Institute of Control and Computation Engineering

2004 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 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 staff and students towards computational and algorithmic aspects of control, decision support, man-machine interfacing, etc. This resulted in creation of new educational profiles offered by the Institute and a change of its name to the present one in 1994. Professor Władysław Findeisen has been the Director of the Institute until he was elected the Rector of the Warsaw University of Technology in 1981. His achievements were recognized worldwide. He is Doctor Honoris Causa of the City University London, Warsaw University of Technology, Technical University of Gdańsk, and Technical University of Ilmenau.

The Institute offers educational possibilities in a broad area of information technology, mainly for control and decision support systems, at three levels of education. At first two levels (equivalent to B.Sc. and M.Sc.) the degree programs combining courses from areas of computer science and control are offered. We are also proud to be able to offer interesting possibilities to our postgraduates for continuation of their study and research towards Ph.D. both in Computer Science and in Control.

Certainly, 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. It is worth to mention that in 2004 the Institute finished realization of significant grant from KBN (Committee for Scientific Research) which resulted in valuable upgrades and new purchases of hardware and software for the research laboratories.

I express my sincere appreciation to 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 to Prof. Eugeniusz Toczyłowski for his nomination to awarding the title of professor. I would also like to compliment Prof. Cezary Zieliński who has been awarded a prize of Ministry of National Education and Sport for the book 'Foundations of logic circuit design' and Mr. Andrzej Rydzewski who has been awarded the Medal of Commission of National Education, the most significant educational award at the national level.

I would like to express my gratitude to all our partners, and in particular to our partners from abroad actively participating in international research programs. We will 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

Contents

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1 General Information

The following information about the Institute personnel regards the period of January 1 – December 31, 2004.

1.1 Board of Directors

Professor Piotr Tatjewski, Director
Professor Andrzej Pacut, Deputy Director for Research
Dr. Jerzy Paczyński, Deputy Director for Academic Affairs

1.2 Organization of the Institute

Control and Systems Division

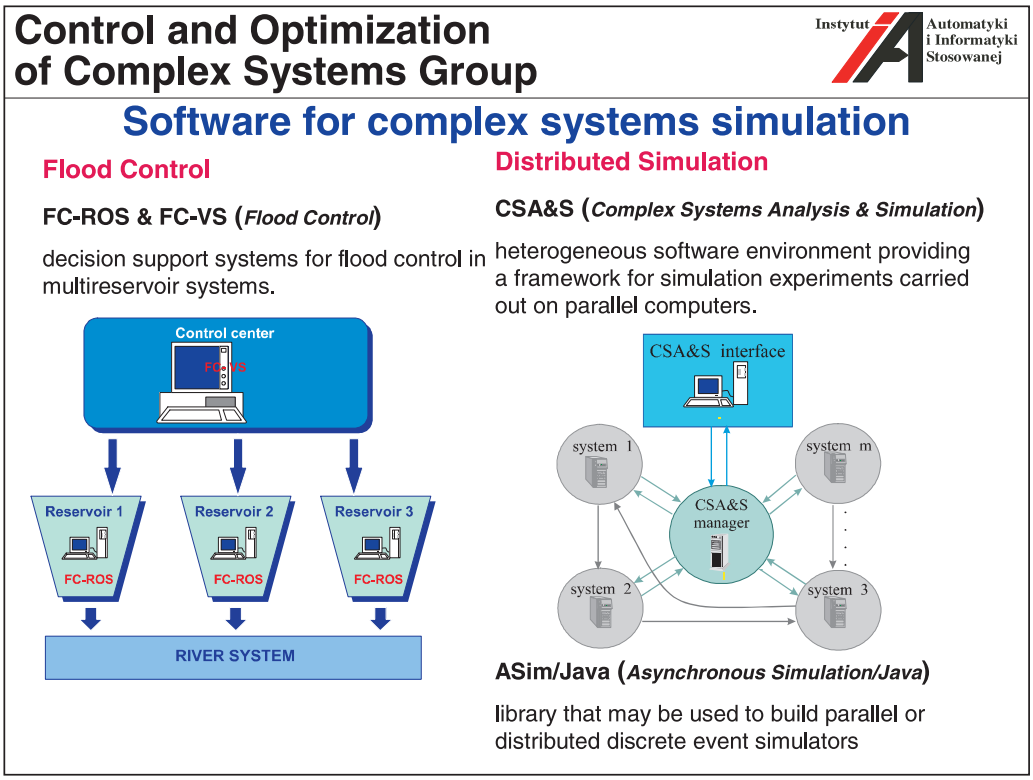
Division Head:	Professor Krzysztof Malinowski
Professors:	Krzysztof Malinowski, Andrzej Pacut, Krzysztof Sacha, Piotr Tatjewski, Cezary Zieliński
Professors, retired:	Władysław Findeisen, Anatol Gosiewski, Radosław Ładziński, Jacek Szymanowski
Assistant Professors:	Piotr Arabas (since October 2004, part-time), Rafał Cegieła, Paweł Domański (part-time), Mariusz Kamola (since December 2004, part-time), Andrzej Karbowski, Włodzimierz Kasprzak, Tomasz J. Kruk, Maciej Ławryńczuk (since March 2004), Piotr Marusak, Ewa Niewiadomska-Szynkiewicz, Stefan Romicki, Wojciech Szynkiewicz, Michał Warchoł (part-time), Adam Woźniak, Andrzej Zalewski
Senior Lecturers:	Jerzy Gustowski, Urszula Kręglewska, Zygmunt Komor, Andrzej Rydzewski
Assistants:	Piotr Arabas (until September 2004, part-time), Adam Czajka (part time), Przemysław Jaskóła (since October 2004, part-time), Mariusz Kamola (until November 2004, part-time), Maciej Ławryńczuk (until February 2004), Tomasz Winiarski (since January 2004, part-time)
Senior Engineers:	Włodzimierz Macewicz, Jerzy Pułaczewski (retired)

Ph.D. Students: Bartłomiej Anszperger, Jacek Błaszczyk, Adam Czajka, Anna Felkner, Przemysław Jaskóła, Radosław Kacperczyk, Adam Kozakiewicz, Bartłomiej Kubica, Michał Andrzej Malarski, Marek Małowidzki, Fumio Adam Okazaki, Michał Pawluk, Sebastian Plamowski, Joanna Putz-Leszczyńska, Robert Seta, Andrzej Sikora, Ewa Snitkowska, Jarosław Sobieszek, Łukasz Stasiak, Marek Strzelczyk, Maciej Staniak, Marcin Szlenk, Krzysztof Sztyber, Karol Wawrzyniak, Paweł Wawrzyński, Tomasz Winiarski

Research of the division is conducted in 4 research groups:

Control and Optimization of Complex Systems Group (**K. Malinowski**, A. Pacut, P. Arabas, M. Kamola, T.J. Kruk, A. Karbowski, E. Niewiadomska-Szynkiewicz, M. Warchoł, A. Woźniak, A. Czajka, P. Jaskóła, B. Anszperger, J. Błaszczyk, A. Kozakiewicz, B. Kubica, M. Małowidzki, J. Putz-Leszczyńska, A. Sikora, J. Sobieszek, Ł. Stasiak, K. Wawrzyniak, P. Wawrzyński)

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 biometric identification.



Control and Optimization of 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

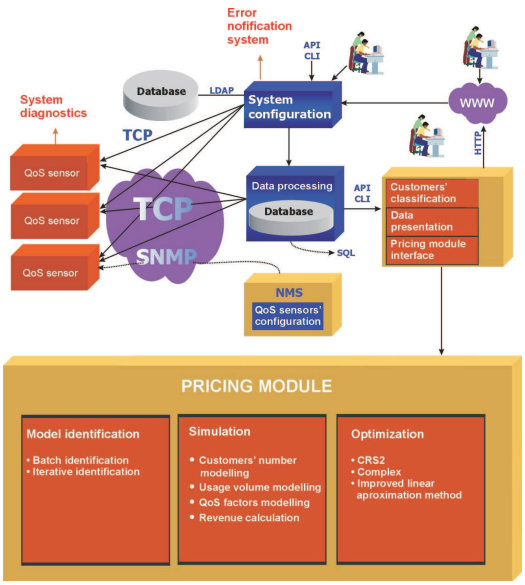
Control and Optimization of Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

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

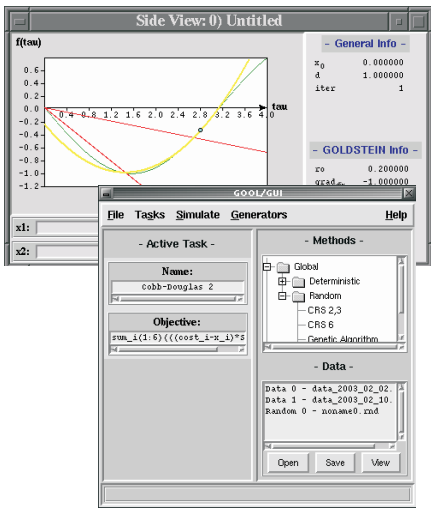


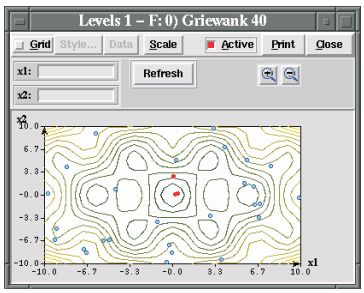
Control and Optimization of Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

Global optimization

GOOL - Global Optimization Object–Oriented Library





GOOL

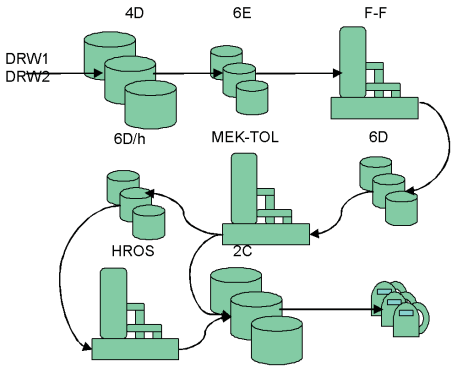
library of random search generators and optimization algorithms for convex and nonconvex, unconstrained and constrained problems

Control and Optimization of Complex Systems Group

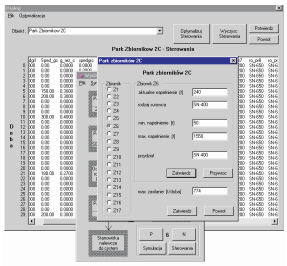
Instytut Automatyki i Informatyki Stosowanej

Operations scheduling using Constraint Programming

Solution of a scheduling problem in an Oil Refinery Division



Oil Refinery Division



Simulation and optimization system

Goals:

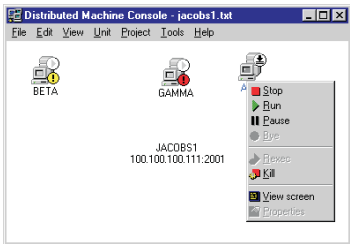
- Simulation of an Oil Refinery Division
- Finding all feasible solutions
- Meeting all technical requirements
- Constraint scheduling methods
- Very fast computations

Control and Optimization of Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

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:

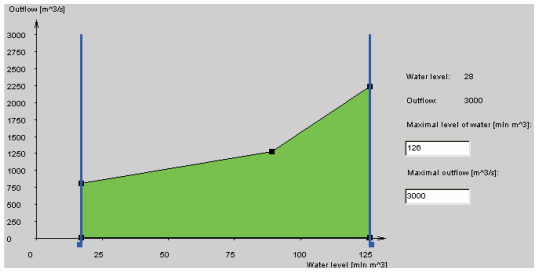
- **WDM** (windows distributed machine) – a software environment for performing distributed computations in a cluster of machines working under windows
- **GEPAS** (generic parallel suite) – an implementation of distributed shared memory in network
- **NONOS** (nonlinear optimization solver) – an ASP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

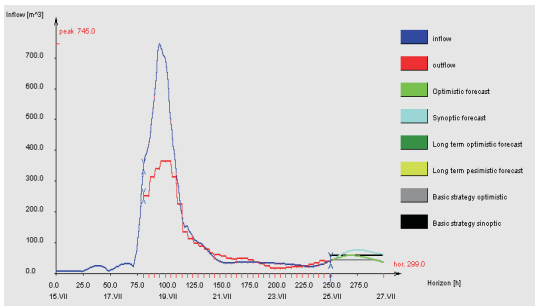
Control and Optimization of Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

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





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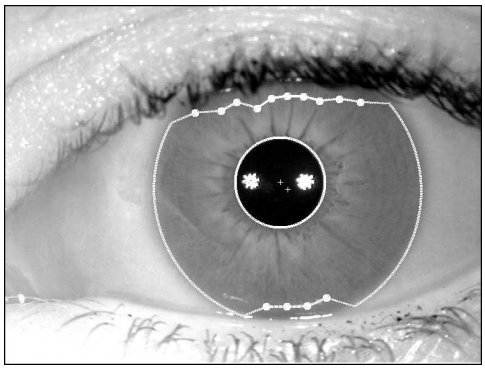
Instytut Automatyki i Informatyki Stosowanej

Biometrics

Human iris verification.

- human iris automatic localization and artifacts (eyelids, eyelashes, reflections) exclusion
- the use of fast Zak-Gabor transform for the unique iris code calculation,
- iris image permutation for replay attack prevention
- research on iris texture statistics,
- fusing iris biometrics with open operating system smart cards (e.g., JavaCards)
- eye aliveness detection (e.g., pupil dynamics, stimulated reflections from cornea, frequency analysis for detection of printed irises)



Human eye imaged in infrared light and the corresponding iris code. An interesting iris region, not occluded by eyelids and eyelashes, automatically determined is also depicted

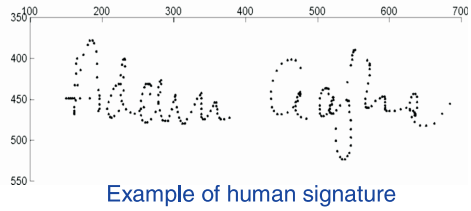
Control and Optimization of Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

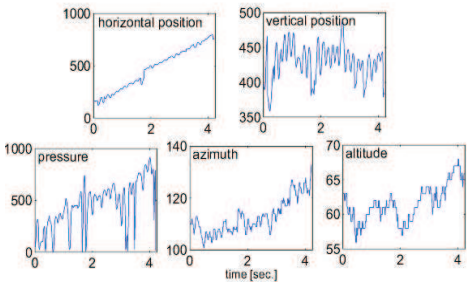
Biometrics

Human handwritten signature recognition

- signature as 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 used in verification process
- the use of neural networks, dynamic programming and time warping as classification techniques



Example of human signature



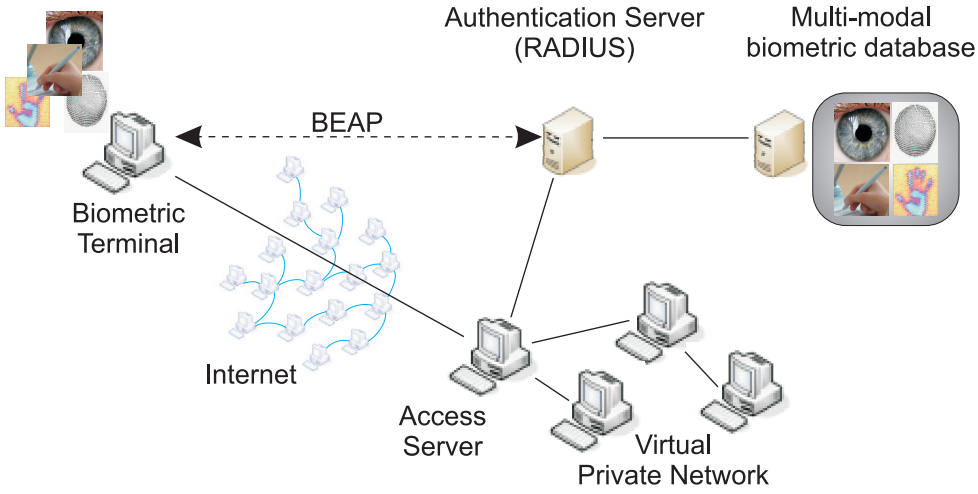
The corresponding signature elements vs. time used in analysis, namely: the pen position, the pen tip pressure and the pen angles – azimuth and altitude

Control and Optimization of Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

Biometrics

Remote access with biometric authentication



Process Control 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)

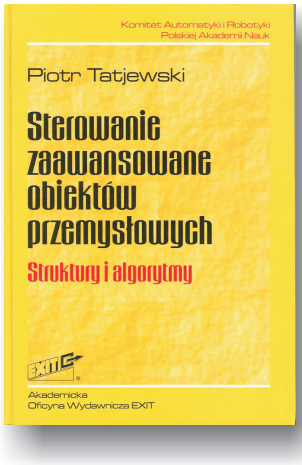
Research of the group encompasses industrial process control. The focus is on predictive and fuzzy control algorithms, multilayer optimizing and supervisory control, and non-linear system control and analysis. Model-based predictive control algorithms for linear and nonlinear process modeling are developed and investigated. Soft computing methods for design and tuning of control systems are used and 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.

Process Control Group

Instytut Automatyki i Informatyki Stosowanej

Advanced control of industrial processes

- Multilayer control structures 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



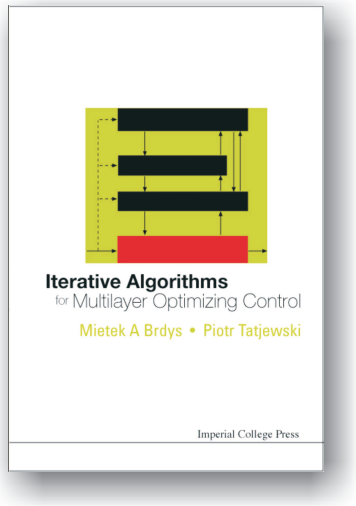
Advanced Control of Industrial Processes, Structures and Algorithms
Academic Publishers EXIT, 2002

Process Control Group

Instytut Automatyki i Informatyki Stosowanej

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

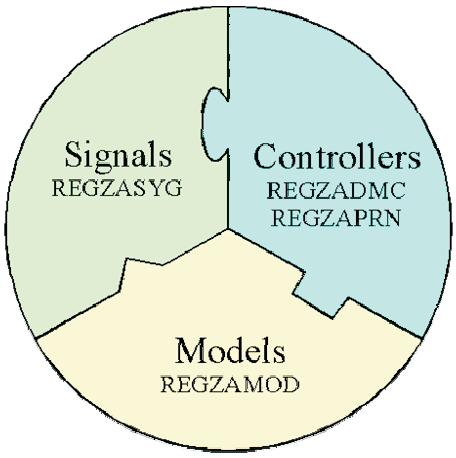
Process Control Group

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



Process Control Group

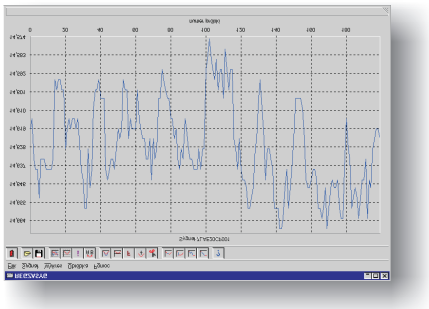
Instytut Automatyki i Informatyki Stosowanej

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

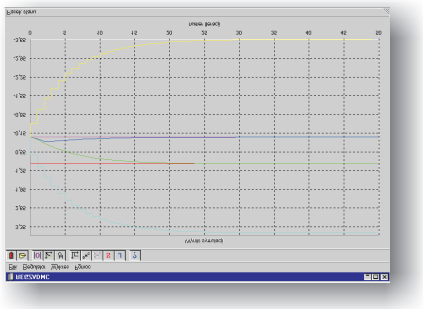
Nonlinear predictive control structures based on fuzzy and neural models

- 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

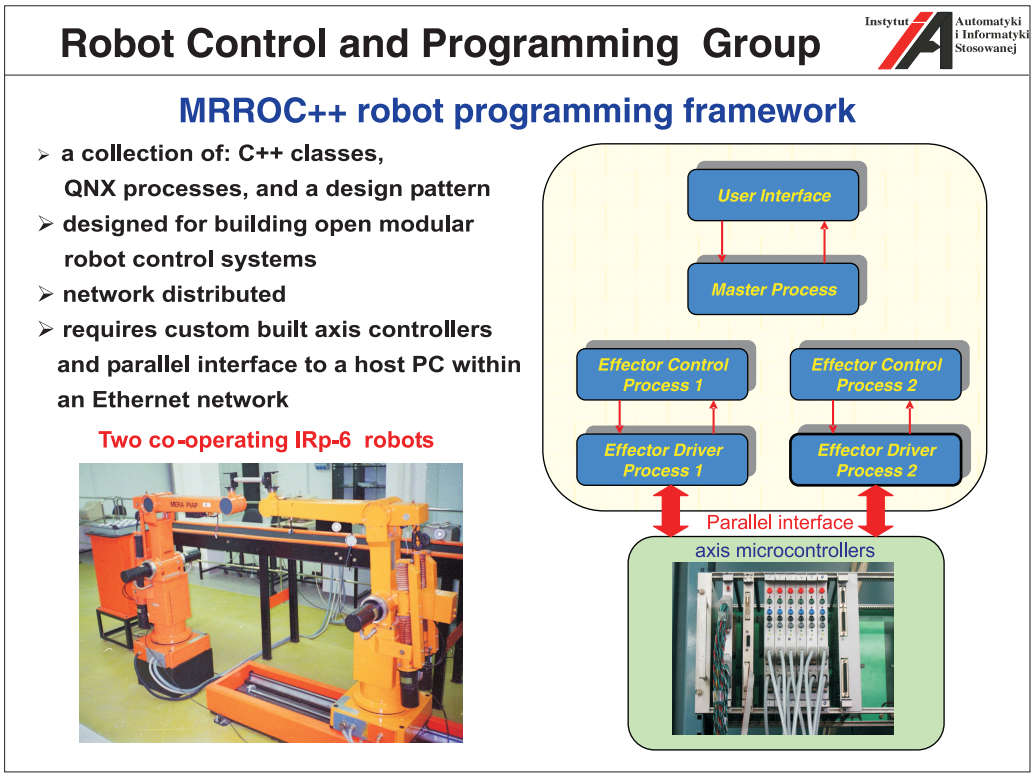


Main window of REGZADMC program



Robot Control and Programming Group (**C. Zieliński**, A. Gosiewski, W. Kasprzak, W. Szynkiewicz, A. Rydzewski, T. Winiarski, M. Jankowski, 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, and computer vision 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 Control and Programming 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

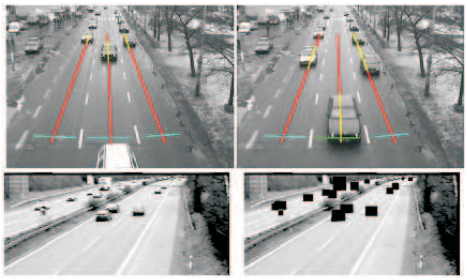
Robot Control and Programming Group

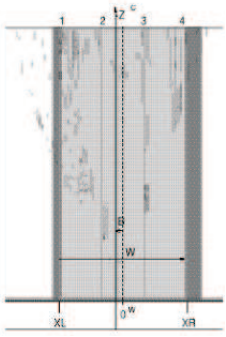
Instytut Automatyki i Informatyki Stosowanej

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.





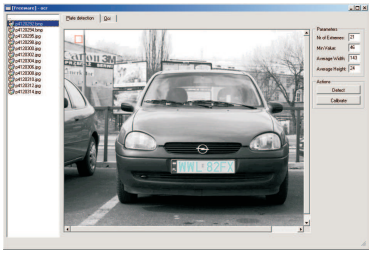
Robot Control and Programming Group

Instytut Automatyki i Informatyki Stosowanej

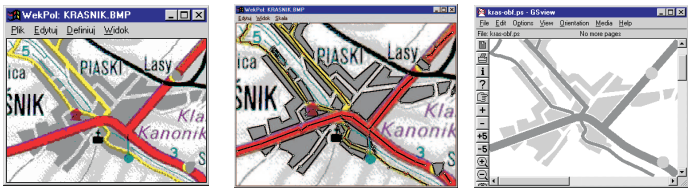
2-D object recognition in digital images

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 Control and Programming Group

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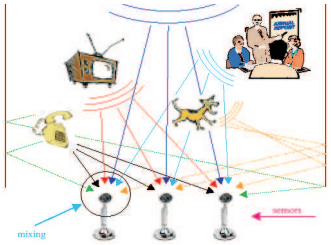
Blind separation of mixed signals

The „cocktail party" problem:

•Only mixtures of source signals can be acquired,

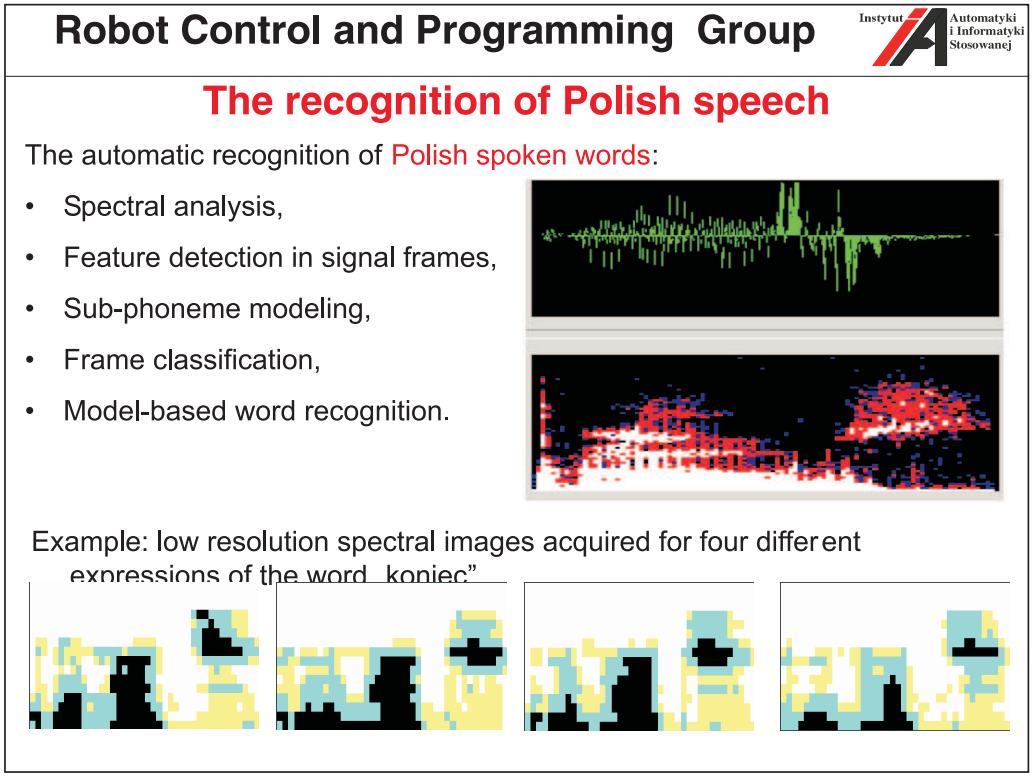
•The goal is to separate the original sources.



•Illustration of deconvolving 2-D image mixtures:

•Three convolved mixtures of three sources at the system's input.

•Three deconvolved images at the output.



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

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.

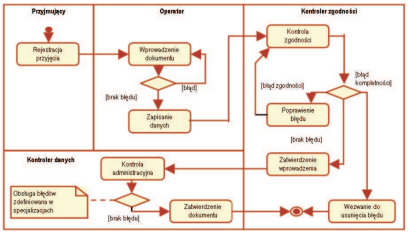
Software Engineering Group

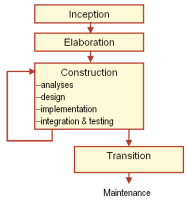
Instytut Automatyki i Informatyki Stosowanej

Software development

Research topics:

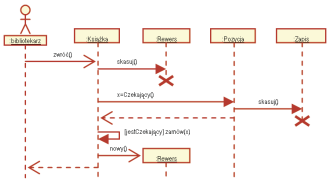
- Software development methods
  - Object-oriented analysis and design
  - Structured analysis and design
- Business process modeling
  - Workflow, Data flow diagram, Function tree
- Requirements engineering
- Acceptance testing
- Software processes
  - Waterfall, incremental, formal

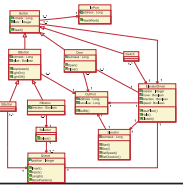




Systems and tools :

- Rational Rose
- Rational RequisitePro
- Structured Architect





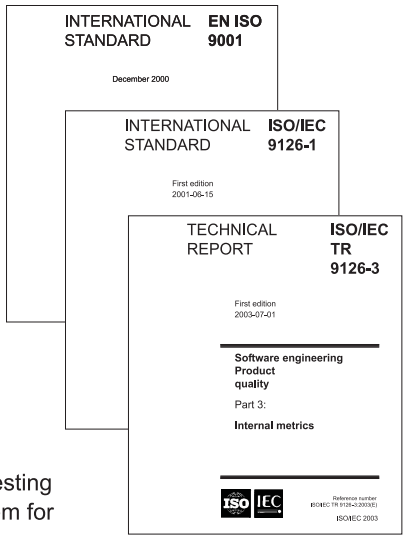
Software Engineering Group

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

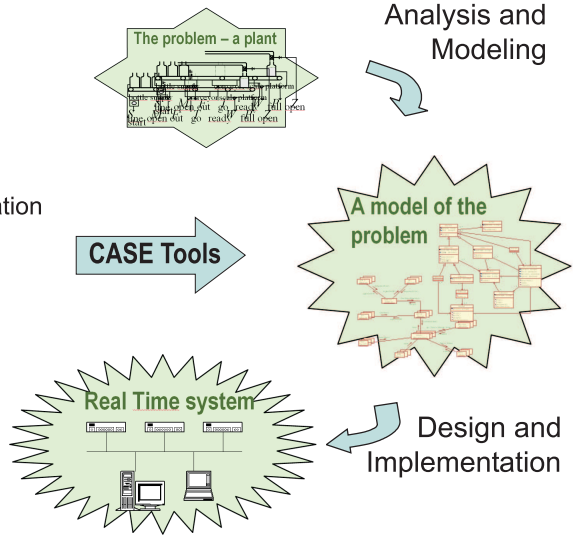
Real time systems

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:

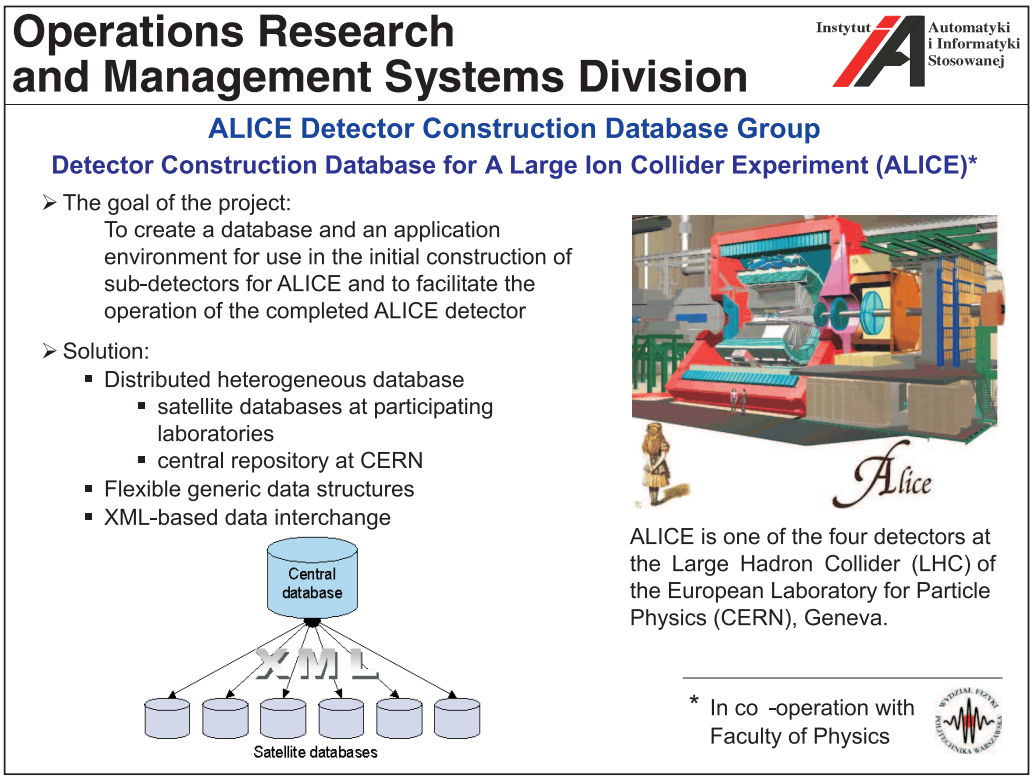
- QNX, OS/9
- Profibus
- Siemens Step 7



Operations Research and Management Systems Division

Division Head:	Professor Eugeniusz Toczyłowski
Professors:	Eugeniusz Toczyłowski
Assistant Professors:	Krzysztof Pieńkosz, Grzegorz Płoszajski, Cezary Szwed, Tomasz Traczyk
Assistants:	Krzysztof Fleszar, Mariusz Kaleta
Ph.D. Students:	Krzysztof Fleszar (until September 2004), Mariusz Kaleta (until September 2004), Mariusz Rogulski, Kamil Smolira, Tomasz Śliwiński, Izabela Żółtowska

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.

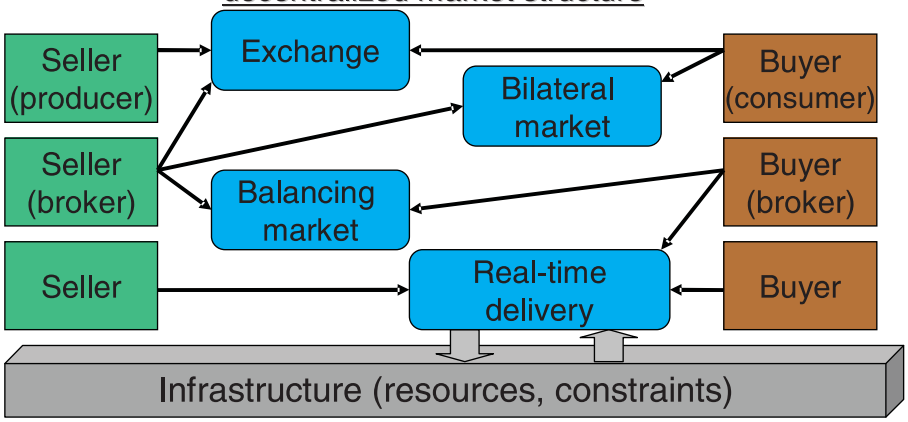


Operations Research and Management Systems Division

Instytut Automatyki i Informatyki Stosowanej

Designing of infrastructure markets under constraints

decentralized market structure

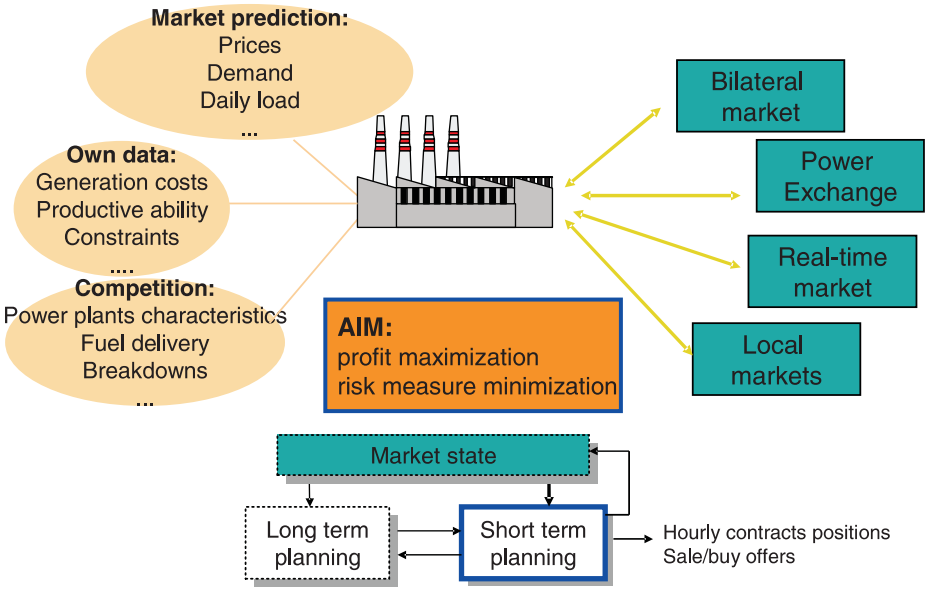


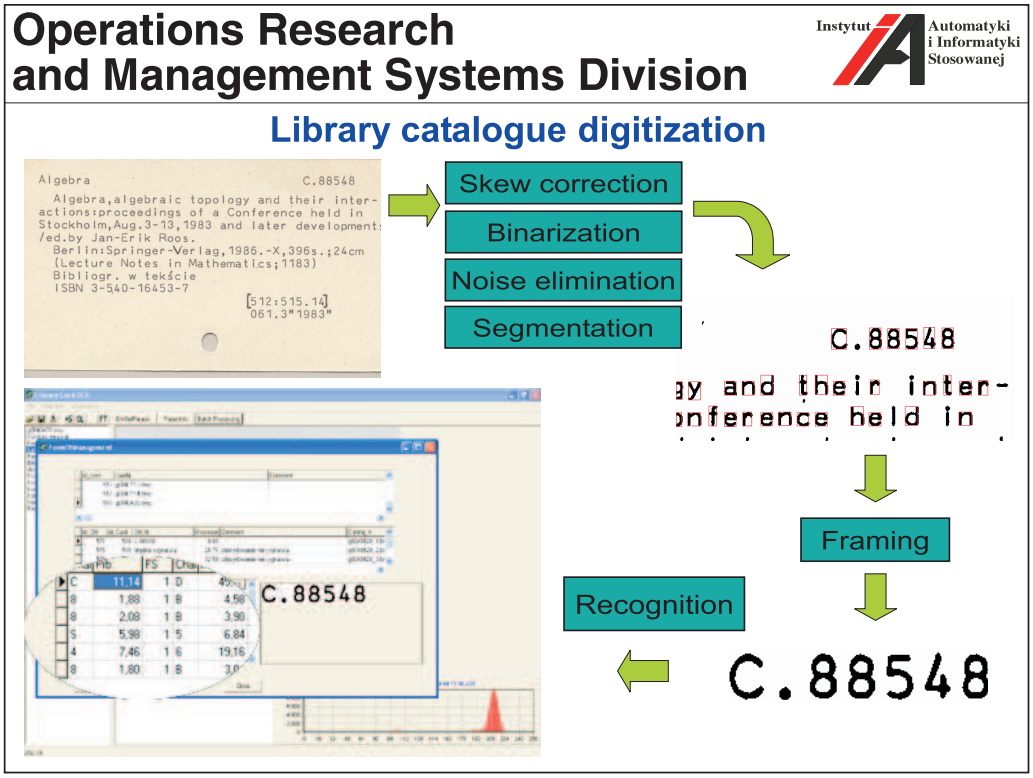
- Object and subject market structure
- Market rules designing
- Strategic and tactical market planning
- Real-time operational control
- Market operator decisions support tools
- XML-based description of market

Operations Research and Management Systems Division

Instytut Automatyki i Informatyki Stosowanej

Electrical energy market – decisions support for players

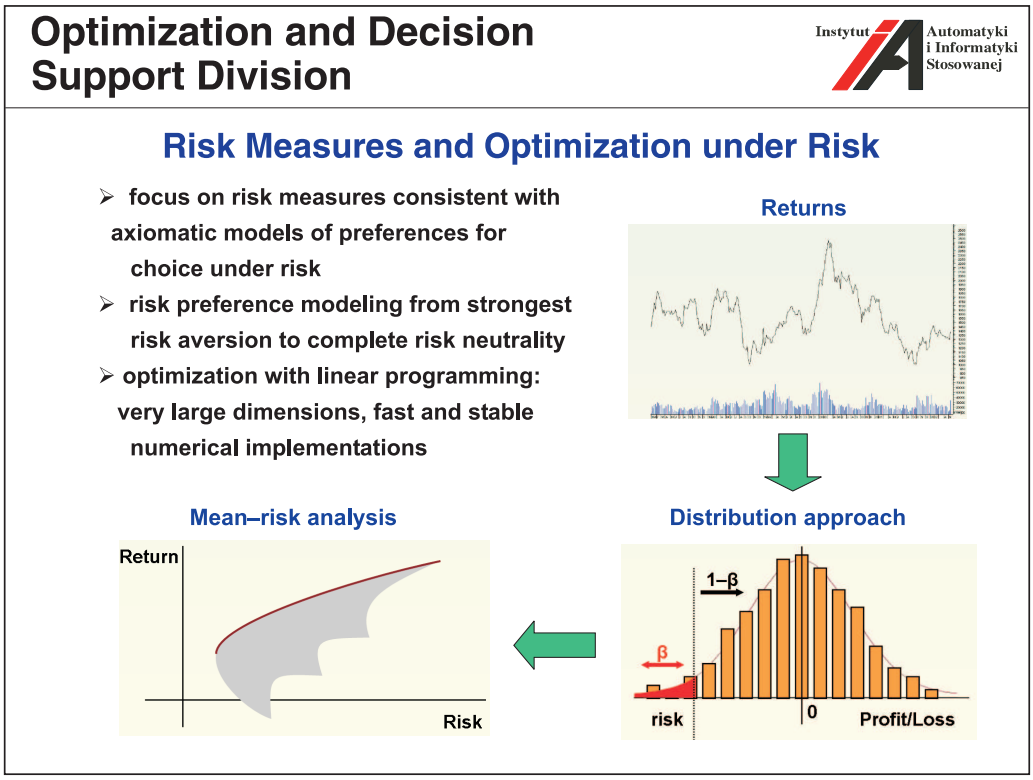



Operations Research
and Management Systems Division
Instytut Automatyki i Informatyki Stosowanej
Library catalogue digitization
Algebra C.88548
Algebra,algebraic topology and their inter-
actions:proceedings of a Conference held in
Stockholm,Aug.3-13,1983 and later development
/ed.by Jan-Erik Roos.
Berlin:Springer-Verlag,1986.-X,396s.;24cm
(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, Andrzej P. Wierzbicki (until January 2004)
Assistant Professors:	Janusz Granat, Jerzy Paczyński, Andrzej Stachurski
Senior Lecturers:	Tadeusz Rogowski (part time), Jerzy Sobczyk (since October 2004, part-time)
Lecturers:	Jerzy Sobczyk (until September 2004, part-time), Grzegorz Wójcik (part-time)
Assistant:	Tomasz Śliwiński (since March 2004, part-time)
Ph.D. Students:	Cezary Chudzian, Piotr Górczyński, Bartosz Kozłowski, Adam Krzemienowski, Sylwester Laskowski, Tomasz Nitychoruk, 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.

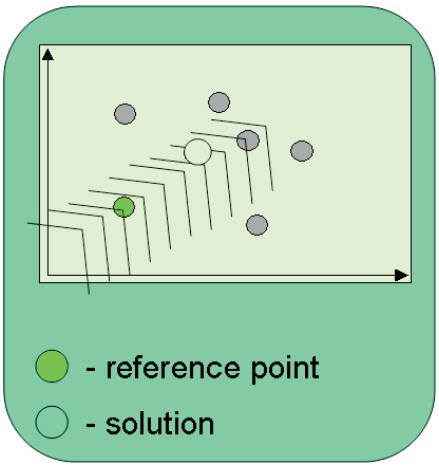


Optimization and Decision Support Division

Instytut Automatyki i Informatyki Stosowanej

Reference Point Method

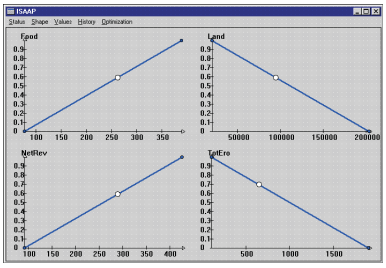
- interactive method for multicriteria model analysis
- guiding information by specification of the reference points
- a Pareto-optimal solution is selected for a given reference point

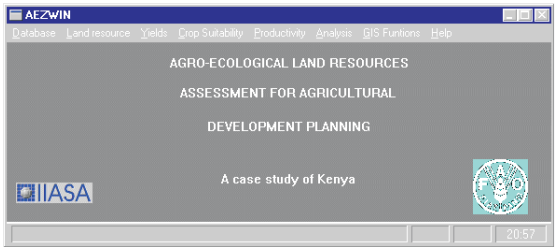


Optimization and Decision Support Division

Instytut Automatyki i Informatyki Stosowanej

Application of the reference point method to land resource assessment





1.3 Statistical Data

FACULTY and STAFF	2002		2003		2004	
	persons	FTE	persons	FTE	persons	FTE
Academic Staff	38(+1)	34.03(+1)	40(+2)	34.90(+1.5)	42(+1)	35.90(+1.5)
by titles/degrees						
Professors	3	2.5(+1)	4(+1)	3.5(+1)	4	4
D.Sc.-s	7	7	6	6	4	4
Ph.D.-s	17	16.5	20	18.9	22(+1)	20(+1)
M.Sc.-s	12	8.03	10(+1)	6.5(+0.5)	12	7.9
by positions						
Professors	9(+1)	8.5 (+1)	9(+1)	8.5 (+1)	8	8
Assistant Professors	17	16.5	19	18	21(+1)	19(+1)
Senior Lecturers	5	4.5	4(+1)	4(+0.5)	6	5
Lecturers	3	1.33	2	1	1	0.5
Assistants	4	3.2	6	3.4	6	3.4
Ph.D. Students	32		35		34	
Technical Staff	10	7.30	6	4.5	4	3
Administrative Staff	6	5.4	7	6	6	5.5

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

ACTIVITIES	2002	2003	2004
Teaching activities			
standard teaching potential, hours	6695	7780	9467
# hours taught	15886	14490	13030
Degrees awarded			
D.Sc.	0	0	0
Ph.D.	3	3	3
M.Sc.	47	42	47
B.Sc.	25	47	53
Research projects			
granted by WUT	9	16	9
granted by State institutions	5	4	3
granted by international institutions	1	1	1
other	0	4	3
Referred publications			
monographs (authored or edited)	2	2	0
textbooks	0	2	0
chapters in books	10	7	7
papers in journals	25	28	24
international	*15*	*21*	*16*
local	*10*	*7*	*8*
papers in conference proceedings	41	35	27
international	*24*	*18*	*19*
local	*18*	*17*	*8*
other referred publications	8	6	–
Reports and unreferred publications	14	30	16
Conferences			

ACTIVITIES	2002	2003	2004
participation (# of conferences)	29	26	23
participation (# of part. from ICCE)	46	39	43

RESOURCES	2001	2002	2003	2004
Space (sq.m.)				
laboratories	585	585	585	585
library + seminar room	74	74	74	74
faculty offices	724	724	724	724
Computers				
workstations*	21	23	14	14
personal computers*	231	244	245	245
Library resources				
books	4459	4547	4601	4683
booklets	1390	1442	1570	1684
journals subscribed	7	7	7	7

* 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, 2004.

The following publication citation codes are used:

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, Control and Optimization of Complex Systems Group
room 524, tel. 6607397 and 8250995
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 (retired October 2001)

Control and Systems Division, Robot Control and Programming Group
room 565, tel. 6607750, 8255280
A.Gosiewski3@wp.pl

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.

Interests: Control theory, optimal control, robot dynamics and robot control.

Jerzy Pułaczewski Senior Engineer (retired since October 2003)
Control and Systems Division, Robot Control and Programming Group
room 570, tel. 6607648
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.

Radosław Ładziński Professor (retired January 1998)
Control and Systems Division, Control and Optimization of Complex Systems Group
room 570, tel. 6607648
R.Ladzinski@ia.pw.edu.pl

Born 1927, M.Sc. 1952, Ph.D. 1957 from WUT; the title of Professor of Technical Sciences awarded in 1968. Retiring by the end of 1997

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.

Jacek Szymanowski Professor (retired January 2000)
Control and Systems Division, Control and Optimization of Complex Systems Group
room 530, tel. 6607922
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.

2.2 Senior Faculty

Piotr Arabas Assistant Professor (since March 2004, part-time)
Control and Systems Division, Control and Optimization of Complex Systems Group
room 573, tel. 6607126
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.

Rafał Cegieła Assistant Professor
Control and Systems Division, Software Engineering Group
room 555, tel. 6607997
R.Cegiela@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~rcegiela

M.Sc. 1996, Ph.D. 2001 from WUT.

With WUT since 2001.

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

Coordinator or principal investigator in: [PR17]

Project participation: [PR16]

Paweł Domański Assistant Professor (part-time)
Control and Systems Division, Process Control Group
room 572a, tel. 6607120
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.

Journal articles: [LJ1]

Conference proceedings: [IC2]

Janusz Granat Assistant Professor
Optimization and Decision Support Division
room 25, tel. 6607640
J.Granat@ia.pw.edu.pl, http://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.

Journal articles: [IJ1]

Jerzy Gustowski Senior Lecturer

Control and Systems Division, Process Control Group
room 525, tel. 6607699
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 Kamola Assistant Professor (since December 2004, part-time)

Control and Systems Division, Control and Optimization of Complex Systems Group
room 573, tel. 6607126
M.Kamola@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~mkamola

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

With WUT since 2002.

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

Coordinator or principal investigator in: [PR9]

Andrzej Karbowski Assistant Professor

Control and Systems Division, Control and Optimization of Complex Systems Group
room 572, tel. 6607632
A.Karbowski@ia.pw.edu.pl, http://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.

Journal articles: [PH2]

Conference proceedings: [IC4, IC5, LC2, LC3]

Włodzimierz Kasprzak Associate Professor

Robot Control and Programming Group
room 554, tel. 6607866
W.Kasprzak@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~wkasprza

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, neural networks, autonomous navigation.

Journal articles: [IJ3]

Conference proceedings: [IC6]

Unreferred publications: [RP1, RP9]

Coordinator or principal investigator in: [PR4, PR14]

Project participation: [PR13]

Urszula Kręglewska Senior Lecturer

Control and Systems Division, Process Control Group
room 553, tel. 6607121
U.Kreglewska@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~ukreglew

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.

Zygmunt Komor Senior Lecturer

Control and Systems Division, Process Control Group
room 571, tel. 6607861
Z.Komor@ia.pw.edu.pl

M.Sc. 1964, Ph.D. 1976 from WUT.

With WUT since 1964.

Interests: Automatic control, control instrumentation design and implementation.

Tomasz J. Kruk Assistant Professor

Control and Systems Division, Software Engineering Group
room 530, tel. 6607922
T.Kruk@ia.pw.edu.pl, http://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.

Books, chapters: [CH3]

Conference proceedings: [LC4, LC5]

Maciej Ławryńczuk Assistant Professor (since April 2004)

Control and Systems Division, Robot Control and Programming Group
room 567, tel. 6607673
M.Lawrynczuk@ia.pw.edu.pl

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

With WUT since 2003.

Interests: Process control and optimization.

Journal articles: [IJ4]

Conference proceedings: [IC12]

Unreferred publications: [RP4, RP5]

Coordinator or principal investigator in: [PR10]

Krzysztof Malinowski Professor (Division Head)

Control and Systems Division, Control and Optimization of Complex Systems Group
room 517, tel. 660 7397 and 8250995
K.Malinowski@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~malinows

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 (1999–2003). Member of the Senate of the Warsaw University of Technology (since 1993), 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 Scientific Society of Warsaw (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-Chairman of the Scientific Council of Research and Academic Computer Network (NASK), Leader of the Research Division of NASK, Member of the Scientific Council of the Industrial Institute for Automation and Measurements (PIAP), Member of the IFAC Technical Committees on 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: [PH2]

Conference proceedings: [IC3, IC7, IC10, IC11, LC6]

Coordinator or principal investigator in: [PR9, PR19]

Piotr Marusak Assistant Professor

Control and Systems Division, Process Control Group
room 567, tel. 660 7673
P.Marusak@ia.pw.edu.pl, www.ia.pw.edu.pl/~pmarusak

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.

Conference proceedings: [IC13]

Unreferred publications: [RP4, RP5, RP6]

Project participation: [PR10]

Ewa Niewiadomska-Szynkiewicz Assistant Professor

Control and Systems Division, Control and Optimization of Complex Systems Group
room 572, tel. 6607632
E.Niewiadomska@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~ens

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.

Journal articles: [PH2, PH4, IJ5, IJ6]

Conference proceedings: [LC1]

Coordinator or principal investigator in: [PR3]

Włodzimierz Ogryczak Professor (Division Head)

Optimization and Decision Support Division
room 26, tel. 6607862
W.Ogryczak@ia.pw.edu.pl, http://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: [CH5]

Journal articles: [PH3, PH6, PH7]

Conference proceedings: [IC15]

Unreferred publications: [RP7, RP8]

Coordinator or principal investigator in: [PR11, PR12, PR15, PR19]

Andrzej Pacut Professor (Deputy Director of the Institute)

Control and Systems Division, Control and Optimization of Complex Systems Group
room 522, tel. 6607733
A.Pacut@ia.pw.edu.pl, http://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 to present. Senior Member of IEEE, member of INNS (Int. Neural Networks Society). V-President of the Polish Section of IEEE (since 2001). 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: [CH1, CH2]

Journal articles: [PH8, PH10]

Conference proceedings: [IC18, IC19, LC7]

Coordinator or principal investigator in: [PR6, PR19]

Project participation: [PR20]

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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 (since Sept. 1996).

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

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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.

Books, chapters: [CH6]

Journal articles: [PH9, LJ4]

Project participation: [PR15]

Grzegorz Płoszajski Assistant Professor

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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.

Tadeusz Rogowski Senior Lecturer (part-time)

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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

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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

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M.Sc. 1974 from WUT.

With WUT since 1974.

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

Unreferred publications: [RP13]

Project participation: [PR13]

Krzysztof Sacha Professor (group leader)

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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: [CH7]

Conference proceedings: [IC16]

Coordinator or principal investigator in: [PR16, PR17, PR19]

Jerzy Sobczyk Senior Lecturer (since October 2004, part-time)

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M.Sc. 1985 from WUT.

With WUT since 1984. FEIT Network Administrator.

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

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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: [PH5]

Conference proceedings: [IC14]

Cezary Szwed Assistant Professor (on leave since October 2004)

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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.

Books, chapters: [CH8]

Project participation: [PR12]

Wojciech Szynkiewicz Assistant Professor

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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 manipulation and motion planning, real-time systems.

Unreferred publications: [RP13, RP15]

Coordinator or principal investigator in: [PR5]

Project participation: [PR13]

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

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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.

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

Journal articles: [IJ4]

Conference proceedings: [IC12, IC13]

Unreferred publications: [RP4, RP5]

Coordinator or principal investigator in: [PR19]

Project participation: [PR10]

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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.

Conference proceedings: [IC1]

Coordinator or principal investigator in: [PR7, PR8, PR15, PR18, PR19]

Tomasz Traczyk Assistant Professor

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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.

Conference proceedings: [LC8]

Project participation: [PR17]

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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. Head of ICCE Optimization and Decision Support Division (1997-2002).

Interests: Knowledge engineering, expert systems, artificial intelligence.

Journal articles: [IJ7]

Coordinator or principal investigator in: [PR19]

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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.

Conference proceedings: [IC2]

Andrzej P. Wierzbicki Professor

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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), 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 Scientific Council of the Industrial Institute for Automation and Measurements (PIAP) (1991–2004), 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 XX+" PAN (since 1986, vice-chairmen since 2000), Member of the Panel for Cooperation with IIASA of PAN. Member of the Polish Association for the Club of Rome (1995-2002). 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

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

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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.

Journal articles: [PH11]

Project participation: [PR13]

Andrzej Zalewski Assistant Professor
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M.Sc. 1997, Ph.D. 2003 from WUT.

With WUT since 2002.

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

Coordinator or principal investigator in: [PR17]

Project participation: [PR16]

Cezary Zieliński Professor (group leader)

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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, Head of the Auditing Team of the Technological University Acreditation Committee (2003–), Head of ICCE Robotics Group since 1996.

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

Conference proceedings: [IC20, IC21, IC22]

Unreferred publications: [RP13]

Coordinator or principal investigator in: [PR1, PR2, PR13, PR19]

2.3 Supporting Faculty and Staff

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M.Sc 2000 from WUT

With WUT since 2003. Research Assistant at NASK Biometrics Laboratory, Ph.D. student in ICCE, student member of IEEE.

Interests: Biometrics, image processing, neural networks.

Books, chapters: [CH1, CH2]

Conference proceedings: [LC7]

Coordinator or principal investigator in: [PR6]

Project participation: [PR20]

Krzysztof Fleszar Assistant (part-time)

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M.Sc. 2000 from WUT.

With WUT since 2003.

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

Journal articles: [IJ2, PH1]

Coordinator or principal investigator in: [PR8]

Project participation: [PR15]

Mariusz Kaleta Assistant (part-time)

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M.Sc. 2000 from WUT.

With WUT since 2003.

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

Coordinator or principal investigator in: [PR7]

Project participation: [PR15]

Maciej Ławryńczuk Assistant (until March 2004)

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for activity see p. 31

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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. 1994 from WUT.

With WUT since 1994, half time since Feb. 1998.

Interests: Computer networks management, information systems.

2.4 Ph.D. Students

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Conference proceedings: [LC3]

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Journal articles: [LJ3]

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Conference proceedings: [IC3]

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Conference proceedings: [IC7, LC2, LC3]

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Supervisor: Włodzimierz Ogryczak

Books, chapters: [CH4]

Coordinator or principal investigator in: [RP3]

Project participation: [PR12, PR15]

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Conference proceedings: [IC10, IC11, LC3, LC6]

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Supervisor: Włodzimierz Kasprzak

Conference proceedings: [IC6]

Unreferred publications: [RP9]

Project participation: [PR4, PR13]

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Conference proceedings: [IC2]

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Project participation: [PR20]

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Supervisor: Eugeniusz Toczyłowski

Journal articles: [LJ5]

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Supervisor: Włodzimierz Kasprzak

Project participation: [PR4]

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Journal articles: [IJ5]

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Supervisor: Eugeniusz Toczyłowski

Journal articles: [LJ5]

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Supervisor: Włodzimierz Kasprzak

Coordinator or principal investigator in: [PR14]

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Supervisor: Cezary Zieliński

Journal articles: [LJ2]

Project participation: [PR4, PR13]

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Project participation: [PR20]

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Supervisor: Piotr Tatjewski

Unreferred publications: [RP10, RP11]

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Conference proceedings: [IC17]

Project participation: [PR17]

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Unreferred publications: [RP12]

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Supervisor: Eugeniusz Toczyłowski

Books, chapters: [CH5]

Unreferred publications: [RP14]

Project participation: [PR11, PR15]

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Supervisor: Andrzej Pacut

Project participation: [PR21, PR22]

Paweł Wawrzyński Ph.D. Student

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Supervisor: Andrzej Pacut

Journal articles: [PH10]

Conference proceedings: [IC18, IC19]

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Supervisor: Cezary Zieliński

Unreferred publications: [RP15, RP16]

Project participation: [PR13]

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2.5 Administrative and Technical Staff

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3 Teaching Activities – Academic Year 2003/2004

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)
Artifficial Inteligence Methods	MSI	2 – – 1	PZ-P, OT	W. Traczyk (spring)
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 and Design	WDIP	2 – 2 –	MKPWD, OT	J. Granat (fall)
Decision Support	WDEC	2 – 2 –	MKPWD, OT, PP-SID	J. Granat
Decision Support Under Risk Conditions	WDWR	2 – – 1	PZ-I, OT	W. Ogryczak (spring)
Digital Control Algorithms	CAR	2 – – 1	MUS, OT	J. Pułaczewski (fall)
Digital Servomechanisms	SCYF	2 – – 1	MUS, OT	S. Romicki (fall)
Discrete Process Scheduling	HPD	2 – 2 –	MKPWD, MUS, OT	E. Toczyłowski
Dynamic Systems	EDYSY	2 – 2 –	ANGL, OT	R. Ładziński (fall)
Event programming (I)	PROZ	2 – – 1	ATP, OT	W. Kasprzak (fall)
Evolutionary strategies	MSR	2 – 2 –	MUS, ISO, OT	P. Domański (spring)
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	EIASR	2 1 2 –	ANGL, OT	W. Kasprzak (fall)
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
Knowledge Engineering	IW	2 – – 1	ISO, OT	W. Traczyk
Numerical Methods (J)	MNUM	2 – – 1	PSTER, OT	Piotr Tatjewski
Numerical Methods	ENUME	2 – 2 –	ANGL, OT	P. Tatjewski (spring)
Object Oriented Programming	PROBE	2 – 2 –	sem. 2	W. Kasprzak (fall)
Parallel Numerical Methods	EPNM	2 – – 2	ANGL, OT	A. Stachurski (fall)
Elements of Robotics	ERO	2 – 2 –	MUS, OT	W. Szynkiewicz
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)
Models and Statistical Inference	MWS	2 – – 1	MKPWD, OT	A. Pacut (fall)
Neural Networks	SNUP	2 – – 1	ISO, OT	A. Pacut (spring)
Operating Systems	SOI	2 – 2 –	OSK, OT	T. Kruk (fall)
Optimization and Decision Support	OWD	2 – – 1	PZ-A, PZ-I, OT	A. Wierzbicki (spring)

Course Title	Course code	Hours per week	Class	Lecturer
Optimalization in Operation Research	OBO	2 – – 1	PZ-A, PZ-I, OT	E. Toczyłowski
Process Automatization Techniques	TAP	2 – 1 –	MUS, PZ-A, OT	P. Tatjewski (fall)
Process Management and Scheduling	ZAH	2 – 2 –	MKPWD, OT, MUS, PP-SID	E. Toczyłowski (spring)
Programmable Controllers	SP	2 – 2 –	MUS, OT	J. Gustowski (fall)
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
Robot Control and Programming	SPRR	2 – – 1	MUS, PZ-A, OT	C. Zieliński (spring)
Synthesis of Decision Rules	ZSRD	2 – 2 –	MKPWD, OT	K. Malinowski (fall)
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)

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
PZ-P	M. Sc., Ph.D.	advanced classes, fundamental
PZ-A	M. Sc., Ph.D.	advanced classes, controls
PZ-I	M. Sc., Ph.D.	advanced classes, informatics
PZ-SID	M.Sc., Ph.D.	
PP-SID	M.Sc., Ph.D.	

4 Projects

[PR1] Network of Excellence within EU FP5 IST-200-26048 **European Robotics Research Network, EURON**, granting period: 8.04.2001–30.04.2004. Principal investigator: Cezary Zieliński.

The objective of EURON (European Robotics Network) is the implementation and maintenance of a network of excellence within the 5th 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] 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.

[PR3] Rector's grant 503G0020004 **Computer simulation in analysis and design of complex**, granting period: 11.05.2004 – 31.12.2004. Coordinator: ICCE. Principal investigator: Ewa Niewiadomska-Szynkiewicz.

In this research the current trends and needs in complex systems optimization and control were considered. The goal was to develop a methodology for computer-based analysis and design of control structures and mechanisms. Computer-based analysis allows the complexity of phenomena in a real system, system-environment interactions and its mathematical model to be coped with. The proposed methodology was verified via the development of methods for controlling the upper Vistula and Dunajec river-basin reservoir systems during flood period. The focus was on hierarchical methods with iterative and periodic coordination, simulation-based optimization and algorithms for global optimization. Particular attention was given to distributed and parallel discrete-event simulation and software environments for parallel computations.

[PR4] Rector's grant 503G0016004 **Speech analysis and synthesis for service robots**, granting period: 11.05.2004 – 31.12.2004. Principal investigator: Włodzimierz Kasprzak. Investigators: Fumio A. Okazaki, Robert Seta, Maciej Staniak.

Research project was jointly performed by two research groups from the Institute of Control and Computation Engineering and the Institute of Telecommunications. Our group was engaged in the subject 'Speech signal reconstruction and speaker-dependent feature detection'. The main motivation of this project was to increase the autonomous level of robot agents by supplying them with intelligent speech sensor processing. The results of this work can be summarised in following 4 points:

- A two-step speech signal deconvolution algorithm was designed for the reconstruction of speech from its many convoluted mixtures
- A new method for speech feature detection on the basis of Independent Component Analysis in Fourier space was proposed
- A study was performed for the programming integration of the algorithms for speech synthesis and analysis in the robot programming environment MROCC

The continuation of this work is planned, as both teams agreed to apply to the MNiI for a common research grant entitled: The analysis and synthesis of speech and digital image for a computerised assistant supporting the human operator in machine control.

[PR5] Rector's grant 503G0015004 **Control of robot team playing soccer**, granting period: 11.05.2004 – 31.12.2004. Principal investigator: Wojciech Szynkiewicz. Investigators: Marek Majchrowski, Piotr Trojanek, Przemysław Maciąg, Jarosław Dembek, Karol Krzak, Kamil Niewiarowski.

Robotic soccer has become a standard 'real-world' test-bed for autonomous multi-robot control. The goal of the project was to design and develop a dedicated control software for mobile robot team playing soccer. The software consists of several concurrently running processes performing the image processing, path planning, action selection and object tracking.

[PR6] Rector's grant 503G0019004 **Human iris for automatic identity verification**, granting period: 11.05.2004 – 31.12.2004. Coordinator: Andrzej Pacut. Principal investigator: Adam Czajka.

The project was devoted to the development of new iris coding algorithms for automatic identity verification. Various iris image acquisition problems were solved (iris localization, detection of eyelid occlusions and reflections, eyeball rotation compensation). The appropriate system prototype was constructed that enables iris verification to be performed in real time. The methodology was evaluated with the use of collected iris images (originating from approximately 200 subjects).

[PR7] Rector's grant 503G0017004 **The optimization models and algorithms for a local electrical energy market**, granting period: 11.05.2004 – 31.12.2004. Coordinator: Eugeniusz Toczyłowski. Principal investigator: Mariusz Kaleta.

The subjects of the dissertation are selected important problems for developing local electrical energy markets. The main issues refer to unit commitment and energy dispatch for a local energy market, local energy market offers submitting to an external market and constraint consideration costs allocation problems. The most important results are: developing multilayer algorithms for scheduling generators based on restriction techniques, developing algorithm for finding optimal export/import offer for a local energy market, analysis and modelling constraints cost allocation and developing algorithm for fairly cost allocation.

[PR8] Rector's grant 503G0018004 **Construction and reduction techniques in scheduling and allocation algorithms**, granting period: 11.05.2004 – 31.12.2004. Coordinator: Eugeniusz Toczyłowski. Principal investigator: Krzysztof Fleszar.

The goal of the work was to design efficient and effective heuristic algorithms for some typical discrete optimization problems: bin-packing, assembly line balancing and combinatorial auctions. Construction heuristics developed are four heuristics based on MBS algorithm for bin-packing problem, two-directional Hoffmann heuristic for assembly line balancing and greedy algorithm for combinatorial auction. Heuristic solutions were further improved using variable neighbourhood search. For assembly line balancing new reduction techniques were also designed, which allowed to improve lower bounds and heuristic solutions. When tested on some benchmark test problem instances all developed algorithms proved to be both effective and efficient in comparison to the best heuristic algorithms available in the literature.

[PR9] Rector's grant 503G0010003: **Algorithms for optimisation problems with implicit and feasibility constraints**, granting period: 16.06.2003 – 29.02.2004. Coordination: Krzysztof Malinowski. Principal investigator: Mariusz Kamola.

The aim of the grant is to support research on optimisation problems with performance index based on simulation output. The works focus on peculiarities in so defined problems, which are: complicated constraints and performance index disturbed by simulation inaccuracy. In particular, simulation failures are investigated; they define an important class of feasibility constraints, especially difficult to handle since no simulation output is available whatsoever. Next, simulation inaccuracy causes a sort of simulation noise obscuring performance index real shape. Construction of hybrid global and distributed optimisation algorithms is the author's proposed approach in such circumstances. Three practical examples are analysed and solved using the postulated methodology. The grant main deliverable is M. Kamola's Ph.D. dissertation (under the same title). Development of optimisation environment for automated classification and solving of problems from the considered class is envisaged as further research direction.

[PR10] Dean's grant 503G0022004 **Methods of optimising predictive control**, granting period: 05.07.2004 – 31.12.2004. Principal investigator: Maciej Ławryńczuk. Investigators: Piotr Marusak, Piotr Tatjewski.

The research was concerned with optimising predictive control when the dynamics of the disturbances was comparable with the process dynamics, because, in such a case, classical hierarchical structure can result in significant economic losses. Different frequencies of the optimisation layer intervention's were investigated, ranging from very low (steady-state set-point optimisation) to high (the optimisation layer was used as frequently as the control layer.) All the necessary modifications of the predictive control and optimisation problems, which resulted from tight cooperation between the optimisation and control layers, were studied. Predictive control problems when the number of inputs (manipulated variables) and controlled outputs are different as well as when the outputs are only bounded, not controlled, were considered.

[PR11] Dean's grant 503G0021004 **Models and algorithms to support operational decisions under uncertain demands**, granting period: 05.07.2004 – 31.12.2004. Coordinator: ICCE. Principal investigator: Włodzimierz Ogryczak. Investigators: Bartosz Kozłowski, Tomasz Śliwiński.

The project is focused on two specific goals: search for robust optimization scheduling models and algorithms for power generation units, search for efficient wavelet-based algorithms allowing to identify trends in seasonal demands.

[PR12] KBN grant PBZ 016/P03/99: **Mathematical methods for analysis of the financial markets and instruments in Poland**, granting period 01.06.2001–30.05.2004. Coordinator: Institute of Mathematics of the Polish Academy of Sciences (IMPAN). Principal investigator: Włodzimierz Ogryczak. Investigators: Cezary Szwed, Adam Krzemienowski.

The goal of the research is to develop mathematical theory and techniques concerned with quantitative analysis and decision support at the strategic, tactical and operational level of risk management in financial markets in Poland. Techniques for risk measurement and portfolio optimization represent the main focus of the research within ICCE. New LP computable risk measures and the corresponding LP solvable portfolio optimization models have been introduced and analyzed.

[PR13] 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, feel 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.

[PR14] MNiI grant no 3T11A 015 26 **The analysis of textures in angiography images**, granting period: 28.04.2004 – 27.12.2004. Coordinator: Włodzimierz Kasprzak. Principal investigator: Ewa Snitkowska.

The research project was created to support the Ph.D. work of Ewa Snitkowska, M.Sc. The task was to study texture description schemas and to develop an own approach to it. Nearly all the existing approaches to texture analysis provide feature detection schemas established by experience in a heuristic manner. A new method was proposed, that applies the technique of independent component analysis (ICA) for texture feature detection. In ICA an optimal transformation (with respect to the statistical structure of the image samples set) is discovered via blind signal processing. Any texture is considered as a mixture of independent sources (basic functions of detected transformation). For practical verification of the usability of proposed method angiography images were used. Several feature detection schemas (Gabor filter-based MPEG features, local PCA-based features and the ICA features) were compared experimentally and this comparison was assessed in terms of the Fisher?s information, i.e. measuring the inner-class compactness and between-class separability of base functions. Also, it was experimentally tested how the main classifiers in pattern classification (i.e. the Bayes classifier, the Support Vector Machine and the k-NN-classifier) deal with such detected texture features.

[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] Project granted by The National Health Fund 501H0006 **Functional audit of the application software of the information system supporting the activities of The National Health Fund**, granting period: 15.11.2004 – 23.12.2004. Principal investigator: Krzysztof Sacha. Investigators: Rafał Cegieła, Andrzej Zalewski.

[PR17] Agency for Restructuring and Modernisation of Agriculture 501H000300 **Advisory and consulting services in the project of the development of Integrated Administration and Control System (IACS)**, granting period: 03.03.2003 - 30.06.2004. Coordinator: Krzysztof Sacha. Principal investigators: Rafał Cegieła, Andrzej Zalewski, participants: Tomasz Traczyk, Marcin Szlenk.

The subject of the project was the assessment of the IT products developed by Hewlett-Packard as parts of IACS system as well as non-IT elements prepared by the Agency. The main criteria of the assessment were quality, embedded risks, conformance with European Union regulations, standards and best practices. During the project an integrated methodology for auditing different kinds of IT deliverables have been developed.

[PR18] EnergoProject-Consulting S.A. 501H0002 **Consulting for EnergoProject-Consulting S.A.**, granting period: 15.07.2003–15.04.2004. Principal investigator: Eugeniusz Toczyłowski.

[PR19] Statutory grant 504G/036/300: **Development of methodology of control, decision support and production management**, granting period 16.4.2003 – 15.04.2004 and 16.04.2004 30.09.2005. Principal investigators: Andrzej Pacut, Krzysztof Malinowski, Włodzimierz Ogryczak, Krzysztof Sacha, Piotr Tatjewski, Eugeniusz Toczyłowski, Wiesław Traczyk, Cezary Zieliński.

[PR20] 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, 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`.

[PR21] 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/`.

[PR22] 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 Degrees Awarded

5.1 Ph. D. Degrees

Advisor: **Krzysztof Malinowski**
• P. Arabas, *Hierarchiczna struktura w systemie obrony przeciwrakietowej; mechanizmy decyzyjne i badania symulacyjne*, 06/2004 (with honors)
• M. Kamola, *Algorithms for Optimisation Problems with Implicit and Feasibility Constrains*, 09/2004

Advisor: **Lech Polkowski (Polish-Japanese Institute of Information Technology)**
• A. Szmigielski, *Wykorzystanie systemu czujników ultradźwiekowych do opisu przestrzeni roboczej robota mobilnego w oparciu o metody mereologii*, 05/2004

5.2 M.Sc. Degrees

Advisor: **Paweł Domański**
• M. Izydorski, *Techniki internetowe w automatyce zaawansowanej*, 03/2004

Advisor: **Janusz Granat**
• J. Jackowski, *Analiza danych pozyskanych z sieci TCP/IP z uwzględnieniem aspektu czasu*, 02/2004
• B. Kozłowski, *Falki w analizie i eksploracji danych*, 02/2004
• A. Rakowski, *Analiza wielokryterialna a teoria zbiorów przybliżonych*, 10/2004
• P. Wyborski, *Wspomaganie podejmowania decyzji w zarządzaniu ryzykiem projektowym*, 06/2004

Advisor: **Jerzy Gustowski**
• M. Chmielewski, *Wykorzystanie sterowników PLC do automatyzacji linii produkcyjnej świetlówek z użyciem wielofunkcyjnego manipulatora*, 10/2004
• A. Więckowski, *System pomiarowy z kartą wizyjną. Zdalny dostęp do obrazu*, 10/2004
• B. Latawiec, *System pomiarowy z kartą wizyjną. Zdalny dostęp do obrazu*, 03/2004

Advisor: **Andrzej Karbowski**
• P. Wiechowski, *Zastosowanie analizy interwałowej do rozwiązywania ciągłych i mieszanych zadań optymalizacji globalnej z ograniczeniami funkcyjnymi*, 10/2004

Advisor: **Ryszard Kossowski**
• J. Borowski, *Amber – Advanced Mobile Banking - design of a mobile payment system*, 01/2004

Advisor: **Tomasz Kruk**
• M. Kszczot, *Rozproszona przestrzeń krotek z transakcjami w języku Java*, 11/2004
• A. Łapuć, *Metody i narzędzia wspomagające uruchamianie jądra systemu operacyjnego. Implementacja zdalnego uruchamiania jądra w systemie Amoeba*, 10/2004
• P. Popławski, *Architektura Usług Sieciowych i przykład jej zastosowania w dziedzinie eAdministracji*, 11/2004

Advisor: **Krzysztof Malinowski**
• T. Konstantynowicz, *Model symulacyjny makiety rynku w środowisku internetowym opartej na koncepcji budowy indywidualnej relacji z klientami*, 03/2004
• C. Zaręba, *Analiza symulacyjna wybranych mechanizmów sterowania ruchem w sieci*, 03/2004

Advisor: **Ewa Niewiadomska-Szynkiewicz**
• K. Adamczyk, *Zastosowanie algorytmów ewolucyjnych do wyceny usług w sieciach IP*, 03/2004

• G. Urbanowicz, *Wykorzystanie optymalizacji hierarchicznej w planowaniu portfela inwestycyjnego*, 04/2004
• M. Dygas, *Zastosowanie algorytmów ewolucyjnych do wyceny towarów i usług*, 04/2004

Advisor: **Włodzimierz Ogryczak**
• G. Rakowski, *Optymalizacja portfela inwestycji z uwzględnieniem kosztów transakcyjnych oraz niepodzielności jednostek*, 10/2004
• P. Kozioł, *Metody optymalizacji w zadaniach harmonogramowania czasu pracy załóg lotniczych*, 10/2004

Advisor: **Andrzej Pacut**
• M. Chochowski, *Dynamika źrenicy jako nowa technika weryfikacji biometrycznej*, 10/2004 (with honors)
• M. Gałusza, *The Adaptive Critics' Design*, 06/2004
• T. Grzejszczyk, *Modelowanie uczenia się zwierząt przy pomocy algorytmów uczenia się przez wzmacnianie*, 06/2004
• J. Putz-Leszczyńska, *Weryfikacja tożsamości przy użyciu podpisu odręcznego*, 06/2004 (with honors)
• Ł. Stasiak, *Weryfikacja tożsamości poprzez wykorzystanie cech dłoni*, 06/2004 (with honors)

Advisor: **Andrzej Pająk**
• A. Krzemieński, *Wizualizacja dwuwymiarowych pól wektorowych*, 03/2004

Advisor: **Krzysztof Pieńkosz**
• K. Tratkiewicz, *Modele i algorytmy optymalizacji rozkroju i spawania kształtowników*, 03/2004
• R. Rutkowski, *Zastosowanie algorytmu Tabu Search do rozwiązywania problemu planowania tras*, 03/2004
• M. Seredyński, *Zastosowanie odwracalnych automatów komórkowych w kryptografii*, 06/2004

Advisor: **Jerzy Pułaczewski**
• E. Pawliński, *Zastosowanie algorytmu Sliding Mode Control w serwomechanizmach*, 03/2004
• L. Leszczyński, *Dwuetapowe algorytmy sterowania, przykłady zastosowań*, 06/2004 (with honors)

Advisor: **Andrzej Rydzewski**
• S. Kapelko, *Głowica kamery video w robocie neutralizująco-wspomagającym SMR-100 Expert*, 10/2004
• K. Marasek, *Karta PCI sprzęgająca komputer PC z magistralą PROWAY*, 10/2004

Advisor: **Krzysztof Sacha**
• P. Konowalski, *Analiza porównawcza wybranych implementacji technologii CORBA*, 03/2004

Advisor: **Jerzy Sobczyk**
• P. Kułakowski, *Zarządzanie zawartością serwera WWW*, 10/2004

Advisor: **Andrzej Stachurski**
• J. Sosnowski, *Wielokryterialna optymalizacja portfela strategii opcyjnych z wykorzystaniem równoległej metody podziału i ograniczeń*, 02/2004

Advisor: **Wojciech Szynkiewicz**
• T. Kłos, *Planowanie ścieżek ruchu robota mobilnego z wykorzystaniem metody probabilistycznych map drogowych*, 10/2004

Advisor: **Cezary Szwed**
• M. Łuniewski, *System informatyczny wspomagający harmonogramowanie sesji egzamina-*

cyjnych, 10/2004

Advisor: **Eugeniusz Toczyłowski**
• A. Midera, *Bilansowanie uczestników rynku energii elektrycznej na Rynku Dnia Bieżącego*, 10/2004 (with honors)
• P. Kacprzak, *Metody efektywnego bilansowania się uczestników rynku energii przed rynkiem bilansującym*, 10/2004 (with honors)
• R. Sałuda, *Zastosowanie metod wieloagentowych do harmonogramowania pracy jednostek grafikowych na rynku energii elektrycznej*, 10/2004

Advisor: **Tomasz Traczyk**
• D. Kaczmarek, *Intranetowy system do wspomagania zarządzania projektem informatycznym*, 03/2004
• J. Wojcieszuk, *Zastosowanie języka XML do sterowania obiegiem informacji w rozproszonej heterogenicznej bazie danych*, 04/2004
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• B. Derdziński, *Zastosowanie RDF/XML do wymiany metainformacji między systemami*, 10/2004

Advisor: **Adam Woźniak**
• C. Nowacki, *Badania symulacyjne układów z linearyzującym sprzężeniem zwrotnym*, 03/2004

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Advisor: **Ilona Bluemke**
• J. Małka, *Projekt i implementacja kolekcji warstw wektorowych komponentu mapowego na urządzenia typu PDA*, 03/2004

Advisor: **Jerzy R. Chrząszcz**
• T. Boboli, G. Jaglarski, *Sprzętowa implementacja ściany ogniowej*, 10/2004

Advisor: **Andrzej Ciemski**
• P. Wójcik, *System wyboru optymalnego portfela instrumentów finansowych*, 03/2004

Advisor: **Janusz Granat**
• P. Wyborski, *Analiza danych w środowisku GRID*, 03/2004

Advisor: **Jerzy Gustowski**
• P. Golus, *Stanowisko laboratoryjne manipulatora elektropneumatycznego*, 03/2004
• M. Szczęsny, K. Szulc, *Zastosowanie sterownika PLC w tworzeniu systemu automatyki budynku i jego implementacja fizyczna*, 03/2004
• E. Chachulska, M. Walendzik, *Karta applicom PCI 2000 PFB jako węzeł sieci Profibus DP – własności techniczne, konfiguracja i obsługa programowa*, 10/2004
• P. Małaczek, *Wizualizacja procesów z zastosowaniem webserwerów przemysłowych*, 10/2004
• M. Pieczyński, *Wizualizacja obiektów sterowanych binarnie*, 10/2004

Advisor: **Andrzej Karbowski**
• W. Fedyszyn, *Porównanie narzędzi programistycznych do tworzenia numerycznych aplikacji rozproszonych w systemie Windows*, 10/2004
• M. Bachanowicz, *Badanie przydatności środowisk gridowych i klastrowych do rozwiązywania złożonych zadań optymalizacji na przykładzie systemów SUN One Grid Engine i MOSIX*, 10/2004

Advisor: **Zygmunt Komor**

• K. Ślusarczyk, *Opracowanie, wykonanie i zbadanie środowiska do prezentacji przemysłowego regulatora fuzzy-logic*, 10/2004

Advisor: **Ryszard Kossowski**
• M. Trojnara, *Weryfikacja certyfikatów w bibliotece Open SSL*, 02/2004

Advisor: **Adam Kozakiewicz**
• M. Karpowicz, *Gridowy system operacyjnego zarządzania ochroną przeciwpowodziową*, 10/2004 (with honors)

Advisor: **Tomasz Kruk**
• Ł. Walkiewicz, *Realizacja protokołu SSH w systemie Amoeba. Techniki programowania TCP/IP*, 03/2004
• K. Bala, *Internetowe narzędzia wspomagające prowadzenie projektów informatycznych*, 03/2004
• A. Tadeusiak, *Implementacja protokołu FLIP/RPC w systemie operacyjnym LINUX*, 03/2004

Advisor: **Ewa Niewiadomska-Szynkiewicz**
• R. Skotnicki, *Interfejs użytkownika systemu CSA&S*, 02/2004
• P. Wojdat, *Realizacja i badanie algorytmu sterowania przepływami FLID-DL w sieciach IP w środowisku CSA&S*, 02/2004

Advisor: **Grzegorz Płoszajski**
• P. Foremniak, *Projekt wirtualnej biblioteki w oparciu o współczesne narzędzia informatyczne z uwzględnieniem standardowego protokółu wymiany Z39. 50*, 03/2004
• T. Wysocki, *System wspomagania dydaktyki badań operacyjnych w zakresie symulacji systemów obsługi masowej specyficznych dla projektu w ramach przedmiotu MNSK*, 10/2004

Advisor: **Andrzej Rydzewski**
• P. Franusiak, *Mikroprocesorowy czujnik do pomiaru siły*, 10/2004

Advisor: **Krzysztof Sacha**
• W. Maziarz, *Symulowany obiekt interaktywny*, 10/2004

Advisor: **Jerzy Sobczyk**
• T. Tokarski, *Wizualizacja obciążenia sieci*, 03/2004
• P. Sułek, *Wirtualne sieci prywatne VPN*, 10/2004

Advisor: **Wojciech Szynkiewicz**
• M. Babik, *Komunikacja między dwoma robotami mobilnymi*, 03/2004
• M. Elis, *Rozwiązywanie problemu układania kostki Rubika za pomocą metod sztucznej inteligencji*, 10/2004
• P. Topór, *Wykorzystanie informacji wizyjnej do sterowania robotem na przykładzie gry w warcaby*, 10/2004

Advisor: **Cezary Szwed**
• M. Waksmundzki, *System informatyczny wspierający działania operacyjne i raportujące w przedsiębiorstwie usługowym*, 03/2004
• M. Fedyszyn, *System informatyczny wspomagający realizację procesów dydaktycznych*, 03/2004

Advisor: **Wiesław Traczyk**
• K. Stefańczyk, *System ekspercki wspomagający wypełnienie rocznej deklaracji podatkowej PIT*, 03/2004

Advisor: **Michał Warchoł**
• D. Cagara, *Rozszerzenie pakietu CSA&S o moduł wizualizacji 3D*, 03/2004

Advisor: **Adam Woźniak**
• L. Girtler, *Brutalna siła w optymalizacji*, 02/2004

Advisor: **Grzegorz Wójcik**
• P. Urawski, *System instalacji oprogramowania w heterogenicznych sieciach komputerowych*, 01/2004

Advisor: **Andrzej Zalewski**
• M. Roszatycki, *Narzędzie kontroli złożoności projektów prowadzonych metodyką obiektową*, 03/2004
• K. Obałka, *Narzędzie wspomagające planowanie i budżetowanie projektów informatycznych*, 10/2004

Advisor: **Cezary Zieliński**
• A. Bartoszuk, *Realizacja czujników wirtualnych systemu MROOC++ z wykorzystaniem protokółu TCP/IP oraz systemów operacyjnych Windows i QNX*, 03/2004
• K. Wojdan, *Zaprojektowanie i implementacja regulatorów osi robota IRP6*, 10/2004
• K. Dziubek, *Sterowanie rozmyte pojedynczym członem ramienia robota*, 10/2004
• J. Nowacki, *Generatory trajektorii w systemie MRROC++*, 10/2004
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[CH8] C. Szwed, "System informatyczny wspomagający decyzje inwestycyjne", in *Modelowanie preferencji a ryzyko '04*, pp. 509-521, 2004

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[PH4] E. Niewiadomska-Szynkiewicz, "Computer Simulation of Flood Operation in Multireservoir Systems", *Simulation – Transactions of the Society for Modelling and Simulation International*, vol. 80, no. 2, pp. 101–116, 2004

[PH5] Z. Nowak, A. Stachurski, "Modelling and identification of voids nucleation and growth effects in porous media plastic flow", *Control and Cybernetics*, vol. 32(2003), no. 4, pp. 820–849, 2004

[PH6] W. Ogryczak, A. Wierzbicki, "On Multi-Criteria Approaches to Bandwith Allocation", *Control and Cybernetics*, vol. 33(2004), no. 3, pp. 427–448, 2004

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[PH11] A. Woźniak, "Policy Modeling in Four Agent Economy", *Lecture Notes In Computer Science*, vol. 3038, pp. 615–622, 2004

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[IJ3] W. Kasprzak, "Blind deconvolution of timely correlated sources by gradient descent search", *Image Processing & Communication*, vol. 1, no. 1, pp. 33–52, 2004

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[IJ7] W. Traczyk, "Probes for fault localization in computer networks", *Journal of Telecommunications and Information Technology*, vol. 3, pp. 23–27, 2004

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[LJ1] J. Arabas, P. Domański, "Gdy pomyłka pomyłce nierówna, czyli prognozowanie w realiach rynku energii, *Rynek terminowy*, pp. 78–83, 2004

[LJ2] W. Czajewski, M. Staniak, "Visual Identification of the Rubik's Cube in Human Environment", *Przegląd Elektrotechniczny*, vol. 4'2004, pp. 311–314, 2004

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[IC5] A. Karbowski, "Modernization of the Direct Method of Hierarchical Optimizations", *The 10th IFAC/IFORS/IMACS/IFIP Symposium on Large Scale Systems, Theory and Applications, Osaka, Japan, 2004*, vol. 2, pp. 458–463, 2004

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[IC7] A. Kozakiewicz, K. Malinowski, "Combining Globus and Mosix for MPI Calculations", *Modelling and Simulation '2004. The European Simulation and Modelling Conference ESM'2004, Paris, France*, pp. 229–233, 2004

[IC8] B. Kozłowski, "On Time Series Forecasting Methods of Linear Complexity Utilizing Wavelets", *AISTA 2004 International Conference Advances in Intelligent Systems – Theory and Applications*, pp. 1–8, 2004

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[LC4] T. Kruk, W. Krawczyk, "Automatyczne wytwarzanie reguł dla systemów IDS", *VIII Konferencja bezpieczeństwa IT, Warszawa*, pp. 58–64, 2004

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[RP1] W. Kasprzak, "Detekcja sygnału mowy i cech osobniczych sygnału mowy na potrzeby rozpoznawania komend głosowych", ICCE Report, 2004

[RP2] B. Kozłowski, "Analyzing Time Series with Wavelets", ICCE Report, 2004

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