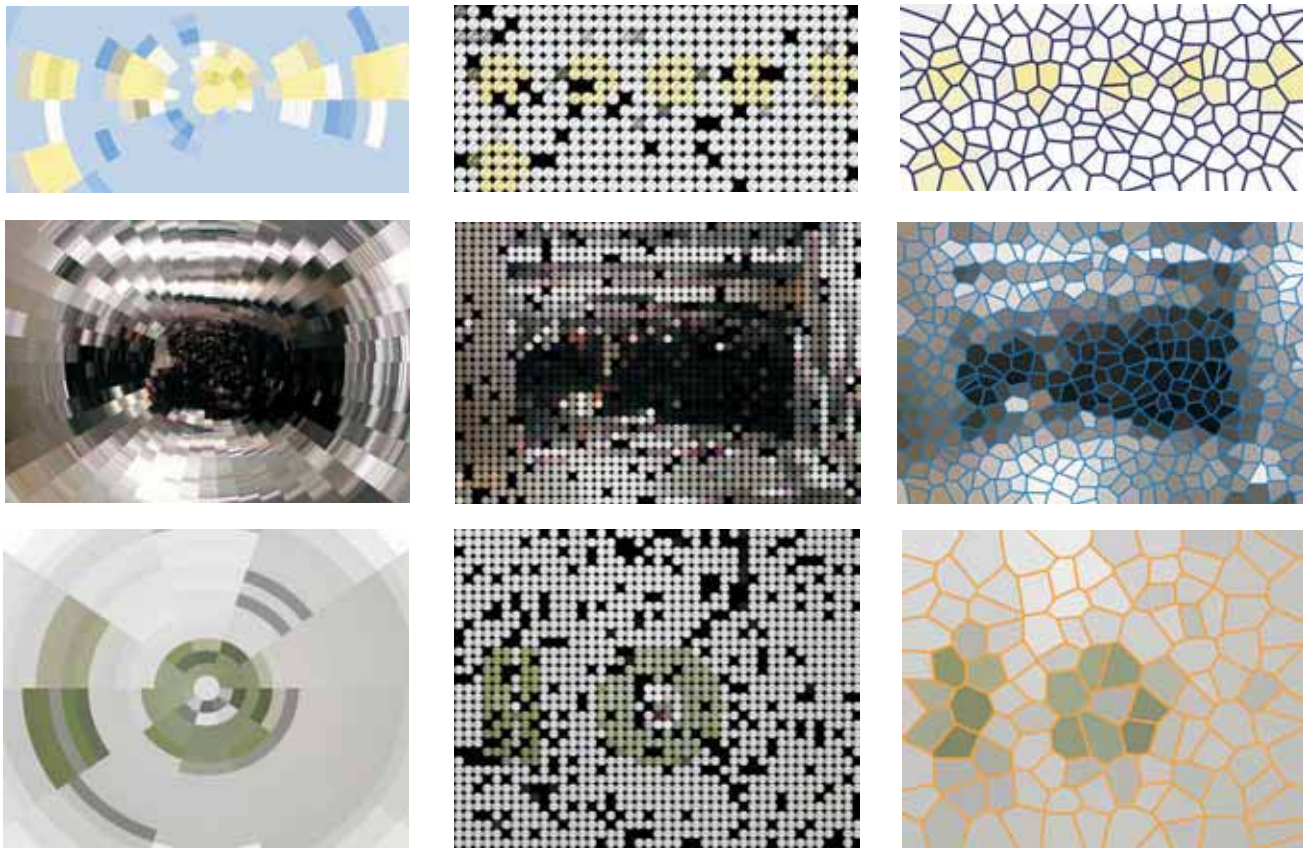
SNE SIMULATION NEWS EUROPE



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

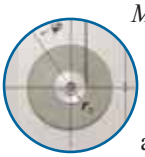
ARGESIM

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.

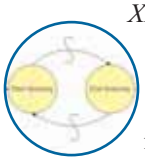
Felix Breitenecker, editor-in-chief; Felix.Breitenecker@tuwien.ac.at

SNE 16-1 / SNE 46 in Five Minutes

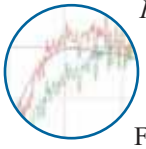
Process Modelling in a Sterilisation Tunnel (TN) - presents modelling and simulation for temperature profiles in an industrial production process – ***page 3***



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***

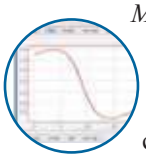


XML in DEVS (TN) – introduces XML as model basis for discrete event models for simulation via WWW and presents a prototype implementation – ***page 16***

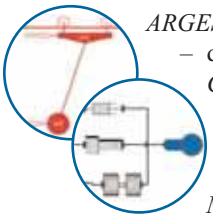


Real-time Simulation with DSPs (SN) - reports about a connection of two DSPs, one identifying the plant, the other performing Kalman Filter and LQ control – ***page 21***

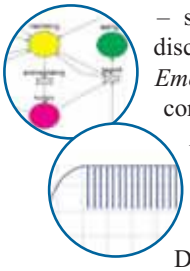
Simulation of Blood Glucose Regulation (SN) – presents MATLAB models glucose status together with a graphical interface for educational use – ***page 23***



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

Contact

SNE - Editors /ARGESIM
c/o Inst. f. Analysis and Scientific Computation
Vienna University of Technology
Wiedner Hauptstrasse 8-10, 1040 Vienna, AUSTRIA
Tel + 43 - 1- 58801-10115 or 11455, Fax - 42098
sne@argesim.org; WWW.ARGESIM.ORG

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.
Editor-in-Chief: Felix Breitenecker, Mathematical Modelling and Simulation, Inst. f. Analysis and Scientific Computing, Vienna University of Technology, Wiedner Hauptstrasse 8-10, 1040 Vienna, Austria; *Felix.Breitenecker@tuwien.ac.at*
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

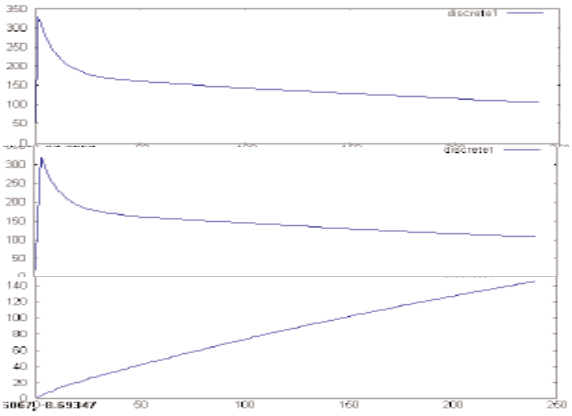
An Analytic Approach to ARGESIM Comparison C15 'Renal Clearance Identification' using Maxima/LISP

Peter Schrammel, Florian Judex, Vienna University of Technology; *Florian.Judex@tuwien.ac.at*

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.

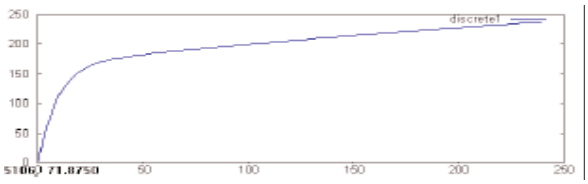


Figure 4: Difference concentration of injection - concentration in the compartment.

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).

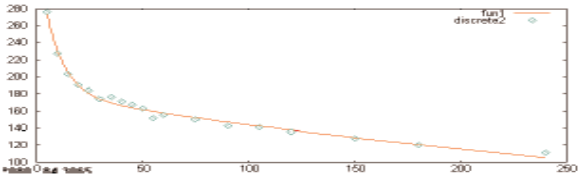


Figure 5: Comparison of simulation and measurements.

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
Corresponding author: Florian Judex
Peter Schrammel, Florian Judex, Vienna Univ. of Technology, Inst. f. Analysis and Scientific Computing, Wiedner Hauptstrasse 8-10, 1040 Vienna, Austria
Florian.Judex@tuwien.ac.at

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