

INSTITUTE OF CONTROL
AND COMPUTATION ENGINEERING

2012 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 has been supplemented by postgraduate studies in Management of Information Technology Resources and in Project Management organized by Dr. Andrzej Zalewski, in IT Security and Biometry led by Dr. Adam Czajka as well as in Engineering of Management Information Systems and Decision Support Systems, and recently, Designing Information Systems with Databases organized by Dr. Tomasz Traczyk. There is a growing interest in this form of studies and nearly 200 persons took part in these courses in the 2011/2012 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 in 2007. The partners of Warsaw University of Technology in this Program are Ecole Centrale de Nantes (Nantes, France) – the coordinator and Università Degli Studi di Genova (Genova, Italy). The students from within and outside of the EU study for two years, each year in one of the partner institutions and obtain a double diploma from those universities upon successful completion of the studies.

Warsaw University of Technology was successful to secure funds from the EU European Social Fund for the Program of Development of WUT. Our Institute participated in the realization of the task: Development of the 2nd level studies in Control and Robotics in WUT. Prof. Piotr Tatjewski was responsible for this task. Four faculties of WUT participate in it. It was scheduled for the years 2008–2012.

In 2012 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 7th FP EU grant ICT-2009.1.1: The Network of the Future (FP7-ICT-2009-5). The ECONET project focuses its research and development efforts on 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 2012 Prof. Andrzej Pacut coordinated the project on 'Biometrics techniques and PKI for modern ID documents securing of and information systems' granted by the National Centre for Research and Development (NCBiR) involving NASK, WUT, ASSECO Poland S.A., Trusted Information Consulting Ltd. and University of Wrocław. Within ICCE prof. Włodzimierz Kasprzak led the team of biometrics and pattern recognition groups.

Dr. Maciej Ławryńczuk was selected to the Top 500 Innovators Program for the brightest young scientists to enable them to complete a two month program on commercialization of research results at UC Berkeley and Stanford University in California.

Research is a vital part of our activities, directly affecting both the Institute's recognition in Poland and abroad, and the quality of teaching. Description of research programs conducted by the faculty of the Institute can be found in this report. I express my sincere appreciation to the faculty and staff of the Institute for their efforts and contributions to our achievements in teaching and research. In particular, I would like to congratulate to Prof. Krzysztof Malinowski for his nomination for the second term as a Chairman of the Committee on Automatic Control and Robotics of the Polish Academy of Sciences, and to Prof. Krzysztof Sacha for his second nomination to the Board of the National Centre for Research and Development. I would also like to compliment Prof. Władysław Findeisen who was awarded the highest decoration of the Republic of Poland, the Order of the White Eagle, and by the Holy See the Pontifical Equestrian Order of St. Gregory the Great.

Cezary Zieliński

Contents

1	General Information	1
1.1	Directors	1
1.2	Organization of the Institute	1
1.3	Research Areas	5
1.4	Statistical Data	37
2	Faculty and Staff	39
2.1	Professors Emeriti	39
2.2	Senior Faculty	42
2.3	Supporting Faculty and Staff	55
2.4	Ph.D. Students	57
2.5	Administrative and Technical Staff	60
3	Teaching Activities – Academic Year 2011/2012	62
3.1	Undergraduate and Graduate Studies	62
3.2	Extramural Graduate Studies	65
3.3	Graduate Distance Learning	65
4	Projects	66
5	Degrees Awarded	77
5.1	Professor Degrees	77
5.2	D.Sc. Degrees	77
5.3	Ph.D. Degrees	77
5.4	M.Sc. Degrees	78
5.5	B.Sc. Degrees	83
6	Publications	90
6.1	Scientific or Technical Books	90
6.2	Scientific and Technical Papers in Journals	90
6.3	Scientific and Technical Papers in Books and Conference Proceedings	93

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



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

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

1 General Information

The following information about organization of the Institute reflects the situation on December 31, 2012.

1.1 Directors

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

1.2 Organization of the Institute

SYSTEMS CONTROL DIVISION

<i>Division Head:</i>	Professor Krzysztof Malinowski
<i>Professors:</i>	Włodzimierz Kasprzak, Krzysztof Malinowski, Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Cezary Zieliński
<i>Professors, retired:</i>	Władysław Findeisen, Radosław Ładziński, Jacek Szymanowski
<i>Reader:</i>	Adam Woźniak
<i>Assistant Professors:</i>	Piotr Arabas, Adam Czajka, Mariusz Kamola, Andrzej Karbowski, Adam Kozakiewicz, Tomasz J. Kruk, Bartłomiej Kubica, Michał Kudelski (until Nov. 2012), Joanna Putz-Leszczyńska, Wojciech Szynkiewicz, Paweł Wawrzyński, Tomasz Winiarski
<i>Assistant:</i>	Tomasz Kornuta, Michał Wałęcki, Marcin Chochowski (since March 2012)
<i>Senior Lecturer:</i>	Michał Warchoń
<i>Ph.D. Students:</i>	Marcin Chochowski, Krzysztof Stanisław Daniluk, Andrzej Igielski, Tomasz Kornuta, Krzysztof Lasota, Michał Marks (until Oct. 2012), Bartosz Papis, Krzysztof Piech (since Oct. 2012), Paweł Przybysz, Andrzej Sikora, Maciej Stefańczyk, Michał Wałęcki
<i>Software Engineers:</i>	Michał Wałęcki, Piotr Trojanek (until Dec. 2012), Tomasz Kornuta (since Oct. 2012)

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-Leszczynska, P. Wawrzyński, M. Chochowski, B. Papis, k. Piech)

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, M. Stefańczyk, P. Trojanek, M. Walęcki)

Research of the group is concerned with robot motion planning and control systems, autonomous mobile robot localization and navigation, robot programming methods, computer vision systems and speech recognition systems. In the robot control systems area research is focused on new motion and force/position control algorithms for multi-robot systems. Special emphasis is given to the sensor-based motion planning and control of 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

<i>Division Head:</i>	Professor Piotr Tatjewski
<i>Professors:</i>	Piotr Tatjewski, Krzysztof Sacha
<i>Assistant Professors:</i>	Paweł Domański, Maciej Ławryńczuk, Piotr Marusak, Marcin Szlenk, Andrzej Zalewski, Andrzej Ratkowski (since Oct. 2012)
<i>Assistant:</i>	Andrzej Ratkowski (until Sept. 2012)
<i>Senior Lecturers:</i>	Jerzy Gustowski, Urszula Kręglewska
<i>Senior Engineer:</i>	Włodzimierz Macewicz
<i>Ph.D. Students:</i>	Adam Hurkała, Tomasz Leś (since Oct. 2012), Szymon Kijas, Wojciech Pikulski, Maciej Szumski, Michał Romanowski (since Oct. 2012), Antoni Wysocki (since Oct. 2012)

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, M. Szumski, A. Wysocki)

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, A. Hurkała, S. Kijas, T. Leś, W. Pikulski, M. Romanowski, P. Sztandera)

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

OPERATIONS AND SYSTEMS RESEARCH DIVISION

<i>Division Head:</i>	Professor Eugeniusz Toczyłowski
<i>Professors:</i>	Włodzimierz Ogryczak, Eugeniusz Toczyłowski
<i>Professor, retired:</i>	Wiesław Traczyk, Andrzej P. Wierzbicki
<i>Readers:</i>	Tomasz Traczyk
<i>Assistant Professors:</i>	Janusz Granat, Mariusz Kaleta, Kamil Kołtyś (since Oct. 2012), Bartosz Kozłowski (since Sept. 2012), Adam Krzemienowski, Piotr Pałka, Krzysztof Pieńkosz, Grzegorz Płoszajski, Andrzej Stachurski, Tomasz Śliwiński, Izabela Żółtowska
<i>Assistants:</i>	Przemysław Kacprzak (until Feb. 2012), Kamil Kołtyś (until Sept. 2012), Bartosz Kozłowski
<i>Senior Lecturers:</i>	Tadeusz Rogowski, Jerzy Sobczyk
<i>Ph.D. Students:</i>	Jarosław Hurkała, Jan Kurnatowski (since Oct. 2012), Michał Majdan (until Oct. 2012), Piotr Modliński, Paweł Olender, Adam Połomski, Michał Przyłuski, Kamil Sędrowicz (since Oct. 2012)

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, I. Żółtowska, K. Kołtyś, P. Modliński, J. Kurnatowski, K. Sędrowicz)

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. Granat, B. Kozłowski, A. Krzemienowski, A. Stachurski, T. Śliwiński, T. Rogowski, J. Sobczyk, J. Hurkała, M. Majdan, P. Olender, A. Połomski, M. Przyłuski)

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

1.3 Research Areas

Complex Systems Group

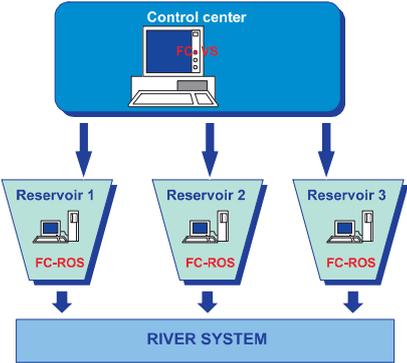


Software for complex systems simulation

Flood Control

FC-ROS & FC-VS (Flood Control)

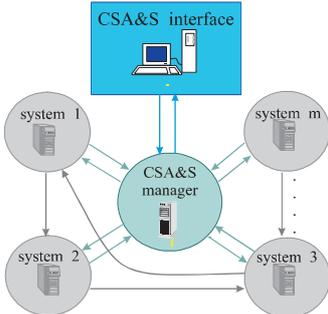
decision support systems for flood control in multireservoir systems.



Distributed Simulation

CSA&S (Complex Systems Analysis & Simulation)

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



ASim/Java (Asynchronous Simulation/Java)

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

Complex Systems Group



Traffic control in TCP/IP networks

Family of price-based control algorithms for IP networks

Congestion control:

- New algorithm proposed
- Verified through simulations

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

Simulation Tools

TcpSim – a fast TCP/IP simulator:

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

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

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

Complex Systems Group

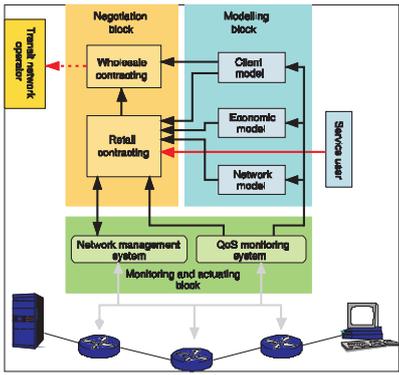


Dynamic contracting of IP services

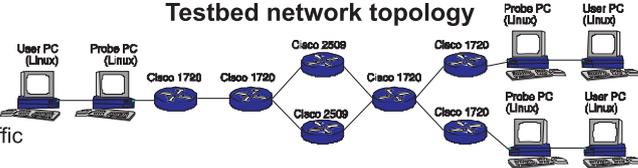
System features:

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

System architecture



Testbed network topology



Implementation - technologies:

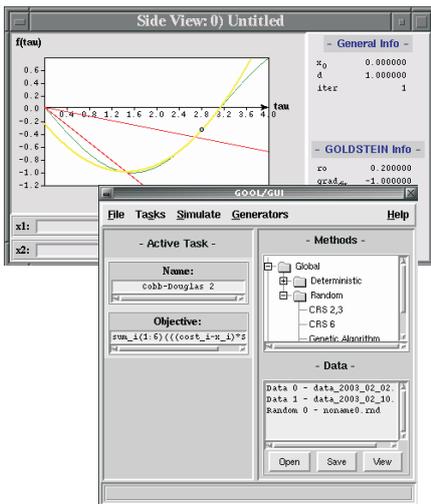
- Cisco *CBWFQ* (class-bases weighted fair queuing), *shaping*, *policing* used
- Monitoring and actuating block implemented in *PERL* using *command-line* access
- a dedicated control and measurements network used, *Precision Time Protocol* applied
- traffic generation and measurements tools: *bulk*,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

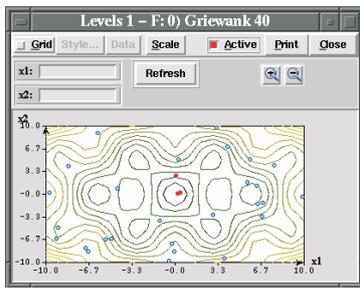
Complex Systems Group



Global optimization

GOOL - Global Optimization Object-Oriented Library





GOOL

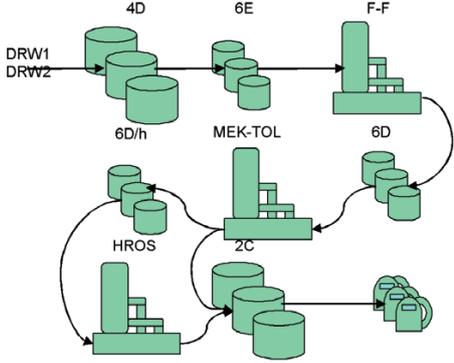
library of random search generators and optimization algorithms for convex and nonconvex, unconstrained and constrained problems

Complex Systems Group



Operations scheduling using Constraint Programming

Solution of a scheduling problem in an Oil Refinery Division



Oil Refinery Division



Simulation and optimization system

Goals:

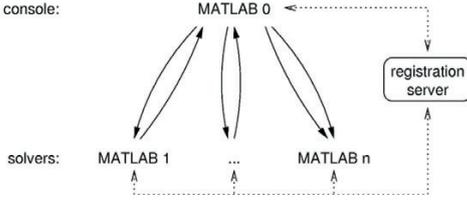
- Simulation of an Oil Refinery Division
- Finding all feasible solutions
- Meeting all technical requirements
- Constraint scheduling methods
- Very fast computations

Complex Systems Group



Parallel and distributed computations

- research on price and Benders method of decomposed optimization
- research on parallel implementation of global optimization algorithms
- development of new software tools for parallel and distributed computations
- a monograph published in 2009





New software tools:

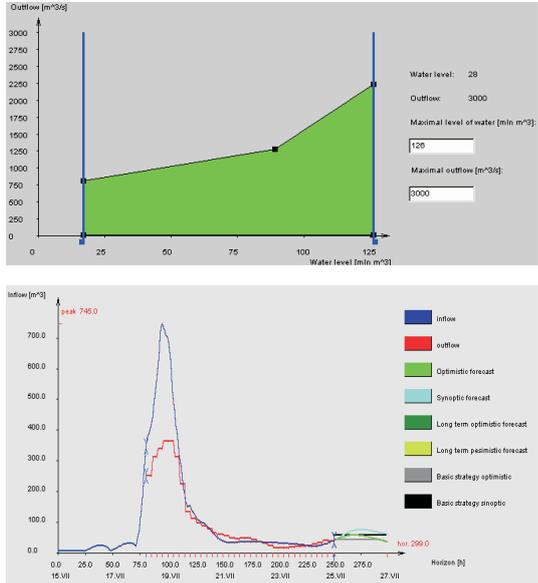
- **jPar** – a software environment for parallelizing Matlab calculations on multicores and in clusters without file communication
- **parAMPL** – a library for parallelizing AMPL calculations on multicores and in clusters

Complex Systems Group



Optimal control and closed-loop design

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

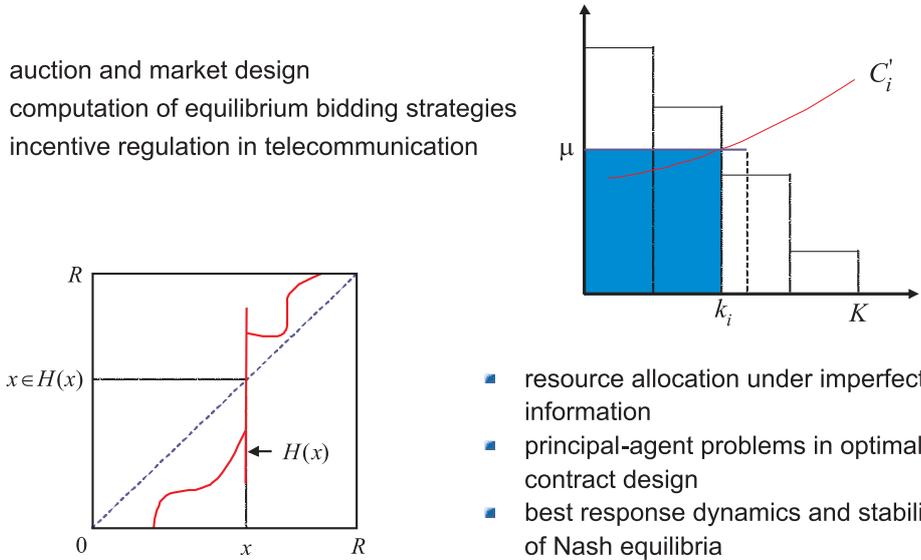


Complex Systems Group



Game theory and mechanism design

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



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

Complex Systems Group



Interval computations for nonlinear problems

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

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

$$a \in \mathbf{a} = [\underline{a}, \bar{a}], \quad b \in \mathbf{b} = [\underline{b}, \bar{b}],$$

$$\varepsilon \in \{+, -, \cdot, / \} \Rightarrow a \varepsilon b \in \mathbf{a} \varepsilon \mathbf{b}$$

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

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

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

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

Interval (inclusion) function:

$$f(x) = x^2 + 2x + 1$$

$$f(\mathbf{x}) = \mathbf{x}^2 + 2 \cdot \mathbf{x} + 1$$

$$x \in \mathbf{x} = [\underline{x}, \bar{x}] \Rightarrow f(x) \in f(\mathbf{x})$$

$$f[-5, 1] = [-5, 1]^2 + 2 \cdot [-5, 1] + 1 = [-9, 28] \supseteq [0, 16]$$

Interval tools:

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

Problems that can be solved:

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

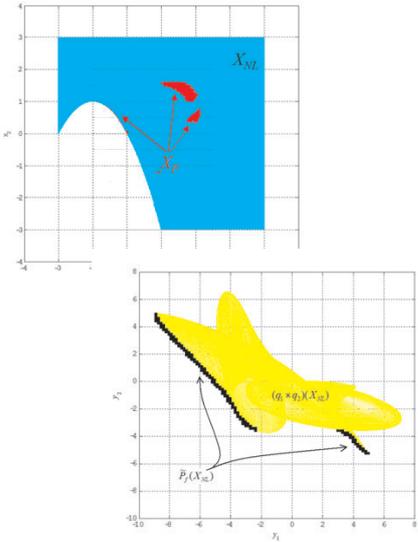
Complex Systems Group



Interval computations seek the Pareto-front of nonlinear multicriterial problems

```

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



Biometrics and Machine Learning Group



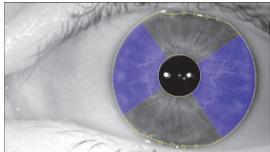
Biometrics

Iris verification

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

Prototype iris recognition system (IRS) with aliveness detection

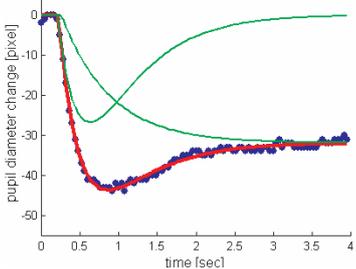




Iris coding
Human eye imaged in infrared light by the IRS. Automatic localization of iris sectors free from occlusions (marked in blue)

Aliveness detection

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



Biometrics and Machine Learning Group



Biometrics

Handwritten signature-based identity verification

Verification of on-line signatures

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

Verification of scanned signatures (off-line)

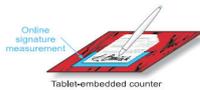
- integration of several independent methods of verification in a two stage classifier with a global classifier at the second stage
- use of morphological, texture and grid features

Template creation improvements:

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

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

Online signature measurement



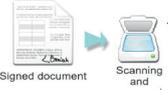
Verification



Signature templates



Signed document



Verification



Signature templates



Biometrics and Machine Learning Group

Biometrics
Robust algorithms on GPUs
(Graphics Processing Units)

Iris-based verification and identification system

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

Biometrics and Machine Learning Group

Biometrics
Biometric authentication for secure remote access

Novel authentication protocols and techniques employing biometrics

VPN & wireless networks applications

Development of biometric capable mobile devices and workstations

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

Central template database design and management

Multiple biometrics (iris, fingerprint and others)

Biometrics and Machine Learning Group

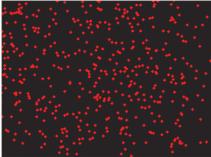


Biometrics

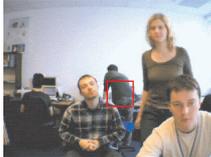
Particle filter-based face tracking and identification

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

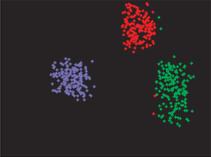
Sample tracking sequence (24 fps)



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



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



Frame #4: Dust filtering for exact tracking



Biometrics and Machine Learning Group



Biometrics

EEG-based identity verification

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



Biometrics and Machine Learning Group



Biometrics

Biometric cryptography

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

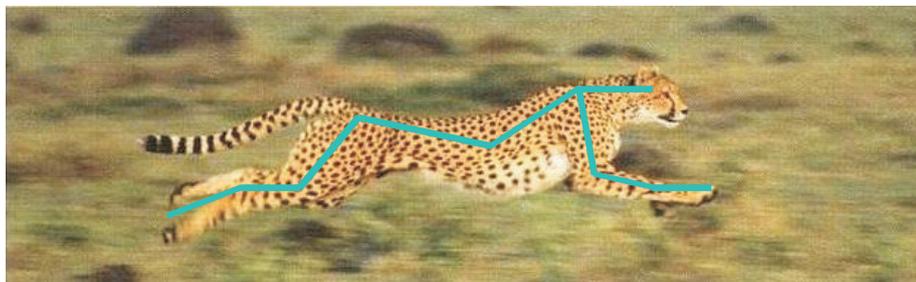
Biometrics and Machine Learning Group



Machine Learning

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

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



Biometrics and Machine Learning Group



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.



Biometrics and Machine Learning Group



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 funded by grant N514237137 of Ministry of Science and Higher Education in Poland.



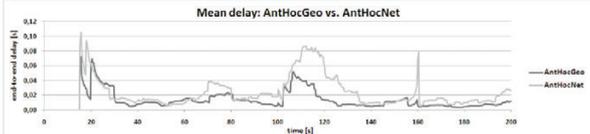
Biometrics and Machine Learning Group

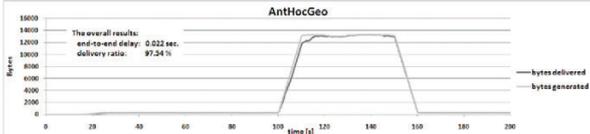


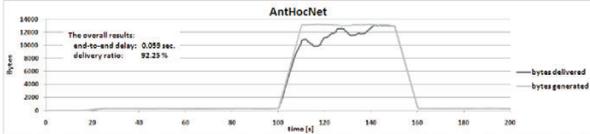
Machine Learning

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

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







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



Robot Programming and Pattern Recognition Group

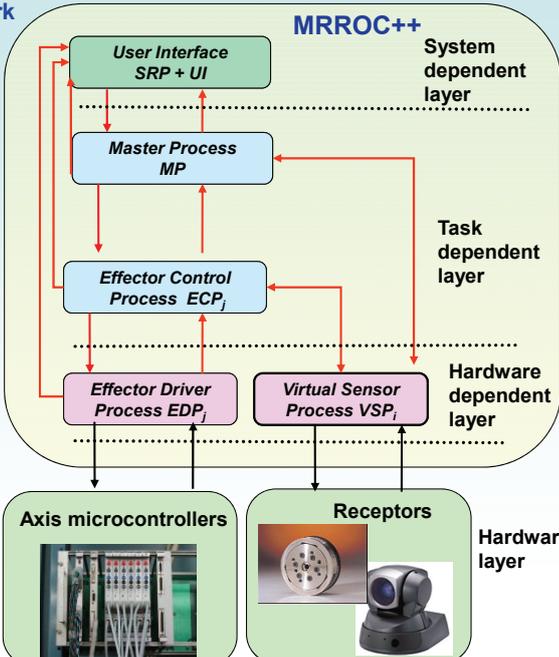


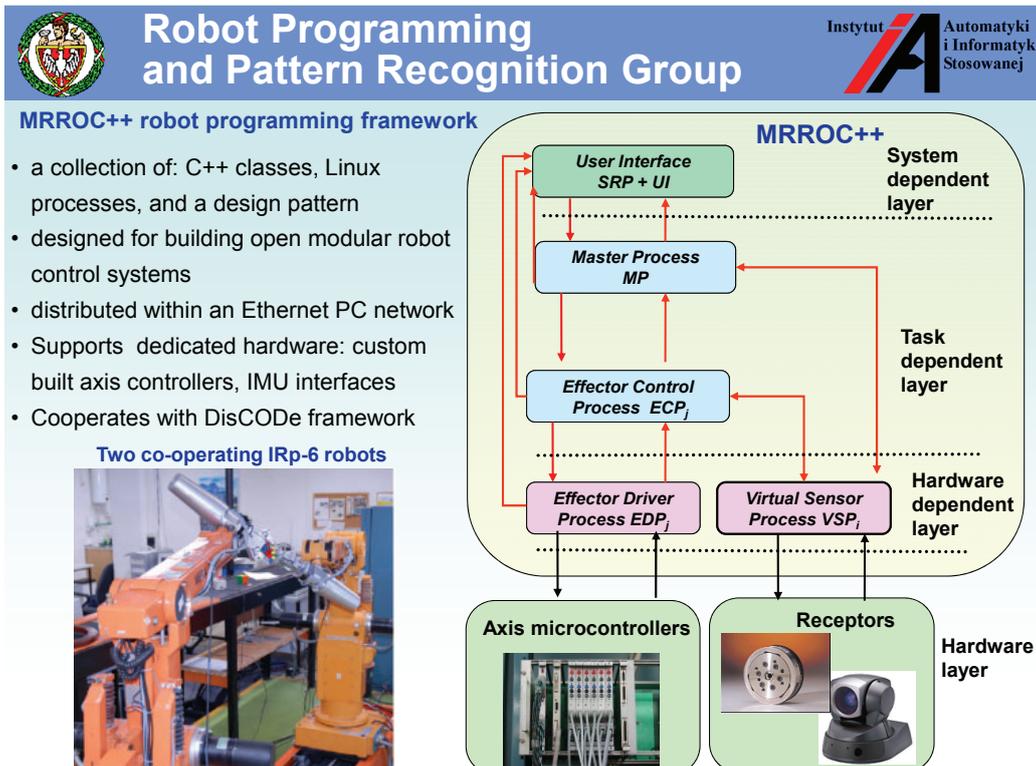
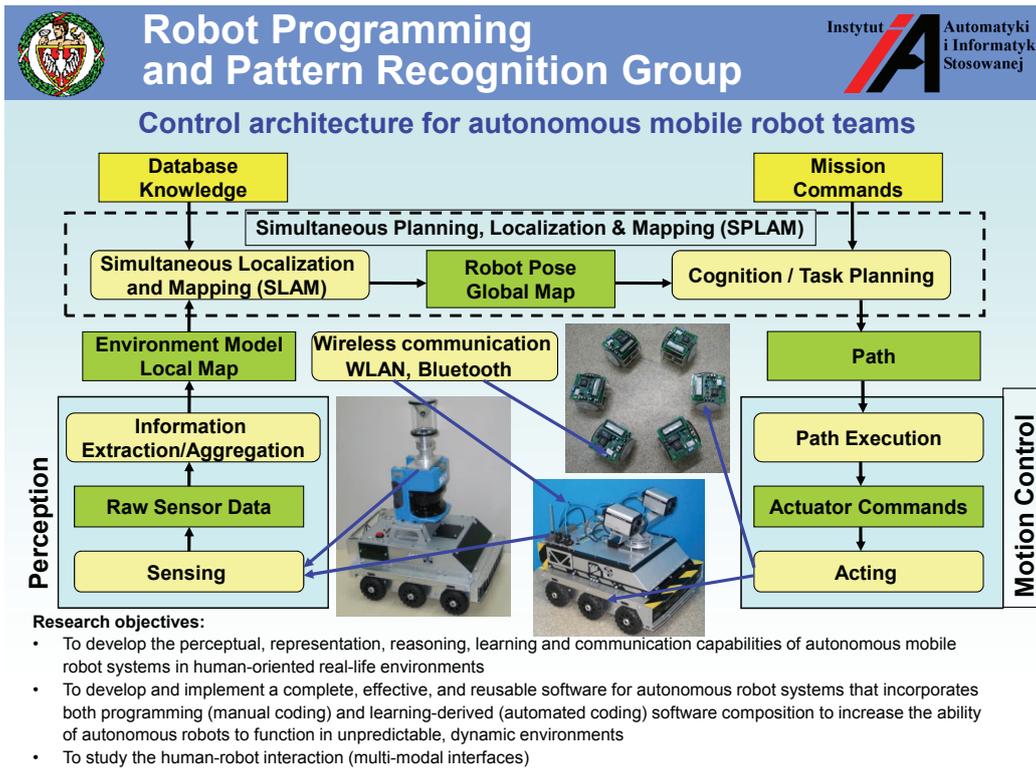
MRROC++ robot programming framework

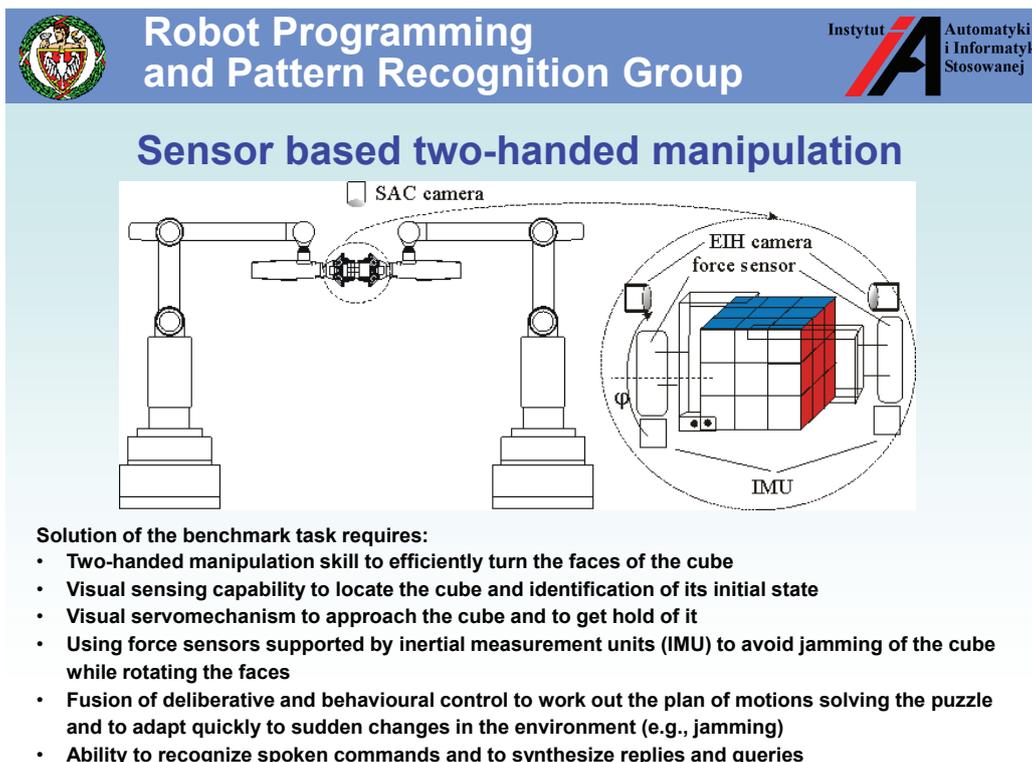
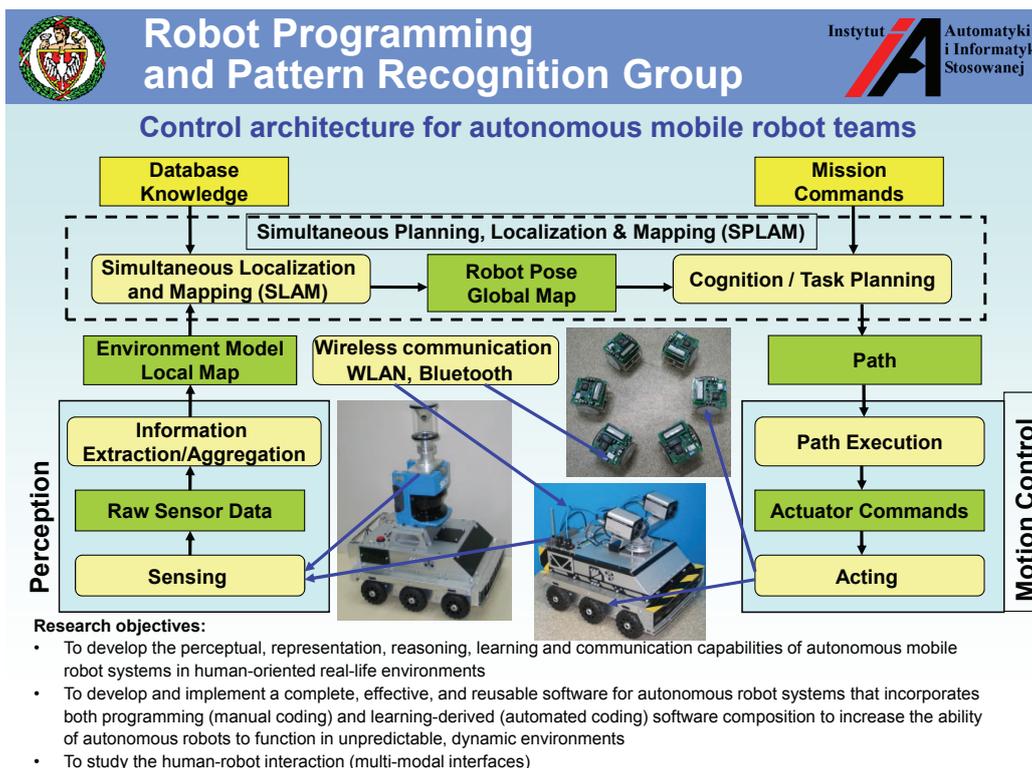
- a collection of: C++ classes, Linux processes, and a design pattern
- designed for building open modular robot control systems
- distributed within an Ethernet PC network
- Supports dedicated hardware: custom built axis controllers, IMU interfaces
- Cooperates with DisCODE framework

Two co-operating IRp-6 robots

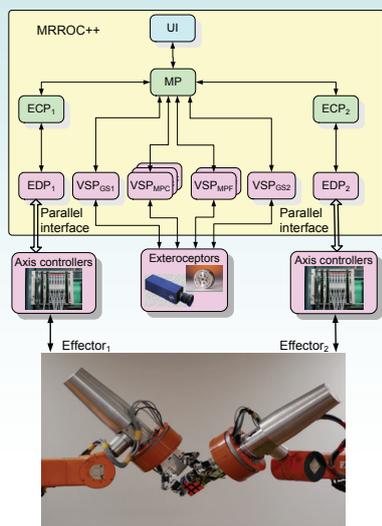








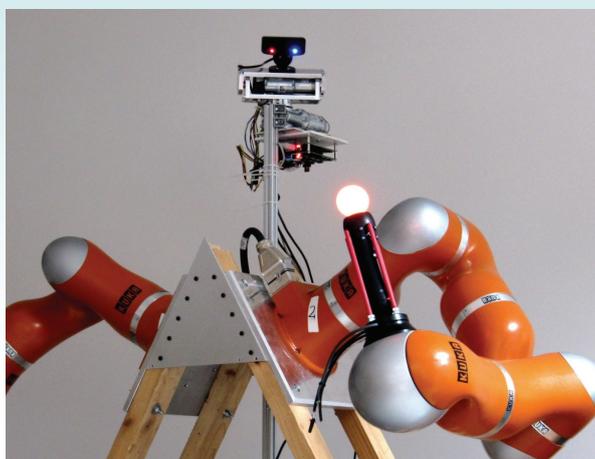
Two-handed Service Robot Controller Capable of Solving a Rubik's Cube Puzzle



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)

Velma: two arm robotic system with redundant manipulators and active head



14 DOF two arm system

- Torque controllers in joints
- Full dynamic control
- Redundant kinematic structure
- Antropomorphic form
- Lightweight (30 kg)
- Controlled by ROS, OROCOS software

2DOF active head

- Custom hardware
- Internal trajectory generation
- High precision servocontrol
- Fast motion
- Constructed as a platform for various sensors: 3D structured light camera, stereovision system
- Controlled by ROS, OROCOS software



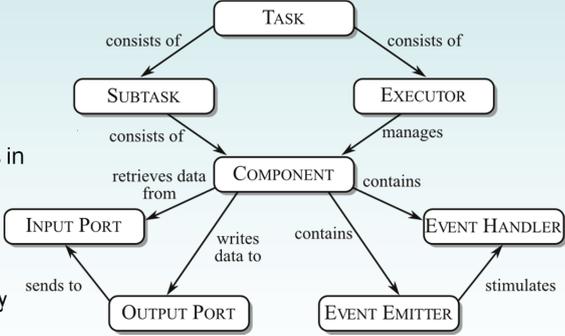
Robot Programming and Pattern Recognition Group



DisCODe: Distributed Component Oriented Data Processing

Major concepts:

- **Facilitation** of the development and testing of diverse, multi-step sensory processing algorithms
- **Utilization** of implemented algorithms in robotic tasks: drivers for hardware, ready-to-use communication mechanisms with robotic frameworks
- **Reusability** of components created by users – core separated from the component libraries



```

            graph TD
            TASK -- consists of --> SUBTASK
            TASK -- consists of --> EXECUTOR
            SUBTASK -- consists of --> COMPONENT
            EXECUTOR -- manages --> COMPONENT
            COMPONENT -- retrieves data from --> INPUT_PORT
            COMPONENT -- writes data to --> OUTPUT_PORT
            COMPONENT -- contains --> EVENT_EMITTER
            COMPONENT -- contains --> EVENT_HANDLER
            INPUT_PORT -- sends to --> OUTPUT_PORT
            EVENT_EMITTER -- stimulates --> EVENT_HANDLER
            
```



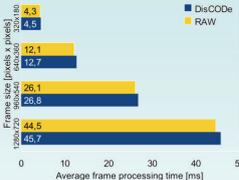
Robot Programming and Pattern Recognition Group



DisCODe: Benchmark applications

Roadsign detection test

- **Low** communication overhead
- **Robust** structure

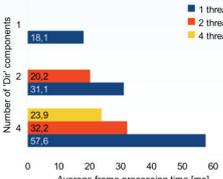


Frame size (pixels x pixels)	DisCODe (ms)	RAW (ms)
1280x720	4.3	45.7
1024x768	4.5	44.5
768x1024	12.1	26.8
640x480	12.7	26.1

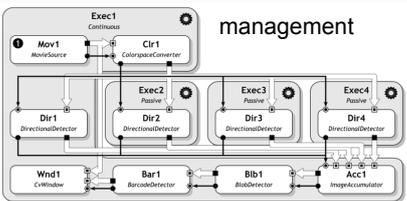


Barcode detection test

- **Parallel** computations
- **Execution threads management**



Number of Dir components	1 thread (ms)	2 threads (ms)	4 threads (ms)
1	16.1	-	-
2	20.2	31.1	-
3	23.9	32.2	57.6





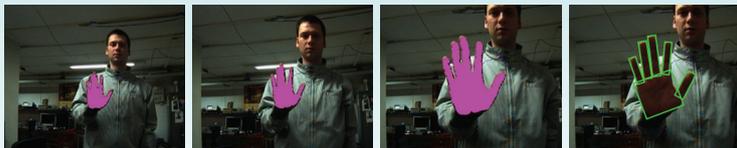
Robot Programming and Pattern Recognition Group



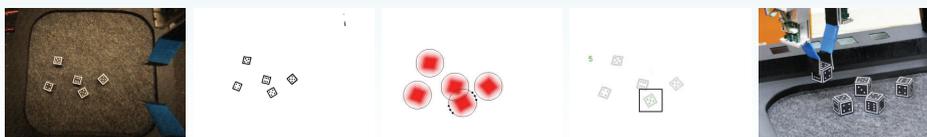
Instytut
Automatyki
i Informatyki
Stosowanej

DisCODE: Robotic applications

Active recognition of the hand posture



Robot playing a game of dice





Robot Programming and Pattern Recognition Group

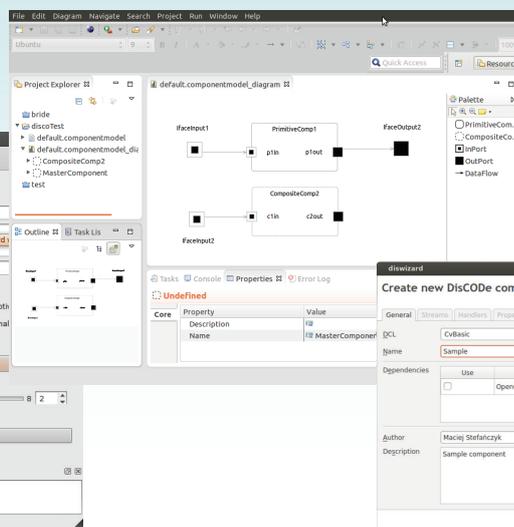
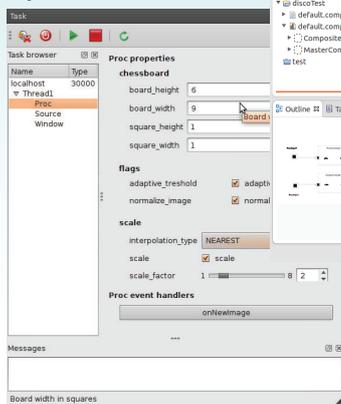


Instytut
Automatyki
i Informatyki
Stosowanej

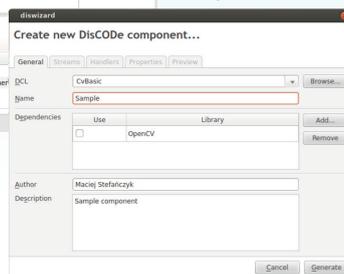
DisCODE: Graphical tools

Metamodel-based task editor

Dynamic user interface



Component wizard



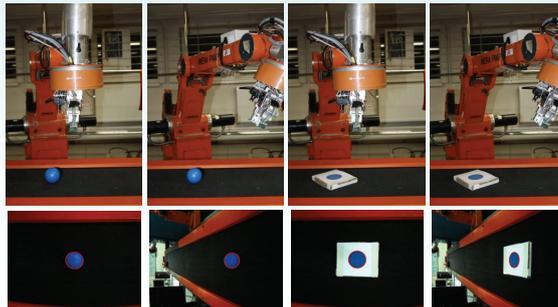
Concept: Active Perception and Active Vision

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 a distant or partially occluded object can be very difficult and sometimes even impossible. Those problems can be overcome by the introduction of an active observer, able to perform actions facilitating the gathering and interpretation of perceptual information.

Example: determination of object convexity



Major system concepts:

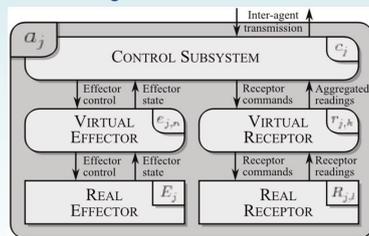
- **Embodied Agent** based decomposition of the control system into subsystems
- Utilization of **Transition functions** for description of subsystem behaviours
- **Combination** of several behaviours of enabling the successful realisation of the task

Embodied Agent: a robot control system design method

Concept:

- Design of robot control systems requires a specification method that would facilitate its subsequent implementation.
- The postulated approach bases on decomposition of a system into **Embodied Agents** and description of their **Behaviours** in terms of **Transition Functions**.

Embodied Agent:

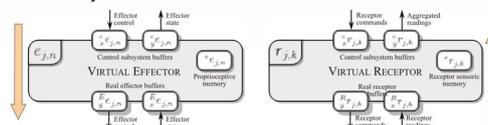


- **Embodied Agent** - any device or program having the ability to perceive its surroundings to subsequently influence the environment state, can communicate with other agents and has an internal imperative to achieve its goal.

Subsystems and transition functions:

- Five types of internal subsystems: its **effector**, **receptor**, **virtual effector**, **virtual receptor** and a **control subsystem**
- The former two form the agent's **corporeal body**, whereas the latter three its **control system**.

• The evolution of the state of each of those subsystems is defined in terms of a transition function, transforming the values taken from input buffers and internal memory into the values written to output buffers (and back to the internal memory as well) and sent subsequently to the associated subsystems.



 **Robot Programming and Pattern Recognition Group** 

Elementary behaviours of robot manipulators

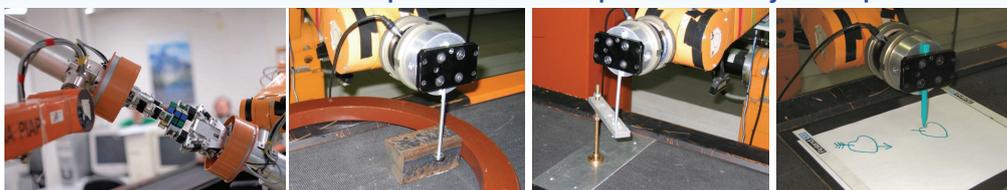
Main concepts:

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

- unconstrained motion with the assumption that no contact with obstacles will be encountered – where pure position control suffices
- contact with the environment – where pure force control is used,
- intermediate or transitional behavior – where initially unconstrained motion is 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

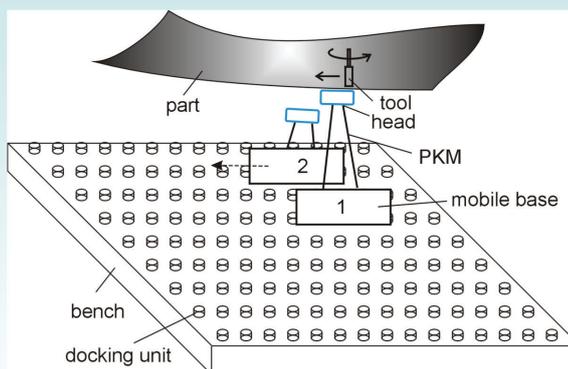
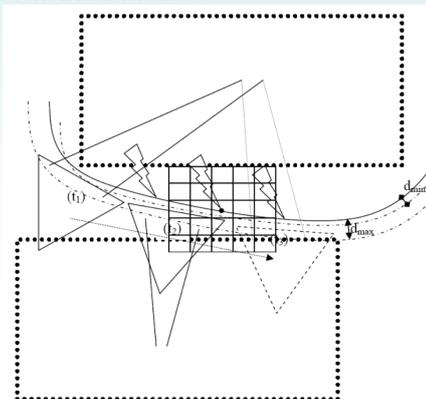
Rotating a crank

Copying drawings

 **Robot Programming and Pattern Recognition Group** 

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.

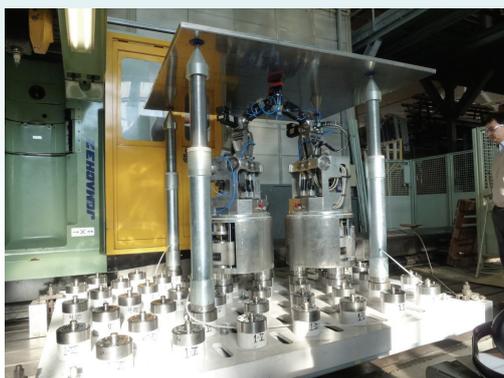


Robot Programming and Pattern Recognition Group



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

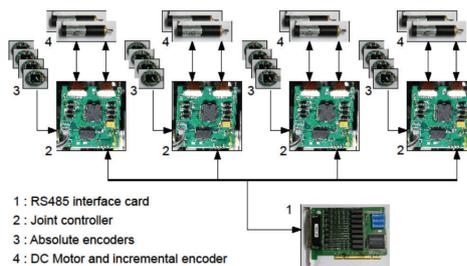


Robot Programming and Pattern Recognition Group



Three finger gripper

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





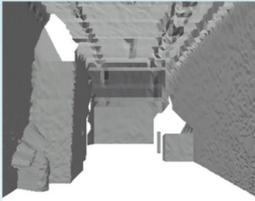
Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

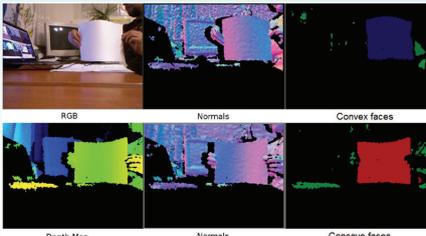


Computer Vision in mobile and service robotics

Environment map generation, obstacle avoidance.




Depth-map and color image Segmentation



3D object recognition





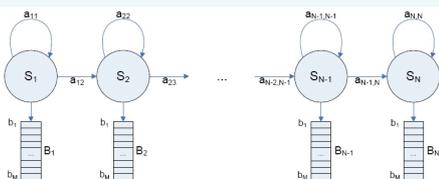

Robot Programming and Pattern Recognition Group

Instytut Automatyki i Informatyki Stosowanej

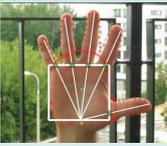
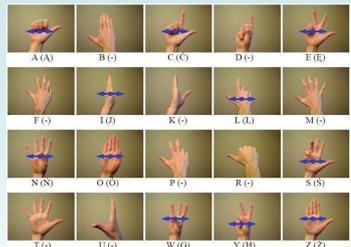


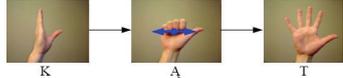
Palm pose and gesture recognition in video sequences

- Palm pose recognition
- Static and dynamic („letters”):
- HMM and DBN modelling of pose sequences:



- Examples of gestures („words”):

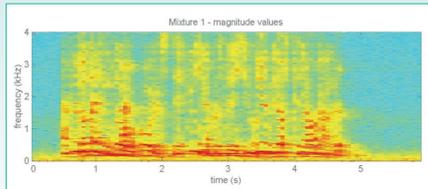
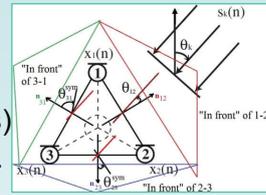



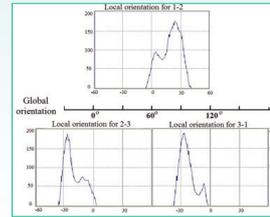
Robot Programming and Pattern Recognition Group Instytut Automatyki i Informatyki Stosowanej

Auditory scene analysis

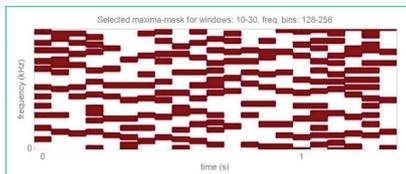
- Only mixtures of source signals can be acquired,
- The goal is to estimate the directions (and locations) of the speakers and to estimate the original sources.



Example:
two sources and three mixtures



Time delay-based detection of source directions:

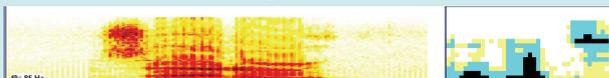


A spectrogram mask for extraction of a single source

Robot Programming and Pattern Recognition Group Instytut Automatyki i Informatyki Stosowanej

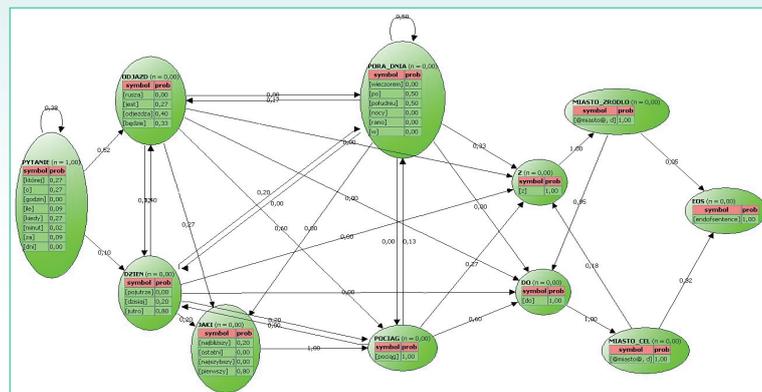
Spoken sentence recognition

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



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

Example of a "semantic" HMM for the recognition of train connection questions:





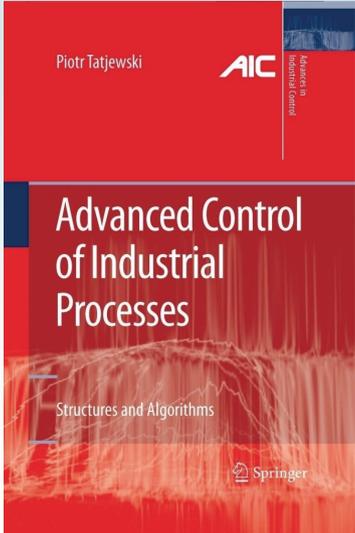
Control Engineering Group



Instytut
Automatyki
i Informatyki
Stosowanej

Advanced control of industrial processes

- Non-linear process modeling using fuzzy logic and neural networks, design of fuzzy controllers
- Algorithms and structures of MPC (Model-based Predictive Control) with linear and nonlinear process models (quick control laws, precise optimization-based algorithms)
- Supervisory control and set-point optimization
- Fault-tolerant control
- Software for development and testing of advanced control systems





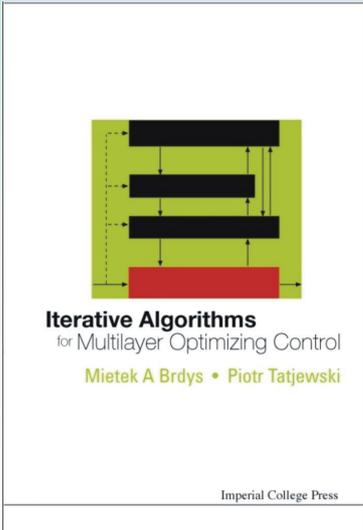
Control Engineering Group



Instytut
Automatyki
i Informatyki
Stosowanej

Optimization of industrial processes and large-scale systems

- Algorithms for optimization of steady-states of industrial processes
- 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



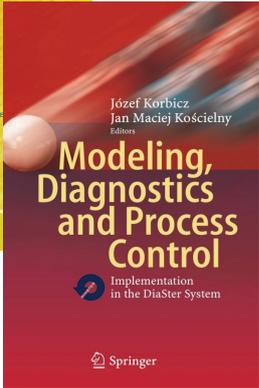


Control Engineering Group



DiaSter (Diagnostics and Control) software system (co-authors)

- Model building and identification (linear and nonlinear models, including fuzzy and neural)
- Diagnostics
- Design of classical control algorithms (PID)
- Design of advanced control algorithms (fuzzy, MPC)
- Development of set-point optimization
- Simulation



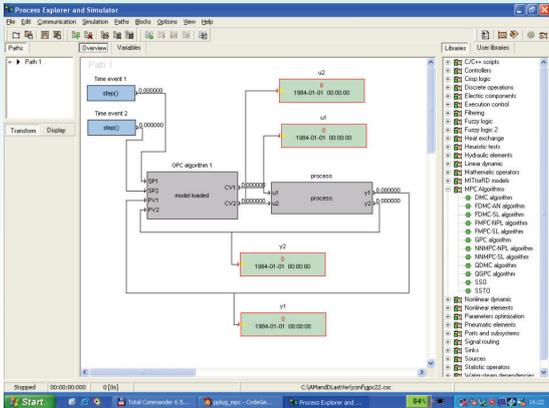
Control Engineering Group



DiaSter (Diagnostic and Control) software system

Model Predictive Control (MPC) algorithms based on *linear models*:

- Dynamic Matrix Control (DMC) algorithm based on step-response models
- Generalized Predictive Control (GPC) algorithm based on input-output models



Two version of DMC and GPC algorithms:

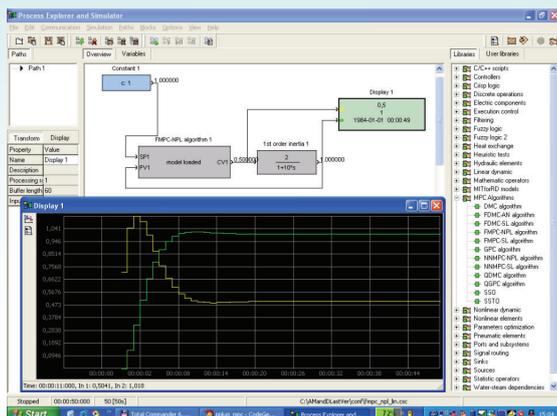
- *Explicit algorithms*: the control law is designed off-line
- *Numerical algorithms*: on-line control optimization based on quadratic programming is used

Control Engineering Group Instytut Automatyki i Informatyki Stosowanej

DiaSter (Diagnostic and Control) software system

Model Predictive Control (MPC) algorithms based on *nonlinear models*:

- MPC algorithm with on-line Successive Linearization (MPC-SL)
- MPC algorithm with on-line Nonlinear Prediction and Linearization (MPC-NPL)



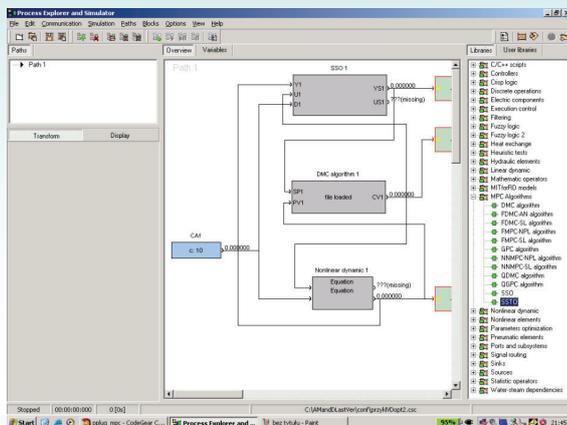
- The MPC algorithms are *computationally efficient* because *quadratic programming* is used on-line rather than *difficult nonlinear optimization*
- Neural and fuzzy models can be used for prediction

Control Engineering Group Instytut Automatyki i Informatyki Stosowanej

DiaSter (Diagnostic and Control) software system

Set-point optimization structures which cooperate with MPC algorithms:

- Steady-State Optimization structure
- Steady-State Target Optimization structure with on-line model linearization



The set-point optimization structures are *computationally efficient* because *linear programming* is used on-line rather than *difficult nonlinear optimization*



Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej



MPC Controller for the burning process in small furnaces used for house\water heating

- Benefits of advanced control algorithms (MPC – Model-based Predictive Control):
 - Good control accuracy
 - High process efficiency
 - Increase of economic profits
 - Ecology - the process is friendly for the environment
- The controller is on the market (manufactured by **Plum** company)





Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej



The anti-smoke ventilation control in buildings

The fire smoke is most dangerous: to save people air pressure and flow must be quickly controlled in rescue areas – highly demanding nonlinear feedback control problem

Classical PID control unable to fulfill the requirements

Nonlinear MPC algorithm with on-line model adaptation designed, featuring:

- computational efficiency (quadratic programming is used on-line)
- very fast operation
- control accuracy satisfying demanding requirements

Therefore: **increase of fire safety**



The controller is on the market (manufactured by **Plum** company)

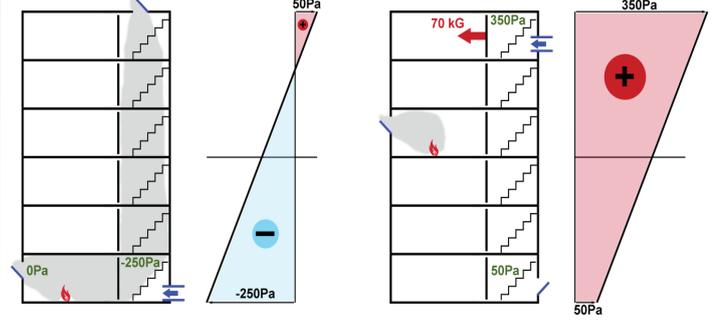


Control Engineering Group



The anti-smoke ventilation control in high buildings

In high buildings the anti-smoke control is much more difficult due to **chimney effect** – multivariable control with two actuators (high power ventilators) required




Nonlinear MPC algorithm with **on-line model adaptation** designed (the controller manufactured by **Plum** company)



Software Engineering Group



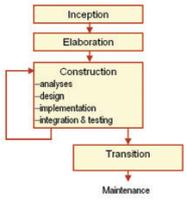
Software development

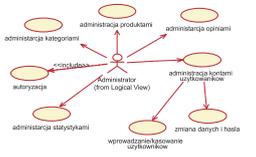
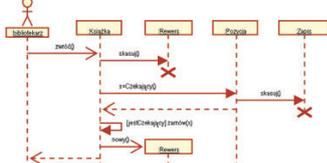
Research topics:

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

Systems and tools :

- Rational Rose
- Rational RequisitePro
- Structured Architect



Software Engineering Group



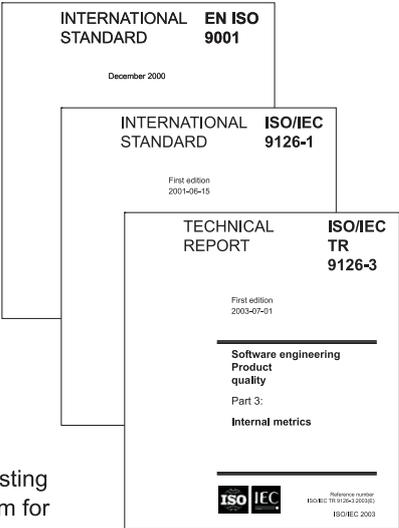
Evaluation of the software quality

Research topics:

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

Sample projects:

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



Software Engineering Group



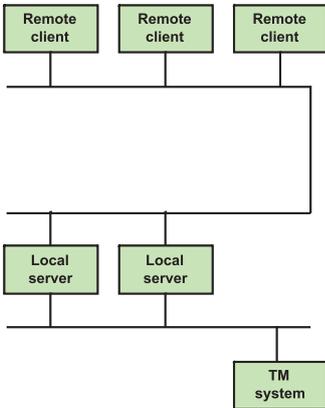
Distributed Open Systems

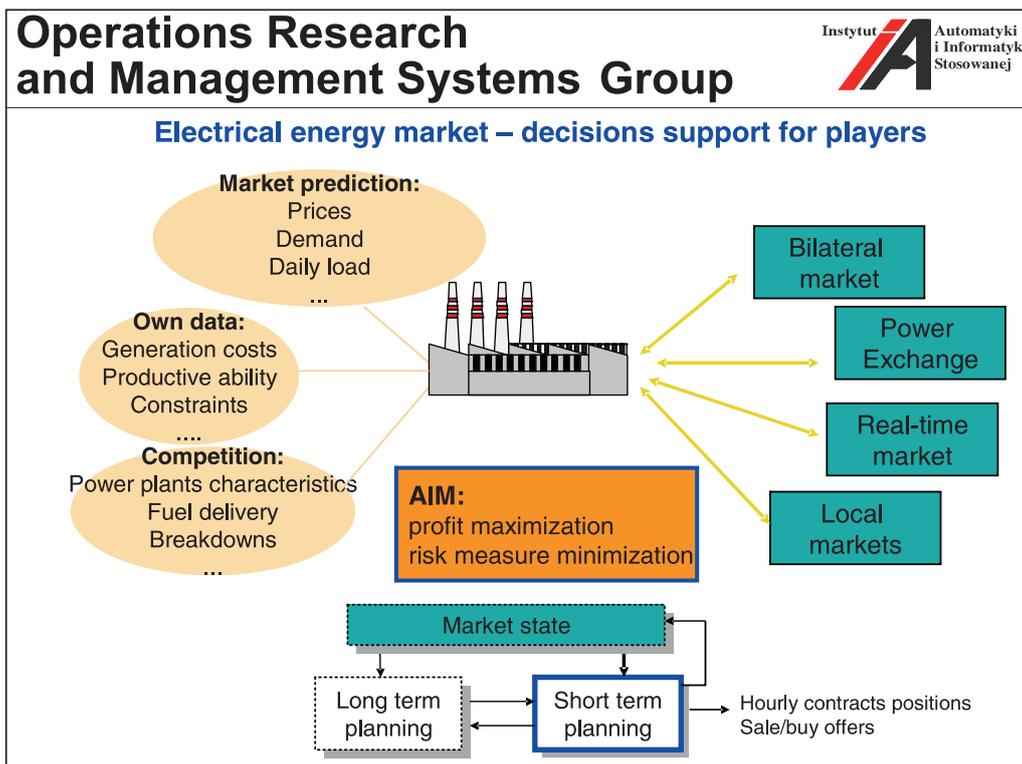
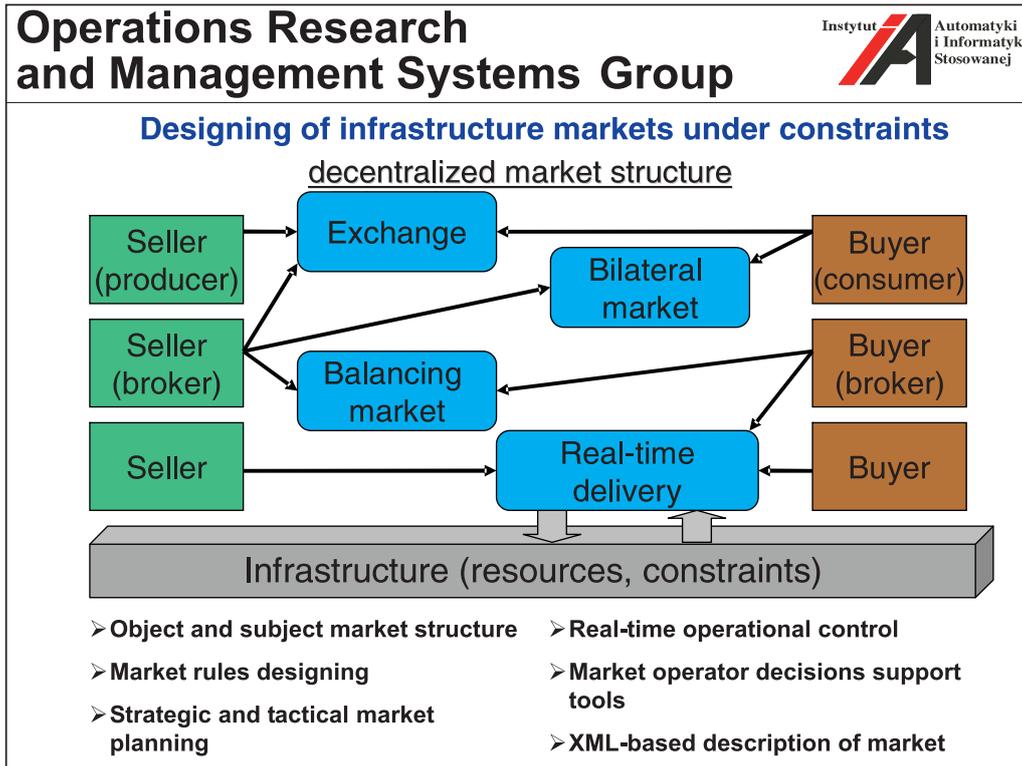
Research topics:

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

Languages and Conceptual Tools:

- ∅ BPMN, BPEL
- ∅ RT₀, RT₁, RT₂, RT^T
- ∅ Architecture Decision Models

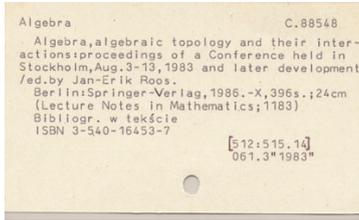




Operations Research and Management Systems Group



Library catalogue digitization



Skew correction

Binarization

Noise elimination

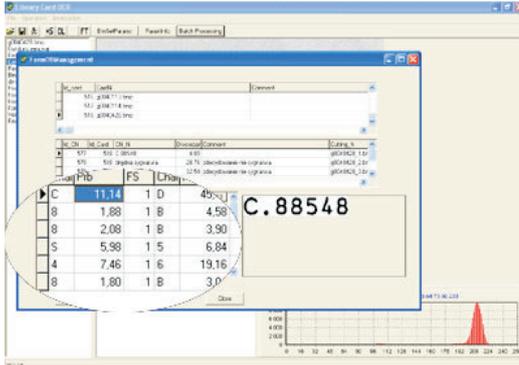
Segmentation

C.88548

Algebra and their inter-
ference held in

Framing

C.88548



Operations Research and Management Systems Group



M³ Multicommodity Market Model

M³ is a flexible and universal market data and communication model

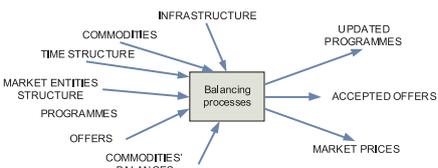
http://www.openm3.org

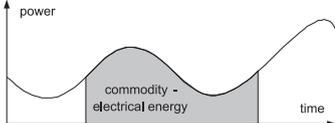
M³ is mainly (but not only) designed for

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

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

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





M³ helps markets' development by providing

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

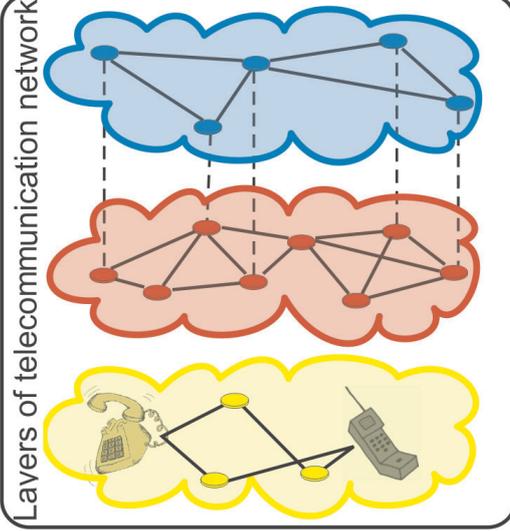
Operations Research and Management Systems Group

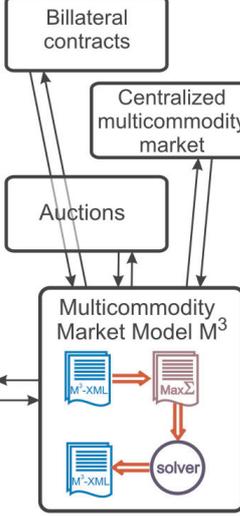


Design of Multicommodity Market Model – M³

Application of M³ on the Communication Bandwidth Market

Layers of telecommunication network





M³ model:

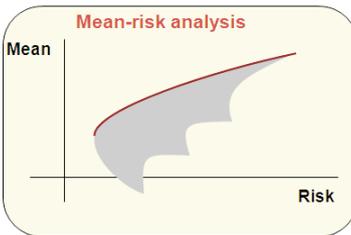
- may be used in information systems for market balancing in various infrastructure networks
- is a set of formal data models, which results in XML-derived information interchange specification
- may be used in a wide range of market-oriented network systems and may significantly facilitate communication,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

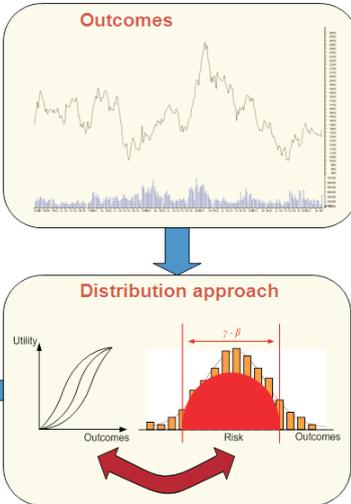
Optimization and Decision Support Group



Risk Measures and Optimization under Risk

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



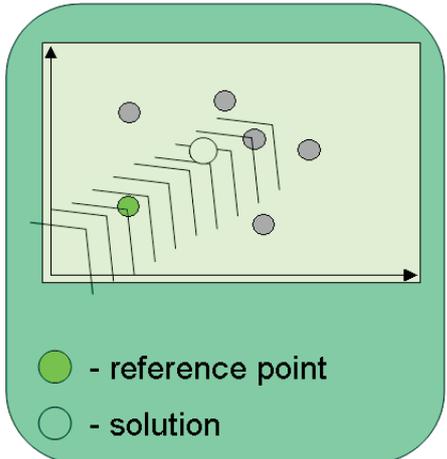


Optimization and Decision Support Group



Reference Point Method

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



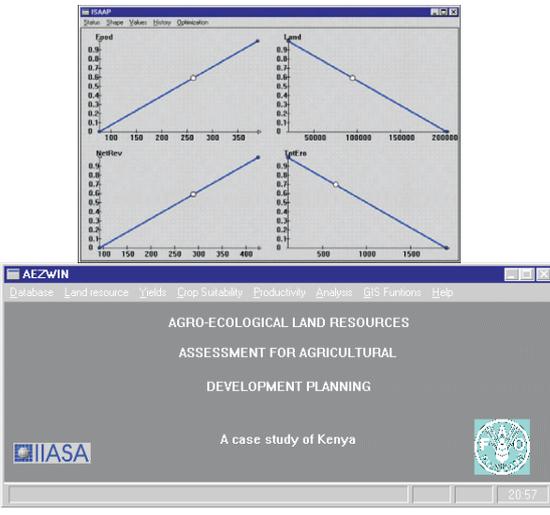
● - reference point
○ - solution

Optimization and Decision Support Group



Application of the reference point method for land resource assessment



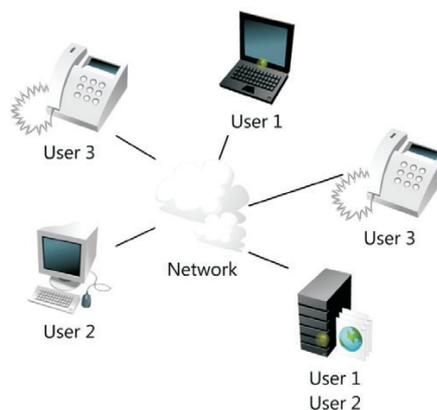



Optimization and Decision Support Group



Fair network design and optimization

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



1.4 Statistical Data

FACULTY and STAFF	2010		2011		2012	
	persons	FTE	persons	FTE	persons	FTE
Academic Staff	45(+1)	38.95(+1)	46(+1)	39.7(+0.5)	47	40
by titles/degrees						
Professors	4	4	6	6	7	7
D.Sc.-s	5	5	4	4	4	4
Ph.D.-s	28(+1)	24.95(+1)	27(+1)	24(+0.5)	29	25
M.Sc.-s	8	5	9	5.7	7	4
by positions						
Professors	9	9	9	9	9	9
Readers	3	2.5	2	2	2	2
Assistant Professors	24(+1)	21.95(+1)	25(+1)	22.5(+0.5)	28	24.5
Senior Lecturers	5	3.5	5	3.25	5	3
Lecturers	0	0	0	0	0	0
Assistants	4	2	5	2.95	3	1.5
Ph.D. Students	27		19		19	
Technical Staff	5	3.5	8	4.4	8	4.6
Administrative Staff	8	6.5	10	8.5	9	8

FTE – Full Time Employment units,

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

ACTIVITIES	2010	2011	2012
Teaching activities			
standard teaching potential, hours	8 303.75	8 508.95	9 453.15
# hours taught	12 701.20	12 376.60	11 906.29
Degrees awarded			
Professor	1	2	1
D.Sc			1
Ph.D.	5	3	4
M.Sc.	50	52	46
B.Sc.	53	70	76
Research projects			
granted by WUT	0	3	6
granted by State institutions	17	15	12
granted by international institutions	5	5	3
other	4	6	8
Reviewed publications			
monographs (authored or edited)	5	2	4
chapters in books	14	28	16
papers in journals	63	64	50
papers in conference proceedings	12	14	41
Reports, abstracts and other papers	9	12	24
Conferences			
participation (# of conferences)	37	43	66
participation (# of part. from ICCE)	55	70	84

RESOURCES	2010	2011	2012
Space (sq.m.)			
laboratories	585	585	585
library + seminar room	74	74	74
faculty offices	724	724	724
Computers			
personal computers	288	274	226
Library resources			
books	4 076	4 105	3 036
booklets	2 160	2 289	2 444
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, 2012.

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 Biometrics in 2005 from Warsaw University of Technology (both with honors). Since 2003 he is with Warsaw University of Technology, and since 2002 with Research and Academic Computer Network (NASK). Chair of the Biometrics and Machine Learning Laboratory at ICCE. Head of the Postgraduate Studies on Security and Biometrics (2011–). V-ce Chair of the NASK Biometrics Laboratory and a member of the NASK Research Council (2006–). Member of the Technical Committee on Biometrics (2009–) and the Technical Committee No. 182 on Information Security in IT Systems (2007–) of Polish Normalization Committee (PKN), expert of the ISO/IEC SC37 on Biometrics. Associate Member (2002–2005), Member (2006–2011) and Senior Member (2012–) of the IEEE (Institute of Electrical and Electronics Engineers, Inc.). Active Member of the EAB (European Association for Biometrics, 2012–).

Interests: Interest: Biometrics (methods, devices and applications, security of biometrics, quality of biometric data, biometric standardization), pattern recognition.

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. D.Sc. 2012

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.

Kamil Kołtyś Assistant Prof. (since Oct. 2012)

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, Ph.D. 2012 from WUT

With WUT since 2011.

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

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.

Bartosz Kozłowski Assistant Professor

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.

Urszula Kręglewska Senior Lecturer (part-time)

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, multi-threaded programming, real-time systems.

Michał Kudelski Assistant Professor (part-time, until Nov. 2012)

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.

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 (part time since March 2012)

**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.

Interests: Information retrieval, text algorithms, operation research, digitalization standards, library automation, classification.

Joanna Putz-Leszczyńska Assistant Professor (part-time)

**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

Andrzej Ratkowski Assistant Professor (since Oct. 2012)

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.

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.

Jerzy Sobczyk Senior Lecturer (part-time)

Operations and Systems Research Division, Optimization and Decision Support Group
room 519, tel. 22 234 7863
J.Sobczyk@ia.pw.edu.pl, www.ia.pw.edu.pl/~jurek

M.Sc. 1985 from WUT.

With WUT since 1984. FEIT Network Administrator.

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

Andrzej Stachurski Assistant Professor

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

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

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

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

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

Marcin Szlenk Assistant Professor

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

M.Szlenk@ia.pw.edu.pl

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

With WUT since 2005.

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

Wojciech Szykiewicz Assistant Professor

**Systems Control Division, Robot Programming and Pattern Recognition Group
room 572, tel. 22 234 7632**

W.Szykiewicz@ia.pw.edu.pl

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

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

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

Tomasz Śliwiński Assistant Professor

**Operations and Systems Research Division, Optimization and Decision Support Group
room 26, tel. 22 234 7862**

T.Sliwinski@ia.pw.edu.pl

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

With WUT since 2004.

Interests: Discrete optimisation, operations research, decision support.

Piotr Tatjewski Professor (Head of Division)

**Control and Software Engineering Division, Control Engineering Group
room 524, tel. 22 234 7397 and 825 0995**

P.Tatjewski@ia.pw.edu.pl, www.ia.pw.edu.pl/~tatjewsk

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

With Warsaw University of Technology since 1972. Head of Control Engineering Group since 1991, Deputy Director of ICCE for Academic Affairs (1987–1991), Director of ICCE 1996–2008. Vice Dean for Research of the Faculty since 2012. 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.Toczyłowski@ia.pw.edu.pl

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

With WUT since 1973. Head of Operations Research and Management Systems Division, Vice-Dean of the Faculty of Electronics at WUT (1990–1993), chairman of the Rector's Committee for University Computerization (1993–1999), Advisor to the Dean on Strategic Planning (1993–1996). Head of the Undergraduate Program in Information Systems for Decision Support (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 CO₂ 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: Applications of DBMS in management and control, information systems, Web-based systems, XML language and its applications, variant configuration, long-term digital archives.

Michał Warchoń 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, mobile robots, impedance control, manipulator force control.

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 (1999–2012), 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, the title of Professor of Technical science awarded in 2012.

With WUT since 1985. Research visitor at Loughborough University of Technology, UK (1990, 1992), Senior Fellow at Nanyang Technological University, Singapore (1999–2001), Secretary of Priority Research Program in Control, Information Technology, and Automation (PATIA) (1994–1999). Member of the 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

Marcin Chochowski Assistant (part-time; since March 2012),

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

M.Sc. 2004 from WUT

With WUT since 2011

Interests: biometrics, image processing, classification tasks, machine learning

Przemysław Kacprzak Assistant (part-time; until Feb. 2012)

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 Koltys Assistant (part-time; until Sept. 2012)

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 Assistant (part-time), Software Engineer (since Oct. 2012),

Systems Control Division, Robot Programming and Pattern Recognition Group
room 012, tel. 22 234 7117
room 556.
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.

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; until Sept. 2012)

**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, IT architectures.

Piotr Trojanek Software Engineer; until Dec. 2012

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

M.Sc. 2005 from WUT.

With WUT since 2009.

Interests: Robot programming, real-time systems.

Michał Wałęcki Assistant (aprt-time)

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

M.Sc from WUT.

With WUT since 2010.

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

2.4 Ph.D. Students

Adam Jan Hurkała Ph.D. Student

**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

**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

Jan Kurnatowski Ph.D. Student (since Oct. 2012)

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

Supervisor: Eugeniusz Toczyłowski

Krzysztof Lasota Ph.D. Student

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

Supervisor: Ewa Niewiadomska-Szynkiewicz

Tomasz Leś Ph.D. Student (since Oct. 2012)

Control and Software Engineering Division, Software Engineering Group

Supervisor: Krzysztof Sacha

Michał Majdan Ph.D. Student (until Oct. 2012)

**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

Michał Marks Ph.D. Student (until Oct. 2012)

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

Krzysztof Piech Ph.D. Student (since Oct. 2012)

Systems Control Division, Biometrics and Machine Learning Group

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

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

Michał Romanowski Ph.D. Student (since Oct. 2012)

Control and Software Engineering Division, Software Engineering Group

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

Kamil Sędrowicz Ph.D. Student (since Oct. 2012)

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

Michał Wałęcki Ph.D. Student

Systems Control Division, Robot Programming and Pattern Recognition Group

room 012, tel. 22 234 7117

M.Walecki@ia.pw.edu.pl

Supervisor: Cezary Zieliński

Antoni Wysocki Ph.D. Student (since Oct. 2012)

Control and Software Engineering Division, Control Engineering Group

room 563,

Supervisor: Piotr Tatjewski

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 (until Sept. 2012).

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 Niedbała Office support.

room 529, tel. 22 234 7865
room 521, tel. 22 234 7397
J.Niedbalo@ia.pw.edu.pl

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

Agnieszka Słojewska Finances specialist (since Sept. 2012).

room 556, tel. 22 234 6096
A.Slojewska@ia.pw.edu.pl

baccalaureate

Hanna Szot Finances support (until Aug. 2012).

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

baccalaureate

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 2011/2012

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 (spring)
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 (spring), P. Marusak (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 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 (fall)
Fundamentals of Programming	PRI	2 1 2 –	sem. 1	J. Putz-Lewszczyńska (spring)
Image and Speech Recognition	EIASR	2 1 – 1	ANGL, OT	W. Kasprzak (fall)
Information Project Management	ZPI	2 – – 1	BDSI, OT	K. Pieńkosz (spring/fall)
Introduction to Robotics	WR	2 – 2 –	MUS, SCRJC, OT	W. Szynkiewicz (spring/ fall)
Management IT Systems	SIZ	2 – – 2	MKPWD, OT	J. Granat (spring/fall)
Mobile robots	EMOR	2 – – –	ANGL, ECETC, OT	W. Szynkiewicz (spring)
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)

Course Title	Course code	Hours per week	Class	Lecturer
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	M. Kaleta (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, applications 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.

Postgraduate studies **Designing Information Systems with Databases** are intended for IT specialists, who want to acquire new skills in field of design and development of databases and information systems based on them. The programme contains: modeling of processes and data structures, basics of databases usage, engineering of information systems, data management systems, development of applications in systems with databases. The classes take form of lectures and laboratories.

3.3 Graduate Distance Learning

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

4 Projects

[PR1] Large scale integrate 7 FP UE grant. ICT-2009.1.1: The Network of the Future.

FP7-ICT-2009-5: **Low Energy Consumption NETworks (ECONET)**.

Granting period: 01.10.2010 – 31.09.2013.

Principal Investigators (WUT): Ewa Niewiadomska-Szynkiewicz, and Krzysztof Malinowski.

Investigators: Michał Karpowicz, Michał Marks, Andrzej Sikora, Krzysztof Daniluk, Marcin Mincer.

Partners: Consorzio Nazionale Interuniversitario per le Telecomunicazioni (Italy) – 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), Warsaw University of Technology (Poland), NetVisor (Hungary), Ethernity Networks Ltd (Israel), LightComm S.r.l. (Italy), Infocom (Italy).

Aim of project: 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. 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 overall idea is to introduce novel green network-specific paradigms and concepts enabling the reduction of energy requirements of wired network equipment with respect to the business-as-usual scenario.

Expected results: The expected results of the ECONET project will cover 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.

Keywords: computer networks, green networking, low consumption communications, energy efficiency.

[PR2] Seventh Framework Programme FP7-214678 (NMP-2007-3.2-1): **Self Reconfigurable Intelligent Swarm Fixtures (SwarmItFIX)**.

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).

Aim of project: Construction of an adaptive fixture supporting thin-sheet metal plates undergoing machining. A step beyond flexible/reconfigurable fixtures for higher continuous adaptation of production resources 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 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. A new concept of self adaptable swarm fixtures composed of mobile agents was developed. It can freely move on a bench and reposition below the supported part behaving as a team of cooperating robots, all without moving/removing the part from the fixture. 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 was adopted and each robot was treated as an autonomous agent exhibiting its own behaviors. Behavior 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. The role of WUT was to design and implement the controller of the system and the planner deciding the behavior of this system.

Expected result: Adaptive fixture supporting thin-sheet metal plates undergoing machining.

Keywords: adaptive fixture, multi-agent system, multi-robot system.

[PR3] Program of WUT Development, supported by EU (European Social Fund), National Cohesion Strategy, Operational Programme Human Capital. No. 50031281302.

Granting period 1.10.2008 – 31.12.2012.

Task No. 28: **Development of second level studies in Automation and Robotics** at Warsaw University of Technology.

Head of the task: Piotr Tatjewski, secretary: Maciej Ławryńczuk.

Aim of project: The aim of the task is partial coordination of programs and, first of all, supporting preparation of second level (graduate) studies in Automation and Robotics at four faculties of WUT (Electronics and Information Technology, Electrical Engineering, Mechatronics, Power and Aeronautical Engineering).

Expected results: coordination of the first part of the program (first semester) and supporting realization of programs at four participating faculties exploiting their different expertise. The main part of the task was to support development or modernization of courses at participating faculties; preparation of 28 courses was supported. Information campaign was organized including preparation of the web-site and printed materials.

Keywords: education, graduate studies, automation and robotics

[PR4] 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.

- [PR5] Industrial research agreement No 1/2011 with Plum Ltd. company: **Modeling of evacuation areas of high buildings and development of advanced control algorithms for anti-smoke systems.** Granting period 30.05.2011 – 30.06.2012.

Principal investigator: Piotr Tatjewski.

Investigators: Maciej Ławryńczuk, Piotr Marusak.

Aim of project: The goal of the project was modeling of evacuation areas in buildings for the case of a fire, for the purpose of feedback control design. Then development of advanced, adaptive feedback control algorithms for very quick and precise control of air pressure and flow in these areas, generated by high-power ventilators of pressure differentiation systems, to prevent these areas from smoke to enable safe evacuation of people.

Expected results: The research was carried out using dedicated installation constructed by the Plum company and in appropriate laboratory build at the Faculty of Environmental Engineering of WUT. 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 in the design of nonlinear model-based predictive, adaptive algorithm, using also neural network modeling technique. The controller was industrially implemented by the Plum company, obtained international and national certificates and is available on the market. The second and more demanding phase of the project concerned high to very high buildings, where at least two high-power and cooperating ventilators are necessary to cope with the chimney effect, and multivariable nonlinear control is necessary. This phase of research and design of the control algorithm was completed in 2012.

Keywords: fire fighting, anti-smoke pressure ventilation, advanced feedback control, model predictive control, nonlinear control

- [PR6] 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.

Aim of project: 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.

Expected results: Project design and prototype of a small, educational humanoid robot, electronic controller for this robot connected to a set of sensors, software for this controller, technology for control optimization of robot movement, based on reinforcement learning.

Keywords: robotics, control systems, learning robots, reinforcement learning.

- [PR7] 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.

Aim of a project: The purpose of the grant obtained from the Ministry of Science and Higher Education is to develop a methodology focused on the support of perpetual evolution of modern SOA systems rather than just their initial construction. The methodology shall consist of: models and methods for change specification and modeling, change impact analysis techniques, change impact assessment method based on GQM scheme, transformational change implementation

basing on formal models built upon LOTOS, change documentation based on GQM scheme as well as role-based trust management mechanisms and models. The grant is expected to be completed in 30 months.

Expected results: the methodology for evolving service-oriented systems, the model for documenting evolution of service-oriented systems with architectural decisions, the change assessment scheme supporting decision-making process, the evolution process defining activities made during evolution steps.

Keywords: service-oriented architecture, software evolution, architectural decisions

[PR8] 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)

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

Expected results: 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

Keywords: electronic trade, distributed systems, SOA, multi-agent systems, multi-commodity trade, infrastructural markets

[PR9] 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.

Principal investigator: Eugeniusz Toczyłowski.

Aim of project: The goal of the project is analysis, development, and evaluation of different aspects and properties of the market models, mechanisms, and decision making processes in the complex market systems. The research on different features and applications of the market mechanisms are conducted. Particularly complex, multistage, long-term, multi-commodity, infrastructural constrained markets are deeply analyzed. Complex models, mechanisms which are characterized by desirable properties, e.g. harmonizing goals of particular market participants, groups of them, all the society, a market designer, a regulator, and also interested exterior entities (e.g. government, governmental /nongovernmental/ supranational institutions) are analyzed, developed, and verified.

Expected results: During the work under the project following effects was reached. Significant criteria for evaluation of the market mechanisms were gathered and formulated. The methodology for market mechanism analyzing was proposed. Market mechanisms guaranteeing efficiency and incentive compatibility for simple, unconstrained exchanges was reviewed. The preliminary

studies of the models ensuring robustness against collusion, or coalition formation, were done. The auctions of time, and iterative auction were reviewed. The models complying uncertainty of supply goods and services, and multicriteriality in the models of preferences of market participants, were studied. Proposed models and mechanisms in a following areas were deeply analyzed. In the area of the environmental protection, in particular the market for greenhouse gases emission permits was studied. In the energy area, particularly models for balancing electricity market was evaluated. In the telecommunication field, the models for bandwidth trading, and routing algorithms for delay and disruptive tolerant networks that uses the mechanism theory, was analyzed. Outlined above issues relate to efficient and incentive compatible models, mechanisms, and processes.

Keywords: multi-agent systems, incentive compatibility, game theory, market mechanism theory, multi-criteria modeling.

[PR10] 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-Leszczynska, Maciej Stefańczyk

Aim of project: The goal 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 put equal pressure on the document CPU technologies and support systems such as PKI and biometrics. The project addresses the challenges associated with the integration of identification documents, biometrics and security techniques for personal data given either in paper or electronic form. In particular, at the Warsaw University of Technology mechanisms for biometric data protection are elaborated, by ensuring the security of their storage, transmission and processing. These mechanisms are based on solutions in cryptography, biometrics and steganography.

Expected results: The final deliverable of this project will be a number of demonstrators, which will provide sample implementations of the developed solutions: The 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. Various biometric and steganography techniques which 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.

Keywords: biometric identification, cryptography, document security, face recognition, image steganography/watermarking, PKI systems

[PR11] 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.

Aim of project: Introduction of a generalization of the Conditional Value-at-Risk for measuring multivariate risk. The aim of the research was 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, that 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.

Expected results: Within the framework of the project some properties of the measure in terms of coherent risk measures have been proven, a related portfolio optimization model has been proposed and the dedicated optimization algorithm has been devised. The portfolio optimization procedure has been numerically verified for various multivariate probability distributions.

Keywords: multivariate risk measures, quantile risk measures, portfolio optimization, column generation algorithm.

[PR12] NCN grant 2011/01/N/ST7/03383: **Methodology of robot control systems specification utilizing the Active Vision paradigm form objects identification.**

Granting period: 7.12.2011 – 6.12.2012.

Principal investigator: Tomasz Kornuta.

Aim of project: The goal of the project was to develop a methodology for designing control systems of robots actively acquiring informations about their surroundings. The task required to answer the questions regarding elements that should be distinguished in the structure of the control system and skills (behaviors) that the robot must possess. The elaborated methodology, based on top-down multiphase system decomposition, enables the design and specification of control systems for robots utilizing the active vision paradigm.

Expected results: As a result of the studies a method of robot control systems specifications, describing both its structure and operation, was developed. The proposed notation, the method of specification, along with the examples of its application and the experimental verification were described in the Ph.D. dissertation entitled “Design of Structures and Behaviors of Robot Control Systems Using Active Vision”.

Keywords: robot control systems, design methodology, embodied agent, behavior, active Visio.

[PR13] 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.

Aim of project: 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.

Expected results: 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.

[PR14] NCBiR Grant No DOBR/0071/R/ID1/2012/03: **Development of a system enabling digitization, long-term storage, management and making available in secure electronic form of documents and archival materials.**

Granting period: 20.12.2012 –19.12.2014.

Principal investigator: Tomasz Piotrowski (NASK).

Principal investigator from WUT: Ewa Niewiadomska-Szynkiewicz, Adam Kozakiewicz.

Investigators: Mariusz Kamola, Paweł Szafachowski, Krzysztof Daniluk.

Aim of a project: Development of a modern, fully functional solution supporting the process of digitization, long-term archivization and secure access to classified documents. Detailed goals: preparation of procedures for the process of digitization of documents and archival materials: research and deployment of hardware-software solutions supporting the process of digitization, design and development of a system supporting the process of digitization automating the acquisition of metadata of the digitized objects, implementation of a system with the functionality of a long-term storage archive with advanced mechanisms for making available, searching and access control, design and practical exploitation in the developed software of methods for secure storage of digital content employing advanced cryptographical algorithms, preparation of a long-term storage policy, encompassing the issues of medium and data format migration, implementation of methods and algorithms ensuring authenticity and integrity of both individual resources and the archive as a whole, preparation and execution of integration of the developed system with existing systems for flow, processing and storage of documents and digital resources, design of rooms for hardware infrastructure for digitization and storage of classified documents and digital materials, design and extension of workstations and network for sharing of classified archival documents and archival materials, testing and demonstration of the prototype of the system in operational conditions, training of the system's users.

Expected results: The planned final result of the project will be the development of a complete hardware-software solution supporting the process of digitization, long-term archiving and secure sharing of documents, ready to be deployed in all institutions maintaining archives of classified documents and complying with all regulations applicable to this kind of archives. The software developed as part of the project will comprise of the following elements: a module supporting the process of digitization, automating the acquisition of metadata of the objects being digitized, a module providing the function of a long-term storage archive, equipped with advanced sharing, search and access control mechanisms, a module integrating the archive with existing document and digital materials flow, processing and storage systems. Digitization support will include both the ability of selective entry of individual documents and mass import. This will make the system capable of fast data import on startup as well as regular entry of newly created documents. The main characteristics of the module implementing the function of a long-term storage archive will include: support for execution of procedures specified in the protection of classified information act regarding periodic review of stored classified materials, security of stored data, ability to retrieve the complete history of documents, ability to search the archive based on both metadata values and document content, capability of remote access to any group of documents, following the security policies in force, scalability and stability.

Keywords: digitization, archiving, long-term storage, classified documents, cryptography.

[PR15] NCBiR Project no PBS1/A3/8/2012: RobREx: **Autonomy for rescue and exploration robots.**

Granting period: 12.12.2012 – 30.11.2015.

Partners: Industrial Research Institute for Automation and Measurements – PIAP, Warsaw University of Technology, Łódź University of Technology, Wrocław University of Technology, Poznań University of Technology, Institute of Computer Science of the Polish Academy of Sciences. Principal investigator from WUT: Cezary Zieliński. Investigators: Włodzimierz Kasprzak, Wojciech Szynkiewicz, Tomasz Winiarski, Tomasz Kornuta, Michał Wałęcki, Maciej Stefańczyk, Paweł Wawrzyński.

Aim of a project: Development of technologies enabling the creation of autonomous robots, specifically for rescue and exploration tasks. Current rescue and exploration robots (RERs), including those manufactured by PIAP, are teleoperated, what significantly limits their operating range and requires constant human supervision. The conducted market analysis shows that in the near future the demand for autonomous devices will dominate. The goal of the project is to produce a set of technologies and an adequate architecture necessary for the production of autonomous RERs, or in general service and field robots. In particular, the project will deliver technologies enabling: perception of the environment; navigation and control of mobile platforms and manipulators; impedance control of manipulators and grippers; intelligent two-handed manipulation; active sensing and the use of ontology common to people and robots. The results will be demonstrated on two robots: a mobile manipulator SCOUT/GRYF manufactured by PIAP and a two-handed robot manipulator. The team from the Institute of Control and Computation Engineering of the Faculty of Electronics and Information Technology of Warsaw University of Technology is responsible for creation of technologies for intelligent two-handed manipulation and active sensing.

Expected results: A set of technologies enabling the creation of autonomous robots, specifically for rescue and exploration tasks.

Keywords: rescue robots, exploration robots, robot autonomous behaviors, two-handed manipulation, active sensing, perception

[PR16] Rector's grant no 500C/1000541 **BallCollector – autonomous robot operating in sport arena area.**

Granting period: 01.06.2012 – 31.12.2012.

Principal Investigator: Tomasz Winiarski.

Investigators: Piotr Majcher, Maciej Stefańczyk, Michał Wałęcki, Konrad Banachowicz, Tomasz Ferens, Wojciech Węclewski, Kamil Drożdżał.

Aim of a project: Prototype constructions investigation as well as feasibility studies are recently performed basing on research platforms. The main advantage of these platforms is versatility of applications and shortening of time needed to elaborate and test new algorithms, due to e.g. reuse of main software and hardware components. The approach was used to develop hardware and software for mobile robot built to collect table tennis balls. An under pressure effector was used to suck the balls to aggregate container, appropriate sensors (3D cameras and lidars) both to determine the balls positions and participate in robot navigation. Finally the computational power together with navigation algorithm guide the robot to the goal through the environment with obstacles.

Expected results: mechanics and electronics design, electronic components assembly, implementation of control and navigation algorithms, final tests, preparation of demonstration application.

Keywords: robotics, mobile robot, sport robot.

[PR17] Dean's grant 504M0015: **Pan-tilt unit for use in a service robot's vision system.**

Granting period: 01.07.2012 – 31.12.2012.

Principal investigator: Michał Wałęcki.

Investigator: Maciej Stefańczyk.

Aim of project: The project aims at development of a pan-tilt unit for a service robot's active head. Application of an active head allows to extend the range of applied cameras and other sensors. A standard camera mounted in robot's mechatronic head can cover the whole manipulation space and actively explore the entire visual field for the information that is essential to the ongoing task. Moreover, it may be used to keep the object of interest in the field of view. The developed unit is mounted on Robot Velma ℓ a two handed manipulation robot being a part of the equipment of the Laboratory of Advanced Robotics.

Expected results: All of the following tasks were successfully accomplished: Mechanical specification of the head for mounting devices of a robot's vision system, Design and development of the active head's motor controllers, Integration of the motor controllers with ROS system running on a personal computer, Implementation of an experimental system, using developed pan-tilt unit equipped with a camera for visual servoing.

Keywords: robot, motor control, visual servoing, active head.

[PR18] Dean's grant 504M0014: **Control system of robotic manipulator with general force readings corrected basing on inertial measurement unit measurements.**

Granting period: 01.07.2012 – 31.12.2012.

Principal investigator: Tomasz Winiarski. Investigator: Konrad Banachowicz

Aim of a project: The project elaborates an acquisition system of the general force measured between the manipulator's end-effector and the environment using six axis force transducer mounted in manipulator's wrist and additional inertial measurement unit mounted in the manipulator's tip. The proposed solution significantly improves the initial force measurement originated from the transducer by reducing the influence of: tool weight, gravitational force and inertial force. It can be used to develop an inexpensive industrial robot to achieve a service robot manipulation capabilities.

Expected results: All of tasks supposed to be done were successfully accomplished: Purchase and installation of inertial measurement unit in manipulator's wrist, design, assembly and programming of IMU to PC interface board, programming of data measurements from inertial measurement unit on PC, calibration of relation of coordinate systems of manipulator's wrist and inertial measurement unit basing on gravitational force, general force correction in position force controller implemented in MRROC++ robot control software, elaboration and implementation of system correctness verification methods.

Keywords: robot, manipulator, general force, inertial measurements unit.

[PR19] Dean's Grant no 504M/0016: **Tools facilitating the design of robotic, three-dimensional perception subsystems.**

Granting period: 1.07.2012 – 31.12.2012.

Principal Investigator: Tomasz Kornuta.

Aim of project: The aim of this project was the enrichment of the DisCODE framework by creation of tools supporting the design of robot sensor subsystems, with attention focused on task of a three-dimensional perception of the environment.

Expected results: Within the project we developed a meta-model of the DisCODE framework. This meta-model enabled the implementation of tools for graphical design of components and tasks, based on EMF (Eclipse Modeling Framework). For this purpose we developed a set of generators responsible for generation of adequate code directly from the graphical ("drawn") model of the task. In addition, the work on the meta-model resulted in new mechanisms for transmission and processing of data and the introduction of new concepts to the very structure of the framework, including e.g. composite components (i.e. composed of several components).

Keywords: perception, computer vision, framework, model driven engineering.

[PR20] Dean's grant 504M0013: **Efficient automatic generation and verification of signatures of active threats.**

Granting period: 30.06.2012 – 31.03.2013.

Principal Investigator: Adam Kozakiewicz

Aim of project: Increasing knowledge and obtaining new scientific results in the field of security of systems and networks, focusing on the problem specified in the grant's title, namely automatic generation and efficient verification of threat signatures and application of machine learning and

artificial intelligence methods to this problem, Preparation of a laboratory for further research in the field of network security, Publication of results leading to habilitation.

Expected results: Review of the literature on the issue of syntactic signature generation and verification, purchase of laboratory equipment enabling research on malicious software in secure, isolated environment, development of generation and verification methods with the goal of increasing selectivity and sensitivity of signatures, increasing the performance of signature generation and verification methods through multicore parallel processing and use of GPU, documentation of results in reports, preparation of papers to be published in journals. Research on enhancement of signatures generated by multiset algorithms was performed, A parallel version of a signature generator was implemented.

Keywords: detection of network threats, automatic generation of signatures, honeypots.

[PR21] 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.

Aim of a project: 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.

Expected results: The new implementations and heuristics for interval algorithms for the problems of equations systems solving or Pareto-set seeking.

Keywords: interval computations, numerical computations, parallel computing, reliable computing.

[PR22] NCN grant No N N514 672940: **Methods and tools for ad hoc network design and control.**

Granting period: 04.04.2011 – 03.04.2014.

Principal Investigator: Ewa Niewiadomska-Szynkiewicz.

Investigators Krzysztof Malinowski, Andrzej Sikora, Michał Marks, Mariusz Kamola, Piotr Arabas, Adam Woźniak, Krzysztof Daniluk, Krzysztof Lasota.

Aim of project: The ad hoc networking is an ultimate technology in wireless communication that allows wireless devices located within their transmission range to communicate directly to each other without the need for established fixed network infrastructure. It is a new area of research that has become extremely popular over the last decade and is rapidly increasing its advance into different areas of technology. Ad hoc networks are growing rapidly in both size and complexity, and it is becoming increasingly difficult to develop and investigate such large and complex systems. The project concerns the important problems related to ad hoc networks design and development. Two types of networks are considered: WSN - Wireless Sensor Networks and MANET ℓ Mobile Ad hoc Networks. The focus is on three key aspects of the design: accurate localization of devices that form a network, reliable and energy aware inter-node communication and managing the mobility of an ad hoc network. The main goal of the project is to design and develop new methods, algorithms and protocols for ad hoc network applications. The second objective is to develop a software tool for ad hoc networks simulation and create laboratory for testing solutions for wireless sensor networks.

Expected results: The project will deliver novel protocols for reliable and energy-aware inter-node communication and the localization system for calculating the geographic position of devices that form a network. The effectiveness of both new solutions will be tested through simulation and in a testbed network. A comprehensive approach for design of cooperative, fully connected self-organizing networks will be provided. The novel algorithm for efficient calculating of motion trajectories for wireless devices will be developed and evaluated. Moreover, the software platform

for parallel and distributed simulation, and computer-aided design of self-organizing mobile networks will be delivered. Finally, the wireless sensor network laboratory will be built in which demonstration tests will be conducted. The results of the project will be described in the research papers, a book devoted to ad hoc network design and development, and presented on conferences. Both network simulator and WSN laboratory will be used for research and education.

Keywords: ad hoc network, wireless sensor network (WNS), MANET, localization system, mobility model, topology control, energy-efficient communication, optimization, simulation.

[PR23] Statutory Grant No. 504G036300: **Development of methodology of control, decision support and production management.**

Granting period: 28.03.2011 – 31.12.2012, 14.05.2012 – 31.10.2013.

Principal investigators: Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Włodzimierz Ogryczak, Krzysztof Sacha, Piotr Tatjewski, Eugeniusz Toczyłowski, Cezary Zieliński.

5 Degrees Awarded

5.1 Professor Degrees

Professor CEZARY ZIELIŃSKI has been nominated to the title of professor on April 2012.

5.2 D.Sc. Degrees

ANDRZEJ KARBOWSKI

Metody i algorytmy obliczeniowe do rozwiązywania złożonych zadań syntezy mechanizmów sterowania

Degree awarded on November 3, 2012

5.3 Ph.D. Degrees

Advisor: **Krzysztof Pieńkosz**

KAMIL KOŁTYŚ

Modele wielotowarowych aukcji zasobów sieci teleinformatycznej

Thesis defended on June 12, 2012

Advisor: **Andrzej Pacut**

MALGORZATA KUDELSKA

Ant algorithms for adaptive routing in telecommunication networks

Thesis defended on May 15, 2012

Advisor: **Krzysztof Malinowski**

MAREK MAŁOWIDZKI

Modeling Traffic Sources with the Fourier Transform

Thesis defended on December 18, 2012

Advisor: **Włodzimierz Ogryczak**

PIOTR RZEPAKOWSKI

Techniki eksploracji danych wspomagające personalizację ofert usług telekomunikacyjnych

Thesis defended on October 30, 2012

Advisor: **Włodzimierz Kasprzak**

ARTUR WILKOWSKI

Gesture recognition in image sequences based on shape and motion analysis of objects with deformable shape

Thesis defended on June 12, 2012

5.4 M.Sc. Degrees

Advisor: **Piotr Arabas**

M. WŁODKOWSKI

Analiza danych ruchowych oraz modelowanie zachowań użytkowników na ich podstawie

Degree awarded on March 2012

Advisor: **Robert Bembenik (II)**

W. SMOLAREK

Analiza porównawcza możliwości eksploracji danych przestrzennych w komercyjnych SZBD oraz Open Source na przykładzie Oracle i Postgre SQL

Degree awarded on October 2012

Advisor: **Adam Czajka**

K. PIECH

Automatyczny dobór parametrów kodowania tęczy w metodzie wykorzystującej transformację Zaka-Gabona

Degree awarded on June 2012

Advisor: **Paweł Domański**

M. GINTROWSKI

Alternatywne metody prognozowania szeregów czasowych

Degree awarded on October 2012

Advisor: **Janusz Granat**

B. NACHYŁA

Algorytmy eksploracji danych w Internecie Przyszłości

Degree awarded on January 2012 (with honors)

M. MALICKI (OKNO)

Analiza wpływu anomalii na optymalizację łańcucha dostaw

Degree awarded on March 2012

T. GŁÓWKA

Wielokryterialne wyszukiwanie informacji w serwisach WWW

Degree awarded on October 2012. Czaplicki Badanie wpływu zastosowania obliczeń równoległych i rozproszonych na efektywność metod grupowania danych November 2012

Advisor: **Jerzy Gustowski**

P. KOCZKODAJ

Modele obiektów dynamicznych do ćwiczeń z programowania PLC

Degree awarded on June 2012

P. KORCZAK

Stanowisko badawcze odwróconego wahadła z silnikiem liniowym

Degree awarded on October 2012

Advisor: **Adam Kozakiewicz**

P. JAKUBCZYK

Szybka generacja i analiza procesów samopodobnych z zależnościami długoterminowymi przy użyciu procesora karty graficznej i/lub procesorów wielordzeniowych

Degree awarded on March 2012

M. POWAŁA

Zastosowanie nowoczesnych technologii sieciowych w projektowaniu rozległej sieci firmowej

Degree awarded on October 2012

Advisor: **Artur Krystosik (II)**

T. ŻEWŁAKOW

System do zarządzania zapleczem pozycjonerskim opartym na systemie zarządzania treścią Wordpress

Degree awarded on July 2012

Advisor: **Bartłomiej Kubica**

J. STOCKA

Programowanie równoległe w środowiskach COBRA i Web Services

Degree awarded on October 2012

Advisor: **Maciej Ławryńczuk**

P. NOSALSKI

Nieliniowe dynamiczne modele wielomianowe: identyfikacja i regulacja predykcyjna

Degree awarded on June 2012 (with honors)

P. GÓRECKI

Sieci neuronowe do optymalizacji nieliniowej

Degree awarded on June 2012 (with honors)

Advisor: **Piotr Marusak**

R. CIEPIELSKI

Rozmyte algorytmy regulacji predykcyjnej w układzie regulacji nieliniowego obiektu chemicznego o wielu wejściach i wielu wyjściach – porównanie i wnioski

Degree awarded on October 2012

S. SWIANIEWICZ

Neuronowe i ewolucyjne metody identyfikacji i dostrajania modeli rozmytych – implementacja i porównanie

Degree awarded on October 2012

Advisor: **Robert Nowak (ISE)**

M. MICHAŁAK

Optymalizacja sekwencji i protokołu syntezy DNA

Degree awarded on October 2012

Advisor: **Ewa Niewiadomska-Szynkiewicz**

A. PUTZ

Nowe formaty pakowania macierzy w zastosowaniu z solverami programowania nieliniowego

Degree awarded on February 2012

M. TYM-CZARNOCKI

Heterogeniczna sieć ad-hoc zbudowana z bezprzewodowych czujników i robotów mobilnych

Degree awarded on July 2012

P. KANIA

Wykorzystanie metod odkrywania wiedzy do lokalizacji węzłów w sieciach ad hoc

Degree awarded on October 2012

K. NOWAKOWSKI

Budowa energooszczędnej sieci bezprzewodowych czujników w środowisku Tinyos

Degree awarded on October 2012

M. LUSA

Badanie modeli ruchu dla sieci MANET

Degree awarded on October 2012

Advisor: **Włodzimierz Ogryczak**

P. SOSNA

Konstrukcja odpornego portfela inwestycji przy nieprecyzyjnych prawdopodobieństwach scenariuszy

Degree awarded on October 2012

R. KWAŚNY

Wyznaczanie portfeli efektywnych metodą NISE

Degree awarded on October 2012

Advisor: **Andrzej Pacut**

W. GUTFETER

Zastosowanie ukrytych modeli Markowa w kodowaniu odręcznego podpisu statycznego

Degree awarded on October 2012

Advisor: **Piotr Pałka**

M. CAŁKA

Implementacja i analiza strategii współpracy w wieloagentowej platformie wymiany wielkotowarowej na przykładzie polskiego rynku energii elektrycznej

Degree awarded on October 2012

M. CIEŚLIK

Badanie mechanizmów osłabiania siły rynkowej na rynku energii w czasie transformacji rynku w Polsce

Degree awarded on October 2012

Advisor: **Krzysztof Pieńkosz**

M. BIAŁOBRZEWSKI

Problemy asekuracji przy alokacji przepustowości dla wirtualnych sieci prywatnych

Degree awarded on October 2012

Advisor: **Piotr Salata (II)**

W. BĄK

Budowa rekomendacji w oparciu o wspólną filtrację

Degree awarded on Oktober 2012

Advisor: **Jerzy Sobczyk**

T. TOKARSKI (OKNO)

Wizualizacja obciążenia sieci

Degree awarded on July 2012

Advisor: **Andrzej Stachurski**

Ł. LENDA

Optymalizacja długości połączeń w układach wysokiej skali integracji (VLSI)

Degree awarded on November 2012

Advisor: **Marcin Szlenk**

P. BORKOWSKI (OKNO)

Analiza porównawcza wybranych technologii RIA

Degree awarded on March 2012

Advisor: **Wojciech Szynkiewicz**

K. TRZCIŃSKI

Algorytm syntezy i wykonania chwytu precyzyjnego

Degree awarded on March 2012 (with honors)

Advisor: **Tomasz Śliwiński**

B. KOTŁOWSKI

Wspomaganie optymalizacji ryzyka w projektowaniu portfela inwestycyjnego

Degree awarded on March 2012

P. OGRODNIK

Analiza możliwości automatycznego generowania aplikacji na bazie modeli BPMN

Degree awarded on October 2012

Advisor: **Eugeniusz Toczyłowski**

W. KĘDZIERSKI

Wieloagentowy system wymiany usług i realokacji zasobów sieci teleinformatycznej

Degree awarded on November 2011

K. SĘDROWICZ

Strategie decyzyjne dla wieloagentowych modeli rynku energii

Degree awarded on March 2012 (with honors)

T. JASTRZĘBSKI

Wykorzystanie aukcji wielkotowarowych do zarządzania zintegrowanymi łańcuchami dostaw

Degree awarded on October 2012 (with honors)

Advisor: **Paweł Wawrzyński**

P. SUSZYŃSKI

Stochastyczne uczenie gradientowe impulsowych sieci neuronowych z wykorzystaniem sieci referencyjnych

Degree awarded on December 2012

Advisor: **Jarosław Wilk (Wydział Elektryczny)**

R. MILESZCZYK (OKNO)

Synchronizacja danych w relacyjnej bazie danych na podstawie danych o strukturze hierarchicznej

Degree awarded on March 2012

Advisor: **Piotr Witoński (IMIO)**

A. DUDEK (OKNO)

Platformy wirtualizacyjne Hyper -v i ESXi – porównanie wydajności

Degree awarded on October 2012

Advisor: **Andrzej Zalewski**

A. ZDANOWSKI

Zarządzanie informatyką na potrzeby Politechniki Warszawskiej

Degree awarded on March 2012

M. ROMANOWSKI

Zintegrowany model architektury

Degree awarded on March 2012

Advisor: **Cezary Zieliński**

M. BORYŃ

Dobór nastaw regulatorów w układach serwomechanizmów wizyjnych

Degree awarded on October 2012

5.5 B.Sc. Degrees

Advisor: **Piotr Arabas**

M. MAZEK

Rozproszony generator ruchu sieciowego

Degree awarded on September 2012

M. KISIEL

Konfiguracja ścieżek MPLS w Linux

Degree awarded on September 2012

Advisor: **Adam Czajka**

K. KOZIOL

Urządzenie do pozyskiwania obrazów żył palca

Degree awarded on February 2012

P. BULWAN

Termika dłoni

Degree awarded on February 2012

Advisor: **Jarosław Dawidczyk (IMIO)**

K. DUDA

System obsługi wsparcia technicznego przedsięwzięć

Degree awarded on September 2012

Advisor: **Janusz Granat**

M. PIĘNKOSZ

Wielokryterialne metody routingu z ograniczeniami dla Internetu Przyszłości

Degree awarded on February 2012

M. CIECHOWICZ

Monitoring wykorzystania zasobów wirtualnych w sieciach komputerowych

Degree awarded on July 2012

P. ŁYSZCZARZ

Algorytmy zarządzania sieciami wirtualnymi

Degree awarded on September 2012 (with honors)

Advisor: **Jerzy Gustowski**

M. CIEŚLAK

Skryptowe funkcje dynamizacji obiektów graficznych (w języku C) w systemie wizualizacji procesów przemysłowych WIN CC

Degree awarded on February 2012

M. BARWIKOWSKI

Sterowanie procesem butelkowania soku z wykorzystaniem stanowiska dydaktycznego FESTO MPS PA

Degree awarded on September 2012

Advisor: **Krystian Ignasiak (IRE)**

M. MAJ

Framework do budowy sklepu internetowego w technologii JEE

Degree awarded on February 2012

Advisor: **Ryszard Jachowicz (ISE)**

S. OLENCINSCHI

Wirtualne laboratorium „Symulacja funkcjonowania mikroczujników”

Degree awarded on February 2012

Advisor: **Mariusz Kaleta**

P. MENIO

Analiza modelu referencyjnego systemów typu workflow

Degree awarded on February 2012

H. CIEPLICKI

Obrót wielotowarowy w sieciach społecznościowych

Degree awarded on February 2012

M. OLSZEWSKI

Projekt i implementacja systemu informatycznego dla aukcji wielotowarowych

Degree awarded on September 2012

Advisor: **Mariusz Kamola**

J. KUREK

Badanie efektywności protokołu OpenFlow

Degree awarded on September 2012

Advisor: **Andrzej Karbowski**Ł. Bogusz Poprawa efektywności solverów rozwiązujących zadania sterowania optymalnego poprzez wektoryzację i zrównoleglenie February 2012

M. KASZLEJ

Zrównoleglenie algorytmu sympleks dla dużych zadań rzadkich

Degree awarded on September 2012

Advisor: **Włodzimierz Kasprzak**

D. KUNA – BRONIOWSKI

Tworzenie mapy rozbieżności I wspomaganie segmentacji obrazu w systemie analizy stereo – pary obrazów

Degree awarded on February 2012

M. SZUMIELEWICZ

Lokalizacja mówców na podstawie analizy sygnałów z wielu mikrofonów

Degree awarded on September 2012

M. LISICKI

3D object recognition based on depth map and color image fusion

Degree awarded on September 2012

J. TYSZKA

Rozpoznawanie obiektów 3D na podstawie analizy obrazu I wnioskowania w sieci Bayesa

Degree awarded on September 2012

Advisor: **Adam Kozakiewicz**

M. SZABŁOWSKI

Moduł monitorujący klienckiego honeypota Capture – HPC dla systemy GNU/ Linux

Degree awarded on February 2012

P.ZAWADA

Wykrywanie anomalii za pomocą sztucznego systemu immunologicznego w strukturze receptorów umożliwiającej stosowanie wyjątków

Degree awarded on February 2012(with honors)

P. WASILEWSKI

Aplikacja do monitoringu serwera z modułem automatycznego wykrywania zagrożeń i anomalii

Degree awarded on February 2012

K. SZEWCZYK

Narzędzie do analizy i edycji struktury pliku PDF

Degree awarded on February 2012

A. SZPOTON

Analiza algorytmów odległości edycyjnej z wykorzystaniem GPU

Degree awarded on February 2012

Advisor: **Bartosz Kozłowski**

S. RADOŁA

Interfejs klastra obliczeniowego dla systemów heterogenicznych

Degree awarded on September 2012

Advisor: **Tomasz Jordan Kruk**

D. JAGODZIŃSKI

Implementacja serwera typu push do efektywnej komunikacji z urządzeniami typu Android

Degree awarded on February 2012

K. GAJOWY

Wirtualny ekran na grupie urządzeń roboczych pod kontrolą systemu Android

Degree awarded on February 2012

Advisor: **Adam Krzemienowski**

D. WIŚNIEWSKI

Model optymalizacyjny średniej warunkowej z kompensacją dla problem lokalizacyjnego

Degree awarded on September 2012

Advisor: **Bartłomiej Kubica**

M. LITWIŃSKI

Concurrent implementation of interwal tree

Degree awarded on February 2012Ł. Tylicki Kolejka priorytetowa wydajna w środowisku wielowątkowym
February 2012

T. MACIEJKO

Wyznaczanie pozycji robota mobilnego z zastosowaniem arytmetyki przedziałowej

Degree awarded on February 2012

G. SZYMAŃSKI

Implementacja biblioteki realizującej mechanizm automatycznego różniczkowania w technologii CUDA
Degree awarded on February 2012

E. WOJDAK

Model optymalizacyjny średniej warunkowej dla problemu wyboru portfela inwestycji z zabezpieczeniem ekstremalnych strat

Degree awarded on September 2012

Advisor: **Piotr Marusak**

E. KERBIZI

Regulacja rozmyta nieliniowego procesu chemicznego

Degree awarded on September 2012

Advisor: **Ewa Niewiadomska – Szykiewicz**

F. NABRDALIK

Energoszczędna transmisja danych w sieciach bezprzewodowych czujników

Degree awarded on June 2012

Advisor: **Andrzej Pacut**

K. BOCIAN

Tworzenie syntetycznej tęczy na podstawie zadanego kodu

Degree awarded on February 2012

T. PISKOZUB

Odruch świetlny źrenicy w zastosowaniu do badania żywotności oka

Degree awarded on September 2012

Advisor: **Piotr Pałka**

M. BIAŁEK

Wdrożenie modułu SAP Warehouse Management na serwerze dydaktycznym

Degree awarded on February 2012

M. ROKICKI

Wykorzystanie języka modelowania procesów biznesowych do modelowania procesów aukcyjnych

Degree awarded on February 2012

P. TRZASKA

Badanie wydajności komunikacji systemu wieloagentowego w symulacji rzeczywistego rynku energii elektrycznej

Degree awarded on February 2012

A. RAMATOWSKI

Obrót wielkotowarowy w sieciach społecznościowych

Degree awarded on September 2012

P. KAŁAMUCKI

System zarządzania przepustowością lotnisk wykorzystujący model aukcji wielotowarowej

Degree awarded on September 2012

K. KUCHARCZYK

Mechanizm wyboru strategii dla rynku pozwoleń na emisję gazów cieplarnianych

Degree awarded on September 2012

Advisor: **Krzysztof Pieńkosz**

P. CZYŻ

Algorytmy optymalizacji wykroju elementów kolistych z materiału

Degree awarded on February 2012Ł. Owczarz Heurystyczna metoda rozwiązywania semi-ciągłego problemu dystrybucyjnego February 2012

D. ZIELIŃSKI

Heurystyczne algorytmy listowe dla semi – ciągłego problemu pakowania pojemników

Degree awarded on February 2012

N. JAKUBIAK

Algorytmy multikolorowania grafów

Degree awarded on September 2012

Advisor: **Michał Rudowski (II)**

R. KOELNER

Analiza porównawcza systemu Vertica z mechanizmem zmaterializowanych perspektyw Oracle oraz opcją Oracle OLAP w zakresie analityki biznesowej

Degree awarded on September 2012

Advisor: **Henryk Rybiński (II)**

A. TARASZKIEWICZ

Wtyczka Latex do środowiska programistycznego IntelliJ IDEA

Degree awarded on January 2013

Advisor: **Radosław Schoeneich (TELE)**

M. ANDRZEJEWSKI

System monitorowania statków powietrznych z wykorzystaniem urządzeń mobilnych i sieci niespójnych

Degree awarded on February 2012

Advisor: **Krzysztof Sacha**

D. ZAŁUGA

Metody i narzędzia testowania

Degree awarded on September 2012

Advisor: **Jerzy Sobczyk**

P. ZAKRZEWSKI

Narzędzia do analizy i edycji plików binarnych

Degree awarded on February 2012

F. KARPIŃSKI

Komputerowe wspomaganie organizacji zajęć dydaktycznych

Degree awarded on February 2012

Advisor: **Andrzej Stachurski**

E. LEŚNIEWSKI

Wyznaczanie trasy autobusu szkolnego

Degree awarded on February 2012

M. GRĄDZKI

Optymalizacja kosztów zakupów w Internecie

Degree awarded on February 2012

Advisor: **Cezary Stępień (II)**

P. KUKLO

Modelowanie animowanych obiektów powleczonech futrem w programie 3 ds MAX

Degree awarded on February 2012

Advisor: **Marcin Szlenk**

M. DRZAZGA

Implementacja systemu do gry w wojny rdzeniowe w języku funkcyjnym

Degree awarded on February 2012

Advisor: **Eugeniusz Toczyłowski**

R. KARPUK

Rozwój narzędzi wspomagających symulację iterowanych procesów rynkowych w systemie AIMMS

Degree awarded on February 2012

T. KOPCZUK

System wspomagania decyzji o lokalizacji inwestycji w elektrownię małej mocy

Degree awarded on February 2012

Advisor: **Tomasz Traczyk**

P. BARSZCZ

Wizualizacja rozkładów zajęć w językach XHTML I SVG

Degree awarded on February 2012

M. JAMIOŁKOWSKI

Interfejs do kolektywnego wprowadzania danych do bazy danych dokumentującej zabytki

Degree awarded on June 2012

Advisor: **Paweł Wawrzyński**

J. PAWŁOT

Symulator impulsowej sieci neuronowej w technologii nVidia CUDA

Degree awarded on February 2012

K. KREJ

Efektywna implementacja Echo State Network w technologiach NVIDIA CUDA I SSE

Degree awarded on September 2012

Advisor: **Tomasz Winiarski**

O. LESZCZYŃSKI

Sterowanie manipulatorem za pomocą telefonu komórkowego

Degree awarded on February 2012

T. POKORSKI

Robot IRp-6 grający w kości

Degree awarded on September 2012

Advisor: **Jacek Wytrębowski (II)**

M. JAKÓBCZYK

Aplikacja zarządzająca serwerem VoIP Asterisk

Degree awarded on February 2012

A. MATŁACZ

Rozwiązania bezpiecznej sieci dla domów studenckich

Degree awarded on July 2012

Advisor: **Wojciech Zabołotny (ISE)**

J. KOŁODZIEJSKI

System wbudowany do akwizycji i dystrybucji danych z wielokanałowego detektora GEM

Degree awarded on February 2012

Advisor: **Cezary Zieliński**

S. PIĄTEK

Planowanie działań robota

Degree awarded on February 2012

P. CHABER

Sterowanie robotem mobilnym za pomocą krzywych NURBS

Degree awarded on February 2012

A. SZYMANEK

Serwomechanizm wizyjny z możliwością połączenie źródła obrazu

Degree awarded on February 2012

6 Publications

6.1 Scientific or Technical Books

- [B1] Maciej Ławryńczuk: *Sieci neuronowe w efektywnych obliczeniowo algorytmach regulacji predykcyjnej*. Prace naukowe Politechniki Warszawskiej – Elektronika. Oficyna Wydawnicza PW, 2012.
- [B2] Andrzej Stachurski: *Aproksymacje kwadratowe w ciągłej optymalizacji nieliniowej*. Prace Naukowe PW, seria Elektronika. Oficyna Wydawnicza PW, 2012.
- [B3] Mikołaj Busłowicz and Krzysztof Malinowski: *Advances in Control Theory and Automation*. Printing House of Białystok University of Technology, 2012.
- [B4] Mariusz Kaleta and Tomasz Traczyk: *Modeling Multi-commodity Trade: Information Exchange Methods*. Springer-Verlag, 2012.

6.2 Scientific and Technical Papers in Journals

- [J1] Alice Collaboration, K. Aamodt, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Erratum to “rapidity and transverse momentum dependence of inclusive J/Ψ production in pp collisions at $\sqrt{s} = 7$ TeV” [phys. lett. b 704 (5) (2011) 442]. *Physics Letters B*, 718: 692–698, 2012.
- [J2] Alice Collaboration, K. Aamodt, B. Abelev, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Harmonic decomposition of two-particle angular correlations in pb-pb collisions at $\sqrt{s_{nn}} = 2.76$ TeV. *Physics Letters B*, 708: 249–264, 2012.
- [J3] Alice Collaboration, K. Aamodt, B. Abelev, A. Abrahantes, D. Adamova, Tomasz Traczyk and et al.: Particle-yield modification in jet-like azimuthal di-hadron correlations in pb-pb collisions at $\sqrt{s_{nn}} = 2.76$ TeV. *Physical Review Letters*, 108(092301): 1–11, 2012.
- [J4] Alice Collaboration, B. Abelev, J. Adam, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Heavy flavour decay muon production at forward rapidity in proton-proton collisions at $\sqrt{s} = 7$ TeV. *Physics Letters B*, 708: 265–275, 2012.
- [J5] Alice Collaboration, B. Abelev, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: J/ψ polarization in pp collisions at $\sqrt{s} = 7$ TeV. *Physical Review Letters*, 108(082001): 1–10, 2012.
- [J6] Alice Collaboration, B. Abelev, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Light vector meson production in pp collisions at $\sqrt{s} = 7$ TeV. *Physics Letters B*, 710: 557–568, 2012.
- [J7] Alice Collaboration, B. Abelev, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Measurement of charm production at central rapidity in proton proton collisions at $\sqrt{s} = 2.76$ TeV. *JOURNAL OF HIGH ENERGY PHYSICS*, (01(2012)128): 1–29, 2012.
- [J8] Alice Collaboration, B. Abelev, J. Adam, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Measurement of event background fluctuations for charged particle jet reconstruction in pb-pb collisions at $\sqrt{s_{nn}} = 2.76$ TeV. *JOURNAL OF HIGH ENERGY PHYSICS*, (03(2012)053): 1–25, 2012.
- [J9] Alice Collaboration, B. Abelev, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Neutral pion and ν meson production in proton-proton collisions at $\sqrt{s} = 0.9$ TeV and $\sqrt{s} = 7$ TeV. *Physics Letters B*, 717: 162–167, 2012.

- [J10] Alice Collaboration, B. Abelev, A. Abrahantes, D. Adamova, A. Adare, Tomasz Traczyk and et al.: Underlying event measurements in pp collisions at $\sqrt{s} = 0.9$ and 7 TeV with the alice experiment at the lhc. *JOURNAL OF HIGH ENERGY PHYSICS*, (07(2012)116): 1–42, 2012.
- [J11] Piotr Przemysław Arabas, Przemysław Jaskóła, Mariusz Kamola and Michał Karpowicz: Analysis and modeling of domain registration process. *Journal of Telecommunications and Information Technology*, (2/2012): 63–73, 2012.
- [J12] Jacek Błaszczuk, Andrzej Karbowski, Kamil Krawczyk, Krzysztof Malinowski and Alnoor Allidina: Optimal pump scheduling for large scale water transmission system by linear programming. *Journal of Telecommunications and Information Technology*, (3/2012): 91–96, 2012.
- [J13] Mateusz Boryń and Tomasz Michał Kornuta. Dobór nastaw regulatorów w serwomechanizmach wizyjnych. *Prace Naukowe PW, seria Elektronika*, II(182): 617–626, 2012.
- [J14] Adam Czajka and Krzysztof Piech: Secure biometric verification station based on iris recognition. *Journal of Telecommunications and Information Technology*, (3/2012): 40–49, 2012.
- [J15] Krzysztof Daniluk and Ewa Niewiadomska-Szynkiewicz: A survey of energy efficient security architectures and protocols for wireless sensor networks. *Journal of Telecommunications and Information Technology*, (3/2012): 64–72, 2012.
- [J16] K. Fujimoto, N. Hamada and Włodzimierz Kasprzak: Estimation and tracking of fundamental, 2nd and 3d harmonic frequencies for spectrogram normalization in speech recognition. *Bulletin of the Polish Academy of Science, Technical Science*, 60(1): 71–81, 2012.
- [J17] Mariusz Kaleta and Przemysław Krajewski: Technologie informatyczne w operacyjnych procesach decyzyjnych na rynku mikrogridów. *Rynek Energii*, (1(98)): 39–46, 2012.
- [J18] Mariusz Kamola, Piotr Przemysław Arabas, Przemysław Jaskóła, Tomasz Wiśniewski, Ewa Niewiadomska-Szynkiewicz, Krzysztof Malinowski, Michał Karpowicz, Andrzej Sikora, Michał Marks, Marcin Mincer and Krzysztof Daniluk: Econet – energooszczędne techniki dla przewodowych sieci komputerowych. *Przegląd Telekomunikacyjny- Wiadomości Telekomunikacyjne*, LXXXV(8-9/2012): 650–655, 2012.
- [J19] Mariusz Kamola: Who is asking and for what: Whois traffic analysis. *Journal of Telecommunications and Information Technology*, (4/2012): 14–21, 2012.
- [J20] Andrzej Karbowski: Integrated routing and network flow control embracing two layers of tcp/ip networks – methodological issues. *Journal of Telecommunications and Information Technology*, (2/2012): 51–54, 2012.
- [J21] Włodzimierz Kasprzak and Piotr Olszewski: Architektura informatyczna systemów ITS. *Zeszyty Naukowe, Warszawska Wyższa Szkoła Informatyki*, 5(5): 47–62, 2012.
- [J22] Włodzimierz Kasprzak, Artur Wilkowski and Karol Czapnik: Hand gesture recognition based on free-form contours and probabilistic inference. *International Journal of Applied Mathematics & Computer Science*, 22(2): 437–448, 2012.
- [J23] Kamil Kołtyś, Krzysztof Pieńkosz and Eugeniusz Toczyłowski: Auction models supporting end-to-end connection trading. *Journal of Telecommunications and Information Technology*, (2/2012): 55–62, 2012.
- [J24] Tomasz Michał Kornuta and Cezary Zieliński: Projektowanie układów sterowania robotów. część i: Metodyka. *Prace Naukowe PW, seria Elektronika*, II(182): 597–606, 2012.

- [J25] Tomasz Michał Kornuta, Maciej Stefańczyk and Cezary Zieliński: Projektowanie układów sterowania robotów. część ii: Aktywna wizja. *Prace Naukowe PW, seria Elektronika*, II(182): 607–616, 2012.
- [J26] Tomasz Michał Kornuta and Cezary Zieliński: Specyfikacja struktur serwomechanizmów wizyjnych. *Pomiary Automatyka Robotyka PAR*, (2/2012): 370–376, 2012.
- [J27] Bartłomiej Jacek Kubica: A class of problems that can be solved using interval algorithms. *Computing*, 94: 271–280, 2012.
- [J28] Suwat Kuntanapreeda and Piotr Marusak: Nonlinear extended output feedback control for cstrs with van de vusse reaction. *COMPUTERS & CHEMICAL ENGINEERING*, 41: 10–23, 2012.
- [J29] Krzysztof Lasota, Ewa Niewiadomska-Szynkiewicz and Adam Andrzej Kozakiewicz: Adaptacja rozwiązań honeypot dla sieci czujników. *Studia Informatica – Zeszyty Naukowe*, 33(3A(107)): 139–147, 2012.
- [J30] Krzysztof Lasota, Ewa Niewiadomska-Szynkiewicz and Adam Andrzej Kozakiewicz: Multi-cdn content delivery: theory and experiments. *Przegląd Telekomunikacyjny- Wiadomości Telekomunikacyjne*, (8-9/2012): 687–698, 2012.
- [J31] Maria Marks, Daria Józwiak-Niedźwiedzka, Michał A. Glinicki, Jan Olek and Michał Marks: Assesment of scaling durability of concrete with cfbc ash by automatic classification rules. *Journal of Materials in Civil Engineering*, 24: 860–867, 2012.
- [J32] Michał Marks, Jarosław Jantura, Ewa Niewiadomska-Szynkiewicz, Przemysław Mirosław Strzelczyk and Krzysztof Gózdź: Heterogeneous gpu&cpu cluster for high performance computing in cryptography. *Computer Science*, 14(2): 63–79, 2012.
- [J33] Piotr Marusak. Wykorzystanie właściwości algorytmów regulacji predykcyjnej w detekcji uszkodzeń: *Pomiary Automatyka Robotyka PAR*, (2/2012): 338–343, 2012.
- [J34] Marcin Mincer and Ewa Niewiadomska-Szynkiewicz: Application of social network analysis to the investigation of interpersonal connections. *Journal of Telecommunications and Information Technology*, (2/2012): 83–91, 2012.
- [J35] Zbigniew Nahorski, Jarosław Stańczak and Piotr Pałka: Application of multi-commodity market model greenhouse gases emission permits trading. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 165–177. Springer-Verlag, 2012.
- [J36] Ewa Niewiadomska-Szynkiewicz, Michał Marks, Jarosław Jantura and Mikołaj Podbielski: A hybrid cpu/gpu cluster for encryption and decryption of large amounts of data. *Journal of Telecommunications and Information Technology*, (3/2012): 32–39, 2012.
- [J37] Ewa Niewiadomska-Szynkiewicz, Andrzej Sikora, Piotr Przemysław Arabas and Joanna Kołodziej: Control system for reducing energy consumption in backbone computer network. *Concurrency and Computation-Practice & Experience*, 25(4): 1–17, 2012.
- [J38] Ewa Niewiadomska-Szynkiewicz: Localization in wireless sensor networks: Classification and evaluation of techniques. *International Journal of Applied Mathematics & Computer Science*, 22(2): 281–297, 2012.
- [J39] Włodzimierz Ogryczak and Paweł Olender: On MILP models for the OWA optimization. *Journal of Telecommunications and Information Technology*, (2/2012): 5–12, 2012.

- [J40] Piotr Pałka: Wpływ wyłączenia niemieckich elektrowni jądrowych na sytuację energetyczną w Polsce. *Rynek Energii*, (Zeszyt tematyczny I(VII)): 186–194, 2012.
- [J41] Piotr Pałka: Wykorzystanie narzędzi xml do tworzenia matematycznych modeli optymalizacyjnych. *Studia Informatica – Zeszyty Naukowe*, 33(2B(106)): 229–241, 2012.
- [J42] Andrzej Sikora and Ewa Niewiadomska-Szynkiewicz: Mobility model for self-organizing and cooperative msn and manet systems. *Sensors & Transducers*, 14-2(3/12): 164–178, 2012.
- [J43] Maciej Stefańczyk, Konrad Banachowicz, Michał Wałęcki and Tomasz Winiarski. Nawigacja robotem elektron z wykorzystaniem kamery 3d i lidar. *Prace Naukowe PW, seria Elektronika*, II(182): 265–274, 2012.
- [J44] Marcin Strzałek and Piotr Pałka: Problematyka poufności, autentyczności, integralności oraz niezaprzeczalnych danych w systemach wieloagentowych. *Studia Informatica – Zeszyty Naukowe*, 33(2B(106)): 217–227, 2012.
- [J45] Wojciech Szynkiewicz, Włodzimierz Kasprzak and Teresa Zielińska: Planowanie rozmieszczenia ruchomych podpór jako dyskretny problem spełniania ograniczeń. *Pomiary Automatyka Robotyka PAR*, (2/2012): 344–350, 2012.
- [J46] Wojciech Szynkiewicz: Skill-based bimanual manipulation planning. *Journal of Telecommunications and Information Technology*, (4/2012): 54–62, 2012.
- [J47] Michał Wałęcki, Konrad Banachowicz, Maciej Stefańczyk, Rafał Chojecki, Mateusz Wiśniowski and Tomasz Winiarski: Uniwersalna struktura sprzętu badawczo-dydaktycznej platformy mobilnej. *Prace Naukowe PW, seria Elektronika*, II(182): 305–314, 2012.
- [J48] Tomasz Winiarski, Konrad Banachowicz and Maciej Stefańczyk: Bezpieczna strategia otwierania drzwi robotem manipulacyjnym kuka-lwr. *Prace Naukowe PW, seria Elektronika*, II(182): 395–404, 2012.
- [J49] Andrzej Zalewski, Marcin Szlenk and Szymon Kijas: An evolution process for service-oriented systems. *Computer Science*, 13(4): 71–86, 2012.
- [J50] Izabela Żółtowska: Dyskretny decyzje w modelach obrotu: wpływ na ceny energii. *Rynek Energii*, (Zeszyt tematyczny I(VII)): 229–234, 2012.

6.3 Scientific and Technical Papers in Books and Conference Proceedings

- [P1] Piotr Przemysław Arabas, Krzysztof Malinowski and Andrzej Sikora: On formulation of a network energy saving optimization problem. In 2012 Fourth International Conference on Communications and Electronics (ICCE), pages 227–232. IEEE, 2012.
- [P2] Jacek Błaszczak, Andrzej Karbowski and Krzysztof Malinowski: Solving optimal control problems by direct methods. In Radosław Pytlak, editor, *Interactive computer environment for solving optimal control problems-IDOS*, pages 163–203. BEL Studio Sp. z o.o., 2012.
- [P3] Jacek Błaszczak, Krzysztof Malinowski and Alnoor Allidina: Aggregated pumping station operation planning problem (apsop) for large scale water transmission system. In Kristján Jónasson, editor, *Applied Parallel and Scientific Computing: 10th International Conference, PARA 2010, Reykjavik, Iceland, June 6-9, 2010, Revised Selected Papers*, pages 260–269. Springer, 2012.
- [P4] Michał Chrzanowski and Tomasz Jordan Kruk: Bezpieczeństwo systemu nazw domenowych. In Grażyna Szpor and Wojciech R. Wiewiórowski, editors, *Internet. Prawno-informatyczne problemy sieci, portali i e-usług*, pages 83–96. C.H.Beck, 2012.

- [P5] Krzysztof Daniluk: Energy-efficient protocol in omnet++ simulation environment. In Galina Setlak, Mikhail Alexandrov and Krassimir Markov, editors, *Artificial Intelligence Driven Solutions to Business and Engineering Problems*, pages 159–163. ITHEA, 2012.
- [P6] Krzysztof Daniluk and Ewa Niewiadomska-Szynkiewicz: Energy-efficient security in implantable medical devices. In M Ganzha, L Maciaszek and M Paprzycki, editors, *Proceedings of the Federated Conference on Computer Science and Information Systems*, IEEE Digital Library, pages 773–778. IEEE, 2012.
- [P7] Rafał Dąbrowski and Bartłomiej Jacek Kubica: Cache-oblivious algorithms and matrix formats for computations on interval matrices. In Kristján Jónasson, editor, *Applied Parallel and Scientific Computing*, Lecture Notes In Computer Science, pages 269–279. Springer Berlin Heidelberg, 2012.
- [P8] Daniel Dolk and Janusz Granat: Modeling for decision support in network-based services. In Daniel Dolk and Janusz Granat, editors, *Modeling for Decision Support in Network-Based Services*, pages 1–13. Springer Berlin Heidelberg, 2012.
- [P9] Anna Felkner and Krzysztof Sacha: The semantics of role-based trust management languages. In Tomasz Szmuc, Marcin Szpyrka and Jaroslav Zundulka, editors, *Advances in Software Engineering Techniques*, Lecture Notes In Computer Science, pages 179–189. Springer, 2012.
- [P10] Janusz Granat, Kamil Kołtyś and Krzysztof Pieńkosz: Modelling virtual network market data with open multi-commodity market model. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 179–191. Springer-Verlag, 2012.
- [P11] N. Hamada, Włodzimierz Kasprzak and Paweł Przybysz: Auditory scene analysis by time-delay analysis with three microphones. In *Proceedings of the 17th IEEE International Conference on Emerging Technologies and Factory Automation*, pages 1–8. IEEE, 2012.
- [P12] Jarosław Hurkała and Tomasz Śliwiński: Fair flow optimization with advanced aggregation operators in wireless mesh networks. In M Ganzha, L Maciaszek and M Paprzycki, editors, *Proceedings of the Federated Conference on Computer Science and Information Systems*, pages 415–421. IEEE, 2012.
- [P13] Mariusz Kaleta and Tomasz Śliwiński: Fair sales scheduling under the expert conditions. In Katarzyna Grzybowska, editor, *Logistics – Selected concepts and best practices*, pages 91–115. Publishing House of Poznań University of Technology, 2012.
- [P14] Mariusz Kaleta. Security constrained network winner determination problem: In Adam Świerniak and Jolanta Krystek, editors, *Automatyzacja procesów dyskretnych. Teoria i zastosowania*, pages 111–118. Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2012.
- [P15] Mariusz Kaleta and Tomasz Śliwiński: Solving optimal control problems described by odes with integer valued controls. In Radosław Pytlak, editor, *Interactive computer environment for solving optimal control problems-IDOS*, pages 309–345. BEL Studio Sp. z o.o., 2012.
- [P16] Mariusz Kaleta, Przemysław Kacprzak, Kamil Smolira and Eugeniusz Toczyłowski: M3 applications on the electricity markets. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 129–147. Springer-Verlag, 2012.
- [P17] Mariusz Kaleta and Eugeniusz Toczyłowski: M3 – motivations and formal model. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 3–19. Springer-Verlag, 2012.

- [P18] Mariusz Kamola: Software environment for market balancing mechanisms development and its application to solving more general problems in parallel way. In Kristján Jónasson, editor, *Applied Parallel and Scientific Computing*, Lecture Notes In Computer Science, pages 231–241. Springer Berlin Heidelberg, 2012.
- [P19] Andrzej Karbowski and Kamil Krawczyk: Shooting methods for optimal control problems. In Radosław Pytlak, editor, *Interactive computer environment for solving optimal control problems-IDOS*, pages 261–284. BEL Studio Sp. z o.o., 2012.
- [P20] Włodzimierz Kasprzak and Maciej Stefańczyk: 3d semantic map computation based on depth map and video image. In Leonard Bolc, Ryszard Tadeusiewicz, Leszek J. Chmielewski and Konrad Wojciechowski, editors, *Computer Vision and Graphics*, Lecture Notes In Computer Science, pages 441–448. Springer-Verlag, 2012.
- [P21] Szymon Kijas and Andrzej Zalewski: Formalizing architectural decisions for service. In Adam Grzech, Leszek Borzemski, Jerzy Świątek and Zofia Wilimowska, editors, *Information Systems Architecture and Technology. Networks Design and Analysis*, pages 33–42. Oficyna Politechniki Wrocławskiej, 2012.
- [P22] Bartłomiej Jacek Kubica and Adam Woźniak: Applying an interval method for a four agent economy analysis. In Roman Wyrzykowski, Jack Dongarra, Konrad Karczewski and Jerzy Wasniewski, editors, *Parallel Processing and Applied Mathematics*, Lecture Notes In Computer Science, pages 477–483. Springer Berlin Heidelberg, 2012.
- [P23] Bartłomiej Jacek Kubica: Tuning the multithreaded interval method for solving underdetermined systems of nonlinear equations. In Roman Wyrzykowski, Jack Dongarra, Konrad Karczewski and Jerzy Wasniewski, editors, *Parallel Processing and Applied Mathematics*, Lecture Notes in Artificial Intelligence, pages 467–476. Springer, 2012.
- [P24] Bartłomiej Jacek Kubica and Adam Woźniak: Using the second-order information in pareto-set computations of a multi-criteria problem. In Kristján Jónasson, editor, *Applied Parallel and Scientific Computing*, Lecture Notes In Computer Science, pages 137–147. Springer Berlin Heidelberg, 2012.
- [P25] Maciej Ławryńczuk: On-line trajectory-based linearisation of neural models for a computationally efficient predictive control algorithm. In Leszek Rutkowski, Marcin Korytkowski and et al., editors, *Artificial Intelligence and Soft Computing – 11th International Conference, ICAISC 2012*, Lecture Notes In Computer Science, pages 124–132. Springer, 2012.
- [P26] Michał Grzegorz Majdan and Włodzimierz Ogryczak: Determining OWA operator weights by mean absolute deviation minimization. In Leszek Rutkowski, Marcin Korytkowski and et al., editors, *Artificial Intelligence and Soft Computing – 11th International Conference, ICAISC 2012*, Lecture Notes In Computer Science, pages 283–291. Springer, 2012.
- [P27] Krzysztof Malinowski: Remarks on optimizing versus regulatory control of dynamic systems: Objectives, differences and challenges. In Mikołaj Busłowicz and Krzysztof Malinowski, editors, *Advances in Control Theory and Automation*, pages 15–24. Printing House of Białystok University of Technology, 2012.
- [P28] Krzysztof Malinowski and Radosław Pytlak: Optimization problems in finite dimensional spaces. In Radosław Pytlak, editor, *Interactive computer environment for solving optimal control problems-IDOS*, pages 1–41. BEL Studio Sp. z o.o., 2012.
- [P29] Michał Marks: Enhancing wsn localization robustness utilizing hpc environment. In Klaus Troitzsch and Michael Mohring, editors, *Proceedings 26th European Conference on Modelling and Simulation*, pages 540–546. 2012.

- [P30] Piotr Marusak: Efficient mpc algorithms based on fuzzy wiener models and advanced methods of prediction generation. In Leszek Rutkowski, Marcin Korytkowski and et al., editors, *Artificial Intelligence and Soft Computing – 11th International Conference, ICAISC 2012*, Lecture Notes In Computer Science, pages 292–300. Springer, 2012.
- [P31] Piotr Modliński: Wykorzystanie aukcji czasu do harmonogramowania problemów wieloagentowych. In Adam Świerniak and Jolanta Krystek, editors, *Automatyzacja procesów dyskretnych. Teoria i zastosowania*, pages 173–182. Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2012.
- [P32] Zbigniew Nahorski, Jarosław Stańczak and Piotr Pałka: Application of multi-commodity market model greenhouse gases emission permits trading. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 165–177. Springer-Verlag, 2012.
- [P33] Ewa Niewiadomska-Szynkiewicz and Andrzej Sikora: A software tool for federated simulation of wireless sensor networks and mobile ad hoc networks. In Kristján Jónasson, editor, *Applied Parallel and Scientific Computing: 10th International Conference, PARA 2010, Reykjavik, Iceland, June 6-9, 2010, Revised Selected Papers*, Lecture Notes In Computer Science, pages 303–313. Springer, 2012.
- [P34] Ewa Niewiadomska-Szynkiewicz, Andrzej Sikora, Piotr Przemysław Arabas and Joanna Kołodziej: Control framework for high performance energy aware backbone network. In Klaus Troitzsch and Michael Mohring, editors, *Proceedings 26th European Conference on Modelling and Simulation*, pages 490–496. 2012.
- [P35] Ewa Niewiadomska-Szynkiewicz and Andrzej Sikora: Managing the mobility of a cooperative ad hoc network using clusters formation and potential function. In *Proceedings 8th IEEE International Conference on Wireless Communications, Networking and Mobile Computing WICOM 2012 Shanghai, China 2012*, pages 1–4. IEEE, 2012.
- [P36] Ewa Niewiadomska-Szynkiewicz and Michał Marks: Software environment for parallel optimization of complex systems. In Kristján Jónasson, editor, *Applied Parallel and Scientific Computing*, Lecture Notes In Computer Science, pages 86–96. Springer Berlin Heidelberg, 2012.
- [P37] Ewa Niewiadomska-Szynkiewicz, Michał Marks and Filip Nabrdalik: Testbed implementation of energy aware wireless sensor network. In Marek Adamowicz, editor, *Military Communications and Information Technology: A Trusted Cooperation Enabler*, pages 318–331. Military University of Technology, 2012.
- [P38] Włodzimierz Ogryczak. Robust decision under risk for imprecise probabilities: In Yuri Ermoliev, Marek Makowski and Kurt Marti, editors, *Managing Safety of Heterogeneous Systems. Decisions under Uncertainties and Risks*, pages 51–66. Springer, 2012.
- [P39] Włodzimierz Ogryczak, Patrice Perny and Paul Weng: On WOWA rank reversal. In Vicenc Torra et al., editors, *Modeling Decision for Artificial Intelligence, 9th International Conference MDAI 2012 Proceedings*, Lecture Notes in Artificial Intelligence, pages 66–77. Springer, 2012.
- [P40] Włodzimierz Ogryczak and Tomasz Śliwiński: Sequential algorithms for exact and approximate max-min fair bandwidth allocation. In Francesco Matera, editor, *Proceedings of 15th International Telecommunications Network Strategy and Planning Symposium*, pages 1–6. IEEE. Italy Section, 2012.
- [P41] Piotr Pałka: Application of the multi-agent systems in the context of the multi-commodity market model m3. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 79–98. Springer-Verlag, 2012.

- [P42] Piotr Pałka: Communication models used in the context of multi-commodity trade. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 47–64. Springer-Verlag, 2012.
- [P43] Adam Połomski: Multiagent scheme for voice conference moderation. In M Ganzha, L Maciaszek and M Paprzycki, editors, *Proceedings of the Federated Conference on Computer Science and Information Systems*, pages 1215–1220. IEEE, 2012.
- [P44] Andrzej Ratkowski, Krzysztof Sacha and Andrzej Zalewski: Optimization of business processes in service oriented architecture. In C-h Chi and G Grossmann, editors, *16th International Enterprise Distributed Object Computing Conference Workshops*, pages 42–50. IEEE Computer Society, 2012.
- [P45] Krzysztof Sacha and Andrzej Ratkowski: Implementation of business processes in service oriented architecture. In H Mannaert and et al., editors, *ICSEA2012: The Seventh International Conference on Software Engineering Advances*, pages 129–136. IARIA, 2012.
- [P46] Barbara Siemiątkowska, Rafał Chojecki, Mateusz Wiśniowski, Michał Wałęcki, Marcin Wielgat and Jakub Michalski: Mobile system for non destructive testing of weld joints via time of flight diffraction (tofd) techniques. In Krzysztof Kozłowski, editor, *Robot Motion and Control 2011*, Lecture Notes in Control and Information Sciences, pages 65–74. Springer London, 2012.
- [P47] Andrzej Stachurski: Broyden restricted class of variable metric methods and oblique projections. In M Ganzha, L Maciaszek and M Paprzycki, editors, *Proceedings of the Federated Conference on Computer Science and Information Systems*, pages 463–466. IEEE, 2012.
- [P48] Maciej Stefańczyk and Włodzimierz Kasprzak: Multimodal segmentation of dense depth maps and associated color information. In Leonard Bolc, Ryszard Tadeusiewicz, Leszek J. Chmielewski and Konrad Wojciechowski, editors, *Computer Vision and Graphics*, Lecture Notes In Computer Science, pages 626–632. Springer-Verlag, 2012.
- [P49] Marcin Szlenk, Andrzej Zalewski and Szymon Kijas: Modelling architectural decisions under changing requirements. In C Hofmeister and J Kuusela, editors, *10th Working Conference on Software Architecture & 6th European Conference on Software Architecture*, pages 211–214. IEEE/IFIP, 2012.
- [P50] Piotr Tatjewski: Modelling deterministic disturbances and state filtering in model predictive control with state-space models. In Mikołaj Busłowicz and Krzysztof Malinowski, editors, *Advances in Control Theory and Automation*, pages 263–274. Printing House of Białystok University of Technology, 2012.
- [P51] Tomasz Traczyk: M3 data structures. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 21–46. Springer-Verlag, 2012.
- [P52] Michał Wałęcki, Konrad Banachowicz and Tomasz Winiarski: Research oriented motor controllers for robotic application. In Krzysztof Kozłowski, editor, *Robot Motion and Control 2011*, Lecture Notes in Control and Information Sciences, pages 193–203. Springer London, 2012.
- [P53] Paweł Wawrzyński: Autonomous reinforcement learning with experience replay for humanoid gait optimization. In H Chan and Ah Tan, editors, *Proceedings of the Neural Network Society Winter Conference*, pages 205–211. IEEE, 2012.
- [P54] Przemysław B. Więch and Tomasz Gidlewski: A semantic web approach to the m3 model. In Mariusz Kaleta and Tomasz Traczyk, editors, *Modeling Multi-commodity Trade: Information Exchange Methods*, pages 99–111. Springer-Verlag, 2012.

- [P55] Andrzej Zalewski and Szymon Kijas: Feature-based architecture reviews. In Leszek Borzemski, Adam Grzech, Jerzy Świątek and Zofia Wilimowska, editors, *Information Systems Architecture and Technology. Web Engineering and High-Performance Computing on Complex Environments*, pages 81–96. Oficyna Wydawnicza Politechniki Wrocławskiej, 2012.
- [P56] Cezary Zieliński, Tomasz Michał Kornuta and Mateusz Boryń: Specification of robotic systems on an example of visual servoing. In Ivan Petrovic and Peter Korondi, editors, *SYROCO 2012 Preprints*, pages 45–50. IFAC, 2012.
- [P57] Cezary Zieliński, Tomasz Michał Kornuta, Piotr Trojanek, Tomasz Winiarski and Michał Wałęcki: Specification of a multi-agent robot-based reconfigurable fixture control system. In Krzysztof Kozłowski, editor, *Robot Motion and Control 2011*, Lecture Notes in Control and Information Sciences, pages 171–182. Springer London, 2012.