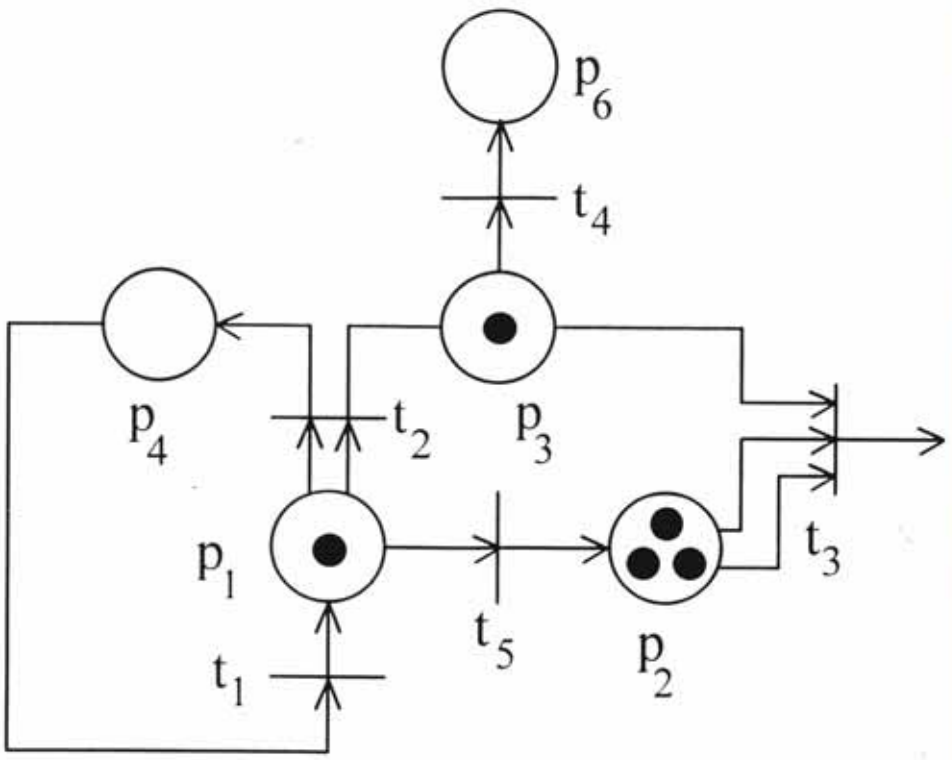
SIMULATION NEWS EUROPE

EUROSIM

ISSN 0929 - 2268



Number 9

November 1993

A EUROPEAN FORUM ON SIMULATION ACTIVITIES

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Readership Information

EUROSIM - Simulation News Europe is published on behalf of EUROSIM (the Federation of European Simulation Societies) three times a year by the "ARGE Simulation News", a non-profit working group. Circulation is 2500. EUROSIM - Simulation News Europe is distributed by all member societies to their individual members (as part of the membership services). It is also included in the scientific journal "Simulation Practice and Theory", published by Elsevier Science Publishers.

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

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The title page illustration shows a Petri Net.

The deadline for the next issue will be February 4, 1994.

Editorial

The idea of the newsletter **EUROSIM - Simulation News Europe** (SNE) is to promote simulation in Europe by publishing information relating to simulation. It disseminates information to all EUROSIM member societies and to all members of these societies. Furthermore it highlights the importance of simulation to industry, government, and education.

In pursuit of this purpose we publish essays on simulation, reports from EUROSIM and members of EUROSIM (the European simulation societies), reports from international societies, presentations of simulation centers, industry news, book reviews, software comparisons, a calendar of events, etc. The successful series on software comparisons gives an overview of features of simulation languages.

The newsletter is edited at Technical University Vienna since 1990 and this is the second issue printed by Elsevier Science Publishers. This issue is the last that is limited to 32 pages, so we have not been able to publish all the material we received and we have had to edit most of the contributions to fit. From 1994 on this newsletter will have 44 pages. In SNE 10 (March 1994) we will therefore publish any "left-over" materials and describe the very successful software comparisons in more detail: how they are defined, how long each comparison is running, how many solutions have been sent in, how many different languages took the challenge, etc.

The production of the newsletter is financed by advertisements and grants covering current expenses for editing, running of the editorial office, promotion, and other editorial expenses. We would like to thank all those who have contributed to this issue and invite readers to send us their comments and contributions.

F. Breitenecker, I. Husinsky

EUROSIM - Simulation News Europe

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

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

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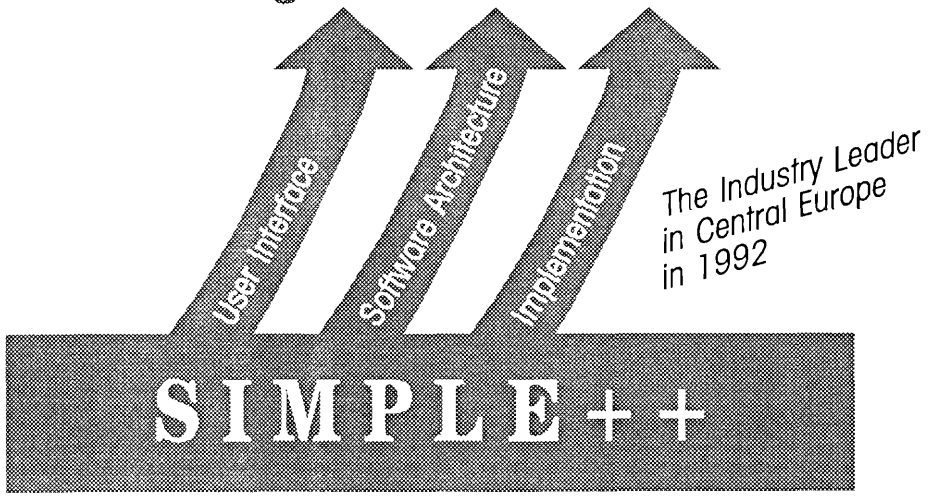
ARGE Simulation News: Gröhrmühlg. 8, A-2700 Wiener Neustadt

Printed by: Elsevier Science Publishers, Amsterdam, The Netherlands

ISSN 0929 - 2268

The new Class of Simulation Software

»Full Object Orientation«



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- **powerful built-in language and debugging facilities**
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- **easy-to-use graphical user interface, all informations is represented graphically**
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- **available on UNIX workstations and PC's with SCO-Unix**

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SIMPLE++ was developed by AESOP together with the Fraunhofer Institute for Production and Automation (IPA) and is based on over 10 years of experience in applying and developing simulation software.

SIMPLE++ defines a new class of simulation software because of its modeling efficiency, user friendliness and range of application. Most of the users benefit stems from the full object orientation.

SIMPLE++ was installed almost 100 times in Central Europe in 1992 after its introduction in January. Many thanks to industry for the confidence.

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AESOP GmbH, Königstraße 82
D-70173 Stuttgart 1
Germany

AESOP

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

The following national and regional simulation societies form EUROSIM: ASIM - Arbeitsgemeinschaft Simulation (Austria, Germany, Switzerland), DBSS - Dutch Benelux Simulation Society (Belgium, The Netherlands), FRANCOSIM - Société Francophone de Simulation (Belgium, France), ISCS - Italian Society for Computer Simulation (Italy), SIMS - Simulation Society of Scandinavia (Denmark, Finland, Norway, Sweden), UKSS - United Kingdom Simulation Society (UK), and, as a new member, CSSS, the Czech and Slovak Simulation Society (Czech Republik, Slovak Republic).

EUROSIM is governed by a **Board** consisting of one representative of each member society. The Board elects officers, who are at present:

F. Breitenecker (ASIM)	president,
R. Zobel (UKSS)	secretary,
L. Dekker (DBSS)	treasurer.

At the last Board meeting (held on the occasion of the UKSS conference at Keswick, September 1993) a number of decisions was taken that will influence the future development of EUROSIM:

First of all, the application for membership from CSSS, the Czech and Slovak Simulation Society, was accepted unanimously. EUROSIM therefore has now seven members and has indicated its willingness to warmly welcome any new member that fulfills the conditions of admission. Decisions on other applications for membership were postponed.

The Board furthermore decided to create the position of Past President, an officer with a voting right, in order to guarantee continuity of work.

Additionally, the Board resolved to introduce an "Observer Status" for societies or groups wishing to become members of EUROSIM or to co-operate with EUROSIM. Any society or group working mainly on simulation, consisting of about 50 people and governed by registered bylaws or being part of a society with registered bylaws may become an "Observer" within EUROSIM. Such a group may attend the meetings and share in the discussion of further developments. Only one society per country (or a federation covering more than one country) can be a member of EUROSIM, countries not having a member society may have more than one "Observer".

In the following meeting of the Editorial Board of EUROSIM's scientific journal "**Simulation Practice and Theory**", Prof. L. Dekker, the Editor in Chief, reported on the favourable acceptance of the first issue and gave an overview of forthcoming issues. Authors interested in publishing in this journal are requested to contact the editor (Prof. L. Dekker, Noordeinseweg 61, 2651 LE Berkel en Rodenrijs, The Netherlands, Tel: +31-1891 12714, Fax: +31-1891 13883).

Letter from the President

Dear Simulationists,

You are reading the second new-style **EUROSIM - Simulation News Europe** (SNE), the newsletter of the European simulation societies. This newsletter is also incorporated into the new scientific journal "Simulation Practice and Theory", both being official publications of EUROSIM. The first issue of the scientific journal (July 1993) was warmly accepted. This issue of SNE is also part of the second issue of this scientific journal.

As a major point I would like to welcome CSSS, the Czech and Slovak Simulation Society, as a new member of EUROSIM. CSSS, under the leadership of Mr. Milan Kotva, was unanimously accepted as a new member at the last Board meeting. I offer my personal congratulations to CSSS and Mr. Kotva and am sure that the new member, the first from a reform country, will enrich the work of EUROSIM substantially.

In view of the dramatic changes in the political landscape of Europe EUROSIM has created the status of "Observer", which I believe has been a wise decision. The "Observer Status" should give groups involved in simulation work the opportunity to co-operate with EUROSIM and to form simulation societies who could apply for membership in EUROSIM. The creation of this "Observer Status" allows EUROSIM on the one hand to be open to all new groups and on the other hand to prevent misunderstandings and undesirable developments.

Furthermore I would like to draw your attention to a number of simulation congresses that are organized or co-sponsored by EUROSIM, by EUROSIM societies or other societies. In 1994, the Conference on "Massively Parallel Processing, Applications and De-

velopment" will take place in Delft (organized by DBSS) and the CISS conference in Zurich (joint conference of simulation societies).

The next EUROSIM Congress, the "family meeting" of the European simulation societies, will be held in Vienna in September 1995. I am looking forward to meeting you all on one or more of these conferences.

If you have any questions, comments or suggestions regarding EUROSIM, the scientific journal "Simulation Practice and Theory", the newsletter EUROSIM Simulation News Europe, or any other simulation matters, please contact the representatives of the European societies, the editors of the journal or the newsletter, or me directly.

F. Breitenecker, EUROSIM President

Mr.Breitenecker, EUROSIM President (right), hands over the provisional admission document to Mr.Kotva, head of CSSS; left Mr.Zobel, EUROSIM secretary and organizer of the UKSS conference in Keswick.

EUROSIM CONGRESS '95

TU VIENNA • September 11-15

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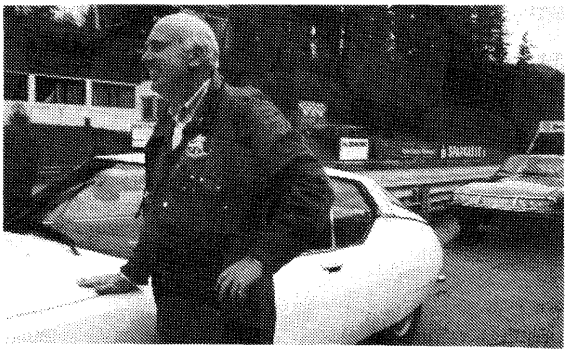
Readers Forum

Henk W.A. Jungbauer October 4, 1993



Dear Simulationists,

Through this international medium I would like to inform you that the time has come for me to leave the simulation-arena. It has been a great pleasure and honour for me to be part of your simulation world for more than 30 years. From hesitating early beginnings in the late 50's to high-tech state-of-the-art situations now at the end of 1993.

Those of you whom I had the honour of meeting and working with during the last three decades might remember me from my long lasting strong links with EAI-Electronic Associates resp. with Scientific Computers.

I thank all of you for your valuable advises, for your business relationship, for your constructive critics and above all for your friendship. It has been a great experience and satisfaction for me working with you and sharing so many good and exciting years with you throughout Europe and the USA.

I will, of course, try not to lose contact with you but, Dios mediante, I hope to enjoy the forthcoming years in new adventures and in activating my extensive family/friend relations around the world and specifically on the Iberian peninsula and in Latin America.

God bless you all!

It would be nice hearing from you in the near future and/or meeting you at one of the next EUROSIM activities.

Henk W. A. Jungbauer
Horbacher Str. 31, D - 52072 Aachen, Germany
Tel/Fax: +49-(0)241 13027

The editors look back on almost twenty years of business and non-business contacts with Mr. Jungbauer. Together we have experienced a few milestones in analogue and hybrid computing in the past two decades. Knowing Mr. Jungbauer is something special. We wish him the best for the future.

Petri Nets in Simulation

A. Jávor
KFKI Research Institute for Measurement and Computing Techniques
H-1525 Budapest, P.O.Box 49, Hungary

Introduction

Since the time Petri introduced the basic concept of Petri Nets (PN) in 1962 [1] a discipline with various aspects has developed including pure computer science, languages, etc. [2]. An important aspect is the modeling of systems with parallel, concurrent events. This enables the description and investigation of the dynamic behaviour of highly complex systems by modeling and simulation.

The idea of PNs is highly attractive since they can be regarded as directed graphs where the building elements of the model are nodes and their interconnection may describe the structure of the system. This corresponds to using *non-procedural* i.e. *structural* models of systems - as well as their internal subsystems - for a realistic mapping of the real-world systems investigated. On the other hand this approach suits perfectly the *object oriented architecture* in case the elements of the PN are implemented as objects communicating with messages [3].

Basic properties of Petri Nets

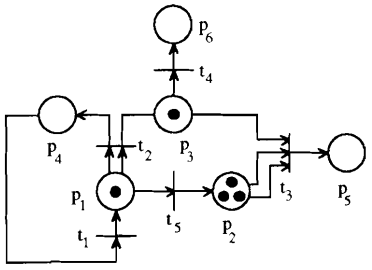


Figure 1

In Fig. 1 the directed graph representation of a PN is shown. The nodes are *places* (depicted as circles) and *transitions* (depicted as bars). They can only be interconnected in an alternating way as can be seen, i.e. no two nodes of the same type can be interconnected. A PN can also be described as a four-tuple

$$C = (P,T,I,O) \qquad (1)$$

$P = \{p_1,p_2,...p_n\}$ being a finite set of places and $T = \{t_1,t_2,...t_m\}$ a finite set of transitions, the set of places and transitions being disjoint. $I:T \rightarrow P^{\infty}$ is the input function mapping transitions to bags of places. $O:T \rightarrow P^{\infty}$ is the output function mapping transitions to bags of places. A place p_i is an input place of a transition t_j if $p_i \in I(t_j)$; p_i is an output place if $p_i \in O(tj)$. The state of a PN can be characterized by its *marking* i.e. the distribution of *tokens* (marked with dots as in Fig. 1) in the *places*. The marking $\mu(p_i)$ of a place denotes the number of tokens in place p_i. The trajectory of a PN in the time-state space is described by the sequence of the markings called the *token play*. The changes in the markings are caused by the *firing* of the transitions. A transition fires if it is *enabled*. This happens if for all $p_i \in P$

$$\mu(p_i) \geq \#(p_i, I(t_j)) \qquad (2)$$

where $\#(p_i, I(t_j))$ denotes the *multiplicity* of the place in the input bag of transition t_j or with other words the number of arcs directed from p_i to t_j. In case transition t_j fires it changes the marking of the PN from μ to μ'

$$\mu' = \mu(p_i) - \#(\mu(p_i), I(t_j)) + \#(\mu(p_i), O(t_j)) \qquad (3)$$

$\#(\mu(p_i), O(t_j))$ denoting the output multiplicity. In Fig. 1 e.g. the firing of the enabled transition t_3 will remove 2 tokens from p_2 one from p_3 and create one in p_5.

The markings in the places can be regarded as states and conditions of the operation of the model while the transitions represent the actions if certain conditions are fulfilled creating new states after firing.

The analysis of the properties as e.g. the determination of the *reachability set* i.e. the set of markings that may occur after a sequence of firings is an important field of study although in most cases the solutions are NP complete, i.e. not feasible for large networks [2].

Another important problem is the occurrence of conflicts. In Fig. 1 e.g. both t_3 and t_4 are enabled. In case one of them fires it removes the token from p_3 disabling the other. This reveals a problem occurring also in systems in the real world and has to be dealt with.

High level Petri Nets

In order to simulate systems of high complexity a large number of modifications have been proposed for more sophisticated *high level PNs* [4]. These have in general enhanced the modeling and descriptive power of PNs at the expense of decreasing their analyzability. This compromise is usually acceptable from practical modeling and simulation point of view due to the com-

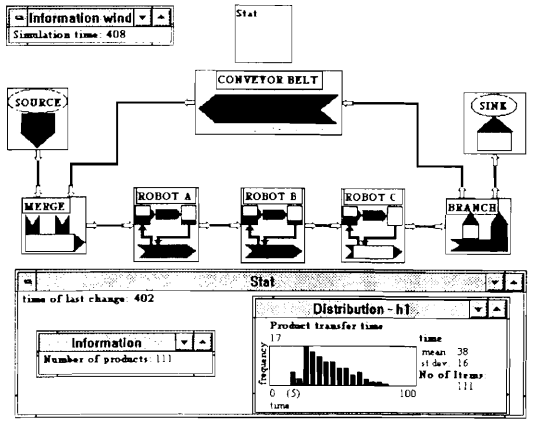
plexity of the algorithms that could be used for the structural analysis of the PNs.

Some of the important high level Petri Nets are

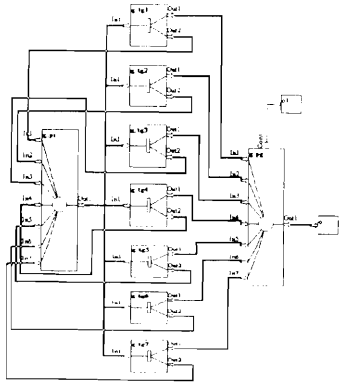
- *Colored Petri Nets*, where tokens of different colors i.e. types are marking the places and considered as conditions for firing [2].
- *Delayed and Stochastic Petri Nets*, for describing time delays in the models [2].
- *Numerical Petri Nets* [5], where the different token types may have numerical and string attributes. These attributes can be considered as conditions for firing evaluated in complex arithmetic and logic relations. System variables for the whole network are reachable both for testing as conditions for firing of any transition and may be modified by their *transition operations* similarly to the attributes of the newly created tokens.
- *Object Petri Nets* already use explicitly the principles of object oriented architecture [4].
- *Knowledge Attributed Petri Nets (KAPN)* [6] make it possible that the tokens can access knowledge bases as their attributes, enabling the introduction of mobile knowledge into the models.

Figure 2

a)



b)



Application of Petri Nets in Simulation

There are numerous fields of application where PNs have been applied extensively [2] [3] [4] [5] [6] for simulation as

- flexible manufacturing systems
- computer networks and communication protocols
- computer systems (hardware and software)
- logistics
- transportation
- management etc.

In practical applications usually high level PNs are used. These enable - among other aspects - that various token types can represent different mobile entities (vehicles, workpieces, persons, etc.) within the system. It is also possible to make complex decisions at various aggregated model elements including also inferencing using knowledge bases.

The utilization of PNs is illustrated on an example using version 3.0 of the CASSANDRA (Cognizant Adaptive Simulation System for Applications in Numerous Different Relevant Areas) simulation system [3], where the internal kernel is based on Knowledge Attributed Petri Nets [6]. The example shown is the model of a flexible manufacturing system (see Fig. 2/a). The individual blocks represent robots and conveyor belts, etc. Internally they are represented by KAPNs as it is shown in Fig. 2/b for the SOURCE block.

Conclusions

The application of Petri Nets in recent years to simulate highly complex systems in a large number of various fields with concurrent procedures revealing the structure of the systems investigated has proven to be very effective, and numerous results of the research undertaken in the field have been implemented. The structure of Petri Nets is promising also for applying them on massively parallel processing hardware in the future. This means that further R&D work as well as new applications can be expected.

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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.

Reports from ASIM

ASIM's annual conference took place from September 27 to 30 in Berlin. About 130 papers were presented, six invited speakers gave their presentations and a panel discussion was organized. The program was accompanied by meetings of software user groups, tutorials, and an exhibition. The social program was very interesting and more than 350 participants had good chances to participate in the interesting program, to meet old friends, and to make new friends.

On Monday, September 27th, the ASIM Board met for the preparation of ASIM's general assembly. The Board thanked Prof. Sydow for the organization of the conference. Further subjects of discussion were: a) A new working group was founded under the title "*Simulation in Physik und Chemie*". Initiator and first speaker of the working group is Prof. Müller-Preußker of Humboldt Universität Berlin. He presented his concept at the meeting. b) Preparations of the ASIM symposium in Stuttgart in 1994 are proceeding well, see also below.

About 60 members of ASIM met on Tuesday, September 28th, for the ASIM general assembly. Main point of that meeting was the election of the new Board. The ASIM Board has 8 elected members, additionally all speakers of the working groups are members of the Board. The following 8 persons were elected by the general assembly: Bausch-Gall (München), Breitenecker (TU Wien), Grützner (Universität Rostock), Halin (ETH Zürich), Kampe (FHT Esslingen), Krug (DUAL Zentrum Dresden), Möller (TU Clausthal), Schäfer (DAIMLER-BENZ, Berlin). The following speakers of the working groups are additional members of the curent Board: Fuss, Hummeltenberg, Kuhn, Müller-Preußker, Münch, Szczerbicka.

Prof. Ameling, one of the founders of ASIM in 1981 and speaker from 1985 to 1991, was no candidate. In a short note he declared that he wanted to give younger scientists a chance to work for the society. ASIM thanked Prof. Ameling for all his activities and the work he performed during the founding and growing phase of ASIM. Without his work ASIM would not be what it is today.

The general assembly agreed furthermore to raise the membership fee from DM 30,00 to DM 50,00 per year for individual members. Main reasons for the increase were the major raise of fees of the German Bundespost and the growth of ASIM, so external help for mailing and other administrative work is necessary.

ASIM's newly elected Board will meet on December 3rd to elect the new speaker and vice speaker and to define further positions amongst the Board members.

Contact Addresses

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ASIM Meetings to come

January 31 - February 1, 1994: Joint spring workshop of the working groups "*Simulation Technischer Systeme*" and "*Simulationsmethoden und Sprachen für parallele Prozesse*" in Vienna.

Februray 22, 1994: Meeting of the working group "*Simulation von Verkehrssystemen*" in Hanover.

March 24 - 25, 1994: Workshop of the working group "*Simulationssoftware und -hardware*" in Clausthal-Zellerfeld.

April 13 - 15, 1994: Workshop of the working group "*Simulation und künstliche Intelligenz*" at DLR in Braunschweig.

April 28 - 30, 1994: *6. Ebernburger Gespräche* of the working group "*Simulation in Medizin, Biologie und Ökologie*".

October 10 - 13, 1994

The **9th Symposium on Simulation (ASIM 94)** will take place at Stuttgart University in southern Germany on October 10 to 13, 1994. The symposium will be organized by Stuttgart University (Prof. Zeitz) in co-operation with Fachhochschule für Technik Esslinen (Prof. Kampe). It will be a platform for the presentation and discussion of problems and solutions in modelling and simulation, regarding theoretical as well as practical aspects. Three main areas of interest will be

covered: methods of modelling and simulation, tools, applications.

Invited speakers will report on 5 topics: coupling of simulation programs, automotive simulators, industrial simulation applications in chemistry, models and simulation in molecular genetics, state-of-the-art of simulation in the GUS.

For October 10, user group meetings (e.g. ACSL, MATRIXx, Spice, MATLAB, GPSS) and tutorials will be organized on hardware-in-the-loop simulation, simulation in mechatronics, animation. An exposition of hardware and software for simulation will be part of the symposium. An ASIM plenary meeting is planned for October 11.

Deadlines: March 1, 1994 for abstracts;
July 1, 1994 for camera-ready copies.

Further details may be obtained from Dipl.Ing. (FH) Martin Kraus, FHTE, Flandernstr. 101, D - 73732 Esslingen, Tel: +49-(0)711 397 3755, Fax: +49-(0)711 397 3763, E-mail: kraus@ti.fht-esslingen.de.

September 1995: EUROSIM Congress in Vienna.

Meetings with ASIM participation

August 22 - 25, 1994: CISS - First Joint Conference of International Simulation Societies, ETH Zürich. Contact Dr. Halin.

August 28 - September 2, 1994: IFIP-GI-Jahrestagung 1994. Fachgespräch Simulationstechnik. Contact: Dr. I. Bausch-Gall.

Working Groups

"Simulationsmethoden und Sprachen für parallele Prozesse"

January 31 and February 1, 1994: Joint workshop with working group "*Simulation technischer Systeme*", see below.

Speaker: Dr. Hans Fuss, GMD-I1, Postfach 1240, D-53731 St. Augustin 1. Tel: +49-(0)2241/14-3125, Fax: +49-(0)2241/14-3006, E-mail: fuss@gmd.de

"Simulationssoftware und -hardware"

24. bis 25. März 1994: Workshop mit dem Thema: Die Bedeutung von Simulationssoft- und Hardware zur Lösung von Ingenieuraufgaben. Institut für Informatik der Technischen Universität Clausthal in Clausthal-Zellerfeld. Eingeladene Vorträge von Prof. Zenger (TU München), Prof. Durst (Erlangen), Prof. Burkhardt (TU Hamburg), Präsentation der Firmen DEC, HP, IBM, SNI, SUN.

Speaker: Prof. Dr. Dietmar P.F. Möller, TU Clausthal, Institut für Informatik, Erzstraße 1, D-38678, Clausthal-Zellerfeld, Tel. +49-(0)5323/722402 or 722504, Fax +49-(0)5323/723572

"Simulation und künstliche Intelligenz"

The 7th workshop will take place from April 13 to 15, 1994 at DLR in Braunschweig. Main topic will be "validation".

Speaker: Dr.-Ing. Helena Szczerbicka, Universität Karlsruhe, Institut für Rechnerentwurf und Fehlertoleranz, Postfach 6980, D-76128 Karlsruhe, Tel. +49-(0)721 608-4216, Fax +49-(0)721 370455, E-mail: helena@ira.uka.de

"Simulation in Medizin, Biologie und Ökologie"

6. Ebernburger Gespräche, 28. bis 30. April 1994 zum Thema: Umweltsystemanalyse - Umweltinformatik.

Speaker: Prof. Dr. Dietmar P.F. Möller, TU Clausthal, Institut für Informatik, Erzstr. 1, D-38678 Clausthal-Zellerfeld, Tel. +49-(0)5323/722402 or 722504, Fax +49-(0)5323/723572

"Simulation technischer Systeme"

On January 31 and February 1, 1994 the 11th spring workshop will take place at TU Vienna, Austria. It will be a joint workshop with the working group *"Simula-tionsmethoden und Sprachen für parallele Prozesse"*. Main topics will be mechatronics, software, education, and methods for parallel processes. This workshop will be followed by the 1st MATHMOD conference of IMACS.

Speaker: Prof. Dr.-Ing. Gerald Kampe, FHT Esslingen, Flandernstraße 101, D-73732 Esslingen. Tel: +49-(0)711 397-3740 or 3741

"Simulation in der Fertigungstechnik"

The working group produced a guideline for simulation technology with the title *"Simulationsanwendungen in Produktion und Logistik"*. The book was announced for summer 1993, but due to printing problems the publication will be delayed until November 1993.

Detailed information about the sixth ASIM working group conference *"Simulation und Fabrikbetrieb"* held on 10th and 11th of February, 1993 in Aachen is published as *ASIM-Mitteilungen, Heft Nr. 37*. The next event organized by the working group will take place at the University of Erlangen/Nürnberg in February 1995.

Speaker: Prof. Dr.-Ing. A. Kuhn, Fraunhofer Institut, IML, Joseph-von-Fraunhofer-Str. 2-4, D-44227 Dortmund. Tel: +49-(0)231 9743-132, Fax: +49-(0)231 9743-234

"Simulation in der Betriebswirtschaft"

Speaker: Prof. Dr.-Ing. W. Hummeltenberg, Universität Hamburg, FB Wirtschaftswissenschaften, Bundesstraße 55, D-20146 Hamburg. Tel: +49-(0)4123-4023, Fax: -49-(0)4123-5535

"Simulation von Verkehrssystemen"

The next meeting will be in Hanover, February 22nd, 1994. *Gastgeber ist das Institut für Verkehrswesen, Eisenbahnbau und -betrieb (IVE) an der Universität Hannover. Geplante Präsentationsschwerpunkte sind: Modell des IVE zum Thema Simulation von Betriebsvorgängen im Schienenverkehr, Simulation in der Vorstudie eines europäischen Großprojekts (Tunnel Tirol).*

Zur Schärfung des Problembewußtseins wurde vom Arbeitskreis ein Informationsband "Simulation von Verkehrssystemen" erstellt, der künftig auch als ASIM-Mitteilung gegen einen Druckkostenbeitrag von DM 35.- bei Frau Dr. Bausch-Gall erhältlich ist.

Speaker: Mr. Karl-Heinz Münch, SIEMENS AG, Bereich VT2 CIR, Ackerstraße 22, D-38126 Braunschweig, Tel: +49-(0)531-226-2225, Fax: +49-(0)531-226-4305

I. Bausch-Gall

International Conference "Massively Parallel Processing, Applications and Development" June 21-23, 1994, Delft, The Netherlands A EUROSIM Conference

Abstracts

There is still the opportunity to send your abstract to the Scientific Committee. The absolute deadline for sending your abstract is October 30, 1993. Notification of acceptance will be sent to you before November 15, 1993. The submission of your full paper has to be done before February 15, 1994.

EUROSIM Journal

Conference papers which are of interest for a broader audience will be selected to be published in the EUROSIM Journal "Simulation Practice and Theory". This Journal from the Federation of European Simulation Societies (EUROSIM) is published by Elsevier. The Proceedings of this Conference will also be published by Elsevier.

Invited/Keynote Speakers

Lectures will be held on the following topics: * Programming models * Parallel data bases * Real-time, parallel system for simulation of virtual humans * Meta computing * MPP Architecture * Modelling of MPP Applications * Structural mechanics/Fluid dynamics * Computer simulation of coagulation processes

Experts on these topics, such as W.K. Giloi, University of San Diego/TU Berlin, Ch. Farhat, University of Colorado, L. Katgerman, TU Delft/Alcan International, have accepted our invitation to present a paper. J. Gurd from the University of Manchester expressed also his willingness to present a paper.

ESPRIT/MAST Programme

Some papers will present progress made in relation to parallel data processing in different ESPRIT-projects, forming part of the ESPRIT programme of the European Community. On-going programmes, like HAMLET, PREPARE, DESIRE, PATRANS and PEPS have already shown their interest in presenting several papers, as well as NOWESP. They will also take part in the exhibition on topics as "Parallel programming tools" and "Parallel FORTRAN".

Exhibition

During the Conference in the Aula Congress Centre an exhibition will be organized, partly for commercial use, partly for scientific use. Until now CONVEX, Siemens Nixdorf and some Institutes of the Delft University of Technology have confirmed their participation in the exhibition.

Scientific Committee

The Scientific Committee has been extended with: Prof. Dr. Brian Unger, University of Calgary, Canada; Prof. Dr. N. Petkov, University of Groningen, The Netherlands.

Final Announcement

The final announcement, registration forms and detailed information on the Scientific Programme, registration fee and hotel reservation will be distributed in January 1994.

For information on the conference and exhibition please contact:

Aula Conference Centre
P.O. Box 5020, 2600 GA Delft, The Netherlands
Telephone: +31-15 788022/781340
Telefax: +31-15 786755
E-mail: Secretariaat@rc.tudelft.nl

CSSS

General Information

CSSS (Czech&Slovak Simulation Society) is a scientific non-profit association of Czech/Slovak speaking individuals professionally involved in simulation, which has a 26 years long record. CSSS has now about 70 individual members both from the Czech Republic and the Slovak Republic. Since September 13, 1993, CSSS is a full member of EUROSIM.

Activities

On June 1-4, the traditional **International Symposium on Modelling and Simulation MOSIS 93** was held in Olomouc (Moravia) with about 80 participants from eight countries. Altogether 58 papers were presented in four sessions: New Algorithms for Simulation, Simulation in biology, economics and social sciences, Simulation in Automated Control, Methodology of Modelling and Simulation.

On September 7-9, another traditional domestic meeting of CSSS was entertained by the Mining University of Ostrava (Moravia). The colloquium **Selected Problems of Simulation Models** was attended by 31 Czech and Slovak simulationists who got together over 34 presented papers.

The Slovak Group of CSSS has been preparing a seminar on **Control, Modelling and Simulation of Systems** scheduled for October 12-14 in Sulov (Slovakia). Thirty-five contributions in six sessions are expected by the organizers.

The first meeting of the Local Steering Committee of the **European Simulation Multiconference 95** (ESM 95) took place in Prague on September 29. At present, the following sessions are put forward:

Simulation Theory and Methodology
Simulation Software, Tools and Applications
Simulation and Object Oriented Programming
Advanced Computing and Simulation
Simulation in Transport, Traffic and Telecommunications, in Economics and Business, of Ecological and Environmental Systems, in Military and Defense.

together with a special session for students on all possible topics from the simulation field. By all odds, the ESM 95 will be held in Prague on June 5-7, 1995.

Information for those who are interested in computer simulation in biology, ecology, medicine and health care: the **9th Prague Symposium 94** on this topic will

take place in Zurich (Switzerland) as a part of CISS - First Joint Conference of International Simulation Societies (August 22-25, 1994).

Contact Addresses

Milan Kotva (Chairman of CSSS)
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Tel.: +42-2 7992145 (office), +42-2 464179 (home)
Fax: +42-2 7992318 or 763211 or 7934594
E-mail: simul@utia.cas.cz (NEW!)

Mikolas Alexik (Vice-Chairman of CSSS)
VSDS-KTK, Velky diel, 010 26 Zilina,
Slovak Republic
Tel.: +42-89 54042, Fax: +42-89 54806
E-mail: alexik@uvt.utc.sk

M. Kotva

DBSS

General Information

DBSS is grouping the Dutch speaking simulation people from the Benelux countries. DBSS has a primary goal to promote the advancement of systems simulation.

DBSS is closely co-operating with the other member societies of EUROSIM. Moreover, for already many years, DBSS has affiliation agreements with IMACS (International Association for Mathemathics and Computers in Simulation) and SCSi (Society for Computer Simulation International).

DBSS-Membership

Individuals (in particular Dutch speaking ones) and institutes etc. from the Benelux countries, active in the field of simulation, can become DBSS-member. Membership fee (per annum) is in 1993: 50 guilders or 900 Belgium francs (personal member), 100 guilders or 1800 Belgium francs (institutional member).

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

Dutch Benelux Simulation Society
Secretariat: Computing Centre, P.O. Box 354,
2600 AJ Delft, The Netherlands
Tel: +31-(0)15-785698,Fax: +31-(0)15-783787

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

The membership fee should be paid to: Giro account 3582241, J.C. Zuidervaart, Leeuwerikplantsoen 27, 2636 ET Schipluiden, The Netherlands, with the mention: DBSS membership 1993.

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

J.C. Zuidervaart

FRANCOSIM

FRANCOSIM, the French Speaking Simulation Society, was founded in 1991. Its legal seat is in France, Roanne:

FRANCOSIM
Esplanade Diderot
F - 42300 Roanne, France
Tel. +33-77 70 80 80, Fax: +33-77 70 80 81

Contact: Michel Lebrun or Nathalie Sarles

FRANCOSIM is organized in several working groups:

Discrete Event Simulation Systems

Continuous Systems Simulation

This working group regularly meets at E.S.I.E.E. in Noisy le Grand. The next meeting is due to take place on November 17th, 1993. Following the conclusions of the previous discussions the people interested in this theme decided to dedicate their meetings to the conception of a document giving the users an evaluation of the possibilities of the geatest number of software packages to be found on the market. The meeting of November 17th will deal with starting this study.

Bond Graph Modelling and Simulation

The Bond Graph Club decided to join FRANCOSIM and operate on a collaboration basis in January 1993. Since then a Bond Graph training course has been oranized in March 1993 in Roanne.

ACSL User Group

Next to the SCS Congress of June 1993 people have expressed their interest in constituting a French User Group. The system already exists in Britain and in the U.S.A. (and in the German speaking countries) and

proves to be an enriching meeting point where various viewpoints are confronted.

The first meeting is planned on November 8, 1993 and is going to take place in la SNECMA, in the Parisian area. If you are interested in this meeting please contact N. Sarles.

Constitution of a MATRIXx User Group

A first meeting of this working group is due to take place in December. The program has not yet been set up, please contact us for further information.

N. Sarles

ISCS

General Information

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

The affairs of ISCS are directed by a Steering Committee presently consisting of the following persons: G. Iazeolla (chairman), F. Cennamo (vice-chairman), V. Grassi (treasurer), M. Colajanni (secretary).

Membership

At present ISCS counts 131 members: 6 institutional, 4 honorary, 119 regular and 2 affiliate.

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

Contact Addresses

For further information or application for membership, please contact:

ISCS
c/o Dipartimento Ingegneria Elettronica
Università di Roma "Tor Vergata"
Via della Ricerca Scientifica
I-00133, Roma, Italy
Phone: +39-6 725944.77 (.78/.86)
Fax: +39-6 2020519
E-mail: iazeolla@irmias.bitnet

Activities

The Italian Society for Computer Simulation is taking part in a project among several research centers and universities in USA, Europe and Asia to create a global knowledge network aiming to facilitate world-wide sharing of information needed for developing environmentally sound products. The name of this project is CERES, and an outline is given below.

CERES, A Global Knowledge Network for Environmentally Sound Product Development

The Concurrent Engineering Research Center (CERC) at West Virginia University, in collaboration with a number of universities in Europe and Asia, has launched an initiative to create a global knowledge network to facilitate world-wide sharing of information needed for developing environmentally sound products. Examples of such information are: processes for recycling, standards for products, laws and regulations, recommended manufacturing processes, materials, and so on.

This project called CERES (for the Roman goddess who was believed to protect the fruits of the Earth) will connect users with globally distributed knowledge bases using current network information infrastructures, such as Internet, and generic servers such as Gopher and WAIS. This should make it possible for any product developer in the world to explore models and information related to product/process/material/deployment alternatives that will have the least impact on the Environment.

It is envisioned that each country/region will create repositories of sharable knowledge that will be made available through the CERES Network. Proprietary knowledge on a pay-for-use basis may also be made available through CERES. This aspect will be explored in future with organizations such as the National Center for Manufacturing Science (NCMS-USA).

The CERES concept is based on the following assumptions:

1. There is global interest in sharing environmental knowledge and thus making it a global resource.
2. Knowledge exists in diverse forms and media.
3. Global information infrastructure is emerging rapidly.
4. Government mandates and incentives for producing environmentally sound products are rapidly evolving.
5. Recycling infrastructure development is becoming a high priority for many countries.

Specifically CERES will contain knowledge pertaining to:

1. Disposability 2. Recyclability 3. Material Substitution 4. Process Alternatives 5. Cost Models 6. Expert Systems 7. Animations/ Simulations 8. Expert Refferal networks 9. Advanced Research results 10. Case histories and other relevant information.

An initial prototype network will be created and demonstrated using the Collaboration Technology developed under the DARPA Initiative in Concurrent Engineering (DICE-USA). The prototype network will have nodes at the following universities and research centers:

1. Concurrent Engineering Research Center (USA) - Coordination
2. University of Ghent (Belgium)
3. Eindhoven University of Technology (The Netherlands)
4. University of Roma at Tor Vergata (Roma, Italy)
5. Institute for Research in Productics and Logistics (France)
6. St. Petersburg Academy for Aerospace Technology (Russia)
7. Tokyo Metropolitan Institute of Technology (Japan)
8. GINTIC Institute for Manufacturing Technology (Singapore)
9. Cranfield Institute of Technology (UK)
10. Intelligent Engg. Systems Lab. , M.I.T. (USA)

The initial organizing committee for CERES includes:

Prof. R. Reddy, USA (Chairman); Prof. G. Vansteenkiste, Belgium; Prof. E.J. Sol, The Netherlands; Prof. G. Iazeolla, Italy; Prof. S. Fukuda, Japan; Mr. F. Perihirin, France; Prof. A. Lukoshkin, Russia; Prof. R. Yusupov, Russia; Dr. S. Evans, UK; Mr. D. Sng, Singapore.

The first working meeting of the organizing committee (including present members and other interested persons) is scheduled to be held in Washington, D.C, USA around January, 1994. The project will be kicked off at an International Conference to be held on Lake Baikal (Russia) in the third week of July, 1994. An electronic journal, to be named <CERES Journal>, will itself be made available through the knowledge network.

The following committees of CERES are planned:

1. CERES Network Design Committee
2. CERES Knowledge Representation Committee
3. CERES Journal Committee
4. CERES Organizational Committee

In addition, several domain-specific committees will be formed later. If you are interested in participating in the development of the CERES concept please contact:

Professor Ramana Reddy, Director
Concurrent Engineering Research Center
P.O. Box 6506, 886 Chestnut Ridge Road
Morgantown, WV 26506, USA
Tel: +1-304 293 7226 (Office), +1-304 594 1584 (Home)
Fax: +1-304 293 7541, E-mail: rar@cerc.wvu.edu

M. Colajanni

SIMS

The Scandinavian Simulation Society, SIMS, has about 250 members from Denmark, Finland, Norway and Sweden. For 35 years SIMS has served as the regional simulation society in Scandinavia, gathering individuals and organizations involved in simulation. The activities have been concentrated on arranging annual meetings and courses, delivery of information letters, and co-operation at European and international level in the field of simulation.

How to join SIMS ?

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

E.K. Puska
Technical Research Centre of Finland
P.O.Box 208 (Tekniikantie 4)
SF-02151 Espoo, Finland
Tel: +358-0 4561, Fax: +35- 0 456 5000
Email:puska@vtydic.vtt.fi

SIMS'93 in Kongsberg

The 35th SIMS Simulation Conference, Applied Simulation in Industry, was held on June 9-11, 1993 at Kongsberg College of Engineering, in Kongsberg, Norway.

SIMS'93 had 77 participants, mainly from the Nordic countries. Anniversary Paper 'SIMS through 35 Years' was given by Peer Martin Larsen.

In the conference 39 technical papers, consisting of invited and contributed papers, were presented. The technical sessions of the conference were titled:

- Tools and Technology
- Control Applications
- Process Applications
- Mechanical Systems
- Distributed Parameter Systems
- Factory Planning and Production Management.

During the conference demonstrations of nine simulation software products were given, too.

Social events of the conference were connected with the history of Kongsberg in mining and refinement of silver and production of silver coins: The 'Get Together' was held in The Kings Mines, and Conference Dinner in The Smelting House.

SIMS Annual Meeting was also held during the SIMS'93 in Kongsberg. The members of the SIMS board are at present:

Torleif Iversen (chairman)	Norway
Eija K. Puska (secretary)	Finland
Odd Falmyr	Norway
Niels Houbak	Denmark
Sakari Kaijaluoto	Finland
Lars Langemyr	Sweden
Poul Rathje	Denmark
Agneta Sjvgren	Sweden

Further, Kaj Juslin (Finland) will continue as SIMS representative in international organisations, and Lars Lidner (Sweden) as treasurer.

The SIMS'93 Conference Proceedings are available from Torleif Iversen, SINTEF Automatic Control, N-7034 Trondheim, Norway (Tel.: +47-7594474, Fax:+47-7594399, E-mail:torleif@itk.unit.no) with the cost of 300 Nkr plus expedition and shipping costs.

E.K. Puska

UKSS

UKSS Committee News

The Annual General Meeting and a Committee Meeting were held during the UKSS Conference in Keswick. Richard Zobel retires as Chairman of the Committee, but remains the International Liaison Officer. Adrian Magill retires as Treasurer and also steps down from the Committee. Many thanks to both for all their hard work in helping UKSS to start up. Thanks also to Sally Brailsford, David Maclay, Mohammed Rahbar who stand down from the Committee. Rob Pooley takes over as Chairman, and Anona Hawkins as Treasurer. Russell Cheng continues as Secretary, Elizabeth Rimmington as Membership Secretary, David Murray Smith remains on the Committee. We welcome new Committee Members Jeff Baynham and Gwyn Jones.

It was agreed to try to arrange one-day meetings this coming year on real-time simulation and control, object oriented programming, graphical applications and analysis, virtual reality and organisational modelling.

It was agreed that the UKSS Conference should take place at least once every two years rather than every three years as at present. The next Conference is scheduled provisionally for Spring 1995.

Contact Address

The annual subscription for an individual member is unchanged at 20 pounds Sterling. Information about UKSS Membership and other events may be obtained from:

Mrs. Elizabeth Rimmington
Computing Centre, Watts Building
University of Brighton
Moulescomb, Brighton BN2 4GJ
Tel: +44-(0)273 600 900

Russell Cheng

UKSS 93 Conference on Computer Simulation. A EUROSIM Conference.

The UKSS 93 Conference was held from 13-15 September 1993 at the lovely old Victorian Keswick Hotel in the small village of Keswick in Cumbria. Keswick is in the northern part of the Lake District in a beautiful part of England close to Derwentwater lake. The area is renowned for hill walking and is very popular with tourists. The conference was chaired by Richard N. Zobel, Computer Science, University of Manchester with programme chairman Rob J. Pooley, Computer Science, University of Edinburgh.

Commencing with a get-together party on Sunday evening, 12 October, the Conference opened on Monday with a superb invited presentation by Prof. Graham Birtwhistle, University of Calgary, entitled "Objects - Then and Now", which was entertaining, illuminating and thought provoking. The conference continued with twin parallel sessions on:

Robotics * Discrete Event * Education and Training * Environmental Simulation * Manufacturing * Military and Aerospace * Object Oriented Simulation * Organisational Modelling * Real Time * Neural Networks * Transport * Panel Session: Future Directions * Tools and Methodology * Parallel Simulation * Tools * Applications and Techniques.

The conference was well supported by an industrial simulation exhibition in the delightful, large (but slightly leaking!) conservatory. Exhibitors included Applied Dynamics International, Encore Computers, Production Modelling Corporation of Europe, The Solutions Foundry, Integrated Systems Inc. Ltd, with displays by the Society for Computer Simulation International and Elsevier Science Publishers.

Activities arranged during the conference included an ACSL Users Group meeting, EUROSIM Board meeting, "Simulation Practice and Theory" Editorial Board meeting, UKSS Committee meeting and the UKSS Annual General Meeting. The participants comprised a satisfying combination of academic, industrial and foreign visitors in approximately equal numbers.

Social events included the get-together party, the conference dinner and a boat trip (in the rain!) on Derwentwater lake. The conference and venue were judged by the participants to be excellent. The next UKSS conference will be in 2 years time, date and venue to be announced.

Copies of the Proceedings (ISBN No. 0 9516509 1 2) are available at £20 (surface mail) from R.J. Pooley, Dept. of Computer Science, University of Edinburgh, Kings Buildings, Mayfield Road, Edinburgh EH9 3JZ, U.K. (Fax: +44-31 667 7209; email rjp@dsc.ed.ac.uk). The contents will be given in the next issue.

Richard Zobel

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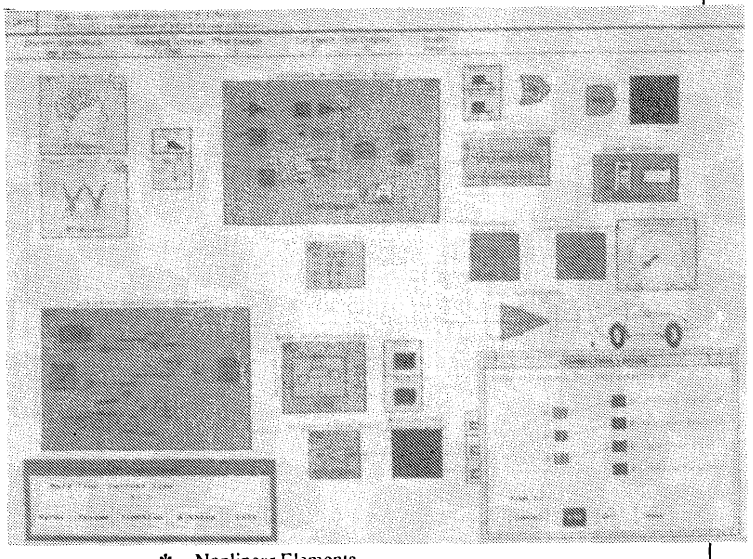

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CROSSIM

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

CROSSIM sent a letter of intention to EUROSIM with a request to become a full member of the EUROSIM federation in June 1992. The Society is also in the process to become the affiliation institution with The Society for Computer Simulation, USA.

Membership

The annual membership fee is equivalent to 8 German marks for regular members, and 2 German marks for students. CROSSIM currently has 47 individual members (including one member from each of the following countries: USA, United Kingdom and Hungary).

Contact Address

Professor Vlatko Ceric
Chairman of CROSSIM
Faculty of Economics, University of Zagreb
Kennedyjev trg 6, 41000 Zagreb, Croatia
Tel: +385-41 231 111, Fax: +385-41 235 633
E-mail: vlatko.ceric@uni-zg.ac.mail.yu

Activities

- Co-organizing the 3rd Operations Research Conference in Croatia, held from 5-7 October 1993 in Rovinj, Croatia. This conference had a simulation session.
- Organizing a simulation seminar which is regularly held at the Faculty of Economics, University of Zagreb.
- Co-operation in founding of the new international journal Computing and Information Technology, launched in 1993 (including computer modelling topics). Anybody interested in receiving information about the journal may contact the CROSSIM Chairman.
- Work on several scientific projects in discrete and continuous simulation, and applications of simulation in such diverse fields as engineering, economy, medicine, ecology, etc.
- Publications (textbook on Simulation Modelling /in Croatian/ by Vlatko Ceric published in 1993, papers in international and domestic journals and conference proceedings).
- Co-organizing the 16h International Conference "Information Technology Interfaces" ITI '94, to be held in Pula, Croatia, from 14-17 June 1994. The conference traditionally has a strong simulation session. Anybody interested may contact the CROSSIM Chairman.
- Co-organizing the 4th Operations Research Conference in Croatia, to be held in October 1994 in Rovinj, Croatia. The conference will have a simulation session. Papers are in Croatian and English. Anybody interested may contact the CROSSIM Chairman.

V. Ceric

Hungarian Simulation Group IMACS/Hungary

As we have announced already in the last issue of EUROSIM - Simulation News Europe, as a succession of the series of IMACS European Simulation Meetings organized in Hungary (Discrete Simulation and Related Fields 1980, Simulation in Research and Development 1984, Problem Solving by Simulation 1990) the organization of the next IMACS European Simulation Meeting to be held in the last week of August 1995 proceeds well. The conference is intended to be held in Gyor at the Szechenyi Istvan College. Similarly to our former conferences we are expecting active participation also from overseas and the Far East beyond Europe.

At the end of this year we intend to organize for Hungarian participants a seminar and demonstration of AI controlled simulation where beyond simulation experts people from the potential users community are expected.

In summer 1993 we renewed our application from 1992 for membership in EUROSIM.

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

A. Jávor

CISS

Simulation

August 22-25, 1994
ETH Zurich, Zurich, Switzerland

Extended abstracts of the papers (two pages typewritten without drawings and tables) are due to arrive IN QUADRUPLICATE at the office of the General-Conference-Chairman, Jurgen Halin, before January 31, 1994. Please mention in your abstract the originality of your contribution.

Only original papers, written in English, which have not previousl been published elsewhere will be accepted. In case you want to organize a panel discussion, please contact the corresponding program chairman.

Simulation Methodology and Tools
Chairs: Niels Houbuk, Lingby (DK)
Walter Schaufelberger, ETH Zurich (CH)

Simulation of Energy and Environmental Systems
Chairs: Ariel Sharon, Oak Brook, Il (USA)
Brian L. Smith, PSI Würenlingen (CH)

Simulation of Multibody Systems
Chairs: R. Schwertassek, DLR Oberpfaffenhofen (D)
Hans Brauchli, ETH Zurich (CH)

Simulators, Methods, and Applications of Real Time Simulation
Chairs: R. Zobel, Univ. of Manchester (UK)
Robert O'Reilly, Montreal (CDN)

Simulation by Means of Vector-, Parallel, and Neurological Computers
Chairs: Marie Lou Padgett, Auburn Univ., AL (USA)
Kevin Gates, ETH Zurich (CH)

Simulation in Design and Manufacturing
Chairs: Henry Pierreval, Inst. Franç. Mecanique Avancée, Aubiere (F)
Gabriele Schröder, Siegrid Wenzel, Fraunhofer Institute, Dortmund (D)

Simulation in Biology, Ecology and Medicine
Chairs: Milan Kotva, Univ. of Prague (CS)
Edward Dowd, WHO, Geneva (CH)

Simulation using Bond-Graphs
Chairs: M. Lebrun, Sor Imagine, Roanne (F)
Jean Thoma, J. Thoma Cons., Zug (CH)

Building Simulation
Chairs: Rick Van de Perre, Brussels (B)
Alfred Moser, ETH Zurich (CH)

General Conference Chair:
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ETH Zürich,
Institute of Energy Technology
Clausiusstrasse 33,
CH-8092 Zürich
Tel.: +41-1-632-4608
Fax: +41-1-262-2158
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e-mail: Karplus@cs.ucla.edu

General Finance Chair and Coordination:
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Participating Societies

- **CASS**: Chinese Association for System Simulation
- **CSSS**: Czech&Slovak Simulation Society
- **EUROSIM**: Federation of European Simulation Soc.
- i.e. **ASIM**: Arbeitsgemeinschaft Simulation, Germany
- **DBSS**: Dutch and Benelux Simulation Soc.
- **FRANCOSIM**: French Simulation Society
- **ISS**: Italian Simulation Society
- **SIMS**: Scandinavian Simulation Soc.
- **UKSS**: United Kingdom Simulation Soc.
- **IBPSA**: Intern. Building Performance Simulation Assoc.
- **JSST**: Japanese Society for Simulation Technology
- **KSS**: Korean Simulation Society
- **LSS**: Latvian Simulation Society
- **SCSI**: Society for Computer Simulation International
- **SVI/FSI**: Swiss Federation of Information Prof. Soc.
- **PAR-SI**: Group for Parallel Systems of the Swiss Inform.Soc.

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ROMSIM

The Romanian Society of Modelling and Simulation

The activity in the field of modelling and simulation in Romania has started 30 years ago, but the first society was set up in 1991 and was called ROAMSE - Romanian Association of Modelling and Simulation. Its founder members were 40 and another 100 joined the society. In 1992 ROAMSE changed into ROMSIM - the Romanian Society of Modelling and Simulation. Since the modelling and simulation activity was an activity mainly carried on by oneself, ROMSIM hoped in and realized from the beginning a better communication of the specialists in the field. The aim of ROMSIM is to gather all people interested in advanced modelling and simulation techniques. We wish to establish a profitabie connection between those who propose methods, models, algorithms and instruments, and those who are working on practical applications. ROMSIM is a nonprofit society, the purpose of which is to develop modelling and simulation systems, from both theoretical and practical point of view, and also the related fields, e.g. system analysis, optimization and control of systems, etc.

The first important act of our society was to organize a Workshop "Modelling and Simulation". It was in September 1991 at ICI - Research Institute for Informatics, Bucharest, where ROMSIM is located. The workshop was attended by about 100 people, and over 50 papers were presented, advanced modelling and simulation methods, and applications. Some of the papers presented at this workshop were included in the special issue of the Romanian Journal of Informatics and Automation (no.3/1992). ROMSIM keeps its members in touch with the significant events, and supported them in attending IFAC'91 Symposium on Design Method of Control Systems (Zürich), SAS'92 Conference on Systems Analysis and Simulation (Berlin), AMSE'92 Conference on Signals and Systems (Geneva), etc.

In the opinion of Romanian managers modelling and simulation activities could provide decision support. The Romanian specialists in modelling and simulation are requested to contribute to solving some important problems, e.g. modelling and simulation of macro-economic systems, power systems, ecological systems. If the efforts of these people will bear fruits depends not only on their own knowledge and instruments, but also on the integration of ROMSIM into Europe, via EUROSIM.

ROMSIM is interested in co-operating with the EUROSIM societies. Please contact Dr. Florin Stanciulescu, ROMSIM President, on the address: Dr. Florin Stanciulescu, ROMSIM, Research Institute for Informatics, 8-10 Averescu Avenue, RO-71316 Bucharest 1 - Romania

SCS

ESM'94
1994 SCS European Simulation Multiconference
Barcelona, Spain, June 1-3, 1994

ESM'64 is hosted by the Universitat Politecnica de Catalunya. The Scientific Program is structured aroud seven major themes: Simulation Methodology and Applications, Object Oriented Modeling and Simulation, Qualitative Information, Fuzzy Techniques, and Neural Networks in Simulation, Simulation in Aerospace, Simulation of Continuous Processes, Simulation in Manufacturing and Logistics, Simulation in Electronics.

Contact address for information: Philippe Geril. The Society for Computer Simulation, European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Belgium. Tel/Fax: +32-9 2234941, E-mail: scsi@fland.rug.ac.be

Official Inauguration of the SCS European Chair in Simulation Sciences

Establishment of the European Branch of the McCleod Institute of Simulation Sciences
Initiation of the Esprit Working Group "Simulation in Europe"

I. SCS European Chair in Simulation Science

SCS (The Society for Computer Simulation International) is a non-profit society which has as its major goal the promotion of computer simulation in broad perspective. SCS has a world-wide membership, although 70% in the USA and Canada.

At the occasion of the 40-years anniversary of SCS in 1992, it was decided to establish an "SCS European Chair in Simulation Sciences". It was the intention to guarantee an optimal international co-operation in education and research in the field of computer simulation and closely related fields through an international and multiple occupation of the chair, supported by a number of different European Universities. It is left to the chair holders to initiate activities in mutual co-operation with respect to courses, research, exchange of scientists, etc. The activities should however not be restricted to the own universities, but rather cover a broad European framework.

II. Chair holders

The SCS proposal submitted to a number of European Universities has been accepted by the University of Ghent (Belgium) and the University of Salford (UK), with as the chair holders respectively Prof. G.C. Vansteenkiste and Prof. J. L. Hay. In order to broaden the European integration of the activities to be developed, another chair holder from a 3rd EC member country was invited to participate: Prof. E.J.H. Kerckhoffs (Delft University of Technology, The Netherlands).

Especially with the aim to start activities in the framework of the SCS Chair in Simulation Sciences at the University of Ghent, Prof. Kerckhoffs has been appointed as part-time professor of the University of Ghent. Prof. Kerckhoffs has an intensive and productive working relation with the University of Ghent (especially the group of Prof. Vansteenkiste) already for more than 15 years.

III. Official inauguration of SCS Chair

The official inauguration of the SCS Chair in Simulation Sciences took place on October 11th in the Aula of the University of Ghent. In the inauguration program the Rector of the University of Ghent, a representative of the Commission of the European Communities (DG Industry), the International Director of the McCleod Institute of Simulation Sciences, and the chair holders as well, gave a short speech. The major part of the program was formed by lectures of some international top-researchers in simulation technology and related fields: Prof. Ramana Reddy (Director Concurrent Engineering Research Centre - USA), Prof. Walter Karplus (Professor UCLA - USA), and Prof. A. Medin (Director Institute for Simulation and Training - USA).

IV. McCleod Institute for Simulation Sciences

A first initiative related to the SCS Chair is the establisment of the centre of the European branch of the McCleod Institute of Simulation Sciences (John McCleod was the founder of SCS). The McCleod Institute is operational in a network of Universities (currently: California State University/USA, University of Ottawa/Canada, University of Naples/Italy). The institute has as its goal the promotion of computer simulation through the development and implementation of educational curricula, research projects, exchange of scientists, contacts to industry, etc. The International Director of the Institute is Prof. R.C. Huntsinger (California State University, USA). It is intended that the SCS chair holders shall co-ordinate the European activities of the McCleod Institute.

V. Esprit Working Group "Simulation in Europe"

In the recent Esprit round a proposal has been submitted by Prof. G. Vansteenkiste, Prof. E. Kerckhoffs and Prof. R. Huber (Barcelona) to establish an official Working Group "Simulation in Europe" in the framework of the Esprit Basic Research program. This initiative was supported by the existing EC Special Interest Group "Si-

mulation in Europe". The Working Group was proposed to focus in a 3-years program on three major themes: 1. Improvement of the modelling and simulation process, 2. New and innovative applications of simulation, and 3. User-simulator interfaces.

Meanwhile, it is known that the Commission of the European Communities has accepted the proposal and will provide financial support. In the Working Group approximately 25 European universities and industrial research institutions are involved. Although the initiative and co-ordination of the Working Group is in the hands of the Ghent SCS chair holders mentioned above, it is emphasized that the Working Group is not at all a pure SCS activity but rather an activity in a broad European framework in which also other European Simulation Societies are involved (such as e.g. EUROSIM).

VI. Workshop "Simformatics" (Ghent, October 12-13, 1993)

Following the official inauguration of the SCS European Chair in Simulation Sciences on October 11, a workshop on "Simformatics" (SIMulation inFORMATICS) took place. In this workshop it is tried to give a more general and more future-oriented meaning to simulation than it currently has. A major part of the speakers of the inauguration program were also speakers during the workshop.

E.J.H. Kerckhoffs

IMACS

1. MATHMOD VIENNA

February 2-4, 1994
Technical University Vienna, Austria

Scope: All aspects of mathematical modelling of all types of systems, including systems which are * dynamic or static * deterministic or stochastic * continuous or discrete * lumped parameter or distributed parameter * linear or nonlinear.

Social program: Get-Together Party (Tuesday, February 1) * Reception by the Mayor of Vienna (Wednesday, February 2) * Viennese Heuriger (Thursday, February 3).

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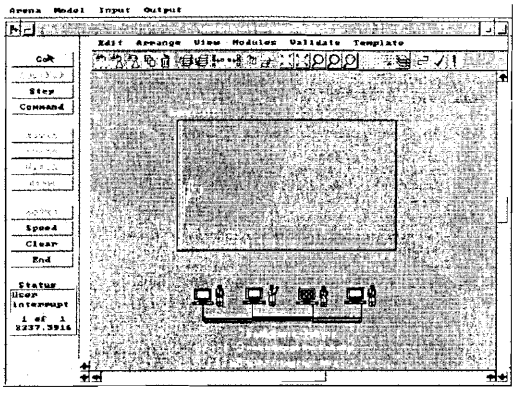
E-mail: itroch@email.tuwien.ac.at

SYSTEMS MODELING CORPORATION

ARENA



Applications in: Enterprise Management, Manufacturing, Business, Transport, Networks, Etc.

ARENA is a Simulation Tool for users from different disciplines and varying degrees of expertise from novice to expert. It supports the user in quick and easy model building in a menu driven comfortable way. ARENA speaks the language of the user.

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ARENA's ease-of-use evolves from the revolutionary Application Solution Template (**AST**), whereby specific modules tailor the software to a user's specific needs, combined with exciting graphics creating visually impressive and effective animations.

Unlike other simulation tools, ARENA modeling constructs are not hard coded (or permanently fixed) into the software, but soft specified into a separate data file (the template) allowing flexibility for any type of project.

The overall structure created within this system means problem solving cannot be made easier.

ARENA is also a portable system which runs on more standard hardware than any other: PCs Running either MS-DOS or OS/2) and Sun Sparc, HP/9000, DECStation, and IBM RS/6000 workstations.

Industry News

Introducing MedModel and ServiceModel ... two new simulation systems

MedModel and ServiceModel are both Windows based simulation systems which provide revolutionary modeling capabilities to the healthcare and service industries. Developed to overcome the specific problems and requirements of their respective fields, they provide all the advantages of ease-of-use, high quality graphics and comprehensive results analysis as the innovative ProModel for Windows. MedModel and ServiceModel each have their own extensive libraries of detailed graphic icons to add realism to the models, and use the same simple method of line drawing to add animation as the ProModel for Windows Simulation System.

For further information contact: Production Modeling Corporation of Europe, Barclays Venture Centre, University of Warwick Science Park, Sir William Lyons Road, Coventry CV4 7EZ, England. Tel: +44-(0)203 693485, Fax: +44-(0)203 690185.

Real-time connection to SIMULINK

dSPACE introduces the Real-Time Interface (RTI) to SIMULINK, one of the most used simulation tools in the control and data processing field. Using the software tools by The MathWorks and by dSPACE, executable real-time code for the DSP boards is generated for any nonlinear dynamic system represented as a block diagram in SIMULINK. A controller design can be implemented in real time within a few minutes.

During real-time experimentation block-diagram parameters can be changed from SIMULINK and directly affect the DSP application without re-generating code. The Real-Time Interface is available for all dSPACE floating-point DSP boards for SUN SPARC workstation platforms.

Other new products: Faster DSP-Board for High-Speed Control, Graphical instrument panel COCKPIT

dSPACE GmbH. An der Schönen Aussicht 2, D-33098 Paderborn, Germany.

IDAS

The Inter Disciplinary Analysis System IDAS characterises itself by the parallel use of three equally weighted typical engineering languages namely

circuit concentrated components,
block orientated signal-flow-graphs,
augmented state graphs

for the modelling of

electric/electronic circuits, electric/electrofluid drives, control systems and processes.

IDAS can be run on IBM compatible PCs on MS-Windows 3.1 and SUN workstations. An IBM RS 6000 version is in preparation.

SIMEC Simulation und Automation, Bernsdorferstr. 210/212, D-09126 Chemnitz.

Book Review

Vlatko Ceric: "Simulacijsko Modelliranje" (Simulation Modelling),

Published by Skolska knjiga, Zagreb, Croatia, 1993, 328 pages, in Croatian language.

This book provides a very good overview of the basic principles of discrete event simulation and systems dynamics. It gives a variety of well illustrated examples, which facilitate understanding and learning of the presented material. The value of this book is emphasized by the fact that it presents some topics which have not been published before in the Croatian language.

The first part of the book deals with the fundamental principles of simulation. Basic ideas relating to simulation modelling are addressed, and the benefits of using this method are discussed. The main types of simulation models are also presented and analyzed.

The second part addresses discrete event simulation. It describes the basic ideas of this method, the development of conceptual models using activity cycle diagrams, and the development of computer models. As a part of simulation software classification and analysis, the author presents the simulation language GPSS using a variety of program examples. The subsequent sections deal with model validation and verification, random number generation, input data analysis, design of simulation experiments, and output data analysis.

The last part of this book gives an overview of systems dynamics. Basic principles of this method are introduced. A special section is dedicated to the systems dynamics software DYNAMO, including various examples of applications of this language. Appendices provide an index of terms as well as a list of relevant books, journals, societies and conferences organized in the area of simulation modelling.

Due to its content, structure, writing style, and numerous practical examples provides, this book can be recommended both to students, and to simulation practitioners involved in real-life simulation projects. The book introduces the reader to the basic concepts quickly and thoroughly, developing the reader's interest to a level of competence that would enable him or her to follow the literature or seek more advanced information.

Vlatka Hlupic

Comparison 6 - Micro Saint

The system: Micro Saint is based on task network modelling. The system to be studied is modelled as a series of tasks. It features two types of animation which facilitate the understanding and development of the model.

The model: With Micro Saint, most of the model development process involves building and defining the network of activities. For this problem, this network simulated the flow of the patient through the system. The network required is presented in Figure 1. On this diagram, the activities that the patient must go through are indicated by the oval-shaped figures, the sequence is defined by the arrows linking tasks, the points at which decisions about "what the patient must do next" are indicated by the diamond-shaped figures, and the points at which queues might build are indicated by the small rectangles located before the activities where the queue for service might be required.

Of course, each of these activities, decisions, and queues required further detail (e.g. service time, decision logic). This information was put into Micro Saint through the development windows opened by pointing to the activity, queue, or decision and "double-clicking" the mouse button. A menu then opened prompting users to provide needed information that can be as simple or complex as the problem demands. In this model, most of the these entries were straightforward (e.g. service times), but there was some slight complexity in defining patient flow as a function of patient type and service received. An example of the window for defining the branching logic for patient flow after receiving treatment at a casualty ward is presented in Figure 2.

In addition to building the network model, we also built an Action View animation that enabled us to watch patients flow through this system.

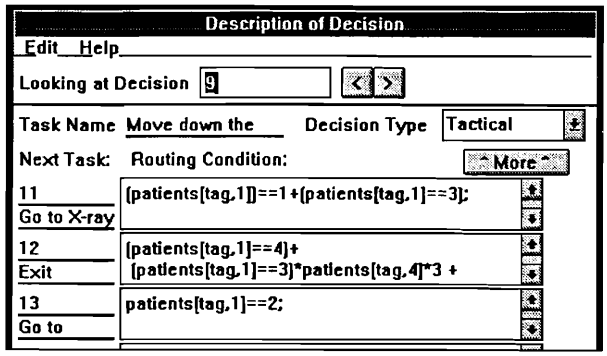

Figure 2: Decision window

Table 1 presents the time that the clinic completed serving all 250 patients and the mean service times for each of the four different patient types, based on ten simulation runs:

Table 1 Service Times (mins)

	task a	task b	task c
close(hr)	13.50	14.20	12.52
type 1	236.9	247.0	128.9
type 2	136.1	144.9	135.0
type 3	263.2	289.5	142.2
type 4	130.7	129.4	119.5
overall	176.9	181.3	127.1
std dev	82.7	94.7	56.8

task a: baseline model
task b: moving doctors when queues > 20
task c: equally allocated doctors & sorted queues

Model development time: Using a moderately experienced modeller, the total time required to develop the baseline model for the problem presented was eight hours.

A discussion of the results obtained with Micro Saint will be given in the next issue.

Ron Laughery, President, Micro Analysis and Design, Suite 201E, 4900 Pearl East Circle, Boulder CO 80301, USA; Andrew Rayner, Rapid Data Ltd. Crescent House, Crescent Road, Worthing, W Sussex BN11 5RW, U.K., Tel: +44-(0)903 821266, Fax: +44-(0)903 820762

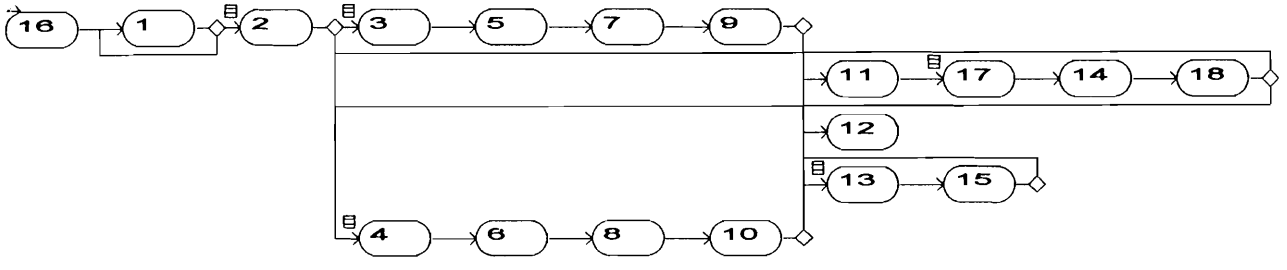

Figure 1: Task network diagram

Comparison 6 - GPSS/H

GPSS/H is a flexible and efficient general purpose simulation language. The Comparison 6 logic was easy to implement using Transactions for patients *and* doctors, and User Chains for queuing. The model can run under the widely available Student version of GPSS/H.

Our initial model showed "exploding" (continuously growing) queues. We stepped back to do some non-simulated analysis of the system flow. Given the patient arrival rate, the distribution of patient types, and the routings, we can calculate the demand at each treatment point. Similarly, we can calculate the capacities based on the given service times. (The mean of a triangular distribution is (min+mode+max)/3.) Table 1 gives the demand (ignoring the effects of upstream bottlenecking) and capacity at each station. CW1 and CW2 are the main bottlenecks. We expect to see "exploding queues" at registration and at CW.

Area	Demand (Patients/hr)	Capacity (Patients/hr)	Theoretical Utilization (%)
Registration	200	105.88	188
CW1	168	37.11	453
CW2	112	27.27	411
X-Ray	90	40.45	222
Plaster	50	15.65	319

Table 1. Calculated demand vs. capacity

Part (a): In the presence of exploding queues, the "overall treatment time" cannot assume a steady state. Furthermore, the proportion of patient types at the output does not match that at the input because Types 1 and 3 get hung up twice in the CW queue. To solve this problem, we limit the arrivals to 250 patients each day, and run the model until the system empties (Table 2). All of our experiments from now on use this approach.

	Count	Mean Time	Std. Dev.
OVERALL	250.0	171.959	79.020
TYPE 1	83.8	230.731	63.621
TYPE 2	54.6	144.854	62.866
TYPE 3	14.1	250.154	51.216
TYPE 4	97.5	124.891	58.200

Table 2. Part (a) with a limit of 250 arriving patients

Notes on GPSS/H Experimentation: Using the Control Statement Programming Language of GPSS/H, we ran 10 separate one-day trials for each part. All numbers in the tables are averages over the 10 trials. By specifying separate random number streams, we used the same patient arrival stream for each experiment. Execution of each ten-day experiment on a 486SL/25 PC running GPSS/H Professional took eight to 13 seconds.

Part (b): Part (b) asks us to switch two doctors when CW2 gets congested. We assumed that the given times are for the doctor types. So, in our Part (b) model, the CW2 doctor working in CW1 takes the longer times (mode 4.1) multiplied by 1.2. For the CW1 doctor working in CW2, the shorter times (mode 3.2) are used.

What will the doctor shift accomplish? Our analysis showed that both CW stations are overutilized. When we switch, both CW stations are still overutilized, the total CW capacity decreases, and the times get worse (Table 3). We eliminated the switching of doctors for all subsequent experiments.

	Count	Mean Time	Std. Dev.
OVERALL	250.0	182.487	91.369
TYPE 1	83.8	247.102	81.806
TYPE 2	54.6	151.116	69.788
TYPE 3	14.1	257.791	72.546
TYPE 4	97.5	133.049	68.480

Table 3. Part (b), in which doctors can switch

Part (c): In part (c), we are asked to minimize the standard deviation of total treatment time by introducing a priority ranking. The suggested ranking is "second visits to X-Ray or CW have priority" with FIFO queuing within each priority group (Table 4).

	Count	Mean Time	Std. Dev.
OVERALL	250.0	159.477	73.147
TYPE 1	83.8	158.430	72.063
TYPE 2	54.6	166.765	74.819
TYPE 3	14.1	175.840	70.085
TYPE 4	97.5	153.691	72.392

Table 4. Part (c) with the suggested priority ranking

To further lower the standard deviation, we can try to treat everyone more equally. Because all four types visit CW shortly before leaving, we used this discipline at CW: "first-time Type 1 and Type 3 patients have priority, followed by everyone else ranked by longest time in system." This is easily implemented in GPSS/H by computing a ranking value (0 for priority patients and arrival time for everyone else) then LINKing to a User Chain in rank order. Results are shown in Table 5.

	Count	Mean Time	Std. Dev.
OVERALL	250.0	200.752	52.926
TYPE 1	83.8	196.876	51.894
TYPE 2	54.6	211.342	54.450
TYPE 3	14.1	199.734	48.947
TYPE 4	97.5	197.895	52.121

Table 5. Part (c) with first pass through CW favored

The mean is longer due to new congestion in Plaster and X-ray from the rush of CW Pass 1 patients early in the day. The sacrifice of 41 minutes in the mean for a gain of 20 minutes in the standard deviation is possibly not such a good idea. The approach of sacrificing mean time to improve the standard deviation can be taken to extremes. If we required every patient to remain in the system for, say, 6 hours, we would complete all the cases and have zero standard deviation. In practice, the mean time in system must also be a measure of performance for this system.

For comments, questions, or a copy of the GPSS/H model, please contact Dan Brunner, System Flow, 12644 Chapel Road Suite 210, Clifton, VA 22024, USA, Internet: 75010.2247@compuserve.com

Comparison 7 - STEM

STEM, Simulation Tool for Easy Modelling, is a general purpose simulation package for MS-DOS machines based on Turbo Pascal. A short description of STEM is given in issue number 5 of EUROSIM SNE with comparison 1.

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

```
Environment
  BegValue = 0              (* starting Time value *)
  EndValue = 10             (* ending Time value *)
Declaration
  Measurement               (* no measurements *)
  Constants                 (* constants used in program *)
    c[m] = 1.02             ! mass of pendulum
    c[l] = 1                ! length of pendulum
    c[lp] = 0.7             ! pin distance
    c[g] = 9.81             ! gravity constant
    c[Phi0] = pi/6          ! initial angle
    c[dPhi0] = 0            ! initial angular velocity
    c[d] = 0.2              ! damping factor
    c[PhiP] = -pi/12        ! pin angle
  Zerostate                 (* boundary conditions *)
    s[Time] = BegValue
    s[Phi] = c[Phi0]        ! angle
    s[dPhi] = c[dPhi0]      ! angular velocity
    a[lsPrev] = Conditional(s[Phi]<c[PhiP],c[l]-c[lp],c[l])
Model                       (* the model-equations *)
  a[ls] = Conditional(s[Phi]<c[PhiP],c[l]-c[lp],c[l])
                            ! effective swing length
  d[dPhi]=(-c[m]*c[g]*sin(s[Phi])-c[d]*a[ls]*s[dPhi])/(c[m]*a[ls])
  d[Phi]  = s[dPhi]
Output                      (* output-variables *)
  s[dPhi]=s[dPhi]*Conditional(a[ls]=a[lsPrev],1,Conditio-
nal(s[Phi]<c[PhiP],c[l]/(c[l]-c[lp]),(c[l]-c[lp])/c[l]))
  a[lsPrev] = a[ls]         ! previous effective swing length
Minimization                (* calibration-criteria *)
  TBMin = abs(-pi/2-s[Phi])
```

Most available integration methods in STEM use a variable integration step. This causes that a model block evaluation may be invalid as result of too large an integration step. For this reason, the change of s[dPhi] must be done in the Output Block. s[dPhi] changes when the pendulum is passing the pin. The variable a[lsPrev] is needed to detect this passing, keeping the value of ls at the end of the previous integration step.

Results: a) Simulation with different initial conditions. Running the model it is easy to change the initial conditions. Simulation of the system gives the plots in figure I. This figure shows the angle φ [-1,1], the angular velocity $\dot{\varphi}$ [-5,5] and the effective swing length ls [0,1] for task a i) and a ii). Simulations were carried out with Runge-Kutta-Fehlberg, order 4(5) and a relative error of 1E-6. The calculation time of a simulation was about half a second on an 80486DX computer running at 33 MHz, where about half of the time was spent on numerical and graphical output.

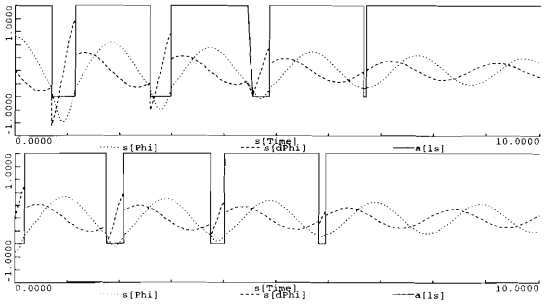

Figure I

b) To compare the two models, STEM permits plots of different models. The easiest way to calculate the deviation of the linearized model, is to run the two models simultaneously. The result is the shown in figure II. This figure shows the angle Phi, the linearized angle PhiL [-0.5,0.5] and LDiff, the difference between Phi and PhiL [-0.05,0.05].

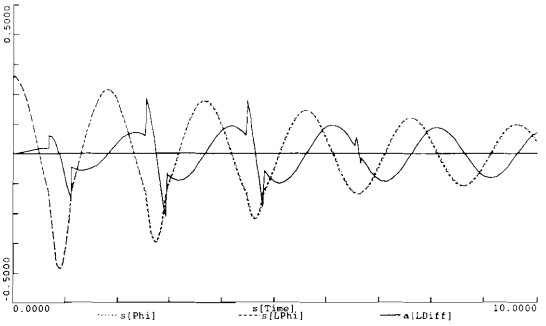

Figure II

c) STEM has facilities for minimization by varying constants automatically using the method of Nelder and Mead. The function to minimize in this model, is the difference between -pi/2 and the maximum angle. This is specified under Minimization. Because the pendulum is damped, this maximum angle is reached as soon as it swings back: $\dot{\varphi} \geq 0$ and $\ddot{\varphi} \geq 0$. To speed up minimization, the model is changed setting d[Phi] to zero as soon as the pendulum is at its maximum angle. Doing so, s[Phi] will be constant at the maximum angle until the end of the simulation interval and can be compared with -pi/2.

Obviously there are two solutions, STEM found 2.2912 (with initial guess 1) and -2.1852 (with initial guess -1) as values for c[dPhi0], the initial angular velocity.

More information about STEM and a demonstration disk containing this model is available with: *Diederik Waardenburg, Resource Analysis, Zuiderstraat 110, 2611 SJ Delft, The Netherlands, Tel. +31-(0)15 122622, Fax +31-(0)15 124892.*

Comparison 7 - SIMUSOLV

SIMUSOLV is an integrated, multifunctional software package designed to help scientists and engineers develop and use mathematical models of physical systems. It is based on ACSL and has essentially all of ACSL's capabilities. In addition, it can perform parameter estimation, optimization, and sensitivity analysis. It provides an easy and versatile means of making experimental data available to the program for parameter estimation, graphing and arbitrary functions. The latest release can solve sets of simultaneous algebraic and differential equations and has many user interfaces that allow the program to interact with or be called by external programs or subroutines.

Model description: This model of the constrained pendulum is based on the model published by Breitenecker (SNE 8, July 1993). The program is modified to make the discontinuity at the pin more reliable by incorporating two DISCRETE segments, one for hitting the pin and one for leaving the pin. In addition, calls to LOGD are added to ensure that values are recorded right when the pedulum hits and leaves the pin. This makes the plots more accurate, although it does not affect the computational results.

```
PROGRAM   Constrained Pendulum
  VARIABLE TIME  $  ALGORITHM IALG=9
  LOGICAL LOG,NORM
  CONSTANT PI    =3.141592654,    PHI0=0.3   ,   L =1.0    ...
          ,G     =9.81          ,  DPHI0=0.0   ,   LP=0.7    ...
          ,D     =0.2           ,   PHIP=-0.2 ,   M =1.02   ...
          ,SDPHI=.02        , TARGET=-1.570796,LAG=1.E-5    ...
          ,TSTOP=10.          , POINTS=100. ,NORM=.TRUE.
  PI2 = PI/2. $  PI6 = PI/6. $  PI12= PI/12. $  PI24= PI/24.
  MPI2 =-PI/2. $ MPI6 =-PI/6. $ MPI12=-PI/12. $ MPI24=-PI/24.
 INITIAL
  CINT=TSTOP/POINTS
  LS   = L-LP
  SWIL =(PHI0-PHIP)*SIGN(1.,PHIP).GE.0.0
  LA    = RSW(SWIL,LS,L)
  LOG=.FALSE.
 END
 DYNAMIC
  DERIVATIVE DER
   SCHEDULE HIT.XN.(PHI-PHIP+LAG)
   SCHEDULE OFF.XP.(PHI-PHIP-LAG)
   DDPHI =-(G/LA)*SIN(PHI) - (D/M)*DPHI
    DPHI = INTEG(DDPHI,DPHI0)
     PHI = INTEG( DPHI, PHI0)
   PROCEDURAL
    IF(LOG) CALL LOGD(.TRUE.)
    LOG=.FALSE.
   END
  END
  DISCRETE HIT
   CALL LOGD(.TRUE.)
   LA    = LS
   DPHI  = DPHI*L/LS
   LOG   = .TRUE.
  END
  DISCRETE OFF
   CALL LOGD(.TRUE.)
   LA    = L
   DPHI  = DPHI*LS/L
   LOG   = .TRUE.
  END
  OF = ABS(PHI-TARGET) $' Objective function for optimization'
  IF(NORM)GOTO 20
  TERMT(DPHI.GT.0.0)  $' Termination condition for Task C '
20..CONTINUE
  TERMT(TIME.GE.TSTOP)
  ZPHI = PHI+GAUSS(0.0,SDPHI) $' Experimental data simulator '
 END
END
```

Task a: This task is accomplished in the same way as Breitenecker described and will not be discussed except to show the required commands and results.

```
PREPARE TIME DPHI PHI  $  SET POINTS=200.  $  START
SET STRPLT=.T. CALPLT=.F. SYMSPL=.F. $ PLOT DPHI PHI
```

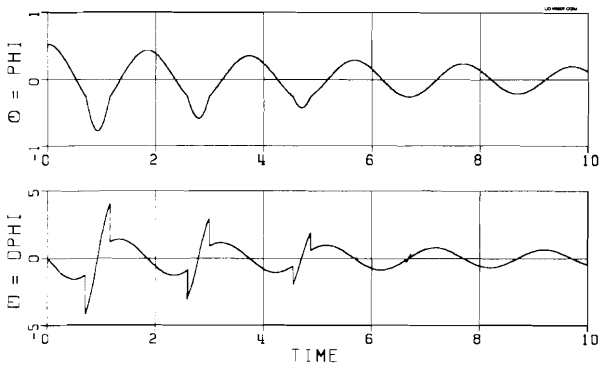

Figure 1

The times when the pendulum hits and leaves the pin are as follows:

Hits:	0.7034670	2.5904100	4.5427100	6.6485700
Leaves:	1.1517900	2.9905400	4.8674900	6.7205000

Task c: Task c is to find the initial angular velocity that causes the pendulum to swing just to the horizontal position after hitting the pin (PHI=$-\pi/2$). This can be accomplished in SIMUSOLV by defining an objective function (OF=ABS(PHI-TARGET)), terminating simulations at the left extremum of a swing (TERMT(DPHI.GT.0.0)), and then minimizing the final value of the objective function by adjusting the initial velocity DPHI0.

At runtime, NORM is set to .F. so that simulations will terminate at the left extrema. Then the following commands set up and run the optimization:

```
SET PHI0=PI6 PHIP=MPI12 DPHI0=-.5 TSTOP=2. NORM=.F.
VARY DPHI0 $ LOWER DPHI0=-3.0 $ MINIMIZE OF 'FINAL' $ OPTIMIZE
```

The response from SIMUSOLV will be:

```
                          DESCRIPTION    PARAMETER ESTIMATES
                          -----------    -------------------
                                         INITIAL       FINAL
        MINIMIZATION VARIABLE, OF        0.74392     1.01328E-05
                                 XPHI0  -0.50000      -2.1938
OPTIMIZATION METHOD: GENERALIZED REDUCED GRADIENT

SUCCESSFUL TERMINATION: ONE GRG LINE SEARCH COMPLETED.

FUNCTION EVALUATIONS FOR OPTIMIZATION =   23
FUNCTION EVALUATIONS FOR STATISTICS   =    0
NUMBER OF LINE SEARCHES =    1
OPTIMIZE TIME =     0.360 SECONDS
```

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RAPID DATA

Comparison 7: New Task d (SIMUSOLV)

We wish to suggest a new task not included in the original Comparison 7. Suppose that we do not know the values of PHI0, DPHI0, D, but we have stroboscopic pictures that show the position of the pendulum at measured times. We can read the angle with a standard deviation of ±0.02. We wish to estimate the values of the three parameters. To do so, we provide the simulated data in the command file as follows:

```
PROC D1
 DATA
  TIME    PHI
  0.     0.7991 $ 0.10   0.7328 $ 0.20   0.5866 $ 0.30   0.4900
  0.40   0.2724 $ 0.50   0.0204 $ 1.00  -0.9520 $ 1.50   0.3731
  2.00   0.4004 $ 2.50  -0.5268 $ 3.00  -0.0600 $ 3.50   0.4088
  4.00   0.0673 $ 4.50  -0.4823 $ 5.00   0.0796 $ 5.50   0.2664
  6.00  -0.0717 $ 6.50  -0.1722 $ 7.00   0.0621 $ 7.50   0.1350
  8.00  -0.0202 $ 8.50  -0.1662 $ 9.00  -0.0169 $ 9.50   0.1387
 END
END
```

It is obvious that PHI0 should be about 0.8 and a couple of simulations suggest that DPHI0 and D should be about -.2 and .3, respectively. Setting these values as starting guesses we can perform a quantitative parameter estimation with the following runtime commands:

```
SET PHI0=.8 DPHI0=-.2 D=.3 $ VARY PHI0 DPHI0 D $ LOWER DPHI0=-3.
FIT PHI   $   OPTIMIZE 'METHOD'='GRG'
```

Part of the resulting report after the parameter estimation is as follows:

```
                                DESCRIPTION    PARAMETER ESTIMATES       STANDARD
                                -----------    -------------------       DEVIATION
                                               INITIAL       FINAL
                    LOG LIKELIHOOD FUNCTION     27.830       56.587
                                      PHI0     0.80000      0.79149      1.163E-02
                                     DPHI0    -0.20000     -0.23711      3.208E-02
                                         D     0.30000      0.39580      1.039E-02

              PHI          PHI                          STANDARDIZED    RESIDUAL
   TIME    OBSERVED    PREDICTED      % ERROR    RESIDUAL      PLOT
 0.0000E+00 0.7991      0.7915          0.95       0.332          |*
 0.1000     0.7328      0.7343         -0.20      -6.352E-02      |
 0.2000     0.5866      0.6152         -4.87      -1.25       *****|
    .
    .
    .
 8.500     -0.1662     -0.1382        -16.82      -1.22        ****|
 9.000     -1.6900E-02  2.6282E-02   -255.52      -1.89     *******|
 9.500      0.1387      0.1144         17.53       1.06           |****

STATISTICAL SUMMARY:
      MAXIMIZED      WT RESID   WEIGHTED   STANDARD   PERCENTAGE
    LOG LIKELIHOOD    SUM OF    RESIDUAL   ERROR OF   VARIATION   WEIGHTING
       FUNCTION       SQUARES     SUM      ESTIMATE   EXPLAINED   PARAMETER
      ---------      --------   --------   --------   ---------   ---------
 PHI     56.59      1.258E-02  7.448E-02  2.448E-02    99.658       0.00

CORRELATION MATRIX:
                PHI0        DPHI0          D
   PHI0         1.000
  DPHI0        -0.6612      1.000
    D           0.7549     -0.6492      1.000

OPTIMIZE TIME =    3.410 SECONDS
```

The log likelihood value (LLF) is a statistical criterion for judging goodness of fit: the more positive it is the better the fit. The values used for simulating experimental data were: PHI0=0.8 DPHI0=-0.25 D=0.4. The LLF with these values is 56.279, not a significantly different fit than obtained using the estimated values.

Figure 1 shows plots of PHI and DPHI using the estimated parameters; the symbols represent experimental data. In Figure 2, contour and surface plots show the sensitivity of LLF to changes in PHI0 and DPHI0. The commands for these graphs are as follows:

```
SET CALPLT=.T. STRPLT=.F.   $   PLOT PHI
SET SYMSPL=.F.              $   PLOT DPHI
MAP POINTS=15   $   MAP 3D REUSE
```

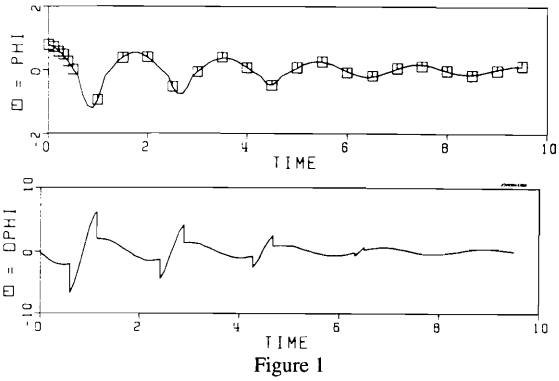

Figure 1

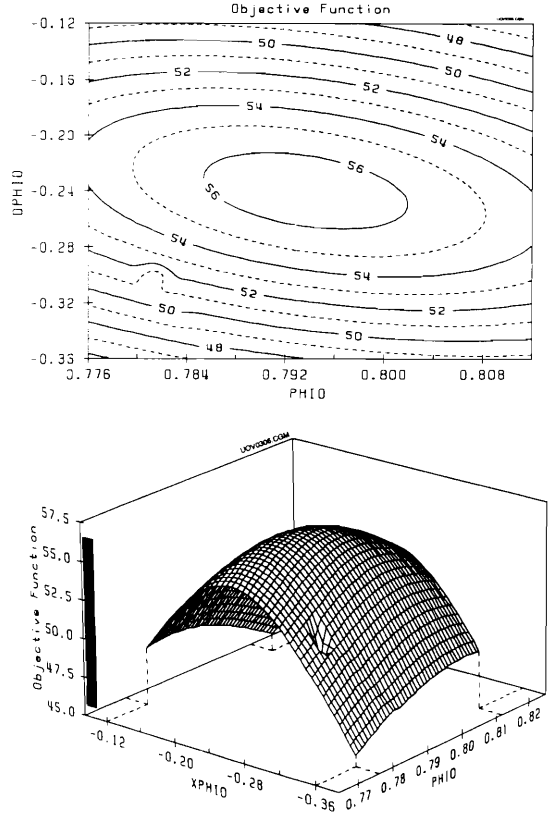

Figure 2

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Comparison 7 - SIMPLEX II

Description of SIMPLEX II: SIMPLEX is an universal simulation system for continuous, discrete and combined models. It consists of a model construction environment with a special model specification language, an experimentation environment supporting execution and administration of model experiments and the presentation environment with functions for business graphics and animation. These three parts are embedded in a common X Window interface with an interactive command language.

Model construction: The pendulum equations are written in a SIMPLEX model component. There are different versions of one component allowed, so that the exact and the linearized model can be implemented in two different files as two versions of one model component. Afterwards two models (named P_exact and P_linear) are to be created by the following commands:

```
CREATEMODEL Pendulum-Vers_1 P_exact;
CREATEMODEL Pendulum-Vers_2 P_linear;
```

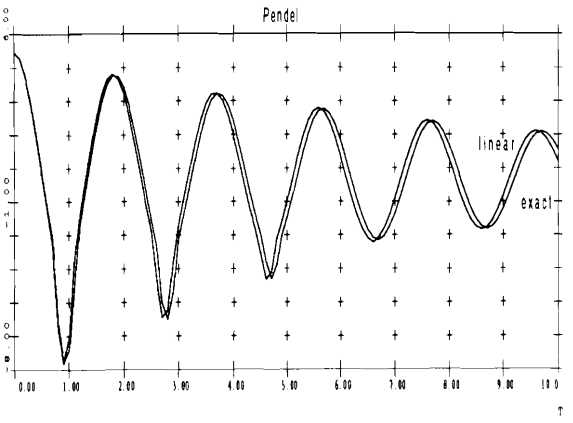
Experimentation: There are two possibilities for executing simulation experiments in SIMPLEX: The interactive and the programmed mode. Here we will introduce the programmed experiments by the aid of the SIMPLEX Experiment Descriptions. One can define the course of an experiment by the elements of a common high level programming language, by using the commands of the interactive command language (written in capitals), and by a very simple read or write access to the value of model quantities (signed by brackets).

Task a/Task b: It follows the experiment description for tasks 1 and 2. First the model is selected, then the observation method is defined, the model quantities are set to the values asked in the task and the run is executed by the SIMULATE-command. This proceeding is repeated four times. Obviously an experiment is able to include runs derived from different models. The results of these runs can be compared using the DRAW-commands which produce the output shown in the figure. Task b can be solved analogously, the results however can not be shown on this single page.

```
EXPERIMENT ASIM_1_2
BODY OF EXPERIMENT
 SELECT MODEL P_exact;
 OBSCOMPLETE spion 0 10 0.05; ADDVAR spion phi;
 <phi> := 0.5236; <d> := 0.2; SIM TO 10;    # Run1
 NEWRUN;
 <phi> :=-0.5236;  <d>:= 0.1; SIM TO 10;    # Run2

 SELECT MODEL P_linear;
 OBSCOMPLETE spion 0 10 0.05; ADDVAR spion phi_L;
 <phi_L> :=  0.5236; <d>:=0.2; SIM TO 10;   # Run3
 NEWRUN;
 <phi_L> := -0.5236; <d>:=0.1; SIM TO 10;   # Run4

 DRAW funct, Run1.phi, Run3.phi_L;
 DRAW funct, Run2.phi, Run4.phi_L;
END OF ASIM_1_2
```



Task c: The third task also can be solved by such an experiment description, because it is possible to declare in it own variables to calculate with. In this solution the search is implemented very simple but is is possible to formulate any other algorithm. After eleven runs the loop ends with a value for the initial velocity phi_1 = 2.29297 which leads to the maximum angle for phi as -1.57116.

```
EXPERIMENT ASIM_3
DECLARATION OF VARIABLES
phi_old  (REAL) := -0.5,    # maximum of last run
velo_old (REAL) :=  0,      # initial vel. last run
velo_act (REAL) :=  1,      # actual velocity
step     (REAL) :=  1,      # variation step
factor   (REAL) := -0.25,   # factor to modify step
accuracy (REAL) :=  0.001,  # max. difference to -pi
Continue (LOGIC):= TRUE,    # flag to leave the loop
pi       (REAL) :=  3.14159

BODY OF EXPERIMENT
SELECT MODEL Pendel;

LOOP <search>  WHILE  Continue  REPEAT
 NEWRUN ;                        # create a new run
 velo_act := velo_act + step;    # determine velocity
 <phi_1> := velo_act;            # set model quantity
 SIMULATE TO 10;                 # execute a run

 # leave the loop if criterion reached:
 IF  ABS( -pi/2 - <phi> ) < accuracy
   DO  EXIT <search>;  END

 # determine the new search step:
 IF ( (<phi>-(-pi/2)) * (phi_old-(-pi/2)) ) < 0
   DO  step := step * factor;  END

 # store actual values for later comparison
 velo_old := velo_act;  phi_old := <phi>;
END LOOP <search>
DISPLAY('velo_act:=%lg,
phi:=%lg\n',velo_act,<phi>);
END OF ASIM_3
```

For further information please contact: J.Wittmann, Uni Erlangen, IMMD IV, Martensstr.1, D-91058 Erlangen, Tel: +49-9131 85 7906, Fax: +49-9131 39388.

Calendar of Events

December 1993

6-10 **International Congress on Modelling and Simulation 1993**. Perth, Australia.
Contact: Michael McAleer, Dept. of Economics, University of Western Australia, Nedlands, WA 6009, Australia, Tel: 61 9 380 3400, Fax: 61 9 380 1016

12-15 **1993 Winter Simulation Conference**. Los Angeles, USA.
Contact: Edward C. Russell, Russell Software Technology, 1735 Stewart St., Santa Monica, CA 90404, Tel: +1-310 453 2927, Fax: +1-310 829 6760.

January 1994

4-7 **HICSS-27**. Hawaii International Conference on System Science. Maui, Hawaii
Contact: Dr. A. Verbraek, Dept. of Information Systems, TU Delft, P.O. Box 356, 2600 AJ Delft, The Netherlands, Tel: +31-15 783805, Fax: +31-15 786632, E-Mail: a.verbraeck@is.twi.tudelft.nl

24-26 **MASCOTS'94**. International Workshop on Modeling, Analysis and Simulation of Computer and Telecommunication Systems. Durham, North Carolina
Contact: Salvatore Tucci, Dipartimento Ingegneria Elettronica, Università di Roma "Tor Vergata", Via Ricerca Scientifica I-00133, Roma, Italy, Tel: +39-(0)6 72594490, Fax: +39-(0)6 2020519, E-mail: TUCCI@tovvx1.ccd.utovrm.it

24-26 **1994 Western MultiConference**. Tempe, Arizona, USA.
Contact: Dr. Ph. A. Wilsey, University of Cincinnati, Tel: +1-513 556 4779, Fax: +1-513 556 7326, E-mail: phil.wilsey@uc.edu

31- February 1
11th Spring Workshop of ASIM Working Group *"Simulation Technischer Systeme"*. Vienna, Austria
Contact: Prof. Dr.-Ing. Gerald Kampe, FHT Esslingen, Flandernstraße 101, D-73732 Esslingen. Tel: +49-(0)711 397 3740 or 3741

February 1994

2-4 **1. MATHMOD VIENNA**. Vienna, Austria.
Contact: Prof. I. Troch, Technische Universität Wien, Wiedner Hauptstr. 8-10, A-1040 Wien.

22 **Workshop of the ASIM Working Group *"Simulation von Verkehrssystemen"***. Hanover, Germany.
Contact: K.H. Münch, SIEMENS AG, Bereich VT2 CIR, Ackerstraße 22, D-38126 Braunschweig, Tel: +49-(0)531 226 2225, Fax: +49-(0)531 226 4305

March 1994

24-25 **Workshop of the ASIM Working Group *"Simulationsssoftware und -hardware"***. Clausthal, Germany
Contact: Prof. D. Möller, TU Clausthal, Institut für Informatik, Erzstr. 1, D-38678 Clausthal-Zellerfeld, Tel. +49-(0)5323 722402 or 722504, Fax +49-(0)5323 723572

April 1994

28-30 ***"Ebernburger Gespräche"* of the ASIM Working Group *"Simulation in Biologie, Medizin und Ökologie"***. Ebernburg, Germany
Contact: Prof. D. Möller, TU Clausthal, Institut für Informatik, Erzstr. 1, D-38678 Clausthal-Zellerfeld, Tel. +49-(0)5323 722402 or 722504, Fax +49-(0)5323 723572

June 1994

1-3 ESM'94, 1994 SCS European Simulation Multiconference. Barcelona, Spain
Contact: Philippe Geril. The Society for Computer Simulation, European Simulation Office, University of Ghent, Coupure Links 653, B-9000 Ghent, Belgium. Tel/Fax: +32-9 2234941, E-Mail: scsi@fland.rug.ac.be

21-23 **Massively Parallel Processing, Applications and Development**. EUROSIM Conference, Delft, The Netherlands.
Contact: Aula Conference Centre, P.O. Box 5020, 2600 GA Delft, The Netherlands, Tel: +31-15 788022/781340 Fax: +31-15 786755, E-mail: Secretariaat@rc.tudelft.nl

August 1994

22-25 **1st Joint Conference of International Simulation Societies**. Zurich, Switzerland
Contact: Dr. J. Halin, ETH Zurich, Institute for Energy Technology, Clausiusstrasse 33, CH-8092 Zürich, Tel: +41-(0)1 632-4608, Fax: +41-(0)1 262-2158

October 1994

10-13 **ASIM 94. 9. Symposium Simulationstechnik**. Stuttgart, Germany.
Contact: Prof. Dr.-Ing. Gerald Kampe, FHT Esslingen, Flandernstraße 101, D-73732 Esslingen. Tel: +49-(0)711 397-3740 or 3741

September 1995

11-15 EUROSIM '95. Vienna, Austria

Classes on Simulation

December 1993

1-3 **CACI Simscript II.5**, Maastricht, Netherlands
Contact: CACI Products Division, G. Martinolaan 85, 6229 GS Maastricht, The Netherlands, Tel: +31 43 670780, Fax: +31 43 670 200

7 **Seminar on SIMPLE++**, Vienna, Austria.
Contact: I. Husinsky, Computer Center, TU Vienna, Wiedner Hauptstr. 8-10, A-1040 Wien, Tel: +43-1 58801 5484.

7-8 **MATLAB Kurs**, München, Germany.
Contact: BAUSCH-GALL GmbH, Wohlfartstr. 21 b, D - 80939 München, Tel: +49-(0)89 3232625, Fax: +49-(0)89 3231063

8 **New Developments in Simulation Technology**. Seminar with CACI and Hewlett Packard, Bracknell, U.K.
Contact: Janine Muijlkens, CACI Products Division, G. Martinolaan 85, 6229 GS Maastricht, Netherlands, Tel: +31-43 670 780, Fax: +31-43 670 200

13-15 **CACI Comnet II5./III**, Camberley, U.K.
Contact: CACI Products Division, Coliseum Business Centre, Watchmoor Park, Riverside Way, Camberley, Surrey GU15 3YL, U.K. Tel: +44 276 671671, Fax: +44 276 670677

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