Institute of Control and Computation Engineering

2005 Annual Report

Warsaw University of Technology
Faculty of Electronics and Information Technology
Institute of Control and Computation Engineering
Nowowiejska 15/19, 00-665 Warsaw, Poland
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From the Director

The Institute of Control and Computation Engineering (ICCE, Polish: Instytut Automatyki i Informatyki Stosowanej) was created in 1955 as the Chair of Automatic Control and Telemechanics by Professor Władysław Findeisen. It was reorganized in 1970 to become the Institute of Automatic Control. Rapid development of microprocessor technology and its impact on the field of control in recent years directed the interest of the staff and students towards computational and algorithmic aspects of control, decision support, man-machine interfaces, network communications, etc. This resulted in 1994 in the creation of new educational profiles offered by the Institute and a change of its name to the present one. Professor Władysław Findeisen had been the Director of the Institute until he was elected the Rector of Warsaw University of Technology in 1981. His achievements are recognized worldwide. He is Doctor Honoris Causa of the City University London, Technical University of Gdańsk, Technical University of Ilmenau and Warsaw University of Technology.

The Institute celebrated in 2005 its 50th anniversary. There was a special Anniversary Session devoted to this event during XV Polish Control Conference in June in Warsaw. In September, a special half-day meeting of the current and past staff and PhD students of the Chair/Institute was organized at Klepisko restaurant, beautifully located near Warsaw. This created an opportunity to meet colleagues, to talk about past events, to present current achievements, and to enjoy good food and drinks in a nice surrounding till late in the evening. The occasion of the anniversary, was an opportunity for the Rector of Warsaw University of Technology to award three Institute staff members (now retired), Prof. Prof. Konstanty Kurman, Radosław Ładziński and Jerzy Pułaczewski, with the Decoration of the Distinguished Employee of WUT.

From September 2005 a new 3-year term of Institute Management has started. The positions of Deputy Directors are now occupied by Prof. Cezary Zieliński (Research) and Dr. Tomasz Traczyk (Academic Affairs). Let me take this opportunity to thank former Deputy Directors, Prof. Andrzej Pacut (Research) and Dr. Jerzy Paczyński (Academic Affairs) for many years of dedicated service to the academic community of the Institute. Moreover, during this year a new research group was established: Biometrics and Machine Learning, headed by Prof. Andrzej Pacut.

From 16 through 18 February 2005 European Robotics Network of Excellence held its annual meeting in WUT, Warsaw. Well above 100 european institutions dealing with robotics were represented. ICCE was the principal organizer of the event and the university. We also co-organized the 8-th National Conference on Evolutionary Algorithms and Global Optimization in Korbielów, Poland, 30 May - 1 June, 2005. It drew the attention of more them 60 researchers.

The Institute offers courses in a broad area of information technology, concentrating on control and decision support systems, at three levels of education. At first two levels (equivalent to B.Sc. and M.Sc.) the degree programs combine courses from the areas of computer science and control.

We are also proud to be able to offer interesting opportunities to our postgraduates for continuation of their study and research towards Ph.D. both in Computer Science and in Control. Research is a very important part of our staff activities, directly affecting both Institute's recognition in Poland and abroad, and the quality of teaching. Description of research programs conducted by the staff of the Institute can be found in this report.

I express my sincere appreciation to the faculty and staff of the Institute for their efforts and contributions to our achievements in teaching and research. In particular, I would like to congratulate Dr. Jerzy Paczyński who has been awarded the Medal of the Commission of National Education, the most significant educational award at the national level. I would also like to congratulate Prof. Andrzej Pacut on being elected Chairman of the IEEE Poland Section.

I express my gratitude to all our partners, and in particular to our partners from abroad actively participating in international research programs. We would appreciate a feedback from our partners concerning our activities and this report itself. We will be glad to answer any and all questions and we will be pleased to send reprints of our papers and reports upon request.

Piotr Tatjewski

In Memory of Professor Anatol Gosiewski

On the 7th of May 2005 Prof. Anatol Juliusz Gosiewski passed away. He was a person of great merit with many years' service for the Institute of Control and Computation Engineering of the Faculty of Electronics and Information Technology of Warsaw University of Technology, a great man, devoted academic teacher and scientist.

Born on 27th of February 1928 in Warsaw, he graduated from the Faculty of Electrical Engineering of Warsaw University of Technology. After receiving his M.Sc. degree in the field of electrical measurement he continued his studies as a Ph.D. student in the Chair of Electrical Measurement of the Faculty of Electrical Engineering of WUT. Since 1956 Professor worked in the Chair of Automation and Telecommunication of WUT (presently Institute of Control and Computation Engineering). He earned his Ph.D. degree in technical studies in 1959 at the Faculty of Electrical Engineering, and in 1972 he attained the degree of Doctor of Science (habilitation) at the Faculty of Electronics of WUT. He became the Professor of Technical Studies in the same year. Since 1992 he was employed by WUT as a Tenured Professor. Despite his retirement in 2001, the Professor continued his cooperation with the parent institute.

In 1957 he participated in six-month training in scientific institutions of Moscow and Leningrad, and in 1961 in the Case Institute of Technology in Cleveland, USA. The Professor's scientific research concentrated on: general control theory, theory and applications of optimal control, multi-dimensional systems, selected mathematical topics (extremality problems), and recently the dynamics and control of industrial robots. Considering his major achievements one should mention that his was the first Polish doctoral dissertation on optimality theory and that he introduced the concept of a mathematical model to the Polish scientific community. Moreover, he investigated global sensitivity of optimal-control systems (the topic of his D.Sc. thesis), analyzed time-suboptimal control, elaborated a discrete observer of continuous linear systems and a new frequency domain method of multi-dimensional control system synthesis, analyzed the damaging influence of transport delays on the functioning of multi-dimensional control systems and synthesized compensators partially reducing this bad influence, introduced quantitative measures of controllability, observability and non-reducibility of stationary linear systems. In the last years his research focused on problems of robotics and was related to the analysis of dynamic interactions present in robot manipulators. This led to the formulation of new control algorithms.

The Professor organized and supervised several large research projects, among them: Development of Control Theory, Programming and Dynamics Models for Industrial Robots and Manipulators; Methods of Modeling Anti-Tank Missile Control on an Analogue Machine; Design of an Optimizing Unit and a Modernized Controller for an Arc-Furnace in a Steel-Mill; Temperature Stabilization System in the Xenon Bubble-Chamber; Investigation of Dynamic Properties and Design of Tracking Controller for IRb-6/60 Robots. All those activities besides deepening our understanding of control problems also had a side effect - integration of the control community through exchange of views and conducting joint research activities.

The Professor was also active in education, thus he delivered many interesting lectures dealing with: Control Theory, Optimal Control, Robot Control and Dynamics and Linear System Control. He was the first to introduce humanistic subjects, beside the discussion of specialist problems, into engineering diploma seminars. 19 Ph.D. and about 60 M.Sc. theses were completed under his supervision. The Professor was particularly very proud of his Ph.D. students.

It should be pointed out that the Professor was invited on various occasions to many foreign universities and other scientific institutions to deliver lectures, speeches and conduct research. He also held significant positions at the University, Faculty and Institute. Between 1984 and 1986 he was the Vice Dean of the Faculty of Electronics of WUT. He also was the supervisor of Ph.D. studies in Control and Computer Science (1971-2003). In the period from 1966 till 1970 Professor Gosiewski was the head of Control Theory Division in the Chair of Control and Telemechanics. He also served various institutions external to WUT. He was a member of the Central Committee for Scientific Title and Degrees (1994-1997) and Chairman to Automation and Robotics Section in the State Committee for Scientific Research (1991-97). Moreover, he was a member of two Scientific Committees: of the Industrial Research Institute for Automation and Measurements and of the Institute of Systems Research of the Polish Academy of Sciences. Professor Gosiewski was first the Secretary and later (1988-91) the President of the VI Division of Warsaw Scientific Society. For his work he received many distinctions.

The Professor was an exceptionally kind person, open towards people and their views. Many will remember him as a great and eager participant of discussions who also encouraged others to undertake intellectual effort. He devoted much time to teach undergraduate and Ph.D. students, not only imbibing them with his professional knowledge, but also encouraging them to broaden their horizons. The Professor put much effort into preparation of his lectures what resulted in their popularity with the students. He made complicated issues and mathematical transformations easy to grasp, thanks to his ability to clarify and explain to students various problems, sometimes even reaching philosophical foundations. Attending his lectures was a true pleasure. He also encouraged his collaborators to undertake interesting projects, helping them later in the realisation of their research.

Privately he was interested in history, especially the contemporary one, cinematography and the history of movies. Since 1962 he was a member of the Society of Authors ZAiKS. With the death of Professor Anatol Gosiewski we lost a friend and a great teacher.

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1 General Information

The following information about the Institute personnel regards the period of January 1 – December 31, 2005.

1.1 Directors

Professor Piotr Tatjewski, Director
Professor Cezary Zieliński, Deputy Director for Research
Dr. Tomasz Traczyk, Deputy Director for Academic Affairs

1.2 Organization of the Institute

Control and Systems Division

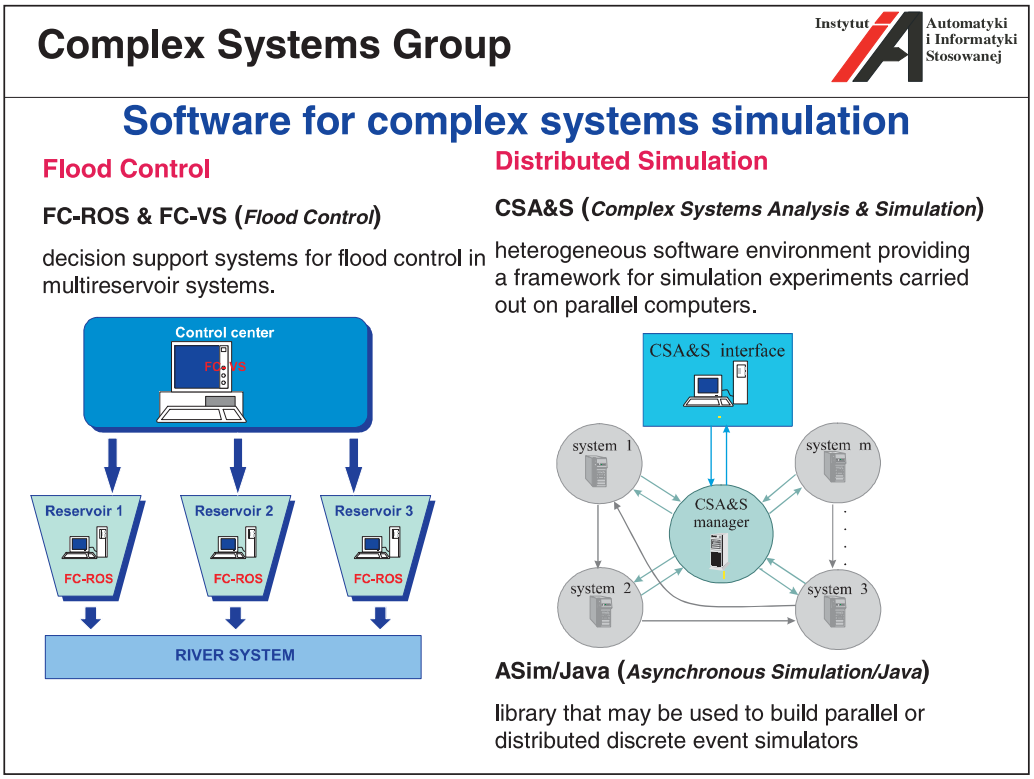
Division Head:	Professor Krzysztof Malinowski
Professors:	Włodzimierz Kasprzak, Krzysztof Malinowski, Andrzej Pacut, Krzysztof Sacha, Piotr Tatjewski, Cezary Zieliński
Professors, retired:	Władysław Findeisen Anatol Gosiewski Radosław Ładziński, Jacek Szymanowski
Assistant Professors:	Piotr Arabas, Rafał Cegieła, Paweł Domański, Mariusz Kamola, Andrzej Karbowski, Tomasz J. Kruk, Maciej Ławryńczuk, Piotr Marusak, Ewa Niewiadomska-Szynkiewicz, Stefan Romicki, Wojciech Szynkiewicz, Michał Warchoł, Adam Woźniak, Andrzej Zalewski
Senior Lecturers:	Jerzy Gustowski, Zygmunt Komor, Urszula Kręglewska, Andrzej Rydzewski
Assistants:	Adam Czajka, Przemysław Jaskóła, Tomasz Winiarski, Bartłomiej Kubica, Marcin Szlenk, Paweł Wawrzyński
Senior Engineers:	Włodzimierz Macewicz, Jerzy Pułaczewski

Ph.D. Students: Bartłomiej Anszperger, Jacek Błaszczyk, Marcin Chochowski, Adam Czajka, M. Falkiewicz, Anna Felkner, Małgorzata Gadomska, Andrzej Igielski, Przemysław Jaskóła, Radosław Kacperczyk, Michał Karpowicz, Tomasz Kornuta, Adam Kozakiewicz, Bartłomiej Kubica, Michał Kudelski, Marek Małowidzki, Roman Bartosz Nowicki, Fumio Adam Okazaki, Michał Pawluk, Sebastian Plamowski, Joanna Putz-Leszczyńska, Andrzej Ratkowski, Artur Sehn, Robert Seta, Andrzej Sikora, Ewa Snitkowska, Jarosław Sobieszek, Łukasz Stasiak, Marek Strzelczyk, Przemysław Strzelczyk, Maciej Staniak, Marcin Szlenk, Krzysztof Sztyber, Rafał Wardziński, Karol Wawrzyniak, Paweł Wawrzyński, Tomasz Winiarski

Research of the division is conducted in 5 research groups:

Complex Systems Group (**K. Malinowski**, P. Arabas, M. Kamola, T.J. Kruk, A. Karbowski, E. Niewiadomska-Szynkiewicz, M. Warchoł, A. Woźniak, P. Jaskóła, B. Anszperger, J. Błaszczyk, M. Karpowicz, A. Kozakiewicz, B. Kubica, M. Małowidzki, A. Sikora)

The main area of interest is the theory and methodology of model-based predictive repetitive control and hierarchical control structures for non-linear systems under uncertainty, methods for solving continuous and discrete time optimization problems, and software for computer aided analysis and design of complex systems. Particular attention is given to distributed and parallel, synchronous and asynchronous, computations as well as to analysis and design of control algorithms and pricing techniques for computer networks. Also, important work is concerned with development of techniques for information systems security.



Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

Traffic control in TCP/IP networks

Family of price-based control algorithms for IP networks

Congestion control:
- New algorithm proposed
- Verified through simulations

Joint traffic engineering / bandwidth allocation methodology - designed to improve effectiveness (under investigation).

Simulation Tools

TcpSim – a fast TCP/IP simulator:
- calculation of transmission times for bulk data transfers
- flow-based - much faster than packet-level simulators
- original method of traffic modeling
- implemented in Java.

BrokerSim – a C++ pricing simulation package for OPNET:
- traffic generator for user profiles
- short-term traffic demand approximator
- broker module: pricing decisions and traffic shaping
- router pricing module augmenting OPNET's router model

Complex Systems Group

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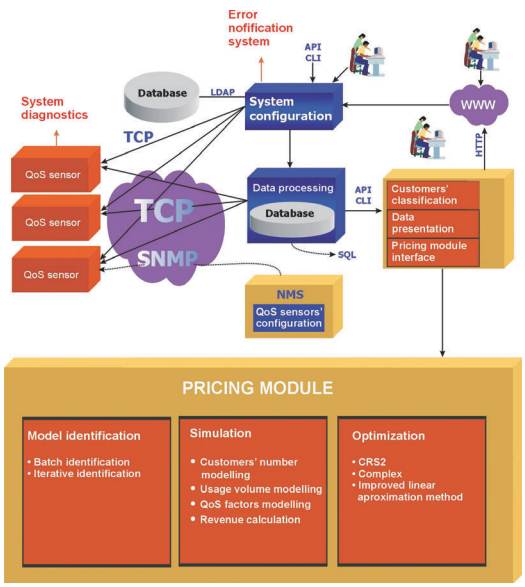
QOSIPS System

Participation in QOSIPS (Quality of Service and Pricing Differentiation for IP Services) project of 5FP

QOSIPS goals:
- Differentiation of IP services
- Quality of service
- Pricing support
- Integration with NSP operation systems



Complex Systems Group

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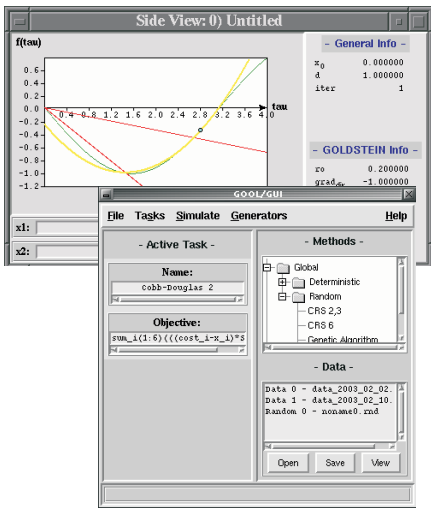
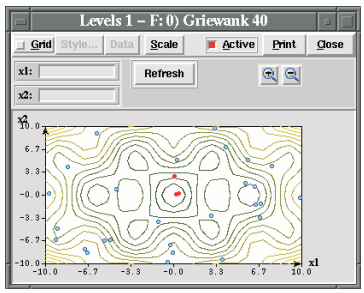
Global optimization

GOOL - Global Optimization Object–Oriented Library





GOOL

library of random search generators and optimization algorithms for convex and nonconvex, unconstrained and constrained problems

Complex Systems Group

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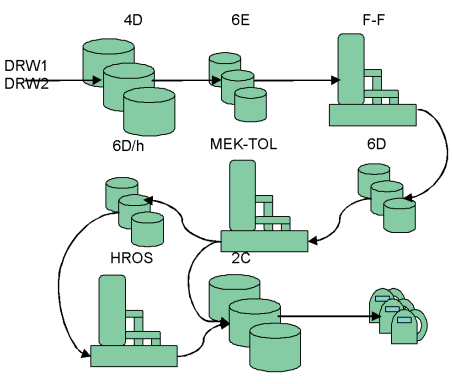
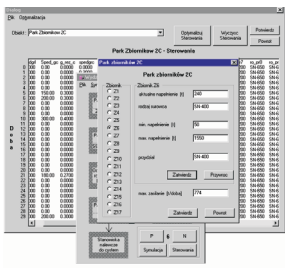
Operations scheduling using Constraint Programming

Solution of a scheduling problem in an Oil Refinery Division



Oil Refinery Division



Simulation and optimization system

Goals:

- Simulation of an Oil Refinery Division
- Finding all feasible solutions
- Meeting all technical requirements
- Constraint scheduling methods
- Very fast computations

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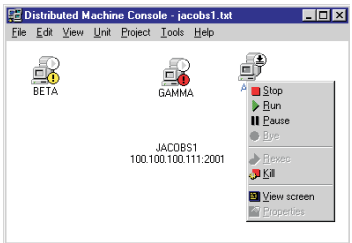
Parallel and distributed computations

- research on price and direct method of decomposed optimization
- research on parallel implementation of global optimization algorithms
- development of new software tools for parallel and distributed computations
- a monograph published in 2001



New software tools:

- **WDM** (windows distributed machine) – a software environment for performing distributed computations in a cluster of machines working under windows
- **GEPAS** (generic parallel suite) – an implementation of distributed shared memory in network
- **NONOS** (nonlinear optimization solver) – an ASP type optimization server (submission by e-mail or browsers)

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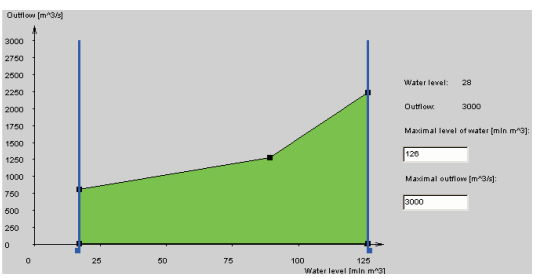
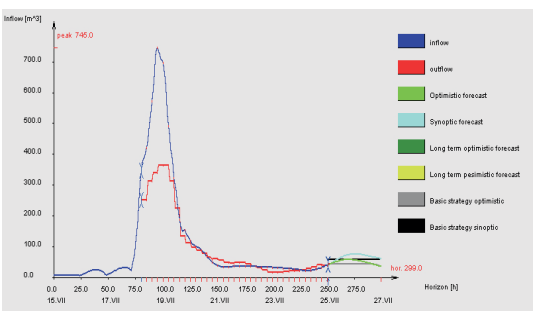
Optimal control and closed-loop design

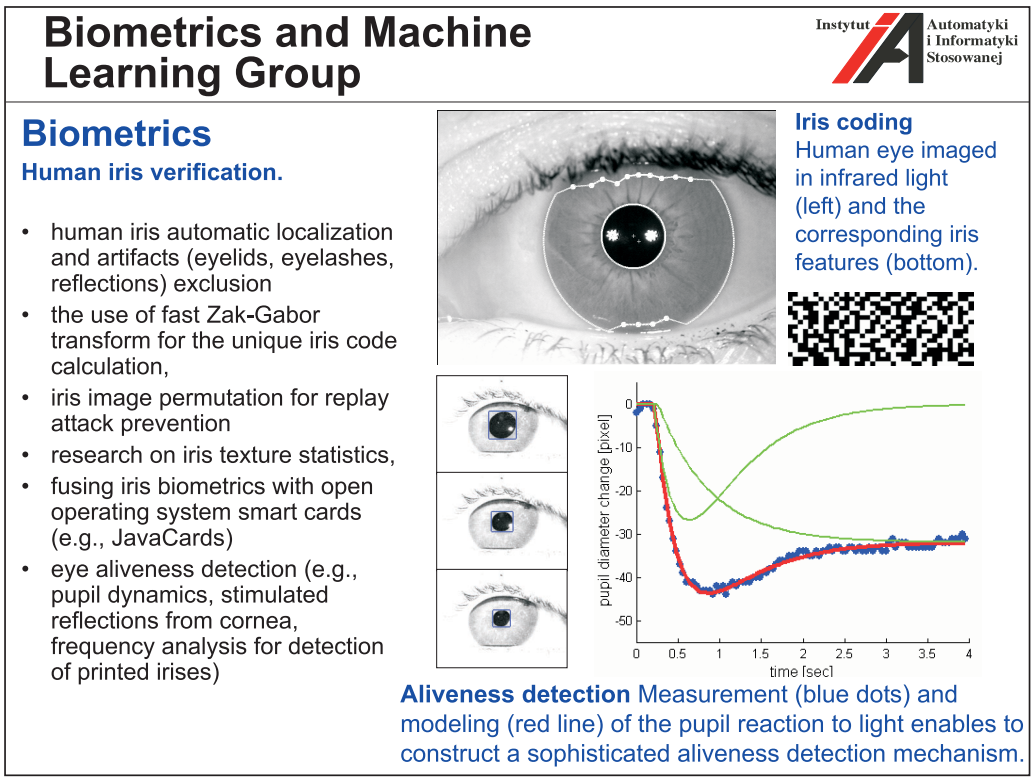
- development of OO libraries for calculation of optimal control in general nonlinear deterministic problems with constraints
- development of OO libraries for calculation of optimal closed-loop policies in general stochastic problems
- development of Decision Support Systems for flood control in single and multireservoir systems
- theoretical studies on optimal control in various conditions eg. with stochastic scenarios, fuzzy systems, worst-case, different risk measures, etc.
- theoretical and simulation studies on real-time control in computer networks at different levels





Biometrics and Machine Learning Group (**Andrzej Pacut**, A. Czajka, K. Wawrzyniak, P. Wawrzyński, M. Chochowski, M. Gadomska, A. Igielski, M. Kudelski, R.B. Nowicki, J. Putz-Leszczyńska, Ł. Stasiak, P. Strzelczyk, R. Wardziński)

The research is centered on biologically inspired control and information technology, including biometrics, machine learning, uncertainty modeling, and biological modeling. Biometrics consists in using personal characteristics for identity authentication. Our research in biometrics includes pattern recognition for iris, hand-written signature, hand shape and lines, etc. Also, safety of biometric data storage and exchange, biometrics intelligent cards, and data encryption using biometrics are investigated. Machine learning research is focused on reinforcement learning, and in particular, learning algorithms, adaptive control, and multi-agent systems. Also, learning in neural networks and modeling granularity is investigated. The group has been a part of Complex Systems Group until September 2005.



Biometrics and Machine Learning Group

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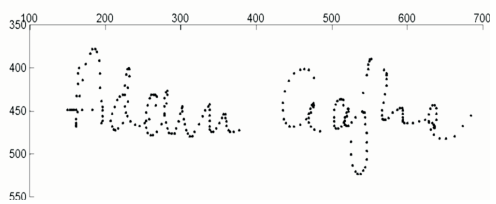
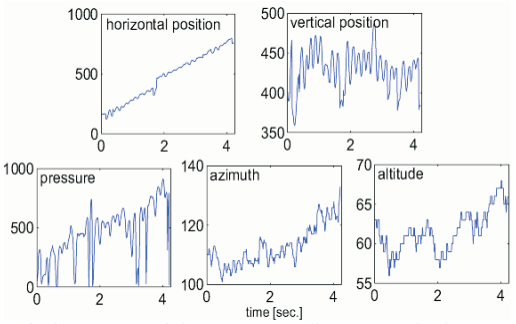
Biometrics

Handwritten signature-based identity verification

- signature as a multidimensional curve (five quantities vs. time are measured, namely the pen position, the pen tip pressure and the pen altitude and azimuth angles)
- the use of statistics and Hidden Markov Models for signature features extraction
- highly correlated features are removed from the feature set
- only dynamic features that are difficult to forge are employed in verification process
- the use of neural networks, dynamic programming and time warping for classification purposes



Example of human signature



A signature and the corresponding curves in time (pen position, pen tip pressure, pen angles)

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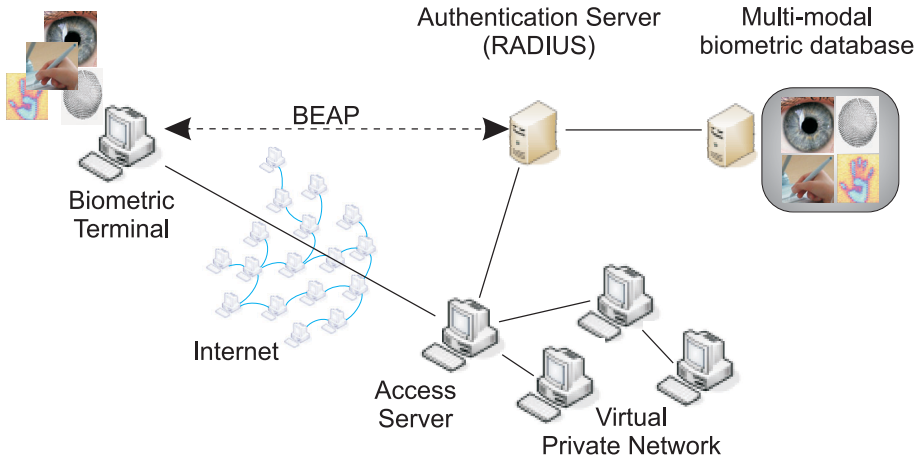
Biometrics

Remote access with biometric authentication



Based on **BEAP protocol** (Biometric Extensible Authentication Protocol). Biometric **replay attack prevention** and biometric **aliveness detection** included into the scenario. Iris and fingerprints biometrics supported in the pilot implementation. Evaluation of VPN connection performed on the international scale (Poland-Spain).

Biometrics and Machine Learning Group

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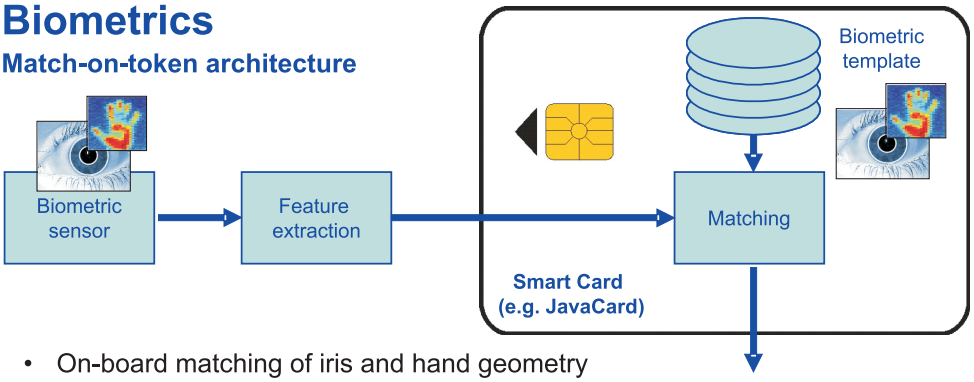
Biometrics

Match-on-token architecture



- On-board matching of iris and hand geometry
- Based on JavaCard architecture
- Central biometric database for identity verification is not required
- Secure enrollment procedure and card-terminal transmission implemented (mutual authentication, data integrity and confidentiality)
- „Display message" mechanism to enable terminal authentication by the card holder

Biometrics and Machine Learning Group

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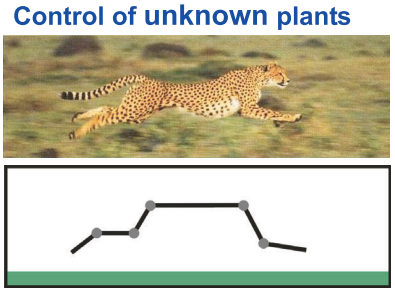
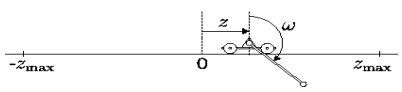
Control of unknown plants

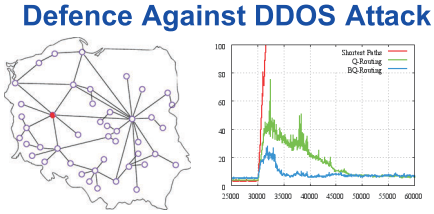


Half-Cheetah - planar model of a running animal: The objective of control is to make the object run as fast as possible. Our algorithms are able to optimize the control policy without any preliminary knowledge of the complex dynamics of this object.

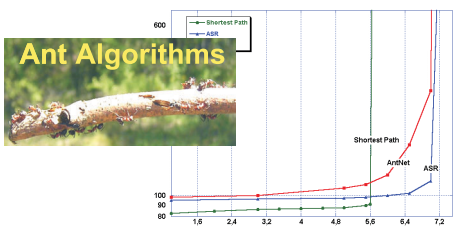


Cart-Pole Swing-Up: swing the pole and stabilize it upwards within the track bounds. Our **Batch Actor Critic** do the job in 20 min. of plant's time, as compared to 5 hours for competitors

Defence Against DDOS Attack



Q-Routing: fast recovery from DDOS attack - NASK network's Poznañ node attacked by other nodes (packet delay vs. time; red – non adaptive, green and blue – Q-Routing)



Ant Packet Routing works for loads too heavy for Shortest Path Routing (Nippon Telephone & Telegraph Network - packet delay vs. network load)

Control Engineering Group (**P. Tatjewski**, P. Domański, Z. Komor, M. Ławryńczuk, P. Marusak, J. Pułaczewski, S. Romicki, J. Gustowski, U. Kręglewska, S. Plamowski, M. Strzelczyk, K. Sztyber)

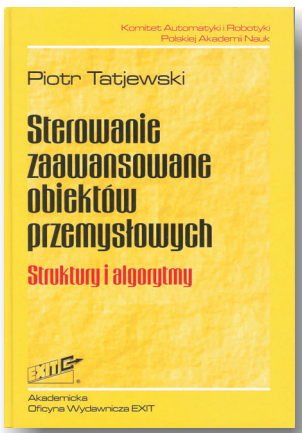
Research of the group encompasses control engineering techniques, in particular industrial process control. The focus is on predictive and fuzzy control algorithms, multilayer optimizing and supervisory control, and non-linear system control and analysis. Model-based predictive control algorithms for linear and nonlinear process modeling are developed and investigated. Soft computing methods for design and tuning of control systems are used, based on fuzzy systems, neural nets, and genetic algorithms. Theoretical considerations are combined with simulation analysis and investigations. Computer Control Systems Laboratory features laboratory-scale processes and is equipped with programmable controllers, industrial computers and workstations with software tools, including Matlab with Toolboxes and professional SCADA systems.

Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Advanced control of industrial processes

- The multilayer control structure for industrial processes
- Non-linear process modeling using fuzzy techniques and neural networks
- Fuzzy control algorithms of Takagi-Sugeno type
- Algorithms and structures of model predictive control with linear process models (control laws, optimization-based algorithms)
- Algorithms and structures of non-linear model predictive control
- Software for development and testing of advanced process control algorithms



Advanced Control of Industrial Processes, Structures and Algorithms
Academic Publishers EXIT, 2002

Control Engineering Group

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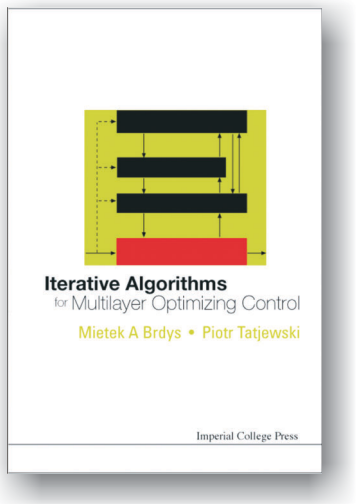
Optimization of industrial processes and large-scale systems

- Procedures for steady-state optimization of industrial processes
- Structures and algorithms for on-line measurement-based set-point optimization under uncertainty
- Hierarchical (multilevel) optimization methods for large-scale systems
- Multilevel algorithms for on-line set-point optimization of interconnected processes under uncertainty



Imperial College Press/World Scientific 2005

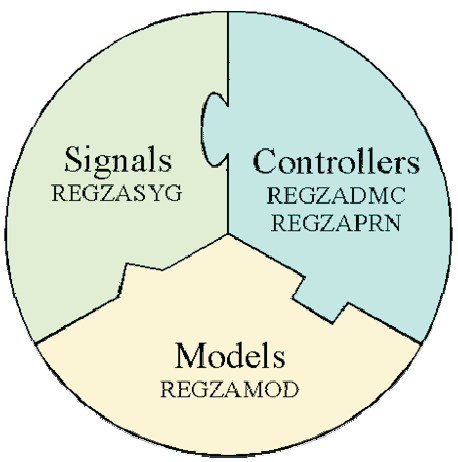
Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

REGZA - Algorithms and software environment for modeling and advanced control of industrial processes

Software Package REGZA:

- **REGZASYG** – programs and interface for signal processing
- **REGZAMOD –** programs and interface for process modeling
- **REGZADMC –** interface and model predictive control algorithms: linear DMC and nonlinear with fuzzy process models
- **REGZAPRN** – interface and model predictive control algorithms: linear GPC and nonlinear with neural network process models



Control Engineering Group

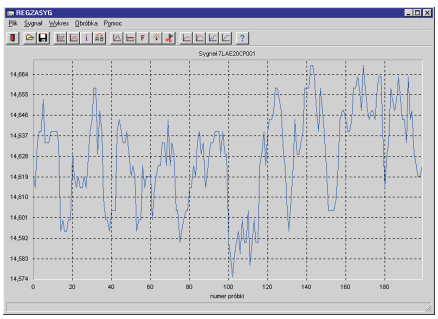
Instytut Automatyki i Informatyki Stosowanej

REGZA - Algorithms and software environment for modeling and advanced control of industrial processes

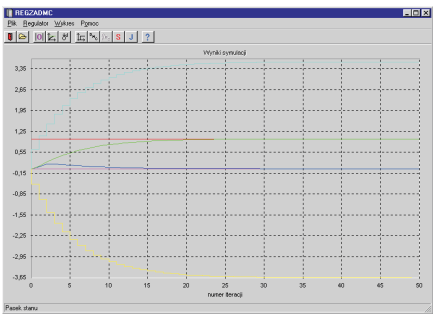
Nonlinear predictive control structures based on fuzzy and neural models

- Algorithms with successive linearization
- Algorithms with nonlinear prediction and linearization
- Algorithms with iteratively updated nonlinear prediction and linearization
- Algorithm with nonlinear optimization

Main window of REGZASYG program

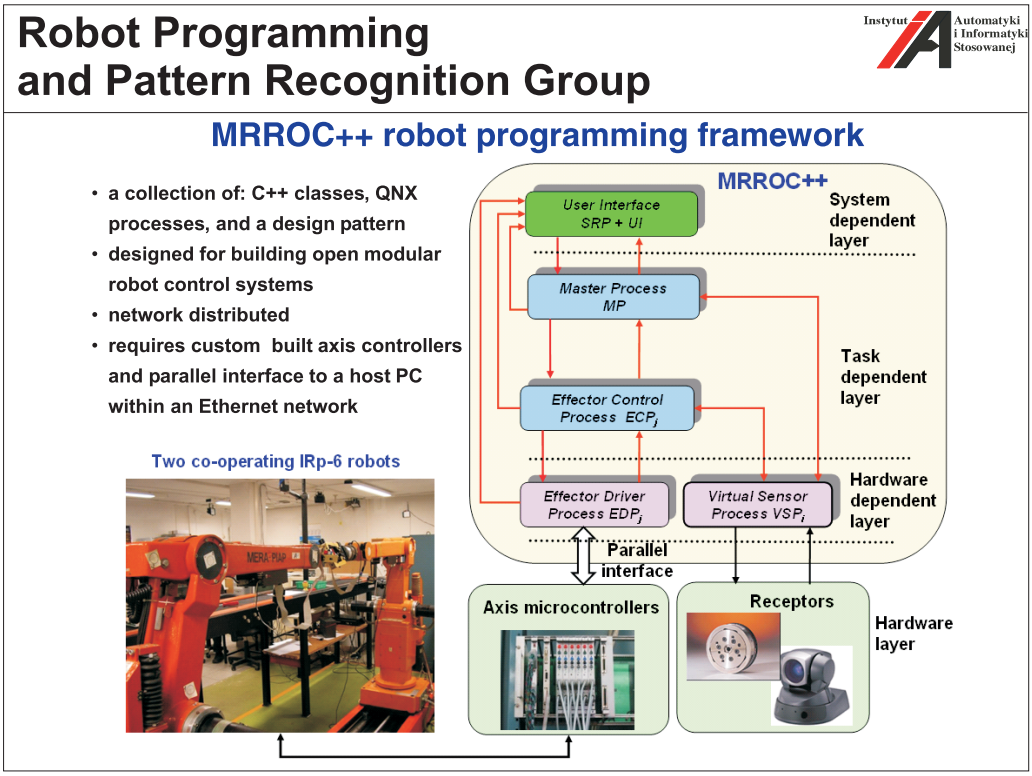


Main window of REGZADMC program



Robot Programming and Pattern Recognition Group (**C. Zieliński**, A. Gosiewski W. Kasprzak, W. Szynkiewicz, A. Rydzewski, T. Winiarski, T. Kornuta, A. F. Okazaki, M. Pawluk, R. Seta, E. Snitkowska, M. Staniak)

Research of the group is concerned with robot motion planning and control systems, autonomous mobile robot localization and navigation, robot programming methods, computer vision systems and speach recognition systems. In the robot control systems area research is focused on new motion and force/position control algorithms for multi-robot systems. Special emphasis is given to the sensor-based motion planning and control of the single and multiple articulated or mobile robots. In the computer vision and signal processing (speech analysis) area the research is concentrated on autonomous navigation, transportation and security relevant environments. All of this research is centered around service robots, i.e. two-handed devices using visual servoing, force control, and speach recognition to fulfill tasks that humans usually execute.



Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

RNT and POLYCRANK prototype robots

- **RNT robot:** high stiffness, large workspace, serial-parallel kinematic structure
  – well suited to milling and polishing tasks
- **POLYCRANK robot:** capable of very fast motions, has no joint limits, direct drive
  – well suited to palletization tasks

RNT robot:

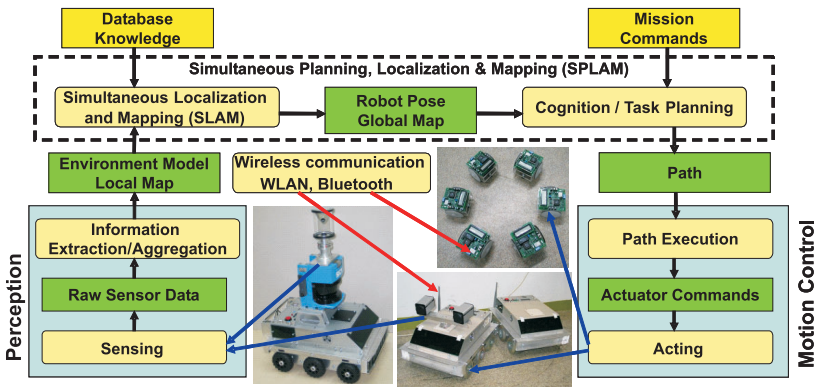
Control systems based on MRROC++ programming framework

POLYCRANK robot

Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

Control architecture for autonomous mobile robot teams



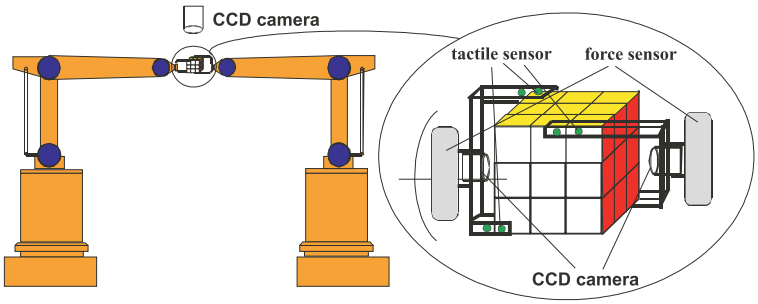
Research objectives:

- To develop the perceptual, representation, reasoning, learning and communication capabilities of autonomous mobile robot systems in human-oriented real-life environments
- To develop and implement a complete, effective, and reusable software for autonomous robot systems that incorporates both programming (manual coding) and learning-derived (automated coding) software composition to increase the ability of autonomous robots to function in unpredictable, dynamic environments (an extension of the MRROC++ programming framework)
- To study the human and robot team interaction (multi-modal interfaces)

Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

Sensor based two-handed manipulation



Rubik's cube puzzle as a benchmark task for service robots

Solution of the benchmark task requires:

- Two-handed manipulation skill to efficiently turn the faces of the cube
- Visual sensing capability to locate the cube and identification of its initial state
- Visual servomechanism to approach the cube and to get hold of it
- Using tactile and force sensors to avoid jamming of the cube while rotating the faces
- Capacity for using tactile and force stimulus in manipulation
- Fusion of deliberative and behavioural control to work out the plan of motions solving the puzzle and to adapt quickly to sudden changes in the environment (e.g., jamming)
- Ability to recognize spoken commands and to synthesize replies and queries

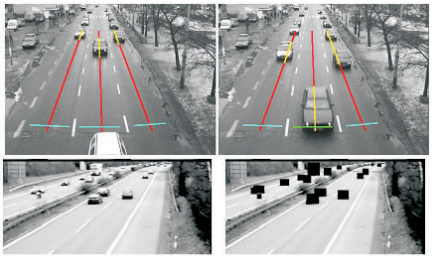
Robot Programming and Pattern Recognition Group

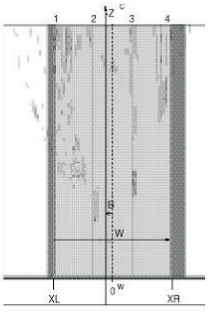
Instytut Automatyki i Informatyki Stosowanej

Road traffic analysis. Autonomous navigation.

•Supported by the project IST-11250 **OMNI** ("*Open Model For Network-wide Heterogeneous Intersection-based Transport Management*", 2000-2003) an „intelligent" visual sensor system was developed that performs queue length measurement and car counting – for every road lane in the image.

•Computer-vision based car driver assistance – road tracking and obstacle detection.





Robot Programming and Pattern Recognition Group

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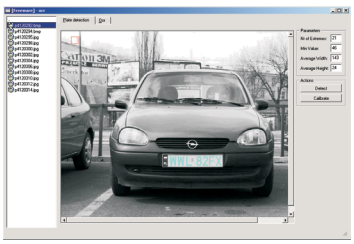
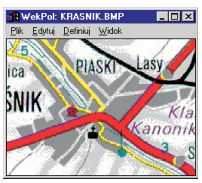
2-D object recognition in digital images

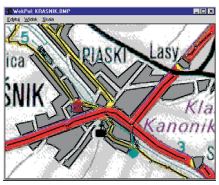
Car's license plate recognition :

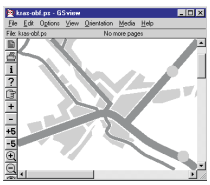
- Automatic image region detection;
- Single symbol detection.
- Symbol classification.



Various 2-D object recognition:
i.e. fingerprint images, cartographic objects.







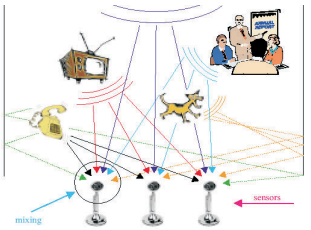
Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

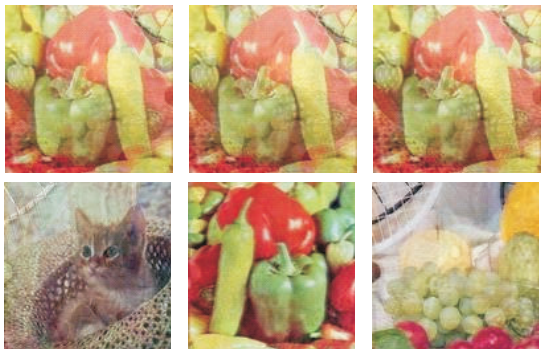
Blind separation of mixed signals

The „cocktail party" problem:

- Only mixtures of source signals can be acquired,
- The goal is to separate the original sources.



- Illustration of deconvolving 2-D image mixtures:
- Three convolved mixtures of three sources at the system's input.
- Three deconvolved images at the output.



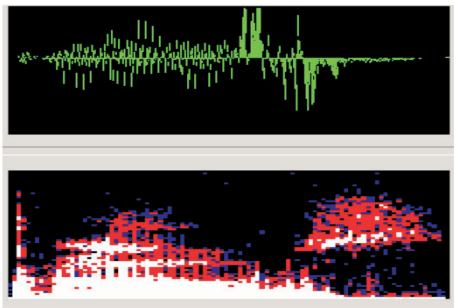
Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

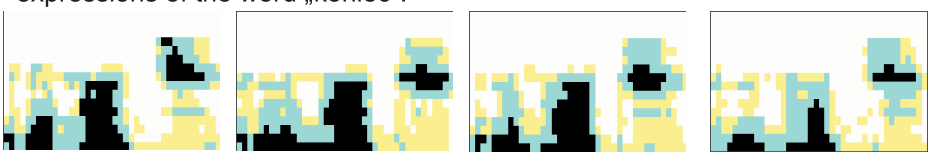
The recognition of Polish speech

The automatic recognition of Polish spoken words:

- Spectral analysis,
- Feature detection in signal frames,
- Sub-phoneme modeling,
- Frame classification,
- Model-based word recognition.

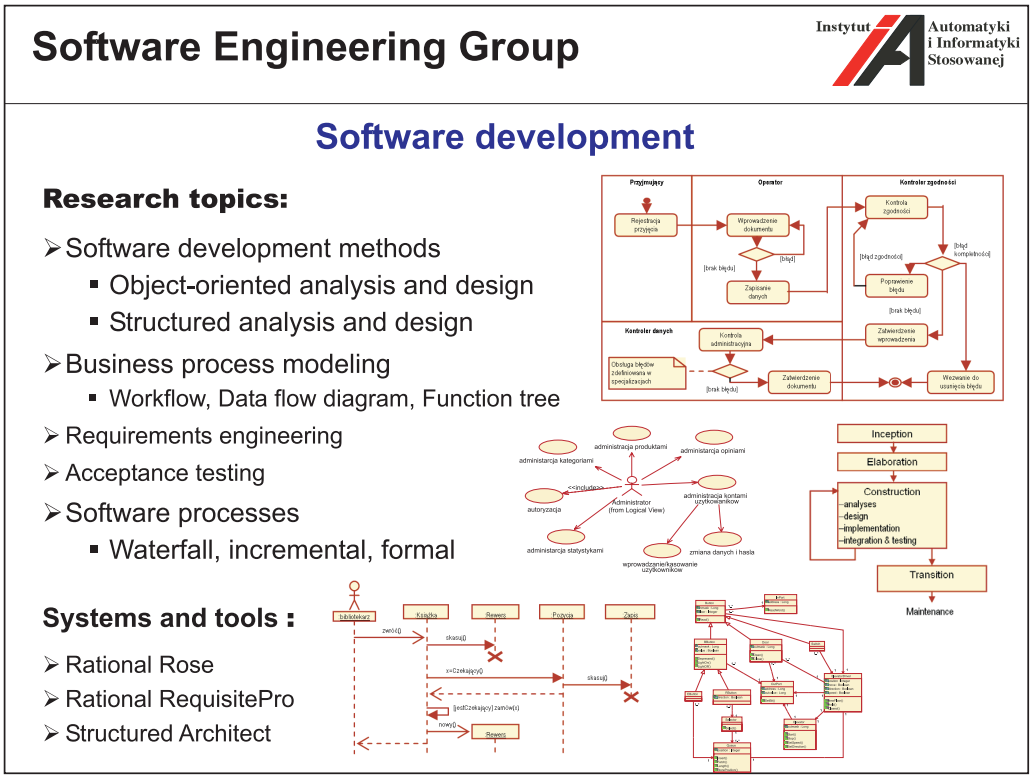


Example: low resolution spectral images acquired for four different expressions of the word „koniec”.



Software Engineering Group (**K. Sacha**, R. Cegieła, A. Zalewski, W. Macewicz, M. Szlenk, A. Felkner, R. Kacperczyk, A. Ratkowski, A. Sehn)

The main area of interest is the development and quality evaluation of software. Topics include software processes, analysis, design and quality evaluation methods, and software audit. Apart of the research activity, we have been working on a number of commercial projects related to the development and evaluation of huge software systems for public organizations and for the industry. The scope of those projects included business process modeling, requirements analysis, strategic planning, conducting the testing process, and software audit.



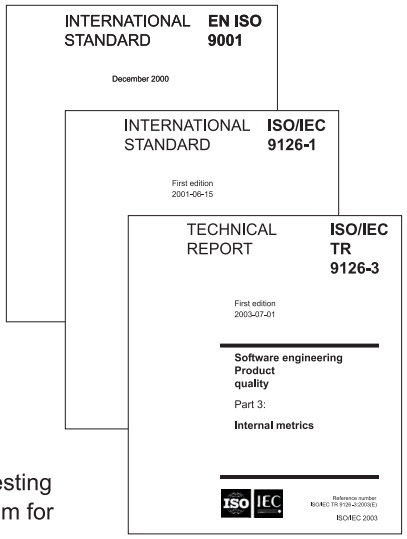
Software Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Evaluation of the software quality

Research topics:

- Quality of the software process
- Quality of the software products
- Evaluation method:
  - Defining the set of quality criteria
  - Defining the set of questions
  - Evaluation and ranking
  - Threats and recommendations



Sample projects:

- Evaluation of the expected quality of software developed for IACS (support system for EU Common Agriculture Policy in Poland)
- Supervision and evaluation of the acceptance testing of the integrated management and control system for the post delivery service in Poland

Software Engineering Group

Instytut Automatyki i Informatyki Stosowanej

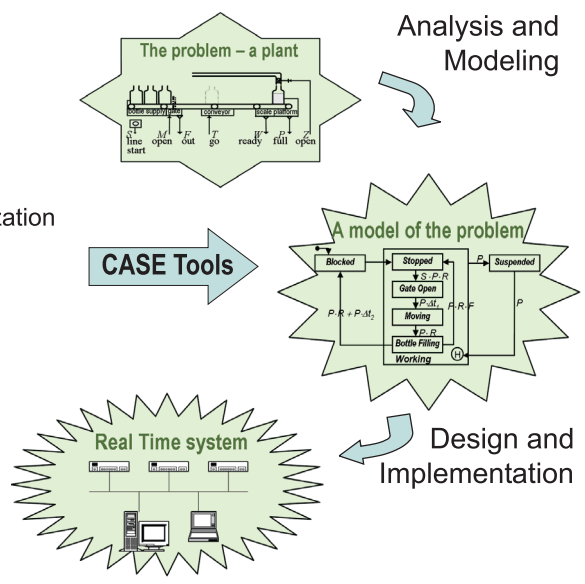
Real time systems

Research topics:

- System analysis and design
- System and software architecture
- Real time operating system
  - Task scheduling
  - Communication and synchronization
- Industrial networks
  - Devicebuses
  - Fieldbuses
- PLC controllers
  - Automatic program generation

Systems and tools:

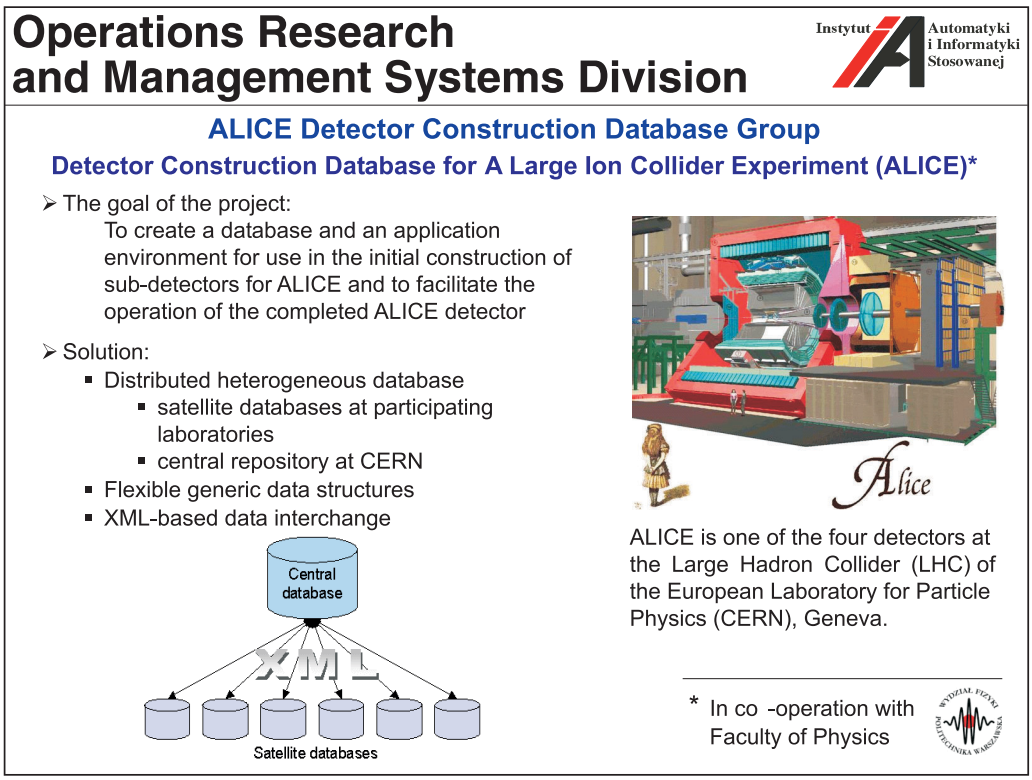
- QNX, OS/9
- Profibus
- Siemens Step 7



Operations Research and Management Systems Division

Division Head:	Professor Eugeniusz Toczyłowski
Professor:	Eugeniusz Toczyłowski
Assistant Professors:	Krzysztof Fleszar, Mariusz Kaleta, Krzysztof Pieńkosz, Grzegorz Płoszajski, Cezary Szwed, Tomasz Traczyk
Assistant:	Izabela Żółtowska
Ph.D. Students:	Zdzisław Dybikowski, Andrzej Midera, Przemysław Kacprzak, Piotr Pałka, Mariusz Rogulski, Kamil Smolira, Tomasz Śliwiński

Research of the division is concerned with operation research and structural discrete optimization methods for control and management of discrete processes, including applications in the deregulated electric power industry, computer integrated manufacturing and educational systems. The research is focused on market and auctions design, scheduling techniques, efficient structural-based optimization algorithms, time-table generation, strategic and tactical planning, detailed scheduling, and real-time operational control. Also, the object oriented and relational database management systems and CASE methods are investigated to design of the distributed multi-functional heterogeneous information systems.

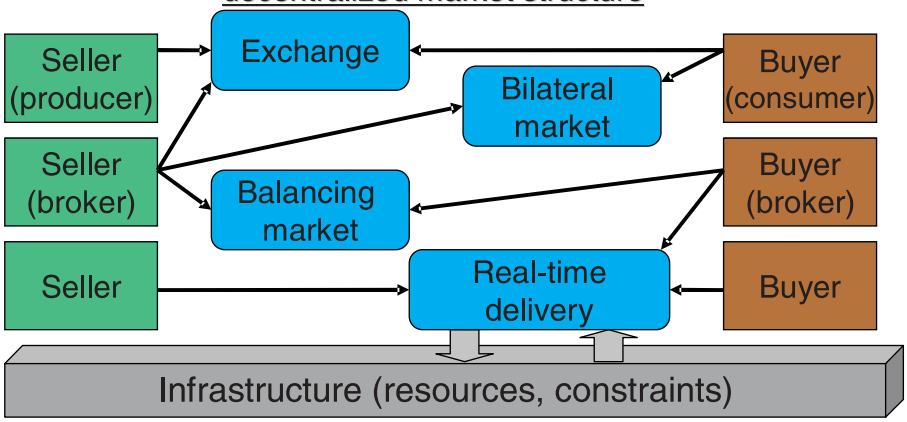


Operations Research and Management Systems Division

Instytut Automatyki i Informatyki Stosowanej

Designing of infrastructure markets under constraints

decentralized market structure

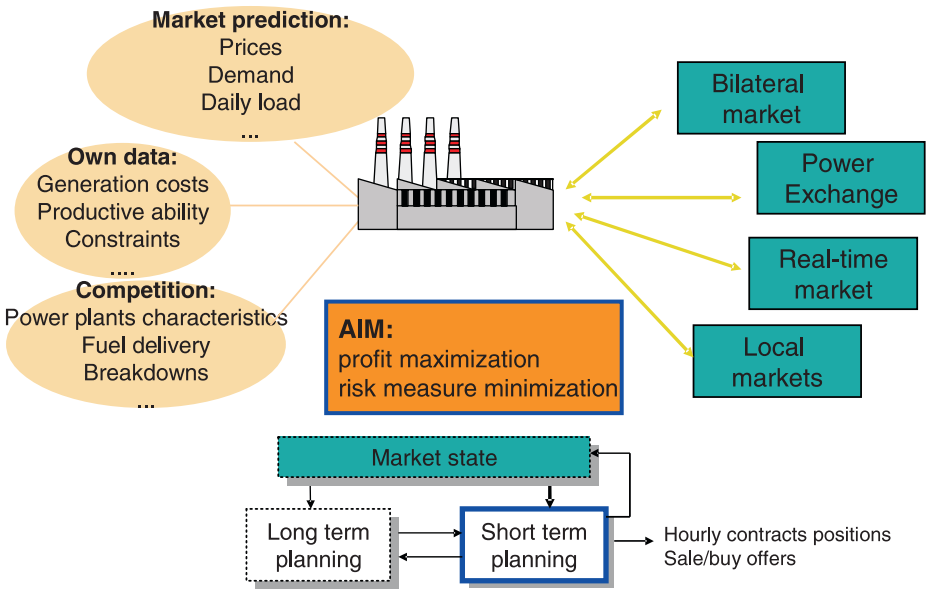


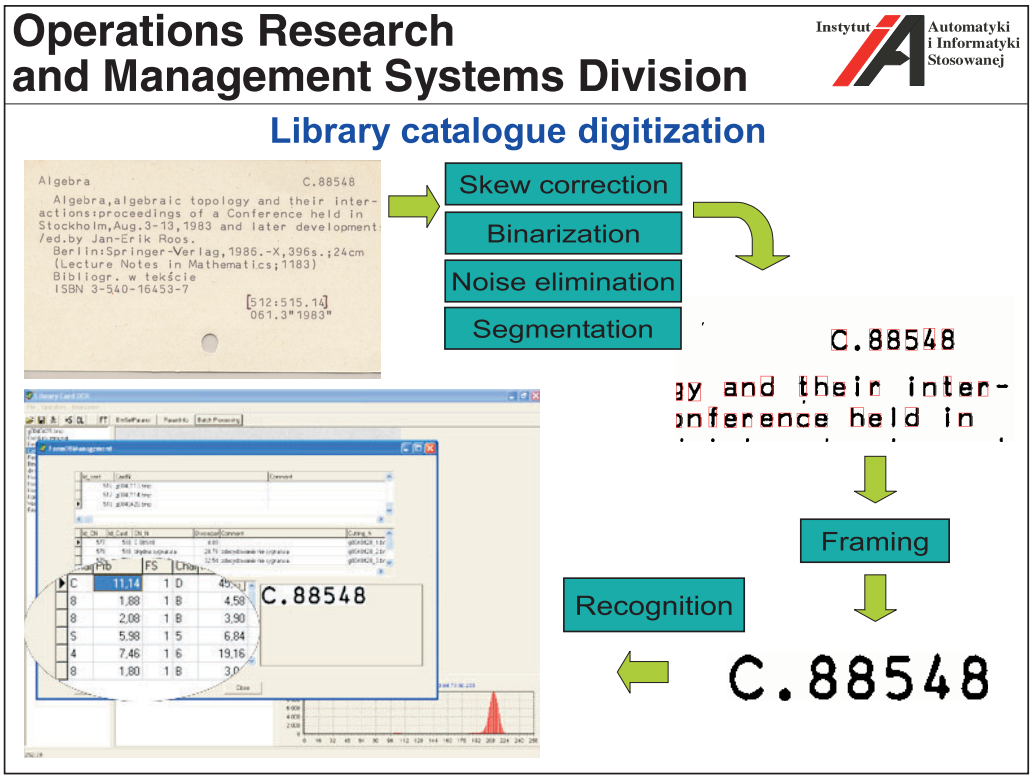
- Object and subject market structure
- Market rules designing
- Strategic and tactical market planning
- Real-time operational control
- Market operator decisions support tools
- XML-based description of market

Operations Research and Management Systems Division

Instytut Automatyki i Informatyki Stosowanej

Electrical energy market – decisions support for players

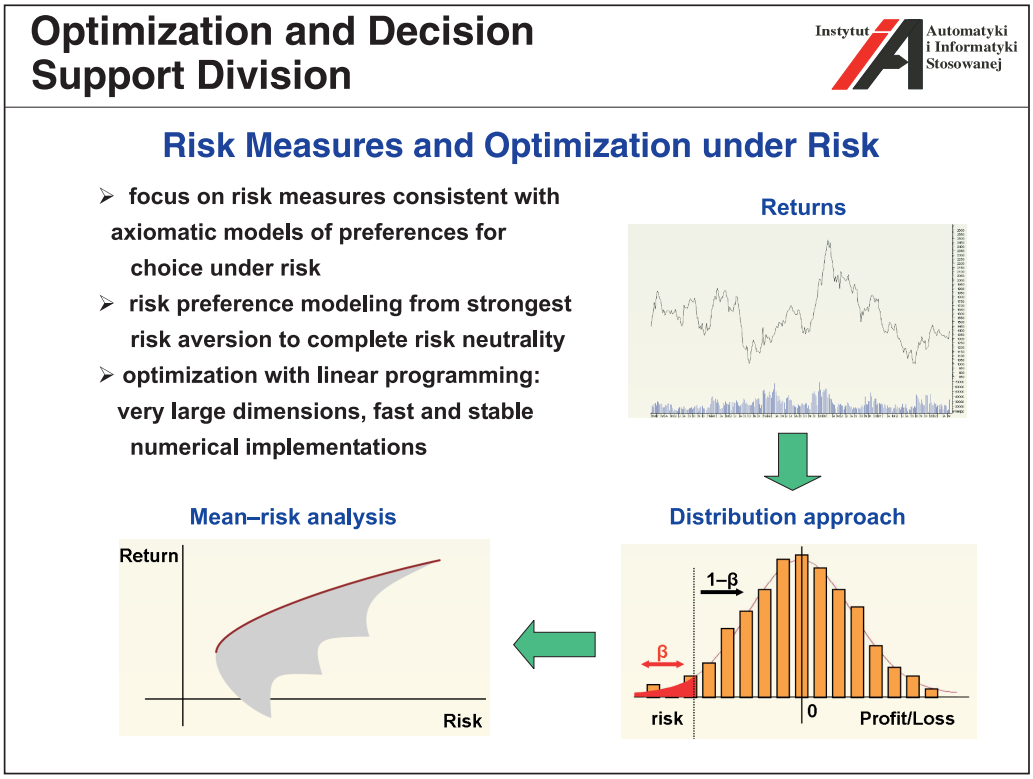



Operations Research
and Management Systems Division
Instytut Automatyki i Informatyki Stosowanej
Library catalogue digitization
Algebra C.88548
Algebra,algebraic topology and their inter-
actions:proceedings of a Conference held in
Stockholm,Aug.3-13,1983 and later development
/ed.by Jan-Erik Roos.
Berlin:Springer-Verlag,1986.-X,396s.;24cm
(Lecture Notes in Mathematics;1183)
Bibliogr. w tekście
ISBN 3-540-16453-7
[512:515.14]
061.3"1983"
Skew correction
Binarization
Noise elimination
Segmentation
C.88548
gy and their inter-
onference held in
Framing
Recognition
C.88548

Optimization and Decision Support Division

Division Head:	Professor Włodzimierz Ogryczak
Professors:	Włodzimierz Ogryczak, Wiesław Traczyk
Assistant Professors:	Janusz Granat, Jerzy Paczyński, Andrzej Stachurski
Senior Lecturers:	Tadeusz Rogowski, Jerzy Sobczyk
Lecturer:	Grzegorz Wójcik
Assistant:	Tomasz Śliwiński
Ph.D. Students:	Cezary Chudzian, Piotr Górczyński, Bartosz Kozłowski, Adam Krzemienowski, Sylwester Laskowski, Tomasz Nitychoruk, Tomasz Strąbski, Paweł Wyborski

Research of the division is focused on the theory of distributed and parallel computational methods, and software for optimization. The theory covers a whole area of linear and non-linear, dynamic, stochastic and multiple criteria problems, and deals with such topics as the sensitivity aspects and the parametric aspects. Another area covers the decision theory, including the multi-person decisions and the game theory, and deals with software building for decision support and organization and management of computer networks. Also, research is carried on the methods of reasoning in knowledge based systems.

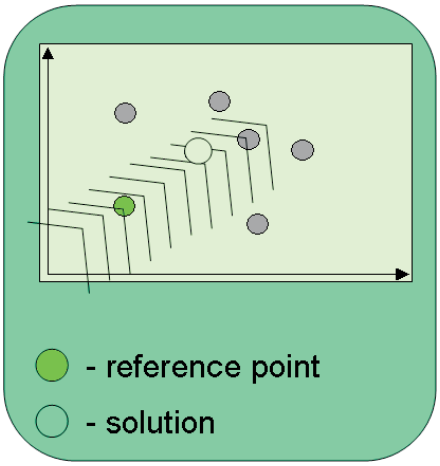


Optimization and Decision Support Division

Instytut Automatyki i Informatyki Stosowanej

Reference Point Method

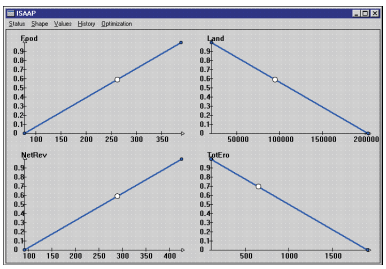
- interactive method for multicriteria model analysis
- guiding information by specification of the reference points
- a Pareto-optimal solution is selected for a given reference point

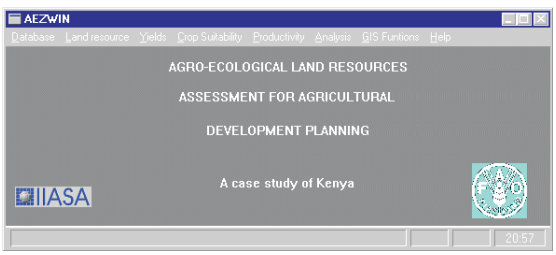


Optimization and Decision Support Division

Instytut Automatyki i Informatyki Stosowanej

Application of the reference point method to land resource assessment





1.3 Statistical Data

FACULTY and STAFF	2003		2004		2005	
	persons	FTE	persons	FTE	persons	FTE
Academic Staff	40(+2)	34.90(+1.5)	42(+1)	35.90(+1.5)	44(+2)	37.48(+2)
by titles/degrees						
Professors	4(+1)	3.5(+1)	4	4	4	4
D.Sc.-s	6	6	4	4	5	5
Ph.D.-s	20	18.9	22(+1)	20(+1)	24(+2)	21(+2)
M.Sc.-s	10(+1)	6.5(+0.5)	12	7.9	11	7.48
by positions						
Professors	9(+1)	8.5 (+1)	8	8	9	9
Assistant Professors	19	18	21(+1)	19(+1)	21(+2)	19(+2)
Senior Lecturers	4(+1)	4(+0.5)	6	5	6	5
Lecturers	2	1	1	0.5	1	0.5
Assistants	6	3.4	6	3.4	7	3.98
Ph.D. Students	35		34		36	
Technical Staff	6	4.5	4	3	3	2.5
Administrative Staff	7	6	6	5.5	6	5.5

FTE – Full Time Employment units,
\+ – corrections due to persons on long-term leave of absence

ACTIVITIES	2003	2004	2005
Teaching activities			
standard teaching potential, hours	7 780	9 467	8 212
# hours taught	14 490	13 030	15 914.5
Degrees awarded			
D.Sc.	0	0	0
Ph.D.	3	3	5
M.Sc.	42	47	47
B.Sc.	47	53	40
Research projects			
granted by WUT	16	9	11
granted by State institutions	4	3	5
granted by international institutions	1	1	1
other	4	3	4
Reviewed publications			
monographs (authored or edited)	2	0	2
textbooks	2	0	0
chapters in books	7	7	18
papers in journals	28	24	15
international	*21*	*16*	*13*
local	*7*	*8*	*2*
papers in conference proceedings	35	27	55
international	*18*	*19*	*24*
local	*17*	*8*	*31*
other reviewed publications	6	0	0
Reports and not reviewed publications	30	16	14

ACTIVITIES	2003	2004	2005
Conferences			
participation (# of conferences)	26	23	33
participation (# of part. from ICCE)	39	43	52

RESOURCES	2002	2003	2004	2005
Space (sq.m.)				
laboratories	585	585	585	585
library + seminar room	74	74	74	74
faculty offices	724	724	724	724
Computers				
workstations*	23	14	14	9
personal computers*	244	245	245	165
Library resources				
books	4547	4601	4683	4732
booklets	1442	1570	1684	1779
journals subscribed	7	7	7	6

* Classification into workstations and personal computers changes due to modification of technical standards.

2 Faculty and Staff

Presentation of our faculty starts with Professors Emeriti and continues with Senior Faculty, Supporting Faculty, Ph.D. Students, and Administrative Staff. Senior Faculty includes Professors, Associate Professors, Assistant Professors, and Senior Lecturers. By Supporting Faculty we understand Lecturers, Assistants, and Research Associates, as well as Technical Staff. The personal information below regards the period of January 1 – December 31, 2005.

The following publication citation codes are used:

BK	books	Sec. 61
CH	chapters in books	Sec. 61
PH	Philadelphia list journal articles	Sec. 62
IJ	other international journal articles	Sec. 62
LJ	local journal articles	Sec. 63
IC	international conference proceedings	Sec. 63
LC	local conference proceedings	Sec. 65
RP	reports, abstracts and not reviewd papers	Sec. 67

In project participation lists, the reader is referred to the project listing in Sec. 4.

2.1 Professors Emeriti

Władysław Findeisen Professor (retired July 1999)

Control and Systems Division, Complex Systems Group
room 524, tel. 660 7397 and 825 0995
W.Findeisen@ia.pw.edu.pl

M.Sc. 1949, Ph.D. 1954. Full Professor since 1962.

Founder and Director of ICCE (1955–1981), elected and re-elected Rector of WUT (1981–1985). Member of Polish Academy of Sciences (PAN) since 1971. Doctor Honoris Causa of The City University in London (1984), Warsaw University of Technology (1996), Gdańsk University of Technology (1997), Technische Universität Ilmenau (1998). Chairman of the Social Council to the Primate of Poland (1986–90), Vice-President of the Polish Academy of Sciences (PAN)(1990–1992), Senator of the Republic of Poland (1989–93), President of "Kasa Mianowskiego" (a foundation which sponsors foreign scientists in Poland) (since 1991), Vice-President of the Polish Committee for UNESCO (since 1999).

Anatol Gosiewski Professor

Passed away on May 2005

Control and Systems Division, Robot Programming and Pattern Recognition Group

Ph.D. 1959, D.Sc. 1964 from WUT; the titles of Professor of Technical Sciences awarded in 1972 and 1992.

With WUT since 1951. Post-Doctoral Fellow at Case Institute of Technology, Cleveland, Ohio (1961), Visiting Prof. at the Dept. of Electrical Eng. of University of Minnesota, Minneapolis, Minnesota (1975), Visiting Prof. at the Dept. of Mechanical and Aerospace Eng., of University of Delaware, Newark, Delaware (1979). Member of the State Committee for the Scientific Title and Scientific Degrees (1993–1996), member of the Committee on Automation and Robotics of Polish Academy of Sciences (PAN). Member of Scientific Council of Institute of System Research (IBS PAN) (since 1985), and of the Industrial Institute for Automation and Measurements (PIAP) (since 1983). Chairman of the Section

of Automation and Robotics T11A of the State Committee for Scientific Research (KBN) (1991–1996), Member of Scientific Society of Warsaw (TNW) (since 1983). Head of ICCE Robotics Group (1986–1996) and then Robotics and Operation Research Division, Director of the Ph.D. Program in Automatic Control and Computer Science at EIT.

Books, chapters: [CH4]

Radosław Ładziński Professor (retired January 1998)

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room 570, tel. 660 7648
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Born 1927, M.Sc. 1952, Ph.D. 1957 from WUT; the title of Professor of Technical Sciences awarded in 1968.

With WUT since 1949. Vice-Dean of the Faculty of Electronics, (1964–1969), head of the Ph.D. Program in Control Engineering and Computer Science (1977–1981), chairman of the Electronics and Information Technology Committee for Ph.D. Degree in Control and Computer Engineering (1991–1996). Parallel working with Institute of Electrical Engineering of Polish Academy of Sciences (PAN) (1955–1962), and with Institute of Automatic Control of PAN (1963–1968). Post-Doctoral Scholar, Royal Institute of Technology, Stockholm, Sweden (1957), British Council Scholar, University of Cambridge, England (1959–60), Visiting Lecturer, Department of Mathematics, University of Ghana, Accra, Ghana (1962–63), Professor of Engineering Science, University of Mosul, Iraq (1970–74), Professor of Engineering Mathematics, Rivers State University of Science and Technology, Port Harcourt, Nigeria (1981–87), Member of Magdalene College, University of Cambridge, England.

Interests: Dynamic systems, control theory, and applied mathematics.

Jerzy Pułaczewski Senior Engineer (retired since October 2003)

Control and Systems Division, Robot Programming and Pattern Recognition Group
room 570, tel. 660 7648
J.Pulaczewski@ia.pw.edu.pl

M.Sc. 1958, Ph.D. 1965 from WUT.

With WUT since 1956, Deputy Director of ICCE (1972–80 and 1993–96), Deputy Dean of the Faculty of Electronics (1981–87), Chairman of the Departmental Curriculum Committee (1981–90), member of the Senate of Warsaw University of Technology (1987–90). Scholarship in Moscow Electroenergy University (1958–59), the British Council scholarship at Cambridge University, UK (1965–66), visiting researcher at Minneapolis University, Minneapolis, MN (1980–81).

Interests: Digital control algorithms, process modeling and simulation, process control.

Jacek Szymanowski Professor (retired January 2000)

Control and Systems Division, Complex Systems Group
room 530, tel. 660 7922
J.Szymanowski@ia.pw.edu.pl

M.Sc. 1962, Ph.D. 1966, D.Sc. 1983 from WUT.

With WUT since 1968. Visiting Professor, Laboratoire d'Automatique de Nantes, Ecole Centrale de Nantes, France, 1992, 1994, 1995, 1996, 1997. Retired since January 1999.

Interests: Simulation of control systems, linear and nonlinear programming, control applications of optimization techniques, operating systems.

Andrzej P. Wierzbicki Professor (retired March 2004)

Optimization and Decision Support Division
room 24, tel. 6607750, 8255280
A.Wierzbicki@ia.pw.edu.pl

M.Sc. 1960, Ph.D. 1964, D.Sc. 1968 from WUT, titles of Professor of Optimization and Decision Theory awarded in 1975 and 1992.

With WUT since 1961, half time since March 1997. Deputy Director of the ICCE (1971-1975), Deputy Dean (1971-1972) and then Dean of FEIT (1975-1978) member of the Senate (1975-1978), member or chairman of many university commissions.

Since 1978 working with the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria and served (1979-1984) as the chairman of the Systems and Decision Sciences Program. Visiting prof. at the University of Minnesota, Minneapolis, MN, Brown University, Providence, RI (1970–1971), Kyoto University, Japan (1989-1990), Fernuniversitaet Hagen (1985) and Japan Advanced Institute of Science and Technology (2004-).

Director of the National Institute of Telecommunications in Poland (1996-2004). Chairman of the Commission of Applied Research of the State Committee for Scientific Research (KBN) (1991–1994). Chairman of the Consulting Panel for Promotion and Policy of Science of State Committee for Scientific Research (KBN) (1994-2000), Member of the Consulting Panel for Computer Infrastructure of Science KBN (1994-2000), Chairman of the Consulting Panel for International Scientific Cooperation of State Committee for Scientific Research (KBN) (2000-2004). Chairman of the Scientific Council of the Industrial Institute for Automation and Measurements (PIAP) (1991-2004), chairman of the Scientific Council of Scientific and Academic Computer Network NASK (1994-2004), and member of the Scientific Council of Institute of System Research (IBS PAN) (since 1992). Member of the Committee of Automation and Robotics of Polish Academy of Sciences (PAN) (since 1970). Member of the Committee for Future Studies "Poland 2000+" PAN (since 1986, deputy chairman since 2000). Member and deputy chairman of the Panel for Cooperation with IIASA of PAN.

Member of the Polish Association for the Club of Rome. Member of Polish Mathematical Society (PTM) (since 1975) and of Society of Polish Electrical Engineers (SEP) (since 1970). Member of the Information Society Technology Advisory Group (ISTAG) of the European Commission (2000-2002). Recipient of George Cantor Award of the Int. Soc. of Multi-Criteria Decision Making for his results in multi-criteria optimization theory and decision support methodology (1992). Recipient of Tomasz Hofmokl Award of NASK for the promotion of informational society, 2005. Recipient of Best Paper Award at the Hawaii International Conference of Systems Science, 2005 for the paper: "Knowledge Creation and Integration: Creative Space and Creative Environments".

Interests: Optimization theory and algorithms, decision theory, decision support systems, negotiation methods and experiences, applications in telecommunication, information society issues, knowledge creation.

2.2 Senior Faculty

Piotr Arabas Assistant Professor (part-time)

Control and Systems Division, Complex Systems Group
room 573, tel. 22 660 7126
P.Arabas@elka.pw.edu.pl

M.Sc 1996, Ph.D. 2004 from WUT

With WUT since 2002.

Interests: Hierarchical systems, predictive control, management of telecommunication services.

Conference proceedings: [LC1]

Rafał Cegieła Assistant Professor

Control and Systems Division, Software Engineering Group
room 555, tel. 22 660 7997
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M.Sc. 1996, Ph.D. 2001 from WUT.

With WUT since 2001. Member of Information Systems Audit and Control Association (ISACA)

Interests: Software engineering, formal methods, IT project management and system audit.

Paweł Domański Assistant Professor (part-time)

Control and Systems Division, Control Engineering Group
room 571, tel. 22 660 7861
P.Domanski@ia.pw.edu.pl

M.Sc. 1991, Ph.D. 1996 from WUT.

With WUT since 1991, half time since 1997.

Interests: Adaptive control, intelligent control, fuzzy logic.

Conference proceedings: [IC1, LC3]

Project participation: [PR13]

Krzysztof Fleszar Assistant Professor (on leave since October 2005)

Operations Research and Management Systems Division
room 561, tel. 22 660 7123
K.Fleszar@ia.pw.edu.pl, www.ia.pw.edu.pl/~kfleszar

M.Sc. 2000, Ph.D. 2004 from WUT.

With WUT since 2003.

Interests: Combinatorial optimisation, scheduling and allocation, combinatorial auctions decision support, multi-dimensional optimisation.

Books, chapters: [CH3]

Conference proceedings: [LC4]

Project participation: [PR8, PR15]

Janusz Granat Assistant Professor

Optimization and Decision Support Division
room 25A, tel. 22 660 7640
J.Granat@ia.pw.edu.pl, www.ia.pw.edu.pl/~janusz

M.Sc. 1986, Ph.D. 1997 from WUT.

With WUT since 1987, member of IFIP Working Group 7.6, Optimization-Based Computer Modeling and Design

Interests: Decision support systems, multicriteria decision analysis, data warehouses, decision support in telecommunication industry.

Jerzy Gustowski Senior Lecturer

Control and Systems Division, Control Engineering Group
room 525, tel. 22 660 7699
J.Gustowski@ia.pw.edu.pl

M.Sc. 1979 from WUT.

With WUT since 1979.

Interests: Low level software for computer control, interfacing, single-chip microcomputers, PLC controllers.

Mariusz Kaleta Assistant Professor

Operations Research and Management Systems Division
room 561, tel. 22 660 7123
M.Kaleta@ia.pw.edu.pl

M.Sc. 2000, Ph.D. 2005, from WUT

With WUT since 2003.

Interests: Discrete optimization, operations research and management, decision support in energy market.

Conference proceedings: [LC7, LC8, IC4]

Reports, abstracts and not reviewed papers: [RP1, RP2]

Coordinator or principal investigator in: [PR18]

Project participation: [PR8, PR15]

Mariusz Kamola Assistant Professor (part-time)

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M.Sc. 1997, Ph.D. 2004 from WUT.

With WUT since 2002.

Interests: Modeling and simulation, optimization, parallel computation, IP networks.

Conference proceedings: [LC9]

Andrzej Karbowski Assistant Professor

Control and Systems Division, Complex Systems Group
room 572, tel. 22 660 7632
A.Karbowski@ia.pw.edu.pl, www.ia.pw.edu.pl/~karbowsk

M.Sc. 1983, Ph.D. 1990 from WUT.

With WUT since 1983. Research visitor, Politecnico di Milano and Universita di Genova, 1992, Edinburgh Parallel Computing Centre, 2000. Member of IEEE.

Interests: Large scale systems, distributed computations, optimal control and management in risk conditions, decision support systems, neural networks, environmental systems management, control and decision problems in computer networks.

Books, chapters: [CH5]

Journal articles: [IJ1]

Conference proceedings: [IC5]

Włodzimierz Kasprzak Professor

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room 554, tel. 22 660 7866
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M.Sc. 1981, Ph.D. 1987 from WUT, Dr-Ing. 1997 from Univ. of Erlangen-Nuremberg, D.Sc. 2001 from WUT.

With WUT since 1997. Member of Polish Section of IAPR.

Interests: Computer vision, speech recognition, pattern classification, signal analysis, artificial intelligence.

Books, chapters: [CH6, CH8, CH12]

Journal articles: [PH1, IJ5]

Conference proceedings: [IC6, IC7, IC20]

Coordinator or principal investigator in: [PR11]

Project participation: [PR14]

Zygmunt Komor Senior Lecturer

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room 571, tel. 22 660 7861
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M.Sc. 1964, Ph.D. 1976 from WUT.

With WUT since 1964.

Interests: Automatic control, control instrumentation design and implementation.

Urszula Kręglewska Senior Lecturer

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room 553, tel. 22 660 7121
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M.Sc. 1973 from WUT.

With WUT in 1973–1993 and from 1994 to present, with Digital Equipment Poland 1993–1994.

Interests: Computer interfaces design.

Tomasz J. Kruk Assistant Professor

Control and Systems Division, Software Engineering Group
room 530, tel. 22 660 7922
T.Kruk@ia.pw.edu.pl, www.ia.pw.edu.pl/~tkruk

M.Sc. 1994 from Technical University of Gdańsk. Ph.D. 1999 from WUT.

With WUT since 1999.

Interests: Operating systems, computer and network security, distributed systems.

Maciej Ławryńczuk Assistant Professor

Control and Systems Division, Robot Programming and Pattern Recognition Group
room 567, tel. 22 660 7673
M.Lawrynczuk@ia.pw.edu.pl

M.Sc. 1998, Ph.D. 2003 from WUT.

With WUT since 2003. Winner of "Gold chalk" ("Złota kreda") award

Interests: Process control and optimization, predictive control, neural networks, modelling.

Conference proceedings: [IC8, LC12]

Project participation: [PR13]

Krzysztof Malinowski Professor (Head of Division)

Control and Systems Division, Complex Systems Group
room 517, tel. 22 660 7397 and 8250995
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M.Sc. 1971, Ph.D. 1974, D.Sc. 1978, the title of Professor of Technical Sciences awarded in 1989, appointed to ordinary professorship in 1994.

With WUT since 1971. Director of ICCE (1984–1996), Dean of the FEIT (1996–1999), Director of the Center for Control and Information-Decision Technology (1993–2003). Member of the Senate of the Warsaw University of Technology (1993–2002), Chairman of the Senate Committee on Academic Staff (1993–1996 and 1999–2002), Chairman of Senate Committee on Research (1996–1999), Director of the University Priority Research Program in Control, Information Technology, and Automation (PATIA) (1994–1999). Correspondent Member of the Polish Academy of Sciences (PAN) (since 1998), Member of the Warsaw Scientific Society (TNW), Member of Technical Sciences Group of the Ministry of National Education Expert Committee, Member of the Committee of Automation and Robotics of Polish Academy of Sciences (PAN), Vice Director (Research) of the Research and Academic Computer Network Institute (NASK), Chairman of the Scientific Council of the Industrial Institute for Automation and Measurements (PIAP), Member of the IFAC Technical Committees on Optimal Control and on Large Scale Systems.

Interests: Hierarchical control, model-based predictive control of nonlinear systems, applications of optimization, management and control of computer networks.

Journal articles: [IJ3]

Conference proceedings: [IC9, LC1, LC11, LC14, IC10]

Reports, abstracts and not reviewed papers: [RP5, RP3]

Coordinator or principal investigator in: [PR4, PR7, PR16]

Piotr Marusak Assistant Professor

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M.Sc. 1997, Ph.D. 2003 from WUT.

With WUT since 2002.

Interests: Predictive control of nonlinear systems, digital control algorithms, process modeling and simulation.

Reports, abstracts and not reviewed papers: [IC8, LC12]

Project participation: [PR13]

Ewa Niewiadomska-Szynkiewicz Assistant Professor

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M.Sc. 1986, Ph.D. 1995 from WUT.

Research Assistant at the Institute of Geophysics of Polish Academy of Sciences in (1987–1988), with WUT since 1988, NASK since 2001, IEEE Member.

Interests: Large scale systems, hierarchical control, computer simulation, computer aided control systems design, environmental systems management, decision support systems, distributed computations, global optimization, telecommunication systems.

Books, chapters: [BK2]

Journal articles: [IJ4]

Conference proceedings: [IC17, IC10, LC21, LC10, LC15]

Włodzimierz Ogryczak Professor (Head of Division)

Optimization and Decision Support Division
room 24, tel. 22 660 7750, 8255280
W.Ogryczak@ia.pw.edu.pl, www.ia.pw.edu.pl/~wogrycza

M.Sc. 1973, Ph.D. 1983 in Mathematics from Warsaw University, D.Sc. 1997 in Computer Science from PAN.

With Warsaw University, Institute of Informatics 1973–2000, with WUT since 2000. H.P. Kizer Eminent Scholar Chair in Computer Science at Marshall University, USA (1989-1992), visiting professor at Service de Mathématique de la Gestion of Université Libre de Bruxelles, Brussels, Belgium (1994-1995). Member of INFORMS, International Society of MCDM, GARP, Expert of The State Accreditation Committee.

Interests: Computer solutions and interdisciplinary applications in the area of operations research, optimization and decision making with the main stress on: multiple criteria analysis and decision support, decision making under risk, linear, network and discrete programming, location and distribution problems.

Books, chapters: [CH3, CH16]

Journal articles: [IJ6, PH2]

Conference proceedings: [IC11, LC16]

Reports, abstracts and not reviewed papers: [RP6, RP8, RP9, RP7]

Coordinator or principal investigator in: [PR2, PR15, PR16]

Andrzej Pacut Professor (Leader of the Group, Deputy Director of the Institute until August 2005)

Control and Systems Division, Biometrics and Machine Learning Group
room 522, tel. 22 660 7733
A.Pacut@ia.pw.edu.pl, www.ia.pw.edu.pl/~pacut

M.Sc. 1969, Ph.D. 1975, D.Sc. 2000 from WUT.

With Warsaw University of Technology since 1969, first with the Institute of Mathematics (until 1978) then with ICCE. Visiting Assistant Prof. at Lefschetz Center for Dynamical Systems of Brown University, Providence, RI (1980–1981), Visiting Associate Prof. at Oregon State University, Corvallis, OR (1984 and 1986–1991). Deputy Director of ICCE 1985–1986 and 1993–2005. Senior Member of IEEE, member of INNS (Int. Neural Networks Society). Vice Chairman (2001–2005) and Chairman (2006–) of the IEEE Poland Section. Member, Tech. Committee 182 of Polish Normalization Committee (PKN) (2003–), Head of the NASK Biometrics Laboratory (2003–).

Interests: Learning systems, system identification, biometrics, neural modeling, neural networks.

Books, chapters: [CH9]

Conference proceedings: [IC22, IC13, LC2]

Reports, abstracts and not reviewed papers: [RP13, RP10]

Coordinator or principal investigator in: [PR3, PR16]

Project participation: [PR17]

Jerzy Paczyński Assistant Professor (Deputy Director of the Institute until August 2005)

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M.Sc. 1963 from WUT, M.Sc. in Mathematics 1973 from Warsaw University, Ph.D. 1974 from WUT.

With WUT since 1963. Deputy Director for Academic Affairs (1996–2005).

Interests: Modeling, modeling languages, transformations of formal languages — tools and applications, application of computer algebra and logic programming to systems theory and optimization.

Krzysztof Pieńkosz Assistant Professor

Operations Research and Management Systems Division
room 560a, tel. 22 660 7864
K.Pienkosz@ia.pw.edu.pl

M.Sc. 1984, Ph.D. 1992 from WUT.

With the Research Institute of Polish Gas and Oil Company 1984–1986, with WUT since 1986.

Interests: Operations research in particular discrete optimization, combinatorial algorithms, production planning and scheduling in manufacturing systems.

Conference proceedings: [IC12]

Project participation: [PR15]

Grzegorz Płoszajski Assistant Professor

Operations Research and Management Systems Division
room 560a, tel. 22 660 7864
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M.Sc. 1968 from WUT, M.Sc. in Mathematics 1974 from Warsaw University, Ph.D. 1974 from WUT.

With WUT since 1969. Deputy Director for Information of the Main Library of WUT since 1996. Committee Member of 'Kasa Mianowskiego' since 2004.

Interests: Control and simulation of discrete production systems, production management, quality management, library automation, text algorithms, information retrieval.

Conference proceedings: [LC19]

Tadeusz Rogowski Senior Lecturer (part-time)

Optimization and Decision Support Division
room 530, tel. 22 660 7922
T.Rogowski@ia.pw.edu.pl

M.Sc. 1972 from WUT.

With WUT since 1972, Director of University Computer Center (1989-2002).

Interests: Computer network, programming languages, operating systems.

Stefan Romicki Assistant Professor

Control and Systems Division, Control Engineering Group
room 566, tel. 22 660 7649
S.Romicki@ia.pw.edu.pl

M.Sc. 1962, Ph.D. 1970 from WUT.

With WUT since 1962.

Interests: Automatic control, design of microprocessor devices, digital servomechanisms.

Andrzej Rydzewski Senior Lecturer

Control and Systems Division, Robot Programming and Pattern Recognition Group
room 566, tel. 22 660 7649
A.Rydzewski@ia.pw.edu.pl

M.Sc. 1974 from WUT.

With WUT since 1974.

Interests: Design of digital systems and microprocessor-based control and measurement systems.

Project participation: [PR9, PR14]

Krzysztof Sacha Professor (Leader of the Group)

Control and Systems Division, Software Engineering Group
room 562, tel. 22 660 7756
K.Sacha@ia.pw.edu.pl, www.ia.pw.edu.pl/~sacha

M.Sc. (1973), Ph.D. (1976), D.Sc. (1996) from WUT.

With Minicomputer Research and Development Center ERA (1973), with WUT since 1976. Software Engineering Consultant for Industrial Automation Enterprize PNEFAL

(1987–90), University of Groningen (1991–1992). Member of IEEE Computer Society and Section of Software Engineering of Polish Academy of Sciences (PAN). Member of the Senate of High School of Economy and Information Technology, Warsaw, Poland.

Interests: Software engineering, software quality evaluation, real-time systems, software specification and design methods.

Books, chapters: [CH11, CH10, CH4]

Conference proceedings: [PH4, IC16]

Coordinator or principal investigator in: [PR5, PR10, PR16]

Jerzy Sobczyk Senior Lecturer (part-time)

Optimization and Decision Support Division
room 519, tel. 22 660 7863
J.Sobczyk@ia.pw.edu.pl, www.ia.pw.edu.pl/~jurek

M.Sc. 1985 from WUT.

With WUT since 1984. FEIT Network Administrator.

Interests: Computer networks, programming languages, parallel and distributed programming, multi-criteria optimization.

Andrzej Stachurski Assistant Professor

Optimization and Decision Support Division
room 25a, tel. 22 660 7640
A.Stachurski@ia.pw.edu.pl, www.ia.pw.edu.pl/~stachurs

M.Sc. 1976, Ph.D. 1980 from WUT.

Senior Assistant (1979–80) and then Assistant Professor (1980–92) at the Institute of System Research (IBS PAN), with WUT since 1992. Visiting Professor at the Calabria University, Italy, 1984, Äbo Swedish Academy in Turku, 1987, Jyväskylä University, Finland, 1988, JSPS invitee at the Department of Control Engineering, Osaka University, Japan, 1988–89. Member of Polish Society of Operations and Systems Research. Author and co-author of many scientific papers and reports on optimization algorithms, identification, applications of optimizations in macro-economy modeling and optimal design problems in structural engineering. Co-author of a textbook "Podstawy optymalizacji" ("Foundations of Optimization") published in 1999. Reviewer of Control&Cybernetics, Optimization, Archives of Control Science, SIAM J. on Optimization, IEEE Concurrency.

Interests: Interests: nonlinear programming, large-scale optimization, applications to the optimal design problems in structural engineering, parallel and distributed calculations in Mathematical Programming.

Journal articles: [PH3]

Cezary Szwed Assistant Professor (on leave since October 2004)

Operations Research and Management Systems Division
room 561, tel. 22 660 7123
C.Szwed@ia.pw.edu.pl

M.Sc. 1993 from WUT. Ph.D. 1999 from WUT.

With WUT since 1999. Member of Polish Electricity Association since 2004.

Interests: Operation research, timetabling, discrete optimization, combinatorial algorithms.

Conference proceedings: [LC13]

Wojciech Szynkiewicz Assistant Professor

Control and Systems Division, Robot Programming and Pattern Recognition Group
room 554, tel. 22 660 7866
W.Szynkiewicz@ia.pw.edu.pl

M.Sc. 1985, Ph.D. 1996 from WUT.

With WUT since 1985. Deputy Director of the Research Center for Control and Information-Decision Technology (1999–2003).

Interests: Robotics, multiple robots coordination, robot sensor-based manipulation and motion planning, autonomous navigation, real-time systems.

Books, chapters: [CH14, CH7]

Journal articles: [PH1]

Conference proceedings: [LC24, IC25]

Reports, abstracts and not reviewed papers: [RP12]

Coordinator or principal investigator in: [PR6]

Project participation: [PR14]

Piotr Tatjewski Professor (Director of the Institute, leader of the Group)

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M.Sc. 1972, Ph.D. 1976, D.Sc. 1988, the title of Professor of Technical Sciences awarded in 2003

With Warsaw University of Technology since 1972. Head of Process Control Group since 1991, Deputy Director of ICCE for Academic Affairs (1987–1991), Director of ICCE since 1996. Head of the Undergraduate Degree Program in Computer Control Systems (1994-1996). DAAD scholarship in 1978 (TU Hanover), SERC research fellow at the City University, London (1986), visiting professor at the University of Birmingham (1992/1993). Member of Committee of Control and Robotics of Polish Academy of Sciences, Member of the Control and Robotics Section of the Scientific Research Council (KBN) 1997–2004. Member of Programme Committee of the Journal PAK, Member of the IFAC Technical Committee on Education, Expert of Ministry of Education and Science for Educational Standards

Interests: Multi-layer control systems, process control and optimization, predictive control, decomposition methods in optimization and control, soft computing methods.

Books, chapters: [BK1]

Journal articles: [LJ1]

Conference proceedings: [LC12, IC8, IC9, LC18, LC26]

Coordinator or principal investigator in: [PR13, PR16]

Eugeniusz Toczyłowski Professor (Head of Division)

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M.Sc. 1973, Ph.D. 1976, D.Sc. 1989 from WUT, the title of Professor of Technical Sciences awarded in 2004.

With WUT since 1973. Head of Operations Research and Management Systems Division, Vice-Dean of the Faculty of Electronics at WUT (1990–1993), chairman of the Rector's Committee for University Computerization (1993–1999), Advisor to the Dean on Strategic Planning (1993–1996). Head of the Undergraduate Program in Information Systems for Decision Support. Member of the Section on Decision Support (since 1992) and the Section on Knowledge Engineering and Operations Research (2003–) of the Committee of Automation and Robotics of Polish Academy of Sciences, Member of the Scientific Council of the Systems Research Institute (IBS PAN) (since 2002), Member of Consulting Council EnergoProject S.A. (2003–), Member of Steering Committee of the Energy Market (2003–).

Interests: Structural approaches to discrete optimization, operations research and management, management information systems, auction theory, competitive market design under constraints.

Journal articles: [LJ2]

Conference proceedings: [LC4,LC6,LC7,LC8,IC4,LC17,LC20,IC18,IC19,LC22,LC25,LC27, LC31]

Coordinator or principal investigator in: [PR8, PR12, PR15, PR16]

Tomasz Traczyk Assistant Professor (Deputy Director of the Institute since August 2005)

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M.Sc. 1984, Ph.D. 1992 from WUT.

With WUT since 1984.

Interests: Database management systems (DBMS), applications of DBMS in management and control, fourth generation languages, CASE methods, information systems, Web-based and distributed systems, XML language and its applications.

Books, chapters: [CH15]

Conference proceedings: [LC28, LC29]

Wiesław Traczyk Professor

Optimization and Decision Support Division
room 523, tel. 22 660 7791
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M.Sc. 1959, Ph.D. 1964, D.Sc. 1969 from WUT, the title of Professor awarded 1983.

With WUT since 1957, Vice-Dean of the Faculty of Electronics (1971–1975), Deputy Director (1975–1981) and Director of ICCE (1981–1984). Member of the Senate of Warsaw University of Technology (1981-1984), Chairman of the Senate Committee of Finances (1981-84). Professor of the University in Port Harcourt, Nigeria (1984-1987), Professor of the Institute of Telecommunications since 1997. Chairman of FEIT Committee for Ph.D. Degrees in Automatic Control and Computer Sciences (1990–2005). Head of ICCE Optimization and Decision Support Division (1997-2002).

Interests: Knowledge engineering, expert systems, artificial intelligence.

Journal articles: [IJ8]

Conference proceedings: [IC21, LC30]

Michał Warchoł Assistant Professor, part-time

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M.Sc. 1991, Ph.D. 2002 from WUT.

With WUT since 1991.

Interests: Predictive control, synthesis of control systems, symbolic calculations, operating systems.

Adam Woźniak Assistant Professor

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M.Sc. 1970, Ph.D. 1975 from WUT.

With WUT since 1970. Advisor to the Dean of Faculty for Departmental Libraries (1987–1993 and 1999–2002), Member of WUT Library Council (since 1999), Member of WUT Committee for Student Admissions (2001-2002).

Interests: Control of complex systems, servomechanisms, robot control, multi-criteria optimization, game theory, multiagent systems, decision support systems.

Project participation: [PR14]

Andrzej Zalewski Assistant Professor

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M.Sc. 1997, Ph.D. 2003 from WUT.

With WUT since 2002. Member of Information Systems Audit and Control Association (ISACA)

Interests: Software engineering, real-time systems, timing requirements, concurrent systems, performance analysis for computer systems, IT project economics.

Cezary Zieliński Professor (Leader of the Group)

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M.Sc. 1982, Ph.D. 1988, D.Sc. 1996 from WUT.

With WUT since 1985. Research visitor at Loughborough University of Technology, UK (1990, 1992), Senior Fellow at Nanyang Technological University, Singapore (1999-2001), Secretary of Priority Research Program in Control, Information Technology, and Automation (PATIA) (1994-1999). Member of the Editorial Board of International Journal of Intelligent Mechatronics: Design and Production, Program Committee Member of PAK (Pomiary, Automatyka, Kontrola). Member of the Forecast Committee of the Polish Academy

of Sciences: Poland 2000 Plus (2003–). Senior Member of IEEE (2002-). Vice Dean for Research and International Cooperation FEIT (2002–2005), Head of the Auditing Team of the Technological University Acreditation Committee (2003–), Head of ICCE Robot Programming and Pattern Recognition Group since 1996. Member of the board of EURON (European Robotics Network of Excellence). Deputy Director of ICCE for Research (2005–).

Interests: Robot programming methods, open-structure robot controllers, behavioral control, digital and microprocessor systems.

Books, chapters: [CH1, CH17, CH18]

Journal articles: [IJ9]

Conference proceedings: [IC23, IC25, IC24]

Reports, abstracts and not reviewed papers: [RP12]

Coordinator or principal investigator in: [PR1, PR14, PR16]

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With WUT since 2003. Head of Biometrics Laboratory (2003–). Assistant at NASK Biometrics Laboratory (2002–). Member of the IEEE (2002–).

Interests: Biometrics, pattern recognition, systems security.

Books, chapters: [CH9]

Conference proceedings: [LC2]

Reports, abstracts and not reviewed papers: [RP10]

Project participation: [PR17]

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M.Sc. 2001 from WUT.

With WUT since 2005.

Interests: Interval mathematics, optimization, numerical computations, queueing systems, probability, network management

Journal articles: [IJ3]

Conference proceedings: [LC11]

Reports, abstracts and not reviewed papers: [RP5]

Project participation: [PR4]

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M.Sc. 1983 from WUT.

With WUT since 1983.

Interests: Computer networks, data bases, operating systems, programming languages, text processing.

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M.Sc. 2000 from WUT

With WUT since 2005

Interests: Software engineering, object-oriented modelling, formal methods.

Books, chapters: [CH13]

Coordinator or principal investigator in: [PR5]

Project participation: [PR10]

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M.Sc. 2000 from WUT

With WUT since 2004

Interests: Discrete optimisation, operations research, decision support.

Conference proceedings: [LC16, LC25]

Project participation: [PR12, PR15]

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M.Sc. 2001 from WUT and 2004 from Warsaw University. Ph.D. 2005 from WUT.

With WUT since 2005.

Interests: Reinforcement learning, neural networks; modeling of memory, consciousness, and perception; adaptive control, learning robots.

Conference proceedings: [IC22]

Reports, abstracts and not reviewed papers: [RP14]

Project participation: [PR3]

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M.Sc. 1994 from WUT.

With WUT since 1994, part-time since Feb. 1998.

Interests: Computer networks management, information systems.

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M.Sc. 2000 from WUT.

With WUT since 2005.

Interests: Operations, planning and economics of electric energy systems, optimization theory and its applications.

Conference proceedings: [LC17, LC31]

2.4 Ph.D. Students

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Supervisor: Krzysztof Malinowski

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Conference proceedings: [LC2]

Project participation: [PR17]

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Conference proceedings: [IC3]

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Supervisor: Krzysztof Sacha

Books, chapters: [CH2]

Conference proceedings: [IC2]

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Conference proceedings: [LC6]

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Supervisor: Krzysztof Malinowski

Journal articles: [IJ4]

Conference proceedings: [LC10]

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Supervisor: Krzysztof Malinowski

Journal articles: [IJ2, IJ4]

Conference proceedings: [LC10]

Reports, abstracts and not reviewed papers: [RP3]

Project participation: [PR7]

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Journal articles: [PH2]

Reports, abstracts and not reviewed papers: [RP4]

Coordinator or principal investigator in: [PR2]

Project participation: [PR15]

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Conference proceedings: [LC6]

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Books, chapters: [CH8]

Journal articles: [IJ5]

Conference proceedings: [IC6, IC7]

Project participation: [PR11, PR14]

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Conference proceedings: [LC17, LC31]

Reports, abstracts and not reviewed papers: [RP11]

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Supervisor: Cezary Zieliński

Journal articles: [IJ7]

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Journal articles: [LJ1]

Conference proceedings: [LC5, LC18]

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Conference proceedings: [IC13]

Project participation: [PR17]

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Supervisor: Krzysztof Sacha

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Conference proceedings: [IC14, IC15, LC20]

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Conference proceedings: [IC6]

Project participation: [PR11]

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Conference proceedings: [IC17, LC21]

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Journal articles: [LJ2]

Conference proceedings: [IC18, IC19, LC22]

Reports, abstracts and not reviewed papers: [RP1, RP2]

Project participation: [PR18]

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Books, chapters: [CH12]

Conference proceedings: [IC20]

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Books, chapters: [CH1]

Project participation: [PR14]

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Project participation: [PR17]

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Optimization and Decision Support Division

Supervisor: Włodzimierz Ogryczak

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Supervisor: Piotr Tatjewski

Conference proceedings: [LC23]

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Supervisor: Andrzej Pacut

Books, chapters: [CH9]

Conference proceedings: [LC2]

Project participation: [PR17]

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Supervisor: Krzysztof Sacha
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Krzysztof Sztyber Ph.D. Student
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Supervisor: Andrzej Pacut

Project participation: [PR17]

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Supervisor: Andrzej Pacut

Coordinator or principal investigator in: [RP13]

Project participation: [PR19, PR20]

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Supervisor: Cezary Zieliński

Books, chapters: [CH17]

Conference proceedings: [IC23, IC25]

Project participation: [PR14]

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2.5 Administrative and Technical Staff

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M.Sc. 2002 from Warsaw School of Management and Marketing.

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Beata Woźniak Manager, Administration.

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M.Sc. 1993 from Warsaw University.

3 Teaching Activities – Academic Year 2004/2005

Course Title	**Course code**	**Hours per week**	**Class**	**Lecturer**
Administration of UNIX and TCP/IP	ASU	2 – 2 –	OSK, OT	J. Sobczyk
Algorithms and Data Structures	AISD1	2 – 1 –	sem. 3	A. Zalewski (spring)
Art of Negotiations	SNE	2 – – 1	MKPWD, OT	A. Wierzbicki (fall)
Commercial Data Bases 2	KBD2	2 – – 2	BDSI, OT	T. Traczyk (spring)
Computer Networks	ECONE	2 1 1 –	ANGL, OT	J. Sobczyk (spring)
Computer Networks (I)	SKM	2 – 1 1	SKOR, OT	J. Sobczyk (fall)
Control	ECONT	2 1 1 –	ANGL, OT	R. Ładziński (spring)
Control Theory	TST	2 1 – 1	MUS, PZ-P, OT	A. Woźniak (spring)
Data Bases 2	BD2	2 – – 1	BDSI, OT	T. Traczyk
Decision Support	WDEC	2 – 2 –	MKPWD, OT, PP-SID	J. Granat
Decisions Under Competition Circumstances	DWW	2 – – 1	MKPWD, OT, PZ, PZ-I, PZ-SID	A. Woźniak (spring)
Decision Support Under Risk Conditions	WDWR	2 – – 1	PZ-I, OT	W. Ogryczak (spring)
Digital Circuits	EDC1	2 – 2 –	ANGL	C. Zieliński (spring)
Discrete and Network Optimisation	ODS	2 – – 1	PZ-I, PZ-A, PZ-O, OT	E. Toczyłowski (fall)
Distributed Operating Systems	RSO	2 – 1 –	PZ, OT, PZ-I, PZ-SID, PZ-ISI	T. Kruk (spring)
Dynamic Systems	EDYSY	2 – 2 –	ANGL, OT	R. Ładziński (fall)
Event programming (I)	PROZ	2 – – 1	ATP, OT	W. Kasprzak (fall)
Fundamentals of Control Systems	PSTE	2 – 1 –	sem. 4	P. Tatjewski (spring) K. Malinowski (fall)
Fundamentals of Digital Technology	PTCY	2 – 2 –	sem. 2	C. Zieliński (fall)
Fundamentals of Operation Research	POBO	2 – 1 –	sem. 4	K. Pieńkosz (spring) G. Płoszajski (fall)
Fundamentals of Optimization	POPTY	2 – 2 –	MKPWD, OT	A. Stachurski
Fundamentals of Parallel Computation	PORR	2 – – 2	SKOR, PZ-A, PZ-I	A. Karbowski
Fundamentals of Programming	PRI	2 1 2 –	sem. 1	J. Paczyński (spring)
Image and Speech Recognition	ROSM	2 – – 1	PZ-P, ISO, OT, MUS	W. Kasprzak (fall)
Information Project Management	ZPI	2 – – 1	BDSI, OT	K. Pieńkosz
Intelligent Robot Systems	ISR	2 – 1 –	MUS, PZ-A, PZ-SID, OT	C. Zieliński (spring)
Introduction to Robotics	WR	2 – 2 –	MUS, SCRJC,OT	W. Szynkiewicz
Knowledge Engineering	IW	2 – – 1	ISO, OT	W. Traczyk
Numerical Methods (J)	MNUM	2 – – 1	PSTER, OT	P. Tatjewski
Numerical Methods	ENUME	2 – 2 –	ANGL, OT	P. Tatjewski (spring)
Object Oriented Programming	PROBE	2 – 2 –	sem. 2	W. Kasprzak (fall)
Operating System	EOPSY	2 1 1 –	ANGL, OT	T. Kruk (fall)
Software Engineering	IOP	2 – 1 –	OSK, OT	K. Sacha
Software Specification and Design	SPOP	2 – 1 –	OSK, PZ-SID, PZ-I, OT	K. Sacha
Management IT Systems	SIZ	2 – – 2	MKPWD, OT	J. Granat
Microcomputer Systems	SMK	2 – 1 –	SYK, OT	A. Rydzewski (spring)
Neural Networks	SNR	2 – – 1	ISO, PZ, PZ-I, PZ-SID, OT	A. Pacut (spring)
Operating Systems	SOI	2 – 2 –	OSK, OT	T. Kruk (fall)

Course Title	Course code	Hours per week	Class	Lecturer
Optimization and Decision Support	OWD	2 – – 1	PZ-A, PZ-I, OT	W. Ogryczak (spring)
Principles of Computer Science	EPCOS	2 – – –	ANGL, OT	W. Kasprzak (fall)
Process Automatization Techniques	TAP	2 – 1 –	MUS, PZ-A, OT	P. Tatjewski (fall)
Process Control	STP	2 1 – 1	PSTER, OT, SCRJC	P. Tatjewski
Process Management and Scheduling	ZAH	2 – 2 –	MKPWD, OT, MUS, PP-SID	E. Toczyłowski (spring)
Programmable Controllers	SP	2 – 1 –	MUS, OT	J. Gustowski (spring)
Programming 1	EPRO1	2 1 1 –	ANGL, OT	J. Paczyński (fall)
Programming 2	EPRO2	2 – 2 –	ANGL, OT	A. Stachurski (spring)
Real-time Systems	SCZR	2 – 2 –	PSTER, OT	K. Sacha
Synthesis of Decision Rules	SRD	2 – 2 –	MKPWD, MUS, OT, PP-SID	K. Malinowski (spring)
System Simulation and Control	SSS	2 – –1	PZ-A, PZ-I, OT	K. Malinowski (spring)
Theory of Optimization	TOP	2 – – 1	MKPWD, PZ-P, OT	W. Ogryczak (fall)
Uncertainty, Modeling, and Prediction	POZ	2 – – 1	MUS, OT, PP-SID	A. Pacut

Table explanations

Hours per week

The digits in a four-digit code denote number of hours per week of, consecutively: lectures, tutorials, laboratory hours and project hours (for instance, `[2 -1 1]` corresponds to two hours of lectures, no tutorials, one hour of laboratory and one hour of project per week).

Semester

symbol	level	description
OT	all levels	free electives
ANGL	all levels	taught in English
MUS	B.Sc.	specialization in Control Systems and Methods
MKPWD	B.Sc.	specialization in Computer Methods of Decision Support
BDSI	B.Sc.	specialization in Databases and Information Systems
OSK	B.Sc.	specialization in Computer System Programming
ISO	B.Sc.	specialization in Intelligent Computation Systems
PSTER	B.Sc.	specialization in Control
SKOR	B.Sc.	specialization in Computer Networks and Distributed Computations
ATP	B.Sc.	specialization in Programming Algorithms
SYK	B.Sc.	specialization in Computer Systems
SCRJC	B.Sc., M.Sc.	specialization in Control Systems
PZ-P	M. Sc., Ph.D.	advanced classes, fundamental
PZ-A	M. Sc., Ph.D.	advanced classes, control
PZ-I	M. Sc., Ph.D.	advanced classes, informatics
PZ-SID	M.Sc., Ph.D.	advanced classes, Decision and Information Systems
PP-SID	M.Sc., Ph.D.	fundamental classes, Decision and Information Systems

4 Projects

[PR1] Network of Excellence within EU FP6 IST FET 507728 **European Robotics Research Network of Excellence**, granting period: 01.05.2004 – 31.05.2008. Principal investigator from WUT: Cezary Zieliński. EURON II is the continuation of EURON I within FP6.

The objective of EURON (European Robotics Network) is the implementation and maintenance of a network of excellence within the 6th Framework Programme that enables the coordination of research and education, fosters the collaboration between academic and industrial institutions, encourages publications and conferences in the area of robotics. The aim is to provide the foundation that allows Europe to remain at the forefront of robotics both in terms of research and industrial products.

[PR2] Rector's grant 503G002005 **Risk Preference Modeling with Conditional Average as Risk Measure**, granting period: 17.03.2005 – 31.12.2005. Coordinator: Włodzimierz Ogryczak. Principal investigator: Adam Krzemienowski.

Conditional Average (CAVG) is a new risk measure designed to cover typical attitudes towards risk for any type of distribution. It can be viewed as a generalization of Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR), two commonly used risk measures. The preference structure induced by CAVG relates to Tversky and Kahneman's cumulative prospect theory. The measure is based on the new stochastic ordering called dual prospect stochastic dominance, which can be considered as a dual stochastic ordering to recently developed prospect stochastic dominance. In general, CAVG translates into a nonconvex quadratic programming problem, but in the case of a finite probability space it can also be expressed as a mixed-integer program (MIP). The research covers both theoretical analysis and computational studies.

[PR3] Rector's grant 503G002005 **Long-term memory Actor-Critic algorithms**, granting period: 17.03.2005 – 23.05.2006. Principal investigator: Andrzej Pacut. Investigators: Paweł Wawrzyński.

The goal of this work is to design reinforcement learning (RL) algorithm based batch estimation. Within the traditional approach to RL control policy results from stochastic approximation in which an increment is associated with a single control step. This makes a very inefficient way of information processing. Consequently, algorithms based on this principle are too slow to be applicable as adaptive control techniques. The idea elaborated in this work is to replace stochastic approximation with optimization of a batch estimator of a performance index. The optimization process could be based on the entire history of plant-controller interaction gathered in a database and be proceeded in parallel to the control process. Potentially, this principle of control systems optimization is much efficient than efficient that the traditional RL. The work confirms this suspicion.

[PR4] Rector's grant 503G0024005 **Optimization of Admission Control for Systems with Uncertain Parameters**, granting period: 17.03.2005 – 31.12.2005. Principal investigator: Krzysztof Malinowski, investigator: Bartłomiej Kubica.

The increasing intensity of Internet traffic makes the operators to pay more attention to ensure the QoS for users. The increasing role of Internet services implies the crescent importance of this problem in the future. Therefore, the problem of Internet Congestion Control becomes more and more popular in recent years. Most methods concentrate on treating network links and ranks as bottle-necks and ignore the congestion at the end servers or routers. Such an approach is incomplete - delays at the servers may

be even more important than those at the links. The thesis tries to deal with these problems. It considers a few models of servers' access controls - the Gupta et al.'s model and several variants of Mendelson's model. As some kind of sub-tasks, two some global optimization methods and probabilistic models were expolered. The researches resulted in a new interval branch-and-bound global optimization method, using Groebner bases and in the new formalism of interval random variables that were used to estimate unknown parameters and to approximate the Laplace transform of PDFs of long-tailed random variables.

[PR5] Rector's grant 503G0027005 **Semantics and reasoning about UML conceptual class diagram**, granting period: 17.03.2005 - 31.12.2005. Coordinator: Krzysztof Sacha. Principal investigator: Marcin Szlenk.

The semantics (meaning) of models written in UML is not unambiguously and rigorously defined. The goal of the research was to formally (mathematically) define both the syntax and semantics of the conceptual class diagram expressed in UML notation. Using the proposed formalization, the problem of semantic consistency of class diagrams was precisely stated and some examples of inconsistencies were shown. The basic relations between two diagrams like a consequence (implication) and an equivalence were also formally defined and analysed.

[PR6] Rector's grant 503G0029005 **Control of a team of miniature mobile robots**, granting period: 17.03.2005 - 31.12.2005. Principal investigator: Wojciech Szynkiewicz. Investigators: Piotr Trojanek, Marek Majchrowski, Marcin Hamada.

The main goal of the project was to design and build a team of miniature robots. Both, the mechanical and electronic parts have been designed and assembled. All robots have differential drive bases with two electric DC motors. The control hardware is based on 16-bit Atmel microcontroller. Bluetooth technology is used to carry out wireless communication.

[PR7] Rector's grant **Effective Load Theory for Pricing and QoS Control of Network and Grid Resources**, granting period: 17.03.2005 – 31.12.2005. Principal investigator: Krzysztof Malinowski. Investigator: Adam Kozakiewicz.

Effective bandwidth theory is an advanced mathematical tool for analysis of network traffic. Apart from purely theoretical papers, most published literature describes its application to ATM networks. The goal of this research is to verify the applicability of this theory to other networks, e.g. Internet or Frame Relay. The theory is used for advanced traffic control and pricing of network flows with nontrivial stochastic models.

[PR8] Deans's grant 503G0029005 **Models and algorithms for complex market systems**, granting period: 15.06.2005 – 31.12.2005. Principal investigator: Eugeniusz Toczyłowski. Investigators: Mariusz Kaleta, Krzysztof Fleszar.

The project is focused on two specific goals: analysis and developing of market models under constraints and preparation of laboratories referring to market models for the lecture ZAH. A general framework for the problem of resource constraint cost allocation on the complex markets is formulated, which is based on the global parametric analysis in the space of the right hand side parameters of resource constraints. This approach allows to allocate appropriately the costs of resource constraints, while some advisable features of this allocation are assured. The framework appears to be a generalization of some important specific game-theory approaches for cost allocation, including Aumann-Shapley pricing. Dedicated software developed for the laboratories let the students game and look for good strategies in case of specific market model.

[PR9] Dean's grant 503G 0033 005 **PCI interface card between a host computer and the IRp-6 robot controller**, granting period: 15.06.2005 – 31.12.2005. Principal investigator: Andrzej Rydzewski.

IRP-6 robot control system consists of a PC computer (host computer) and axis controllers. These parts of the system are connected via an interface, which is formed of a PC extension card (until recently an EISA card) and a controller card. The goal of the project was to design, construct and test a PCI interface card which would substitute the EISA card. This change makes possible the utilization of PC computers, that no longer support the EISA bus, for the purpose of robot control. The card is based on a PLX 9052 PCI local bus bridge. All axis controllers are connected to a local bus, which is configured in such a way that the communication protocols are unchanged.

[PR10] Dean's grant 503G0032005 **Analysis and evaluation of the state of the art in software engineering**, granting period: 15.06.2005 - 31.12.2005. Principal investigator: Krzysztof Sacha. Investigator: Marcin Szlenk.

The goal of the research was to analyze and present the current state of software engineering technologies used by leading IT companies in Poland. The foundation for the analysis and evaluation were the observations made during the auditing of huge software systems developed by the mentioned companies for government agencies in years 2002-2004/2005.

[PR11] Dean's grant 503G0031005 **Methods of hand-image analysis for person identification**, granting period: 15.06.2005 – 16.12.2005. Principal investigator: Włodzimierz Kasprzak. Investigators: Adam Okazaki, Robert Seta.

The goal was to design and develop image analysis methods that allow a hand-based person identification. A specific assumption was that hands may be freely located and oriented in the image. This required to recognize the object first and then to extract and to classify such hand features, that were not influenced by different, unknown scale. The feature set consisted of 11 markant border points and of lines contained in a well-defined palm region. In course of identification a best space transformation wass determined between current point set and a particular person set. The identification decision depends upon the quality of match between current point and line features and template features.

[PR12] MNiI grant 3 T11C 030 28 **Column Generation Technique in structural scheduling and decision support algorithms**, granting period: 24.05.2005 – 23.05.2006. Principal investigator: Eugeniusz Toczyłowski. Investigators: Tomasz Śliwiński.

The goal of the project was to develop models and algorithms for a group of difficult discrete optimization problems. The approach is based on a structural analysis of the problems towards application of Danzig-Wolfe decomposition and column generation scheme together with other optimisation algorithms. Effective solution procedures were found for such problems as: solving linear programs with the ordered weighted averaging objective, resource allocation with max-min fairness for mulicomodity network flows, unit commitment for power generation, scheduling multiple items of different types on a single flexible flow line and preemptive jobs scheduling on parallel machines with setup times and renewable resources.

[PR13] MNiI grant 3 T11A 005 28 **Multipurpose predictive control algorithms**, granting period: 17.05.2005 – 16.11.2007. Principal investigator: Piotr Tatjewski. Investigators: Paweł Domański, Maciej Ławryńczuk, Piotr Marusak.

The goal of the research is to develop structures and algorithms of multipurpose predictive control, in particular concerning optimizing predictive control and control in reconfigurable structures. The first topic concerns a case when dynamics of disturbances

(uncontrolled process inputs) is comparable with dynamics of the controlled process, thus making classical multilayer approach not efficient. Closer cooperation or even integration of regulatory control and current set-point optimization is the subject of the research. The second topic is to develop design procedures leading to multipurpose reconfigurable predictive control, when both structure and parameters of the controller can be on-line adopted to the changes in control targets and/or external influences. The hierarchical approach is considered, with an intelligent supervisory unit. Related practically important case is when reconfiguration is triggered by occurrence of faults, leading to the design of fault-tolerant control systems. Versatility in formulation of predictive control algorithms makes on-line changes in their structure and parameters possible, adopting to the current process situation.

[PR14] MNiI grant no 4 T11A 003 25: **Control of Multirobot systems performing service tasks**, granting period: 15.11.2003 – 14.11.2006. Principal investigator: Cezary Zieliński. Investigators: Włodzimierz Kasprzak, Wojciech Szynkiewicz, Adam Woźniak, Andrzej Rydzewski, Tomasz Winiarski, Maciej Staniak, Fumio Adam Okazaki, Krzysztof Mianowski (IAEAM), Marek Wojtyra (IAEAM), Witold Czajewski (ISEP).

The general objective of the grant is to create a service robot. Unlike industrial robots that operate in factories, hence in very structured environments and with very little interaction with human beings, service robots will have to operate in unstructured and to a certain extent unpredictable human ambient, moreover frequently interacting with people. To operate efficiently in such conditions service robots will have to posses similar capabilities that human beings have. Their sensing capabilities will have to include: vision, touch, feeling of exerted force and hearing. They must have that ability of two-handed dexterous manipulation. Last but not least, they must be highly reactive to sudden changes in the environment and be capable of reasoning, i.e. creation of action plans leading to the execution of the task at hand. Integration of all of the above components into a single complex system requires both adequate programming tools (e.g. a robot programming framework) and theoretical investigations showing what should be the proper structure of such a system. The operation of the constructed system will be validated on the task of solving a Rubik's cube on the operator's vocal prompt.

[PR15] MNiI grant no 3T11C 005 27 **Models and algorithms for efficient and fair resource allocation in complex systems**, granting period: 20.10.2004 – 19.10.2007. Coordinator: ICCE. Principal investigators: Włodzimierz Ogryczak, Michał Pióro (IT), Eugeniusz Toczyłowski. Investigators: Krzysztof Pieńkosz, Krzysztof Fleszar, Mariusz Kaleta, Adam Krzemienowski, Tomasz Śliwiński.

The goal of the research is to develop theory and techniques concerned with quantitative analysis and decision support at the strategic, tactical and operational level of fair resource (or cost) allocation in various systems. Techniques for inequality measurement and equitable optimization algorithms as well as their use in decision support process represent the main algorithmic focus while the fairness of costs or profits allocation procedures within complex systems is major modeling issue of the research within ICCE. Fairness problems related to the telecommunication network design are analyzed by researchers from IT.

[PR16] Statutory grant 504G036300: **Development of methodology of control, decision support and production management**, granting period 16.04.2004 – 30.09.2005 and 1.10.2005 – 30.09.2006. Principal investigators: Andrzej Pacut, Krzysztof Malinowski, Włodzimierz Ogryczak, Krzysztof Sacha, Piotr Tatjewski, Eugeniusz Toczyłowski, Cezary Zieliński.

[PR17] Integrated Project IST-2002-001766 **BioSec (Biometrics and Security)**, granting period: 01.12.2003 – 31.11.2005. Coordinator: Telefonica, Spain. Investigators (from ICCE): Andrzej Pacut, Adam Czajka, Marcin Chochowski, Joanna Putz-Leszczyńska, Łukasz Stasiak, Przemysław Strzelczyk, Rafał Wardziński.

BioSec is a two-year Integrated Project within the FP6 IST programme towards answers for the above listed challenges. BioSec will provide improved performance to: novel 3D face and hand method, noise-cancellation based voice verification method, as well as with emphasis on multimodal biometrics, including face-voice and iris-finger combinations used together with advanced classification methodology. Fake-resistive methods will be developed to leverage the security of fingerprint and iris modalities. Token-based solutions are developed for enhanced privacy in sensitive applications. BioSec consortium observes and actively contributes to the development of biometric standards. Project results are being disseminated to general public, scientific community, business and public bodies in the field. Coherent methods and practises for performance evaluation will be developed and applied in the project. This includes also acquisition and deployment of sufficient test material in the form of databases, latter to be made available for the R&D community. The usability and attitude issues will be an integral part of planning biometric use-cases. Scenarios will focus on the cases of remote access and physical access control. Official webpage: `http://www.biosec.org`.

[PR18] Granted by National Institute of Telecommunications **Knowledge learning and decision support on the basis of polish telecommunication infrastructure data**, granting period: 01.06.2005 – 31.08.2005. Principal investigator: Mariusz Kaleta. Investigator: Kamil Smolira.

The objective of the project is to analyze potential approaches for knowledge learning from telecommunication infrastructure data and to elaborate the idea of Knowledge Center System. The fundamental functional requirements for the System were determined and several systems and applications useful for building the System were pointed. Also rich knowledge managing and learning survey was performed.

[PR19] European Project IST-2001-32243 **CrossGrid**, granting period: 01.03.2002 – 30.04.2005. Coordinator: CYFRONET Academic Computer Centre of the University of Mining and Metallurgy - Cracow. Principal investigator: Interdisciplinary Centre for Mathematical and Computational Modelling (ICM), University of Warsaw. Investigator (from ICCE): Karol Wawrzyniak.

The CrossGrid project is developing, implementing and exploiting new Grid components for interactive compute and data intensive applications like simulation and visualization for surgical procedures, flooding crisis team decision support systems, distributed data analysis in high-energy physics, and air pollution combined with weather forecasting. The elaborate methodology, generic application architecture, programming environment, and new Grid services are validated and tested thoroughly on the CrossGrid testbed, with an emphasis on a user friendly environment. Users should be able to run their applications on the Grid in an easy and transparent way, without needing to know details of the Grid structure and operation. CrossGrid is developing user-friendly portals and mobile personalized environments and is integrating new components into the Grid and application development tools. The work is being done in close collaboration with the Grid Forum and the DataGrid project to profit from their results and experience, and to obtain full interoperability. This results in further extension of the Grid across eleven European countries.

Contribution of the ICCE investigator is the design of GMDAT (Grid Monitoring and Data Analysis Toolkit). GMDAT is a monitoring part of Cross-Grid scheduler. The main foundation of the tool was to create lightweight monitoring system, working on 24h/day basis, being able to deliver data describing Grid status to the Grid scheduler. GMDAT Sensors are built on top of Ganglia monitoring system, the central database uses Round Robin Database (RRD) format and SOAP interface to the scheduler. The data analysis module is written from scratch and utilizes Kalman filter to predict the behavior of the Grid. Currently GMDAT allows for control more than 90 metrics critical for the grid. Work on implementation of the GMDAT to others European grid projects (I4grid, EGEE) are at an advanced stage. Many parts of GMDAT (i.e. SOAP interface, Ganglia improvements) were developed in cooperation with other memebers of Warsaw CrossGrid team. Official project webpage: `http://www.crossgrid.org/`.

[PR20] European Project IST-2003-508833 **EGEE**. Coordinator: European Organization for Particle Physics CERN. Principal investigator: Interdisciplinary Centre for Mathematical and Computational Modelling (ICM), University of Warsaw. Investigator (from ICCE): Karol Wawrzyniak.

The project aims to provide researchers in academia and industry with access to major computing resources, independent of their geographic location. The EGEE project also focuses on attracting a wide range of new users to the Grid. The Grid is built on the European Union Research Network GEANT and exploit Grid expertise generated by many European Union, national and international Grid projects to date.

Responsibilities of the ICCE investigator: configuring and monitoring cluster specific applications as well as network, taking care of some security issues, developing of monitoring tools. Official project web-page: `http://public.eu-egee.org`.

5 Ph. D. Degrees Awarded

Advisor: **Eugeniusz Toczyłowski**

Mariusz Kaleta
Wybrane modele i algorytmy optymalizacji na rynku energii elektrycznej
Degree awarded on January 25, 2005

Krzysztof Fleszar
Techniki redukcji i konstrukcji w algorytmach szeregowania i alokacji
Degree awarded on January 25, 2005 (with honors)

Advisor: **Włodzimierz Kasprzak**

Ewa Snitkowska
Analiza tekstur w obrazach cyfrowych i jej zastosowanie do obrazów angiograficznych
Degree awarded on October 25, 2005

Advisor: **Andrzej Pacut**

Paweł Wawrzyński
Intensive Reinforcement Learning
Degree awarded on October 25, 2005

Adam Czajka
Human Iris for Automatic Identity Verification
Degree awarded on December 20, 2005 (with honors)

6 Publications

6.1 Monographs

6.1.1 Scientific or Technical Books

[BK1] M.Brdyś, P.Tatjewski: *Iterative Algorithms for Multilayer Optimizing Control*. Imperial College Press, London, 2005. ISBN 1-86094-514-7

[BK2] E.Niewiadomska-Szynkiewicz: *Symulacja komputerowa w analizie i projektowaniu złożonych systemów sterowania*. Prace Naukowe Politechniki Warszawskiej, Elektronika. Oficyna Wydawnicza PW, Warszawa, 2005. No. 150

6.1.2 Chapters in Scientific or Technical Books

[CH1] W.Czajewski, M.Staniak, C.Zieliński: *Pewne aspekty wykorzystania informacji wizyjnej w robotach usługowych* (in: Postępy Robotyki, Sterowanie robotów z percepcją otoczenia). Wydawnictwa Komunikacji i Łączności 2005. pp. 53-64

[CH2] A.Felkner: *Zakres zastosowań standardów bezpieczeństwa XML* (in: Wysokowydajne sieci komputerowe. Zastosowanie i bezpieczeństwo). Wydawnictwa Komunikacji i Łączności 2005. pp. 601-609

[CH3] K.Fleszar, W.Ogryczak: *On generalized OWA Approach to Support Location and Routing Decisions* (in: Advanced OR and AI Methods in Transportation. Proceedings of 10th EWGT Meeting and 16th Mini-EURO Conference). Publishing House of Poznan University of Technology 2005. pp. 746-751

[CH4] A.Gosiewski, K.Sacha: *Sterowanie* (in: Wielka Encyklopedia PWN). PWN 2005. Vol. 26. pp. 65-67

[CH5] A.Karbowski: *Distributed, Asynchronous Algorithms for Data Networks Control - A State of the Art Review* (in: Artificial Intelligence and Computer Science). Nova Science Publishers 2005. pp. 59-82

[CH6] W.Kasprzak, M.Jankowski: *Implementacja czujnika wizyjnego w systemie sterowania ruchem drogowym* (in: Postępy Robotyki, Sterowanie robotów z percepcją otoczenia). Wydawnictwa Komunikacji i Łączności 2005. pp. 72-28

[CH7] M.Majchrowski, P.Trojanek, W.Szynkiewicz: *Sterowanie robotem mobilnym w zastosowaniu do ligi RoboCup* (in: Postępy Robotyki, Przemysłowe i medyczne systemy robotyczne). Wydawnictwa Komunikacji i Łączności 2005. pp. 233-242

[CH8] F.Okazaki, W.Kasprzak: *Rozplatanie sygnałów mowy z ich mieszanin przy założeniu stałej przekątnej macierzy mieszającej* (in: Postępy Robotyki, Sterowanie robotów z percepcją otoczenia). Wydawnictwa Komunikacji i Łączności 2005. pp. 95-104

[CH9] A.Pacut, A.Czajka, P.Strzelczyk: *Iris Biometrics for Secure Remote Access* (in: Cyberspace Security and Defense: Research Issues). Springer 2005. pp. 259-278

[CH10] K.Sacha: *Automatyczne programowanie sterownika PLC z użyciem czasowej maszyny stanowej* (in: Systemy Czasu Rzeczywistego. Kierunki badań i rozwoju.). Wydawnictwa Komunikacji i Łączności 2005. pp. 251-263

[CH11] K.Sacha: *Evaluation of Software Quality* (in: Software Enginnering: Evolution and Emerging Technologies). IOS Press 2005. pp. 381-388

[CH12] E.Snitkowska, W.Kasprzak: *Procedura analizy składowych niezależnych i jej wykorzystanie do opisu tekstur w obrazach cyfrowych* (in: Postępy Robotyki, Sterowanie robotów z percepcją otoczenia). Wydawnictwa Komunikacji i Łączności 2005. pp. 105-114

[CH13] M.Szlenk, W.Homenda: *A Practical Approach to the Chord Analysis in the Acoustical Recognition Process* (in: Computational Intelligence for Modelling and Prediction). Springer 2005. pp. 221-231

[CH14] W.Szynkiewicz: *Planowanie manipulacji dwuręcznej* (in: Postępy Robotyki, Sterowanie robotów z percepcją otoczenia). Wydawnictwa Komunikacji i Łączności 2005. pp. 187-196

[CH15] T.Traczyk: *Rozproszona heterogeniczna baza danych wspierająca budowę wielkiego eksperymentu fizyki wysokich energii* (in: Bazy danych - modele, technologie, narzędzia). Wydawnictwa Komunikacji i Łączności 2005. pp. 127-134

[CH16] M.Pióro, M.Dzida, A.Tomaszewski, M.Zagożdżon, E.Kubilinskas, P.Nilsson, W.Ogryczak: *Applications of the Max-Min Fairness Principle in Telecommunication Network Design* (in: 2005 Next Generarion Internet Networks). IEEE 2005. pp. 219-225

[CH17] T.Winiarski, C.Zieliński: *Stanowisko do badania algorytmów sterowania pozycyjno-siłowego robotów* (in: Postępy Robotyki, Sterowanie robotów z percepcją otoczenia). Wydawnictwa Komunikacji i Łączności 2005. pp. 85-94

[CH18] C.Zieliński: *Formalizacja opisu struktur ramowych do programowania systemów wielorobotowych* (in: Postępy Robotyki, Przemysłowe i medyczne systemy robotyczne). Wydawnictwa Komunikacji i Łączności 2005. pp. 53-66

6.2 Scientific and Technical Papers in Journals

6.2.1 "Philadelfia List" Journals

[PH1] W.Kasprzak, W.Szynkiewicz, M.Karolczak: *Global Color Image Features for Discrete Self-localization of an Indoor Vehicle* (in: Computer Analysis of Images and Patterns 11th International Conference CAIP 2005. LNCS.). 2005. No. 3691. pp. 621-627

[PH2] A.Krzemienowski, W.Ogryczak: *On Extending the LP Computable Risk Measures to Account Downside Risk* (in: Computational Optimization and Applications, Springer). 2005. No. 32. pp. 133-160

[PH3] M.Lechman, A.Stachurski: *Nonlinear section model for analysis of RC circular tower structures weakened by openings* (in: Structural Engineering and Mechanics). Vol. 20, No. 2(2005). pp. 161-172

[PH4] K.Sacha: *Automatic Code Generation for PLC Controllers* (in: R.Whinter, B.Gran, G.Dahll: Computer Safety, Reliability, and Security. LNCS.). 2005. No. 3688. pp. 303-316

6.2.2 Other International Journals

[IJ1] A.Karbowski: *Distributed asynchronous algorithms in the Internet - new routing and traffic control methods* (in: Journal of Telecommunications and Information Technology). 2005. No. 3/2005. pp. 1-8

[IJ2] A.Kozakiewicz: *Optimization approach with -proximal convexification for Internet traffic control* (in: Journal of Telecommunications and Information Technology). 2005. No. 3/2005. pp. 37-42

[IJ3] B.Kubica, K.Malinowski: *An Interval Global Optimization Algorithm Combining Symbolic Rewriting and Componentwise Newton Method Applied to Control a Class of Queueing Systems* (in: Reliable Computing, Springer). 2005. No. 11(2005). pp. 393-411

[IJ4] E.Niewiadomska-Szynkiewicz, M.Karpowicz, A.Kozakiewicz: *Application of Grid Technologies to Multireservoir Systems Management During Flood* (in: Acta Geophysica Polonica). 2005. Vol. 53. No. 4. pp. 473-485

[IJ5] F.Okazaki, W.Kasprzak: *A two-step approach to blind deconvolution of speech and sound sources in the time domain* (in: Bulletin of the Polish Academy of Science, Technical Science). 2005. No. 1. pp. 49-55

[IJ6] W.Ogryczak, M.Pióro, A.Tomaszewski: *Telecommunications network design and max-min optimization problem* (in: Journal of Telecommunications and Information Technology). 2005. No. 3/2005. pp. 43-56

[IJ7] M.Pawluk, K.Arent: *Unfalsified control of manipulators: simulation analysis* (in: Bulletin of the Polish Academy of Science, Technical Science). 2005. Vol. 53. No. 1. pp. 19-29

[IJ8] W.Traczyk: *Structural representations of unstructured knowledge* (in: Journal of Telecommunications and Information Technology). 2005. No. 3/2005. pp. 81-86

[IJ9] C.Zieliński: *Formal approach to the design of robot programming frameworks: the behavioural control case* (in: Bulletin of the Polish Academy of Science, Technical Science). 2005. Vol. 53. No. 1. pp. 57-67

6.2.3 Local Journals

[LJ1] S.Plamowski, P.Tatjewski: *Wariantowa struktura regulacji z przełączającym algorytmem diagnostycznym w układzie regulacji temperatury pary kotła energetycznego* (in: PAK Pomiary-Automatyka-Kontrola). 2005. No. 9'2005 BIS. pp. 267-269

[LJ2] K.Smolira, E.Toczyłowski: *Mechanizmy czasu rzeczywistego na rynku bilansującym energii elektrycznej* (in: Energetyka). 2005. No. VII. pp. 112-116

6.3 Scientific and Technical Papers in Conference Proceedings

6.3.1 International Conference Proceedings

[IC1] P.Domański, P.Prokop: *Industrial Portal for Oil & Gas Management* (in: 3rd International Oil and Gas Conference). 2005. pp. 1-10

[IC2] A.Felkner: *XML - praktyczne zastosowanie języka* (in: VII International Workshop for Candidates for a Doctor's Degree OWD'2005). 2005. pp. 113-118

[IC3] P.Górczyński: *Model of an intelligent tutoring system using data mining methods to discover successful teaching strategies for SCORM-compatible courses.* (in: Proceedings of V International Conference on Decision Support for Telecommunications and Information Society). 2005. pp. 225-236

[IC4] M.Kaleta, E.Toczyłowski: *Metoda wyceny kosztów spełniania ograniczeń systemowych na rynku bilansującym energii elektrycznej* (in: APE 2005 XII Międzynarodowa Konferencja Naukowa Aktualne Problemy w Elektroenergetyce). 2005. No. III. pp. 163-170

[IC5] A.Karbowski: *Distributed Asynchronous Algorithms for Network Control with Contracted Flow Rates - A Review* (in: The Fifth International Conference od Decision Support and Telecommunications and Information Society Preliminary Proceedings). 2005. pp. 35-45

[IC6] W.Kasprzak, A.Cichocki, F.Okazaki: *Blind extraction of sparse images from underdetermined mixtures* (in: Computer Vision and Graphics, International Conference, ICCVG 2004. Series: Computational Imaging and Vision). Vol. 32. Springer. 2005. pp. 826-831

[IC7] W.Kasprzak, F.Okazaki, R.Seta: *A common feature representation scheme for speech and contour recognition* (in: Computer Vision and Graphics, International Conference, ICCVG 2004. Series: Computational Imaging and Vision). Vol. 32. Springer. 2005. pp. 463-468.

[IC8] M.Ławryńczuk, P.Marusak, P.Tatjewski: *Optimising Predictive Range Control for a Distillation Process* (in: 11th IEEE International Conference on Methods and Models in Automation and Robotics). 2005. pp. 379-384

[IC9] K.Malinowski, P.Tatjewski: *Coordination as a means to understand and to organize complex systems* (in: J.Gu, G.Chroust: IFSR'2005 The First World Congress of the International Federation for Systems Research). 2005. No. S4-3-1 CD. pp. 1-7

[IC10] E.Niewiadomska-Szynkiewicz, K.Malinowski: *Price Management - Optimization Solvers and Numerical Results* (in: 11th IEEE International Conference on Methods and Models in Automation and Robotics). 2005. pp. 979-984

[IC11] W.Ogryczak, A.Wierzbicki, M.Milewski: *A Multi-Criteria Approach to Fair and Efficient Bandwidth Allocation* (in: The Fifth International Conference od Decision Support and Telecommunications and Information Society Preliminary Proceedings). 2005. pp. 73-92

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