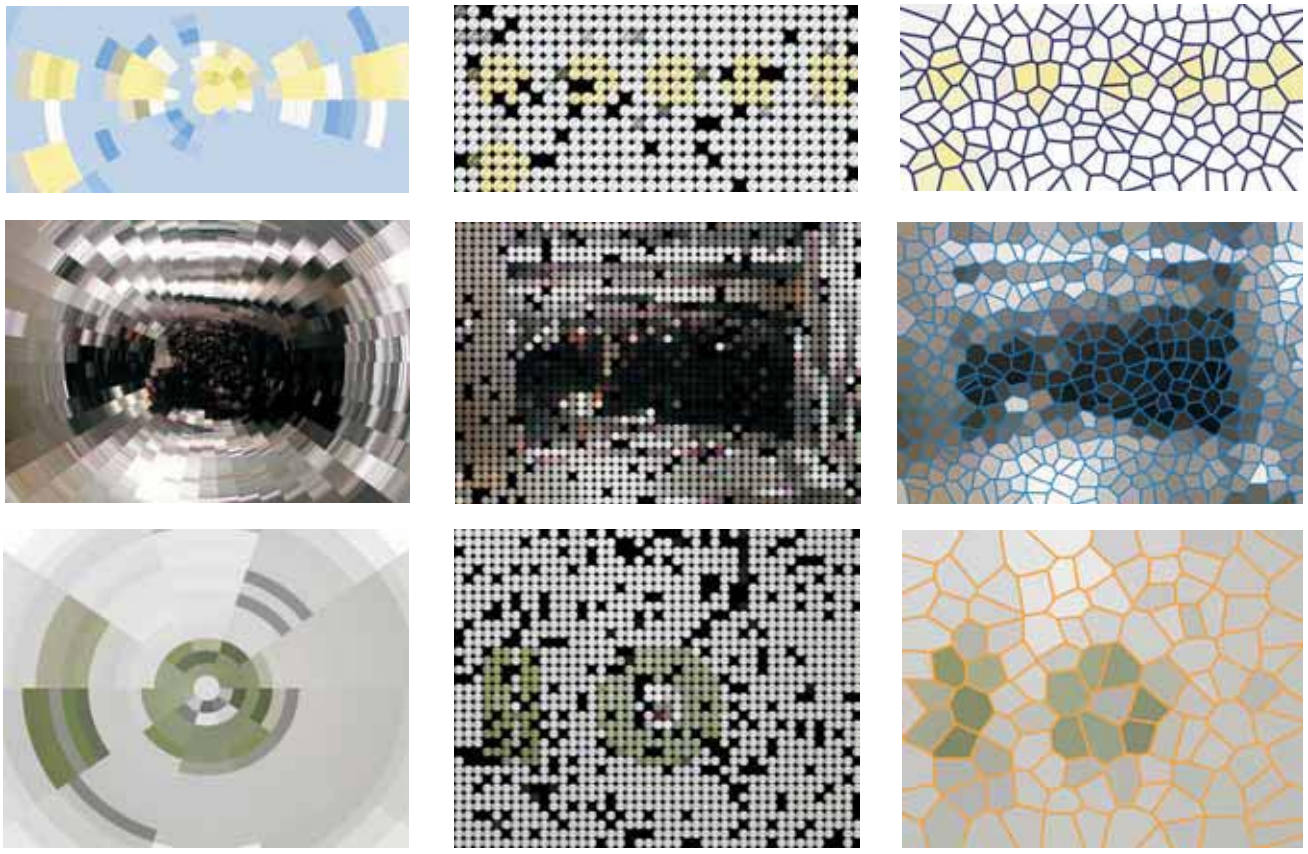
SNE SIMULATION NEWS EUROPE



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Journal on Developments and Trends in Modelling and Simulation

Membership Journal for Simulation Societies in EUROSIM

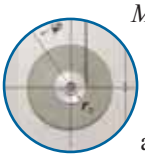
ARGESIM

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.

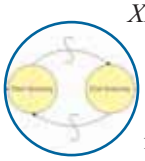
Felix Breitenecker, editor-in-chief; Felix.Breitenecker@tuwien.ac.at

SNE 16-1 / SNE 46 in Five Minutes

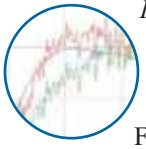
Process Modelling in a Sterilisation Tunnel (TN) - presents modelling and simulation for temperature profiles in an industrial production process – ***page 3***



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***

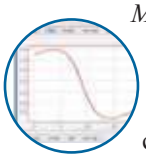


XML in DEVS (TN) – introduces XML as model basis for discrete event models for simulation via WWW and presents a prototype implementation – ***page 16***

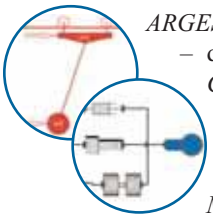


Real-time Simulation with DSPs (SN) - reports about a connection of two DSPs, one identifying the plant, the other performing Kalman Filter and LQ control – ***page 21***

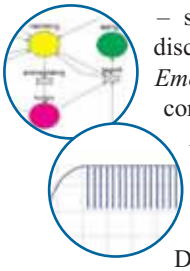
Simulation of Blood Glucose Regulation (SN) – presents MATLAB models glucose status together with a graphical interface for educational use – ***page 23***



Modelling and Control of a 2DOF - Robot (SN) – outlines modelling and simulation of a simple robot for E-learning of simulation and control via WWW – ***page 25***



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***

Book Reviews and *Journal News* – Eleven book reviews and one book news

Introduction of the SNE Special Issue *Parallel and Distributed Simulation Methods and Environments*

Call for next SNE Special Issue *Validation and Verification*
– ***page 39 - 47***

Young Simulationists – introduction of simulationists from Germany and Austria – ***page 48***

EUROSIM Society Reports – 20 pages reports from EUROSIM societies, followed by 8 pages from International Societies and Groups (ECMS/SCS, MATHMOD, Modelica, etc.) and 2 pages *Industry News* in the *News Section*

Content

SNE Editorial Boards

SNE - Simulation News Europe – is advised by two Editorial Boards. The *SNE Editorial Board* is taking care on reviewing and handling of Technical Notes, Shortnotes, Software Notes, Book and Journal Review, and of Comparison and Benchmark Notes. The *SNE News Editorial Board* (News Section) is responsible for reports from EUROSIM, EUROSIM societies, International Societies, and for Industry News.

Editorial board

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SNE 16/1 (46), August 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).

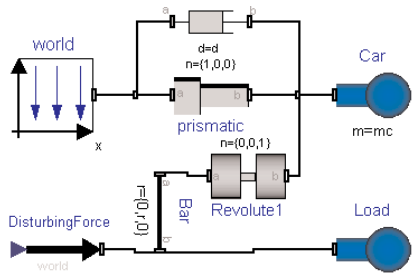

Figure 1: Nonlinear crane model with Modelica MultiBody Library.

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).

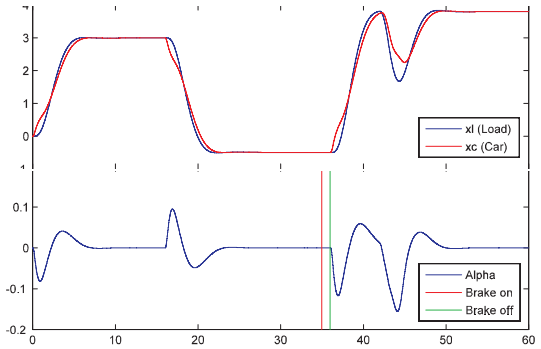

Figure 2: Time domain results for controlled model

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

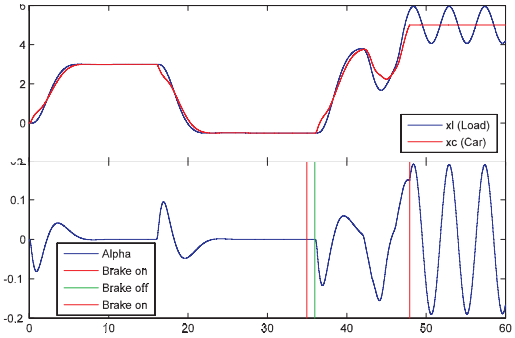

Figure 3: Results for diagnosis experiment (the second brake-on event is due to an emergency stop).

Classification: Modelica approach, diagnosis model
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