# Annual Report of the
# McLeod Institute of Simulation Sciences Hungarian Center


**Center Postal Address:**

Budapest University of Technology and Economics
Faculty of Economic and Social Sciences
Department of Information and Knowledge Management
H-1111 Budapest
Sztoczek u. 4.
Hungary

**Center Director:**

Prof. András JÁVOR PhD, DSc

**Center Managing Secretary:**

Ágnes VIGH

**Center Phone:**

+36 1 4631987

**Center Fax:**

+36 1 4634035

**Center E-mail:**

javor@eik.bme.hu

**Center Web Address:**

www.itm.bme.hu/mcleod


## Research Activities & Projects

The methodological research in applying AI in simulation by using intelligent demons (a special class of high level agents) and Knowledge Attributed Petri Nets (KAPN) is continued. The application of simulation is aimed at various fields and especially to interdisciplinary, economic and conflict resolving problems.

A new direction of applying simulation methodologies for problem solving is in the field of environmental problems with due regards to sustainable development. In this direction two new PhD students started to work.

We participate in an EU project "Technologies for Road Advanced Cooperative Knowledge Sharing Sensors" of the 6th Framework program dealing with the simulation of traffic that started this year with the participation of consortium members from the following countries: Spain, Italy, UK, Germany, France, Czech Republic.

Furthermore we have participated in the "USE-eNET (US-Europe e-Learning NETwork in Science and Engineering): An International Experiment in Modelling and Simulation Education" Transatlantic project coordinated by the universities of Chico and Hamburg and which was finished in 2006.

Finally we would like to mention that a volume "Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center" containing papers about the research activities of the Center has been published.

## Education

The simulation courses taught by the personal of the Hungarian MISS Center:

At the Budapest University of Technology and Economics:

- Modeling and Simulation in Economy
- Promoting Decision Making and Management by Simulation
- Methodology of Simulation and their Application in Decision Making
- Modeling and Simulation for Decision Making in Economy

There are 7 PhD students working on their thesis at the Hungarian MISS Center. They are actively taking part in the different research projects as well as in teaching simulation for graduate and undergraduate students.

As the Board of Directors at the 2004 board meeting in San Jose decided that the PhD degrees – obtained at universities where McLeod Institute of Simulation Sciences centers are operating and the PhD research work was undertaken in the field of simulation sciences under the supervision of the corresponding center - can be awarded by an international certificate.

The first certificate was awarded by the McLeod Institute of Simulation Sciences Hungarian Center to Gábor Szűcs based on his thesis „Optimizing and Modeling Methods of Highly Sophisticated Systems by Artificial Intelligence Controlled Simulation, with Special Emphasis on the Investigation of Traffic Systems".

Gábor Szűcs is adjunct professor at the Budapest University of Technology and Economics and is engaged in simulation research since the establishment of the Hungarian Center, participating in various national and international projects. The certificate was signed by Professor Agostino Bruzzone director of the McLeod Institute of Simulation Sciences and Professor András Jávor director of the Hungarian Center.

In November 2005 Professor András Jávor has been invited by Professor Felix Breitenecker director of the MISS Vienna Center to the Technical University of Vienna to be the opponent of the PhD thesis of a student who elaborated his thesis

under the supervision of Professor Breitenecker in the framework of MISS Vienna Center in the field of simulation. As he defended his thesis with success I propose that he should also obtain the MISS international certificate mentioned above.

**Center publications**


Jávor, A.: Simulation of Soft Systems - Keynote lecture
Informatics 2005, Bratislava, Slovak Republic, June 20-21, 2005, 13-17.

Jávor, A.: Model Identification and Reconstruction by Intelligent Agent Controlled Simulation
Control Science and Infocommunication, Universitas-Gyor Kht., Gyor, 2005. 81-87. (in Hungarian)

Szűcs, G.: Building a Traffic Simulation Software and a New Concept for Integration of Best Simulators
Periodica Polytechnica Ser. Trans. Eng., Vol.33, No.1-2 (2005), 103-124.

Varga, A.: Forecasting the Voice Traffic on a Liberalized Network by Computer Simulation
Magyar Távközlés XVI. No. 4., 2005 October
(in Hungarian)

Jávor, A. (ed.): Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center
Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006.

Jávor, A.: Model Identification using Intelligent Agents
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 9-20.

Szűcs, G.: The Simulation of Rare Events using the RESTART Method
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 21-32.

Mészáros-Komáromy, G.: Simulation of the Choice of Bank Offices using a High Level Petri Net
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 33-43.

Varga, A.: Simulation of Voice Traffic on a Liberalized TELECOM Market using a High Level Petri Net
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 45-59.

Wágner, L.: Portfolio Management to Help Decision Making in Investment in Information Technology
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 61-79.

Szabó-Bonifert, É.: Tax System and Simulation
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 81-91.

Für, A., Tóth, Á.: Vision Modeling by Knowledge Attributed Petri Nets and Synthesized Symbolic Descriptions
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 93-121.

Szegedi, M.: Building an Agent-Based Manufacturing Model
Studies in Simulation undertaken at the McLeod Institute of Simulation Sciences Hungarian Center, Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 123-133.

Für, A.: Simulation Methodologies for Planning Sustainable Energy Resource Management
Information and Knowledge Processes, No 10., Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 289-316.
(in Hungarian)

Für, A., Tóth Á.: Simulation of the Operation of Neural Cell Networks using Petri Nets
Information and Knowledge Processes, No. 9., Alma Mater, BME Department of Information and Knowledge Management, Budapest, 2006. 311-344.
(in Hungarian)

Jávor, A.: Demons as Forerunners of Software Agents in Simulation – Invited paper
2006 SCS International Conference on Modeling and Simulation - Methodology, Tools, Software Applications (M&S-MTSA'06), Calgary, Canada, July 31- August 2.
(in publication)

Jávor, A., Für, A.: R&E in Simulation of Transdisciplinary Problem Solving in Planning Sustainable Development
Summer Computer Simulation Conference (SCSC'06), Calgary, Canada, July 31- August 2.
(in publication)

## Center simulation tools

The main tool we apply in our research projects as well as in education is the AI controlled simulation system CASSANDRA (Cognizant Adaptive Simulation System for Applications in Numerous Different Relevant Areas) 3.0 we have developed in the recent years. (The CASSANDRA system has been applied in numerous international projects in various fields of application and its main features are outlined in the courses taught as mentioned above.)

Beyond CASSANDRA 3.0 developed by us we have already used the other two software systems as well.

The hardware configurations on which our simulation softwares run are PCs and Workstations.

## Center highlights

The Center intends to combine basic research of simulation methodologies coupled tightly with applications in various fields. Our approach is that we aim at finding solutions to problems arising in practical problem solving where the existing solutions are inadequate. In the past we have been participating in various projects, that we intend to continue. On the other hand we intend to get the students involved in the research work.

The main area of simulation we are active in is discrete simulation combined with artificial intelligence. The possible field of applications is rather wide. There are however some areas in which we already have been active or intend to be active in the near future. These priority areas are; the development of regions, planning sustainable development, advising SMEs strategy selection by means of simulation, flexible manufacturing systems, traffic, logistics, conflict resolution, micro and macro economy. We are however open to undertake simulation in other application fields as well where our expertise and tools can be applied efficiently.

The direction in which we intend to work is the simulation of ill-defined systems with particular emphasis on economic and multidisciplinary problems. Our approach where we expect new results is the solution of the model reconstruction problem where our demon (agent) controlled simulation system can be applied with success and new scientific and practical results can be expected.

Our first results have already been obtained in the field of the development of regions mentioned already above among the projects. This field of application we regard as especially important with special emphasis on sustainable development and environment control. Our present activities are aimed at the application of our AI controlled simulation methodologies and simulation tool system to this area.

Budapest, June 15, 2006.

Prof. András Jávor PhD, DSc
Director of the Hungarian MISS Center