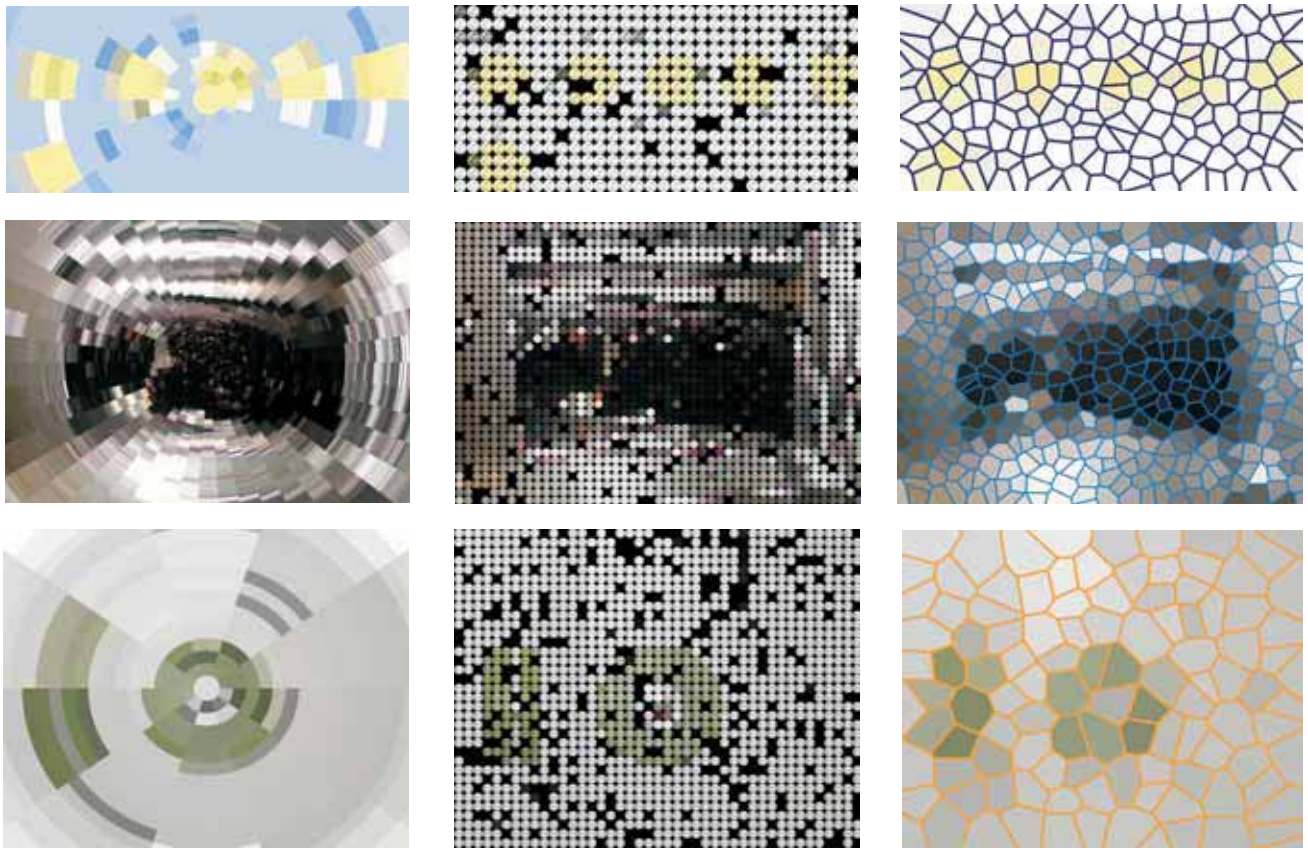
SNE SIMULATION NEWS EUROPE



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

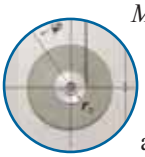
ARGESIM

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.

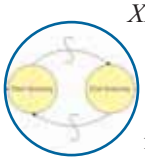
Felix Breitenecker, editor-in-chief; Felix.Breitenecker@tuwien.ac.at

SNE 16-1 / SNE 46 in Five Minutes

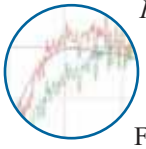
Process Modelling in a Sterilisation Tunnel (TN) - presents modelling and simulation for temperature profiles in an industrial production process – ***page 3***



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***

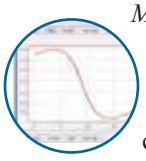


XML in DEVS (TN) – introduces XML as model basis for discrete event models for simulation via WWW and presents a prototype implementation – ***page 16***

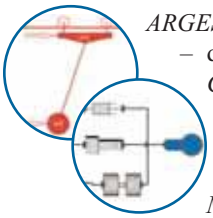


Real-time Simulation with DSPs (SN) - reports about a connection of two DSPs, one identifying the plant, the other performing Kalman Filter and LQ control – ***page 21***

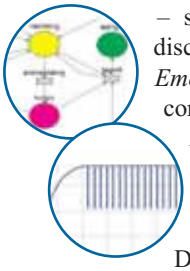
Simulation of Blood Glucose Regulation (SN) – presents MATLAB models glucose status together with a graphical interface for educational use – ***page 23***



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

Modelling of Temperature Conditions in Sterilisation Tunnel; A. Knoll, M. Atanasijevic-Kunc, R. Karba ... 3

Modelling and Control of Yoyo; L. Zlajpah ... 9

Using XML in the Domain of Discrete Event Modelling and Simulation; M. Gyimesi ... 16

Real - time Simulation with Kalman Filter and LQ Control using Connected Signal Processing Boards; Z. Sehic, J. Osmic, N. Prljaca ... 21

Modelling the Human Blood Glucose Regulation - a MATLAB GUI for Educational Purposes; A. Ernst, F. Judex, J. Höbarth ... 23

Simulation of a Control for a Robot with Two Degrees of Freedom – an E-learning Example; J. Kropf, O. Andryushchenko ... 25

ARGESIM Comparison 'Crane and Embedded Control' – Definition of a Benchmark with Implicit Modelling, Digital Control and Sensor Action. Revised Definition – Comparison 13rev.; A. Schiftner, F. Breitenecker ... 27

A Modelica Approach to ARGESIM Comparison C13Rev 'Crane and Embedded Control' using the Simulator Dymola; A. Schiftner ... 30

Petri Net Modelling to ARGESIM Comparison C4 'Dining Philosophers' with Petrinetz-Tool, with Integrated Net Analyzer INA, and Peneca / CHROMOS; R. Hohmann ... 31

A Numerical MBTY-Solution of ARGESIM Comparison C5 'Two State Model' O. Kozlov, K. Timofeev, S. Petukhov ... 32

A Programmed Solution to ARGESIM Comparison C 6 'Emergency Department' with DSOL, a Java - based Suite; R: Lezuo, F. Breitenecker ... 33

A Cellular Automata – Approach to ARGESIM Comparison C 10 'Dining Philosophers II' using MATLAB; G. Höfinger ... 34

A Classical ODE-based approach to ARGESIM Comparison C 11 'SCARA Robot' using DESIRE; S. Seichter ... 35

An Analytic Approach to ARGESIM Comparison C15 'Renal Clearance Identification' using Maxima/LISP; P. Schrammel, F. Judex ... 36

A Matrix-oriented Approach to CA Modelling in ARGESIM Comparison C17 'SIR-type Epidemic' with MATLAB; D. Leitner, M. Moczydlowska, L.Lapinski ... 38

Book Reviews and Journal Reviews 39

Book and Journal News 45

Simulationists: Ch. Deatcu, F. Judex 48

News on EUROSIM and EUROSIM Societies, International Societies and Industry News 32 pages

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

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

Gerhard Höfinger, Vienna University of Technology, Vienna; *Gerhard.Hoefinger@tuwien.ac.at*

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.

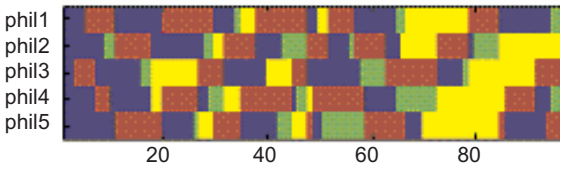


Figure 1: Gantt chart with philosophers actions: red – eating, green and yellow – waiting, blue – thinking

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.

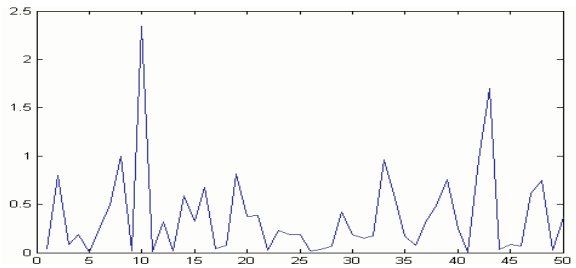


Figure 2: Deadlock times versus run number.

Classification: Cellular automata approach

Corresponding author: Gerhard Höfinger,
Vienna Univ. of Technology, Inst. f. Analysis and Scientific Computing, Wiedner Hauptstr. 8-10, 1040 Vienna, Austria
Gerhard.Hoefinger@tuwien.ac.at

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