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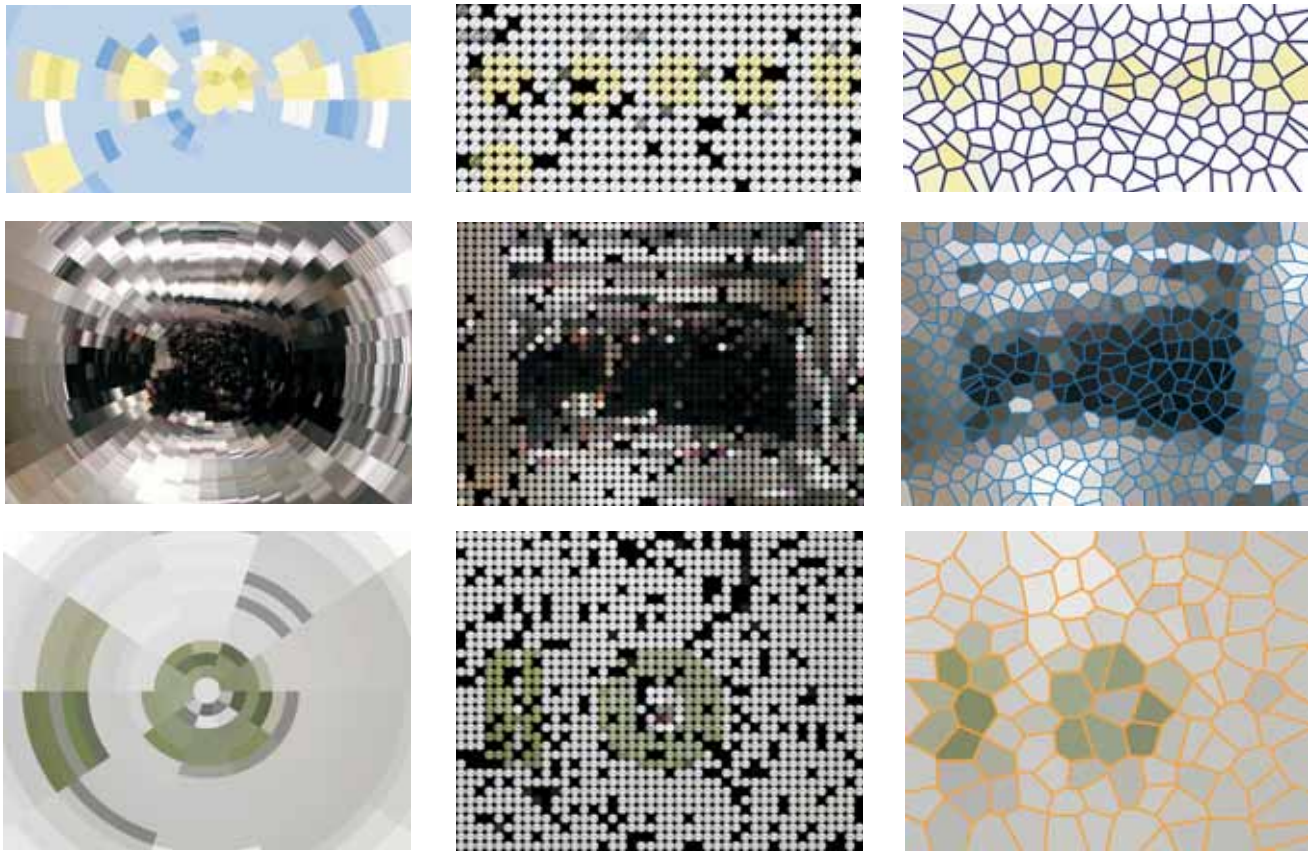


Volume 16 Number 1 (SNE 46) August 2006, ISSN 0929-2268

Journal on Developments and Trends in Modelling and Simulation

Membership Journal for Simulation Societies in EUROSIM

ARGESIM

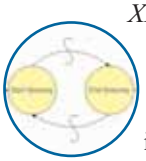
Dear readers,
This is the second SNE issue with new layout, and we are glad, that we got positive reactions for changes in SNE layout and for opening the publication strategy of SNE. Together with this issue, we are proud to announce the first SNE Special Issue 'Parallel and Distributed Simulation Methods and Environments'. First born as idea in ASIM - ASIM Working Groups intend to publish alternately a Special Issue each year, the SNE Special Issues are open for all societies and conference organisers. The Special Issues cause a change in numbering the SNE issues: this regular SNE issue, SNE 46, is now identified as SNE 16/1 (Volume 16, Number 1), the first Special Issue as SNE 16/2; the next regular SNE double issue (SNE 47/48) will be numbered SNE 16/3-4. This remembers, that we are running SNE since 16 years, and we thank our faithful readers.
Together with the new layout, both editorial boards are being reorganised and will be enlarged for the future. We are also working on a new infrastructure for running an editorial office, together with tasks for SNE on the web.
We hope, the readers enjoy this issue, and the contributors appreciate the new editorial structure (more strict, but hopefully more efficient). Three Technical Notes and three Short Notes in this issue show the broad variety of modelling and simulation. The Technical Notes are special ones: based on a post-conference review procedure via Internet for contributions to MATHMOD 2006 Vienna, papers were selected for publication in SNE (to appear also in the next SNE issues). Furthermore, as first reaction on the ARGESIM / MATHMOD Yo-yo Challenge, the Techncial Note by Leon Zlajpah introduces into mechanical mysteries of Yo-yo control. The Comparison Section publishes an updated version of Comparison C13 'Crane and Embedded Control', reflecting the developments in this area of modelling and simulation; furthermore, seven comparison solutions concentrate on modelling issues and alternative approaches.
The News Section reports about progress in new structures for EUROSIM, and about activities in EUROSIM member societies and in Societes related to Modelling and Simulation. We thank all contributors, members of the editorial boards, and people of our ARGESIM staff for co-operation in producing this SNE issue.

Felix Breitenecker, editor-in-chief; Felix.Breitenecker@tuwien.ac.at

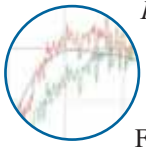
SNE 16-1 / SNE 46 in Five Minutes

Process Modelling in a Sterilisation Tunnel (TN) - presents modelling and simulation for temperature profiles in an industrial production process – ***page 3***

Modelling and Control of Yoyo (TN) – deals with the classical Yoyo toy: mathmatical models for control and for haptic interfaces, control strategies, and verification by a robot – ***page 9***



XML in DEVS (TN) – introduces XML as model basis for discrete event models for simulation via WWW and presents a prototype implementation – ***page 16***



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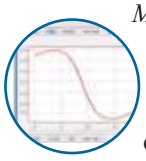

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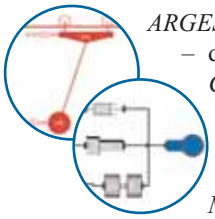
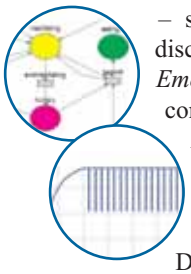


ARGESIM Comparison Section – defines a revised benchmark C13 *Crane and Embedded Control* (implicit modelling, digital control, sensor action), followed by a sample solution with *Modelica/Dymola* – ***page 27***



– seven *Comparison Solutions* for discrete comparisons (*Dining Philosophers*, *Emergency Department*), continuous comparisons (*Switching States*, *SCARA Robot*) and general comparisons (*Cellular Automata*, *Identification*) show efficient implementations using MATLAB/Simulink, Dymola, DSOL/Java, Maxima and special Petri Net tools – ***page 31 - 38***

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Editorial Info - Impressum

SNE Simulation News Europe ISSN 1015-8685 (0929-2268).
Scope: Information on development in modelling and simulation, comparisons and bechmarks on modelling and simulation, membership information for EUROSIM and Simulation Societies.
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Layout: A. Breitenecker, ARGESIM TU Vienna / Linz; Anna.Breitenecker@liwest.at
Printed by: Grafisches Zentrum, TU Wien, Wiedner Hauptstrasse 8-10, A-1040, Wien
Publisher: ARGESIM and ASIM
ARGESIM, c/o Inst. for Scientific Computation, TU Vienna, Wiedner Hauptstrasse 8-10, A-1040 Vienna, Austria, and ASIM (German Simulation Society), c/o Wohlfartstr. 21b, D-80939München

TECHNICAL NOTES

Modelling of Temperature Conditions in Sterilisation Tunnel

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In the paper a basic construction of sterilisation tunnel used in pharmaceutical production is presented. For this tunnel a mathematical model is developed which describes a temperature profile of a glass bottle travelling through the tunnel. Glass heating with the hot air and with the IR-emitters is discussed as well as heating and cooling of the glass through the heat radiation.

SNE 16/1 (46), August 2006

Introduction

Large volume parenterals (LVP) are drugs, administered directly into the blood stream of the patient and therefore they bypass most of body's natural defences against infections. It is therefore of vital importance that the administered drug is sterile. However, only sterility is not enough. The sterilisation process usually results in disintegration of all live microbes, spores and viruses.
The problem is that the wastes of dead microbes are cell membranes which in many cases cause raised body temperature. Therefore in addition to the sterilisation, all biological material that could harm the patient, must be removed. This is ensured by the process called depyrogenation.

For sterilisation and depyrogenation of glass bottles or ampoules the so-called sterilisation tunnels are used in pharmaceutical production. These tunnels are usually part of filling lines, where bottles are washed, sterilised, filled with the product, and finally closed. The sterilization tunnel consists of three zones: in-feed zone, sterilization zone and cooling zone. The main focus lies on sterilization zone which has a task to heat up the bottles to temperatures that ensure complete sterilization and depyrogenation process. These temperatures are usually about 300°C. Before filling, bottles pass through cooling zone, where they are cooled down to about 30°C.

During reconstruction of a part of sterile production facilities in Krka, d.d. a new line for production of LVPs was installed. Part of this line is also a tunnel (Figure 1 and Figure 2), used for sterilization of glass bottles of different volumes.

Figure 1: Tunnel exterior.

During the start-up of the line a set of parameters was recorded for each bottle format, with which the production can run.

Due to pharmaceutical production specifications the operation conditions were far from optimal. Therefore we decided to build a model of temperature conditions of the process. It should enable simulation of temperature profile of each bottle as it travels through the heating zone. With such a model the optimisation of production parameters would be enabled.

1 Model Development

The necks and sides of the bottles in the tunnel are heated by a laminar flow of hot air from the top. A system of heaters, fans, filters and diffusers is installed to ensure that the hot air coming from above to the bottles has equal temperature all over the heating zone and that it is particle-free.

Figure 2: Tunnel interior.

In addition a set of infra-red heaters is installed below the transport belt to heat up the bottoms of the bottles. The bottle's temperature is significantly influenced also by the surrounding energy flow.

We have decided to divide the model in two parts. The first submodel corresponds to the bottle travelling somewhere in the middle of the transport belt and the second to the bottle travelling by its edge.
Each bottle is heated up by the stream of hot laminar airflow from above and which passes between the bottles. The bottles receive energy flow also from the surrounding - the tunnel housing, which is also heated by the same hot air as the bottles. Bottom of the bottle is heated up by infrared heaters, installed under the transport belt. On the other hand, the bottle is cooled down by radiating heat to the surrounding (the housing of the tunnel) and in the cooling zone also by the stream of cold air, flowing in laminar flow from above and which passes between the bottles.

After initial model definition, further improvements were necessary. Additional dynamics were introduced for heat transfer from the infra-red heaters to the bottles. As it was mentioned before, these heaters are installed below the transport belt and therefore do not heat up the glass directly. They heat up the transport belt and this transport belt then heats up the bottom of the bottles.

Another improvement was achieved by adaptation of the heat transfer factor. The energy transfer from the hot air to the glass depends on heattransfer factor, which is not a constant. The value of this factor depends on air speed, air temperature, glass finish, geometry of the fissure between the bottles, etc.

Nusselt's theory was used to calculate the value of heat transfer factor at different temperatures in the tunnel.
The described process was modelled on the basis of the following equations.

Heating of the bottles by hot air

$$m_s \cdot c_s \cdot \frac{dT_s}{dt} = \alpha \cdot (1 + k_n) \cdot S_s \cdot (T_z - T_s) \qquad (1)$$

where symbols used have the following meaning:

m_s - mass of the bottle [kg]
c_s - specific heat of the glass [J/kg K]
T_s - glass temperature [K]
t - time [s]
S_s - area of bottle sides [m^2]
T_z - air temperature [K]
α - factor of heat transfer from air to glass [W/m^{2}K]
k_n - influence of inside of the bottle [$0<k_n<1$]

Heating of bottles by IR-heaters

Heating of the transport belt by IR-heaters:

$$m_t \cdot c_t \cdot \frac{dT_t}{dt} = S_g \cdot e_g \cdot \sigma \cdot T_g^{\,4} \qquad (2)$$

Cooling of transport belt by radiation and cold air:

$$m_t \cdot c_t \cdot \frac{dT_t}{dt} = \left[2 \cdot S_t \cdot e_t \cdot \sigma \cdot T_t^4 + \alpha \cdot S_t \cdot (T_t - T_z)\right] \qquad (3)$$

where notation is the following:

e_t - emissivness of transport belt [$0 < e_t < 1$]
m_t - mass of transport belt heated by one IR-heater [kg]
σ - Stephan's constant [W/m^{2}K^4]
T_t - temperature of transport belt [K]
S_g - area of IR-heater [m^2]
S_t - area of transport belt [m^2]
c_t - specific heat of transport belt [J/kgK]
e_g - emissivness of IR heaters [$0 < e_g < 1$]
T_g - temperature of IR-heater [K]

Part of heat radiation from transport belt, that is directed upwards, is heating the bottom of bottles. So the energy, heating bottom of one bottle can be expressed as:

$$m_s \cdot c_s \cdot \frac{dT_s}{dt} = n \cdot S_d \cdot e_t \cdot \sigma \cdot T_t^4 \qquad (4)$$

where notation is the following:

n - part of energy, adsorbed by the glass
S_d - area of bottle's bottom [m^2]

Interaction of the bottles with surroundings

The bottle, travelling in the middle of the transport belt has only other bottles for its neighbours. These bottles have very similar temperature and therefore the heat transfer between these bottles can be neglected. The only interaction with the surrounding the bottle experiences is with its bottom and its neck.

The equation for the 'middle' bottle interaction can be expressed as:

$$m_s \cdot c_s \cdot \frac{dT_s}{dt} = (n \cdot S_d \cdot e_o \cdot \sigma \cdot T_z^4 - 2 \cdot S_d \cdot e_s \cdot \sigma \cdot T_s^4) \qquad (5)$$

The bottle at the edge of the transport belt travels by the tunnel housing and one half of its side can experience considerable heat transfer.
The equation for the 'edge' bottle interaction can be expressed as:

$$m_s \cdot c_s \cdot \frac{dT_S}{dt} = n \cdot (S_d + \frac{S_s}{2}) \cdot e_o \cdot \sigma \cdot T_z^4 - (2 \cdot S_d + \frac{S_s}{2}) \cdot e_s \cdot \sigma \cdot T_s^4 \qquad (6)$$

In the equations (5) and (6) the meaning of symbols is:

e_s - emissivnes of glass [$0 < e_s < 1$]
e_o - emissivnes of tunnel housing [$0 < e_0 < 1$]

Factor α

The value of the factor α is very difficult to establish precisely, since it depends on a lot of factors, which are not easily measurable.

However the approximate value can be estimated by Nusselt's theory, which estimates the α-value based on the shape of the 'pipe' (see Figure 3), where the media flows.

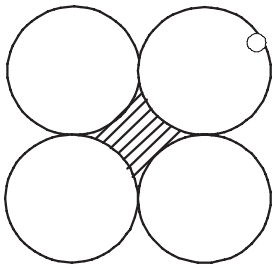

Figure 3: 'Pipe' between the bottles.

The value of α factor can be estimated from the following equation:

$$\frac{\alpha \cdot D_e}{\lambda} = \frac{0.0396 \cdot P_r \cdot R_e^{0.75}}{1 + 0.35 \cdot (P_r - 1)} \qquad (7)$$

where the symbols in equation (7) have the following meaning:

D_e - equivalent hydraulic diameter of the 'pipe' [m]
λ - heat conductivity of air [W/mK]
P_r - Prandtl's number
R_e - Reynold's number

The presented model was realised in the MATLAB/ Simulink environment. It enables the observation of the temperature profile of a bottle, travelling through the sterilisation tunnel. Actually we got two temperature profiles, one for the 'middle' and one for the 'edge' bottle.

The start-up measurement of the tunnel's performance resulted in a set of data for each of the six different bottle formats used in our production. These data sets were used for optimisation of five model parameters.

For optimisation those parameters were chosen which had significant impact on the model's behaviour and for which exact values were not possible to be defined reliably during the modelling phase. Starting values of these five parameters were estimated on the basis of physical properties tables or deducted from the model behaviour.

The goal of optimisation was to find a set of values for those five parameters that would improve the fit of simulated temperature profile to the measured one for all six different bottle formats.

The resulting simulated temperature profiles are shown in Figure 4 and Figure 5, where the lines marked with an asterisk represent measurement, straight lines show optimised temperature profiles, and the dashed lines show simulated temperature profiles before optimisation.

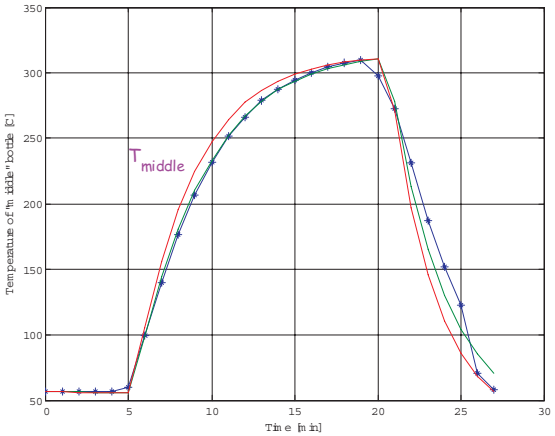

Figure 4: Simulated and measured temperature profiles of the ‘middle’ bottles.

Similar good matching was achieved regarding all six different bottle formats. Correlation factor between measured and simulated temperature profiles was in average equal 0,9892.

2 Model Usage

To experiment with the actual system during operation is due to the specifics of pharmaceutical production almost impossible.

Therefore we used the developed model for forecasting of critical situations in system operation regarding malfunctions of IR-heaters and enlargement of production capacity.

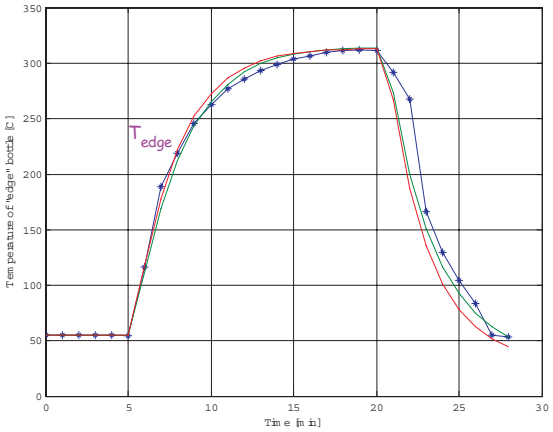

Figure 5: Simulated and measured temperature profiles of the ‘edge’ bottles.

In pharmaceutical production a criterion for evaluation of depyrogenation process is the so called F_H value.

This value is calculated according to the equation (8) and should at least reach value 30 at the end of sterilization zone:

$$F_H = \int_{T_s \geq 180^o C} 10^{\frac{T_s(t)-T_0}{z}} dt \qquad (8)$$

In the equation above the variables and parameters have the following meaning (including the F_H value being the forementioned criterion for the depyrogenation process:

F_H - equivalent time of depyrogenation
T_0 - standard temperature of depyrogenation
z - temperature difference necessary for 10-fold rise in depyrogenation effect

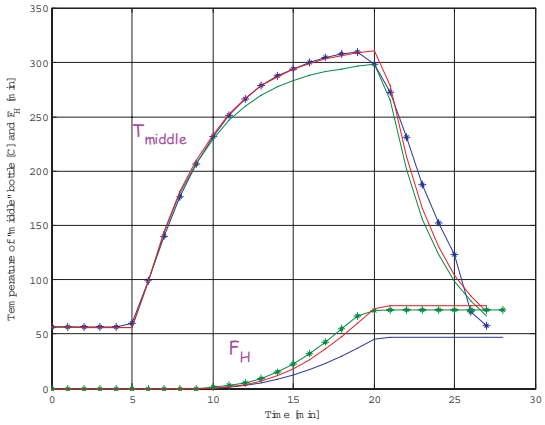

Figure 6: Temperature profile of the 'middle' bottle and F_H -factor in the case of IR-heater malfunction.

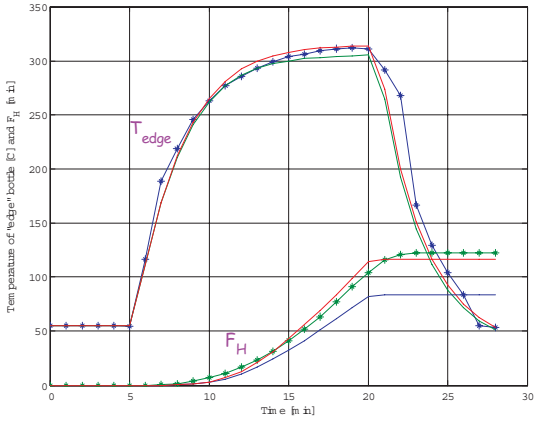

Figure 7: Temperature profile of the 'edge' bottle and F_H -factor in the case of IR-heater malfunction.

IR-Heaters malfunction

With the use of simulation model it is easy to see, what would happen if during the production the tunnel experiences IR-heaters malfunction.

In Figure 6 and Figure 7 it is illustrated that the end F_H value drops significantly but that such situation is not critical for depyrogenation process only if we run the process with high enough safety factor.
In Figure 6 and Figure 7 the straight line curves represent the temperature profile of a bottle, travelling through a tunnel with IR-heaters shutdown.

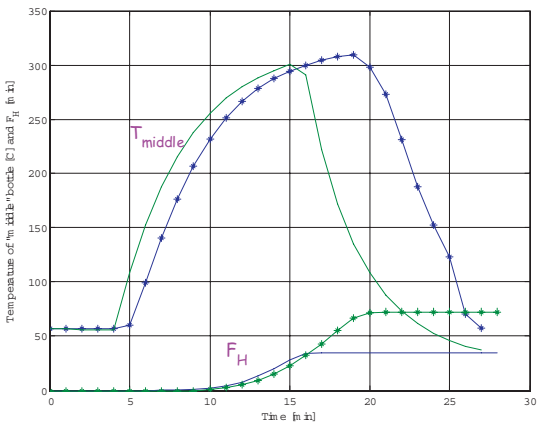

Figure 8: Temperature profile of the 'middle' bottle and F_H -factor in the case of 30% increase in the transport belt speed.

The dashed curve represents a temperature profile of a bottle, travelling through fully functioning tunnel.
On the same figures also the profile of F_H factor is presented.

Production capacity optimisation

If we want to increase the speed of the filling line, we must be certain, that the sterilisation tunnel will cope with the increased transport belt speed. The testing using actual system during the production is of course impossible.

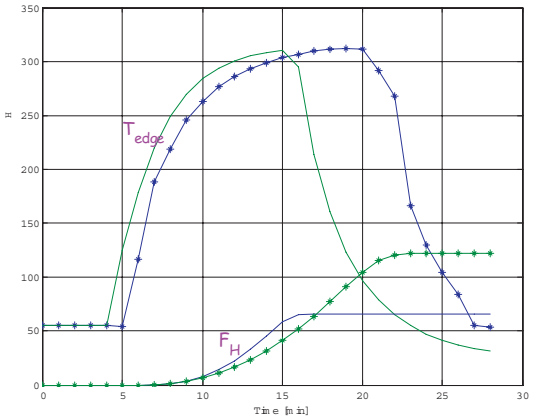

Figure 9: Temperature profile of the 'edge' bottle and F_H -factor in the case of 30% increase in the transport belt speed.

Therefore we simulated for every bottle used in the production, at what speed of the transport belt we reach the minimum acceptable value for the F_H - factor.
In the same two figures the lines marked with asterisks re-present measurement and straight-lines represent simulated temperature profile and F_H - value profile.

In Figure 8 and Figure 9 it is illustrated how a 30% increase in the transport belt speed influences the temperature profiles and the F_H - value profile.

The 30% (or more) increase of transport belt speed influences the production capacity of the whole production line directly only in those cases, where the sterilisation tunnel was found out to be the bottle neck.
The results of transport belt speed optimisation can of course only be used if we accept the risk of IR-heaters failure.

3 Conclusion

At first sight the temperature of the bottles follow first-order transient. It is however more complex, as it can be seen by observing temperature transients of different bottles. Our goal, to build a mathematical model of sterilization tunnel, was achieved.

We did not aim to develop a model that would perfectly fit one format of the bottle, used in production. Rather we developed a model that works well in wide range of different bottles and works well using only basic parameters of the bottles and of the tunnel.

With such model it is easy to test critical situations that can accrue during the production and it represents also a good starting point to perform optimization of production.

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Received: June 15, 2006
Revised: July 10, 2006
Accepted: July 30, 2006

Modelling and Control of Yoyo

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In the paper we address a problem of modelling of a yo-yo. Yo-yo is a toy made of two discs connected with a short thin axle, which can be moved up and down by moving a string tied to the axle. To understand the system we have analysed the yo-yo motion and then we have developed two models. The first model is a one DOF model which captures all important features of the yo-yo important for the control design and the other considers also the sting forces and is appropriate for simulation with haptic interface. Next we discuss the control strategy and present two approaches: one based on predefined hand motion patterns and the other with online hand-motion generation. The proposed control has been verified by experiments with the Mitsubishi PA10 robot

Introduction

In the last years there has been a growing interest in robot systems that are capable of performing rhythmic tasks. One of the exciting tasks is juggling or playing with different toys, among which is also a yo-yo. Common to all of them is that playing with them is usually more or less an easy task for a human, but a complex task for a robot. Namely, the dexterity of the system and the synchronization with the toy are required. A human can use his senses to learn how to operate a toy. However, developing a robotic system that can perform the same job requires complex sensory systems and advanced control strategies based on corresponding models.

Yo-yo is a toy made of two discs connected with a thin short axle. A string is tied to the axle and the operator controls the motion of the yo-yo by moving it up and down. The objective is to attain a periodic motion of the yo-yo. For an efficient control of yo-yo with a robot a corresponding model is needed. A good insight into the behaviour of the yo-yo is given in [1]. The motion of the yo-yo is divided into four phases, and each of them is analysed. As the derived model is very complex, the authors propose a simplified model. However, some of their assumptions are too restrictive, especially neglecting the diameter of the string although the control relies on the cycle time which may depend on the diameter of the rope.
In [2], a simplified model is given, but the authors assume that the energy loss is only due to the friction and they neglect the bottom impact. A modified model based on impact dynamics is given in our previous work [3,4]. All these models do not model the forces in the string correctly.

To obtain realistic forces in the model, we can not treat the interaction between the yo-yo and the string as an impact between two rigid bodies, but the string has to be modelled as a stiffness-damping system [5].

1 Analysis of Yo-yo Motion

Before modelling we have analyzed the motion of a yo-yo. We have measured the position trajectories of the yo-yo and hand, and the forces in the string. Figure 1 shows the motion of the yo-yo without human interaction (‘free’ motion).
We can notice that the amplitude decreases with each period. Furthermore, some small disturbing oscillations in x and y direction can be seen. This indicates that the yo-yo has more than one degree-of-freedom (DOF). Next, when the yo-yo reaches the bottom position an impact occurs and the string forces are significantly larger than the gravity forces due to the weight of the yo-yo.

The amplitude of the impact forces significantly depends on the properties of the string. We have compared two strings which differ in their elasticity: a very stiff string and an elastic string.

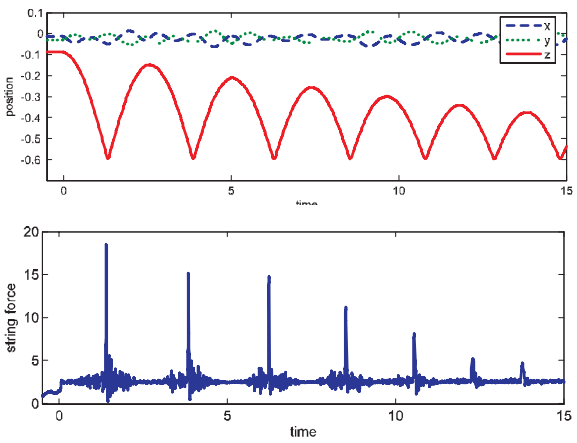

Figure 1: String forces during yo-yo ‘free’ motion.

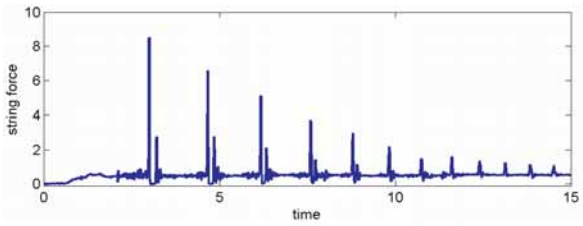

Figure 2 Forces in the stiff string

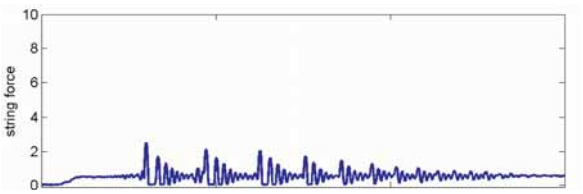

Figure 3: Forces in the elastic string.

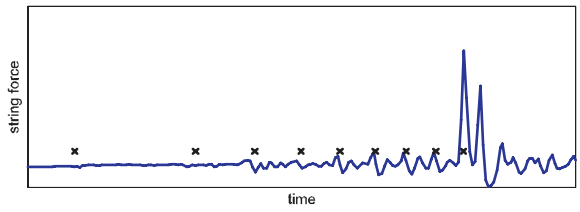

Figure 4: Forces due to string unwinding (markers show the time when yo-yo is turned for one turn).

The string forces during free motion for the stiff string are shown in Figure 2 and for the elastic string in Figure 3. We can see that before the yo-yo reaches the bottom position, the string force is rather small (proportional to the yo-yo weight).

However, when the yo-yo reaches the bottom position an impact occurs. After the impact, there is a short period when the string is not under tension (yo-yo is flying free) followed by a series of smaller impacts (in [1] reffered as the transition phase). Comparing both figures we can see that the amplitude of the impact force is greater when the string is not elastic and that the free flying period is longer when the string is elastic.

Jin [1] has shown that under certain conditions regarding the inertial properties a yo-yo can not be operated. However, our measurements have shown that this is valid only for the stiff string. If the string is elastic, the yo-yo can still be operated.

Additionally, we have investigated the forces during down/up motion. As the string winds around the axle in several layers, some jerks occur when the string layer changes.

Figure 4 shows string forces during unwinding, i.e. yo-yo is moving from top to bottom position. The markers indicate the time when the yo-yo has turned for one turn. We can observe small force pulses which are 'synchronized'' with the turns of the yo-yo. Note that the time between two markers correspond to one turn of the yo-yo.

2 Modelling of the Yo-yo

In general a yo-yo is a free flying object con-strained by a string attached to it and has 6 DOF (Figure 5). When modelling a system it is important to know for what purposes the model will be used. Namely, although the model could describe all features of the system it is reasonable to consider only those features which are important for the purpose the model will be used for.

Here we focus on the bouncing motion of the yo-yo. For that it is essential to observe the up and down motion. Therefore, when modelling the yo-yo we use some the following assumptions which simplify the analysis:

Assumption 1: The center of mass of the yo-yo is moving only in the vertical direction and the yo-yo is rotating only along the axle.
The rotational axis is always perpendicular to the vertical axis.

Assumption 2: The string is flexible; the mass and the radius of the string can be neglected.

Assumption 3: Dissipative forces are due to the viscous friction.

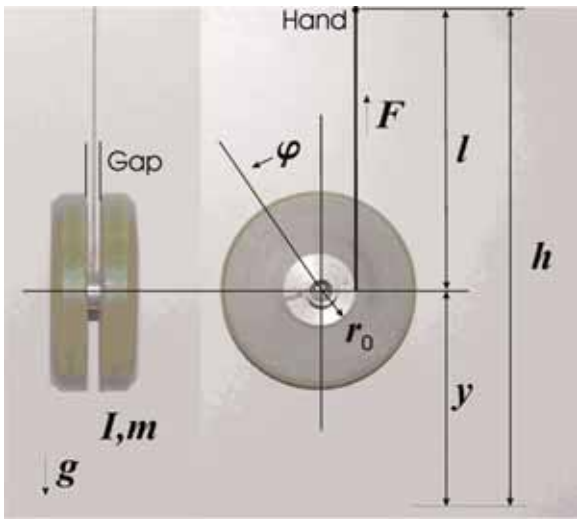

Figure 5: Schematic picture of a yo-yo.

Using these assumptions, yo-yo can be modelled as a two DOF system: one DOF for the vertical motion and the other for the rotation of the yo-yo around the axle. The other four DOF allow motion in the remaining directions and this motion represents in our case the disturbances. Of course, these disturbances influence the basic motion and a more realistic model (considering all DOF) would be of benefit.

Even using these assumptions, it is not straightfor-ward to model the yo-yo [4]. To develop control strategies it is important to consider energy balance. For that the focus is on the vertical and rotational velocity of the yo-yo and it is not so important to include forces in the model. On the other hand, if we are interested in forces, e.g. for simulation of a yo-yo including haptic interface, then we have to model the string as part of the dynamical system. In the following we will describe two models, one suitable for control design and the other for simulation with haptic interfaces.

3 Model for Control Design

When a yo-yo is bouncing up and down, the kinetic energy is converted to potential and vice versa. Additionally, it dissipates the energy at the bottom impact and due to the friction between the string and the yo-yo. Note that this model should be suitable to select the control strategy for the robot and that the model will not be directly included in the control loop.

Therefore, when modelling we can use some assumptions which simplify the analysis:

Assumption 4: The string is not extensible.

Assumption 5: The time needed for the rotation for π at the bottom can be neglected.

Assumption 6: The string is always stretched and the restitution coefficient is zero.

Assumption 7: Motion of the hand is smooth, i.e. hand velocities are continuous.

Assumption 4 allows us to neglect the dynamics of the string. Namely, as the motion of the yo-yo can be controlled only by the motion of the top end of the string, it is necessary that the string is always under tension, otherwise the controllability of the yo-yo is lost. Therefore, the string should not be extensible. Some authors neglect also the influence of the diameter of the string [1,2]. However, the tests on different yo-yos have shown that the diameter of the string (actually the change of winding radius) influences the cycle time of the yo-yo and it can not be neglected in modelling if the control strategy relies on the yo-yo cycle timing.

Using assumption 5 the motion of the yo-yo at the bottom position (when no string is wrapped around the axle) is modelled as an impact.

Assumption 6 allows further simplifications of the model. If the string is stretched, the vertical motion and rotation are dependent (constrained). Then, the yo-yo can be modelled as one DOF system [1].

Using these assumptions the relation between the vertical position of the yo-yo y and the rotational angle φ is (for a complete modelling procedure see [4]):

$$y = h - L + (r_0 + k_r|\varphi|)|\varphi|$$

- where h is the height of the top end of the string (hand position), L is the total length of the string, r_0 is the radius of the axle and k_r is the effective radius of the string.

Next, the motion of the yo-yo can be described by the following equations:

$$I\ddot{\varphi} + B\dot{\varphi} = -r_a F$$
$$m\ddot{y} = F - mg$$

- where I, m and B are the inertia, the mass and viscose friction coefficient of the yo-yo, respectively, g is gravity constant, F is the string force, and r_a is the force moment arm. After some calculations we obtain:

$$\ddot{\varphi} = \frac{(r_0 + k_r|\varphi|)sign(\varphi)\, m(\ddot{h} + 2k_r\dot{\varphi}^2 + g) + B\dot{\varphi}}{I + m r^2 + m r k_r|\varphi|}$$

Next, we have modelled the motion at the bottom as an impact. Let $(.)^-$ denote the states immediately before the impact and $(.)^+$ after the impact. Applying Assumption 4 and 5, we neglect the highly complex dynamic motion which depends mainly on the properties of the string.
The velocities after the impact can be obtained by using the principles of impact dynamics [1,3,4]:

$$\dot{\varphi}^+ = \frac{I - r_0^2}{I + r_0^2}\dot{\varphi}^-, \quad \dot{y}^+ = \dot{h} + r_0|\dot{\varphi}^+|$$

Figure 6 shows the simulation response (the relative yo-yo height, $y^* = y - h$) compared with the measured motion of a yo-yo. As one can see, the motion of the yo-yo is almost equal in both cases. To obtain such results we had to consider the change in effective inner radius due to the string thickness.

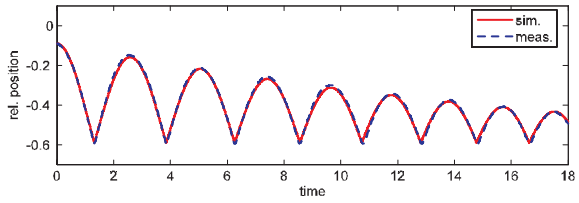

Figure 6: Yo-yo 'free' motion - comparison of simulation results and measured responses.

4 Model for Haptic Interface

When playing a virtual yo-yo with a haptic interface it is very important that the operator gets a correct information about the yo-yo so that he can synchronize the hand motion with the motion of the yo-yo. So, beside the visual information, i.e. the position of the yo-yo in the space, he must also get the information about the force in the string [5].

The model of the yo-yo given in the previous section does not model the forces in the string. Therefore, a new model has to be developed which includes also the model of the string. We have modelled the string as a spring-damping system:

$$F = K_s(x - x_0) + B_s\,\dot{x}$$

where the model parameters are the spring constant K_s, the natural spring length (offset) x_0, and the damping constant B_s representing dissipation. In our case $x_0 = L$ and the string length is

$$x = \begin{cases} h - y + r_0\ (|\varphi| - \dfrac{\pi}{2}), & |\varphi| \geq \dfrac{\pi}{2} \\ h - y - r_0\ \cos(\varphi), & |\varphi| < \dfrac{\pi}{2} \end{cases}$$

Note that Assumption 5 can not be applied. The force moment arm is now:

$$r = \begin{cases} r_0\ sign\ (\varphi), & |\varphi| \geq \dfrac{\pi}{2} \\ r_0\ \sin(\varphi), & |\varphi| < \dfrac{\pi}{2} \end{cases}$$

After some calculations we obtain the following equations (the detailed procedure is given in [4]):

$$m\ddot{y} = K_s(h - l - y - r_0(|\varphi| - \frac{\pi}{2})) + \\ + B_s(\dot{h} - \dot{y} + r_0\dot{\varphi}\ sign\,(\varphi)) - mg, \quad |\varphi| \geq \frac{\pi}{2}$$

$$m\ddot{y} = K_s(h - l - y - r_0(\cos(\varphi)) + \\ + B_s(\dot{h} - \dot{y} + r_0\dot{\varphi}\sin(\varphi)) - mg, \quad |\varphi| < \frac{\pi}{2}$$

$$I\ddot{\varphi} = K_s(h - l - y - r_0(|\varphi| - \frac{\pi}{2}))r_0 sign(\varphi) - B\dot{\varphi}, \ |\varphi| \geq \frac{\pi}{2}$$

$$I\ddot{\varphi} = K_s(h - l - y - r_0(\cos(\varphi))r_0\sin(\varphi) - B\dot{\varphi}, \ |\varphi| < \frac{\pi}{2}$$

The main problem is now how to define the parameters K_s, B_s and B to obtain realistic results. In our case they have been selected so that the motion and the impact forces of the real yo-yo and the virtual are almost equal. Additionally, we have superimposed small force pulses for each yo-yo turn, so that the operator 'feels' the rotation of the yo-yo. Figure 7 and Figure 8 show real forces in a yo-yo which is not operated (no hand motion) and output of the virtual yo-yo model.

Control strategy

The objective of playing the yo-yo is to keep the amplitude of the yo-yo at a desired level. It is evident that the motion of the yo-yo can be controlled only by moving the free end of the string (i.e. hand) up and down [4,7,8].

For the design of the robot control it is important to understand energy transfer. The potential energy stored in the yo-yo at the top position is sum of the potential energy in the previous top position, the energy lost during last impact and the energy supplied by the hand during last cycle. From the model it can be easily seen that only the hand acceleration can influence the yo-yo motion.

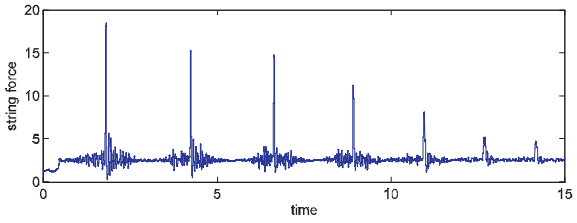

Figure 7: Forces during free motion - real yo-yo.

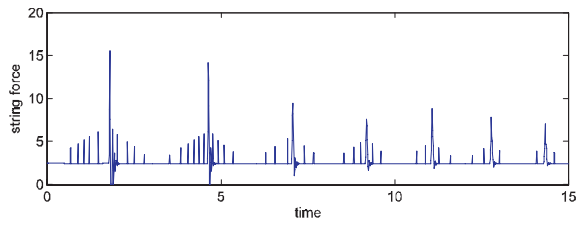

Figure 8: Forces during free motion - simulation.

Based on measurements and using the derived model, we have found out that the most efficient transfer of the energy from the hand to the yo-yo is if the major upward acceleration is performed just before the bottom impact [6].

Before selecting the control strategy for the robot we have studied the strategies of human operators. We have found out that the 'playing' strategies depend mainly on the skills of the operator. One operator prefers smooth hand motion with larger amplitudes and another more 'jerky' motion. Common to all of them is that for the successful playing they had to synchronize the hand motion with the motion of the yo-yo. For synchronization some information about the state of the yo-yo is needed [1,4,8].

Additionally, for playing it is necessary to predict the time of the next bottom impact. As the time interval between the two consecutive bottom impacts is relatively long, a human can not predict precisely enough the moment when the upward motion should start and he starts the motion at the wrong moment.

We present two control strategies: one based on predefined patterns and another one which generates the motion online.

5 Predefined Motion Pattern

The control strategy can be based on predefined hand motion patterns. The nominal motion pattern can be learned by imitating the human motion [9] or it can be composed of smooth functions [2,4,6]. We have selected the nominal hand motion pattern as shown in Figure 9.

The actual hand motion is generated from the nominal one considering the state of the yo-yo

$$h = k_a\, h_n(k_t \tau), \quad 0 \le \tau \le 1$$

where τ is the nominal pattern time, k_a is the gain to adjust the amplitude of the hand motion, and k_t is the scaling factor between the real and nominal time; $\tau = 0$ and $\tau = 1$ indicate the time when the motion starts t_{start} and when one cycle is completed t_{end}, respectively.

Between two cycles, $t_{end,i} < t < t_{start,i+1}$, hand is not moving.

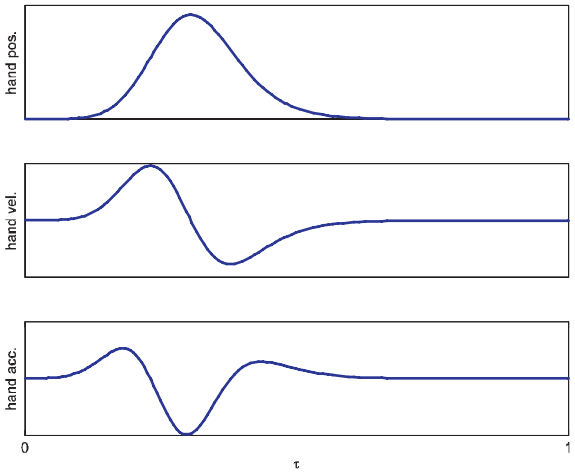

Figure 9: Hand motion pattern.

The moment t_{start} must occur before the impact. As it is impossible to predict t_{start} directly, the hand motion is started at a certain height before the yo-yo reaches bottom position. By changing the amplitude (gain k_a) and the duration of the motion (the factor k_t) the yo-yo peak height can be controlled.
The peak height can be increased by increasing k_h or decreasing k_t and vice versa.

To illustrate the capabilities of the proposed control strategy we present some simulation results (Figure 10). We can see that the proposed control strategy ensures a stable yo-yo motion and that the peak height tracks the desired height.

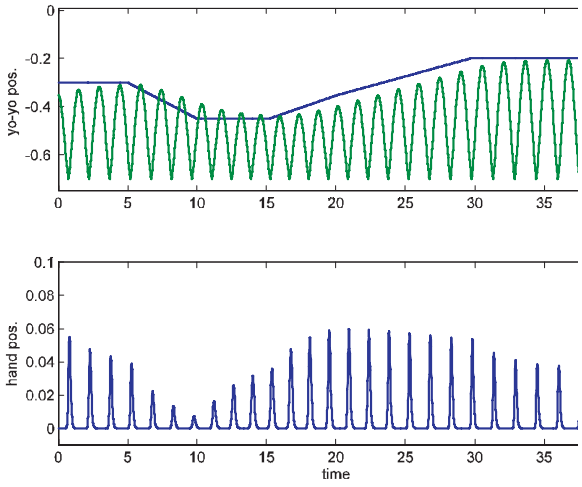

Figure 10: Simulation of robotic yo-yo based on predefined hand motion patterns (top: desired yo-yo top height and actual yo-yo height; bottom: hand position).

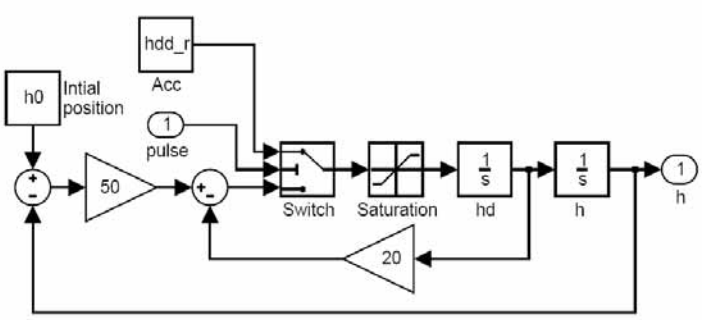

Figure 11: Block scheme of hand motion generator.

6 Online Generated Motion

The alternative to the predefined hand motion pattern is to generate the desired hand motion online. The motion should be generated so, that the upward motion starts before the impact and after the impact the hand moves into its initial position [7,8,3,4]. To generate the hand motion online based on the state of the yo-yo we propose a motion generator as shown in Figure 11.

This controller generates the hand motion according to the pulse input. If the input is high then hand is moved upward with constant acceleration and if input is low the hand is moved into its initial position (for details see [4]). The principal motion pattern is given in Figure 12.

The amount of energy transferred to the yo-yo in the acceleration phase depends on the duration of the acceleration pulse P_i and its amplitude. The proposed controller assures stable yo-yo motion.

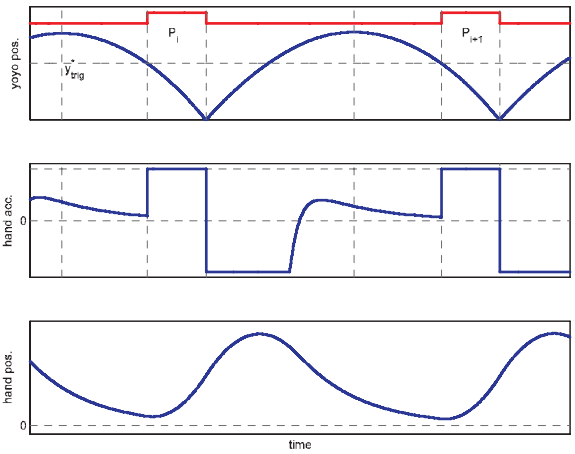

Figure 12: Hand motion generation.

To illustrate the capabilities of the proposed control strategy based on on-line hand motion generation we have used the Mitsubishi PA10 robot arm. The experimental set-up is shown in Figure 13. The yo-yo has been tied to the tip of the robot. To measure the position of the yo-yo a vision system has been used. The proposed control strategy relies on good timing and synchronization. Using only the video information it is very hard to determine the moment of the bottom impact precisely. To improve the performance, a force sensor, which measures forces in the string, has been used to detect the bottom impact.

Figure 14 shows a detailed view of 10s - motion. The small variations of the yo-yo peak height are due to the disturbances caused by swinging of the yo-yo. Although the controller parameters have been constant during this experiment, we can see that the amplitude of the robot tip motion h changes. Namely, when the yo-yo peak height decreases the interval P increases and more energy is transferred to the yo-yo (e.g., Figure 14 in $P_i > P_{i+1}$). This stabilising action is one of the key features of the proposed control strategy.

Experimental results have shown that when the robot is playing yo-yo, swinging of the yo-yo occurs (Assumption 1 violated). This swinging can even make the primary up-down motion of the yo-yo in vertical direction impossible. Therefore, to reduce the disturbing swinging we have implemented an additional controller which compensates the yo-yo swinging by moving the robot tip in horizontal direction.

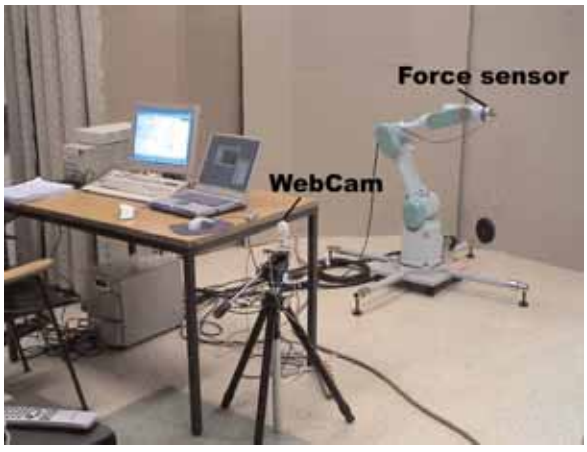

Figure 13: Experimental setup.

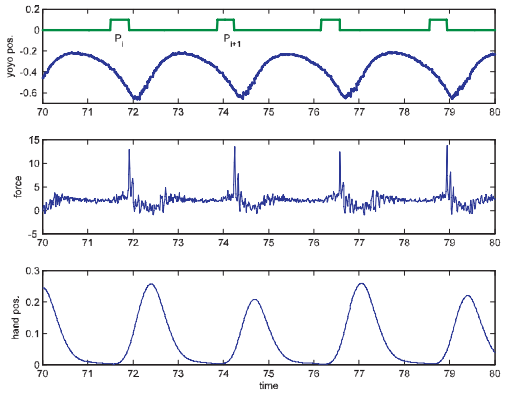

Figure 14: Detailed view of yo-yo height, string force and robot tip position.

Conclusion

This paper deals with the modelling of a yo-yo and selection of a control strategy for playing a yo-yo with a robot. Although, playing a yo-yo is an easy task for a human, it is an exciting piece of work for a robot. First of all, not all of the yo-yo states are measurable and secondly, the motion of the yo-yo can be controlled only by moving the free end of the string. To understand the system we have analysed the yo-yo motion and then we have developed two models.

The first model is a one DOF model which captures all important features of the yo-yo important for the control design and the other considers also the sting forces and is appropriate for simulation with haptic interface.

When selecting a control strategy two things are important for robotic yo-yo: to select suitable nominal hand motion strategy and to synchronize the robot motion with the yo-yo. Experiments with yo-yo have shown that visual feedback is essential for playing the yo-yo, because the hand motion up-ward should be started before bottom impact. 'Feeling' the bottom impact can improve the operation but it is not required. We have compared two cases when the hand motion is generated using a predefined pattern and when the motion is generated online.

The proposed control has been verified by experiments with the Mitsubishi PA10 robot. To keep the yo-yo running for a longer time, it has been necessary to implement additional controller that suppresses the swinging of the yo-yo.

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Received: June 3, 2006
Accepted: July 15, 2006

Using XML in the Domain of Discrete Event Modelling and Simulation

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Today the World Wide Web is undergoing a transformation from an HTML-based medium to XML and XML-based technologies. Up to now most actions in the WWW are sorts of human-computer interaction, but the introduction of the extensible markup language (XML) machine interaction and machine-machine interaction vanish. Meanwhile the domain of modeling and simulation notices an emerging demand and development of web-based simulation. In consequence the overall evolution of the WWW will produce some influence in the simulation domain. This contribution discusses the impact of XML in the discrete event simulation (DES) domain and the use of follow up technologies like web service technology or the semantic web for discrete event simulation. As example, an implementation of a small prototype is shown, understanding flow models.

SNE 16/1 (46), August 2006

Introduction

With the introduction of the *eXtensible Markup Language* (XML) the Internet and the WWW are on the cusp of a paradigm shift. Up to now most actions in the WWW are sorts of human-computer interaction, but the introduction of the XML changed the perception.

The Internet will be seen as a great space of information and with the use of XML and following technologies like Web Services, Grid Computing and Semantic Web the difference between human-machine interaction and machine-machine interaction vanishes.

Meanwhile the simulation domain noticed an emerg-ing demand and development of web-based simulation.

The combination of the simulation with the Internet and more precisely with Web technology gives hope to the overcoming of some limitations due to deficiencies of existing multidomain simulation software the simulation community stated during the past few years:

- High investment costs
- Only suitable for simulation experts or experienced users
- The lack of integration in existing information systems
- Despite the multidomain approach of the simulation software most enterprises favour the proprietary development of their simulation software.
- Most simulation software uses proprietary data formats and definition standards

Some of this limitations can be addressed by the use of the concept of *Application Service Providing* (ASP) from *Business to Business* (B2B) communication and using XML as a core technology to build simulation web services.
Therefore we developed a framework for a DES web service - the *SimASP* framework.

This paper is organized as follows. In the first section the concept of the SimASP framework is outlined. As a consequence of our work we investigated the concept of a so called *Generic DES Model*.

The implications of XML to such generic DES models are outlined in the second section. In the third section we give some concluding remarks as well as a small preview on forthcoming development.

1 SimASP - a Framework for DES Service Providing

1.1 Simulation service providing

In a conventional way of selling simulation software, the customer typically buys the software (or the license to use it) from the vendor, which generates high investment costs.
While the running costs are not to high, with the most multidomain simulation software the user has to become kind of an expert to use it in a profitably way.

Simulation Service Providing tries to offer a client a useful service that he can use via the Internet. A charge is paid for the amount of the services used.

1.2 Modular Services

The implication of useful means that a costumer (and that means not a simulation expert - he would buy a simulation software anyway), who is normally an expert in his domain, must be enabled to use simulation for his purpose. Therefore the functionality of a simulation study is divided in several modules (Figure 1).

The client can choose according to his needs which functionality he wants. Projected functions are

- Several simulation engines
- Experiment control
- Optimization
- Advanced data analysis
- Animation

1.3 XML used for data management

As all modules have to operate on the same model a data repository is needed. Therefore different types of databases can be used (e.g. a RDBM system or an XML database). For different modules, different parts of the model have to be extracted. These model parts are sent to the accordingly chosen simulation or other software and the produced output has to be stored in the model (or linked to it).

For this purpose of data communication XML (*eXtensible Markup Language*) fits well. XML is an open well-accepted standard with a lot of follow up technologies usable for software development. Figure 2 depicts some of the interaction of the software components on the application server.

The model stored in the database is translated in an according XML - model. The information how to transform is stored in an XML schema. From the XML representation of the whole model (which is usually very small because XML files are plain text files), the needed subset for the specific SimASP module is extracted and sent to the software (simulation or other).

The software output is compiled again in XML and linked to the model data in the data repository.

1.4 XML as core technology for web services

For client server interaction a web service approach was chosen. The use of XML-based technologies like SOAP, WSDL and UDDI web services provides a very flexible environment for service registration, service request and service communication.

UDDI (*Universal Description Discovery and Integration*) is an XML-based registry, where a provider can register his service. WSDL (*Web Service Description Language*) is an XML-based service description on how to communicate with the service.

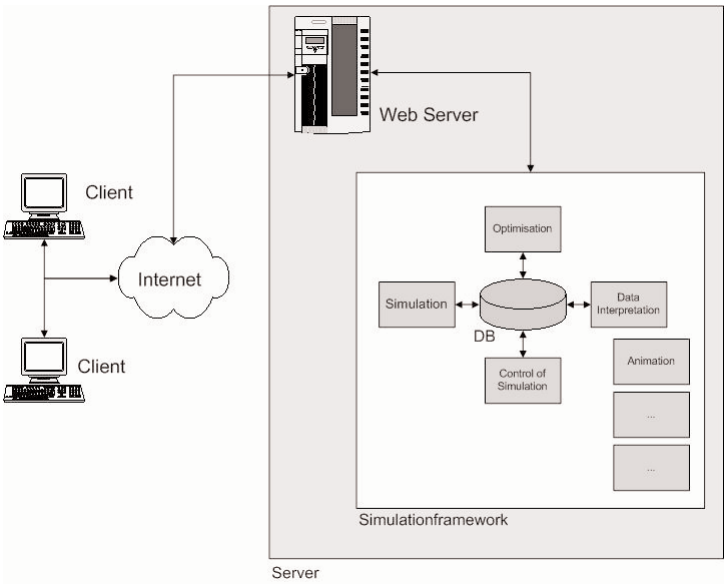

Figure 1: The modular concept of the SimASP framework.

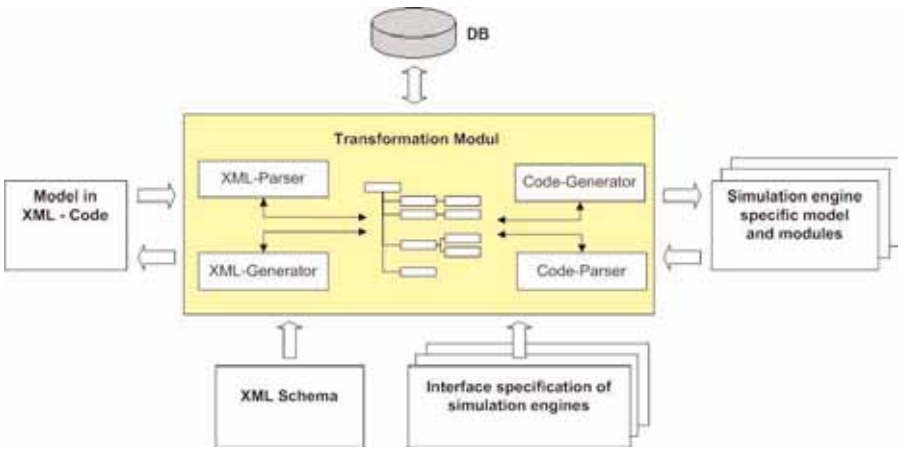

Figure 2: Different modules operating on the same model.

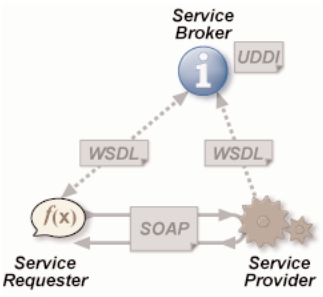

Figure 3: Functionality of a Web Service.

SOAP is a standard for exchanging XML - messages over a computer network and enables the communication in-between service requester and service provider.

2 Generic DES Models using XML

A consequence of the modular concept of the new SimASP framework is the possibility to use different simulation software for the simulation of a model. Hence the client can use the software he is used to or if he requires some functionality that is not supported from all simulation engines, the switching between the simulation engines can be encapsulated and is transparent for the client.
Therefore the generic DES model definition was developed. It is oriented on an object-oriented approach and defines some standard resources (like Sources, Server …), which are familiar in the DES domain. The representation of the model is independent from the finally used simulation engine although interfaces to the simulation engine have to exist. We developed interfaces for two different simulation packages with different modeling paradigms.

2.1 Definition of the generic DES models

We used XML as a definition language for the structure of the generic DES model. XML is an open standard and provides a lot of software technologies for the definition and management of data like SAX, DOM, XML Schema, XSLT …

The concept of Web Services and Grid Services relies heavily on the data representation in XML, too.
The hierarchical, structured way of data representation is very suitable for the definition of content related to an object oriented approach.

Thus the definition of the generic DES models is made in XML Schema, which is an XML document for itself. Unlike the older XML definition language DTD, XML Schema provides user defined data types as well as the possibility to restrict the content of XML elements and XML attributes by regular expressions.

A short graphical abridgement of the XML Schema for generic DES models is given in Figure 4. It defines the content and the shape of a valid XML representation of a generic DES model. A software application that tries to deal with such a file, expect the following structure.

The model file is expected to have a root element with name Simulation, which contains two more elements (head, model).
The head is expected to hold information about the simulation run and the experiment control, the model element contains an arbitrary number of simObjects, which again are either connectors or simEntities which descend from their types and so on.

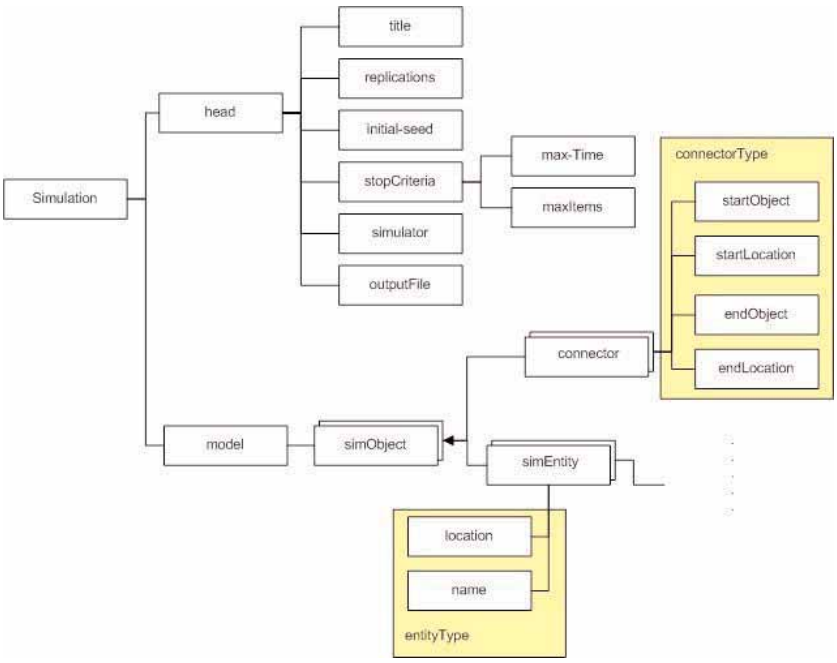

Figure 4: Part of the XML Schema definition of a generic DES model.

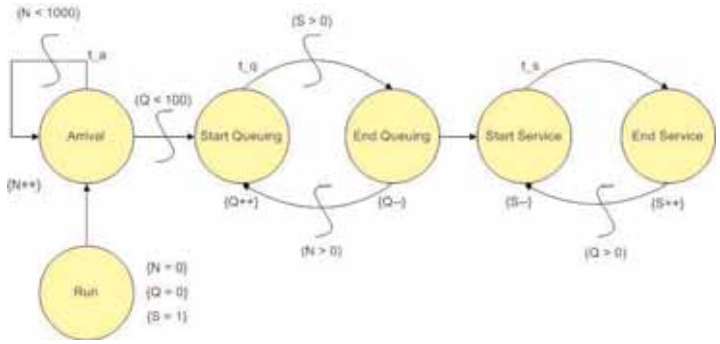

Figure 5: Event oriented definition - Job Shop Model with event graphs

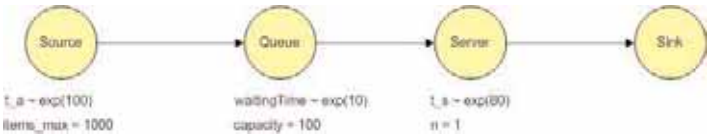

Figure 6: Process oriented definition - Job Shop Model with flow graph

The mapping of the defined model entities to the required objects of specific simulation software is not defined at the client side, but is made on the server side according to the specified functionality.

2.2 Example - Job Shop Model

Current available simulation engines in the SimASP (for which interfaces are written) are *Simkit*, a software package for implementing DES models written in Java, and the process oriented package *JSIM*, a Java-based simulation and animation environment supporting web based simulation.

The generic model interfaces are written in Java and translate the generic model in a simulation package specific format. Figures 5 and 6 depict the according definitions of a Job Shop Model.

Both simulation engines worked properly and their specific results have been translated in a generic XML output file (a fragment of the XML schema definition is shown in Figure 7)

The output files are readable through every XML-compatible software and can be displayed or processed in a convenient way.

3 Conclusion

In this work we showed different possibilities for the DES domain to benefit from the use of a service-oriented approach and the use of XML. The openness and flexibility as well as the availability of existing open standards and protocols make XML extreme powerful.

We used some of these strengths to build a framework for DES service providing and a generic DES model witch can be used as a starting point to overcome some obstacles which are founded in a proprietary way of building and running simulation models.

Neither the Generic DES model is finished nor are is the development of XML. Meanwhile the SimASP framework was built, new XML standards emerged and the use of ontologies and the semantic web will be the next XML-based trend that will influence the simulation domain.

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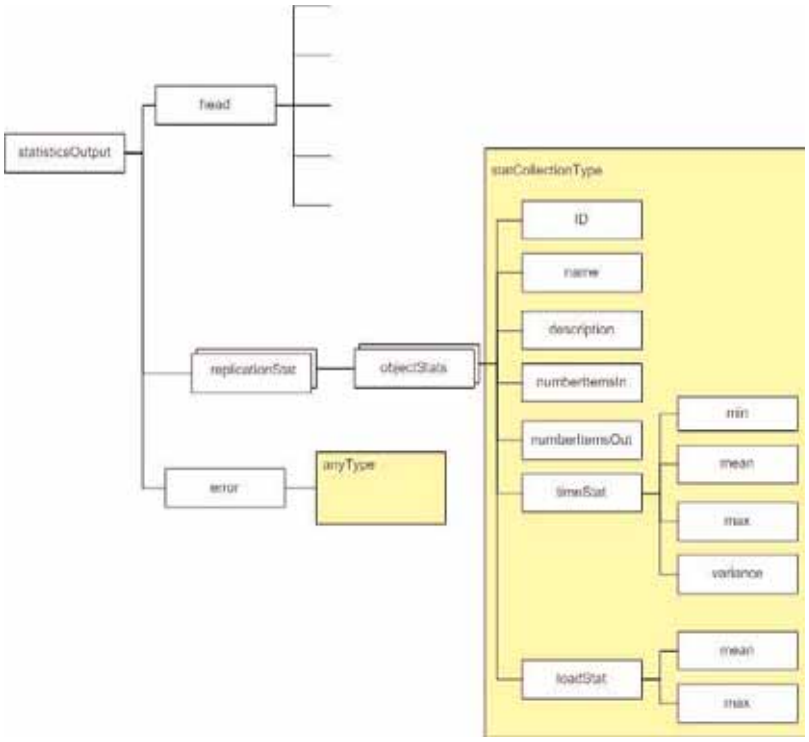

Figure 7: Generic Schema for statistic output.

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Received: March 20, 2006
Revised: July 10, 2006
Accepted: July 30, 2006

SHORT NOTES

Real - time Simulation with Kalman Filter and LQ Control using Connected Signal Processing Boards

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In this paper we present a connection of two signal processing boards, the dSPACE board *DS1104* and the Burr Brown board *PCI-20001C-2*. The user interface for the dSPACE board is *ControlDesk,* and for the Burr Brown board it is *LabTech Notebook*. Both platforms are working in real-time. This connection of boards is demonstrated with a practical application of a Kalman Filter and LQ controller. The controller is implemented on the dSPACE board, while the simulation of the plant is running on the Burr Brown board.

Introduction

In this paper we present the control design for an unknown SISO plant with system noise and measurement noise. The control and the plant are embedded on two independent real time simulation boards.
The plant is implemented on the *Burr Brown* board *PCI-20001C-2*. The board has an A/D converter on the input channel and a D/A converter on the output channel, which are connected to the D/A converter and to the A/D converter of the *dSPACE* board *DS1104*.
We make use of a specially developed set of MATLAB/Simulink blocks, which support the dSPACE board. These blocks enable easy programming of different control algorithms in the Simulink frame. After developing control algorithms and models, C-code generated from the Simulink model, is downloaded to the dSPACE board.
ControlDesk is a user-interface for the *DS1104* board. It is an environment for running real-time simulations. From this environment, we are able to download applications to the *DS1104* board, to configure virtual instrumentations, to control, monitor and automate experiments, and to develop controllers [3].

1 Identification of the Plant Model

First we identified the plant transfer function - implemented and simulated at the Burr Brown board *PCI-20001C-2* using the *LabTech Notebook*.
The step response of the plant is shown in Figure 1. With the identification and verification input as shown in Figure 2 we captured the plant output. The sampling frequency for capturing and later for the LQ controller is 1 Hz. It is important to choose the right frequency. If the frequency is too high, the identification is poor due to noise, and if the frequency is too low, the identified transfer function of the plant will have poor transition response.

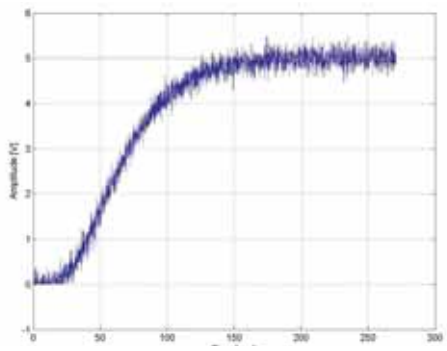

Figure 1: Step response of the plant.

From the relatively slow plant step response we can conclude that an identification input made of a step and some suitable pulse generators will be satisfying to cover the frequency range of the plant.

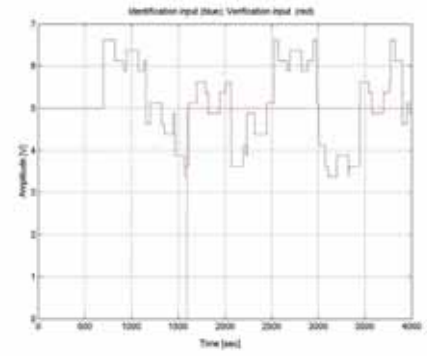

Figure 2: Identification and verification input.

Capturing is made by the *ControlDesk* interface and the data is saved as `.mat` - file.

The simulated model of the plant was obtained by the MATLAB *System Identification Toolbox* [4]. We kept the order of the simulated plant low (10th order) and achieved a model fit over 95 % (Figure 3). Further increase of the model order (up to 20th order) yielded maximally a 2 % increase of the model fit.

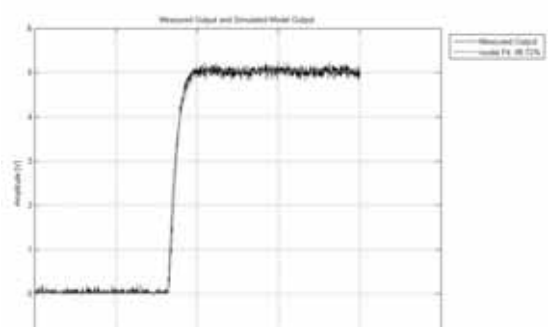

Figure 3: Comparison of measured and simulated model output.

2 Design of Kalman Filter and LQ controller

After the identification we designed a Kalman filter for the plant, using the plant model with approximated covariance values and with measurement noise of zero mean value [1, 4].

Now the estimated plant states and the error signal *e*, $e = r - y$, allow the LQ controller to track the reference input to the system (Figure 4).

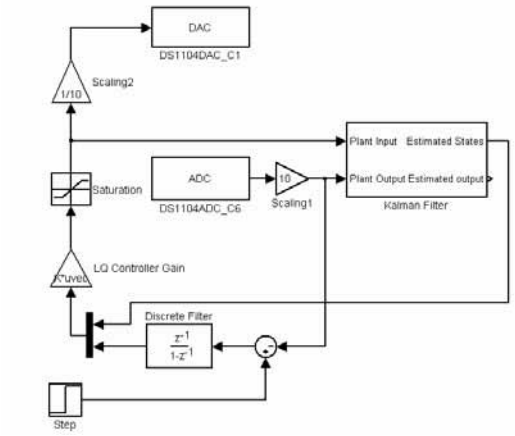

Figure 4: Simulink model of the Kalman filter and LQ controller (adapted for the dSPACE board).

We defined the output weighting for the LQ controller experimentally so that the rising time of the plant is reduced about 36 % and so that the overshoot (with noise) does not exceed 12 % (Figure 5).

3 Conclusion

dSPACE in combination with MATLAB/Simulink enables so called rapid prototyping.
Such an approach to a problem gives the engineer the possibility to concentrate on the problem itself while generating code is the job of the software.

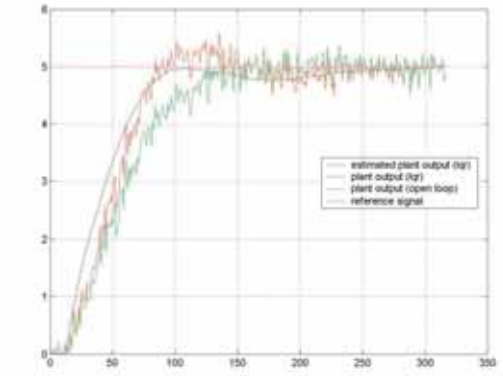

Figure 5: Response of the plant controlled by the LQ controller.

The step from simulation to a real-time application, although using different connected real-time boards, was very fast and the results were satisfying, because both boards are equipped with comfortable interfaces. For a good control of the plant a good plant model is very important. The quality of a model depends on the identification test signal and verification signal, on the the noise level in the plant and on required the model order. The biggest problem in the application shown here were the reduction of system and the measurement noise (it is essential to keep noise at the minimal possible level during the identification).

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Received: July 12, 2006
Revised: July 15, 2006; July 25, 2006
Accepted: July 30, 2006

Modelling the Human Blood Glucose Regulation - a MATLAB GUI for Educational Purposes

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This contribution presents a MATLAB GUI (Graphical User Interface) for controlling experiments with basic physiological models simulating the human blood glucose regulation. The GUI interfaces to three models, from simple glucose regulation by the kidney until more complex glucose regulation by the kidney and by the hormones insulin glucagone. The GUI is intended for educational purposes in medical and physiological engineering. Predefined parameter settings allow simulating classic diseases.

Introduction

In the course of [2] a software, more exactly a MATLAB GUI with basic physiological models from [1], for comparing and analysing different models for the blood glucose regulation was developed. In this work the models were also analysed for the properties of observability, controllability and stability, but we will not go into these details here.

The human body gets his energy from glucose (= sugar) which is extracted from carbohydrates. Hence the time of ingestion (= input of carbohydrates) and the time the glucose is needed is not the same and thus there are mechanisms in the body that can save glucose and also keep the glucose level in the blood constant. The storage of the energy (in liver, muscles and fat) can only happen when the glucose is transformed in glycogen. For this transformation the hormone insulin, which is produced in the pancreas, is needed. The antagonist of insulin is glucagon. It is also produced in the pancreas and is secreted when the glucose concentration in the blood falls under a certain level.

In the following three different models are presented which include different influencing factors mentioned above. Due to the developed software it is easily possible to compare these different models and see the effects of the neglected or included factors.

1 Basic Models

GLUKID model. GLUCID is a simple first order model for the blood glucose regulation by the kidney. All other system components involved in blood glucose regulation remain neglected. The disease *juvenile diabetes mellitus* (*type 1 diabetes*) justifies the design of a model based on blood glucose regulation by the kidney alone. In this type of diabetes the endocrine pancreas does no longer produce insulin. Dangerously high blood glucose concentrations may occur, which can only be removed from the blood by the kidneys over the urine.

INSUL model. In the model INSUL the blood glucose regulation is modelled only through the hormone insulin. It is a one-compartment model with an additional feedback loop. The compartment contains two substances, insulin and glucose. This results in a second order model with two states (Figure 1). In this model it is also possible, by setting parameters, to simulate *juvenile diabetes* where the pancreas is unable to produce insulin.

PANKID model. The model PANKID is the most complex model for blood glucose regulation discussed in [2]. It is a combination of the known models and represents the blood glucose regulation in the human body by the kidney, the hormone insulin and the hormone glucagone. The whole process of blood glucose regulation is extremely complex and even this model is a strong simplification. This model contains three state variables, the concentration of glucose, insulin and glucagon. The model is described through three first order linear ordinary differential equations - one for each substance.

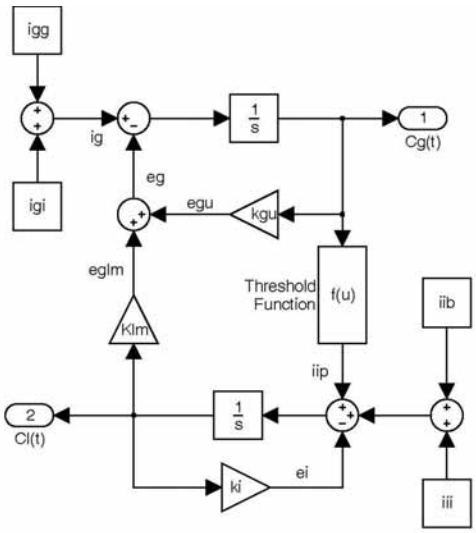

Figure 1: Simulink diagram of model INSUL.

The system analysis gives that the model is controllable and observable in all settings. All occurring parameters are due to physiological reasons ≥ 0 and thus the system is asymptotically stable.
In this model is it also possible, by setting appropriate parameters, to simulate several diseases like *juvenile diabetes mellitus*, liver diseases

where the liver does not respond to glucagon in providing the blood with glucose or special types of tumours that secrete insulin constantly.

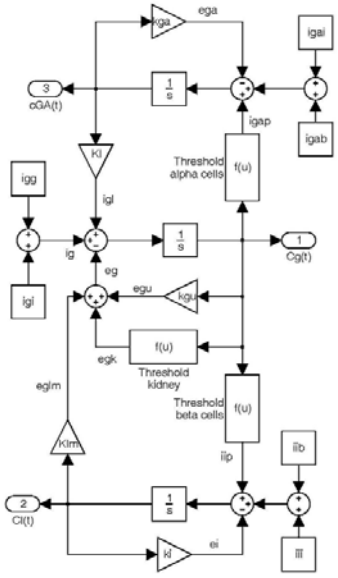

Figure 2: Simulink block diagram of the model PANKID

2 GUI - Graphical User Interface

The MATLAB GUI - developed with MATLAB standard features - offers menus for choosing models and setting parameters (Figure 3). In the pulldown menu the user can select one of the implemented models for glucose regulation. According to the chosen model it is possible to set parameter values in the appropriate fields.

If a user is not yet experienced with the parameter settings of the models, he can push the button *default setting* to obtain values to simulate a healthy person's blood glucose regulation. The GUI offers either to plot a graph with new parameter settings in an empty plotting window, or - by using the *Add Plot* button - to plot a graph with different settings in the same window, so that different parameter settings can be compared directly. Figure 4 and Figure 5 show results for model INSUL and for model PANKID.

Similar experiments (identical glucose input and insulin input into both models, additional glucagon input into PANKID model) show qualitative similar results for glucose concentration, but quantitative differences because of additional glucagon state in the PANKID model.

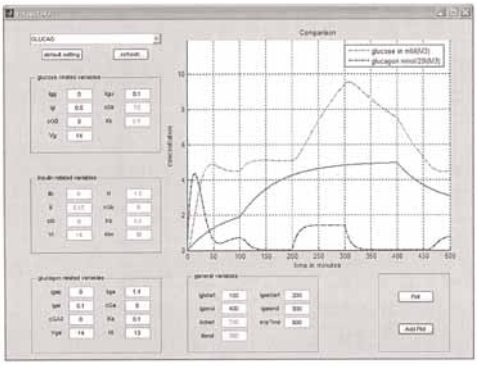

Figure 3: The MATLAB GUI.

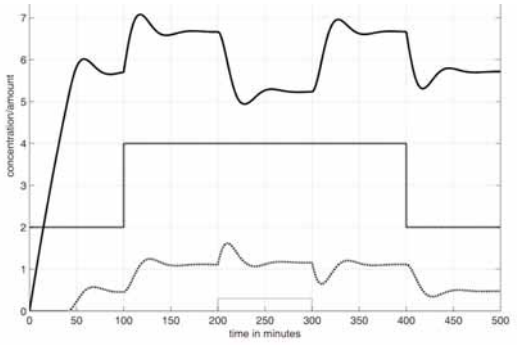

Figure 4: Results of model INSUL, glucose and insulin input.

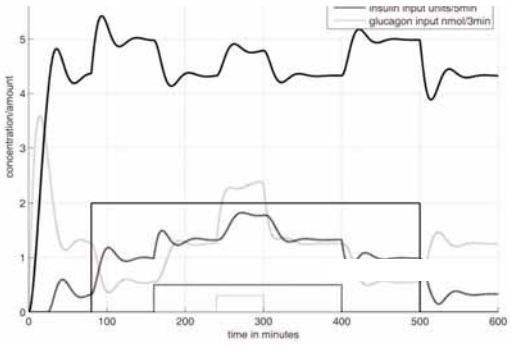

Figure 5: Results of PANKID, with glucagon dynamics.

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Received: January 20, 2006
Revised: April 15, 2006;
July 5, 2006
Accepted: July 20, 2006

Simulation of a Control for a Robot with Two Degrees of Freedom – an E-learning Example

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This contribution shows the modelling, simulation and control of a robot of two degrees of freedom. It is part of a large e-learning project where we want to offer a database of mathematical modelling examples for demonstration and studying online. The main audience are students of electrotechnical engineering and technical mathematics, but also other students might be skilled in modelling in simulation.

Introduction

With our mechatronic models students should be able to 'play' to get to now how control works, but they should also be trained in development of small own models. Here it might be possible to offer to develop own control algorithms of the certain robot.
The system is based on MATLAB and Java, combined with a comfortable experimentation environment

1 Modelling

Modelling the Robot Mechanics. The robot with two degrees of freedom consists of two arms, one moves rotational in the vertical plane around axis o1 (arm 1) and the other one performs a linear movement (arm 2). On arm 2 a grab for taking up loads is fixed, its mass is included in mass of arm 2, m_2 (Figure 1).

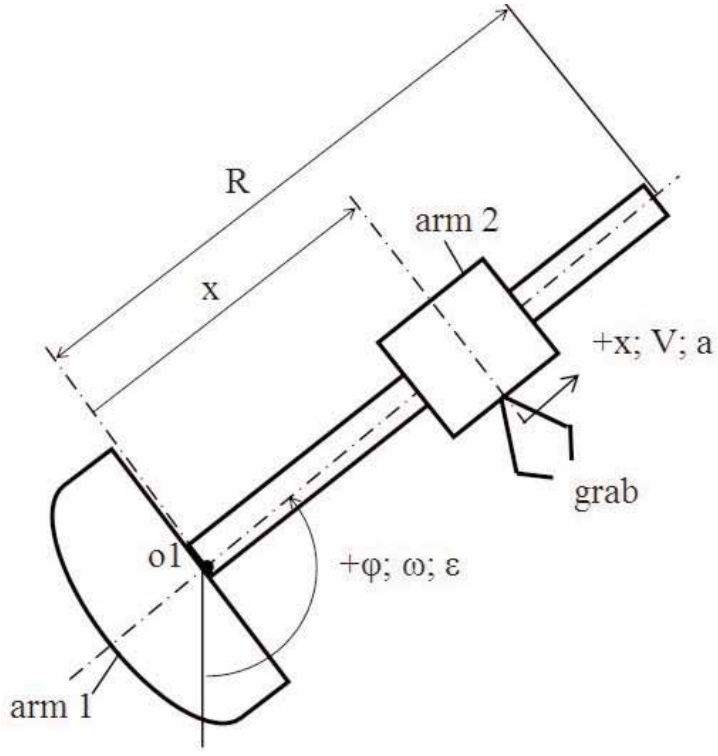

Figure 1: Scheme of robot with 2 degrees of freedom.

The positions are described through the angel φ and the distance x. Velocities and accelerations are given through ω, ε and V, a respectively. The basic geometry is given in Figure 1. For the description of the robot mechanics we need to define its inertial forces, named J_{01} for arm 1. For arm 2 we also have to consider the position of the grab.

The whole robot dynamics with drive is shown in Figure 2, where the basic equations of balance are given in the central box.

In our model friction is neglected for clearer presentation but it should be able to experiment with different electrical engines and so mechanical conversion is regarded. For the actuation of the robot arms we have conversions; the following equations complete the model, giving conversion parameter for arm 1 and for arm 2:

$$i_\partial = \frac{\omega_{en1}}{\omega}, \qquad R_{i\partial} = \frac{V}{\omega_{en2}}$$

Modelling the electrical drive. In our example also the drive of the electrical engine is modelled including the digital-analog converter and amplifiers. All parameters are taken from real parts, so students can make studies with different kind of engines, for example. It should also be possible to experiment with different kind of electrical engines to understand the differences in its control.

2. Digital controller

The implemented digital controller supports linear and circular movements of the robot grab, realised by a P-control mechanism. The path the robot grab should follow, can be defined by the student and the change of position and velocity of each arm can be observed. Also the error in position and velocity can be studied.

A simulation result is shown in Figure 3, where the positions of the arms can be observed. Also the overall position of the grab, here performing a circle, is shown.

In further development students can also develop there on controls, following an ellipsoid for example.

3 Implementation

The model was implemented in MATLAB, but also in Java, what makes it available easier on the net for E-learning purposes.

The additionally developed graphical user interface is shown in Figure 3. Everything is implemented by an object oriented approach what makes our model adaptable easily for other parts or for more sophisticated features of the robot.

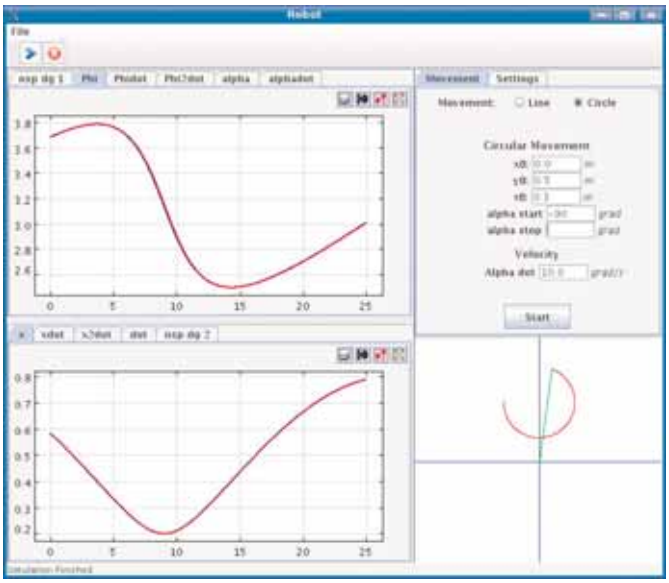

Figure 3: Screenshot of the Java robot control GUI.

Summary

Summarizing we have developed a user friendly tool to experiment with a robot of two degrees of freedom online.
The example is not too complex consciously. It should transport the main ideas and principles of modelling and simulation.
At end of the project, software will be available at the web.

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Received: March 2006
Revised: June 3, 2006
Accepted: July 15, 2006

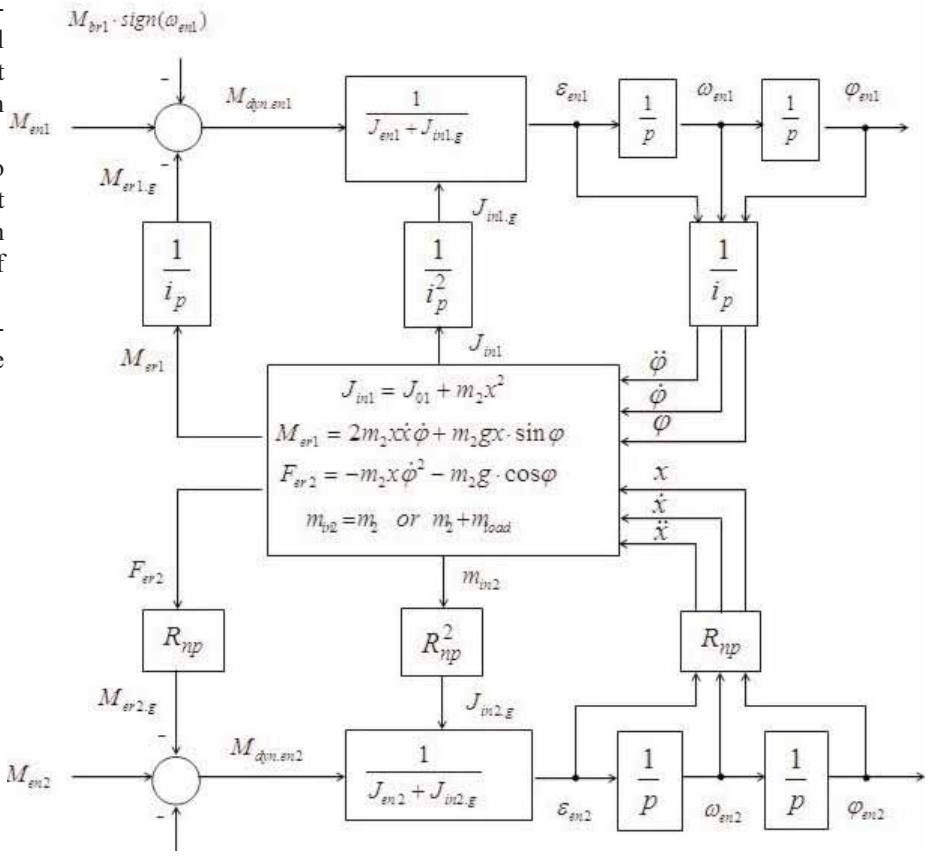

Figure 2: Structure of the model for robot and control.

ARGESIM SIMULATION BENCHMARKS

'Crane and Embedded Control' – Definition of an ARGESIM Benchmark with Implicit Modelling, Digital Control and Sensor Action

Revised Definition – Comparison 13revised

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The ARGESIM Comparison / Benckmark C13 'Crane and Embedded Control' is based on modeling and controlling a crane crab and addresses digital elements together with implicit continuous model description. The comparison goes back to a formulation as test example for VHDL-AMS and has been defined first as ARGESIM Comparison C13 in SNE 35/36. This redefinition presents an improved observer based digital control with more stable behaviour. The revised tasks ask for comparison of uncontrolled nonlinear and linearised system behaviour, for modeling and simulation of digital control with sensor action, and for simulation of a diagnosis of sensor action.

SNE 16/1 (46), August 2006

Introduction

This benchmark originates from a publication of E. Moser and W. Nebel in the Proceedings of the conference DATE'99 [2]. The authors set up a benchmark mainly for testing the VHDL-AMS model description. Therefore, the benchmark comprises digital elements (digital controller, sensor action and diagnosis) as well as a continous model description.

The first definition as ARGESIM Comparison C13 *Crane and Embedded Control* extended this VHDL-AMS benchmark for simulators of any kind. Experiences with solutions sent in showed, that the design of the control is not really adequate, leading to misinterpretations and to a too narrow stability region. Consequently, for this revised definition, the design of the control has been improved significantly. Furthermore, the tasks to be performed with the modelled system and required control are formulated more precisely, so that solutions can be compared better.

1 Definition of Crane Dynamics

The crane consists of a horizontal track, a car moving along this track, and a load that is connected to the car via a cable of length *r* as shown in Figure 1.
The car is driven by the force f_c, which is exerted by a motor controlled by a digital controller. A disturbance is modelled as the disturbing force f_d, accelerating the load in horizontal direction.
Several sensors provide information about the current state of the system. The actuators for steering the crane are the motor and a brake.

In the following the nonlinear and linearized equations for the system are given. The linear model description originates from [1], where a detailed version can be found. In this comparison also the nonlinear model is to be investigated ([3]). The basic model parameters can be found in Table 1.

Linear Model / linearised model

$$\ddot{x}_c = \frac{f_c}{m_c} + g\frac{m_l}{m_c}\alpha - \frac{d_c}{m_c}\dot{x}_c$$

$$r\ddot{\alpha} = -g(1+\frac{m_l}{m_c})\alpha + (\frac{d_c}{m_c} - \frac{d_l}{m_l})\dot{x}_c -$$

$$-r\frac{d_l}{m_l}\dot{\alpha} - \frac{f_c}{m_c} + \frac{f_d}{m_l}, \quad x_l = x_c + r\alpha$$

Nonlinear model
It is to be noted that the nonlinear model is an implicit one, of type

$$\mathbf{M}(\mathbf{x})\,\ddot{\mathbf{x}} = \mathbf{g}\,(\mathbf{x}, \dot{\mathbf{x}})$$

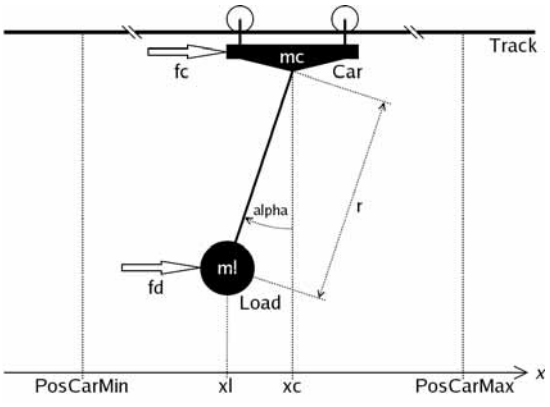

Figure 1: Schematic overview of crane model.

$$\ddot{x}_c = \left[m_c + m_l \sin^2(\alpha)\right] = -d_c \dot{x}_c + f_c + f_d \sin^2(\alpha) + \\ + m_l \sin(\alpha)\left[r\dot{\alpha}^2 + g\cos(\alpha)\right] - d_l \dot{x}_c \sin^2(\alpha)$$

$$r^2\ddot{\alpha}\left[m_c + m_l \sin^2(\alpha)\right] = \left[f_d \frac{m_c}{m_l} - f_c + d_c \dot{x}_c\right] r\cos(\alpha) - \\ - \left[g(m_c + m_l) + m_l r\dot{\alpha}^2 \cos(\alpha)\right] \sin(\alpha) - \\ - d_l\left[\frac{m_c}{m_l}(\dot{x}_c r\cos(\alpha) + r^2\dot{\alpha}) + r^2\dot{\alpha}\sin^2(\alpha)\right]$$

$$x_l = x_c + r\sin(\alpha)$$

Depending on the simulation system used, these DAEs may be used directly, or they must be made explicitly by analytical or by numerical means.

Description	*Name*	*Value*
mass of car	m_c	10 kg
mass of load	m_l	100 kg
length of cable	r	5 m
gravity	g	9.81m/s^2
friction coefficient of car	d_c	0.5kg/s
friction coefficient of car with activated brake	d_c^{Brake}	100000 kg/s
friction coefficient of load	d_l	0.01kg/s
maximum position of car	*PosCarMax*	5m
minimum position of car	*PosCarMin*	-5m

Table 1: Basic model parameters.

2 Specification of the Control

The control includes the sensors, actuators, the digital controller and the diagnosis. The variable *PosDesired* is used as input to the controller and controls the position of the car (*PosCar*).

Actuators. The car is driven by a motor which exerts the force f_c on the car. As a model for the motor, including a specific controller for it, a first-order transfer function is used:

$$\dot{f}_c = -4\ (f_c - f_c^{Desired})$$

Activation of the brake is given by the following actions:

$$f_c^{Desired} := 0, \quad d_c := d_c^{Brake}$$

Sensors

Three sensors give information about the status of the system, one measuring position of the car and the other ones informing about reaching limits (Table 2).

Name	*Type*	*Description*
PosCar	Real	reports the position of the car (x_c)
SwPosCarMin	Boolean	true if $x_c <$ *PosCarMin*, else false
SwPosCarMax	Boolean	true if $x_c >$ *PosCarMax*, else false

Table 2: Sensor Variables / parameters.

Definition of the digital controller

The digital controller is implemented as a cycle based controller using a fixed cycle time of 10 ms. A discrete state space observer calculates the 'fictive' states **q** based only on the observation of *PosCar*:

$$\mathbf{q} = (\tilde{f}_c, \tilde{x}_c, \tilde{\dot{x}}_c, \alpha, \dot{\alpha})^T$$

The vector **q** is then fed into a state regulator. In the following the control algorithm is given, where n numbers the controlling cycles (a schematic overview of the controller is given in Figure 2).

The parameters for the controller are $V = 109.5$, *ForceMax* = 160, and *BrakeCondition* = 0.01, the vector and matrix parameters are given in the following:

$$\mathbf{q}_{n+1} := (\mathbf{M} - \mathbf{d}\,\mathbf{c}^T)\,\mathbf{q}_n + PosCar_n\,\mathbf{d} + f_c^{Desired}{}_n\,\mathbf{b}$$

$$u_{n+1} := V\ PosDesired - \mathbf{h}^T\mathbf{q}_{n+1}$$

$$f_c^{Desired}{}_{n+1} := \max\{\min\{u_{n+1}, ForceMax\}, -ForceMax\}$$

State matrix **A**, input vectors $\mathbf{b_1}$ and $\mathbf{b_2}$, and output vector **c** are given by the linear model.

$$\mathbf{M} = \begin{pmatrix} 0.96 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0.01 & 0 & 0 \\ 0.001 & 0 & 0.9995 & 0.981 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ -0.0002 & 0 & 0.0001 & -0.2158 & 1 \end{pmatrix}$$

$$\mathbf{c} = \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \mathbf{d} = \begin{pmatrix} 34.5724 \\ 0.2395 \\ 2.0322 \\ 0.0164 \\ -0.1979 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} 0.04 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \mathbf{h} = \begin{pmatrix} 2.9 \\ 109.5 \\ 286.0 \\ 1790.6 \\ 44.5 \end{pmatrix}$$

Diagnosis

The diagnosis runs concurrently to the digital controller. It is used to ensure the car stays within the given limits *PosCarMin* and *PosCarMax*. Therefore a boolean value *EmergencyMode* is introduced, which defaults to *false* and will not be reset once set to *true*.

In parallel, a condition for activating the brake while the car is standing still, is observed:

- if *PosCar* > *PosCarMax* then set
  EmergenceMode = *true*
- if *PosCar* < *PosCarMin* then set
  EmergenceMode = *true*
- if *EmergencyMode* or if for more than 3s
  $((\,|\,(f_c^{Desired})\,|\, < BrakeCondition$
  then activate the brake

3 Tasks

First present the general approach, the implementation idea and the simulation system used. Especially, make clear how the implicit nonlinear model was handled, and how the digital controller was implemented. Furthermore it is of interest how the experiments were managed, especially in tasks b and c (features of the simulation environment).

The initial states for all of the following tasks should be zero:

$$x_c = 0, \dot{x}_c = 0, \alpha = 0, \dot{\alpha} = 0$$

A - Task: Nonlinear vs linear model. Implement the model (crane and motor) once using the linear equations for the crane dynamics and once using the nonlinear equations. Give details about the handling of the implicit nonlinear model (transformation to explicit model, or use of algorithms for implicit models indicating the nature of the algorithm).

Compare the linear and nonlinear models without controller and without brake, with following scenario:

- Initial state, $f_d = 0$
- At time $t = 0$: set $f_c^{Desired} = 160$ for 15s, then $f_c^{Desired} = 0$
- At time $t = 4$: set $f_d = Dest$ for 3s, then set $f_d = 0$

Print a table showing the steady-state difference (reached after about 2.000s) in the position of the load (x_l) for three values of *Dest* , *Dest* = -750,-800,-850.

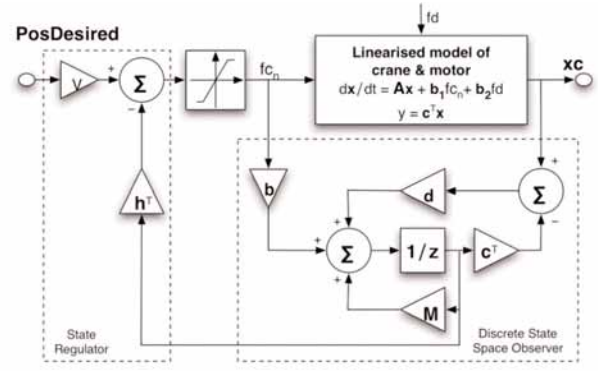

Figure 2: Schematic overview of controller.

B - Task: Controlled system. Implement the controller and brake and use the nonlinear equations for the crane dynamics. Describe how the continuous system and the discrete controller work together and how the brake is implemented.

Simulate the following scenario:

- Initial position, $f_d = 0$
- At time $t = 0$: *PosDesired* = 3
- At time $t = 16$: *PosDesired* = -0.5
- At time $t = 36$: *PosDesired* = 3.8
- At time $t = 42$: f_d = -200 for 1s, then $f_d = 0$
- At time $t = 60$: stop simulation

Results should be displayed as graph of position of car (x_c), position of load (x_l), angle α, and the state of the brake over time.

Task c - Controlled system with diagnosis

Add the Diagnosis to the controller. State how the *EmergencyStop* event is handled.

Simulate the following scenario:

- Initial position, $f_d = 0$
- At time $t = 0$: *PosDesired* = 3
- At time $t = 16$: *PosDesired* = -0.5
- At time $t = 36$: *PosDesired* = 3.8
- At time $t = 42$: $f_d = 200$ for 1s, then $f_d = 0$
- At time $t = 60$: stop simulation

Results should be displayed as graph of position of car (x_c), position of load (x_l), angle α, state of the brake and status of *EmergencyStop* over time.

For a solution, please follow the guidelines at the ARGESIM website WWW.ARGESIM.ORG/comparisons for and include your model source code files with the solution you send in.

References

[1] O. Foellinger: *Regelungstechnik*. Huethig, 5. Auflage, 1985

[2] E. Moser, W. Nebel. *Case Study: System Model of Crane and Embedded Controller*. Proc. DATE'99, pages 721-724, 1999.

[3] J. Scheikl, F. Breitenecker, I. Bausch-Gall: Comparison C13 *Crane and Embedded Control – Definition*. SNE 35/36, Dec. 2002; 69 – 71.

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Received: May 5, 2006
Revised: July 15, 2006
Accepted: July 20,2006

A Modelica Approach to ARGESIM Comparison 'Crane and Embedded Control' (C13 rev.) using the Simulator Dymola

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Simulator: *Modelica* is a freely available, object-oriented language for multi-domain modelling. It comes with an extensive library allowing easy modelling of complex mechanical systems. *Dymola* as simulator offers all the functionality needed, but has a rather poor experimentation environment.

Model. The nonlinear crane was modelled using the *Multi-Body Library* of Modelica 2.2. Only graphical blocks representing mechanical devices have to be connected following the physical relations (Figure 1). Modelica generates the same equations than given in the definition. The simulator Dymola has integration schemes being able to handle implicit models (DASSL). The linear crane model was implemented using the *Modelica Block Library* (graphical transfer functions like in SIMULINK).

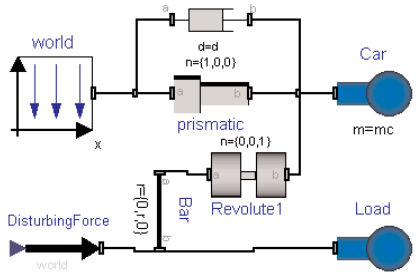

Figure 1: Nonlinear crane model with Modelica MultiBody Library.

All controller actions and sensor actions were modelled textually. Modelica's function `sample` and the `pre(.)` function (giving the previous sampled value of the argument) were used for modelling the digital controller with a fixed sample time of 10ms. Sensor actions were described by `if-then-else` constructs, which – in case of Dymola – are interpreted as state events and synchronised by an iterative event finder:

```
when sample(0, 0.01) then
 q := (A - b2*c)*pre(q) +
       + b1*pre(fcDes) + b2*pre(PosCar);
 y := h*q; u := k*PosDesired - y[1,1];
 vc := max(min(u, ForceMax), -ForceMax);
 ts := if (abs(vc) < BrakeCondition) then
       pre(ts) + 0.01 else 0;
 Brake := if (EmergencyStop or (ts >= 3))
       then true else false;
 fcDes := if Brake then 0 else vc;
end when;
```

A - Task: Nonlinear vs linear model. Linear and nonlinear model were simulated independently, and final values for x_l were read out (results Table 1).

Dest	x_l *nonlinear*	x_l *linear*	*difference*
-750	294.041	294.075	-0.034
-800	0.008	-0.005	0.013
-850	-294.112	-294.096	-0.016

Table 1: Steady state differences of nonlinear and linear calculated positions of load

B - Task: Controlled system. Implementation of the brake was done by checking the brake condition in every cycle of the digital controller (see code before). A state variable, representing the time since the brake condition holds, is updated accordingly and used for controlling the brake (results in Figure 2).

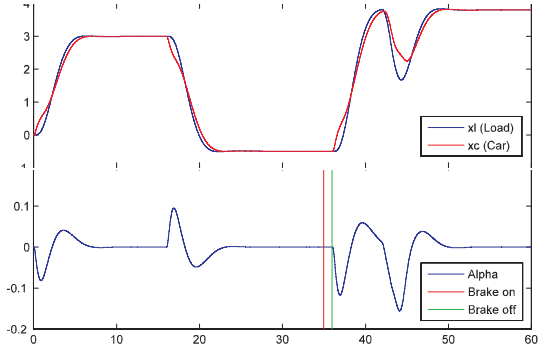

Figure 2: Time domain results for controlled model

C - Task: Controlled system & diagnosis. A separate `when`-clause of the digital controller handles the emergency stop (results Figure 3).

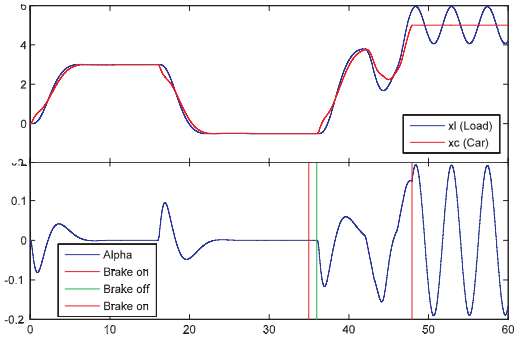

Figure 3: Results for diagnosis experiment (the second brake-on event is due to an emergency stop).

Classification: Modelica approach, diagnosis model
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Reveised: June 10, 2006
Accepted: July 10, 2006

Petri Net Modelling to ARGESIM Comparison C4 'Dining Philosophers' with Petrinetz-Tool, with Integrated Net Analyzer INA, and Peneca / CHROMOS

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Simulator: *The Petrinetz-Tool*, developed at Magdeburg University, is a graphic net editor and simulator for PT-nets. It represents the reachability graph, creates the incidence matrix and the INA file of the net. INA, a freely available tool of the HU Berlin, performs a reachability analysis here. It unfolds Colored Petri Nets (CPN) into PT-nets before analyzing. The graphic net editor/ simulator CHROMOS for CPNs is a product from Peneca, Ilmenau.

Model. The base of the investigation is the classic model. Five philosophers with five chopsticks can meditate or eat. At the beginning of the eating the chopsticks on the left and on the right next to the plate are seized and put back after the eating in pairs. With five chopsticks only two philosophers can eat simultaneously which implies conflicts.

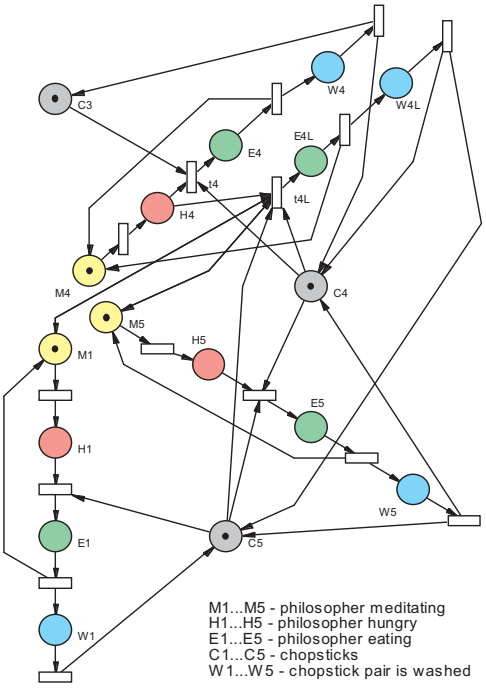

Figure 1: Refined and extended Place/Transition net.

Refinement of the model. A place 'Hungry' has been inserted between the places 'Meditating' and 'Eating'. After the eating the philosopher continues the meditating. His chopsticks are cleaned simultaneously and they are put back in pairs on their places after that. The cleaning is modeled by the place 'Washing'. The refinement increases the reachability set to 352 while the classic problem had 11 states. An analysis with INA confirms the liveness of the net. Figure 1 shows the refinement for the philosopher P5.

Additional chances. If a hungry philosopher is missing a chopstick, he shall get the possibility to borrow a chopstick of a neighbour.
To this end the model is extended by two alternative branches per philosopher.

The left completion of philosopher P4 is obvious from Figure 1. He can only borrow the chopstick C5 if P5 and P1 are meditating (test arcs to M5 and M1). After cleaning, C5 is put back on its place together with the own chopstick C4. By means of the right branch, P4 would try to eat with C3 and the borrowed C2. The competition doesn't intensify this way but the chances improve for a fair treatment. The own chopsticks are always preferred trough a higher priority, e.g. of transtion t4 compared to t4L or t4R. Altogether 3581 states were generated and the Petri net was recognized as lively.

Colored Petri Net. The complete PT-net consists of 45 places and 50 transitions. The folding to a CPN with individual tokens reduces this number to a fifth and simplifies the structure. The arcs are labeled with variables, their colors and values are assigned by CHROMOS in the menu *Function symbols* see Figure 2 for details of the coloured net).
A further folding of the place-triples 'Eating' and 'Washing' and their corresponding transitions reduces the CPN to five places and four transitions. However, the original structure is no longer recognizable.
INA confirms the liveness and the reachability set above.

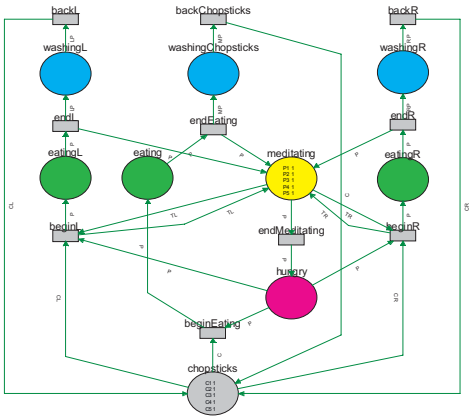

Figure 2: Complete couloured Petri net.

Classification: Petri net modelling and net analysis

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Received: March 15, 2006
Revised: Juni 15, 2006-09-23
Accepted: July 20, 2006

A Numerical MBTY-Solution of ARGESIM Comparison C5 'Two State Model'

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Simulator: *MBTY* is software package for graphical modelling, simulating and analysing of dynamic models. It provides a graphical user interface for building block diagrams. MBTY enables to develop new function elements (blocks) using an embedded programming tool (built-in language).

Model. The model uses MBTY's predefined standard blocks. For modelling the differential equations for two *Integrators*, *Cross Detects*, *Relays*, and *Sums* have been used (Figure 1). The initial values and the parameters of the problem have been set by the global parameter editor.

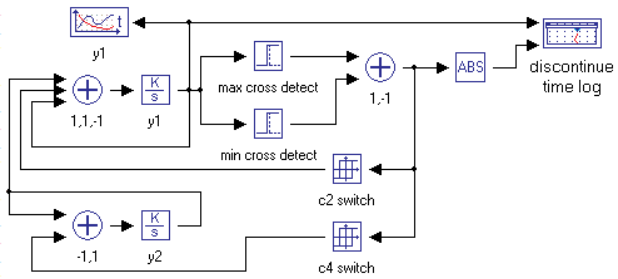

Figure 1: Block diagram model in MBTY.

Two *Cross Detection* blocks have been used to determine a time of input crossing lower and upper limit (*y1_max, y1_min*). Within those time limits the output value of blocks is counted 1, otherwise the output is 0. The user can set an accuracy of the crossing time. Two output values from the *Cross Detection* blocks were summed. Min cross output used again coefficient of -1 in the *Sum* block.
The output from *Sum* becomes 1 when the value of y_1 crosses *y1_max* and -1 when it crosses *y1_min*. The *Relay* c2 switch and c4 switch change the parameters according to the detected events. The *Event log* block is used to log the event times.

Tasks a - c: Time domain simulation and event times for different accuracies. The MBTY allows the user to set up the Max and the Min *time steps* for solvers (here set to 10^{-3} and 10^{-12}, resp.). Accuracy was set at 10^{-12} for the *Cross Detect* block. The MBTY adaptive explicit solver detects if discontinuity has placed with the same result. Figure 2 shows the time domain simulation, Table 1 event times and final value for y_1 for different accuracies.

Rel. tol.	10^{-6}	10^{-10}	10^{-14}
t1	2.46288272933086E-7	2.46288272437342E-7	2.46288273098263E-7
t2	1.1083061677931	1.10830616776826	1.10830616776578
t3	2.12968535517524	2.12968535516337	2.12968535514373
t4	3.05415290714476	3.05415290708184	3.05415290698186
t5	4.07553209453104	4.07553209448122	4.07553209435989
t6	4.99999964651487	4.99999964643625	4.99999964619767
y1(5)	5.36931247360320	5.36931365394820	5.36931409117480

Table 1: Event times and final value y_1.

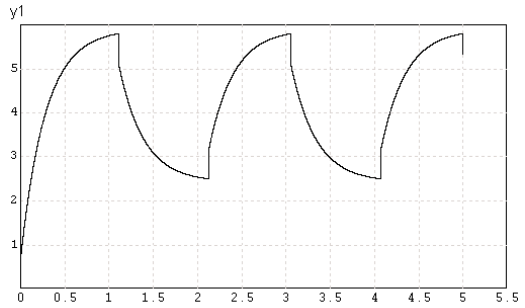

Figure 2: y_1 over time, switching state.

D- Task : Change of State2 behaviour. Changing of the *State 2* parameter value and the switching condition in global parameter editor results in high frequent oscillation behaviour of y_1. All adaptive solvers compute 63 discontinuities. The first and last discontinuities and the final value of y_1 are shown in the Table 2, computed with relative accuracy of 10^{-11}. Figure 3 also reflects the high-frequency oscillations.

	10^{-11}
t1	0.00000000730024
t2	1.10830617053450
t3	1.12172997202320
…	…
t61	4.80930641761650
t62	4.92304042409690
t63	4.93646422553790
y1(5)	5.30470141338140

Table 2: Event times in case of high-frequent *State 2.*

Figure 3: High-frequent oscillations in y_1

Classification: Numerical solution with high accuracy

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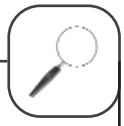
Received: February 10, 2006
Reveised: June 10, 2006
Accepted: July 10, 2006



A Programmed Solution to ARGESIM Comparison C 6 'Emergency Department' with DSOL, a Java- based Suite

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Simulator: *DSOL* is an open source, Java based suite for continuous and discrete event simulation. *DSOL* is written with distributed computing in mind and supports distributed models. Models are implemented in Java code. *DSOL* offers facilities for graphical data evaluation like charts but also supports 2D and 3D animation. There are predefined classes for standard entities like generators, stations and resources. There is also a big library of statistic classes, including distributions and tallies which compute mean and standard deviation automatically.

Model / Implementation of Strategies for tasks. Model and experiments (tasks) of C6 are implemented using one class for each station (*registration*, *casualty ward*, *x-ray* and *plaster*). There is just one casualty ward object hiding the details of two wards with two doctors each. Additionally a patient source and a patient sink are used, primary for evaluation purposes and implementation details. The patients themselves are a class also and know the details about their path through the hospital and their priority for task c. The glue between all the classes is DSOL's event mechanism.

The patient source schedules a `goto next station` event for newly created patients and re-schedules the `create patient event` as long as needed.
The patient schedules an arrival event on his next station and gets queued there. As soon as the station treated the patient it will create an `goto next station` event for the patient and reschedule itself as long as there are patients queueing. The patient sink terminates this mechanism and stops the simulation when all patients left the hospital.

The method `getNextStation` returns the next target of the patient. In that way only the patient has to know about his way through the hospital, so new types of patient could be added easily.

Each station implements a `queuePatient` method, basically re-scheduling itself: in pseudo code:

```
void queuePatient(Patient p)      {
  if (queue.isEmpty())  {
   queue.add(p);
    scheduleProcessing(drawStationDelay());
 } else{
    queue.add(p);    } }
```

The last missing puzzle piece is the implementation of `scheduleProcessing` which draws a random delay and after that delay calls a method named `processing`. This method in pseudo code:

```
void processing()                 {
  p = queue.pop();
  p.notify();
  if (!queue.isEmpty())       {
   scheduleProcesing(drawStationDelay());}}
```

It basically takes the first patient from the queue and puts him to the next station. If there are still patients left it is re-schedules itself. The patient sink finally stops the mechanism by implementing a method, which writes statistically data to the experiment database (to be examined by the *DSOL GUI*).

Tasks a -c: Different strategies for operation. As special actions (change of doctors) and priorities are programmed directly in the method definitions, no further effort is necessary for complete the more complex tasks b and c.

Results for 50 simulation runs are given in Table 1 below. In general, results from task b are almost identically to task a, so swapping doctors seems to have no effect. Task c shows improvements of the priority strategy: although the overall treatment time for all patients did not change, the overall treatment time for each patient is reduced.

Type	sm[a]	sd[a]	sm[b]	sd[b]	sm[c]	sd[c]
1	205	12.47	215	13.16	169	14.97
2	98	14.13	99	12.63	109	15.68
3	286	22.22	287	17.52	165	21.63
4	98	4.81	106	5.97	122	6.18
all	171	13.41	176	12.32	141	14.62

Table 1: Mean and standard deviation for treatment times.

Classification: Programmed DEVS library-based approach.

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Received: October 24, 2005
Revised: January 23, 2006
Accepted: March 30, 2006

A Cellular Automata – Approach to ARGESIM Comparison C 10 'Dining Philosophers II' using MATLAB

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Simulator: MATLAB (version 7.01) is (not only) a powerful programming language and was used without any toolboxes to program the simulation model as well as the statistical evaluations. For multiple simulation runs, the code can be translated automatically into C++ and compiled, which makes execution faster - especially code with extensive for – loops gets slow in MATLAB.

Model. The behaviour of the five philosophers can be studied using a one-dimensional cellular automaton (CA). The CA depends on some stochastic effects (time until hunger arises, time it takes to eat) and the behaviour of their neighbours (which causes chopsticks to be in use or not). Time is discrete in this model (steps of one minute), so time can be modelled as steps of the automaton. A trick was used to get the uniform distribution of thinking and eating times into the model: There is not only one cell state for eating (resp. thinking) time, but several states, represented by decreasing numbers, are used as count down timer. The first state in an eating (thinking) period is chosen by a random generator. The matrix (Table 1) in which cell states are stored shows this (1-10: philosopher thinking; 11-20: eating; 21 - waiting for left chopstick; 22 - waiting for right chopstick).

1	7	2	10	2
17	6	1	9	1
16	5	16	8	22
15	4	15	7	22
14	3	14	6	22
13	2	13	5	22
12	1	12	4	22
11	21	11	3	22
4	11	6	2	13
3	10	5	1	12
2	9	4	22	11
1	8	3	12	4
…	…	…	…	…

Table 1: CA states for philosophers.

A - Task: Single Run – Evaluations. Simulation is performed by stepwise update of the CA, with sampling of statistical data. In a fully programmed approach the statistical evaluation takes most of the effort. It is not possible to store all the states of the automaton for all times up to a deadlock (which occurs very rarely). As it takes too much time to evaluate statistically after every simulation step, a compromise was chosen: the states are stored for at most 7000 steps, if memory is full, all necessary statistical computations are performed (Table 2 and Table 3, deadlock after 8.003.569 steps).

Chopstick utilisation	
chopstick 1	0.9196
chopstick 2	0.9194
chopstick 3	0.9195
chopstick 4	0.9194
chopstick 5	0.9197
total	0.9195

Table 2: Chopstick Utilisation, single run.

	Eating		Thinking		Waiting	
	mean	std. Dev.	mean	std. dev.	mean	std. dev.
P 1	5.5007	2.8734	5.4879	2.8699	11.4356	8.0647
P 2	5.4970	2.8696	5.4930	2.8712	11.4412	8.0617
P 3	5.4898	2.8682	5.4902	2.8684	11.4393	8.0727
P 4	5.5020	2.8676	5.4912	2.8702	11.4234	8.0557
P 5	5.4894	2.8694	5.4899	2.8705	11.4329	8.0581
total	5.4958	2.8697	5.4904	2.8700	11.4345	8.0626

Table 3: Statistics for the philosophers' states

B - Task: Correct management of simultaneous access. By construction as matrix operations and CA update, progress in the system is well defined. The Gantt chart (Figure 1) shows that the behaviour of the philosophers was implemented correctly.

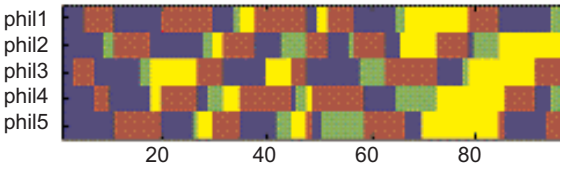

Figure 1: Gantt chart with philosophers actions: red – eating, green and yellow – waiting, blue – thinking

C - Task: Multiple simulation runs. Within 50 simulation runs, the time until a deadlock varied from 16.839 to 23.428.401 time steps (mean time 3.752.924). Figure 2 shows deadlock times versus run number). The CA detects a deadlock by construction.

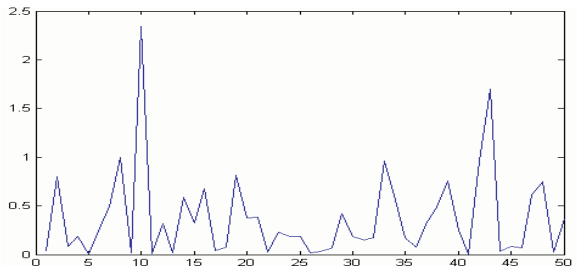

Figure 2: Deadlock times versus run number.

Classification: Cellular automata approach

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Received: May 20, 2006
Accepted: June 30, 2006

A Classical ODE-based Approach to ARGESIM Comparison C 11 'SCARA Robot' using DESIRE

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Simulator: DESIRE stands for *Direct Executing SImulation in REal time*. It is specially designed for solving differential equations very fast.
DESIRE is text-based with graphical output. The programming language is similar to BASIC, and line numbering is obligatory. Differential equations, either linear or nonlinear, can be entered in natural mathematical notation, and mixed with matrix/vector equations. DESIRE allows solving up to 40.000 ODEs using fixed- and variable-step *Runge-Kutta* routines, or up to 600 differential equations with variable-step/variable-order *Adams* and *Gear* integration rules.

A - Task: Description of mechanical model. The system of differential equations has to be made explicit prior to solving it with DESIRE, as it has no abilities to handle implicit differential equations. Furthermore, the differential equations of second order have to be reduced to a system of first order.
In DESIRE's first program section, the program parameters, like time step, simulation time, etc., are set.
After that all the constants are defined, followed by the command `drun`, which executes all commands in the DYNAMIC block. In the following, some self-explaining parts of the model:

```
264  u1 = 130 | u2 = 100 | u3 = 1047
311  m3 = m3A + m3L
321  Theta1 = (m1/3 + m2 + m3)*L1*L1
333  if op=0 then U3max=1 | else proceed
435  xtip = L1*cos(q1) + L2*cos(q1+q2)
531  d/dt I1 = (U1-kT1*u1*qdot1 - ...
612  ma12 = Theta2*cos(q2) + Theta3
621  denom = ma11*ma22 - ma12*ma21
632  mainv12 = -ma12/denom
```

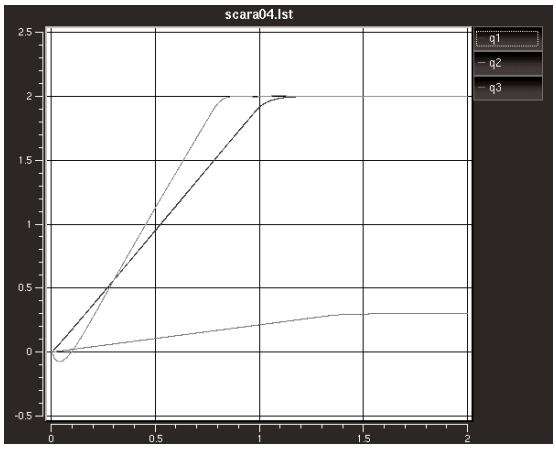

Figure 1: Joint position over time with PD control.

```
811  d/dt q1 = qdot1
812  d/dt qdot1=mainv11*b1+mainv12*b2
851  term q1-2 (target condition)
```

B - Task: Servo motor and PD control. Control is implented by simple equations and by the `term` statement. The limits for the current are defined by saturation limiters:

```
531 I1 = ... * I1max * sat(I1 / I1max))
```

Results for the joint positions are shown in Figure 1.

C - Task: Collision avoidance. DESIRE does not support state events directly. A proper way around to is to make use of the simple switch function. Here, the operation mode is determined by applying this switch function in the conjunction of height and distance to obstacle:

```
1-switch(height))*(1-switch(dist))
```

In case of emergency, the current positions are defined as new target values for the joints, so that the PD control stops as fast as possible. All three motors have the maximal voltage at their disposal for that purpose. It can be seen in Figure 2, that the position of the robot arm stays nearly constant until the tool tip has cleared the obstacle height, and then continues to move to the desired position.

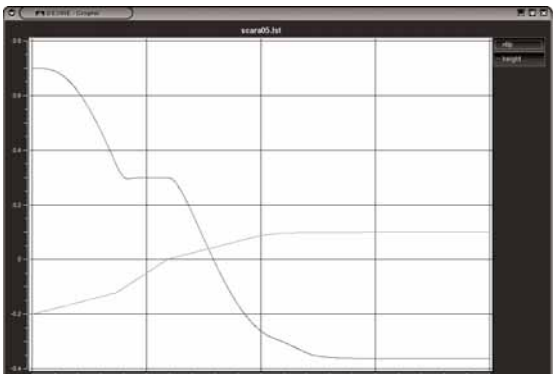
Figure 2: Tip positions in case of obstacle.

Classification: Explicit model approach
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Received: May 10, 2006
Revised: July 2, 2006
Accepted: July 15, 2006

An Analytic Approach to ARGESIM Comparison C15 'Renal Clearance Identification' using Maxima/LISP

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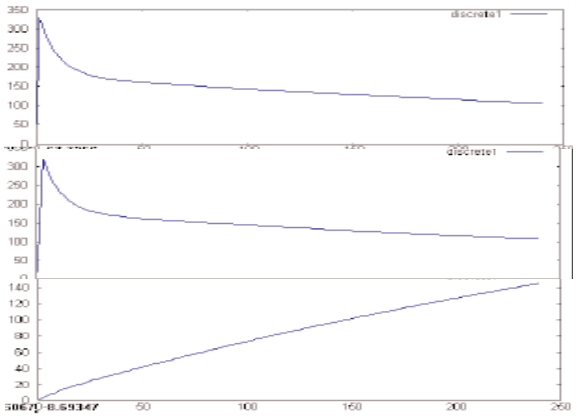
Simulator. *Maxima* is an open source symbolic mathematics package (MAXIMA.SOURCEFORGE.NET). Maxima is an open version of Macsyma, which originally was developed at MIT from 1967 on. Macsyma and Maxima are written in LISP, a functional programming language, and therefore allow executing LISP-like scripts. Plots can be performed with the help of *GNUPLOT*.

Model. The model is defined as system of differential equations in Maxima / Macsyma notation, in textual form (similar to Mathematica). Maxima can solve this system analytically using the Maxima command `desolve`. Because of the discontinuity of the input function *f(t)* (square pulse), the differential equation system has to be solved two times.

A - Task: Simulation with bolus input. The ODEs are solved analytically twice. First they are solved with initial conditions $x_1(0)=0$ and $x_2(0)=0$ and $f(t) = D/\tau$, which yields $c(t)$ for $0 \le t \le \tau$. Then the system is solved with initial conditions at $x_1(\tau)$ and $x_2(\tau)$ taken from the first solution, which yields $c(t)$ for $\tau \le t \le 240$. The two resulting functions are concatenated piecewise in the respective ranges, giving the solutions for three different bolus injections (Figure 1 - 3), and difference of concentrations (Figure 4).
The desired state values are: $\tau = 0.5$, $x_1(\tau+1) = 2342.55$; $\tau = 3$, $x_1(\tau+1) = 2208.83$; $\tau = 240$, $x_1(\tau) = 1060.40$.



Figures 1-3: Simulated concentrations for $\tau = 0.5$, $\tau = 3$ and $\tau = 240$ min.

k_{01}	k_{12}	k_{21}	V_1	max(c)	clear	res.
0.00416	0.0591	0.0499	7.298	342.5	30.4	261

Table 1: Identified parameters and algorithm results.

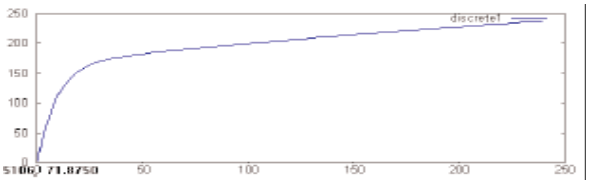


Figure 4: Difference concentration of injection - concentration in the compartment.

B - Task: Identification of model parameters. The parameters k_{01}, k_{12}, k_{21}, and V_1 are estimated using the Levenberg-Marquardt algorithm, a gradient descent method using least squares and adaptation. Maxima does not offer functions for numerical optimization, so this algorithm had to be implemented in LISP.

Programming an identification algorithm in LISP is a non-trivial task. Maxima as symbolic tool is able to calculate analytical solutions parameterised with k_{01}, k_{12}, k_{21}, and V_1 , giving a formula input to the identification algorithm (results in Table 2 and Figure 5).

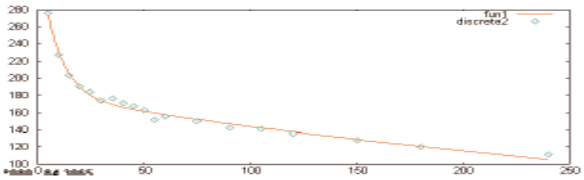


Figure 5: Comparison of simulation and measurements.

C - Task: Error estimation. A loop programmed in LISP performs the identification of the perturbed data. As LISP is interpretative and very slow, only 100 samples have been drawn (results in Table 2).

	k_{01}	k_{12}	k_{21}	V_1
mean	0.004112	0.05922	0.04956	7.331
std. dev.	0.0001620	0.001958	0.001799	0.1170

Table 2: Mean and standard deviation for parameters, 100 samples.

Classification: Analytical simulation approach
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Received: May 20, 2006
Revised: July 5, 2006
Accepted: July 20, 2006

A Matrix-oriented Approach to CA Modelling in ARGESIM Comparison C17 'SIR-type Epidemic' with MATLAB

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Simulator: MATLAB (version 6.05) is a powerful programming language and very suitable for CA modelling and analysing cellular automata (CA).

Model. For implementing the different cellular automata models, similar matrix structures are used. For *LGCAs* we are using a matrix with elements 0, 1, 2, 3, (0 - no element there, 1 - susceptible, 2 - infected and 3- recovered individual).
In the *HPP* model every cell includes four positions (up, down, left, right), characterised by a 2 x 2 matrix per cell. Thus, the *HPP CA* is modelled by a $2m$ x $2n$ matrix (m, n grid size). In the *FHP* model every cell includes six positions (up-left, up, up-right, down-left, down, down-right,), represented by a 2x3 matrix for each cell of the grid. The following main model shows a very dense MATLAB code: spatial update, random changes, spread of infection in the CA update.

```
for k=1:time
    A = HPP_Step(A);
    if deflrdn A = HPP_Deflrdn(A); end;
    [A,nS,nI,nR] = HPP_Infection(A,r,a);
end;
```

A - Task: CA and ODE solutions. For the ODE solution, MATLAB's standard algorithm ode45 was used. The CA grids were updated in single time steps. The results are qualitative similar, but have different time constants. In the ODE model, the desease spreads at fastest - 7000 infected (maximun) after 10 days, while the CA models show more smooth behaviour (FHP: 4000/14 days, HPP: max 3000/16 days). If in the CA models additionally random motion takes place, the system again slows down (HPP motion: max 2500/25 days) - the more spatial movement, the slower the model (Figure 1).

B - Task: Vaccination strategies in CA models. Vaccination is implemented complex additional update rule when performing a step with the CA.

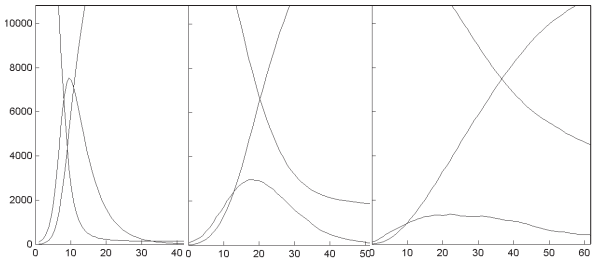

Figure 1: ODE model, HPP model, FHP random deflection.

Three experiments work with 100 infected individuals in the upper half domain, and with 16.000 susceptible individuals uniformly distributes in the whole domain:
- Experiment 1: vaccination of every fourth (eigth, etc) in the whole domain
- Experiment 2: vaccination of every second (fourth, sixth, ...) in the 'infected' halfdomain
- Experiment 3: vaccination of 4.000 individuals nearest to the border of the infected area.

Experiment 1 and 2 show similar results, vaccination clearly smoothes down the infection. In principle, in both experiments the same number of individuals is vaccinated, but the denser vaccination in the infected halfdomain works faster. The third vaccination strategy is the best, because the desease is primarily attacked there, where most infected people stay. Although only one fourth of individuals is vaccinated, less people are infected; but the overall recvery process takes more time (Figure 2).

C - Task: Convergence of CA solutions to ODE solution. Rearrangement of indiviuals in each update step is implemented by simple random distribution at the grid after the update. As result, the FHP CA solution (Figure 3) is very similar to the ODE solution as well as the DE solution.

Classification: Matrix-based directly programmed approach

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Received: May 10, 2006
Revised: June 15, 2006; July 13, 2006
Accepted: July 30, 2006

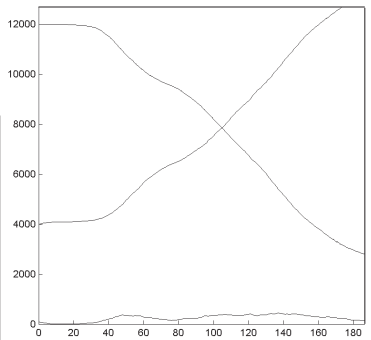

Figure 2: Best vaccination on border to infected region.

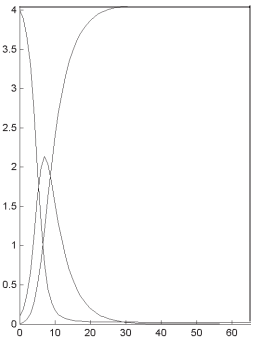

Figure 3: FHP solution with random reordering.

BOOK REVIEWS - JOURNAL REVIEWS

Book Reviews

An Invitation to 3-D Vision
From Images to Geometric Models
Y. Ma, S. Soatto, J. Kosecka, S. Shankar Sastry
Interdisciplinary Applied Mathematics Vol. 26,
Springer 2003, ISBN 0-387-00893-4

This book gives senior undergraduate and beginning graduate students and researchers in computer vision, applied mathematics, computer graphics, and robotics a self-contained introduction to the geometry of 3D vision. That is the reconstruction of 3D models of objects from a collection of 2D images.
Following a brief introduction, Part I provides background materials for the rest of the book. The two fundamental transformations, namely rigid body motion and perspective projection are introduced and image formation and feature extraction discussed.

Part II covers the classic theory of two view geometry based on the so-called epipolar constraint.
Part III shows that a more proper tool for studying the geometry of multiple views is the so- called rank consideration on the multiple view matrix.
Part IV develops practical reconstruction algorithms step by step as well as discusses possible extensions of the theory.

Exercises are provided at the end of each chapter. Software for examples and algorithms are available on the author's website.

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

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Free Energy and Self-Interacting Particles
T. Suzuki
Progress in Nonlinear Differential Equations
and Their Applications (Vol. 62),
Birkhäuser, 2005; ISBN 0-8176-4302-8, 366 pages

This book examines a nonlinear system of parabolic partial differential equations (PDEs) arising in mathematical biology and statistical mechanics. In the context of biology, the system typically describes the chemotactic feature of cellular slime molds.
One way of deriving these equations is via the random motion of a particle in a cellular automaton. In statistical mechanics, on the other hand, the system is associated with the motion of the mean field of self-interacting particles under gravitational force.

Physically, such a system is related to Langevin, Fokker-Planck, Liouville and gradient flow equations, which involve the issues of free energy and the second law of thermodynamics. Mathematically, the mechanism can be referred to as a quantized blow-up. Actually, it is regarded as a nonlinear theory of quantum mechanics, and it comes from the mass and location quantization of the singular limit for the associated nonlinear eigenvalue problems.

This book describes the whole picture, i.e., the mathematical and physical principles: derivation of a series of equations, biological modeling based on biased random walks, the study of equilibrium states via the variational structure derived from the free energy, and the quantized blowup mechanism based on several PDE techniques.

Free Energy and Self-Interacting Particles is suitable for researchers and graduate students of mathematics and applied mathematics who are interested in nonli-near PDEs in stochastic processes, cellular automata, variational methods, and their applications to natural sciences. It is also suitable for researchers in other fields such as physics, chemistry, biology, and engineering.

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

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Spiking Neuron Models
Single Neurons, Populations, Plasticity
W. Gerstner, W. Kistler
Cambridge University Press, 2002
ISBN 0-521-89079-9, 400 pages

Neurons in the brain communicate by short electrical pulses, the so-called action potentials or spikes. Regarding the communication of neurons questions about the generation of spikes, information transmission of neurons, the interaction of thousands of neurons in a seemingly random network, and the coherence between network connectivity and activity patterns arise.

These questions are addressed in this introductory text aimed at those taking courses in computational neuroscience, theoretical biology, neuronal modelling, biophysics, or neural networks. The authors focus on phenomenological approaches so that beginners can get to grips with the theorectical concepts before confronting the wealth of detail in biological systems.

The book is dealing in three parts with neurons and connections, collective behavior in networks, and synaptic plasticity and its role in learning, memory, and development. Each chapter ends with a literature survey, and a comprehensive bibliography is included. As such the book will also introduce readers to cur-rent research.

The approach will be suitable for students of physics, mathematics, or computer science with an interest in biology; but it will also be useful for biologists who are interested in mathematical modelling. A large number of worked examples are embedded in the text, which is profusely illustrated. There are no mathematical prerequisities beyond what the audience would meet as undergraduates: more advanced tech-niques are introduced in an elementary, concrete fashion when needed.

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

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Modern Developments in Multivariate Approximation
W. Haussmann, K. Jetter, M. Reimer, J. Stöckler (eds.)
Proc. 5th International Conference,
Witten-Bommerholz (Germany), September 2002
Birkhäuser, 2003; ISBN 3-7643-2195-4, 320 pages

This volume contains a selection of eighteen peer-reviewed articles that were presented at the 5th International Conference on Multivariate Approximation, held in Witten-Bommerholz in September 2002.

The contributions cover recent developments of constructive approximation on manifolds, approximation by splines and kernels, subdivision techniques and wavelet methods.

The main topics are:

- applications of multivariate approximation in finance
- approximation and stable reconstruction of images, data reduction
- multivariate splines for Lagrange interpolation and quasi-interpolation
- radial basis functions
- spherical point sets
- refinable function vectors and non-stationary subdivision
- applications of adaptive wavelet methods
- blending functions and cubature formulae
- singularities of harmonic functions

The book provides an overview of state-of-the-art developments in a highly relevant field of applied mathematics, with many links to computer science and geophysics.

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

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Coding, Cryptography and Combinatorics
K. Feng, H. Niederreiter, C. Xing (eds.)
Birkhäuser, 2004; ISBN 3-7643-2429-5,413 pages

This book contains a selection of papers submitted to the Workshop on Coding, Cryptography and Combinatorics (CCC 2003).
An important feature of the book are invited surveys on key topics such as Boolean functions in cryptology, correlation attacks on LFSR sequences, decoding algorithms for linear codes, LDPC codes, and towers of function fields.
There are also carefully selected contributed papers on many aspects of coding theory, cryptology and combinatorics, for instance, new constructions of codes, decoding algorithms, coding bounds, digital nets, cryptanalysis of cryptosystems and other cryptographic schemes, linear complexity of sequences, cross-correlation of sequences, authentication codes, fast arithmetic for cryptosystems, capacity regions, and combinatorial tableaux.
The reader will be informed about current research in these very active areas.

The book is of interest for postgraduate students and researchers in mathematics, computer science, information theory and electrical engineering.

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

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Modeling and Computational Methods for Kinetic Equations
P. Degond, L. Pareschi, G. Russo (eds.)
Birkhäuser, Boston, 2004; ISBN 0-8176-3254-9

Kinetic models can be used to describe the behavior of gases and fluids in applications when classical approaches, like macroscopic models, are unsuited.
After a short introduction to the topic in the foreword, which is more or less a commented table of contents, the main part starts right away.

The structure is different from a classical book, as it is actually a collection of scientific papers. This guarantees high quality, since these have been approved by the scientific world prior to printing, which makes the level of the book rather high.

The single articles, which can be mostly read independently from each other, give a profound insight into the research that is presently done in this domain, and contain extensive reference lists for even more detailed treatment of the subject.

The first part of the book deals with the Boltzmann equation, which is used for describing the dynamics of rarefied gases on the basis of a kinetic modeling approach.
Kinetic models can be seen as a connection between the microscopic view of particle dynamics, which describes physical processes with differential equations for the individual motions of particles, and the macroscopic view of fluid models, e.g. the Navier-Stokes equations, which involve averaged quantities. The latter can be derived from the Boltzmann equation by perturbation techniques, like the Chapman-Enskog expansions.

When wanting to establish suitable mathematical models for particle systems, the balance between complexity (physical accuracy) and efficiency (reasonable computing time) is a key issue. Different approaches for solving and applying the Boltzmann equation are given, starting with an introduction to the macroscopic limitations, dealing with Monte-Carlo and finite difference methods as well as giving insight into various numerical methods.
This concept of discussing modelling aspects together with the numerical methods is continued throughout the book, which makes it rather unique as most e-xisting descriptions focus on either one of these two aspects.

The second part of the book is devoted to applications of kinetic equations. It is interesting to notice that traffic flow can be modeled by the same equations as gas and fluid dynamics. How this works is explained in a whole article, including the description of traffic instabilities, stop-and-go behavior and lane changing. The Fokker-Planck-Landau equation, which describes collisions between charged particles, is investigated in great detail.

Numerical methods for granular gases involving hydrodynamical models are developed, and another article deals with quantum kinetic theory, within which Bose-Einstein condensation can be explained.

Finally, the Smoluchowsi coalescence equation, which describes the growth of particles by successive mergers, is introduced.

A sound knowledge of modeling in physics is required for being able to follow the expositions in this book. The derivations demand high mathematical abilities as well, so it is recommended primarily for mathematicians with a high interest in physics, or for theoretical physicists, both of which at least at graduate level, but for those who understand the presented ideas, it might be a highly valuable tool or an inspiration for further research.

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

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Mathematics and Computer Science III
Algorithms, Trees, Combinatorics and Probabilities
M. Drmota, P. Flajolet, D. Gardy,
B. Gittenberger (eds.).
Birkhäuser 2004, ISBN 3-7643-7128 5

This book contains invited and contributed papers on combinatorics, random graphs and networks, algorithms analysis and trees branching processes, constituting the Proceedings of the 3rd International Colloquium on Mathematics and Computer Science that was held in Vienna in September 2004. It addresses a large public in applied mathematics, discrete mathematics and computer science, including resear-chers, teachers, graduate students and engineers. They will find here current questions in computer science and the related modern and powerful mathe-matical methods. The range of applications is very wide and goes beyond computer science.

The proceedings are divided into

- Combinatorics and Random Structures
- Graph Theory, Analysis of Algorithms
- Trees, Probability
- Combinatorial Stochastic Processes
- Applications

The book can be recommended for specialist in the area the title addresses.

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

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Modern Methods and Algorithms of Quantum Chemistry
J. Grotendorst (ed.)
Proc. Winterschool February 2000,
John von Neumann Institute of Computing (NIC),
Forschungszentrum Jülich, Germany
ISBN 3 00 005834 6

This interdisciplinary winterschool brought together experts from the fields of quantum chemistry, computer science and applied mathematics in order to present recent methodological and computational advances to research students in the field of theoretical chemistry and their applications.

The participants were also informed about new software developments and about implementation issues that are encountered in quantum chemistry codes, particularly in the context of high-performance com-puting (topics not yet included in typical university courses). The major focus of the winterschool was on method development and algorithms, but state-of-the-art applications were also demonstrated for illustration.

The following topics are covered by twenty lectures:

- Density functional theory
- Ab initio molecular dynamics
- Post-Hartree-Fock methods
- Molecular properties
- Heavy-element chemistry
- Linear scaling approaches
- Semiempirical and hybrid methods
- Parallel programming models and tools
- Numerical techniques and automatic differentiation
- Industrial applications

The programme was compiled by Johannes Grotendorst (Research Centre Jülich), Marius Lewerenz (Université Pierre et Marie Curie, Paris), Walter Thiel (Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr) and Hans-Joachim Werner (University of Stuttgart).

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

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A Path to Combinatorics for Undergraduates
T. Andreescu, Z. Feng
Birkhäuser Verlag, 2004; ISBN 0-8176-4288-9

The goal of the book is to explain the main concepts and ideas of combinatorics to undergraduate students. Extremely helpful is the extensive use of examples for explanation purposes, which makes this book so pleasant to read.

All the ideas and problems are addressed by giving rich examples, and what is even more, each example is solved in high detail immediately after it is posed. More books which are intended to be used as study material should be written in this way, because it is extremely convenient and instructive to use the theoretical knowledge for solving problems as soon as it is presented. Out of the examples, the definitions and theorems with proofs are developed, and general considerations are given, but much information is also contained in the solutions to the examples. So it is highly recommended to read everything in the book.

This should be a clear proposal, but in most other books, it is not always necessary to study the examples in order to understand a topic. This way of presenting information is very well-suited to provide a good basis of understanding for the reader.
Also a lot of additional exercises, many of which come from Olympiades and other competitions, are given with each chapter and at the end of the book so that the reader can practise the skills obtained so far right away.

The reader is introduced to combinatorics, which seems to be part of number theory, but it contains much more, as it exchanges problem-solving strategies and solutions with other mathematical theories. One of the main objects of the book is to give strategies how to count quickly, correctly, and systematically, which is more complicated than it seems.

The structure of the book is very well planned and guides the reader from the basics to complex problems, with each chapter highlighting a particular aspect of the subject and widens the reader's mathematical horizons.

The first chapter explains fundamental notions like probability, prime decomposition and permutations (injective maps from a set onto itself).

Combinations count the sets of unordered objects. Properties of bi-nomial coefficients are investigated, starting with Pascal's triangle, introducing Fibonacci numbers, the Vandermonde identity and leading to number theoretical theorems on divisibility by Lucas and Kummer.
Bijections and recursions, or recursive relations, are explained in the next chapters, which can be very useful in solving combinatorial problems. A technique which is helpful for counting the elements of the union of overlapping sets is the inclusion-exclusion principle.

Many interesting problems, including the question in how many ways a number of couples can sit around a table such that men and women alternate and no woman is seated next to her husband. Fubini's principle can be used to sum up all entries in a matrix, either as sum of the row sums or as sum of the column sums.

Generating functions are polynomials which are connected with a sequence such that the coefficient of x^n is the equivalent to the n-th entry of the sequence. Due to their connection with the binomial coefficients, they are very useful in proving combinatorial identities.

The use of the professional typesetting software Latex makes the layout very pleasant. Although the level is moderate, the book contains a lot of information and provides a profound insight into the topic, which makes it very recommendable and pleasing to read, follow the presented ideas and solve the posed problems.

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

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Mathematical Modeling
Case Studies from Industry
E. Cumberbatch, A. Fitt (eds.)
Cambridge University Press, 2001
ISBN 0-021-01173-6

Once the reader starts with chapter 0, called 'mathematical preliminaries', he realizes that the title *Mathematical Modeling* chosen for this book is somewhat lacking an added 'using partial differential equations'. After this short treatise on mass conservation and the PDE's for kinetics and fluid dynamics, thirteen case studies are presented. Every case study is a chapter for itself, and self containing, so the book is more like a volume of proceedings.

The topics are quite varied, ranging from cooking rice for cereals to gas-powered bird scare guns. All chapters, although from different authors, follow the same outline, which gives credit to the editors. In every case study, an introduction in the field of application is followed by a short discussion of the physical principles of the appliance. Then the governing partial differential equation are derived, an analytical solution are proposed. Numeric techniques like FEM are not used at all. Only the conclusion are often sparse or vague, leading to the suspicion that some authors were not allowed to publish all their results.

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

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The Role of Norms and Electronic Institutions in Multi-Agent Systems.
The HARMONIA Framework
J. Vasquez-Salceda
Birkhäuser 2004, ISBN 9-7643-7057-2

With the rise of object oriented programming, agent-based modeling began to appear. From the simple systems implemented in a single model emerged open systems, with agents created for different purposes.
To govern such a system, roles and norms have to be defined, introduced and implemented, and violations if those rules have to be detected and penalised.
A formalization of electronic norms for an agent mediated electronic organisation for the procurement of organs and tissues throughout the whole of Spain, called CARREL, is defined. Then HarmonIA, a multi level framework for e-organisation is proposed. The most important elements -roles, norms, procedures, policies, rules and context - of HARMONIA are discussed. Then the implementation of CARREL based on the HarmonIA framework is introduced. The most important part is the definition of special police agent, whose role is to detect violations of the norm by other agents and to sanction them.

But some questions are not answered: Is it sensible to use an open multi agent system to govern the management of organ donors and receivers, especially when it is only applied to a single country? Wouldn't be a centralised self containing system more appropriate? Is it necessary to define agents who's intentions are to get as much organs as possible, and police agents overlooking an equal distribution of aforesaid organs?

So if you are interested in agent based modelling, the book can be recommended, otherwise it is an example where the cart is put before the horse - choosing the modeling technique before examining the problem.

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

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BOOK AND JOURNAL ANNOUNCEMENTS

Journal Announcements

SNE Special Issue *Parallel and Distributed Simulation Methods and Environments*

The new *SNE Special Issue Series* has been introduced as an extension of the regular SNE. The aim is to publish high quality scientific and technical papers concentrating on a specific topic. Using this approach the *Special Issues* will present the state of research in specific modelling and simulation oriented topics in Europe, and interesting papers from the world wide modelling and simulation community.
The first Special Issue of SNE is edited by members of the ASIM Working Group *Methods of Modelling and Simulation*. It is devoted to *Parallel and Distributed Simulation Methods and Environments* and includes seven selected papers, and a call for a benchmark in distributed and parallel simulation.

Content

The development of parallel and distributed simulation methods and software tools has been strongly influenced by High Level Architecture (HLA) in recent years. HLA has its origins in the military simulation community. As a consequence of its openness and generic character it has also had a significant impact on non-military applications and is now an IEEE standard for distributed simulation. The *first paper* by Strassburger (Fraunhofer Institute Magdeburg, Germany) introduces the history of HLA, presents its main concepts and discusses recent developments. It provides enough background information for non-experienced readers in this field for the two further HLA related contributions in this journal.

The *second and third papers* discuss specific parallel and distributed simulation approaches for Discrete EVent specified Systems (DEVS) and the associated simulator algorithms. Zacharewicz, Frydman and Giambiasi (University Marseille, France) investigate new lookahead computation methods in the G-DEVS/HLA environment. G-DEVS is a specific extension of the DEVS theory and its simulator algorithms for hybrid dynamic systems. Continuous and discrete model components and their associated simulators can be located on different computers and integrated in a global simulation model using HLA technology.

The contribution by Wainer and Glinsky (Carleton University, Ottawa, Canada) investigates parallel simulation techniques for DEVS and Cell-DEVS models that combine cellular automata with DEVS theory. In their parallel simulation environment, CD++, the DEVS simulation algorithms are modified and combined with conservative and optimistic synchronization algorithms.

Scientific and Technical Computing Environments (SCEs) such as MATLAB, Scilab or Octave are essential tools in today's computational engineering and science. Especially optimization and simulation are well supported by integrated algorithms and subsystems like Simulink, Scicos or Stateflow.
The *fourth paper* by Fink, Pawletta and Lampe (Wismar University of Technology, Germany) gives a detailed overview about SCE based parallel processing. In this paper, a new taxonomy on SCE based parallel proc-essing is presented, followed by the identification and assignment of more than 30 existing projects. Furthermore, simulation and optimization applications which have been parallelized under usage of SCEs are discussed. Parallel runtime results as well as general application characteristics are presented.

The *fifth, sixth and seventh papers* have been motivated by engineering applications.
Stenzel, Pawletta, Ems and Bünning (University Wismar and MTG Marinetechnik GmbH, Hamburg; Germany) describe an application, where existing real-world software components, mainly written in FORTRAN, have to be integrated into an HLA compliant federation. FORTRAN/HLA integration approaches are examined in detail, whereas experiences in the field of MATLAB/HLA connectivity serve as design pattern.
The contribution by Eichler, Knöchel, Altmann, Hartong and Hartung (Fraunhofer Institute Dresden and Cadence Design Systems GmbH, Feldkirchen; Germany) describes the coupling of different simulators via TCP/IP network socket connection. The implementation and application of such a co-simulation is described in detail for the simulators MATLAB/Simulink and AMS Designer.
The contribution by Leitner, Wassertheurer, Breitenecker, Hessinger and Holzinger (ARC Seibersdorf research GmbH, Vienna; Vienna University of Technology; Medical University Graz; Austria) presents a Lattice-Boltzmann model (LBM) for solving fluid

mechanical problems in engineering and biomedical applications. The investigated model is relevant for blood flow simulation because it uses Reynolds and Womersley numbers found in haemodynamics with a realistic time dependent pressure gradient as a boundary condition. A big advantage of LBM is the possibility of easy parallelization. Therefore different approaches of implementations are discussed with respect to parallelization.

Finally, this SNE Special Issue publishes a call for a benchmark on parallel and distributed simulation tasks. This new *ARGESIM Benchmark* on *Parallel and Distributed Simulation* extends the ARGESIM Comparison on *Parallel Simulation Techniques* from 1994. The three tasks of this new benchmark are more general, so that also different algorithms for solving the tasks can be used, so that different strategies for parallelisation or distribution of the tasks can be set up and compared, and so that not only simulation software is addressed.

Guest Editors of this SNE Special Issue on *Parallel and Distributed Simulation Methods and Environments (*SNE 16/2) are Thorsten and Sven Pawletta from University Wismar. The issue will be sent to all ASIM members - together with the regular SNE 16/1 (SNE 46), and sample copies will be sent to other European Simulation Societies (with oordering offer). Furthermore, it is available on basis of an individual subscription of SNE.

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SNE Special Issue 2007 *Verification and Validation* - Call for Contributions

Simulation is an important method which helps to take right decisions in system planning and operation. Building high-quality simulation models and using the right input data are pre-conditions for achieving significant and usable simulation results. For this purpose, a simulation model has to be well-defined, consistent, accurate, comprehensive and applicable.
The quality criteria can be proved by verification (*building a model in the right way*) and validation (*building the right model*).

The ASIM-Working Group *Simulation in Production and Logistics* which has worked on this topic since three years accommodates the increased significance of verification and validation and will publish the forthcoming *Special Issue* SNE 17/2 of Simulation News Europe.
Papers on one or more of the following topics will be welcome:

- Procedure Models for Verification and Validation
- Methods for Verification and Validation
- Certification and Accreditation
- Information and Data Acquisition for Simulation Models and their Verification and Validation
- Verification and Validation - Documentation Aspects
- Credibility
- Automatic Verification and Validation
- Case Studies and Practical Experiences

The guest editor of this SNE Special Issue (SNE 17/2), Prof. Dr. Sigrid Wenzel from University Kassel, invites for submitting a contribution. Contributions should not exceed 8 pages (template) and should be mailed directly to the editor not later than March 31, 2007; contributions will be peer reviewed.
Templates available end of November 2006 at ASIM and ARGESIM web page or from the editor - (WWW.ASIM-GI.ORG, WWW.ARGESIM.ORG).

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Book Announcements

ROMSIM announces book on *High Complexity Systems* by F. Stanciulescu

ROMSIM, the Romanian Simulation Society is pleased to announce this book on high-complexity systems. The book is a research monograph, of an interdisciplinary scope that brings together complexity system analysis, hybrid modelling and simulation, knowledge-based and fuzzy control engineering. It attempts to demonstrate the effectiveness and usefulness of hybrid methods and techniques, based on

mathematical-heuristic modelling, herein discussed, for a correct approach to any high complexity system. High complexity systems are a serious challenge for both academic and industry people. High complexity systems usually raise problems not to be solved through classical, methods. The author takes PC-based numerical insights into solving natural systems problems, and man-developed systems problems, and exemplifies all his assertions.

As uncertainty is the keyword in the definition of high complexity systems, considerable attention has been paid to working out the Principle of Uncertainty. The book sets out to provide new methods and tech-niques for computer modelling of high complexity systems. The discussed methods/techniques are called mathematical-heuristic methods. The mathematical-heuristic model for simulation and control is composed of several models, of different kinds, i.e. a continuous and/or a discrete-time model, a discrete-event model, and a heuristic knowledge-based model and/or a fuzzy knowledge-based control model. The compatibility of models is ensured by two theorems of compatibility between mathematical, heuristic or fuzzy models. The author has developed an algorithm for simulation and control of high complexity systems based on a mathematical-heuristic model.
The algorithm underlies the designing of a new type of controller, called the fuzzy knowledge-based controller. Stability criteria for complex control systems, including fuzzy control and risk analysis of high complexity systems, have been set out. An important aspect has been that of numerical analysis of the computation algorithm, based on the mathematical-heuristic model, such as the problem of numerical convergence.
Numerical approach has been inspired by both mathematical-heuristic models, which exploit not only expert-acquired qualitative knowledge, but also quantitative knowledge (expressed by numbers, intervals, etc.) and numerical simulation of processes, described by mathematical-heuristic models.

The book covers numerous PC-run applications. One example is the simulation and control of industrial systems, for discrete-time manufacturing processes, as shown by the application in the book. The fuzzy control model has been produced to compute new control variables, able to reset, provided having an exit from within the intervals, the product inventory within the sub-optimality intervals.
The mathematical-heuristic model has proven efficiency in simulation and control of power systems, i.e. the control of an electrical energy distribution system, composed of several interconnected distribution stations, which supply electrical energy to a large number of consumers.

A series of applications is being devoted to natural systems. One such application is the solving, via simulation, of the complex hydrological and biochemical control problems of a river delta ecosystem (e.g. control of water circulation and water refreshment in lakes, prediction of the chemical and biological state variables). Another application is solving, via simulation, of the control problems related with biological state variables of plants and soil, as for example: dynamics of living vegetal biomass and wooden biomass, in a forest ecosystem as well as in an agro-ecosystem.
One last application will be solving, via simulation, of the problem of air pollution monitoring, i.e. simulation of the industrial chemical pollutants diffusion in the urban atmosphere, considering multiple emission sources, such as gases, i.e. sulphur dioxide. All the applications are beneficial for both experts and managers. Comparison of simulation results with those obtained by experts, following direct measurements, has certified computer simulation results. Each chapter includes a dedicated bibliography.

The book addresses a large readership: computer scientists, system analysts, modellers, simulationists, control engineers, naturalists, ecologists, environment experts and managers, teachers, students/masters of science, doctoral students and others.
The book attaches a CD with the application software for modelling, simulation and control of high complexity man-made and natural systems, e.g. ecological systems (big lakes, rivers, river deltas, soil systems, forests, agro-ecosystems) and for environmental protection (diffusion of industrial chemical pollutants in urban atmosphere, air quality control).
We mention that the book has received the prix 'Grigore Moisil' of Romanian Academy.

Bibliographical Information:
Modelling of High Complexity Systems with Applications
Florin Stanciulescu
WIT Press, Southampton, Boston, 2005
ISBN 1-85312-778-7

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SIMULATIONISTS

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Christina Deatcu works as laboratory engineer at Hochschule Wismar, located in North Germany close to the Baltic Sea. She was born in 1970 near Hamburg. After a first study of Gardening at University of Hannover from 1991 to 1995, she studied Multimedia Engineering at Department of Electrical Engineering & Computer Science at Hochschule Wismar until winter 2003.
During diploma phase she first got in contact with simulation issues. Her diploma thesis 'Development of an Object-Oriented DEVS-Simulator with MATLAB' aimed to enhance an existing prototype DEVS simulator to an easy-to-use simulator with graphical interfaces for modelling and simulation. As this simulator was intended to implement the classical DEVS (Discrete EVent System) formalism of Zeigler in a one-to-one manner, her interest in discrete event formalisms was sparked.

As a member of the research group *Computational Engineering and Automation* (CEA) at University Wismar, she is currently working on her PhD thesis. In cooperation with University of Rostock the field of DEVS-based modelling and simulation in scientific and technical computing environments is analysed. This includes the investigation of new formal approaches and algorithms for structure variable and hybrid DEVS systems.

In 2003, 2004 and 2006 she acted as co-organiser of ASIM workshops on modelling, simulation and control in automotive and process automation taking place in Wismar and as co-editor of workshop proceedings.
She may also be known as sender of the electronical *ASIM Newsletter*.

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Born 1979 in Vienna, Austria, Florian Judex began his studies on Technical Mathematics in Computer Sciences at the Vienna University of Technology in 1997. His first contact with modelling and simulation was in a lecture on this topic, held by Profs. Inge Troch and Felix Breitenecker. He decided to concentrate on this subject, and joined the ARGESIM working group, starting as staff member on the 2003 MATHMOD conference.

He first worked on the ARGESIM comparisons, both continuous and discrete, which lead to some pages in the SNE magazine, and his first conference publications on the 2004 EUROSIM Congress in Paris.
He continued with a diploma thesis on parameter identification in dynamic systems, finishing his studies in 2005.

During the 5th MATHMOD conference hosted in Vienna in February 2006 by ARGESIM he was part of the National Organising Committee,

At the moment he is part of Prof. Breitenecker's ARGESIM group, and is doing his PhD thesis in cooperation with ARC Seibersdorf Research, division Biogenetics / Natural Resources, looking for alternative approaches in groundwater modelling, emphasising on dealing with problems with very sparse data.

Through this cooperation, his position as project assistant on the Institute for Analysis and Scientific Computing is funded by, allowing him to participate in the education in modelling and simulation, joining his former lecturers in the very lectures which introduced him to his field of work.

SNE NEWS SECTION

CONTENT

SNE - Simulation News Europe is the official journal of EUROSIM and sent to most members of the EUROSIM Societies as part of the membership benefits. Furthermore **SNE** is distributed to other societes and to individuals active in the area of modelling and simulation. SNE is registered with ISSN 1015-8685. Circulation of printed version is 3000 copies.

SNE at Web – recent issues of SNE are also available via internet at WWW.ARGESIM.ORG. Members of EUROSIM Societies have access to the SNE Archive. If you have any information, announcement, etc. you want to see published, please contact a member of the editorial board in your country or *sne@argesim.org*.

SNE REPORTS EDITORIAL BOARD

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Editorial Information / Impressum - see front cover, inside

EUROSIM and EUROSIM Societies

EUROSIM - Federation of European Simulation Societies

General Information. *EUROSIM*, the Federation of European Simulation Societies, was set up in 1989. The purpose of EUROSIM is to provide a European forum for regional and national simulation societies to promote the advancement of modelling and simulation in industry, research, and development.
EUROSIM members may be regional and/or national simulation societies. 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, president and past president, and representatives for SNE and SIMPRA. The President is nominated by the society organizing the next EUROSIM Congress (B. Zupancic; president, SLOSIM); Secretary and Treasurer are elected out of members of the Board: P. Fritzson (secretary, SIMS), F. Breitenecker (treasurer and SNE, ASIM), Y. Hamam (past president, FRANCOSIM), J. Halin (SIMPRA).

SNE - Simulation News Europe. EUROSIM societies are offered to distribute to their members the journal *Simulation News Europe* (**SNE**) as official membership newsletter. SNE is a membership newsletter with information from the societies in the *News Section* as well as a journal with reviewed contribu-tions in the *Notes Section*.
SNE's Notes Section publishes technical notes (fully reviewed), short notes (reviewed), and software notes on general overviews or new developments, on new software and hardware, on new applications and methods, and book reviews on recent books in modelling and simulation and in related areas.
Furthermore SNE presents Simulation Centres, introduces Simulationists and reviews recent books on modelling and simulation and related topics.

SNE's special series *Comparisons of Modelling and Simulation Techniques and Tools* (*ARGESIM Comparisons*) gives a comprehensive overview on developments in application and implementation. These comparisons have become well-known benchmarks for modelling and simulation. In 2006, SNE starts with an opening of the comparison section. First, the comparison definitions will be complemented by contributions on the modelling procedure and on the mathematical, physical and general background, and second, SNE will also report about other benchmarks.

SNE reports in the *News Section* about EUROSIM, EUROSIM societies, SCS Europe and about other Simulation Societies and Simulation Groups.

In 2006, SNE started with a new layout, and also with a new organisational structure (editorial boards, review documentation, etc.). SNE appears three times a year, a single issue in July/August, and a double issue in December. Additionally, from 2006 on, *SNE Special Issues* will be published. In November 2006, the first special issue *Parallel and Distributed Simulation Methods and Environments* will be available. More information at WWW.ARGESIM.ORG.

SIMPRA. Members of EUROSIM societies can subscribe the official EUROSIM scientific journal *Simulation Modelling Practice and Theory* (SIMPRA) at a significantly reduced price. Information about recent issues and special issues may be found at WWW: EES.ELSEVIER.COM/simpat/ or from J. Halin (*halin@iet.mavt.ethz.ch*).

Report of the EUROSIM President

Board Meeting Vienna, February 2006

Contacts with groups in Spain. AES does not exist any more. They have Modelling & Simulation thematic group - app. 30 people in the frame of C*omité Espanol de Automática* (CEA), the coordinator is Miguel Angel Piera. I will contact him and propose that this group exchanges the former group.
Cooperation with Modelica Association. I invited Modelica Association to become associated member. However Modelica group is up to now not interested for it.
Contacts with CASS and JSST (Chinese Association for System Simulation - CASS; Japan Society for Simulation Technology - JSST). EUROSIM is co-sponsor of Asian Simulation Conference, 2005 in Beijing, 2006 in Tokyo and I was invited to be the member of International Steering Committee. Bo Hu Li and S. Takaba were invited into EUROSIM 2007 IPC.
Contacts with CSSS (Czech-Slovak Simulation Society - CSSS). I visited conference MOSIS'05 - April, 2005, Hradec nad Moravcí and had fruitful discussions with many members of CSSS (president Jan Štefan, Mikulaš Alexik, Miroslav Šnorek, …).
Contact with president of LSS (Latvian simulation society - LSS). I had a meeting with LSS president Yuri Merkuryev in March, 2005 in Ljubljana and invited LSS to become the member of EUROSIM.
LSS will apply for EUROSIM membership, after arranging some administrative formalities.

Contacts with SCS. During SCSC Conference in Philadelphia in July 2005 I had discussion with Francois Cellier, president of SCS. SCS and EUROSIM will try to establish some small cooperation steps: links on WEB pages, cooperation regarding calendar of events, exchange newsletter information.
Other possibilities: co-operation in IPCs, organisation of special sessions, collocated events, societies can offer reduced conference fees for members of SCS and EUROSIM.

Contacts with EUROSIM Observer Societies. The contacts with all three observers were established. Observer status is a transitional phase, observers must try to fulfil conditions and become full members.

General remark: New and younger active people are needed and are welcome in EUROSIM board, in societies' boards, ...

Report of the Editor-in-Chief SIMPRA
Jürgen Halin had a meeting with Elsevier representa-tive Keith Jones. Number of subscribers has not in-creased. However the number of downloaded articles increases (40 000/year). 200 submitted articles per year, 70 published per year.
Editor-in-chief will ask EUROSIM societies presidents for new candidates for SIMPRA board. Number of issues will be increased to 12 till 2009.

27. Board Meeting Vienna, February 2006, from the left: Borut Zupancic, (EUROSIM pres.), Constanza Zoe Radulescu (ROMSIM), Jadranka Bo□ikov (CROSSIM), Mikulaš Aleksik (CSSS), Andras Javor (HSS), Rihard Karba (SLOSIM), Alessandra Orsoni (UKSIM), Francois Rocaries (FRANCOSIM), Felix Breitenecker (Treasurer+ASIM+SNE), Peter Fritzson (Secretary), Esko Juuso (SIMS)

Report of the Editor-in-Chief SNE. Last issue of SNE from Dec. 2005 has a new coloured layout. More emphasize will be given to technical papers and short notes. With regard to the news section the editor-in-chief appeals not to send old information but only new one. There is enough place on the WEB to document old activities. Some special issues will be published for ASIM and offered to other societies. As there is no participant fee for EUROSIM Societies it is expected that societies buy SNE for all members.

EUROSIM Events & Conferences. Detailed analysis about simulation conferences in Europe (see minutes for details on WWW.EUROSIM.INFO) was presented. There are many events, most organised on profit bases, so the chances to make some coordination are very small. But EUROSIM must make coordination at least with regard to its own events.

Proposal for short term measures:

Societies must do the best that existing annual conferences promote EUROSIM: logo, link to EUROSIM, reduced fees for EUROSIM members.
The period arround EUROSIM congress must be free of other societies events.
If possible societies can skip annual conferences in the congress year - congress is replacement for it.

Proposals for longer term measures (after EUROSIM 2007):

We need more other events under co-organisation or sponsorship of EUROSIM.
But not new ones, as many events already exist: several ASIM events, UK conference, MOSIS by CSSS, MATHMOD in Vienna, SIMS conference, SimSafe, BIoMedSIm, conference of ISCS, MOSIM conference in France.
EUROSIM must become a trademark, which will help to attract more attendants.

We need a different structure of EUROSIM events - every year one conference. But not new one. Just existing conferences should be used, but more carefully prepared at this year, with higher standards, in English. EUROSIM board will make selection for some years in advance: e.g. 2008 UKSIM, 2009 ASIM (MATHMOD), 2010 EUROSIM Congress, 2011 SIMS ….. There are several structural possibilities for one triennial period.

EUROSIM Lists (membership lists, conference participants lists, …). Membership lists of national societies should be available to EUROSIM for different reasons: to inform people, for EUROSIM conferences, to know who is legitimate for reduced fee, …
There was a discussion about legal problems. It was decided that societies must obtain individual permissions (based on prepared enquiry) and send to EUROSIM such membership lists (with at least name and email).
EUROSIM would like to build a massive (email) list of people interested in modelling and simulation (events). It can be built and upgraded by the help of societies - from lists of theirs events. Later societies will be able to use it too.

EUROSIM WEB. National societies were asked again to put in its own information. Minimal structure: Info/contact News/activities /Conf./events. This structure can be expanded. Societies must nominate the person responsible for WEB.
Reports Societies (Reports/remarks/suggestions of EUROSIM member societies, EUROSIM observer member societies) - see Website WWW.EUROSIM.INFO
EUROSIM Congress 2007 in Ljubljana - see Website WWW.EUROSIM2007.ORG, see *Call for Papers*.

Any other business. It was proposed that more than one organisation from a country can become EUROSIM member and that necessary changes of the internal rules will be done and confirmed at the next board meetings.

Recent and Future Activities

Borut Zupancic and Khalid Al-Begain

Contacts ECMS-EUROSIM. During the European Conference on Modelling and Simulation (ECMS 2006) held in Sankt Augustin, near Bonn, Germany on May 29-31, 2006, I had a fruitful discussion with Khalid Al-Begain, the new president of *European Council for Modelling and Simulation* (ECMS).

Khalid has been elected during the ECMS General Meeting during the conference for the next two years after the period in which ECMS became an independent society with the intention to maintain strong collaboration with SCS International.

The meeting commenced with a mutual information exchange on current status of ECMS and EUROSIM. We also discussed some important issues within both societies. The second part of the discussion was devoted to explore possibilities for better cooperation. It was agreed that there should not be a rush for major immediate changes but better to start with concrete although small actions. Some of the discussed possible actions are:

- Webpage: to create links on both webpages to point to the other society's webpage.
- Calendar of events: important events of both societies can be included. These calendars can enable appropriate coordination of events which are in interest of both organisations.
- ECMS to act as co-sponsor on EUROSIM events and EUROSIM to co-sponsor ECMS events without any financial obligations.
- Both organisations can cooperate also in international program committees.
- Reduced conference registration fee for members of both organizations can be discussed in the future.
- The old idea of the organisation of a co-located event can be discussed and realised in the future.

Other Activities. During ECMS 2006 conference in Bonn I had fruitful discussions with some people with an aim to revitalize EUROSIM activities in some counties. Prof. Javier Otamendi from Madrid will help in renewing activities in Spain. With prof. António Carvalho Brito from Porto I discussed about the possibilities to establish the society in Portugal.

After a meeting in 2005 I met LSS president Yuri Merkuryev again in April and May 2006 in Ljubljana and in Bonn. He informed me that LSS will apply for EUROSIM membership in autumn 2006.
Prof. Leon Bobrowski, the president of Polish Society for Computer Simulation invited me to the PSCS 2006 workshop in Kazimierz Dolny (Aug. 31 - Sept. 2, 2006). During the workshop we shall discuss also about the possibility that Poland becomes full member of EUROSIM.

In November I shall visit the traditional Asian Simulation Conference JSST 2006 in Tokyo with the aim to establish better contacts especially with Japan and Chinese simulation societies and to promote EUROSIM 2007 congress also in that part of the world.

Borut Zupancic, EUROSIM president
borut.zupancic@fe.uni-lj.si

EUROSIM Congress.

The EUROSIM Congress is arranged every three years by a member society of EUROSIM. EUROSIM'04, the *5th EUROSIM Congress*, took place in Noisy-le-Grand, near Paris, France in Sept. 2004.
The *6th EUROSIM Congress* will be organized by the Slovene Society for Simulation and Modelling SLOSIM in close cooperation with German speaking modelling and simulation society ASIM and other simulation societies.

EUROSIM'07

6th EUROSIM Congress

September 10-14, 2007, Ljubljana, Slovenia

WWW.EUROSIM2007.ORG

Ljubljana - Your Host City. Ljubljana, the capital of Slovenia which is the member of the European Union, is the heart of the political, economic, cultural and scientific life of Slovene nation. It was build on the place of a Roman city Emona. Numerous churches, theatres, museums, galleries, the Medieval castle, give Ljubljana a reputation of being a modern and one of the most beautiful towns in Europe. Especially impressive are some works of the famous architect Jo□e Plecnik.

For more information about EUROSIM'07, please contact:

Prof. Borut Zupancic, chair of the congress
borut.zupancic@fe.uni-lj.si
Prof. Rihard Karba, chair of the IPC
rihard.karba@fe.uni-lj.si

ASIM - Buchreihen / ASIM Book Series

REPORTS

REPORTS

Fortschritte in der Simulationstechnik (FS) / Series Frontiers in Simulation (FS) - Monographs, Proceedings:

W. Borutzky: *Bond Graphs Methodology for Modelling Multidisciplinary Dynamic Systems*. FS 14, ISBN 3-936150-33-8, 2005.

M. Becker, H. Szczerbicka (eds.): *19th Symposium Simulation Techniques*. Proceedings Tagung ASIM 2007, Hannover; FS 16, ISBN 3-936150-49-4, 2006.

S. Wenzel (Hrsg.): *12. Fachtagung Simulation in Produktion und Logistik*. Proceedings Tagung ASIM SPL 2006; ISBN 3-936150-48-6, 2006.

F. Hülsemann, M. Kowarschik; U. Rüde: *18th Symposium Simulation Techniques*. Proceedings Tagung ASIM 2005 Erlangen; FS 15, ISBN 3-936150-41-, 2005.

Available / Verfügbar: SCS Publishing House e.V., Erlangen, WWW.SCS-PUBLISHINGHOUSE.DE
Download ASIM Website WWW.ASIM-GI.ORG (partly; for ASIM members)

Fortschrittsberichte Simulation (FB) / Advances Simulation (AS) / ASIM Mitteilung (AM) ARGESIM Reports (AR) - Special Monographs, PhD Theses, Workshop Proceedings

C. Deatcu, S. Pawletta, T. Pawletta (eds.): *Modelling, Control and Simulation in Automotive and Process Automation*. Proceedings ASIM Workshop Wismar 2006, ARGESIM Report 31, AM 101; ISBN 3-901-608-31-1, 2006.

H. Ecker: *Suppression of Self-excited Vibrations in Mechanical Systems by Parametric Stiffness Excitation*. ARGESIM Report FB 11, ISBN 3-901-608-61-3, 2006.

M. Gyimesi: *Simulation Service Providing als Webservice zur Simulation Diskreter Prozesse*. ARGESIM Report FB 13, ISBN 3-901-608-63-X, 2006.

J. Wöckl: *Hybrider Modellbildungszugang für biologische Abwasserreinigungsprozesse*. ARGESIM Report FB 14, ISBN 3-901608-64-8, 2006.

Available / Verfügbar: ARGESIM/ASIM Publisher, TU Vienna, WWW.ARGESIM.ORG
Download / Bestellung zum Mitgliederpreis € 10.- ASIM Website WWW.ASIM-GI.ORG

Reihen der ASIM-Fachgruppen / Series of ASIM Working Groups

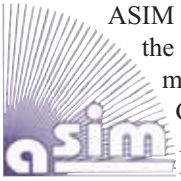
S. Collisi-Böhmer, O. Rose, K. Weiß, S. Wenzel (Hrsg.): *Qualitätskriterien für die Simulation in Produktion und Logistik*. AMB 102, Springer, Heidelberg, 2006; ISBN 3-540-35272-4.

M. Rabe, S. Spiekermann, S. Wenzel (Hrsg.): *Verifikation und Validierung für die Simulation in Produktion und Logistik*. AMB 103, Springer, Heidelberg, 2006; ISBN 3-540-35281-3.

A. Gnauck (Hrsg.): *Modellierung und Simulation von Ökosystemen - Workshop Kölpinsee 2004*. AMB 93, Shaker Verlag, Aachen, 2006; 3-8322-5203-7

Available / Verfügbar: Bookstore / Buchhandlung, ermäßigter Bezug für ASIM Mitglieder
Info at ASIM webite WWW.ASIM-GI.ORG

ASIM - German Simulation Society
Arbeitsgemeinschaft Simulation



ASIM (Arbeitsgemeinschaft Simulation) is the association for simulation in the German speaking area, servicing mainly Germany, Switzerland and Austria. ASIM was founded in 1981 and has now about 700 individual members, and 30 institutional or industrial members. Furthermore, ASIM counts about 300 affilated members.

ASIM News

From the ASIM Board

ASIM Conference. At the last board meeting in Hannover, June 2006, discussions about the structure of ASIM conferences took place. It can be observed, that the annual *ASIM Conference* attracts less people, while the application oriented conferences and workshops of the ASIM working groups show an increasing number of participants. Suggestions were e.g. to organise the *ASIM Conference* only bi-annual, or to set a special topic for the conference.
ASIM website. Another topic was the new *ASIM website*, where extensions and improvements were discussed. Up to now problems with the database occur, because of problems with firewalls.
ASIM Award. Furthermore, it was decided to introduce an annual *ASIM Award.* This award will be given to members, who have done excellent work in research and development of modelling and simulation, as well as in education for modelling and simulation.
EUROSIM 2007 Congress. Within international relations, it was again underlined to support strongly the *EUROSIM Congress 2007* in Ljubljana by special sessions, organisation of an ASIM meeting, etc.

ASIM Publications

SNE - Simulation News Europe. ASIM is publishing (co-publishing) SNE, which is regularly published and sent to all ASIM members (as part of their membership; 900 issues) and to all other member societies of EUROSIM (500), and which is spread for promotion (500 issues).

SNE - Special Issues. From 2006 on, the ASIM working groups will publish special issues with state-on-the-art reports on modelling and simulation in their workscope.

These series will be started in November the working group *Methods in Modelling and Simulation* with a special issue on *Parallel and Distributed Simulation Methods and Environments.*
The working group *Simulation in Production and Logistics* will continue in 2007 with a special issue on *Verification and Validation* (more details see elsewhere in this SNE issue).

ASIM Nachrichten. In December 2005, the *ASIM Nachrichten* has been replaced by an electronic newsletter - *ASIM Newsletter.* Up to now, three newsletters have been sent. Editors are T. Pawletta and C. Deatcu, University Wismar, *pawel@mb.hs-wismar.de*. Please send recent information to be round-mailed.

ASIM Mitteilungen. The trademark *ASIM - Mitteilungen* (AM) stands for all publications of the *ASIM Working Groups*.
Each publication of a working group gets an identification as *ASIM - Mitteilung,* independent of the publisher, and independent of the publication medium (print, CD, web).
For instance, the working groups *Simulation of Technical Systems* and *Methods in Modelling and Simulation* report about their spring meetings as well in a printed booklet (ASIM self-publishing or published by the hosting university) as well as on CD, as well as on the ASIM website (download of CD), while the working group *Simulation in Production and Logistics* publishes books at Springer Verlag, which are offered to the members at a reduced price; there, it is planned to compose an abstract volume for web publication (both being an *ASIM-Mitteilung*).
At present a database with all *ASIM - Mitteilungen* is set up, to be used in connection with the ASIM website for download for ASIM members.

ASIM Books. ASIM co-operates with the *SCS Publishing House e.V.* (previously *SCS Europe Publishing House*) and with *ARGESIM* (Vienna University of Technology) in publication of two book series: *Fortschritte in der Simulationstechnik - Frontiers in Simulation* and ASIM/ARGESIM/SCS book series *Fortschrittsberichte Simulation - Advances in Simulation.*
In these series the Proceedings of the annual ASIM conferences, Proceeding from special ASIM conferences, and also PhD theses are published.

Recent books in these and other series are:

M. Becker, H. Szczerbicka (eds.): *Proc. 19th Symposium Simulation Technique Hannover 2006*. Frontiers in Simulation FS 16, ASIM / SCS Publishing House e.V., ISBN 3-936150-49-4.

S. Wenzel (Hrsg.): *Simulation in Produktion und Logistik 2006*; Tagungsband 12. Fachtagung Kassel Sept. 2006. AMB 104, SCS Publishing House e.V, ISBN 3-936150-48-6.

H. Ecker: *Suppression of Self-excited Vibrations in Mechanical Systems by Parametric Stiffness Excitation*. Fortschrittsberichte Simulation / Advances in Simulation, ARGESIM Report Vol. 11, ASIM / ARGESIM Vienna, 2006; ISBN 3-901608-61-3.

M. Gyimesi: *Simulation Service Providing unter Verwendung von Web Service Technologie*. Fortschrittsberichte Simulation / Advances in Simulation, ARGESIM Report Vol. 13, ASIM / ARGESIM Vienna, 2006; ISBN 3-901608-63-X.

J. Wöckl: *Hybrider Modellbildungszugang für biologische Abwasserreinigungsprozesse*. Fortschrittsberichte Simulation / Advances in Simulation, ARGESIM Report Vol. 14, ASIM / ARGESIM Vienna, 2006; ISBN 3-901608-64-8.

S. Collisi-Böhmer, O. Rose, K. Weiß, S. Wenzel (Hrsg.): *Qualitätskriterien für die Simulation in Produktion und Logistik*. AM 102, Springer Heidelberg, 2006; ISBN 3-540-35272-4.

M. Rabe, S. Spiekermann, S. Wenzel (Hrsg.): *Verifikation und Validierung für die Simulation in Produktion und Logistik*. AM 103, Springer Heidelberg, 2006; ISBN 3-540-35281-3.

A. Gnauck (Hrsg.): *Modellierung und Simulation von Ökosystemen - Workshop Kölpinsee 2004*; Shaker Verlag, Aachen 2006, AM 93; ISBN 3-8322-5203-7.

C. Deatcu, S. Pawletta, T. Pawletta (eds.): *Modelling, Control and Simulation in Automotive and Process Automation*. Proceedings ASIM Workshop Wismar 2006, ARGESIM Report no. 31, AM 101; ISBN 3-901-608-31-1.

Books may be ordered via the ASIM website from December 2006 on; price reduction for ASIM members is offered (WWW.ASIM-GI.ORG)

ASIM Working Groups

Working Group Structure. ASIM is part of GI - *Gesellschaft für Informatik (Society for Informatics)* and is itself structured into working groups, which address various areas of modelling and simulation.

WG Methods in Modelling and Simulation

The ASIM working group *Methods in Modelling and Simulation* (GMMS) held two meetings in February 2006. The first meeting was a joint meeting with the working group *Simulation of Technical Systems* (STS) on February 20-21, 2006 in Munich (report see later).

Immediately after this meeting the working group met for a special workshop on Technical University Munich on February 22 - 24, 2006. The workshop was organised by Hans-Joachim Bungartz, Institute for Informatics, Technical University Munich.

The following lectures gave a survey on methods and applications in modelling:

- From dendritic and eutectic growth to grain coarsening using a phase-field model, Britta Nestler, HS Karlsruhe
- Some Aspects of High-Speed Electrophotographic Printing, Rainer Hoffmann, océ Munich
- Simulation of flow and transport processes in porous media - from CO2 sequestration in the sub-surface to the fuel cell, Rainer Helmig, University Stuttgart
- Geodynamic Earthmodels, Hans-Peter Bunge, LMU Munich
- Computational Mathematics in Nanoelectronics -- how mathematics contributes to chip design, Michael Günther, Universität Wuppertal
- Simulation elektronischer Schaltungen - vom Modell über den Simulationsalgorithmus zum industriellen Designflow, Peter Schwarz, TU Dresden
- Interactive Visualization: New Approaches and Advanced Techniques, Thomas Ertl, Universiy Stuttgart
- Lattice-Boltzmann methods: From Basics to Applications, Manfred Krafczyk, TU Braunschweig
- Adaptive Mesh Refinement - basic principles and algorithmic realization, Jörn Behrens, TU Munich
- Advances in Computational Fluid Structure Interaction, Wolfgang Wall, TU Munich

- Large eddy simulation of geometrically complex flows: immersed boundary method and wall models,
  Michael Manhart, TU München
- Modelling of interface phenomena in fluid mechanics, Nikolaus Adams, TU München

Abstracts and partly papers can be downloaded from the ASIM website (ASIM Mitteilungen) or directly from WWW5.IN.TUM.DE/workshops/asim.

In 2007, the annual workshop will take place at RWTH Aachen, organised by Ch. Bischof *(bischof@sc.rwth-aachen.de*). Information on web at WWW.SC.RWTH-AACHEN.DE/Events/ASIM07/.

ASIM GMMS Workshop 2007
Survey on Methods and Application in Modelling
February 28 - March 2, 2007, Aachen

The working group will also co-organise a joint meeting with the working group *Simulation of Technical Systems* (see later).
The working group is itself installing research groups on specific topics, like in education, scientific computing, structural-dynamic systems, etc.

WG Simulation in Environmental Systems and Medicine, Biology and Biophysics

The ASIM working group *Simulation in Environmental Systems and Medicine, Biology and Biophysics* (SUMGB) co-operates since many years with other working groups of GI (*Gesellschaft für Informatik*) in the area of environmental simulation. The working group is running two annual workshop series, the one on *Simulation in Environmental Systems*, and the other one on *Modelling and Simulation of Ecosystems.*
In March 2006, a workshop of the first series took place in Leipzig. Information can be found at WWW.IBGW-LEIPZIG.DE/asim. The next workshop in the second series is organised in October 2006:
Information can be obtained by Albrecht Gnauck, Brandenburgische Technische Universität Cottbus, Email: *umweltinformatik@tu-cottbus.de,*
WWW.TU-COTTBUS.DE/UMWELTINFORMATIK/

ASIM SUGMBB Workshop 2006
Modelling and Simulation of Ecosystems
October 25-27, 2006; Kölpinsee, Usedom

For spring 2007 again a workshop in the series *Modelling and Simulation of Ecosystems* is planned.

The working group is publishing Proceedings of the meetings in the series *Umweltinformatik* at Shaker Verlag. It is intended to make these books electronically available to ASIM members or to produce separately a booklet with abstracts (*ASIM Mitteilungen*).

WG Simulation of Technical Systems

The ASIM working group *Simulation of Technical Systems* (STS) and *Methods in Modelling and Simulation* held a joint meeting in Munich on February 20-21, 2006. About 120 engineers and scientists from industry, research labs and university met in Munich for a common meeting at FH München.

Three plenary papers introduced into the main topics:
- Ausführliche Fehlersimulation zur Absicherung von Robustheit und Verfügbarkeit mechatronischer Systeme
  A. Junghanns, DaimlerChrysler AG, Berlin
- Simulation: durch Abstraktion zum Systemverständnis
  Thomas Lang, BMW AG, München
- XML-Schnittstelle für Simulations- und Berechnungsprogramme
  Hansjörg Kapeller, arsenal research, Wien

About 50 presentations introduced to intense discussions of the following subjects:
- Methods of model based development
- Errorsimulation, Simulation of alternate drives
- Special aspects of HIL-Simulation
- Simulation with VHDL-AMS

The evening of the first day was spent in the Löwenbräu beer restaurant, downtown in Munich. The meeting was closed with a visit of the BMW production line. Ten exhibitors showed their software and their services. The participants had much time for discussions and the chance to meet close new contacts and to meet old friends. The meeting was organized by FH Munich (Prof. Kohl) and ASIM. *Proceedings* of this meeting are available as *ASIM Mitteilung* in electronic from at the ASIM website.

In 2007, the working group will organise the annual workshop at University Bremen (organiser Rainer Laur, *rlaur@item.uni-bremen.de*), again together with working group GMMS:

ASIM STS/GMMS Workshop 2007
Modelling of Technical Systems
February 26 - 27, 2007; Bremen

The workshop emphasises on exchange of experience between industry, university and research centres. Information about this workshop at website WWW.ITEM.UNI-BREMEN.DE/asim/.

WG Simulation in Production and Logistics

The ASIM working group *Simulation in Production and Logistics* (SPL) organises the very successful bi-annual conference series *Simulation in Production and Logistics*. These conference series is continued with the *12th Conference* in Kassel, September 26 -27 2006. A detailed report will be given in the next SNE issue.
The Proceedings of this conference will be published at SCS Publishing House e.V. In 2007, they will be also available at the ASIM website (download for members). More info about this conference (organiser Sigrid Wenzel) from *asim@uni-kassel.de* or at WWW.UNI-KASSEL.DE/fb15/ipl/pfp/asim06spl/ .

The working group organises also one-day meetings in industry, at research centres or at fairs. The last meeting took place in June 2006 at Adam Opel AG Rüsselsheim. For info on next meetings, follow entry WWW.ASIM-GI.ORG/index.php?id=192 at ASIM website.

The working group SPL has compiled two books, which appear in November 2006 (details before in section on ASIM books):

- Qualitätskriterien für die Simulation in Produktion und Logistik
- Verifikation und Validierung für die Simulation in Produktion und Logistik

WG Simulation in Business Administration

The working group *Simulation in Business Administration* (SBW) held its tri-annual conference *Simulation as Operational Decision Support* on March 13 - 15, 2006, in Braunlage, Harz. Info at the website WUB113.WISO.UNI-GOETTINGEN.DE.

WG Simulation of Traffic Systems

The working group *Simulation of Traffic Systems* (SVS) plans a meeting on the occasion of the SIMVIS conference, Magdeburg, March 2-3, 2007.

ASIM Conferences

ASIM organises the annual *ASIM Conference*, the ASIM working groups organise annual workshops (up to 150 participants) and bi-annual conferences (more than 150 participants. ASIM cooperates in organising the tri-annual *EUROSIM Congress*.

Furthermore, ASIM co-organises local conferences, e.g. the annual *ASIM Workshop Simulation in Automotive* in Wismar
A special co-operation was established with the annual conference series SIMVIS - *Simulation and Visualisation* in Magdeburg (March) and with the three-annual conference series MATHMOD - *Mathematical Modelling* in Vienna (February).

ASIM Annual Conference. In 2006, the annual *ASIM Conference* takes place in Hannover. The conference is organised by at University Hannover by Helena Szczerbicka and Rainer Rimane, Septemer 6 - 11, 2006. A detailed report will be given in the next issue.

EUROSIM Congress. In 2007, SLOSIM, the Slovenian Simulation Society will organise the *EUROSIM Congress*; ASIM will not only co-sponsor, but also co-organise this event, so that in this year the annual ASIM Conference is part of EUROSIM 2007. Details see later.

SIMVIS. ASIM is co-organiser of the annual international conference *Simulation and Visualisation* (SIMVIS) in Magdeburg:

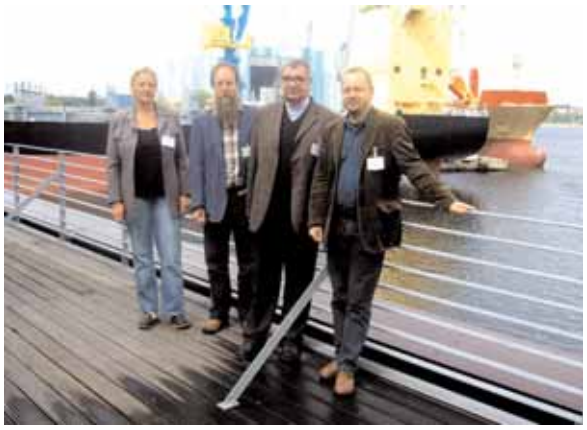
SIMVIS 2007
17th Simulation and Visualization Conference
March 8 - 9, 2007, Magdeburg, Germany

The Conference *Simulation and Visualization* 2007 is open to everyone with interest in the fields of simulation, modelling and visualization (SimVis). The goal of this conference is the presentation of new research and innovative applications. In addition SIMVIS provides meeting place for simulation and visualization practitioners, researchers, and vendors working in all disciplines and in the industrial, governmental, military, and academic sectors.
The conference program is being organized into tracks that reflect the current state of the SIMVIS field as well as the mix of interests and professional orientations of conference attendees.
More information about SIMVIS can be found at WWW.SIMVIS.ORG.

MATHMOD. ASIM is co-organiser of the tri-annual conference series MATHMOD in Vienna.
The 5th MATHMOD Conference took place at Vienna University of Technology on February 7 - 10, 2006. A detailed report can be found in this SNE issue.
The 6th MATHMOD Conference will take place February 4 -7, 2009 (info at WWW.MATHMOD.AT).

Wismar Workshop

At University Wismar a regional workshop has been established, the workshop on *Modelling, Control and Simulation in Automotive and Process Automation*.
The *3rd ASIM Wismar Workshop* took place from 18th to 19th May in Wismar, Germany.
A substantial goal of the workshop was exchange of experience between simulation specialists from universities and industry about the field of automotive as well as process automation.
For this reason the workshop was organised together by representatives from universities as well as from industry.
Organisers came from the *Department of Mechanical Engineering* and *Department of Electrical Engineering & Computer Science* of University Wismar, the *University of Rostock* as well as from the industrial partner *IAV GmbH Gifhorn* and the workshop was arranged in cooperation with ASIM.



Wismar Workshop May 2006: Organisers with ASIM President (Ch. Deatcu, Thorsten Pawletta, Felix Breitenecker, Sven Pawletta)

Wismar Workshop May 2006: Coffee Break

More than 60 participants from all over Germany visited Wismar to discuss about current developments. Both days were filled with interesting talks on e.g. modelling of car components, sensor technology, recent improvements of modelling and simulation tools as Modelica/Dymola, engine control and much more. Collected contributions are issued as *ARGESIM Report* no. 31 with ISBN 3-901-608-31-1 (for ASIM members also download from ASIM website).

Also the beautiful location close to the Baltic Sea contributed to good success of the third event of Wismar workshop series. Next workshop is planned for spring 2008.

ASIM at EUROSIM 2007

In 2007, SLOSIM, the Slovenian Simulation Society will organise the *EUROSIM Congress* EUROSIM'07. ASIM will not only co-sponsor, but also co-organise this event, so that in this year the annual *ASIM Conference* is part of EUROSIM 2007.

Call for Sessions - Call for Contributions
ASIM invites its members to come to Slovenia in September 2007 and to participate at the EUROSIM 2007 Congress in

- Special Sessions, Work Groups
- ASIM General Meeting
- Continuation Yo-yo Contest

Up to now, the following Special Sessions / Workshops are planned:

- Simulation in / and Education
- Quality Management in Modelling and Simulation
- Validation and Verification in Discrete Simulation
- Modelling with XML / UML
- Modelling and Simulation of Structural -dynamic Systems
- Modelica - Modelling and Simulation
- Modelling and Simulation with Cellular Automata
- Benchmarking in Modelling and Simulation

Furthermore, ASIM will organise an *ASIM Member Assembly* and a continuation of the *Yo-Yo - Contest*, started at 5th MATHMOD in Vienna 2006.

Details and Calls will be published at the ASIM website in December 2007. For information, please visit WWW.EUROSIM2007.ORG, WWW.ASIM-GI.ORG.

ASIM Conference Calendar

Informatik 2006
36. Jahrestagung der GI
Gesellschaft für Informatik
October 2 -6, 2006; Technische Univ. Dresden, Germany
WWW.INFORMATIK2006.DE

ASIM SUGMBB Workshop 2006
Modelling and Simulation of Ecosystems
October 25-27, 2006; Kölpinsee, Usedom
WWW.TU-COTTBUS.DE/umweltinformatik/

ASIM - STS/GMMS Workshop 2007
February 20 - 21, 2007; Bremen, Germany
WWW.ITEM.UNI-BREMEN.DE/asim/

ASIM - GMMS Workshop 2007
February 28 - March 2, 2007, Aachen
WWW.SC.RWTH-AACHEN.DE/Events/ASIM07

SIMVIS 2007
17th Simulation and Visualization Conference
March 8 - 9, 2007, Magdeburg, Germany
WWW.SIMVIS.ORG

ASIM - SUGMBB Workshop
Simulation in Environmental Systems
To be announced later

6th EUROSIM Congress
EUROSIM 2007
ASIM Special Sessions
Sept. 10-14, 2007, Ljubljana, Slovenia
WWW.EUROSIM2007.ORG, WWW.ASIM-GI.ORG

ASIM Info and Contact

ASIM Working Groups

GMMS Methods in Modeling and Simulation
P. Schwarz, Fraunhofer Gesellschaft Dresden
schwarz@eas.iis.fhg.de

SUGMBB Simulation in Environmental Systems and Medicine, Biology, and Biophysic
J .Wittmann, Univ. Hamburg,
wittmann@informatik.uni-hamburg.de

STS Simulation of Technical Systems
A. Wohnhaas, debis Systemhaus GEI,
Achim.Wohnhaas@t-systems.com

SPL Simulation in Production and Logistics
Sigrid Wenzel, Universität Kassel,
s.*wenzel@uni-kassel.de*

SVS Simulation of Transport Systems
U. Brannolte, Univ. Weimar,
Ulrich.Brannolte@bauing.uni-weimar.de
M. Klug, ARCS Seibersdorf,
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SBW Simulation in OR
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Austria, payment-, membership administration

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Prof. Dr. Sigrid Wenzel (Stellv. Sprecher)
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Switzerland

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WWW-Information: WWW.ASIM-GI.ORG

Email: *info@asim-gi.org* (for information)

admin@asim-gi.org (for administration)

CROSSIM - Croatian Society for Simulation Modelling

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. CROSSIM is a full member of EUROSIM since 1997.

Information, Contact Address

The updated information about Society available from EUROSIM website at: WWW.EUROSIM..INFO

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jbozikov@snz.hr

Activities.

The Society is engaged in dissemination of information on simulation as well as in organization of meetings, courses and workshops. CROSSIM co-operates with the University Computing Centre, Zagreb, in organization of an international conference Information Technology Interfaces (ITI) and in pub-lishing of the Journal of Computing and Information Technology (CIT). All information concerning CIT is available at CIT.SRCE.HR.

Past Events

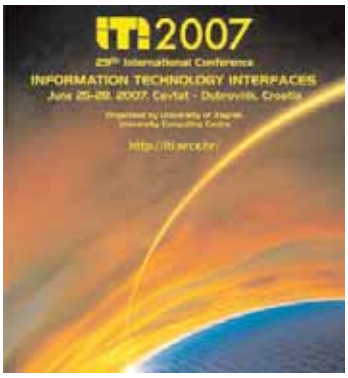
28th International Conference *Information Technology Interfaces ITI 2006* was held in Cavtat near Dubrovnik on June 19-22, 2006. This year the Conference gathered together 198 participants from 27 countries, and, as usually, included a session on simulation, modelling and optimisation.

Coming Events

The announcement and call for papers for the next, ITI 2007 Conference is already launched. The Conference will be held in Cavtat near Dubrovnik on June 25-28, 2007.

ITI 2007
28th Conference
Information Technology Interfaces
June 25 - 28, 2007
Cavtat near Dubrovnik, Croatia
ITI.SRCE.HR

The Conference has a long tradition (since 1974) of creating an inspiring, productive and pleasurable atmosphere for interdisciplinary communication among researchers, scholars and professionals from various subfields of ICT arena. ARGESIM and CROSSIM are among Conference co-operating institutions.



ITI Conference is scientific, multidisciplinary confer-ence, but each year there is a special topic for the conference. In 2006 this special topic is *Knowledge Discovery in Education, Government, Industry and Business*.
Conference registration, paper submission and hotel reservation can be done through Internet at: ITI.SRCE.HR.

KOI 2006
11th International Conference on
Operational Research
September 26 - 29, 2006
Pula, Croatia

Another conference that also includes topics on modelling, simulation and optimisation is the 11th International Conference on Operational Research - KOI-2006 organised by the *Croatian Operational Research Society* (CRORS).

It will take place on September 27-29, 2006 in the Histria hotel in Pula, Croatia.
Information available at:
OLIVER.EFPU.HR/koi06.

Jadranka Bozikov
jbozikov@snz.hr

CSSS - Czech and Slovak Simulation Society

General Information

CSSS -The *Czech and Slovak Simulation Society* has about 150 members working in 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.
Steering committee of CSSS:

- Jan Stefan, chairman
- Mikulas Alexik, Univ. of Zilina, vicechairman
- Miroslav Snorek, Czech Technical University in Prague, tresauer
- Milan Ceška, Brno University of Technology
- Frantisek Zboril, Brno University of Technology
- Petr Peringer, Brno Univ. of Technology
- Stanislav Racek, Univ. of West Bohemia,Pilsen
- Milan Sujansky, Technical Univ. Kosice
- Ev□en Kindler, Universitas Ostraviensis, Ostrava
- Miro Luhan, Prague

News. In January 25, Brno University of Technology, Faculty of Information Sciences, hosted the Board Meeting of CSSS, where among other topics the question of EUROSIM 2010 was discussed. CSSS society is capable to prepare EUROSIM 2010 congress in Prague. Futher decision will be made at EUROSIM 2007 Congress next year in Ljubljana, where members of CSSS will actively participate.

The representative of CSSS in EUROSIM Board prof. Mikulas Alexik was asked to propose the preparation of the next EUROSIM Board in Bratislava. It is comfirmed, that the next EUROSIM Board will be held at Slovak Technical University on 11. 12. 2006. A social program (welcome program) will be held on Saturday and Sunday for Board members.
The next executive board of CSSS will be held during ASIS workshop on 12. 9. 2006 - 13. 9. 2006 in Vranov u Brna, Czech republic.

Past Events. The *3rd International Workshop New Trends in System Simulation* (NETSS'2006) took place in Vranov u Brna, Czech republic from 22nd to 23th of February. About 25 participants from Czech and Slovak republic attended the workshop. The chairman of the international organising committee was Dr. Ing. Jan Stefan.
The *39th International Conference on Modelling and Simulation of Systems* (MOSIS'2006) that took place from 25th to 27th of April 2005 in Prerov, Czech republic, was organised by the Department of Computer Science FEEI VSB - Technical University Ostrava and Faculty of Information Technology, University of Technology Brno and sponsored by CSSS, ASU, EUROSIM and SCS. The Conference was connected with conference ISM'2006 - *Information System Implementation and Modelling* and 1st International Workshop WFM'06 - *Workshop on Formal Models*. Some 72 participants from Czech republic, Slovakia and Poland attended the conference. The chairman of the international organising committee was Dr. Ing. Jan Stefan.

Mikulas Alexík
alexik@frtk.fri.utc.skl

Coming Events

The 28th International Workshop *Advancements in Simulation Systems* (ASIS'2006) will take place in the Moravian town Vranov u Brna, Czech republic on September 12-14, 2006. The chairman of the international organising committee is Dr. Ing. Jan Stefan.

ASIS'2006
28th International Workshop
Advancement in Simulation Systems
September 12 - 14, 2006
Vranov u Brna, Czech republic

The 7th International Scientific *Conference on Electronic Computers and Informatics'2006* will take place on September 20-22, 2006, in Herlany, Slovak republic. One of the topics is focusing on *Modelling and Simulation of the Systems*. The general chair of the conference is prof. Hudak from Technical University of Kosice, chair of organisation committee is doc. Jan Baca, email:*jan.baca@tuke.sk*.. More information can be found on web: KPI.FEI.TUKE.SK/eci.

Electronics Computers and Informatics 2006
7th International Scientific Conference
September 20 - 22, 2006
Herlany Slovak Republic

SIMS - Scandinavian Simulation Society

General Information

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

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*), DKSIM (*Dansk Simuleringsforening*) and NFA (*Norsk Forening for Automatisering*).

Membership, SIMS Board
- Peter Fritzson, chairman
- Jørn Amundsen, Erik Dahlquist, Brian Elmegaard, Kaj Juslin, Esko Juuso, Bernt Lie, Kim Sörensen
- Vadim Engelson - SIMS coordinator for practical matters
- The position of Iceland will be filled later.

You can contact the chair of the SIMS board:
Prof. Peter Fritzson
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58183 Linköping, Sweden
Phone +46 13 281484, Fax +46 13 284499
petfr@ida.liu.se

To become a member of SIMS you should join one of the SIMS member organizations, as specified on the SIMS web page WWW.SCANSIMS.ORG.

Past Events

The *Danish Simulation Day on Simulation of Boilers* was organised by DKSIM at Aalborg Industries in Aalborg April 18, 2006.

The *Finnish Simulation Day on Virtual Mill and 3D modelling in Plant Design* was organised by FinSim at Pöyry Engineering in Helsinki May 23, 2006.

The Control Systems 2006 Conference was held in Tampere, Finland June 6-8th, 2006 with the workshop of *COST Action* E36 Modeling and Simulation in the Pulp&Paper Industry on June 5th as a pre-event. The conference belongs to a long series of bi-annual events with rich history extending back to the 1980s.

The *COST Action* is a European Commission sponsored form of networking, and the workshop was open to participants outside the EU as well.
The programme consisted of 35 papers, 3 keynote presentations and 12 posters. More than 90 partici-pants attended the conference.
The plenaries provided industrial and research perspectives on challenges in control systems development. The programme contained modelling and simulation and industrial applications both in pulping and in paper machines. The applications covered control, monitoring and diagnostics as well as optimisation and decision support.

The next *Control Systems Conference* will be held in Vancouver, Canada, in 2008. Further information is available on SIMS web page WWW.SCANSIMS.ORG.

The *1st IFAC Workshop on Applications of Large Scale Industrial Systems* - ALSIS'06 Workshop was arranged as a cruise between two Scandinavian capitals, Helsinki and Stockholm in August 30-31, 2006.

The *Applications of Large Scale Industrial Systems*, the first workshop of its kind in IFAC, covered such systems as mill- and company-wide systems, communication systems, environmental systems, intelligent manufacturing systems, and so on. Large scale system theory provides methodologies to deal with complexity in modelling, control, and design of such systems.

The special emphasis was on industrial applications (chemical and petrochemical industries, metallurgical industries and pulp and paper) and development tools and methods applicable in industrial environment.
Further information is available on the web page NTSAT.OULU.FI

The Workshop on *New Trends in Automation* was organised by Malardalen University in Vasterås, Sweden, September 4-5, 2006. The workshop contained keynote presentations, peer reviewed papers and discussion workshops.

The program included speeches of well knows researchers and authorities in different areas in the field of automation.
The workshop discussed on various future trends, combining experience and competence different areas, Robotics and possibilities of new advanced controls in process industries and power plants. Further information is available on the SIMS web page WWW.SCANSIMS.ORG.

The *International Modelica Conference* was held at Arsenal Research in Vienna, Austria on September 4-5, 2006.
The conference was organized by the Modelica Association and Arsenal Research. Further information is available from WWW.MODELICA.ORG.

Future Events

The *47th Scandinavian Conference on Simulation and Modelling*, will be organized by *Finnish Simulation Forum* (FinSim) in Helsinki, Finland, September 27-29, 2006.

47th SIMS Conference
SIMS 2006 Annual Conference
September 28-29, 2006
Helsinki, Finland

The purpose of SIMS 2006 is to cover broad aspects of modeling and simulation and scientific computation. It will be of interest for model builders, simulator personnel, scientists, engineers, vendors, etc.
The scientific program consists of technical sessions with submitted and invited papers, and vendor demonstrations.
Presented papers will be considered for publication in the EUROSIM scientific journal *Simulation and Modelling - Practise and Theory* (SIMPRA) published by Elsevier Science. The annual meeting of SIMS will be held during the conference.
Further information is available on the SIMS web page WWW.SCANSIMS.ORG.

SIMS Contact Address, Information
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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, and the Chinese Association for System Simulation and the Japanese Society for Simulation Technology.

The Steering Committee of DBSS consists of the following members: A.W. Heemink (TU Delft), Chairman, L. Dekker, Vice-Chairman , W. Smit (E&E Consultants, Inc.), Secretary and Treasurer, Th.L. van Stijn (Royal Dutch Meteorological Institute/KNMI).

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:

- 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).
- 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.

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

Dutch Benelux Simulation Society
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The Netherlands,
Tel: + 31 (0)15 2785813, Fax: -2787209
a.w.heemink@its.tudelft.nl

SLOSIM - Slovenian Society for Simulation and Modelling

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 69 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. The following activities were undertaken by the SLOSIM members.

MATHMOD 2006. The SLOSIM members took an important part in the 5th MATHMOD in Vienna:

- The vice president of SLOSIM dr. Leon □lajpah had an invited plenary lecture entitled: *Simulation in Robotics*.
- Prof. Borut Zupancic organized two sessions entitled: *Modelling and Simulation for Control*, *Coordination, and Supervision*.
- Prof. Drago Matko organized a session entitled: *Mathematical Models in Cooperative Multiagent Systems*.
- SLOSIM members chaired five sessions.
- Eleven contributions, presented by the SLOSIM members were included in the programme of MATHMOD 06.

ERK06. The members of the society were animated to participate in the 15th Slovenian ERK 06 conference in September in Portoro□, Slovenia, where SLOSIM traditionaly organizes sessions from modelling and simulation area.

SLOSIM Executive Board Meeting took place in May at the Faculty of Electrical Engineering where the past actions were presented to the members and also some new were planned.

Preparation EUROSIM 2007. The following was undertaken concerning the organisation of the EUROSIM'07 Congress

- about 2000 leaflets announcing the Congress were distributed on different meetings all over the world till now,
- extensive mailing list were integrated, internet page WWW.EUROSIM2007.ORG was designed,
- International Programme Comittee with more than sixty members was established,
- the first email with call for papers was sent,
- some initial actions connected with tutorials, sponsors, and exhibitors were undertaken.

EUROSIM president prof. Borut Zupancic and SLOSIM president prof. Rihard Karba took part in the EUROSIM Board meeting in February in Vienna

Information, Contact Address

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ROMSIM - Romanian Modelling and Simulation Society

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.

Contact Address

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71316 Bucharest, Romania
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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, and conferences.

Activities

At the Department of *Information and Knowledge Management* at the Faculty of Economic and Social Sciences of the Budapest University of Technology and Economics classes *Simulation and Modeling in Economy* and an other *Decision Making and Management using Simulation* as well as simulation laboratory practices are held for graduate and post-graduate students studying economy, informatics and electrical engineering. PhD students participate in various simulation research projects aimed at methodological basic research as well as applications of simulation mainly in the fields of traffic, economic and interdisciplinary problems.

In the town of Györ at the Széchenyi István University the discipline of simulation is also taught. Here the class *Simulation Methodology and Applications* is studied by undergraduate students of informatics, electrical and traffic engineering. Lately a new specialization called *Compter Science in Economy* was started, where simulation is also taught as a basic subject.

Our efforts mentioned are intended to contribute to the dissemination of the various aspects of the methodology and application of simulation. 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.

Contact address

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Faculty of Economic and Social Sciences
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1111 Budapest, Sztoczek u. 4. , Hungary
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E-mail: *javor@eik.bme.hu*

PSCS - Polish Society for Computer Simulation

General. PSCS 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 264 members. The Board of fifth cadence consisting of the following persons directs the affairs of the PSCS:

- Leon Bobrowski - President
- A. Chudzikiewicz, A. Grzyb - Vice Presidents
- Zenon Sosnowski - Treasurer
- Zdzislaw Galkowski - Secretary
- R. Bogacz , Z. Strzyzakowski, A. Tylikowski

Activities. The main activity of the Polish Society for Computer Simulation are annual conferences known as PSCS *Workshops on Simulation in Research and Development*. The PSCS Workshops were organized in Mielno (1994), Warszawa(1995), Wigry (1996), Jelenia Gora (1997, 1998), Bialystok and Bialowieza (1999), Zakopane - Koscielisko (2000), Gdansk-Sobieszewo (2001), Osieki k/Koszalina (2002), Zakopane (2003), Bialystok/Augustow (2004), and Sarbinowo Morskie k/Koszalina (2005).

Past Events. On February 9, 2006 the general assembly of PSCS members was held in Warsaw. This meeting, besides representing an interesting forum to discuss and promote activities of the society, was the occasion to elect the Board for the period 2006-2008.
Publications. Proceedings of the 11th PSCS Workshop on *Simulation in Research and Development*, L. Bobrowski and A. Tylikowski (Eds.), Warszawa, 2005, (in Polish). The price is 30,- PLN.

Coming Events. Prof. Z. Strzyzakowski will organize the 13th PSCS Workshop on *Simulation in Research and Development* on Aug. 31- Sept. 2, 2006 in Kazimierz Dolny, Poland. Contact: *zstrz@data.pl.*

13th PSCS Workshop
Simulation in Research and Development
September 15 - 18, 2006

Contact Address:

The Polish Society for Computer Simulation
c/o IBIB PAN
ul. Trojdena 4, p.416, 02-109 Warszawa,
Tel +48 22 6608244, Fax. - 6608622
leon@wi.pb.edu.pl

Z. Sosnowski, *zenon@wi.pb.edu.pl*

UKSim United Kingdom Simulation Society

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.

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 until the next conference. For more information about the Membership please contact the Membership Secretary:

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DUCATI.DOC.NTU.AC.UK/UKSIM/

UKSIM Activities

The UK Simulation Society has held its international conference at Oriel College (Oxford) on 4-6 April 2006. For the second year the conference did benefit from the technical co-sponsorship of the IEEE UK-RI Computer Chapter. A total of 30 high quality papers, including 2 invited talks by industrial and academic keynote speakers, were presented at the conference.
The first keynote address by Neil Bowerman, simulation specialist at Nestle UK, illustrated with on-line examples the costs and benefits of simulation in this important industrial sector.

The second keynote speaker, Prof. Mahdi Mahfouf, from the University of Sheffield Department of Automatic Control and Systems Engineering, presented the main landmarks and future trends in the modelling and optimisation of intelligent systems for material processing.

The presentations were organised in 8 sessions covering the key modelling and simulation areas of Health and Human Models, Performance Modelling and Optimisation, Algorithms, Methodologies and Applications, Distributed Systems and Networks, Performance Models and Wireless Networks, Environment and Health Models, Industrial and Business Applications, Distributed Systems and Networks.

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 social activities for the conference participants included one afternoon of sightseeing in Oxford, and a conference banquet at Oriel.

The Society held a *Meeting at Oriel College* to finalise the planning for next year's conference and further plan for 2006/2007 activities. New board members were elected during the meeting to support the increased number of activities and events organised by the society, and to strengthen its international and industrial links. As a result the board of the UKSim society welcomes three new members: Neil Bowermann, a long-term industrial supporter from Nestle and friend of UKSim, as industrial representative, Dr. Gaius Mulley from the University of Glamorgan, as newsletter editor, and Dr. Adam Brentnall from Imperial College as newsletter co-editor.

Several members of the UKSim board have significantly contributed to the management and organisation of the *20th European Conference on Modelling and Simulation* (ECMS'06) held in Bonn, Germany on 28-31 May 2006. The scientific programme included over 120 high quality papers organised in 13 sessions. The new President of ECMS, elected during the ECMS/SCS-Europe Council meeting in Bonn is Prof. Khalid Al-Begain from the University of Glamorgan, who has been part of the UKSim board for several years.

Conferences

On the occasion of the 10th anniversary of UKSim conferences, the society will hold its 2007 meetings in Thailand as the *Asian Modelling Symposium 2007*, at the Prince of Songkla University, Phuket Campus, from 27 to 30 March 2007, in conjunction Thailand's *Annual National Symposium for Computational Science & Engineering* (ANSCSE-11).

Paper/poster submissions for the conference are invited by the deadline of 12 October 2006.

UKSIM 2007 Conference
AMS'07 - Asian Modelling Symposium
March 27 - 30, 2007
Phuket Camus, Thailand

For participants starting their trip in the UK, the conference organizers are preparing a 10 day travel and accommodation package to include 3 days in Bangkok and 7 days in Phuket, details will be made available on the conference website

DUCATI.DOC.NTU.AC.UK/UKSIM/uksim'07/
Asia_Modelling_Symposium.htm

Thailand, the land of smiles, wishes to welcome you all with warm hospitality to AMS2007.

EMS Conferences. In September the society will launch a new series of events under the title of *European Modelling Symposium*. The first meeting of this series, EMS2006, will be hosted by University College London on 11-12 September 2006. This two-day event will be especially attractive to new researchers, post-graduates and post-doctoral fellows. Fully credited papers will be rigorously reviewed to international standards and will appear in the Symposium

Proceedings. In addition, a selection of the papers will be chosen to be published in the *International Journal of Simulation, Science and Technology*. Further information may be found at

WWW.EURO-MODELLING-SYMP.INFO

EMS 2006
European Modelling Symposium
September 11 - 12, 2006
London, UK

Journal JSSST. A special issue of the IJSSST on *Modelling, Simulation, and Decision Support* was published in July, including a selection of extended papers from the UKSim conference (July 2006). Three issues of the journal were published earlier in 2006. These include a special issue on *Performance Evaluation of Computer Systems* (January), a special issue on *Performance Engineering* (March), and a special issue on *Vision &Visualisation* (May).

Newsletter Service. The society has recently started a newsletter service where news on simulation research and related events are posted and shared among members. Members are encouraged to contribute to the newsletter with short reports on research achievements or simulation events recently attended and with information on upcoming events of interest.

Alessandra Orsoni, *A.Orsoni@kingston.ac.uk*

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 and simulation of discrete event systems. To improve the necessary synergy between industry and academia workers in the area of system modelling, the pole co-organises a series of conferences MOSIM (*Modelling and Simulation*).
Pole contact:

Professor Henri Pierreval,
IFMA, Campus des Cezeaux,
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Tel +33 (0)4 73 28 - 81 06, Fax - 81 00
pierreva@ifma.fr

Pole Modelling and simulation of continuous systems. This pole has launched in 1999 a series of conferences on *Modelling and Simulation in Medicine and Biology* (BioMedSim). The fifth will take place in Jordan in spring 2007. Pole contact:

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ISCS - Italian Society for Computer Simulation

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: Ing. Mario Savastano (Chairman), Prof. Franco Maceri (Vice Chairman), Dr. Paola Provenzano (Secretary), Prof. Pasquale Arpaia (Treasurer).

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INTERNATIONAL SOCIETIES AND RESEARCH GROUPS

MATHMOD Vienna - MATHMOD Conference Series

The *MATHMOD Conference Series* was started with the first MATHMOD Conference in February 1994. In 1997, 2000 and 2003 the series was successfully continued by the second, third, fourth and fifth MATHMOD Conference. The series has established as well-accepted and high-standing triannual conferences on mathematical modelling and simulation.
The conference series is run by the Institute for Analysis and Scientific Computing (I. Troch) of Vienna University of Technology, in close cooperation with ARGESIM (F. Breitenecker). After a very successful 5th MATHMOD the organisers start now with the preparation of the next conference, the 6th MATHMOD 2009.

6th MATHMOD Vienna
6th Vienna International Conference on Mathematical Modelling
February 4 – 6, 2009; Vienna, Austria

The scope of the conference covers theoretic and applied aspects of the various types of mathematical i.e. formal modelling for systems of dynamic nature (deterministic, stochastic, continuous, discrete or hybrid, etc.). The conference will also deal with alternative modelling methods (e.g. cellular automata) and modelling for / in scientific computing. The topics to be discussed will include e.g.

- modelling theory, processes and methods for model formulation, identification, development, reduction and validation
- automation of modelling and software aids for modelling, computer modelling
- qualitative modelling including fuzzy and iterative approaches to modelling
- modular modelling and interdisciplinary modelling
- learning networks / uncertainties in modelling
- methodologies for model validation
- fitting mathematical models to real processes
- relationship between the modelling approach and problem solutions
- comparison of methods for modelling, model reduction and model validation
- applications in the field of engineering systems and in natural sciences
- applications in other fields (such as environmental systems, biotechnology, etc.)
- case studies of comparisons for ideas or methods
- education in modelling
- modelling aspects in scientific computing

The *Scientific Programme* will consist of Invited Lectures, Regular Sessions, Organised Sessions, Poster Sessions, and Student Sessions.
The *Social Programme* will include Welcome Party, Heurigen Evening, and Reception. Program for Accompanying Persons will include the Social Programme and Guided Tours in Vienna.

More information at WWW.MATHMOD.AT

Conference Report 5th MATHMOD Vienna, February 2006

During Feb. 8 - 10, 2006 the Fifth International Symposium on Mathematical Modelling i.e. 5th MATHMOD Vienna took place at Vienna University of Technology. This event was sponsored by IMACS (International Association for Mathematics and Computers in Simulation) and also by Vienna University of Technology and especially by the Institute for Analysis und Scientific Computing (E101) at this University and, cosponsored by IFAC (International Federation for Automatic Control), ASIM (*Working Group Simulation* within the German Society for Computer Science - GI), GAMM (Society for Applied Mathematics and Mechanics, Germany), VDI/VDE-GMA (Society for Measurement & Automation at VDI/VDE, Germany), OCG (Austrian Computer Society), OEMG (Austrian Mathematical Society), EUROSIM (Federation of European Simulation Societies) and ARGESIM (Working Group Simulation at TU Vienna).

The conference gathered about 314 scientists from 33 countries from four continents. This great interest in a topic like this is due to an increasing need for reliable formal models and also on methods for modifying and handling such 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 or, it can be intended to help for a better understanding of the properties of a system. Examples for the first case are many types of design problems such as controller design, optimization of solutions and design of production plants whereas the request for an improved understanding is often found in connection with non-engineering systems especially for biological, medical, economic or environmental processes.

MATHMOD 2006: Opening Session.

However, modelling must not be seen only as establishing equations, graphs or algorithms which describe the dynamic behaviour of a given system. Modelling is essentially concerned also with the formal description of constraints and goals.

While setting up a model the modeller must also have in mind which algorithms and/or methods are available for solving a certain type of problem.
The best model is of no use when it is to complex to be handled further with reasonable effort, time and resources. Therefore, many contributions are concerned with modelling concrete problems from various areas of applications.
Moreover, when studying journals it is to be seen that methods, relations etc. are discovered repeatedly.

MATHMOD 2006: Tutorials (Maple, Modelica).

Therefore, a conference having mathematical modelling as its central theme will allow also for a fruitful and stimulating exchange of ideas - be it the exchange between different areas of application or be it the exchange between theory and practice.
Consequently, a variety of topics of more theoretic nature as well as new or modified methods was presented as well as modelling problems in many areas of application. Moreover, a broad variety of types of systems was discussed such as deterministic systems, stochastic systems, continuous, discrete or hybrid systems, lumped or distributed parameter systems etc.

Invited Lectures. In order to allow for a fruitful exchange of ideas across traditional borderlines, seven plenary lectures were given which reflect well the many aspects between theory and concrete industrial application:

- Rudolf Rabenstein (Germany): *Block-Based Physical Modeling*
- Peter Schwarz (Germany): *Modelling of Systems with Dynamic Structures*
- Kurt Schlacher (Austria): *Mathematical Modeling for Nonlinear Control - a Hamiltonian Approach*
- Reinhard Viertl (Austria): *Fuzzy Models for Precision Measurements*

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MATHMOD 2006: Welcome Party

- Gerta Zimmer (Germany): *Modeling and simulation of steam turbine processes: individual models for individual tasks*
- Leon Zlajpah (Slovenia): *Simulation in Robotics*
- Siegfried Tagesen (Austria): Modeling *Energy Dependent Nuclear Reaction Probabilities From Pointwise Measurements Including Full Covariance Information*

Special Sessions. To improve the aforementioned exchange of ideas further, well-known scientists followed the invitation to organize a so-called Special Session where not only those interested in a specific and more specialized topic could meet and exchange ideas but also colleagues working in a different area of specialization could get a good impression on the most recent research topics and results in a particular field.
From this resulted 26 groups of sessions on the following topics (name(s) of organiser(s) in parentheses):

- Advanced mathematical methods for simulation based research services (Kaj Juslin, Finland)
- Control-oriented modelling of advanced multilink manipulators (Peter Rentrop, Rainer Callies, Germany)
- Efficient Operation of Sequential Batch Reactors for Wastewater Treatment (Denis Dochain, Belgium)
- Future Mobile Communication Systems (Christoph Überhuber, Austria)
- Issues of Model Quality and Validation (David Murray-Smith, Scotland, UK)
- Mathematical models of co-operative multi agent systems (Drago Matko, Slovenia)
- Mathematical Modeling of Semiconductors (Martin Burger and Hans Kosina, Austria)
- Modeling and control of (bio)chemical reactors and reactions (Philippe Bogaerts, Jan van Impe, Belgium)
- Modelling and Simulation for Control System Design, Coordination and Supervision (Borut Zupancic, Slovenia)
- Modeling and Simulation in the Pulp and Paper Industry (Bernt Lie, Norway)
- Modeling of distributed-parameter systems for control purposes (Andreas Kugi, Germany)
- Modelling of Environmental Systems (Albrecht Gnauck, B. Luther, Germany)
- Model Reduction and Reduced Order Modelling (Boris Lohmann, Peter C. Müller, Germany)
- Multiscale Modelling in Materials Science (Martin Burger; Peter Weinberger, Austria)
- Nonlinear Oscillations (Alois Steindl, Horst Ecker, Austria)
- Object Oriented Modeling (Gianni Ferretti, Francesco Casella, Italy)
- Optimal Control of Applications described by DAEs/PDEs/PDAEs (Kurt Chudej, Roland Griesse, Germany)
- Optimization in multibody dynamical models (Felix Chernousko, N. N. Bolotnik, Russia)
- PDAE Models in Engineering Applications (Bernd Simeon, Germany)
- Petri Nets: Current Research Topics and Their Application in Traffic Safety and Automation Engineering (Eckehard Schnieder, Joerg R. Müller, Germany)
- Port-based modelling and control - on a geometric basis) (Peter Breedveld, The Netherlands)
- Rule-based Automation of Engineering in Process Industries (Ulrich Epple, Reiner Jorewitz, Germany)

MATHMOD 2006: Reception at Townhall

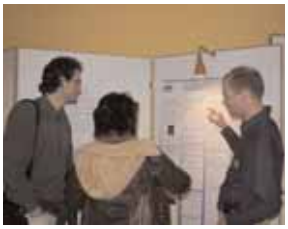
- Stochastic Optimization Methods (Kurt Marti, Germany)
- Structural Control (Hans Irschik, Markus Gusenbauer, Austria)
- Systems Biology (Wolfgang Wiechert, Germany)
- Tool Integration and Interchange Formats for Hybrid Systems (Manuel Remelhe, Sebastian Engell, Germany)

Regular Sessions. It is self-understood that scientists were invited to submit individually contributions. As a result, about 150 extended abstracts were submitted and were carefully reviewed by the 37 members of International Program Committee (chaired by Inge Troch) coming from 14 countries worldwide. This reviewing resulted in invitations to 109 authors to present their contribution during the conference as a paper and 7 authors were invited to present their ideas as a poster.

MATHMOD 2006: Café Simulation.

Unfortunately, not all these authors were able to participate in the 5th 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 further nine strings of sessions according to their main thematic point:

- Modelling Methods and Techniques
- Discrete Modelling and Planning
- Physical Modelling
- Electrical and Power Systems
- Mechanical Systems
- Modelling for/and Control
- Modelling in Biology and Physiology
- Process Modelling
- Ecomomic Systems



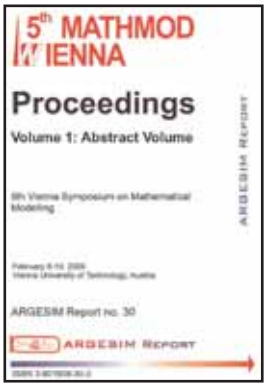
MATHMOD 2006: Poster Session.

Poster Session. The organizing committee, Inge Troch and Felix Breitenecker, was careful to provide enough time for scientific and other discussions. Hence, there were not only sufficiently long coffee breaks and lunch breaks and the permanently opened *Café Simulation* 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' by the participants took place. Taous-Meriem Laleg (INRIA, France) received as prize for the best Poster *Arterial Pressure Modelling by an Integrable Approximation of Navier-Stokes Equations*, a one-year subscription of 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, Palle Kotta (Estonia) won this prize. Further one year subscriptions of *Simulation News Europe* (SNE) were handed over for the second place to Katsumi Moriwaki and K. Tanaka (University of Shiga Prefecture, Japan) for the Poster *Mathematical Modelling of an Autonomous Vehicle for Navigation Control*, for the third place to Julia Heßeler, Julia K. Schmidt, Udo Reichl, Dietrich Flockerzi (Germany) for the Poster *Dynamics of an Experimentally Based Chemostat Model* und for the fourth place to Joachim Deutscher and Markus Bäuml (Germany) for the Poster *A State Space Embedding Approach to Time Discretization via an Approximate Normal Form*.

MATHMOD 2006: Subscriptions of MCMDS and SNE for best posters.



MATHMOD 2006: Closing Session - YoYo Challenge.

Proceedings - Publications. The written versions of the invited lectures, of (almost) all contributions to the conference as well as abstracts of all posters are collected in the *Proceedings* (ISBN 3-901608-30-3), edited by Inge Troch and Felix Breitenecker and published by ARGESIM, Vienna.
These Proceedings consist of a printed *Abstract Volume* with one page abstracts of all papers and posters and a *CD-ROM Volume* as second volume containing the full versions of the papers. In addition, a selection of survey lectures regular papers will appear also in a special issue of the IMACS journal *Mathematics and Computers in Simulation*.

MATHMOD 2006: Evening event in wine cellar.

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.

Social Programme. 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 Wappensaal of the town hall of Vienna and a traditional (and really Viennese) evening in the historic Zwölf-Apostelkeller (Twelve Apostles cellar) in the very heart of Vienna - 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 - in view of the growing interest (about 50 % more participants than 2003) in a conference like this - a 6th MATHMOD symposium at TU Vienna during February 11 – 13, 2009.

Inge Troch, Vienna; *Inge.troch@tuwien.ac.at*

6th MATHMOD Vienna
February 4-6, 2009
WWW.MATHMOD.AT

SCS - Society for Computer Simulation- SCS Europe

Conference Report ECMS 2006

The *2006 European Conference on Modelling and Simulation* (ECMS 2006) was held 28th - 31st May, 2006 at Bonn-Rhein-Sieg University of Applied Sciences in Sankt Augustin, Germany near Bonn..

ECMS 2006 featured a comprehensive scientific programme including two tutorials on Sunday, three keynote speeches, a plenary lecture to the track on Bond Graph modelling and state-of-the-art research and practice papers. There were twelve thematic tracks ranging from *Intelligent Systems*, to *Bond Graph Modelling*, *Modelling and Simulation Methodologies*, *Simulation in Industry, Business and Services*, to *Computer Games and Simulation,* a student session and an accompanying exhibition. Furthermore, ECMS 2006 included the *High Performance Computing and Simulation Conference* (HPC&S) organised by H. Karatza (Univ. of Thessaloniki, Greece) and W. Smari (Univ. of Dayton, Ohio, USA) and was joint by the collocated *13th International Conference on Analytical and Stochastic Modelling Techniques and Applications* (ASMTA) organised b y K. Al-Begain (Univ. of Glamorgan, UK).

In total, this event had about 150 reviewed accepted papers by more than 240 authors from 35 countries from Europe, the Americas, Asia and Africa. All contributions are documented in the Proceedings each registered participant received as a printed volume and on CD.

Keynotes. The keynote addresses were given by three distinguished, well renowned personalities:

- Prof. L. Zaheh (Computation with Information Described in Natural Language)
- Prof. F. Cellier (Wrapping Multi-Bond Graphs: A Structured Approach to Modelling Complex Multi-Body Dynamics)
- Prof. U. Trottenberg (Multigrid in Industry)

Prof. S. Junco from the Universidad Nacional de Rosario, Argentina, gave an invited plenary lecture to the track on Bond Graph Modelling titled *Bond Graphs: An Engineering Tool for Integrated Modelling, Analysis, Diagnosis and Controller Synthesis of Physical Systems*. His talk well complemented the keynote speech of Prof. Cellier and the tutorial of Prof. W. Borutzky titled *Bond Graph Modelling and Simulation of Mechatronic Systems – An Introduction into the Methodology*.

In the presentation of the tutorial, W. Borutzky was assisted by Ir. J. Hemssens from Controllab Products, Enschede, Netherlands, who illustrated the features of Bond Graph modelling by means of the well-known, mature and intuitively to use modelling and simulation environment 20sim™. This shows that Bond Graph modelling was one of the topics on which this year's ECMS focused.

Closing Session - Awards. In the closing session, Alper O. Almaz, Ýlhan Or and Birnur Özbaþ from the Bogaziçi University, Istanbul, Turkey, were honoured with the best paper award for their contribution titled *Simulation of Maritime Transit Traffic in the Istanbul Channel*.
This outstanding paper got the unanimous vote of all three conference chair persons. Of course, there can be only one best paper award. However, the authors of another excellent paper were honoured in public by a small ECMS reward during the conference dinner. The reward was given to Massoud Najafi for a paper titled *Computation of Spin-Wave Spectra of Mag-netic Nanostructures for Information Storage Systems* jointly written by M. Bolte, G. Meier, M. Najafi, and D.P.F. Möller, Hamburg, German y.

ECMS/SCS Council Meeting. During the ECMS 2006 a meeting of the ECMS/SCS-Europe Council took place. In this meeting, Prof. Andrzej Bargiela stepped down as Chairman at the end of his chairmanship of the Council and Prof. K. Al-Begain from the University of Glamorgan, Pontrypridd, Cardiff, UK, being ASMTA 2006 Conference Chair, was unanimously elected Chairman of the Council and nominated representative of the European Council to SCS International. We all wish him good luck for his term in office.

Social Programme. The social programme of ECMS included tours to the cities of Bonn and Cologne, a conference dinner in the restaurant of the former foreign office at the banks of the river Rhine, and after the closing session a visit to the division of the German Aerospace Centre (DLR) near Cologne, where the participants could learn about the research activities of DLR, the contributions to the International Space Station (ISS) , and could visit the training facilities for astronauts.

Wolfgang Borutzky, Alessandra Orsoni,
Richard Zobel, ECMS 2006 Conference Chairs
WWW2.INF.FH-BRS.DE/ESM2006/

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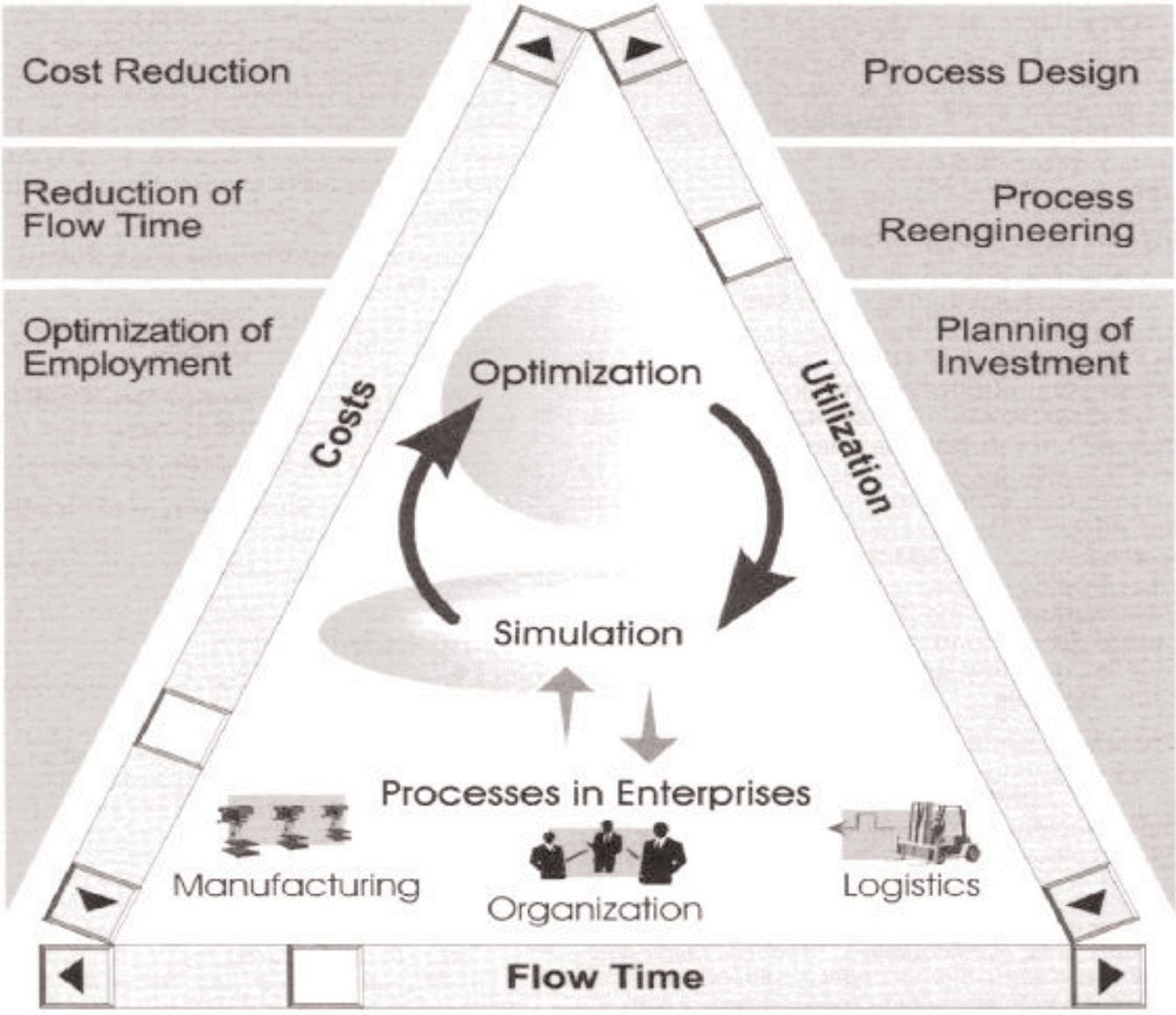

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CISM - International Centre for Mechanical Sciences

CISM is a non-profit organization, founded in 1968 to favour the exchange and application of the most advanced knowledge in the mechanical sciences and in other fields (mathematics, information and system theory, operations research, computer science, artificial intelligence).

Located in the Palazzo del Torso in the centre of Udine (see Figure), the Centre's facilities include two lecture halls, several smaller lecture and meeting rooms, the Centre's library, secretariat, administrative and technical offices and, on separate premises, the Centre's printing press. CISM is international in both scope and structure: the Scientific Council, rectors, lecturers are selected from among the acknowledged authorities in their respective fields the world over.

Figure: Palazzo del Torso, seat of CISM

The principal activity of the Centre is the organization of courses, seminars, work shops, symposia, and conferences to present the state of the art of these sciences to researchers. It also provides advanced training for engineers operating in industry.

The Centre has produced over 350 texts, the collected lectures of CISM courses, together with the proceedings of symposia hosted by CISM, and selected monographs, for publication by Springer-Verlag of Vienna and New York. The journal *Mechanics Research Communications* was founded by CISM in collaboration with Pergamon Press, Oxford in 1973.

CISM is funded by the Friuli Venezia Giulia Region, the Province and the city of Udine, and local public institutions. Further financial support comes from the CNR, and from UNESCO.

CISM Courses

The typical course or seminar is brief, but intense: a week of 35/40 lectures, more or less the equivalent of a university course of one semester. Participants pay a registration fee, but young researchers who cannot be supported by their own institutions may apply for scholarships.

The following list shows courses scheduled for 2007:

- Direct Methods for Limit State Assessment of Structures; June 25 – 29, 2007; A.R.S. Ponter (Leicester, UK), D. Weichert (Aachen, D),
- Vortices Turbulence at Very Low Temperatures; July 2 – 6, 2007; C.F. Barenghi (Newcastle, UK), Y.A. Sergeev (Newcastle, UK)
- Generalised Continua and Dislocation Computational Methods and Experimental Verification; July 9 – 13, 2007; C. Sansour (Nottingham, UK)
- 15th IUTAM Summer School - Bone Cells and Tissue Mechanics; July 16 – 20, 2007; S. Cowin (New York, USA)
- Advances in Constitutive Relations Applied in Computer Codes, July 23 – 27, 2007; J.R. Klepaczko (Metz, F)
- Sport Aerodynamics; September 3 – 7, 2007; H. Nørstrud (Trondheim, N)
- Simulation Techniques for Applied Dynamics; September 17 – 21, 2007; M. Arnold (Halle-Wittenberg, D), W. Schiehlen (Stuttgart, D)
- Poly-, Quasi- and Rank-One Convexity in Applied Mechanics; September 24 – 28, 2007; J. Schroeder (Duisburg-Essen, D), P. Neff (Darmstadt, D)
- Semi-active Vibration Suppression; Oct. 1–5, 2007; A. Preumont (Bruxelles, B)
- Soft Computing in Mechanics of Structures and Materials; October 8 – 12, 2007; Z. Waszczyszyn (Cracow, PL)

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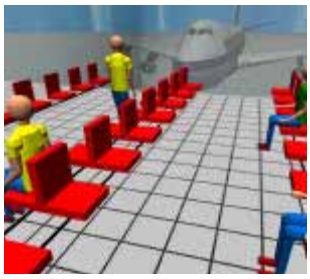

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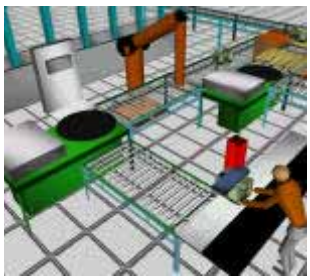

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Modelica Association

The *Modelica Association* is a non-profit, non-governmental organization with the aim of developing and promoting the Modelica modelling language for modelling, simulation and programming of physical and technical systems and processes.

Modelica Tools. Up to now five tools 'understand' Modelica models (some subsets, some extensions):

Dymola from Dynasim is the classical Modelica tool with a translator which is able to perform all necessary symbolic transformations for large systems and for real time applications (WWW.DYNASIM.SE).

MathModelica from MathCore Engineering provides a Modelica simulation environment which is closely integrated into Mathematica and Microsoft Visio. Info at WWW.MATHCORE.COM.

MOSILAB from the Fraunhofer-Gesellschaft is a newly developed Modelica simulator for complex technical systems. MOSILAB allows mapping of state-dependent changes of the model structure during the simulation experiment (WWW.MOSILAB.DE).

SimulationX from ITI is a graphically-interactive modelling and simulation tool understanding Modelica models. A comprehensive API supports the integration into any CAE, CFD, CAD or database tool environment (WWW.SIMULATIONX.COM).

Open Modelica is a project at Linköping University. The goal is to create a complete Modelica modelling, compilation and simulation environment based on free software distributed in source code form in-tended for research purposes. More info at website WWW.IDA.LIU.SE/~pelab/modelica/OpenModelica.html

Modelica Conferences. The *5th International Modelica Conference* was held at Techbase Vienna, September 4 – 5 2006, organised organized by the Modelica Association and by arsenal research (Ch. Kral, A. Haumer). About 200 people attended this Modelica family meeting (information and details at It is a strategy of Modelica organisation to offer the Proceedings for free at the web: WWW.MODELICA.ORG/events/modelica2006/

Modelica Organisation
WWW.MODELICA.ORG

SIMVIS – University Magdeburg

The conference series *Simulation and Visualisation* (SIMVIS) is running since 18 years at Magdeburg University, hosted mainly by the Institute for Simulation and Graphics. The series was initiated by Peter Lorenz and is now continued by Thomas Schulze.
The conference SIMVIS is open to everyone with interest in the fields of simulation, modelling and visualization. The goal of this conference is the presentation of new research and innovative applications. In addition SIMVIS provides meeting place for simulation and visualization practitioners, researchers, and vendors working in all disciplines and in the industrial, governmental, military, and academic sectors. The conference program is being organized into tracks reflecting the current state of the SIMVIS field.

SIMVIS 2006. In 2006, the 17th SIMVIS took place on March 2 -3. ASIM, the German simulation society, was again co-organiser of this event. Both invited speakers were coming from Vienna. Helwig Hauser (Scientific Director of the VRVis Research Center, Vienna) gave a survey on discrete simulation and visualisation; Felix Breitenecker (Vienna University of Technology, ASIM President) gave an overview on the development of simulation systems.
Since March 2006, the Proceedings of this conference are available at WWW.SIMVIS.ORG.

SIMVIS 2007. The 18th SIMVIS is scheduled for March 8 -9, 2007. Invited talks will be given by Frits Post, Delft University of Technology, and Wilhelm Dangelmaier, Heinz Nixdorf Institut Paderborn.
The organisation committee invites interested people to come to the conference and to submit contributions. The deadlines are:

Paper Submission Deadline: Nov. 6, 2006
Papers Notification of Acc.: Dec. 20, 2006
Camera-ready Papers Due: Jan. 22, 2007.

Further information at WWW.SIMVIS.ORG/Tagung2007/

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Industry News

COMSOL Multiphysics – New Features in Release 3.3

With its enhanced features, COMSOL Multiphysics 3.3 brings simulation and virtual prototyping to a far wider community of engineers. The release also greatly expands the number of possible application areas for the technology into virtually every field of science, research, and engineering. Key among these enabling features are ready-made couplings between common physics, an even more convenient user interface thanks to a Model Tree, interactive meshing, merging components to build models, the ability to handle CAD assemblies, support for the multiphysics analysis of surface contact, and gains towards fully automatic solver selection.

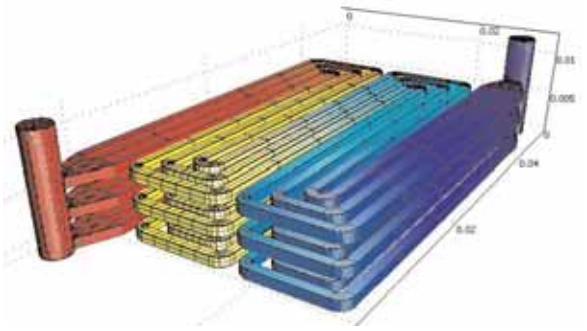
Easier, faster problem setup. An aspect that makes it easier for the average engineer to successfully create models is the increased number of predefined multiphysics couplings. Users know intuitively what they want to do, for example, evaluate fluid -structure interaction. The new features allow that users simply select ready-made couplings from a menu with the correct physics, boundary settings, and couplings already set up. Then they quickly modify this interface to meet the specific needs of the geometry. A number of new predefined multiphysics couplings join an already comprehensive selection (microwave heating, induction heating, rotating machinery, fluid-thermal interactions for laminar, nonisothermal and turbulent flow, and fluid-structure interaction).

Solving made straightforward. When a model is set up, the software now takes a first step towards fully automating the solver choice, a choice that is fully aware of the mathematics and numerical schemes required to solve the multiphysics couplings. The version also adds the PARDISO solver - a shared-memory parallel algorithm that works well as a powerful direct solver applicable to, for example, large electromagnetic models.

During the solution process a realtime probe-plot feature tracks the value of any selected variable and graphs this scalar value in real time. Similarly, while the software is calculating the solution, users can monitor a convergence plot that shows the solver's progress on a realtime graph.

Interactive meshing. It is possible to optimize the mesh locally for each part or model subdomain through the interactive meshing environment. This makes it possible to build a mesh in an incremental fashion where each meshing operation acts on a set of subdomains. Furthermore, using interactive meshing users can apply different meshing techniques to different domains of a geometry object. Outside of the obvious benefits for matching a mesh to a subdomain's geometry, this feature also provides improved flexibility as sometimes the mesh must suit the phys-ics found within one subdomain that may not exist in other subdomains.

Multiphysics contact. The Structural Mechanics and MEMS Modules now offer increased support for contact problems to bring to the industry the first tool for true Multiphysics Contact applications. Identifying contact pairs at the geometry-creation stage, users can now model contact and couple it with their other physics. Heat flux, electric current, and species diffusion generated at, or flowing across contact surfaces, can now be modelled and coupled to the material properties of the contact materials. This means, for example, that COMSOL can model the generation of heat from contact friction and simultaneously couple and solve this with contact and material properties that vary with the generated heat.



Concentration profile in the flow channels of a fuel cell stack are visualized in the new COMSOL Multiphysics GUI

Contact: FEMLAB GmbH
Berliner Strasse 4, 37073 Göttingen
Tel.: +49(0)551-99721–0, Fax: –29
info@femlab.de
WWW.FEMLAB.DE, WWW.COMSOL.COM

DYNASIM Acquired by Dassault Systems - New Library

Dassault Systèmes has acquired Dynasim AB (June 27, 2006). "I am delighted that Dassault Systèmes has decided to use Modelica and Dymola as key technologies of its future CATIA Systems strategy" says Hilding Elmqvist, founder and CEO of Dynasim.
Dassault Systèmes will endorse Modelica as an open standard for describing embedded systems. Dynasim will continue as a company in Sweden with the same management.

At the *5th International Modelica Conference*, the *SmartElectricDrives* library was released. This library allows modelling and simulation of an entire electric drive system and is ideal for simulation of hybrid electrical vehicles and new alternative concepts with electrical auxiliaries. The library is developed by *arsenal research*, Austria.

Contact: Dynasim AB
Ideon Research Park, 223 70 Lund, Sweden
info@dynasim.com, WWW.DYNASIM.COM

Incontrol – Solutions for Knapp Group

KNAPP Group is the world's leading provider of automatic order fulfilment systems. KNAPP offers a wide variety in warehouse management solutions.
Since warehouse automation is quite an investment, in some cases KNAPP provides its customers with a full range computer simulation even before the contract is signed. To that end, KNAPP uses Incontrol's simulation software.
'In complicated warehouse situations it is of eminent importance to have a clear view of the entire process. Somewhere in the flow of the process you'll inevitably meet surprises, but using computer simulations you are one step ahead. Thus simulation minimises the implementation time; we can run several tests on the site itself and make modifications on the spot', managers at KNAPP acknowledge.

More about industrial simulations with Enterprise Dynamics at Incontrol's website.

Contact: Enterprise Dynamics, Planetenbaan 21
3606 AK Maarssen, The Netherlands
Tel +31-346-552500, Fax – 552451
WWW.ENTERPRISEDYNAMICS.COM

Scientific Computers: Maple Toolbox for MATLAB – Distributor for Expert Control

The *Maple Toolbox* for MATLAB® combines the best in symbolic and numeric computation to develop mathematical solutions.
Key features are:
- Interactive technical document interface
- Up to 50 times faster than the Extended Symbolic Math Toolbox
- Access to full Maple features
- Two-way interoperability between the Maple and MATLAB environments

Scientific Computers, started to distribute products from *ExpertControl*. Products include
- Toolboxes for MATLAB (IDCON nonlinear identification, ACD – automatic control design, CANbus – real time access to the can-bus, etc.)
- Toolboxes for LabView, and
- Toolboxes for Maple

Contact: Scientific Computers GmbH
Friedlandstrasse 18, D-52064 Aachen,
Tel + 49 (0241) 40008 - 0, Fax – 13
info@scientific.de, WWW.SCIENTIFIC.DE

Major Upgrades of MATLAB's Control Design Software

The MathWorks announced major upgrades to three of its control design software products- Control System Toolbox 7, Simulink® Control Design 2, and Simulink® Response Optimization 3. The new versions provide a stronger integration with Simulink® to create a streamlined platform for control design and optimization using Model-Based Design. A new graphical user interface (GUI) unifies the three products, enabling control engineers of all experience levels to now tune and optimize control systems on multidomain plant models directly in Simulink.
The new products are available immediately for download, and they are shipped with the new MATLAB release 2006b.

Contact: The Mathworks GmbH,
Friedlandstr. 18, D- 52064 Aachen
Tel +49 -241-47075-0, Fax – 12
info@mathworks.de, WWW.MATHWORKS.DE

CALL FOR PAPERS

CALL FOR PAPERS

September 9-13, 2007, Ljubljana, Slovenia

EUROSIM - Federation of European Simulation Societies

EUROSIM 2007

6th EUROSIM Congress on Modelling and Simulation

September 9 - 13, 2007, LJUBLJANA, SLOVENIA

About EUROSIM:

EUROSIM is the Federation of European Simulation Societies and the EUROSIM congress organization (a triennial event) is one of the most important activities of the federation.

For more information about EUROSIM see:
www.eurosim.info

PROGRAMME:

The EUROSIM 2007 scientific programme consists of: Plenary lectures, Regular sessions, Special sessions, Posters, Students' competition and Tutorials. Papers will be published in two Proceedings Volumes: Volume 1: Book of Abstracts, Volume 2: DVD volume with full papers and multimedia files.

SCOPE AND TOPICS:

The scope includes all aspects of continuous, discrete (event) and hybrid modelling, simulation, identification and optimisation approaches. So the common denominator is problems solving with modelling and simulation in a way that can be useful also for solving other problems in similar or different areas. Contributions from technical (engineering) areas but also from nontechnical areas are welcome.

M&S methods and technologies: modelling and simulation of complex, large scale, distributed, hybrid, hierarchical, stochastic, control, expert, adaptive, fuzzy, decision support, multivariable, multiagent, reconfigurable, agent based, knowledge based, real time, queuing systems, scheduling, parallel processing concepts, high performance computing, M&S system architectures, neural networks, model validation and verification, simulation life-cycle evolution, genetic algorithms, man-in-the loop simulation, hardware-in-the loop simulation, nested simulation models, distributed enterprise simulation, data mining, bond graphs, simulation with Petri nets, discrete event simulation, statistic modelling, component based modelling, object oriented modelling, mathematical /numerical methods in simulation, graphical modelling, nano technology modelling, embedded and firmware modelling, middleware architecture modelling, visualisation, graphics and animation, modelling and simulation tools, WEB based simulation, human behaviour representation techniques, virtual reality and virtual environments, CAD/CAM/CIM/CAE, experiential digital media, future of M&S

M&S applications: aerospace, automotive systems and transportation, agriculture, architecture, biopharmacy, biomedicine, bioinformatics, genomics, business, applied chemistry, civil engineering, communications, ecological and environmental systems, economics, econometrics, economics of M&S, education, electrical engineering, geophysical systems, industrial processes, logistics, manufacturing systems, maintenance, reliability, marine systems, materials modelling and simulation, mechanical engineering, mechatronics, meteorology/climate, military systems, organisational processes, process engineering, traffic/transportation, power systems, applied psychology, computational fluid dynamics, training simulators, social systems biology, sciences, robotics, water management and treatment, mobile robotics, seismism, pulp & paper, supply chains, lifecycle management and plant data

VENUE:

University of Ljubljana, Faculty of Electrical Engineering, Ljubljana, Slovenia

DEADLINES:

Proposal for special sessions and tutorials: **1 Feb. 2007**

Submission of extended abstracts: **9 April 2007**

Notification of acceptance: **30 May 2007**

Early registration: **11 June 2007**

Submission of camera-ready papers: **9 July 2007**

Hotel Reservation: **27 July 2007**

CONTACTS:

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L. Žlajpah (SI)

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- University of Ljubljana, Faculty of Electrical Engineering
- EUROSIM member societies: ASIM, CROSSIM, CSSS, DBSS, FRANCOSIM, HSS, ISCS, SIMS, UKSIM, AES, PSCS, ROMSIM

CO-SPONSORS:

- CASS Chinese Association for System Simulation,
- ECMS European Council for Modelling and Simulation,
- JSST Japan Society for Simulation Technology,
- LSS Latvian Simulation Society,
- SCS The Society for Modeling and Simulation Int.

EXHIBITION:

Exhibitors with software, hardware and books from the area of M&S are cordially invited to participate.