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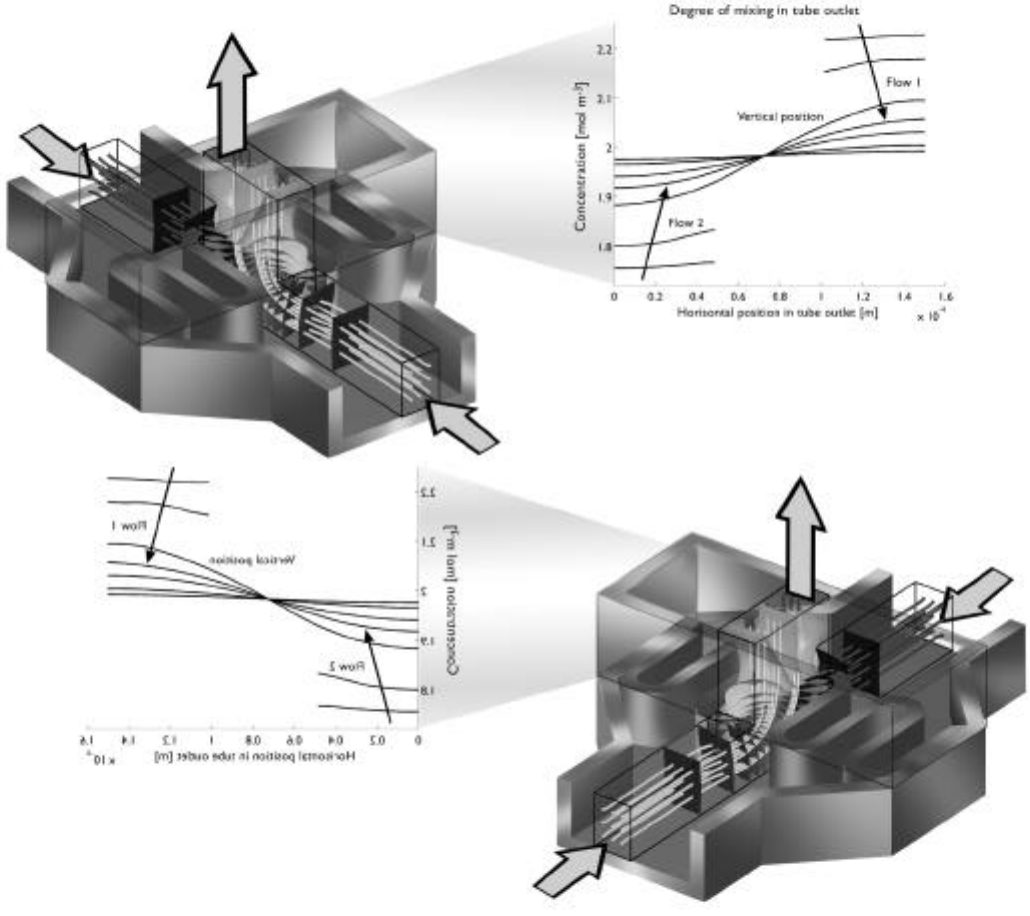

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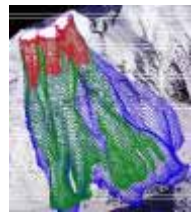

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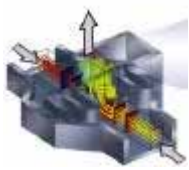

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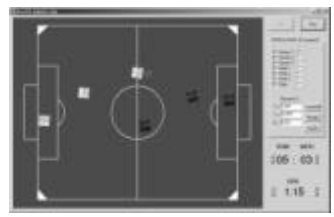

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EDITORIAL

Dear readers,

In the last two issues we have started a discussion about an extended role of modelling and simulation, and about the changes within the simulation societies. Modelling and simulation has become a widespread method, which now is not only dealt with in simulation societies but also in application societies, simulation societies open to computational engineering.

***SNE** will follow this development:*

- *by publishing technical notes and short notes on new methods and new applications - (in this issue e.g. about modelling and simulation in snow sciences),*
- *by introducing simulation activities from "application societies" and from projects (in this issue e.g. about the Liophant Simulation Club),*
- *comparing and evaluating in the ARGESIM comparisons not only features of simulators, but also - nowadays mainly - different modelling methods (for the next issue we are preparing a comparison, which emphasises on the modelling procedure)*

*Furthermore, this issue starts with a change of the **SNE** structure. The "news section" can be found at the end of the issue, separating this section more strictly from the "archive section" ("technical section"). There are two reasons: Unfortunately some EUROSIM societies send in their contributions very late and /or not regularly. The new structure allows adding late contributions at the end (either in printed form by us or in copied form directly by the society). Second, Some societies put their news at the web and / or distribute electronic newsletters, so that they are more interested in the technical section. It is intended to publish also special issues for certain subjects, if a society is interested in.*

We are glad, that in this issue we can publish a very interesting technical note, which presents different modelling approaches in snow science, and three short notes: from equation-based modelling of distributed systems via simulation of robot soccer to tips for modelling limiters better. Furthermore

*We hope, you enjoy this issue, and I thank all authors and members of editorial boards for their cooperation. As some societies sent in their contributions very late, this issue **SNE 37** is published late as July issue, distributed in August. We are sorry for this delay and we have reacted (see above). The next issue **SNE 38/39** will be a double issue (November 2003), deadline begin of October.*

Felix Breitenecker, editor-in-chief
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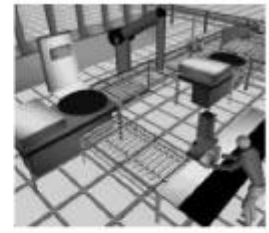

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Aims & Scope

The journal **SNE - S**imulation **N**ews **E**urope – is intended i) to inform about new developments in modelling and simulation and ii) to report about news from European simulation societies and events from International Simulation Societies and Simulation Groups all over the world. SNE is the also the official membership journal of **EUROSIM** and **SCS Europe**.

SNE reports in the *News Section* about EUROSIM, EUROSIM societies, SCS Europe and about other International Simulation Societies and Simulation Groups. A calendar of simulation conferences, industry news, etc. concludes the *News Section*.

SNE's *Technical Section* publishes technical notes and short notes on general overviews or new developments, new software and hardware, new applications and methods. Furthermore **SNE** presents *Simulation Centres,* introduces *Simulationists* and reviews t recent books on modelling and simulation and related topics. **SNE**'s special series *Comparison of Modelling and Simulation Technique and Tools* (**ARGESIM Comparisons**) gives a comprehensive overview on developments in application and implementation.

Parts of **SNE** can be also found on the web. News from societies is published at EUROSIM's web server (www.eurosim.info). Contents, archive and an evaluation of the Comparisons are available at ARGESIM's website www.argesim.org

All contributions are selected and may be edited. For news publication, please contact a member of SNE's News Editorial Board (p. XXIV), for publication of technical notes, short notes, etc. please contact a member of SNE's General Editorial Board (p.40) or the Editor-in-Chief.

TECHNICAL NOTES

Modelling and Simulation in Snow Science

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…. Introduces into modelling and simulation of snow mechanics

…. discusses advantages and disadvantages of different modelling approaches – from static to FE

…. sketches approaches to avalanche dynamics

…. presents 2D simulation of avalanche dynamics – validated with events like Galtür event

Abstract

Modelling of complex systems or complex behaviour (Prigogine et al., 1990) is obviously not trivial. Natural processes with which we deal in snow mechanics and avalanche dynamics possess many features which complicate the description of both the whole system under concern as well as single events. The fact that worldwide more then hundred avalanche models are used to calculate the run-out can be interpreted in two ways: First, it seems to be difficult to find a best fit modelling concept to describe the process and second, the validation process seems to be restricted because of the lack of observations with sufficient quality. But modelling and simulation of real world phenomena with the aim to support quantitative risk analysis can only deliver satisfying reliability, if the models depict reality with all relevant influence parameters and subsystems.

Snow Mechanics

Snow mechanics is the theoretical and applied science of the mechanical behaviour of snow (Shapiro 1997). It is that branch of mechanics concerned with the response of snow to the force fields of its environment. The understanding of snow mechanical behaviour supports the optimisation of permanent and temporary control measures like snow fences, snow bridges and artificial avalanche release. Although in a broader sense, also avalanche dynamics can be seen as a part of snow mechanics. In this chapter only the mechanical behaviour of the more or less compact seasonal snow cover will be taken into account.

Modelling objectives

The scope of the work is to set up a simulation tool which can be applied to engineering problems involving snow mechanics. Although the macroscopic deformation of snow is a result of micro structural processes, a macroscopic model view has been chosen. Observations show that the strength of the snow cover, described by the viscosity η?undergoes only very slow changes in the well settled snow cover. Furthermore, the model is intended to predict maximum and average load on obstacles.

By the help of a mechanical model it should be possible to test and optimise

- new designs of defending structures,
- arrangements of snow stabilising structures,
- and arrangements of afforestation measures.

It has to be emphasised that the objective to use the model for engineering problems involve the claim for serious validation on field measurements. Besides for the suitable description of the snow material, the proper implementation of the snow - ground surface conditions and the resistance forces in general is of high importance. Snow gliding – the movement of the whole snow pack on the ground – and creeping cause high forces on objects and constructions placed on a sloping area. Because of the high sensitivity of the gliding velocity to the conditions in the boundary layer, four types of resistance forces can be distinguished and must be taken into account:

- adhesion: frozen conditions in the soil – ground - interface (very rarely at the field site)
- dry friction (sand paper friction): normal pressure dependent resistance force (absence of free liquid water in the interface)
- viscous friction: velocity dependent resistance force (occurrence of liquid water in the interface, the effect of tiny asperities is reduced)
- macroscopic roughness: independent of the contact conditions in the interface, larger asperities and obstacles cause a reaction force (topographically shaped boundary conditions like obstacles, rocks, and local slope changes).

Creeping and Snow gliding

The snow cover undergoes permanent viscous deformation caused by the gravitational forces. But in contrary to this continuous internal deformation, gliding can have both a steady as well as a non-steady moving character. McClung (1994) and Kleemayr (1996) showed that the highest gliding velocities and non-steady movements occur at the beginning and the end of the winter when slippery boundary conditions are dominant. The absence of the velocities, which peaks at the end of the winter in contrary to McClung's investigations (McClung, 1994) can be related to the fact that in the project area the roughness is higher than the smooth rock surface at the field site studied by McClung.

It is also remarkable how gliding velocity decreases to a stationary movement during the winter while in the same time the snow depth changes vary from 50 – 230 cm and also the temperature of the snow cover permanently changes. With the classical definition of snow gliding (the slip of the whole snow cover on the ground surface) this can scarcely be explained. It seems to be reasonable that with the ongoing metamorphosis process and settlement of the snow the density and viscosity of the lower most layers continuously increases. This part of the snow cover once it is settled, the condition will change only very slowly because 1) the heat waves from the snow cover surface are very weak near the ground due to the high isolation capacity of snow and 2) the latent heat from the ground is a stationary active heat source which again leads to a homogenous energy situation. If there are some "minimum obstacles" the snow cover has to creep around, the movement is not only partly influenced by the slip condition or adhesion, but also by the snow strength. This kind of movement in addition to the classical definition could be called "boundary layer creeping".

The creeping of the snow cover has been measured by sawdust profiles. The measured velocity profiles can be interpreted as shear strain rates (though this kind of measurements does not have the same quality like standardised laboratory tests in the field of geotechnics). But taking only the well settled snow cover into account, the data are largely in agreement with those of the Rockies and the Swiss Alps.

Due to the fact of reduced creeping velocities in the lower parts of the snow cover, shear viscosity was also calculated as a function of the snow depth (Fig 1). The figure shows depth dependent shear viscosity derived from experimental data of four sample sites (7,8,9,12) in ROTHWALD. This data can be used to improve the material model instead of using an unrealistic unique viscosity for the whole snow cover.

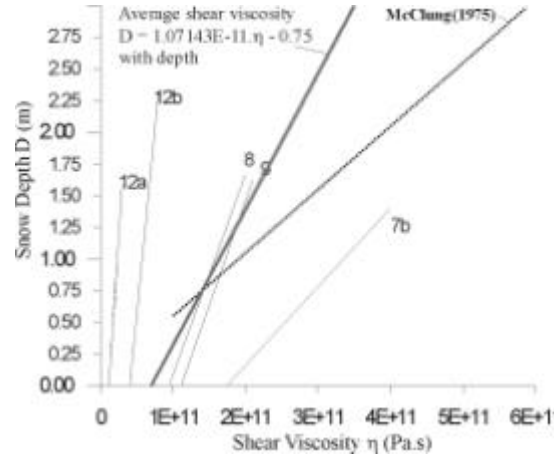

Figure 1: Pressure dependent shear viscosity determined by field data

Mathematical model

As already mentioned from a purely mechanical point of view (neglecting metamorphosis processes and temperature influences) the snow cover can be treated as elastic, viscoelastic or viscous medium (Bader, et. al. 1989, Oh'zumi 1986, Lang et al. 1983, Mellor 1975, McClung 1975). Because of the focus on "long time deformation" and concentration on the well settled snow cover for which viscous behaviour is predominant, a linear viscous constitutive equation was employed.

The movement of the snow cover takes place slowly so that kinetic energy terms can be neglected. Since the surface of the snow cover is supposed to be stress free, the only external factors which are included in the model are the body weight and the friction of the snow cover against the soil and obstacles. An additional assumption made for simplification is supposing that the snow is a homogenous material. Additionally, linear and isotropic behaviour is assumed. Following this, deviatoric and dilatational deformation effects can be considered separately. The stress tensor can be written as the sum of two tensors: the spherical tensor representing a hydrostatic state of stress which produces volume change without distortion, and the deviatoric stress tensor σ' which is supposed to bring about a change of shape:

$$\sigma' = \sigma + \mathrm{p}\,\mathrm{I} \qquad (1)$$

$$\boldsymbol{\varepsilon}' = \boldsymbol{\varepsilon} - e\mathrm{I} \qquad (2)$$

where $\mathrm{p} = -1/3\ \sigma$ is the material pressure, and where $e = 1/3\ \varepsilon$ is the volumetric strain.

The linear viscous constitutive equation was defined by using the Mises yield stress given by

$$\tilde{q} = \sqrt{\frac{3}{2} s'_{ij} s'_{ij}} \tag{3}$$

and the equivalent creep strain rate $\dot{\tilde{e}}^{cr}$ which may be written in the form

$$\dot{\tilde{e}}^{cr} = \sqrt{\frac{2}{3} e'_{ij} e'_{ij}} \tag{4}$$

The deviatoric creep law which describes the relation between these variables is of the form

$$\dot{\tilde{e}}^{cr} = \frac{1}{3?} \tilde{q} \tag{5}$$

where η is the shear viscosity.

The volumetric creep law establishes a relation between the hydrostatic stress and the volumetric strain rate $\dot{\tilde{e}}^{vol}$

$$\dot{\tilde{e}}^{vol} = -\frac{3}{2?} \left(\frac{m-2}{m+1} \right) p \tag{6}$$

where m is the inverse of viscous analogues of Poisson's ratio. To improve the model the pressure dependent shear viscosity was introduced.

Boundary Layer – Gliding modelling

If the water content in the boundary layer is small, so that the ground roughness elements are not drowned, the snow gliding is dependent on contact pressure. For this case the coulomb friction law is employed in the model which assumes that sliding occurs if the equivalent frictional stress τ_{eq} calculated by the two shear stress tangentials to the ground surface

$$\tau_{eq} = \sqrt{\tau_1 + \tau_2} \tag{7}$$

exceeds the critical stress, τ_{crit} which is related to the contact pressure p

$$\tau_{crit} = \mu p \,. \tag{8}$$

If a layer of wet snow is present at the base of the snow pack, a different mechanism occurs. Because of that the gliding model is extended to

$$\tau = \mu p + \eta \frac{v_u}{d} \tag{9}$$

where v_u is the gliding velocity, η is the viscosity of the boundary interface and d is the stagnation depth according to McClung (1981) which can be derived by creep profiles.

Simulation results

Various analysis had been carried out on standard slopes (artificial slopes calculated by a pre-processor programme) as well as for the given sample areas. The simulated gliding is basically largely in agreement with the gliding measurements, but very sensitive to the assumptions of the boundary layer conditions. Kleemayr (1996) and Wieshofer (1998) compared three constitutive equations (linear viscous, linear viscous pressure dependent and viscoelastic) on a 35° steep standard slope with a wavy and a smooth ground surface and 3m snow cover.

Only slight differences could be achieved for the gliding motion. For the recent analysis, only the viscous pressure dependent model therefore has been chosen with the best fit to the creep profiles.

Keeping the friction type (Coulomb dry friction), slope (35°) and density (425 kg/m³) constant, the effect of changing friction, snow depth and wave form could be worked out. The simulations produced results of the earlier analysis of Schweizer (1992) and McCLUNG (1981). Shorter waves lead to higher reaction forces and higher stabilising effects till a critical size when the asperities are enveloped in the wet slush snow of the boundary layer.

Verification

For the sample area 4 analysis of the influence of the dry friction and the combined dry/viscous friction model had been performed.

Figure 2 gives information about the simulated gliding distances (for one week) and the corresponding measured gliding gauges. Both dry friction variants (μ=0,3 and μ=0.5) show a significantly reduced gliding velocity. The combined viscous-dry friction models have higher velocities depending on the supposed viscosity in the boundary layer.

Comparing the calculated gliding distances to the observed ones, the high sensitivity to the friction parameters can be seen. But the similar slopes of the gliding velocities over the profile (except dry friction model 2) also give a clear indication of the high influence of the topography.

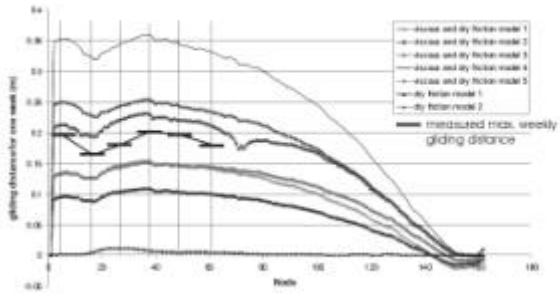

Figure 2: Observed and calculated gliding distances

For this test site it can be assumed that the accuracy of the digital terrain model is sufficient. Yet the general question remains: what is the necessary accuracy to enable realistic simulations?

All analyses show that assuming dry friction, the shear forces in the boundary layer, and in the snow cover near the ground are homogenous and tend to be critical only under extreme conditions (slope inclination >40°, snow depth >3m).

The viscous friction model on the contrary, very easily gives unstable situations with increasing gliding velocity and corresponds better to the measurements. High movements causing high pressure are predominant if the snow cover can slip due to the absence of resistance obstacles (results summarised in Figure 3, model with and without viscous friction).

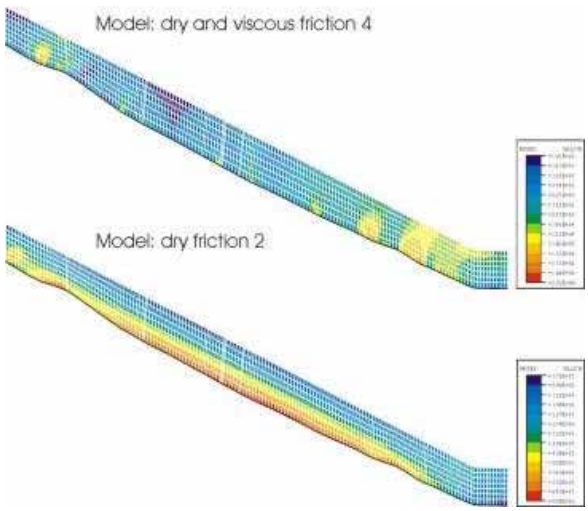

Figure 3: Computation results for model with and without viscous friction

Though the stress distribution in the real snow cover has never been measured, the simulations could be used to analyse critical stress and failure probability on real slopes. The model was also used to optimise a new construction against snow gliding called a stabiliser.

Because this construction is the first technical measure which is not oriented parallel to the slope the model has been used to prove the efficiency and optimise this construction.

Conclusions for the modelling of snow mechanics

Though the modelling of the seasonal snow cover has to be improved in the future with more detailed constitutive equations (BARTELT, 1998), the measurements and preliminary results give a clear hint that for a “realistic” modelling of the chosen subsystem – gliding of a well settled snow cover - it is necessary to improve the implementation of the boundary conditions.

It will be necessary to measure real resistance forces on the ground surface and the dependency of these forces on roughness and strength properties in the boundary layer.

Avalanche dynamics

Although in the snow science community most of the efforts are put into avalanche dynamics the quality of the data is still not satisfying. There are nearly no data of the internal processes and only few data of avalanche front velocities.

The fact that there are worldwide more then 100 avalanche models can be interpreted in the way that it seems to be hard to validate the models. The expectable selection process of the “best models” seems to be restricted. It is not possible to give a historical overview of the development of avalanche models in this paper.

But it can be stated that only in single cases the development of a new model was driven by the attempt to solve contradictions of existing models to observations. Similar to the previous chapters a range of modelling concepts – from statistical to dynamical models– will be given and discussed shortly.

Topographical regression analysis

Because of the fact that it is sometimes impossible to define the input parameters for more or less physical models Lied (1980) had the idea, to derived regression functions in order to calculate the run out.

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The data only contain topographical parameters of a track (Track height, average slope of the track, slope of the release area, Pauschalgefälle, etc.) derived from extreme events. Without any estimation of release height, release area etc. the regression functions (Table 1) give the possible run out of an extreme event.

Paznaun	$\alpha = 0.91\,\beta + 0.81$	R = 0.91	S = 1.7
Pitztal	$\alpha = 0.83\,\beta + 4.07$	R = 0.95	S = 1.3
Paznaun u. Pitztal	$\alpha = 0.89\,\beta + 1.77$	R = 0.94	S = 1.5

Table 5: Regression functions of Pitztal and Paznaun

For the catastrophic event of Galtür the topographic model only failed with 50 m. But there are some serious problems with the regression function. The application of the function to a new track is only valid if their parameters are in the range of those of the database.

For complex terrains, tracks with topographic instantaneities the function is not applicable. Also the missing return period of the calculated event reduces the practicability for hazard zoning.

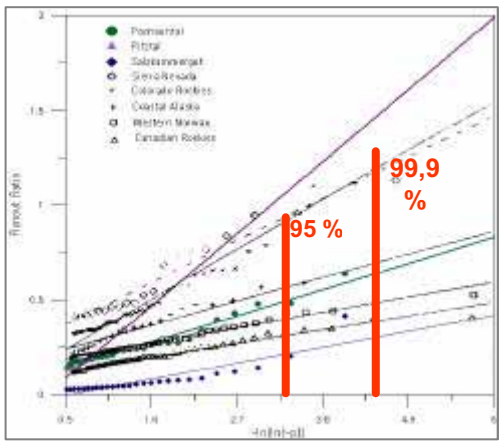


Figure 4: Topographic ratio and non-exceedence probability for the Galtür-event

To reduce these disadvantages, McClung defined a topographic ratio, which in contrary to the Lied function is dimensionless:

$$MR = \frac{x_\delta}{x_\beta} = \frac{\tan\beta - \tan\alpha}{\tan\alpha - \tan\delta}$$

with α: Pauschalgefälle, β: average slope of the track and δ: average slope of the run out zone.

With this topographic ratio for the first time frequency analysis could be carried out. Figure 4 shows the non-exceedence probability of the Galtür – event based on the Paznaun data.

The various regression functions over different regions and valleys in figure 4 also give a clear hint that it is statistically possible to distinguish between meteorological and topographical influences.

But again the applicability of the method to a new track is critical if the similarity to the database is weak.

Similarity analysis

Based on the positive experiences with topographical parameters, Bakkehoi (1996) developed a very simple but robust method to find topographically similar avalanche tracks (given in Figure 5).

With this method, the run out will not be calculated explicitly. But if in a database similar avalanche tracks can be found, the avalanche activity can be discussed in detail.

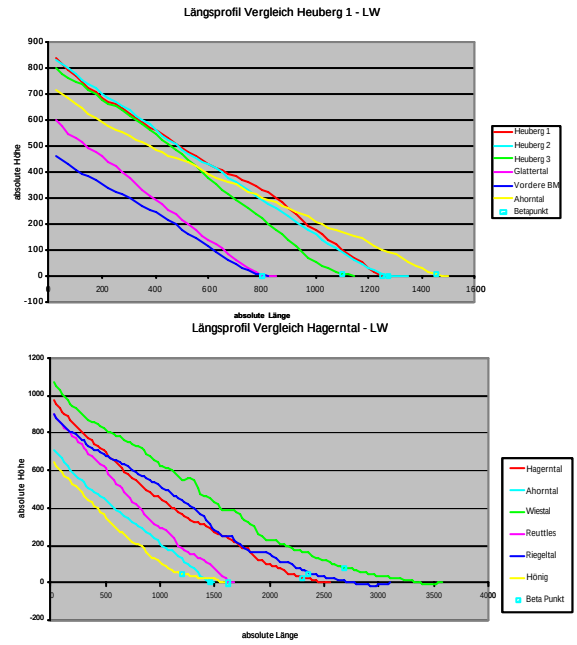


Figure 5: Topographically similar avalanche tracks

2D avalanche simulation with ELBA

Most of the existing dynamical avalanche models are 1D models. But in reality in many cases the avalanche path is depend on the size of the event. The model ELBA is the attempt to enhance the capabilities of one of the most famous avalanche models the Voellmy model.

Voellmy states, that at the end of the release zone the avalanche is fully developed. For the dense flow avalanche he calculates the velocity by extending the Chezy formula with the turbulent friction term to

$$v = \sqrt{h\,x\,(\sin j \; - \; m\cos j\;)}$$

with h: flow depth, φ: slope inclination, μ: dry friction coefficient and ξ: turbulent friction coefficient.

At the end of the track (determined by the m-dependent point P) the fluid behaviour is – according to Voellmy – changing to a translatoric movement. By calculating the velocity v^2_P in point P with the average deposit height d_s

$$d_s = d_P + \frac{v_P^2}{10\,g}$$

and the velocity in the run-out zone V^2

$$V^2 = d_s\,x\,(m\cos j_{\;s} - \sin j_{\;s})$$

the run out length can be determined:

$$s = \frac{d_s\,x}{2g}\ln\left(\frac{v_P^2}{V^2}\right) + \frac{v_P^2}{V^2}$$

For the 1D - application there exist many experiences which show the validity of this rough modelling approach.

The main disadvantage of this "analytical" model is the reduced possibility to include topographic properties of a real avalanche track. Therefore a spatial discretisation is necessary.

The acceleration of a mass unit for the 1D case is calculated with

$$\frac{\mathbf{dv}}{\mathbf{dt}} = \mathbf{g} * (\sin\beta + \sin\omega - \mathbf{sign}(\mathbf{v}) * (\mu.\cos\beta + \frac{\mathbf{v}^2}{\xi * \mathbf{h}}))$$

with β: slope of the track, ω: slope of the hydrostatic flow height, μ: dry friction parameter, ξ: turbulence friction parameter and h: flow height.

The conservation of mass for the 1D case is given by

$$\frac{\partial(wh)}{\partial t} + \frac{\partial(whu)}{\partial s} = 0$$

and the momentum balance by

$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial s} + g\frac{\partial h}{\partial s}\cos j \; = \; g\sin j \; - \; mg\cos j \; - \; \frac{g\,u^2}{x\,R}$$

.

To improve the analytical velocity function of Voellmy, the hydrostatic flow height had been introduced which enables the calculation of the spatial distribution of the masses.

Already the first results with this simple model showed reasonable results. The next step of improvement was the development of a 2D distributed model and the integration of snow masses by snow erosion (snow entrainment). Although there are recently many discussions about the entrainment process and how it is influencing the whole process of the gravity current for ELBA a very simple approach had been chosen.

If the shear stress exceeds on a certain point the threshold value a predefined amount of snow is added to the avalanche body. It has to be emphasised that the whole modelling process from Voellmy to Elba can be characterised as a "macroscopic" view. The aim of the erosion implementation was not a better understanding of the erosion process itself (this has to be done necessarily) but to improve the mass balance according to reality.

Figure 6 shows the clear positive effect of this rough modelling concept. The outline of the simulations is in very good congruence with observed run out of the catastrophic event.

Figure 7 shows the implementation of a planned dam in the digital terrain model. In contrary to 1D models 2D simulation tools can give important of the effect of the various controls.

But despite of the reasonable result, the core of the model is still a rough description of the real processes. The proper description of the turbulent head of the gravity current should be the main focus of avalanche dynamics in the near future.

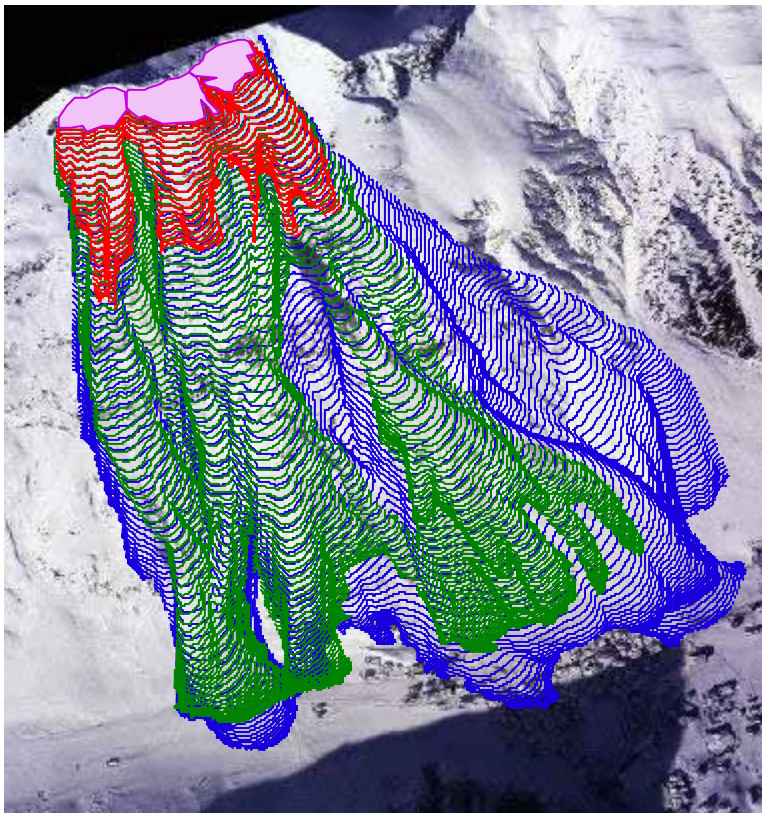
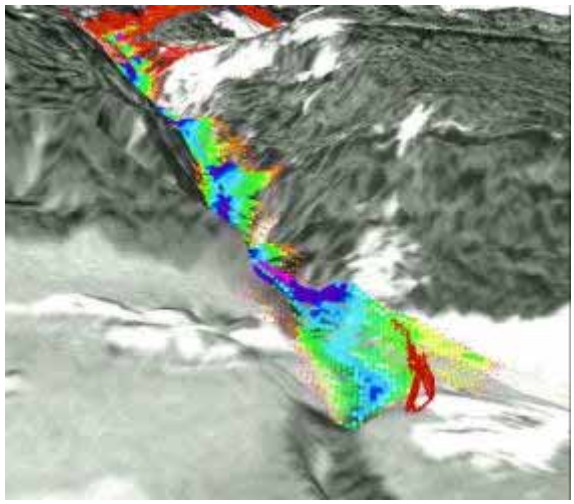


Figure 6: Run out calculation for the Galtür event with constant fracture height but increasing snow entrainment



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SHORT NOTES

Equation Based Modeling

Stefan Funken, Femlab GmbH, Germany

…. deals with FE modelling and simulation
…. concentrates on equation-based modelling
…. presents four case studies, modelled and simulated with FEMLAB: lamella mixer, micro switch, photonic device, and fuel cells

Modeling is unquestionably a major part of 21st century engineering and science. Over the past ten years in particular, modelling based on finite element, finite volume, and finite difference analyses has progressively transformed the methods that prototype engineers and scientists use in design, research, and development.

Much of the real physical phenomena involve coupling different physical descriptions -multiphysics. Traditional modelling packages include the most common multiphysics couplings as hard-wired elements. However, as computers have become more powerful and easy-to-use, modelling has penetrated into all disciplines of science and engineering, which has made it increasingly difficult for software developers to hard-wire all the possible couplings. The solution to this is given by equation-based packages, where these couplings are created dynamically through equation interpreters that transfer a given formulation to a numerical code.

This article presents four studies made with the equation-based modelling (EBM) package FEMLAB. This finite element package combines ready-to-use applications with free equation formulations. The formulations in the ready-to-use applications are open, which means that it is easy to change the existing equations and to add arbitrary couplings with other physical phenomena.

None of the models require the use of subroutines or user defined functions that are very common in older hard-wired packages. The models also demonstrate the possibilities of using graphical representation in the interpretation of results from the simulations.

Technology at Microscale

Miniature laboratories are required to efficiently analyze the information in human DNA. This leads to tailor-made diagnosis and treatment of hereditary diseases for individuals. One of the problems that arise in these lab-on-chip units lies in the transport of the liquid samples and other solutions in the chip. Since moving parts on the micro scale make the chips very fragile and expensive, these are avoided as much as possible. One way of transporting the fluid in the samples is through the use of electrokinetic effects, where the charged ions in the solutions are subjected to an electric field. These ions are able to drag the whole solution through the channels in the microchip from one point to another. These effects can be used to propel the solution through heat exchangers, mixers, and require the simultaneous modelling of electric fields and fluid mechanics.

Figure 1 shows the flow through a lamella mixer, where the mixer decreases the diffusion length in laminar flow between two different solutions. The diffusion length is decreased by the formation of intercalated thin layers of the two solutions. In this case, the interesting entity is the degree of mixing obtained in the lamella mixer.

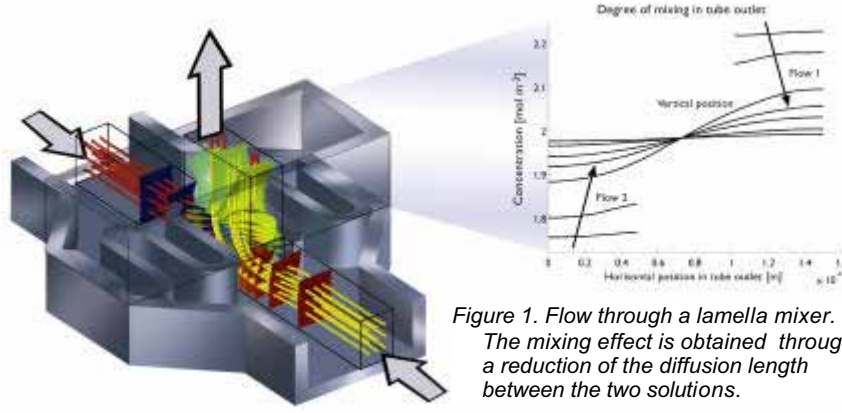

Figure 1. Flow through a lamella mixer. The mixing effect is obtained through a reduction of the diffusion length between the two solutions.

Micro-Switch

The second model shows an application of modelling in electronics. Research and design for electromechanical devices is often done in order to develop tailor-made switches, relays, and attenuators. Figure 2 shows a model of a micro-switch, which involves the coupling of electromagnetic and structural phenomena. The model is used to calculate the electric field needed to move the cantilever beam. It shows that there is a nonlinear relation between the applied potential and the displacement of the cantilever beam, as the electric field increases with displacement at the tip of the beam.

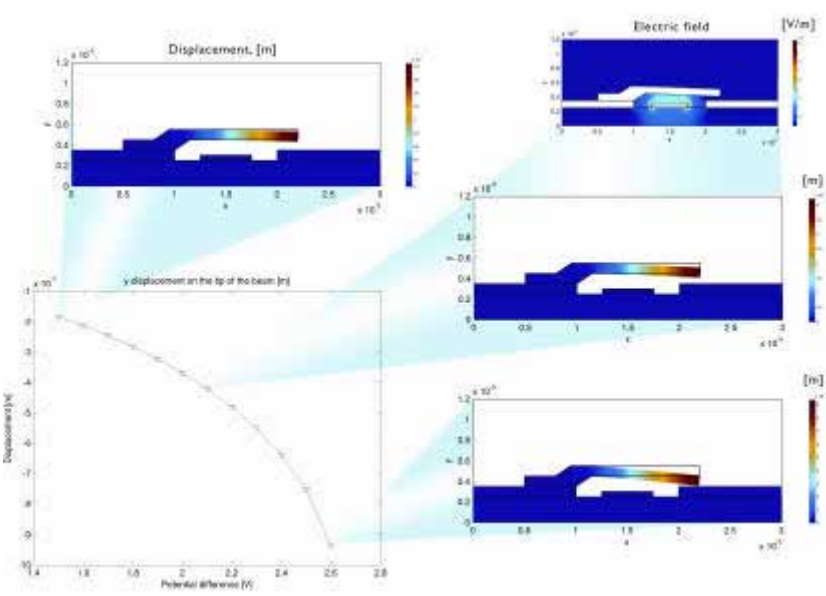

Figure 2. Displacement on the tip of the cantilever beam connected to the potential difference and the resulting electric field.

Coupling of structural analysis, fluid mechanics, and electromagnetic fields is very common in the modelling of micro electro mechanical systems (MEMS).

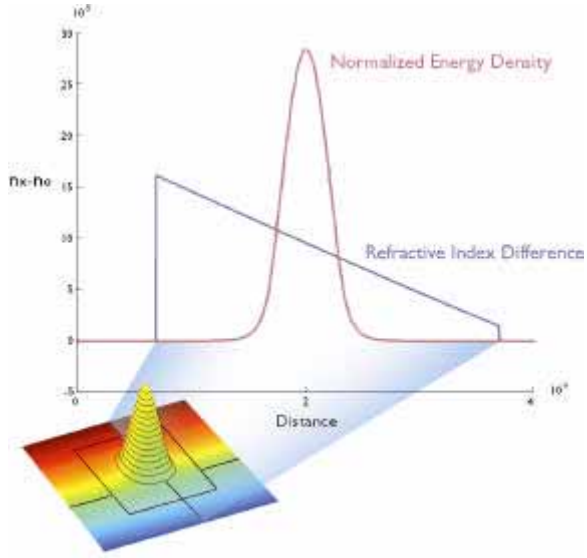

Figure 3. The thermally induced stresses from the manufacturing process of a photonic waveguide affects the refractive index of the silica layers and causes a weak birefringence. The figure shows the difference in refractive index between horizontal (Nx) and vertical (Ny) polarizations respectively and the resulting mode intensity.

Photonic device

An unusual multiphysics coupling is the coupling obtained when modelling photonic devices, where optical properties are influenced by mechanical stresses. Planar photonic waveguides in silica (SiO_2) have great potential for use in wavelength routing applications in fiber network systems. One major problem with this technology is birefringence caused by mechanical stresses originating in the manufacturing process. Anisotropic refractive indices result in fundamental mode splitting and pulse broadening.

The goal is to minimize birefringence effects by adapting materials and the manufacturing process. The source of birefringence is the use of a silicon (Si) wafer on which the waveguide structure is deposited. After annealing at high temperature (approximately 1000 °C), mismatch in thermal expansion between the silica and silicon layers results in thermally induced stresses in the structure at the operating temperature (typically room temperature, 20 °C).

The purpose of the model is to optimize the structure in order to avoid mode splitting and pulse broadening. Figure 3 shows a model that fully defines the mechanical stresses caused by differences in thermal expansion and their influence on the mode propagation in a photonic waveguide.

Fuel Cells

The fuel cell is also a typical example of a system that involves several physical phenomena, which have to be accounted for in its design. Research in recent years has brought fuel cell technology to the threshold of a commercial breakthrough. Hurdles that still need to be overcome involve materials management problems. Fuel cells – consisting of gas diffusion electrodes and a variety of electrolytes – let alone the entire fuel cell system, are complex and delicate systems, which require exact control of mass transfer, humidity, current and potential distribution and temperatures.

The materials required to house and catalyze the reactions and transport processes taking place are expensive, making design optimization absolutely crucial.

MATLAB
MATLAB ist eine intuitive Sprache und eine Oberfläche für technische Berechnungen. Es besteht aus einem mathematischen Kern und modernen Grafik-Werkzeugen für technische Berechnungen, Datenanalyse, Visualisierung sowie für die Entwicklung von Algorithmen und Anwendungen.

Simulink
Simulink ist eine Entwicklungsplattform für den Entwurf, die realitätsgetreue Simulation und Analyse von dynamischen, Systemen und Prototypen. Simulink bietet eine mit Block-Diagrammen operierende, grafische Programmierumgebung zur Modellierung von Systemen, die auf MATLABs mathematischer Kernfunktionalität aufbaut.

Stateflow
Stateflow ist eine grafische Simulationsumgebung zur Modellierung von Zustandsautomaten für den Entwurf ereignisgesteuerter Systeme. Als Add-on zu Simulink bietet Stateflow eine elegante Lösung zur Entwicklung von Steuer- oder Protokoll-Logiken.

Toolboxen
Toolboxen sind Sammlungen hoch optimierter, anwendungsspezifischer Funktionen, die MATLAB erweitern. Sie unterstützen Anwendungen, wie die Signal- und Bildverarbeitung, den Entwurf von Regelungs-Systemen, Optimierungen, finanztechnische Anwendungen, neuronale Netze und vieles mehr.

Blocksets
Blocksets sind Bibliotheken anwendungsspezifischer Simulink-Blöcke für unterschiedlichste Anwendungsgebiete, z.B. zum Entwurf von Steuerungen und Kommunikationssystemen, für die digitale Signalverarbeitung, für die Entwicklung von Festkomma-Algorithmen u.a.

Werkzeuge zur Code-Generierung
Der Real-Time Workshop und der Stateflow Coder erzeugen individuell zugeschnittenen, effizienten C-Code aus Ihren Simulink-Modellen und Stateflow-Diagrammen, der dann zum Rapid Prototyping, für Hardware-in-the-Loop Simulationen und in Embedded Systems eingesetzt wird.

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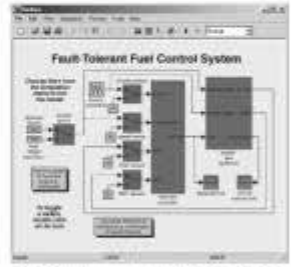

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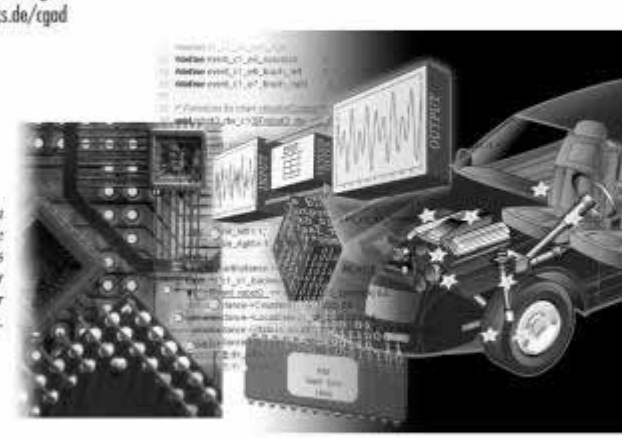

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Figure 4 shows the concentration distribution of oxygen and the current density distribution in a unit cell of the bipolar plate and the proton exchange membrane fuel cell (PEMFC) cathode. The graph shows that the transport of oxygen determines the current density distribution in the active layer.

In common for all the models discussed above is that they involve rather unorthodox multiphysics couplings. This often implies that the engineer has to define the system of partial differential equations and design its solution algorithm. All the models presented above were solved using the multiphysics package FEMLAB. FEMLAB is design for maximum flexibility and allows the engineer to create his/her own partial differential equations and systems of partial differential equations. It also includes a large library of predefined equations and solvers for transport and reactions in chemical engineering, electromagnetic waves and AC/DC applications, and structural and fluid mechanics. These applications can be combined freely to create the desired multiphysics combinations required in science and modern engineering design.

The Future

The adaptability of EBM packages opens up for the use of partial differential equations in combination with ordinary differential equations, conditional expressions, and algebraic equations. This means that advanced models can be directly incorporated into parameter estimations and direct comparisons with experimental data. Instead of going from the computer to the lab, and back again, engineers and scientists will be able to evaluate and model a real process as it operates.

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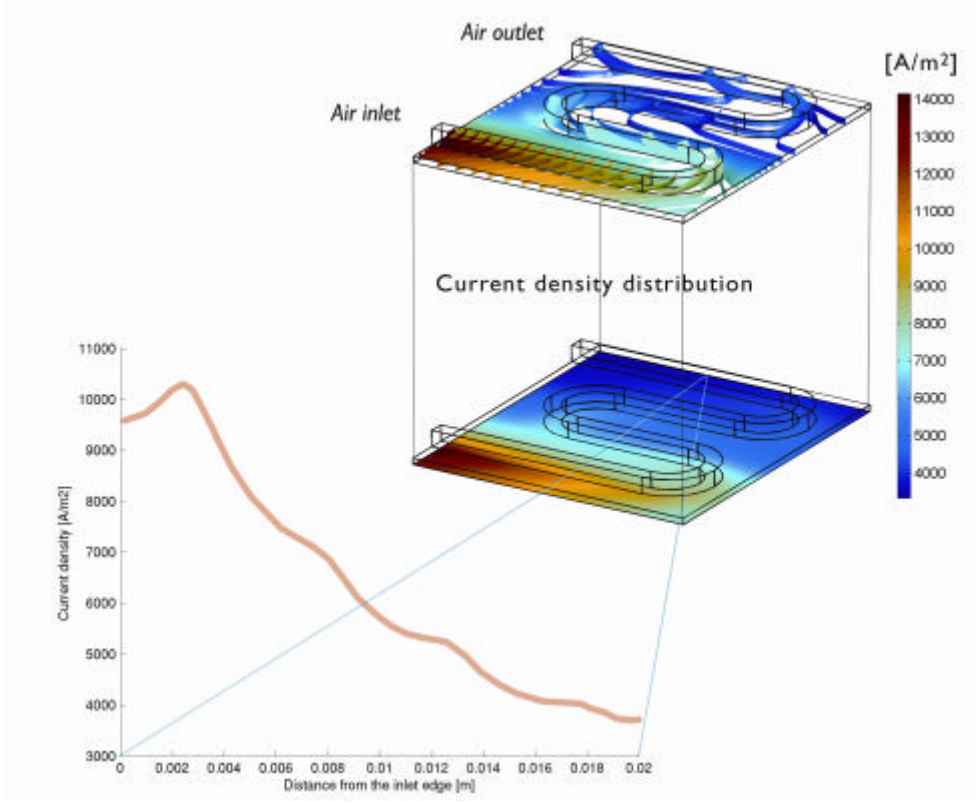

Figure 4. Concentration and current density distribution in a unit cell of the bipolar plate and the cathode in a PEMFC for automotive applications.

Robot Soccer Simulator

Marko Lepetic, Gregor Klancar
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…. introduces to Robot Soccer
…. sketches vision and control mechanisms
…. presents a realistic simulator application of robot soccer

In this note a realistic simulator application of the robot soccer is presented. The robot soccer set-up (see Figure 1) consists of six MiroSot category robots (for two teams) of size 7.5*cm* cubed, orange golf ball, rectangular playground of size 1.5×1.3*m*, *JAI* MCL-1500 camera, frame-grabber Matrox Meteor II, and personal computer. The vision part of the program processes the incoming images to identify the positions and orientations of the robots and the position of the ball. Finally, the control part of the program calculates the linear and angular speeds, v and ω, that robots should have in the next sample time according to current situation on the playground. Calculated speeds are sent to the robots by radio connection.

The Control Application consists of two levels. Lower level performs single robot control (guidance algorithms, path tracking). Higher level is called strategy and is responsible for coordination among robots – agents. When the programmer is developing game strategy it is neceseary to try as many situations as possible. This means the programmer must move robots on the playground, which is very time consuming. Furthermore, the programmer is forced to work in the same place where the real device is situated and only one man can work at the time. Also it is very important to have a test bed where experiments are repeatable.

The solution for all above-mentioned problems was to build the simulator. The requirements for the simulator were:

- User-friendly interface
- Use of the same control programme as with the real set-up
- Real time simulation
- Realistic collision models

First one is especially important, because the programmer must focus minds and energy in control application that is developing.

Also very important is the second one. The control programme developed on the simulator should be directly connectable to the real device. The programme therefore not needs any changes that could bring errors into the programme.

Simulator should run in real time so that data coming from simulator appear in the same time intervals as in real set-up. Another possibility is that simulator runs faster in order to speed up experiments or slower than real time to enable easy visualization of the scene. Another advantage of the scheme presented in Figure 2 is that all modules for both competitors (simulator, two control applications) can run on one computer. As already mentioned the same control program can without any change be applied to real or simulated game.

Collisions are very hard for modelling due to their discontinuous character, but should be designed realisticaly to assure transferability of the designed algorithms to the real system.

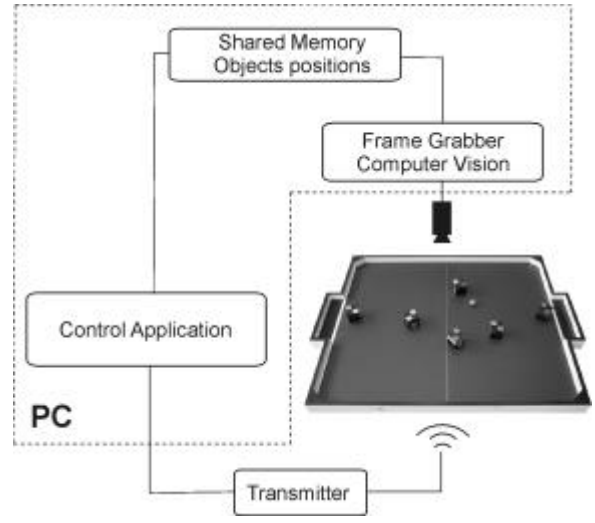

Figure 1: Real Set-up

As seen from Figure 1 there are two applications running on personal computer, computer vision and control application. The communication among them is realized through shared memory.

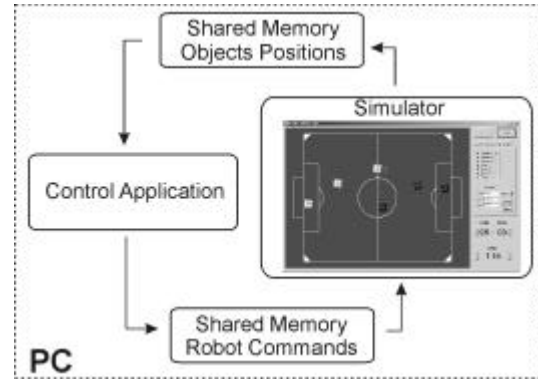

Figure 2: Simulator Set-up

Figure 2 depicts the situation where real system (playground with robots and ball) is replaced by simulator. Robots and ball movements are simulated in C++ language while control algorithm and shared memory for object positions remain unchanged. Communication between control and simulator is again realized through another shared memory for calculated robot speeds (commands).

The simulator offers initial robot position seting, changeable simulation step and displays ceurent result and time. Detailed view of the simulators Graphical User Interface (GUI) is shown in Figure 3.

Figure 3: Detailed view of the Simulator GUI

Which are the important advantages of the proposed simulation environment? In real game robot positions and orientations of the object from the playground are obtained by camera and computer vision program. The role of simulator is therefore to avoid the usage of hardware (except PC), which is expensive and needs a large place to be set up. In addition the real system is not mobile and it is time consuming to manipulate with it.

Simulator was also tested in the local robot soccer simulation league organized at the faculty. Fifteen students participated in seven teams. In short time (two months) they manage to build their own strategy application entirely on the simulator. The winning team of the simulation league took part in European championship organized in Vienna, Austria in April 2002. They won the second place in Small MiroSot league (real robots) with the same strategy application as developed on the simulator.

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Tricks and Treats: Five Fast Limiters

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…. presents five useful limiter functions
…. gives different implementations
…. discusses briefly the advantages of the alternative implementation with absolute value function instead of floating point comparison

Dynamic-system simulations often use the following useful limiter functions:

```
lim(x) = max(x,0)
sat(x) = lim(x + 1) - lim(x - 1)
                    (saturation at -1 and 1)
SAT(x) = lim(x) - lim(x - 1)
                    (saturation at 0 and 1)
TRI(x) = lim(1 - abs(x))
                    (triangle function)
deadz(x) = x - sat(x)
                    (deadzone limiter)
```

Traditionally, one usually implements these and similar limiter functions with floating-point comparisons. But that is slow on your personal computer!

Not only are Pentium and Athlon floating-point comparison routines relatively slow, but random inputs are certain to cause bad branch predictions, which then repeatedly stall processor instruction pipelines. This is especially serious with the extra-long pipelines of Intel Pentium 4 processors.

The exact speed loss due to pipeline stalls depends critically on your problem, but there is a better way. You can easily implement floating-point limiters with the faster absolute-value instruction. That simply sets the floating-point sign bit; there is no comparison and no branch prediction. We use

```
lim(x) = 0.5(x + |x|)
sat(x) = 0.5(|x + 1| - |x - 1|)
SAT(x) = 0.5(1 + |x| - |x - 1|)
TRI(x) = 0.5(1 - |x| +|1 - |x||)
deadz(x) = x - 0.5(|x + 1| - |x - 1|)
```

A proper **C** or **FORTRAN** compiler (or assembly language) simply accumulates such expressions on the Pentium or Athlon floating-point-processor stack without extra memory references. In the first four functions, you can even eliminate the multiplication by 0.5 by rescaling.

SIMULATIONISTS PERSONALITIES

This new SNE corner – introduced in December 2000 in SNE 29 - follows two aims: to introduce young simulationists or simulationist of the rising generation, resp., and to report about awards and personal events.

Robert G. Sargent
Lifetime Professional Achievement Award from INFORMS–CS

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Robert G. Sargent, Professor Emeritus of Electrical Engineering and Computer Science at Syracuse University, received the 2002 Lifetime Professional Achievement Award from the INFORMS–College on Simulation (INFORMS–CS). The award was presented at the Opening Session of the 2002 Winter Simulation Conference.

The highest honour given by INFORMS–CS, this award recognizes major contributions to the field of simulation that are sustained over a professional career. For 2002 the award selection committee consisted of James R. Wilson, chair (North Carolina State University); Thomas J. Schriber (The University of Michigan); and Julian Reitman (University of Connecticut, Stamford).

Bob Sargent first became involved with discrete-event simulation in the early 1960s as a graduate student at The University of Michigan, where he studied simulation methodology and developed simulation models. After completing his Ph.D. in 1966, Bob joined the faculty of Syracuse University and taught there until he retired in the late 1990s. In the field of simulation Bob has made significant contributions to research, practice, dissemination of knowledge, development of software, service to the profession, and advancement of the status and visibility of the discipline.

His contributions to simulation research include groundbreaking papers in the following areas: hybrid analytic/simulation modelling; event graph models; hierarchical control flow graph models; computational speedup of model execution and event-list processing; output analysis; and a general framework for discrete-event modelling and simulation based on formal logic. Perhaps Bob is best known for his research on verification and validation of simulation models.

Bob Sargent's contributions to simulation practice include pioneering work on modelling of computer systems for performance evaluation as well as work with the U.S. Air Force on military problems.

An active disseminator of simulation knowledge to practitioners and researchers alike, Bob has given numerous tutorials on wide-ranging simulation-related topics at conferences and universities around the world. He was a co-editor of the *Proceedings of the Winter Simulation Conference* in 1976 and 1977; co-editor of a special issue of *Operations Research* on simulation (1983); and co-author of state-of-the-art bibliographies. Bob was a National Lecturer with the Association for Computing Machinery (ACM) from 1985 to 1989. He supervised nine Ph.D. students, six of whom did their dissertation research in simulation. For the special fiftieth anniversary issue of *Operations Research* (2002), Bob co-authored an invited article on the past, present, and future of the field of simulation that was titled "Perspectives on the Evolution of Simulation."

Bob's editorial work includes helping to establish the Simulation Department of *Management Science* in the mid-1970s. He was the Departmental Editor for Simulation Modeling and Statistical Computing (Research Contributions) of the *Communications of the ACM* from 1980 to 1985. Bob also helped to establish the *ACM Transactions on Modeling and Computer Simulation* (*TOMACS*); and he served on the *TOMACS* Editorial Advisory Board from 1989 to 1997. Bob has received service awards from ACM, IIE, the WSC Board of Directors, and INFORMS–CS (in particular, he received the College's Distinguished Service Award in 1988).

Bob Sargent has set a standard for uncompromising integrity and a commitment to excellence that many people in the international simulation community have tried to emulate. Bob's career epitomizes the highest ideals of the INFORMS–CS Lifetime Professional Achievement Award, and it was with great pride that the selection committee presented the award to him.

David Goldsman - INFORMS CS Distinguished Service Award

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The Institute for Operations Research and the Management Sciences (INFORMS) College on Simulation established the Distinguished Service Award to recognize individuals who have provided long-standing, exceptional service to the simulation community. The award may be given annually and to at most one person. David Goldsman is this year's recipient of the Distinguished Service Award. He is a Professor in the School of Industrial and Systems Engineering at Georgia Tech. Dave has given long-standing, exceptional service to the simulation community in three important areas.

Contributions in service to WSC. Dave has served the Winter Simulation Conference (WSC) as Associate Proceedings Editor for the Twenty-Fifth Anniversary (1992) WSC and he served as Program Chair for WSC'95. He is currently the representative of the Institute of Industrial Engineers (IIE) on the WSC Board of Directors. These are all positions of great responsibility, and Dave has performed the associated duties with the same high standards of professionalism that characterize all his work. In addition Dave has been a consistent contributor to the content of WSC with his many conference papers, his panel memberships, and as session chair.

Editorial Board Contributions. Dave has distinguished himself through his service as Simulation Department Editor of *IIE Transactions* (1993-present), Associate Editor of the Simulation Department of *Management Science* (1988-1992), and Associate Editor of *Operations Research Letters* (1990 to present). A few months before Alan Pritsker's retirement in December 1998, Dave conceived the idea of editing a special issue of *IIE Transactions* in Alan's honour. Nothing like this had ever been done before in *IIE Transactions*; and Dave's initiative established a precedent by which leading figures in the industrial engineering community may be honoured upon their retirement through the publication of a special issue of IIE's flagship archival journal. The special issue of *IIE Transactions* honouring Alan Pritsker appeared in March 2001, several months after Alan's death.

Contributions in service to INFORMS-CS. Dave was Associate Newsletter Editor during the period 1987-1988; and he served as Newsletter Editor during the period 1988-1990. In those days, before the web became the primary vehicle for regular communications with the entire College membership, Dave oversaw a complete revamping of the format and content of the Newsletter.

During the period 1987-1988, Dave founded the Ph.D.-Student Colloquium at the Winter Simulation Conference; and he arranged for this activity to be sponsored by the College. This has become one of the most highly visible activities of the College, attracting students from major universities around the world. While serving as College President during the period 1994-1996, Dave undertook three major initiatives that have profoundly changed the College's infrastructure and some of its most important traditions.

Dave conceived the idea of the College's Lifetime Professional Achievement Award (LPAA) in 1994; he appointed an Ad Hoc Awards Committee to produce a detailed proposal for such an award and to present that proposal to the entire College; and he shepherded the proposal through a lengthy process of discussion and final approval by the College membership.

During his term as College President, Dave also initiated another important innovation in the College on Simulation---namely the creation and ongoing maintenance of the College website. In 1995, Dave recruited others to help him in the establishment of the College website. Then he convinced the School of Industrial and Systems Engineering at Georgia Tech to provide host computer services; and finally he set up the arrangement for ongoing website maintenance that has continued to the present time. In the Fall of 1997, Dave recruited the web editor; and since that time he served as consulting web co-editor to ensure that <www.informs-cs.org> is a valuable resource to the international simulation community.

Summary. This citation cannot cover all of the contributions that Dave Goldsman has made to simulation. Dave gives his time, his effort, and himself to the service of our profession – and he does it with a joy that is infectious. Dave Goldsman is a most appropriate recipient of the Distinguished Service Award of the INFORMS-College on Simulation.

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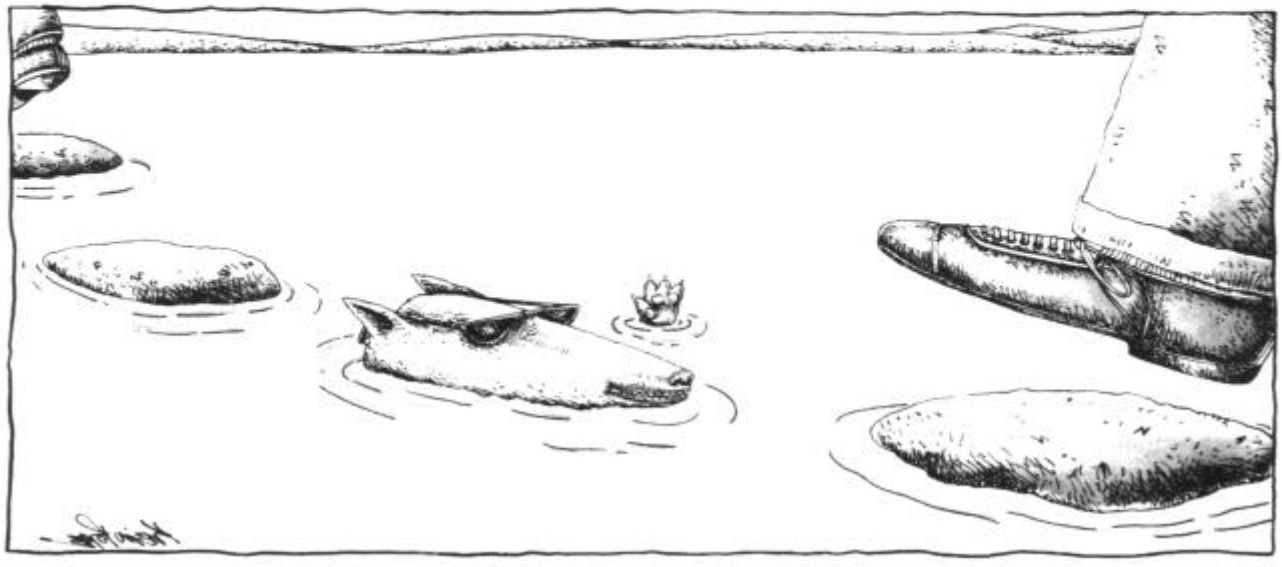

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Academician Ivan Plander - 75 Year Anniversary

Ivan Plander, Professor, DrSc., member of the Slovak Academy of Sciences (SAS) and former Czechoslovak Academy of Sciences, foreign member of the Russian Academy of Sciences (former Academy of Sciences of the USSR), Chief Scientist of the Institute of Technical Cybernetics (1965-1990) and of the Institute of Computer Systems of SAS Bratislava (1991-1997), director of the Institute of Technical Cybernetics SAS (1978-1990), rector of The University of Trencín (1997-2001).

He has obtained the PhD degree from the Technical University in Prague in 1959, he became Associate Professor at the Faculty of Electrical Engineering of the Slovak Technical University (STU) Bratislava in 1967, obtained the DrSc. degree in Computer Sciences from the Faculty of Electrical Engineering of STU Bratislava in 1980, became Professor in Applied Informatics at the Faculty of Electrical Engineering of STU Bratislava in 1995. His research activity includes parallel computer system architecture for artificial intelligence and specialized problem-oriented computers for vision systems and robotics. He paid particular attention to research of the parallel associative SIMD-architecture computer for image and signal processing and for control systems of large relational databases. He was the head and coordinator of the project "RPP -16 Control Computer System FOR Real-Time Processing" project (1969-1973) produced by the Czecho-Slovak industry. He was the head of the "SIMD Parallel Associative Computer" science and research project (1982-1988) implemented into industrial production. He was awarded the State Prize for Technical Sciences for the RPP-16 Project in 1976.

He was the head of 10 national and international research projects resulting in realized products, many of them introduced into industrial production, as well. His recent publications are devoted to the following topics: Optimal partitioning and mapping for reconfigurable massively parallel computers, Task migration and memory requirements minimization, Applications of massively parallel architectures in artificial intelligence and knowledge processing, Interconnection networks for parallel and distributed computer architectures, Parallel switching structures for very rapid networks, Artificial intelligence conceptual state and applications. He was the head of the "Knowledge Processing Systems" complex scientific project within the "New Generation Computer Systems of the Academies of Sciences of Central and Eastern European countries" project (1985-1990). From 1991 to 1993, he was the head of the "Structure and Architecture of Parallel Computers for Knowledge Processing" grant projects of the Slovak Academy of Sciences and took part in the "Algorithms and Software for Parallel Computer Systems" international project.

He has published 10 books, including 5 in world languages, and more than 100 scientific papers. He was invited speaker at 33 inland and 30 international conferences, presented 41 invited papers. He was lecturing at the Computer Science and Informatics Department of the Faculty of Electrical Engineering and Informatics, Slovak Technical University in Bratislava. In 1961-1989, he introduced and lectured 9 new subjects of computer science and technology. In 1988-1989, he was visiting Professor and lectured Computer architecture for artificial intelligence and led the "Computers for artificial intelligence" seminar at the Technical University Munich, Institute of Informatics. He is the Editor-in-Chief of the "Computers and Artificial Intelligence" international journal (1982-currently), as well as member of editorial boards in 4 international scientific journals: Applied Artificial Intelligence, Hemisphere, Washington (1990-1993); Applied Intelligence, Kluwer Academic Pub., Boston/Dordrecht/ London (1987-currently); New Generation Computer Systems, Academy of Science, Berlin (1989-1992); Autonomous Robots, Los Angeles (1994-currently).

He is organizer of the regular "Artificial Intelligence and Information and Control Systems of Robots" international conferences held in 1980, 1982, 1984, 1987, 1994 and 1997. He was the program committee member of 11 international conferences on computer science and artificial intelligence. He is the Slovak representative in the International Federation for Information Processing IFIP TC-5 and the IFIP Silver Core holder (1977), member of the IEEE Computer Society, USA (1984-currently) and member of the ACM Computer Society, USA, the IEEE Computer Pioneer Award holder (1997), member of the American Association for Artificial Intelligence AAAI (1969-currently). He is the president of the Slovak Society for International Relations and Understanding, vice-president and president of the Association of Slovak Scientific-Technological Societies (1993-1999), chairman of the Slovak Society for Applied Cybernetics and Informatics (1995-currently) and he cooperates with the DG XIII European Union Commission, Brussels - Information Technologies. In 1997, he obtained award of the Institute of Electrical and Electronic Engineers (IEEE) "Pioneer in Computers".

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

Mikuláš Alexik, alexik@frtk.fri.utc.sk

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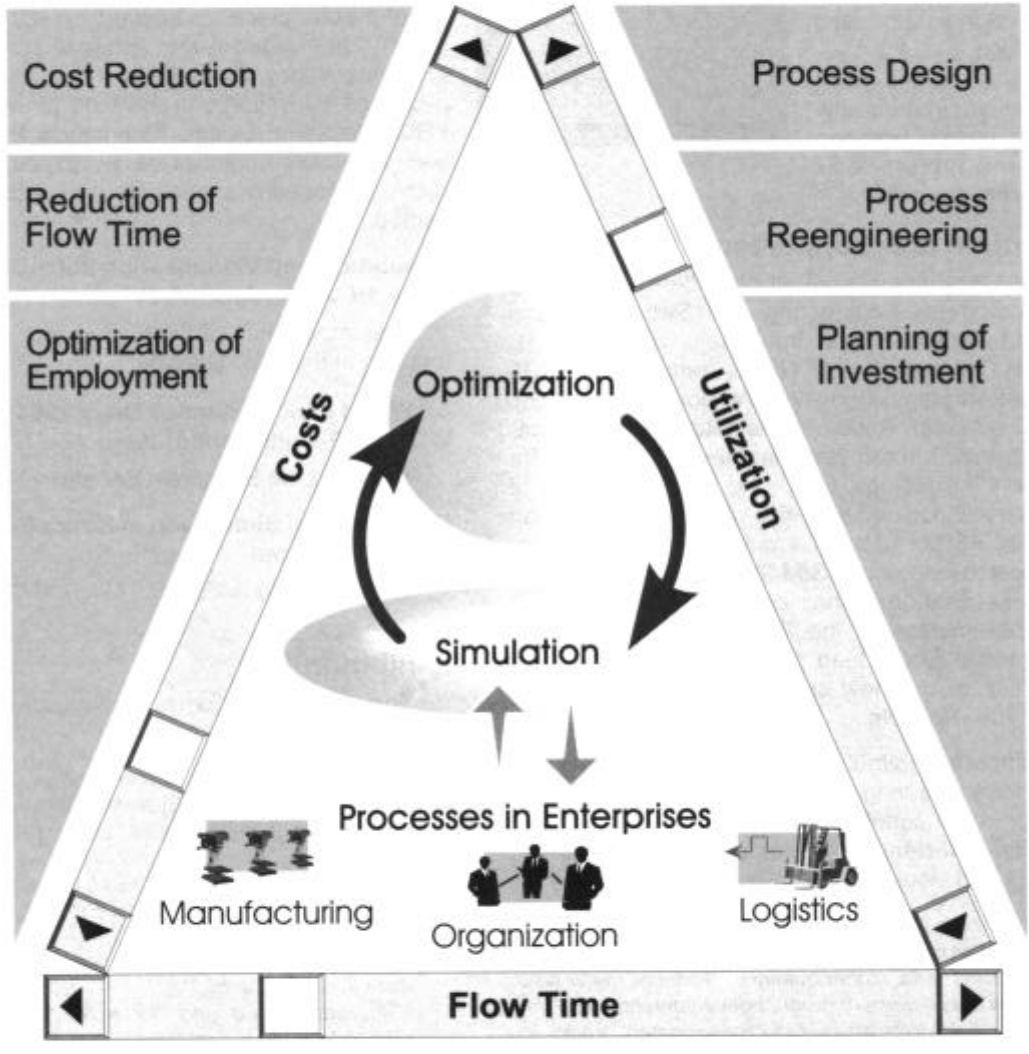

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ARGESIM COMPARISONS

An Object-Oriented Solution of ARGESIM Comparison "C2 - Flexible Assembly System" with AnyLogic

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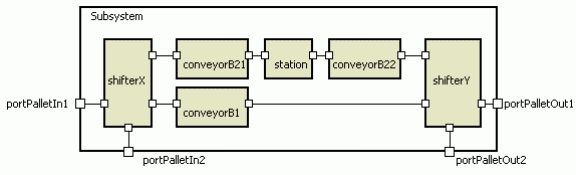
Simulator: AnyLogic (www.xjtek.com) is a general-purpose simulation environment for discrete, continuous and hybrid systems generating cross-platform standalone Java models.

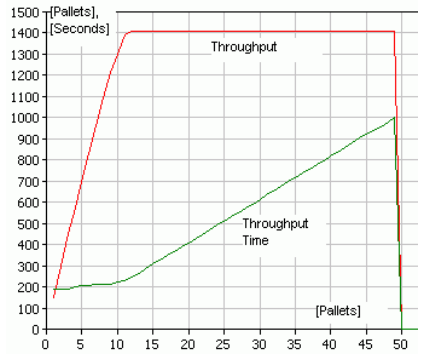
Model: The assembly system consists of 8 subsystems of the following structure:

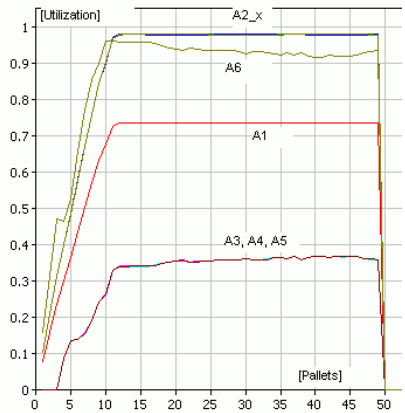


The objects inside the subsystem are representing ShifterX, Station, ShifterY and the intermediate conveyor belts B1, B21 and B22. They are connected via ports to exchange the pallets and some status messages like "Ready" and "Busy".

Task a: Control Strategy/ Statistical Evaluation: Generally the ShifterX of a subsystem checks locally whether the pallet requires processing if the conveyor belt B21 is free. However in subsystem A2_a only every third and in A2_b only every second pallet is shifted. A3 uses additionally a global strategy: A6 must be busy to approve the shift. A4 and A5 perform shifts only if the previous station(s) (A3/A4) had already processed the pallet. This strategy yields in a minimal throughput time also in the case of few pallets.

Statistical data of utilization, and throughput time are collected via Dataset objects - displayed in charts within the AnyLogic environment; this evaluation also can be done via Java statements in the model.





Task b: Simulation Results. Analytical investigations validate the simulation results:

MinThroughputTime	191.67
MaxThroughputA1	1763.27
MaxThroughputA2	469.57
MaxThroughputA3	1350.00
MaxThroughputA4	1350.00
MaxThroughputA5	1350.00
MaxThroughputA6	919.15
MaxThroughput	1408.70
MaxUtilizationA1	0.73
MaxUtilizationA2	0.97
MaxUtilizationA3	0.93
MaxUtilizationA4	0.93
MaxUtilizationA5	0.93
MaxUtilizationA6	0.95

The minimal throughput time is the sum of operation times in the required stations (A1, A2 and A6), therefore 3 up and 3 down shifts (B1-B2), and the travel time for one conveyor B1 loop. Maximal throughput of a station equals simulation time (8 h) divided by the sum of operation time and loading time (1.33 s). A3, A4, A5 and A6 can process about 2269 pallets. Thus the A2 stations, assembling around 1409 pallets, cause the bottleneck.

Hence the maximum utilization of a station is the maximum throughput multiplied by the operation time of the station divided by the simulation time. Graphs and

$N_{Pallets}$	Throughput	$t_{Throughput}$
1	150	191.67
3	451	191.67
5	698	206.41
7	964	209.09
9	1214	213.50
11	1394	227.34
12	1409	245.32
13	1409	265.76
20	1409	408.67
40	1409	819.26
49	1409	1003.9
50	0	0

tables show results of summary statistics.

Task c: Simulation Results - Optimisation: Additional Java code sets up a loop from 1 to 50 pallets (optimum 12 pallets):

```
for (n=1; n <= 60; n++) {
  addPallet();
  forerun();      // 2 hours
  collectData(); // 8 hours
}
```

The simulation stopped at 50 pallets due to a deadlock. AnyLogic also offers the OptQuest environment for optimisation (not used here).

C2 Classification: Object- / Process-oriented Modelling

Simulator: AnyLogic V.5

A fully Numerical Solution of ARGESIM Comparison "C5 - Two State Model" with SIMULINK

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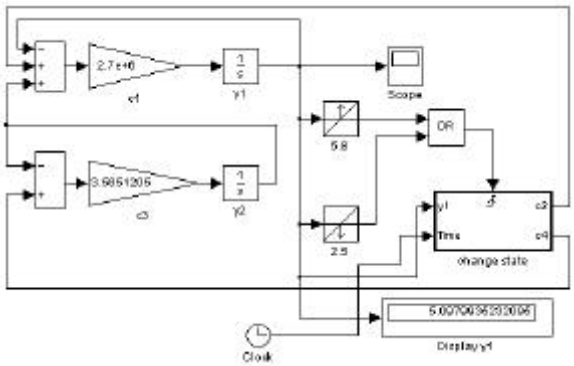
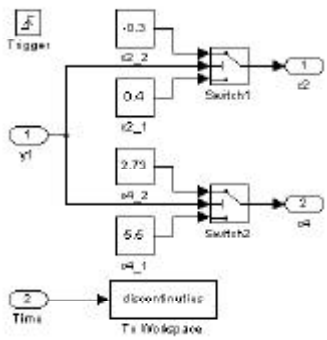
{epazour, fbreiten}@osiris.tuwien.ac.at

Simulator: SIMULINK is MATLAB's software package for graphical modeling, simulating and analyzing dynamic models. It provides a graphical user interface for building block diagrams.

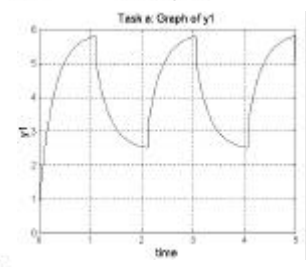
Model: The model uses SIMULINK's predefined standard blocks. For modeling the differential equations two `Integrators`, `Gains` and `Sums` are used. The detection of the change of states is implemented by two `Hit Crossing` blocks. If the value of y_1 rises above 5.8 or falls below 2.5 one of the blocks outputs 1, otherwise 0.



In the case of output 1, a triggered subsystem is executed. The subsystem changes the values of c_2 and c_4 by using `Switches` which pass through different values depending on y_1.



Task a, b: The following table shows the results for the located discontinuities and the final value of y_1 for different solvers (relative tolerance of 10^{-10}.



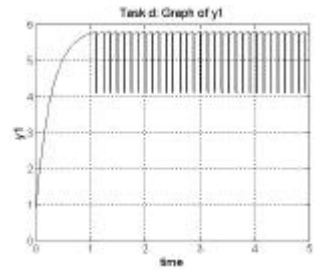
As the system is stiff, the `ode45` solver, which is based on an explicit Runge-Kutta formula, is inefficient and the last discontinuity is not found. The solvers, which are suitable for stiff systems (`ode15s`, `ode23s`, `ode23t`, `ode23tb`) are accurate enough to locate the last discontinuity. The table shows the results for `ode15s`, a variable order multistep solver based on numerical differentiation formulas and `ode23s`, a modified Rosenbrock method but the other two stiff solvers also provide similar results.

solver	ode45 Dormand-Prince	ode15s stiff/NDF	ode23s stiff/Mod. Rosenb.
t_0	0.00000021204414	0.00000021204049	0.00000021204189
t_1	1.10830375286938	1.10823990341505	1.10826751481646
t_2	2.12968573520500	2.12953629209048	2.12959805425123
t_3	3.05415418062369	3.05394045301652	3.05402788435275
t_4	4.07553425048787	4.07523684992900	4.07535852984632
t_5		4.99964071144095	4.99978874716609
$y_1(5)$	5.79999923704293	5.09658601719750	5.09799352320946

Task c: When using the relative error tolerance 10^{-14} SIMULINK displays a warning that the value is too small and automatically sets it to the value $2.8421709430404 01*10^{-14}$.

solver	ode23s (stiff/Mod. Rosenbrock)		
rel. tol.	1.E-06	1.E-10	1.E-14
t_0	0.00000021203842	0.00000021204189	0.00000021204189
t_1	1.10819703097179	1.10826751481646	1.10826702210142
t_2	2.12943121479381	2.12959805425123	2.12959815870731
t_3	3.05378375726469	3.05402788435275	3.05402798906175
t_4	4.07501989547822	4.07535852984632	4.07535910244564
t_5	4.99937437981031	4.99978874716609	4.99978931998371
y1(5)	5.09405508729644	5.09799352320946	5.09799897169501

Task d: The changing of the state 2 parameter values and the switching condition results in high frequent oscillation behaviour of y_1. All used solvers compute 63 discontinuities. The first and last discontinuities and the final value of y_1 are shown in the table:



solver	ode45	ode15s	ode23s
t_0	0.00000000962055	0.00000000962066	0.00000000962046
t_1	1.10830389685258	1.10823958567604	1.10826680849999
t_2	1.12172730465457	1.12166325375780	1.12169046605979
...	...	...	...
t_{61}	4.92306167126274	4.92251064904719	4.92274184583829
t_{62}	4.93648552292577	4.93593431333147	4.93616550342221
y1(5)	5.78039335464986	5.78063127592552	5.78053132948846

C5 Classification: Numerical Approach
Simulator: MATLAB / SIMULINK Rel. 13

A CSSL-like Solution of ARGESIM Comparison "C7 - Constrained Pendulum" with ACSL

M.Jach,K.Vogel, R. Hohmann;
Otto von Guericke-University Magdeburg;
Matthias.Jach@Student.Uni-Magdeburg.de

Simulator: ACSL is a general purpose simulation language modelling systems by time-dependent differential equations and running on a wide range of computers (this solution run on a home PC, WIN 98.

Model: In the following model (for task a, b) we use the Schedules **hit** and **hitlin** to serve the discrete sections **hit** and **hitlin**, if the pendulum reaches or leaves the pin. The section with the suffix **lin** handles the linearized model (linear and nonlinear models in Task b) run simultaneously):

```
PROGRAM Constrained Pendulum Task A and B
LOGICAL cl , cllin
 CONSTANT pi = 3.141592654; pi6 = pi/6
 pi12=pi/12;mpi2=-pi/2;mpi6 =-pi6;
 mpi12=-pi12; TEND=9.99! Pi-frac, time 10 sec
 INITIAL ! Pendulum Parameters
  CONSTANT l=1,m=1.02,d=0.2,g=9.81,lp=0.7
  CONSTANT phi0=0.3,dphi0=0,phip=0.2 !Default
  phi0lin=phi0;dphi0lin=dphi0
  ! Determine initial position of pendulum --
  ls=l-lp;cl=.false.;cllin=.false.
  IF(SIGN(1.0,phip).NE.SIGN(1.0,phi0)) THEN
   la=l; lalin=l; ELSE
   IF(ABS(phi0).GT.ABS(phip))THEN
    la=l; lalin=l; ELSE
    la=ls; lalin=ls ; cl=.true.;cllin=.true.
   ENDIF
  ENDIF
 END ! of INITIAL
 DYNAMIC
  DERIVATIVE ! Dynamics of pendulum
   ddphi = -(g/la)*SIN(phi) - (d/m)*dphi
   dphi = INTEG(ddphi, dphi0)
   phi = INTEG(dphi, phi0)
   SCHEDULE hit .XZ. (phi-phip) ! P hits pin
   ddphilin=-(g/lalin)*philin - (d/m)*dphilin
   dphilin = INTEG(ddphilin, dphi0lin)
   philin = INTEG(dphilin, phi0lin)
   SCHEDULE hitlin.XZ.(philin-phip)! hit(lin)
   deltaphi = philin-phi !error of lin eq.
  END ! of DERIVATIVE
  DISCRETE hit ! Change of Velocty and length
   cl = .NOT. cl ! switching in the following
   la = RSW(cl,ls,l);
   dphi= RSW( cl, dphi*l/ls, dphi*ls/l)
  END ! of DISCRETE hit
  DISCRETE hitlin ! as HIT linear
   cllin = .NOT. cllin
   lalin=RSW(cllin,ls,l)
   dphilin=RSW(cllin,dphilin*l/ls,
               dphilin*ls/l)
  END ! of DISCRETE hit
 CINTERVAL CINT = 0.01
 TERMT ( t .GT. tend,'Stop on time limit')
END ! of DYNAMIC
END !of Program
```

Task a, Task b: The following figures show the results of task a-1 (left) and task a-2 (right) – simultaneously results for task b arge obtained.

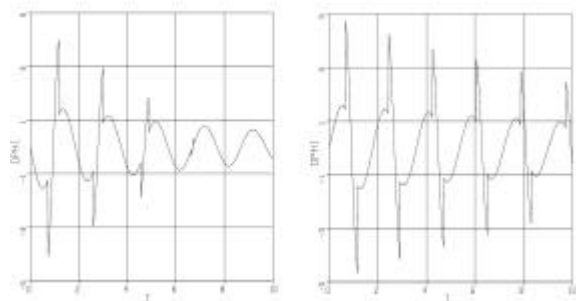


fig. 1: task a-1 (angle velocity dphi) fig. 2: task a-2

Task c: Our approach can be described as "brute-force" using only a minimum of information implemented in the model. Starting with the angle velocity $d\phi_0$ we are looking for, the pendulum moves to the right ($d\phi_0 > 0$) and swings then back or it goes to the left in the other case instantly.

If the absolute value of this initial angle velocity is sufficiently large, the pendulum reaches the angle of $-\pi/2$. On the other hand the pendulum does not reach this angle, if the initial angle velocity is too small.

We use three event-driven commands to catch the desired value by bisection: First we estimate the two limits of our interval a<b with sign(a)=sign(b) or with 0 as one limit. We start with the value absolutely higher.

- Event 1: The pendulum -coming from the right - reaches the pin, its length and angle velocity change. We suppose that this event always takes place.
- Event 2: The pendulum traverses the angle $-\pi/2$ which means that $d\phi_0$ was estimated (absolutely) too high. Therefore we stop the simulation, cut the initial angle velocity and try it again.
- Event 3: The pendulum leaves the pin coming from the left. That means that it was not stopped reaching the angle $-\pi/2$, so $d\phi_0$ was estimated (absolutely) too small. We stop the simulation, increase the value and try it again.

If we choose the start value sufficiently large and the other limit of the interval in the way that Event 2 does not occur, we have a classic bisection.
We get $d\phi_0$= -2.1847 after 53 iterations with a= -5 and b= 0 and $d\phi_0$= 2.29107 after 56 iterations with a= 0 and b= 5.

C7 Classification: Model Segment Approach

Simulator: ACSL 11.8.4

A mixed Analytical – Numerical Solution of ARGESIM Comparison "C7-Constrained Pendulum" with Maple

Stefan Pawlik, F. Breitenecker, TU Vienna
pawlikb@fsmat.at

Simulator: Maple is a widely used Computer Algebra System, which also contains many numerical tools. Therefore it is a good choice if parts of the problem can be done symbolically.

Model: A change of the state space was done to simplify the task. This approach uses the tangential velocity instead of the angular velocity, which leads to a system of two simpler differential equations:

```
> diffsys:={diff(phi(t),t)=psi(t)/l(phi(t)),
  diff(psi(t),t)= -g*sin(phi(t))-d/m*psi(t)}:
> d:=0.2: g:=9.81: m:=1.02: phi_pin:=-Pi/12:
> l:=p->piecewise
    (p>=phi_pin, 1, p<phi_pin, 0.3):
> solu1:=dsolve(diffsys union
    {phi(0)=Pi/6, psi(0)=0},{phi(t),psi(t)},
     type=numeric, method=rkf45,
     output=listprocedure):
```

In then above equations the change of the pendulum length was achieved with the use of the `piecewise` function.

Task a –Simulation of the System: The numerical algorithm used was a RKF45 (without state event handling) which gives the following graphs for hitting the pin in case of task a-1. In case of task a-2 parameters in the `piecewise` – function have to be changed.

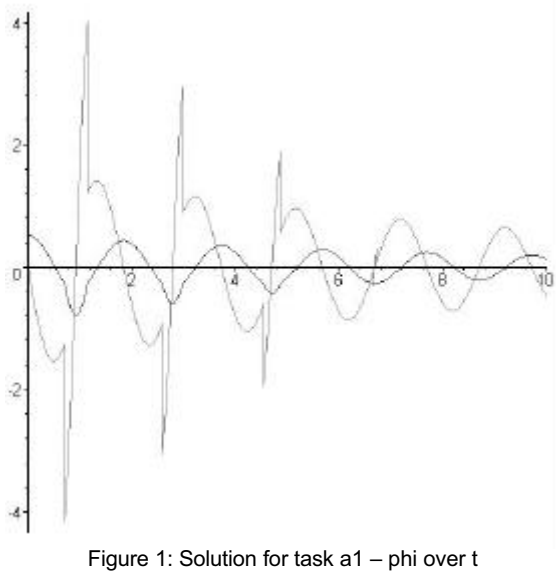


Figure 1: Solution for task a1 – phi over t

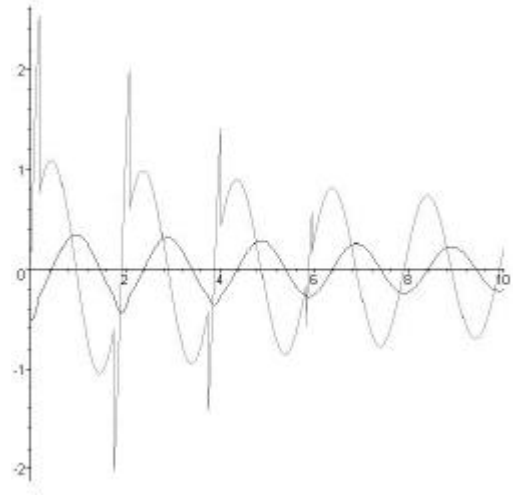


Figure 2: Solution for task a2 – phi over t

Task b - Comparison of nonlinear and linear model. Maple can calculate the analytical solution of the linear problem by symbolic computation:

```
>diffequlin:={m*l(phi(t))*diff(phi(t),t,t)=
          -m*g*phi(t)-d*l(phi(t))*diff(phi(t),t)}
```

The exact solution can be calculated till the pendulum hits the pin, then the next part of the solution can be calculated exactly with the new starting conditions which are the conditions at the time the pendulum hits the pin (by inverting the solution getting time as function of the angle), and so on (results in figure 3)

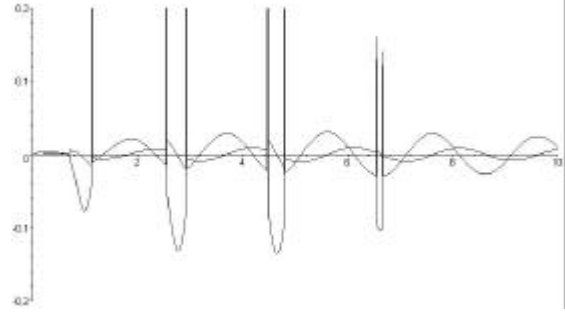


Figure 3: Difference of angle and angular velocity

Task c – Boundary Value Problem. This Problem can be seen as an initial value problem with inverse time. The initial values are angle = $-\pi/2$ and angular velocity = 0. Then only the time till the angle is $\pi/6$ has to be calculated and we are done.

C7 Classification: Analytical/Numerical Approach

Simulator: Maple 8.01

A C++ - based Object-oriented Solution of ARGESIM Comparison "C10 – Dining Philosophers II" using CSIM

Herb Schwetman, Mesquite Software Inc.;
Sabri Pllana, TU Vienna;
hds@mesquite.com / spllana@osiris.tuwien.ac.at

Simulator: CSIM (Mesquite Software) is a process-oriented, general-purpose simulation toolkit, which supports the development of process-oriented, discrete-event simulation models, by using the standard programming languages C and C++. Because of the nature of compiled C and C++ programs and CSIM's dynamic memory allocation, developed models are compact and efficient. CSIM supports the Object-Oriented Simulation (OOS).

Model: The OOS models the system by specifying the behaviour of objects during the time. Each philosopher in our model is an object of the class *Philosopher*, which is represented in Figure 1, by using the Unified Modelling Language (UML) notation.

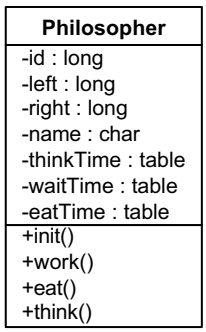


Figure 1, left: The UML representation of the class *Philosopher*

Figure 2 depicts the method *work()* of the class Philosopher, which implements the behaviour of the philosopher (its thinking, waiting and eating activities). Each chopstick is an object of the CSIM class *Facility*.

```
1   void Philosopher::work(void) {
2     create (name); // create the philosopher process
3     double waitBegin; // begin of the waiting time
4     double waitEnd; // end of the waiting time
5     while (1) {
6       this->think(); // thinking time
7       waitBegin = simtime(); // begin waiting
8       set_priority(2); // high priority
9       (*cs)[left].reserve(); // get the left chopstick
10      hold(1); // a pause after grabbing the left
11      set_priority(1); // low priority
12      (*cs)[right].reserve(); // get the right chopstick
13      waitEnd = simtime(); // end of the w. time
14      waitTime.record(waitEnd - waitBegin); // w.t.
15      this->eat(); // eating time
16      (*cs)[right].release(); // release the right
17      (*cs)[left].release(); // release the left
18    } // end while
19  };
```

Figure 2: The `work()` method of the class *Philosopher*

Task a: Simulation until deadlock. Table 1 shows simulation results for the case in which the deadlock is reached at simulation time 1116359. The objects of the CSIM class *Table* are used to collect explicit statistics on thinking, waiting, and eating times.

	Thinking time		Waiting time		Eating time	
	mean	s.d.	mean	s.d.	mean	s.d.
P1	5.50	2.87	11.46	7.74	5.49	2.87
P2	5.49	2.87	11.41	7.74	5.51	2.88
P3	5.52	2.88	11.47	7.77	5.49	2.87
P4	5.51	2.87	11.44	7.74	5.52	2.88
P5	5.51	2.86	11.46	7.73	5.51	2.87
All	5.51	2.87	11.45	7.74	5.50	2.87

Table 1: Average times (with standard deviation) of thinking, waiting, and eating periods for each philosopher

Statistics on usage of CSIM *facilities*, which are used to model chopsticks, are collected automatically by CSIM (see Table 2).

Chopstick utilization [%]					
C1	C2	C3	C4	C5	All
0.91	0.91	0.91	0.91	0.91	0.91

Table 2: Chopstick utilization

Task b: Simultaneous access. When a philosopher executes *(*cs)[right]reserve()* (see Fig. 2, line 9) it either gets the chopstick immediately (if the chopstick is free), or it is placed in the queue of philosophers waiting for the chopstick.

The default queue discipline is FCFS (First Come, First Served). If priorities differ, then the philosopher with a higher priority gets the chopstick first. In our model the philosopher on the right has a higher priority (see Fig. 2, line 8).

Task c: 50 simulation runs. Basically, our model allows an arbitrary number of philosophers. 50 simulation runs were executed by the command **`dph -np 5 -nr 50`**, where **`-np`** specifies the number of the philosophers, and **`-nr`** the number of the simulation runs.

The maximum and the minimum termination simulation times were 21915300 and 80177 units. The deadlock is detected by using the CSIM built-in event **`event_list_empty`**, which indicates that all philosophers are waiting. 50 simulation runs took 42 minutes of the wall clock time. Simulation is executed on Sun Ultra 10 workstation (CPU 440MHz, memory 256MB).

C10 Classification: Object/Process – oriented Approach

Simulator: CSIM Rel. of 2002

An Event Graph –based Approach to ARGESIM Comparison "C10 Dining Philosophers II" with Simkit

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Simulator: Simkit, a Java package, provides an API for creating Discrete Event Simulation models based on Event Graph methodology. Simkit's strengths are its modelling flexibility and platform independence. Simkit's Event List algorithm does not throw an error when it becomes empty, but simply terminates the simulation run.

Model: Creating an Event Graph model consists of defining the parameters for the model, defining state variables and their initial values, the state transition functions that form the events, and finally the scheduling relationships between the events. The parameters for the Dining Philosopher's problem consist of n, the number of philosophers; $\{t_M\}$, the sequence of meditation times; and $\{t_E\}$, and the sequence of eating times. For the comparison, n=5 and the sequences are specified as iid discrete uniform (1,10) random variates. The state variables are defined as {p[0],… ,p[n-1]} (C/Java numbering) with possible values {M, WL, WR E, } (Meditating, Waiting for Left chopstick, Waiting for a Right chopstick, and Eating, resp.).

The Event Graph is shown in fig. 1, where the initial Run event is omitted for clarity. At the start of the simulation there are n StartMeditating(i) events on the event list with parameters 0…n-1. All the expressions are assumed to be modulo n (e. g., if philosopher 0 is waiting to pick up both chopsticks, EndEating(4) will schedule TakeLeft(0), since 4+1 mod 5 = 0). Note that the StartEating(i) event corresponds to philosopher i picking up the chopstick at the right, which could only occur if he had already picked up the left chopstick.

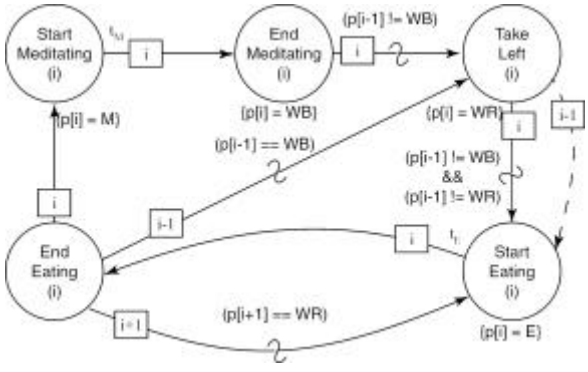

Figure 1: Event Graph for Dining Philosophers

Tiebreaking can be specified by a partial ordering of the Event Graph scheduling edges. For this model, the scheduling edges for the TakeLeft(i) event have higher priority than any other events.

Thus, if StartEating(2) and TakeLeft(1) are scheduled at the same time, TakeLeft(1) will always occur first, and will cancel StartEating(2). Note that the states of the chopsticks can be completely determined by the states of the philosophers.

Task a: Simulation of the System. With a single run, the simulation deadlocked at time 2345079. Statistics on the waiting time and chopstick utilization are shown in Table 1 and Table 2. There is no need to estimate mean the time eating or meditating, since they are completely determined by the probability distributions. The standard deviations for waiting time were gathered, despite the fact that they are meaningless due to correlation of the observations.

Philosopher	0	1	2	3	4	All
Mean	11.43	11.45	11.44	11.42	11.44	11.45
Std	8.07	8.07	8.06	8.09	8.08	8.08

Table 1: Philosopher Waiting Times

Chopstick	0	1	2	3	4	All
Utilization	91.88%	91.97%	91.92%	91.96%	91.93%	91.93%

Table 2: Chopstick Utilization

Task b: Correct Event Management. The model was run in verbose mode, which prints out the state of the event list. The state transitions for the current event were also listed:

```
philosopher[1]:
        Waiting for Left => Waiting for Right
chopstick[1]: 0 => 1
Time: 2345079.000 Current Event: TakeLeft {1}
 ** Event List --  **
2345079.000     TakeLeft        {2}
2345079.000     TakeLeft        {4}
2345079.000     TakeLeft        {0}
2345079.000     StartEating     {3}
2345079.000     StartEating     {1}
 ** End  of Event List --  **
philosopher[2]:
        Waiting for Left => Waiting for Right
chopstick[2]: 0 => 1
Time: 2345079.000 Current Event: TakeLeft {2}
 ** Event List --  **
2345079.000     TakeLeft        {4}
2345079.000     TakeLeft        {0}
2345079.000     StartEating     {1}
 ** End  of Event List --  **
```

Task c: 50 Replications. The model was repeated 50 times and statistics gathered on the deadlock times. The times varied between 9391 and 9172542, with a mean of 3125763.14 and a standard deviation of 2447495.21. Note that in this case the standard deviation *is* meaningful because the runs are independent.

C10 Classification: Object/Event – oriented Approach

Simulator: Simkit Rel. of 2002

A directly Programmed Solution to ARGESIM Comparison "C13 Crane and Embedded Control" with MATLAB

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Simulator. MATLAB is a widely used software tool based on numerical vector and matrix manipulation. Additionally it provides several toolboxes for various tasks.

Model: The differential equations of the mechanical model of the crane and the DC-motor are implemented directly in MATLAB. For the numerical integration a Euler-algorithm has been implemented: `[t,y]=myeuler('lindiffgl',[0 0.01],[init],steps).`

The Euler-algorithm has been chosen to provide a comparison of the performance of a simple ODE solver to more sophisticated ODE Solvers (see SNE 35/36).

To simulate the controlled system, time in general was discretised to the time base of the controller Δt=10ms. In each sample interval the Euler ODE-solver was started to integrate the system in this interval and the dedicated brake-conditions and controller reactions are evaluated.

The following code describes the implemented Euler-algorithm:

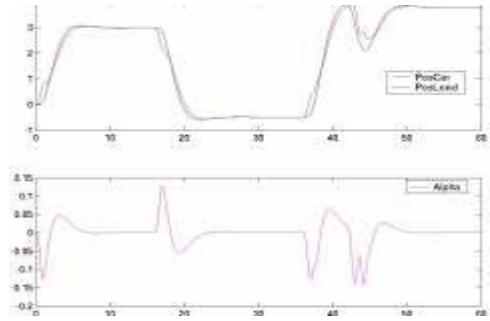
```
function [t,y] = myeuler(dglstr,range,vars,steps);

   nrsteps   = steps;
   starttime = range(1);
   endtime   = range(2);
   stepwide  = (endtime-starttime)/nrsteps;
   time = starttime;
   y=zeros(nrsteps,5); t=zeros(nrsteps,1);
   value=vars;    %Init. d. i. Int. kum.  Flaeche

for i=1:nrsteps
   time =time + stepwide;
   PosCar = value(1); PosCar_dot = value(2);
   alpha = value(3); alpha_dot = value(4);
   fc = value(5);

    fktwert = eval([dglstr,'(',num2str(time),'…
    ,[',num2str(PosCar),';',num2str(PosCar_dot)…
    ,';',num2str(alpha),';',num2str(alpha_dot)…
    ,';',num2str(fc),'])']);

   value = value + fktwert .* stepwide;
   y(i,:)=value';  t(i,1)=time;

end
```

Task a: Comparison of uncontrolled nonlinear and linear model. For this task, linear and nonlinear differential equations have been simulated at [0 600] sec with the RKF45–integration algorithm, which allows an implicit approach (DAE-systems) for the nonlinear ODE (result differences given in next table).

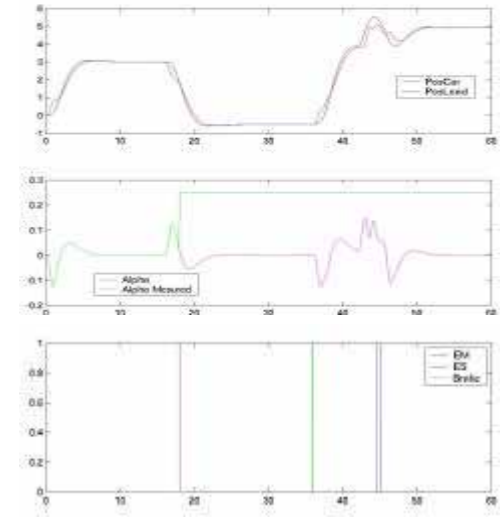
disturbance fd	-750	-800	-850
difference Δx_l	-135,7	-222,0	-311,8

Task b: Simulation of the controlled system. Controller and brake-logic were implemented in MATLAB m-functions. For the integration in task b and task c the Euler – algorithm was used.

The next figure shows the result of important variables at [0 60] sec, the times for the brake activation are: t = 15.37, 32.13 and 56.73 sec.



Task c: Simulation of controlled system with sensor diagnosis. In case of failure the controller switches to the emergency mode without a consideration of the angle alpha (time courses next figure), with time instants: emergency mode t = 18.05, brake activation t = 35.81, emergency stop at t = 44.47 sec.



Generally it turns out, that the simple Euler-algorithm (with stepsize equal to controller sampling time, Δt_E=1ms) is almost as accurate as any ODE solver of higher order: all compared results are found within the technical accuracy of the system.

C13 Classification: Hybrid / Discrete Approach

Simulator: MATLAB Rel.13

An Object-oriented Hybrid Approach to ARGESIM Comparison "C13 Crane and Embedded Control" with AnyLogic

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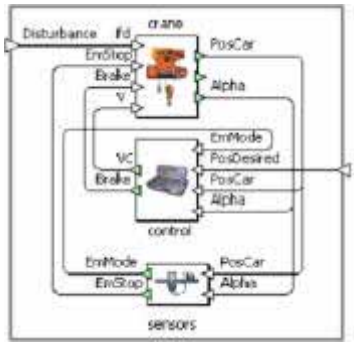
maxim@mail.ioffe.ru

Simulator: AnyLogic (www.xjtek.com) is a general-purpose simulation environment for discrete, continuous and hybrid systems. It employs UML-RT structure diagrams for building hierarchical models in object-oriented way and *hybrid statecharts* for behaviour specification. The generated model is Java and can be extended with user's Java code. The simulation engine handles discrete events and dynamically changing sets of algebraic-differential equations. It automatically detects "change" (or "state") events. Debugging and visualization facilities are present.

Model: The model was intuitively decomposed into the following blocks: crane, control and sensors.

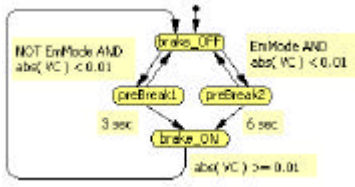


The **crane** object consists of the crane- mechanics and the DC-motor. The mechanics of linear and nonlinear systems, as well as the DC-motor were implemented plainly using given equations. The **control** block generates voltage for the motor and switches on/off brakes, whereby discretisation is implemented by triggering the block with the sampling time. This object receives information about **car status** and **car desired** position. The **sensors** object implements checking and control of any emergency modes.

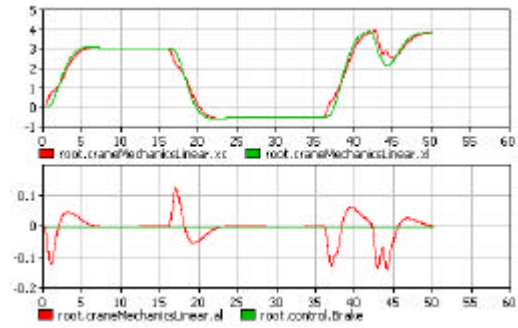
Task a: Comparison of uncontrolled nonlinear and linear model. The following table shows the differences of linear and nonlinear model in X_L:

Disturbance	-750	-850	-800
Δx_L	-150	-265	-389

Task b: Simulation of the controlled system. Brake control was implemented in the control block using statechart notation (see figure left). If the condition for activating the brake is true it switches to the **preBrake** state.



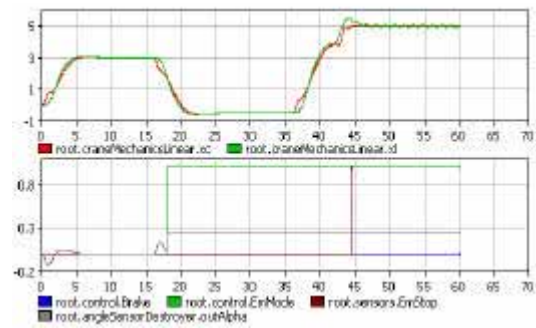
If condition will be true for the specified time it will pass to the **brake_ON** state, activating the brakes.



The above figure shows the diagrams for the variables **PosCar**, **PosLoad**, **Angle** and **Brake**. As follows from the diagram the brakes are not activated during operation. Thus the brakes activating condition may be too strict.

Task c: Simulation of controlled system with sensor diagnosis. Diagnosis was implemented as follows: imagine a status function F of the sensor: F = 0 then sensor is valid, F = 1 otherwise. Let integrate this function for a 100 ms time window (it is possible to integrate a difference of F and 100 ms delayed F). The result will be a total time when the sensor status was invalid during 100 ms. An EmergencyMode will be switched on if the result is greater than 50.

The following figure shows the transient diagrams for **PosCar**, **PosLoad**, **Angle**, and states the time instants of break-on, emergency-mode and emergency-stop events. The system switches to Emergency-Mode at t = 18.05 and Emergency Stop is triggered at t = 44.4798.



C13 Classification: **Object-oriented / Hybrid Approach**

Simulator: Anylogic V.4.5

A Process-oriented Solution of ARGESIM Comparison "C14 Chain Supply" with AutoMod

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Simulator. AutoMod, a product of Brooks Automation, can be used in almost any area of manufacturing and material handling. It provides true to scale 3-D virtual reality animation, user expert-based material handling templates for Conveyors, Path-based Vehicle Movement, Power & Free, AS/RS, etc. and a general propose template Process System for modelling resources, queues etc. The spreadsheet interface and an English-like simulation language provide flexibility in modelling applications.

Model: The Supply Chain Management is modelled by using the Process System Template. Each element (factories, distributors, wholesaler) is represented by an infinite capacity queue. The different products are modelled with the AutoMod element "loads" which are controlled by the logic of the model.

Figure 1: 3D visualisation of the model

The loads arrive in the queues representing the factories (user-defined attributes "product type" and "factory" set). The loads are also waiting in a logical list (order list). In order lists loads are delayed until another load orders them to continue. Rules which are used to order loads satisfying special conditions (e.g. product type) and rules, which are used in case the order is not filled, are possible. Order lists are a simple way to define backorder strategies. Dummy loads are implemented to order the necessary loads from the order lists of the according factories to the distributors. The use of arrays for production plan, supply lead time (all tasks), order strategies (task a, b), backorder and cost matrix give a general algorithm:

```
if V_P(zPro,V_Factory)>=V_BO(zPro,zDis) then begin
order V_BO(zPro,zDis) loads satisfying LA_P=zPro
       from OL_F(V_Factory) to V_ProcessPtr(zDis)
if V_BO(zPro,zDis)>0 then inc V_Cost(zDis,
      V_Factory) by (V_LeadT(zDis,V_Factory)*10)
set V_BO(zPro,zDis) to 0
end
else inc V_BO(zPro,zDis) by V_BO(zPro,zDis)
```

The algorithm is also used for the order of the wholesaler and with simple modifications for every task. AutoMod includes the module "AutoStat" to perform statistical analyses. AutoMod also provides a component "Business Graphics" to watch values or changes of variables during the simulation run.

Task a: Simple Order Strategy. This strategy leads to an increment in the stock for each distributor as shown in following figure (stocks v. time) and table.

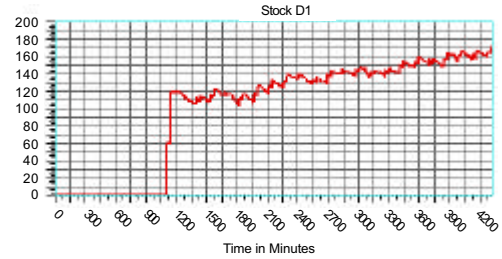

Fig. 2: Stock of Distributor D1 task a

Task a	min	max	mean	dev
C	30.210 €	36.428 €	33.157 €	1372,6
N	189	262	224	14,01
R	134 €	170 €	148 €	6,959

Task b: On Demand Order Strategy. The modified strategies of task b and task c are controlled by the aforementioned "order list". Costs for distributors decrease (mainly at storage costs), while stock stays almost constant (following figure).

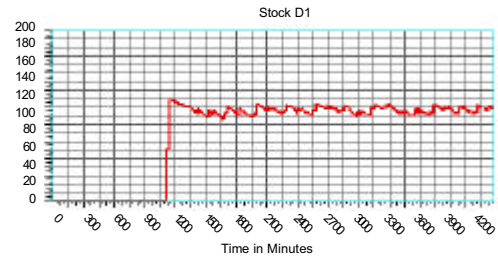

Fig. 3: Stock of Distributor D1 task b

Task b	min	max	mean	dev
C	29.731 €	36.628 €	32.698 €	1452
N	197	260	226	14,12
R	129 €	157 €	144 €	5,82

Task c: Minimal Supply Time – Strategy. The minimal supply lead time leads to a decrease of costs, giving the best results (shown in following table).

Task c	min	max	mean	dev
C	24.126 €	29.268 €	26.364 €	1129,4
N	197	260	226	14,12
R	103 €	129 €	116 €	4,84

C14 Classification: Material / Process Flow – Approach

Simulator: AutoMod, Rel. of 2002

An Object-oriented Solution of ARGESIM Comparison "C14 Chain Supply" with eM-Plant

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sebastian.kernbaum@mf.tu-berlin.de

Simulator. eM-Plant (www.emplant.com) is an object oriented discrete simulation tool. It is a system for production, logistics and all kinds of engineering, applied in industries, research and education. Features are: automatic model build-up, virtual reality presentations (real 3Dsolid graphics), online changes, integrated internet access, ActiveX integration.

Model: The Supply Chain Management is modelled using the standard material flow objects. The factories, the distributors and the group of wholesalers are represented by the object "Store" with an infinite capacity. Each factory has an object "Source" that creates the products exponentially. The transport between factories and distributors is modelled by the object "ParallelProc" (work time being supply lead time).

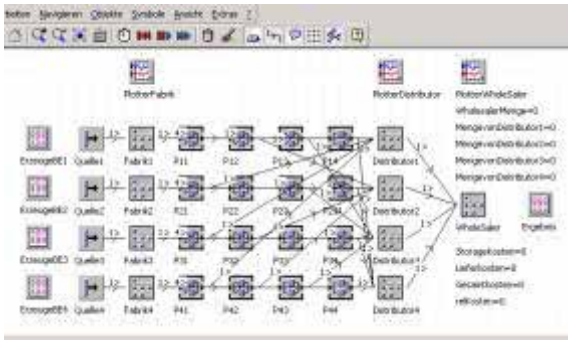

Figure 1: Model layout of the Supply Chain in eM-Plant

The "Event Controller" controls the simulation time of 30 days. After seven days the object "Generator" activates methods which determine the distributors and wholesalers order event according to the supply strategy. For example, when the distributor orders, the method determines the storage of the factory. In case the required amount is available, the products are moved to the distributor (part of code shown below):

```
for zDis:=1 to 4 loop
  for zPro:=1 to 12 loop
  i:=1;
  repeat
  if ((Order[zDis, zPro][1,i].occupied) and
  (Order[zDis, zPro][1,i].content.type=zPro)) then
  Order[zDis, zPro][1,i].transfer(zDis);
  tabDisIni[zDis,zPro]:=tabDisIni[zDis,zPro]+1;
  end;
  i:=i+1;
  until ((TabDisIni[zDis, zPro]>=10) or (i>5000));
  if zDis=1 then supcosts:=
               supcosts+tabcosts[factory, zDis];
  end;   next; next;
```

eM-Plant does not support the experimental design. In order to carry out the needed 100 simulation runs for each tasks a special method has been developed. The results of the simulation runs are evaluated using the DDE interface of eM-Plant. After each simulation run the values are transferred to MS Excel and analysed by standard functions.

Task a: Simple Order Strategy. This strategy leads to an increment in the stock for each distributor as shown in following figure and table.

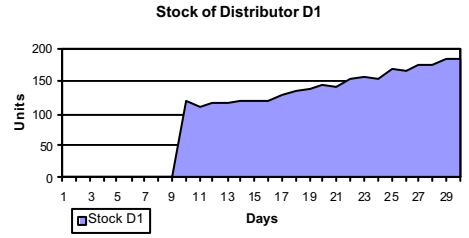

Fig. 2: Stock of Distri-butor D1 (task a)

Task a	min	max	mean	dev
C	27.293 €	34.516 €	31.460 €	1542,19
N	184	246	212	13,12
R	135 €	166 €	148 €	6,46

Task b: On Demand Order Strategy. This modified strategy is implemented as further method in the object "Generator" (as also done for task c). Costs for distributors decrease, while stock stays almost constant (following figure).

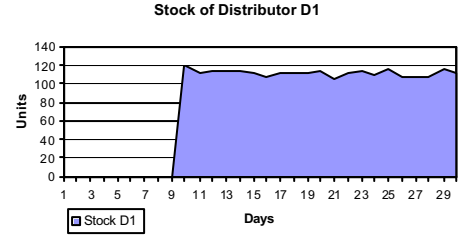

Fig. 3: Stock of Distri-butor D1 (task b)

Task b	min	max	mean	dev
C	27.770 €	33.260 €	30.799 €	1266,05
N	186	246	213	11,82
R	129 €	162 €	145 €	6,02

Task c: Minimal SupplyTime – Strategy. The distributor tries to order from the factory with the minimal supply lead time. This results in a decrease of costs and is the best strategy in comparison with the other strategies.

Task c	min	max	mean	dev
C	22.009 €	27.184 €	24.698 €	1134,88
N	184	246	212	13,12
R	105 €	129 €	117 €	4,94

C14 Classification: Process Flow – Object-oriented Approach

Simulator: eM-Plant, Rel. of 2002

An Object-oriented Solution to ARGESIM Comparison "C15 Clearance Identification" with AnyLogic and Identification with OptQuest

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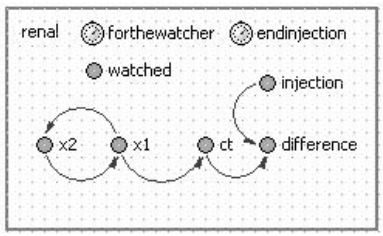
efelo@fsmat.at

Simulator: AnyLogic is able to handle continuous, discrete and hybrid models. It is based on JAVA and therefore object-oriented. It offers drag-and-drop dialogues for the basic parts of the model's structure as well as for animation. Everything needed is created as an instance of the ActiveObject class, starting with the 'root' class, which represents the model to state variables (appearing on the left-hand side of an ODE), with statecharts and animation.



Model: A basic class represents the model, with all relevant variables (equations of compartments; see left).

The injection (input) is modelled using a timer, which on expiry changes the value of f(t) from D/τ zero.

Task a: Simulation of the System. As AnyLogic is object orientated, several instances of the same model can be placed in the 'root' conveniently, allowing simulation with several sets of parameters in one replication.

Furthermore we add another timer and a state variable to acquire the exact values of the concentration one minute after the injection: c(1.5) = 320.9, c(4) = 302.579 and c(240) = 145.261. Finally another pair of state variables allows a plot of the difference of injection and c(t).

Task b: Identification. AnyLogic offers an optimisation toolbox based on OptTek's OptQuest optimisation engine, which uses genetic algorithms (at present – April 2003 – not well documented and only available via a graphical user interface. To get the data for the cost function (least square deviation between measured and computed concentration), we use still another timer, which on expiry gets the current value of $x_1(t_i)$ and restarts itself with the time between the current and the next point of the dataset at t_{i+1}.

The resulting values after 500 iterations are k01=0.00464 E-5, k12=0.0641 E-4, k21=0.0538 E-4, v1=7.177 E-2). Figure 2 shows the result, comparing measures and modelled concentration.

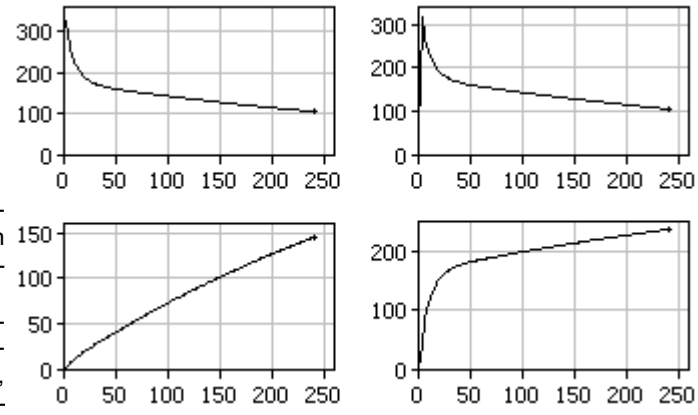


Figure 1: x1 for τ=0.5 (upper left), τ=3 (upper right)τ=240 (lower left) and difference injection / for τ=0.5 (lower right)

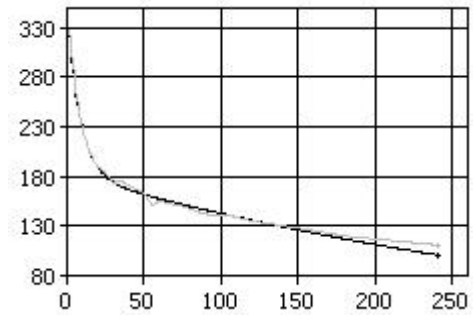


Figure 2: Expimental data (grey) and solution of the identification problem (black)

Task c: Error Estimation. As mentioned above, AnyLogic's optimisation toolbox is only available via a GUI and has no features for multiple optimisation runs or data input/output. Every run has to be started manually.

The perturbed data were obtained with a small MATLAB program and transferred into and out of the model using cut-and-paste and finally evaluated using SPSS.

Considering this time consuming process, the identification was only performed 50 times with the following results:

Variable	k_{01}	k_{21}	k_{12}	v_1
Mean	$4.587 \cdot 10^{-3}$	$5.129 \cdot 10^{-2}$	$6.293 \cdot 10^{-2}$	7.2296
Std Dev	$3.096 \cdot 10^{-4}$	$4.275 \cdot 10^{-3}$	$5.036 \cdot 10^{-3}$	0.1554

Table 1: Results of the error estimation

C15 Classification: Fully Numerical Approach
Simulator: AnyLogic V. 4.5 (2003)

BOOK REVIEWS

Quantum Simulations of Complex Many-Body Systems: From Theory to Algorithms

Johannes Grotendorst, Dominik Marx, Alejandro Muramatsu (Eds.)
NIC Series Volume 10, ISBN 3-00-009057-6

This book contains lecture notes for the Winter School 2002 organized by the John von Neumann Institute for Computing (NIC).

The topics of the Winter School, covers modern quantum simulation techniques and their implementation on high- performance computers, in particular on parallel systems. The focus is clearly on numerical methods which are tailored to treat large quantum systems with many coupled degrees of freedom ranging from superfluid Helium to chemical reactions.

The book is divided into three parts: Time-Independent Simulation Methods starting with an overview of Monte Carlo Methods and seven lectures; Time-Dependent Quantum Simulation Methods containing a recapitulation of Classical Molecular Dynamics as well as seven further lectures; Numerical Methods and Parallel Computing offering an introduction to Statistical Analysis of Simulations as well as five lectures.

The book covers recent methodological advances as well as offering insight into recent software developments and implementation issues involved, in particular in the context of high-performance computing. Overview lectures provide an insight on various important fields; focus lectures deal with Quantum Monte Carlo and Quantum Molecular Dynamics and special lectures deal with numerical and computational techniques.

Beginner	Intermediate	Expert
	●	●
Theory	**Mixed**	**Practice**
	●	●
Lecture Note	**Monograph**	**Proceedings**
●		

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Advanced Computer Performance Modelling and Simulation

Kallol Bagchi, Jean Walrand, George W. Zobrist (eds.); Gordon & Breach Publishing Group, 1998, ISBN 9056995693

The object of this book is to lead researchers, practitioners and students involved in the discipline of performance modelling and simulation. It provides tutorials and surveys and relates new research results.

It is the first of four books concerning the state of the art in performance modelling and simulation of advanced computer systems and networks and it deals primarily with theory, tools and techniques. The tools range from a hierarchical simulator to an object-oriented parallel system simulator to an instrumentation system for integrated parallel system design and evaluation. The theory ranges from Parallel Simulation to Petrinets to Stochastic Process Algebra. Novel techniques are described in performance evaluation as well as in simulation and modelling. The systems considered are mostly sequential, parallel and distributed systems.

The book begins with a hierarchical architecture design simulation environment and goes on with various aspects of parallel and distributed system modelling, especially multiprocessor systems. One of the problems discussed is the problem with tracing techniques related to shared memory multiprocessor systems, focussing on the danger of relying too heavily on such event traces where the programs execution exhibits nondeterministic behaviour. This is a new and important area being addressed increasingly by researchers.

The next chapters deal with parallel simulation tools and techniques – conservative and optimistic. One of them is a tutorial on memory management and speedup issues while another on is concerned with new load balancing strategies on a multiprocessor machine. It considers the problem of load balancing for parallel simulation on multiprocessor machines and experiments with several techniques based on both conservative and optimistic approaches.

The end of the book concerns performance evaluation techniques, e.g. performance evaluation using micro-benchmarking and machine analysis. It presents a new methodology for CPU performance evaluation based on the concept of an abstract machine model and contrasts it with benchmarking. By combining machine and program characterizations, accurate execution time predictions are obtained. A wide variety of computers are analysed and results are presented that assert the usefulness of this new methodology.

The design of this book is not the best and it is pretty hard to read especially when you are not very familiar with the theme yet. I therefore would only recommend it to people with a solid background in performance modelling.

Beginner	Intermediate	Expert
		●
Theory	**Mixed**	**Practice**
●		
Lecture Note	**Monograph**	**Proceedings**
	●	

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Mathematical Modeling

Ellis Cumberbatch, Alistair Fitt
Cambridge University Press, 2001; 300 pages;
ISBN 0-521-01173-6

Industrial Mathematics is growing enormously in popularity around the world. This book deals with real industrial problems from real industries. Presented as a series of case studies by some of the world's most active and successful industrial mathematician, this volume shows clearly how the process of mathematical collaboration with industry can not only work successfully for the industrial partner, but also lead to interesting and important mathematics.

The book begins with a brief introduction, where equations that most of the studies are based upon are summarized. Thirteen different problems are then considered, ranging from cooking of cereal to the analysis of epidemic waves in animal populations. The problems cover several topics, as thermo- and fluid-dynamics, boundary problems, optimization, ordinary and partial differential equation. Throughout the work, the emphasis is on providing to people in industry information that they can use.

This book is suitable for all final year undergraduates, masters and Ph.D. Students who are working on practical mathematical modelling.

Beginner	Intermediate	Expert
	● ●	●
Theory	**Mixed**	**Practice**
	● ● ●	
Lecture Note	**Monograph**	**Proceedings**
	● ●	

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Mathematical Methods in Physics

Distributions, Hilbert Space Operators, and Variational Methods

P. Blanchard, E. Brüning
Birkhäuser, 2003; ISBN 0-8176-4228-5

This translated and extended version of the German book *"Distributionen und Hilbertraumoperatoren. Mathematische Methoden der Physik", Springer-Verlag Wien, 1993*, which emerged form a course in mathematical methods in physics, gives a basic knowledge of the theory of generalized functions (in particular distributions) and of the theory of linear operators in Hilbert spaces.

In fact, modern theoretical physics, especially for modern views of quantum mechanics, relativistic quantum field theory and related areas, assumes to have knowledge in this field of mathematics.

The book starts after a short overview of functional spaces with the theory of distributions with physical aspects respectively. In detail, the first chapter introduces the reader into spaces of functions, Schwartz distributions, Fourier transformation and some other spaces of generalized functions.

The second chapter is dedicated to the theory of Hilbert space operators and the spectral theory of them.

The book is closing with the third chapter where it gives an introduction and an overview of variational methods.

Recapitulating one can say that this book is a good lecture for people who already have some basic knowledge in functional analysis and who are interested in deepen their experience in operator theory, especially for application in partial differential equations or in fields of theoretical physics.

Beginner	Intermediate	Expert
	●	
Theory	**Mixed**	**Practice**
●		
Lecture Note	**Monograph**	**Proceedings**
●		

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An Agent-Based Approach for Coordinated Multi-Provider Service Provisioning

Monique Calisti
Birkhäuser Verlag 2003, Basel-Boston-Berlin,
ISBN 3-7643-6922-1, 282 + x pages, Softcover

The present book deals with an increasing problem of modern communication networks: the service provisioning between service providers.

The basic problems, which are introduced in this book, are:

- Sharing of (limited) network resources, especially
- Guaranteed Quality of Services (QoS) for certain networking services

under certain financial aspects.

For this, a new approach is proposed, the so called "Network Provider Interworking". Based on autonomous and self-motivated software entities (the Agents) the optimal networking operation is dynamically enabled. This also holds for economical constraints. Very interesting, the amount of data, given to external providers is reduced to a minimum, therefore no internal or even confidential data is transmitted.

The book includes a chapter with other approaches for provider coordination, which gives the reader the possibility to compare the new technology with already used strategies.

The present book is very interesting for operators and anyone involved in service provisioning. The usage of agents proves a highly flexible way of communication coordination. The protocols for negotiation to establish a connection are covered as well as risks in using agents.

This book definitely needs advanced knowledge of interoperability as well as knowledge of agent based technologies. Otherwise the reader fails to understand this new methodology.

Beginner	Intermediate	Expert
		●
Theory	**Mixed**	**Practice**
	●	
Lecture Note	**Monograph**	**Proceedings**
	●	

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Numerical Methods for the Investigation of Periodic Motions in Multibody System Dynamics

Cornelia Franke, Shaker Verlag, 170 pages,
ISBN 3-8265-4061-1

Most often mechanical Systems are modelled as multibody systems, consisting of rigid bodies with masses and massless connections. Almost always there are additional constraints, which lead to differential-algebraic-equations (DAEs) – typically of index three.

Usually these were reduced to a state space form to investigate their periodic motions or non-linear dynamics with common numerical methods, which inevitably result in severe numerical problems. The aim of the author is to overcome these problems by creating an algorithm for treating the original DAEs.

Starting with a quick introduction to multibody systems a theoretical framework for the characterisation of stability and the isolation of periodic solutions is provided. Poincaré maps lead to generalized monodromy matrices and their eigenvalues, the Floque multipliers which allow the detection of periodic solutions as well an analysis of their stability are discussed in detail. All this culminates to a generalisation of the Hopf Bifurcation Theorem for index-1 DAEs, which finally links the aforesaid results neatly in the existing theory.

Based on this work, the main numerical task, the approximation of the periodic solutions is achieved. The problem is transformed in to a suitable index-2 boundary value problem, which can be solved via nonlinear projective collocation, and approximations for the all-important Floquet multipliers are obtained as by-products while solving the projective collocation equations.

Finally, an algorithm is introduced in which all the results are put to test.. Written in C++ and using parts of the LAPACK++ Library and tested on the actual model of a wheel set with satisfying results although they are only compared with those obtained with a regular DASSL algorithm.

Beginner	Intermediate	Expert
		●
Theory	**Mixed**	**Practice**
●		
Lecture Note	**Monograph**	**Proceedings**
	●	

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The Nature of Mathematical Modeling

Neil Gershenfeld, Cambridge University Press 1999, ISBN 0-521-57095-6, xii+344 pages

As is implied by the title, this book is about the nature of mathematical modelling in general and on the methods and techniques available to that purpose in particular. The text is divided into three parts, whereof the first covers exact and approximate analytical techniques (ordinary differential and difference equations, partial differential equations, variational principles, stochastic processes); the second, numerical methods (finite differences for differential equations, finite elements, cellular automata); and the third, observational techniques (function fitting, data transforms, network architectures, density estimation, filtering and state estimation, time series).

The focus of the book clearly is on model inference, as part three encompasses roughly as many pages as the first two parts taken together.

Each chapter presents a brief introduction to one particular area, followed by some core results and numerous references for further reading. By covering that much material so compactly, the text helps bring it to a broad audience.

The downside, however, is that this approach entails a very cursory treatment of the topics discussed, making most chapters hard to understand without some prior knowledge of the subject. Furthermore, hardly any examples are being offered in the text; rather, they are deferred to the problems section.

Solutions to all problems are however supplied in an appendix. There is also an appendix giving a survey of graphical and mathematical software available, including sample code and plenty of links.

In summary, the text thus is an exhaustive compendium of fundamental methods and techniques (both analytical and numerical) available in mathematical modelling rather than a full-fledged textbook. Whoever wants to delve more deeply into some specific area should consult either one of those or the research literature.

Beginner	Intermediate	Expert
	●	
Theory	**Mixed**	**Practice**
	●	
Lecture Note	**Monograph**	**Proceedings**
	●	

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Advanced Arithmetic for the Digital Computer

Ulrich W. Kulisch, Springer Wien New York, 2002 ISBN 3-211-83870-8

This book deals with computer arithmetic in a more general way than usual and examines the implementation of advanced computer arithmetic by fast hardware. It requires that all computer approximations of arithmetic operations differ from the correct result by at most one rounding. Generally this book consists of three independent articles. Each covers a unique theoretical field which contributes to the goal of implementing advanced computer arithmetic.

The first chapter provides a short insight into the background and motivation of advanced computer arithmetic and deals with fast and accurate vector operations. The author takes the point of view that the 'normal' floating-point operations like +,-,x,/ should be expanded with a fifth, the scalar product. With this new tool you could enhance the accuracy of the computed results and increase the speed of computation. Scalar product units (SPU) are developed for digital signal processors, personal computers and workstations. In the end the author discusses the simulation of the accurate scalar product on conventional processors and the theoretical foundation of advanced computer arithmetics like its twelve fundamental data types. The short second chapter deals with a condition under which a computer representable element has a unique additive inverse. The book is closing with a chapter about interval arithmetic. With the help of the results of the first chapter it is shown that interval vector and matrix operations can be performed faster than with floating-point arithmetic.

Recapitulating one can say that his book is for people who already have some knowledge in computer arithmetic. Interesting ways are shown to extend the basic floating-point operations and to increase the accuracy of the computed results by not reducing the computational speed. The implementations of the SPUs for different types of computers complement the theory and contribute to the better understanding of advanced computer arithmetic quite well.

Beginner	Intermediate	Expert
	●	
Theory	**Mixed**	**Practice**
	●	
Lecture Note	**Monograph**	**Proceedings**
	●	

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Partial Differential Equations - Methods and Applications

Abdul-Majid Wazwaz; A.A. Balkema Publishers, Lisse, Tokyo 2002; ISBN 90-5809-369-7

This Book is designed to serve as a text and a reference. It can be used for advanced undergraduate and beginning graduate students in Mathematics, Science and Engineering. The available partial differential equations texts only use classical methods without incorporating the newly developed methods that have appeared in research journals.

This text is different from other texts in that it explains classical methods in a non abstract way and it introduces and explains how the newly developed methods provide more concise methods to provide efficient results.

The book is divided into eleven chapters. Starting with basic concepts (e.g. definition of linear, nonlinear PDE's, listing some typical linear and nonlinear equations, introducing the concept of well posedness), chapter 2 deals with solution methods for first order PDEs.

The heat equation, wave equation and Laplace's equation in one dimension but also in higher dimensions are subject of chapters three to seven. The rest of the book deals with nonlinear equations, some physical models (nonlinear advection, Burger's equation, Telegraph equation etc.) and a short survey of numerical applications. It finishes with an introduction into Solitons and Compactons.

The book is equipped with numerous examples and exercises, ranging in level from very easy to difficult. All together it offers a comprehensive introduction to the theory of partial differential equations and its basic concepts from a classical point of view.

Beginner	Intermediate	Expert
	●	
Theory	**Mixed**	**Practice**
	●	
Lecture Note	**Monograph**	**Proceedings**
	●	

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Analytical and Numerical Methods for Wave Propagation in Fluid Media

Series on Stability, Vibration and Control of Systems, Vol. 7 (Eds. Ardeshir Guran)

K. Murawski, World Scientific, Singaport, New Jersey, London, Hong Kong, 2002; ISBN 981-238-155-4

This monograph presents some analytical and numerical methods for wave propagation in fluids. It is divided into two main parts. The first deals with model equations for which analytical solutions of the Cauchy problem are known. This includes the theory of linear waves but also weakly nonlinear waves as for example the inviscid Burgers equation for fast MHD waves, Burgers equation for acoustic waves in viscous fluids, the Korteweg-de Vries equation for long waves in a cylinder etc.

The second part is divided into 6 chapters and discusses the numerical solutions to wave propagation phenomenas. This includes finite differences methods, finite elements methods and finite volume methods. Chapter 6 gives discussions to numerical errors, problems with source terms and the way shock capturing schemes are designed.

In the rest of the book the author discusses the application of the numerical methods to special equations as for example one dimensional hyperbolic systems, two dimensional problems, MHD equations. The final Chapter gives a detailed description of numerical experiments.

The book is for a general scientific and engineering readership, and is also mathematically precise enough to be a useful reference for research specialists in mechanics and control, nonlinear dynamics, and in applied mathematics and physics.

It is published as volume 7 of the „Series on Stability, Vibration and Control of System", edited by A.Gura, A. Belyaev, H.Brenner, C.Christov, G. Stavroulakis and W.B. Zimmermann.

Beginner	Intermediate	Expert
	●	
Theory	**Mixed**	**Practice**
	●	
Lecture Note	**Monograph**	**Proceedings**
	●	

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Facts, Conjectures, and Improvements for Simulated Annealing

Peter Salamon, Paolo Sibani, Richard Frost
SIAM (Soc. for Industrial and Applied Mathematics), 2002; 150 pages; ISBN 0-89871-508-3

Simulated annealing has proved to be an easy and reliable method for optimization in cases where there is no road map to possible solutions. This book offers an introduction to this topic for novices and provides an informative review of the area for the more expert reader. This book provides an overview of the theoretical foundations for improvements to algorithms for global optimization that until now existed only in scattered research articles.

The method described in this book operates by simulating the cooling of a usually fictitious physical system whose possible energies correspond to the values of the objective function being minimized.

The analogy works because physical systems occupy only states with the lowest energy as the temperature is lowered to absolute zero.

This book is suitable for advanced undergraduate and graduate students and for professionals in a wide variety of subject areas as bioinformatics, chemistry, computer science, engineering, finance, geology, mathematics and physics.

The book is split in five main parts as overview, basic facts, improvements and conjectures, structure theory and real understanding, and resources.

Beginner	Intermediate	Expert
	● ●	
Theory	**Mixed**	**Practice**
	● ● ●	
Lecture Note	**Monograph**	**Proceedings**
	● ●	

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Pathway Analysis and Optimization in Metabolic Engineering

Néstor V. Torres, Eberhard O. Voit; Cambridge University Press, 2002; ISBN 0-521-80038-2

Rapid advances in functional genomics and proteomics targeting in the manipulation of the genetic and metabolic composition of organisms, combined with unprecedented computational power, are forging a niche for a new subspecialty of biotechnology called metabolic engineering.

This emerging field has metabolic pathways and gene networks as its targets, and optimization as its ultimate goal.

This book gives a very basic introduction into concepts in modelling of biochemical and metabolic processes and afterwards an overview of pathway analysis and optimization in metabolic systems. The first chapter is dedicated to biochemical systems theory where the reader is introduced in some basics like molecular kinetics and he gets an overview of the basic concepts in modelling.

The rest of the book is deals with optimization concerning to the application of metabolic models. This part of the book starts with the really basic mathematical concepts of optimization like finding maxima in functions of one variable and based on that, optimization of more complex models is described.

Not to forget, there are not only these exact methods of optimization, the reader can also find the concepts of some stochastic optimization models like the Monte-Carlo Method at all in this book.

The book closes with two examples: The Optimization of citric acid production in Asperigiluss niger and a maximization of ethanol production in sacharomyces cerevisiae.

In conclusion, this easy to read book gives an overview of the basics of modelling of metabolic systems and optimization of such models respectively. For real applications of these concepts the description of the used models and concepts may be too rudimental and would need some other lectures.

This book is maybe written for students of biology who want to have an overview of concepts in biochemical modelling, but it could also be interesting for other people which have already some knowledge in simulation and want to get some basics in modelling biochemical processes.

Beginner	Intermediate	Expert
●		
Theory	**Mixed**	**Practice**
	●	
Lecture Note	**Monograph**	**Proceedings**
	●	

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If you have any information, suggestions for contributions (technical notes, developments, comparison solutions), questions etc. please contact a member of the editorial board or the editor-in-chief.

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EUROSIM '04
5th EUROSIM Congress on Modelling and Simulation
6 – 10 September 2004
Cité Descartes, Marne la Vallée, France

Conference chair and contact:
Yskandar Hamam
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Conference themes

Adaptive simulation
Bondgraph simulation
Biomedical systems
Complex systems
Component based modelling
Continuous simulation
Control systems
Data mining
Decision support systems
Discrete event simulation
Distributed systems
Expert systems
Fuzzy simulation
Genetic algorithms
Graphical modelling
Heterogeneous systems
Hierarchical modelling
High complexity systems
High performance computing
Hybrid modelling
Integrated modelling
Intensive computation
Knowledge based systems
Large scale systems
Man-in-loop simulation
Mathematical methods in simulation
Mathematical modelling
Methodology of complex societal problems
Methodology of systems modelling
Multi-agent based systems
Neural networks Model validation
New inductive and deductive methods
Open systems
Operations research
Optimisation by simulation
Parallel modelling
Parallel processing
Petri nets
Real-time systems
Scientific computation
Self-organising systems
Statistic modelling
Statistical modelling
Stochastic systems
WEB based simulation

The EUROSIM 2004 Congress will be organised by the French Speaking Simulation Society (FRANCOSIM) on behalf of the Federation of European Simulation Societies (EUROSIM). It will take place in September 2004 at ESIEE in Marne la Vallée, France. It aims to address the impact of simulation science on the society in general. Contributions from natural and life sciences such as experimental and computational physics, mathematical engineering, applied chemistry, structural architecture, environmental management, economics and econometrics, operations research, social and behavioural sciences, such as experimental philosophy and applied psychology.

Besides submitting papers, interested persons may propose special sessions and invite contributors in the corresponding field. Selected papers on special issues may be published in the SIMPRA Journal.

Important dates:

January 9th, 2004:	proposal of special sessions
February 13th, 2004:	submission of abstracts
April 9th, 2004:	acceptance of abstracts
May 10th, 2004:	submission of full papers
May 28th, 2004:	final acceptance of papers
June 6th, 2004:	authors' and early registration

About Cité Descartes

The Descartes Science Centre, located at the heart of the Marne la Vallée New Town, officially created on March 22nd, 1983, has been given high priority in France's planning for regional development. It has a number of major advantages: proximity to PARIS, exceptional service both by public transport and by road and railroad networks (High Speed Train station of Marne la Vallée/Chessy) and it is close to the Roissy Charles de Gaulle and Orly Airports. Its environment and surroundings are of high quality and its development has always been guided by a strong consideration for the preservation and protection of the natural spaces. .

EUROSIM SOCIETIES

EUROSIM Federation of European Simulation Societies

www.eurosim.info

EUROSIM, the Federation of European Simulation Societies, was set up in 1989. The purpose of EUROSIM is to provide a European forum for regional and national simulation societies to promote the advancement of modelling and simulation in industry, research, and development. EUROSIM members may be regional and/or national simulation societies. At present **EUROSIM** has ten full members and three observer members:

- **ASIM** – Arbeitsgemeinschaft Simulation (Austria, Germany, Switzerland)
- **CROSSIM** – Croatian Society for Simulation Modelling (Croatia)
- **CSSS** – Czech & Slovak Simulation Society (Czech Republic, Slovak Republic)
- **DBSS** – Dutch Benelux Simulation Society (Belgium, The Netherlands)
- **FRANCOSIM** – Société Francophone de Simulation (Belgium, France)
- **HSS** – Hungarian Simulation Society (Hungary)
- **ISCS** – Italian Society for Computer Simulation (Italy)
- **SIMS** – Simulation Society of Scandinavia (Denmark, Finland, Norway, Sweden)
- **SLOSIM** – Slovenian Simulation Society (Slovenia),
- **UKSIM** – United Kingdom Simulation Society (UK, Ireland)
- **AES** – Asociación Española de Simulación (Spain; observer member)
- **PSCS** – Polish Society for Computer Simulation (Poland, observer member)
- **ROMSIM** - Romanian Society for Modelling and Simulation (Romania; observer member)

EUROSIM Board

EUROSIM is governed by a Board consisting of one representative of each member society, plus the organizer of the last and next EUROSIM Congress (past president and president), and of prepresentatives for the official EUROSIM publicatiosn (journals SIMPRA and SNE).

At the **EUROSIM'01** Congress the Board elected new officers for a three years period: Y. Hamam (president), L. Dekker (past president), M. Savastano (treasurer), P. Fritzson (secretary), J. Halin (SIMPRA), F. Breitenecker (SNE), F. Maceri (member).

The Executive Board and the Board met in April 2003 in Ljubljana in order to discuss daily affairs and to discuss and decide about options for the future. At this occasion SLOSIM's application for organisation of **EUROSIM'07** (suggested for Sept. 2007 in Slovenia, in co-operation with ASIM) was warmly accepted.

EUROSIM Publication SNE and SIMPRA

SNE. EUROSIM societies are offered to distribute to their members the journal **Simulation News Europe** (**SNE**) as official membership journal:

www.sne.org, www.eurosim.info

SIMPRA. Furthermore members can subscribe the scientific journal **Simulation and Modelling, Practice and Theory** (**SIMPRA**) at a significantly reduced price: www.elsevier.nl/locate/simpra/

Conferences, EUROSIM Congress

EUROSIM societies are organised national and international conferences and workshops, with the common trademark *EUROSIM Conference*, or *EUROSIM Event*, resp. For details please refer to the announcements of the member societies.

The EUROSIM Congress is arranged every three years by a member society of EUROSIM.

The next congress, **EUROSIM'04**, the 5th EUROSIM Congress, will take place in September 2004 in Paris (announcement see below). SLOSIM, in close co-operation with ASIM will organise the 6th EUROSIM Congress, **EUROSIM'07**, in Slovenia.

Congress Announcement

EUROSIM '04

5th EUROSIM Congress

Sept. 6 -10, 2004; Cite Descartes
Marne la Valle (near Paris), France

See Call for papers in this **SNE** issue

More information about EUROSIM and EUROSIM societies may be found at EUROSIM's WWW Server.

For personal information about EUROSIM and about the congress EUROSIM'04 please contact the EUROSIM president, Mr. Y. Hamam.

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- Dj. Tavangarian (Hrsg.): Proc. 16. Symposium Simulationstechnik, Rostock, Sept. 2002
  Panreck, F. Dörrscheidt (Hrsg.): Proc. 15. Symp. Simulationstechnik, Paderborn, 2001
- W. Borutzki: Bondgraphen – Eine Methodologie zur Modellierung multidisziplinärer dynamischer Systeme;
- H: Szczerbicka, T. Uthmann (Hrsg.): Modellierung, Simulation und Künstliche Intelligenz
- S. Wenzel (Hrsg.): Referenzmodelle für die Simulation in Produktion und Logistik
- I. Bausch-Gall (Hrsg.): Simulation technischer Systeme – Stand und Entwicklungen

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- E. Hajrizi: Intelligentes Online – Planungs- und Steuerungssystem für Flexible Produktionssysteme basierend auf Simulation und Optimierung mit genetischen Algorithmen
- Th. Fent: Applications of Learning Classifier Systems for Simulating Learning Organizations

Schwerpunkte / Topics:

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SCS SCS SCS

ARGESIM REPORT ARGESIM REPORT

ASIM

German Simulation Society

Arbeitsgemeinschaft Simulation

www.asim-gi.org

ASIM (Arbeitsgemeinschaft Simulation) is the association for simulation in the German speaking area. ASIM was founded in 1981 and has now about 700 individual members, and 30 institutional or industrial members.

From the ASIM Board

During the ASIM Conference ASIM'2002 in Rostock, September 2002, the ASIM board was elected anew. The following eight members were elected directly for the next three years: Felix Breitenecker, TU Vienna; Rüdiger Hohmann, University Magdeburg; Veronika Hrdliczka, ETH Zürich; Markus Klug, ARCS Seibersdorf; Klaus Panreck, University Paderborn; Thorsten Pawletta, University Rostock; Peter Schwarz, FhG Dresden; Sigrid Wenzel, FhG Dortmund. Additionally, all Heads of the Working Groups are members of the board (see list at the end of this contribution), and the board itself nominates additionally officers for special tasks.

At the following board meetings (December, Munich; April, Erlangen; June, Magdeburg) officers were elected and plans for publications and conferences were discussed (details see later). The new main officers are: F. Breitenecker, President; Th. Pawletta and S. Wenzel, Vice Presidents; I. Bausch-Gall, Treasurer / Secretary. The next board meeting will take place on occasion of ASIM'03 in Magdeburg, September 2003. Please contact the speaker, if you feel an important issue should be discussed there.

ASIM Publications

ASIM is publishing (co-publishing) **ASIM-Nachrichten** and **SNE** (Simulation News Europe). Both journals are regularly published and sent to all ASIM members (as part of their membership 700 issues) and spread for promotion (500 issues). Furthermore, the ASIM working groups report in so-called **ASIM - Mitteilungen** about their meetings. ASIM cooperates with SCS Europe and with **ARGESIM** (TU Vienna) in publication of the two book series: „Fortschritte in der Simulationstechnik – Frontiers in Simulation" and „Fortschrittsberichte Simulation – Advances in Simulation".

Based on the results on a questionnaire to the members, the board discussed some changes in the publications. First, from 2004 on, ASIM-Nachrichten will appear as electronical newsletter. Second, ASIM publication in SNE will be extended. News and gerneral information will be put as (German or English) addendum in SNE's news section. Furthermore ASIM plans to publish special issues of SNE. Each year one ASIM working Group will prepare a Special Issue dealing with "Status, Developments and Trends" in its area. Details will be given in the next issue.

ASIM Working Groups

A discussion on working groups is taking place. While some working groups are very active and consequently have many members, some working groups attract only few people to workshops and cannot attend more members, due to various reasons. It is discussed either to combine small working groups, or to put them as subgroup into a big working group.

The ASIM Working Groups ***"Fundamentals and Methods of Modeling and Simulation"*** (GMMS) and ***„Simulation of Technical Systems"*** (STS) were organizing a Special Workshop „Modeling and Simulation of Spatially Distributed Systems". It was held on May 14th and May 15th in Nuremberg in connection with the SIMPAT 2003 Conference "Simulation and Visualisation in Manufacturing and Logistics" and the "World Fluidic Dynamic Day". About 50 people attended this meeting, resulting in fruitful discussions; the contributions will be published as ASIM-Mitteilungen.

Topics were Mathematical description methods (partial differential equations, ...) and modeling problems; Solution methods: FEM, FDM, BEM, finite networks; Specialized methods for fluidics, mechanics, acoustics, electronics, and electro-magnetic fields; Coupled physical domains (e.g., mechanics-electrostatics, acoustics-mechanics); Coupled simulation algorithms and simulator coupling; Reduced-order modeling for system simulation (PDE --> low-order ODE).

The working group ***„Simulation of Technical Systems"*** (STS) organised also a meeting in Ulm, March 2003. As in the previous years the members and the prospective customers of the specialized group met to an exchange of experience at the beginning of March. The meeting took place in the areas of T-Systems GEI GmbH in Ulm.

This year the emphasis of the meeting was on the area of the simulation in the automobile development. 75 members, among them ASIM members and a large number of prospective customers of automobile manufacturers and suppliers showed by their presence that the simulation of electrical, electronic and mechatronic systems during the development process of vehicles plays an important part.

The meeting was introduced by Professor Dr. Schroer with an overview lecture on mathematical modelling of dynamic systems. The development of electronic functions by the Simulation and Rapid Controller Prototyping was presented and discussed in further contributions. The test of the designed systems was focused in the session "HiL/SiL test-systems and methods". Presentations showed the use of

these technics in the development process of commercial autos to perform an integration test of all electronic control units (ECU) as a whole. Another application showed the use in automotive air condition systems. Data solutions during the model-based development process were presented by methodology and tools for modelling. An application showed the handling of great amounts of simulation models with a Simulation Data Management Solution (SDM Solution).The simulation of electronic systems with specification languages such as VHDL-AMS and Modelica/Dymola took a further part. The fact that VHDL-AMS as a tool-independent specification language wins increasingly in meaning showed the numerous contributions. In a special session the manufacturers of simulation tools could report on application, news, efficiency and applications of the tools. The 23 contributions are published at the homepage of the working group.

In a trade fair and in different demonstrations different projects were presented by the T-Systems GEI GmbH, e.g. solutions from container logistics and a HiL Solution for ABS ECU test. A life presentation demonstrated the actual possibilities of telematic diagnosis implemented in high end cars. The excursion after the meeting through the bus manufacturing of the EvoBus GmbH showed the impressing and to a large extent still handi craft manufacturing of the buses, which is equipped with most modern technology.

The working group ***"Simulation in Production and Logistics"*** (SPL) had some successful meetings:

- 26th November 2002 at Smart GmbH in Hambach; visitation of smartville
- 18th February 2003 at FH Pforzheim with presentation of simulators, part II: ARENA (SAT GmbH), DOSIMIS-3 (SDZ GmbH)
- 24th June 2003 at VW in Baunatal;

The next conference will be in October 2004 (location: Berlin, Germany), organised by M. Rabe, Fraunhofer IPK, markus.rabe@ipk.fhg.de

ASIM Conferences

ASIM organises the annual ASIM Conference, the ASIM Working Groups organise workshops (up to 100 participants) and conferences (more than 100 participants. ASIM cooperates in organising the three-annual EUROSIM Congress, and ASIM and SCS Europe will continue the co-operation for the ESM and ESS conferences.

R. Hohmann (Univ. Magdeburg) is preparing the annual conference ASIM'2003 (September 2003, Univ. Magdeburg). In 2004, the annual ASIM conference is skipped: ASIM members are invited to visit the EUROSIM Congress (Paris, September 2004), where special ASIM sessions are planned, or to attend the special conference "Simulation in Production and Logistics" (Berlin, October 2003).

The annual conference ASIM 2005 will take place in Erlangen – where the first ASIM conference took place in 1982. In 2007, SLOSIM, the Slovenian Simulation Society will organise the EUROSIM Congress; ASIM will not only co-sponsor, but also co-organise this event.

ASIM 2003
17th Symposium Simulation Technique
September 16-19, 2003, Magdeburg, Germany

European Simulation Symposium ESS'03
October 26 – 29, 2003, Delft, The Netherlands

7th ASIM SUG Workshop
Modelling of Environmental Systems
October 29 – 31, 2003, Kölpinsee/Usedom, Germany

5th EUROSIM Congress - EUROSIM '04
Sept. 6 -10, 2004; Cite Descartes (near Paris), France
Special Sessions organised by ASIM

ASIM – SPL Conference
Simulation in Production and Logistics
October 2004; Berlin, Germany

ASIM Info and Contact

GMMS *Methods in Modeling and Simulation, P. Schwarz, FhG Dresden, http://www.gmms.asim-gi.org*
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SUG *Simulation of Environmental Systems, J .Wittmann, Univ. Hamburg, wittmann@informatik.uni-hamburg.de*
SMBB *Simulation in Medicine, Biology, Biophysics, D.Möller, Univ. Hamburg, Moeller@informatik.uni-hamburg.de*
STS *Simulation of Technical Systems, A. Wohnhaas, debis Systemhaus GEI, www.sts.asim-gi.org*
SPL *Simulation in Production and Logistics, S.Wenzel, Fraunhofer Institute Dortmund, www.spl.asim-gi.org/*
SBW *Simulation in OR, C.Böhnlein, Univ. Würzburg boehnlein@wiinf.uni-wuerzburg.de; www.asim-gi.org*
SVS *Simulation of Transport Systems, U. Brannolte, Univ. Weimar / M. Klug, ARCS Seibersdorf Ulrich.Brannolte@bauing.uni-weimar.de; www.asim-gi.org*

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CSSS

Czech and Slovak Simulation Society

General Information

CSSS (The Czech and Slovak Simulation Society) has about 150 members in 2 groups connected to the Czech and Slovak national scientific and technical societies (Czech Society for Applied Cybernetics and Informatics, Slovak Society for Applied Cybernetics and Informatics -SSAKI).

The main objectives of the society are: development of education and training in the field of modelling and simulation, organising professional workshops and conferences, disseminating information about modelling and simulation activities in Europe to its members, informing the members about publishing in the field of modelling and simulation. Since 1992 CSSS is a full member of EUROSIM

Past Event

The 36th International Conference on **"Modelling and Simulation of Systems" (MOSIS'2002)** that took place on the 22th to 24th of April 2002 in Rožnov pod Radhoštem, Czech republic, was organised by the Department of Computer Science FEEI VŠB – Technical University Ostrava and Department of Computer Science of FEECS University of Technology Brno and sponsored by CSSS, ASU EUROSIM and SCS. Technical journal AUTOMATIZACE Praha was a medial sponsor. The Conference was connected with two Workshops: workshop ISM'2002 - Modelling of Information System and workshop MANAM'2002 -Modelling in Manager Works. Some 90 participants from Czech republic, Slovakia, Poland, Germany, Greece, Russia attended the conference

The XXIV International Colloquium on **"Advanced Simulation of Systems" (ASIS 2002)** that took place on the 11th to 13th September 2002 in Krnov, Czech Republic was organised by the Department of Computer Science FEEI VŠB – Technical University Ostrava and Department of Computer Science of FEECS University of Technology Brno. The chairman of the international program committee was Dr. Ing. Jan Štefan. Some of the interesting point in topic were "Simulation in Hydrodynamics", "Education of Modelling and Simulation in Education", Parallel and Distributed Simulation", New Modelling Paradigm", "Simulation Case Studies". Some 50 participants from Czech republic, Slovakia and Poland attended the workshop. The Colloquium was connected with annual meeting of CSSS.

The 3rd International **Carpatian Control Conference ICCC'2002** that took place on May 27-30, 2002, Ostrava - Beskydy (Malenovice, Hotel Petr Bezruc), Czech republic. One of parallel sesions of conference was also "Identification, modelling and simulation of processes and systems". The president of International Program Committee was Prof. Ing. Antonín Vítecek, Phd, dean of faculty of Mechanical Engineering, Technicval University of Ostrava, Czech republic. Some 150 participants from Czech republic, Slovakia, Poland, Germany, Greece, Russia, Slovenia attended the workshop

The 5th International Scientific Conference on **"Electronic Computers and Informatics'2002"** took place on October 10-11, 2002, in Herlany Slovak Republic. One of the topics was concentrating on Modelling and Simulation of the Systems. Some 62 participants from Czech republic, Slovakia, Greece, Ukraina, Russia and Romania attended the workshop The general chair of the conference was prof. Jelšina, Technical university of Košice.

The 37th International Conference on **"Modelling and Simulation of Systems" (MOSIS'2003)** took place on April 28-30, 2003, in Brno, Czech republic. Conference was organised by the Department of Computer Science FEEI VŠB – Technical University Ostrava and Department of Computer Science of FEECS University of Technology Brno and sponsored by CSSS, ASU EUROSIM and SCS. The conference was connected with workshop ISM'2003 -Modelling of Information System. Some 95 participants from Czech republic, Slovakia, and Poland attended the MOSIS' 2003 workshop and presented 86 presentation.

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ASIS 2003 September 9-10, 2003,
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jan.stefan@vsb.cz

MOSMIC 2003 October 7-9, 2003,
Zilina- Sulov, Slovak Republic
alexik@frtk.fri.utc.sk

Informatics 2003 November 6 – 7, 2003,
Štrbske Pleso, Slovak Republic
lukackova@stonline.sk

CROSSIM

Croatian Society for Simulation Modelling

http://rudjer.irb.hr/~crossim

General Information

CROSSIM - CROatian Society for SIMulation Modelling was founded in 1992 as a non-profit society with the goal to promote knowledge and use of simulation methods and techniques and development of education and training in the field of simulation modelling. Prof. Vlatko Ceric was the founding president, and Asst. Prof. Jadranka Bozikov is the present woman president. The Society is engaged in dissemination of information on simulation, organization of meetings, courses and workshops as well as in publishing in the field. CROSSIM is an affiliate of SCS since 1994 and a full member of EUROSIM since 1997.

Membership

CROSSIM has only individual members and three categories of membership are recognized according to the statute: regular, honorary and student members. The majority of 70 CROSSIM regular members belong to the academic community but there are also members from institutes, industry, and governmental institutions and a few international members as well.

Information, Contact Address

CROSSIM www site is accessible at:
http://www.irb.hr/~crossim

and an e-mail address is: crossim@irb.hr

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Activities

Most CROSSIM members belong to the academic community and work with applications of simulation modelling in such diverse fields as engineering, economy, biology, medicine, health care, agronomy, forestry, ecology, and others. Many of them teach simulation modelling methods, both discrete and continuous, to graduate and postgraduate students. The Society co-operates with the University Computing Centre, Zagreb, in organization of an international conference *Information Technology Interfaces* (*ITI*) that traditionally has a strong modelling and simulation section, and in publishing *The Journal of Computing and Information Technology* (*CIT*). The journal covers the area of computer science and engineering, modelling and simulation, and information systems, and publishes original scientific and professional papers, short notes, review articles and surveys, as well as book reviews.

All information concerning CIT is available at http://cit.srce.hr/home.html.

Recent Events

We are very proud to report that three CROSSIM members from the Department of Informatics, Faculty of Economics, University of Zagreb, published considerable international publications at the beginning of this year. Prof. Vlatko Ceric co-authored a book and his colleagues Prof. Vesna Bosilj Vuksic and Asst. Prof. Mirjana Pejic Bach published papers in two leading international simulation journals.

On that occasion CROSSIM has organized on March 4, 2003 at Faculty of Economics a promotion of the following publications:

- Seila A, Ceric V, Tadikamalla P.
  Applied Simulation Modeling, 1st Edition
  Published by Duxbury Press, 662 pages
  ISBN/ISSN: 0-534-38159-6
  http://newtexts.com/newtexts/book.cfm?book_id=655
- Pejic-Bach M. Surviving in an environment of financial indiscipline: a case study from a transition country. System Dynamics Review, 2003; Volume 19(1), pp. 47-74.
  http://www3.interscience.wiley.com/cgi-bin/abstract/102527149/START
- Bosilj Vuksic V, Indihar Stemberger M, Jaklic J, Kovacic A. Assessment of e-business transformation using simulation modelling. Simulation, 2002; Volume 78(12), pp. 3-14

Prof. Ivan Lovrinovic, Dean of the Zagreb Faculty of Economics, Prof. Tihomir Hunjak, Vice rector of the Zagreb University, Asst. Prof. Diana Simic, Deputy Minister, Ministry of Science and Technology, and Dr. Mladen Mauher, Head of the Governmental Office for Internetisation were promoters. The Dean pointed out that these and numerous other publications of the hard working group of authors from the Department of Informatics resulted from a team-work that influenced also colleagues at other Faculty departments in application of simulation modelling methods.

Vice rector Prof. Hunjak, who is an expert in field of operations research and theory of decision-making highlighted the value of the promoted publications for the Croatian professional community that needs much more knowledge and experience in usage of these methods in practice. Deputy Minister Diana Simic pointed out that such centres of excellence are very important in a small country like Croatia and that the group of simulationists from Faculty of Economics proved to be such a center by remarkable publications at both national and international level.

Dr. Mladen Mauher who was one of the founders of CROSSIM and was also its president mentioned the importance of presented publications. Dr. Mauher graduated and received his PhD degree from Faculty of Economics and currently he is leading the Governmental project targeted towards introduction of Internet communication in every-day life ant its goal is to provide necessary infrastructure including technical, organisational and legislative prerequisites.

ITI'2003. 25th International Conference *Information Technology Interfaces ITI 2003* was held in a small, charming city Cavtat near Dubrovnik on June 16-19, 2003. The Conference was organized by SRCE – Zagreb University Computing Centre under the auspices of Croatian Ministry of Science and Technology and the University of Zagreb. A detailed report will be given in the next issue.

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DBSS

Dutch Benelux Simulation Society

General Information

The Dutch Benelux Simulation Society (DBSS) was founded in July 1986 in order to create an organisation of simulation professionals within the Dutch language area. DBSS has actively promoted creation of similar organisations in other language areas. DBSS is a member of EUROSIM and works in close cooperation with its members and is further affiliated with SCS International, IMACS, the Chinese Association for System Simulation and the Japanese Society for Simulation Technology.

DBSS Steering Committee

A.W. Heemink (TU Delft): Chairman
L. Dekker: Vice-Chairman
W. Smit (E&E Consultants), Secretary, Treasurer
Th.L. van Stijn (Royal Dutch Meteorological Institute/KNMI), Member
H. de Swaan Arons (Erasmus Universtity Rotterdam), Member

Membership - Information

Both corporate entities (companies, institutes, etc.) and individuals are welcome to join DBSS as full corporate or individual member. The contribution is divided in two options:

1. Euro 34,- individual member or Euro 68,- institutional member, which means that you will receive the newsletter Simulation News Europe two times a year (one double, one single issue).
2. Euro 68,- individual member or Euro 114,- institutional member, which means that you will receive the Journal Simulation Practice and Theory eight times a year, and Simulation News Europe two times a year (one double, one single issue).

Becoming member of DBSS includes automatically being member of EUROSIM, the overall organisation of European Simulation Societies. DBSS members enjoy reduction of the fees attending the "EUROSIM events" which include congresses, conferences, symposia, workshops etc.

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

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

Arnold W. Heemink, a.w.heemink@its.tudelft.nl

Francosim

Société Francophone de Simulation

FRANCOSIM was founded in 1991 and aims to the promotion of simulation and research, in industry and academic fields. Francosim operates two poles.

Pole "Modelling & simulation of discrete events systems"

To improve the necessary synergy between industry and academia workers in the area of system modelling, the pole co-organises the series of conferences "MOSIM" (Modelling and Simulation). The 4th conference took place April 23-25, 2003 (Info: www.laas.fr/mosim03/. A report will be given in the next issue of **SNE**.

Pole contact: Professor Henri Pierreval,
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Pole "Modelling & simulation of continuous systems"

This pole has launched in 1999 a series of conferences on modelling and simulation in medicine and biology (BioMedSim). The first was organised in April 1999 (BioMedSim'99) and has led to the selection of several papers to appear in a special issue of SIMPRA.

This pole organised the 3rd BioMedSim Conference on the 27th-30th of May 2003 at the University of Balamand, Lebanon (www.balamand.edu.lb/docs/biomedsim.html). . A detailed report will be given in the next issue of **SNE**.

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FRANCOSIM organises the 5th EUROSIM Congress on Modelling and Simulation:

EUROSIM'04

Sept. 6 -10, 2004; Cite Descartes
Marne la Valle (near Paris), France

See Call for papers in this SNE issue

HSS

Hungarian Simulation Society

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

Activities Budapest University of Technology. At the Department of Information and Knowledge Management on the Faculty of Economic and Social Sciences of the Budapest University of Technology and Economics classes "Simulation and Modelling in Economy" and an other "Decision Making and Management using Simulation" as well as simulation laboratory practices are held for graduate and postgraduate students studying economy, informatics and electrical engineering. Ph.D. students participate in various simulation research projects aimed at methodological basic research as well as applications.

The establishment of a new doctoral school where simulation and knowledge management is to become a formal program under the leadership of the chairman of HSS is in preparation.

Activities University Gyor. In the town of Gyor at the Szechenyi Istvan University simulation is also taught. Here undergraduate students of informatics, electrical and traffic engineering study the class „Simulation Methodology and Applications". The Hungarian MISS Satellite Center is located in this university. The establishment of a doctoral school within which there will be a program on simulation is in preparation. With regard to this a cooperation with the MISS Satellite Center and its director Prof. Dr. Felix Breitenecker at the TU of Vienna is envisaged..

Our efforts mentioned are intended to contribute to the dissemination of the various aspects of the methodology and application of simulation for the young generation. We have participated at EUROSIM and SCS conferences and presented our simulation results. Our members have been and are successfully participating in national and EU simulation projects.

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ISCS

Italian Society for Computer Simulation

www.iscs.it

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

The affairs of the ISCS are directed by a Steering Committee, which recently was elected anew: Ing. Mario Savastano (Chairman), Prof. Franco Maceri (Vice Chairman), Dr. Paola Provenzano (Secretary), Prof. Pasquale Arpaia (Tresaurer)

The Italian Society for Computer Simulation (ISCS) hold on 5 and 6 December 2002 the National Congress in Brindisi, at the branch office of the University of Lecce. A detailed report will be given in the next Issue of **SNE.**

Information, Website. For further information or application for membership, please contact:

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Please have a look at the new designed website of ISCS: www.iscs.it

Mario Savastano

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AES

Spanish Simulation Society

No news received.

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PSCS

Polish Society for Computer Simulation

General Information

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

At present PSCS counts 258 members. The Board of third cadence consisting of the following persons directs the affairs of the PSCS: Andrzej Tylikowski (President), Leon Bobrowski and Andrzej Chudzikiewicz (Vice Presidents), Zenon Sosnowski (Secretary), Kazimierz Furmanik (Treasurer), and R. Bogacz, J. Rybicki, A. Grzyb (Members).

Activities. The main activities of the Polish Society for Computer Simulation are annual conferences known as „PSCS Workshops on Simulation in Research and Development": Mielno (1994), Warszawa (1995), Wigry (1996), Jelenia Gora (1997, 1998), Bialystok & Bialowieza (1999), Zakopane – Koscielisko (2000), Gdansk-Sobieszwo (2001).

Past Events. On December 16, 2002 the general assembly of PSCS members was held in Warsaw. This meeting, besides representing an interesting forum to discuss and promote the activity of the society, was the occasion to elect the Board for the period 2003-2005.

The annual PSCS Workshop on Simulation in Research and Development took place on August 28-31, 2002 in Osiekik/ Koszalina, Poland.

Publications. Proceedings of the 8th PSCS Workshop on „Simulation in Research and Development", J. Rybicki and A. Tylikowski (Eds.), Gdansk Sobieszewo, 2001, (in Polish). The price is 20,- PLN.

Conference Announcement

10th PSCS Workshop

Sept. 9-12, 2003, Zakopane, Poland

Prof. A. Grzyb will organize the 10th PSCS Workshop on „Simulation in Research and Development" Sept. 9-12, 2003, Zakopane, agrzyb@mech.pk.edu.pl

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ROMSIM

Romanian Modelling and Simulation Society

General Information

ROMSIM has been founded in 1990 as a non-profit society, devoted to both theoretical and applied aspects of modelling and simulation of systems.

ROMSIM currently has about 100 members from both Romania and Republic of Moldavia. The main objectives of ROMSIM are: development of new methods and instruments of modelling and simulation of systems, development of new application of modelling and simulation of both natural systems and those created by man, development of education and training in the field of modelling and simulation of systems. An other important objective of ROMSIM is organization of national scientific events in the field of modelling and simulation and participation at international conferences. In April 1999 ROMSIM has been accepted as an observer member of EUROSIM.

Past Events

ROMSIM has developed in the last time a lot of activities in both scientific and information field, as for instance: organization of scientific conferences and seminaries in modelling and simulation of systems, information of ROMSIM members on international conferences, etc.

ROMSIM helped the organization of the 9th IFAC/IFORS/IMACS/IFIP Symposium on Large Scale Systems: Theory and Applications, held in Bucharest in July 2001. Several members of ROMSIM presented communications in the frame of this Symposium and/or chaired Technical Sessions. Several members of ROMSIM presented communications at CSCS-13th International Conference on Control Systems and Computer Science, held in Bucharest in May 2001. Some members of ROMSIM attended ECC-European Control Conference, held in Porto, Portugal, in September 2001.

A member of TOMSIM has participated at MATHMOD Conference 2003 organized at TU Vienna.

At the demand of Prof. Yskandar Hamam, EUROSIM President, a ROMSIM member was proposed for international programme committee of BioMedSim03 conference.

Present and Coming Events

ROMSIM is involved in organization of the periodic scientific seminary titled Fuzzy Systems and Fuzzy Logic; 15 to 20 specialists attend the reunion of the seminary.

The seminary present and discuss both theoretical and applied contributions of participants, in the field of fuzzy sets, fuzzy logic and fuzzy systems. We emphasize that the founder of this seminary was the well-known fuzzy expert Prof. C. V. Negoita.

We emphasize also the activity of ROMSIM members in the field of publishing books, monographs and articles in international and/or Romanian journals. Some monographs are to be published in a new Series titled Technologies of Information, of Technical Publishing House, Bucharest and articles will be published in the Romanian journals SIC-Studies in Information and Control and RRIA-Romanian Journals of Informatics and Automatics. ROMSIM members ensure the reviewing of articles submit by authors to Editorial Staff of these journals.

The Seminar on "Fuzzy sets, theory and applications" started working in 1996. Since then the activity of the seminar has taken place at the Institute of Informatics in Bucharest. The main fields of interest are: fuzzy set theory, fuzzy logic and various applications in modelling, optimization and fuzzy systems. The seminar is in fact an interdisciplinary one; there are mathematicians, computer science engineers, economists and logicians trying to apply fuzzy techniques. Many other subjects were considered: modal logic, causality, machine learning neural nets, large systems, etc. The activity of the seminar was reported in"Studies in information and control" (in 1997, 1998, 1999, and 2000). In this very moment (the spring 2003) the seminar is concentrated on dynamic logic and representations of fuzzy structures. The leader of the Seminary is Paul Fflondor.

At the same time ROMSIM members are interested to attend the 5th International EUROSIM 2004 Congress, which will take place in Paris. ROMSIM encourages some members to prepare tutorials and/or scientific communications to be presented at EUROSIM 2004 Congress.

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SIMS

Scandinavian Simulation Society

www.scansims.org

SIMS is the Scandinavian Simulation Society with members from the four Nordic countries Denmark, Finland, Norway and Sweden. The SIMS history goes back to 1959. SIMS practical matters are taken care of by the SIMS board consisting of two representatives from each Nordic country.

The SIMS annual meeting takes place at the annual SIMS conference or in connection to international simulation conferences arranged in the Nordic countries.

Sims Structure

SIMS is organised as federation of regional societies. There are FinSim (Finnish Simulation Forum), MoSis (Society for Modelling and Simulation in Sweden), DKSIM (Dansk Simuleringsforening) and NFA (Norsk Forening for Automatisering).

Membership, SIMS Board

- Peter Fritzson, chairman
- Erik Dahlquist, Brian Elmegaard, Anne Elster, Kaj Juslin, Esko Juuso, Bernt Lie, Kim Sörensen
- Vadim Engelson is SIMS coordinator for practical matters.

You can contact the chair of the SIMS board, Prof. Peter Fritzson (Linköping University, Sweden):

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To become a member of SIMS you should join one of the SIMS member organizations, as specified on the SIMS web page. Updated SIM web page with news and recent information:

www.scansims.org

Coming Events

Malardalen University together with the SIMS and MoSiS is arranging SIMS 2003 - 44th Conference on Simulation and Modeling on September 18 -19, 2003 in Västerås, Sweden.

Conference Announcement

44th SIMS Conference

Sept. 18 – 19, 2003, Västerås, Sweden

The aim of this conference is to cover broad aspects of modeling and simulation and scientific computation. It will thus be of interest for model builders, simulator personnel, scientists, engineers, vendors, etc. The scientific program will consist of technical sessions with submitted and invited papers, and is open for poster sessions and vendor demonstrations. Invited speakers are

- Prof Finn Jensen from Aalborg University, one of the world leaders on Bayesian Networks : What Bayesian Nets an be used for.
- Charlotte Brogren, research director ABB Corporate Research in Västerås, Sweden, and responsible for Automation Corporate Research: ABB´s Research Activities in the Automation Field.
- Hans-Jörgen Zimmerman, Technical leader of the Artificial Neural Net group at Siemens, Germany :Applications of Artificial Neural Nets for industrial and analytical finance applications.

Topics of the conference include but are not limited to: Modelling Tools, Numerical methods for simulation, Simulation Tools and Technology, Visualization of Modelling and Simulation Results, AI in Simulation, Parallel simulation, Simulation of distributed parameter systems, Training Simulators and Real-Time Simulation, Simulation in Control Engineering, Process Plant Simulation, Simulation in Pulp and Paper Industry, Simulation in Metallurgical Industry, Simulation in the Energy Sector, Power Station Design, Simulation in Chemical Engineering, Simulation in Biological and Environmental Engineering, Simulation in Electronic Manufacturing, Simulation of Electronic Systems, Simulation in Mechanical Engineering, Simulation of Marine Systems.

Presented papers will be considered for publication in the Journal "Simulation News Europe" or "Simulation Practice and Theory"Further information is available from www.scansims.org

An Exposition for books, commercial simulation programs and small-scaled experimental equipment used for simulation purposes will be held in conjunction with the Conference to provide an opportunity for organizations to display their products or services to Conference delegates. Fur further details, please, contact the Conference Secretariat.

There are a high number of direct flights from all over the world to Stockholm (Arlanda),from where there is a bus taking1h 30 min or you can take a taxi (1h 10 minutes). The flight connections between Vasteras and Copenhagen, Gotenburg, London and Oslo are also quite good.

The conference will be held in autumn, which is one of the most beautiful seasons. If the weather is fine a tour at Lake Malaren is a nice experience.

Vasteras is an attractive, high-quality conference city.

It is known for high-level technology expertise and rapid growth with 130 000 inhabitants. Vasteras hosts a well-known science park, which is one of the fastest growing in Europe.

The university has 13000 students equally distributed between the two neighboring cities Vasteras and Eskilstuna on opposite sides of lake Malaren. See web pages

http://www.vasteras.se

http://www.mdh.se

Important Dates:

- Submission of extended abstracts or draft papers - June 8, 2003
- Notification of acceptance - June 22, 2003
- Submission of full papers (assuming that extended abstract has been accepted) - July 18, 2003
- Reviewers feedback and recommendations - August 7, 2003
- Camera-ready manuscripts - August 25, 2003
- The conference - September 18-19, 2003

SIMS - 44th Conference on Simulation and Modeling,
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Conference Announcement

Automaatio Seminar Days

Sept. 9 – 13, 2003, Finland

The forthcoming Automaatio Seminar Days 9 – 11 September 2003 organized by the Finnish Society of Automation will already be the 15th in the series.

The Automaatio 03 Fair in conjunction with the Automaatio Seminar Days make up the most important automation industry event in Northern Europe. It has traditionally taken place every second year.

The seminar will last three days. The main language is Finnish but there will also be presentations in English in some extent.

The Seminar Days will serve as a forum for professionals in the field of automation. More information is available from the web:

www.automaatioseura.fi/autom03/eng/

Conference Announcement

VForum 2003

Nov. 5-7, 2003, Linköping, Sweden

VRForum 2003, The Forum on Virtual Reality, Modeling, Simulation and Visualization will be held in Linköping, Sweden, November 5-7, 2003.

This forum is devoted to simulation of rescue efforts, training and coordination activities in case of accidents. More information is available from

www.scansims.org

Conference Announcement

3rd Modelica International Conference

Nov. 2-4, 2003, Linköping, Sweden

The 3rd Modelica International Conference will be organized in Linköping, Sweden, November 2-4, 2003.

This is the third conference devoted to new equation-based object-oriented language for physical modeling and simulation. More information is available from www.scansims.org

Contact Address, Information

Updated SIMS web page with news and recent information: www.scansims.org

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SLOSIM

Slovenian Society for Simulation and Modelling

msc.fe.uni-lj.si/SLOSIM

General Information

SLOSIM (Slovenian Society for Simulation and Modelling) was established in 1994 and became the full member of EUROSIM in 1996. Currently it has 93 members from both slovenian universities, institutes, and industry. It promotes modelling and simulation approach to problem solving in industrial as well as in academic environments by establishing communication and cooperation among the corresponding teams.

News

On November 21st, 2002, the general and election assembly was held at the Faculty of Electrical Engineering in Ljubljana. The reports about the previous election period and plans for the future were presented by the president and treasurer. A new SLOSIM board for the next four-year period has been elected:

R. Karba - president
L. Žlajpah - vice-president
A. Belic - secretary
M. Simcic - treasurer

The board also consists of nine members from different institutions.

The first president of SLOSIM who successfully led the society through first two four-year periods, prof. dr. Borut Zupancic, was nominated for the first deserving member of the society.

On February 10th, 2003 prof. Roger Jelliffe from the University of Southern California, Keck School of Medicine (Los Angeles, USA), presented the invited lecture from area of population pharmacokinetics modelling. He described developement of the corresponding simulation environment which was later demonstrated to the members. After the presentation, the new SLOSIM board had its first meeting where plans for the future work were discussed.

Some members of SLOSIM participated actively also on the 4th MATHMOD conference in Vienna this February by organising two sessions: Modelling in Biopharmaceutics and Health Care 1 and 2.

Prof. dr. Borut Zupancic, deserving member of SLOSIM (right) and R. Karba (left)

The members will participate also on the international conference EUROCON, which will take place in September this year in Ljubljana and on ERK 2003 conference that will be held in Ljubljana in the same month. For contributions to the latter, the deadline is July 11th. Information about the conferences can be found on:

http://www.eurocon2003.si/
http://www.ieee.si/erk03/

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UKSim

United Kingdom Simulation Society

ducati.doc.ntu.ac.uk/uksim/

General Information

The UK Simulation Society (UKSim) has more than 100 members throughout the UK from universities and industry. It is active in all areas of simulation and it holds a biennial conference as well as regular meetings and workshops.

Publications

The UKSIM is publishing the

International Journal of Simulation: Systems, Science & Technology (IJS^{3}T).

At begin of 2002 a special issue on Business Process Modelling (ed. V. Hlupic) was published. For more details please refer to the corner *Journal News* in this **SNE** issue or to the web site:

ducati.doc.ntu.ac.uk/
uksim/journal/issue-1/cover.htm

Membership, Information

Membership of the UK Simulation Society is very good value at only £20 per year including a subscription to Simulation News Europe.

Those who attend the biennial conferences get free two-year membership untill the next conference. For more information about the Membership please contact the Membership Secretary:

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ducati.doc.ntu.ac.uk/uksim/

Past Events

UKSIM 2003 Conference was held from 9th to 11th April 2003, at Emmanuel College, Cambridge. The conference had about 40 participants, including colleagues from the U.K., Germany, Italy, Holland and the U.S.A..

The conference began with a very interesting presentation about Semiotic Cognitive Information Processing from the invited speaker Burghard Rieger (University of Trier, Germany).

The conference continued with 8 sessions comprising many high-quality papers in the ever-expanding areas of modelling and simulation: Analytical and Stochastic Models, Business Processes, Mobile Networks, Optimisation and OR, AI Techniques, Transport, Cluster Computing, Scheduling and the Internet.

Papers presented within these sessions generated a great deal of interest and discussion, and provided an opportunity for the instigation of future collaboration amongst participants.

The conference provided many opportunities for socialising, including a conference dinner in Emmanuel College's Old Library - a beautiful 17th century panelled hall. A very entertaining and informative after-dinner speech was given by Neil Bowerman, Nestle UK, about the invaluable use of Simulation within Industry. The speech concluded with a number of impressive simulation demonstrations.

The auspicious scientific content, outstanding conference facilities, delicious food and stunning surroundings contributed to the success of this conference. Due to the positive outcome of UKSIM 2003, the UKSIM conference will run annually. The envisaged location for UKSIM 2004 (to be held at the end of March) is St. Catherine's College, Oxford, with a probable return to Cambridge in 2005.

Copies of the UKSIM 2003 conference proceedings may be obtained from Dr David Al-Dabass, School of Computing and Mathematics, The Nottingham Trent University, Nottingham NG1 4BU, United Kingdom. Please see the conference website for more details:

http://ducati.doc.ntu.ac.uk/uksim/uksim'03/
CFP-uksim'03.htm

UKSIM's associated journal: the International Journal of Simulation: Systems, Science & Technology, has several special issues coming out later this year on various aspects of modelling and simulation, for more details please refer to the journal website:

http://ducati.doc.ntu.ac.uk/uksim/journal/
issue-1/cover.htm

Dr Joanna Hartley, UKSim committee member
Dr David Al-Dabass, Chairman, UKSim.

Vlatka Hlupiv, UKSIM Secretary
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INTERNATIONAL SOCIETIES

MATHMOD Conference Series

www.mathmod.at

The MATHMOD Conference Series was started with 1st MATHMOD Conference in February 1994. In 1997 and 2000 the series was successfully continued by 2nd and 3rd MATHMOD. The series has established as well-accepted and high-standing tri-annual conferences on mathematical modelling and simulation. It was continued with 4th MATHMOD conference in February 2003.

The conference series is run by the Dept. Simulation and Mathematics of Control (I. Troch) of Vienna University of Technology, in close Co-operation with ARGESIM (F. Breitenecker).

The scope of the conferences covers theoretic and applied aspects of the various types of mathematical i.e. formal modelling (equations of various types, Petri nets, bond graphs, qualitative and fuzzy models etc.) for systems of dynamic nature (deterministic, stochastic, continuous, discrete or hybrid, etc.).

Comparison of modelling approaches, model simplification, modelling uncertainties, validation, automation of modelling and software support for modelling etc. will be discussed in special sessions as well as applications for control, design or analysis of systems in engineering and other fields of application, and learning networks in modelling, fitting models to real processes, model reduction.

Conference Report
4th MATHMOD Vienna, Feb. 2003

During Feb. 5 - 7, 2003 the "Forth International IMACS Symposium on Mathematical Modelling" i.e. 4th MATHMOD Vienna took place at Vienna University of Technology. This event was sponsored by IMACS and by Vienna University of Technology and especially by the Division for Mathematics of Control and Simulation (E114/3) at TU Vienna and, co-sponsored by IFAC (Int. Federation for Automatic Control), ASIM (German Simulation Society), GAMM, VDI/VDE-GMA (Society for Measurement & Automation at VDI/VDE, Germany), OCG (Austrian Computer Soc.), OEMG (Austrian Mathematical Soc.), EUROSIM and ARGESIM (Working Group Simulation News TU Vienna).

The conference gathered about 230 scientists form 29 countries from four continents.

This great interest in a topic like this is due to an increasing need for reliable formal models. In some disciplines, use of mathematical models is a rather new approach to problem solution whereas in other disciplines mathematical models are used since long time but need continuing adaptation and refinement. Consequently, an appropriate model can be used for finding a good solution of a problem to be solved or, it can be intended to help for a better understanding of what is going on in a system. Examples for the first case are many types of design problems such as controller design whereas the request for an improved understanding is often found in connection with non-engineering systems such as biological or medical systems, economic or environmental systems etc.

However, modelling must not be seen only as e.g. equations or graphs etc. describing the dynamic behaviour of a given system, modelling is concerned also with e.g. the formal description constraints and goals. Last but not least, the modeller must also have in mind which algorithms and/or methods are available for solving a certain type of problem. Otherwise, he/she will end up with a - maybe very accurate - model which can not be handled further at reasonable cost.

The concrete area of application and the modeller's experiences determine to a certain extent not only the modeller's knowledge of modelling principles and his references of modelling approaches and tools, but also his/her knowledge of methods for model simplification or for parameter estimation etc. and hence, the type of the resulting model and of tools to be used for solving the given problem. Moreover, many methods, relations etc. are discovered repeatedly. Therefore, a conference having mathematical modelling as its central theme will allow for a fruitful and stimulating exchange of ideas - be it the exchange between different areas of applications or be it the exchange between methods and practice.

Consequently, the 4th MATHMOD was devoted to a variety of topics such as comparison of modelling approaches, model simplification, modelling uncertainties, port-based modelling, the impact of items such as these on problem solution, numerical techniques, model validation, automation of modelling and software support for modelling, co-simulation, etc. Moreover, many areas of applications were covered such as e.g. automatic control, design or analysis of engineering, biological, environmental etc. systems. Moreover, a broad variety of types of systems was discussed such as deterministic systems, stochastic systems, continuous, discrete or hybrid systems, lumped parameter or distributed parameter systems etc.

A wide variety of formal models was discussed during the 4th MATHMOD Vienna and the term "mathematical model" includes classical models such as differential or difference equations, Markov processes, ARMA models as well as more recent approaches such as Bond graphs or Petri nets.

In order to allow for a fruitful exchange of ideas across traditional borderlines, three plenary lectures were given:

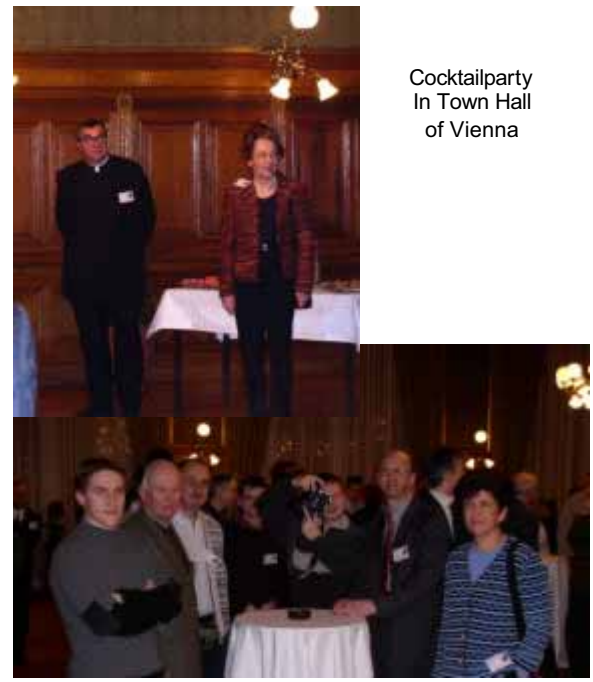
- Modelling and Simulation in Mechatronics (P. Breedveld, Univ. Twente, The Netherlands)
- Modelling and Simulation in Snow Science (K. Kleemayr, Univ. Agricultural Sciences, Vienna)
- Modelling, Analysis and Control of Parallel Hybrid Vehicles (N. A. Kheir, Oakland University, USA)

Inge Troch and Peter Breedveld at Opening Sessission

To improve the aforementioned exchange of ideas further, 23 well-known scientists followed the invitation to organize a so-called special session where not only those interested in a more specialized topic could meet and exchange ideas but also colleagues with a different area of specialization could get a good impression on the most recent research topics and results in a particular area. In addition, the Call for Papers invited scientists to contribute individually.

As a result, about 150 extended abstracts were submitted and were carefully reviewed by the 35 members of International Program Committee (chaired by Inge Troch) coming from 16 countries worldwide. This reviewing resulted in invitations to 109 authors to present their contribution during the conference as a paper and 7 were invited to present their ideas as a poster. Unfortunately, not all these authors were able to participate in the 4th MATHMOD conference. Nevertheless, the scientific program contained 104 contributed plus 97 papers presented in a special session i. e. a total of 201 regular papers which were colleted and arranged in 17 strings of sessions according to their main thematic point:

- Physical Modelling, Automatic Control
- Mechanics and Mechatronics, Robotics
- Fluids Systems, Biology
- Process Engineering and Process Simulation
- Manufacturing Systems, Finite Automata
- Computing and Discrete (Event) Systems
- Geoinformation and Environmental Systems
- Physiology and Medicine
- Financial and Economic Systems
- Methods, Identification, Education
- Model Simplification and Model Reduction



Cocktailparty In Town Hall of Vienna

The organizing committee, Inge Troch, Felix Breitenecker and Friedrich Urbanek, was careful to provide enough time for scientific and other discussions. Hence, there were not only sufficiently long coffee breaks and lunch breaks where participants could meet and talk or, could have a look on the many books and journals on display or on the 13 posters. These posters could be discussed with the authors during these breaks but especially during the special Poster Session where also a selection of the 'best poster' took place. Johann Reger from the University Erlangen-Nürnberg with the poster on "Analysis of multi-linear systems using Groebner-bases over the finite field GF(2)" was the winners of the best poster award consisting of a one year subscription to the journal "Mathematical and Computer Modelling of Dynamical Systems". A second one-year subscription of this journal was disposed of by lot among those conference participants who played an active part in this selection. Further, four one year subscriptions of "Simulation News Europe" (SNE) were handed over as second and third prices for poster presentations and participation in the selection, respectively.

The written versions of the three invited lectures, of (almost) all contributions to the conference as well as abstracts of all posters are collected in a Proceedings volume (ISBN 3-901608-24-9), edited by I. Troch and F. Breitenecker and published by ARGESIM, Vienna. These Proceedings consist of a printed Abstract volume with One page abstracts of papers and posters and a CD ROM (2nd Volume) with the full versions of the papers. In addition, the survey lectures and selected regular papers will appear also in a special issue of the IMACS journal "Mathematics and Computers in Simulation". Further, it is intended to invite some authors to submit a suitably enlarged and adapted version of their contribution to "Mathematical and Computer Modelling of Dynamical Systems" (MCMDS). For any of these possibilities, selection of papers is based on a second reviewing procedure based on full papers.

Moreover, a rich social program during the three conference evenings - a Get-Together-Party on the eve of the symposium, a cocktail party in the beautiful Senatssitzungssaal of the town hall of Vienna and a traditional (and really Viennese) Heurigen evening in Neustift am Wald - offered further possibilities to make friends with colleagues from other countries or, sometimes also with colleagues from ones own town.

Finally, it should be mentioned that there were also several committee meetings during or immediately after the conference. Among them was a meeting of the IMACS TC-2, the IMACS Technical Committee on "Mathematical Modelling". There the recommendation was given to organize 5th MATHMOD symposium at TU Vienna.

Conference Announcement

5th MATHMOD Vienna 2003

February 2007, Vienna, Austria

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Liophant Simulation Club

www.liophant.org

As many People active in the Simulation Field know, Liophant Simulation Club (LSC), is a non-profit association that gathers under its flag more than 100 members: researchers, university teachers, freelance consultants, people from companies and government, students, but most of all persons that are interested in computer simulation all over the world, and is the European Local Chapter of Society for Computer Simulation International.

To let all the readers know something more about the aims of the club, we will say that they are to show how simulation could be more and more useful in an increasing number of application fields, to give opportunities to members for learning new concepts and skills on simulation and for participating to seminars, stages and conferences on simulation topics all over the world. In order to spread simulation and enlarge its use all over the world, LSC has started a series of innovative projects that involve now old and new partners. One of the traditional partners of LSC, in Italy, is DIP, Genoa University (Italy), with whom the Club created a network of people interested in simulation for industry, exchanging information, news & material and establishing a common baseline for simulation studies and future standards. This program is active since May 2000 when the first SIREN (Simulation Report & Networking) Meeting took place in Italian Riviera, with more than 60 attendees coming from Academy, Industry, Governments, Institutions, Research Centres.

One of the incoming needs of Italian audience was noticed to be a more detailed vision on the principles of simulation. So, Liophant and DIP with the collaboration of McLeod Institute for Simulation Sciences, organised a series of three–days courses on Modelling & Simulation, each one with different topics, such as M&S Basis, High Level Architecture, Verification, Validation and Analysis, Simulation to Manage & Control ERP Systems, Simulation Project Management, Simulation For Logistics. etc. The attendance was very various, coming from shipbuilding, aerospace industry, retail companies, research centres, local authorities and universities; almost 150 people attended the courses held until now, listening to lectures and experiencing on exercises and case studies. Teachers came from various affiliations: DIP, that has experienced a long tradition on simulation projects, McLeod Institute of Simulation Sciences, Boston College, NASA, NCS DMSO, Aegis, etc.

Meanwhile, the SIREN Network developed to more than 100 persons and was the promoter and organiser of the conference Virtuality 2002 in Turin, a very important event on the field of Virtual Reality, that was organised in 2001 too.

But another event in the simulation field is very important for LSC: yearly the Club in partnership with DIP organises the HMS (Harbour, Maritime & Multimodal Logistics Modelling & Simulation) workshop. In 1999 it was held in Genoa and in 2000 it took place in the wonderful frame of Portofino. In 2001 HMS has been held in Marseille, France, in cooperation with DIAM – IUSPIM Engineering School, and in 2002 has come back to Italian Riviera, coupled with a new event: MAS2002 (Modelling and Applied Simulation). This year HMS will be organised in Riga and in 2004 will be held in Rio, always organised by LSC. Liophant is proud to make possible each year this great event, that will be doubled with MAS in 2003 and that allows simulation experts from all over the world to meet and present their own works and researches in the field of logistics. As said previously, another aim of LSC is to allow students and young researchers interested in simulation to go abroad and work on concrete projects with experts both of the Industrial and both Academic world, or to participate to international conferences an events. Just like every year even in 2002 some Liophant Members have been able to participate to conferences and Experiences in Innsbruck, Dresden, Crete, Rio de Janeiro, Orlando, Boston, Lisbon, and Marseille. Meanwhile, LSC has a special cooperation agreement with National Center For Simulation - Kennedy Space Center, to send members of the Club in Orlando in order to participate to research programmes.

Another great opportunity in this field was the approval, in 2001, of the IEPAL Project, that Liophant & DIP have started in cooperation with Boston College, NCS, Stevens Institute, University of Central Florida, DIAM – IUSPIM Marseille University, University of Magdeburg and CFLI.

IEPAL (Intensive Educational Project in Advanced Logistics) is a project funded by European Community and US Department of Education, that allows students from EC and USA to travel on both sides of the Atlantic Ocean. The participants attend innovativ e Courses in Logistics and Simulation within Academic partners and they get industrial experience by the modules organised by the Industrial Consortiums.

Modules in Magdeburg, Genoa, Venice and Orlando have been held during Summer/Fall 2002, giving the opportunity to 27 students to work and study together abroad in international teams on topics of simulation for logistics.

The IEPAL
Event organised by LSC at
Claudio Congress Center

LSC, in co-operation with DIP, University of Genoa, organised Thursday July 4 2002 at 11:00 am in Hotel Congress Centre "Claudio", Bergeggi (Savona), the press presentation of IEPAL Project. The presentation included a meeting involving company representatives involved in Genoa Area during 2002: COOP Liguria (Supermarket Chain), Piaggio Aeroindustries (Aerospace Industry), Messina (Port Terminal), Vernazza Autogru (Special Crane Services), Voltri Terminal Europe (Port Terminal). The companies and agencies involved in I-EU1 Industrial Module during 2002 in Italy included also a site in Venice with Venice Port Authority.

In that occasion, LSC proposed examples of previous experiences in international student exchanges with major institutions, companies and agencies world-wide.

IEPAL program provides opportunities for student exchanges focusing on Information Technology applied to Logistics and involves both Universities and Companies in European Community as well in USA. During this first phase experiences have been completed in Italy (Genoa and Venice), Germany (Magdeburg), Orlando (NCS and UCF) involving students from DIP Genoa University, Marseille University, Magdeburg University, Boston College, University of Central Florida and Stevens Institute. In the industrial realities the teams (mixing a total of 27 different students from EC and USA) worked on IT&Logistics problem solving, involving in the USA the Hi-Tech consortium NCS (involving NASA, AT&T, Air Force Research Lab, Boeing, Florida Administration, Lockheed Martin, Marines Research Center, Silicon Graphics and about 100 other enterprises). Current IEPAL reference point is being held (February/April 2003) in Orlando-Boston-Hoboken.

LSC is also involved as supporting partner in developing an HLA tool for the management of a very complex project on supply chain management with many sub contractors geographically distributed.

Other Projects are in course of development with other partners, such as projects for remote education in Information Technologies for Logistics.

One of the most interesting and challenging topics on which LSC has been active since 1999, is a project for using benefits of Fuzzy Logic Techniques in the field of Military Data Fusion.

A cooperation with Italian Navy was born in order to improve the process of identification and tracking of targets in naval scenarios by fusing signals coming from different sensors (Radar, ESM, IFF, EO, IR) not only with traditional techniques (Kalman filtering, Bayesian and Dempster – Shafer), but also with the support of Fuzzy Rules.

The results are so interesting that also a very famous car racing company in Italy is interested in applying such techniques in its own field in order to predict competitor behaviour during races.

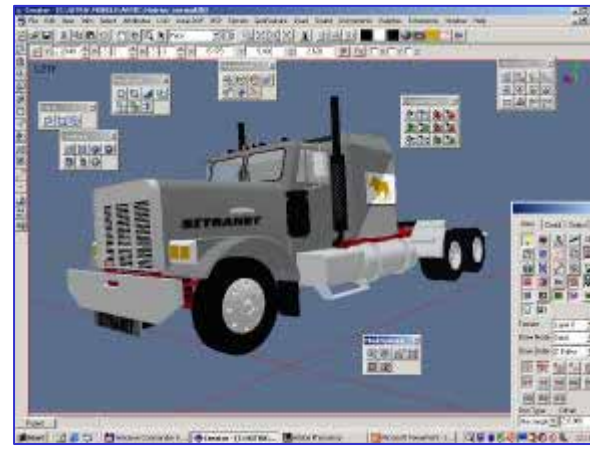
This case was not the first experience of LSC in the military field, because in the past members of the Club have performed cooperations with the most important Military Shipbuilding Company in Italy in order to create a DSS with internal Genetic Algorithms that was able to simulate the planning and the construction of ships in order to manage and solve real and possible problems (i.e. supplier delay, make or buy decisions, operation scheduling, and so on).

Now, a recent Naval application on which LSC Members have been involved, is the construction of a tool that will optimise fluxes of petrol shipping for a great petrol - chemical company, with particular attention to Chaos Phenomena. This project won the best project award contest in ICAMES 2002, Istanbul.

A very innovative project in which LSC is involved, started in 2002 after a long phase of preliminary feasibility studies: it is named SI.TRA.NE.T. (Simulation Training-Networking for Equal opportunities in Transport): its main and innovative core consists in the development of new generation PC-based simulators that utilise modern synthetic environments and can interact with the operator through special interfaces and between themselves through special architectures (i.e. HLA - High Level Architecture).

Setting up a series of simulators for training that enhances prevention in high-risk activities, such as handling particularly heavy loads using hoisting equipment (such as container cranes), it also makes it easier for those people who would find it difficult to gain access to or be retrained in the specific work areas to enter the profession.

Ideally, using this type of tool, based on such innovative technologies, would drastically lower costs, allowing it to be significantly extended throughout the sector. There is also an obvious impact on safety as well as on the productivity of real plants that is drastically reduced when used for training, allowing also to test new cooperative training methods (i.e. two cranes that lift a load together) and to effectively distribute such an approach to all potentially interested companies.



In the figure: one of the SITRANET 3D Models

By the way, logistics applied simulation tools have been performed in research programmes on Retail systems: models for improving Customer Satisfaction by simulating sell shops and applying new management and operational solutions, tools for finding best reorder algorithms and parameters for each kind of item, and so on.

Next projects of LSC are to establish new international cooperations to create a World wide network of simulation, projected towards the future.

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Chiara Briano, LSC General Director
Agostino G. Bruzzone, LSC President

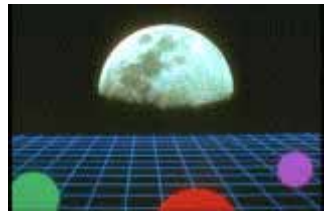
WSC Winter Simulation

Conference Organisation

www.wintersim.org

The Winter Simulation Conference (**WSC**) is the premier international forum for disseminating recent advances in the field of system simulation, with the principal focus being discrete-event simulation and combined discrete-continuous simulation. In addition to a technical program of unsurpassed scope and quality, WSC provides the central meeting place for simulation practitioners, researchers, and vendors. The congress is co-organised by various groups, e.g. **INFORMS** and **SCS**.

Report WSC'02



The 2002 Winter Simulation Conference (**WSC'02**) was held December 8–11, 2002, at the Manchester Grand Hyatt San Diego in San Diego, California, USA.

The WSC'02 conference featured a comprehensive program ranging from introductory tutorials to state-of-the-art research and practice. There were 13 tracks with over 200 presentations focused on simulation uses across the enterprise from supply-chain integration to e-commerce, customer service, modelling and analysis methodology, and applications in manufacturing, military, healthcare, transportation, logistics, and distribution. All of the sessions and tracks were documented in the highly esteemed WSC Proceedings, which each registrant receives on CD. Also, the exhibits area had displays by the leading simulation software vendors, which cover the full spectrum of commercial simulation products and services. Also many publishers showed publications on modelling and simulation (also SNE was on display).

SNE at display on WCS'02

Rounding out the conference were social gatherings as well as meetings of several professional societies and users' groups, and all these events gave attendees the opportunity to get acquainted and to become involved in the ongoing activities of the international simulation community. Further, the Manchester Grand Hyatt San Diego had an ideal prime waterfront location on San Diego Bay.

WSC'03 New Orleans

WSC '03 will be held December 7-10, 2003 at the legendary Fairmont New Orleans Hotel adjacent to the French Quarter in the Central Business District. The Fairmont New Orleans sets the standard for elegance and impeccable service in a city known for its gracious accommodations. The Fairmont's location is within walking distance not only to the French Quarter but also the Garden District, Jackson Square, the Royal Street Antique Shops, the National D-Day Museum and many other attractions making New Orleans a perfect place for WSC. Moreover, shopping and dining is world class and an experience not soon to be forgotten.

WSC '03 will have sixteen concurrent tracks with something of interest for everyone with its blend of cutting-edge research, innovative applications, exhibits from top companies in the simulation industry and international speakers. Our Keynote speaker, author Stephen Shapiro from London, England, has coached companies around the world including Australia, Singapore, England, France, Belgium, America and others. His work, bringing Innovation back into companies, includes simulation in its approach. Mark your calendar now for WSC '03 and join us for an exceptional conference in this exceptional location.

WSC 2003 will have 8 full tracks, 8 mini-tracks, a poster session and Ph.D Colloquium: Introductory Tutorials, Advanced Tutorials, Software Tutorials, Modeling Methodology, Analysis Methodology, Manufacturing Applications, Military Applications, Applications in Logistics, Transportation, and Distribution, Focused Mini-tracks, Business Process Reengineering, Construction Engineering and Project Management, Risk Analysis, Semiconductor Manufacturing, Simulation-Based Scheduling, Health Care, Simulation in Education, Future of Simulation ,Poster Session, Ph.D. Student Colloquium.

General Chair: Douglas J. Morrice
The University of Texas at Austin
Austin, E-mail: morrice@mail.utexas.edu
www.wintersim.org

IEMSS

International Environmental Modelling and Software Society

www.iemss.org

The International Environmental Modelling and Software Society (IEMSS) was formed in June 2000. The Society places an emphasis on interdisciplinarity and forms an umbrella for different regional groups and is linked to the Environmental Modelling and Software (EMS) Journal.

The aims of the iEMSs are to:

- develop and use environmental modelling and software tools to advance the science and improve decision making with respect to resource and environmental issues,
- promote contacts among physical, social and natural scientists, economists and software developers from different countries and coordinate their activities;
- improve the cooperation between the sciences and decision makers/advisors on environmental matters;
- exchange information in the field of environmental modelling and software among scientific and educational organizations and private enterprises, as well as non-governmental organizations and governmental bodies.

To achieve these aims, the iEMSs:

- organizes international conferences, meetings and courses in environmental modelling and software;
- publishes scientific studies and popular scientific materials in the Environmental Modelling and Software journal (Elsevier);
- hosts a website which allows members to communicate research and other information relevant to the Society's aims with one another and the broader community;
- delivers a regular newsletter to members.
-

Conference Announcement

Conference iEMS 2004

June 14 – 17, 2004, Osnabrück, Germany

The second Biennial meeting of the International Environmental Modelling and Software Society will be held in University of Osnabrück, Germany in 14-17 June 2004.

The Society (iEMSs) is an umbrella group linking various interests including those working on modelling, software systems, multiobjective decision support and innovative methods such as artificial intelligence. The theme of the Osnabrück meeting is "Complexity and integrated resources management".

The topics which will be covered by the conference include:

- Complexity, sensitivity and uncertainty issues in using models for integrated resource management
- Adaptive management and complex adaptive systems
- River basin management
- Urban water management
- Management of actor networks in complex systems
- Economic and ecological valuation of resource flows
- Regional planning and land use
- Political economy perspectives in integrated resource management
- Scenario development and integrated scenario modelling
- Ecological modelling and conservation
- Stakeholder and public participation
- Climate change impact assessment
- Scaling methods in hydrology and ecology and linkage with social systems
- Methods for the modelling of decision making
- Surface and subsurface hydrological and water quality
- Prediction methods in ungauged basins
- Modelling in the marine environment
- Atmospheric and air pollution modelling
- Agricultural-economic modelling
- Applications of emerging methods in AI such as neural nets, Bayesian networks
- Information Technologies for Integrated Resource Management
- Software issues in the design of decision support systems
- Educational software and curriculum development for integrated resource management
-

The deadline for submission of abstracts is 31 October 2003. Abstracts can be submitted through the conference web pages. The deadline for papers (6 A4 pages) is 29 February 2004. There will be several special journal issues set aside for selected papers from the conference proceedings.

Claudia Pahl-Wostl
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www.iemss.org/iemss2004

INDUSTRY NEWS

Applied Simulation Ltd

A sister Company of Rapid Data Ltd (RDL, founded 1981) named Rapid Data Systems Ltd (founded 1986 now renamed ASL) is now again able to offer state of the art simulation and allied products. At this time, this includes the following products:

- 20-sim. An advanced modeling and simulation program which fully supports graphical modeling and which replaces the involvement of RDL with ACSL and Simulink in an up to date manner, whilst able to import and export data to MATLAB.
- Car-Truck-and AutoSim. These reproduce the dynamic behavior of vehicles to a degree hitherto not available based on decades of research and which RDL already started to establish in Europe and now includes many improvements.
- DSH-plus. Another continuation of RDL's product, it provides one tool from conception to start-up for the dynamic calculation of complex fluid-technical systems with modules which support the hydraulic or pneumatic design engineer.

We would be pleased to provide you with further information on any of these products and if this proves of interest for you to investigate further with a no obligation type 30-day free trial of the software to investigate its suitability for your application. For further information contact:

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MATLAB Webinars

www.mathworks.de

The MathWorks now offers free, live, interactive webinars that include product overviews and demonstrations. In less than an hour, you can learn about the latest MathWorks products and features. The offerings change monthly, so visit our webinar schedule often for a listing of upcoming events.

Recorded Webinars: Recordings of previous webinars are also available for viewing. The following list gives details on some of the recorded Webinars:

- **Release 13 Overview.** This webinar provides an introduction to the new features, new products, and enhancements in Release 13.
- **Creating MATLAB based add-ins for Excel.** You will learn how to convert MATLAB algorithms into Excel add-ins through an easy-to-use GUI.
- **Application Deployment Using MATLAB.** Through this recording, you will see how the MATLAB Compiler, the new MATLAB COM Builder, and the MATLAB Excel Builder can help you reduce development time for MATLAB-based applications that run outside MATLAB.
- **Controller Tuning and Plant Modeling.** Through this recording, you will see how the NCD Blockset can be used to tune linear and nonlinear control systems within Simulink, and how the System Identification toolbox enables you to create linear dynamic models from measured input-output data.
- **Advanced Image Processing with MATLAB.** Through this recording, you will see demonstrations and examples featuring the capabilities of the Image Processing Toolbox.
- **Applied Optimization Using MATLAB.** Learn about MATLAB and the Optimization Toolbox and how to apply to solve also large-scale optimization problems.
- **Data Analysis with Curve Fitting and Statistics Toolboxes.** Through this recording, you will see demonstrations and examples featuring the capabilities of these two toolboxes.
- **Accelerating MATLAB.** This webinar provides an overview of the JIT-Accelerator and reviews different methods for optimizing MATLAB code including the new performance profiler, memory allocation and vectorization.
- **Using MATLAB as a Java Interface.** Through this recording, you will learn how you can write MATLAB programs that retrieve and analyze data that is publicly available on the Internet.
- **Modeling and Simulating Event Driven Systems with Simulink.** Through this recording, you will see how Stateflow provides an integrated solution for designing embedded systems that contain supervisory logic.

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info@mathworks.de, www.mathworks.de

Scientific Computers shipping Maple 9

www.scientific.de

Scientific Computers, distributor for the German speaking area, is pleased to present Maple 9, the newest version of the widely adopted Maple mathematical computation product line.

Maple 9 has opened new avenues through which to access and direct Maple's power:

- **Code Generation for MATLAB® and Visual Basic®.** MATLAB and Visual Basic have joined Java™, Fortran, and C in the ever growing lexicon of languages that Maple can speak.
- **OpenMaple™ – an API to Maple.** You can now make direct calls to Maple's mathematical engine from external programs with an API called OpenMaple.

- **New help system interface.** We have refurbished the help interface in Maple 9 to make it, well, more helpful. The help system provides one convenient navigation window for keyword searching, topic searching, and browsing by category.
- **Maplet application for ODE analysis.** Maple is world famous for its ODE solvers, but the wealth of available options and algorithms can be overwhelming to new users. Maple 9 has provided a Maplet interface to its ODE solvers and plotters. New users can now bring all of Maple's advanced options to bear on ODE systems without having to learn lots of commands.
- **Graphical library browser and debugger.** Managing Maple libraries and debugging programs are no longer rituals of elite programmers. We can't make debugging fun, but we have lightened the load for the novice with a more graphical debugger in Maple 9.
- **Worksheet improvements.** We have made the Maple 9 worksheet itself a friendlier place to work, with better menu structure, easier section management, more flexible formatting, and other small but appreciable improvements.
- **Classic Worksheet Maple*.** Maple 9 ships with an alternative graphical interface called Classic Worksheet Maple. It provides a basic worksheet environment for older computers with limited memory.
- **Improvements to the Maplet system.** By popular demand, you can now rotate 3-D plots inside Maplet applications. Maplet users and authors will also enjoy faster loading and better control over Maplet layouts.
- **GMP integer arithmetic.** Maple 9 has integrated the GNU Multi Precision Arithmetic Library (GMP), one of the world's most powerful libraries for high precision arithmetic. Cryptographers and leading researchers in algebra use GMP for computations that require millions of bits of accuracy..
- **Industrial-strength FFT routines.** The new DiscreteTransforms package helps you analyze signals, images, and more with industrial-speed FFT routines. These new routines are an order of magnitude faster than the FFT tools in previous releases.
- **Scientific error analysis package.** The new Scientific ErrorAnalysis package complements the ScientificConstants package and helps you analyze data that have errors or uncertainties. Given the errors of base quantities, you can automatically compute the errors of quantities derived from them, as well as correlations and covariances between them.
- **Improved ODE and PDE solvers.** Maple 9 has extended the exact and numeric ODE and PDE solvers to handle many more classes of problems. There are new solving methods for non-linear BVPs from classical physics, Abel problems, second order systems admitting hypergeometric solutions, and much more.

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If you have any information you want to see published, please contact the corresponding member of the editorial board (society news, conference announcements, conference reports, events, etc.).

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ARGESIM

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Introducing Maple 8

command the brilliance of a thousand mathematicians

Maple 8 ist aus der gemeinsamen Begeisterung einer der dynamischsten und leidenschaftlichsten Gemeinden in der Computerwelt entstanden. Seit über 20 Jahren haben Anwender aus der ganzen Welt ihren Beitrag dazu geleistet, das Maple-System von einem ursprünglich hoch spezialisierten Forschungsprojekt in eine der führenden Kräfte im Bereich der Computeranwendungen für Technik und Unterricht umzugestalten.

Evolution Maple 8 bietet eine Vielzahl von neuen mathematischen Funktionen und Verbesserungen wie z.B. neue Pakete für Analysis 1 und für Scientific Constants, numerische Löser von Randwertproblemen bei PDEs, Code-Generierung und Java-Konnektivität, Rechtschreibprüfung, bessere Kontrolle über die Worksheet-Displays und vieles mehr.

Revolution Maple 8 beinhaltet Maplets, eine innovative Neuerung im Bereich mathematischer Software. Maplets erlauben es Ihnen, auf einfache Weise individuelle grafische Benutzeroberflächen für Maple zu entwickeln, ohne dabei umständliches Programmieren in Kauf nehmen zu müssen.

Für weitere Informationen wenden
Sie sich bitte an maple@scientific.de
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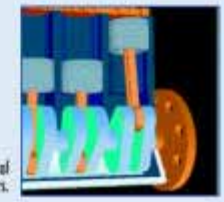
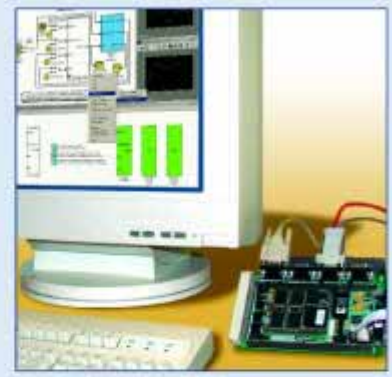
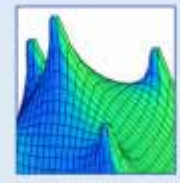


Simulate mechanical systems and controllers.



Model, generate, and verify embedded code.



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