

## DEPARTMENT OF CYBERNETICS AND ARTIFICIAL INTELLIGENCE

<http://www.tuke.sk/kkui/>  
Tel./Fax: ++421 95 625 3574

Head of Department  
prof. Ing. Ján Sarnovský, CSc.  
E-mail: [sarnovj@tuke.sk](mailto:sarnovj@tuke.sk)



### 1 DEPARTMENT'S PROFILE

The Department is responsible for education in the specialization of Control Engineering and Automation with two main directions: Control Theory and Artificial Intelligence. Students are prepared for creative application of basic control to practical applications.

The main research topics at the Department are methods and algorithms of control and decision processes for large-scale systems, speech recognition systems, constraint satisfaction systems, knowledge-based systems, and the use of fuzzy and neural net techniques in speech and image recognition. The Department is also involved in continuing education.

The actual title: The predecessor of the Department was founded in 1964. Department of Cybernetics and Artificial Intelligence was adapted in 1989. Currently it has 21 staff members, 26 internal and 17 external Ph.D. students. There are 3



sections within the department: Control Systems, Artificial Intelligence, and Automation Systems. The Department is involved in a number of research and educational projects. The following types of projects were under way in 2000: 5 research and 3 educational grants from European Commission, 1 bilateral Slovak-Austrian research grant, 5 grants awarded by the Slovak Grant Agencies and Ministry of Education and 1 faculty grant.

## 2 STAFF

**Professors:** prof. Ing. Ján Sarnovský, CSc.  
prof. Ing. Ladislav Madarász, CSc.  
prof. Ing. Dušan Krokavec, CSc.

**Associate Professors:** doc. Ing. Július Csontó, CSc.  
doc. Ing. Anna Filasová, CSc.  
doc. Ing. Ján Jadlovský, CSc.  
doc. RNDr. Eva Ocelíková, CSc.  
doc. Ing. Tomáš Sabol, CSc.  
doc. Ing. Peter Sinčák, CSc.

**Assistant Professors:** Ing. Marián Bučko, CSc.                      Ing. Juraj Galko  
Ing. Anna Jadlovská                                      Ing. Rudolf Jakša, PhD.  
Ing. Kristína Machová, CSc.                              Ing. Marián Mach, CSc.  
Ing. Iveta Zolotová, CSc.                                      Ing. Ján Paralič, PhD.

**Senior Scientists:** Dr. Ing. Vratislav Hladký                      Dr. Ing. Ján Vaščák  
Ing. Ján Liguš

**Technical Staff:** Imrich Balogh                                      Tatiana Baňasová  
Mária Feješová

**PhD. Students:** Ing. Peter Benko                                      Ing. Ján Kašprišin  
Ing. Marek Bundzel                                      Ing. Róbert Kende  
Ing. Jana Horanská                                      Ing. Peter Kostelník  
Ing. Ján Hreňo    Ing. Daniel Novotný  
Ing. Marcel Hric    Ing. Peter Macej  
Ing. Miroslav Hudec                                      Ing. Jozef Marcin  
Ing. Stanislav Kaleta                                      Ing. Zdeno Orinčák  
Ing. Martin Palko    Mgr. Eva Schwardyová  
Ing. Marek Polák    Ing. Marek Šamulka  
Ing. Milan Schmotzer                                      Ing. Marek Štofko  
Ing. Dalibor Schon    Ing. Maroš Timko

## 3 EQUIPMENT

### 3.1. Teaching and Research Laboratories

- Laboratory of Information Systems (L-535)
- Laboratory of Distributed Control Systems - ROCKWELL AUTOMATION LABORATORY (L-536)
- Laboratory of Complex Systems Control (L-513)
- Laboratory of One-Chip-Computers (L-509)

- Artificial Intelligence Laboratory (LUI)
- Laboratory of Speech and Pattern Recognition (V-147)
- Signal Processors Laboratory (V-101b)

### 3.2. Special Measuring Instruments and Computers

2 x RISC stations IBM RS-6000, server DEC ALPHA 1000/200, about 30 PCs, programmable logic automates of various types (PLC-5/20E, SLC 5/4, SLC-5/03, TSX-47/40, TSX-17, SIMATIC S5-90U, SIMATIC S5-95U), far connectors, industrial visualization terminals and intelligent measurement elements, block of far I/O based on modules SLC, industrial terminal Panel-View-550, 3 x analogue computers MEDA-50, three-phase drive Rockwell-Automation, model for measurement and regulation of hot water supply, asynchronous drive, resources for recognition of black and white images: black and white camera MINILUX SUPER CCTV CAMERA and CCD CAMERA CCD-4230A, program resources based on AI elements, framegrabber SHARK 22n SHT G22.N1 with PHILIPS SAA 7110 WP videoprocessor; resources for infrared images recognition: AGA TERMOVISION SYSTEM 608, camera, remote control, black and white and color monitor, PC-LabCard 812, 2 x computers SUN SPARC station 20, , 8 x single-chip-computer configurations based on I-80552, 10 x set TEMS-51 LAB based on I-8031, three application on-chip-computer configurations 196 LAB based on I-80196, 3 x 3-channel oscilloscope, 3 x generator of signals, 3 x variable voltage supply, Lego mindstorm system, 4 x kit based on ADSP - 2100 signal processor; 4 x kits based on ADSP - 2181 signal processor.

## 4 TEACHING

### 4.1. Undergraduate Study (Bc.)

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Identification and Modeling	5 <sup>th</sup>	2/3	Filasová
Artificial Intelligence	5 <sup>th</sup>	2/2	Csontó
Linear Systems Control Theory	5 <sup>th</sup>	3/2	Madarász
Simulation Programming Tools Seminar	5 <sup>th</sup>	0/2	
Programming for Control	5 <sup>th</sup>	1/3	Zolotová
Cybernetics and Management	5 <sup>th</sup>	2/2	Sarnovský
Non-linear Systems Control Theory	6 <sup>th</sup>	2/2	Madarász
Stochastic Processes in Dynamic Systems	6 <sup>th</sup>	2/2	Krokavec, D.
Single-chip Microcomputers in Control	6 <sup>th</sup>	2/3	Jadlovský
Elements of Control Systems	6 <sup>th</sup>	2/2	Hladký
Signal Processors Applications Seminar	6 <sup>th</sup>	0/2	
Applied Programming Seminar	6 <sup>th</sup>	0/2	
Protocols and Interfaces	6 <sup>th</sup>	2/2	Jadlovský
Computer Vision	6 <sup>th</sup>	2/2	Zolotová
Scheduling and Logistics	6 <sup>th</sup>	2/2	Paralič, J.

#### 4.2. Graduate Study (Ing.)

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Computer Tools for Technological Systems Control	7 <sup>th</sup>	2/3	Jadlovský
Theoretical Foundations of Artificial Intelligence	7 <sup>th</sup>	2/3	Sabol
Neural Networks	7 <sup>th</sup>	3/2	Sinčák
Discrete-time System Theory	7 <sup>th</sup>	3/2	Krokavec, D.
Database Management System Applications	7 <sup>th</sup>	3/2	Ocelíková
Expert Systems	7 <sup>th</sup>	3/2	Mach
AI Programming Languages Seminar	7 <sup>th</sup>	0/2	
Control System Design Seminar	7 <sup>th</sup>	0/2	
Fuzzy Systems in Control	7 <sup>th</sup>	2/2	Vaščák
Robot Control Systems	7 <sup>th</sup>	2/2	Kováč
Optimal and Adaptive Control Theory	8 <sup>th</sup>	3/2	Sarnovský
Multicriterial Decision Making	8 <sup>th</sup>	3/2	Ocelíková
Evolutionary Algorithms	8 <sup>th</sup>	3/2	Mach
Intelligent Sensor Systems	8 <sup>th</sup>	3/2	Krokavec, D.
Control and Visualization of Processes	8 <sup>th</sup>	2/2	Zolotová
Control and Artificial Intelligence	8 <sup>th</sup>	2/2	Sarnovský
Knowledge Management	8 <sup>th</sup>	2/2	Mach, Paralič, J.
Planning and Problem Solving	8 <sup>th</sup>	2/2	Sabol
Discrete Modeling	8 <sup>th</sup>	2/2	Sabol
Machine Learning	8 <sup>th</sup>	2/2	Mach
Online Identification	8 <sup>th</sup>	2/2	Krokavec, D., Filasová
System Analysis and Synthesis	8 <sup>th</sup>	2/2	Madarász
Robust Control	8 <sup>th</sup>	2/2	Filasová
Information Transmission	8 <sup>th</sup>	2/2	Krokavec, D.
Biocybernetics	9 <sup>th</sup>	3/1	Csontó
Complex Systems Control	9 <sup>th</sup>	3/2	Sarnovský
Complexity and Decision Making	9 <sup>th</sup>	2/2	Madarász
Distributed Control Systems	9 <sup>th</sup>	2/3	Jadlovský
Dynamic Systems Diagnostics	9 <sup>th</sup>	3/2	Krokavec, D.
Speech Recognition	9 <sup>th</sup>	2/2	Krokavec, D.
Neuro-fuzzy Systems	9 <sup>th</sup>	2/2	Sinčák
Project Management	9 <sup>th</sup>	2/2	Sabol
Agent Systems	9 <sup>th</sup>	2/2	Sabol
Electronic Commerce	10 <sup>th</sup>	2/2	Sabol, Kováč

#### 4.3. Undergraduate and Graduate Study for Foreign Students (in English Language)

All subjects listed in previous two subsections are offered also in English

language for foreign students.

## 5 RESEARCH PROJECTS

- *Web Technologies Supporting Direct Participation in Democratic Processes (WEBOCRACY)*, European Commission within the IST Program (5th Framework Program), IST-1999-20364, collaboration: Faculty of Electrical Engineering and Informatics, TU Kosice, SK, The School of Computing & Information Technology, University of Wolverhampton, UK, Department of Information Systems, University of Essen, D, JUVIER s.r.o. - SK, Citec Information, Citec Engineering Oy Ab, Vaasa, FIN, City ward Tahanovce, SK, City ward Dargovskych hrdivov, SK, Wolverhampton Council, UK, duration: 2000 – 2003, members: Tomáš Sabol (co-ordinator), Marián Mach, Ján Paralič, Róbert Kende, Ján Hreňo, Peter Macej, activity: Project aims to empower citizens with innovative communication, access and voting systems supporting increased participation in democratic processes. This organizational objective is achieved through scientific objectives, which are of technical and methodological nature. Technical objectives involve design and development of a Web-based system Webocrat. Webocrat will support: communication and discussion, publication of documents (incl. notices for competitive tendering), browsing and navigation, voting, intelligent retrieval (access to requested documents), calculation of summaries/statistics. All functions will be supported by knowledge model module. The methodological objectives are focused on development of a methodological framework and organizational practices for development and management of systems providing on-line support to public administration (PA) services.
- *Web in Support of Knowledge Management in Company (Know-Web)*, ESPRIT Project 29065 supported by European Commission, collaboration: Luton Business School, University of Luton, UK - co-ordinator, Marketing Assessments Limited, Ltd. - UK, Oy Botnia Retail Data Ab, Finland, Faculty of Electrical Engineering and Informatics, TU Kosice, SK, University of Vaasa, Finland, IFBL Slovakia Ltd. - SK, duration: 1998 – 2000, members: Tomáš Sabol, Marián Mach, Ján Paralič, Róbert Kende, activity: Development of tools which help to capture, maintain, share and retrieve knowledge and foster communication within the company. The Know-Web is based on Web technologies (intelligent agent technologies, dynamic Web, etc.), knowledge modeling and sharing techniques (ontologies), case-based reasoning, and others.
- *Geographic Information On-Line Analysis (GIS - Data Warehouse Integration) (GOAL)*, INCO-COPERNICUS Project No. 977091, collaboration: Technical University Vienna (AUT) – co-ordinator; Czech Technical University Prague (CZ); Lumare GIS, Ltd. (CZ); Technical University of Kosice (SK); University GH Essen (D); VEGA, Ltd. (CZ), duration: 1998 –2001, members: Ján Paralič (leader), Július Csontó, Marek Hubal', Peter Bednár, Martin Pecuch, activity: The research project GOAL aims to find the way to integrate data warehouses (DWH) with geographical information systems (GIS) to support top executives in their decision-making by providing them with the information stored in the geographical information system. Our department is responsible for the knowledge discovery package integrated within the GIS-DWH prototype.
- *Euro-international Symposium on Computational Intelligence, 5th Framework Program* No. HPCF-CT-1999-00220, duration: 1999-2002, activity: This project

is devoted to organization of 2 events – Euro-international Symposiums on Computational Intelligence. One of them was held at TU Kosice between August 30. – September 1, 2000. Computational Intelligence is an important domain of Machine intelligence. On the symposium more than 100 researchers from all over the world participated on the event. The leading research persons participated on the conference including prof. Lotfi Zadeh from University of Berkeley, prof. David Goldberg from University of Illinois, prof. Kuhiniko Fukushima from University of Tokyo, prof. K. Hirota from Tokyo Institute of Technology, prof. Haydeuki Takagi from Kyushi Institute of Technology, prof. Claudio Moraga from University of Dortmund, prof. J. Kaczprzyk from Polish Academy of Science, prof. L. Koczy from Technical University of Budapest, prof. I. Rudas from Budapest Polytechnic and many others. The next event is expected to be held in June 2002.

- *CLUstering Evaluation (CLUE)*, bilateral Slovak-Austrian research project, duration: 1999 – 2000, members: Ján Paralič and Andreas Rauber (Vienna Univ. of Technology), activity: The main focus of the CLUE project is the evaluation and comparison of different approaches to cluster analysis for data mining. By evaluating the strengths and weaknesses of compared approaches rules of thumb have been identified as to which approach or which combination promises to be most suitable for a specific goal. CLUE thus provides both partners with additional expertise in each other's domains as well as new expertise in the overlap and combination of those rather independently analyzed and applied approaches.
- *Integration of Tools for Intelligent Technologies*, Scientific Grant Agency project (S.G.A.) No. 1/5032/98, duration: 1998 – 2000, members: Július Csontó (project leader), Tomáš Sabol, Marián Mach, Kristína Machová, Ján Paralič, activity: The project concentrates on two ways of integration of tools developed in frame of different fields of artificial Intelligence, such as: inclusion of different AI tools into one integral programming tool and integration of AI tools into architecture of multi-agent environment.
- *Multiagent Hybrid Control in Large-Scale Systems Using Methods of Artificial Intelligence*, S.G.A. project No. 1/5236/1999, duration: 1999 – 2001, members: Ján Sarnovský (project leader), Ladislav Madarász, Anna Filasová, Ján Vaščák, Vratislav Hladký, Ján Liguš, Marián Bučko, Anna Jadlovská, Ján Jadlovský, Rudolf Jakša, Peter Benko, Maroš Timko, activity: The goal of the project is the research and design of algorithms and methods of control and decision of automatic control systems, namely using modern paradigm of multiagent approach to control large-scale systems using the principles and methods of artificial intelligence.
- *Pattern Recognition on the Basis of Intelligent and Information Technologies*, S.G.A. project No. 1/6061/99, duration: 1999 – 2001, members: Eva Ocelíková (project leader), Ladislav Madarász, Iveta Zolotová, Nguyen Hong Thai, Ján Krištof, Jozef Marcin, Andrea Julényová, Juraj Galko, Marek Štofko, activity: Resolving problems of image acquisition as primary input information in the recognition process, analysis of their nature and followed pre-processing, design and implementation of programming modules for suitable informative feature extraction and dimension reduction of feature space, development of classification methods and hybrid classifiers with combination of classical statistical methods and neural technologies. The data are used from control of large-scale technological process (situational control, surface inspection of

materials), from ecology (remotely sensed data) and from medicine (cardiovascular illnesses data, bio-medical images).

- *Robust Diagnosis of Dynamic Systems*, S.G.A. project No. 1/6270/99, duration: 1999 – 2002, members: Dušan Krokavec (project leader), Anna Filasová, Juraj Galko, Róbert Németh, activity: Investigation of test signals which reflects inconsistencies between the fault-free and fault system as well as neural network, classifier training and discriminative hidden Markov models learning for system fault classes, testing of procedures for fault function decomposition and fault isolation, robustification of fault tolerant control for uncertain dynamic systems.
- *Computational Intelligence in Decision Making Procedures*, S.G.A. project No. 1/6087/99, duration: 1999 – 2002, members: Peter Sinčák (project leader), Ján Vaščák, Rudolf Jakša, Stanislav Kaleta, some other colleagues from different Universities, activity: Computational Intelligence represents a part of Artificial Intelligence and mainly integrates 3 different technologies concerning artificial neural networks, fuzzy systems and evolutionary systems. Integration of these systems results in so called hybrid intelligent systems. The project covers and focuses on basic-and-fundamental research issues and also on application domain in the following directions: intelligent control, intelligent prediction systems and intelligent image processing systems. In all application problems we focus on decision-like procedures and utilization of obtained knowledge based in these processes. The level of decision procedures is the crucial point of the technology level. If we will be able to make intelligent decisions (decisions with high level reliability) we can improve many technological processes in general. The machine IQ seems to be an attempt to measure the level of intelligence of human-made systems and to evaluate decision procedures in technology.
- *SCADA/HMI Systems as Decision Support Systems in Industry Automatization*, Institutional project of FEI TU Košice No. 1/6087/99, duration: 1999 – 2002, members: Iveta Zolotová (project leader), Eva Ocelíková, Marek Štofko, Vratislav Hladký, Ján Jadlovský, Ján Liguš, Jozef Marcin, Peter Vilím, Anna Jadlovská, activity: The goal of the project is the creation of the whole methodics for software projects of SCADA/HMI systems (Supervisory Control and Data Acquisition/Human Machine Interface) with the attention to the newest technology and emergence trends of automation and informatics. It deals about methods of integration, distribution, evt. design of software (COM, ActiveX) components and whole systems with the functions: human-machine interface - HMI (classical and remote), OPC servers, alarms and messages, statistical process control, communication with databases, decision support e.g. trend prediction with the using of methods of artificial intelligence. Science-technical and education goal is application of these methods in the laboratory technical evt. simulate models with the technological nets (e.g. DH+, DH485), the protocols (DHTML, TCP/IP) and internet/intranet technology.

## 6 CO-OPERATION

### 1.1. Co-operation in Slovakia

- Department of Biophysics IEP Slovak Academy of Science - DB IEP SAS
- Department of Automatic Control Systems Bratislava – DACS

- Slovak University of Technology, Bratislava
- Institute of Control Theory and Robotics Slovak Academy of Science in Bratislava
- University of P.J. Šafárik, Košice
- Economic University, Faculty of Business Economics, Kosice
- The City of Kosice
- Local Authority Kosice – City ward Stare mesto
- Local Authority Kosice – City ward Juh
- Local Authority Kosice – City ward Zapad
- Local Authority Kosice – City ward Tahanovce
- Local Authority Kosice – City ward Dargovskych hrdinov
- Tatrabanka

#### 1.1.1. Visitors to the Department

- prof. Imre Rudas - Polytechnic Budapest, Hungary
- prof. Vladimir Kvasnicka, DrSc. - STU Bratislava
- prof. Lotfi Zadeh - University of Berkeley, USA
- prof. David Goldberg - University of Illinois, USA
- prof. Kauro Hirota - Tokyo Institute of Technology, Japan
- prof. Haydeuki Takagi - Kyushu Institute of Technology, Japan
- prof. Kuhiniko Fukushima - Univeristy of Tokyo, Japan
- prof. Claudio Moraga - University of Dortmund, Germany
- prof. Laszlo Koczy - TU Budapest, Hungary
- prof. Boris Igelnik - CWU Cleveland, USA
- Dipl.-Ing. Andreas Rauber – Vienna University of Technology, Austria
- Ing. Kamil Matoušek – ČVUT Praha, Czech Republic
- Assoc. prof. Mudrončík, D. Ph.D. - DACS Bratislava
- Ph.D. Tomori, Z. - DB IEP Slovak Academy of Sciences

#### 1.2. International Co-operation

- Boston University, USA
- University of Dortmund, Germany
- Tokyo Institute of Technology, Japan
- Kuyshu Institute of Technology, Japan
- University of Wolverhampton, United Kingdom
- University of Luton, United Kingdom
- The Open University, Knowledge Media Institute, United Kingdom
- Marketing Assessment Ltd, United Kingdom
- University of Vaasa, Finland
- Helsinki University of Technology, Dipoli, Finland
- University of Essen, Germany
- Oy Botnia Ab, Finland
- CITEC, Finland
- Department of Informatics, Technical University, Ostrava, Czech Republic
- Department of Control Systems and Instrumentation, Faculty of Mechanical Engineering Technical University of Ostrava, Czech Republic
- Department of Software Engineering, Vienna University of Technology, Austria
- Department of Cybernetics, Czech Technical University Prague, Czech Republic
- Department of Control Engineering, Czech Technical University, Prague, Czech



Republic

- Institute of Information Theory and Automation , Academy of Sciences of Czech Republic, Prague, Czech Republic
- Faculty of Mechanical Engineering, Department of Automation, Institute of Information, University of Miskolc, Hungary
- Budapest Polytechnic, Hungary
- Budapest University of Technology and Economics, Hungary
- California Institute of Technology, Jet Propulsion Laboratory (Dr. Antal, K. Bejczy), USA, California
- Hungarian Academy of Sciences, Computer and Automation Research Institute, Hungary (prof. Gyorgy Kovács)
- Bay Zoltán Foundation for Applied Research (prof. László Cser)

### 1.2.1. Visits of Staff Members to Foreign Institutions

- Bundzel, M.: Danish Hydrological Institute, Copenhagen, Denmark
- Filasová, A.: Czech Technical University, Prague, Czech Republic
- Hladký, V.: Vienna University of Technology, Austria
- Hudec, M.: Boston University, USA
- Kaleta, S.: Chios – Int. Conference on Computational Intelligence, Greece
- Krokavec, D.: Czech Technical University, Prague, Czech Republic
- Mach, M.: Czech Technical University, Prague, CR, Oy WINPOS Ab, Kevlax, Finland
- Ocelíková, E.: Czech Technical University, Prague, Czech Republic, Institute of Information Theory and Automation, Academy of Sciences of Czech Republic, Prague, Czech Republic
- Orinčák, Z.: Vienna University of Technology, Austria
- Ottmár, P.: Czech Technical University, Prague, Czech Republic, University of Technology, Budapest, Hungary
- Paralič, J.: Czech Technical University, Prague, CR, Vienna University of Technology, Austria, Oy WINPOS Ab, Kevlax, Finland, Budapest University of Technology and Economics
- Sarnovský, J.: University of Twente, NL, Kings College, UK, University of Twente, Netherland, Free University of Brussel, Belgium, Technical University Dortmund, Germany, King's College London, University of Stirling, University of Manchester, UK
- Sinčák, P.: University of Salford, UK, University of Twente, NL, Kings College, UK
- Timko, M.: Czech Technical University, Prague, Czech Republic, University of Miskolc, Miskolc, Hungary, University of Technology, Budapest, Hungary
- Zolotová, I.: – University of Miskolc, Hungary, Vienna University of Technology, Austria

### 1.3. Membership in International Organizations and Societies

- Sabol Tomáš: Information Society Technologies Program Committee (IST PC), 5th Framework Program, Brussels
- Paralič Ján: ACM – Association of Computer Machinery
- Ocelíková, E. – Sinčák, P. – Zolotová, I.: Czech Society for Cybernetics and Informatics
- Ocelíková, E. - Sinčák, P. - Zolotová, I.: CPRS - Czech Pattern Recognition

#### Society

- Ocelíková, E. - Zolotová, I.: CSSS - Czech and Slovak Society for Simulation
- Sarnovský Ján: INES - International Network of Engineers and Scientists for Global Responsibility
- Sarnovský Ján: Principia Cybernetica Web PRNCYB-L
- Sarnovský Ján: SWIIS - Supplementary Ways for Improving International Stability
- Madarász Ladislav: Editorial Board Member of Bulletin for Applied Mathematics, Budapest, Hungary
- Csontó Július: Editorial Board Member of Lékař a technika, Prague, Czech Republic

#### 1.4. Membership in Slovak Organizations and Societies

- Sabol Tomáš: Board of the Open Society Fund, Bratislava
- Sabol Tomáš: Board of the Slovak Association for International Co-operation (SAAIC), Bratislava
- Ocelíková, E. - Zolotová, I.: Slovak Society of Applied Cybernetics and Informatics
- Krokavec Dušan: Slovak Elelectrical Engineering Society:
- Sinčák, P. – Kende, R. – Vaščák, J. – Hric, M. – Sarnovský, J. – Andrassyová, E. – Kaleta, S. - Madarász, L. – Hudec, M. – Schmotzer, M. – Timko, M. – Kostelnik, P. – Šamulka, M.: SAIS - Slovak Artificial Intelligence Society

#### 1.5. Contracts, International Scientific Projects

- IST-1999-20364 "Web Technologies Supporting Direct Participation in Democratic Processes (Webocracy)", 2000-2003, Project Co-ordinator.
- Esprit Project 29065 "Web in Support of Knowledge Management in Company (KnowWeb)", 1998-2000.
- Esprit Project 29015 "Enriching Representations of Work to Support Organizational Learning (ENRICH)", 1998-2000.
- INCO-COPERNICUS Project 977091 "Geographic Information On-Line Analysis (GIS - Data Warehouse Integration) (GOAL)", 1998-2001
- International Education Project TEPMUS - STAMP – European Standards for Advanced Manufacturing Technologies and Intellectual Property, 1999-2001 (Košč, P. – leader, Zolotová, I. and others – members)
- International Scientific Project: Intelligent and Information Technologies for Objects Recognition. Eva Ocelíková (project leader), Jozef Marcin, Iveta Zolotová, Nguyen Hong Thai, Ján Krištof
- International Scientific Project: Intelligent and Information Technologies for Objects Recognition. Eva Ocelíková (project leader), Jozef Marcin, Iveta Zolotová, Nguyen Hong Thai, Ján Krištof. Funding: Slovak-Czech scientific and technological co-operation. Project No. 064/097. Collaboration with Institute of Theory and Automation, Academy of Sciences of the Czech Republic. 2000 – 2001

## 7 THESES

### 1.1. Bachelor Theses

1. Csík, C.: Mining of Decision Trees from Databases (Paralič, J.)

2. Ivan, J.: RSTools Components in SCADA/HMI Systems. (Zolotová, I.)
3. Barnák, B.: RSPowerTools Components in SCADA/HMI Systems. (Zolotová, I.)

## 1.2. Masters Theses

1. Bartko, J.: Multidimensional Data Clustering (Ocelíková, E.)
2. Čapo, J.: Segmentation of Gray-scale Images through Seed Region Growing Method. (Zolotová, I. - Marcin, J.)
3. Dadej, V.: On-line Identification Algorithmization for Heuristic Dynamic Programming (Krokavec, D.)
4. Dorič, M.: Statistical Classification Methods in Complex Classifiers (Ocelíková, E.)
5. Duplinský, D.: Segmentation of Gray-scale Images through Snake Method. (Zolotová, I. - Marcin, J.)
6. Fedor, M.: Computer Aided Airport Traffic Scheduling (Csontó, J.)
7. Gavalier, M.: Intelligent control of autonomous systems (Sinčák, P.)
8. Harhovský, P.: Creation of Information Structure by Means of Web Document Space Indexing (Sabol, T.)
9. Horanská, J.: Architectures of SCADA/HMI Systems. (Zolotová, I.)
10. Hric, M.: Integration of ARTMAP neural networks with fuzzy systems for classification (Sinčák, P.)
11. Hricková, M.: Multimodular neurogenetic system for classification (Sinčák, P.)
12. Ivanecký, M.: Adaptive Control Algorithms of Crain Using Neural Networks (Sarnovský, J.)
13. Kašprišin, J.: Kalman Predictor Algorithmization for Heuristic Dynamic Programming (Krokavec, D.)
14. Kinik, J.: DEMO-versions of Continuous Speech Recognition (Krokavec, D.)
15. Kisbenedek, Š.: Kalman State Predictor for Plants with Uncertain Structuralized Noise Input (Krokavec, D.)
16. Kočan, P.: Algorithm C4.5 as a Tool for Knowledge Discovery in Large Databases (Paralič, J.)
17. Kostelník, P.: information Retrieval Using Cluster Analysis (Sabol, T.)
18. Kozma, F.: Adaptive Fuzzy Control Methods of Systems with Time Delay (Vaščák, J.)
19. Lokaj, P.: Adaptive Fuzzy Control of the Double Inverted Pendulum (Vaščák, J.)
20. Malíková, S.: Deterministic Residual Generation for Singular Systems (Krokavec, D.)
21. Mesarč, I.: Feature Selection and Dimension Feduction of Feature Space (Ocelíková, E.)
22. Novotný, D.: Application of neural networks for time series prediction (Sinčák, P.)
23. Palko, M.: Computer Aided Airline Loading Scheduling (Csontó, J.)
24. Sabo, M.: Computer Aided Time-table Optimization (Csontó, J.)
25. Schmotzer, G.: Algorithms for Control of Non-linear Dynamic Systems Using Neural Networks (Sarnovský, J.)
26. Sita, G.: Optimal Control and Power Systems (Filasová, A.)
27. Sobotka, B.: Simulation of Alga Chlorella Kessleri in Swarm environment (Csontó, J.)
28. Šamulka, M.: Application of neural networks for industry images processing (Sinčák, P.)
29. Šůň, J.: Neural Networks at Optimal Control Theory (Filasová, A.)
30. Zvirinský, P.: Simulation of Gaia Theory (Csontó, J.)

31. Žďárská, M.: Discrete-time Robust LQ Control of Plants with Structuralized Uncertainties (Krokavec, D.)

### 1.3. Doctoral Theses

1. Ing. Nguyen Hong Tai: Maximum Entropy Image Restoration by Neural Network (Ocelíková, E.)

## 8 OTHER ACTIVITIES

- In May 2000 a joint research lab between Department of Cybernetics & AI, Institute of Control Theory and Robotics at Slovak Academy of Science in Bratislava and Institute of Computer Technology was established. The common research lab was officially opened as "Center for Intelligent Technologies (CIT)" and Computational Intelligence Group creates the main core of CIT.
- CIT further cooperates with Tatrabanka, which supports one of the PhD students in his study Mr. Marcel Hric, MSc. - who is working on research problems related to application of computational Intelligence in Financial Domain. Similar cooperation is running with Nuclear Power Plant research Institute in domain of application of computational Intelligence in Power Engineering domain. So additional contacts are with SWH (Siemens) and CA in domain of computational Intelligence and promotion of their products.
- Lectures on the subject „Knowledge Management“ for development engineers of Oy WINPOS Ab and Oy ISI Industry Software Ab, Kvevlax, Finland (Ing. Marián Mach, CSc. - Ing. Ján Paralič, PhD. - doc. Ing. Tomáš Sabol, CSc.).

## 9 PUBLICATIONS

### 9.1. Books

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### 9.2. Journals

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2. Bundzel ,M. - Sinčák, P. - Kopčo, N.: Using Support Vectors Machine for Classification of Remotely Sensed Images, State of Art in Computational Intelligence, pp. 404, ISSN 1615-3871, published in series Advances in Softcomputing, Springer-Verlag, 2000, pp. 361-369, Soft-cover
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5. Kohányi, F. - Zolotová, I. and Tóth, P.: Decision Support Systems in Power Engineering (in Slovak: Systémy na podporu rozhodovania v energetike). In: *Magazine of Electrical Engineering* (in Slovak: *Elektrotechnický magazín - ETM*), Vol. 10, No. 7-8, 2000, pp. 36-38, Czech Republic, ISSN 1210-5422. (in Slovak)
6. Kopčo, N. - Carpenter, G. A.: Graded Signal Functions for ARTMAP Neural Networks; in: The State of the Art in Computational Intelligence, series – Advances in Softcomputing, in Physics Verlag, pp. 9-14, ISSN 1615-3871
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### 9.3. Textbooks

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3. Dzurňáková, Z. and Sarnovský, J.: Hybrid Control Systems, Control Systems Design, IFAC Conference, Bratislava 2000, pp. 109-113
4. Džbor, M. - Paralič, J. and Paralič, M.: Knowledge Management in a Distributed Organization. In Proc. of the BASYS'2000 - 4th IEEE/IFIP International Conference on Information Technology for BALANCED AUTOMATION SYSTEMS in Manufacturing, Kluwer Academic Publishers, London, September 2000, ISBN 0-7923-7958-6, pp. 339-348.
5. Filasová, A. and Krokavec, D.: LQ Controller with Prescribed Closed-loop Pole Position. In: Proc. of the 4th International Scientific – Technical Conference "Process Control 2000" (Eds. Krejčí, S. - Taufer, I. - Jakeš, B. and Macháček, J.). Kouty nad Desnou, Czech Republic, 11-14.6.2000, pp. 170 (Abstract) + CD. ISBN 80-7194-271-5
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8. Hreňo, J.: Automatic Document Abstract Creation, in Proc. of the 11th International Conference on Information and Intelligent Systems - IIS'2000, September 2000, Varaždin, Croatia (on CD).
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  22. Krokavec, D. - Filasová, A.: Optimization in LQ Control and Kalman Prediction Using Neural Networks. In: Preprints of IFAC Conference „Control Systems Design“ (Eds. Kozák, Š. – Huba, M.). Bratislava, Slovak Republic, 15.-16.6.2000, pp. 554-559.
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  25. Landryová, L. - Zolotová, I.: Integrating Methods of Artificial Intelligence into Control, In: Proceedings of International Carpathian Control Conference, ICC'2000, High Tatras, Podbanské, Slovak Republic, May 23-26, 2000, pp. 447-450, ISBN 80-7099-510-6. (in English)

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35. Rauber, A. - Paralič, J. and Pampalk, E.: Empirical Evaluation of Clustering Algorithms, in Proc. of the 11th International Conference on Information and Intelligent Systems - IIS'2000, September 2000, Varaždin, Croatia (on CD).
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#### 9.5. Other Publications

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