of the problem: "Are new simulation concepts needed to use softcomputing methods?"

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 pub- lishing 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

Prof. Vlatko Ceric
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email: vceric@efzg.hr
Web: http://www.efzg.hr/~vceric/

Activities

- Co-organizing the 19th International Conference Information Technology Interfaces ITI 98, held in Pula, Croatia, from June 16-19, 1998. The conference has traditionally a strong modelling and simulation session.
- Co-organizing the 19th International Conference on Operational Research KOI98 held in Rovinj, Croatia, from September 30 - October 2, 1998.
- 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/.

V. Ceric

CSSS

CSSS (The Czech and Slovak Simulation Society) has about 75 members in 2 groups connected to the Czech and Slovak national scientific and technical societies. The main objectives of the society are: development of education and training in the field of modelling and simulation, 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 20th International Workshop on **"Advanced Simulation of Systems (ASIS98)"** was successfully held on September 15-17, 1998 in the Moravian town Krnov, Czech republic. 70 participants from the Czech and Slovak republics and 20 participants from Poland and Ruomania attended the workshop and 60 papers were presented in the sections: Simulation Case Study, Education of Modelling and Simulation, Process Modelling, Simulation Tools, Parallel and Distributed Simulation, Simulation in Hydrodynamics, Modelling in Manager Work. During the workshop the annual meeting of CSSS took place, as well as the 60th Anniversary celebration of Dr. Jan Stefan, chairman of CSSS.

The 13th International Conference on **"Process Control and Simulation"** (ASRTP98) was held on September 8-11, 1998 in Tatranske Matliare, High Tatras, Slovak republic. 62 participants from Czech and Slovak republics and 80 participants from Poland, Austria, Turkia, Kazachstan, Yugoslavia and Ukraine attended the conference. Main topics: Monitoring Systems, Modelling and Simulation (22 papers), Information Technologies, Control of Technological processes, Management Systems, Production Management and Industry Logistic. The ASRTP conferences have a more than 20 years old tradition with a high reputation in control systems theory, modelling and simulation and its industrial applications. The chairperson of the international program committee was Prof. Dr. Ing. D. Malindzak, Technical University of Kosice.

The scientific conference with international participation **"Electronic Computers and Informatics98"** was held October 8-9, 1998 in Herlany, Slovak republic. 50 participants from the Czech and Slovak republics and 10 participants from Poland and Romania attended the workshop and 40 papers were presented. General chair of the conference was Prof Ing. Milan Jelsina, Technical University Kosice, Slovak republic.

Coming Events

The 33th International Conference on "**Modelling and Simulation of Systems**" (MOSIS99) will take place on April 27-29, 1999, in Krnov, Czech republic. The chairman of the international organising committee is Dr. Ing. Jan Stefan. Main topics: Graphics, Visualisation and Animation in the Simulation; Neurone Nets and Simulation; New Simulation Tools; Petri Nets – Modelling and Simulation; New Concepts of Simulation; Information Systems Modelling (Database Theory and Design, Object-Oriented Databases, Formal Definition of Information System Models, Web-Based Information Technologies, Geographic Information Systems etc.); Simulation Case Studies – Manufacturing Systems.

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70 Year Anniversary for Academician Ivan Plander, DrSc.

Ivan Plander, DrSc.
Institute of Computer Systems, Slovak Academy of Sciences
Dubravska cesta 9, SK 842 37 Bratislava, Slovak republic

Review of research, development and pedagogic activities

Ivan Plander, Professor, DrSc., Member of the Slovak Academy of Sciences, of the former Czechoslovak Academy of Sciences and Foreign Member of the former Academy of Sciences of the USSR in Moscow (now Russian Academy of Sciences), Foreign Member of the New York Academy of Sciences (1994), Chief Scientist of the Institute of Computer Systems of the Slovak Academy of Sciences (SAS) in Bratislava, Director of the Institute of Technical Cybernetics, SAS (1978-1990), currently Rector of the University of Trencin, Slovak republic.

He obtained the PhD degree from the Technical University in Prague in 1959, he became Associate Professor at the Department of Automation and Computers of the Technical University Bratislava in 1967, and obtained the DrSc. degree in Computer Science from the Faculty of Electrical Engineering of the Slovak Technical University in Bratislava in 1980. His research interests include parallel computer system architectures for artificial intelligence and specialised problem-oriented computers for vision systems and robotics. He paid particular attention to research in parallel associative SIMD-architecture computers for image and signal processing and for control systems of large relational databases. He was the head of the R&D project "SIMD Parallel Associative Computer" (1982-88), introduced into industrial production. He was the head and co-ordinator of the project "Control Computer System RPP-16 for Real-Time Processing" (1969-1973) produced by Czechoslovak industry and implemented to control technological processes between 1974 and 1984. For this project he was awarded the State Prize for Technical Sciences in 1976. He was the head of 10 national and international research projects, resulting in realised equipment, many of them also introduced into industrial production. His recent publications are devoted to the following topics: Optimal partitioning and mapping for reconfigurable massively parallel computers, task migration and memory requirements minimisation and applications of massively parallel architectures in artificial intelligence and knowledge processing. He was the head of the complex scientific project "Knowledge Processing Systems" within the project "New Generation Computer Systems" of the Academies of Sciences of Central and Eastern European countries (1985-1990). Between 1991 and 1993 he was the head of the grant project of the Slovak Academy of Sciences "Structure and Architecture of Parallel Computers for Knowledge Processing" and took part in the international project "Algorithms and Software for Parallel Computer Systems" co-ordinated by the Vienna University.

He has published 8 books, including 5 in world languages, and more than 100 scientific papers. He was invited speaker at 29 inland and 30 international conferences, presented 41 submitted papers at both inland and foreign conferences. He was lecturing at the Department of Computer Science and Informatics of the Faculty of Electrical Engineering and Informatics, Slovak Technical University Bratislava. In 1961-1989, he introduced and lectured nine new subjects from computer science and computer technology. In 1988-89 he was lecturing Computer Architecture for Artificial Intelligence and led a seminar "Computers for Artificial Intelligence" at the Technical University Munich, Germany, Faculty of Mathematics and Informatics, Institute for Informatics. He is Editor-in Chief of the international journal "Computers and Artificial Intelligence" (1982 - currently), as well as member of editorial boards in several international journals - Applied Artificial Intelligence, Hemisphere, Washington (1990-1993); Applied Intelligence, Kluwer Academic Pub., Boston/Dordrecht/London (1987-currently); New Generation Computer Systems, Academy of Sciences, Berlin (1989-1992); Autonomous Robots, Los Angeles (1994 - currently). He was organiser of the regular international conferences "Artificial Intelligence and Information-Control Systems of Robot", taking place in 1980, 1982, 1984, 1987 and 1994. He was program committee member of 11 international conferences on computer science and artificial intelligence. He is the Slovak representative in the International Federation for Information Processing IFIP-TC 5 and the IFIP Silver Core holder (1977), member of the IEEE Computer Society and Computer Pioneer IEEE (1997). He is the President of the Slovak Society for Applied Cybernetics and Informatics and the President of the Association of Slovak Scientific-Technological Societies. He is co-operating as an expert for the Commission of the European Communities, DG XIII - Information Technology.

The members of CSSS wish him a lot of new ideas for stimulating the computer community in the Slovak republic and a splendid eve of his social and scientific life.

M. Alexik

DBSS

General Information

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

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 into 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.

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

Dutch Benelux Simulation Society
Mrs. 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

(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
J.C. Zuidervaart (TU Delft)	Treasurer
M.J. Dekker-Genemans	Secretary
W. Smit (AKZO NOBEL)	Member
Th.L. van Stijn (Rijkswaterstaat/RIKZ)	Member

Coming Events

- The **symposium**, in co-operation with HPAC (High Performance Applied Computing Centre) in Delft, about the theme "**visualisation**" will take place Friday, November 6, 1998. During this symposium HPAC will officially inaugurate its virtual workbench. To the members of the DBSS the final programme will be mailed separately. Others who are interested to receive the programme are kindly requested to contact the secretary by email.

- The **symposium Neural Networks** related to Water Management has been postponed to January 19, 1999. Place: Aula Congress Center of the Delft University of Technology. Reasons of postponing this event: new results will appear at the end of November 1998. These results will be presented during the symposium. Topics: practical applications of Neural Networks related to Water Management and future developments. This day is the event for everyone interested in Water Management and applications related to Neural Networks. Participation of DBSS members is possible for a reduced fee. If you are interested to receive the symposium programme: contact Technotrans, Institute for Technology Transfer BV. Tel: +31-10 234 10 82; Fax: +31-10 234 11 72; email: technotrans@per.nl

- In Business Economics simulation more and more proves to be a useful tool. Applications vary from continuous-time applications in the field of marketing or internal organization on the one hand to discrete event applications in designing work flow processes on the other. Quite often advanced graphical simulation tools such as Powersim and iThink (for continuous simulation), or Arena and ServiceModel (for discrete event simulation) are used. The Department of Informatics of the Faculty of Economics at Erasmus University Rotterdam intends to organize in co-operation with the DBSS a one-day **symposium** entitled "**Simulation of Business Economical Models**". It will be held in April 1999 at the campus of Erasmus University Rotterdam. For more information, please contact: H. de Swaan Arons, Tel: + 31-10 4081813, email: deswaanarons@few.eur.nl

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 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
  e-mail pierreva@ifma.fr
- Modelling & simulation of continuous systems
  This pole is organizing the following conferences in 1999:

BioMedSim99

Ist Conference on Modelling an Simulation in Biology, Medicine and Biomedical Engineering 20-22 April 1999, ESIEE Noisy-le-Grand, FRANCE

BioMedSim99 is the first of a series of conferences to be held once every 2 years. These conferences are intended to be an opportunity for researchers and industrials to present fundamental work and applications in 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.

For more information on this workshop, please consult the following address:

http://www.esiee.fr/~hamamy/bioconf.html

ModSim99

Workshop on Modelling and Simulation Methods 20-22 April 1999, ESIEE Noisy-le-Grand, FRANCE

This workshop is intended to be an opportunity to bring together scientists and practitioners in order to present and to discuss recent advances in the field of Modeling and Simulation. The workshop is oriented towards applications. Innovative modeling techniques should be presented in combination with their impact to the solution of real world applications.

For more information on this workshop, please consult the following address:

http://www.esiee.fr/~hamamy/confmodsim.html

Important dates:

Please note that the dates have been changed.
The dates are:

Deadline for extended abstracts: October 31st, 1998
Notification of acceptance: November 30th, 1998
Deadline for final papers: January 15th, 1999
Conference & workshop: April 20-22, 1999

Pole and Conference Contact:

Prof. Y.Hamam
Groupe ESIEE
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Do not forget to look at the following pages

http://www.esiee.fr/~hamamy/bioconf.html

http://www.esiee.fr/~hamamy/confmodsim.html

Yskandar Hamam

MOSIM'99
The Second French Conference on MOdelling and SIMulation
Modelling and Simulation of Physical and Informational Flows
October 6-8, 1999
Annecy - France

The LLP/CESALP (*Laboratoire de Logiciels pour la Productique / CEntre des Sciences Appliquées à La Production*) is organising MOSIM'99, the Second French Conference on MOdelling and SIMulation, at Annecy, France. More precisely, modelling and simulation of physical and informational flows of a company are preliminary and necessary steps to be applied in any approach of design or industrial improvement. These steps provide the basic elements for different analysis (diagnosis, configuration, design, etc.) at different levels and fields (control, planning, scheduling, etc.).

At present, several research works focus on both themes of modelling and simulation. These works succeed, on the one hand from a theoretical point of view on new approaches and methodologies, and on the other hand from an application point of view on new tools and languages or software. Also, the purpose of this conference is to inform potential users on important investigations carried out with regard to modelling and simulation of enterprise flows.

Further information:

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Fax: +33-4 50 66 60 20
email: mosim99@esia.univ-savoie.fr
http://www.univ-savoie.fr/mosim99/

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

Last year demonstrations of applications of artificial intelligence controlled simulation have been performed in various fields for their specific subject matter expert audiences. An interdisciplinary workshop and demonstration is planned in the last quarter of this year. It is intended to present and demonstrate the principles and application of the AI controlled CASSANDRA 3.0 simulation system.

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AES

Contact Address: J.M. Giron-Sierra,
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email: gironsi@dia.ucm.es

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 132 members: 6 institutional, 4 honorary, 120 regular and 2 affiliate. Charges per annum are Lit. 30,000 for regular and affiliated members and Lit. 400,000 for institutional members.

Contact Address

For further information or application for membership, please contact:

ISCS, c/o Dipartimento 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 is presently involved in the organization of **ISCS98**, the annual conference that this year will take place in **Napoli, December 15, 1998**.

Topics of interest for the conference are methodological and application aspects of simulation. They include:
Simulation tools and applications
Simulation and object oriented programming
Simulation in software engineering
Simulation theory and methodologies
Simulation graphics
Simulation in computer systems and networks
Simulation in electronics and control
Simulation in electrical engineering and energy systems
Simulation in multimedia systems
Simulation and virtual reality
Simulation in education and training
Simulation in business and management
Simulation in transportation, traffic systems and telecommunication
Parallel and distributed simulation
Simulation in factory and automation
Simulation in environmental and biological systems
Simulation in medicine
Artificial intelligence and simulation

Interested authors should submit 4 copies of an extended abstract (two pages in A4 format) of their paper by November 5, 1998, to the following address.

Segreteria ISCS98
Dipartimento di Informatica
Università di Roma - Tor Vergata
c/o Prof. Vincenzo Grassi
Via di Tor Vergata
I-00133, Roma, Italy
email: {grassi,cortelle}@info.utovrm.it

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

Notification of acceptance will be sent by November 20, 1998, and camera-ready copies (max. six A4 pages) will be strictly due by December 10, 1998. All accepted papers will be published in the conference proceedings.

A limited number of papers will be selected by the Scientific Committee for possible publication in the journal *Simulation Practice and Theory*, printed by Elsevier Science B.V.

For further information please contact Prof. Mario Savastano (iscs@nadis.dis.unina.it) or connect to: http://remlab.dis.unina.it/iscs/iscs_hp.htm

Furthermore, we are pleased to inform that an electronic **mailing list** has been constituted for persons interested in the ISCS activities. In order to be included in this 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.

Notices to ISCS members:

The annual meeting of ISCS members is scheduled to be held on December 15, 1998 in Napoli on the occasion of the ISCS98 Conference.

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 162 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 Polish Society for Computer Simulation 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.

Past Events

The annual PSCS Workshop on Simulation in Research and Development took place on October 7-9, 1998 in Jelenia Gora, Poland. The about 70 participants came from Germany, Japan, USA, and Poland. The 50 papers of the workshop covered the following areas: simulation in mechanical engineering, simulation in mathematical problems, artificial intelligence and simulation, simulation in transportation, neural nets and simulation, simulation in automation and control, military simulation, simulation tools.

Coming Events

The **sixth PSCS Workshop on Simulation in Research and Development** will be organised in Bialystok and Bialowieza on 26-28 August 1999 by Prof. L. Bobrowski: e-mail: ptsk99@ii.pb.bialystok.pl

PSCS will participate in the organisation of the European Simulation Multiconference **ESM99** which will be held in Warsaw on June 1-4, 1999.

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Z. Sosnowski

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 connection international simulation conferences arranged in the Nordic countries.

SIMS99 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 address 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 newsletter

EUROSIM - Simulation News Europe and the scientific journal Simulation Practice and Theory.

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Esko Juuso

SLOSIM

Recent Activities

SLOSIM was one of the co-operative societies in the organization of the traditional **Electrotechnical and Computer Conference ERK98** in Portoroz, Slovenia (Adriatic Coast). The conference took place from September 24 to 26, 1998. There were more than 250 papers presented.

The program consisted of 8 invited lectures, 38 conference sessions, 2 student sessions and several panel discussions. Two video conferences with international participants (TH Darmstadt, University of Milan) were well prepared and very successful.

The session part consisted of the following subjects: Electronics (2 sessions), Telecommunication (5), Automatic control (5), Simulation (2), Power engineering (4), Measurement (4), Computer science (4), Artificial intelligence (1), Robotics (1), Pattern recognition (4), and Biomedical engineering (4), Advances in engineering education (2). Two special student sessions also took place.

SLOSIM was responsible for two sessions entitled *Simulation* and *Modelling of Processes*. Session Simulation covered the following subjects: simulation of hybrid systems, computer aided control system design packages, validation of the efficiency of computer systems, visual interactive modelling and simulation, business and military simulations. Session Modelling of Processes was more application oriented.

The regular annual assembly of SLOSIM is planned for the beginning of November. On this meeting a new SLOSIM board will be elected. SLOSIM members are kindly requested to propose appropriate candidates.

Recently our rules were successfully adapted to the new regulations.

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B. Zupancic

UKSIM

General Information

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

Fourth United Kingdom Simulation Society Conference

Preparations are well under way for the fourth UKSim conference at St. Catherine's College Cambridge, England on April 7-9th 1999. Founded in 1473, St. Catherine's College is beautifully located in the heart of Cambridge, surrounded by many other well-known colleges.

Although a national event, presenters and participants from any country are welcome to attend, especially EUROSIM member countries.

For further information, please see the announcement in this journal or contact the Conference Chair from whom further information is available.

Programme Chair:

Dr. David Al-Dabass
Department of Computing
Nottingham Trent University
Burton Street
Nottingham NG1 4BU
email: dad@doc.ntu.ac.uk

Membership

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

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email: gjones@lgu.ac.uk

Gary J Gray

Fourth United Kingdom Simulation Society Conference
UK Sim 99

St Catherine's College, Cambridge, England

7th-9th April 1999

Papers are invited on any aspect of simulation to be presented at a three day event to be held in Cambridge, England. The conference venue is St Catherine's College Cambridge. Founded in 1473, St Catherine's College is beautifully located in the heart of Cambridge, surrounded by many other well-known colleges. The accommodation, renowned catering and conference facilities are an ideal blend of modern and historic. The venue offers an especially attractive opportunity for both professional discussion and socialising.

Abstracts (two pages of A4 without figures) are invited on any aspect of simulation and its applications. The following are suggested topics, but other topics are also welcome; Simulation methodology and practice, languages, tools and techniques. Models and modelling tools. Data/object bases. Analysis and statistica1 tools. Simulators and simulation hardware, training simulators. Integration of simulation with concurrent engineering, integrated design and simulation systems. AI in simulation. Parallel and distributed simulation. Neural networks.

Simulation applications include: aerospace; electronic circuits and systems; computer networks; business; management; finance; economics; leisure; biology; medicine; public health; manufacturing; planning; control; robotics; measurement; monitoring; energy; safety critica1 systems; transportation; oil and gas; education and training; military. There will be an Exhibitions area.

Accepted papers will be published in the Proceedings of the Conference.

Although a national event, presenters and participants from any country are also welcome, especially EUROSIM member countries.

The registration cost is 160 pounds sterling for members of EUROSIM Societies. This includes proceedings. Accommodation including all meals, (including Conference dinner) and refreshments, tea/coffee is 65 pounds sterling per day for double occupancy or 75 pounds per day for single occupancy.

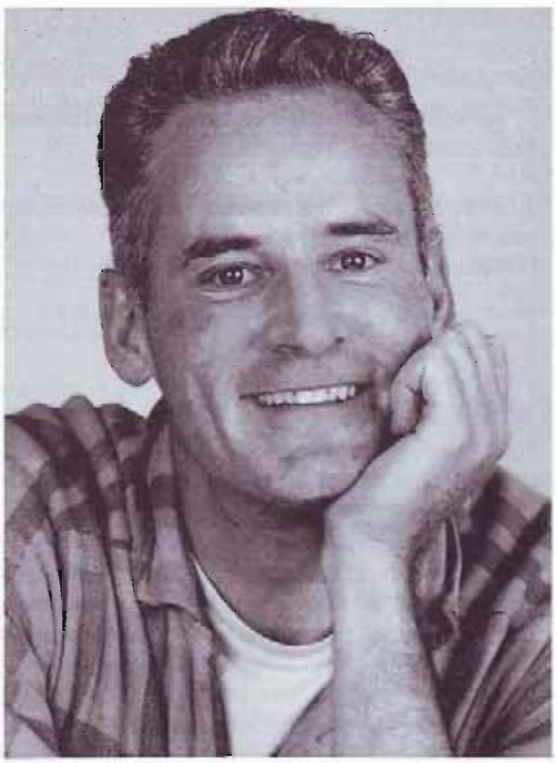
Abstracts/submissions/proposals to the Conference Chair from whom further information is available.

Deadlines:

Abstract (four copies. 2 pages of A4):
end of November 1998
Notice of provisional acceptance:
17th December 1998
Camera ready copy and registration fee:
1st February 1999.

Conference Chair:

Russell Cheng
Canterbury Business School
The University
Canterbury, Kent, CT2 7PE, UK.
Tel: +44 1227 823665
Fax: +44 1227 761187
email: R.C.H.Cheng@ukc.ac.uk



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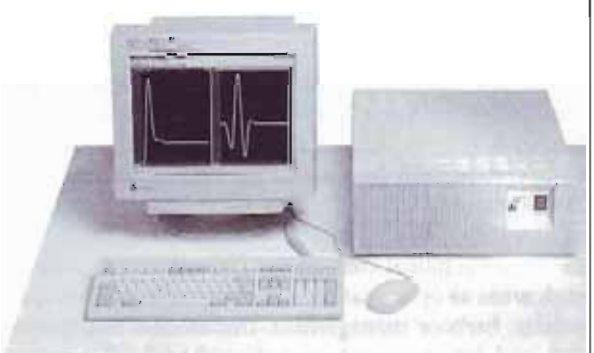

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dSPACE

Simulation Societies

SCS Europe

The SCS European Office (in close co-operation with the SCS European Council) continues to organize international scientific conferences on computer simulation and related fields. For many of our conferences both written Proceedings and CD-ROMs are available, which also can be ordered afterwards. SCS Europe is looking for people who wish to give tutorials at our conferences, and become fully fledged teachers for SCS summer schools. So, if you are interested, get into contact with Philippe Geril (see co-ordinates below).

In the recent past, two SCS events have taken place which are shortly reported here.

The **12th European Simulation Multiconference ESM98** (organized in co-operation with ASIM) has been held in Manchester, UK, June 16-19, 1998. The conference was part of the programme of events in the week of celebrations at the 50th anniversary of the world's first stored program computer. Because of this celebration, a special (invited) session on "History of Simulation" was held. Two presentations dealing with SCS' history (Roy Crosbie: "The history of SCS International"; Eugene Kerckhoffs: "Looking back to a period of 25 years simulation in Europe") will be (re)-published in SIMULATION and/or SNE. Unfortunately, the number of participants (187) was below expectations. The congress papers are published in the Proceedings (eds.: Richard Zobel and Dietmar Möller, ISBN 1-56555-148-6).

The **International Workshop on "Modelling and Simulation within a Maritime Environment"** (September 6-8, 1998, Riga, Latvia) has been organised in co-operation with the Latvian Simulation Society, and the Latvian and Genoa Centers of the McLeod Institute of Simulation Sciences. The workshop was hosted by the Riga Technical University. The workshop covered such areas as optimisation and safety of maritime operations, harbour management, multimodal transportation and logistics, and related methodology aspects. The workshop was said to be very successful; 48 persons from 12 countries participated. Workshop papers were published in the Proceedings (ISBN 1-56555-132-X), edited by Yuri Merkuryev, Agostino Bruzzone and Leonid Novitsky; they can be ordered with the SCS Publishing House (see below).

In the following we give a survey of the forthcoming SCS scientific events.

1. ESS98 (10th SCS European Simulation Symposium & Exhibition)
Nottingham, UK, October 26-28, 1998

General Chair & Program Chair: Andrzej Bargiela (Nottingham, UK). General Program Co-Chair: Eugene Kerckhoffs (Delft, the Netherlands).

This conference focusses on simulation in industry, as well as the science and art of simulation technology. ESS98 aims to bring together scientists, developers and users of leading edge simulation technology. By providing seven thematical tracks (methodology and six application areas), the Programme Committee has attempted to provide foci for scientific contributions while offering an opportunity to the participants to engage in stimulating discussions with colleagues who may have quite different application frames of reference. The major topics are: Simulation Methodologies; Simulation in Chemistry; Engineering Systems Simulation; Simulation in Industry and Services; Simulation in Business and Finance; Simulation and Artificial Intelligence. Moreover, this year's ESS will include a Human Centered Simulation track, which pays attention to simulation in arts, design and the media, and ballances the more traditional topics of simulations in science, engineering and business. From the submitted abstracts 145 papers were accepted for presentation.

2. The First Middle East Workshop on Simulation and Modeling
Amman, Jordan, March 1-3, 1999

(hosted by the University of Jordan)
Chairs: Marwan Al-Akaidi; Alexander Verbraeck; Muneeb Qtaishat

The aim of this SCS workshop is to set up an SCS Council in the Middle East and to stimulate the use of simulation in this geographic area. The workshop features a technical program ranging from introductory tutorials to software reviews to state-of-the-art research and practice. The conference includes exhibits, business meetings for professional societies, and a social program. Contributions are invited in the following (and related areas): Oracle applications; GIS and simulation model integration; Fuzzy systems modeling; Neural Network applications and modeling; Image processing applications; Simulation in Telecommunication systems; Machine learning; Handwritten and

text recognition systems; DSP applications; Speech processing applications; Wavelet applications; Simulation in Wireless communications; Web-based applications. Five copies of full papers (5 pages) or extended abstracts (3 pages) should be submitted and sent in printed form or via e-mail to Philippe Geril (see address below) before November 5, 1998.

3. ECEC99 (6th European Concurrent Engineering Conference 1999)
Erlangen-Nuremberg, Germany, April 21-23, 1999

(hosted by the Friedrich Alexander University, sponsored by Daimler-Benz AG, Research and Technology, Stuttgart, Germany)
General Conference Chairman: Uwe Baake (Daimler-Benz AG, Research & Technology). Program Chairman: Richard Zobel (University of Manchester)

The conference aim of ECEC99 is to provide European Researchers with a forum, where they can discuss the latest developments linked to Concurrent Engineering. ECEC99 aims to identify the progress that has been made in CE over the last year. It helps the dissemination of information and exploitation of results from research and technical developments and provides a forum for the exchange of experiences in developing and implementing CE-based solutions across a wide spectrum of manufacturing and engineering industries. The conference is target at industrial enterprises, industrial associations, universities and research institutes. Major topics are: Organization and Management; Formal Methods and Techniques; Implementation Techniques; Process Modeling; Engineering Data Management and Information Modeling; Engineering Process; Networking and Distribution in CE; Management; Collaborative CE Environments and Virtual Design Studies; Practical Applications and Experiences. Authors are invited to submit extended abstracts (2 pages, 2000-3000 words) of their papers, written in English. The submissions are due to arrive in quadruplicate at the SCS European Simulation Office or sent by e-mail to Philippe Geril (see address below) before December 15, 1998.

4. EUROMEDIA99 (Fourth Annual Scientific Conference on Web Technology, New Media, Communications and Telematics Theory, Methods, Tools and Applications)
Munich, Germany, April 25-28, 1999

General conference chair: Winfried Hahn (University of Passau). General Program Chair: Ellen Walther-Klaus (Siemens Nixdorf Informationssysteme AG, Munich)

The 1999 SCS EuroMedia conference will bring together three individual conferences (WEBTEC, MEDIATEC and COMTEC) culminating in an applica- tions conference (APTEC) on the last conference day. EuroMedia is a scientific event, and focuses on the exchange of new technology, methods, tools, and applications in the wide field of multimedia Information and Communications Technology (ICT). Rather than just showing new tools, the focus is on scientific presentations, based on refereed papers with adequate underlying theory and if possible empirical testing of results. The fields covered at this conference include Web technology, multimedia, telecommunications, mobile computing, broadband networking, distributed computing, and telematics. The papers that are requested for the conference are focused on the following subjects: WEB Technology (WEBTEC), Multimedia Technology (MEDIATEC), Telecommunications Technology (COMTEC), Applications of Telematics (AP TEC). For this scientific conference, it is possible to send in full papers and extended abstracts that will be published in the proceedings. In addition, one can submit short papers or poster presentations, product or vendor presentations, and proposals for panel discussions. Full papers and extended abstracts are to be sent to Philippe Geril (see address below) and are due to arrive before November 15, 1998, in printed form (four copies) or preferably via e-mail.

5. ESM99 (13th European Simulation Multiconference; Modeling & Simulation: a Tool for the next Millennium)
Warsaw, Poland, June 1-4, 1999

Co-sponsored by IEEE Computer Society Poland; hosted by the University of Warsaw, Poland
General Chair : Helena Szczerbicka (University of Bremen, Germany). Program Chair: Marek Niezgodka (ICM, Warsaw University, Poland). Local Chair: Leon Bobrowski (IBIB PAS, Poland)

The ESM99 is an international conference concerned with state of the art technology in modeling and simulation. For several years, ESM has proven to be a forum for researchers involved in building innovative simulation systems, simulation and modeling tools and applications on both the research and industrial front. The conference includes exhibits, business meetings for professional societies, software user groups, and a social program. The scientific program includes tracks on Simulation Methodology, Simulation Languages and Tools, Simulation Validation Methodologies, Web Based Simulation Simulation and Education, Applications of Simulation (such as: Telecommunication; Biomedicine; Modeling of Manufacturing Processes, Scheduling; Modeling Technical Processes; Air Transportation and Aerospace; Decision Processes in Management; Electrical Power Plants; Industrial Applications). There will be two workshops included: International Conference on Qualitative Information, Fuzzy Techniques and Neural Networks in Simulation (organized by Francois Cellier, University of Arizona,

USA) and a workshop on Modeling Multimedia Support in Next Generation High Speed Network (organized by Hermann de Meer, Columbia University, USA, and Stefan Fischer, International University, Germany). Submissions are to be sent in electronic form, indicating the type of submission (full paper or extended abstract), to both the General Chair (esm99@ informatik.uni-bremen.de) and to the SCS European Office (Philippe.Geril@rug.ac.be); deadline 25 November 1998.

6. International Workshop on "Advanced Simulation (including visualization and animation) and AI, Supporting Production Process Development in the Factory of the Future".
Bucharest, Romania, 29-31 August 1999

(hosted by the Bucharest Research Institute for Informatics). General Chairs: Florin-Gheorghe Filip (Research Institute for Informatics, Bucharest, Romania) and Ghislain Vansteenkiste (University of Ghent, Belgium). General Program Chairs: Carmen-Veronica Bobeanu (Research Institute for Informatics, Bucharest, Romania) and Eugene Kerckhoffs (Delft University of Technology, the Netherlands).

The Workshop intends to contribute to the dissemination of scientific and technological results of using advanced modelling and simulation as well as AI techniques in industrial design and manufacturing. Three different tracks are planned to cover recent progress in modelling enterprises, production process planning and control, and simulation and AI in the factory of the future, encompassing methodological approaches, methods, tools and applications. Full papers or extended abstracts, in electronic format, are to be submitted to Philippe Geril (see address below) before March 5th, 1999.

Of course, in the above we were only able to provide global information of the mentioned scientific events. For more detailed information, please contact:

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or have a look to our Website:

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SCS European Publishing House

As a part of the SCS European Office, the SCS European Publishing House publishes high-quality scientific books on computer simulation and related fields in the series "Advances in Simulation" and "Frontiers in Simulation" (editors-in-chief: Eugene Kerckhoffs, Axel Lehmann, Henri Pierreval, Richard Zobel). In the series "Frontiers in Simulation" the following books have appeared:

- Yussef Monsef: Modelling and Simulation of Complex Systems Methods, Techniques and Tools
- W. Krug: *Intelligentes Simulations- und Optimierungssystem für Prozesse der Fertigung, Organisation und Logistik*: *ARENA / ISSOP* (in German)
- Axel Hein: Conjoint Simulation – A Modeling Framework for Combined Performance and Dependability Analysis of Computer Systems
- Peter Heusser: Modelling and Simulation of Boiling Channels – General Front Tracking Approach
- Karin Reger: *Konnzeption und Realisierung der Konfigurierbarkeit universeller Simulationssysteme* (in German)
- Thomas Apsel: *Konzeption des Aufbaus eines universell einsetzbaren Simulationssystems* (in German)
- Christian Kelling: *Simulationsverfahren für zeiterweiterte Petri-Netze* (in German)
- Nicole J. Saam: *Computergestützte Theoriekonstruktion in den Sozialwissenschaften* (in German)
- Markus Rümekasten: *Hybride, tolerante Synchronisation für die verteilte und parallele Simulation gekoppelter Rechnernetze* (in German)

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or have a look to the above-mentioned Website.

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

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). WSC 1998 will be held in Washington DC, USA, December 13-16. 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.

Special Activities

SIGSIM is creating 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, one of the early pioneers of discrete event simulation. This interview is now available to SIGSIM members via the web page in RealVideo format.

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Membership

SIGSIM has approximately 750 members distributed among 50 countries around the world. Annual membership fees are $45, or $22 when accompanied by membership in ACM. Additional membership information is available from:

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Roger Smith

International Societies

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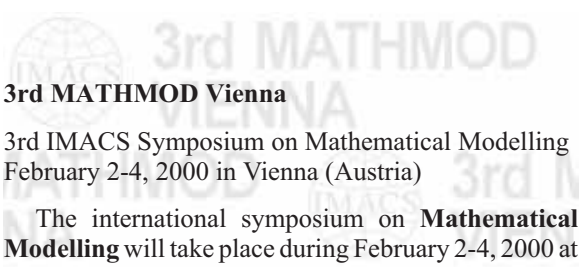

3rd MATHMOD Vienna

3rd IMACS Symposium on Mathematical Modelling
February 2-4, 2000 in Vienna (Austria)

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 model-

ling 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.

Presentations of software and a book exhibition will be organized.

Deadline for submission of extended abstracts (1 - 2 pages in triplicate) is May 15, 1999.

Organizer: Division for Mathematics of Control and Simulation (E114/5) at Technical University Vienna. Chair of IPC: Prof. Dr. Inge Troch.

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Web site:
http://simtech.tuwien.ac.at/3rdMATHMOD

LSS

The Latvian Simulation Society

The international workshop "**Modelling and Simulation within a Maritime Environment**" was held by the Latvian Simulation Society on September 6-8, 1998 in Riga, Latvia, in co-operation with the Society for Computer Simulation International, Latvian and Genoa Centers of the McLeod Institute of Simulation Sciences, and the Liophant Simulation Club. The workshop was sponsored by the Latvian Council of Sciences, supported by the DAMAC-HP project of the European Commission, Directorate General XIII, and hosted by the Riga Technical University.

The workshop was aimed to discuss the role of modelling and simulation in increasing efficiency of maritime operations, and to share already existing experiences in this area. The workshop covered such areas as optimisation and safety of maritime operations, harbour management, multimodal transportation and logistics, and related methodology aspects.

The list of workshop participants incorporates 48 persons from 12 countries, including Belgium, Croatia, Estonia, Germany, Italy, Latvia, Lithuania, The Netherlands, Russia, Sweden, Switzerland and USA. Also, 6 officials and representatives from different Latvian institutions, and 9 students took part in workshop activities. The workshop scientific programme was started on September 7 by the Opening Session, that included welcoming presentations by Prof. Ivars Knets (vice-rector of the Riga Technical University), Prof. Wilfried Krug (SCS representative), Fred Kamperman (terminal manager of the Baltic Container Terminal of the Riga Commercial Harbour) and Prof. Indulis Liepinsh (vice-rector of the Latvian Maritime Academy), and Invited Presentation by Dr. Agostino Bruzzone (the University of Genoa), entitled "Harbour services and layout re-engineering by using simulation".

In total, 26 presentations (including one by Prof. Wilfried Krug "Integration of intelligent simulation and optimisation tools in manufacturing, organisation and logistics" at the Plenary Session on September 8) were made at the following workshop sessions: Maritime Environment I and II, Multimodal Transportation, Logistics, Simulation and Modelling Methodology, The CONSA Project, and The AMCAI/DAMAC-HP Project.

The last two sessions were devoted to specific projects: the CONSA project "Competence network for simulation applications", financed by the Swedish Institute (Sweden), and the DAMAC-HP project "Further development and practical application of harbour processes managing and controlling models, methods and techniques" of the COPERNICUS Programme of the European Commission, DG XIII.

A visit to the Baltic Container Terminal was arranged for workshop participants on September 8, guided by the terminal manager Fred Kamperman and the operations manager Janis Lubinsh.

The workshop was closed by the Closing Session on September 8, were participants highly evaluated organisation of the workshop and its scientific pro- gramme, and expressed interest in organising the same kind of workshops also in future. It was suggested to organise the next workshop, dealing with modelling and simulation within a maritime environment, in a year in Italy.

Workshop papers were published in the Proceedings (ISBN 1-56555-132-X), edited by Yuri Merkuryev, Agostino Bruzzone and Leonid Novitsky. Copies of the workshop proceedings could be ordered from: SCS European Publishing House, Executive Editor, University of Erlangen-Nuremberg, Informatik IV, Martenstrasse 1, D-91058, Germany.

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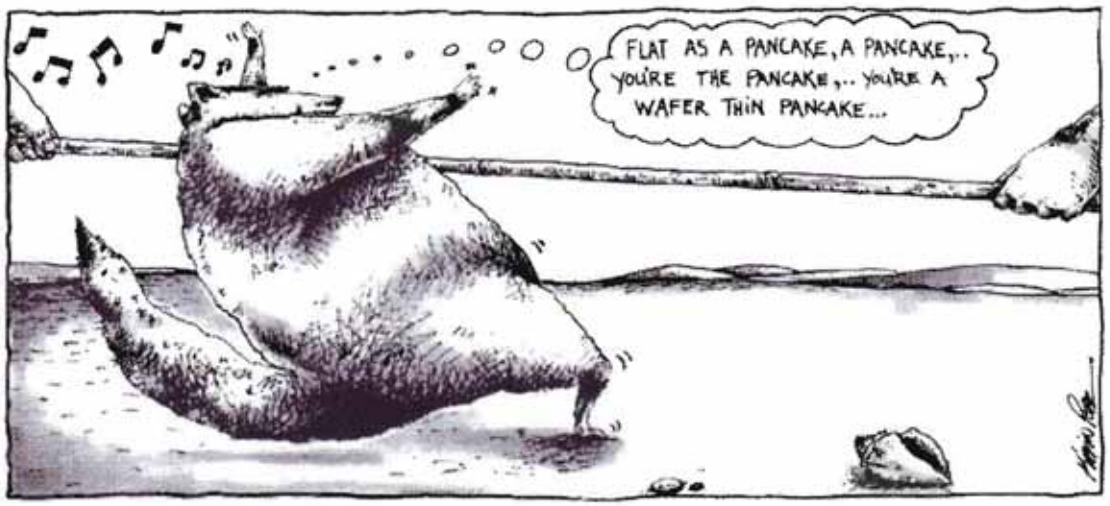

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Comparison 1 – MAPLE

Numerical-Symbolic Approach – Iterative Symbolic Method

Maple, a Computer Algebra System, contains also many numerical methods and together with the formula manipulating functions it seems to be very useful for analysing models and perform simulation experiments.

The following lines show the definition of the model equations and the parameters in Maple V.5:

```
> mequ1 := diff(r(t),t) = dr*r(t) + kr*m(t)*f(t):
> mequ2 := diff(m(t),t) = dr*r(t) - dm*m(t) +
     kf*f(t)^2 - kr*m(t) * f(t):
> mequ3 := diff(f(t),t) = dr*r(t) + 2*dm*m(t) -
     kr*m(t)*f(t) - 2*kf*f(t)^2 - lf*f(t)+p:
> f0:=9.975: m0:=1.674: r0:=84.99:
> kr:=1: kf:=0.1: lf:=1000: dr:=0.1: dm:=1:
```

Task a. When solving differential equations with numerical methods in Maple the result is always a Maple procedure. By invoking this procedure with a specified time instant, the equations are solved until this time instant. Maple is capable of many different numerical solvers for ODEs including also special ones for stiff systems. The commands for solving the equations (preceded by ">") and results by Maple (without ">") are:

```
> soltaska[1] := dsolve({mequ1,mequ2,mequ3,
   r(0)=r0,m(0)=m0,f(0)=f0}, {r(t),m(t),f(t)},
   numeric, method=lsode[adamsfull], start=0);
   soltaska[1] := proc(x_lsode) ... end
> soltaska[1](10);
   [t = 10., r(t) = 31.75557051523804, f(t) =
    .01010071708075705,m(t) = 3.479667281378844]
```

A classical RKF-algorithm, a Gear algorithm and the LSODE algorithm with some modifications were used, resulting in the following relative times (RKF45=1) for calculating the solution until t=10:

rkf45	1.00
lsode[adamsfull]	0.42
lsode[backfull]	0.24
lsode[adamsdiag]	0.41
lsode[backdiag]	0.23
mgear	0.20

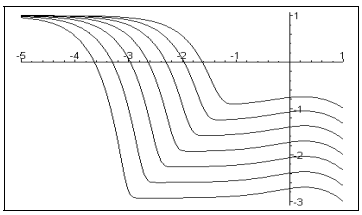
The relative differences of the solutions of all used methods was beneath 10^{-5}, so that all algorithms can be accepted as accurate enough. All algorithms work with variable step size. Some of the algorithms require careful tuning of the algorithm parameters, e.g. initial step size. Using symbolic manipulation features of Maple it is possible to determine these parameters.

Task b. A parameter variation is very simple to implement as loop in Maple. A little bit more com- plicated is the logarithmic plotting, because results of ODEs can only be plotted by the command `odeplot`, but this one cannot produce logarithmic plots. Therefore the results of the `dsolve` command have to be transformed:

```
> soltaskb := dsolve({mequ1,mequ2,mequ3,
     r(0)=r0,m(0)=m0,f(0)=f0}, {r(t),m(t),f(t)},
     numeric, method=lsode[backfull], start=0):
> logf := proc(logt) evalf(log10(
     subs(soltaskb(10^logt),f(t)))) end:
```

For the plot `lf` was set to $10^{(5+i)/3}$ for i=1,..,7.

Task c. The symbolic manipulation features of Maple can be used to get exact solutions for the steady state (`solve`). If the equations are solved numerically (`fsolve`), the same results are returned.




```
> symbsol:=solve({eq1,eq2,eq3},{r,m,f});

                          kr p^2          kr kf p^3          p
   symbsol := {m = ------------, r = ---------------, f = ----}
                        lf^2 dm          lf^3 dm dr        lf

> kr:=1; kf:=0.1; lf:=1000; dr:=0.1; dm:=1; ......
> p:=0; symbsol;
   {m = 0, r = 0, f = 0}
> fsolve({eq1,eq2,eq3},{r,m,f});
   {m = 0, r = 0, f = 0}
> p:=10000; symbsol;
   {m = 10.00000000, r = 1000.000000, f = 10}
> fsolve({eq1,eq2,eq3},{r,m,f});
  {m = 10.00000000, r = 1000.000000, f = 10.00000000}
```

Support by analytical (symbolical) methods. Maple allows to analyse the system symbolically in order to check the stiffness of the system and in order to get a guess for the parameters of the numerical algorithms. The Jacobian matrix is determined symbolically, and evaluated at three operation points.

Determination of the (symbolic) Jacobian:

```
> EquFunc := unapply([eq1,eq2,eq3], (r,m,f)):
> LinSysMat := (a1,a2,a3)->subs({r=a1,m=a2,f=a3},
(jacobian(EquFunc(r,m,f),[r,m,f]))):
> LinSysEig:=(a1,a2,a3)->eigenvalues
(LinSysMat(a1,a2,a3)):
```

Calulating the solution at `t=0.001` by means of Taylor series expansion:

```
> Order:=10:
> solser:=dsolve({mequ1,mequ2,mequ3,
r(0)=r0,m(0)=m0,f(0)=f0}, {r(t),m(t),f(t)},
series):; .....:> approxsol:=solser2(0.001);
approxsol := {m(.001) = 1.674574719, r(.001) =
84.99204948,f(.001) = 3.666318299}
```

Calculation of the eigenvalues of the linarisation at initial state, state at `t=0.001` and steady state, using the symbolical Jacobian:

```
> LinSysEig(r0,m0,f0);
  LinSysEig(subs(approxsol,r(.001)), subs(
approxsol,m(.001)), subs(approxsol,f(.001)));
  LinSysEig(0,0,0);

-.0089838484, -11.068422, -1005.6616
-.021015145, -4.7435647, -1003.1428
-1000., -1., -.1000000000
```

The above results for the eigenvalues show that the system seems to be stiff all along the solution path (difference between smallest and largest eigenvalue 10^{-7} to 10^{-5}). Furthermore, from `t=0` to `t=0.001` the system changes very rapidly. Eigenvalues at `t=0.001` give a guess for (very small) initial step size.

For comparison, the numerical solution with Gear algorithm at `t=0.001`:

```
>soltaska[6]{0.001};
  [t=0.001,f(t)=3.666325840, r(t)=84.9920496848,
m(t)=1.674573149]
```

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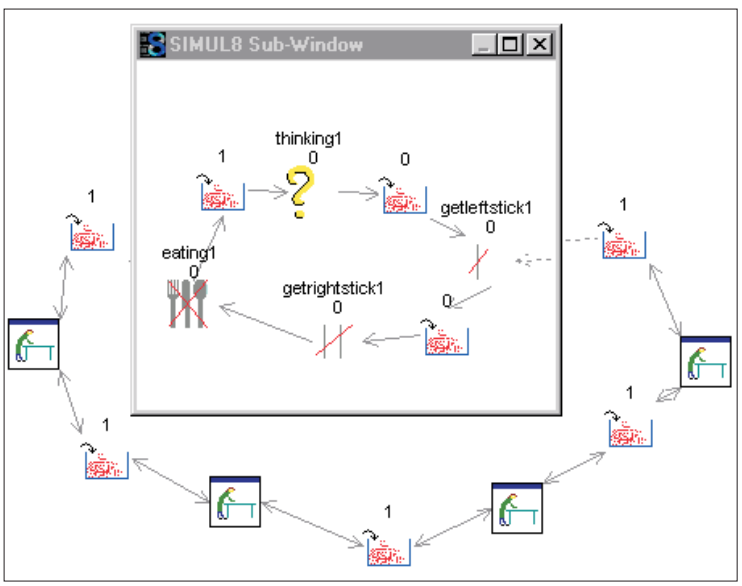
Comparison 4 – SIMUL8
Simulation Approach

"*The way to use SIMUL8 is not based on programming or statistical data, but on drawing the organisation (with the computer's mouse) on the screen, and only filling in numerical information where it's needed, whereby the underlying concept is process oriented*" says the user guide.

Indeed, the whole package is very GUI-oriented and therefore useful for rapid prototyping, but when solving more complex problems, one should be very familiar with the problem description using SIMUL8. Otherwise one will soon be lost in a cradle of submenus.



The Model

Version 4.05 was used to implement a process oriented approach of comparison 4. Each philosopher is represented in a submodel (large work center) and the sticks are work items which are stored in SIMUL8 queues when not used. Submodels (philosophers) are linked to represent the overall system (see figure). In the submodel the philosopher is characterised by four states (thinking, waiting for left stick, waiting for right stick, eating), which again are represented by SIMUL8 work centers (including corresponding storage bins).

A work item circulates through the work centers and represents the actual state of the philosopher (see sub-window in figure).

To examine the model we choose discrete time distributions for thinking and eating states. Furthermore we forced the philosophers to take always the left stick first. This allowed us to investigate the systems behaviour on deadlock situations. The insight we got was that there is no explicit deadlock detection but the event handler sets the simulation time to the final value.

Experiments

To introduce a state "hungry" we added an additional parallel storage bin to simulate a state representing the whole waiting time for both chop sticks. The storage bin is loaded at the end of thinking and cleared when starting to eat.

To enable a state "cleaning the chop stick" we implemented new work centres, one at each chop stick.

We also tried to define a state "very hungry", which means a certain philosopher's waiting time exceeds a given threshold and then interrupts the neighbours' eating states. Unfortunately we were not able to solve this problem in a fast and satisfying way. This may be caused by our, maybe not appropriate, approach or insufficient online documentation.

Results

When using discrete uniform distribution [1,10] for thinking and eating time we exploited the following results:

State	Average	Std. Dev.
Waiting for left stick	1.71	2.33
Waiting for right stick	9.45	7.58
Hungry	11.16	7.99
Stick not used	0.85	1.67

Increasing eating time of one particular philosopher leads to major impact for his neighbours:

State	Average	Std. Dev.
Waiting for left stick	14.33	2.99
Waiting for right stick	16.61	5.23
Hungry	31.00	5.96
Stick not used	0.02	0.31

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Comparison 7 – DYMOLA
Law-Oriented Modelling Approach

DYMOLA (Dynamic Modelling Laboratory) is an object-oriented simulation environment for the modelling, simulation and visualisation of continuous processes. Besides the classical textual model definition, DYMOLA provides an editor for graphical model editing together with comfortable possibilities to reuse objects by means of (graphical) libraries. Model details can be given by ODEs and DAEs in DYMOLA's object-oriented modelling language. For simulation either DYMOLA's simulator DYMOSIM can be used, or other commercial simulators (e.g. ACSL, SIMULINK). DYMOLA is able to output the model in different target languages.

Model description: For the description of the model of the constrained pendulum the textual mode of DYMOLA is used. The constant parameters of this model (m, l, lp, ls, and g) are declared as `constant` whereas the parameters that can vary from one experiment to another are declared as `parameter`. The latter can be changed without re-compilation of the model.

As DYMOLA is truly law-oriented, i.e. an equation like `a=b` is interpreted as 'a is (always) equal to b' rather than '`a` is assigned with the value of `b`', and due to DYMOLA's ability to symbolically transform a system of DAEs and/or ODEs into explicit form, the equation of a pendulum $m \cdot l \cdot \ddot{\varphi} = -m \cdot g \cdot \sin\varphi - d \cdot l \cdot \dot{\varphi}$ can be used directly for modelling, as shown below.

```
model constrained_pendulum
    constant m=1.02, l=1, lp=0.7, ls=l-lp
    constant g=9.81, pi=3.14159
    parameter d=0.2, phip=-pi/12
    output phi=pi/6, dphi
    local lcurr=1, lfact, pin=false
    lcurr  = if phi < phip then ls else l
    lfact  = if phi < phip then l  else ls
    dphi = der(phi)
    m*lcurr*der(dphi)=-m*g*sin(phi)-
                      d*lcurr*dphi
    new(pin) = phi<phip
    when  new(pin) and not pin or
          not new(pin) and pin then
      init(dphi) = dphi*lfact/lcurr
    endwhen
  end
```

The state events occurring whenever the angle φ crosses the angle φ_p are considered by an `if`-statement that changes the current length of the pendulum and by a `when`-statement that increases and decreases resp. the state variable $\dot{\varphi}$. The `if`-statement is straightforward, whereas the `when`-construct has to be examined carefully: The equation(s) enclosed by `when` and `endwhen` are only valid when a condition *becomes* true. Consider the following situation with the two conditions: $\varphi > \varphi_p$ and $\varphi < \varphi_p$:

```
when φ > φp  or φ < φp  then
  equation1
endwhen
```

Equation1 is only valid the first time the expression ($\varphi > \varphi_p$ or $\varphi < \varphi_p$) becomes true. Afterwards, this combined expression *keeps* the value "true" but does not *become* true. In such a situation, the `new`-operator yielding a new value of a discrete variable together with a comparison of the new and the old values has to be used. Whenever possible, DYMOLA translates if- and when- constructs into discrete events, processed by a state event finder.

Task a) For all tasks DYMOSIM (v. 3.00), which works with an iterative state event finder, is used for simulation. In Figure 1 φ and $\dot{\varphi}$ are plotted over $t \in [0,10]$ for the initial conditions and parameter values of Task a (i). The model described above can be used for all initial conditions and hence can be used for Task a (ii), where the starting position of the pendulum is left of the pin.

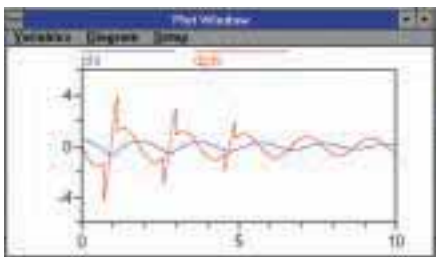

Figure 1

Task b) For the simulation of the linear model the corresponding equations and parameter declarations are inserted directly into the description of the nonlinear model. The comparison of the nonlinear and the linear model is done by simultaneously running the linear and the nonlinear model. The differences $\varphi - \varphi_L$ and $\dot{\varphi} - \dot{\varphi}_L$ plotted over $t \in [0,10]$ are shown in Figure 2.

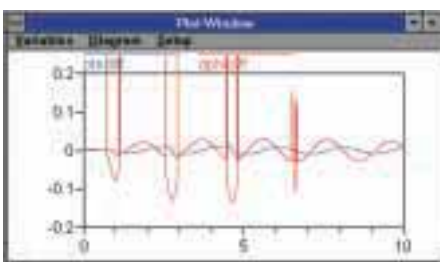

Figure 2

Task c) The determination of the initial angular velocity $\dot{\varphi}_0$ can be avoided by setting the desired results as initial values and inverting the sign of the damping factor. The demanded velocity $\dot{\varphi}_0$ turns out to be the velocity the pendulum attends when it arrives at $\varphi_0 = \pi/6$ the first time. At the occurrence of this event, DYMOLA yields 2.18368 for the value of $\dot{\varphi}$.

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Comparison 7 – ESL
Hybrid Modelling Approach – Model Level

ESL is a continuous system modelling language of the CSSL type. The newest version (NT version 1998) offers graphical modelling and a menu-driven runtime environment. Of interest is the sophisticated state event handling.

Model description: In this solution both the graphical and textual abilities for modelling are used. In the graphical "overall" model parameters and constants are defined by means of graphical icons, and a switch element from the predefined library realising an `if`-statement is used to change the length of the pendulum if necessary. However, the state equations are formulated in a textual submodel (`state`) appearing as graphic block on the canvas of ESL's simulation environment (figure 1).

The inputs to this submodel are the parameters and constants defining the status whereas the output is a logical variable `pin` that indicates whether the actual angle φ is less than φ_{pin} or not and controls the switch element.

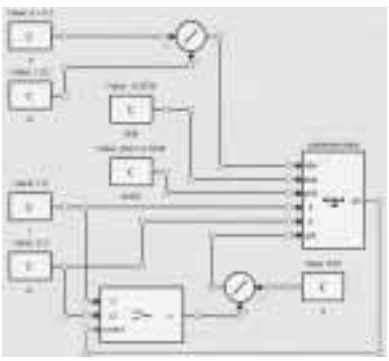

Figure 1

Inside the submodel, the state equations and two `when`-constructs define the dynamic behaviour of the pendulum and the state events occurring whenever the pin is hit or left by the pendulum (automatically invoking a state event finder and handler):

```
SUBMODEL STATE (logical: pin:= real:
                ddm,phip,phi0,ll,ls,gdl);
  real: phi, dphi;
INITIAL
  phi := phi0; dphi := 0.0;
DYNAMIC
  dphi := -gdl*sin(phi)-ddm*dphi;
  phi := dphi;
  pin := phi >= phip;
  when pin then
    dphi := dphi*ls/ll;
  end_when;
  when not pin then
    dphi := dphi*ll/ls;
  end_when; END STATE;
```

All calculations were done with a RKF algorithm of 5th order and variable stepsize.

Task a) The results for Task a1 and a2 in the following figures show the correct modelling given above:

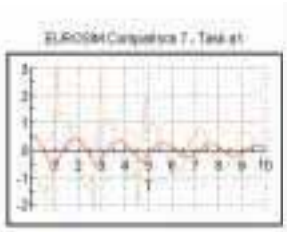

Figure 2

Figure 3

For Task a1, the pendulum hits the pin at the times 0.703462, 2.59043, 4.54276, and 6.64885 and leaves the pin at 1.15178, 2.99053, 4.86749, and 6.7203.

For Task a2, the pendulum leaves the pin at the times 0.187379, 2.0912, 4.0183, and 5.94159 and hits it at 1.75879, 3.74908, and 5.81361.

Task b) The model description for Task b is essentially the same as for Task a, only an integer parameter `toggle` (0/1) is added that decides whether the linear or the exact equation is used and the equation for `dphi'` is modified in the following way:

```
dphi' := -gdl*sin(phi)*toggle-
         gdl*phi*(1-toggle)-ddm*dphi;
```

Using a *post-run-plot,* it is possible to compare results from different simulation runs (figure 4). But for a difference-plot, the linear and the exact model have to be run simultaneously and the differences have to be calculated inside the model.

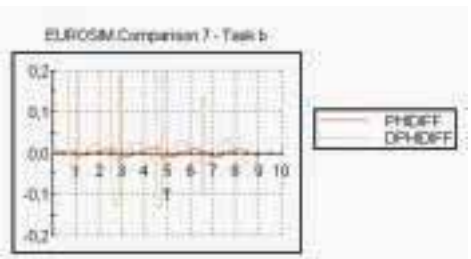

Figure 4

Task c) Using the desired results ($\varphi = -\pi/2$, $\dot{\varphi} = 0$) as initial values and inverting the sign of the damp factor yields the demanded $\dot{\varphi}_0$ at the moment the pendulum crosses the original φ_0 the first time. To stop the model at the moment this event occurs the following lines are added to the dynamic section of the submodel *state*:

```
when phi >= 0.52359877 then
  terminate true;
end_when;
```

The definite value for $\dot{\varphi}_0$ calculated with this model is 2.1847.

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Comparison 10 – MATLAB/SIMULINK
State Machine Approach

MATLAB is a standard CNS (computer numerical system) for matrix manipulation. Toolboxes extend the application range, e.g. SIMULINK for numerical simulation. STATEFLOW extends MATLAB's and SIMULINK's capabilities for handling discrete events (described as finite state machine).

Model Description. The stateflow machine is used to describe the behaviour of the five dining philosophers by means of states, state event changes, and conditions. The basic element of the stateflow machine is a *state*, and states are connected by *transitions*. The transitions are triggered by *events,* either explicitly or by giving conditions.

In this case, each philosopher is modelled by a state containing four substates (for thinking, grabbing the left stick, grabbing the right stick, and for eating, see fig.1). The availability of each chopstick is defined by the states of the two philosophers who share it. So a philosopher who intends to take up a chopstick communicates with his neighbour (left or right) to ask him if the chopstick is available.

In the case of the left chopstick the philosopher has priority over his neighbour who might also want to take the chopstick. So he asks for it (*send(wantl,philx)*), and if his left neighbour is not already eating (the only case in which the chopstick would be occupied), he will answer OK (*send(left,philx)*), even if he also intended to take it, because of the priority rules.

If a philosopher wants to pick up his right chopstick, he has to ask his right neighbour (*send(wantr,philx)*). If the chopstick is already in use, the answer is clear (no event is sent back). But if not, his right neighbour (whose left chopstick it is and who therefore has priority on it) must now decide whether he wants to pick it up or not and eventually answer that the chopstick is available (*send(right, philx)*).

When a philosopher stops eating and lays down the chopsticks, he tells his neighbours about this (*send(left, philx)*), (*send(right,philx)*), because they might already be waiting for the chopsticks.

Deadlock detection and data collection is done outside the stateflow machine in SIMULINK (fig. 2): deadlock is reached when all the philosophers are wai- ting for their right chopstick (state 3), so the state [3 3 3 3 3] means a deadlock. The random numbers are also gene- rated in SIMULINK. The batch of runs required for task b is controlled in a MATLAB loop.

Results. A single run stopping after 259139 time units gave the following results:

Chopstick utilisation (%)					
1	2	3	4	5	all
91.99	91.97	91.91	91.78	91.88	91.91

Times (mean / std. deviation)						
	1	2	3	4	5	all
Eating	5.5375/ 2.8541	5.5050/2 .8959	5.4833/2 .8791	5.5003/ 2.8813	5.4941/ 2.8819	5.5040/ 2.8785
Waiting	12.583/ 7.4940	12.589/7 .4939	12.599/7 .5431	12.629/ 7.4561	12.593/ 7.5426	12.599/ 7.5059
Thinking	5.5071/ 2.8608	5.5069/2 .8826	5.4781/2 .8714	5.4883/ 2.8819	5.5129/ 2.8717	5.4987/ 2.8737

A batch of 100 runs resulted in deadlock times between 7826 (minimum) and 17759772 (maximum) time units.

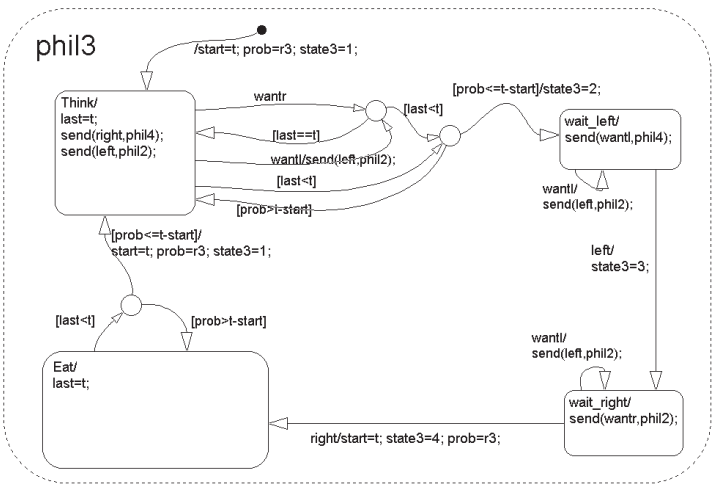

Figure 1: STATEFLOW model of the philosopher 3

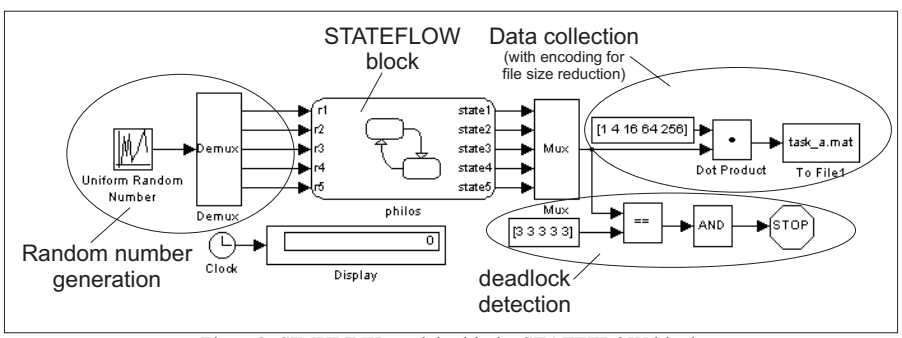

Figure2: SIMULINK model with the STATEFLOW block

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Comparison 11 – ACSL

Hybrid Modelling 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 syntax and can make use of MATLAB m-files.

Model description (Task a): ACSL allows the description of implicit models (and DAE models) by means of an `IMPLC` operator, which either breaks an algebraic loop before a numerical integration step or calls directly an implicit integration scheme (DASSL Code).

The following abbreviated `DERIVATIVE` Section shows the essentials of the implicit model description

```
DERIVATIVE ! Implicit Dynamic Model
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
residdq3 = ma33*ddq3  -b3
dq1, ddq1 = IMPLC(residdq1, dq1ic)
dq2, ddq2 = IMPLC(residdq2, dq2ic)
dq3, ddq3 = IMPLC(residdq3, dq3ic)
q1 = INTEG( dq1, q1ic); q2 = ...
END ! of Derivative
```

When using a standard integration algorithm (e.g. Runge Kutta 4th order) the algebraic loop for the derivatives `ddqx` within the `IMPLC` statement and the equations for the variables `residxx` is broken by a Newton-Raphson iteration. If the DASSL Code for direct integration of implicit systems is chosen the variables `residxx` represent the residuum for the algorithm. In order to compare the two implicit methods an explicit model was also programmed.

Employing ACSL Math allows to transfer all necessary parameter initializations and pre-calculations (outside of the integration loop) to an ACSL Math m-file that can be used for both the implicit and the explicit models. Different integration algorithms can be chosen by assigning appropriate values to the `IALG` parameter.

Point to Point Control (Task b): Servo motors and controllers can be easily implemented by standard modelling features of ACSL. Figure 1 shows the time history for the joint angles (results of implicit and explicit model look identical). The following table compares the normalized simulation times for a simulation over 2 sec. For the implicit model the DASSL code is faster than the Runge-Kutta algorithm. But as expected, execution of the explicit model is considerably faster compared to the implicit one.

Computation time is not affected by using ACSL Math as a runtime interpreter. However, models can be switched easily by loading the respective model into the ACSL Math workspace via the `LOAD` command. This facilitates the model comparison significantly.

```
load @file=scara_exp @format=model
 !!prepare t,q1,q2,q3
 tic(); start, toc()
load @file=scara_imp @format=model
 !!prepare t,q1,q2,q3
 tic(); start, toc()
```

Model Description	Implicit		Explicit
Integr. Algorithm (Stepsize 0.005 s)	RK-4 `IALG=5`	DASSL `IALG=10`	RK-4 `IALG=5`
Norm. CPU-time	1.0	0.86	0.12

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)
```

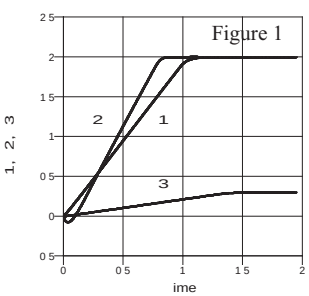
If the value of the checked variable `chkvar(ichk)` crosses zero the `DISCRETE` section "`event`" is triggered and the simulation run is terminated:

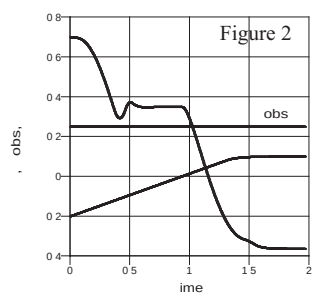
```
DISCRETE event ; TERM(.true.) ; END
```

Parameter changes, restart of simulation and sampling of output data is all done by an ACSL Math script file:

```
!! PREPAR t, x, xobs, h
Q1IC=0; Q2IC=0; Q3IC =0; ... % set init. cond.
ichk = 1;  % Check obstacle distance
!! START
collect_data  % script to save prepared data
if (h < 0)
  set_par1 % script to set new parameters
  reinit  % script resets initial conditions
  ichk = 2  % Check h if obstacle cleared
  !! START
  collect_data  % script saves prepared data
end
set_par2 % script to set new parameters
reinit  % script to reset initial conditions
collect_data  % script to save prepared data
!! START
plot(time,d,time,x_obs,time,h)
```

Figure 2 was plotted from ACSL Math. It shows that the tool tip does not cross the obstacle border line until its height has reached a positive height above the obstacle.





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Comparison 11 – MATLAB/SIMULINK
Hybrid Modelling Approach – Model Level

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

Model Description (Task a): The model was implemented in two ways, using MATLAB 5.2, SIMULINK 1.3. First SIMULINK's `Algebraic Constraint` block was used and the implicit equation $b(q,\dot{q}) - M(q_2)\cdot\ddot{q} = 0$ directly implemented:

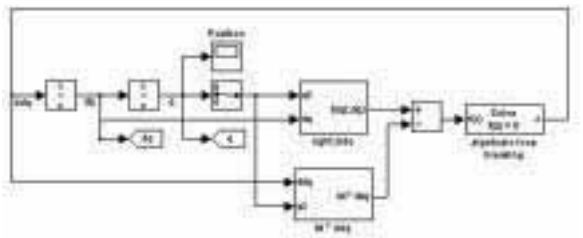

Fig.1: Implicit Equation, Algebraic Loop Breaking

For every integration step SIMULINK's `Algebraic Constraint` block *searches* for a solution of the implicit equation. This procedure is comfortable and does also work in the presence of a `Hit Crossing` block (which was needed for task c)! For the second solution the systems mass matrix M was inverted symbolically outside MATLAB and the explicit equation $\ddot{q} = M(q_2)^{-1}\cdot b(q,\dot{q})$ implemented in SIMULINK.

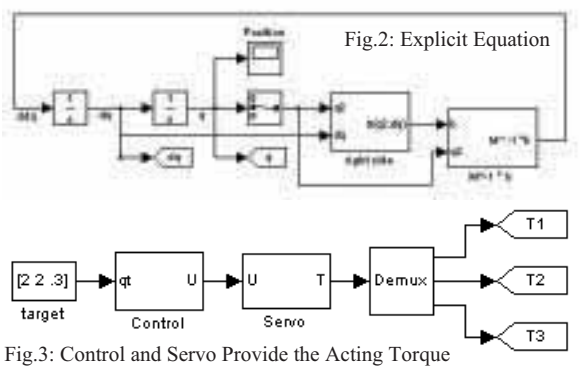

Fig.2: Explicit Equation

Fig.3: Control and Servo Provide the Acting Torque

Point to Point Control (Task b): For point to point movement both solutions use the same controller. A target vector is the input for Submodel `Control` which contains the PD-Controller (`q` and `dq` are provided by `Goto` blocks). The output `U` (the applied voltage) is fed into submodel `Servo` which models the servo drives of the three axes. Finally the resulting torque `T` is provided for the calculation of the right hand side `b`. For implementation of the boundaries of the voltages and currents, SIMULINK offers a very comfortable way: Voltage `U` is bounded by a `Saturation` block inside the submodel `Control` and the resulting armature current is limited by the corres- ponding `Integrator` block itself (inside submodel `Servo`). Figure 4 shows the graph of the joint positions for the demanded movement. Of course execution of the explicit model takes more time than for the implicit one. The processing times were measured from MATLAB using the commands `tic` and `toc` (average of four runs):

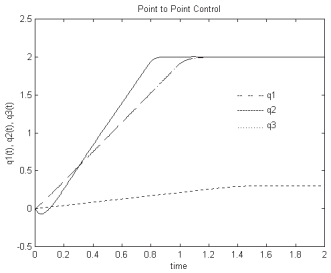

Fig.4: Joint Positions

Model description	Norm. CPU-time
Explicit - inverted matrix	1 (4.57s at P150)
Implicit - algebraic loop breaking	3.28

Obstacle Avoidance (Task c): For collision avoidance submodel `Control` was extended. The distance between the obstacle and the tool tip is permanently checked. If it gets smaller than the critical distance (event `too near`) the target positions for the state-variables are changed to the current position and the emergency maximum voltages are allowed. The robot arms 1 and 2 slow down and return to the position where the danger has been detected. Just after the tool tip of the robot has reached an admissible height (event `clear`) the original target position is reactivated and the arms 1 and 2 start to move again.

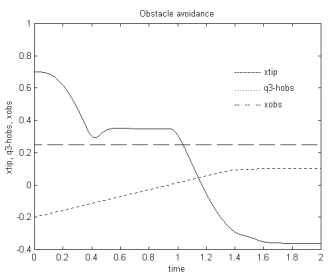

Fig. 5: Obstacle Avoidance

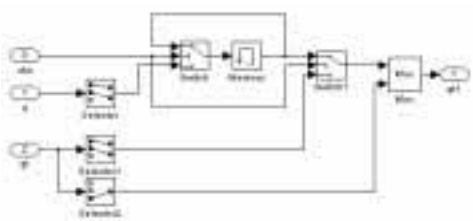

Fig. 6: Changed Target Position in Case of Obstacle

Figure 6 shows how the target position is changed in case of the event `too near`. As soon as the signal `obs` equals one, the current position `q` is stored in a `memory` block. This position is used as target for axes 1 and 2 until the occurrence of event `clear`: `obs` turns `zero`, target `qt` is accepted again and the voltages are limited to `Ureg`.

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Joint Research Initiative Numerical Simulation in Tunnelling

The planned construction of traffic ways represents a major challenge for science and technology. However, the success of modern tunnelling methods like the New Austrian Tunnelling Method (NATM) can only be assured, if it is possible to establish a scientific basis for these methods which are still primarily based on empirical assumptions.

The aim of the Joint Research Initiative (JRI) installed by the Austrian Science Fund is to establish a scientific basis for the numerical simulation in tunnelling. Particular emphasis will be placed on making substantial improvements and further developments of computer aided simulation methods in conjunction with *in situ* measurements. The purpose of this work is to achieve a better correlation between numerical prognosis and the actual *in situ* behaviour.

The technical aim of the JRI is the estimation of the required tunnel construction measures at the planning stage and their influence on the environment. It is planned to completely integrate all the aspects of numerical simulation from the collection of geological data to the comparison of simulation results with measurements, giving the tunnel engineer a powerful tool in the planing and execution of tunnel construction. Variation studies on the basis of the simulation methods, developed in the JRI, should allow the optimisation of tunnel excavations in terms of economy and safety.

The JRI consists of seven projects and involves eight Austrian University institutes in Graz, Innsbruck and Vienna. Univ.-Prof. Dipl.-Ing. Dr. techn. Gernot Beer (Head of the Institute for Structural Analysis at Technical University Graz) has taken over the co-ordination of the JRI. Additionally, in December 1997 a further project was established that is associated with the JRI. The following list gives an overview of the individual projects:

Coordination and Visualisation. The project consists of two parts: coordination and visualisation. The task of the coordination part is to manage the interaction between the individual projects and the flow of data and information between the projects. The second part of the project is developing and applying specialist software for the visualisation of geological data and results of simulations for all the individual projects applying virtual reality techniques.

Site Investigation and Application. This project deals with the improvement of acquisition methods for geotechnical data and on site application of numerical simulation methods. It is an inter-disciplinary project, combining the fields of civil engineering, engineering geology and telematics. The aim of the project is to develop new methods of geological-geotechnical data acquisition, modelling and visualisation of the rock mass, and to develop tools for numerical simulations on site. The project also provides access to site information required by the other participants of the JRI.

Damage Tensor. Numerical modelling of jointed rock is still a complex and unsolved problem. It has a complex mechanical behaviour, such as anisotropy, hysteresis, dilatancy and strongly path-dependent stress-strain relationships, which is generally associated with the existence of cracks and their propagation. With the help of Continuum Damage Mechanics, a damage tensor, directly related to geological data should be developed for the mechanical analysis of the rockmass.

Groundwater Control. The aim of this research project is to develop a three-dimensional numerical model for tunnelling below the groundwater table, taking into account the application of compressed air for dewatering the soil. The basis for the latter is a model for the soil, treating the soil as a three-phase medium, consisting of the deformable porous soil skeleton and the fluid phases water and compressed air. It allows to consider interactions between the fluid flow in the soil and the deformations of the soil in a physically consistent manner.

Compressed Air. Constructing urban traffic tunnels in soft ground and below groundwater level today is still a difficult task. A useful method for excavation in water bearing soil is the NATM in combination with compressed air which holds off groundwater from the driving area. Air pressure in the tunnel working area and air flowing in the ground cause displacements of the tunnel walls as well as in the ground, and subsequently on ground level. These displacements counteract the deformations due to tunnel excavation and so exert a positive effect on the stability of the tunnel itself and on the settlement of structures at the surface. The project seeks

to determine the volume of air loss at the tunnel face area and through the shotcrete lining. Further investigations concentrate on the amount of displacement of the tunnel wall, in the ground and on ground level as a result of applying compressed air.

Shotcrete. The aim of this project is to develop a 3D material model for shotcrete and to use it for numerical simulations of the states of displacements, strains and stresses resulting from the process of the excavation of a tunnel. In the first part of the project, a sophisticated thermo-chemo-mechanical model for shotcrete will be developed, which takes the hardening characteristics of the material into account. In the second part, the constitutive law will be implemented in a finite element code. Large-scale 3D simulations of tunnels will be performed for the purpose of increasing the understanding of the soil-shotcrete interaction and of the structural behaviour of the shotcrete lining.

Large Deformations. The project "Computationally Efficient Algorithms for 3D Simulations of Tunnel Advance Considering Large Deformations and Localised Failure" is aimed at the development and the numerical evaluation of suitable computational models for the representation of the soil in the context of F.E. analyses of tunnel excavations driven according to the NATM. An important focus of the project is modelling of discontinuities of the deformations of the soil in the form of shear bands in the vicinity of shallow tunnels. The influence of the consideration of large deformations on the structural behaviour of tunnels is another important topic which will be investigated in this project.

Shear bands. In shallow tunnelling unfavourable geological conditions together with an inappropriate excavation sequence may lead to extensive shear band formation in the ground, eventually leading to a collapse. Similar problems are encountered in the failure of earth-dams, retaining wall structures, foundations, embankments and slopes.

In this project we develop a numerical model based on "multi-laminate models" and the homogenisation technique for simulating the formation of shear bands. With this model we want to investigate possible collapse mechanisms or the deformation behaviour of structures near failure. The aim is to improve the prediction capabilities of numerical methods significantly and contribute to a safer and a more economic design of tunnels.

Numerical Modelling in the SITU Project

For an economical and safe construction of tunnels following the principles of NATM a continuous adaptation of excavation method and quality and quantity of support to the actual ground conditions is required. Especially for tunnels with high overburden, the design process has to continue during construction. Up to now, this design is based on experience and data from geological documentation and displacement monitoring. This optimisation process very often is based on ”feeling” rather than on facts, so that it would be desirable to supplement this process by numerical simulations. The acceptance of numerical simulations on site will be increased only if results of such simulations are realistic and available well in time to be used to support decisions.

Modelling of geotechnical processes requires among the selection of the most suitable mathematical model various simplifications concerning the modelling of the rock mass, primary stresses, excavation sequences and support. There must always be found a compromise between the expenditure for preparing the model and its calculation and the expected accuracy of the results.

For the numerical simulation in tunnelling, there are two general kinds of mathematical models suitable. First there are models which require the subdivision of the region such as the method of Finite Elements, Finite Differences and Distinct Elements. On the other hand, models with subdivision of the boundary of the region (Boundary Element Method) can be used.

Modelling by using the B.E.M. requires the subdivision only of the boundary of a region, thus the boundary of the tunnel and of joints and the ground surface. The infinite extension of the site is considered by using special fundamental solutions of infinite regions. The expenditure of discretisation can be reduced by this method. But a disadvantage of the B.E.M. is, that only elastic materials can be used and the modelling of sequential excavation and support is difficult.

Modelling by using F.E.M. requires a large scale discretisation of the region. The infinite extension of the site can be considered by using artificial boundary conditions which may sophisticate the calculation results. On the other hand, a variety of material laws, describing the fraction behaviour and plasticity of rock mass is available. In cases, where the stability and performance of a tunnel is governed by the joint system, two and three dimensional distinct element models (D.E.M) are advantageous.

By coupling these methods we can combine the advantages of B.E.M (easy modelling of the infinite extension of site) and F.E.M (consideration of inhomogenous and non-linear material behaviour, sequential excavation and the effects of various supports).

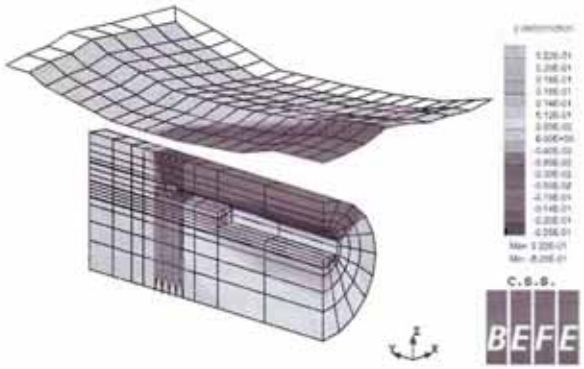

Figure 1 (and the title page) shows an example of a model using F.E.M. coupled with B.E.M. The sequential excavation, rock bolts, the shotcrete lining and the space around the excavation is discretised with finite elements. So the elasto-plastic behaviour of the rock mass and shotcrete is taken into consideration. The size of the F.E. block depends on the extension of the plastic zones around the excavation. The finite elements are implemented in an elastic, infinite halfspace, defined by the boundary elements describing the ground surface.

Site application and numerical simulation on site

Typical geotechnical conditions are identified on site. The relevant geological and mechanical data of rock mass, sequence of construction and support used are collected and serve as input for various models developed within the JRI. Further, monitoring data and data from surface levelling, extensometers, inclinometers, concrete stress cells and strain gauges are evaluated and are used for interpretation of simulation results.

2D and 3D simulations with different methods such as F.E.M., B.E.M. and D.E.M. are performed directly on site. Those comparative computations with different simulation methods show the applicability and limits of simplifications under various geotechnical conditions.

For an efficient simulation on site, a "model library" with prefabricated models of typical geotechnical conditions was established so that the results of simulations are realistic and available in time to be used to support decisions. The prefabricated models were based on the geological design report. The experience gained on site lead to an improvement of the models.

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Simulation Assistant SAINT Solves Convergence Problems

Sometimes the simulation of a continuous system does not converge especially when the system is large and the models of its components are complicated. This report shortly introduces some methods which can help to overcome these convergence problems. The methods can be used for systems which are described by algebraic and/or differential equations. They can help to find an initial solution as well as enhance convergence when the system variables are analysed in the time domain. The methods are implemented in a toolbox SAINT which is used together with the circuit simulator SPICE. It is not necessary to change the source code of the simulator as only the simulator's input is modified.

Operating Point Problems

Circuit simulation normally starts with the computation of an operating point (OP) for which most often the Newton-Raphson-Method is used. This iterative method only solves non-linear equations if the initial value is "close enough" to the solution. In case the Newton-Raphson-Method does not converge, continuation methods [ALL90] are often used to make the system converge:

The operating point problem is formulated as a system of m (nonlinear) equations to be solved:

$$F(x) = 0 \qquad F: \mathbf{R}^m \rightarrow \mathbf{R}^m$$

where x is an m-vector of unknowns. Continuation methods then define a homotopy:

$$H(x,\lambda) = 0 \quad H: \mathbf{R}^m \times \mathbf{R} \rightarrow \mathbf{R}^m \quad \lambda \in [0,1]$$

such that $H(x, 1) = F(x)$ and $H(x, 0) = F_0(x)$ where $F_0(x)$ is a linearized system which is easy to solve.

Starting from the solution to $H(x, 0) = 0$, one follows a connected set of points (x, λ) such that $H(x, \lambda) = 0$ until $\lambda = 1$.

Some circuit simulators already use similar methods to compute the operating point. E.g. SPICE uses *gmin-stepping* and *source-stepping* [WHI86] when the standard procedure fails.

We developed two of these methods [DEH95], namely ltn-stepping (linear-to-nonlinear) and the method of stability. The ltn-stepping adds linear elements between all terminals of a nonlinear device. To achieve convergence the values of these elements are then decreased from step to step.

The method of stability is slower than the ltn-stepping, but solves problems which the ltn-stepping can't. This method changes the derivatives of the system (the Jacobian matrix) by linearization, but not the OP itself.

Every node k of the system is connected to a corresponding voltage source x_{qk} via a conductance g_k (fig. 1). Let there be n nodes, and let x_k denote the voltage on the node k and x_{qk} the value of the added voltage source at node k.

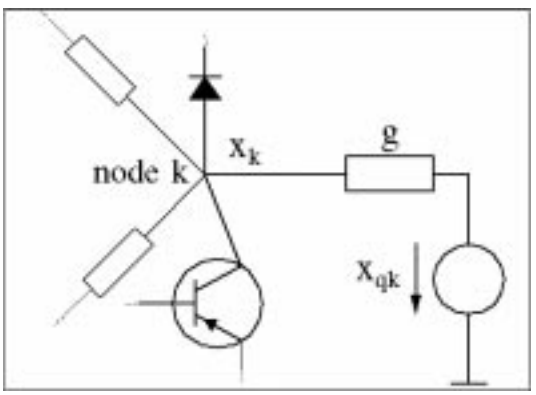

Fig. 1: Principle of the method of stability

Let $F_k(x_1, \ldots, x_n)$ be the equation for the sum of currents flowing into node k of the original system. The kth equation of the modified system looks like:

$$F_k(x) + g(x_{qk} - x_k) = 0 \quad k = 1,2,\ldots,n$$

If each x_{qk} has same voltage as the corresponding x_k, the currents flowing through the conductances g are zero. The OP of the modified system is then equal to the original system. To obtain the OP of the original system one must solve the following system,

$$F(x) - Gx + Gx_q = 0 \quad F: \mathbf{R}^n \rightarrow \mathbf{R}^n$$

where F is the system of equations of the original system and $G \in \mathbf{R}^{n \times n}$ is a diagonal matrix with components g.

Now a second iteration level is introduced which changes the vector of parameter x_q according to (5):

$$x_q^{i+1} = x^i$$

where x^i is the solution of the latest iteration.

Problem Localization

Convergence problems during transient analysis (i.e. analysis in the time domain) occur more seldom as they are often avoided by decreasing the integration time step.

Very often these problems are caused by a small part of the circuit and it would be easy to fix the problem if

this part could be found and investigated more thoroughly. To achieve this, SAINT partitions the circuit and simulates the parts automatically. This can be repeated for different partitions to test the circuit. A failing simulation of one of the parts indicates that the problem is situated in this part. Successive partitioning and simulation can be used to locate the problem more precisely.

The localization techniques were developed for transient analysis although DC convergence problems can be investigated too if they are transformed into transient problems which is easily done e.g. by ramping all initial values.

The user can decide to simulate the parts separately or as coupled system. For the coupled system waveform relaxation is used [WHI86]. In addition, the system offers an enhanced waveform relaxation technique [DMI94] with better convergence properties than standard waveform relaxation.

Conclusion

The above mentioned methods can be used for all types of continuous systems without changing the simulator although the implementation depends on the simulator.

SAINT can be fetched via anonymous ftp from:
`borneo.gmd.de/pub/microsys/saint`

SAINT is running on a SUN workstation using SUNOS 4.1.x. It is implemented as an experimental system for the simulator SPICE3.

Although SAINT does not solve all problems which occur during analog simulation it may significantly reduce the time needed for simulation, in case of troubles with convergence.

References

[ALL90] E. L. Allgower, K. Georg "Numerical Continuation Methods", Springer Series in Computational Mathematics No. 13, Springer-Verlag, Berlin Heidelberg 1990

[DEH95] Dehlwisch, M., "Two Methods of Linearization for DC Operating Point Problems", European Simulation Symposium, ESS, Erlangen Oct. 1995

[DMI94] Dmitriev-Zdorov, V.B., "Multilevel generalization of relaxation algorithms for circuit simulation", European Design Automation Conference EURO-DAC, 1994, pp. 176-181

[WHI86] White, J.; Sangiovanni-Vincentelli, A.L., "Relaxation techniques for the simulation of VLSI circuits", Kluwer Academic Publisher, 1986

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SCICOS – A Dynamic System Builder and Simulator for Hybrid Dynamical Systems

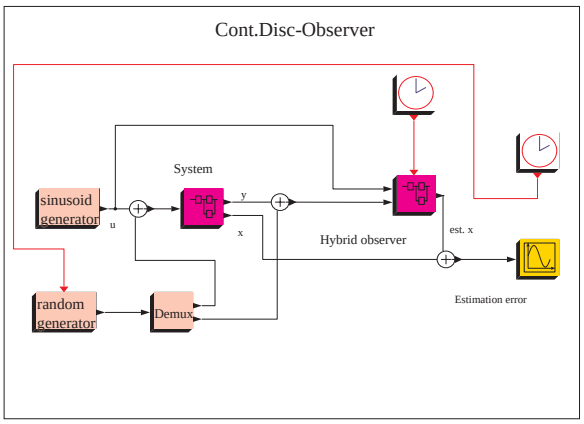

Figure 1: A typical Scicos diagram

Scicos (Scilab Connected Object Simulator) is a Scilab package for modeling and simulation of dynamical systems including both continuous, discrete and event-driven sub-systems. Many interesting problems in systems, control and signal processing applications can be modeled this way.

The formalism used in Scicos is inspired in part by works on synchronous languages, in particular SIGNAL [1] and its extension to continuous time [2]. Associated with each signal, in Scicos, is a set of time indices, called activation times, on which the signal can evolve. Outside their activation times, Scicos signals remain constant (see Figure 2). The activation time set is a union of time intervals and isolated points called events.

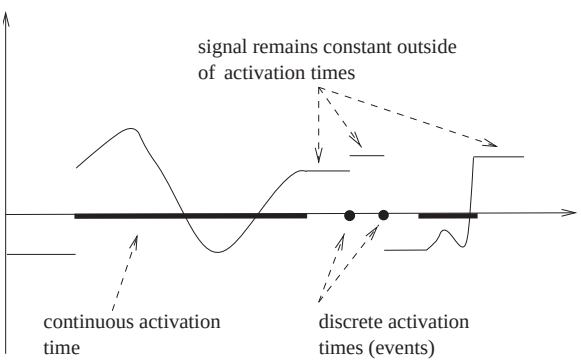

Figure 2: A signal in Scicos and its activation time set

Scicos formalism defines a framework for defining operations on this type of hybrid signals. For example the addition of two hybrid signals gives a hybrid signal, the value of which is the sum of the original signals, and its activation time set, the union of the two activation time sets. Most of Scicos operators are of this type. But, Scicos formalism contains also conditional operators. For example the "IF > 0" operator has for output an activation time set which is a subset of the activation time set of the input hybrid signal of the operator corresponding to the times when it is positive. Similarly there is an operator which generates an event when its input crosses zero. Such activation times can then be used to sample other hybrid signals.

For using this formalism, Scicos comes with a graphical editor. Complex models can be constructed by interconnecting blocks which represent predefined basic operations, defined in Scicos libraries, and user defined blocks. The editor also supports hierarchical structures.

Once the Scicos diagram is complete, the graphical information is compiled generating the order in which blocks should be called under different activation scenarios. The simulation can then be started. For simulating the continuous component, Scicos uses the code lsodar [4].

More information about Scicos can be found in the Scicos Manual [3] and the manual pages of Scicos functions (Scilab help under Scicos library). Scicos demos provided with Scilab constitute also an interesting source of information.

Scicos is an integral part of the free scientific software package Scilab developed at INRIA. Scilab is available on Windows 95/NT, Linux and most Unix workstations. For more details, visit http://www-rocq.inria.fr/scilab/.

References

[1] A. Benveniste and P. Le Guernic, Hybrid Dynamical Systems Theory and the SIGNAL Language, *IEEE Trans. Automat. Control*, AC-35, 1990.

[2] A. Benveniste, Compositional and Uniform Modeling of Hybrid Systems, *IEEE Trans. Automat. Control*, AC-43, 1998.

[3] R. Nikoukhah and S. Steer, SCICOS - A Dynamic System Builder and Simulator: Users Guide, *INRIA publication*, 1998. Available by anonymous ftp from ftp.inria.fr in directory INRIA/Scilab/doc.

[4] L. R. Petzold, Automatic selection of methods for solving stiff and nonstiff systems of ordinary differential equations, *SIAM J. Sci. Stat. Comput.* , vol. 4, 1983.

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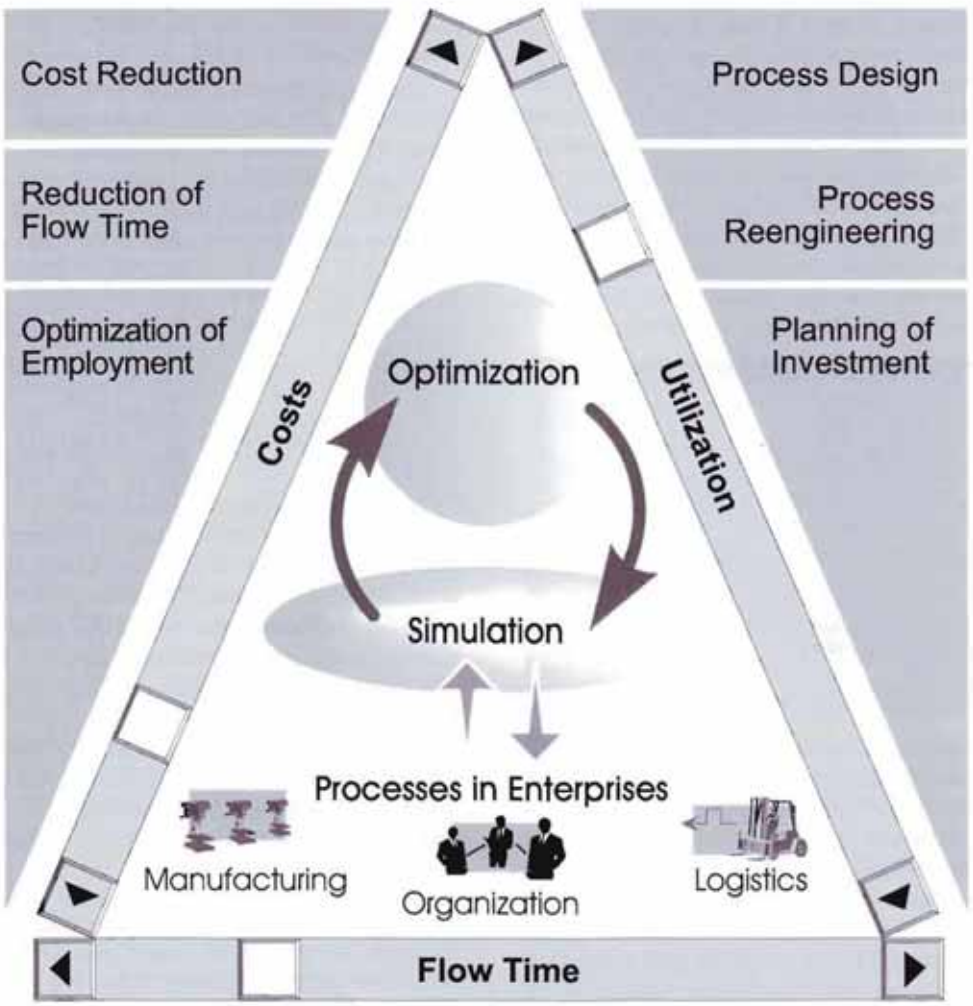

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An All-Rounder for Control Prototyping dSPACE introduces the DS1103 PPC Controller Board

With the DS1103 PPC Controller Board, the company dSPACE in Paderborn, Germany, introduces a new PC board for rapid control prototyping. In addition to a fast PowerPC processor running at 333 MHz, the board also contains a wide selection of I/O interfaces, including 36 A/D channels, 8 D/A channels and 50 Bit-I/O channels. The possibility of connecting to up to seven incremental encoder interfaces, the outputs for three-phase PWM, and the CAN- and serial interfaces make the board an all-rounder for drives engineering, robotics and automation technology as well as for other fields such as automotive technology. With the connection to MATLAB and Simulink from The MathWorks, new control algorithms can be programmed graphically in block diagrams. In combination with dSPACE's software for control design, analysis and optimization, the DS1103 PPC Controller Board offers control engineers the possibility to reduce development times drastically.

Further information: dSPACE GmbH, Technologiepark 25, D-33100 Paderborn, Germany, Tel. +49 5251 1638-0, Fax +49 5251 66529, email: info@dspace.de

Micro Saint version 3.0 Now Released

Rapid Data Ltd announced that latest release of the discrete event simulation package Micro Saint (version 3.0) is now shipping.

Micro Saint for Windows version 3.0 has many new features: long file names, 32-bit functionality, up to 40% faster than Micro Saint 2.0, OptQuest for finding optimal or near-optimal solutions to simulation models, customized appearances of task ovals, syntax checker, resource wizard, resource data collection and task data collection.

For more information, please contact Andrew Rayner at Rapid Data Ltd, Amelia House, Crescent Road, Worthing, West Sussex, BN11 1RL, UK. Tel +44-1903 821266, Fax +44-1903 820762, email: andrew@radata.demon.co.uk

Ten Years of Simulation Software Experience Yields Extend V4

New activity based costing and animation are highlights of Imagine That, Inc.s Extend version 4. With such additions as the ability to import AutoCAD files, hot linking to Microsoft Office, and optimized model run times, version 4 is making simulation modeling easier for the tens of thousands of current Extend users and for future users.

The release of Extend v4.0 earlier this year coincided with the ten year anniversary of the first shipment of Extend. In September, Imagine That, Inc. enhanced the product even further with the release of v4.1. In an unusual move for a software company, Imagine That provided significant new features in a free upgrade. These include new interactive online tutorials, improved paste-link capabilities, and ten new functions. The v4.0 and v4.1 features bring dramatic new functionality to the unlimited hierarchy, automated sensitivity analysis, infinite model size, and integrated development / authoring environment that have made Extend so popular.

The Extend family of desktop simulation tools is used to model industrial and commercial operations, to support engineering and scientific R & D, and to reengineer business processes. Extend empowers users with the ability to simulate and validate ideas, to resolve "what if..." questions, and assist in the decision making process. Before implementing changes, users model existing processes in Extend, then experiment with various scenarios on the model of the process rather than the actual process.

At its core, Extend contains optimized libraries of blocks for graphically creating dynamic models. It also includes a powerful, extensible programming language with object-oriented extensions for building custom blocks.

Extend is available for Windows (98, 95, NT, and 3.1) and Macintosh (68020+ and Power Macintosh). Prices range from $695 to $1,285.

Free maintenance upgrades are available on Imagine That, Inc.'s web site at http://www.imaginethatinc.com.

For more information, please contact: Eva Dobrov, Tel: +1-408-365-0305, evad@imaginethatinc.com

New product announcement

Rapid Data, the official European distributors of the O-MATRIX software products from Harmonic Software, Inc., have recently released The Control Kit, an O-MATRIX toolbox designed for doing control analysis via a user-friendly graphical interface, making it an ideal tool for "classical" control systems courses, and for control engineers needing the powerful features of O-Matrix without the need for programming.

The Control Kit runs with O-Matrix 4, and makes use of its Graphical User Interface (GUI) functions such as push buttons, radio buttons etc. The user has many options to change the model, plot range, input format etc. through a series of dialogue boxes.

For more information, please contact: Rapid Data Limited, Amelia House, Crescent Road, Worthing, West Sussex, BN11 1RL,UK, Tel: +44-1903 821 266, Fax: +44-1903 820 762, email: info@radata.demon.co.uk, http://www.radata.demon.co.uk

Book Reviews

An Introduction to Models and Decomposition in Operator Theory
Carlos S. Kubrusly
Birkhäuser, Boston, 1997
ISBN 3-7643-3992-6, 132 pages

This book gives an elementary approach to operator theory and contains special parts of models and decomposition and applications of those theories. The word elementary is meant in the sense that all proofs use only results of single operator theory.

The first three chapters (0,1,2) summarize the basic knowledge of operator theory that is necessary to understand the special applications in the following chapters. This part starts with a introduction to Hilbert space operators, which is followed by the description of convergence and stability, invariant subspaces and the spectral theorem. Furthermore parts, norms and shifts are explained and the corresponding theorems are proofed.

On the bases of these fundamental theorems a closer look to contractions is made in chapter 3, followed by the explanation of quasisimilar operators and their connection to invariant and hyperinvariant subspaces in chapter 4.

The next two chapters (5,6) are dedicated to the main topic: decompositions and models. First of all three different types of decompositions (Nagy-Foias-Langer decomposition, von Neumann-Wold decomposition, decomposition for idempotent contractions) and the corresponding proofs are introduced. The chapter about the models starts with Rotas Model, followed by a refinement of this technique – the de Branges-Rovnyak Refinement. Then a theorem, which is due to Durszt, extends the previous refinement.

The last but one chapter contains applications of the theorems derived in the two chapters before. The combination of different models and decompositions yields to further pattern and decomposition results. The book concludes with a chapter that deals with the question which operators are similar to contractions. Especially the two subproblems of power boundedness and weak and strong stability are discussed.

In summary this book gives a good introduction to this crucial part of operator theory. It has been written for an audience composed mainly of graduate students taking operator theory either as their major or as a support for applications in mathematics or in one of the sciences. The large number of references is very helpful, because on the one hand it contains many books about basic operator theory and functional analysis, but on the other hand also many articles about recent researches in the fields of operator theory are mentioned.

Ch. Almeder, SIMTECH, TU Vienna
calmeder@osiris.tuwien.ac.at

Experimental Stochastics
Moeschlin O., Grycko E., Pohl C., Steinert F.
Springer, Berlin, 1998
ISBN 3-540-14619-9
CDROM 314 MB (206 + xv p.)

Today a lot of books accompanied by CDs are published. The range spreads from examples on CD to (parts of) text on CD, or both. But nearly all approaches are based on a printed text. This publication is one of the few which are really electronic monographs, based on text modules, hypertext context, demo programs and video clips on CD, with a printed copy of the text modules.

Subject of the publication is "Experimental Stochastics" – avoiding the misleading term "Stochastic Simulation" of similar textbooks.

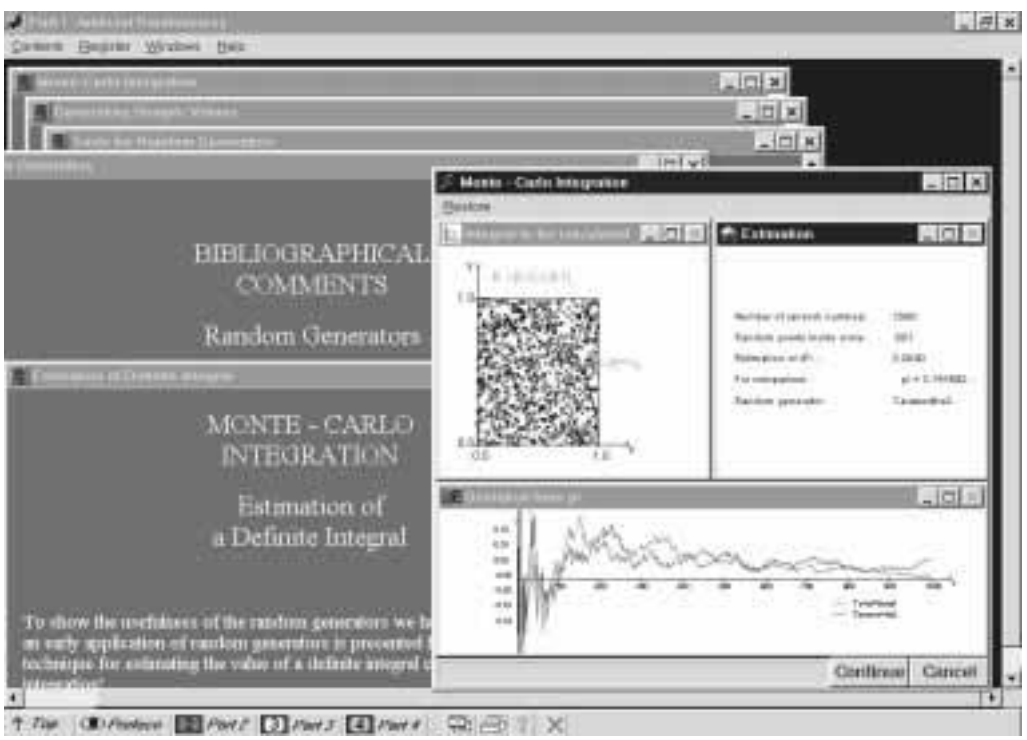
The authors introduce first to generation of pseudo-random numbers (PRNs), checking the "quality of randomness". This introduction not only sketches the methods, it also presents programs for the generation of PRNs by means of flowcharts and partly by source code, and furthermore it offers a variety of (pre-programmed) computer experiments, where the reader on the screen may interactively generate PRNs, test them, check their goodness of fit, and gets insight into applications, e.g. Monte Carlo integration (see figure).

Amongst others, the "visual tests" for quality of PRNs in the sphere are very impressive and give novices and experts a quicker and better insight than formula could do.

Part 2 "Stochastic Models", part 3 "Stochastic Processes", and part 4 "Evaluation of Statistical Procedures" deal with applications based on PRNs..

The basic idea, combining text explaining the subject verbally, online computer experiments demonstrating the subject, and programs implementing algorithms for analysing the subject, is continued. If the experiments become too time-consuming, they are – in some applications – replaced by a video clip showing the results of the experiments. For instance, part 2 presents the distribution of an ideal gas by online computer experiments in case of a small number of molecules, while in case of a big number of molecules precalculated video clips (computed at parallel computers) show the development of the distributions.

Part 2 gives in subchapters "Kinetic Gas Theory" and "Kinetic Dynamics and Equilibrium" a very interesting overview on results by means of stochastic models in this complex subject. Further stochastic models introduce to service systems (showing e.g. the difference between "German" and "English" queuing philosophy), and present the well-known Buffon Needles Problem.



Part 3 deals with stochastic processes, underlining the important role analysis of asymptotic behaviour. This chapter bridges from Markov chains (for the solution of systems of linear equations) and birth and death processes as Markov processes to diffusion processes (Brownian motion, Dirichlet problem as example of probabilistic potential theory) and traffic light control by means of ergodic processes.

Part 4 "Evaluation of Statistical Procedures" introduces and tests statistical methods for test theory, Bayesian estimation, etc., again by means of text explaining the subject and computer experiments demonstrating the subject.

The figure should give an insight into the structure of this electronic monograph, showing cascaded text module windows, program flowchart windows, and windows for controlling and representing experiments.

This really electronic monograph can be highly recommended for all interested in experimental stochastics (or introduction to stochastic simulation, resp.), from novices to lecturers and practising engineers, economists, etc. It is also of interest for experts in the area of mathematics and statistics, because it offers insight which a purely mathematical approach cannot give.

F. Breitenecker

A personal remark: this monograph can really be highly recommended, but should I do that ? – it is able to replace not only a lecture, it also is able to replace a lecturer like me.

Semantic Modeling for the Aquisition of Topographic Information from Images and Maps
SMATI 97
Edited by W. Förstner, L. Plümer
Birkhäuser Verlag, 1997
ISBN 3-7643-5758-4, 228 pages

The book collects papers which were presented at the Workshop "SMATI 97", held in Bonn, Germany in spring 1997. At this workshop specialists in Photogrammetry, Cartography, Image Understanding and Pattern Recognition worked together to discuss the current state of automatic procedures for acquiring topographic information from images and maps.

The problem of acquiring spatial data for geoinformation systems is still mainly solved by human operators who analyze images using classical photogrammetic equipment or digitize maps, possibly assisted by some low level image processing. Automation of these tasks is difficult due to the complexity of the object, the topography, and the deficiency of current pattern recognition and image analysis tolls for achieving a reliable transition from the data to the high level description of topographic objects. The latest attempts to achieve a progress in the automation of these processes are made by incorporating domain-specific semantic models into the analysis procedures. On this topic the workshop focused.

The volume is structured in 4 chapters. The first chapter – "Methods" – deals with the use of semantic nets in the relationship of aerial images and other data like maps or topographic databases, the second chapter gives room to cartographers to present their newest research results. Those, more theoretical chapters, are followed by two chapters presenting the implementation developments. They focus on the recognition of road networks and buildings.

All together the book consists of 13 papers. Of course it is no introduction to pattern recognition or related topics, but for those with some basic knowledge it offers very interesting aspects of todays research in the field of automatic data recognition.

N. Popper
email: npopper@osiris.tuwien.ac.at

Introduction to Partial Differential Equations with MATLAB
Cooper J. M.
Birkhäuser Boston, 1998
ISBN 0-8176-3967-5 (540 + xi p.)

At the first glance this monograph follows a classical lecture-oriented structure:
i) *introductory level*: motivation, first order equations, diffusion (diffusion equation, heat equation, wave motion;
ii) *medium level*: boundary value problems for the heat equations, waves (boundaries, nonlinearities);
iii) *advanced level*: Dispersive waves and Schrödinger equation, heat and wave equations in higher dimensions, equilibrium (Dirichlet problem, etc).

But within each chapter the author also deals with nonlinearities, numerical methods and numerical computed examples, concluding with the last pure numerical chapter on "numerical methods for higher dimensions" (finite differences, finite elements, and Galerkin methods). Examples in each chapter are programmed in MATLAB, offering the reader insight into the phenomenon of nonlinearity, etc. Also the complex numerical methods of the last chapter are demonstrated with MATLAB programs.

The well programmed and well documented programs are available via internet http://www.Birkhauser.com/book/isbn/0-8176-3967-5 or http://www.math.umd.edu/~jec.

Using numerical methods and their implementation in MATLAB the author overcomes a disadvantage of classical introductions into PDEs, the lack of the connection between the analytical side of the subject and of the numerical side, and the omission of nonlinearities because of insufficient analytical methods.

The use of the widely spread Computer Numerical Systems (CNS) MATLAB has made it possible to enlarge the scope of this introductory course in the subject. The author underlines the importance of starting with these numerical methods and examples at the beginning of the course, and consequently the reader finds also in the introductory chapters five MATLAB programs, showing results in graphical form.

The author assumes that the reader is familiar with the analytical calculus (including multivariable calculus) and with ODEs. Prior knowledge of MATLAB is not essential, because in the appendix some basics on MATLAB, and some special features of MATLAB for understanding the special-subject m-files (some of the 28 m-files show essential and long code). Otherwise, today most students – the readers the book addresses most – will already have seen and worked with MATLAB.

This textbook can be recommended as well as introduction for students (self-studying and experimenting with the examples) and as basis for an introductory or medium-level course on PDEs. The monograph really bridges the gap between core analytical methods and numerical methods necessary for e.g. nonlinear phenomena.

F. Breitenecker

Classes on Simulation

November

23 ***Effektive Simulation von Schaltnetzteilen***. Munich, Germany.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21b, D-80939 München, Tel: +49-89 3232625, Fax: +49-89 3231063, email: BauschGall@compuserve.com

27 ***MATLAB Programmierung***. Gümlingen. Switzerland.
Contact: Scientific Computers, Franzstr. 107-109, D- 52064 Aachen, Tel.: +49-241- 47075-0, Fax: +49-241- 44983, email: info@scientific.de

30-December 2
Simulation mit SIMULINK. Munich, Germany.
Contact: BAUSCH-GALL GmbH

December

1-2 ***Einsatz von Simulink in der Regelungstechnik***. Aachen, Germany.
Contact: Scientific Computers

3 Seminar: ***"Soft Computing in Modellbildung und Simulation - ECANSE"***. 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: Felix.Breitenecker@tuwien.ac.at

4 ***ERUDIT (European Network for Fuzzy Logic and Uncertainty Modeling in Information Technology) Meeting***. TU Vienna, Austria
Contact: ARGESIM

10-11 ***Kurs MATLAB.*** Munich, Germany.
Contact: BAUSCH-GALL GmbH

11 ***SIMULINK Kurs***. Gümlingen. Switzerland.
Contact: Scientific Computers

15 Seminar: ***"Modellbildung und Simulation in der Abfallentsorgung"***. TU Vienna, Austria
Contact: ARGESIM

January 1999

20-22 **MicroSaint Training Class**. Worthing, UK.
Contact: Rapid Data Ltd., Amelia House, Crescent Road, Worthing, West Sussex, BN11 1RL, UK, Tel: +44-1903 821266, Fax: +44-1903 820762, email: info@radata.demon.co.uk

28 Seminar: ***"Symbolic Computation in Modellbildung und Simulation"***. TU Vienna, Austria
Contact: ARGESIM

March 1999

8-9 ***Kurs MATLAB.*** Munich, Germany.
Contact: BAUSCH-GALL GmbH

11 ***MATLAB Seminar***. TU Vienna, Austria
Contact: ARGESIM

15-17 ***Simulation mit SIMULINK.*** Munich, Germany.
Contact: BAUSCH-GALL GmbH

April 1999

21-23 **MicroSaint Training Class.** Worthing, UK.
Contact: Rapid Data Ltd.

Calendar of Events

December 1998

13-16 **WSC98.** Winter Simulation Conference.
Washington, D.C.
Contact: WWW: http://www.wintersim.org/

15 **ISCS98.** Annual Conference of ISCS. Naples, Italy
Contact: ISCS, Univ. di Roma Tor Vergata, Via di Tor Vergata, I-00133 Roma, Tel.: +39-6-7259-7380, Fax: +39-6-7259 7460, WWW: http://remlab.dis.unina.it/iscs/iscs_hp.htm

January 1999

17-20 **1999 International Conference on Web-Based Modeling and Simulation**. San Francisco, USA
Contact: Agostino Bruzzone, DIP, Univ. of Genova, Via C. Colombo 6813, I-17019 Varazze, Tel.: +39-19 97 398, Fax: +39-19 97600, Email: agostino@itim.unige.it, WWW: http://cpsi4.dibe.unige.it/~websim/webconf.html

19 **DBSS Symposium Neural Networks**. Delft
Contact: Technotrans, Institute for Technology Transfer BV., Tel.: +31-10 234 10 82, Fax: +31-10 234 11 72, Email: technotrans@per.nl

February 1999

22 **Meeting of ASIM FG „Simulation in Produktion und Logistik"**. Kassel
Contact: Dipl.Inf. Sigrid Wenzel, Fraunhofer Gesellschaft, Inst.f.Materialfluß & Logistik, Joseph-von-Fraunhofer-Str. 2-4, D-44227 Dortmund, Tel.: +49-231-9743-237, Fax: +49-231-9743-234, Email: wenzel@iml.fhg.de

March 1999

1-2 **Meeting of ASIM FG5 „Simulation Technischer Systeme" and FG2 „Simulationssoftware und -hardware"**. Aachen
Contact: Dipl.Ing. Ewald Hessel, Hella KG Hueck&Co, Abt. EE-87, Werk II, Beckumer Straße, D-59552 Lippstadt, Tel.: +49-2941-388572, Fax: +49-2941-388427, Email: hessel@hella.de

1-3 **First Middle East Workshop on Simulation and Modeling**. Amman, Jordan
Contact: Philippe Geril, SCS Europe, c/o 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

3 **Workshop of ASIM FG „Simulation paralleler Prozesse"**. Magdeburg
Contact: Dr.-Ing. Peter Schwarz, Fraunhofer-Institut IIS / EAS Dresden, Zeunerstraße 38, D-01069 Dresden, Tel.: +49-351-4640-730, Fax: +49-351-4640-703, Email: schwarz@eas.iis.fhg.de

5-6 ***Simulation und Visualisierung '99***. Magdeburg, Germany
Contact: Petra Specht, Otto-von-Guericke-Universität Magdeburg, Inst. für Simulation und Graphik, Universitätsplatz 2, D-39106 Magdeburg, Tel.: +49-391-671-8342 , Fax: +49-391-671-1164 , Email: organisation@tagung.simvis.org , WWW: http://www.simvis.org/tagung99

14-16 **ASIM Workshop „Werkzeuge für Modellbildung und Simulation in Umweltanwendungen"**. Koblenz
Contact: Prof.Dr.habil. Rolf Grützner, Universität Rostock, FB Informatik, Albert-Einstein-Str. 21, D-18051 Rostock, Tel.: +49-381-498 3369, Fax: +49-381-498 3426, Email: gruet@informatik.uni-rostock.de

21-24 **Simulation Solutions 99 Conference**. Mesa, Arizona
Contact: IIEs Member and Customer Service, Tel.: +1-800-494-0460, Email: cs@www.iienet.org, WWW: http://www.iienet.org/SimSol99.htm

April 1999

DBSS Symposium „Simulation of Business Economical Models". Rotterdam
Contact: H. de Swaan Arons, Tel.: +31-10 4081813, Email: deswaanarons@few.eur.nl

7-9 **UK Sim 99.** Fourth United Kingdom Simulation Society Conference. Cambridge, U.K.
Contact: Prof. Russell Cheng, Canterbury Business School, The University, GB-Canterbury, Kent CT2 7PE, Tel.: +44-1227-823665, Fax: +44-1227-761187, Email: R.C.H.cheng@ukc.ac.uk

20-22 **ModSim99.** Workshop on Modelling and Simulation Methods. Noisy-le-Grand, France
BioMedSim99. 1st Conference on Modelling and Simulation in Biology, Medicine and Biomedical Engineering. Noisy-le-Grand, France
Contact: Prof. Dr. Yskandar Hamam, ESIEE, Computer Control Laboratory, 2 Bld Blaise Pascal, F-93162 Noisy le Grand, Tel.: +33-1 45 92 66 11, Fax: +33-1 45 92 66 99, WWW: http://www.esiee.fr/~hamamy/bioconf.html

21-23 **ECEC99.** 6th European Concurrent Engineering Conference. Erlangen-Nuremberg, Germany
Contact: Philippe Geril, SCS Europe, c/o 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

25-28 **EUROMEDIA99.** . Munich, Germany
Contact: Philippe Geril, SCS Europe, c/o 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

27-29 **MOSIS99.** 33th Intl. Conf. on Modelling and Simulation of Systems. Krnov, Czech rep.
Contact: Jan Stefan, FEI -VSB TU, Ostrava, tr. 17. listopadu, CZ-70833 Ostrava Poruba, Email: Jan Stefan@vsb.cz

June 1999

1-4 **ESM99.** European Simulation Multiconference. Warsaw, Poland
Contact: Philippe Geril, SCS Europe, c/o 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 1999

26-28 **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, c/o 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

21-24 **ASIM99.** 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

October 1999

6-8 **MOSIM99.** 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/

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/

March 2000

8-9 **9th Conference of ASIM FG „Simulation in Produktion und Logistik“**. Berlin
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
Contact: Prof.Dr. Dietmar P.F. Möller, Universität Hamburg, Inst. f. Informatik, D-22527 Hamburg, Fax: +49-40-5495 2206, Email: moeller@informatik.uni-hamburg.de

September 2000

18-23 **ASIM / ESS2000.** 14. Symposium Simulationstechnik and 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: +49-40-5494 2206, Email: moeller@informatik.uni-hamburg.de

June 2001

26-30 **EUROSIM2001.** European Simulation Congress. Delft
Contact: Ir. J.C. Zuidervaart, DBSS - Dutch Benelux Simulation Society, c/o Computing Centre, Delft Univ. of Technology, Computing Centre, P.O. Box 354, NL-2600 AJ AJ Delft, Tel.: +31-15-2785698, Fax: +31-15-2783787

Websites

SNE publishes the addresses of websites of interest to the simulation community. Please let us know when you come across an interesting site. A collection of "**Hotlinks**" to societies, simulation tools, companies etc. can be found at

http://www.argesim.org/hotlinks/

Survey of discrete-event simulation software *

Every two years, INFORMS (Institute for Operations Research and Management Science) publishes, in *OR/MS Today*, an updated survey of discrete-event simulation software. In recent years, this survey has been conducted by Jim Swain (professor at the University of Alabama).

`http://lionhrtpub.com/orms/surveys/Simulation/Simulation.html`

** We thank Tom Schriber, Univ. of Michigan, for sending us this information.*

ARGESIM

ARGE Simulation News (ARGESIM), located at TU Vienna, is a non-profit working group disseminating information on simulation, organising activities in the area of modelling and simulation, publishing journals and books, and providing support for EUROSIM and ASIM administration.

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EUROSIM - Simulation News Europe

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

Editors: *F. Breitenecker, I. Husinsky*
ARGE Simulation News

Layout: I. Husinsky

Address: c/o Dept. Simulation Techniques, Vienna University of Technology, Wiedner Hauptstraße 8-10, A-1040 Vienna, Austria

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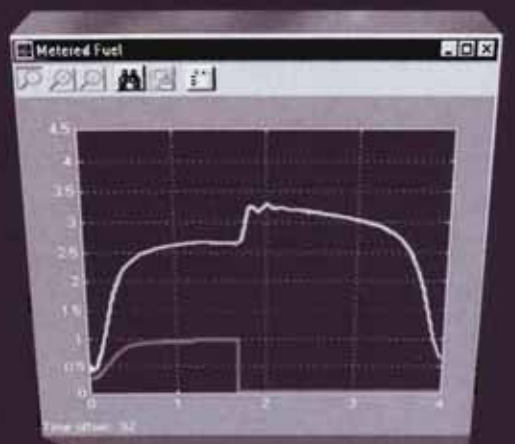

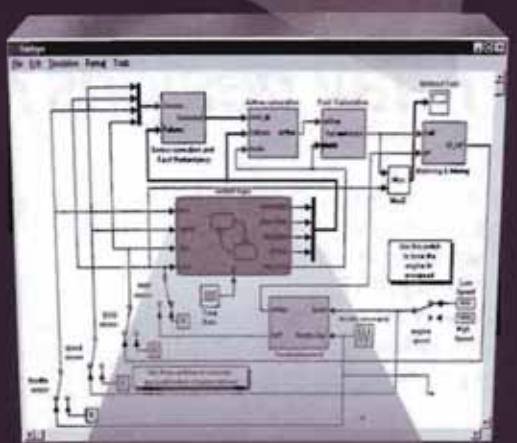

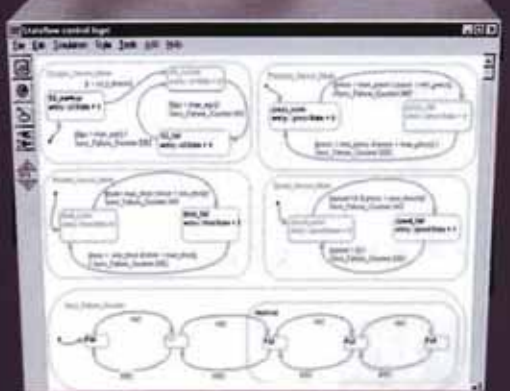

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Dynamische und ereignisorientierte Simulation und Applikation in einer einzigen Entwicklungsumgebung.

Graphische Modellierung.

Aus umfassenden Blockbibliotheken können Sie sehr schnell und intuitiv komplizierte Simulationsmodelle entwickeln. Übersichtlichkeit durch Hierarchisierung ist dabei genauso selbstverständlich wie die Verwendung eigener beschreibender Blocknamen.

Integrierte Entwicklungsumgebung

Mit Simulink und Stateflow können lineare, nichtlineare, zeitkontinuerliche, zeitdiskrete und ereignisorientierte Teilmodelle miteinander kombiniert werden. Die Integration in MATLAB bietet direkten Zugriff auf dessen mathematische, grafische und programmiertechnische Leistungsfähigkeit für die Analyse von Daten, die Automatisierung von Abläufen und die Optimierung von Parametern.

Bei der Simulation muß nicht Schluß sein.

Je nachdem, ob der Schwerpunkt auf Schnelligkeit oder Genauigkeit liegt, stehen unterschiedlichste Integrationsverfahren zur Verfügung. Über die Erweiterung durch den Real-Time Workshop lassen sich die grafischen Modelle in C-Code überführen und somit für Echtzeitimplementierungen auf unterschiedlichster Zielhardware verwenden.

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Power System Blockset für elektrotechnische Systeme

Informationen zur MATLAB-Produktfamilie: www-europe.mathworks.com

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