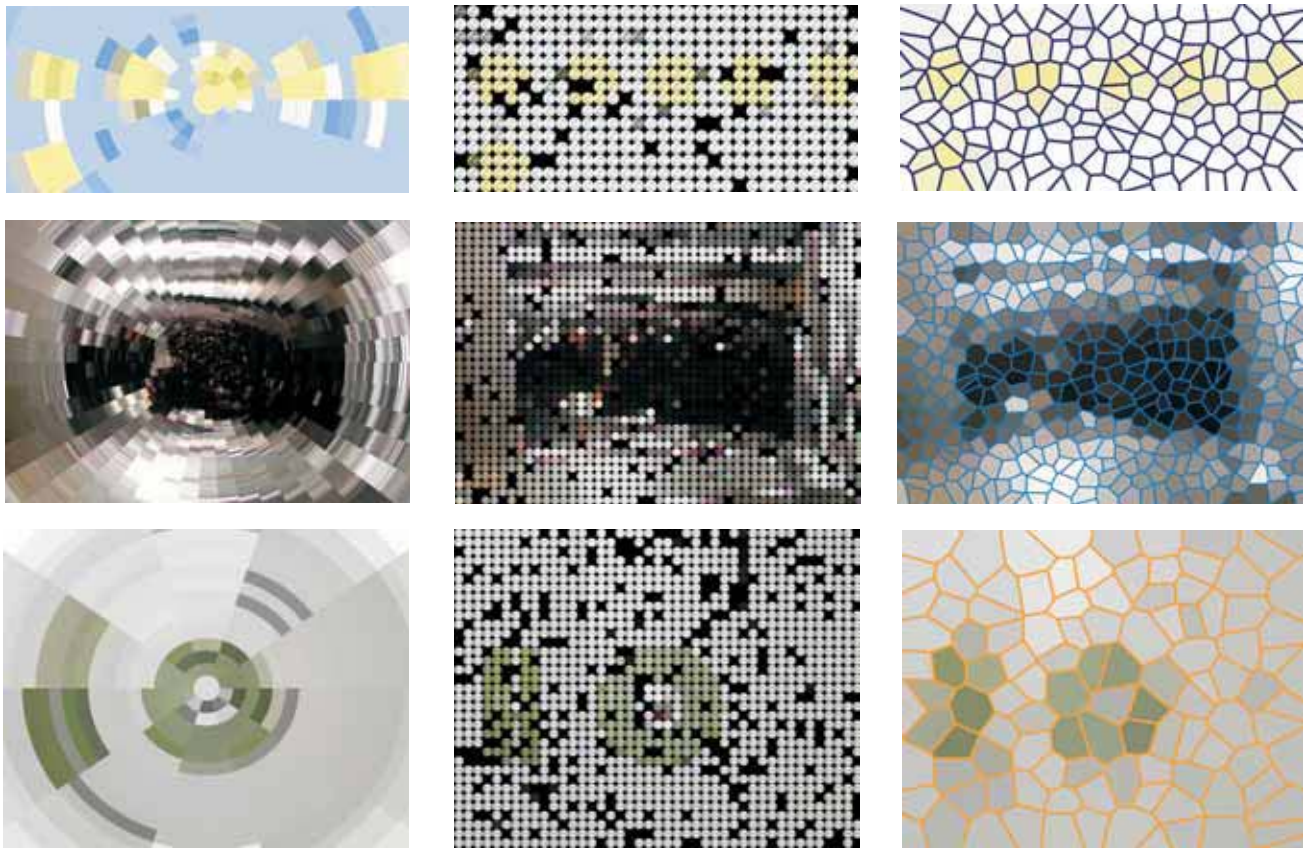
SNE SIMULATION NEWS EUROPE



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Journal on Developments and Trends in Modelling and Simulation

Membership Journal for Simulation Societies in EUROSIM

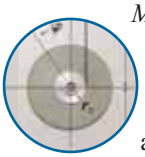
ARGESIM

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.

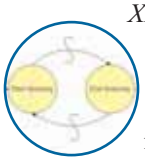
Felix Breitenecker, editor-in-chief; Felix.Breitenecker@tuwien.ac.at

SNE 16-1 / SNE 46 in Five Minutes

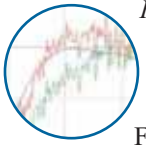
Process Modelling in a Sterilisation Tunnel (TN) - presents modelling and simulation for temperature profiles in an industrial production process – ***page 3***



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***

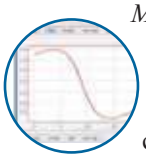


XML in DEVS (TN) – introduces XML as model basis for discrete event models for simulation via WWW and presents a prototype implementation – ***page 16***

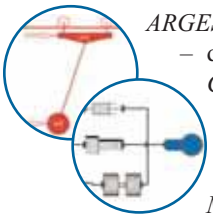


Real-time Simulation with DSPs (SN) - reports about a connection of two DSPs, one identifying the plant, the other performing Kalman Filter and LQ control – ***page 21***

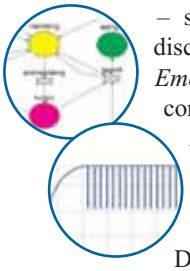
Simulation of Blood Glucose Regulation (SN) – presents MATLAB models glucose status together with a graphical interface for educational use – ***page 23***



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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Editorial Info - Impressum

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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
```

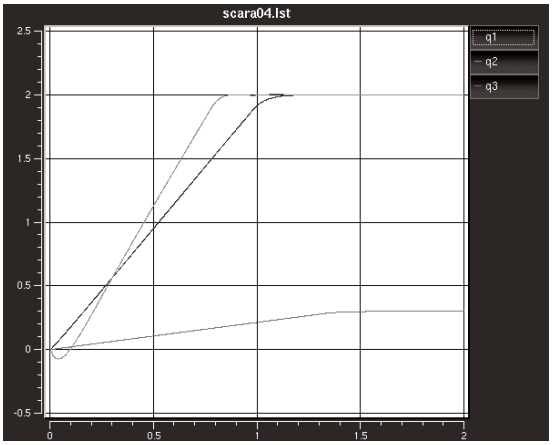

Figure 1: Joint position over time with PD control.

```
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.

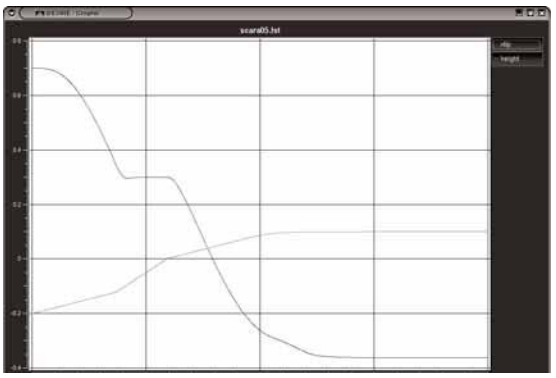
Figure 2: Tip positions in case of obstacle.

Classification: Explicit model approach
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