

INSTITUTE OF CONTROL
AND COMPUTATION ENGINEERING

2010 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
<http://www.ia.pw.edu.pl>, sekretariat@ia.pw.edu.pl



From the Director

The Institute of Control and Computation Engineering (ICCE; in Polish: Instytut Automatyki i Informatyki Stosowanej) was created in 1955 as the Chair of Automatic Control and Telemechanics by Professor Władysław Findeisen. It was reorganized in 1970 to become the Institute of Automatic Control. Rapid development of microprocessor technology and its impact on the field of control directed the interest of the research staff and students towards computational and algorithmic aspects of control, decision support, man-machine interfaces, network communications, etc. This resulted in 1994 in the creation of new educational profiles offered by the Institute and a change of its name to the present one.

The Institute offers courses in a broad area of information technology, concentrating on control and decision support systems, at three levels of education. At the first two levels (equivalent to B.Eng. and M.Eng.) the degree programs combine courses from the areas of computer science and control. We are also proud to offer interesting opportunities to our postgraduates, so that they can continue their study and research towards a Ph.D., either in Computer Science or in Control and Robotics. From the academic year 2007/2008, this standard educational offer is supplemented by postgraduate studies in Management of Information Technology Resources and in Project Management organized by Dr. Andrzej Zalewski as well as in Engineering of Management Information Systems and Decision Support Systems organized by Dr. Tomasz Traczyk. There is a growing interest in this form of studies. The 2009/2010 edition of those courses attracted 130 participants.

Besides that our Institute, as the representative of the Faculty of Electronics and Information Technology, jointly with the Faculty of Power and Aeronautical Engineering started in 2008 an Erasmus Mundus Masters Program in Robotics. The partners of Warsaw University of Technology in this Program are Ecole Centrale de Nantes (Nantes, France) – the coordinator and Università Degli Studi di Genova (Genova, Italy). The students from within and outside of the EU study for two years, each year in one of the partner institutions and obtain a double diploma from those universities upon successful completion of the studies.

The institute is involved in diverse research and development projects. The most significant ones are:

- Warsaw University of Technology was successful to secure funds from the EU European Social Fund for the Program of Development of WUT. Our Institute participates in the realization of the task: Development of the 2nd level studies in Control and Robotics in WUT. Prof. Piotr Tatjewski is responsible for this task. Four faculties of WUT participate in it. It is scheduled for the years 2008-2012.
- In 2010 the group headed by Prof. Ewa Niewiadomska-Szynkiewicz has started the project Low Energy Consumption NETworks (ECONET) within the 7 FP EU grant ICT-2009.1.1: The Network of the Future (FP7-ICT-2009-5). The ECONET project focuses its research and development efforts on studying innovative techniques and architectural solutions to support energy efficiency in next generation networks. The consortium consists of 14 partners (including WUT): Consorzio Nazionale Interuniversitario per le Telecomunicazioni (Italy, the coordinator), Mellanox Technologies Ltd. (Israel), Alcatel-Lucent Italia S.p.A. (Italy), Lantiq (Germany), Ericsson Telecomunicazioni S.p.A. (Italy), Telecom Italia (Italy), Greek Research & Technology Network (Greece), NASK (Poland), Dublin City University (Ireland), VTT (Finland), NetVisor (Hungary), Ethernity Networks Ltd (Israel), LightComm S.r.l. (Italy), Infocom (Italy).

- The Group of Robot Programming and Pattern Recognition, has continued to conduct its research within the grant obtained from the 7th Framework Program of the Commission of the European Union (NHP-2007-3.2-1). The project named Self Reconfigurable Intelligent Swarm Fixtures (SwarmItFIX) is directed at the development of a universal fixturing device that can be used by aeroengineering and car manufacturing industries. The partners of WUT in this project are DIMEC University of Genova (Italy, the coordinator), Exechon (Sweden), PIAGGO Aero Industries Spa. (Italy), ZTS-VVU Vyskumno-vyvojovy Ustav Kosice a.s. (Slovakia), Centro Ricerche FIAT S.C.P.A. (Italy).
- In the year 2010 Prof. Andrzej Pacut lead the project entitled 'The Platform for secure implementation of biometric systems for verification and identification'. The project was the result of the 7th competition for development projects in the field of security and country's defense, of the Ministry of Science and Higher Education. The project is coordinated by ICCE and involves also NASK, Polish Security Printing Works and University of Warsaw. It focuses on the creation of a network of collaborating biometrics laboratories.
- Prof. Eugeniusz Toczyłowski prolonged for the year 2010 an industry-sponsored research grant from the Polish Transmission System Operator, PSE-Operator S.A., for the development of new theoretical market models and algorithms to support efficient and incentive-compatible solutions in the Polish energy balancing market.

Research is a vital part of our activities, directly affecting both the institute's recognition in Poland and abroad, and the quality of teaching. Description of research programs conducted by the faculty of the Institute can be found in this report.

I express my sincere appreciation to the faculty and staff of the Institute for their efforts and contributions to our achievements in teaching and research. In particular, I would like to congratulate Prof. Andrzej Pacut for his nomination to the title of professor. I would also like to compliment Prof. Eugeniusz Toczyłowski who has been awarded the Medal of Commission of National Education, the most significant educational award at the national level. Moreover, I congratulate prof. Krzysztof Sacha who has been nominated the member of the Committee of the National Centre for Research and Development.

Cezary Zieliński

Contents

1	General Information	1
1.1	Directors	1
1.2	Organization of the Institute	1
1.3	Research Areas	5
1.4	Statistical Data	32
2	Faculty and Staff	34
2.1	Professors Emeriti	34
2.2	Senior Faculty	37
2.3	Supporting Faculty and Staff	48
2.4	Ph.D. Students	50
2.5	Administrative and Technical Staff	55
3	Teaching Activities – Academic Year 2009/2010	56
3.1	Undergraduate and Graduate Studies	56
3.2	Extramural Graduate Studies	58
3.3	Graduate Distance Learning	58
4	Projects	59
5	Degrees Awarded	68
5.1	Professor Degrees	68
5.2	Ph.D. Degrees	68
5.3	M.Sc. Degrees	68
5.4	B.Sc. Degrees	73
6	Publications	79
6.1	Monographs	79
6.2	Chapters in Scientific or Technical Books	79
6.3	Scientific and Technical Papers in Journals	80
6.4	Scientific and Technical Papers in Conference Proceedings	84
6.5	Reports and Other Papers	85

Institute of Control and Computation Engineering
Faculty of Electronics and Information Technology
Warsaw University of Technology
Nowowiejska 15/19, 00-665 Warsaw, Poland
<http://www.ia.pw.edu.pl>, sekretariat@ia.pw.edu.pl



MAIN OFFICE, room 521
tel.: +48 22 825 09 95, +48 22 234 73 97, fax: +48 22 825 37 19

STUDENTS OFFICE, room 22
tel.: +48 22 234 7750

1 General Information

The following information about organization of the Institute reflects the situation on December 31, 2010.

1.1 Directors

Professor Cezary Zieliński, Director
Professor Włodzimierz Ogryczak, Deputy Director for Research
Dr. Tomasz Traczyk, Deputy Director for Academic Affairs

1.2 Organization of the Institute

SYSTEMS CONTROL DIVISION

<i>Division Head:</i>	Professor Krzysztof Malinowski
<i>Professors:</i>	Włodzimierz Kasprzak, Krzysztof Malinowski, Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Cezary Zieliński
<i>Professors, retired:</i>	Władysław Findeisen, Radosław Ładziński, Jacek Szymanowski
<i>Reader:</i>	Adam Woźniak
<i>Assistant Professors:</i>	Piotr Arabas, Adam Czajka, Mariusz Kamola, Andrzej Karbowski, Adam Kozakiewicz, Tomasz J. Kruk, Bartłomiej Kubica, Wojciech Szynkiewicz, Paweł Wawrzyński, Tomasz Winiarski
<i>Assistant:</i>	Tomasz Kornuta
<i>Senior Lecturer:</i>	Michał Warchoł
<i>Ph.D. Students:</i>	Marcin Chochowski (until Feb. 2010), Krzysztof Stanisław Daniluk, Andrzej Igielski, Tomasz Kornuta, Małgorzata Kudelska, Michał Kudelski (until Sept. 2010), Piotr Kwaśniewski, Michał Marks, Jacek Michałek, Łukasz Mirtecki, Bartosz Papis, Joanna Putz-Leszczynska (until Sept. 2010), Przemysław Strzelczyk, Anna Sibilska-Mroziewicz, Piotr Trojanek, Michał Wałęcki, Artur Wilkowski
<i>Software Engineers:</i>	Michał Wałęcki, Piotr Trojanek

Research of the division is conducted in 3 research groups:

Complex Systems Group (E. Niewiadomska-Szynkiewicz, K. Malinowski, P. Arabas, M. Kamola, A. Karbowski, A. Kozakiewicz, T. J. Kruk, B. Kubica, A. Woźniak, M. Warchoł, M. Karpowicz, K. Daniluk, P. Kwaśniewski, M. Marks)

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. Particular attention is given to analysis and design of control algorithms for computer networks and ad hoc networks, parallel, synchronous and asynchronous computations and computer simulation. Also, important work is concerned with development of techniques for information systems security.

Biometrics and Machine Learning Group (Andrzej Pacut, A. Czajka, P. Wawrzyński, P. Strzelczyk, M. Chochowski, M. Kudelska, M. Kudelski, J. Michałek, B. Papis, J. Putz-Leszczynska)

Research of the group is centered on biologically inspired control and information processing, including biometrics, machine learning, uncertainty modeling, and biological modeling. Biometrics consists in using personal characteristics for identity authentication. Our research in biometrics includes pattern recognition for iris, hand-written signatures, face images, fingerprints, etc. Also, safety of biometric data storage and exchange, biometrics intelligent cards, and data encryption using biometrics are investigated. Machine learning research is focused on reinforcement learning, applied to adaptive control and multi-agent systems. Also, learning in neural networks and modeling granularity is investigated.

Robot Programming and Pattern Recognition Group (C. Zieliński, W. Kasprzak, W. Szynkiewicz, T. Winiarski, T. Kornuta, A. Sibilska-Mroziewicz, P. Trojanek, M. Wałęcki, A. Wilkowski)

Research of the group is concerned with robot motion planning and control systems, autonomous mobile robot localization and navigation, robot programming methods, computer vision systems and speech recognition systems. In the robot control systems area research is focused on new motion and force/position control algorithms for multi-robot systems. Special emphasis is given to the sensor-based motion planning and control of the single and multiple articulated or mobile robots. This research aims at the creation of service 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 speech recognition to fulfill tasks that humans usually execute.

CONTROL AND SOFTWARE ENGINEERING DIVISION

<i>Division Head:</i>	Professor Piotr Tatjewski
<i>Professors:</i>	Piotr Tatjewski, Krzysztof Sacha
<i>Assistant Professors:</i>	Paweł Domański, Maciej Ławryńczuk, Piotr Marusak, Marcin Szlenk, Andrzej Zalewski
<i>Assistant:</i>	Andrzej Ratkowski
<i>Senior Lecturers:</i>	Jerzy Gustowski, Zygmunt Komor, Urszula Kręglewska
<i>Senior Engineer:</i>	Włodzimierz Macewicz
<i>Ph.D. Students:</i>	Ali Mhammed Benniran, Bartosz Chrabski, Adam Działak, Andrzej Grudzień, Szymon Kijas, Wojciech Pikulski, Andrzej Ratkowski, Piotr Sztandera, Maciej Szumski

Research of the division is conducted in 2 research groups:

Control Engineering Group (P. Tatjewski, P. Domański, Z. Komor, M. Ławryńczuk, P. Marusak, J. Gustowski, U. Kręglewska, A. Działak, M. Szumski)

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

Software Engineering Group (K. Sacha, M. Szlenk, W. Zalewski, A. Ratkowski, B. Chrabski, A. Grudzień, S. Kijas, W. Pikulski, P. Sztandera)

The main area of interest is the development and quality evaluation of software. Topics include software processes, software analysis and design methods, and quality evaluation. A new research area, partially supported by the Polish Ministry of Science and Higher Education, is methodology for the development and evolution of service-oriented (SOA) systems. Part of this research is aimed at addressing security issues in distributed applications by means of trust management services.

OPERATIONS AND SYSTEMS RESEARCH DIVISION

<i>Division Head:</i>	Professor Eugeniusz Toczyłowski
<i>Professors:</i>	Włodzimierz Ogryczak, Eugeniusz Toczyłowski, Wiesław Traczyk
<i>Readers:</i>	Jerzy Paczyński, Tomasz Traczyk
<i>Assistant Professors:</i>	Janusz Granat, Mariusz Kaleta, Adam Krzemienowski, Piotr Pałka, Krzysztof Pieńkosz, Grzegorz Płoszajski, Kamil Smolira, Andrzej Stachurski, Tomasz Śliwiński, Izabela Żółtowska (on leave since November 2009)
<i>Assistants:</i>	Przemysław Kacprzak, Bartosz Kozłowski
<i>Senior Lecturers:</i>	Tadeusz Rogowski, Jerzy Sobczyk
<i>Ph.D. Students:</i>	Krzysztof Bareja, Przemysław Kacprzak, Kamil Kołtyś, Michał Majdan, Paweł Markowski, Piotr Modliński, Paweł Olender, Adam Połomski, Michał Przyłuski, Piotr Rzepakowski

Research of the division is conducted in 2 research groups:

Operations Research and Management Systems Group (E. Toczyłowski, T. Traczyk, M. Kaleta, K. Pieńkosz, G. Płoszajski, K. Smolira, I. Żółtowska, P. Kacprzak, P. Pałka, K. Kołtyś, P. Modliński)


Research of the group is concerned with operation research and structural discrete optimization methods for control and management of discrete processes, including applications in the network structure development, deregulated electric power industry, IP networks, computer integrated manufacturing, etc. 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.

Optimization and Decision Support Group (W. Ogryczak, W. Traczyk, J. Paczyński, J. Granat, A. Krzemienowski, A. Stachurski, T. Śliwiński, T. Rogowski, J. Sobczyk, K. Bareja, B. Kozłowski, M. Majdan, P. Markowski, P. Olender, A. Połomski, M. Przyłuski, P. Rzepakowski)

Research of the group 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.

1.3 Research Areas

Complex Systems Group

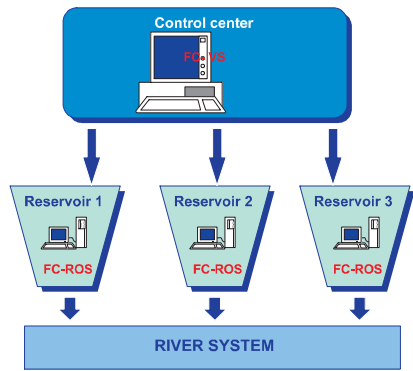


Software for complex systems simulation

Flood Control

FC-ROS & FC-VS (Flood Control)

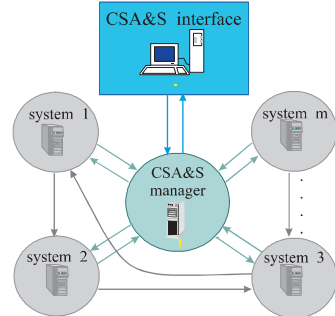
decision support systems for flood control in multireservoir systems.



Distributed Simulation

CSA&S (Complex Systems Analysis & Simulation)


heterogeneous software environment providing a framework for simulation experiments carried out on parallel computers.



ASim/Java (Asynchronous Simulation/Java)

library that may be used to build parallel or distributed discrete event simulators

Complex Systems Group



Traffic control in TCP/IP networks

Family of price-based control algorithms for IP networks

Congestion control:

- New algorithm proposed
- Verified through simulations

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

Simulation Tools


TcpSim – a fast TCP/IP simulator:

- calculation of transmission times for bulk data transfers
- flow-based - much faster than packet-level simulators
- original method of traffic modeling
- implemented in Java.

BrokerSim – a C++ pricing simulation package for OPNET:

- traffic generator for user profiles
- short-term traffic demand approximator
- broker module: pricing decisions and traffic shaping
- router pricing module augmenting OPNET's router model

Complex Systems Group

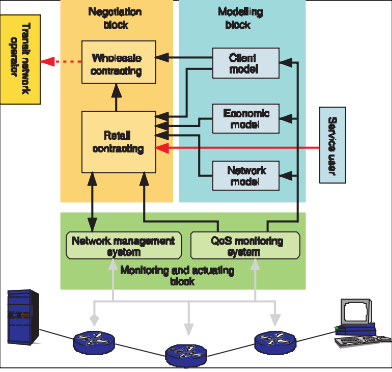


Dynamic contracting of IP services

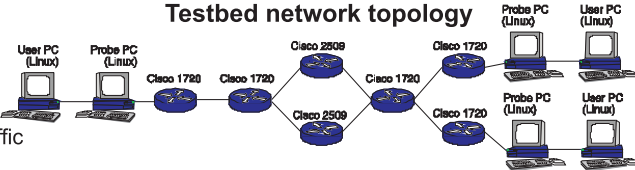
System features:

- small latency guarantees for RT traffic
- bandwidth guarantees for nRT traffic

System architecture




Testbed network topology



Implementation - technologies:

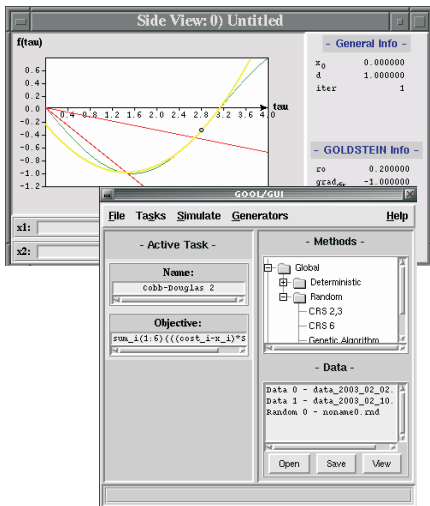
- Cisco *CBWFQ* (class-bases weighted fair queuing), *shaping*, *policing* used
- Monitoring and actuating block implemented in *PERL* using *command-line* access
- a dedicated control and measurements network used, *Precision Time Protocol* applied
- traffic generation and measurements tools: *bulk*, improved *DBS*

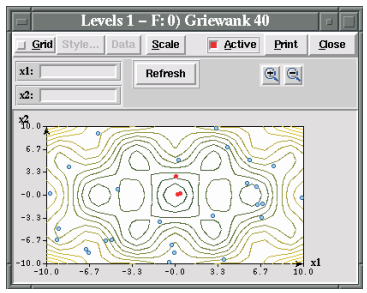
Complex Systems Group



Global optimization

GOOL - Global Optimization Object-Oriented Library






GOOL

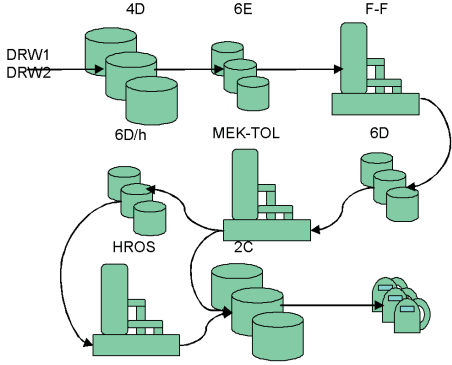
library of random search generators and optimization algorithms for convex and nonconvex, unconstrained and constrained problems

Complex Systems Group

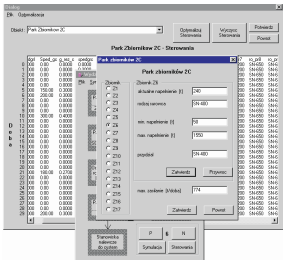


Operations scheduling using Constraint Programming

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

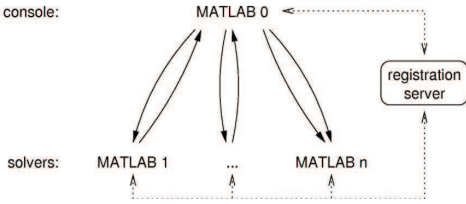
Complex Systems Group



Parallel and distributed computations

- research on price and Benders 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 2009






New software tools:

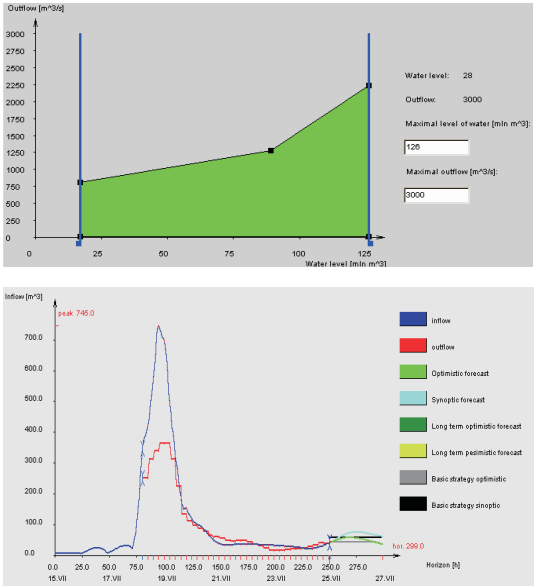
- **jPar** – a software environment for parallelizing Matlab calculations on multicores and in clusters without file communication
- **parAMPL** – a library for parallelizing AMPL calculations on multicores and in clusters

Complex Systems Group




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

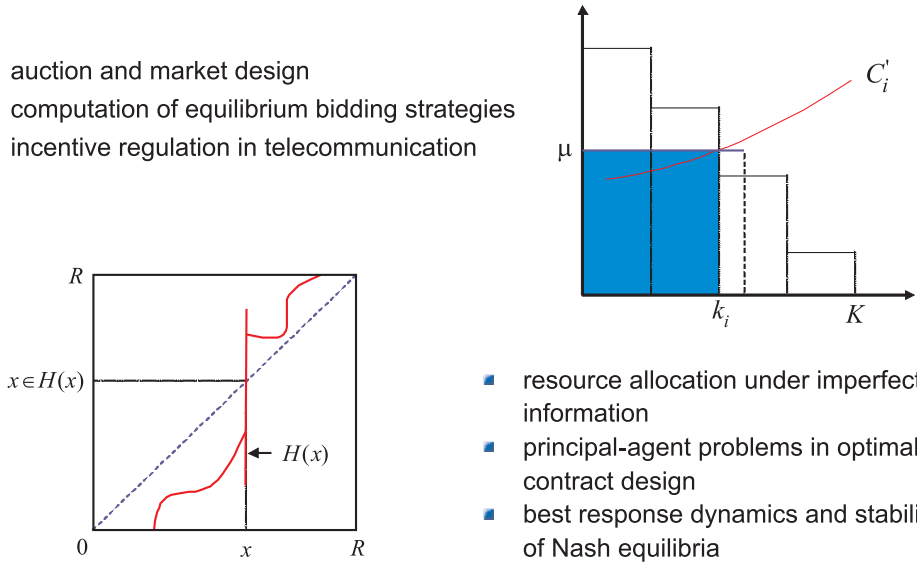


Complex Systems Group




Game theory and mechanism design

- auction and market design
- computation of equilibrium bidding strategies
- incentive regulation in telecommunication



- resource allocation under imperfect information
- principal-agent problems in optimal contract design
- best response dynamics and stability of Nash equilibria

Complex Systems Group



Interval computations for nonlinear problems

Instead of single numbers (points), we can perform calculations on intervals (possibly multidimensional).

Rules of interval arithmetic (and other interval functions) are designed so that:

$$a \in \mathbf{a} = [\underline{a}, \bar{a}], \quad b \in \mathbf{b} = [\underline{b}, \bar{b}], \\ \varepsilon \in \{+, -, \cdot, / \} \Rightarrow a \varepsilon b \in \mathbf{a} \varepsilon \mathbf{b}$$

Such an approach allows to describe the uncertainty of parameters and also to deal with numerical inaccuracy.

For example we have the following rules for addition and multiplication:

$$[\underline{a}, \bar{a}] + [\underline{b}, \bar{b}] = [\underline{a} + \underline{b}, \bar{a} + \bar{b}] \\ [\underline{a}, \bar{a}] \cdot [\underline{b}, \bar{b}] = [\min\{\underline{a}\underline{b}, \underline{a}\bar{b}, \bar{a}\underline{b}, \bar{a}\bar{b}\}, \max\{\underline{a}\underline{b}, \underline{a}\bar{b}, \bar{a}\underline{b}, \bar{a}\bar{b}\}]$$

Interval (inclusion) function:

$$f(x) = x^2 + 2x + 1 \\ f(\mathbf{x}) = \mathbf{x}^2 + 2 \cdot \mathbf{x} + 1 \\ x \in \mathbf{x} = [\underline{x}, \bar{x}] \Rightarrow f(x) \in f(\mathbf{x}) \\ f[-5, 1] = [-5, 1]^2 + 2 \cdot [-5, 1] + 1 = [-9, 28] \supseteq [0, 16]$$


Interval tools:

- the branch-and-bound method
- monotonicity test
- interval Newton operators
- constraint propagation
- ...

Problems that can be solved:

- systems of nonlinear equations
- constraint satisfaction problems
- global optimization problems
- multicriterial optimization problems (convex and nonconvex)

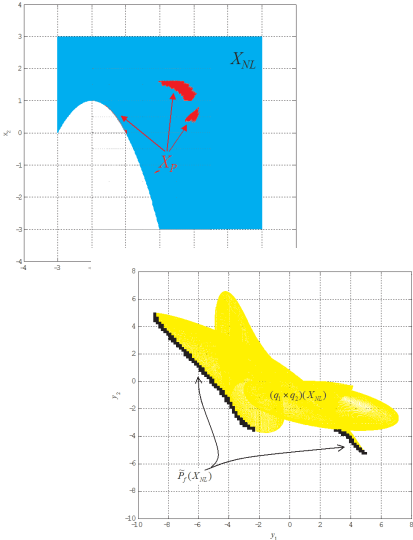
Complex Systems Group




Interval computations seek the Pareto-front of nonlinear multicriterial problems

```

compute (q(), x0, ey, ex)
// L is the list of quadruples
// (y, L_in, L_bound, L_unchecked),
// where L's are lists of qes x
y0 = q(x0);
enqueue(L, (y0, {}, {}, {x0}));
while (a quadruple in L, for which
      wid(y) > ey)
  pop this quadruple
  (y, L1, L2, L3) from L;
  if (L1?{}) then
    delete sets dominated by y;
  end if
  if (wid(y) > ey) then
    bisect y;
    invert resulting sets;
    enqueue results;
  end if
end while
end compute
        
```



Biometrics and Machine Learning Group




Biometrics

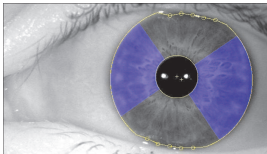
Iris verification

- Prototype iris recognition system
 - real-time automatic iris capture
 - automatic localization of iris and occlusions
 - fast Zak-Gabor transform for calculation of the unique iris features
 - stimulated infrared reflections analysis for detection of subterfuges (printed irises)
- Eye aliveness detection
 - pupil dynamics modeling (patent pending)
 - detection of stimulated reflections from the cornea
 - frequency spectrum analysis
- Iris image permutation for replay attack prevention

Prototype iris recognition system (IRS) with aliveness detection

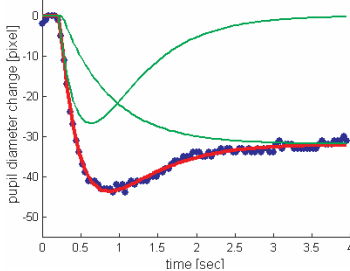


Iris coding
Human eye imaged in infrared light by the IRS. Automatic localization of iris sectors free from occlusions (marked in blue)




Aliveness detection

Comparison of measured (blue dots) and modeled (red line) pupil reaction to light changes enables to construct a subterfuge detection mechanism



Biometrics and Machine Learning Group



Biometrics

Handwritten signature-based identity verification

Verification of on-line signatures

- recognition based on handwriting dynamics [x-velocity, y-velocity, pressure]
- use of neural networks, dynamic time warping and Hidden Markov Models for verification


Verification of scanned signatures (off-line)

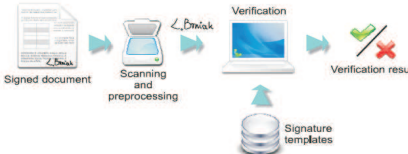
- integration of several independent methods of verification in a two stage classifier with a global classifier at the second stage
- use of morphological, texture and grid features

Template creation improvements:

- **Hidden signature**—it is an „artificial” signature which minimizes mean dissimilarity between itself and the signatures from the training set.
- **Universal forgery features idea**, where the global classifier is able to classify a signature as a genuine one or, as a forgery, without the actual knowledge of the signature template and its owner.

Both ideas have been successfully applied to both on and off-line verification systems and significantly improved the recognition results. Both systems were tested on publicly available databases (MCYT and SVC).





Biometrics and Machine Learning Group

Biometrics
Robust algorithms on GPUs
(Graphics Processing Units)

Iris-based verification and identification system

- application of NVIDIA CUDA™ technology
- optimized algorithms for highly parallel biometric template database search
- using OSIRIS, Daugman and Czajka iris feature coding methods
- up to 10 mln identities checked per second (100 ns per match) on GeForce GTX285,
- identification is from 10 to 50 times faster than state-of-art systems
- identification method based on the best match or on the list of best candidates
- verification engine capable of performing thousands of verification tasks per second
- support for encrypted biometric template databases

Biometrics and Machine Learning Group

Biometrics
Biometric authentication for secure remote access

Novel authentication protocols and techniques employing biometrics

VPN & wireless networks applications


Development of biometric capable mobile devices and workstations

Smartcards and SIM cards application for distributed template storage and processing (match-on-token)

Central template database design and management

Multiple biometrics (iris, fingerprint and others)

Biometrics and Machine Learning Group

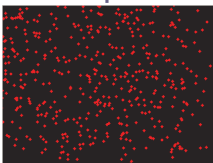


Biometrics

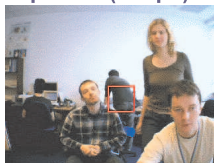
Particle filter-based face tracking and identification

- reference object stored as hue - saturation histogram in the HSV color space
- particle filtering for focus of attention
- „dust”-filtering, based on single pixel classification with fast cluster labelling algorithm for exact tracking
- Bhattacharyya coefficient -based distance measure used to weight particles and „dust”
- automatic detection of the number of objects by Modified X-Means algorithm
- work in progress on gradual information collection for the purpose of identification with increasing confidence level

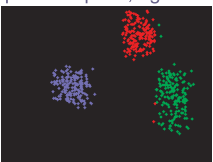
Sample tracking sequence (24 fps)



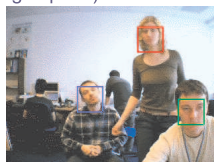
Frame #0: Particles spread all over the image (left: particle space, right: the image space)




Frame #4: Particles converged to objects, number of objects detected automatically



Frame #4: Dust filtering for exact tracking




Biometrics and Machine Learning Group



Biometrics

EEG-based identity verification

- Comparison of EEG signals distant in time
 - Short-term variability of EEG
 - Long-term variability of EEG
- Variability of EEG models in different recording conditions
- Linear modeling of EEG signal
- Nonlinear modeling of EEG
 - GARCH - Generalized Autoregressive Conditional Heteroskedasticity model



Biometrics and Machine Learning Group



Biometrics

Biometric cryptography

- Exploration of „*biometric spaces*” properties
 - analysis of similarity and dissimilarity measures
 - their relation to the notion of distance and metric properties
- Research in the possibility of „*biometric embeddings*”
 - embedding biometric spaces with dissimilarities into metric spaces (in particular Euclidean)
- Assessing information capacity of biometric data
 - no model approach based on statistical properties of comparisons
 - model approach based on models for each modality
- Complexity analysis of biometric data
 - inner-structure of codes (dependencies within e.g. iris codes)
- Analysis of aspects of secure implementation of biometric systems

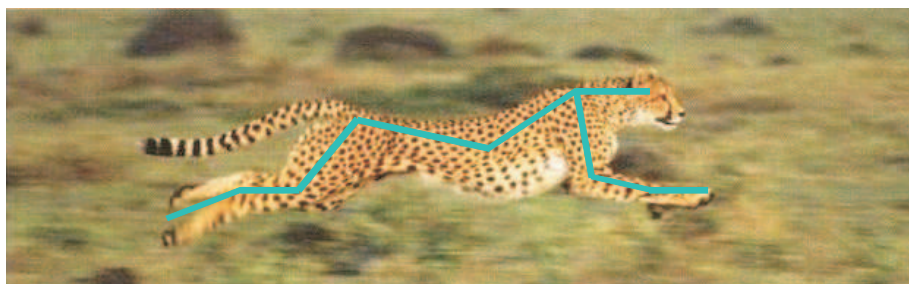
Biometrics and Machine Learning Group







Machine Learning

Model-free on-line adaptive control based on reinforcement learning


Typical Reinforcement Learning methods are far too slow to be used in adaptive control. Our solution is based on a combination of **Actor-Critic methods** and **experience replay**. Simulations show more than **hundredfold increase** of control adaptation learning speed. We tested this approach using a simulated planar model of cheetah.



<h2>Biometrics and Machine Learning Group</h2>	
<h3>Machine Learning</h3> <p>Project on humanoid robots learning of physical activities</p> <p>In cooperation with PLUM z o.o. company we started a project on learning in humanoid robots. The objective of the project is to design algorithms that enable the robots to learn to walk and adroitly run. The immediate result of the project would be a learning brain for a remote-controlled Bioloid.</p> 	

<h2>Biometrics and Machine Learning Group</h2>	
<h3>Machine Learning</h3> <p>Project on learning-driven policy optimization in industrial robots</p> <p>We started a project on learning in industrial robots. The objective of the project is to design a technology that enables the robot controller to optimize their movements through learning. The project is founded by grant N514237137 of Ministry of Science and Higher Education in Poland.</p> 	

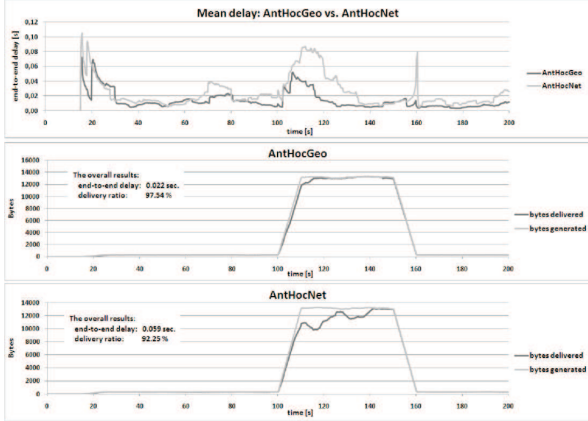
Biometrics and Machine Learning Group



Machine Learning


Ant routing with distributed geographical localization of knowledge in ad-hoc networks

- Highly dynamic environment
- We propose to connect the knowledge gathered by ant agents with locations within the network rather than with individual nodes
- Mobile nodes exchange their knowledge as they move across the network
- Routing connections defined on the locations level are much more robust to dynamic topology changes than the connections on the nodes level
- Adaptation capabilities of ants are improved, together with the overall performance of the network (Fig. right)



Distributed localization of knowledge in AntHocGeo improves the adaptation capabilities of ants (during a sudden jump and a sudden drop of the network's load level)


Robot Programming and Pattern Recognition Group

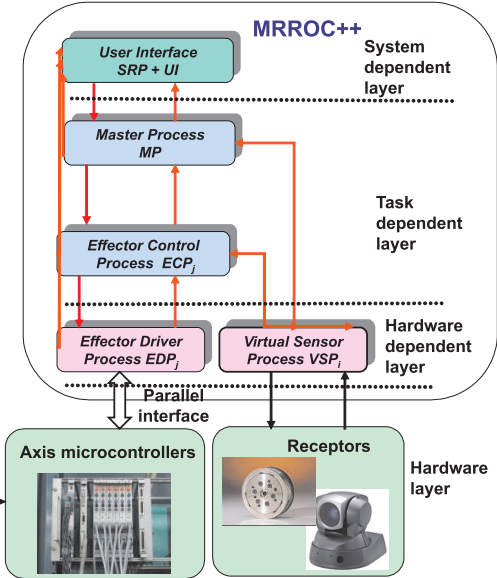


MRROC++ robot programming framework


- a collection of: C++ classes, QNX or Linux processes, and a design pattern
- designed for building open modular robot control systems
- network distributed
- requires custom built axis controllers and parallel interface to a host PC within an Ethernet network

Two co-operating IRp-6 robots






Robot Programming and Pattern Recognition Group



RNT and POLYCRANK prototype robots


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

RNT robot:




Control systems based on MRROC++ programming framework

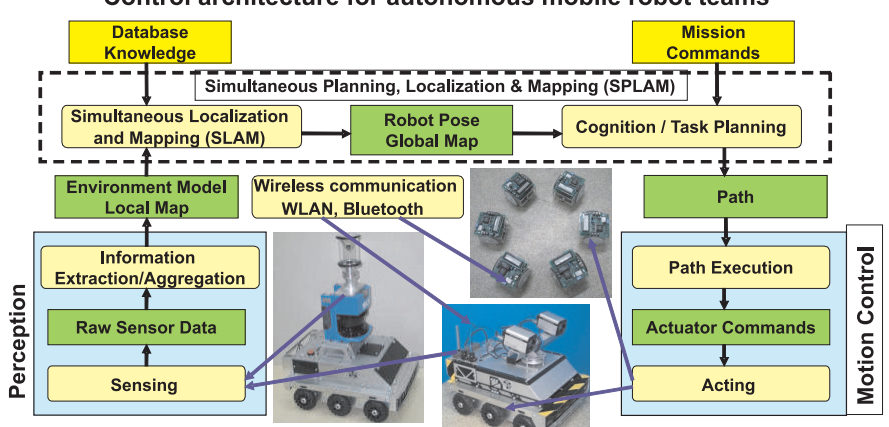
POLYCRANK robot



Robot Programming and Pattern Recognition Group




Control architecture for autonomous mobile robot teams



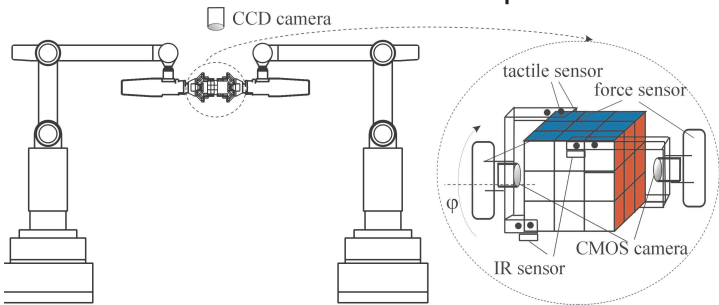
Research objectives:

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

Robot Programming and Pattern Recognition Group



Sensor based two-handed manipulation




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

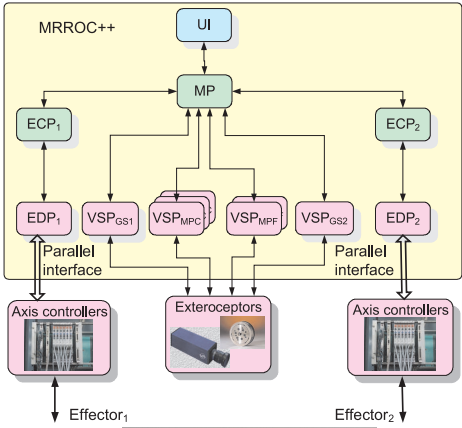
Solution of the benchmark task requires:

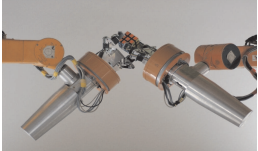
- Two-handed manipulation skill to efficiently turn the faces of the cube
- Visual sensing capability to locate the cube and identification of its initial state
- Visual servomechanism to approach the cube and to get hold of it
- Using tactile and force sensors to avoid jamming of the cube while rotating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

Robot Programming and Pattern Recognition Group



Two-handed Service Robot Controller Capable of Solving a Rubik's Cube Puzzle






Components:

- MP** – Master Process (produces the solution of the puzzle and generates the nominal motion trajectories for the two arms)
- ECP** – Effector Control Process (transmits the macro-steps generated by the MP to the EDP)
- VSP** – Virtual Sensor Process (aggregates data from sensors, i.e. cameras, enabling the localisation of the cube and identification of its state)
- EDP** – Effector Driver Process (divides the macro-step into steps and executes each step using the Task Frame Formalism for position-force control)
- UI** – User Interface (operator console and status and error reporting)

Robot Programming and Pattern Recognition Group



FraDIA: Framework for Digital Image Analysis

FraDIA

- Loading and switching image sources
- Loading and switching user tasks
- Methods for events/data passing between graphical interface, sources and tasks

Process shell (constant)

- Saving images and AVI movies
- Loading and writing configuration XML files
- Communication with the MRROC++ framework

Task Kernel (exchangeable)

- Image processing and recognition algorithm
- Graphical interface related to given task, enabling modification of its parameters, etc.

Image Source Kernel (exchangeable)

- Acquisition from given image source
- Graphical interface enabling management of source parameters

Analog camera

Movie (AVI)

Image sequence

Image (JPG, PNG)


Main concepts:

- Creation of the possibility to implement, train and test image recognition algorithms **offline** (recording/loading movies and images)
- Utilization of created algorithms in robotic tasks: drivers for cameras, ready-to-use communication mechanisms in both FraDIA and MRROC++ frameworks

Implementation details (version 1.0):

- Framework written in C/C++, based on the OpenCV and FLTK libraries
- Four threads: image acquisition, image processing, GUI, communication with the MRROC++
- Object-oriented design: set of base abstract classes and interfaces, collection of ready to use components, utilization of multiple design patterns

Robot Programming and Pattern Recognition Group

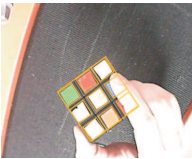


FraDIA: Utilization in selected robotic tasks

Robot playing checkers :

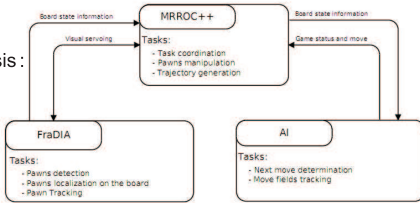
Two working modes of visual information analysis :

- recognition of checkers board state
- estimation of selected checker position (during visual servoing)




Robot Solving Rubik's Cube:

- Real-time estimation of cube position
- Identification of the cube state



Haar Classifier based object grasping:

- Training of the Haar Classifier based on computer -aided object pointing in pre-recorded movies
- Utilization of Haar Classifier for real -time object grasping



Procedures for automatic camera calibration:

- Computations of location of stand -alone camera (SAC) in the global reference frame
- Computations of mounted on the gripper camera (EIH) position in relation to the robots gripper

Robot Programming and Pattern Recognition Group



FraDIA: Future development plans

Core modifications:

- Creation of complex, parallel signal -to-symbols processing stream
- Development of new component type, where results of processing and analysis will be transferred to: sink
- Extraction of existing „hard -coded” sinks (MRROC++ transceiver, recording of movies/single images to files) and their transformation to mode „flexible” form
- Utilization of the Qt framework for the implementation of new GUI and communication between components
- Distribution of whole recognition process into multiple threads/processes

New sources:

- New image sources: fast digital camera (94 fps), virtual camera, lidar
- Possibility for utilization of non -vision sources, e.g. microphone (speech processing)

Utilization of GPU (Graphical Processing Unit):

- Utilization of GPU for fastening of multiple image processing algorithms
- Parallelization of image segmentation and its implementation on GPU

Visual servoing:

- Redesign of the communication methods with the MRROC++ structure
- Implementation of common methods related to the location of objects in the global reference frame

Robot Programming and Pattern Recognition Group



Problems of Active Sensing

Concept:

Active perception means for a perceptual system to actively seek for the information and not just rely passively on information falling accidentally on the sensor. This also means that the system must be mobile and can interact with the environment.

Active vision:

In the case of a static observer, identification of distant or partially occluded object can be very difficult and sometimes even impossible. Those problems can be overcome by the introduction of an active observer, which can perform actions which will facilitate the interpretation of perceptual information. This approach is known as Active Vision.

Examples of active vision behaviours:

- In the case of sensory data received from the cameras located on the active observers (mobile robots, manipulators, etc.) most obvious behavior is to change the location of camera, thus its field of view.
- Change internal camera parameters (focus length, etc.).
- Actively control the scene lightning (position of light sources or the power of their illumination).

Utilization of active vision by the Robot Cashier:

- The goal of robot cashier is to detect and identify objects located on the conveyor belt.
- Object are identified throught the recognition of their barcodes.
- Thus it can be impossible to properly interpret barcodes by the analysis of images retrieved from static camera located above the conveyor, the idea is to use camera integrated with the robot gripper.
- If something similar to barcore is detected on the scene, robot moves its effector in order to reach position which will enable propper barcode identification.

Robot Programming and Pattern Recognition Group



Elementary behaviours of robot manipulators

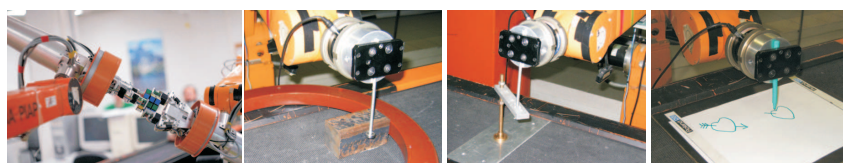
Main concepts:

Three elementary behaviors can be distinguished. They suffice to implement all possible cases of interaction between a manipulator and the environment. Those behaviors are:

- unconstrained motion with the assumption that no contact with obstacles will be encountered – where pure position control suffices
- contact with the environment – where pure force control is used,
- intermediate or transitional behavior – where initially unconstrained motion is expected to result in eventual contact, or vice versa – for this purpose some form of parallel position–force control has to be utilized (e.g., stiffness, damping or impedance control).

The existing manipulator control can be classified taking into account the proposed behaviors.

In terms of those behaviors complex tasks can be specified formally and implemented.



Rubik's cube solver

Following an unknown contour

Rotating a crank

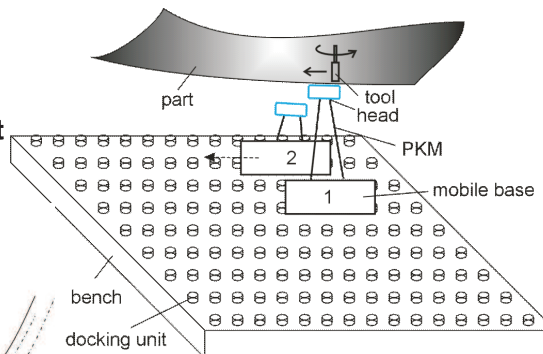
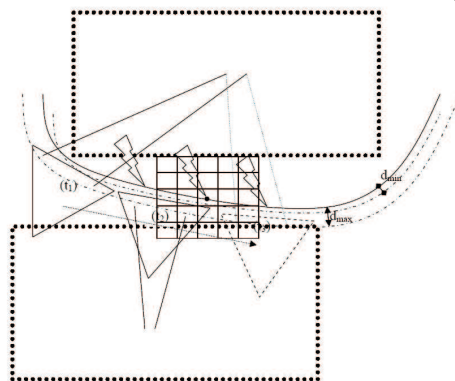
Copying drawings

Robot Programming and Pattern Recognition Group



Planning and controlling a swarm of mobile fixtures

Seventh Framework Program
 Theme [NMP-2007-3.2-1]
 Project: **SwarmItFIX - Self Reconfigurable Intelligent Swarm Fixtures**



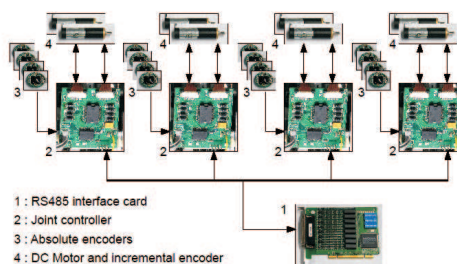
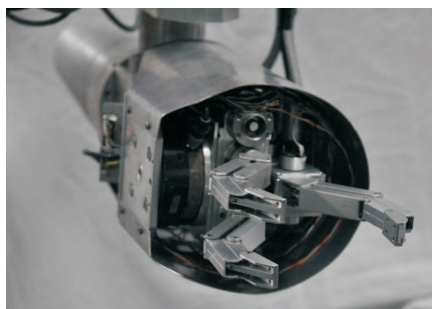
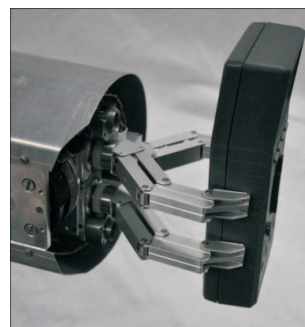
Active mobile fixture system for drilling and milling processes:
 a bench with docking units, 2 mobile bases with PKM manipulators and heads.

Robot Programming and Pattern Recognition Group



Three finger gripper

- 8 active joints in 3 fingers
- Force sensing in 6 joints
- Force compliance to deal both with hard and soft objects
- Ultra compact motion controllers mounted on board
- Cascade controller with external position/force (torque) control loop and optional, internal current control loop
- RS-485 interface to PC Computer with master controller

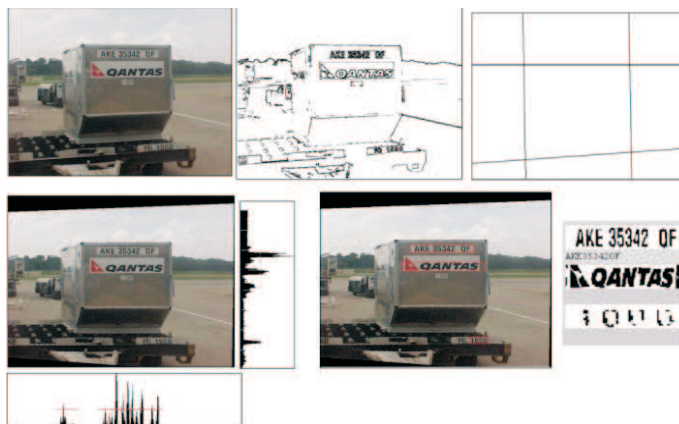


Robot Programming and Pattern Recognition Group



Text recognition in outdoor images

Licence plate detection and text recognition (cars, containers)

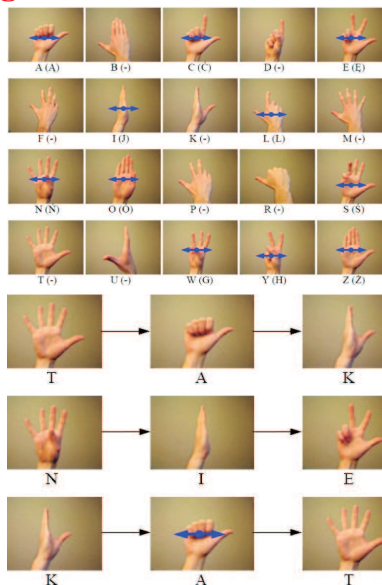


Robot Programming and Pattern Recognition Group

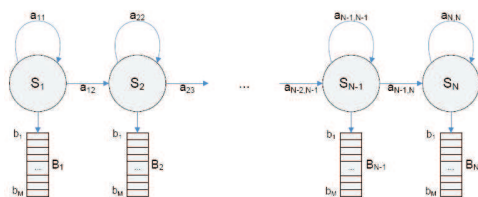


Gesture recognition in digital images

- Static and dynamic poses („letters”)



- HMM modelling of pose sequences



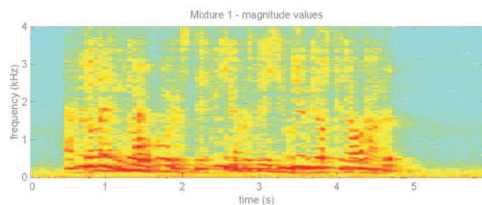
- Examples of gestures („words”):

Robot Programming and Pattern Recognition Group

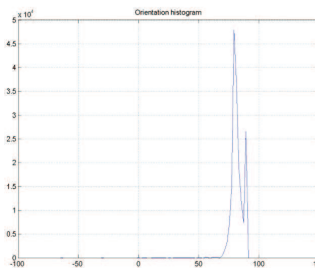


Speech separation and speaker identification

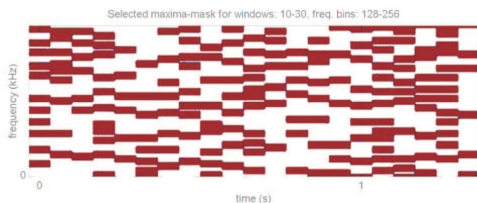
- Only mixtures of source signals can be acquired,
- The goal is to estimate the directions of the speakers and to estimate the original sources.



Example: two sources and two mixtures



Time delay-based detection of source directions:



A spectrogram mask for extraction of a single source

Robot Programming and Pattern Recognition Group



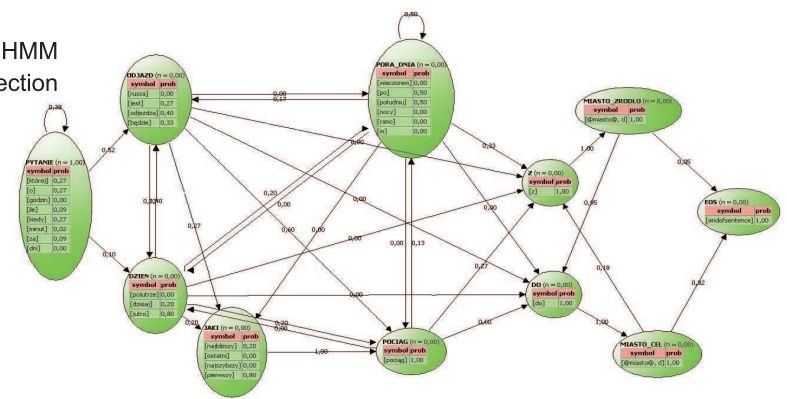
Spoken sentence recognition

- Spectral analysis
- Acoustic-phonetic features
- Word recognition
- N-gram language model
- HMM-based sentence recognition.



$$P(w_i | w_{i-N+1} w_{i-N+2} \dots w_{i-1}) = \frac{C(w_{i-N+1} w_{i-N+2} \dots w_i)}{C(w_{i-N+1} w_{i-N+2} \dots w_{i-1})}$$

Example of a HMM for train connection dialogues:

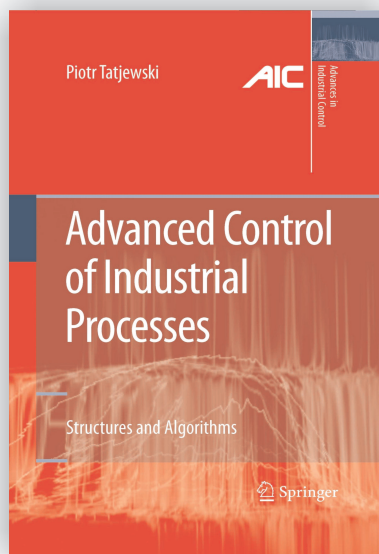


Control Engineering Group




Advanced control of industrial processes

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




Control Engineering Group




Optimization of industrial processes and large-scale systems

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



Imperial College Press/ World Scientific, 2005

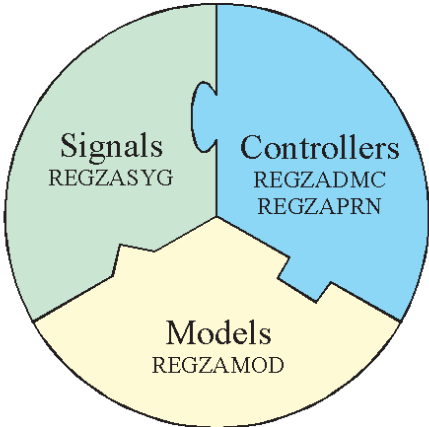
Control Engineering Group




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

Software Package:

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



Control Engineering Group

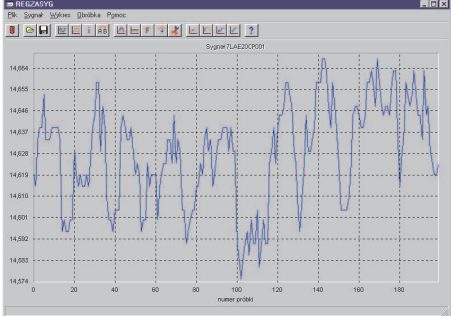


REGZA - Algorithms and software environment for modeling and advanced control of industrial processes

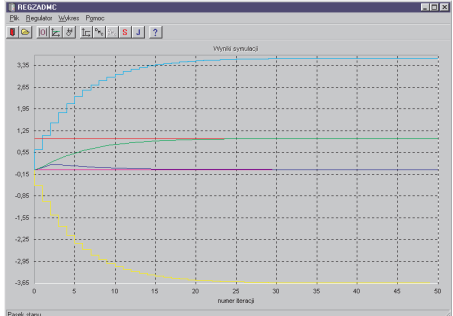
Nonlinear predictive control structures based on fuzzy and neural models

- 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

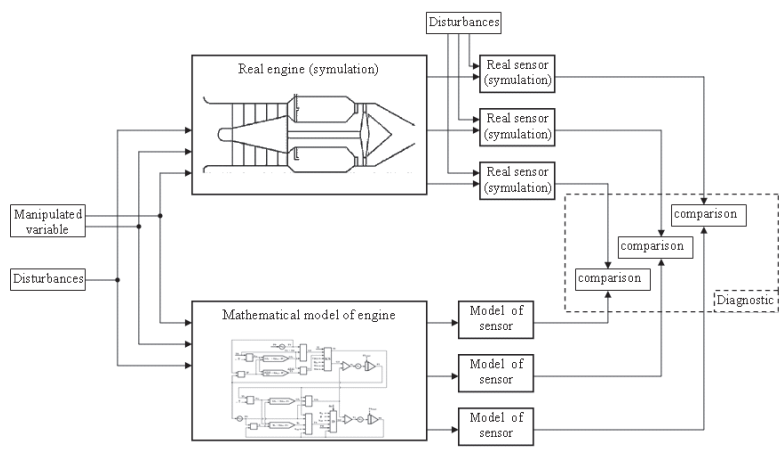



Control Engineering Group



Sensors diagnostic system

mathematical modeling and simulation of a gas turbine engine and sensors, sensors diagnostic system design based on neural networks





Software Engineering Group

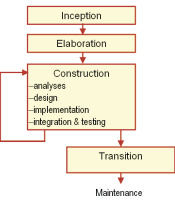
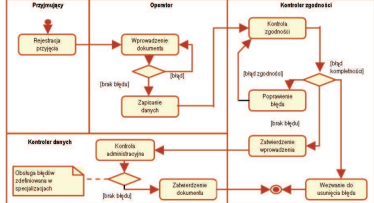
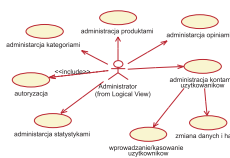
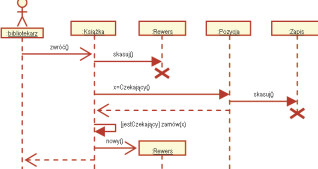
Software development


Research topics:


- Business process modeling
- Requirements engineering
- Software development methods
- Technologies and tools
- Acceptance testing
- Software processes
- Project management

Systems and tools :

- Rational Rose
- Rational RequisitePro
- Structured Architect





Software Engineering Group

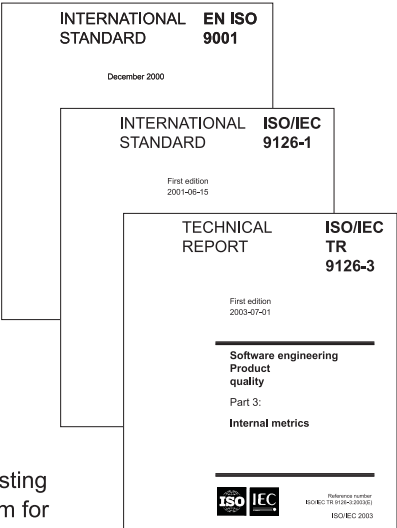
Evaluation of the software quality

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



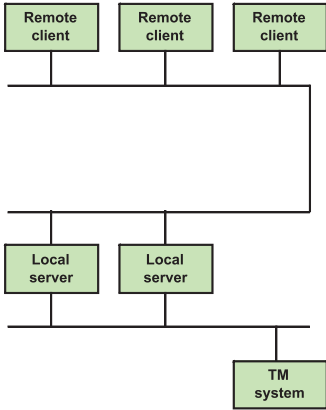
Distributed Open Systems

Research topics:


- ∅ Service Oriented Architectures (SOA)
 - Architecture and Architecture Decisions
 - System Development
 - Evolution and Transformation
- ∅ Security in Distributed Open Systems
- ∅ Role-Based Trust Management languages
 - Syntax and Semantics
 - Credentials
 - Credential Chain Discovery

Languages and Conceptual Tools:

- ∅ BPMN, BPEL
- ∅ RT_0, RT_1, RT_2, RT^T
- ∅ Architecture Decision Models

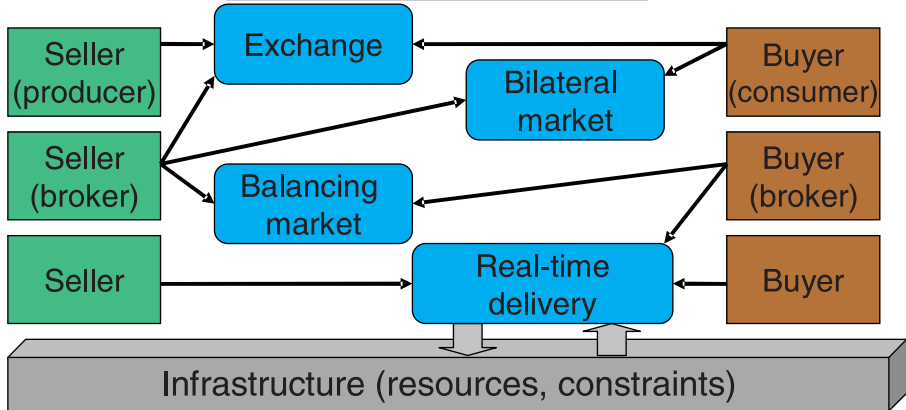


Operations Research and Management Systems Group



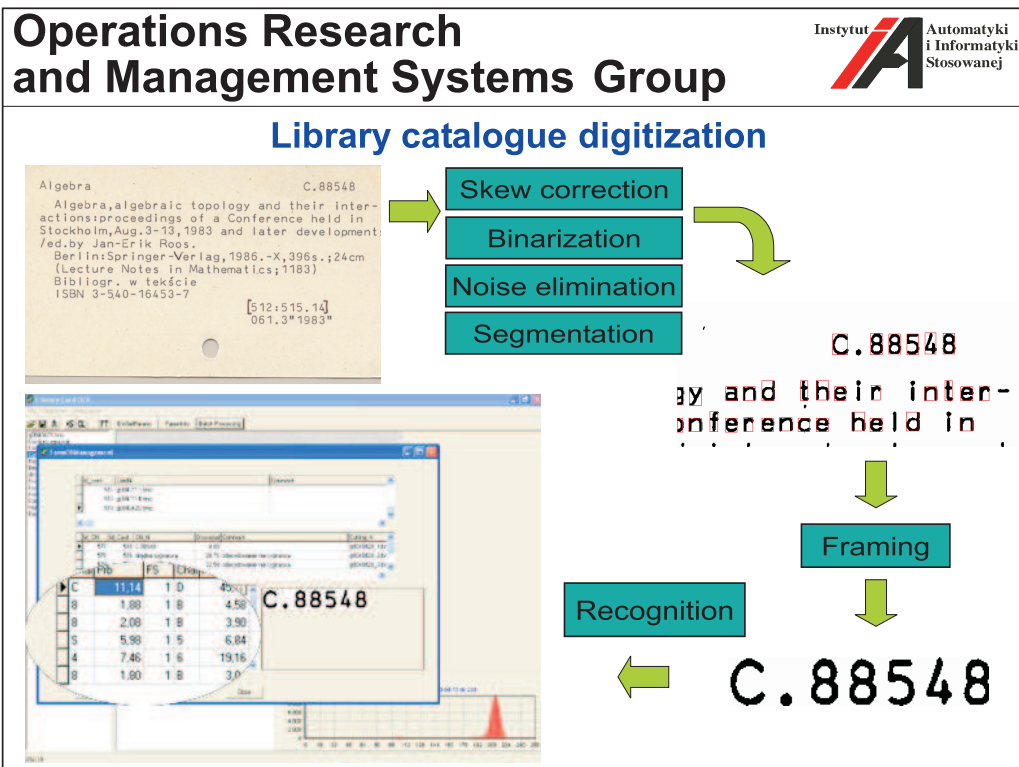
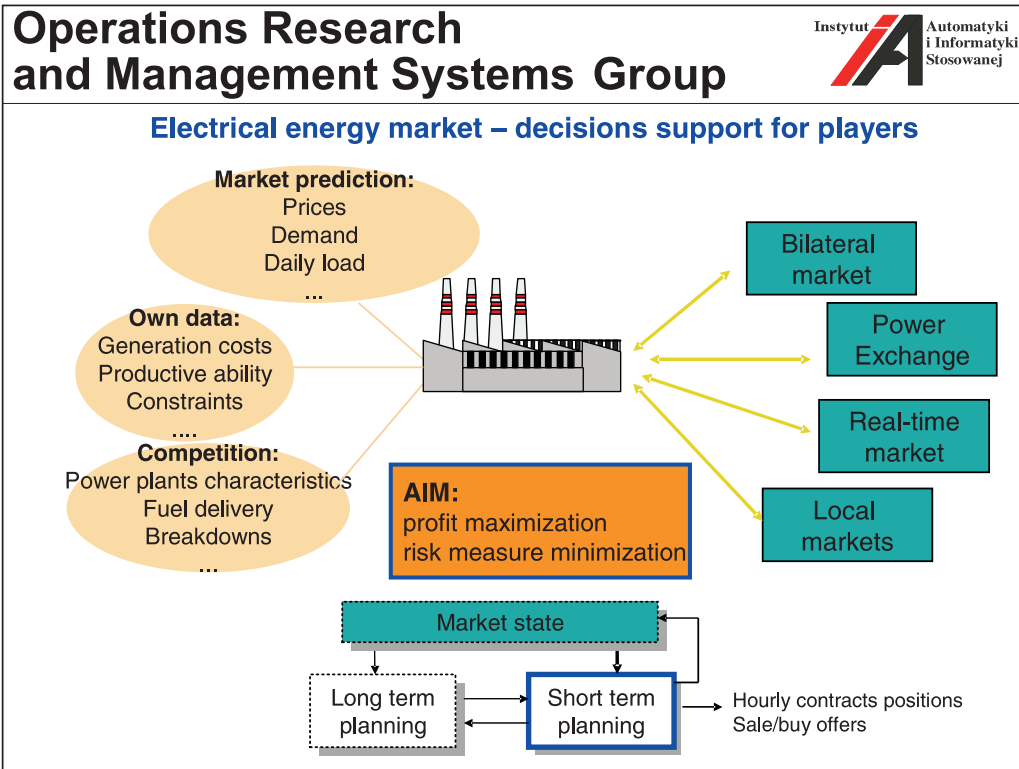
Designing of infrastructure markets under constraints

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 Group



M³ Multicommodity Market Model

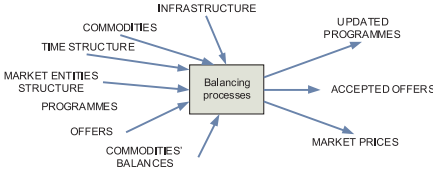
M³ is a flexible and universal market data and communication model
<http://www.openm3.org>

M³ is mainly (but not only) designed for

- **Centralized** (auctions, exchanges) and **distributed, multicommodity** markets
- **Infrastructure** markets
- **„Real-time”** markets on which commodities
 - are non-storable, localized in time and space,
 - delivered too late become worthless, their storage is limited
 - are integrals of some instantaneous values

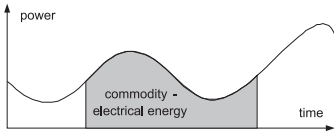
M³ consists of several layers: formal mathematical model, conceptual data model, expressed in form of UML class diagrams, exemplary relational database structure, XML schemas for static data, communication models and XML schemas for messages and Web Services definitions.

Conceptual model of M³ describes the inputs and outputs of elementary balancing process:




M³ helps markets' development by providing

- flexible framework both for real-world market systems and for research projects
- possibilities for integration of software components
- possibilities for organizing benchmark data repository



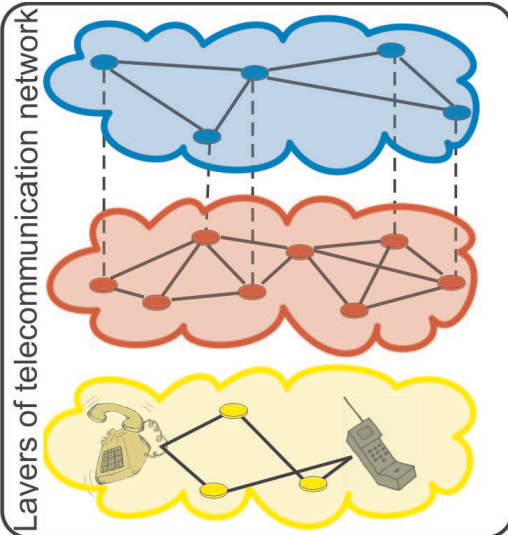
Operations Research and Management Systems Group

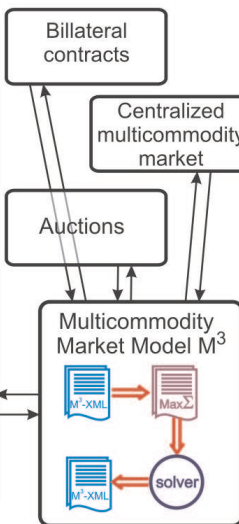


Design of Multicommodity Market Model – M³

Application of M³ on the Communication Bandwidth Market

Layers of telecommunication network






M³ model:

- may be used in information systems for market balancing in various infrastructure networks
- is a set of formal data models, which results in XML-derived information interchange specification
- may be used in a wide range of market-oriented network systems and may significantly facilitate communication, coordination and modelling procedures

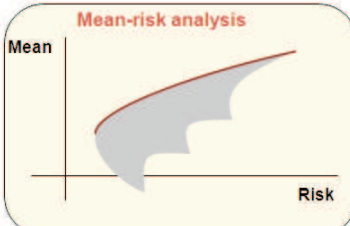
Optimization and Decision Support Group




Risk Measures and Optimization under Risk

- ∅ Focus on risk measures consistent with axiomatic models of preferences for choice under risk
- ∅ Risk preference modeling from strongest risk aversion through risk neutrality to strongest risk seeking
- ∅ Optimization with focus on linear programming: large dimensions, fast and stable numerical implementations

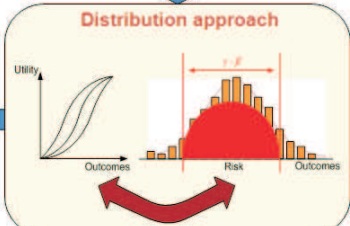
Mean-risk analysis




Outcomes



Distribution approach

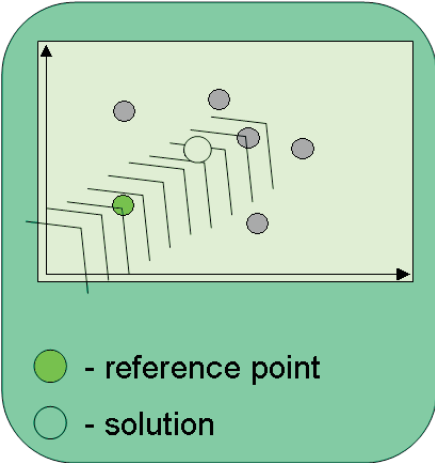


Optimization and Decision Support Group



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



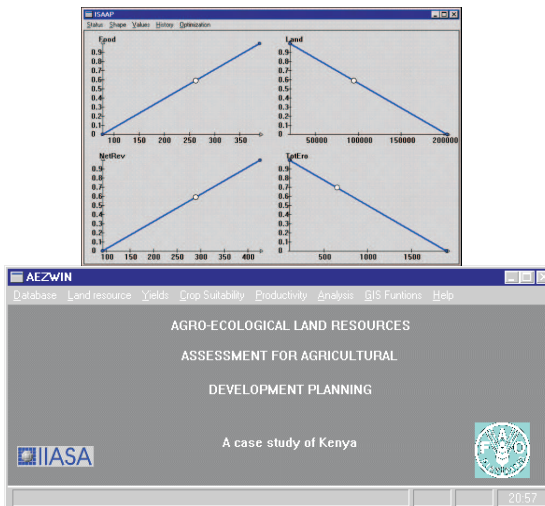
- reference point

- solution

Optimization and Decision Support Group



Application of the reference point method for land resource assessment

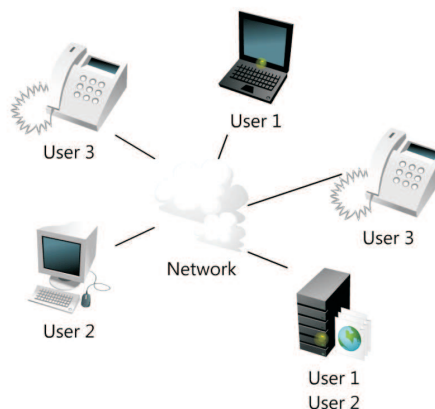


Optimization and Decision Support Group



Fair network design and optimization

- Optimization of networks (systems) which serve many users
- User = demand between a pair of nodes
- Shared resources (node/link capacities)
- Elastic demand – user can consume any bandwidth assigned
- The goal: resource assignment that is effective and fair (acceptable for all users)



1.4 Statistical Data

FACULTY and STAFF	2008		2009		2010	
	persons	FTE	persons	FTE	persons	FTE
Academic Staff	44(+1)	37.25(+1)	46(+1)	39.2(+1)	45(+1)	38.95(+1)
by titles/degrees						
Professors	4	3.5	4	3.5	4	4
D.Sc.-s	6	6	6	6	5	5
Ph.D.-s	27(+1)	23(+1)	29(+1)	25.2(+1)	28(+1)	24.95(+1)
M.Sc.-s	7	4.75	7	4.5	8	5
by positions						
Professors	9	8.5	10	9.5	9	9
Readers	3	2.5	3	2.5	3	2.5
Assistant Professors	23(+1)	20.5(+1)	22(+1)	19.95(+1)	24(+1)	21.95(+1)
Senior Lecturers	6	4	6	4	5	3.5
Lecturers	0	0	0	0	0	0
Assistants	3	1.75	5	3.25	4	2
Ph.D. Students	33		30		27	
Technical Staff	3	2.5	6	4.9	5	3.5
Administrative Staff	6	5.5	6	5.5	8	6.5

FTE – Full Time Employment units,

+ – corrections due to persons on long-term leave of absence

ACTIVITIES	2008	2009	2010
Teaching activities			
standard teaching potential, hours	9 239.63	8 167.75	8 303.75
# hours taught	13 570.60	13 236.80	12 701.20
Degrees awarded			
Professor	0	0	1
Ph.D.	3	7	5
M.Sc.	52	59	50
B.Sc.	57	58	53
Research projects			
granted by WUT	4	1	0
granted by State institutions	12	20	17
granted by international institutions	4	4	5
other	0	3	4
Reviewed publications			
monographs (authored or edited)	4	3	5
chapters in books	43	25	14
papers in journals	47	61	63
papers in conference proceedings	25	10	12
Reports, abstracts and other papers	7	10	9
Conferences			
participation (# of conferences)	39	23	37
participation (# of part. from ICCE)	59	49	55

RESOURCES	2008	2009	2010
Space (sq.m.)			
laboratories	585	585	585
library + seminar room	74	74	74
faculty offices	724	724	724
Computers			
workstations*	5	0	0
personal computers*	331	307	288
Library resources			
books	4030	4058	4076
booklets	1915	2050	2160
journals subscribed	9	9	9

* 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, Readers, Assistant Professors, and Senior Lecturers. By Supporting Faculty we understand Lecturers, Assistants, Research Associates, and Software Engineers, as well as Technical Staff. The personal information below regards the period of January 1 – December 31, 2010.

2.1 Professors Emeriti

Władysław Findeisen Professor (retired July 1999)

Systems Control Division, Complex Systems Group
room 524, tel. 22 234 7397 and 825 0995
W.Findeisen@ia.pw.edu.pl

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

Founder and Director of ICCE (1955–1981), elected and re-elected Rector of WUT (1981–1985). Member of Polish Academy of Sciences (PAN) since 1971. Doctor Honoris Causa of The City University in London (1984), Warsaw University of Technology (1996), Gdańsk University of Technology (1997), Technische Universität Ilmenau (1998). Chairman of the Social Council to the Primate of Poland (1986–90), Vice-President of the Polish Academy of Sciences (PAN)(1990–1992), Senator of the Republic of Poland (1989–93), President of “Kasa Mianowskiego” (a foundation which sponsors foreign scientists in Poland) (1991–2009).

Radosław Ładziński Professor (retired January 1998)

Systems Control Division, Complex Systems Group
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.

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). As Professor Emeritus author of the programme and the first lecturer of the two basic Undergraduate Courses: *Dynamic System* and *Control*, both taught in English (1998–2007). Parallel working with Institute of Electrical Engineering of Polish Academy of Sciences (PAN) (1955–1962), and with Institute of Automatic Control of PAN (1963–1968). Post-Doctoral Scholar, Royal Institute of Technology, Stockholm, Sweden (1957), British Council Scholar, University of Cambridge, England (1959–60), Visiting Lecturer, Department of Mathematics, University of Ghana, Accra, Ghana (1962–63), Professor of Engineering Science, University of Mosul, Iraq (1970–74), Professor of Engineering Mathematics, Rivers State University of Science and Technology, Port Harcourt, Nigeria (1981–87), Member of Magdalene College, University of Cambridge, England.

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

Jerzy Pułaczewski Senior Engineer (retired since October 2003)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 523, tel. 22 234 7791
J.Pulaczewski@ia.pw.edu.pl

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

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

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

Jacek Szymanowski Professor (retired January 2000)

Systems Control Division, Complex Systems Group
room 530, tel. 22 234 7922
J.Szymanowski@ia.pw.edu.pl

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

With WUT since 1968. Visiting Professor, Laboratoire d'Automatique de Nantes, Ecole Centrale de Nantes, France, 1992, 1994, 1995, 1996, 1997. Retired since January 2000.

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

Wiesław Traczyk Professor (retired January 2010)

Operations and Systems Research Division, Optimization and Decision Support Group
room 523, tel. 22 234 7791
W.Traczyk@ia.pw.edu.pl

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 (1997–2006). Chairman of FEIT Committee for Ph.D. Degrees in Automatic Control and Computer Sciences (1990–2005). Head of ICCE Optimization and Decision Support Division (1997–2002).

Interests: Knowledge engineering, expert systems, artificial intelligence.

Andrzej P. Wierzbicki Professor (retired March 2004)

Operations and Systems Research Division, Optimization and Decision Support Group
A.Wierzbicki@ia.pw.edu.pl

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

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

Since 1978 working with the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria and served (1979-1984) as the chairman of the Systems and Decision Sciences Program. Visiting prof. at the University of Minnesota, Minneapolis, MN, Brown University, Providence, RI (1970-1971), Kyoto University, Japan (1989-1990), Fernuniversitaet Hagen (1985) and Japan Advanced Institute of Science and Technology (2004-2007).

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

Member of the Polish Association for the Club of Rome. Member of Polish Mathematical Society (PTM) (since 1975) and of Society of Polish Electrical Engineers (SEP) (1970-2004). Member of the Information Society Technology Advisory Group (ISTAG) of the European Commission (2000-2002). Recipient of George Cantor Award of the Int. Soc. of Multi-Criteria Decision Making for his results in multi-criteria optimization theory and decision support methodology (1992). Recipient of Tomasz Hofmokl Award of NASK for the promotion of informational society, 2005. Recipient of Best Paper Award at the Hawaii International Conference of Systems Science, 2005 for the paper: "Knowledge Creation and Integration: Creative Space and Creative Environments".

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

2.2 Senior Faculty

Piotr Arabas Assistant Professor (part-time)

Systems Control Division, Complex Systems Group
room 573, tel. 22 234 7126
P.Arabas@elka.pw.edu.pl

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

With WUT since 2002.

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

Adam Czajka Assistant Professor (part-time)

Systems Control Division, Biometrics and Machine Learning Group
room 573, tel. 22 234 7126
A.Czajka@ia.pw.edu.pl, www.ia.pw.edu.pl/~aczajka

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

Received his M.Sc. in Computer Control Systems in 2000 and Ph.D. in Control and Robotics in 2005 from Warsaw University of Technology. Since 2003 he is with Warsaw University of Technology, and since 2002 with Research and Academic Computer Network NASK. V-ce Chair of the NASK Biometric Laboratories and a member of the NASK Research Council (2006–). Voting representative of NASK in Technical Committee on Biometrics (2009–) and expert in Technical Committee No. 182 on Information Security in IT Systems (2007–) of Polish Normalization Committee (PKN). He is also a member of the IEEE (Institute of Electrical and Electronics Engineers, Inc., 2002–) and served as the Secretary of the IEEE Poland Section (2005–2009).

Interests: Biometrics, pattern recognition, systems security.

Paweł Domański Assistant Professor

Control and Software Engineering Division, Control Engineering Group
room 571, tel. 22 234 7861
P.Domanski@ia.pw.edu.pl

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

With WUT since 1991, half time since 1997.

Interests: Adaptive control, intelligent control, fuzzy logic.

Janusz Granat Assistant Professor

Operations and Systems Research Division, Optimization and Decision Support Group
room 23, tel. 22 234 6191
J.Granat@ia.pw.edu.pl, www.ia.pw.edu.pl/~janusz

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

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

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

Jerzy Gustowski Senior Lecturer

Control and Software Engineering Division, Control Engineering Group
room 525, tel. 22 234 7699
J.Gustowski@ia.pw.edu.pl

M.Sc. 1979 from WUT.

With WUT since 1979.

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

Mariusz Kaleta Assistant Professor

Operations and Systems Research Division, Operations Research and Management
Systems Group
room 561, tel. 22 234 7123
M.Kaleta@ia.pw.edu.pl

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

With WUT since 2003.

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

Mariusz Kamola Assistant Professor (part-time)

Systems Control Division, Complex Systems Group
room 573, tel. 22 234 7126
M.Kamola@ia.pw.edu.pl, 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, data networks, social networks.

Andrzej Karbowski Assistant Professor

Systems Control Division, Complex Systems Group
room 572, tel. 22 234 7632
A.Karbowski@ia.pw.edu.pl, www.ia.pw.edu.pl/~karbowsk

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

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

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

Włodzimierz Kasprzak Professor

Systems Control Division, Robot Programming and Pattern Recognition Group
room 565, tel. 22 234 7866
W.Kasprzak@elka.pw.edu.pl, 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, Professor since 2005. Member of Polish Section of IAPR.

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

Zygmunt Komor Senior Lecturer (part-time, until March 2010)

Control and Software Engineering Division, Control Engineering Group
room 571, tel. 22 234 7861
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.

Adam Kozakiewicz Assistant Professor (part-time)

Systems Control Division, Complex Systems Group
room 573a, tel. 22 234 7860
akozakie@ia.pw.edu.pl

M.Sc. 2001, Ph.D. 2008 from WUT

With WUT since 2006.

Interests: Computer networks, distributed computation, network and systems security.

Urszula Kręglewska Senior Lecturer

Control and Software Engineering Division, Control Engineering Group
room 553, tel. 22 234 7121
U.Kreglewska@ia.pw.edu.pl, 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.

Tomasz J. Kruk Assistant Professor

Systems Control Division, Complex Systems Group
room 530, tel. 22 234 7922
T.Kruk@ia.pw.edu.pl, www.ia.pw.edu.pl/~tkruk

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

With WUT since 1999.

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

Adam Krzemienowski Assistant Professor

Operations and Systems Research Division, Optimization and Decision Support Group
room 25A, tel. 22 234 7640
 A.Krzemienowski@ia.pw.edu.pl

Ph.D. 2007 from WUT.

With WUT since 2007.

Bartłomiej Kubica Assistant Professor

Systems Control Division, Complex Systems Group
room 573a, tel. 22 234 7860
 bkubica@elka.pw.edu.pl

M.Sc. 2001, Ph.D. 2006 from WUT.

With WUT since 2005.

Interests: Interval mathematics, optimization, numerical computations, parallel computing, multithreaded programming, real-time systems.

Maciej Ławryńczuk Assistant Professor

Control and Software Engineering Division, Control Engineering Group
room 567, tel. 22 234 7673
 M.Lawrynczuk@ia.pw.edu.pl

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

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

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

Krzysztof Malinowski Professor (Head of Division)

Systems Control Division, Complex Systems Group
room 517, tel. 22 234 7397 and 22 825 0995
 K.Malinowski@ia.pw.edu.pl, 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). Member of the Senate of the Warsaw University of Technology (1993–2002), Chairman of the Senate Committee on Academic Staff (1993–1996 and 1999–2002), Chairman of Senate Committee on Research (1996–1999). Corresponding Member of the Polish Academy of Sciences (PAN) (since 1998), Member of the Warsaw Scientific Society (TNW), Chairman of the Committee of Automation and Robotics of Polish Academy of Sciences (PAN), Professor in the Research and Academic Computer Network Institute (NASK), Chairman of Task Group for assessment of applications for projects founded by Action Line 2.3 of Operational Program ‘Innovative Economy’, Chairman of the Scientific Council of the Industrial Institute for Automation and Measurements (PIAP), Member of the IFAC Technical Committees on Optimal Control and on Large Scale Systems.

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

Piotr Marusak Assistant Professor

**Control and Software Engineering Division, Control Engineering Group
room 567, tel. 22 234 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, fuzzy control.

Ewa Niewiadomska-Szykiewicz Professor (Leader of the Group)

**Systems Control Division, Complex Systems Group
room 572, tel. 22 234 7632**

E.Niewiadomska@ia.pw.edu.pl, www.ia.pw.edu.pl/~ens

M.Sc. 1986, Ph.D. 1995, D.Sc. 2005 from WUT.

Research Assistant at the Institute of Geophysics of Polish Academy of Sciences in (1987–1988), with WUT since 1988, NASK since 2001, NASK Director for Research since 2009, IEEE Member.

Interests: Large scale systems, computer simulation, computer aided control systems design, environmental systems management, distributed computations, global optimization, telecommunication systems, ad hoc networks.

Włodzimierz Ogryczak Professor (Leader of the Group, Deputy Director of the Institute)

**Operations and Systems Research Division, Optimization and Decision Support Group
room 24, tel. 22 234 6190**

W.Ogryczak@ia.pw.edu.pl, www.ia.pw.edu.pl/~wogrycza

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

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

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

Andrzej Pacut Professor (Leader of the Group)

Systems Control Division, Biometrics and Machine Learning Group
room 522, tel. 22 234 7733
A.Pacut@ia.pw.edu.pl, www.ia.pw.edu.pl/~pacut

M.Sc. 1969, Ph.D. 1975, D.Sc. 2000 from WUT, the title of Professor of Technical Sciences awarded in December 2010.

With Warsaw University of Technology since 1969, first with the Institute of Mathematics (until 1978) then with ICCE. Visiting Assistant Prof. at Lefschetz Center for Dynamical Systems of Brown University, Providence, RI (1980–1981), Visiting Associate Prof. at Oregon State University, Corvallis, OR (1984 and 1986–1991). Deputy Director of ICCE 1985–1986 and 1993–2005. Senior Member of IEEE. Vice Chairman (2001–2005) and Chairman (2006–2009) of the IEEE Poland Section, Chair of Tech. Committee No. 309 on Biometrics (2010–) and expert of Tech. Committee No. 182 on Information Security in IT Systems (2003–) of Polish Normalization Committee (PKN). Head of the NASK Biometric Laboratories (2003–), vice-chair of NASK Science Council (2009–).

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

Jerzy Paczyński Reader (part-time)

Operations and Systems Research Division, Optimization and Decision Support Group
room 26, tel. 22 234 7862
J.Paczynski@elka.pw.edu.pl, www.ia.pw.edu.pl/~paczynsk

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

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

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

Piotr Pałka Assistant Professor (since Jan. 2010)

Operations and Systems Research Division, Operations Research and Management Systems Group
room 554, tel. 22 234 7648
P.Palka@ia.pw.edu.pl, http://www.ia.pw.edu.pl/~ppalka

M.Sc. 2005, Ph.D. 2009 from WUT.

With WUT since 2009.

Interests: Multi-agent systems, mechanism design, incentive compatibility.

Krzysztof Pieńkosz Assistant Professor

**Operations and Systems Research Division, Operations Research and Management
Systems Group
room 560a, tel. 22 234 7864
K.Pienkosz@ia.pw.edu.pl**

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

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

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

Grzegorz Płoszajski Assistant Professor

**Operations and Systems Research Division, Operations Research and Management
Systems Group
room 560a, tel. 22 234 7864
G.Ploszajski@ia.pw.edu.pl**

M.Sc. 1968 from WUT, M.Sc. in Mathematics 1974 from Warsaw University, Ph.D. 1974 from WUT.

With WUT since 1969. Deputy Director for Information Technology of the Main Library of WUT since 1996. Committee Member of ‘Kasa Mianowskiego’ since 2004. Member of the Digitization Group established by the Ministry of Culture and National Heritage

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

Tadeusz Rogowski Senior Lecturer (part-time)

**Operations and Systems Research Division, Optimization and Decision Support Group
room 530, tel. 22 234 7922
T.Rogowski@ia.pw.edu.pl**

M.Sc. 1972 from WUT.

With WUT since 1972, Director of University Computer Center (1989-2002, 2008–).

Interests: Computer network, programming languages, operating systems.

Krzysztof Sacha Professor (Leader of the Group)

**Control and Software Engineering Division, Software Engineering Group
room 562, tel. 22 234 7756
K.Sacha@ia.pw.edu.pl, www.ia.pw.edu.pl/~sacha**

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

With WUT since 1976. Designer in Minicomputer Research and Development Centre ERA (1973), Software Engineering Consultant for Industrial Automation Enterprise PNEFAL (1987-90), visiting researcher at the University of Groningen, The Netherlands (1991-1992), and Technical University of Lingby, Denmark (1993), Project Manager in Alerton (1999-2002), Advisor to the President of Social Insurance Institution (2005-2009). Head of the Chair of Programming Methods at High School of Economy and Information Technology, Warsaw, Poland (from 2003). Member of the Council of the National Centre for Research

and Development (from 2010). Expert in maintaining and evaluating software projects. Member of IEEE Computer Society.

Interests: Software engineering, software quality evaluation, software security, trust management, real-time systems.

Kamil Smolira Assistant Professor

**Operations and Systems Research Division, Operations Research and Management
Systems Group
room 526, tel. 22 234 7125**

K.Smolira@elka.pw.edu.pl, <http://www.ia.pw.edu.pl/~ksmolira>

M.Sc. 2003, Ph.D. 2009 from WUT.

With WUT since 2009.

Interests: Operations research and management, decision support in energy market.

Jerzy Sobczyk Senior Lecturer (part-time)

**Operations and Systems Research Division, Optimization and Decision Support Group
room 519, tel. 22 234 7863**

J.Sobczyk@ia.pw.edu.pl, www.ia.pw.edu.pl/~jurek

M.Sc. 1985 from WUT.

With WUT since 1984. FEIT Network Administrator.

Interests: Computer networks, system and network administration, programming languages, web applications, parallel and distributed programming, multi-criteria optimization.

Andrzej Stachurski Assistant Professor

**Operations and Systems Research Division, Optimization and Decision Support Group
room 25a, tel. 22 234 7640**

A.Stachurski@ia.pw.edu.pl, www.ia.pw.edu.pl/~stachurs

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

Senior Assistant (1979–80) and then Assistant Professor (1980–92) at the Institute of System Research (IBS PAN), with WUT since 1992. Visiting Professor at the Calabria University, Italy, 1984, Åbo 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.

Marcin Szlenk Assistant Professor

Control and Software Engineering Division, Software Engineering Group
room 555, tel. 22 234 7997
M.Szlenk@ia.pw.edu.pl

M.Sc. 2000, Ph.D. 2006 from WUT.

With WUT since 2005.

Interests: Software modelling and verification, formal methods in software engineering.

Wojciech Szykiewicz Assistant Professor

Systems Control Division, Robot Programming and Pattern Recognition Group
room 572A, tel. 22 234 3650
W.Szykiewicz@ia.pw.edu.pl

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

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

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

Tomasz Śliwiński Assistant Professor

Operations and Systems Research Division, Optimization and Decision Support Group
room 26, tel. 22 234 7862
T.Sliwinski@ia.pw.edu.pl

M.Sc. 1999, Ph.D. 2007 from WUT.

With WUT since 2004.

Interests: Discrete optimisation, operations research, decision support.

Piotr Tatjewski Professor (Head of Division)

Control and Software Engineering Division, Control Engineering Group
room 524, tel. 22 234 7397 and 825 0995
P.Tatjewski@ia.pw.edu.pl, www.ia.pw.edu.pl/~tatjewsk

M.Sc. 1972, Ph.D. 1976, D.Sc. 1988, the title of Professor of Technical Sciences awarded in 2003, appointed to ordinary professorship in 2006

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 1996–2008. Head of Control and Software Engineering Division, 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 since 2004, since 2007 Chair of the Automatic Control Systems Section of this Committee, Member of the Control and Robotics Section of the Scientific Research Council (KBN) 1997–2004. Member of Programme Committee of the Journal PAK, Int. Journal of Applied Mathematics and Computer Science, Journal of Automation, Mobile Robots and Intelligent Systems, Expert of Ministry of Education and

Science for Educational Standards (2005–2006). Member of EUCA (European Union Control Association) Administrative Council (2008–), member of IFAC Technical Committees TC 2.1 and TC 5.4.

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

Eugeniusz Toczyłowski Professor (Head of Division)

**Operations and Systems Research Division, Operations Research and Management
Systems Group
room 516, tel. 22 234 7950
E.Toczyłowski@ia.pw.edu.pl**

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.

Tomasz Traczyk Reader (Deputy Director of the Institute)

**Operations and Systems Research Division, Operations Research and Management
Systems Group
room 22, tel. 22 234 7750
T.Traczyk@ia.pw.edu.pl, www.ia.pw.edu.pl/~ttraczyk**

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

With WUT since 1984.

Interests: Database management systems (DBMS), applications of DBMS in management and control, information systems, Web-based and distributed systems, XML language and its applications, variant configuration, software configuration management, long-term digital archives.

Michał Warchoł Senior Lecturer, part-time

**Systems Control Division, Complex Systems Group
room 570, tel. 22 234 7665
M.Warchol@ia.pw.edu.pl, www.ia.pw.edu.pl/~warchol**

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

With WUT since 1991.

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

Paweł Wawrzyński Assistant Professor

Systems Control Division, Biometrics and Machine Learning Group
room 560, tel. 22 234 7120
P.Wawrzynski@elka.pw.edu.pl, <http://staff.elka.pw.edu.pl/~pwawrzyn>

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

With WUT since 2005.

Interests: Reinforcement learning, neural networks; learning robots, adaptive control, computational neuroscience.

Tomasz Winiarski Assistant Professor (since February 2010)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
tmwiniarski@gmail.com, <http://robotics.ia.pw.edu.pl/tomaszwiniarski>

M.Sc. 2002, Ph.D. 2009 from WUT.

With WUT since 2004.

Interests: Robot control systems, artificial intelligence.

Adam Woźniak Reader

Systems Control Division, Complex Systems Group
room 570, tel. 22 234 7665
A.Wozniak@ia.pw.edu.pl, www.ia.pw.edu.pl/~wozniak

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), Dean’s Coordinator for Graduate Distance Learning (2005–2008).

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

Andrzej Zalewski Assistant Professor

Control and Software Engineering Division, Software Engineering Group
room 555, tel. 22 234 7997
A.Zalewski@ia.pw.edu.pl

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

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

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

Cezary Zieliński Professor (Director of the Institute, Leader of the Group)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 518A, tel. 22 234 5102

C.Zielinski@ia.pw.edu.pl, www.ia.pw.edu.pl/~zielinsk

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). Program Committee Member of PAK (Pomiary, Automatyka, Kontrola). Member of the Forecast Committee of the Polish Academy of Sciences: Poland 2000 Plus (2003–2007). Senior Member of IEEE (2002–). Vice Dean for Research and International Cooperation FEIT (2002–2005), Head of ICCE Robot Programming and Pattern Recognition Group since 1996. Member of the board of EURON (European Robotics Network of Excellence, 2004–2008). Deputy Director of ICCE for Research (2005–2008), Director of ICCE (2008–). Secretary of the Control and Robotics Committee of the Polish Academy of Sciences (2007–).

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

Izabela Żółtowska Assistant Professor (on leave since November 2009)

Operations and Systems Research Division, Operations Research and Management
Systems Group

room 570, tel. 22 234 7648

I.Zoltowska@elka.pw.edu.pl, home.elka.pw.edu.pl/~imilenko

M.Sc. 2000, Ph.D. 2006 from WUT.

With WUT since 2005.

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

2.3 Supporting Faculty and Staff

Przemysław Kacprzak Assistant (part-time)

Operations and Systems Research Division, Operations Research and Management
Systems Group

room 526, tel. 22 234 7125

P.Kacprzak@elka.pw.edu.pl, http://home.elka.pw.edu.pl/~pkacprza

M.Sc. 2004 from WUT.

With WUT since 2009.

Interests: Operations research, energy markets.

Tomasz Kornuta Assistant, Software Engineer (part-time)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117

T.Kornuta@elka.pw.edu.pl, <http://tkornuta.googlepages.com>

M.Sc. 2005 from WUT.

With WUT since 2008.

Interests: Robot programming methods, behavioral control, computer vision, pattern classification, artificial intelligence

Bartosz Kozłowski Assistant (part-time)

Operations and Systems Research Division, Optimization and Decision Support Group
room 25, tel. 22 234 7297

B.Kozlowski@elka.pw.edu.pl

M.Sc. 2004 from WUT.

With WUT since 2010.

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

Włodzimierz Macewicz Senior Software Engineer

Control and Software Engineering Division, Software Engineering Group
room 525, tel. 22 234 7699

W.Macewicz@ia.pw.edu.pl

M.Sc. 1983 from WUT.

With WUT since 1983.

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

Andrzej Ratkowski Assistant (part-time)

Control and Software Engineering Division, Software Engineering Group
room 555, tel. 22 234 7997

A.Ratkowski@ia.pw.edu.pl

M.Sc. 2005 from WUT.

With WUT since 2009.

Interests: Software engineering, Service Oriented Architecture, performance engineering.

Piotr Trojanek Software Engineer

Systems Control Division, Robot Programming and Pattern Recognition Group
room 566, tel. 22 234 7649

P.Trojanek@elka.pw.edu.pl, robotics.ia.pw.edu.pl/PiotrTrojanek

M.Sc. 2005 from WUT.

With WUT since 2009.

Interests: Robot programming, real-time systems.

Michał Wałęcki Software Enginner (since Dec. 2010)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
M.Walecki@elka.pw.edu.pl

Msc from WUT 2010 from WUT.

With WUT since 2010.

Interests: Design of microprocessor-based control and measurement systems, automatic control

Tomasz Winiarski Assistant (part-time, until January 2010)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
TMWiniarski@gmail.com, <http://robotics.ia.pw.edu.pl/tomaszwiniarski>

For short cv and interest see p. 47

2.4 Ph.D. Students

Krzysztof Bareja Ph.D. Student

Operations and Systems Research Division, Optimization and Decision Support Group
room 563, tel. 22 234 7124
K.Bareja@elka.pw.edu.pl

Supervisor: Włodzimierz Ogryczak

Marcin Chochowski Ph.D. Student (until Feb. 2010)

Systems Control Division, Biometrics and Machine Learning Group
room 518a, tel. 22 234 7805
mchochow@elka.pw.edu.pl, www.ia.pw.edu.pl/~mchochow

Supervisor: Andrzej Pacut

Bartosz Chrabski Ph.D. Student (since Oct. 2010)

Control and Software Engineering Division, Software Engineering Group
B.Chrabski@elka.pw.edu.pl

Supervisor: Krzysztof Sacha

Krzysztof Stanisław Daniluk Ph.D. Student (since Oct. 2010)

Systems Control Division, Complex Systems Group
K.S.Daniluk@ia.pw.edu.pl

Supervisor: Ewa Niewiadomska-Szynkiewicz

Adam Działak Ph.D. Student

Control and Software Engineering Division, Control Engineering Group
room 567, tel. 22 234 7673
A.Dzialak@ia.pw.edu.pl

Supervisor: Piotr Tatjewski

Andrzej Grudzień Ph.D. Student

Control and Software Engineering Division, Software Engineering Group
room 563, tel. 22 234 7124
A.Grudzien@ia.pw.edu.pl

Supervisor: Krzysztof Sacha

Szymon Kijas Ph.D. Student

Control and Software Engineering Division, Software Engineering Group
room 563, tel. 22 234 7124
S.Kijas@ia.pw.edu.pl

Supervisor: Krzysztof Sacha

Przemysław Kacprzak Ph.D. Student

Operations and Systems Research Division, Operations Research and Management
Systems Group
room 526, tel. 22 234 7125
P.Kacprzak@ia.pw.edu.pl

Supervisor: Eugeniusz Toczyłowski

For short cv and interest see p. 48.

Kamil Kołtyś Ph.D. Student

Operations and Systems Research Division, Operations Research and Management
Systems Group
room 526, tel. 22 234 7125
K.Koltys@ia.pw.edu.pl

Supervisor: Eugeniusz Toczyłowski

Tomasz Kornuta Ph.D. Student (until Oct. 2010)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
T.Kornuta@elka.pw.edu.pl

Supervisor: Cezary Zieliński

For short cv and interest see p. 49.

Małgorzata Kudelska Ph.D. Student

Systems Control Division, Biometrics and Machine Learning Group
room 560, tel. 22 234 7120
M.Gadomska@elka.pw.edu.pl

Supervisor: Andrzej Pacut

Michał Kudelski Ph.D. Student (until Oct. 2010)

Systems Control Division, Biometrics and Machine Learning Group
room 560, tel. 22 234 7120
M.Kudelski@elka.pw.edu.pl

Supervisor: Andrzej Pacut

Robert Kuźmiuk Ph.D. Student

Operations and Systems Research Division, Operations Research and Management
Systems Group
room 526, tel. 22 234 7125
R.Kuzmiuk@ia.pw.edu.pl

Supervisor: Eugeniusz Toczyłowski

Piotr Kwaśniewski Ph.D. Student

Systems Control Division, Complex Systems Group
room 573a, tel. 22 234 7860
P.Kwasniewski@elka.pw.edu.pl

Supervisor: Krzysztof Malinowski

Michał Majdan Ph.D. Student

Operations and Systems Research Division, Optimization and Decision Support Group
room 563, tel. 22 234 7124
M.Majdan@ia.pw.edu.pl

Supervisor: Włodzimierz Ogryczak

Paweł Markowski Ph.D. Student

Operations and Systems Research Division, Optimization and Decision Support Group
room 563, tel. 22 234 7124
P.Markowski@ia.pw.edu.pl

Supervisor: Włodzimierz Ogryczak

Michał Marks Ph.D. Student

Systems Control Division, Complex Systems Group
room 573, tel. 22 234 7126
M.Marks@ia.pw.edu.pl

Supervisor: Ewa Niewiadomska-Szynkiewicz

Jacek Michałek Ph.D. Student (until Feb. 2010)

Systems Control Division, Biometrics and Machine Learning Group
room 518a, tel. 22 234 7805
J.Michalek@ia.pw.edu.pl

Supervisor: Andrzej Pacut

Łukasz Mirtecki Ph.D. Student (until Feb. 2010)

Systems Control Division, Biometrics and Machine Learning Group
room 518a, tel. 22 234 7805
L.Mirtecki@ia.pw.edu.pl

Supervisor: Andrzej Pacut

Piotr Modliński Ph.D. Student

**Operations and Systems Research Division, Operations Research and Management
Systems Group
room 526, tel. 22 234 7125
P.Modlinski@ia.pw.edu.pl**

Supervisor: Eugeniusz Toczyłowski

Paweł Olender Ph.D. Student

**Operations and Systems Research Division, Optimization and Decision Support Group
P.Olender@stud.elka.pw.edu.pl**

Supervisor: Włodzimierz Ogryczak

Bartosz Papis Ph.D. Student

**Systems Control Division, Biometrics and Machine Learning Group
B.Papis@elka.pw.edu.pl**

Supervisor: Andrzej Pacut

Wojciech Pikulski Ph.D. Student (since Oct. 2010)

**Control and Software Engineering Division, Software Engineering Group
W.Pikulski@ia.pw.edu.pl**

Supervisor: Krzysztof Sacha

Adam Połomski Ph.D. Student

**Operations and Systems Research Division, Optimization and Decision Support Group
A.Polomski@elka.pw.edu.pl**

Supervisor: Włodzimierz Ogryczak

Michał Przyłuski Ph.D. Student (since Oct. 2010)

**Operations and Systems Research Division, Optimization and Decision Support Group
M.Przyluski@ia.pw.edu.pl**

Supervisor: Włodzimierz Ogryczak

Joanna Putz-Leszczyńska Ph.D. Student (until Oct. 2010)

**Systems Control Division, Biometrics and Machine Learning Group
room 558, tel. 22 234 7805
jputz@elka.pw.edu.pl**

Supervisor: Andrzej Pacut

Andrzej Ratkowski Ph.D. Student (until Oct. 2010)

**Control and Software Engineering Division, Software Engineering Group
A.Ratkowski@elka.pw.edu.pl**

Supervisor: Krzysztof Sacha

For short cv and interest see p. 49.

Piotr Rzepakowski Ph.D. Student

Operations and Systems Research Division, Optimization and Decision Support Group
room 563, tel. 22 234 7124
P.Rzepakowski@elka.pw.edu.pl

Supervisor: Włodzimierz Ogryczak

Anna Sibilska-Mroziewicz Ph.D. Student

Systems Control Division, Robot Programming and Pattern Recognition Group
A.Sibilska@ia.pw.edu.pl

Supervisor: Cezary Zieliński

Przemysław Mirosław Strzelczyk Ph.D. Student

Systems Control Division, Biometrics and Machine Learning Group
room 558, tel. 22 234 7805
pstrzelc@elka.pw.edu.pl

Supervisor: Andrzej Pacut

Piotr Sztandera Ph.D. Student

Control and Software Engineering Division, Software Engineering Group
room 563, tel. 22 234 7124
P.Sztandera@ia.pw.edu.pl

Supervisor: Krzysztof Sacha

Maciej Szumski Ph.D. Student

Control and Software Engineering Division, Control Engineering Group
room 567, tel. 22 234 7673
M.Szumski@ia.pw.edu.pl

Supervisor: Piotr Tatjewski

Piotr Trojanek Ph.D. Student

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
P.Trojanek@elka.pw.edu.pl

Supervisor: Cezary Zieliński

For short cv and interest see p. 49.

Michał Wałęcki Ph.D. Student

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
M.Walecki@ia.pw.edu.pl

Supervisor: Cezary Zieliński

Artur Wilkowski Ph.D. Student

Systems Control Division, Robot Programming and Pattern Recognition Group
room 563, tel. 22 234 7124
A.Wilkowski@elka.pw.edu.pl

Supervisor: Włodzimierz Kasprzak

2.5 Administrative and Technical Staff

Teresa Bortkiewicz Manager, Finances (part-time).

room 556, tel. 22 234 6096
T.Bortkiewicz@elka.pw.edu.pl

Maria Graszka Office support (part-time).

room 529, tel. 22 234 7865
M.Graszka@ia.pw.edu.pl

Elżbieta Matyjasiak Secretary, Main office.

room 521, tel. 22 234 7397, 22 825 0995
E.Matyjasiak@ia.pw.edu.pl

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

Jolanta Niedbała Office support (part-time).

room 529, tel. 22 234 7865
J.Niedbalo@ia.pw.edu.pl

Jadwiga Osowska Finances specialist (part-time).

room 556, tel. 22 234 7122
J.Osowska@ia.pw.edu.pl

M.Sc. 1975 from WUT.

Agnieszka Paprocka Finances Support.

room 556, tel. 22 234 7122
A.Paprocka@ia.pw.edu.pl

M.Sc. 2008 from Cardinal Stefan Wyszyński University in Warsaw.

Ryszard Tchórz Technical support (part-time).

room 559, tel. 22 234 7698

Alicja Trojanowska Secretary, Student affairs.

room 22, tel. 22 234 7750
A.Trojanowska@ia.pw.edu.pl

Beata Woźniak Manager, Administration.

room 521a, tel. 22 234 7397
B.Wozniak@ia.pw.edu.pl

M.Sc. 1993 from Warsaw University.

3 Teaching Activities – Academic Year 2009/2010

3.1 Undergraduate and Graduate Studies

Course Title	Course code	Hours per week	Class	Lecturer
Administration of UNIX and TCP/IP	ASU	2 – 2 –	OSK, OT	J. Sobczyk (spring/fall)
Algorithms and Data Structures	AISD1	2 – 1 –	sem. 3	A. Zalewski (spring)
Artificial Intelligence	EAI	2 – – –	ANGL, ECETC, OT	W. Kasprzak (spring)
Artificial Intelligence Methods	MSI	2 – – 1	PZ-P, PZ-O, PZ-SID	C. Zieliński (spring)
Basics in Automatics	PODA	2 – 1 –	PSTER, PSYIA, OT	P. Tatjewski (spring)
Biometric Identity Verification	BIT	2 – 1 –	SIDJB, SIDJC, PP-SID	A. Czajka (spring)
Commercial Data Bases 2	KBD2	2 – – 2	BDSI, OT	T. Traczyk (fall)
Computer Networks	ECONE	2 1 1 –	ANGL, OT	J. Sobczyk (spring)
Computer Networks (I)	SKM	2 – 1 1	SKOR, OT	J. Sobczyk (spring/fall)
Control	ECONT	2 1 1 –	ANGL, OT	P. Domański (spring/fall)
Data Bases 2	BD2	2 – – 1	BDSI, OT	T. Traczyk (spring/fall)
Decision Support	WDEC	2 – 2 –	MKPWD, OT, PP-SID	J. Granat (spring/fall)
Decision Support Under Risk Conditions	WDWR	2 – – 1	PZ-I, OT	W. Ogryczak (spring)
Discrete and Network Optimisation	ODS	2 – – 1	PZ-I, PZ-A, PZ-O, OT	E. Toczyłowski (fall)
Distributed Operating Systems	RSO	2 – 1 –	PZ, OT, PZ-I, PZ-SID, PZ-ISI	T. Kruk (spring)
Dynamic Systems	EDYSY	2 – 2 –	ANGL, OT	M. Ławryńczuk, P. Marusak (spring/fall)
Event programming (I)	PROZ	2 – – 1	ATP, OT	M. Kamola (fall)
Fundamentals of Control Systems	PSTE	2 – 1 –	sem. 4	P. Tatjewski (spring) K. Malinowski (fall)
Fundamentals of Digital Technology	PTCY	2 – 2 –	sem. 2	C. Zieliński (fall)
Fundamentals of Operation Research	POBO	2 – 1 –	sem. 4	K. Pieńkosz (spring) G. Płoszajski (fall)
Fundamentals of Optimization	POPTY	2 – 2 –	MKPWD, OT	A. Stachurski (spring/fall)
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 – 1	ANGL., OT	W. Kasprzak (fall)
Information Project Management	ZPI	2 – – 1	BDSI, OT	K. Pieńkosz (spring/fall)
Intelligent robotic systems	ISR	2 – 1 –	MUS, PZ-A, PZ-SID, OT	C. Zieliński (fall)
Introduction to Robotics	WR	2 – 2 –	MUS, SCRJC, OT	W. Szynekiewicz (spring/fall)
Knowledge Engineering	IW	2 – – 1	ISO, OT	W. Traczyk (spring/fall)
Management IT Systems	SIZ	2 – – 2	MKPWD, OT	J. Granat (spring/fall)
Modelling and Control of Robotics	EMUMA	2 – 1 –	ANGL	C. Zieliński, P. Tatjewski (spring/fall)
Mobile robots	EMOR	2 – – –	ANGL, ECETC, OT	W. Szynekiewicz (spring)
Numerical Methods (J)	MNUM	2 – – 1	PSTER, OT	P. Tatjewski (spring/fall)
Numerical Methods	ENUME	2 – 2 –	ANGL, OT	P. Tatjewski (fall)

Course Title	Course code	Hours per week	Class	Lecturer
Operating System	EOPSY	2 1 1 -	ANGL, OT	T. Kruk (fall)
Optimization Techniques	EOPT	2 - - -	ANGL, ECETC, OT	P. Tatjewski (spring)
Operating Systems	SOI	2 - 2 -	OSK, OT	T. Kruk (fall)
Optimization and Decision Support	OWD	2 - - 1	PZ-A, PZ-I, OT	W. Ogryczak (fall)
Parallel Numerical Methods	EPNM	2 - - 2	ANGL., OT	A. Stachurski (fall)
Principles of Computer Science	EPCOS	2 - - -	ANGL, OT	W. Kasprzak (fall)
Process Control	STP	2 1 1 -	SCRJC	M. Ławryńczuk (fall)
Process Management and Scheduling	ZAH	2 - 2 -	MKPWD, OT, MUS, PP-SID	E. Toczyłowski (spring/fall)
Programmable Controllers	SP	2 - 1 -	MUS, OT	J. Gustowski (spring/fall)
Programming 1	EPRO1	2 1 1 -	ANGL, OT	J. Paczyński (fall)
Programming 2	EPRO2	2 - 2 -	ANGL, OT	A. Stachurski (spring/fall)
Real-time Systems	SCZR	2 - 2 -	PSTER, OT	K. Sacha (spring/fall)
Robot Programming Methods	EPRM	2 - - -	ANGL, ECETC, OT	C. Zieliński (spring)
Software Engineering	IOP	2 - 1 -	OSK, OT	K. Sacha (spring/fall)
Software Specification and Design	SPOP	2 - 1 -	OSK, PZ-SID, PZ-I, OT	M. Szlenk (spring/fall)
Synthesis of Decision Rules	SRD	2 - 2 -	MKPWD, MUS, OT, PP-SID	K. Malinowski (spring)

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).

Class

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

3.2 Extramural Graduate Studies

Postgraduate studies **IT Resources Management: architectures, processes, standards, quality** are designed to provide students with current knowledge necessary for successful management of IT in modern organizations. The programme comprises: IT project management, quality standards and assurance systems, development methodologies, system testing, IT audit, business process modeling, system architectures and managerial skills. The classes take form of lectures, workshops, exercises and laboratories.

Postgraduate studies **Project Management: Standards, Practice, Techniques and Tools** merge theoretical knowledge with practical skills necessary for successful project management. The program encompasses: business case and project efficiency assessment, basic project management standards: PMBoK, PRINCE2, IPMA, specialized project management methods e.g. for IT (software development methods including agile approaches), automotive or construction industries, soft-skills like facilitation, negotiations, conflict management, public relations for project management, hard skills like project planning, scheduling, budgeting.

Postgraduate studies **Engineering of Management Information Systems and Decision Support Systems** are intended for IT specialists, who want to broaden their skills in field of MIS and DSS. The programme contains: management information systems (with special attention on SAP system and ABAP language), modeling of processes and data structures, engineering of information systems, decision support and business intelligence systems, data management systems, applications of MIS and DSS (including service science and MRP). The classes take form of lectures and laboratories.

3.3 Graduate Distance Learning

Starting from academic year 2005/2006 our institute is involved in graduate distance learning programme of WUT (named **OKNO**). We coordinate two specializations: Engineering of Internet Systems and Decision and Management Support Systems. The graduates of the first one are prepared for designing, implementing and taking care of complex information technology and computing systems using possibilities offered by contemporary computer networks. They have also ability to manage the layers of technology involved in the next generation of massive system deployments. The graduates of the latter are prepared for designing and implementing software systems which assist in managing, planning and decision making. Their skills and knowledge enable to manage the layers of technology involved in the new generation of intelligent systems empowering every aspect of business operations. First Ms.Sc. degree was awarded in the year 2008.

4 Projects

- [PR1] Seventh Framework Programme (ICT-2009.1.1: The Network of the Future, FP7-ICT-2009-5): **Low Energy Consumption NETWORKS (ECONET)**. Granting period: 01.10.2010 – 30.09.2013. Principal Investigators: Ewa Niewiadomska-Szynkiewicz and Krzysztof Malinowski. Investigators: Michał Karpowicz, Michał Marks, Andrzej Sikora, Krzysztof Daniluk.

The concept of energy-efficient networking has begun to spread over the past few years, gaining increasing popularity. Besides the widespread sensitivity to ecological issues, such interest also springs from economical needs, since both energy cost and electrical requirements show a continuous growing trend. In order to support next generation network infrastructures and related services for a rapidly increasing customer population, telecoms and service providers need to rapidly deploy ultra high capacity optical transport/access networks and efficiently exploit converged service capability in heterogeneous access. Performance and energy efficiency at the link layer will benefit from massive use of state-of-the-art photonic and wireless techniques, but the continuous growth of data rates will lead network devices to raise their processing capacities, thus increasing their energy requirements. The sole introduction of low consumption silicon technologies may not be enough to effectively curb energy requirements. For disruptively boosting the network energy efficiency, these hardware enhancements must be integrated with ad-hoc mechanisms that explicitly manage energy saving by exploiting network-specific features. ECONET aims at studying innovative techniques and architectural solutions to support energy efficiency in next generation networks. The ECONET project will focus its research and development efforts in three main research axes. In the first axis, novel network-specific HW/FW technologies will be developed to optimize the power management features. The second axis will be devoted to develop local and distributed frameworks for dynamic optimization of the trade-off between energy consumption and network performance. The last axis will focus on the design of a Green Abstraction Layer for interfacing the novel low-level green capabilities with OAM frameworks in a common and standard way. The ECONET project will deliver novel energy-aware device prototypes on which large-scale demonstration tests will be conducted. The project will aim at maximizing its impact on industrial and network operator communities as well as on standardization bodies.

- [PR2] Seventh Framework Programme (NMP-2007-3.2-1): **Self Reconfigurable Intelligent Swarm Fixtures (SwarmItFIX) FP7-214678**. Granting period: 16.09.2008 – 15.09.2011. Partners: DIMEC University of Genova (Italy, coordinator), Exechon (Sweden), PIAGGO Aero Industries Spa. (Italy), ZTS-VVU Vyskumno-vyvojovy Ustav Kosice a.s. (Slovakia), Centro Ricerche FIAT S.C.P.A. (Italy).

A step beyond flexible/reconfigurable fixtures for higher continuous adaptation of production resources with respect to production objectives and technical conditions in the knowledge-based factory is achievable today by synergic convergence of the NMP themes of flexible fixtures, parallel robots and new/smart materials with the ICT themes of robot swarms with networked embedded control. Today's smartest adaptable fixtures have limited adjustment capability, are mostly operated manually, are usually setup off-line with the help of external measuring equipment, e.g. laser. Significant increase in effectiveness and decrease in cost may come from on-line fully actuated configuration/reconfiguration, large adaptability to different shapes and the capability to dynamically concentrate the support in the region where manufacturing is actually performed, doing that on-line and without moving/removing the part from the fixture. We are developing the new concept

of self adaptable swarm fixtures composed of mobile agents that can freely move on a bench and reposition below the supported part behaving as a swarm. Each fixture agent is composed of a mobile platform, a parallel robot fixed to the mobile platform, an adaptable head with phase-change fluid and an adhesion arrangement, to sustain/clamp the supported part perfectly adapting to the part local geometry. A hybrid control system is adopted and each robot is treated as an autonomous agent exhibiting its own behaviours. Behaviour based translocation of the robots to destination positions is adopted to reduce planner complexity, with no need to plan exact trajectories and no significant increase in complexity when extra units are removed/added. The area of manufacturing of thin metal sheets is considered (aircrafts and automotive bodies). The project objective is to develop a swarm fixture for a large range of sheet shapes to fully replace the specialized fixtures today used.

- [PR3] Program of Development of WUT supported by EU (European Social Fund), National Cohesion Strategy, Operational Programme Human Capital. No. 50031281302. Task no.28: **Development of the 2nd level studies in Automation and Robotics**. Head of the task: Piotr Tatjewski, secretary: Maciej Ławryńczuk. Granting period 2008 – 2012.

The aim of the task is to co-ordinate programs of 2nd level (postgraduate) studies in Automation and Robotics at four faculties of WUT (Electronics and Information Technology, Electrical Engineering, Mechatronics, Power and Aeronautical Engineering). In particular, development of the common part of the program and supporting specialized programs for different faculties exploiting their expertise. The main part of the task is to support development or modernization of 26 courses at participating faculties, including purchasing certain computer equipment.

- [PR4] Program of Development of WUT supported by EU (European Social Fund), National Cohesion Strategy, Operational Programme Human Capital. No. 5003121203. Task 21, Subtask: **Adaptation of the curriculum of Postgraduate Training ‘Engineering of Management Information Systems’ to current labour market needs and knowledge-based economy**. Granting period: 2008 – 2012. Subtask leader: Tomasz Traczyk. Contractors: Włodzimierz Ogryczak, Janusz Granat, Mariusz Kaleta, Marcin Szlenk, Tomasz Traczyk.

- [PR5] Program of Development of WUT supported by EU (European Social Fund), National Cohesion Strategy, Operational Programme Human Capital. No. 50031214203. Task 21, Subtask: **Adjustment of the postgraduate professional training in ‘IT Resource Management: Architectures, Processes, Standards, Quality’ to the evolving needs of the contemporary labor market and knowledge-based economy**. Granting period: 2008 – 2012. Subtask leader: Krzysztof Sacha.

The main goal of this project is to elaborate an improved curriculum of the training and to prepare teaching materials for the courses listed in the curriculum.

- [PR6] INTELIWISE S.A. Industrial research No. 501/6/0008 **Speech classifier in a dialogue system**. Granting period: 1.06.2010 – 1.10.2010. Principal investigator: Włodzimierz Kasprzak. Investigators: Paweł Przybysz, Artur Wilkowski.

The goal was to develop an algorithm for spoken sentence recognition, that could be applied in a speech-based dialogue system. The algorithm consists of three main steps: acoustic analysis, phonetic coding and symbolic sentence recognition. Two alternative classifier has been implemented and tested: an acoustic feature-based DTW (dynamic time warping) classifier and a HMM-based (Hidden Markov Model) stochastic phonetic classifier. At the acoustic analysis centered MFCC features (mel cepstral coefficients) have

been extracted, supported by other additional speech parameters, like energy distribution moments and low-pass rate in the frequency domain. Special interest was to design and test various normalization procedures in order to limit the variability of spectral images of man and women voices.

- [PR7] PSE Industrial research No. BK/W013/2008 501E10310004 **Development of the perspective market balancing mechanism solutions respecting multi-commodity character of the electricity market**. Granting period: 2.04.2009 – 31.03.2011. Principal investigator: Eugeniusz Toczyłowski. Investigator: Kamil Smolira.

The main aims of the project are advance of the theoretical principles regarding market mechanisms projecting as well as development of the reference electricity market balancing model. The reference market model should support the safe and efficient work of the Polish electricity system both in a short and in a long timeframe. The project takes into account current state of the Polish power system and should provide solutions elastic and open enough to encompass future evolutionary development of the power system.

- [PR8] PARP Grant No. UDA-POIG.01.04.00-20-016/09-00 **Investigations of learning control systems for educational robots**. Granting period: 13.10.2010 – 28.12.2012. Principal investigator: Paweł Wawrzyński.

The project is realized by a partnership of Plum Sp. z o.o. and the ICCE. Within the project a humanoid robot is developed with 18 degrees of freedom, multiple sensors and fully functional PC onboard connected to the computer network through WiFi. This robot is to be a commercial product manufactured by Plum Sp. z o.o. and available on the market along with software developed by the ICCE. The research objective of the project is to develop learning techniques for optimization of systems that control walking, running, and other locomotive activities in humanoid robots. Those techniques include reinforcement learning with experience replay – a subject of extensive studies in the ICCE.

- [PR9] Project No. 501/E/0007. Ordering party: Municipality of the City of Warsaw, IT Department: **Analysis of the portfolio of projects connected with Integrated Tax Management System**. Granting period: 08.02.2010 – 30.04.2010. Principal investigator: Andrzej Zalewski.

A set of IT projects accompanying the development of Integrated Tax Management System for the Municipality of Warsaw has been analysed in terms of dependencies existing between the projects, their projected cost, risks and quality attributes. Different technical options for each of these projects have been analysed.

MNiSW Grant No. N N516 532139 **A Methodology for the Evolution and Development of Service-oriented Systems**. Granting period: 28.10.2010 – 27.04.2013. Principal investigator: Andrzej Zalewski.

The purpose of the grant obtained from the Ministry of Science and Higher Education is to develop a methodology focused on the support of perpetual evolution of modern SOA systems rather than just their initial construction. The methodology shall consist of: models and methods for change specification and modeling, change impact analysis techniques, change impact assessment method based on GQM scheme, transformational change implementation basing on formal models built upon LOTOS, change documentation based on GQM scheme as well as role-based trust management mechanisms and models. The grant is expected to be completed in 30 months.

- [PR10] MNiSW Grant No. N N519 433339 **Multicommodity auction models for trading telecommunication network resources**. Granting period: 22.10.2010 – 21.10.2011. Principal investigator: Eugeniusz Toczyłowski. Investigator: Kamil Kołtyś.

The project concerns resource allocation problem in the telecommunication network. It is assumed that the network resources may be owned by many different entities and many customers are interested in obtaining some of these resources in order to realize specific telecommunication services. In such a case the resource allocation may be done through multilateral exchange between many sellers and many buyers using market mechanism. The aim of the project is to develop auction models based on the multicommodity turnover model that support efficient allocation of network resources offered for sale to services demanded by customers. Developed auction models should take into account many different requirements regarding network resources (e.g. modular capacity) and services (e.g. VPN service requirements, hop constraint). Auction models are defined as LP or MILP optimization problems that can be solved by standard optimization solvers. Decomposition methods such as aggregation and column generation technique are considered to improve the computational efficiency of proposed models. Desired properties of auction models are examined theoretically using convex optimization and game theory and through simulations.

- [PR11] MNiI Grant No. N N514 128733 **Active sensing, interpretation of sensory information and manipulation in service robots**. Granting period: 31.10.2007 – 30.10.2010. Principal investigator: Cezary Zieliński.

This work focused on the control requirements for service robots, especially on the sensing and manipulative capabilities. Active sensing involves purposeful motion of the robot to obtain relevant information from the environment. Once the measurements are obtained they need to be transformed into symbolic form in the interpretation process. The other aspect of this research is two handed manipulation and multi-fingered grasping. A multi-fingered gripper was developed for that purpose. Force sensing and visual servoing were used to perform service tasks. Moreover, the Human-Machine Interface was under investigation. Both speech understanding and recognition of gestures were studied. The experiments were conducted on a two-handed robot system equipped with cameras and force sensors. The control software was based on the MRROC++ robot programming framework.

- [PR12] MNiSW grant No. PBZ-MNiSw-02/II/2007: **Models of trade in the telecommunication bandwidth market**. Granting period: 02.01.2008 – 31.12.2010. Investigators: Przemysław Kacprzak, Mariusz Kaleta, Kamil Kołtyś, Robert Kuźmiak, Piotr Pałka, Eugeniusz Toczyłowski, Tomasz Traczyk, Izabela Żółtowska.

The aim of the project is to design innovative mechanisms for bandwidth trade in the market of telecommunications transport network. The mechanisms should be designed in the form of auctions and exchanges, that enhance the efficiency of resource allocation and support the development of bandwidth market toward competition. The expected results of the project will be: the analysis of the state of global research and application of bandwidth trading models; the innovative proposals for models and mechanisms for bandwidth trading; the platform for comparative analysis of specific options of research; project of the physical, operational and information architecture of the system supporting the processes of bandwidth trade.

[PR13] MNiSW grant No. PBZ-MEiN-1/2/2006: **Energetic safety of the country**. Granting period: 01.04.2007 - 30.03.2010. Consortium of 4 technical universities. Coordinator: Gdansk University of Technology, Department of Electrical Power Engineering. Principal investigators: Eugeniusz Toczyłowski, Przemysław Kacprzak, Mariusz Kaleta, Piotr Pałka, Mariusz Rogulski, Kamil Smolira, Tomasz Traczyk, Izabela Żółtowska.

In 2009, the detailed task was formulated as follows: "Balancing market: proposal of functional and legal solutions". This topic is a continuation of works conducted in previous years and is focused on summary and proposals of directions for balancing market evolution. It is compatible with the main goal of the project which is to investigate the possibilities for improving energetic safety of the country within the range of generating, transmission and dispatching electrical energy on market conditions. A wide range of safety issues are considered, including strategic safety pertaining to investments, long-term safety pertaining to system utilization, mid-term and short-term safety related to system operating in normal and failure states. ICCE tasks can be grouped in two streams: 1) developing multi-commodity trade mechanisms for balancing electrical energy market and cross-border capacity auctions from the point of view of system safety conditions; 2) developing open data standards for scientific researches in the area of electrical energy market mechanisms. Variants of balancing the electrical energy systems based on multi-commodity mechanism are to be developed. Preliminary open environment for experiments and benchmark data repository of market balancing mechanism are proposed.

[PR14] MNiSW grant No. N N514 416934: **Parallel and distributed global optimization algorithms for large scale systems**. Granting period: 21.04.2008 – 20.04.2010. Principal investigator: Ewa Niewiadomska-Szynkiewicz. Investigators: Krzysztof Malinowski, Adam Woźniak, Andrzej Karbowski, Mariusz Kamola, Bartłomiej Kubica, Michał Marks, Jacek Błaszczyk.

The research is concerned with high performance computing (HPC). The general objective of the project is to develop, implement and test novel optimization methods. The designed and implemented solvers will be applied to solve real-life problems such as control of complex physical systems. Due to the complexity of the considered problems the attention is focused on parallel and distributed computation and issues associated with reduction of computer memory usage. A new data format for storing triangular and symmetric matrices is investigated. Particularly the research is addressed to: fast and minimal storage linear and nonlinear continuous optimization solvers, hierarchical methods applying various approaches to problem decomposition, deterministic and stochastic global optimization and algorithms applying interval arithmetic tools. The project addresses theoretical investigations, computer implementation of developed numerical algorithms and simulation experiments. The expected results of the project are novel optimization algorithms and their computer implementation accompanied with theoretical and experimental investigations. Two libraries of solvers involving parallel and distributed optimization algorithms applying recursive packed formats for storing matrices were developed. The first is the library of fast and effective linear and nonlinear solvers. The second library, called EPOCS (Environment for Parallel Optimization of Complex Systems) is dedicated to complex convex and nonconvex optimization problems. The integrated software platform EPOCS provides tools for calculating local and global solutions on parallel and multi-core computers or computer clusters. It contains algorithms for local and global optimization. The graphical interface is provided to optimization problem definition and results presentation. The effectiveness of optimization algorithms were tested through numerical experiments. Both libraries are useful tools for research and education. The results of the project were described in the research papers, a book devoted to parallel computing, and presented on conferences.

- [PR15] MNiSW Grant No. N N516 186035: **Decision support in problems with numerous and structured criteria**. Granting period: 30.10.2008 – 30.12.2010. Principal investigator: Włodzimierz Ogryczak. Investigator: Bartosz Kozłowski.

This project elaborates on how to deal with multicriteria decision problems characterized by numerous and structured criteria. Appropriate identification of the preferences of the DM is a critical aspect of the optimization problem. Based on objective satisfaction levels, the approximation of preferences on the whole set of decision alternatives is possible to be constructed. Developed approach enables usage of typical Reference Point Method achievement functions based on aspiration and reservation levels as well as a novel concept of the solidarity point. The method can be used on every level of hierarchical structure criteria.

- [PR16] MNiSW Grant No. N N516 430733 **Universal Trust: new trust management algorithms and protocols**. Granting period: 31.10.2007 – 30.10.2010. Coordinator: Polish Japanese Institute of Information Technology. Principal investigator: Włodzimierz Ogryczak. Investigator: Michał Majdan.

The research aims to enhance the functionality of distributed information systems by providing a standard service for managing trust. uTrust (universal Trust) project is a first step on this path. The goal of uTrust is to develop a universal and formalized approach for trust management in a wide range of distributed information systems. Basing on this approach, the practical goal of the project is to provide a universal library of trust management functions.

- [PR17] MNiSW Grant No. N N516 375736: **Methods and architectures of information interchange for electronic trade on infrastructural markets**. Granting period: 28.04.2009 – 27.01.2012. Principal investigators: Tomasz Traczyk, Eugeniusz Toczyłowski, Włodzimierz Ogryczak, Janusz Granat, Mariusz Kaleta, Henryk Rybiński (II), Zbigniew Nahorski (IBS PAN), Jacek Malinowski (IBS PAN). Investigators: Piotr Pałka, Kamil Smolira, Przemysław Kacprzak, Piotr Modliński, Kamil Kołtyś, Rafał Wilk, Łukasz Mączewski, Dominik Ryzko (II PW), Przemysław Więch (II PW).

Development of methods of electronic communication between entities taking part in trade on infrastructural markets. Research work include architecture and protocols of data interchange, and structure of the information, as well as methods for offers searching and negotiations in the Network.

Implementation of the results of this work may stimulate a progress on infrastructural markets, particularly development of multi-commodity Internet auctions, including distributed auctions (without central managing entity), and real-time auctions. Methods worked out can be applied in many segments of infrastructural markets, e.g. in power industry, telecommunications, and other infrastructural sectors of economy. Application of based on strong theory, formalized, verified and well described methods of M3 platform may trigger qualitative changes, which improve effectiveness, transparency, and consistency of market mechanisms. It may also help new entities to have access to the market, which formerly could be impossible due to existing informational or organizational barriers. Application of the result of the work can stimulate development of new markets and services, which finally can contribute to acceleration of growth and improvement of effectiveness of given sector of economy.

- [PR18] MNiSW Grant No. N N516 069837: **Transformational Design of Business Processes in Service Oriented Architecture**. Granting period: 06.10.2009 – 05.08.2010. Principal investigator: Krzysztof Sacha. Investigator: Andrzej Ratkowski.

The research is concerned with a business processes design method and its implementation to the environment of Service Oriented Architecture. The main concept of this method is application to designed business process number of transformations in order to gain concrete result starting from an abstract process. Another desired effect is to reach better quality of a designed process in non-functional aspects. Processes are expressed and designed in a SOA related tool – Business Process Execution Language (BPEL). Each single transformation applied to BPEL process has to improve its quality without changing its behavior. The goal of the research is to define effective method to verify behavior equivalence after the transformation has been applied. To reach this goal the BPEL process has to be translated into LOTOS language and its behavior has to be examined with algebra process formalism. Another problem is how to define set of non-changing behaviour transformations that are similar to refactorings used in software engineering and how to examine processes behavior before and after transformation. To gain consistent design method there are quality metrics calculated for BPEL design process and is proposed a decision making strategy to decide which transformation should be applied in order to reach the best version of final process.

- [PR19] MNiSW Grant No. N N514 237137: **Trajectory optimization in robotic systems with the use of learning based techniques**. Granting period: 13.10.2009 – 12.10.2011. Principal investigator: Paweł Wawrzyński. Investigator: Tomasz Winiarski.

The objective of the project is to create a methodology of movement trajectory optimization in robotic systems that would work as movements are repeated. This would correspond to a natural ability of humans to improve efficiency of their physical activities as these are repeated. The methodology has potential of significant increase of robot work efficiency, like the movement efficiency of a person is increased since he or she grabs a tennis racket for the first time to the moment he/she becomes a tennis Olympic champion. The above methodology will be based on reinforcement learning techniques. When designed and implemented, it will be applied to optimize movements that consist solving the Rubik's cube by a robotic system that includes two modified IRp-6 robots.

- [PR20] MNiSW Grant No. N N516 070637: **Ant Algorithms for Adaptive Routing in Telecommunication Networks**. Granting period: 02.10.2009 – 30.09.2010. Principal investigator: Andrzej Pacut. Investigator: Małgorzata Joanna Kudelska.

The aim of the project is to analyze and optimize ant routing algorithms for communication networks. The robustness of these algorithms to parameter changes and the adaptation process to several scenarios of load level changes will be examined. Moreover, a modeling scheme of the packet end-to-end delay distribution will be proposed. The packet delay distribution will be modeled as a mixture of statistical distributions and these models will be built in every node of the network in an on-line manner. The models will be then used to improve the ant routing algorithms. On the base of the delay models it will be possible to build a path quality indicator that will be a better representation of the packet delays than just a mean value that is used most often. The packet delay models will be also used to develop a modification of the TCP protocol, which would be more robust to packet reordering. The delay model will be used to compute the probability that a packet assumed lost by the TCP agent will still arrive and in fact has not been lost. Thank to such mechanism, it will be possible to decrease the number of needless retransmissions in a network controlled by ant routing algorithms. Moreover, we expect that using the modified TCP will extend the range of load levels under which the

ant algorithms are able to find efficient routing policies. The analysis and results of the operation of the proposed mechanisms will be presented.

- [PR21] MNiSW Grant No. N N516 070937: **Learning mechanisms with geographical localization of knowledge for adaptive routing control in mobile ad-hoc networks.** Granting period: 02.10.2009 – 30.09.2010. Principal investigator: Andrzej Pacut. Investigator: Michał Adam Kudelski.

The aim of the project is to introduce and analyze an innovative approach to managing the knowledge gathered by routing agents in ad-hoc networks during the learning process. Namely, the concept of distributed geographical localization of knowledge will be proposed. In the proposed approach, the knowledge gathered by ant agents in an ad-hoc network will be connected with locations in the network rather than with individual nodes. It is expected that the proposed solution will increase the robustness of the learning algorithm to dynamic topology changes in the network and improve its adaptation capabilities. The expected final result of the project is a complex adaptive routing mechanism for ad-hoc networks based on the ant algorithm with geographical localization of knowledge. The analysis of the operation of the proposed mechanism will be presented as well.

- [PR22] MNiSW Grant No. N N514 408536: **Effective algorithms of optimizing predictive control with neural and fuzzy models of nonlinear processes.** Granting period: 30.06.2009 – 29.12.2011. Principal investigator: Piotr Tatjewski. Investigators: Piotr Marusak, Maciej Ławryńczuk.

The aim of the research project are numerically effective algorithms for model-based optimizing predictive feedback control. Technique of model-based predictive control (MPC) is now a dominating technique of advanced control, having a strong influence both on the direction of development of industrial control systems as well as on research in this area. In the project, research concerning predictive feedback control algorithms acting in cooperation with on-line economic optimization of the set-points will be performed. Nonlinear process models will be considered, as the on-line economic optimization results usually in the necessity of even strong moves of the set-points, therefore the approach based on point-linear process models is not adequate. Due to a number of advantages, in the proposed algorithms nonlinear models mainly in the form of neural networks and fuzzy models (in Takagi-Sugeno structures) will be considered. Important, from practical point of view, topics of the research will be numerical effectiveness, robust stability, tolerance on faults in the control system.

- [PR23] MNiSW Grant No. N N514 044438: **Development of incentive compatible models and mechanisms in multi-agent systems.** Granting period 2.04.2010 – 1.04.2013. Investigator: Eugeniusz Toczyłowski.

Control and management of the production, distribution, exchange of goods and service processes in complex multi-agent systems, in which there are many autonomous entities, requires sophisticated models and decision-making mechanisms. These mechanisms should ensure the effective management processes in terms of information privacy, the incompatibility of individual interests, market competition and the occurrence of many conditions and constraints specific to each system. Effective implementation of overarching objectives in the game market requires that the interests of the individuals, group and global interests are harmonized. The main objective of the project is analysis, design and verification of different aspects and characteristics of the models, mechanisms and decision-making processes in complex systems. The investigation of the various aspects and applications of market mechanisms is needed. In particular, the complex, multi-stage,

long-term, multi-commodity with complex infrastructure constraints, markets is analyzed. The analyze, design and verification of complex models and mechanisms that have desirable properties, namely the harmonization of objectives of individual participants, groups, the market designer, and external stakeholders (government, supranational institutions, such as the European Union) are done. Within the project, we develop methodology for the design of efficient and incentive compatible decision-making mechanism, and analyze the basic elements of models, market mechanisms and processes to ensure efficiency and incentive compatibility.

- [PR24] MNiSW Grant No. IP 2010 021070: **Optimization models of the Conditional Average with hedging and compensation**. Granting period: 20.12.2010 – 31.12.2011. Principal investigator: Adam Krzemienowski.

The aim of the project is to develop and analyze optimization models of the Conditional Average with hedging and compensation. The Conditional Average (CAVG) is a new risk measure which is defined as the integral over the central part of the quantile function. The use of CAVG with hedging may improve the outcomes generated by the Conditional Value-at-Risk (CVaR), a commonly used risk measure. CVaR, as the mean within the specified portion (quantile) of the worst outcomes, is a quite pessimistic measure. Sometimes, this may lead to inferior decisions with respect to risk, since CVaR focuses only on an underperformance. It is possible to overcome this flaw by utilizing CAVG and hedging against extreme losses. A similar strategy can be used in public facility location problems, where the Kaldor-Hicks criterion is used to compensate the most distant clients for their losses. This strategy may improve economic efficiency for the society as a whole.

- [PR25] MNiSW Grant No. O R00 0026 07: **The platform for secure implementation of biometric systems for verification and identification**. Granting period: 17.07.2009 – 16.07.2011. The project is conducted within the 7th competition for development projects in the field of security and country's defense, of the Ministry of Science and Higher Education. Coordination: ICCE WUT. Principal investigators: NASK, Polish Security Printing Works and University of Warsaw. Principal investigator and project coordinator: Andrzej Pacut. Investigators: Włodzimierz Kasprzak, Włodzimierz Ogryczak.

The use of biometric systems becomes an inevitable element to ensure appropriate level of security. This applies to passports, visas, some electronic transactions and in near future other documents or network identifiers. The requirements for application of biometrics apply to common documents, issued by polish authorities but by other countries' as well. Those task are to be faced by The Ministry of Foreign Affairs, The Ministry of the Interior and Administration and The Ministry of infrastructure. This creates the demand for purchase appropriate devices, defining quality requirements for them, selection of appropriate technologies for biometric data comparison, but also defining the procedures for secure collection and verification of biometric data. Appropriate legislative procedures also need to be defined. The application of biometric techniques must fulfill many security requirements so that it improves the security instead of decreasing it. Considering the pan-European scope of those aspects the developed solutions must be harmonized with international standards, and at the same time agree with Polish legislation.

- [PR26] Statutory Grant No. 504G036300: **Development of methodology of control, decision support and production management**. Granting period 1.10.2009 – 31.12.2010 and 6.04.2010 – 31.12.2011. Principal investigators: Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Włodzimierz Ogryczak, Krzysztof Sacha, Piotr Tatjewski, Eugeniusz Toczyłowski, Cezary Zieliński.

5 Degrees Awarded

5.1 Professor Degrees

Professor ANDRZEJ PACUT has been nominated to the title of professor on December 2010.

5.2 Ph.D. Degrees

Advisor: **Krzysztof Malinowski**

MICHAŁ KARPOWICZ

Coordination in Hierarchical Systems with Rational Agents

Thesis defended on January 2010 (with honors)

Advisor: **Andrzej Pacut**

ŁUKASZ STASIAK

Real time particle filtering for parallel face detection, tracking and recognition from video sequences

Thesis defended on November 2010

MICHAŁ KUDELSKI

Ant learning with distributed geographical localization of knowledge for adaptive routing control in ad-hoc networks

Thesis defended on December 2010

JOANNA PUTZ-LESZCZYŃSKA

Handwritten signature verification employing dynamic time warping

Thesis defended on December 2010 (with honors)

Advisor: **Krzysztof Sacha**

ANNA FELKNER

Zarządzanie zaufaniem oparte na rolach

Thesis defended on February 2010

5.3 M.Sc. Degrees

Advisor: **Jarosław Chudziak (II)**

P. POREBSKI

Jakość danych i informacji w systemach informacyjnych

Degree awarded on March 2010

Advisor: **Piotr Garbat (IMIO)**

M. POMARAŃSKI

Zastosowanie ekranu dotykowego w sterowaniu aplikacjami dla urządzeń mobilnych

Degree awarded on October 2010

K. RÓŻYCKI (OKNO)

System wspomagania treningu sportowego z wykorzystaniem technologii RIA

Degree awarded on March 2010 (with honors)

R. SZUL (OKNO)

Opracowanie komponentu zarządzania siecią ekspertów dla dowolnego systemu CMS. Przykładowa implementacja systemu obsługi interesantów dla wybranej instytucji

Degree awarded on March 2010

Advisor: **Piotr Gawrysiak (II)**

G. GROCHOWSKI (OKNO)

Internetowy system obsługi zgłoszeń Helpdesk z modulem sztucznej inteligencji

Degree awarded on March 2010

Advisor: **Janusz Granat**

A. BALCERZAK

Przetwarzanie zdarzeniowe w czasie rzeczywistym w systemach informatycznych wspomagania decyzji

Degree awarded on March 2010

P. DĘBIEC

Równoległe przetwarzanie dużych zbiorów danych w serwerach OLAP

Degree awarded on October 2010

A. HURKAŁA

Zorientowane zdarzeniowo internetowe usługi informacyjne uwzględniające preferencje użytkowników

Degree awarded on July 2010 (with honors)

J. HURKAŁA

System zarządzania wiedzą osobistą

Degree awarded on July 2010 (with honors)

J. WOJCIECHOWSKI

Wirtualna obiektowa baza danych z automatyczną transformatą obiektowo-relacyjną

Degree awarded on March 2010 (with honors)

J. WOJEWÓDZKA (OKNO)

Human Resources Allocation Forecast

Degree awarded on October 2010

Advisor: **Elżbieta Grzejszczyk (Wydział Elektryczny)**

R. KOSTECKI (OKNO)

System CRM w odniesieniu do wybranych zagadnień e-biznesu

Degree awarded on October 2010

Advisor: **Krystian Ignasiak (IRE)**

J. RYBSKI (OKNO)

Przenośność oprogramowania na przykładzie wieloplatformowego komunikatora internetowego

Degree awarded on July 2010

Advisor: **Stanisław Jankowski (ISE)**

M. WOJCIESZONEK (OKNO)

Metoda uczenia sieci neuronowych wykorzystująca teorię wrażliwości

Degree awarded on March 2010

Advisor: **Mariusz Kamola**

P. TALIPSKI

System wspomagania organizacji eksperymentów dla mechanizmu podziału zasobów giełdy usług wielotowarowych

Degree awarded on March 2010

Advisor: **Andrzej Karbowski**

K. OBAŁKA (OKNO)

Metody obliczeniowe oraz ich efektywność dla markowskich procesów decyzyjnych z dwoma kryteriami: wartość oczekiwania oraz semiwariancja

Degree awarded on October 2010

Advisor: **Włodzimierz Kasprzak**

D. BOBOWSKI

Program do analizy zdjęć lotniczych i satelitarnych

Degree awarded on June 2010

P. FRELEK

Symulator systemu wieloagentowego wykonującego zadania eksploracji terenu

Degree awarded on September 2010

Advisor: **Adam Kozakiewicz**

M. KOSTECKI (OKNO)

Rozproszone sieci neuronowe w środowisku gridowym

Degree awarded on October 2010

Advisor: **Bartłomiej Kubica**

Ł. GAJEWSKI (OKNO)

Porównanie narzędzi do tworzenia aplikacji graficznych na stronach internetowych na przykładzie implementacji gry w oparciu o platformy adobe flash i Microsoft Silverlight

Degree awarded on July 2010

T. ZUPKA

Implementacja biblioteki do obliczeń symbolicznych na wielomianach, w tym liczenie baz Gröbnera

Degree awarded on September 2010

Advisor: **Sławomir Kula (TELE)**

K. NOWAK (OKNO)

Technologia 3G – ogólnodostępna alternatywa dla obecnie stosowanych rozwiązań w domowych i firmowych sieciach LAN

Degree awarded on March 2010

Advisor: **Julian Myrcha (II)**

M. GREGORCZYK

JavaFx jako innowacyjne rozwiązanie RIA

Degree awarded on April 2010

Advisor: **Ewa Niewiadomska-Szynkiewicz**

D. PIOTROWSKI

Środowisko do badań porównawczych mechanizmów aukcyjnych

Degree awarded on November 2010

Advisor: **Włodzimierz Ogryczak**

K. DUDZIŃSKI

Metoda punktu odniesienia z agregacją WOVA

Degree awarded on October 2010

J. SKURATOWICZ

Wielokryterialna optymalizacja mapy fluencji

Degree awarded on April 2010

K. WITKOWSKI

Zarządzanie reputacją w sieciach P2P: analiza wybranych algorytmów

Degree awarded on October 2010

Advisor: **Krzysztof Pieńkosz**

T. BARAŃSKI

Szeregowanie zadań z częściową podzielnością na procesorach równoległych

Degree awarded on March 2010

J. GAWORZEWSKI (OKNO)

Problem optymalizacji rozkroju tektury w procesie produkcji opakowań

Degree awarded on October 2010

Advisor: **Grzegorz Płoszajski**

M. GAWAŁKO

Wspomaganie jednolitej klasyfikacji tematycznej preprintów pochodzących z różnych repozytoriów

Degree awarded on March 2010

Advisor: **Piotr Salata (II)**

T. SŁOMSKI

Music Mining: a music player utilizing clustering algorithm and music analysis

Degree awarded on March 2010

Advisor: **Andrzej Stachurski**

K. DZIAĞ

Algorytmy ewolucyjne w wieloetapowym zadaniu transportowym

Degree awarded on July 2010

K. SOKOŁOWSKA

Selekcja cech w zadaniach klasyfikacji obiektów metodą SVM

Degree awarded on March 2010 (with honors)

K. WNUK

Korelacja danych w problemach budowy optymalnego portfela i współzależności giełdy i gospodarki

Degree awarded on October 2010

Advisor: **Wojciech Szynkiewicz**

K. CZAJKOWSKI

System planowania i realizacji chwytów za pomocą robotycznych rąk

Degree awarded on September 2010

M. GAIK

Budowanie trójwymiarowej mapy otoczenia na podstawie danych z kamery i dalmierza laserowego

Degree awarded on September 2010

Advisor: **Tomasz Śliwiński**

S. BISKUP

System wspomaganie decyzji w konstruowaniu portfela inwestycji

Degree awarded on May 2010

Advisor: **Eugeniusz Toczyłowski**

K. CHODNICKI

Uczenie się agentów w wieloagentowej platformie wymiany towarowej w sieciach teleinformatycznych

Degree awarded on October 2010

Advisor: **Paweł Tomaszewicz (TELE)**

M. KUCHARCZYK

Sprzętowe wspomaganie trasowania pakietów IPv6

Degree awarded on October 2010

W. WYDRZYŃSKI

Sprzętowe wspomaganie trasowania pakietów IPv6

Degree awarded on October 2010

Advisor: **Tomasz Traczyk**

M. LECHMAN

Zastosowanie języka XVCL do budowy depozytorium diagramów klas

Degree awarded on April 2010 (with honors)

Advisor: **Wiesław Traczyk**

P. ROZENBAJGIER

Rozproszony system ekspercki z rozmytymi wartościami

Degree awarded on July 2010

Advisor: **Tomasz Winek (Wydział Elektryczny)**

K. WIŚNIEWSKI (OKNO)

Zastosowanie osadzonych komunikatów z wykorzystaniem protokołu SIP przy budowie portali internetowych

Degree awarded on March 2010

Advisor: **Tomasz Winiarski**

J. KURYŁO

Interaktywne programowanie robotów przy pomocy bezprzewodowego interfejsu sterującego

Degree awarded on October 2010

Advisor: **Piotr Witoński (IMIO)**

Ł. DURKA (OKNO)

Wydajne przeszukiwanie zasobów dyskowych

Degree awarded on October 2010

M. SZEWCZYKOWSKI (OKNO)

Projekt i wykonanie oprogramowania do prezentacji, przetwarzania i analizy danych z radarów meteorologicznych

Degree awarded on September 2010

Advisor: **Andrzej Zalewski**

K. GÓRAL

Analiza choreografii procesów biznesowych BPEL

Degree awarded on March 2010 (with honors)

P. MARKIEWICZ

Modelowanie interakcji pomiędzy komponentami w architekturze sterowanej zdarzeniami (EDA) w oparciu o UML

Degree awarded on March 2010

A. WYMYSŁOWSKA

Generowanie kodu dla środowisk integracyjnych ze specyfikacji w języku UML

Degree awarded on July 2010

Advisor: **Izabela Żółtowska**

M. WOJTYNIAK

Planowanie rozkładów jazdy pociągów poprzez aukcje w standardowym M3

Degree awarded on March 2010

5.4 B.Sc. Degrees

Advisor: **Piotr Arabas**

W. GRUSZCZYŃSKI

Narzędzia wspomagające proces redukcji odejść użytkowników z sieci telekomunikacyjnej

Degree awarded on February 2010

Advisor: **Andrzej Ciemski (II)**

A. BIELASTY

Zastosowanie technologii JEE i Hibernate do budowy nowoczesnego muzycznego sklepu internetowego

Degree awarded on February 2010

R. OSIŃSKI

Zarządzanie transakcjami z użyciem monitora transakcji na przykładzie banku

Degree awarded on February 2010

Advisor: **Adam Czajka**

A. BIELAWSKI

Test żywotności oka z wykorzystaniem własności absorpcyjnych tęczy

Degree awarded on September 2010

W. GUTFETER

Lokalizacja tęczy metodą aktywnych konturów

Degree awarded on September 2010

K. PIECH

Biometryczna karta elektroniczna

Degree awarded on September 2010

M. TYM-CZARNOCKI

Kompaktowe kodowanie podpisu odręcznego

Degree awarded on July 2010

Advisor: **Paweł Domański**

S. STOCKI

Time-series prediction

Degree awarded on September 2010 (with honors)

M. WIĘCŁAWSKI

Making computations with a graphic card: CUDA technology in time series prediction

Degree awarded on September 2010

Advisor: **Janusz Granat**

A. KOSTRZEWA

Wykrywanie anomalii w zdalnym monitoringu pacjentów

Degree awarded on October 2010 (with honors)

Advisor: **Antoni Grzanka (ISE)**

T. KUŚMIERCZYK

Deskrytory punktów w analizie morfologicznej obrazów trójwymiarowych twarzy

Degree awarded on September 2010

Advisor: **Jerzy Gustowski**

P. KORCZAK

System zarządzania suszarnią w procesie produkcji kostki brukowej

Degree awarded on September 2010

Advisor: **Mariusz Kaleta**

T. KOLBUS

Wspomaganie obróbki dokumentów M3-XML w systemie z graficznym interfejsem użytkownika

Degree awarded on September 2010

Advisor: **Mariusz Kamola**

P. JABŁOŃSKI

Porównanie metod autoryzacji Port-knocking i Single Packet Authorization pod względem bezpieczeństwa i praktycznego wykorzystania do zdalnego wykonywania operacji na serwerze z zamkniętymi portami

Degree awarded on March 2010

Advisor: **Włodzimierz Kasprzak**

P. SUSZYŃSKI

Rozpoznawanie słów mówionych z wykorzystaniem ukrytych modeli Markowa

Degree awarded on February 2010

Advisor: **Tomasz Kornuta**

M. PRUCHNIAK

Wykorzystanie GPU w algorytmach przetwarzania obrazów

Degree awarded on June 2010

Advisor: **Adam Kozakiewicz**

J. GĘBALA

Narzędzia do analizy zjawiska Fast-flux w DNS

Degree awarded on February 2010

Advisor: **Adam Krzemienowski**

M. SASIN

Optymalizacja portfela opcji z warunkową wartością zagrożoną jako miarą ryzyka

Degree awarded on October 2010

M. SZEWCZYK

Symulator gry rynkowej

Degree awarded on October 2010

Advisor: **Maciej Ławryńczuk**

P. GÓRECKI

Sieci neuronowe do optymalizacji kwadratowej

Degree awarded on July 2010

P. KUŹMA

Integracja możliwości obliczeniowych środowiska MATLAB z Microsoft Visual Studio: uczenie radialnych sieci neuronowych

Degree awarded on September 2010

P. NOSALSKI

Algorytmy regulacji predykcyjnej z modelami w przestrzeni stanów

Degree awarded on July 2010

Advisor: **Piotr Marusak**

S. SWIANIEWICZ

Rozmyte sterowanie predykcyjne reaktora chemicznego w warunkach ograniczeń - implementacja i badania symulacyjne

Degree awarded on July 2010

Advisor: **Ewa Niewiadomska-Szynkiewicz**

P. KANIA

Algorytmy lokalizacji w sieciach mobilnych ad hoc

Degree awarded on September 2010

P. WOLSZCZAK

System informatyczny do badania mechanizmów aukcyjnych

Degree awarded on February 2010

Advisor: **Tomasz Owczarek (ISE)**

M. ZAWIŚLAK

Monitoring mobile networks using mobile terminal

Degree awarded on February 2010

Advisor: **Piotr Pałka**

M. CAŁKA

Szkielet symulatora wieloagentowej platformy wymiany wielotowarowej

Degree awarded on September 2010

Advisor: **Krzysztof Pieńkosz**

M. BIAŁOBRZEWSKI

Modele i algorytmy alokacji przepustowości dla wirtualnych sieci prywatnych

Degree awarded on September 2010

A. CHABOWSKA

Metody i algorytmy pakowania elementów podzielnych

Degree awarded on September 2010

P. MILEWSKI

Przybliżone metody rozwiązywania semi-ciągłego problemu transportowego

Degree awarded on July 2010

Advisor: **Krzysztof Sacha**

Ł. CIECHOMSKI

Monitorowanie przepływów biznesowych na serwerach integracyjnych platformy WebMethods

Degree awarded on February 2010

M. LUSA

Porównanie technologii Java Enterprise Edition 5 i .NET 3.5

Degree awarded on July 2010

K. WÓJCIK

Technologie warstwy prezentacji

Degree awarded on September 2010

Advisor: **Andrzej Stachurski**

Ł. LENDA

Rozproszony algorytm podziału i oszacowań do rozwiązywania kwadratowego zadania przedziału

Degree awarded on October 2010

J. TYSZEWSKI

Comparing different criss-cross pivoting algorithms in linear programming

Degree awarded on July 2010

B. WIECHA

Opracowanie aplikacji wspomagającej zarządzanie pakietem AMPL w systemie Windows XP

Degree awarded on October 2010

Advisor: **Wojciech Szykiewicz**

K. ROGALA

Planowanie i koordynacja działań zespołu robotów na przykładzie zadania gry drużyny robotów w piłkę nożną

Degree awarded on February 2010

K. TRZCIŃSKI

Synteza chwytu precyzyjnego dla chwytaka trójpalczastego

Degree awarded on September 2010

Advisor: **Eugeniusz Toczyłowski**

Ł. DRAŻEK

System wspomagania zarządzania łańcuchem dostaw w warunkach rynkowej konkurencji przy jednostopniowej produkcji

Degree awarded on February 2010

K. SĘDROWICZ

Wspomaganie decyzji operatorów aukcji wielotowarowych w energetyce

Degree awarded on February 2010

J. SKORUPIŃSKI

Wieloagentowy system komputerowy wspomagający wielokryterialną analizę w problemie producenta i klientów

Degree awarded on July 2010

Advisor: **Paweł Wawrzyński**

K. BĄK

Symulator dynamiki złożonych układów fizycznych

Degree awarded on February 2010

K. BOCZKAL

Automatyczny dobór parametru kroki dla uczącej się on-line sieci neuronowej

Degree awarded on September 2010

T. NIEWIAROWSKI

Implementacja interfejsu bezprzewodowego w robocie typu Bioloid

Degree awarded on June 2010

Advisor: **Tomasz Winiarski**

J. STOCKA

Graficzny edytor automatu specyfikującego zadanie robotyczne zapisane w języku XML

Degree awarded on June 2010

K. TARKOWSKI

Mikrokomputerowy układ z interfejsem Eth. do akwizycji danych z czujnika sił i momentów sił

Degree awarded on November 2010

Advisor: **Adam Woźniak**

P. MAJKA

Praktyczne algorytmy sprawiedliwego podziału

Degree awarded on February 2010

M. ŚWIDERSKI

Modelowanie sytuacji decyzyjnej wielu agentów o niezgodnych interesach

Degree awarded on September 2010

A. ZALEWSKI

Narzędzie z graficznym interfejsem użytkownika do optymalizacji gradientowej wykorzystujący pakiet do automatycznego różniczkowania

Degree awarded on March 2010

Advisor: **Andrzej Zalewski**

R. POJDA

Zastosowanie standardu COBIT w audycie rozwiązań integracyjnych

Degree awarded on February 2010

M. ROMANOWSKI

Narzędzie do modelowania decyzji architektonicznych w procesie konstrukcji systemów IT

Degree awarded on September 2010

Advisor: **Cezary Zieliński**

M. BORYŃ

Implementacja serwomechanizmów wizyjnych w systemie MRROC++

Degree awarded on September 2010

R. TULWIN

Trajectory generation in MRROC++ applications

Degree awarded on February 2010

6 Publications

6.1 Monographs

- [B1] Ambroszkiewicz Stanisław, Borkowski Adam, Cetnarowicz Krzysztof, Zieliński Cezary (red.): Inteligencja wokół nas. Współdziałanie agentów softwarowych, robotów, inteligentnych urzędzeń. Tom 15. Akademicka Oficyna wydawnicza EXIT, ISBN 978-83-60434-79-6, 2010
- [B2] Kasprzak Włodzimierz: Metody Sztucznej Inteligencji. OKNO Politechnika Warszawska, 182 pp., 2010
- [B3] Pieńkosz Krzysztof: Wybrane modele i metody optymalizacji alokacji zasobów. Prace naukowe Politechniki Warszawskiej – Elektronika. Tom 174. Oficyna Wydawnicza PW, ISBN 0137-2343, 132 pp., 2010
- [B4] Sacha Krzysztof: Inżynieria oprogramowania. PWN – Państwowe Wydawnictwo Naukowe, ISBN 978-83-01-16179-8, 417 pp., 2010
- [B5] Traczyk Wiesław: Inżynieria wiedzy. Akademicka Oficyna Wydawnicza EXIT, ISBN 978-83-60434-84-0, 273 pp., 2010

6.2 Chapters in Scientific or Technical Books

- [C1] Gawkowski Piotr, Ławryńczuk Maciej, Marusak Piotr, Tatjewski Piotr, Sosnowski Janusz: Dependability Comparison of Explicit and Numerical GPC Algorithms, in: Technological Developments in Education and Automation / Iskander Maged, Karim Mohammad A, Kapila Vikram (Eds.), 2010, Springer, ISBN 978-90-481-3655-1, pp. 419–424
- [C2] Kacprzak Przemysław, Kaleta Mariusz, Pałka Piotr, Smolira Kamil, Toczyłowski Eugeniusz, Traczyk Tomasz: Notation Methods for Large Volume Regular Data in Complex Electronic Trade Problems, in: Information Systems Architecture and Technology / Górski Arkadiusz (Ed.), 2010, Oficyna Wydawnicza Politechniki Wrocławskiej, ISBN 978-83-7493-544-9, pp. 217–228
- [C3] Kacprzak Przemysław, Kaleta Mariusz, Smolira Kamil, Toczyłowski Eugeniusz: Wykrywanie obszarów wymuszonych w mechanizmach rynkowych przy ograniczeniach, in: Automatyzacja procesów dyskretnych. Teoria i zastosowania / Świerniak Adam, Krystek Jolanta (Eds.), 2010, pkjs, ISBN 978-83-62652-01-3, pp. 95–103
- [C4] Ławryńczuk Maciej, Marusak Piotr, Tatjewski Piotr: Efficient Predictive Control Algorithms Based on Soft Computing Approaches: Application to Glucose Concentration Stabilization, in: Technological Developments in Education and Automation / Iskander Maged, Karim Mohammad A, Kapila Vikram (Eds.), 2010, Springer, ISBN 978-90-481-3655-1, pp. 425–430
- [C5] Marusak Piotr: Efficient Predictive Control Algorithms Based on Fuzzy Hammerstein Models: A Case Study, in: Soft Computing in Industrial Applications, AISC 75 / Gao X. Z. (Ed.), 2010, Springer-Verlag, pp. 11–20
- [C6] Ogryczak Włodzimierz, Śliwiński Tomasz: On efficient optimization of the CVaR and related LP computable risk measures for portfolio selection, in: Mathematical and Statistical Methods for Actuarial Sciences and Finance / Corazza Marco, Pizzi Claudio (Eds.), 2010, Springer, pp. 246–252

- [C7] Ogryczak Włodzimierz: On Robust Solutions to Multi-Objective Linear Programs, in: Multiple Criteria Decision Making '09 / Trzaskalik Tadeusz, Wachowicz Tomasz (Eds.), 2010, ISBN 978-83-7246-611-2, pp. 197–212
- [C8] Ogryczak Włodzimierz, Śliwiński Tomasz: On Solving Optimization Problems with Ordered Average Criteria and Constraints, in: Fuzzy Optimization, STUDEFUZZ 254 / Lodwick W.A., Kacprzyk Janusz (Ed.), 2010, Springer-Verlag, pp. 209–230
- [C9] Pałka Piotr, Toczyłowski Eugeniusz: Zgodność wybranych metod wyceny towarów z preferencjami uczestników rynku, in: Modelowanie preferencji a ryzyko'09 / Trzaskalik Tadeusz (Ed.), 2010, Wydawnictwo Uczelniane AE Katowice, ISBN 978-83-7246-549-8, pp. 255–268
- [C10] Sacha Krzysztof: Inference System for Trust Management Credentials, in: J. Mazurkiewicz *et al.*, Models and Methodology of System Dependability, 2010, Oficyna Wydawnicza Politechniki Wrocławskiej, pp. 121–133
- [C11] Sikora Andrzej, Niewiadomska-Szynkiewicz Ewa: Ad hoc Networks Simulator for Rescue Mission Planning, in: Concepts and Implementation for Innovative Military Communications and Information Technology / Amanowicz Marek (Ed.), 2010, Military University of Technology, ISBN 978-83-61486-70-1, pp. 387–396
- [C12] Zieliński Cezary: Formalne podejście do programowania robotów - struktura układu sterującego, in: Inteligencja wokół nas. Współdziałanie agentów softwarowych, robotów, inteligentnych urządzeń / Ambroszkiewicz Stanisław *et al.* (Eds.), 2010, Akademicka Oficyna wydawnicza EXIT, ISBN 978-83-60434-79-6, pp. 267–300
- [C13] Zieliński Cezary, Winiarski Tomasz, Szynkiewicz Wojciech, Kornuta Tomasz Michał, Trojanek Piotr: MRROC++ - programowa struktura ramowa do tworzenia sterowników systemów wielorobotowych, in: Inteligencja wokół nas. Współdziałanie agentów softwarowych, robotów, inteligentnych urządzeń / Ambroszkiewicz Stanisław *et al.* (Eds.), 2010, Akademicka Oficyna wydawnicza EXIT, ISBN 978-83-60434-79-6, pp. 317–384
- [C14] Zieliński Cezary, Trojanek Piotr: Współpraca robotów, in: Inteligencja wokół nas. Współdziałanie agentów softwarowych, robotów, inteligentnych urządzeń / Ambroszkiewicz Stanisław *et al.* (Ed.), 2010, Akademicka Oficyna wydawnicza EXIT, ISBN 978-83-60434-79-6, pp. 301–315

6.3 Scientific and Technical Papers in Journals

- [J1] Bem Tomasz, Kornuta Tomasz Michał, Winiarski Tomasz: Zastosowanie wizyjnej struktury ramowej FraDIA w aplikacjach robotycznych. Część II: Aplikacje, in: Prace Naukowe PW, seria Elektronika, Vol. II, No. 175, 2010, pp. 573–582
- [J2] Czajka Adam, Pacut Andrzej: Iris Recognition System Based on Zak-Gabor Wavelet Packets, in: Journal of Telecommunications and Information Technology, No. 4/2010, 2010, pp. 10–18
- [J3] Felkner Anna, Sacha Krzysztof: Deriving RTT Credentials for Role-Based Trust Management, in: e-Informatica Software Engineering Journal, Vol. 4, No 1, 2010, pp. 9-19, available online at: http://www.e-informatyka.pl/attach/e-Informatica_-_Volume_4/eInformatica2010Art1.pdf
- [J4] Gawkowski Piotr, Grochowski Konrad, Ławryńczuk Maciej, Marusak Piotr, Sosnowski Janusz, Tatjewski Piotr: Testing Fault Robustness of Model Predictive Control Algorithms, in: Architecting Critical Systems / Giese Holger (Ed.), Lecture Notes in Computer Science, No. 6150, 2010, Springer, ISBN 978-3-642-13555-2, pp. 109 – 124

- [J5] Gawkowski Piotr, Ławryńczuk Maciej, Marusak Piotr, Sosnowski Janusz, Tatjewski Piotr: Fail-bounded implementations of the numerical model predictive control algorithms, in: *Control and Cybernetics*, Vol. 39 (2010) No. 4, pp. 1117–1134
- [J6] Kacprzak Przemysław Henryk, Pałka Piotr, Kaleta Mariusz, Smolira Kamil, Toczyłowski Eugeniusz: Wykorzystanie narzędzi teorii gier do analizy mechanizmów rynku energii, in: *Rynek Energii*, Vol. 1(86)-2010, 2010, pp. 148–153
- [J7] Kaleta Mariusz: Computing L-Efficient Cost Allocations for Unbalanced Games, in: *Lecture Notes in Computer Science*, Springer, No. 6430, 2010, pp. 103–112
- [J8] Kaleta Mariusz, Pałka Piotr, Toczyłowski Eugeniusz, Traczyk Tomasz: Wykorzystanie modelu M3 w implementacji wieloagentowej platformy wymiany wielotowarowej w środowisku AIMMS, in: *Studia Informatica*, Vol. 2B(90), 2010, pp. 181–192
- [J9] Kaleta Mariusz, Toczyłowski Eugeniusz, A Cost Allocation Framework for LP and GLP Games, in: *Badania Operacyjne i Decyzje*, nr 4, 2009 (published in 2010), pp. 27–46
- [J10] Karbowski Andrzej, Remiszewski Maciej: Assessment of the Cell Broadband Engine Architecture as platform to solve closed-loop optimal control problems, in: *Parallel Computing*, Vol. 36, 2010, pp. 160–180
- [J11] Kasprzak Włodzimierz: Conditional median as a robust solution concept for uncapacitated location problems, Vol. 18, No. 1, 2010, pp. 271–285
- [J12] Kasprzak Włodzimierz, Ding N., Hamada N.: Relaxing the WDO Assumption in Blind Extraction of Speakers from Speech Mixtures, in: *Journal of Telecommunications and Information Technology*, No. 4/2010, 2010, pp. 50–58
- [J13] Kasprzak Włodzimierz, Czajka Ł., Wilkowski A.: A constraint satisfaction framework with Bayesian inference for model-based object recognition, in: *Computer Vision and Graphics*, part II, *Lecture Notes in Computer Science*, No. 6375, 2010, Springer-Vg., pp. 1–8
- [J14] Kołtyś Kamil Jan, Pałka Piotr, Toczyłowski Eugeniusz, Żółtowska Izabela: Bandwidth Trading: A Comparison of the Combinatorial and Multicommodity Approach, in: *Journal of Telecommunications and Information Technology*, No. 2/2010, 2010, pp. 67–72
- [J15] Kołtyś Kamil Jan, Pieńkosz Krzysztof: Modele aukcji przepustowości dla wirtualnych sieci prywatnych ze specyfikacją dostępu, in: *Przegląd Telekomunikacyjny – Wiadomości Telekomunikacyjne*, SIGMA NOT, No. 8-9/2010, 2010, pp. 1003–1010
- [J16] Kornuta Tomasz Michał: Application of the FraDIA Vision Framework for Robotic Purposes, in: *Lecture Notes in Computer Science*, Springer, No. 6375, 2010, pp. 65–72
- [J17] Kornuta Tomasz Michał: Zastosowanie wizyjnej struktury ramowej FraDIA w aplikacjach robotycznych. Część I: Struktura, in: *Prace Naukowe PW, seria Elektronika*, Vol. II, No. 175, 2010, pp. 563–572
- [J18] Kreinovich Vladik, Kubica Bartłomiej Jacek: From Computing Sets of Optima, Pareto Sets, and Sets of Nash Equilibria to General Decision-Related Set Computations, in: *Journal of Universal Computer Science*, Vol. 16, No. 18(2010), 2010, pp. 2657–2685
- [J19] Kruś Lech, Skorupiński Jan, Toczyłowski Eugeniusz: Analiza motywacyjnie zgodnych decyzji wielokryterialnych na przykładzie problemu producenta i klientów, in: *Polskie Stowarzyszenie Zarządzania Wiedzą, Seria Studia i Materiały*, No. 31, 2010, pp. 108–119

- [J20] Kubica Bartłomiej Jacek, Woźniak Adam: An Interval Method for Seeking the Nash Equilibria of Non-cooperative Games, in: *Lecture Notes in Computer Science*, Springer, Vol. 6068, 2010, pp. 446–455
- [J21] Kudelska Małgorzata Joanna, Pacut Andrzej: TCP Modification Robust to Packet Reordering in Ant Routing Networks, in: *Lecture Notes in Computer Science*, Vol. 6025, 2010, pp. 71–80
- [J22] Kudelski Michał Adam, Pacut Andrzej: A Generalized, Location-Based Model of Connections in Ad-Hoc Networks Improving the Performance of Ant Routing, in: *Lecture Notes in Computer Science*, Vol. 6025, 2010, pp. 91–100
- [J23] Kudelski Michał Adam, Pacut Andrzej: Ant Agent with Distributed Knowledge Applied to Adaptive Control of a Nonstationary Traffic in Ad-Hoc Networks, in: *Lecture Notes in Artificial Intelligence*, Springer, Vol. 6114, 2010, pp. 289–296
- [J24] Ławryńczuk Maciej: Computationally Efficient Nonlinear Predictive Control Based on State-Space Neural Models, in: *Lecture Notes in Computer Science*, Springer, No. 6067, 2010, pp. 350–359
- [J25] Ławryńczuk Maciej: Computationally efficient nonlinear predictive control based on neural Wiener models, in: *Neurocomputing*, No. 74, 2010, pp. 401–417
- [J26] Ławryńczuk Maciej: Dynamic Matrix Control Algorithm Based on Interpolated Step Response Neural Models, in: *Lecture Notes in Artificial Intelligence*, Springer, No. 6114, 2010, pp. 297–304
- [J27] Ławryńczuk Maciej: Explicit Neural Network-Based Nonlinear Predictive Control with Low Computational Complexity, in: *Lecture Notes in Artificial Intelligence*, Springer, No. 6086, 2010, pp. 649–658
- [J28] Ławryńczuk Maciej: Neural Dynamic Matrix Control Algorithm with Disturbance Compensation, in: *Lecture Notes in Artificial Intelligence*, Vol. 6098, 2010, pp. 52–61
- [J29] Ławryńczuk Maciej: Suboptimal nonlinear predictive control based on multivariable neural Hammerstein models, in: *Applied Intelligence*, Springer, Vol. 32, 2010, pp. 173–192
- [J30] Ławryńczuk Maciej: Training of neural models for predictive control, in: *Neurocomputing*, Vol. 73(2010), 2010, pp. 1332–1343
- [J31] Ławryńczuk Maciej, Tatjewski Piotr: Approximate Neural Economic Set-Point Optimisation for Control Systems, in: *Lecture Notes in Artificial Intelligence*, Springer, No. 6114, 2010, pp. 305–312
- [J32] Ławryńczuk Maciej, Marusak Piotr, Tatjewski Piotr: Współdziałanie regulacji predykcyjnej i bieżącej optymalizacji punktu pracy w strukturach sterowania z modelami Wienera, in: *Pomiary Automatyka Robotyka PAR*, No. 2 2010, 2010, pp. 470–480
- [J33] Majdan Michał Grzegorz, Ogryczak Włodzimierz: Multicriteria Subjective Reputation Management Model, in: *Lecture Notes in Artificial Intelligence*, Springer, No. 6086, 2010, pp. 678–687
- [J34] Marks Michał: A Survey of Multi-Objective Deployment in Wireless Sensor Networks, in: *Journal of Telecommunications and Information Technology*, No. 3/2010, 2010, pp. 36–41
- [J35] Marusak Piotr: A Mechanism of Output Constraint Handling for Analytical Fuzzy Controllers, in: *Lecture Notes in Artificial Intelligence*, Vol. 6097, 2010, pp. 222–227

- [J36] Marusak Piotr: Application of Fuzzy Wiener Models in Efficient MPC Algorithms, in: *Lecture Notes in Artificial Intelligence*, Springer, No. 6086, 2010, pp. 669–677
- [J37] Marusak Piotr: Disturbance Measurement Utilization in Easily Reconfigurable Fuzzy Predictive Controllers: Sensor Fault Tolerance and Other Benefits, in: *Lecture Notes in Computer Science*, Springer, No. 6086, 2010, pp. 551–559
- [J38] Marusak Piotr: On Prediction Generation in Efficient MPC Algorithms Based on Fuzzy Hammerstein Models, in: *Lecture Notes in Artificial Intelligence*, Springer, No. 6113, 2010, pp. 136–143
- [J39] Modliński Piotr: Problem harmonogramowania jako kombinatoryczna aukcja czasu, in: *Polskie Stowarzyszenie Zarządzania Wiedzą, Seria Studia i Materiały*, No. 33, 2010, pp. 136–145
- [J40] Niewiadomska-Szynkiewicz Ewa, Marks Michał: A Software Platform for Global Optimization, in: *Journal of Telecommunications and Information Technology*, No. 3/2010, 2010, pp. 49–56
- [J41] Ogryczak Włodzimierz: Bicriteria Models of Fair and Efficient Resource Allocation, in: *Lecture Notes in Computer Science*, Springer, No. 6430, 2010, pp. 140–159
- [J42] Ogryczak Włodzimierz: Conditional median as a robust solution concept for uncapacitated location problems, in: *TOP 18 (1)*, 2010, pp. 271–285
- [J43] Ogryczak Włodzimierz: Ordered Weighted Enhancement of Preference Modeling in the Reference Point Method for Multiple Criteria Optimization, in: *Soft Computing*, Vol. 14(2010), 2010, pp. 435–450
- [J44] Olender Paweł: Stochastic Models in Techno-Economic Analysis of Broadband Access Networks, in: *Journal of Telecommunications and Information Technology*, No. 2/2010, 2010, pp. 43–51
- [J45] Pacut Andrzej: Probabilistic Issues in Biometric Template Design, in: *Journal of Telecommunications and Information Technology*, No. 4/2010, 2010, pp. 75–85
- [J46] Pałka Piotr, Toczyłowski Eugeniusz: Pricing Rules Comparison in the Context of Bandwidth Trade, in: *Journal of Telecommunications and Information Technology*, No. 2/2010, 2010, pp. 61–66
- [J47] Połomski Adam: Multiagent Means of Bandwidth Allocation for Telecommunication Market, in: *Lecture Notes in Artificial Intelligence*, No. 6071, 2010, Springer, pp. 400–408
- [J48] Putz-Leszczynska Joanna Maria, Kudelski Michał Adam: Hidden Signature for DTW Signature Verification in Authorizing Payment Transactions, in: *Journal of Telecommunications and Information Technology*, No. 4/2010, 2010, pp. 59–67
- [J49] Radomski Dariusz, Ławryńczuk Maciej, Marusak Piotr, Tatjewski Piotr: Modeling of Glucose Concentration Dynamics for Predictive Control of Insulin Administration, in: *Biocybernetics and Biomedical Engineering*, Vol. 30, No. 1, 2010, pp. 41–53
- [J50] Sacha Krzysztof: Credential Chain Discovery in RTT Trust Management Language, in: I. Kottenko, V. Skormin (Eds.) *Computer Network Security, LNCS 6258*, 2010, Springer Berlin Heidelberg, pp. 195–208
- [J51] Sacha Krzysztof: Verification and Implementation of software for dependable controllers, in: *Int. J. Critical Computer-Based Systems*, Vol. 1, No 1/2/3, 2010, pp. 238–254

- [J52] Staniak Maciej, Zieliński Cezary: Structures of visual servos, in: *Robotics and Autonomous Systems*, Elsevier, No. 58(2010), 2010, pp. 940–954
- [J53] Stańczuk Wojciech, Pałka Piotr, Lubacz Józef, Toczyłowski Eugeniusz: A Framework for Evaluation of Communication Bandwidth Market Models, in: *Journal of Telecommunications and Information Technology*, National Institute of Telecommunications, No. 2/2010, 2010, pp. 52–60
- [J54] Stasiak Łukasz Adam, Pacut Andrzej: Face Tracking and Recognition with the Use of Particle-Filtered Local Features, in: *Journal of Telecommunications and Information Technology*, No. 4/2010, 2010, pp. 26–36
- [J55] Szykiewicz Wojciech: Planning System for Multi-Agent Based Reconfigurable Fixtures, in: *Journal of Telecommunications and Information Technology*, No. 3/2010, 2010, pp. 71–75
- [J56] Szykiewicz Wojciech, Kasprzak Włodzimierz, Zielińska Teresa, Zlatanov Dimiter: Planowanie rozmieszczenia ruchomych podpór przy obróbce przedmiotów o dużych rozmiarach, in: *Prace Naukowe PW, seria Elektronika*, Vol. I, No. 175, 2010, pp. 321–330
- [J57] Szykiewicz Wojciech, Zielińska Teresa, Kasprzak Włodzimierz: Robotized machining of big work pieces: Localization of supporting heads, in: *Frontiers of Mechanical Engineering in China*, Springer Verlag, Vol. 5, No. 4, 2010, pp. 357–369
- [J58] Toczyłowski Eugeniusz, Kaleta Mariusz, Przemysław Kacprzak, Pałka Piotr, Smolira Kamil: Modelowanie rynkowych problemów decyzyjnych na rynku energii elektrycznej, in: *Rynek Energii*, No. 6-2010, 2010, pp. 16–22
- [J59] Wawrzyński Paweł, Winiarski Tomasz: Optymalizacja trajektorii manipulatora w oparciu o metody uczenia się, in: *Prace Naukowe PW, seria Elektronika*, Vol. 2, No. 175, 2010, pp. 485–494
- [J60] Zalewski Andrzej, Kijas Szymon: Architecture Decision-Making in Support of Complexity Control, in: *Lecture Notes in Computer Science*, Vol. 6285/2010, 2010, pp. 501–504.
- [J61] Zieliński Cezary, Winiarski Tomasz: General specification of multi-robot control system structures, in: *Bulletin of the Polish Academy of Science, Technical Science*, Vol. 58, No. 1, 2010, pp. 15–28
- [J62] Zieliński Cezary, Winiarski Tomasz: Motion generation in the MRROC robot programming framework, in: *International Journal of Robotics Research*, Vol. 4, 2010, pp. 386–413
- [J63] Zieliński Cezary, Winiarski Tomasz, Trojanek Piotr, Kornuta Tomasz Michał: Multi-agent control system specification of a robot based reconfigurable fixture, in: *Prace Naukowe PW, seria Elektronika*, Vol. 2, No. 175, 2010, pp. 691–702

6.4 Scientific and Technical Papers in Conference Proceedings

- [P1] Kacprzak Przemysław, Kaleta Mariusz, Kołtyś Kamil, Pałka Piotr, Pieńkosz Krzysztof, Toczyłowski Eugeniusz, Żółtowska Izabela: Multicommodity exchange model for trading bandwidth in undirected networks, in: *Conference Proceedings. 14th International Telecommunications Network Strategy and Planning Symposium / Pióro Michał et al. (Ed.)*, 2010, IEEE, ISBN 978-1-4244-6703-7, pp. 180–184

- [P2] Kamola Mariusz, Niewiadomska-Szynkiewicz Ewa, Malinowski Krzysztof, Stańczuk Wojciech: Platforma Badawcza Mechanizmów Aukcyjnych, in: Usługi i sieci teleinformatyczne następnej generacji – aspekty techniczne, aplikacyjne i rynkowe, 2010, Instytut Łączności, pp. 1–10
- [P3] Kasprzak Włodzimierz: Integration of different computational models in a computer vision framework, in: CISIM 2010 International Conference on Computer Information Systems and Industrial Management Applications (CISIM), IEEE Catalog Number: CFP1040C-CDR, 2010, IEEE, pp. 13–18
- [P4] Kasprzak Włodzimierz, Ding N., Hamada N.: Blind localization and separation of two speakers based on two mixtures, in: Proceedings of 2nd IEEE Workshop on Biologically Inspired Signal and Image Processing BISIP 2010, Vilnius, Lithuania, March 2010, CD-ROM
- [P5] Kornuta Tomasz Michał, Pruchniak Mateusz: Utilization of GPU for Real-Time Vision in Robotics, in: SPA 2010 Signal Processing Algorithms, Architectures, Arrangements, and Applications Conference Proceedings, 2010, ISBN 978-83-62065-01-1, pp. 44–49
- [P6] Marks Michał Robert, Niewiadomska-Szynkiewicz Ewa: Localization Based on Stochastic Optimization and RSSI Measurement, in: Proc. of the 9th ACM IEEE International Conference on Information Processing in Sensor Networks IPSN'10, 2010, pp. 402–403
- [P7] Nahorski Zbigniew, Stańczak Jarosław, Pałka Piotr: Multi-agent approach to simulation of the greenhouse gases emission permits market, in: 3rd International Workshop on Uncertainty in Greenhouse Gas Inventories Proceedings, 2010, pp. 183–194
- [P8] Ogryczak Włodzimierz, Śliwiński Tomasz: Efficient Portfolio Optimization with Conditional Value at Risk, in: Proceedings of the International Multiconference on Computer Science and Information Technology 2010, 2010, IEEE, ISBN 978-83-60810-27-9, pp. 901–908
- [P9] Ogryczak Włodzimierz: Ordered Median Problem with Demand Distribution Weights, in: Proceedings of the XVIII Euro Working Group on Locational Analysis Meeting, 2010, pp. 26–26
- [P10] Ogryczak Włodzimierz: Tail Mean and Related Robust Solution Concepts, in: URPDM 2010 Uncertainty and Robustness in Planning and Decision Making, Proc. of the 25th Mini-EURO Conference / Antunes Carlos (Ed.), 2010, pp. 1–7
- [P11] Pałka Piotr, Całka Marcin, Kaleta Mariusz, Toczyłowski Eugeniusz, Traczyk Tomasz: Design and Java implementation of the multi-agent platform for multi-commodity exchange, in: TPD 2010 III Krajowa Konferencja Naukowa Technologie Przetwarzania Danych, 2010, pp. 184–196
- [P12] Wawrzyński Paweł: Fixed Point Method of Step-size estimation for on-line neural network training, in: Proceedings of WCCI 2010 IEEE World Congress on Computational Intelligence, July 18-23, 2010, Barcelona, Spain, pp. 2012–2017

6.5 Reports and Other Papers

- [R1] Błaszczyk Jacek: Przegląd wybranego oprogramowania numerycznego pod kątem zastosowania w równoległych i rozproszonych środowiskach optymalizacji dla zadań wielkiej skali, ICCE Report No. 10-05, 2010

- [R2] Karbowski Andrzej: On the definiteness of the diagonal blocks of the inverse of a symmetric indefinite matrix, ICCE Report No. 10-06, 2010
- [R3] Karbowski Andrzej: Parallel algorithms for multicore routers in large computer networks – A review, ICCE Report No. 10-07, 2010
- [R4] Karbowski Andrzej, Remiszewski Maciej, Koczwara Paweł: Assessment of the Cell Broadband Engine Architecture as a Platform to Solve Big Optimization Problems by Decomposed Primal-Dual Interior Point Method, ICCE Report No. 10-08, 2010
- [R5] Talipski Piotr, Kamola Mariusz: Oprogramowanie wspierające prace badawcze nad mechanizmami przydziału zasobów w zadaniach wieloagentowych dużej skali, ICCE Report No. 10-04, 2010
- [R6] Toczyłowski Eugeniusz, Kaleta Mariusz, Pałka Piotr, Smolira Kamil, Kacprzak Przemysław: Opracowanie perspektywicznych rozwiązań w zakresie efektywnego mechanizmu bilansowania z uwzględnieniem wielotowarowego charakteru rynku energii elektrycznej – etap III, ICCE Report No. 10-03, 2010
- [R7] Toczyłowski Eugeniusz, Kaleta Mariusz, Pałka Piotr, Smolira Kamil, Kacprzak Przemysław: Opracowanie perspektywicznych rozwiązań w zakresie efektywnego mechanizmu bilansowania z uwzględnieniem wielotowarowego charakteru rynku energii elektrycznej – etap IV, ICCE Report No. 10-11, 2010
- [R8] Traczyk Tomasz: Metody i architektury wymiany informacji dla handlu elektronicznego na rynkach infrastrukturalnych, część 2, ICCE Report No. 10-14, 2010
- [R9] Winiarski Tomasz: Niskopoziomowy sterownik programowy chwytaka wielopalczastego, ICCE Report No. 10-12, 2010