Institute of Control and Computation Engineering

2011 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 in recent years 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, and recently, in IT Security and Biometrics led by Dr. Adam Czajka. There is a growing interest in this form of studies. 290 persons took part in these courses within the 2010/2011 edition.

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 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 Universita 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.

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 2011 the Group of Robot Programming and Pattern Recognition, has concluded its involvement in a grant obtained from the 7th Framework Program of the Commission of the European Union (NMP-2007-3.2-1). The project named Self Reconfigurable Intelligent Swarm Fixtures (SwarmItFIX) was 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 were 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).

The group headed by Prof. Ewa Niewiadomska-Szynkiewicz has advanced the project Low Energy Consumption NETworks (ECONET) within the 7 FP EU grant: The Network of the Future (FP7-ICT-2009-5). The ECONET project focuses its research and development efforts on the study of innovative techniques and architectural solutions to support energy efficiency in

the 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).

In the year 2011 Prof. Andrzej Pacut concluded the project entitled 'The platform for secure implementation of biometrics for identity verification and identification' coordinated by ICCE while involving also NASK, Polish Security Printing Works and University of Warsaw. His team has just started a new project on 'Biometrics techniques and PKI for modern ID documents and information systems security' granted by the National Centre for Research and Development (NCBiR).

Prof. Eugeniusz Toczyłowski prolonged for the year 2011 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.

Dr Tomasz Winiarski was awarded the first prize in the Third National Diploma Contest 'Young Innovators 2011' for his Ph.D. Thesis and received a distinction in the Third Contest 'Mazovia Innovator 2011'. Dr Joanna Putz-Leszczyńska obtained the 'Golden Chalk' award conferred by the students for excellence in pedagogic work.

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 faculty and staff of the Institute for their efforts and contributions to our achievements in teaching and research. In particular, I would like to congratulate to Prof. Włodzimierz Ogryczak and Prof. Krzysztof Sacha upon their nomination to the title of professor. I would also like to compliment Prof. Włodzimierz Kasprzak who has been awarded the Golden Cross of Merit by the President of Poland.

Cezary Zieliński

Contents

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Warsaw University of Technology
Nowowiejska 15/19, 00-665 Warsaw, Poland
http://www.ia.pw.edu.pl, sekretariat@ia.pw.edu.pl

Instytut Automatyki i Informatyki Stosowanej

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, 2011.

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

Division Head:	Professor Krzysztof Malinowski
Professors:	Włodzimierz Kasprzak, Krzysztof Malinowski, Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Cezary Zieliński
Professors, retired:	Władysław Findeisen, Radosław Ładziński, Jacek Szymanowski
Reader:	Adam Woźniak
Assistant Professors:	Piotr Arabas, Adam Czajka, Mariusz Kamola, Andrzej Karbowski, Adam Kozakiewicz, Tomasz J. Kruk, Bartłomiej Kubica, Michał Kudelski, Joanna Putz-Leszczyńska, Wojciech Szynkiewicz, Paweł Wawrzyński, Tomasz Winiarski
Assistant:	Tomasz Kornuta, Michał Walęcki (since Oct. 2011)
Senior Lecturer:	Michał Warchoł
Ph.D. Students:	Marcin Chochowski, Krzysztof Stanisław Daniluk, Andrzej Igielski, Tomasz Kornuta, Małgorzata Kudelska (until Sept. 2011), Krzysztof Lasota (since Oct. 2011), Michał Marks, Bartosz Papis, Paweł Przybysz (since Oct. 2011), Anna Sibilska-Mroziewicz, Andrzej Sikora, Maciej Stefańczyk (since Oct. 2011), Przemysław Strzelczyk (until Sept. 2011), Piotr Trojanek (until Sept. 2011), Michał Walęcki, Artur Wilkowski (until Sept. 2011)
Software Engineers:	Michał Walęcki (until Sept. 2011), 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, K. Lasota, A. Woźniak, M. Warchoł, M. Karpowicz, K. Daniluk, M. Marks, A. Sikora)

The main area of interest are problems of modeling, design, control, optimization and simulation of various types of complex real systems, including networks, ad hoc networks, social networks, economic systems and the environment. Research in the field of optimization and control are focused on developing the theory and methodology in applying model predictive control, hierarchical control structures in nonlinear systems with uncertainty, developing methods for solving continuous and discrete time optimization problems (including evolutionary optimization methods and using the arithmetic of intervals), game theory and design theory of complex systems of rules (so-called theory of mechanisms). Research in the field of computer simulation and parallel processing of information concerning such departments as: distributed operating systems, programming of parallel machines in computer networks, clusters, grids and GPUs, the creation of systems for computer-aided design and management. Particular attention is devoted to issues of modeling, management and security in computer networks, including sensor networks and mobile ad hoc networks.

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

Research of the group is centered on biologically inspired information processing and control, including biometrics, machine learning, uncertainty modeling, and biological modeling. Biometrics consists in using personal characteristics for identity recognition. Our research is focused mainly on safety of biometrics software, systems, and applications. In particular, safety issues are investigated for iris, fingerprints, and finger veins. Safety of biometric data storage and exchange and data encryption using biometrics are investigated. Original recognition methodology is developed for iris and hand-written signature. Machine learning research is focused on reinforcement learning, applied to adaptive control and multi-agent systems including very large systems and adaptive network routing. 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, P. Przybysz, A. Sibilska-Mroziewicz, M. Stefańczyk, P. Trojanek, M. Walęcki, 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 speach recognition systems. In the robot control systems area research is focused on new motion and force/position control algorithms for multi-robot systems. Special emphasis is given to the sensor-based motion planning and control of single and multiple articulated or mobile robots. In the computer vision and signal processing (speech analysis) area the research is concentrated on autonomous navigation, transportation and security relevant environments. All of this research is centered around service robots, i.e. two-handed devices using visual servoing, force control, and speech recognition to fulfill tasks that humans usually execute.

Control and Software Engineering Division

Division Head:	Professor Piotr Tatjewski
Professors:	Piotr Tatjewski, Krzysztof Sacha
Assistant Professors:	Paweł Domański, Maciej Ławryńczuk, Piotr Marusak, Marcin Szlenk, Andrzej Zalewski
Assistant:	Andrzej Ratkowski
Senior Lecturers:	Jerzy Gustowski, Urszula Kręglewska
Senior Engineer:	Włodzimierz Macewicz
Ph.D. Students:	Ali Mhammed Benniran, Bartosz Chrabski (until Sept. 2011), Adam Działak (until Sept. 2011), Andrzej Grudzień (until Sept. 2011), Adam Hurkała (since Oct. 2011), Szymon Kijas, Wojciech Pikulski, Piotr Sztandera (until Sept. 2011), Maciej Szumski

Research of the division is conducted in 2 research groups:

Control Engineering Group (**P. Tatjewski**, P. Domański, 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 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 neural nets and fuzzy systems. 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, A. Hurkała, 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 evalua-tion. 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

Division Head:	Professor Eugeniusz Toczyłowski
Professors:	Włodzimierz Ogryczak, Eugeniusz Toczyłowski
Professor, retired:	Wiesław Traczyk
Readers:	Jerzy Paczyński (until March 2011), Tomasz Traczyk
Assistant Professors:	Janusz Granat, Mariusz Kaleta, Adam Krzemienowski, Piotr Pałka, Krzysztof Pieńkosz, Grzegorz Płoszajski, Kamil Smolira (until March 2011), Andrzej Stachurski, Tomasz Śliwiński, Izabela Żółtowska
Assistants:	Przemysław Kacprzak, Kamil Kołtyś (since Nov. 2011), Bartosz Kozłowski
Senior Lecturers:	Tadeusz Rogowski, Jerzy Sobczyk
Ph.D. Students:	Krzysztof Bareja (until March 2011), Jarosław Hurkała (since Oct. 2011), Przemysław Kacprzak, Kamil Kołtyś (until Sept. 2011), Michał Majdan, Paweł Markowski (until Sept. 2011), Piotr Modliński, Paweł Olender, Adam Połomski, Michał Przyłuski, Piotr Rzepakowski (until Sept. 2011)

Research of the division is conducted in 2 research groups:

Operations Research and Management Systems Group (**E. Toczyłowski**, T. Traczyk, M. Kaleta, P. Pałka, K. Pieńkosz, G. Płoszajski, K. Smolira, I. Żółtowska, P. Kacprzak, 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, B. Kozłowski, A. Krzemienowski, A. Stachurski, T. Śliwiński, T. Rogowski, J. Sobczyk, J. Hurkała, 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

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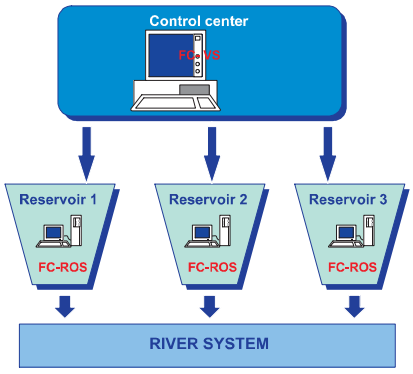
Software for complex systems simulation

Flood Control

FC-ROS & FC-VS (*Flood Control*)

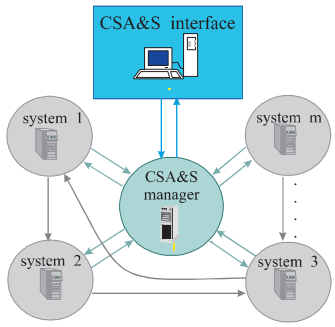
decision support systems for flood control in multireservoir systems.



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

Instytut Automatyki i Informatyki Stosowanej

Traffic control in TCP/IP networks

Family of price-based control algorithms for IP networks

Congestion control:
- New algorithm proposed
- Verified through simulations

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

Simulation Tools

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

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

Complex Systems Group

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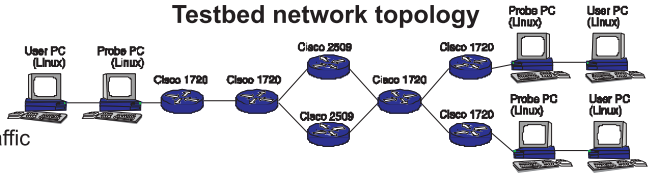
Dynamic contracting of IP services

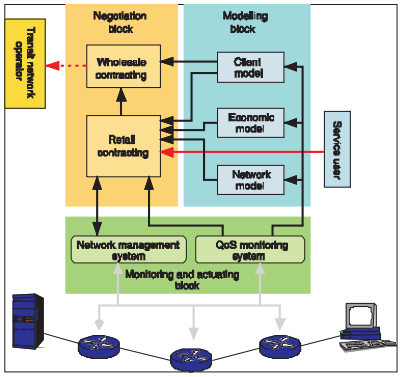
System features:

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

Testbed network topology



System architecture



Implementation - technologies:

- Cisco *CBWFQ* (class-bases weighted fair queuing), *shaping*, *policing* used
- Monitoring and actuating block implementated 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

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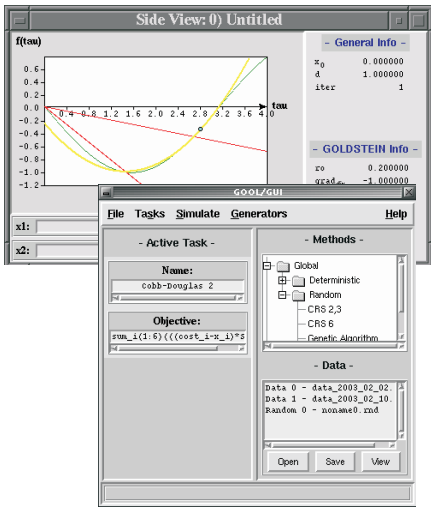
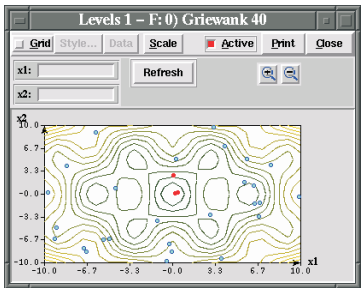
Global optimization

GOOL - Global Optimization Object–Oriented Library





GOOL

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

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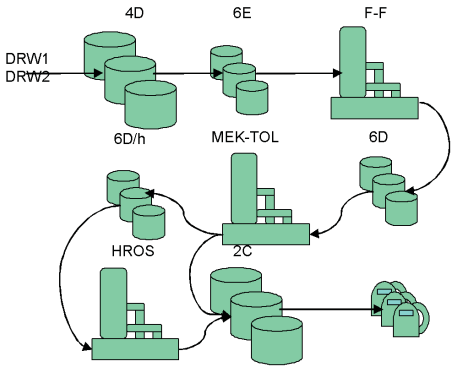
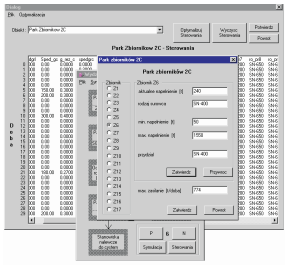
Operations scheduling using Constraint Programming

Solution of a scheduling problem in an Oil Refinery Division



Oil Refinery Division



Simulation and optimization system

Goals:

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

Complex Systems Group

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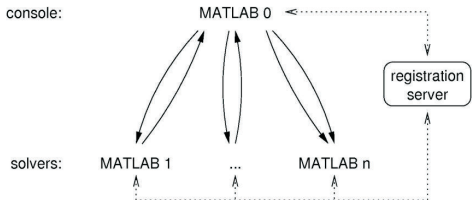
Parallel and distributed computations

- 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

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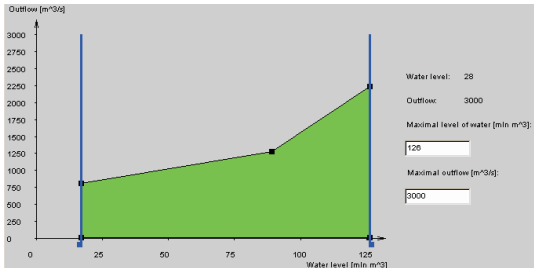
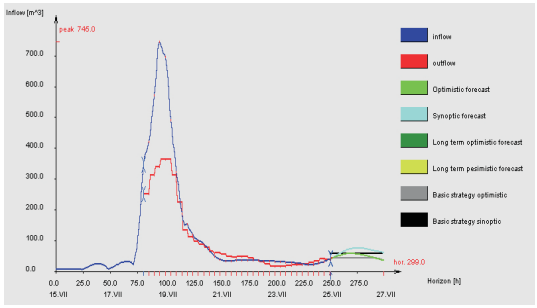
Optimal control and closed-loop design

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





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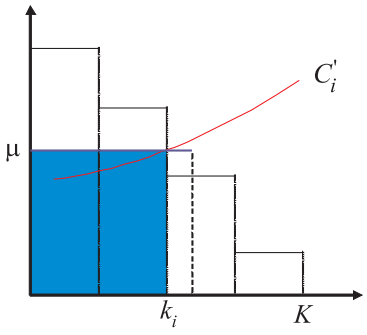
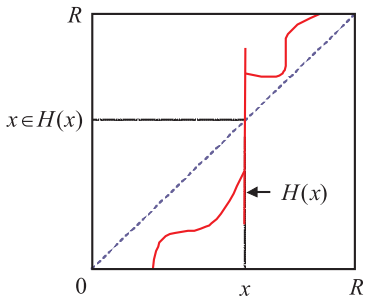
Game theory and mechanism design

- 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

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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:

$$a \in \boldsymbol{a} = [\underline{a}, \overline{a}],\ b \in \boldsymbol{b} = [\underline{b}, \overline{b}],$$
$$\circ \in \{+, -, \cdot, /\} \ \Rightarrow\ a \circ b \in \boldsymbol{a} \circ \boldsymbol{b}$$

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

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

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

Interval (inclusion) function:

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

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

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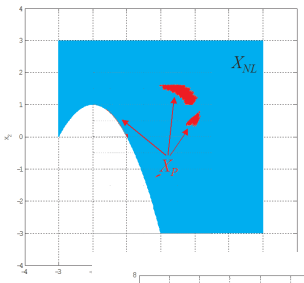
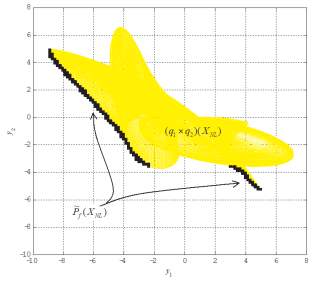
Interval computations seek the Pareto-front of nonlinear multicriterial problems

```
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

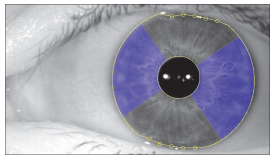
Instytut Automatyki i Informatyki Stosowanej

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

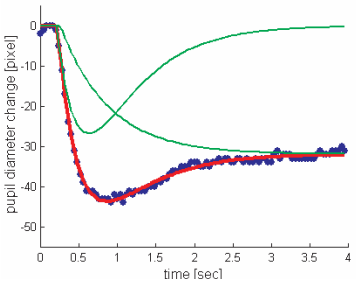


Iris coding

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



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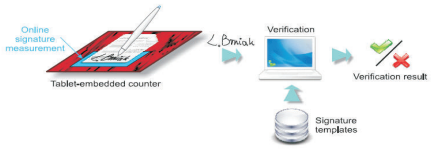
Biometrics

Handwritten signature-based identity verification

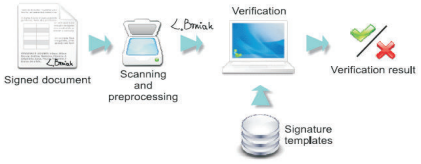
Verification of on-line signatures

- 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, textureand 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).

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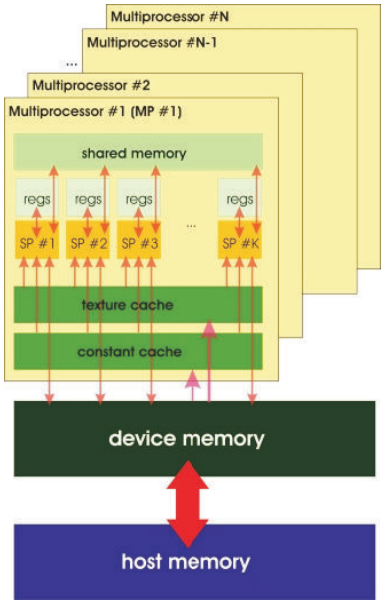
Biometrics

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 encypted biometric template databases



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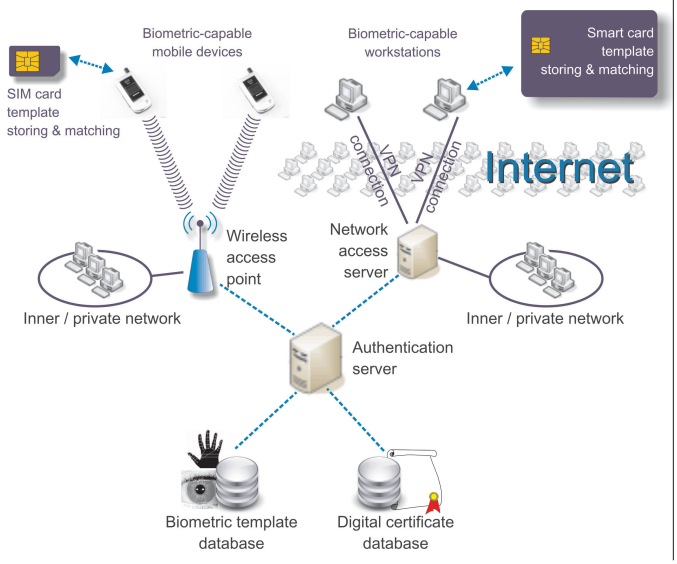
Biometrics

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)

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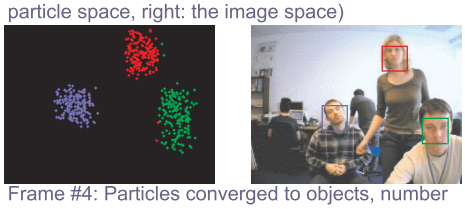
Biometrics

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

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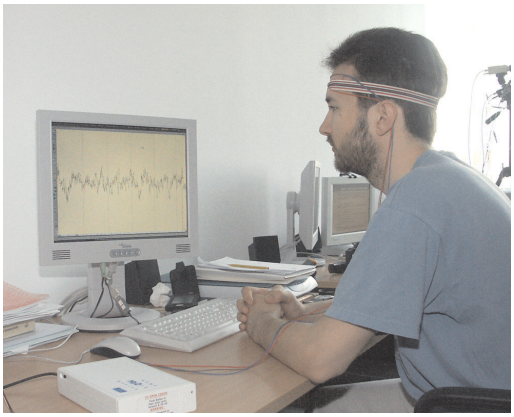
Biometrics

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



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Biometrics

Biometric cryptography

- Exploration of *„biometric spaces"* properties
  - analysis of similarity and dissimilarity measures
  - their relation to the notion of distance and metric properties
- Researchin 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 (dependencieswithin e.g. iris codes)
- Analysis of aspects of secure implementation of biometric systems

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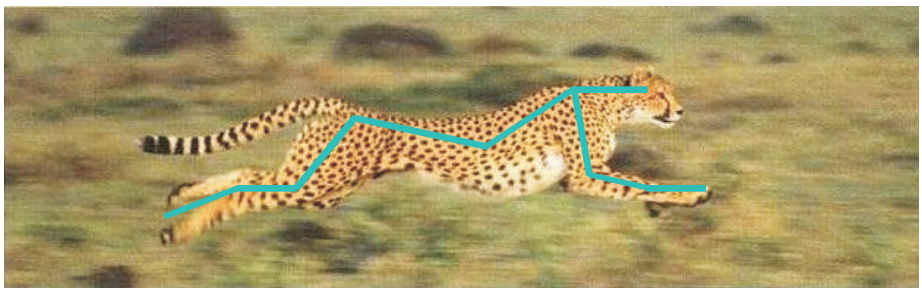
Machine Learning

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.



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Machine Learning

Project on humanoid robots learning of physical activities

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.

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Machine Learning

Project on learning-driven policy optimization in industrial robots

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.

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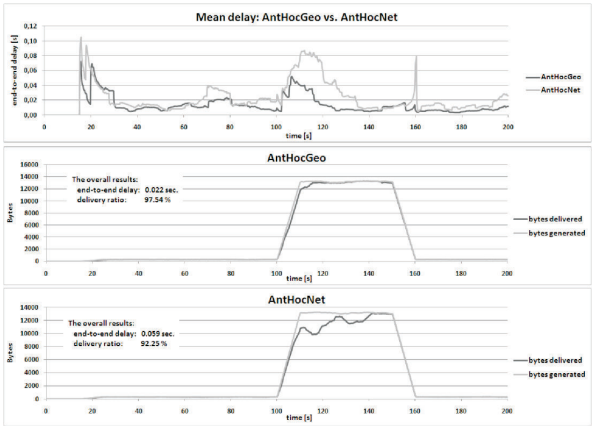
Machine Learning

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)

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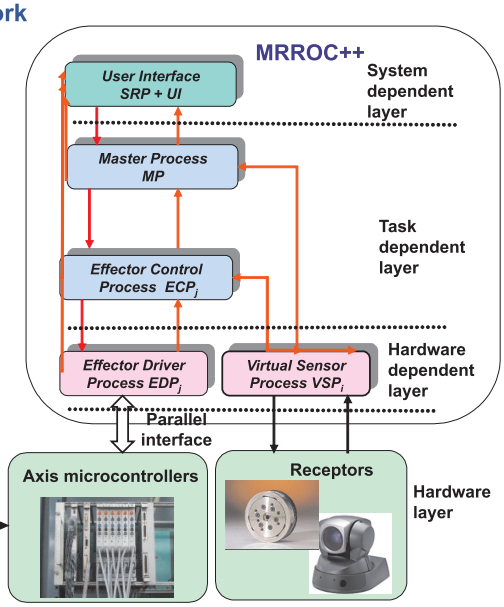
MRROC++ robot programming framework

- **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



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RNT and POLYCRANK prototype robots

- **RNT robot:** high stifness, 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

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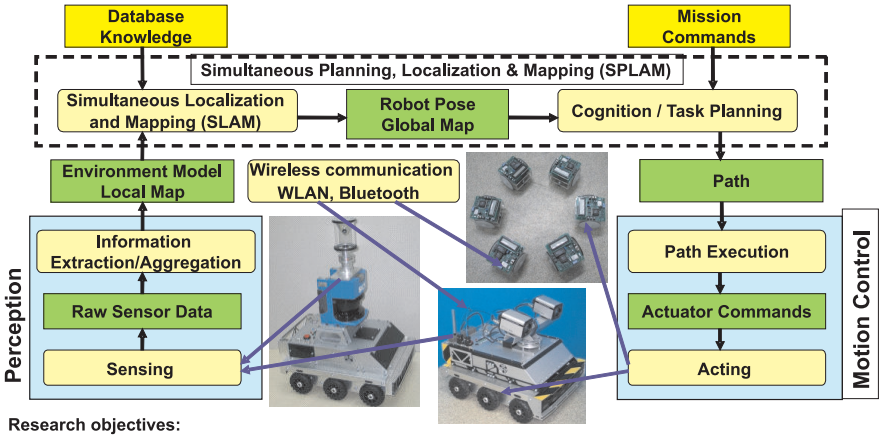
Control architecture for autonomous mobile robot teams



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)

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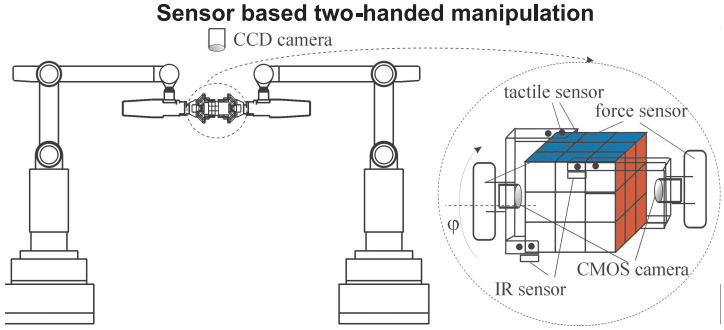
Sensor based two-handed manipulation



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**

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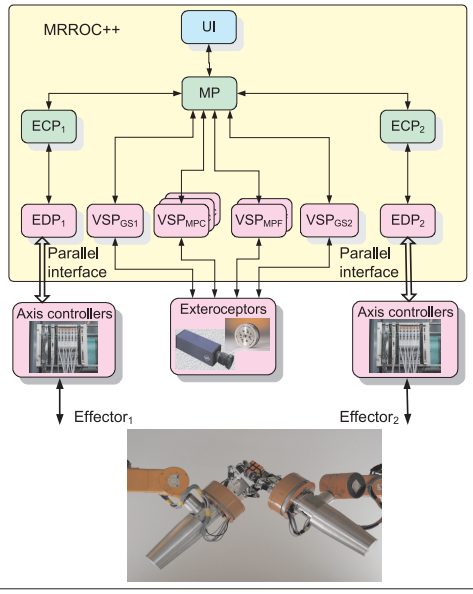
Two-handed Service Robot Controller Capable of Solving a Rubik's Cube Puzzle



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)

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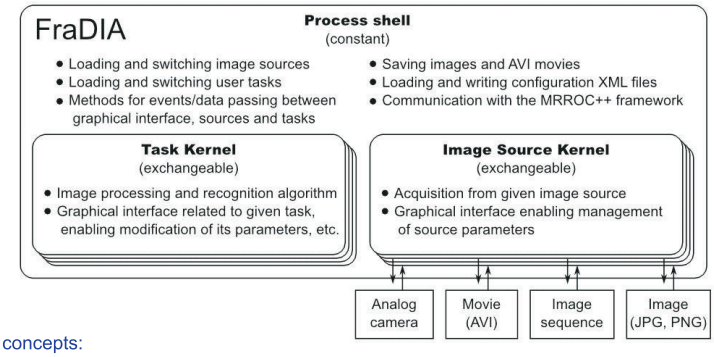
FraDIA: Framework for Digital Image Analysis



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

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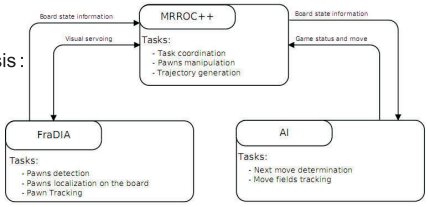
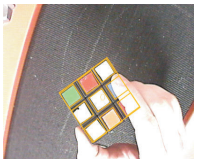
FraDIA: Utilization in selected robotic tasks

Robot playing checkers:

Two working modes of visual information analysis:
- recognition of checkers board state
- estimation of selected checker position (during visual servoing)





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

Robot Solving Rubik's Cube:

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

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

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FraDIA: Future developement plans

Core modifications:

- Creation of complex, parallel signal -to-symbols processing stream
- Developement of new component type, where results of processsing and analysis will be transfered 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

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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 overcomed 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.

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Elementary behaviours of robot manipulators

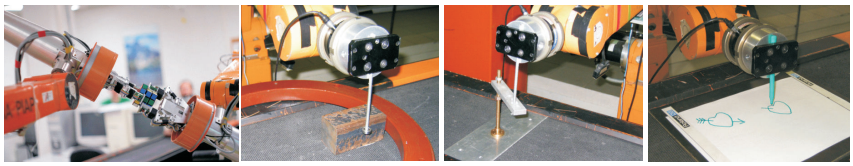
Main concepts:

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 expect 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

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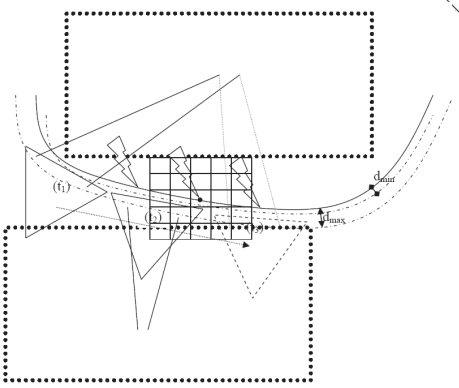
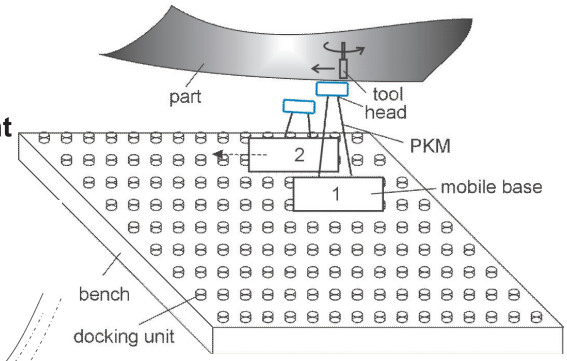
Programming and control of a swarm of mobile fixtures

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.

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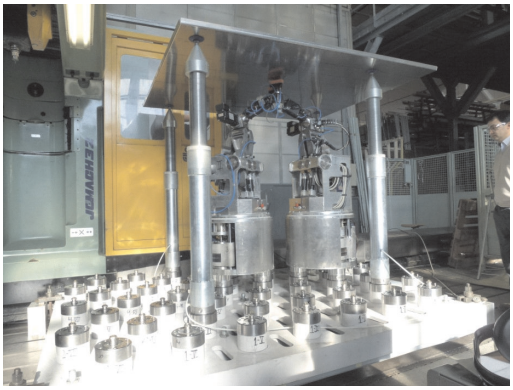
Mobile supports replacing static fixtures

Instead of fixtures manufactured to support a single workpiece, robots can support many shapes, thus making production cost effective.



Standard fixture

The SwarmItFIX system

Project partners:University of Genova,Piaggio Aero, Exechon, ZTS VVU Kosice, Centro Ricerche FIAT, Warsaw University of Technology

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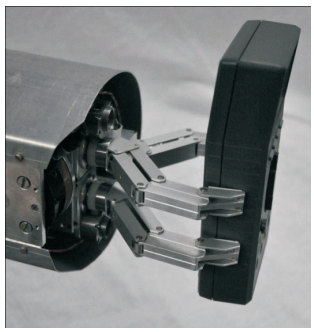
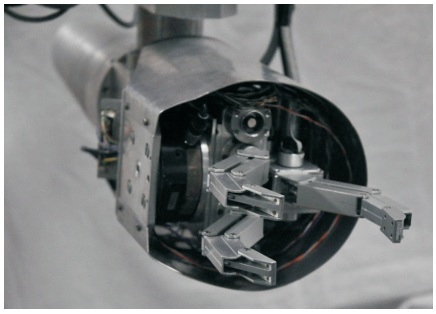
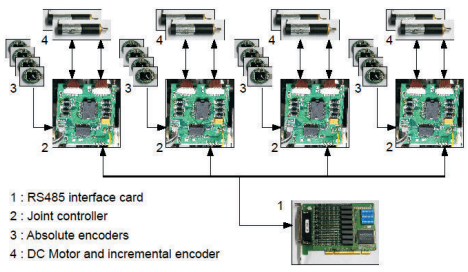
Three finger gripper

- 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







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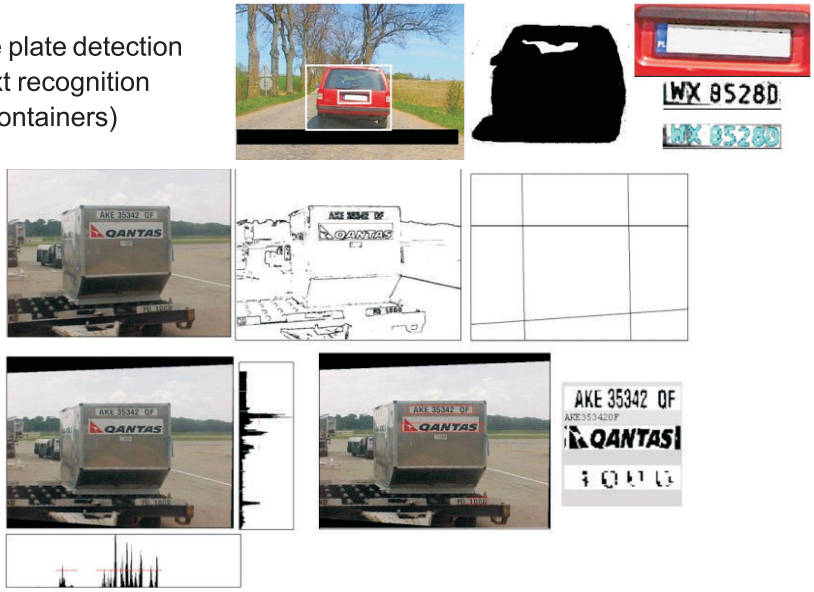
Text recognition in outdoor images

Licence plate detection and text recognition (cars, containers)



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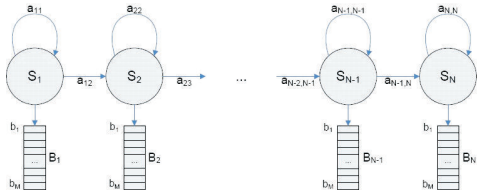
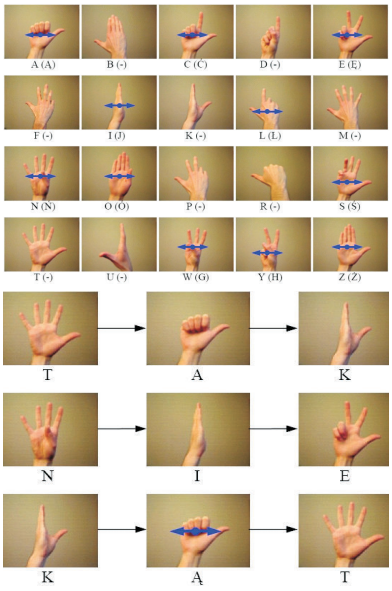
Gesture recognition in digital images

- Static and dynamic poses („letters”)
- HMM modelling of pose sequences



- Examples of gestures („words”):



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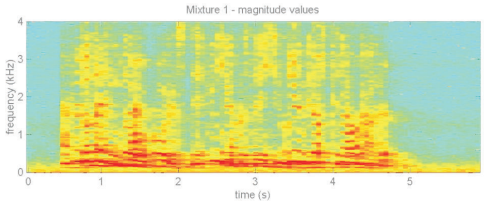
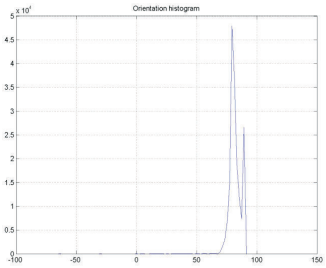
Speech separation and speaker identification

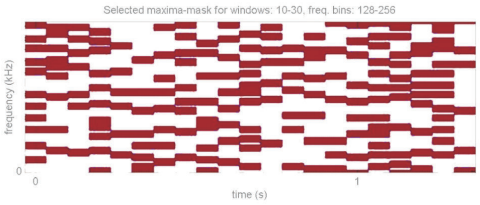
- Only mixtures of source signals can be acquired,
- The goal is to estimate the directions of the speakers and to estimate the original sources.



Example: two sources and two mixtures



Time delay-based detection of source directions:



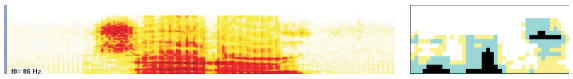
A spectrogram mask for extraction of a single source

Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

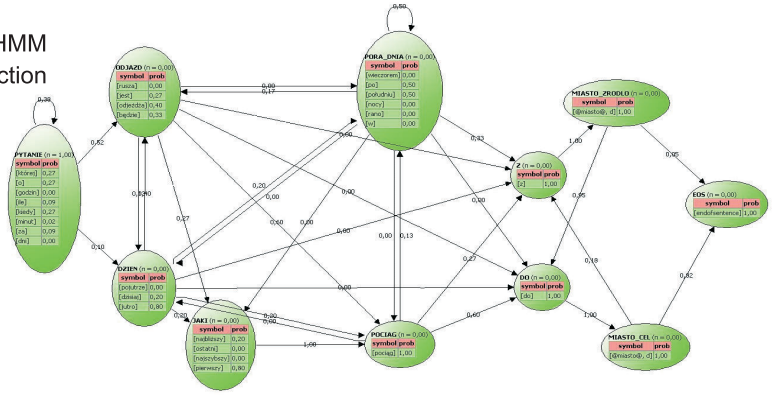
Spoken sentence recognition

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



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

Example of a HMM for train connection dialogues:

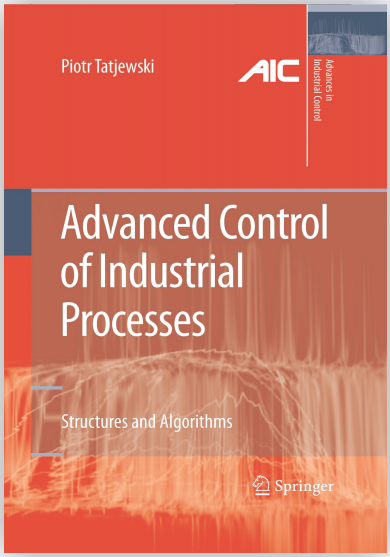


Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Advanced control of industrial processes

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



Springer, London, 2007

Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Optimization of industrial processes and large-scale systems

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

Imperial College Press/ World Scientific, 2005

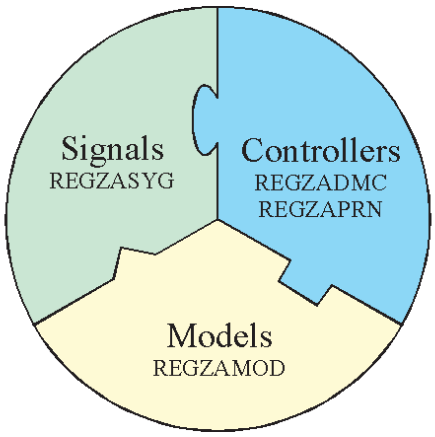
Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

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

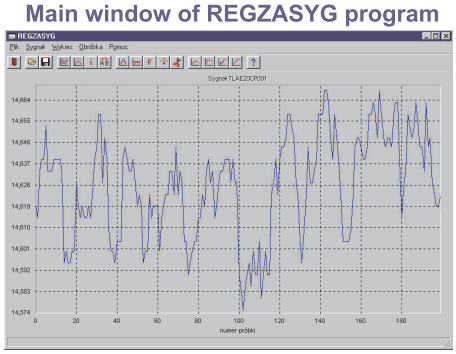
Instytut Automatyki i Informatyki Stosowanej

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

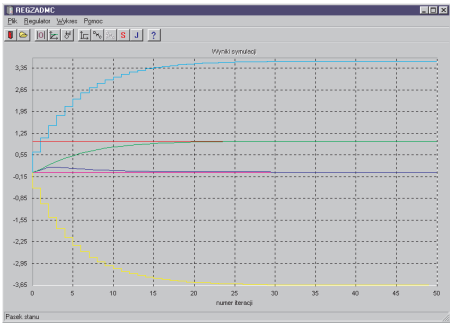
Nonlinear predictive control structures based on fuzzy and neural models

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

Main window of REGZASYG program



Main window of REGZADMC program



Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Predictive control of the burning process in small furnaces used for house central heating

- The classical PID controllers work inefficiently when applied for boilers
- Benefits of advanced predictive control algorithms:
  - Good control accuracy
  - High process efficiency
  - Increase of economic profits
  - The process is more friendly for the environment
- The controller is on the market

Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Adaptive model-based predictive control of the anti-smoke ventilation process in tall buildings

- The smoke can make it unable to rescue people; especially, in tall buildings where there is a significant pressure difference along the building
- The classical PID controllers based on linear models do not work when applied for ventilation systems in tall buildings
- Benefits of advanced model-based predictive control (MPC) algorithms:
  - Very fast operation and good control accuracy
  - Increase of safety in case of fire
- The controller will be on the market within a few months

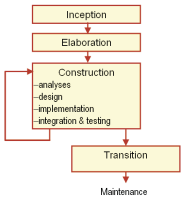
Software Engineering Group

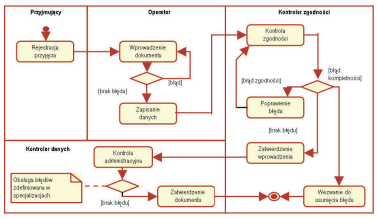
Instytut Automatyki i Informatyki Stosowanej

Software development

Research topics:

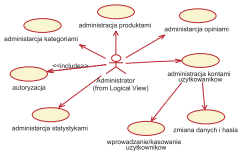
- Business process modeling
- Requirements engineering
- Software development methods
- Technologies and tools
- Acceptance testing
- Software processes
- Project management

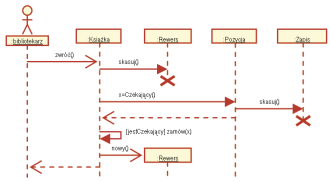




***Systems and tools* :**

- Rational Rose
- Rational RequisitePro
- Structured Architect





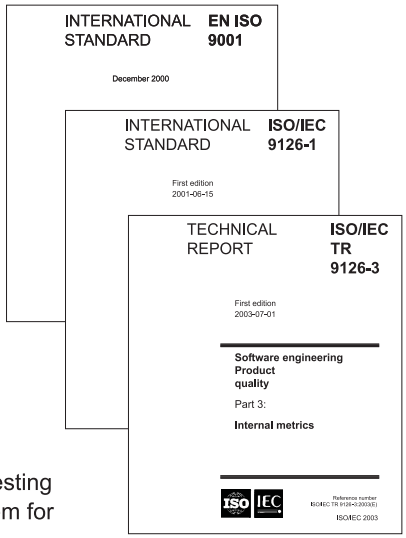
Software Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Evaluation of the software quality

Research topics:

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



Sample projects:

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

Software Engineering Group

Instytut Automatyki i Informatyki Stosowanej

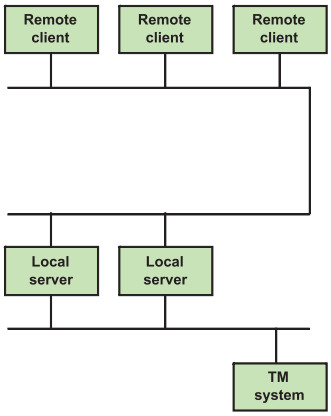
Distributed Open Systems

Research topics:

Ø Service Oriented Architectures (SOA)
- Architecture and Architecture Decisions
- System Development
- Evolution and Transformation

Ø Security in Distributed Open Systems

Ø Role-Based Trust Management languages
- Syntax and Semantics
- Credentials
- Credential Chain Discovery



Languages and Conceptual Tools:

Ø BPMN, BPEL

Ø RT_0, RT_1, RT_2, RT^T

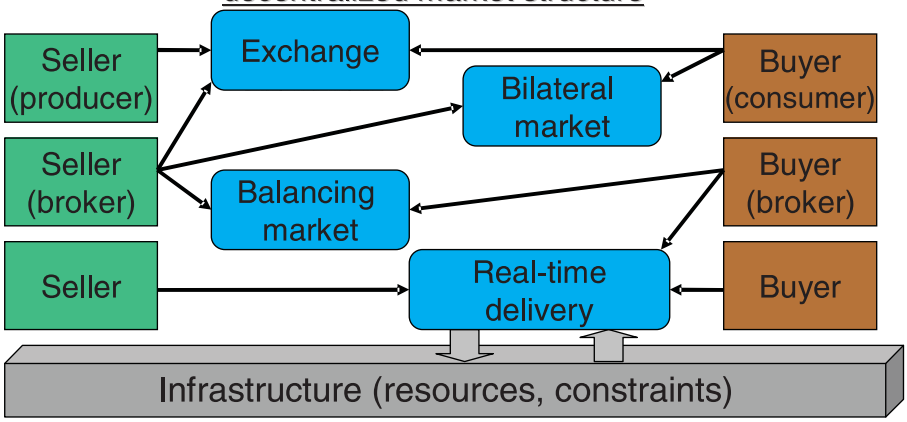
Ø Architecture Decision Models

Operations Research and Management Systems Group

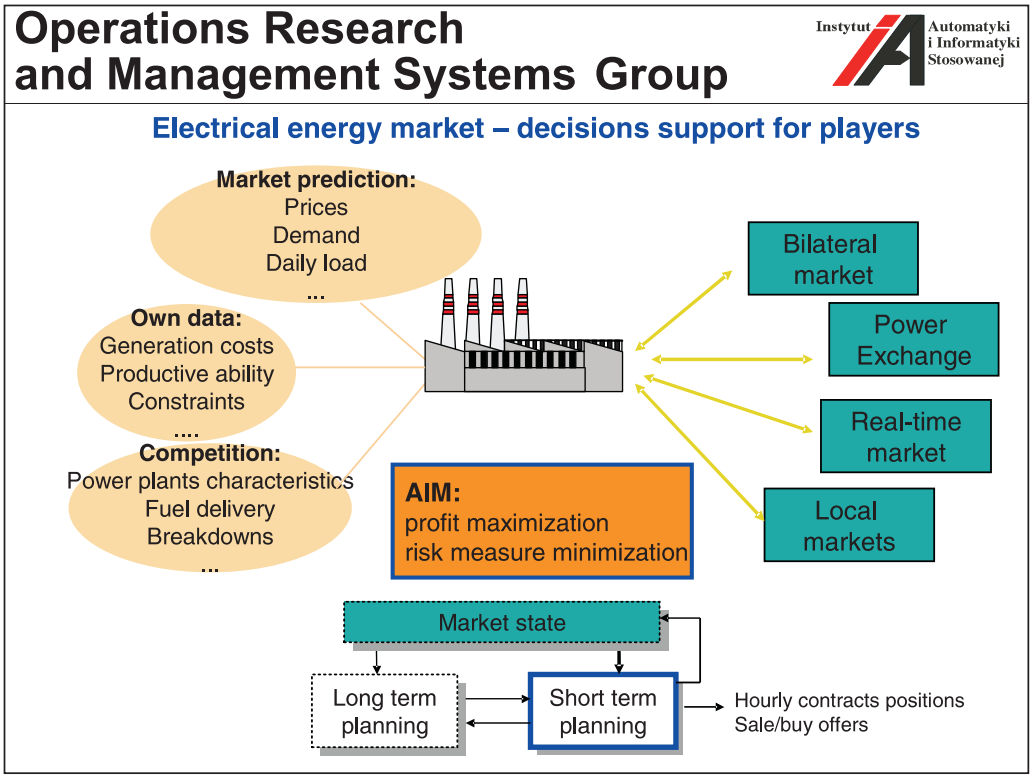
Instytut Automatyki i Informatyki Stosowanej

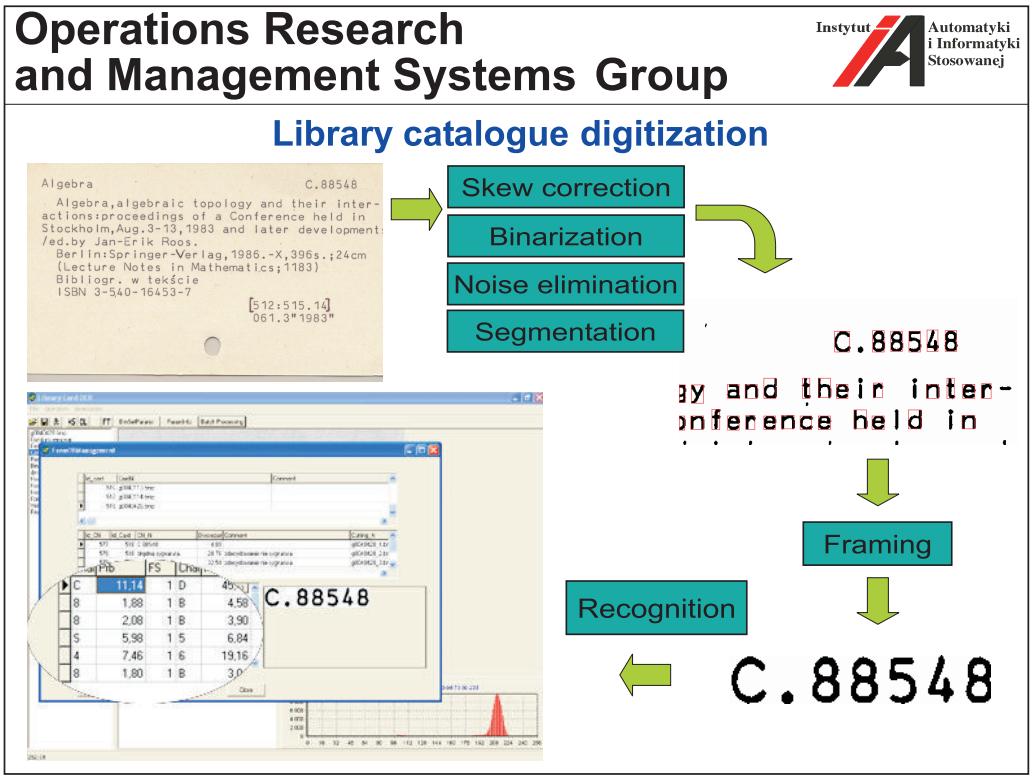
Designing of infrastructure markets under constraints

decentralized market structure



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


Operations Research
and Management Systems Group
Instytut Automatyki i Informatyki Stosowanej
Electrical energy market – decisions support for players
Market prediction:
Prices
Demand
Daily load
...
Own data:
Generation costs
Productive ability
Constraints
....
Competition:
Power plants characteristics
Fuel delivery
Breakdowns
...
AIM:
profit maximization
risk measure minimization
Bilateral market
Power Exchange
Real-time market
Local markets
Market state
Long term planning
Short term planning
Hourly contracts positions
Sale/buy offers


Operations Research
and Management Systems Group
Instytut Automatyki i Informatyki Stosowanej
Library catalogue digitization
Skew correction
Binarization
Noise elimination
Segmentation
C.88548
Framing
Recognition
C.88548

Operations Research and Management Systems Group

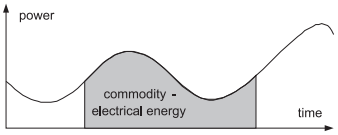
Instytut Automatyki i Informatyki Stosowanej

M^3 Multicommodity Market Model

M^3 is a flexible and universal market data and communication model
http://www.openm3.org

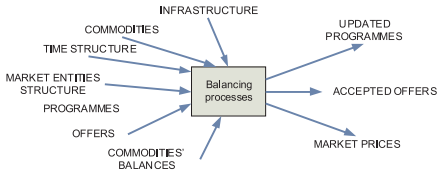
M^3 is mainly (but not only) designed for

- **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



M^3 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 M^3 describes the inputs and outputs of elementary balancing process:



M^3 helps markets' development by providing

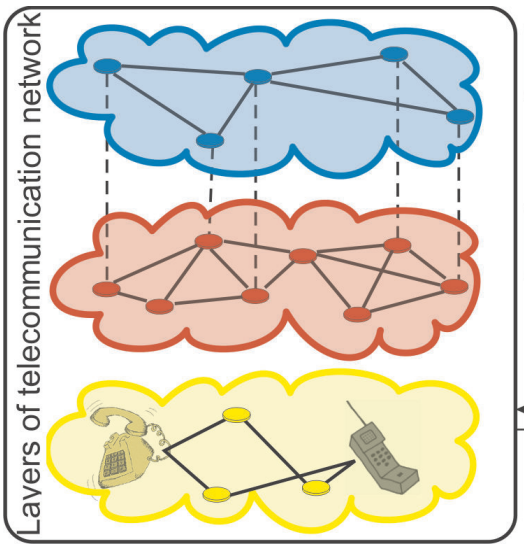
- flexible framework both for real-world market systems and for research projects
- possibilities for integration of software components
- possibilities for organizing benchmark data repository

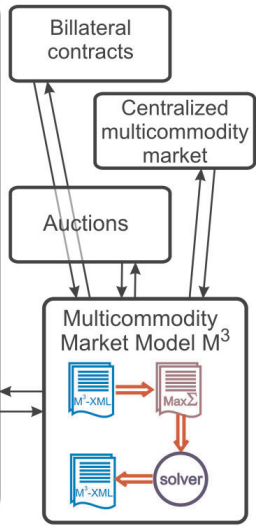
Operations Research and Management Systems Group

Instytut Automatyki i Informatyki Stosowanej

Design of Multicommodity Market Model – M^3

Application of M^3 on the Communication Bandwidth Market





M^3 model:

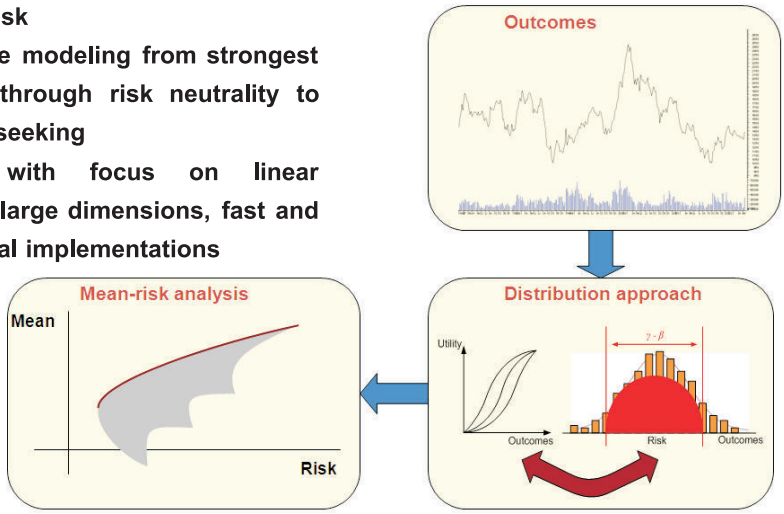
- may be used in information systems for market balancing in various infrastructure networks
- is a set of formal data models, which results in XML-derived information interchange specification
- may be used in a wide range of market-oriented network systems and may significantly facilitate communication,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

Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

Risk Measures and Optimization under Risk

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

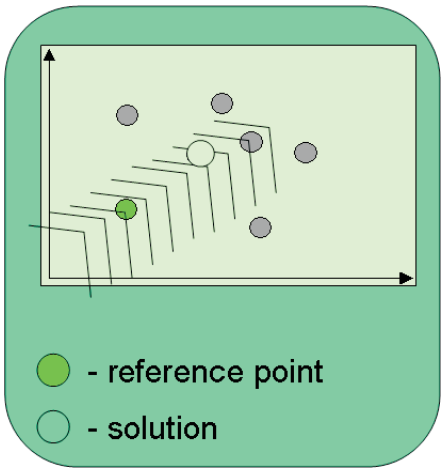


Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

Reference Point Method

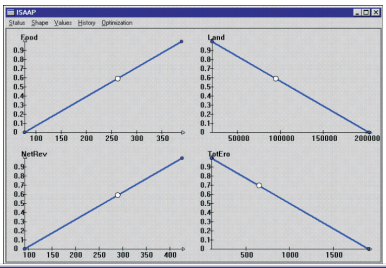
- ➢ interactive method for multicriteria model analysis
- ➢ guiding information by specification of the reference points
- ➢ a Pareto-optimal solution is selected for a given reference point

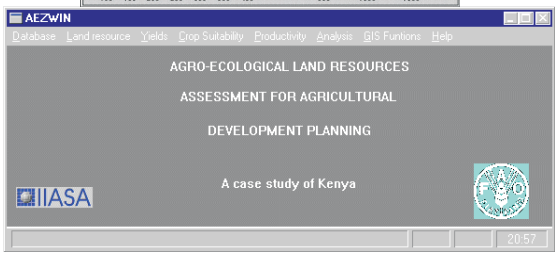


Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

Application of the reference point method for land resource assessment



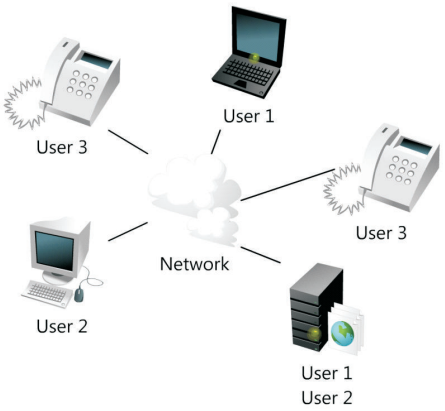


Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

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	2009		2010		2011	
	persons	FTE	persons	FTE	persons	FTE
Academic Staff	46(+1)	39.2(+1)	45(+1)	38.95(+1)	46(+1)	39.7(+0.5)
by titles/degrees						
Professors	4	3.5	4	4	6	6
D.Sc.-s	6	6	5	5	4	4
Ph.D.-s	29(+1)	25.2(+1)	28(+1)	24.95(+1)	27(+1)	24(+0.5)
M.Sc.-s	7	4.5	8	5	9	5.7
by positions						
Professors	10	9.5	9	9	9	9
Readers	3	2.5	3	2.5	2	2
Assistant Professors	22(+1)	19.95(+1)	24(+1)	21.95(+1)	25(+1)	22.5(+0.5)
Senior Lecturers	6	4	5	3.5	5	3.25
Lecturers	0	0	0	0	0	0
Assistants	5	3.25	4	2	5	2.95
Ph.D. Students	30		27		19	
Technical Staff	6	4.9	5	3.5	8	4.4
Administrative Staff	6	5.5	8	6.5	10	8.5

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

ACTIVITIES	2009	2010	2011
Teaching activities			
standard teaching potential, hours	8 167.75	8 303.75	8 508.95
# hours taught	13 236.80	12 701.20	12 376.60
Degrees awarded			
Professor	0	1	2
Ph.D.	7	5	3
M.Sc.	59	50	52
B.Sc.	58	53	70
Research projects			
granted by WUT	1	0	3
granted by State institutions	20	17	15
granted by international institutions	4	5	5
other	3	4	6
Reviewed publications			
monographs (authored or edited)	3	5	2
chapters in books	25	14	28
papers in journals	61	63	64
papers in conference proceedings	10	12	14
Reports, abstracts and other papers	10	9	12
Conferences			
participation (# of conferences)	23	37	43
participation (# of part. from ICCE)	49	55	70

RESOURCES	2009	2010	2011
Space (sq.m.)			
laboratories	585	585	585
library + seminar room	74	74	74
faculty offices	724	724	724
Computers			
personal computers	307	288	274
Library resources			
books	4 058	4 076	4 105
booklets	2 050	2 160	2 289
journals subscribed	9	9	9

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, 2011.

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 558, tel. 22 234 7805
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–). Expert of ISO/IEC JTC1/SC37 Biometrics Committee. 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). Head of postgraduate studies on IT Security and Biometrics (2011–). 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.

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.

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 (part-time since Oct. 2011)

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. Visiting Lecturer at the University of Leeds, United Kingdom (2007–2008).

Interests: Optimization and decision support under risk, risk measures, stochastic programming.

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.

Michał Kudelski Assistant Professor (part-time, since February 2011)

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

M.Sc. 2005, Ph.D. 2010 from WUT.

Received his M.Sc. (Computer Control Systems) in 2005 and Ph.D. (Computer Science) in 2011, both from the Warsaw University of Technology. Since 2011 he is with Warsaw University of Technology as an Assistant Professor, and since 2008 he is also a researcher at the Biometric Laboratory of Research and Academic Computer Network NASK. He is presently during his postdoc stage held at IDSIA, Switzerland.

Interests: Artificial intelligence, adaptive systems, distributed robotics, biometrics and related areas

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), Vice-Chairman of the Scientific Council of NASK (2011–), Chairman of Task Group for assessment of applications for projects founded by Action Line 2.3 of Operational Program 'Innovative Economy' (2008–), Chairman of Task Group of Ministry of Science and Higher Education for assessment of applications for funding large scale research equipment and constructions (2011–), 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-Szynkiewicz Professor (Leader of the Group)

Systems Control Division, Complex Systems Group
room 572a, tel. 22 234 3650
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, the title of Professor of Technical Sciences awarded in 2011.

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–), member of NASK Research Council (2007–), vice-chair (2009–2011). Member of Scientific Council of Central Laboratory of Criminology (2011–).

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

Jerzy Paczyński Reader (part-time, until April 2011)

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

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, D.Sc. 2011 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.

Joanna Putz-Leszczyńska Assistant Professor (part-time, since February 2011)

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

M.Sc. 2004, Ph.D. 2010 from WUT.

Since 1999 she is with Warsaw University of Technology, presently being an assistant professor at the Institute of Control and Computation Engineering. Since 2003 she works as a research assistant at Biometric Laboratory of Research and Academic Computer Network NASK.

Interests: Biometrics, identification, security and global optimization heuristics

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, the title of Professor of Technical Sciences awarded in 2011.

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 Institute of Software Engineering at Vistula University, Warsaw, Poland. 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 (until March 2011)

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, Äbo Swedish Academy in Turku, 1987, Jyväskylä University, Finland,

1988, JSPS invitee at the Department of Control Engineering, Osaka University, Japan, 1988–89. Member of Polish Society of Operations and Systems Research. Author and co-author of many scientific papers and reports on optimization algorithms, identification, applications of optimizations in macro-economy modeling and optimal design problems in structural engineering. Co-author of a textbook 'Podstawy optymalizacji' ('Foundations of Optimization') published in 1999. Reviewer of Control & Cybernetics, Optimization, Archives of Control Science, SIAM J. on Optimization, IEEE Concurrency.

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

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 Szynkiewicz Assistant Professor

Systems Control Division, Robot Programming and Pattern Recognition Group
room 572, tel. 22 234 7632
W.Szynkiewicz@ia.pw.edu.pl

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

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

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

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 Control Engineering 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, Member of Board of ISA Transactions (2011–), Expert of Ministry of Education and Science for Educational Standards (2005–2006). Member of EUCA (European Union Control Association) Administrative Council (2008–2011), member of IFAC Technical Committees TC 2.1 and TC 5.4, Vice-Chairman of the Control Committee of POLSPAR (2010–).

Interests: Multi-layer control systems, process control and optimization, model based 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.Toczylowski@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 (1992–2004). 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. (2003–2004), Member of Steering Committee of the Energy Market (2003–2004). Member of the Polish National Council for CO_2 Reduction Emission Program, and Head of the Energy Market Group (2009–), Member of the European Commission DG Advisory Group for Energy Roadmap 2050 (2011–).

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

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

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–). Member 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

Operations and Systems Research Division
Operations Research and Management Systems Group
room 554, 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.

Kamil Kołtyś Assistant (part-time)

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

M.Sc. 2007 from WUT.

With WUT since 2011.

Interests: Operations research, bandwidth auctions, mechanism design, multicommodity trade.

Tomasz Kornuta Software Engineer (until Oct. 2011), Assistant

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

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, Ph.D. 2011 from WUT.

With WUT since 2009.

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

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 Walęcki Software Enginner (until Sept. 2011), Assistant (since Oct. 2011)

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.

2.4 Ph.D. Students

Krzysztof Bareja Ph.D. Student (until March 2011)

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

Bartosz Chrabski Ph.D. Student (until Sept. 2011)

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

Supervisor: Krzysztof Sacha

Krzysztof Stanisław Daniluk Ph.D. Student

Systems Control Division, Complex Systems Group
k.daniluk@stud.elka.pw.edu.pl

Supervisor: Ewa Niewiadomska-Szynkiewicz

Adam Działak Ph.D. Student (until Sept. 2011)

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 (until Sept. 2011)

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

Supervisor: Krzysztof Sacha

Adam Jan Hurkała Ph.D. Student (since Oct. 2011)

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

Supervisor: Krzysztof Sacha

Jarosław Hurkała Ph.D. Student (since Oct. 2011)

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

Supervisor: Włodzimierz Ogryczak

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

Kamil Kołtyś Ph.D. Student (until Sept. 2011)

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

Supervisor: Eugeniusz Toczyłowski
For short cv and interest see p. 50.

Małgorzata Kudelska Ph.D. Student (until Sept. 2011)

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

Supervisor: Andrzej Pacut

Krzysztof Lasota Ph.D. Student (since Oct. 2011)

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

Supervisor: Ewa Niewiadomska-Szynkiewicz

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 (until Sept. 2011)

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

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

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

Paweł Przybysz Ph.D. Student (since Oct. 2011)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 563, tel. 22 234 7124
P.Przybysz@ia.pw.edu.pl

Supervisor: Włodzimierz Kasprzak

Michał Przyłuski Ph.D. Student

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

Supervisor: Włodzimierz Ogryczak

Piotr Rzepakowski Ph.D. Student (until Sept. 2011)

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

Maciej Stefańczyk Ph.D. Student (since Oct. 2011)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 563, tel. 22 234 7124
M.Stefanczyk@ia.pw.edu.pl

Supervisor: Włodzimierz Kasprzak

Przemysław Mirosław Strzelczyk Ph.D. Student (until Sept. 2011)

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 (until Sept. 2011)

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 (until Sept. 2011)

Systems Control Division, Robot Programming and Pattern Recognition Group
room 566, tel. 22 234 7649
P.Trojanek@elka.pw.edu.pl

Supervisor: Cezary Zieliński
For short cv and interest see p. 51.

Michał Walęcki 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 (until Sept. 2011)

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.

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

Jolanta Cieślewicz Librarian.

room 564, tel. 22 234 7276

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.

Bohdan Murzynowski Technical support.

room 035, tel. 22 234 7757

Jolanta Niedbało Office support.

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

Jadwiga Osowska Finances specialist (part-time, until July 2011).

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.

Jolanta Podobas Offices support.

room 529, tel. 22 234 7865

Hanna Szot Finances support.

room 556, tel. 22 234 6096
H.Szot@elka.pw.edu.pl

Ryszard Tchórz Technical support (part-time).

room 035, tel. 22 234 7757

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 2010/2011

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	W. Kasprzak (spring)
Basics in Automatics	PODA	2 – 1 –	PSTER, PSYIA, OT	P. Tatjewski (spring) K. Malinowski (fall)
Biometric Identity Verification	BIT	2 – 1 –	SIDJB, SIDJC, PP-SID	A. Czajka (spring/fall)
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)
Computer Vision	ECOVI	2 1 – –	Emaro	W. Kasprzak (fall)
Control	ECONT	2 1 1 –	ANGL, OT	P. Domański (spring/fall)
Data Bases 2	BD2	2 – – 1	BDSI, OT	T. Traczyk (spring/fall)
Decisions in Competition Environment	DWW	2 – – 1	PZ, PZ-SID, OT	A. Woźniak (spring)
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 Artificial Intelligence	PSZT	2 – – 1	PINI, PINJ, ISO	P. Wawrzyński (spring/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	E. Niewiadomska-Szynkiewicz (spring/fall)
Fundamentals of Programming	PRI	2 1 2 –	sem. 1	J. Paczyński (spring)
Image and Speech Recognition	ROSM	2 – – 1	ISO, MUS, OT, PZ-P, PZ-SID	W.Kasprzak (fall)
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. Szynkiewicz (spring/fall)

Course Title	**Course code**	**Hours per week**	**Class**	**Lecturer**
Knowledge Engineering	IW	2 – – 1	ISO, OT	W. Traczyk (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. Szynkiewicz (spring)
Neural Networks	SNR	2 – – 1	ISO, OT, PZ-P, PZ-SID	A. Pacut (fall)
Numerical Methods (J)	MNUM	2 – – 1	PSTER, OT	P. Tatjewski (fall)
Numerical Methods	ENUME	2 – 2 –	ANGL, OT	P. Tatjewski (fall)
Operating System	EOPSY	2 1 1 –	ANGL, OT	T. Kruk (fall)
Optimization Techniques	EOPT	2 – – –	ANGL, ECETC, OT	W. Ogryczak (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	ERTS	2 – – 1	Emaro	B. Kubica (fall)
Real-time Systems	SCZR	2 – 2 –	PSTER, OT	K. Sacha (spring/fall)
Robot Programming Methods	EPRM	2 – – –	ANGL, ECETC, OT	C. Zieliński (spring)
Signal Processing	ESPRO	2 1 – –	Emaro	W. Kasprzak (fall)
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, aplications of MIS and DSS (including service science and MRP). The classes take form of lectures and laboratories.

Postgraduate studies **IT Systems Security and Biometrics** are aimed at providing knowledge related to the most important aspects of IT systems security, in particular including access control, physical security, cryptography, applications and operational security, biometrics, security evaluation and certification, security management and auditing, as well as legal, ethical and social aspects of biometrics and security. Lectures are supplemented by laboratory classes, organized in recently renewed Biometrics and Machine Learning Laboratory, lavishly equipped with topical biometric systems, measurement devices and software.

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 – 31.01.2012. 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. Granting period 2008 – 2012. Task No. 28: **Development of the 2nd level studies in Automation and Robotics**. Head of the task: Piotr Tatjewski, secretary: Maciej Ławryńczuk.

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] 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 log 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.

[PR7] NASK Industrial research No. 501/G/0100: **Existing architactures of virtualization systems for special applications and requirements imposed by them**. Granting period: 10.01.2011 – 04.02.2011. Principal investigator: Ewa Niewiadomska-Szynkiewicz.

As part of a research project "Secure workstation for special applications", NASK – Research and Academic Computer Network, one of the project consortium members, required an investigation of existing virtualization systems, focused on systems designed for special applications, that is processing of restricted information, especially in situations where different security levels are required for different machines. The object of work was preparation of a report describing such architectures and the requirements they impose on underlying virtualization mechanism (hypervisor). Special focus was expected on MILS (Multiple Independent Levels of Security) type of systems.

[PR8] Plum sp. z o.o. Industrial research No. 5/2010: **Consultancy in the development of the control algorithm for the burning process in small pellet furnaces with automatic fuel dosing**. Granting period 15.11.2010 – 30.09.2011. Principal investigator: Piotr Tatjewski. Investigators: Maciej Ławryńczuk, Piotr Marusak.

The goal of the project was the consultancy in development of mathematical modeling of the pellet burning furnace and development of the advanced, adaptive control algorithms for such process. The task was successfully performed, the Plum company designed the industrial controllers equipped with the proposed algorithm, the controllers are offered on the market.

[PR9] Plum sp. z o.o. Industrial research No. 6/2010: **Consultancy in the development of the control algorithm for ecological coal burning process in small furnaces**. Granting period 15.11.2010 – 30.08.2011. Principal investigator: Piotr Tatjewski. Investigators: Maciej Ławryńczuk, Piotr Marusak.

The goal of the project was the consultancy in development of mathematical modeling of the coal burning furnace and development of the advanced control algorithms for ecological operation of the furnace. The task was successfully performed, the Plum company designed the industrial controllers equipped with the proposed algorithm, the controllers are offered on the market.

[PR10] Plum sp. z o.o. Industrial research No 1/2011: **Modeling of evacuation areas of high buildings and development of advanced control algorithms for anti-smoke systems**. Granting period 30.05.2011 – 30.04.2012. Principal investigator: Piotr Tatjewski. Investigators: Maciej Ławryńczuk, Piotr Marusak.

The goal of the project is modeling of evacuation areas in buildings in the case of fire and development of advanced, adaptive algorithms for very quick and precise controlling of the pressure in these areas generated by ventilators of pressure differentiation systems, to prevent these areas from smoke to enable safe evacuation of people. First phase of the project concerning low to medium height buildings (where the chimney effect can be neglected and one ventilator is sufficient) was successfully completed, resulting with the design of nonlinear model-based predictive, adaptive algorithm, using also neural networks technique. The second and more demanding phase of the project concerning high buildings is scheduled to be done in 2012.

[PR11] 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.

[PR12] 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 the develop a methodology focused on the support of perpetual evolvement of modern SOA systems rather than just their initial construction. The methodology shall consists 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-base trust management mechanisms and models. The grant is expected to be completed in 30 months.

[PR13] 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.

[PR14] 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 Ryżko (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 consistence 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.

[PR15] MNiSW Grant No. N N516 069837: **Transformational Design of Business Processes in Service Oriented Architecture**. Granting period: 06.10.2009 – 30.12.2011. 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.

[PR16] 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 rocket 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.

[PR17] MNiSW Grant No. N N516 070637: **Ant Algorithms for Adaptive Routing in Telecommunication Networks**. Granting period: 02.10.2009 – 31.12.2011. 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.

[PR18] 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.

[PR19] 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.

[PR20] 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.

[PR21] 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.

[PR22] NCBiR Grant No. O R0B 0027 01: **Biometrics and PKI techniques of modern identity documents and protection of information systems (BIO-PKI)**. Granting period: 28.12.2011 – 28.12.2013. Project coordinator: Andrzej Pacut. Principal investigator: Włodzimierz Kasprzak. Investigators (from ICCE): Włodzimierz Ogryczak, Marcin Chochowski, Adam Czajka, Joanna Putz-Leszczyńska.

The scope of this project is to build solutions supporting provision of advanced services related to identity documents. A modern identity document can be regarded in terms of both technical solutions implemented in the document processing system and external systems and services that support it. Therefore, the R&D activities of this project will put

equal pressure on the document CPU technologies and support systems such as PKI. One of the key parts of the project will be development of procedures for safe delivery of on-line services to ID holders. These procedures will form a basis for an implementation of tools for identity documents and service providers. An important element of the project will be use of various biometric techniques. These techniques allow for better linkage of identity with their owners, enriching and improving of multi-factor authentication process. At the same time, it allows for better automation, improved efficiency and convenience of identity identification and verification, and additional protection against fraud. The project will address the challenges associated with the integration of identification documents and biometrics. In particular, mechanisms for biometric data protection will be elaborated, by ensuring the security of their storage, transmission and processing. These mechanisms will be based on solutions in both cryptography and biometrics. The final deliverable of this project will be a number of demonstrators, which will provide sample implementations of the developed solutions.

[PR23] NCN Grant No. N N111 453440: **The Multivariate Conditional Value-at-Risk as a Measure of Risk**. Granting period: 04.05.2011 – 03.06.2012. Principal investigator: Adam Krzemienowski.

The aim of the research is to introduce a new risk measure called the Multivariate Conditional Value-at-Risk (MCVaR). MCVaR is a scalar risk measure for multivariate risks modeled by multivariate random variables. It is assumed that the univariate risk components are perfect substitutes, i.e., they are expressed in the same units. MCVaR is a quantile risk measure that allows one to emphasize the consequences of more pessimistic scenarios. By changing the level of the quantile, the measure permits to parameterize prudent attitudes toward risk ranging from extreme risk aversion to risk neutrality. In terms of definition, MCVaR is slightly different from the popular and well-researched Conditional Value-at-Risk (CVaR). Nevertheless, this small difference allows one to efficiently solve MCVaR portfolio optimization problems based on the full information carried by a multivariate random variable using column generation technique, which is not possible in the case of CVaR. In fact, optimal portfolios obtained with respect to CVaR are based on the small amount of information carried by a multidimensional variable random due to the limitations of the CVaR portfolio optimization model. An application of MCVaR should result in significant improvements in the quality of decisions in all practical problems where risks are modeled by random variables.

[PR24] NCN grant No UMO-2011/01/N/ST7/03383: **Methodology of Robot Control Systems Specification Utilizing the Active Vision Paradigm for Objects Identification**. Granting period: 7.12.2011 – 6.12.2012. Principal investigator: Tomasz Kornuta.

The goal of the project is to develop a methodology for designing control systems of robots actively acquiring informations about their surroundings. The task requires to answer the questions regarding elements that should be distinguished in the structure of the control system and skills (behaviours) that the robot must possess. The elaborated methodology, based on top-down multiphase system decomposition, will allow to design and specify in a formal manner control systems for robots utilizing the active vision paradigm. As a result of the project a novel methodology for designing control systems for service robots utilizing the Active Vision paradigm will be developed and described in the form of a PhD dissertation. Additionally it is planned that an article for the National Conference on Robotics will be written. Results also include publication of research results in an international journal concerning robotics.

[PR25] NCN grant No UMO-2011/01/N/ST7/03383: **Design and specification of multi-robot control systems**. Granting period: 07.12.2012 – 6.12.2012. Principal investigator: Piotr Trojanek.

The problem addressed in this project is modeling and control of multi-robot systems. The main difficulty in this class of systems is their operation in response to concurrent and distributed events occurring in the environment. The goal is to develop a formal method of design and specification of multi-robot control systems. The goal of this project is to develop a formal method of design and specification of multi-robot control systems, which would allow to precisely define their operation. A formal method provides both a vocabulary of concepts required to model the control system and their unambiguous definitions. Given such specification it is possible not only to develop a provably correct implementation of the control system, but also to formally analyze and reason about properties of the controller. Robotics still lacks systematic and formal methods of designing, thus a contribution of this project will be significant.

[PR26] Rector's grant No. 500/C1000/541: **KinectBot – control of autonomous mobile robot in unstructured and dynamically changing environment**. Granting period: 01.08.2011 – 31.12.2011. Principal investigator: Tomasz Winiarski. Investigators: Michał Walęcki, Maciej Stefańczyk, Piotr Majcher, Konrad Banachowicz, Bartosz Markocki, Piotr Miedzik, Karol Rejmanowski, Wojciech Węclewski.

Aim of this project was to equip the robot electron in a set of new sensors (Kinect, infrared sensors, an inertial sensor), and implementation of software to control new sensors (data acquisition and fusion). The proposed solution involves the use of modules, so it can be reused on other robots.

[PR27] Dean's grant No. 504/M/0011: **MRROC++ robot programming framework executed in Linux operating system with new force sensors software**. Granting period: 01.09.2011 - 31.12-2011. Principal investigator: Tomasz Winiarski. Investigators: Tomasz Kornuta, Piotr Trojanek, Michał Walęcki

The result of the project is the migration of MRROC++ robot programming framework from QNX operating system to Linux operating system. This involved: 1) Modification of interprocess communication based on MESSIP, 2) New implementation of forces and torques sensor software, 3) Creation of manipulator axes control software.

[PR28] Dean's Grant No. 504/M/0012: **Interval methods for solving nonlinear problems.** Granting period: 26.08.2011 – 5.04.2012. Principal investigator: Bartłomiej Kubica.

Interval methods are a well-established approach to solve several versions of nonlinear decision problems - equations systems, optimization problems, multi-criteria analysis, etc. Interval algorithms are robust, but time-consuming and memory demanding; hence, developing proper acceleration tools is very worthwhile - heuristics, data structures or tests based on advanced mathematical tools. The works in the grant concentrate on parallelization (in particular, on multicore architectures and GPUs) and heuristic creation.

[PR29] Statutory Grant No. 504G036300: **Development of methodology of control, decision support and production management**. Granting period: 6.04.2010 – 31.12.2011, 28.03.2011 – 31.12.2012. Principal investigators: Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Włodzimierz Ogryczak, Krzysztof Sacha, Piotr Tatjewski, Eugeniusz Toczyłowski, Cezary Zieliński.

5 Degrees Awarded

5.1 Professor Degrees

Professors Włodzimierz Ogryczak and Krzysztof Sacha have been nominated to the title of professor on April 2011.

5.2 D.Sc. Degrees

Krzysztof Pieńkosz
Wybrane modele i metody optymalizacji alokacji zasobów
Degree awarded on October 11, 2011

5.3 Ph.D. Degrees

Advisor: **Włodzimierz Ogryczak**

Bartosz Kozłowski
Decision Support for Problems with Numerous and Structured Criteria
Thesis defended on June 7, 2011

Advisor: **Krzysztof Sacha**

Andrzej Ratkowski
Projekowanie transformacyjne procesów w architekturze usługowej
Thesis defended on December 6, 2011

Advisor: **Piotr Tatjewski**

Ali Mhammed Benniran
Application of Predictive Algorithms to Industrial Robot Control
Thesis defended on November 21, 2011

5.4 M.Sc. Degrees

Advisor: **Piotr Arabas**

A. Wojtkowski
Narzędzie do wspomagania symulacji sieci typu DiffServ w symulatorze NS-2. Optymalizacja parametrów sieci
Degree awarded on March 2011

P. Bornikowski
Narzędzie do zbierania i analizy profile ruchowych użytkowników sieci w oparciu o protokół SNMP
Degree awarded on March 2011

Advisor: **Krzysztof Bryś (Wydział MINI)**

K. Jurkowski
Porównanie metod klastrowania (grupowania) danych
Degree awarded on October 2011

Advisor: **Paweł Cichosz (ISE)**

O. Rakevich
Wymiana miedzy złożonością a dokładnością w globalnie optymalnych drzewach decyzyjnych
Degree awarded on July 2011

Advisor: **Adam Czajka**

A. Bielawski
Test żywotności oka z wykorzystaniem własności statycznych struktury tęczówki
Degree awarded on June 2011

R. Brize
Modelowanie kurczenia mięśnia tęczówki dla potrzeb biometrii
Degree awarded on October 2011 (with honors)

Advisor: **Janusz Granat**

P. Głuszczyk
Zorientowana zdarzeniowo analiza danych sensorowych na urządzeniach mobilnych
Degree awarded on March 2011

M. Dorociński
Zorientowana zdarzeniowo analiza danych multimodalnych
Degree awarded on March 2011

K. Bąk
Wykorzystanie metod eksploatacji danych w internecie przyszłości
Degree awarded on October 2011

Advisor: **Jerzy Gustowski**

R. Osiński
Wizualizacja SCADA na platformie JPalio
Degree awarded on June 2011

R. Smagowski
Zaawansowane metody programowania sterowników PLC
Degree awarded on October 2011

Advisor: **Mariusz Kaleta**

F. Kondej
Modele i algorytmy planowania jednostek wytwórczych energii elektrycznej
Degree awarded on March 2011

P. Krajewski
Obrót wielotowarowy w modelu M3 z wykorzystaniem technologii SOA i MAS
Degree awarded on October 2011

P. Biel (OKNO)
APEdu - metodyka wdrażania system SAPERP na użytek wdrożeń dydaktycznych
Degree awarded on October 2011

Advisor: **Mariusz Kamola**

B. Piech
Analiza dynamiki sieci społecznej modelowanej danymi o połączeniach telefonicznych
Degree awarded on March 2011

K. Rybak
Konstrukcja modeli sieci społecznych na podstawie danych heterogenicznych
Degree awarded on October 2011

Advisor: **Adam Kozakiewicz**

A. Kostrzewa
Development of a Man in the middle attack on the GSM um interface
Degree awarded on April 2011

M. Rogowski (OKNO)
Porównanie systemów przeznaczonych do wirtualizacji środowisk IT – VMware vSphere i Microsoft Hyper-V
Degree awarded on October 2011

Advisor: **Tomasz Jordan Kruk**

A. Kukuła (OKNO)
Analiza porównawcza systemów operacyjnych Linux i OpenSolaris
Degree awarded on March 2011

J. Gębala
Automatyczna klasyfikacja złośliwych domen
Degree awarded on March 2011

Advisor: **Adam Krzemieniowski**

K. Koczorowska
Optymalizacja portfela inwestycji z prognozowaniem stop zwrotu w modelu Blacka-Littermana
Degree awarded on July 2011

Advisor: **Bartłomiej Kubica**

A. Winek
Wyszukiwanie i analiza obrazu cyfrowego w sieci WWW
Degree awarded on March 2011

P. Kozak
Obliczenia rozproszone w architekturze REST
Degree awarded on April 2011

Advisor: **Maciej Ławryńczuk**

J. Kmiecicki
Krytyczny przegląd struktur modeli neuronowych i algorytmów regulacji predykcyjnej
Degree awarded on March 2011

J. Godlewski
Standardowe i hybrydowe programowanie genetyczne w problemach identyfikacji modeli
Degree awarded on March 2011

Advisor: **Włodzimierz Ogryczak**

M. Niemczuk
Zastosowanie metody NISE do wyznaczania optymalnych portfeli inwestycyjnych
Degree awarded on October 2011

P. Kwiatkowski
Strategie przeszukiwania sąsiedztwa w metodzie Tabu Search dla problemu marszrutyzacji z oknami czasowymi
Degree awarded on October 2011

Advisor: **Tomasz Owczarek (ISE)**

M. Zawiślak
Monitoring and analyzing mobile networks using mobile terminal
Degree awarded on March 2011

Advisor: **Piotr Pałka**

J. Jagnicki
Zastosowanie modelu M3 do zarządzania ograniczeniami przepustowości portu lotniczego
Degree awarded on March 2011

Advisor: **Wiktor Peryt (IF)**

J. Ciechan
Projektowanie aplikacji korporacyjnych
Degree awarded on October 2011

Advisor: **Krzysztof Sacha**

Ł. Szaniawski
Badanie działania protokołu DDS w sieciach rozległych z utajnianiem kryptograficznym w warunkach ograniczonej przepustowości
Degree awarded on July 2011

Advisor: **Andrzej Stachurski**

M. Brzeziński
Visualizer for linear programming and nonlinear unconstrained optimization problems
Degree awarded on March 2011

M. Wilk
Visualizer for linear programming and nonlinear unconstrained optimization problems
Degree awarded on March 2011

P. Borysiuk
Barzilai and Borwein variant of Stecpest – Descent vs classical gradient methods
Degree awarded on October 2011

Advisor: **Lucjan Stapp (Wydział MINI)**

A. Grądziel (OKNO)
Metodologia zarządzania procesem testowania w systemach złożonych
Degree awarded on October 2011

Advisor: **Marcin Szlenk**

A. Bielasty
Modelowanie programów funkcyjnych tworzonych w języku F#
Degree awarded on October 2011

K. Kiełbasa
Modelowanie i generowanie kodu aplikacji w technologii Flex
Degree awarded on October 2011

Advisor: **Wojciech Szynkiewicz**

T. Zaborowski
Algorytm FastSLAM jednoczesnej lokalizacji i budowy mapy otoczenia przez robota mobilnego
Degree awarded on March 2011

K. Przedniczek
Budowa map symantycznych
Degree awarded on July 2011

Advisor: **Tomasz Śliwiński**

G. Łach
Grafikowanie czasu pracy z uwzględnieniem preferencji czasu
Degree awarded on October 2011

Advisor: **Eugeniusz Toczyłowski**

Ł. Karbowski
Mechanizmy iterowania dla modelu rynku wielotowarowego
Degree awarded on March 2011

A. Biernacki
Problem pokrycia terenu w bezprzewodowych sieciach sensorowych
Degree awarded on October 2011

Ł. Drążek
System wspomagania zarządzania łańcuchem dostaw produktów starzejących się
Degree awarded on October 2011

Advisor: **Tomasz Traczyk**

Ł. Mączewski
Zastosowanie modelowania zorientowanego na usługi i technologii usług sieciowych w projekcie oprogramowania pośredniczącego w dostępie do bazy danych o strukturze generycznej
Degree awarded on March 2011 (with honors)

M. Rybiński
Dopasowywanie otologii jako środek do konsolidacji heterogenicznych metadanych opisowych
Degree awarded on June 2011 (with honors)

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

R. Bochenek (OKNO)
Aktywne metody ochrony systemów komputerowych
Degree awarded on October 2011

J. Grądzki (OKNO)
Wybrane rozwiązania środowisk wirtualnych w aspekcie zarządzania wydajnością pamięci masowych
Degree awarded on October 2011

Advisor: **Tomasz Winiarski**

M. Żbikowski
Symulacja robota Polycrank w systemie MRROC++
Degree awarded on March 2011

Advisor: **Piotr Witoński (IMIO)**

P. Garbacewicz (OKNO)
Program wspomagający zarządzanie załogami statków morskich – aplikacja w języku Java
Degree awarded on March 2011

A. Bieńkowski (OKNO)
Porównanie platform Spring i EJB wersja 2.0 jako wsparcia w tworzeniu aplikacji webowych J2EE
Degree awarded on October 2011

Advisor: **Adam Woźniak**

P. Majka
Gry z potencjałem w modelowaniu sytuacji decyzyjnych
Degree awarded on October 2011

Advisor: **Andrzej Zalewski**

D. Sokołowska
Notacja graficzna dla dokumentowania decyzji architektonicznych MADv2.0
Degree awarded on March 2011

T. Kroll
Metodyka oceny architektury rozwiązań integracyjnych opartych na koncepcji SOA
Degree awarded on March 2011

N. Atallah
Identyfikacja usług w systemach zorientowanych usługowo
Degree awarded on October 2011

Advisor: **Cezary Zieliński**

M. Szymczak
Wykorzystanie GPU do implementacji szybkiej segmentacji obrazów
Degree awarded on July 2011

5.5 B.Sc. Degrees

Advisor: **Paweł Domański**

J. Zambrzycki
SOA extension through integration of control algorithms into Service Oriented Distributed Control System prototype using BPEL
Degree awarded on July 2011

W. Szymański
Distributed Control System prototype built on SOA platform using BPEL
Degree awarded on June 2011

M. Gintrowski
Modelowanie zasobów finansowych w placówkach bankowych
Degree awarded on September 2011

D. Dytko
Model of the DC motor control system implemented on an oil rig
Degree awarded on September 2011

Advisor: **Piotr Gawrysiak (II)**

W. Fijołek
Geolokalizacja z użyciem platformy mobilnej Google Android
Degree awarded on June 2011

Advisor: **Jerzy Gustowski**

K. Zegadło
Zbieranie i reprezentacja graficzna danych z urządzeń przemysłowych obsługujących protokół Modbus lub FTP
Degree awarded on February 2011

M .Dyoniziak
Sterownik silnika liniowego
Degree awarded on February 2011

K. Rogalski
Stanowisko laboratoryjne z siecią hierarchiczną
Degree awarded on February 2011

J. Malecka
Symulator sterownika PLC
Degree awarded on June 2011

K. Nowakowski
Dane w systemie SIMATIC. Metody przechowywania i podtrzymywania
Degree awarded on July 2011

P. Grabowska
Symulator obiektów dynamicznych sterowanych przez zdalny sterownik PLC
Degree awarded on September 2011

M. Jaworski
Stanowisko operatora modelu reaktora chemicznego
Degree awarded on September 2011

C. Łysiak
Programowanie sterowników Simens SIMATIC
Degree awarded on September 2011

Advisor: **Przemysław Kacprzak**

M. Paszkowski
System alokacji zasobów na rynku telekomunikacyjnym
Degree awarded on February 2011

Advisor: **Mariusz Kaleta**

P. Najdychor
Projekt i implementacja hurtowni danych na przykładzie operatora telefonii komórkowej z wykorzystaniem technologii Oracl'a
Degree awarded on September 2011

A. Szalast
System symulacyjny handlu wielkotowarowego na potrzeby edukacyjne
Degree awarded on September 2011

Advisor: **Mariusz Kamola**

K. Iracki
Przeglądarka internetowa dla urządzeń mobilnych
Degree awarded on June 2011

P. Radlak
Weryfikacja metod tomografii sieciowej w środowisku laboratoryjnym
Degree awarded on September 2011

Advisor: **Andrzej Karbowski**

P. Paluch
Optymalizacja międzywarstwowa w sieciach TCP/IP - ocena efektywności metody rozszerzonego lagranżianu
Degree awarded on September 2011

Advisor: **Tomasz Kornuta**

M. Cieślik
Lokalizacja i odczytywanie kodów kreskowych przez robota kasjera
Degree awarded on February 2011

K. Wasak
Rozpoznawanie układu dłoni za pomocą estymacji MAP
Degree awarded on July 2011

Advisor: **Adam Kozakiewicz**

R. Karbarz
Przybliżone algorytmy optymalizacyjne średniej warunkowej jako miary ryzyka
Degree awarded on July 2011

Advisor: **Tomasz Jordan Kruk**

J. Tomaszkiewicz
Systemy do wyszukiwania i przechowywania w rozproszonych nierelacyjnych bazach danych
Degree awarded on June 2011

M. Radzikowski
Porównanie systemów Haase i Cassandra pod względem przechowywania materiałów archiwalnych
Degree awarded on June 2011

J. Krzemień
Indeksacja i wyszukiwanie z wykorzystaniem narzędzi Apache
Degree awarded on June 2011

P. Stalewski
System do tworzenia zapasowych kopii danych z urządzeń mobilnych
Degree awarded on September 2011

Advisor: **Adam Krzemienowski**

S. Szymczyk
Model optymalizacyjny wielowymiarowej warunkowej wartości zagrożenia, jako miary ryzyka
Degree awarded on September 2011

Advisor: **Bartłomiej Kubica**

A. Kowalski
Porównanie środowisk do programowania wielowątkowego
Degree awarded on February 2011

M. Nogala
Relaksacja i programowanie liniowe w rozwiązywaniu niedookreślonych układów równań nieliniowych
Degree awarded on June 2011

K. Szymański
Implementacja przedziałowego algorytmu wyznaczania zbioru rozwiązań Pareto-optymalnych zadania wielokryterielnego
Degree awarded on September 2011

G. Kozikowski
Implementacja biblioteki do automatycznego różniczkowania w technologii OpenCl
Degree awarded on September 2011

Advisor: **Maciej Ławryńczuk**

W. Turak
Regulacja predykcyjna złożonego obiektu przemysłowego
Degree awarded on June 2011

P. Rzeczkowski
Algorytmy regulacji predykcyjnej z aproksymacją neuronową
Degree awarded on September 2011

Advisor: **Piotr Marusak**

I. Rakevich
Algorytmy regulacji predykcyjnej bazującej na rozmytym modelu obiektu - badania porównawcze w układzie regulacji nieliniowego reaktora chemicznego
Degree awarded on February 2011

Advisor: **Ewa Niewiadomska-Szynkiewicz**

J. Skomiał
Algorytmy lokalizacji i ich implementacja w sieci bezprzewodowych czujników
Degree awarded on February 2011

M. Mincer
Metody analityczne w sieciach socjalnych
Degree awarded on February 2011

J. Śmietanka
Implementacja gry terenowej z wykorzystaniem heterogenicznej sieci ad hoc
Degree awarded on September 2011

Advisor: **Włodzimierz Ogryczak**

M. Duda
Wspomaganie wielokryterialnego wyboru ścieżki na przykładzie schematu tatrzańskich szlaków turystycznych
Degree awarded on February 2011

P. Sosna
Epsilon – efektywne portfele inwestycji z ryzykiem mierzonym odchyleniem
Degree awarded on February 2011

U. Czerwonka
Zunifikowany model optymalizacji wielokryterialnej
Degree awarded on September 2011

Advisor: **Andrzej Pacut**

G. Górnicki
Particle swarm optimization in multiparameter problems
Degree awarded on September 2011

Advisor: **Piotr Pałka**

L. Korona
Heurystyka parametrycznej reguły wyceny towarów
Degree awarded on September 2011

K. Sienicki
Zastosowanie narzędzi języka XML do generowania modeli optymalizacyjnych
Degree awarded on September 2011

P. Dawiec
Protokół negocjacji wielostronnych w wieloagentowej platformie handlu wielotowarowego
Degree awarded on September 2011

M. Strzałek
Problemy poufności, niezaprzeczalności oraz autentyczności w systemach wieloagentowych
Degree awarded on September 2011

Advisor: **Krzysztof Pieńkosz**

G. Więckowski
Metody dekompozycji przepływów w sieciach
Degree awarded on February 2011

Advisor: **Jacek Raczkowski (II)**

M. Sobiecki
Modelowanie zjawiska wzbitego puchu śnieżnego dla potrzeb animacji komputerowej
Degree awarded on February 2011

Advisor: **Krzysztof Sacha**

M. Paszkowska
Refaktoryzacja kodu
Degree awarded on September 2011

Advisor: **Andrzej Stachurski**

K. Korbacz
Rozproszony algorytm populacyjny do rozwiązywania kwadratowego zadania przydziału
Degree awarded on February 2011

P. Goczyński
Zastosowanie programowania ilorazowego do wyboru portfela inwestycji
Degree awarded on February 2011

M. Kowalczewski
Wybór optymalnej trasy w sieci dróg polskich
Degree awarded on October 2011

Advisor: **Marcin Szlenk**

M. Pasieka
Generowanie kodu na podstawie modeli zapisanych w języku Alloy
Degree awarded on September 2011

I. Sawczuk
Generowanie systemów zarządzania treścią na podstawie diagramów klas UML
Degree awarded on September 2011

Advisor: **Piotr Szotkowski (TELE)**

A. Dąbrowski
Projekt i implementacja platformy do obliczeń rozproszonych z wykorzystaniem akceleratorów sprzętowych
Degree awarded on February 2011

B. Sosnowski
Heurystyczny algorytm dopasowania funkcji boolowskich
Degree awarded on September 2011

Advisor: **Wojciech Szynkiewicz**

P. Gołoś
Manipulacja dwuręczna modelu robota
Degree awarded on September 2011

Advisor: **Tomasz Śliwiński**

S. Sobociński
Analiza danych pochodzących z sond paliwowych pod kątem wykrywania sytuacji nietypowych
Degree awarded on September 2011

Advisor: **Piotr Tatjewski**

A. Bułka
Środowisko do porównywania algorytmów regulacji predykcyjnej z wykorzystaniem pakietu Matlak
Degree awarded on September 2011

Advisor: **Eugeniusz Toczyłowski**

T. Jastrzębski
Zarządzanie wewnętrznym łańcuchem dostaw z wykorzystaniem mechanizmów rynku wielotowarowego
Degree awarded on February 2011

Advisor: **Tomasz Traczyk**

K. Pater
Narzędzie do elastycznego tworzenia stron www na podstawie zawartości bazy danych w strukturze generycznej
Degree awarded on February 2011 (with honors)

T. Gidlewski
Ontologie w systemie handlu wielotowarowego M3
Degree awarded on February 2011

K. Jackiewicz
Generowanie raportów z baz danych za pomocą technologii Oracle ApEx oraz XSL-FO
Degree awarded on September 2011 (with honors)

Advisor: **Paweł Wawrzyński**

B. Jurek
Zastosowanie algorytmów ewolucyjnych do stworzenia bota efektywnie grającego w Robocode
Degree awarded on February 2011

A. Barszczewski
Efektywna implementacja sieci neuronowych w technologiach Cuda, SSE i OpenMP
Degree awarded on June 2011

Advisor: **Tomasz Winiarski**

T. Borkowski
Metoda LCM do unikania kolizji w nawigacji robotów mobilnych w pakiecie Player/Stage
Degree awarded on February 2011

A. Skubis
Graficzny editor interpretowanego języka specyfikującego zadania robotów
Degree awarded on September 2011

M. Wróblewski
Graficzna konsola sterownicza systemu MRROC++ w środowisku QT
Degree awarded on September 2011

Advisor: **Jan Zabrodzki (II)**

P. Caryk
Równoległe przetwarzanie w metodzie energetycznej
Degree awarded on October 2011

Advisor: **Cezary Zieliński**

M. Michniewicz
Zastosowanie wizji i dotyku do manipulacji na przykładzie toczenia kulki w labiryncie
Degree awarded on September 2011

R. Ciepielski
Kalibracja układu robotycznego
Degree awarded on September 2011

6 Publications

6.1 Monographs

[B1] Kasprzak Włodzimierz: Image and Speech Recognition, 2011, PW, 196 p.

[B2] Malinowski Krzysztof, Dindorf Ryszard (eds.): Postępy automatyki i robotyki, Monografie, vol. 16, 2011, Politechnika Świętokrzyska

6.2 Chapters in Scientific or Technical Books

[C1] Błaszczyk Jacek, Malinowski Krzysztof, Allidina Alnoor: Zagregowane zadanie sterowania stacjami pomp w systemie wodociągowym wielkiej skali, in: Postępy automatyki i robotyki / Malinowski Krzysztof, Dindorf Ryszard (eds.), Monografie, vol. 16, 2011, Politechnika Świętokrzyska, pp. 173–183

[C2] Boryń Mateusz: Implementacja serwomechanizmów wizyjnych w systemie MRROC++, in: Innowacyjne rozwiązania w obszarze automatyki, robotyki i pomiarów / Kacprzyk Janusz (eds.), 2011, Oficyna Wydawnicza PIAP, pp. 215–240

[C3] Kacprzak Przemysław, Kaleta Mariusz, Kołtyś Kamil, Lubacz Józef, Pałka Piotr, Pieńkosz Krzysztof, Stańczuk Wojciech, Toczyłowski Eugeniusz: Modele i mechanizmy aukcji przepustowości, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 66–96

[C4] Kaleta Mariusz, Stańczuk Wojciech: Model informacyjny, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 111–125

[C5] Kaleta Mariusz, Pałka Piotr, Traczyk Tomasz: Offers Modelling in Complex Trade Problems, in: Information Systems Architecture and Technology, Information as the Intangible Assets and Company Value Source / Wilimowska Zofia et al. (eds.), 2011, Wrocław University of Technology, ISBN 978-83-7493-633-0, pp. 63–72

[C6] Kamola Mariusz, Karpowicz Michał, Malinowski Krzysztof, Niewiadomska-Szynkiewicz Ewa: System badawczy, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 126–138

[C7] Karbowski Łukasz: Mechanizm iterowania z zakresem wycen dla modelu giełdy wielotowarowej, in: Automatyka, vol. 15, no 2, 2011, pp. 205–208

[C8] Karpowicz Michał: Problemy projektowania mechanizmów aukcyjnych i giełdowych, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 50–65

[C9] Karpowicz Michał, Lubacz Józef, Stańczuk Wojciech: Specyfika transakcji handlowych w telekomunikacji, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 9–32

[C10] Kasprzak Włodzimierz, Przybysz Paweł: Stochastic Modelling of Sentence Semantics in Speech Recognition, in: Computer Recognition Systems 4 / Burduk Robert et al. (eds.), Advances in Intelligent and Soft Computing, vol. 95, 2011, Springer, ISBN 978-3-642-210319-0, pp. 737–746

[C11] Kijas Szymon, Zalewski Andrzej, Sacha Krzysztof, Szlenk Marcin, Ratkowski Andrzej: Formal Semantics of Architectural Decision Making Models as a Component of an Integrated Evolution Methodology for Service-Oriented Systems, in: Information Systems Architecture and Technology, Service Oriented Networked Systems / Grzech Adam et al. (eds.), 2011, Wrocław University of Technology, ISBN 978-83-7493-631-6, pp. 37–46

[C12] Krzemienowski Adam: Sprawiedliwy wybór lokalizacji centrów usługowych z kryterium minimalizacji średniej warunkowej i kompensacją, in: Modelowanie preferencji a ryzyko'11 / Trzaskalik Tadeusz (eds.), Studia Ekonomiczne. Zeszyty Wydziałowe, vol. 96, 2011, Wydawnictwo UE w Katowicach, ISBN 978-83-7246-721-8, pp. 281–294

[C13] Ławryńczuk Maciej: Odporny nieliniowy algorytm regulacji predykcyjnej z optymalizacją kwadratową, in: Postępy automatyki i robotyki / Malinowski Krzysztof, Dindorf Ryszard (eds.), Monografie, vol. 16, 2011, Politechnika Świętokrzyska, pp. 106–120

[C14] Malinowski Krzysztof, Karpowicz Michał: Operacyjne aukcje przepustowości, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 97–110

[C15] Marusak Piotr: Efektywny obliczeniowo, analityczny algorytm regulacji predykcyjnej bazujący na modelach Wienera, in: Postępy automatyki i robotyki / Malinowski Krzysztof, Dindorf Ryszard (eds.), Monografie, vol. 16, 2011, Politechnika Świętokrzyska, pp. 133–142

[C16] Pałka Piotr, Korona Lidia: Efektywny obliczeniowo algorytm dla parametrycznej reguły wyceny in: Modelowanie preferencji a ryzyko'11, Trzaskalik Tadeusz (eds.), Studia Ekonomiczne. Zeszyty Wydziałowe, vol. 96, 2011, Wydawnictwo UE w Katowicach, ISBN 978-83-7246-721-8, pp. 281-294

[C17] Ratkowski Andrzej, Sacha Krzysztof: Business Process Design in Service Oriented Architecture, in: Information Systems Architecture and Technology, Service Oriented Networked Systems / Grzech Adam et al. (eds.), 2011, Wrocław University of Technology, ISBN 978-83-7493-631-6, pp. 15–24

[C18] Ratkowski Andrzej, Sacha Krzysztof: Przewidywanie wydajności procesów w języku BPEL, in: Integracja systemów informatycznych - nowe wyzwania / Górski Janusz, Orłowski Cezary (eds.), Automatyka Informatyka, 2011, Pomorskie Wydawnictwo Naukowe-Techniczne PWNT, ISBN 978-83-926806-7-3, pp. 205–212

[C19] Stańczak Jarosław, Pałka Piotr, Nahorski Zbigniew: Artificial intelligence methods in the CO2 permission market simulation, in: Modellierung and Simulation von Okosystemen, Berichte aus der Umweltinformatik,, 2011, pp. 185–205

[C20] Syfert Michał, Chrzanowski Paweł, Fajdek Bartłomiej, Ławryńczuk Maciej, Marusak Piotr, Patan Krzysztof, Rogala Tomasz, Stec Andrzej, Szulim Robert, Tomasik Piotr, Wachla Dominik, Witczak Marcin: Application of the DiaSter System, in: Modeling, Diagnostics and Process Control. Implementation in the DiaSter System / Korbicz Józef, Kościelny Jan M, 2011, Springer-Verlag, ISBN 978-3-642-16652-5, pp. 295–368

[C21] Szlenk Marcin: Metamodel and UML Profile for Functional Programming Languages, in: Dependable Computer System / Zamojski Wojciech et al. (eds.), Advances in Intelligent and Soft Computing, vol. 97, 2011, Springer, ISBN 978-3-642-21392-2, pp. 233–242

[C22] Tatjewski Piotr, Trybus Leszek, Ławryńczuk Maciej, Marusak Piotr, Świder Zbigniew, Stec Andrzej: Supervisory Control and Optimization, in: Modeling, Diagnostics and Process

Control. Implementation in the DiaSter System / Korbicz Józef, Kościelny Jan M, 2011, Springer-Verlag, ISBN 978-3-642-16652-5, pp. 233–294

[C23] Toczyłowski Eugeniusz: Wprowadzenie do mechanizmów aukcyjnych i giełdowych, in: Mechanizmy aukcyjne i giełdowe w handlu zasobami telekomunikacyjnymi / Lubacz Józef (eds.), 2011, Wydawnictwo Komunikacji i Łączności, ISBN 978-83-206-1825-9, pp. 33–49

[C24] Trojanek Piotr, Zieliński Cezary: Dekompozycja i specyfikacja systemów robotowych, in: Projektowanie, analiza i implementacja systemów czasu rzeczywistego / Trybus Leszek, Samolej Sławomir (eds.), 2011, Wydawnictwo Komunikacji i Łączności – WKŁ, ISBN 878-83-206-1822-8, pp. 53–64

[C25] Winiarski Tomasz: Elementary behaviours implementation in position-force control tasks for robot manipulators, in: Innowacyjne rozwiązania w obszarze automatyki, robotyki i pomiarów / Kacprzyk Janusz (eds.), 2011, Oficyna Wydawnicza PIAP, pp. 39–56

[C26] Wojdan Konrad, Świrski Konrad, Warchoł Michał, Jarmoszewicz Grzegorz, Chomiak Tomasz: Bio-Inspired Process Control, in: Bio-Inspired Computing and Networking / Xiao Yang (eds.), 2011, pp. 167–208

[C27] Zalewski Andrzej, Kijas Szymon, Sokołowska Dorota: Dokumentowanie ewolucji architektury przy użyciu notacji MAD 2.0, in: Inżynieria oprogramowania w procesach integracji systemów informatycznych / Górski Janusz, Orłowski Cezary (eds.), 2011, PWNT Gdańsk, pp. 405–411

[C28] Zalewski Andrzej, Kijas Szymon: Od zasad do szczegółów: zintegrowany model architektury wielkich systemów informatycznych, in: Inżynieria oprogramowania w procesach integracji systemów informatycznych / Górski Janusz, Orłowski Cezary (eds.), 2011, PWNT Gdańsk, pp. 77–86

[C29] Zalewski Andrzej, Sacha Krzysztof, Szlenk Marcin, Sztandera Piotr Michał, Ratkowski Andrzej, Kijas Szymon: W kierunku metodyki ewolucji systemów o architekturze usługowej, in: Integracja systemów informatycznych - nowe wyzwania / Górski Janusz, Orłowski Cezary (eds.), Automatyka Informatyka, 2011, Pomorskie Wydawnictwo Naukowe-Techniczne PWNT, ISBN 978-83-926806-7-3, pp. 87–92

[C30] Zieliński Cezary, Winiarski Tomasz, Szynkiewicz Wojciech, Mianowski Krzysztof, Banachowicz Konrad, Czajkowski Krzysztof: Sterownik manipulatora z chwytakiem wielopalczastym, in: Postępy automatyki i robotyki / Malinowski Krzysztof, Dindorf Ryszard (eds.), Monografie, vol. 16, 2011, Politechnika Świętokrzyska, pp. 576–592

6.3 Scientific and Technical Papers in Journals

[J1] Andrzejewski Michał, Schoeneich Radosław Olgierd: Zastosowanie sieci niespójnych w monitorowaniu statków powietrznych, in: Przegląd Telekomunikacyjny- Wiadomości Telekomunikacyjne, SIGMA NOT, vol. LXXXIV, no 8-9/2011, 2011, pp. 1322–1325

[J2] Badyda Krzysztof, Bujalski Wojciech, Niewiński Grzegorz, Warchoł Michał: Selected issues related to heat storage tank modelling and optimisation aimed at forecasting its operation, in: Archives of Thermodynamics, The Committee on Thermodynamics and Combustion , vol. 32(2011), no 3, 2011, pp. 3–31, DOI:10.2478/v10173-011-0010-8

[J3] Boryń Mateusz, Kornuta Tomasz Michał, Zieliński Cezary: Struktura ramowa do implementacji i testowania serwomechanizmów wizyjnych, in: Pomiary Automatyka Robotyka PAR, PIAP, no 2/2011, 2011, pp. 677–686

[J4] Burakowski Wojciech, Śliwiński Jarosław Marcin, Tarasiuk Halina, Bęben Andrzej, Niewiadomska-Szynkiewicz Ewa, Pyda Piotr: The IP QoS System, in: Journal of Telecommunications and Information Technology, no 3/2011, 2011, pp. 5-11

[J5] Felkner Anna, Kozakiewicz Adam Andrzej: Czasowa ważność poświadczeń języka RT_+^T, in: Studia Informatica – Zeszyty Naukowe, Politechnika Śląska, vol. 32, no 3A (98), 2011, pp. 145–154

[J6] Felkner Anna, Kozakiewicz Adam Andrzej: Semantyki języka zarządzania zaufaniem, in: Przegląd Telekomunikacyjny- Wiadomości Telekomunikacyjne, SIGMA NOT, vol. 8, no 9, 2011, pp. 1072–1081

[J7] Felkner Anna, Kozakiewicz Adam Andrzej: Time Validity in Role-Based Trust Management Inference System, in: Communications in Computer and Information Science, Springer, no 187, 2011, pp. 7–15

[J8] Jagnicki Jakub, Pałka Piotr: Zastosowanie mechanizmów handlu wielotowarowego do zarządzania przepustowością portów lotniczych, in: Automatyka, AGH w Krakowie, vol. 15, no 2, 2011, pp. 195–203

[J9] Kamola Mariusz, Niewiadomska-Szynkiewicz Ewa, Malinowski Krzysztof, Stańczuk Wojciech, Pałka Piotr: A Software Platform for Research on Auction Mechanisms, in: Journal of Telecommunications and Information Technology, no 3/2011, 2011, pp. 38–46

[J10] Kamola Mariusz, Arabas Piotr Przemyslaw: Dynamically established transmission paths in the future Internet - proposal of a framework, in: Bulletin of the Polish Academy of Science, Technical Science, PAN, vol. 59, no 3, 2011, pp. 357–366, DOI:10.2478/v10175-011-0043-9

[J11] Karbowski Łukasz: Mechanizm iterowania z zakresem wycen dla modelu giełdy wielotowarowej, in: Automatyka, vol. 15, no 2, 2011, pp. 205–208

[J12] Karpowicz Michał: Designing Auctions: A Historical Perspective, in: Journal of Telecommunications and Information Technology, no 3/2011, 2011, pp. 114–122

[J13] Kasprzak Włodzimierz, Ding N., Hamada N.: Speaker localization and speech separation in two echoic mictures, in: Science-Future of Lithuania, Vilnius Gediminas Technical University (VGTU) Press, vol. 3, no 1, 2011, pp. 43–49

[J14] Kołtyś Kamil, Pieńkosz Krzysztof, Toczyłowski Eugeniusz: A Flexible Auction Model for Virtual Private Networks, in: Lecture Notes In Computer Science, Springer, no 6641, 2011, pp. 97–108

[J15] Kornuta Tomasz Michał, Zieliński Cezary: Dekompozycja sysytemu sterowania robota-kasjera, in: Pomiary Automatyka Robotyka PAR, PIAP, no 2/2011, 2011, pp. 41–48

[J16] Kozłowski Bartosz, Ogryczak Włodzimierz: On Ordered Weighted Reference Point Model for Multi-attribute Procurement Auctions, in: Lecture Notes In Computer Science, Springer, no 6922, 2011, pp. 294–303

[J17] Kruś Leon, Skorupiński Jan, Toczyłowski Eugeniusz: Analiza motywacyjnie zgodnych decyzji w wielokryterialnym przetargu, in: Automatyka, vol. 15, no 2, 2011, pp. 281–289

[J18] Krzemienowski Adam: Sprawiedliwy wybór lokalizacji centrów usługowych z kryterium minimalizacji średniej warunkowej i kompensacją. Zeszyty Naukowe Wydziałowe 96, Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, 2011, pp. 281–294.

[J19] Kubica Bartłomiej Jacek: The Second Derivative of a Non-Differentiable Function and its Use in Interwal Optimization Methods, in: Journal of Telecommunications and Information Technology, no 4/2011, 2011, pp. 81–85

[J20] Lasota Krzysztof, Kozakiewicz Adam Andrzej: Analiza podobieństw złośliwych nazw domenowych, in: Studia Informatica - Zeszyty Naukowe, Politechnika Śląska, vol. 32, no 3A (98), 2011, pp. 177–186

[J21] Lasota Krzysztof, Kozakiewicz Adam Andrzej: Analysis of the Similarities in Malicious DNS Domain Names, in: Communications in Computer and Information Science , Springer, no 187, 2011, pp. 1–6

[J22] Ławryńczuk Maciej: Accuracy and computational efficiency of suboptimal nonlinear predictive control based on neural models, in: Applied Soft Computing, no 11, 2011, pp. 2202-2215, DOI:10.1016/j.asoc.2010.07.021

[J23] Ławryńczuk Maciej: Nonlinear Predictive Control Based on Multivariable Neural Wiener Models, in: Lecture Notes In Computer Science, Springer, no 6593, 2011, pp. 31–40

[J24] Ławryńczuk Maciej: On improving accuracy of computationally efficient nonlinear predictive control based on neural models, in: Chemical Engineering Science, Elsevier, no 66, 2011, pp. 5253–5267, DOI:10.1016/j.ces.2011.07.015

[J25] Ławryńczuk Maciej: On-line set-point optimisation and predictive control using neural Hammerstein models, in: Chemical Engineering Journal, no 166(2011), 2011, pp. 269–287, DOI:10.1016/j.cej.2010.07.065

[J26] Ławryńczuk Maciej: Online set-point optimisation cooperating with predictive control of a yeast fermentation process: A neural network approach, in: Engineering Applications of Artificial Intelligence, Elsevier, no 24, 2011, pp. 968–982, DOI:10.1016/j.engappai.2011.04.007

[J27] Ławryńczuk Maciej: Precise and Computationally Efficient Nonlinear Predictive Control Based on Neural Wiener Models, in: Lecture Notes in Artificial Intelligence, Springer, no 6804, 2011, pp. 668–672

[J28] Ławryńczuk Maciej: Predictive Control of a Distillation Column Using a Control-Oriented Neural Model, in: Lecture Notes In Computer Science, Springer, no 6593, 2011, pp. 230–239

[J29] Marusak Piotr: Advanced Prediction Method in Efficient MPC Algorithm Based on Fuzzy Hammerstein Models, in: Lecture Notes In Computer Science, Springer, no 6922, 2011, pp. 193–202

[J30] Marusak Piotr, Kuntanapreeda Suwat: Constrained model predictive force control of an electrohydraulic actuator, in: Control Engineering Practice, Elsevier, no 19, 2011, pp. 62–73, DOI:10.1016/j.conengprac.2010.09.002

[J31] Marusak Piotr: Efficient Predictive Control and Set-Point Optimization Based on a Single Fuzzy Model, in: Lecture Notes In Computer Science, Springer, no 6594, 2011, pp. 215–244

[J32] Marusak Piotr: Numerically Efficient Analytical MPC Algorithm Based on Fuzzy Hammerstein Models, in: Lecture Notes In Computer Science, Springer, no 6594, 2011, pp. 177–185

[J33] Mianowski Krzysztof, Banachowicz Konrad, Winiarski Tomasz, Zieliński Cezary, Szynkiewicz Wojciech, Czajkowski Krzysztof: Chwytak wielopalczasty dla robota usługowego – konstrukcja, in: Pomiary Automatyka Robotyka PAR, PIAP, no 5/2011, 2011, pp. 46–52

[J34] Nahorski Zbigniew, Pałka Piotr, Stańczak Jarosław, Radziszewska Weronika: Wieloagentowa metodyka zarządzania niedoborami i nadmiarami energii w sieciach dystrybucyjnych, in: Rynek Energii, KAPRINT, no 1(92), 2011, pp. 22–27

[J35] Niewiadomska-Szynkiewicz Ewa, Marks Michał, Kamola Mariusz: Localization in Wireless Sensor Network Using Heuristic Optimization Techniques, in: Journal of Telecommunications and Information Technology, no 4/2011, 2011, pp. 55–64

[J36] Niewiadomska-Szynkiewicz Ewa: Simulation-based design of self-organising and cooperative networks, in: International Journal of Space-Based and Situated Computing, Inderscience Publishers, vol. 1, no 1, 2011, pp. 68–75

[J37] Ogryczak Włodzimierz, Śliwiński Tomasz: On Dual Approaches to Efficient Optimization of LP Computable Risk Measures for Portfolio Selection, in: Asia-Pacific Journal of Operational Research, World Scientific Publishing Co, vol. 28, no 1, 2011, pp. 41–63, DOI:10.1142/S0217595911003041

[J38] Ogryczak Włodzimierz, Perny Patrice, Weng Paul: On Minimizing Ordered Weighted Regrets in Multiobjective Markov Decision Processes, in: Lecture Notes in Artificial Intelligence, Springer, no 6992, 2011, pp. 190–204

[J39] Ogryczak Włodzimierz, Śliwiński Tomasz: On solving the dual for portfolio selection by optimizing Conditional Value at Risk, in: Computational Optimization and Applications, vol. (2011) 50, 2011, pp. 591–595, DOI:10.1007/s10589-010-9321-y

[J40] Ogryczak Włodzimierz, Kozłowski Bartosz: Reference point method with importance weighted ordered partial achievements, in: Top, Springer, no 19, 2011, pp. 380–401, DOI:10.1007/s11750-009-0121-4

[J41] Pałka Piotr: Multilateral Negotiations in Distributed, Multi-agent Environment, in: Lecture Notes In Computer Science, Springer, no 6923, 2011, pp. 80–89

[J42] Pałka Piotr, Traczyk Tomasz, Wilk Rafał: Scentralizowane negocjacje multilateralne w handlu wielotowarowym z wykorzystaniem standardów w M3 i EBXML, in: Studia Informatica – Zeszyty Naukowe, Politechnika Śląska, vol. 32, no 2B(97), 2011, pp. 455–466

[J43] Pałka Piotr: Uwolnienie cen detalicznych na obecnym rynku energii elektrycznej, in: Rynek Energii, KAPRINT, no 2(93), 2011, pp. 129–134

[J44] Putz-Leszczyńska Joanna Maria, Pacut Andrzej: Signature verification based on a global classifier that uses universal forgery features, in: Lecture Notes in Artificial Intelligence, Springer, 2011, pp. 170–179

[J45] Ratkowski Andrzej, Zalewski Andrzej: Transformational Design of Business Processes for SOA, in: Lecture Notes In Computer Science, Springer, no 4980, 2011, pp. 76–90

[J46] Sacha Krzysztof: Trust Management Languages and Complexity, in: Lecture Notes In Computer Science, Springer, no 7045, 2011, pp. 588–604

[J47] Schoeneich Radosław Olgierd, Pałka Piotr: Zastosowanie mechanizmów aukcyjnych w decyzjach routingowych dla bezprzewodowych sieci niespójnych DTN, in: Przegląd Telekomunikacyjny- Wiadomości Telekomunikacyjne, SIGMA NOT, vol. LXXXIV, no 8-9/2011, 2011, pp. 1000–1003

[J48] Siemiątkowska Barbara, Chojecki Rafał, Wiśniowski Mateusz, Walęcki Michał, Wielgat Marcin, Michalski Jakub: Mobile System for Non Destructive Testing of Weld Joints via Time of Flight Diffraction (TOFD) Techniques, in: Lecture Notes in Control and Information Sciences, no 422, 2011, pp. 65–74

[J49] Smolira Kamil, Toczyłowski Eugeniusz, Kacprzak Przemysław: Analiza symulacyjna struktur procesów rynku energii, in: Rynek Energii, KAPRINT, no 1(92), 2011, pp. 66–72

[J50] Szumski Maciej: Porównanie algorytmów liniowej regulacji predykcyjnej, in: Pomiary Automatyka Robotyka PAR, PIAP, no 2/2011, 2011, pp. 605–612

[J51] Szynkiewicz Wojciech, Czajkowski Krzysztof, Zieliński Cezary, Winiarski Tomasz, Mianowski Krzysztof, Banachowicz Konrad: Chwytak wielopalczasty dla robota usługowego – planowanie chwytów, in: Pomiary Automatyka Robotyka PAR, PIAP, no 7-8/2011, 2011, pp. 75–81

[J52] Szynkiewicz Wojciech, Błaszczyk Jacek: Optimization-Based Approach to Path Planning for Closed Chain Robot Systems, in: International Journal of Applied Mathematics & Computer Science, University of Zielona Góra and Lubuskie Scientific Society (Poland), vol. 21, no 4, 2011, pp. 659–670, DOI:10.2478/v10006-011-0052-8

[J53] Tarasiuk Halina, Śliwiński Jarosław Marcin, Arabas Piotr Przemyslaw, Jaskóła Przemysław Mariusz, Góralski Witold: Performance Evaluation of Signaling in the IP QoS System, in: Journal of Telecommunications and Information Technology, no 3/2011, 2011, pp. 12–20

[J54] Toczyłowski Eugeniusz, Kaleta Mariusz, Kacprzak Przemysław, Pałka Piotr, Smolira Kamil: Środowisko symulacyjne do analizy rozwiązań hurtowego rynku energii elektrycznej, in: Rynek Energii, KAPRINT, no 2(93), 2011, pp. 112-117

[J55] Trojanek Piotr, Zieliński Cezary: Specyfikacja złożonych syystemów robotowych, in: Pomiary Automatyka Robotyka PAR, PIAP, no 2/2011, 2011, pp. 266–274

[J56] Walęcki Michał, Banachowicz Konrad, Winiarski Tomasz: Research Oriented Motor Controllers for Robotic Application, in: Lecture Notes in Control and Information Sciences, no 422, 2011, pp. 193–203

[J57] Wawrzyński Paweł, Papis B: Fixed point method for autonomous on-line neural network training, in: Neurocomputing, no 74(2011), 2011, pp. 2893–2905

[J58] Winiarski Tomasz, Banachowicz Konrad, Zieliński Cezary, Szynkiewicz Wojciech, Mianowski Krzysztof, Czajkowski Krzysztof: Chwytak wielopalczasty dla robota usługowego – sterowanie, in: Pomiary Automatyka Robotyka PAR, PIAP, no 6/2011, 2011, pp. 52–57

[J59] Zalewski Andrzej, Kijas Szymon, Sokołowska D: Capturing Architecture Evolution with Maps of Architectural Decisions 2.0, in: Lecture Notes In Computer Science, Springer, no 6903, 2011, pp. 13–16

[J60] Zalewski Andrzej, Kijas Szymon: Towards the Competitive Software Development, in: Lecture Notes In Computer Science, Springer, no 6795, 2011, pp. 103–112

[J61] Zieliński Cezary, Tchoń Krzysztof: Design, Control and Modelling Robots. Editorial, in: Journal of Automation, Mobile Robotics and Intelligent Systems, vol. 5, no 3, 2011, pp. 5–7

[J62] Zieliński Cezary, Kornuta Tomasz Michał, Trojanek Piotr, Winiarski Tomasz: Metoda projektowania układów sterowania autonomicznych robotów mobilnych. Część 2. Przykład zastosowania, in: Pomiary Automatyka Robotyka PAR, PIAP, no 10/2011, 2011, pp. 84–90

[J63] Zieliński Cezary, Kornuta Tomasz Michał, Trojanek Piotr, Winiarski Tomasz: Metoda projektowania układów sterowania autonomicznych robotów mobilnych. Część 1. Wprowadzenie teoretyczne, in: Pomiary Automatyka Robotyka PAR, PIAP, no 9/2011, 2011, pp. 84–87

[J64] Zieliński Cezary, Kornuta Tomasz Michał, Trojanek Piotr, Winiarski Tomasz, Walęcki Michał: Specification of a Multi-Agent Robot-Based Reconfigurable Fixture Control System, in: Lecture Notes in Control and Information Sciences, no 422, 2011, pp. 171–182

6.4 Scientific and Technical Papers in Conference Proceedings

[P1] Gruszczyński Witold, Arabas Piotr Przemyslaw: Application of Social Network to Improve Effectiveness of Classifiers in Churn Modelling, in: 2011 International Conference on Computational Aspects of Social Networks (CASoN) / Nn n, 2011, IEEE Xplore, ISBN 978-1-4577-1132-9, pp. 217-222

[P2] Houmani N, Garcia-Salicetti S, Dorizzi B, Montalvao J, Canuto J, Andrade M.v, Kudelski Michał Adam, Putz-Leszczyńska Joanna Maria: BioSecure Signature Evaluation Campaign (ESRA'2011): Evaluating Systems on Quality-based categories of Skilled Forgeries, in: Proc. IEEE IJCB 2011 (International Joint Conference on Biometrics, 2011, ISBN 978-1-4577-1358-3, pp. 1–10, DOI:10.1109/IJCB.2011.6117487

[P3] Kornuta Tomasz Michał, Zieliński Cezary: Behavior-based control system of a robot actively recognizing hand postures, in: 15-th IEEE International COnference on Advanced Robotics ICAR 2011, 2011, IEEE, pp. 265–270

[P4] Marks Michał, Niewiadomska-Szynkiewicz Ewa: Self-adaptive Localization using Signal Strenght Measurements, in: SENSORCOMM 2011The Fifth International Conference on Sensor Technologies and Applications , 2011, IARIA, ISBN 978-1-61208-144-1, pp. 73–78

[P5] Piech Bartłomiej, Kamola Mariusz, Niewiadomska-Szynkiewicz Ewa: Reconstruction of a Social Network Graph from Incomplete Call Detail Records, in: 2011 International Conference on Computational Aspects of Social Networks (CASoN) / Nn n, 2011, IEEE Xplore, ISBN 978-1-4577-1132-9, pp. 136–140, DOI:10.1109/CASON.2011.6085932

[P6] Sacha Krzysztof: Complexity of Credential Processing, in: Proceedings of EUROCON 2011, International Conference on Computer as a Tool, 2011, IEEE, pp. 1–4, DOI:10.1109/EUROCON.2011.5929192

[P7] Sikora Andrzej, Niewiadomska-Szynkiewicz Ewa: Mobility Model for Self-Configuring Mobile Sensor Network, in: SENSORCOMM 2011The Fifth International Conference on Sensor Technologies and Applications, 2011, IARIA, ISBN 978-1-61208-144-1, pp. 97–102

[P8] Tatjewski Piotr: Disturbance Modeling and State Estimation for Predictive Control with Different State-Space Process Models, in: Proceedings of the 18th IFAC World Congress, 2011, 2011, IFAC, ISBN 978-3-902661-93-7, pp. 1–10

[P9] Tatjewski Piotr: Model predictive control in fault-tolerant control systems, in: Proceedings 10th International Science and Technology Conference Diagnostic of Processes and Systems, 2011

[P10] Wilkowski Artur, Kasprzak Włodzimierz: Hand gesture modeling using Dynamic Bayesian Networks and Deformable Templates, in: The 7th International Conference on SIGNAL IMAGE TECHNOLOGY & INTERNET BASED SYSTEMS – SITIS 2011, 2011, ISBN 978-0-7695-4635-3-11, pp. 390–397, DOI:10.1109/SITIS.2011.55

[P11] Wojdan Konrad, Świrski Konrad, Warchoł Michał, Milewski Janu, Miller A..: A Practical Approach to Combustion Process Optimization Using an Improved Immune Optimizer, in: 2011 Mechanical Engineering Conference on Sustainable Research and Innovation, 2011, pp. 1–3

[P12] Zalewski Andrzej, Kijas Szymon: From Principles to Details: Integrated Framework for Architecture Modeling of Large Scale Software Systems, in: 5th IFIP TC2 Central and Eastern European Conference on Software Engineering Techniques, 2011, IFIP, pp. 1–10

[P13] Zieliński Cezary, Kornuta Tomasz Michał: Generation of Linear Cartesian Trajectories for Robots Using Industrial Motion-Controllers, in: 16-th IEEE International Conference on Methods and Models in Automation and Robotics, MMAR 2011, 2011, IEEE, pp. 62–67

[P14] Zieliński Cezary, Winiarski Tomasz, Szynkiewicz Wojciech, Mianowski Krzysztof, Banachowicz K: Sterownik manipulatora z chwytakiem wielopalczastym, in: XVII Krajowa Konferencja Automatyki KKA 2011 / Dindorf R (eds.), 2011, pp. 1102–1115

6.5 Reports and Other Papers

[R1] Banachowicz K. (2011): Opracowanie i wykonanie drugiej generacji mikroprocesorowych sterowników napędów chwytaka. ICCE Research Report No. 11-03

[R2] Banachowicz K., Winiarski T. (2011): Oprogramowanie czujników sił i momentów sił. ICCE Research Report No. 11-08

[R3] Daniluk K. (2011): A survey on energy – efficient for security issues in wireless sensor networks. ICCE Research Report No. 11-02

[R4] Karbarz R., Krzemienowski A. (2011): Przybliżone algorytmy optymalizacyjne średniej warunkowej jako miary ryzyka. ICCE Research Report No. 11-04

[R5] Krzemienowski A. (2011): Multivariate Conditional Value-at-Risk as a Risk Measure. ICCE Research Report No. 11-01

[R6] Krzemienowski A. (2011): Risk Management with the Conditional Average and Insurance Strategies. ICCE Research Report No. 11-09

[R7] Krzemienowski A. (2011): Sprawiedliwy wybór lokalizacji centrów usługowych z kryterium minimalizacji średniej warunkowej i kompensacją. ICCE Research Report No. 11-05

[R8] Krzemienowski A., Śliwiński T. (2011): On Implementation of the Kaldor- Hicks Criterion in Equitable Optimization. ICCE Research Report No. 11-10

[R9] Nahorski Z., Stańczak J., Pałka P. (2011): Simulation of an uncertain emission market for greenhouse gases using agent-based methods. Research Report of Systems Research Institute of Polish Academy of Sciences

[R10] Trojanek P., Winiarski T. (2011): Komunikacja międzyprocesorowa w oparciu o MESSIP. ICCE Research Report No. 11-07

[R11] Traczyk T., ed. (2011): Metody i architektury wymiany informacji dla handlu elektronicznego na rynkach infrastrukturalnych, cz. 3. ICCE Research Report No. 11-13.

[R12] Walęcki M., Winiarski T. (2011): Oprogramowanie sterowników manipulatorów. ICCE Research Report No. 11-06