Institute of Control and Computation Engineering

2015 Annual Report

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

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

The Institute offers courses in a broad area of information technology, concentrating on control and decision support systems, at three levels of education. At the first two levels (equivalent to B.Eng. and M.Eng.) the degree programs combine courses from the areas of computer science and control. In 2014 we launched B.Eng. and M.Eng. programs in Control and Robotics. The programs offer the opportunity to acquire all the knowledge and skills necessary for effective design of contemporary control and robotic systems. 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. 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. There is a growing interest in this form of studies and above 180 attendees took part in these courses in the 2014/2015 edition.

The Robot Programming and Pattern Recognition Group is involved in a 7th Framework Program Project RAPP – Robotic Applications for Delivery Smart User Empowering Applications (ITC-2013.5.3, grant no.610947). The partners of the project are: Centre for Research and Technology Hellas (CERTH, Greece) – the coordinator, Aristotle University of Thessaloniki (AUTh, Greece), Institute National de Recherche en Informatique et en Automatique (INRIA, France), Warsaw University of Technology (WUT, Poland), Sigma Orionis S.A. (France), Ortelio Ltd (United Kingdom), Idryma Ormylia (Greece) and Fundation Instituto Gerontologico Matia-Ingema (Spain). The project focuses on utilization of cloud computing and robots in the process of social inclusion of people facing exclusion.

The Robot Programming and Pattern Recognition Group has also concluded research within a project entitled “Autonomy in rescue and exploration robots” (RobREx) funded by the National Centre for Research and Development. The consortium consisted of: Industrial Research Institute for Automation and Measurements PIAP (coordinator), Warsaw University of Technology, Wrocław University of Technology, Poznań University of Technology, Łódź University of Technology and The Institute of Computer Science of the Polish Academy of Sciences. Our group was responsible for two tasks: intelligent manipulation and active sensing.

Moreover the same group has completed work on the design and implementation of controllers for a family of industrial robots created by the SORTER company based in Radom. The robots will be utilized mainly in the fruit processing industry for sorting.

In 2015 the group lead by Dr. Tomasz Traczyk worked on the R&D project “Digital Document Repository CREDO” within the National Centre for Research and Development program Demonstrator+. The project is conducted together with the industrial partners: Polish Security Printing Works S.A. and Skytechnology Ltd. The aim of the CREDO project is to design and launch a demonstrative version of a digital repository enabling short- and long-term archiving of large volumes of digital resources. By design the repository is to act both as a secure file storage and as a digital archive providing metadata management and including the resources in archival packages.

Two R&D projects within the EU Innovative Economy Operational Programme have been concluded. The Control Techniques Group headed by Prof. Piotr Tatjewski worked on the project “Design and Construction of the Controller for the Air Water Heat Pump”. The project was conducted with the industrial company

PLUM, where the laboratory stands with heat pumps were installed and where the designed controllers will be produced. The aim of the project is to design advanced model-based controllers, able to increase efficiency of the AW Heat pumps operation. The Optimization and Decision Support Group headed by Prof. Włodzimierz Ogryczak carried out the project "Decision Support System for Large-Scale Periodic Vehicle Routing and Scheduling Problems with Complex Constraints" which is conducted together with SMT Software S.A. The aim of the project was the development of algorithms for large-scale periodic time-dependent vehicle routing and scheduling problems with complex constraints supporting planning and management of mobile personnel tasks.

In the year 2015 Prof. Andrzej Pacut has started the project on "System for biometric identification of perpetrators of offences or criminals based on photographs and/or video materials" granted by the National Centre for Research and Development (NCBiR). The biometric part of the system will consist of integrated modules, including face detection module, surveillance module, 'biometric engines' for face and silhouette recognition, and fusion module generating biometric profiles.

Research is a vital part of our activities, directly affecting both the Institute's recognition in Poland and abroad, and the quality of teaching. Description of research programs conducted by the faculty of the Institute can be found in this report. I express my sincere appreciation to the faculty and staff of the Institute for their efforts and contributions to our achievements in teaching and research. In particular, I would like to congratulate Prof. Krzysztof Malinowski for his nomination for the Chair of the Council of Provosts, Division IV: Engineering Sciences, Polish Academy of Sciences.

Cezary Zieliński

Contents

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1 General Information

The following information about organization of the Institute reflects the situation on December 31, 2015.

1.1 Directors

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

1.2 Organization of the Institute

Systems Control Division

Division Head:	Professor K. Malinowski
Professors:	W. Kasprzak, K. Malinowski, E. Niewiadomska-Szynkiewicz, A. Pacut, C. Zieliński
Professors, retired:	W. Findeisen, R. Ładziński, J. Szymanowski
Assistant Professors:	P. Arabas, A. Czajka, M. Kamola, A. Karbowski, M. Karpowicz, T. Kornuta, A. Kozakiewicz, T.J. Kruk, B. Kubica (until Sept. 2015), J. Putz-Leszczyńska, W. Szynkiewicz, P. Wawrzyński, T. Winiarski, A. Woźniak (until Sept. 2015)
Software Engineers:	M. Walęcki
Ph.D. Students:	K.S. Daniluk, W. Dudek, J. Figat, M. Figat, W. Gutfeter, A. Igielski, M. Krzysztoń, K. Lasota, J. Panasiuk, B. Papis, K. Piech, P. Przybysz, D. Seredyński, K. Siudek, M. Stefańczyk, M. Trokielewicz, M. Walęcki, D. Wiśniewski
Technical Support:	K. Banachowicz

Research of the division is conducted in 3 research groups:

Complex Systems Group (**E. Niewiadomska-Szynkiewicz**, P. Arabas, K. Daniluk, K. Lasota, M. Kamola, A. Karbowski, M. Karpowicz, A. Kozakiewicz, T.J. Kruk, B. Kubica (until Sept. 2015), M. Krzysztoń, K. Malinowski, D. Wiśniewski, A. Woźniak (until Sept. 2015))

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 (**A. Pacut**, A. Czajka, W. Gutfeter, J. Panasiuk, B. Papis, K. Piech, J. Putz-Leszczyńska, M. Trokielewicz, P. Wawrzyński)

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 hand-written signature, 3D face and EEG. 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**, K. Banachowicz, W. Dudek, J. Figat, M. Figat, W. Kasprzak, T. Kornuta, P. Przybysz, D. Seredyński, K. Siudek, M. Stefańczyk, W. Szynkiewicz, M. Walęcki, T. Winiarski)

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

Control and Software Engineering Division

Division Head:	Professor P. Tatjewski
Professors:	M. Ławryńczuk, K. Sacha, P. Tatjewski
Assistant Professors:	P. Domański, P. Marusak, S. Plamowski, A. Ratkowski, M. Szlenk, A. Zalewski
Senior Lecturers:	J. Gustowski
Senior Engineer:	W. Macewicz
Ph.D. Students:	P. Chaber, A. Hurkała, S. Kijas, G. Mąkosa, W. Pikulski, M. Romanowski, M. Wasilewski, A. Wojtulewicz, A. Wysocki

Research of the division is conducted in 2 research groups:

Control Engineering Group (**M. Ławryńczuk**, P. Chaber, P. Domański, J. Gustowski, P. Marusak, S. Plamowski, P. Tatjewski, A. Wojtulewicz, 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**, W. Macewicz, M. Szlenk, W. Zalewski, A. Ratkowski, A. Hurkała, S. Kijas, G. Mąkosa, W. Pikulski, M. Romanowski, M. Wasilewski)

The main area of interest is the development and maintenance of software. Topics include software processes, software analysis and design methods, and the methods for software quality evaluation. New approaches to the assessment of high-level system architecture in the earliest phases of software development are investigated. Methods for architectural decision modeling during the evolution of service-oriented (SOA) systems are developed. Part of the research is aimed at security and trust management issues in distributed open applications.

Operations and Systems Research Division

Division Head:	Professor E. Toczyłowski
Professors:	W. Ogryczak, E. Toczyłowski
Professors, retired:	W. Traczyk, A. P. Wierzbicki
Readers:	T. Traczyk
Assistant Professors:	J. Granat, M. Kaleta, K. Kołtyś (until Sept. 2015), B. Kozłowski, A. Krzemienowski, P. Pałka, K. Pieńkosz, G. Płoszajski, A. Stachurski, T. Śliwiński, I. Żółtowska
Senior Lecturer:	J. Sobczyk
Ph.D. Students:	J. Hurkała, T. Jastrzębski, R. Karpuk, P. Modliński, A. Mościcka, P. Olender, M. Przyłuski, K. Sędrowicz, G. Zalewski

Research of the division is conducted in 2 research groups:

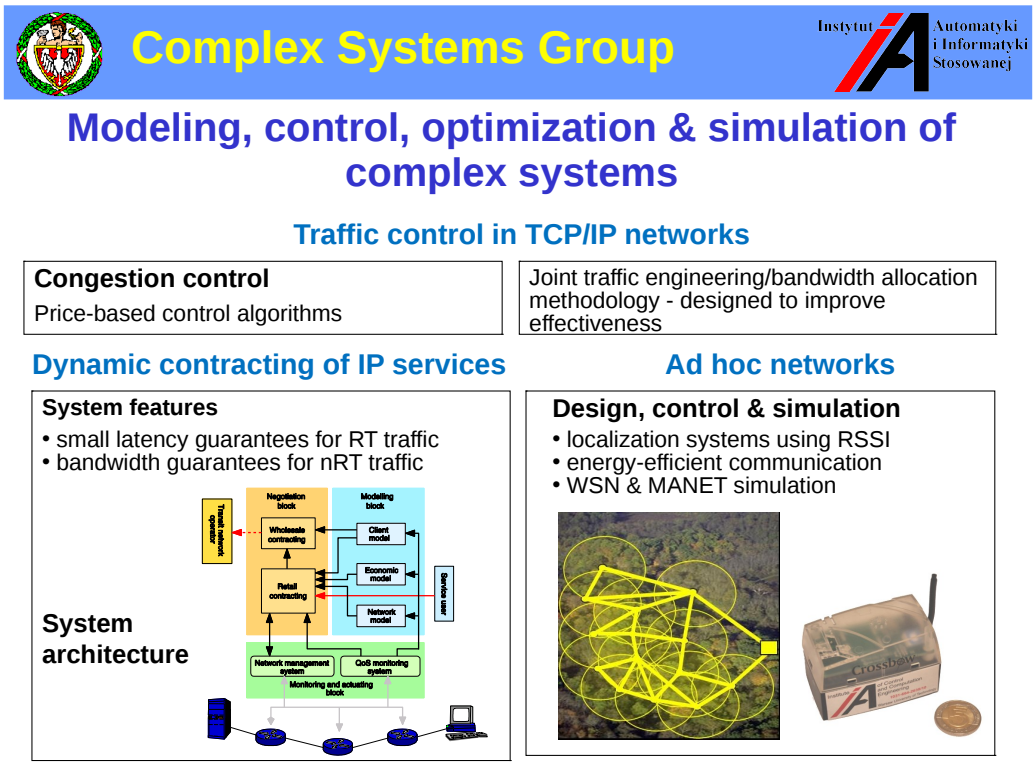
Operations Research and Management Systems Group (**E. Toczyłowski**, M. Kaleta, R. Karpuk, K. Kołtyś, P. Modliński, P. Pałka, K. Pieńkosz, G. Płoszajski, K. Sędrowicz, T. Traczyk, I. Żółtowska)

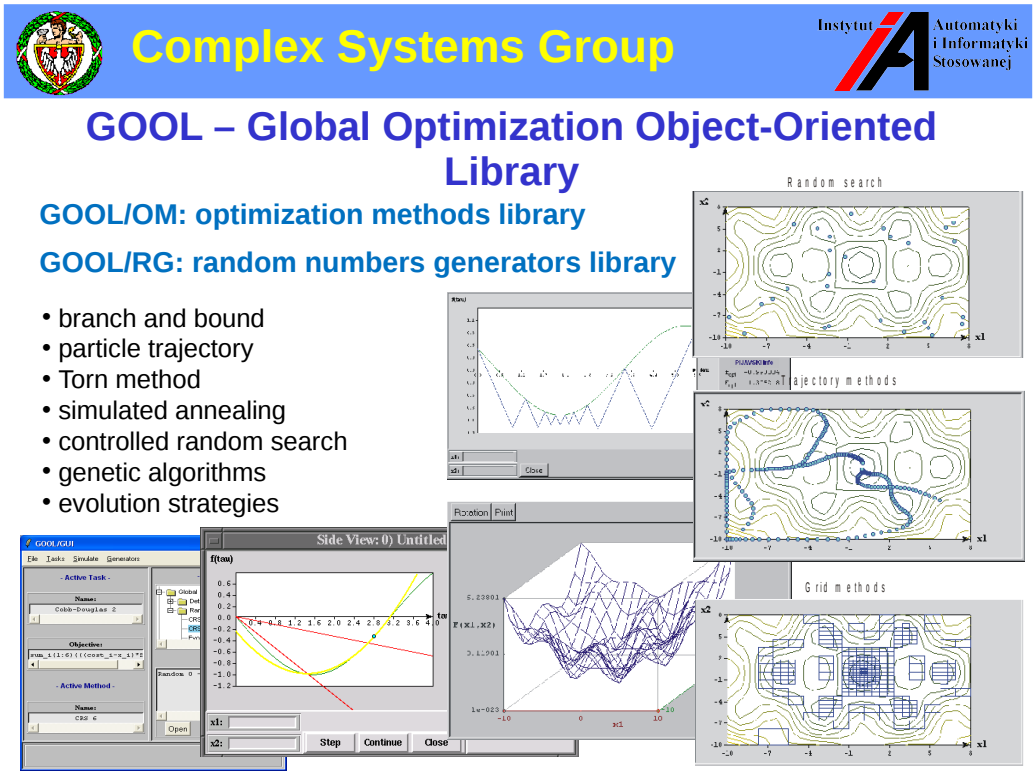
Research of the group is concerned with operation research and structural discrete optimization methods for control and management of discrete processes, including applications in the network structure development, deregulated electric power industry, IP networks, computer integrated manufacturing, etc. 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**, J. Granat, B. Kozłowski, A. Krzemienowski, J. Sobczyk, A. Stachurski, T. Śliwiński, J. Hurkała, A. Mościcka, P. Olender, M. Przyłuski, G. Zalewski)

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

1.3 Research Areas





Complex Systems Group

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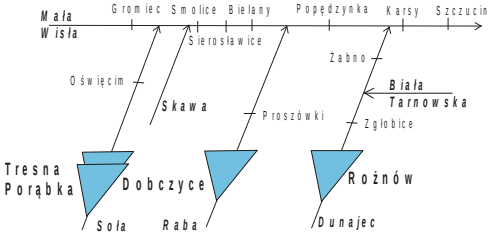
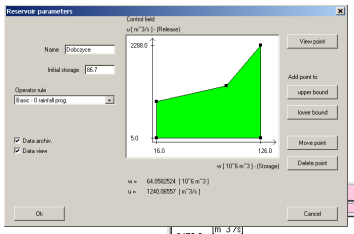
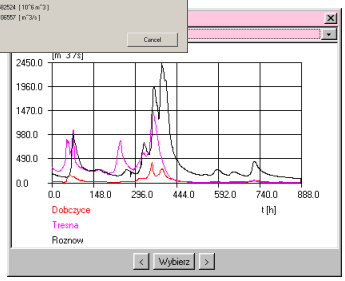
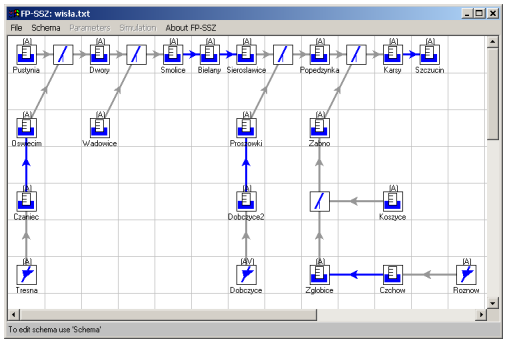
Flood Control

- **FP-SOZ: Flood Control – Reservoir Operation System**
- **FP-SGW: Flood Control – Upper Vistula System**









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Parallel and distributed computations

New software tools:

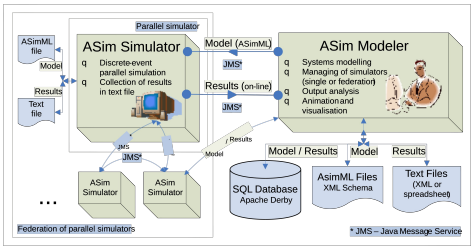
jPar – software environment for parallelizing Matlab calculations

parAMPL – library for parallelizing AMPL calculations

AsimJava – library for parallel simulation of dicrete event systems

MobAsim – software environment for ad hoc network simulation

- parallel optimization algorithms
- parallel and distributed simulation
- new software tools for parallel and distributed computations
- monographs published in 2001 & 2009



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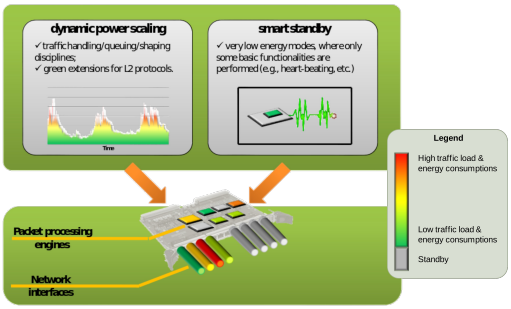
low Energy Consumption NETwork

ECO net

7 Frame Programme UE grant
ICT-2009.1.1: The Network of the Future

The ECONET project aims at introducing:

- novel network-specific HW/FW technologies to optimize the power management features
- local and distributed frameworks for dynamic optimization of the trade-off between energy consumption and network performance
- Green Abstraction Layer for interfacing the novel low-level green capabilities
- novel energy-aware device prototypes



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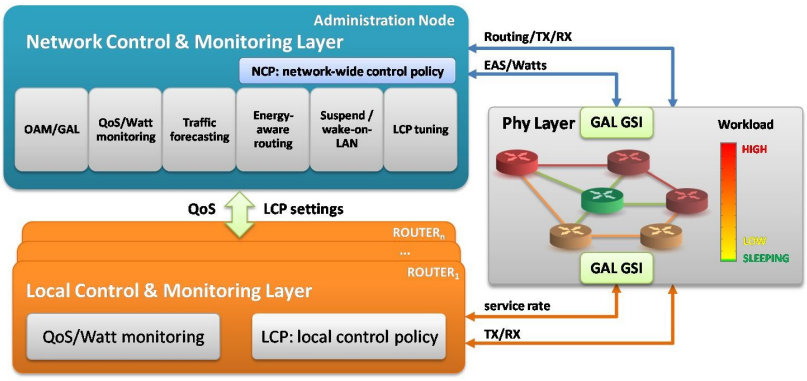
ECO net

low Energy Consumption NETwork

System architecture

- GAL – Green Abstraction Layer – ETSI standardised network devices energy management interface
- NCP – energy-aware traffic engineering
- LCP – node energy aware control



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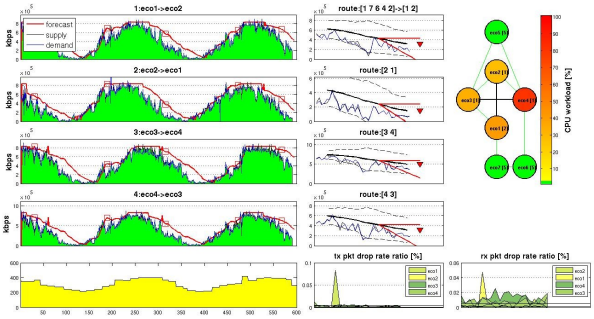
ECO net

Testbed network

- WARMAN metropolitan network topology
- power monitoring system
- local (LCP) nad network (NCP) mechanisms verification



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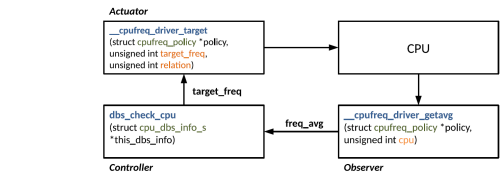
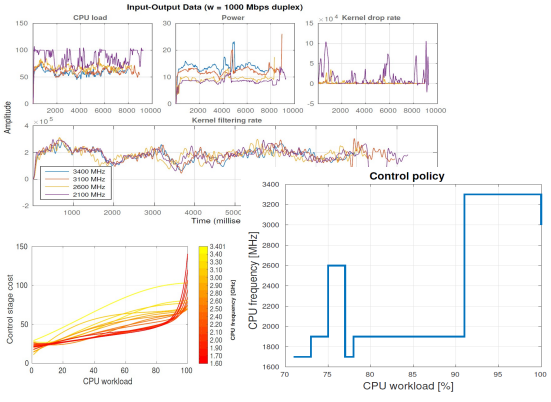
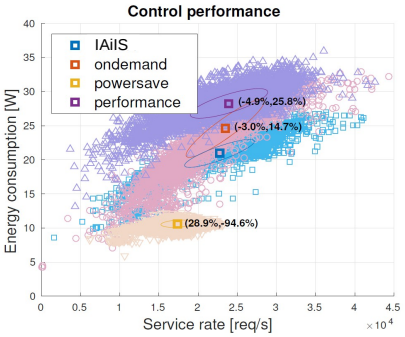
Energy-saving CPU frequency governor



- Application specific power consumption model
- RFC2544-based identification methodology
- Customized frequency scalling governor





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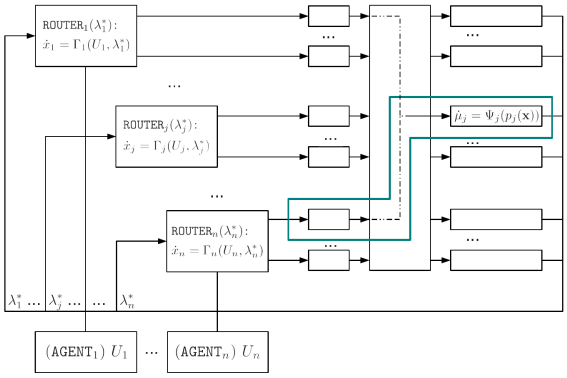
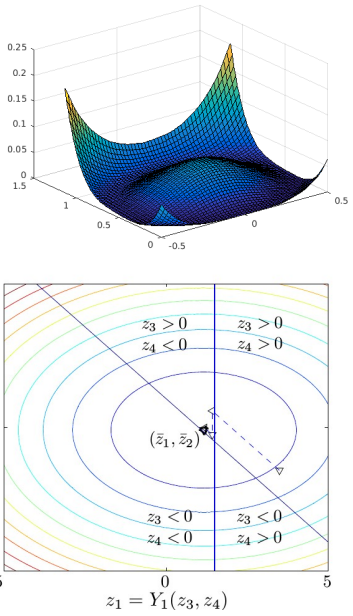
Game theory and mechanisms design

- Nash equilibria design
- Robust TCP/AQM design
- Stability analysis in noncooperative games





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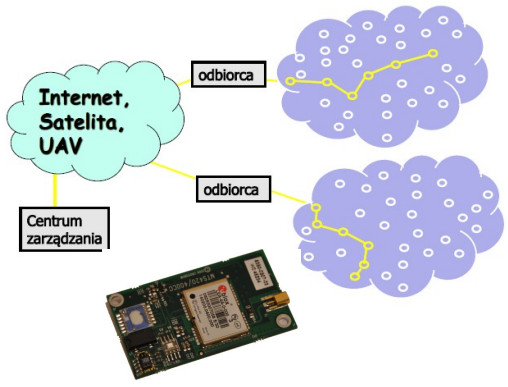
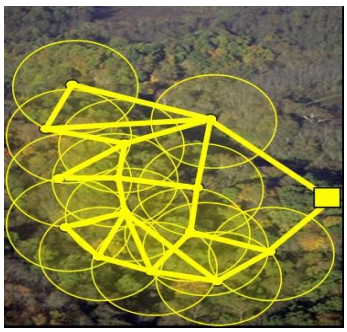
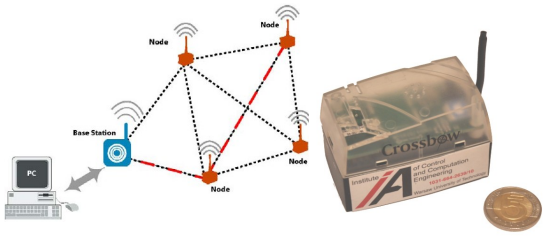
Energy-saving communication in wireless sensor network





- Transmitted signal power control
  Power Control (PC)
- Node activity control
  Activity Control (AC)



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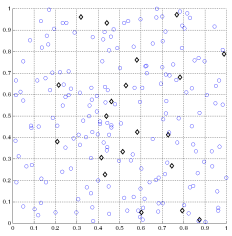
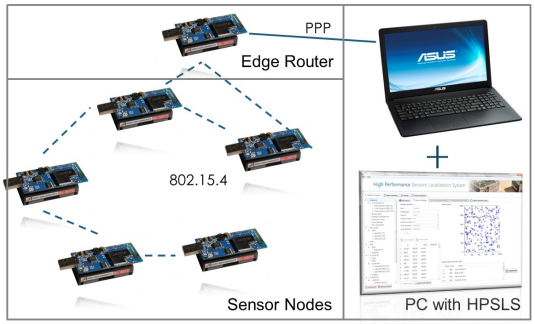
Localization of wireless sensor network nodes

Two phase method

1: Trilateration
2: Stochastic optimization
- Simulated annealing
- Genetic algorithm





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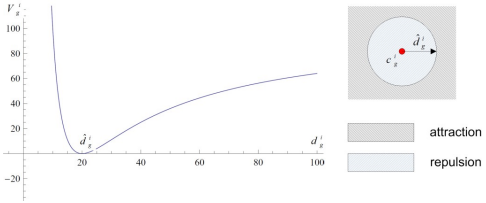
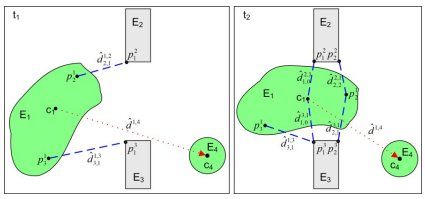
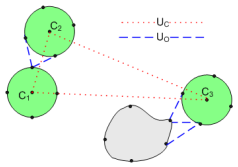
MANET nodes mobility modelling

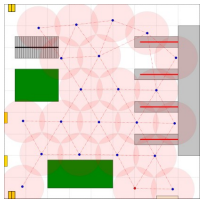
Artificial potential function mobility model

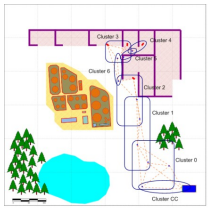


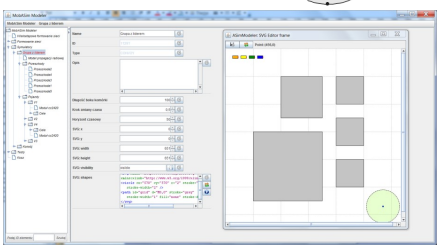




Connected network design
Monitoring nodes location optimization





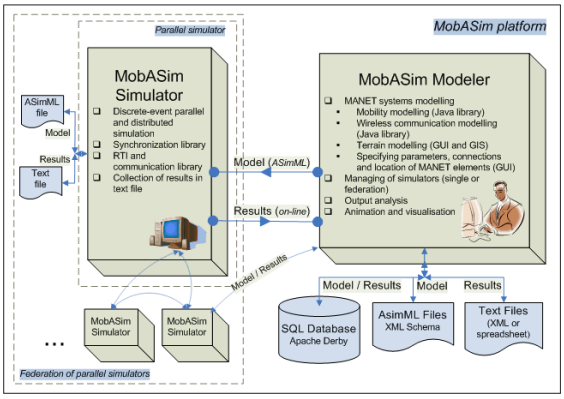


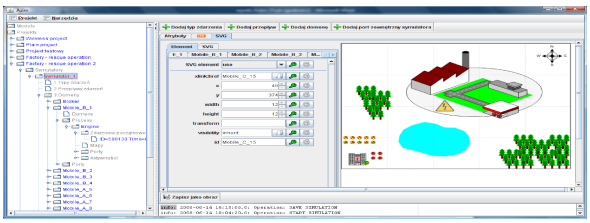
Complex Systems Group

Instytut Automatyki i Informatyki Stosowanej

Asim/Java Simulation Library

- **Complex systems simulation**
- **Technology:**
  - Java
  - distributed
- **Implemented simulators:**
  - Frame Relay network
  - MobAsim – mobile wireless network – IEEE 802.11 b/g
  - WPAN (Wireless Personal Area Network) – IEEE 802.15.4





Complex Systems Group

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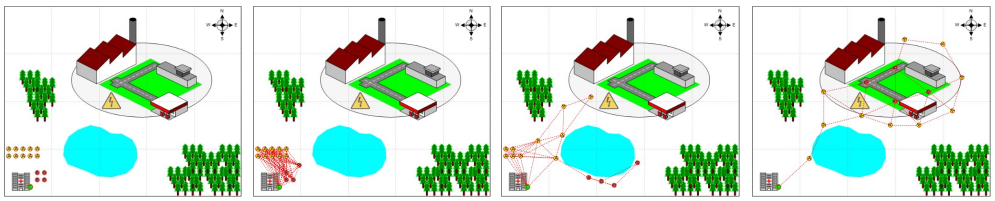
MobAsim

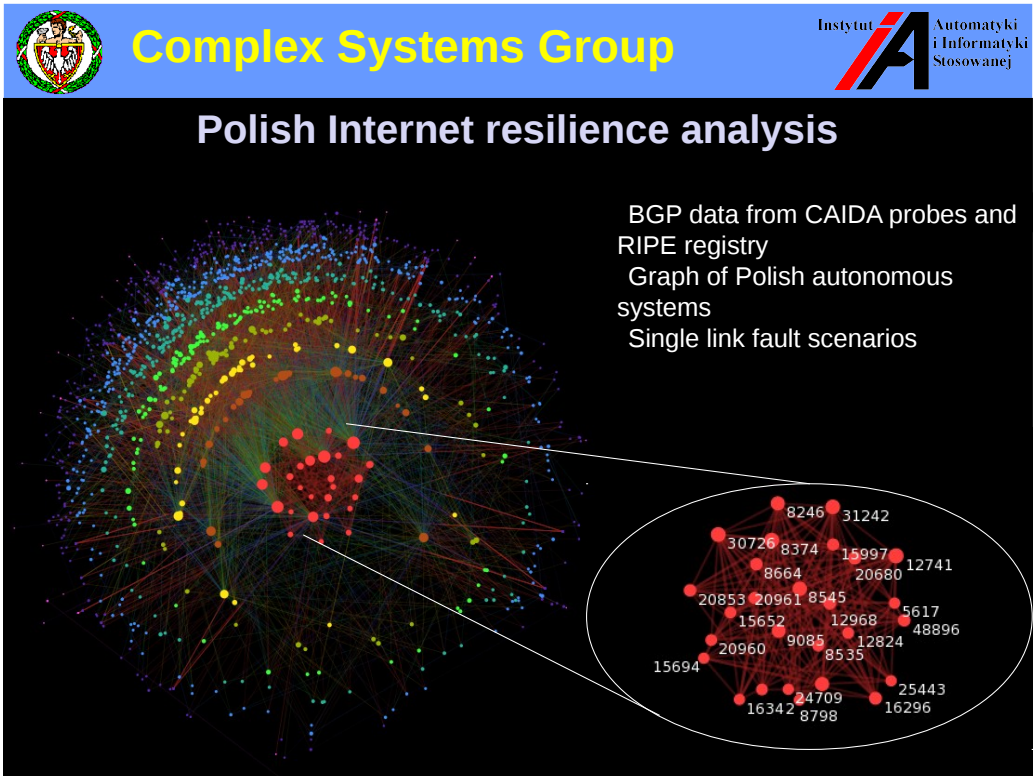
Network simulation

- Library of synchronization routines
- Comunication library for federated simulators

Network modelling

- Wireless transmission and mobility,
- Terrain modelling (SVG/GIS),
- SQL database persistency,
- Distributed management for federated simulators,
- SVG (Scalable Vector Graphics) animations.





Biometrics and Machine Learning Group

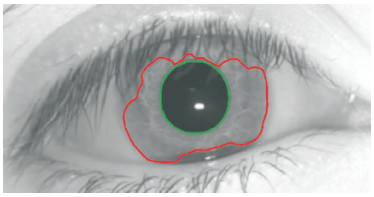
Instytut Automatyki i Informatyki Stosowanej

Biometrics

Iris recognition

- **Methods**
  - fast Zak-Gabor transform for calculation of the unique iris features
  - active contours for flexible iris segmentation
  - randomization of the iris stripes for replay attack prevention
- **System prototyping**
  - iris cameras: real-time. automatic iris capture and processing with various configuration of illuminants
  - iris recognition software development kit (SDK) for C/C++ (Windows and Linux versions)
  - assessment of device interoperability

IrisCUBE: iris recognition system developed in our labs.



Human eye imaged in infrared light and segmented with the use of Active Contours

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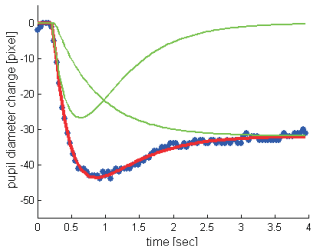
Biometrics

Iris recognition reliability

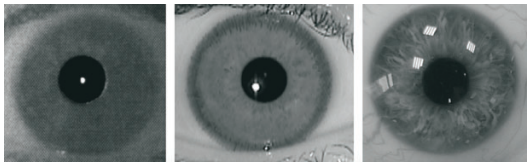
- **Liveness detection**
  - use of static 2D and 3D images, frequency spectrum analysis, assessment of near-infrared light absorbance by the eye tissues, thermal imaging
  - use of image sequences, pupil dynamics (US patent 8,061,842), detection of stimulated light reflections from the cornea
  - co-hosting of the LivDet-Iris international competitions (2013, 2015) evaluating iris liveness detection methods (http://livdet.org)
- Assessment of how the eye **diseases** impact iris recognition
- Understanding of the **eye aging** and its influence on the reliability of long term iris recognition



Liveness detection

Upper right: Comparison of the observed (blue dots) and modeled (red line) pupil reaction to light changes allows constructing a subterfuge detection mechanism.

Bottom: example eye imitations used in our labs in evaluation of the liveness detection methods (from left to right: paper printout, printed contact lens, prosthetic eye)



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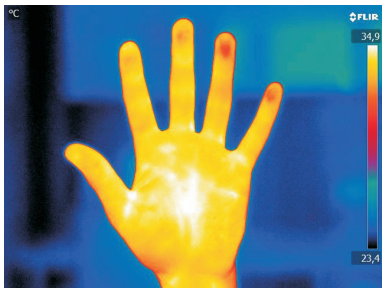
Biometrics

Thermal imaging in biometrics

- **Hand recognition**
  - use of **temperature of the inner part of the hand** to calculate individual biometric features
  - use of **thermal cameras** (contactless acquisition)
  - **unconstrained environment:** on-the-fly image acquisition: no pegs, no constraints, almost no user training
- **Liveness detection**
  - use of temperature distribution to detect imitations of the authentic biometric characteristics (eye, hand, face)

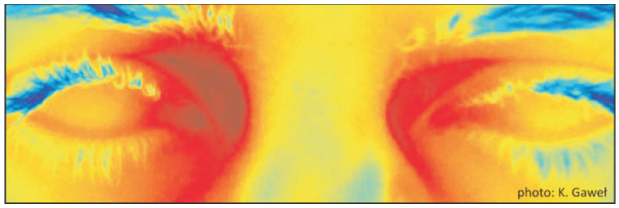


Hand thermal image

Temperatures of the inner part of a hand are unique and can be used in biometric recognition.

Eye thermal images

Temperatures of the eye and their surroundings are difficult to be copied by the attackers.



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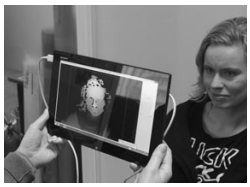
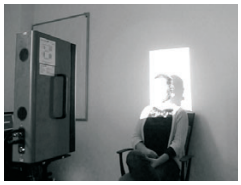
Biometrics

3D face recognition

- Exploring new techniques of collecting face images
  - Developing system for mobile 3D face acquisition and identification.
  - Comparing data from different types of depth sensors and high-resolution 3D scanner.
- Spatial data processing
  - Structures for storing and processing point clouds containg information about face in context of biometric recognition
- Methods of recognition
  - Analysis of feature selection for classification: surface and color face characteristics

Collecting images for 3D face database
Comparing data obtained with mobile depth sensor and structural light scanner. Selecting parameters for feature extraction from images with different resolutions and levels of noise.





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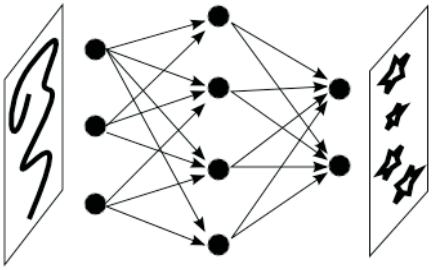
Machine Learning

Towards parameterless on-line learning algorithms

Most on-line learning are based on stochastic steepest descent.
This methodology requires preliminary experiments to determine proper step-size.
We develop methods to automatize stochastic steepest descent.
We successfully tested several approaches to autonomous learning in deep neural networks.



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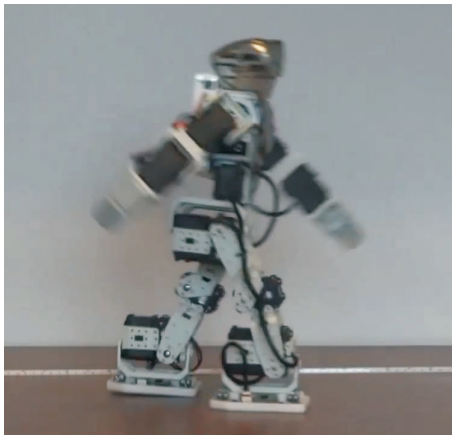
Machine Learning

Project on humanoid robots learning of physical activities

In cooperation with the Faculty of Mechatronics we run a project on learning in humanoid robots.

The immediate objective of the project is to design algorithms that enable the robots to learn to walk and adroitly run.



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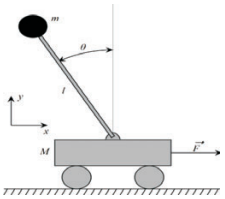
Machine Learning

Reinforcement Learning

- NADA (Neighbourhood Ambiguity Driven Abstraction):
  A state abstraction approach
  - Identification of state variables
  - Quantized and continuous, discrete-time domains
  - Handles about a dozen of variables
  - „State abstraction in Reinforcement Learning" Ph. D. dissertation, 2015

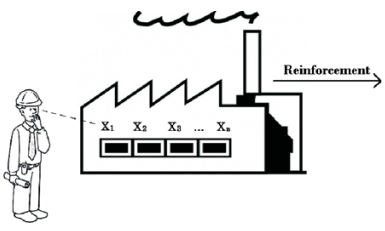
Cart-Pole Swing-Up

A typical task for RL algorithms evaluation. Enhanced to a 10-dimensional version for the purpose of demonstrating the capabilities of the state abstraction algorithm. Other tasks include 20-dimensional version of Mountain Car environment.



Stimulus discrimination

The approach is inspired by the way animals are able to focus on a subset of relevant stimuli



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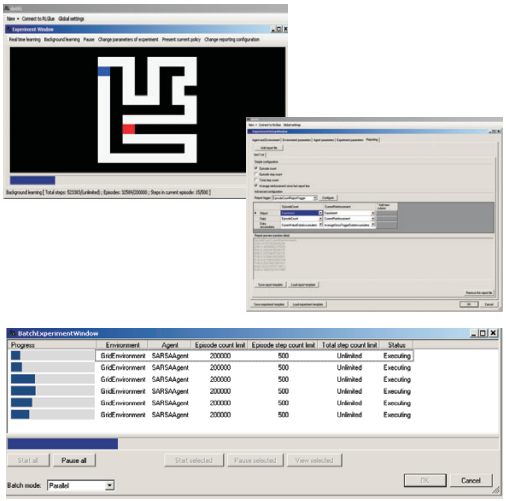
Machine Learning

Reinforcement Learning

- dotRL: Platform for rapid RL algorithms development and testing
  - Implemented classes automatically integrate with the solution
  - Built-in mechanisms for algorithm parameters and reporting
  - Many state-of-art environments and agents already implemented
  - Integrated with commonly used RL-Glue protocol
  - Multithreaded batch evaluation of multiple instances of the same experiment
  - Loosely coupled modules supporting reusability of agents and environments



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Robot Programming and Pattern Recognition Group

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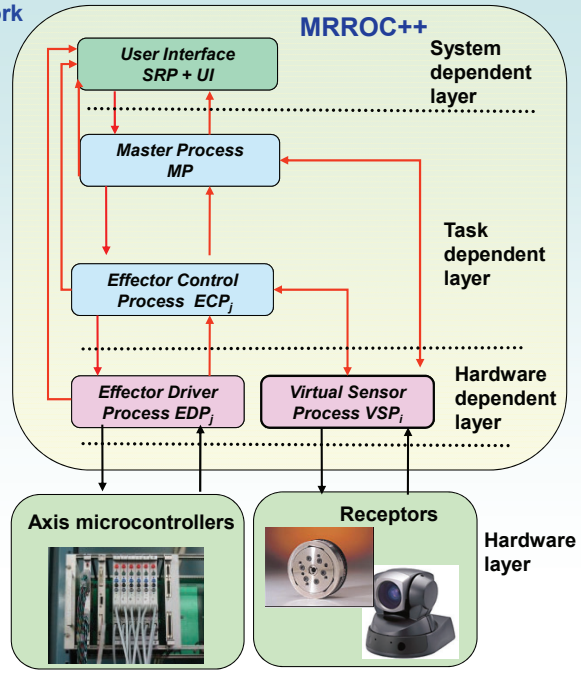
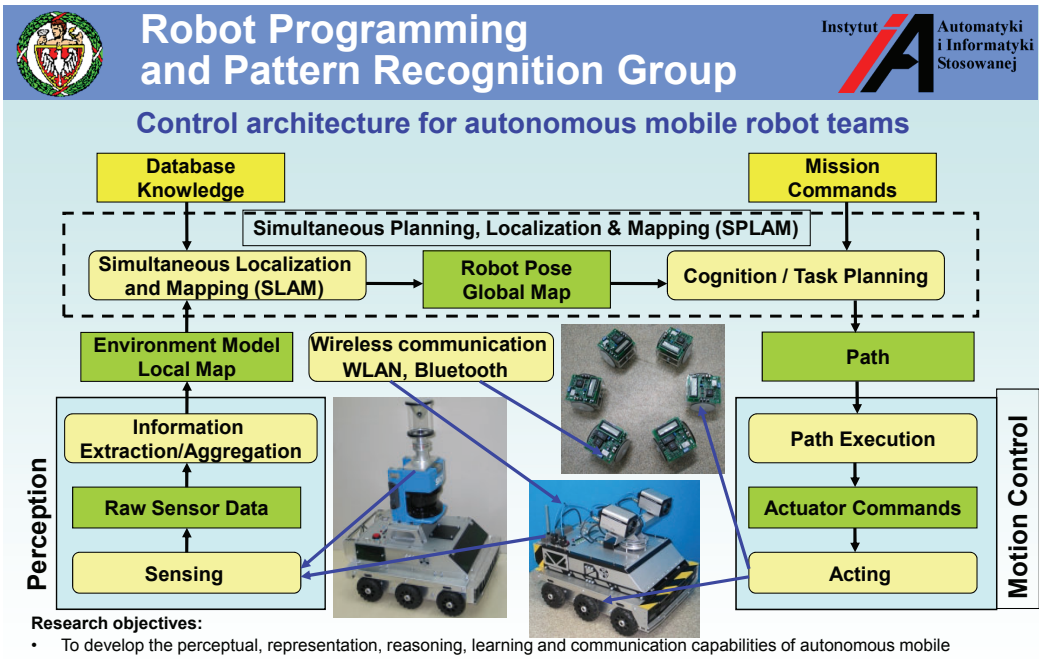
MRROC++ robot programming framework

- 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

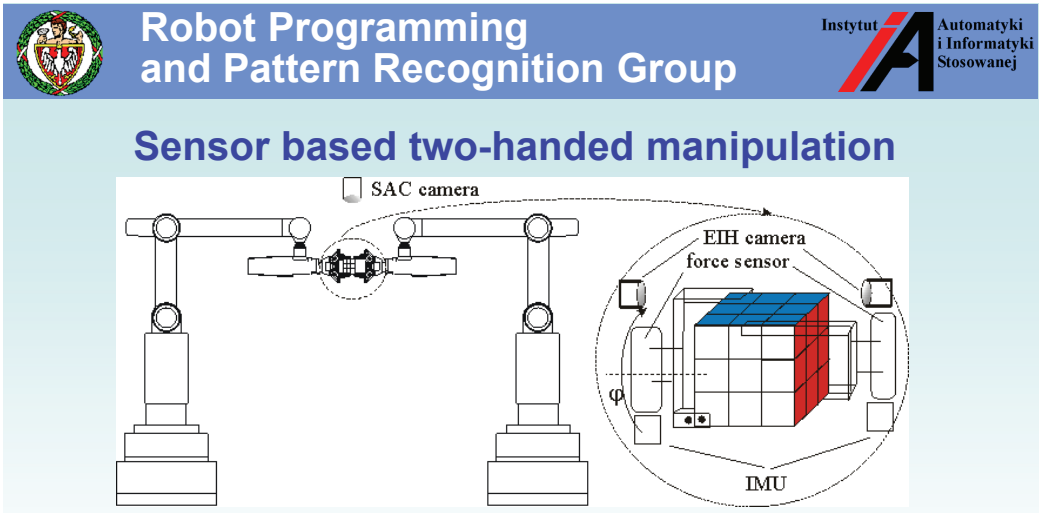
Two co-operating IRp-6 robots





Research objectives:

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



Solution of the benchmark task requires:

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

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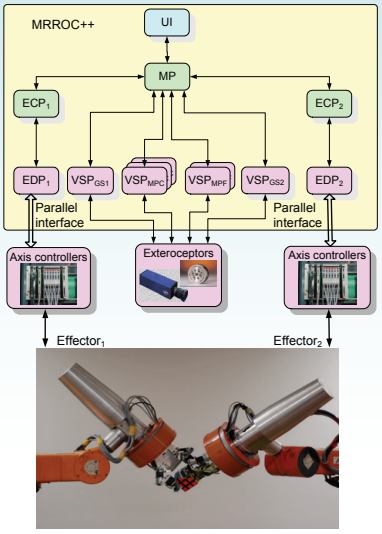
Two-handed Service Robot Controller Capable of Solving a Rubik's Cube Puzzle



Components:

MP – Master Process (produces the solution of the puzzle and generates the nominal motion trajectories for the two arms)

ECP – Effector Control Process (transmits the macro-steps generated by the MP to the EDP)

VSP – Virtual Sensor Process (aggregates data from sensors, i.e. cameras, enabling the localisation of the cube and identification of its state)

EDP – Effector Driver Process (divides the macro-step into steps and executes each step using the Task Frame Formalism for position-force control)

UI – User Interface (operator console and status and error reporting)

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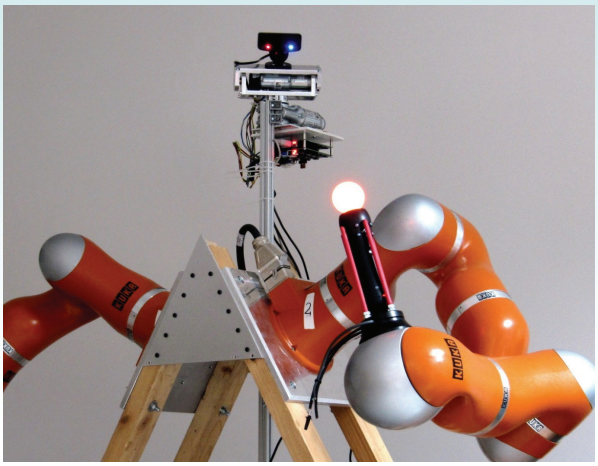
Velma: two arm robotic system with redundant manipulators and active head



14 DOF two arm system

- Torque controllers in joints
- Full dynamic control
- Redundant kinematic structure
- Antropomorfic 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, sterovision system
- Controlled by ROS, OROCOS software

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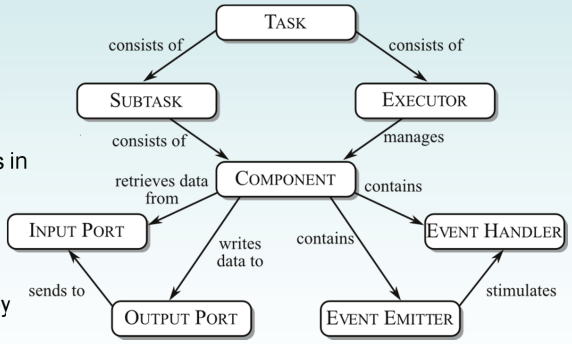
DisCODe: Distributed Component Oriented Data Processing

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



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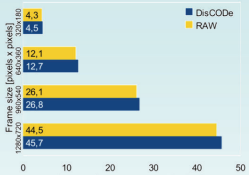
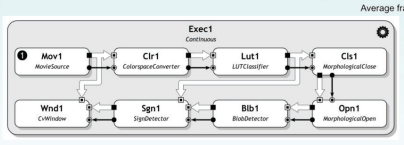
DisCODe: Benchmark applications

Roadsign detection test

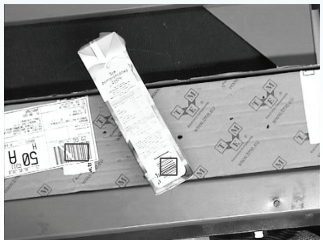
- **Low** communication overhead
- **Robust** structure

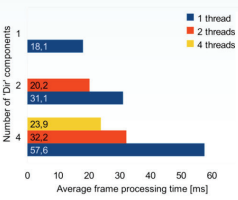


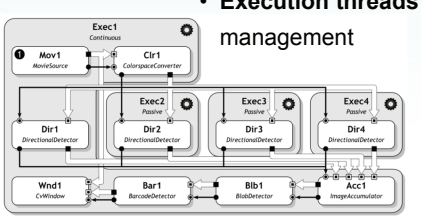


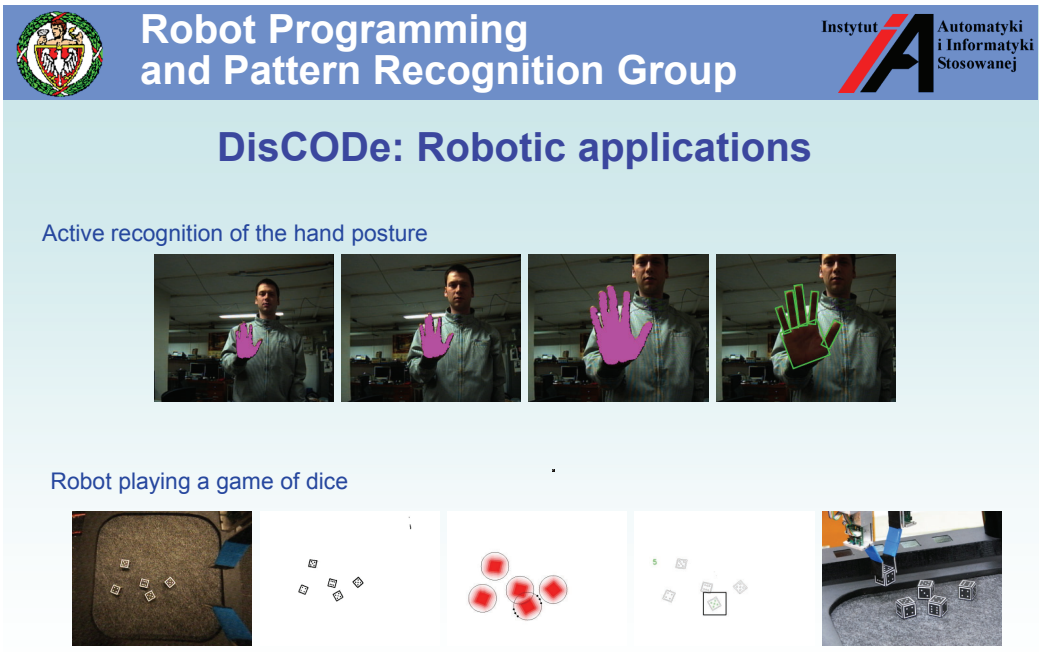
Barcode detection test

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





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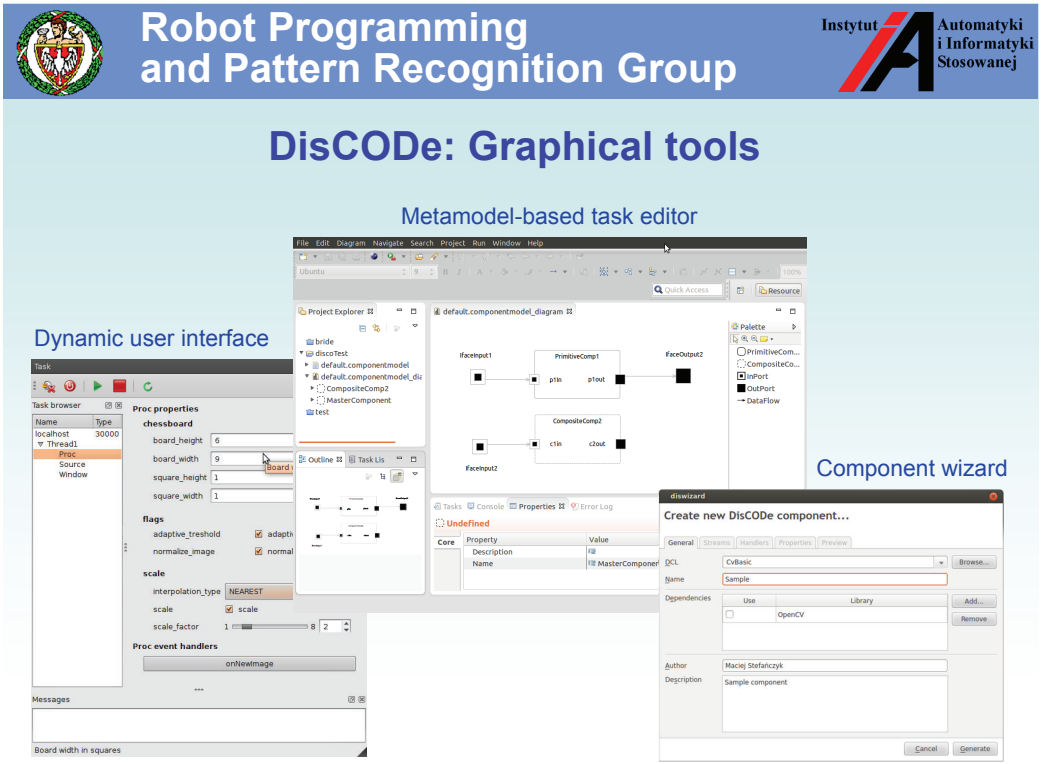
DisCODe: Robotic applications
Active recognition of the hand posture
Robot playing a game of dice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DisCODe: Graphical tools
Metamodel-based task editor
Dynamic user interface
Component wizard
Create new DisCODe component...

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Active Perception and Active Vision

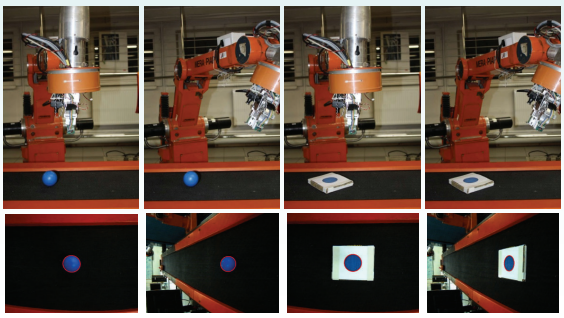
Concept:

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

Active vision:

In the case of a static observer, identification of a distant or partially occluded object can be very difficult and sometimes even impossible. Those problems can be overcomed by the introduction of an active observer, 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 successfull realisation of the task

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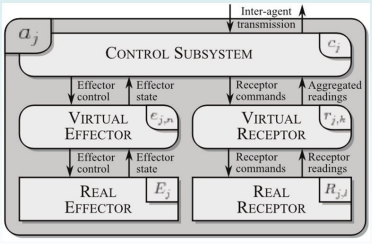
Embodied Agent: a robot control system design method

Concept:

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

Embodied Agent:

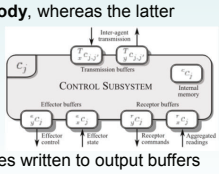


• **Embodied Agent** - any device or program having the ability to perceive its surroundings to subsequently influence the environment state, can communicate with other agents and has an internal imperative to achieve its goal.

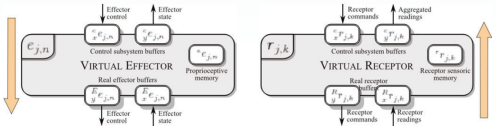
Subsystems and transition functions:

• 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.



11

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Elementary behaviours of robot manipulators

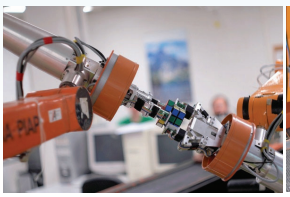
Main concepts:

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

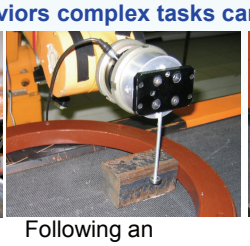
- unconstrained motion with the assumption that no contact with obstacles will be encountered – where pure position control suffices
- contact with the environment – where pure force control is used,
- intermediate or transitional behavior – where initially unconstrained motion is expect to result in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

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

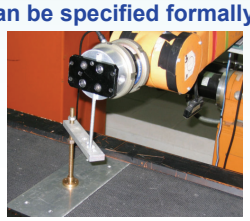
In terms of those behaviors complex tasks can be specified formally and implemented.



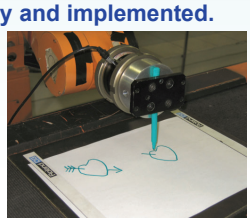
Rubik's cube solver



Following an unknown contour



Rotating a crank



Copying drawings

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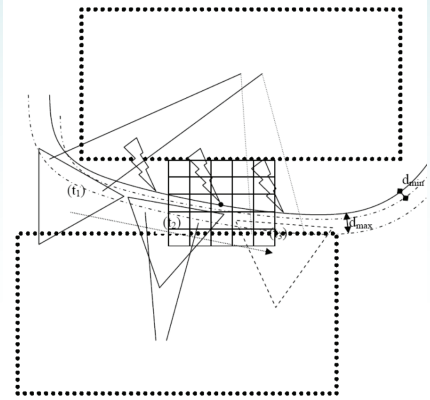
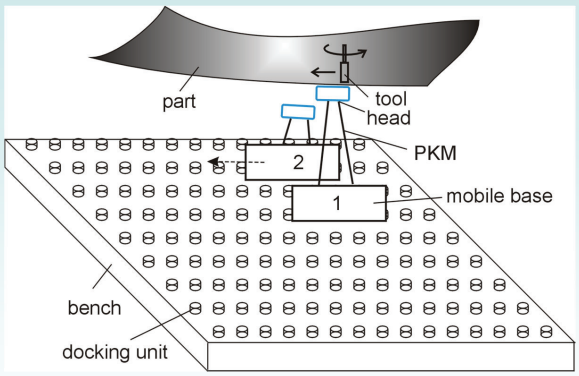
Programming and control of a swarm of mobile fixtures

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





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

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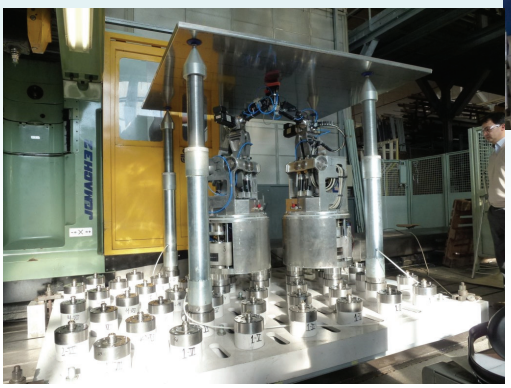
Mobile supports replacing static fixtures

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

Standard fixture



The SwarmItFIX system

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

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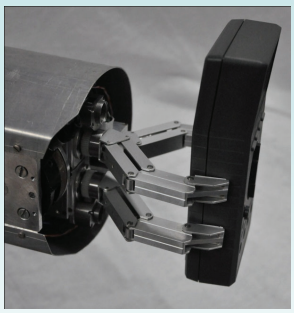
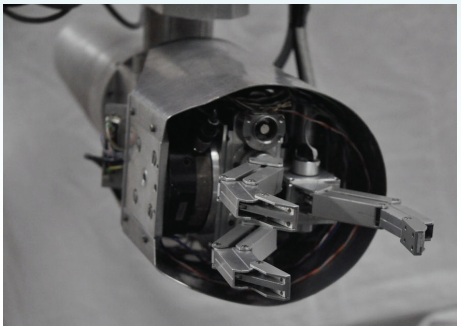
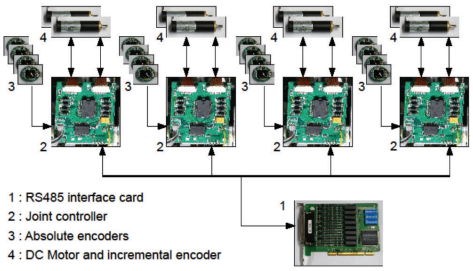
Three finger gripper

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







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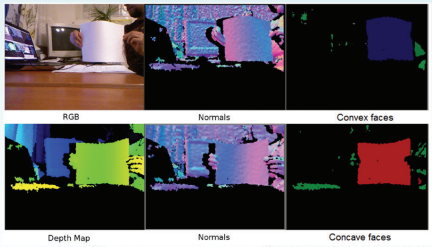
Computer Vision in mobile and service robotics

Environment map generation, obstacle avoidance.

Depth-map and color image Segmentation



3D object recognition

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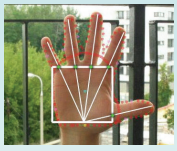
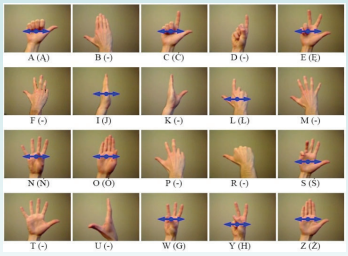
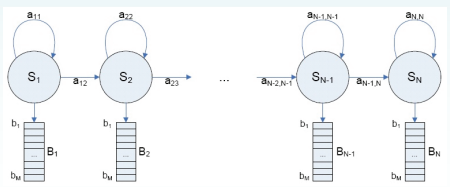
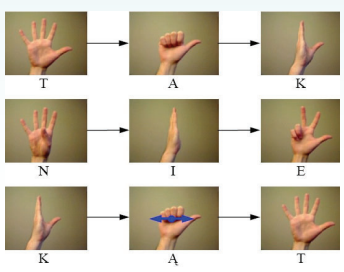
Palm pose and gesture recognition in video sequences



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







- Examples of gestures („words”):

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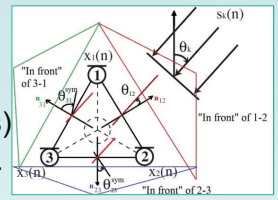
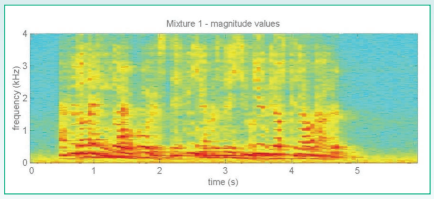
Auditory scene analysis

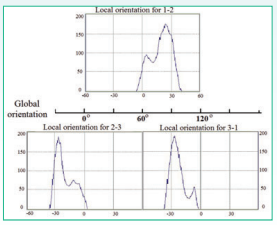


- Only mixtures of source signals can be acquired,
- The goal is to estimate the directions (and locations) of the speakers and to estimate the original sources.

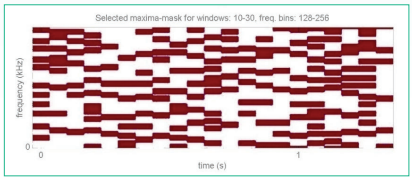


Example:

two sources and three mixtures



Time delay-based detection of source directions:



A spectrogram mask for extraction of a single source

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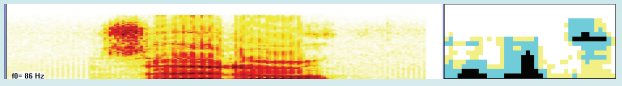
Spoken sentence recognition

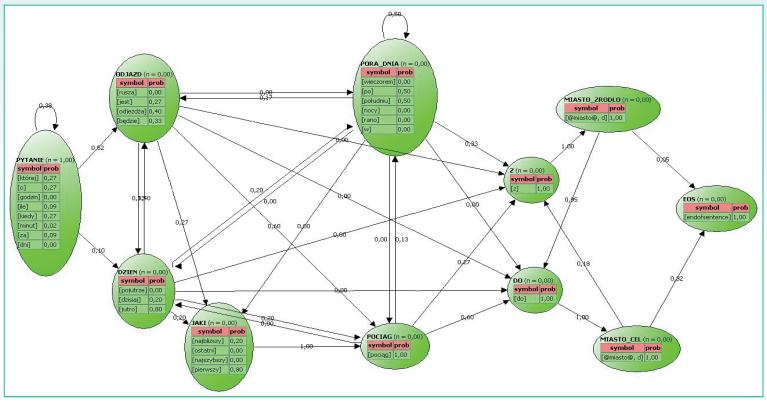
- Spectral analysis
- Acoustic-phonetic features
- Word recognition
- A N-gram language model

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

- HMM-based sentence recognition



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



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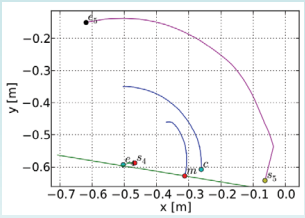
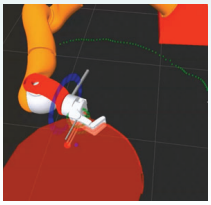
Door opening

- Impedance control of humanoid robot
- Estimation of the door pose based on visual markers
- Tactile sensors on finger tips used for active sensing for better pose estimation
- Unknown door model
- Door parameters (radius, position of the handle) are obtained during the task execution
- Visualisation of the robot state and the environment state

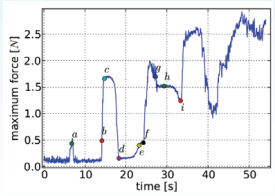
Velma robot opening the door



The plot of measured and commanded trajectories



The visualisation of the robot and environment state



The plot of total force acting on the tactile sensors

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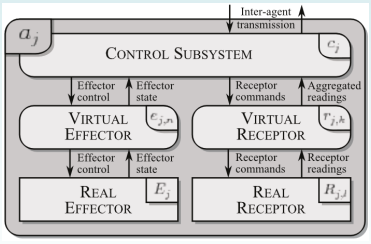
Embodied Agent: a robot control system design method

Concept:

• Design of robot control systems requires a specification method that would facilitate its subsequent implementation.

• The postulated approach bases on decompostion of a system into **Embodied Agents** and description of their **Behaviours** in terms of **Transition Functions**.

Embodied Agent:

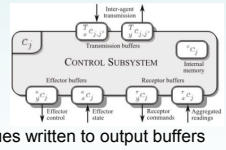


• **Embodied Agent** - any device or program having the ability to perceive its surroundings to subsequently influence the environment state, can communicate with other agents and has an internal imperative to achieve its goal.

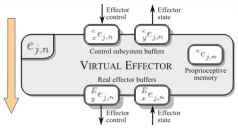
Subsystems and transition functions:

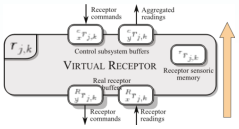
• Five types of internal subsystems: its **effector**, **receptor**, **virtual effector**, **virtual receptor** and a **control subsystem**

• 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.





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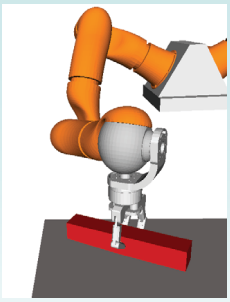
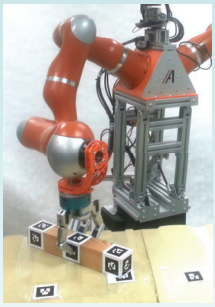
Grasping

- Impedance control of humanoid robot
- Visual markers
- Feedback from tactile sensors used for grasp evaluation
- Full environment model
- Planning collision free motion of the manipulators
- Task oriented grasp planning based on analytical contact forces analysis



Velma robot grasping a cuboid (simulation)



Velma robot grasping a cuboid

The visualisation of tactile sensors readings

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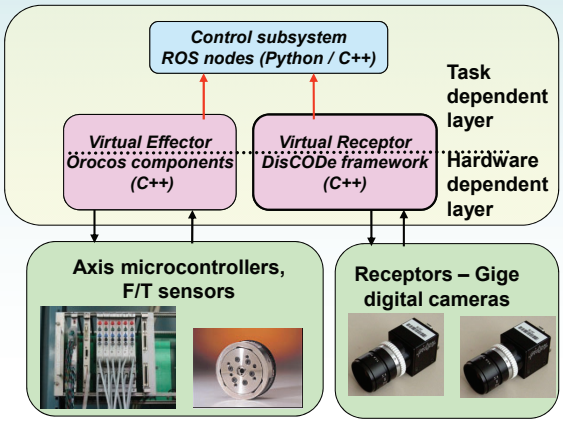
IRPOS robot programming framework

Two co-operating IRp-6 robots

- a collection of: C++ Orocos components, Python/C++ ROS nodes, and an embodied agent inspired design pattern
- designed for building open, modular manipulator control systems
- Supports dedicated hardware: custom built axis controllers, Force/Torque sensors
- Cooperates with DisCODe framework computing a visual data from Gige digital cameras
- Unified, three behavioral Position/force, external space control with inner loop position joint control



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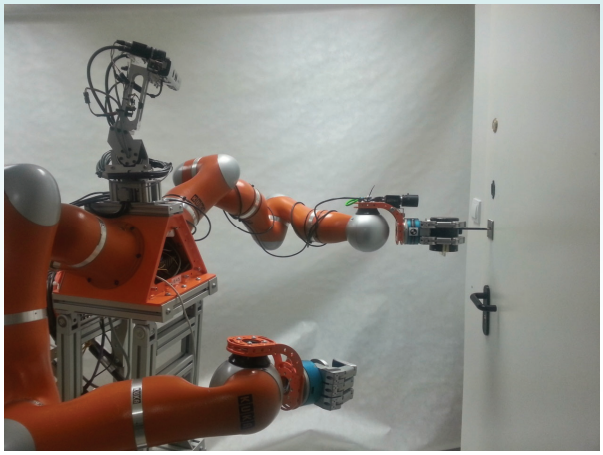
Velma: two arm robotic system with redundant manipulators, grippers, active head and torso



16 DOF two arm system

- Torque controllers in joints
- Full dynamic control
- Redundant kinematic structure
- Antropomorfic form
- 2 DOF active torso
- Controlled by ROS, OROCOS software
- 3 figered barrett hand grippers with tactile sensing

2DOF active head

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

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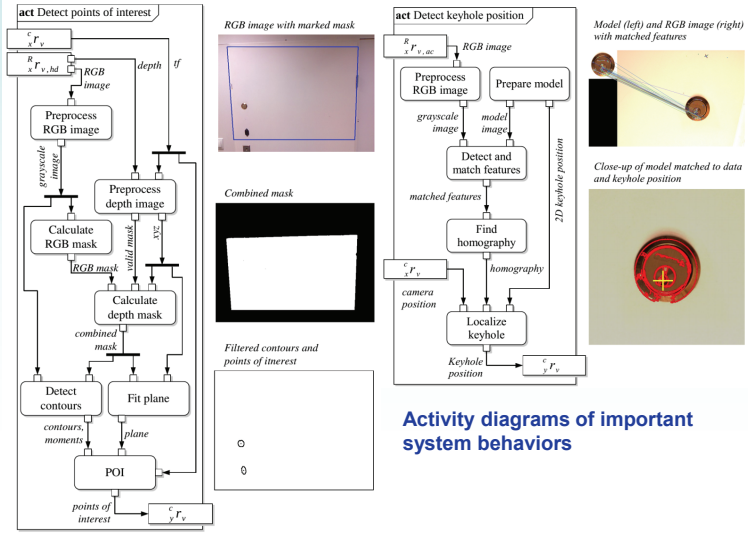
Localization and inspection of door locks

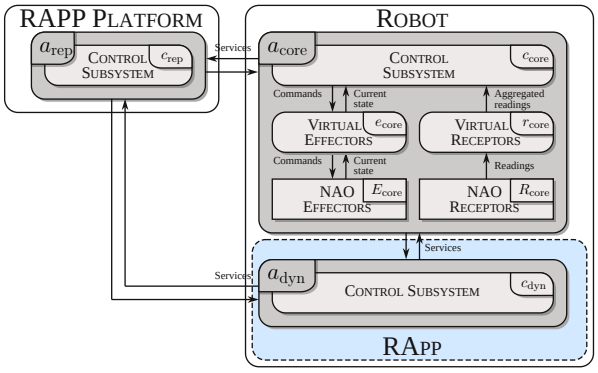
- comprehensive strategy of door locks examination as a paradigm of active sensing
- initial region of interest is localized using the RGB-D low resolution camera mounted on the robot head
- it is then inspected using 2D camera mounted on the robot arm



Activity diagrams of important system behaviors

Variable structure robot control system

Robotic Applications for Delivering Smart User Empowering Applications
RAPP: Robots enabling societal inslusion



- a_{core} – robot control + system composition (fixed)
- a_{dyn} – user task executor (exchangeable)
- a_{rep} – application software and service provider

Observations:

- limited robot controller capabilities
- unlimited capabilities of the cloud

Conclusion:

- downloadable application part
- switchable supervisor

FP7 Collaborative Project RAPP (Grant no 610947), European Commission, 2013–2016

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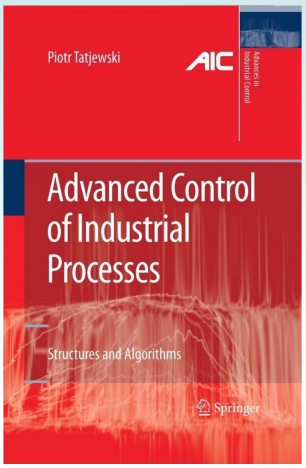
Advanced control of industrial processes

- 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



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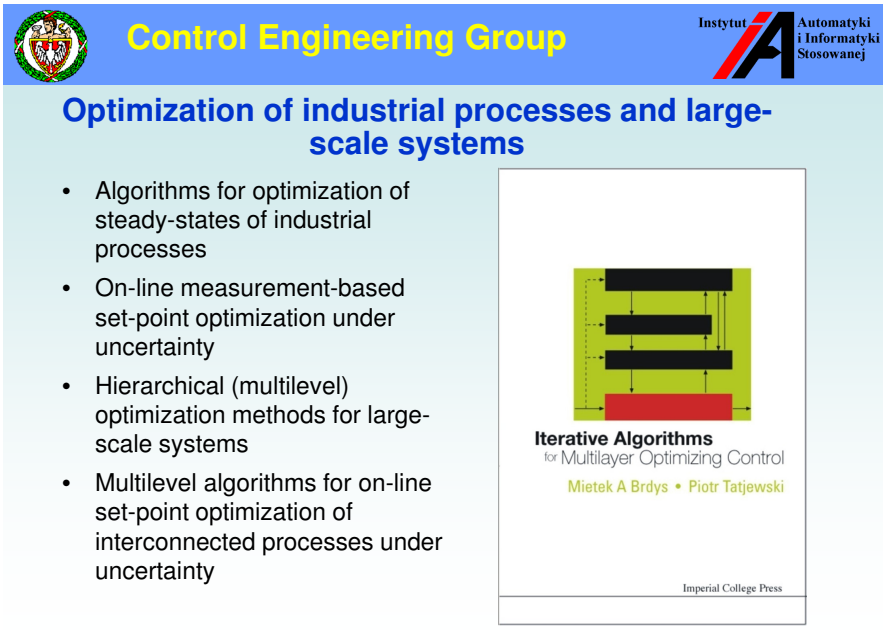
Control Engineering Group
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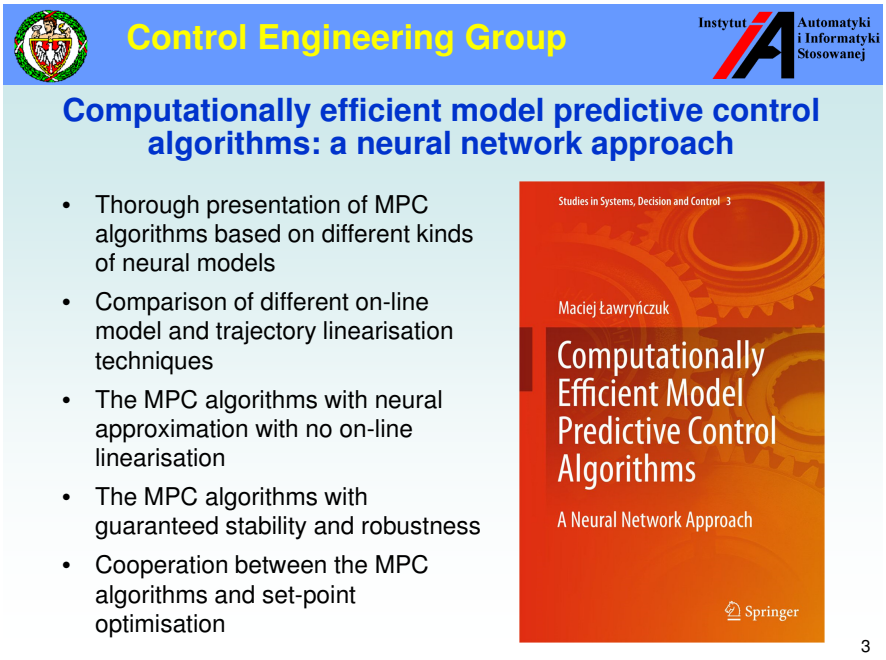
Optimization of industrial processes and large-scale systems
• Algorithms for optimization of steady-states of industrial processes
• On-line measurement-based set-point optimization under uncertainty
• Hierarchical (multilevel) optimization methods for large-scale systems
• Multilevel algorithms for on-line set-point optimization of interconnected processes under uncertainty
Iterative Algorithms
for Multilayer Optimizing Control
Mietek A Brdys • Piotr Tatjewski
Imperial College Press
2


Control Engineering Group
Instytut Automatyki i Informatyki Stosowanej
Computationally efficient model predictive control algorithms: a neural network approach
• Thorough presentation of MPC algorithms based on different kinds of neural models
• Comparison of different on-line model and trajectory linearisation techniques
• The MPC algorithms with neural approximation with no on-line linearisation
• The MPC algorithms with guaranteed stability and robustness
• Cooperation between the MPC algorithms and set-point optimisation
Studies in Systems, Decision and Control 3
Maciej Ławryńczuk
Computationally Efficient Model Predictive Control Algorithms
A Neural Network Approach
Springer
3

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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

4

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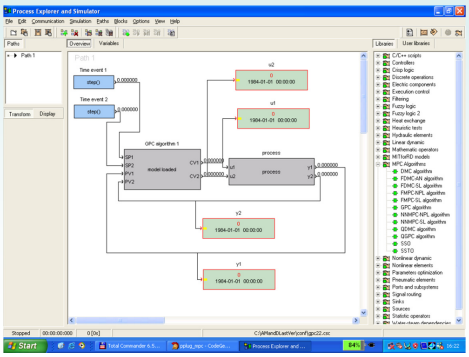
DiaSter (Diagnostic and Control) software system

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

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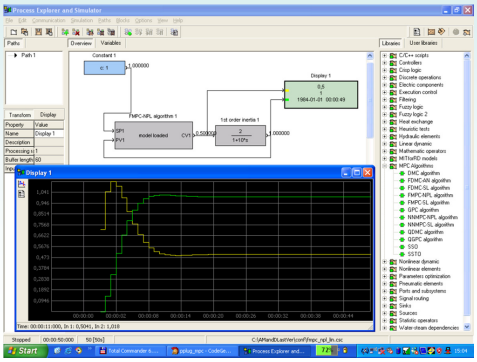
DiaSter (Diagnostic and Control) software system

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

6

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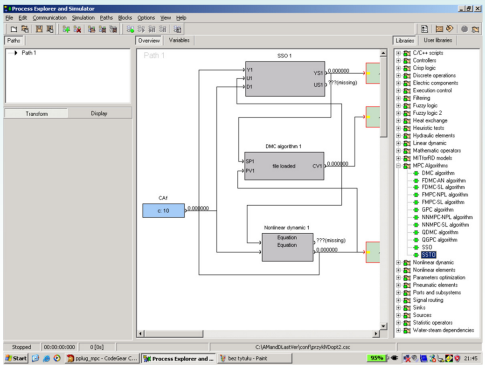
DiaSter (Diagnostic and Control) software system

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

7

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R&D project: 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)

8

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R&D project: The anti-smoke ventilation control in high 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)

9

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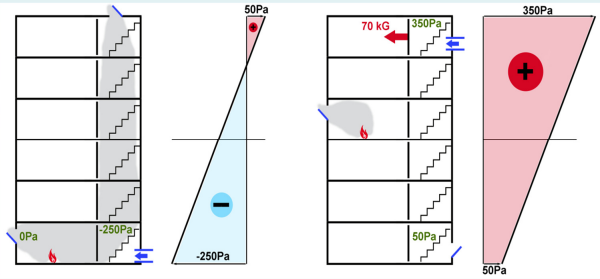
R&D project: The anti-smoke ventilation control in high buildings

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 is manufactured by ***Plum*** company)

10

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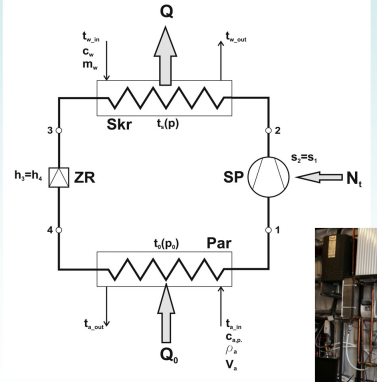
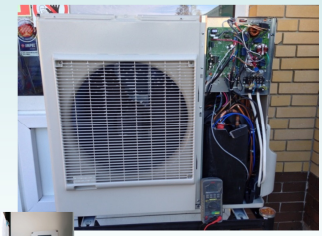
R&D project: Control of air-water heat pump

The heat pump absorbs heat from a cold space and transfers it to a warmer one





11

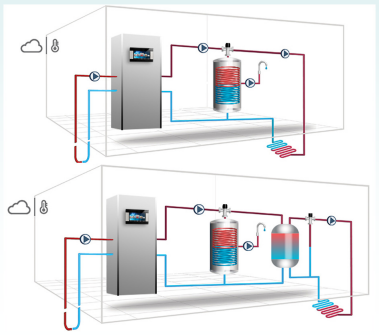
Control Engineering Group

Instytut Automatyki i Informatyki Stosowanej

R&D project: Control of air-water heat pump

The controller:

- Maximises the Coefficient of Performance (COP)
- Minimises energy consumption
- Automatically adapts to changing environmental conditions



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

12

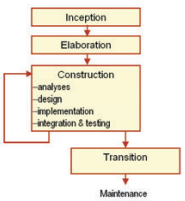
Software Engineering Group

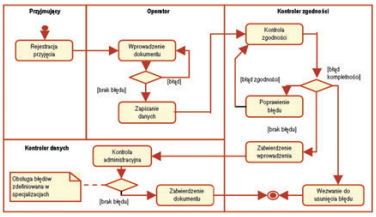
Instytut Automatyki i Informatyki Stosowanej

Software development

Research topics:

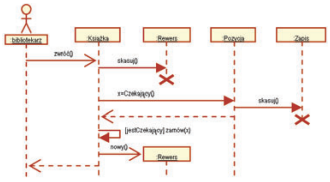
- Business process modeling
- Requirements engineering
- Software development methods
- Technologies and tools
- Acceptance testing
- Software processes
- Project management





Systems and tools **:**

- Rational Rose
- Rational RequisitePro
- Structured Architect



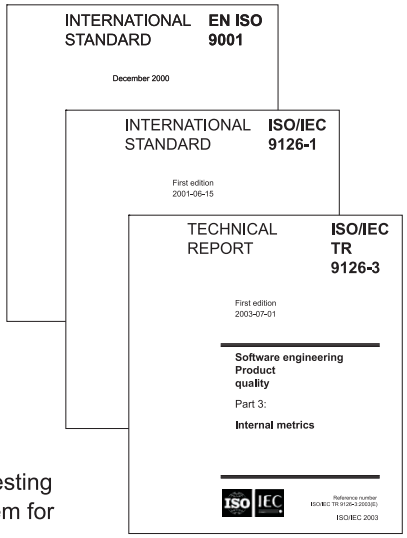
Software Engineering Group

Instytut Automatyki i Informatyki Stosowanej

Evaluation of the software quality

Research topics:

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



Sample projects:

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

Software Engineering Group

Instytut Automatyki i Informatyki Stosowanej

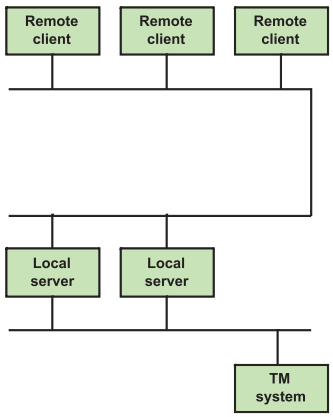
Distributed Open Systems

Research topics:

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

Ø Security in Distributed Open Systems

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

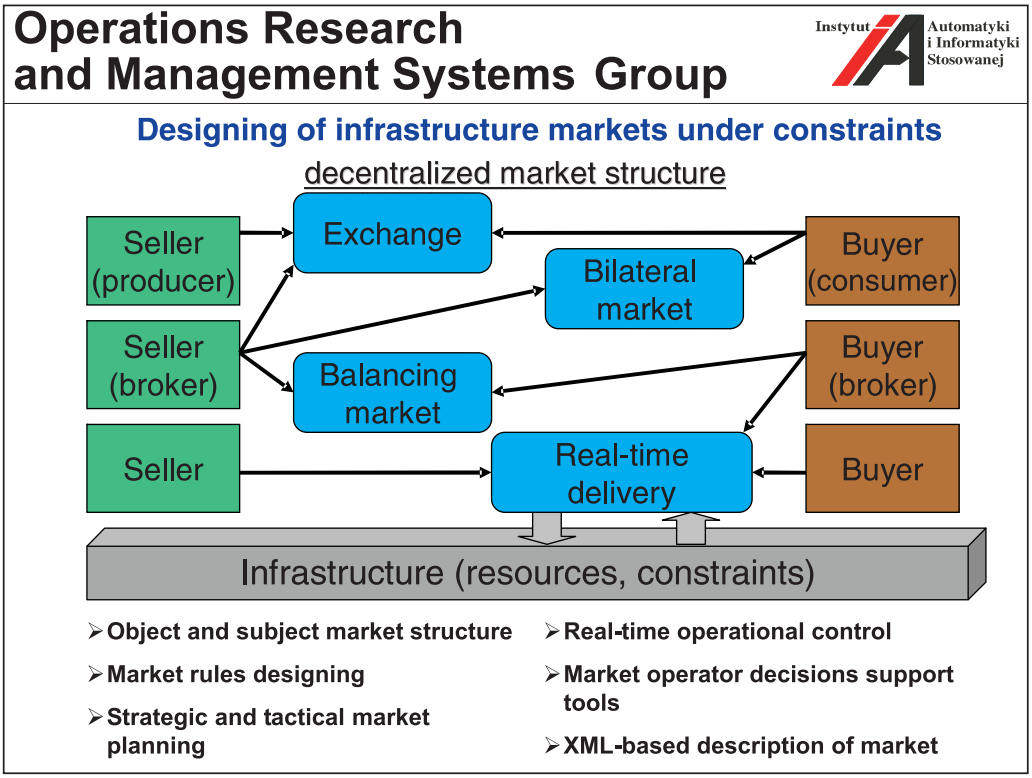


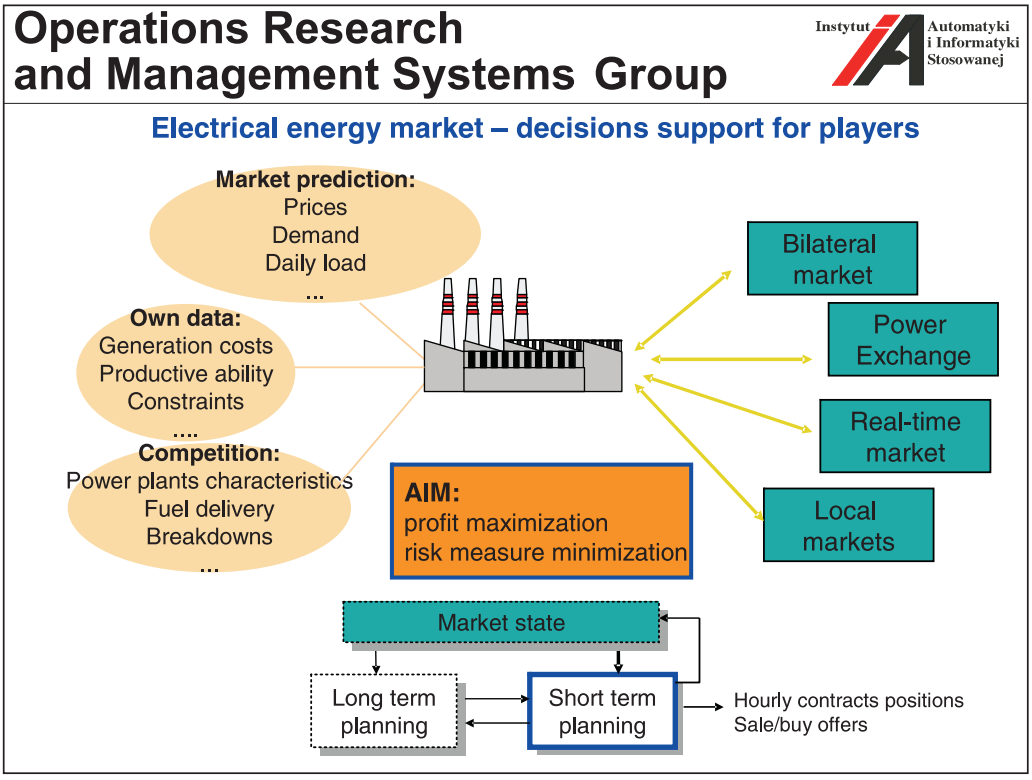
Languages and Conceptual Tools:

Ø BPMN, BPEL

Ø RT_0, RT_1, RT_2, RT^T

Ø Architecture Decision Models

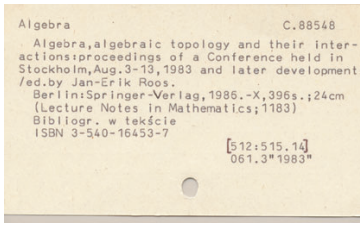

Operations Research
and Management Systems Group
Instytut Automatyki i Informatyki Stosowanej
Designing of infrastructure markets under constraints
decentralized market structure
Seller (producer)
Seller (broker)
Seller
Exchange
Bilateral market
Balancing market
Real-time delivery
Buyer (consumer)
Buyer (broker)
Buyer
Infrastructure (resources, constraints)
Object and subject market structure
Market rules designing
Strategic and tactical market planning
Real-time operational control
Market operator decisions support tools
XML-based description of market


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

Operations Research and Management Systems Group

Instytut Automatyki i Informatyki Stosowanej

Library catalogue digitization

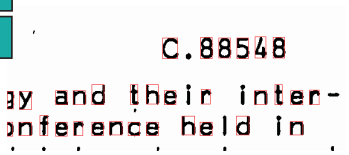


Skew correction

Binarization

Noise elimination

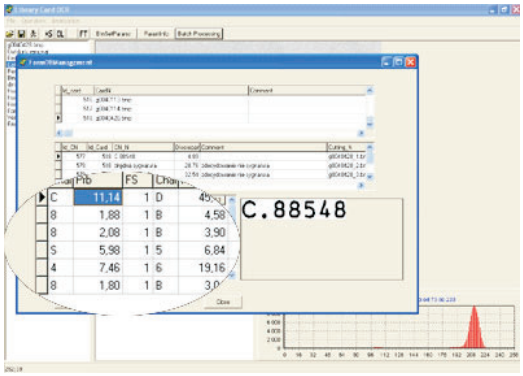
Segmentation



Framing

Recognition

C.88548



Operations Research and Management Systems Group

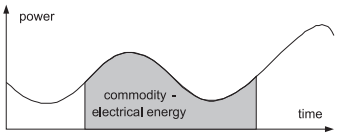
Instytut Automatyki i Informatyki Stosowanej

M³ Multicommodity Market Model

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

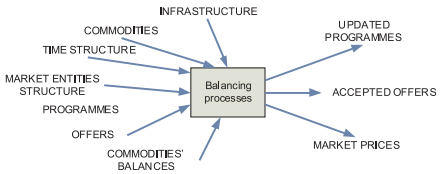
M³ is mainly (but not only) designed for

- **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

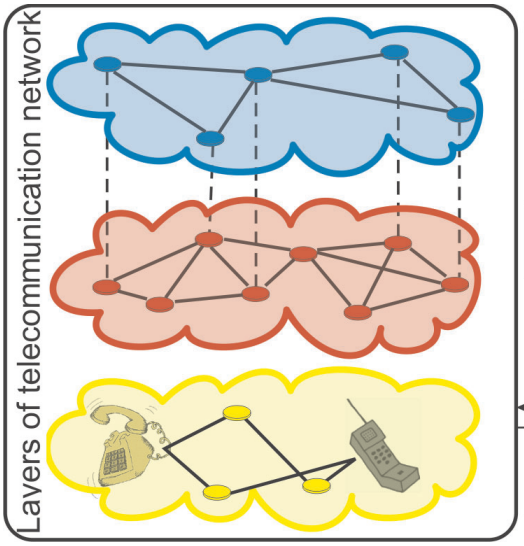
- flexible framework both for real-world market systems and for research projects
- possibilities for integration of software components
- possibilities for organizing benchmark data repository

Operations Research and Management Systems Group

Instytut Automatyki i Informatyki Stosowanej

Design of Multicommodity Market Model – M³

Application of M³ on the Communication Bandwidth Market



M³ model:

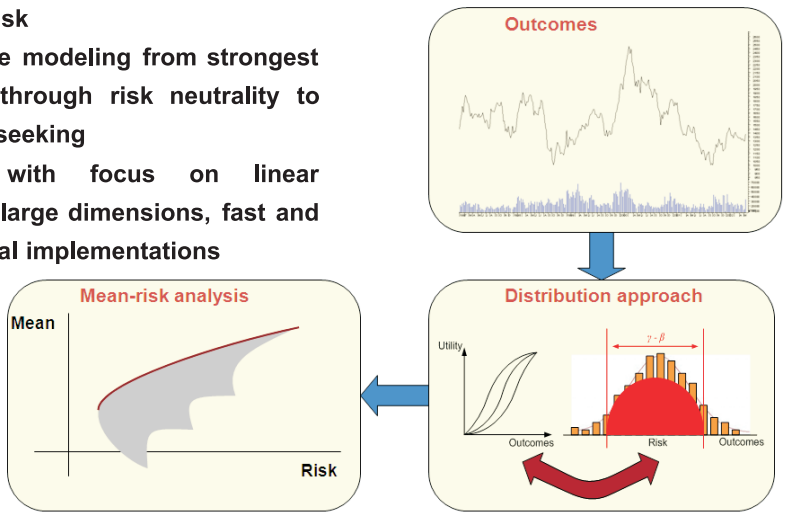
- may be used in information systems for market balancing in various infrastructure networks
- is a set of formal data models, which results in XML-derived information interchange specification
- may be used in a wide range of market-oriented network systems and may significantly facilitate communication,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

Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

Risk Measures and Optimization under Risk

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

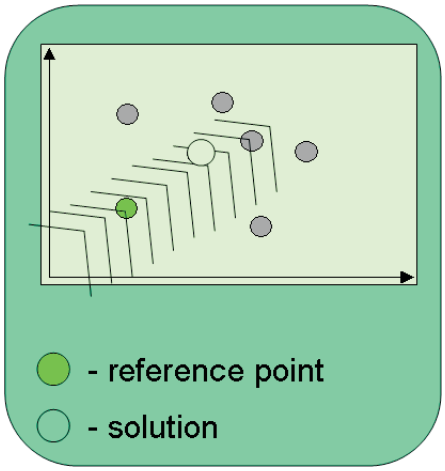


Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

Reference Point Method

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

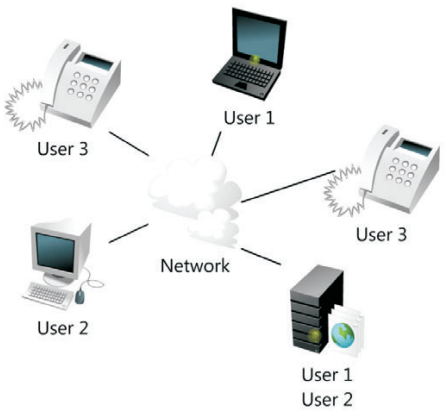


Optimization and Decision Support Group

Instytut Automatyki i Informatyki Stosowanej

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	2013		2014		2015	
	persons	FTE	persons	FTE	persons	FTE
Academic Staff	44	38,5	43	38	37(+3)	33,5 (+2,5)
by titles/degrees						
Professors	7	7	8	8	8	8
D.Sc.-s	6	6	5	5	6	6
Ph.D.-s	28	23,5	28	23,5	21(+3)	18(+2,5)
M.Sc.-s	3	2	2	1,5	2	1,5
by positions						
Professors	9	9	9	9	10	10
Readers	1	1	1	1	1	1
Assistant Professors	30	26	31	26,5	24(+3)	21 (+2,5)
Senior Lecturers	4	2,5	2	1,5	2	1,5
Lecturers	0	0	0	0	0	0
Assistants	0	0	0	0	0	0
Ph.D. Students	28		27		27	
Technical Staff	5	3,25	6	5	9(+1)	3,4(+1)
Administrative Staff	7	5	9	7	7	7

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

ACTIVITIES	2013	2014	2015
Teaching activities			
standard teaching potential, hours	9 242,40	9 086,00	9 754,50
# hours taught	12 415,10	12 246,40	13 995,20
Degrees awarded			
Professor	0	1	0
D.Sc	2	0	1
Ph.D.	4	1	5
M.Sc.	46	46	48
B.Sc.	57	45	40
Research projects			
granted by WUT	4	5	5
granted by State institutions	13	12	11
granted by international institutions	4	1	1
other	6	8	8
Sci.-Tech. publications			
monographs (authored or edited)	4	7	5
chapters in books and proceedings	39	61	50
papers in journals	36	32	31
Reports, abstracts and other papers	42	33	21
Conferences			
participation (# of conferences)	34	22	34
participation (# of part. from ICCE)	41	43	54

RESOURCES	2013	2014	2015
Space (sq.m.)			
laboratories	585	585	995
library + seminar room	74	74	74
faculty offices	724	724	724
Computers			
personal computers	172	175	192
Library resources			
books	3 127	3 141	3 151
booklets	2 544	2 635	2 724
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, 2015.

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). Honored with the Order of the White Eagle (2012).

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 , 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
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
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 the highest honours). Since 2003 he is with Warsaw University of Technology, and since 2002 with Research and Academic Computer Network (NASK). Visiting Associate Professor at the Department of Computer Science and Engineering of the University of Notre Dame, IN, USA (fall 2014 and since spring 2016). Chair of the Biometrics and Machine Learning Laboratory at the Institute of Control and Computation Engineering. Head of the Postgraduate Studies on Security and Biometrics (2011-). V-ce Chair of the NASK Biometrics Laboratory (2006-) and a member of the NASK Research Council (2006–2015). Member (2009-) and Chair (2014-) of the Technical Committee on Biometrics of Polish Normalization Committee (PKN). Member of the PKN Technical Committee No. 182 on Information Security in IT Systems (2007-). Expert of the ISO/IEC SC37 and CEN TC224 WG18 on Biometrics. Member of the Main Council of the Research Institutes (2015-). 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: 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 570, tel. 22 234 7665
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. D.Sc. 2012 from WUT

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

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

Michał Karpowicz Assistant Professor (part time)

Systems Control Division, Complex Systems Group
room 573a, tel. 22 234 7860
M.karpowicz@ia.pw.edu.pl, staff.elka.pw.edu.pl/~mkarpowi

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

With WUT since 2014

Interests: Control theory, game theory, 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, the title od Professor awarded in 2014.

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 Professor (part-time) (until Sept. 2015)

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M.Sc. 2007, Ph.D. 2012 from WUT

With WUT since 2011.

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

Tomasz Kornuta Assistant Professor, on leave since Sept. 2015

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M.Sc. 2005, Ph.D 2013 from WUT.

With WUT since 2008.

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

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

With WUT since 2006.

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

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M.Sc. 2004 from WUT.

With WUT since 2010.

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

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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.

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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 (until Sept. 2015)

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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.

Maciej Ławryńczuk Professor (Leader of the Group)

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M.Sc. 1998, Ph.D. 2003, D.Sc. 2013 from WUT.

With WUT since 2003. Winner of "Gold chalk" ("Złota kreda") award. The coordinator of B.Sc. and M.Sc. studies in automation and robotics since 2011.

Interests: advanced process control algorithms, in particular Model Predictive Control (MPC) algorithms, set-point optimisation algorithms, artificial intelligence and soft computing techniques, in particular neural networks, modelling and simulation.

Krzysztof Malinowski Professor (Head of Division)

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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 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, Chair of the Council of Provost, Division IV: Engineering Science, Polish Academy of Sciences (2015–).

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

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

With WUT since 2002.

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

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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. Member of of the Scientific Council of NASK since 2002 (Vice-Chairman 2008–2009). Ekspert of the Polish Accreditation Committee, secretary of the Committee of Automation and Robotics of Polish Academy of Sciences (PAN).

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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 Polish 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.

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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.

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

With WUT since 2009.

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

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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.

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Interests: Modeling and simulation, optimization, diagnostics, predictive control, SCADA and DCS systems.

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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.

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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

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M.Sc. 2005, Ph.D. 2011 from WUT.

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

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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 Denmark (1993), Project Manager in Alerton (1999–2002), Advisor to the President of Social Insurance Institution (2005–2009). Professor at Vistula University, Warsaw, Poland (2002–2015), Member of the Council of the National Centre for Research and Development (2010–2014). Member of the Supervisory Board of Atena Usługi Informatyczne i Finansowe S.A. (since 2015). Expert in maintaining and evaluating software projects. Member of IEEE.

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

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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.

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

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

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

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

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

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

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Interests: Discrete optimisation, operations research, decision support.

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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 Int. Journal of Applied Mathematics and Computer Science, Journal of Automation, Mobile Robots and Intelligent Systems, Member of Advisory 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–), Vice-chairman of the Scientific Council of Systems Research Institute of Polish Academy of Sciences (2011–).

Interests: Advanced process control and optimization, model based predictive control, multi-layer control systems, decomposition methods in optimization and control, soft computing methods.

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

With WUT since 1973. Head of Operations Research and Management Systems Division, Vice-Dean of the Faculty of Electronics at WUT (1990–1993), chairman of the Rector's Committee for University Computerization (1993–1999), Advisor to the Dean on Strategic Planning (1993–1996). Head of the Undergraduate Program in Information Systems for Decision Support (1992–2004). Member of the Section on Decision Support (since 1992) and the Section on Knowledge Engineering and Operations Research (2003–) of the Committee of Automation and Robotics of Polish Academy of Sciences, Member of the Scientific Council of the Systems Research Institute (IBS PAN) (since 2002), Member of Consulting Council EnergoProject S.A. (2003–2004), Member of Steering Committee of the Energy Market (2003–2004). Member of the Polish National Council for CO_2 Reduction Emission Program, and Head of the Energy Market Group (2009–), Member of the European Commission DG Advisory Group for Energy Roadmap 2050 (2011–).

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

Tomasz Traczyk Reader (Deputy Director of the Institute)

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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.

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M.Sc. 2001, Ph.D. 2005 from WUT.

With WUT since 2005.

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

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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.

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

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

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M.Sc. 1997, Ph.D. 2003, D.Sc 2015 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)

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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.

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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

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

Sylwia Piskorska R&D Specialist, on leave since Oct. 2015.

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M.Sc. 2012 from Technical University of Gdańsk.

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

2.4 Ph.D. Students

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3 Teaching Activities – Academic Year 2014/2015

3.1 Undergraduate and Graduate Studies

Course Title	Course code	Hours per week	Class	Lecturer
Adaptive and Learning Systems	SAU	2 – 1 –	PP-SID SIDJ	P.Wawrzyński (fall)
Administration of UNIX and TCP/IP	ASU	2 – 1 –	OSK,OT, MERJ	J.Sobczyk (spring/fall)
Algorithms and Data Structures	AISDI	2 – 1 –	sem.3	A.Zalewski (spring)
Artificial Intelligence	EAI	2 – – –	ANGL, OT	W Kasprzak (spring)
Artificial Intelligence Methods	MSI	2 – – 1	ISO, PZ-P OT, PZ	W Kasprzak (spring)
Fundamental of Automatics	PODA	2 – 1 –	PSTER, OT, PSYIA	P.Tatjewski (spring) K.Malinowski (fall)
Biometric Identity Verification	BIT	2 – 1 –	OT, SIDJ,PP-SID	A.Czajka (spring/ fall)
Commercial Data Bases 2	KBD2	2 – – 2	BDSI, OT	T.Traczyk (fall)
Computer Networks	ECONE	2 1 1 –	ANGL, OT	J.Sobczyk (spring)
Computer Networks (I)	SKM	2 – 1 1	SKOR, OT	J.Sobczyk (spring/fall)
Computer Vision	ECOVI	2 1 – –	Emaro	W Kasprzak (fall)
Control	ECONT	2 1 1 –	ANGL, OT	P.Domański (spring/fall)
Data Bases 2	BD2	2 – – 1	BDSI, OT, SIDJ, PP-SID	T.Traczyk (fall)
Decisions in Competition Environment	DWW	2 – – 1		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, MKPWD,PZ, PZ-OWJ, PP-SID	A.Krzemienowski (spring)
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	ISO, OT, PINJ, PP-SID	P.Wawrzyński (spring/fall)
Fundamentals of Digital Technology	PTCY	2 – 2 –	sem. 2	C.Zieliński (fall)
Fundementals of Operation Research	POBO	2 – 1 –	Sem. 4	K.Pieńkosz (spring) G.Płoszajski (fall)
Fundamentals of Optimization	POPTY	2 – 2 –	MKPWD, OT, PP-SID	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-Leszczyńska (spring)
Image and Speech Recognition	EIASR	2 1 – 1	ANGL. OT	W.Kasprzak (fall)
Information Project Management	ZPI	2 – – 1	BDSI, OT, METJ	K.Pieńkosz (spring/fall)
Introduction to Robotics	WR	2 – 2 –	MUS, SCRJ, OT	W.Szynkiewicz (spring/fall)
Numerical Methods (J)	MNUM	2 – – 1	PSTER, OT, PP-SID, SIDJ, MATA, MKPWD	P.Tatjewski (spring/fall)
Numerical Methods	ENUME	2 – 2 –	ANGL, OT	P.Marusak (fall)
Management IT Systems	SIZ	2 – – 2	MKPWD, OT, SWDJ	J.Granat (spring/fall)
Mobile Robots	EMOR		ANGL, ECETC, OT	W.Szynkiewicz (spring)
Modeling and Control of Manipulators	EMOMA	3 1 – –	Emaro	C.Zieliński (fall)
Operating System	EOPSY	2 1 1 –	ANGL, OT	T.Kruk (fall)
Optimization Techniques	EOPT		Emaro	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)
Principles of Computer Science	EPCOS	2 – – –	ANGL, OT	W.Kasprzak (fall)
Process Control	STP	2 1 1 –	OT, PSTER	M.Ławryńczuk (fall)
Process Management and Scheduling	ZAH	2 – 2 –	MKPWD, OT, MUS, PP-SID, SWDJ	E.Toczyłowski (spring/fall)
Programmable Controllers	SP	2 – 1 –	MUS, OT, METJ	J.Gustowski (spring/fall)
Real-time Systems	ERTS	2 – – 1	EMARO	B.Kubica (fall)
Real-time Systems	SCZR	2 – 2 –	PSTER, OT, PINJ, PP-SID	K.Sacha (spring/fall)
Robot Programming Methods	EPRM		Emaro	C.Zieliński (spring)
Signal Processing	ESPRO	2 1 – –	EMARO	W Kasprzak (fall)
Software Engineering	IOP	2 – 1 –	OSK, OT, PINJ, PP-SID	K.Sacha (spring/fall)
Software Specyfication and Design	SPOP	2 – 1 –	OSK, PZ-SID, PZ-I, OT	M.Szlenk (spring/fall
Synthesis of Decision Rules	SRD	2 – 2 –	MKPWD, OT, PP-SID, SIDJ	K.Malinowski (spring)
System Architecture and Integration	AIS	2 – 1 –	PZ-OWJ, PZ-OTI	A.Ratkowski (spring/fall)
Programming Fundamentals	EPFU	2 1 1 –	ANGL, OT	M.Kaleta (spring/fall)
Distributed Operating Systems	RSO	2 – 1 –	PZ-OWJ, PZ-SID, OT	T.Kruk (spring)
Intelligent Robotic System	ISR	2 – 1 –	PZ-AIR, PZ-OWJ, PZ-SID, PZ-A, OT	C.Zieliński (fall)
Object Programming	PROI	2 – 2 –	MPRIA, OT	M.Warchoł (fall)
Modelling and Identification	MODI	2 1 – 1	PODAA, PZ-AIR, OT	A.Woźniak (fall)
Neural Networks	SNR	2 – – 2	PZ-OTJ, PZ, OT	A Pacut (fall)
Automation and Robotics Equipment	APA	2 – 1 –	PODAA, OT	T.Winiarski (spring)
Networks and Systems Control	SST	2 – – 1	PZ-AIR, PZ-A, PZ, OT	K.Malinowski (spring)
Advanced Process Control Techniques	TAP	2 – – 2	PZ-AIR, PZ-A, PZ, OT	P.Tatjewski (spring)

Table explanations

Hours per week

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

Class

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

3.2 Extramural Graduate Studies

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

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

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

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

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] 7 FP EU grant No. FP7–ICT–2013–10, FP7–ICT–2013.5.3: **RAPP – Robotic Applications Store for Delivering Smart User Empowering Applications.**

Granting period: 01.12.2013–30.11.2016.

Coordinator: Centre for Research and Technology Hellas/Informatics and Telematics Institute (Greece).

Partners: Institute National de Recherche en Informatique et Automatique (France), Warsaw University of Technology (Poland), Sigma-Orionis (France), Ormylia Foundation (Greece), Ingema Foundation (Spain), Ortelio Ltd. (UK).

Project coordinator from WUT: Cezary Zieliński.

Investigators from WUT: Wojciech Szynkiewicz, Włodzimierz Kasprzak, Tomasz Michał Kornuta, Tomasz Winiarski, Michał Walęcki, Maciej Stefańczyk.

Aim of the project: RAPP (Robotic Applications for Delivering Smart User Empowering Applications) will provide a software platform in order to support the creation and delivery of robotics applications (RAPPs) targeted to people at risk of exclusion, especially older people. The open-source software platform will provide an API that contains the functionalities for implementing RAPPs and accessing the robot's sensors and actuators using higher level commands, by adding a middleware stack with added functionalities suitable for different kinds of robots. RAPP will expand the computational and storage capabilities of robots and enable machine learning operations, distributed data collection and processing, and knowledge sharing among robots in order to provide personalized applications based on adaptation to individuals. The use of a common API will assist developers is creating improved applications for different types of robots that target to people with different needs, capabilities and expectations, while at the same time respect their privacy and autonomy, thus the proposed RAPP Store will have a profound effect in the robotic application market. The results of RAPP will be evaluated through the development and benchmarking of social assistive RAPPs, which exploit the innovative features (RAPP API, RAPP Store, knowledge reuse, etc.) introduced by the proposed paradigm.

Expected results: Provide an infrastructure for developers of robotic applications, so they can easily build and include machine learning and personalization techniques to their applications Create a repository, from which robots can download Robotic Applications (RApps) and upload useful monitoring information Develop a methodology for knowledge representation and reasoning in robotics and automation, which will allow unambiguous knowledge transfer and reuse among groups of humans, robots, and other artificial systems Create RApps based on adaptation to individuals and taking into account the special needs of elderly people, while respecting their autonomy and privacy Validate this approach by deploying appropriate demos to demonstrate the use of robots for health and motion monitoring, and for assisting technologically illiterate people or people with mild memory loss.

Keywords: elderly, social robots, assistive robots, robotic framework, smart user empowering robotic applications, mobility assistance and health monitoring, technology illiterate

[PR2] 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: 20.12.2012–19.12.2015.
Principal investigator: Paweł Zarzycki (NASK).
Principal investigator from WUT: Ewa Niewiadomska-Szynkiewicz, Adam Kozakiewicz.
Investigators: Mariusz Kamola, Paweł Szałachowski, Krzysztof Daniluk.

Aim of the 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 od 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.

[PR3] 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 Walęcki, Maciej Stefańczyk.

Aim of the 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

[PR4] NCBiR Grant No. POIG.01.03.01-00-071/12: **Development and construction of the controller for the air-water heat pump**,

Project financed from EU funds within the Operational Program Innovative Economy (POIG).

Granting period: 01-04-2013 31-10-2015.

Coordinator: Warsaw University of Technology. Partner: Plum Sp. z o.o.

Project coordinator from WUT: Piotr Tatjewski. Investigators from WUT: Piotr Marusak, Maciej Ławryńczuk, Marian Rubik, Piotr Ziętek. Aim of the project: Development of the industrial feedback controller for air-water heat pumps, which maximises operation efficiency. The problem is of economic and also ecological importance, leading to reduction of usage of conventional energy sources. The control of air-water heat pumps is more difficult than other types of heat pumps (ground-water or water-water pumps), due to significant changes of air temperature and humidity, including also frost effects during winter.

Results: A research stand has been built by the industrial partner, the Plum company. The stand has been equipped with sensors connected to a data base, which made automatic data acquisition possible. A mathematical model of the process has been developed and verified (by WUT and partly by the Plum company). Next, controllers have been designed and tested through computer simulations (by WUT and by the Plum company). The controllers have been applied to the real process (the Plum company) and after a comparison, the control algorithm has been selected. A supervisory optimisation controller for cascade structure of heat pumps has been also designed and tested. The industrial partner has implemented the chosen control algorithm as a microprocessor-based controller. Currently, the controller is available on the market. Theoretical and practical outcomes of the project have been described in one conference paper and one journal article, three further publications are planned in 2016.

Keywords: renewable energy, air-water heat pump, model identification, feedback control, microprocessor control.

[PR5] NCBiR Grant No. POIG.01.03.01–14–076/12: **Decision Support System for Large-Scale Periodic Vehicle Routing and Scheduling Problems with Complex Constraints.**

Project financed from EU funds within the Operational Program Innovative Economy (POIG).

Granting period: 23.05.2013–30.06.2015.

Coordinator: Warsaw University of Technology. Partners: SMT Software S.A. Wrocław.

Project coordinator from WUT: Włodzimierz Ogryczak.

Principal Investigators from WUT: Tomasz Śliwiński, Jarosław Hurkała, Mariusz Kaleta, Piotr Pałka.

Aim of the project: Development of algorithms for large-scale periodic time-dependent vehicle routing and scheduling problems with complex nonuniform constraints with respect to frequency, time windows, working time, etc. With additional fast adaptive procedures for operational rescheduling of plans in presence of various disturbances. Application of algorithms within a system supporting planning and management of mobile personnel (sales representatives and others).

Expected results: Advanced decision support system for large-scale periodic time-dependent vehicle routing and scheduling problems with complex constraints supporting planning and management of mobile personnel tasks.

Keywords: decision support, optimization, vehicle routing, scheduling, algorithm.

[PR6] NCBiR Grant DEMONSTRATOR+ No. WND–DEM–1–385/00: **Digital Document Repository CREDO.**

Granting period: 01.11.2013–31.03.2016.

Coordinator: Polska Wytwórnia Papierów Wartościowych. S.A, Partners: Warsaw University of Technology, Skytechnology sp. z o.o.

Principal investigator from WUT: Tomasz Traczyk.

Investigators from WUT: Grzegorz Płoszajski, Bartosz Kozłowski, Piotr Pałka, J. Hurkała, A. Hurkała.

Aim of the project: The goal of the CREDO project is to design and launch a demonstrative version of a digital repository enabling short- and long-term archiving of large volumes of digital resources. By design the repository is to act both as a secure file storage and as a digital archive providing metadata management and including the resources in archival packages.

Expected results: One of the system's primary functions will be the support for various currently available data carriers: hard drives, solid state drives, tapes. The repository will ensure a high level of security for the information stored through, among other things, advanced access rights management methods and the capability to encrypt the resources stored. Reliability of information readouts will be ensured by the data recording replication mechanisms in the repository's file system, as well as the distributed nature of the system that will enable storing copies of the resources in more than one locations. The repository's architecture will be multi-tiered and it will enable (together with the emergence of new technologies) replacement and continuous upgrades of the individual components. This solution has been designed for institutions that store large digital resources for long periods of time, e.g. cultural institutions, mass media, state administration offices, and health care institutions. The system designed is to have the features of a product ready to be offered to users.

Keywords: digital resources, long-term archiving, long-term storage, metadata.

[PR7] NCN OPUS Grant No. 2012/07/B/HS4/03076: **Construction of robust investment portfolios by means of the generalized ordered weighted averages.**

Granting period: 01.07.2013–30.06.2016.

Principal investigator: Włodzimierz Ogryczak.

Investigators: Adam Krzemienowski, Tomasz Śliwiński, Michał Przyłuski, Jarosław Hurkała.

Aim of the project: The basis of the portfolio selection is to determine the share of each financial asset. From a mathematical point of view, this issue boils down to portfolio optimization. This is a typical optimization problem solved by the Markowitz method, which maximizes the expected rate of return and minimizes risk defined as the variance. The assumptions of the Markowitz model should ensure that the optimal portfolios are stable over time, i.e., they should be characterized by the absence of fluctuations in their shares, or in other words, the risk and the expected return should

correspond to those estimated from the historical data. In practice, these assumptions are not met. The aim of the project is to develop and analyze a new method that selects robust portfolios, stable over time in terms of their composition for the assumed set of financial assets. The method is supposed to bring out-of-sample results no worse than in-sample results for some performance measures for a given tolerance level.

Expected results: Development and analysis of a portfolio optimization procedure suited for risk measures consistent with the axiomatic models for choice under risk. One of the scientific objectives of the project is to develop and analyze risk measures based on the generalized ordered weighted average operators with reach preference modeling capabilities. There is also planned to develop and empirically analyze efficient algorithms for portfolio optimization models incorporating developed risk measures. In particular, the performance of the risk measure called Multivariate Conditional Value-at-Risk (MCVaR) applied to a portfolio optimization problem with the multivariate robust distribution.

Keywords: portfolio optimization, portfolio mangement, financial engineering, operations research, robustness, risk, decision support.

[PR8] NCN SONATA Grant No. 2012/05/D/ST6/03097: **Methodology of design and implementation of multi-sensory robotic systems for service purposes.**

Granting period: 01.02.2013–31.01.2016.

Principal investigator: Tomasz Winiarski.

Investigators: Cezary Zieliński, Tomasz Kornuta, Michał Walęcki, Maciej Stefańczyk, Łukasz Żmuda, Konrad Banachowicz, Dawid Seredyński, Karol Kateżawa, Michał Laszkowski.

Aim of the project: The aim of the research is to develop a method of design and implementation of intelligent service robots. It has been established that in order to execute the tasks formerly exclusively performed by humans, such a system requires sensors corresponding to human senses such as sight and perception of force as well as appropriate processing algorithms. In this project we focus on developing the algorithms and the technology necessary for creating a working robotic system, able to locate and classify objects, generate an appropriate plan of approaching those objects and, in the final phase, their classification and manipulation using appropriate tool assuming that the object have internal degrees of freedom.

Expected results: The societies of developed countries have been prospering for many years, but at the same time they have to face the problem of aging. In consequence, there is a great demand for services for people (especially elders), but those services are invariably time-consuming, and involving other people. It's arguable whether acquiring cheap workforce is a solution to that problem. An alternative solution is automating the work formerly done by economic emigrants. This challenge has been taken by roboticists who developed service robotics. Their work resulted in creating vacuuming or lawn-mowing robots. However, commercially built robots do not have manipulation skills which are essential to performing useful tasks in human environment. The proposed research project focuses on manipulation and developing technologies for aiding manipulation (such as multi-sensory perception). This remains in agreement with current trends in service robotics while at the same time attempting to evolve it in a direction that is arguably crucial.

Keywords: robotics, manipulation, control systems.

[PR9] Industrial research agreement No. 501/E/1031/112 with SORTER SJ: **Fruit sorting robot controller.**

Granting period: 10.06.2013–30.06.2015.

Principal investigator: Cezary Zieliński.

Investigators: Włodzimierz Kasprzak, Wojciech Szynkiewicz, Tomasz Winiarski, Tomasz M. Kornuta, Michał Walęcki, Maciej Stefańczyk, Dawid Seredyński.

Aim of the project: Design of the robot controller and the creation of a programming language, in which the user will be able to express the task that the robot has to execute.

Expected results: The robot will be controlled using position-force mode, utilizing trajectory generation both in operational and configuration space. It will have separate perception units, effector control drivers and a control subsystem responsible for edition and interpretation of the user program (task).

Keywords: universal robot controller, fruit sorting robot.

[PR10] Statutory Grant No. 504G036300: **Development of methodology of control, decision support and production management**.
Granting period: 19.05.2014–31.12.2015 and 19.05.2015 – 31.12.2016
Principal investigators: Ewa Niewiadomska-Szynkiewicz, Andrzej Pacut, Włodzimierz Ogryczak, Krzysztof Sacha, Maciej Ławryńczuk, Eugeniusz Toczyłowski, Cezary Zieliński.

[PR11] Industrial research agreement No. 501210100824 with Plum Ltd.: **Mathematical modelling, development and validation of adaptive control algorithms in active noise control systems**.

Granting period: 04.11.2013–31.05.2015.

Principal investigator: Piotr Tatjewski.

Investigators: Patryk Chaber, Maciej Ławryńczuk, Piotr Marusak, Antoni Wysocki.

Aim of the project: Reduction of noise generated by fans used in typical ventilation systems. The general objective of the project is to reduce noise generated by fans used in typical ventilation systems in industrial and residential buildings. In order to achieve that objective a mathematical model of the ventilation system has been first developed. Next, a model-based adaptive control algorithm has been developed. Effectiveness of the algorithm has been assessed using a specially designed laboratory ventilation system. The developed algorithm reduces the level of the noise to an acceptable level.

Expected results: Development of a mathematical model of the process, development and validation of an adaptive control algorithm (a noise control algorithm).

Keywords: active noise control, mathematical modelling, adaptive control.

The project is partially financed by Regional Operational Programme for Podlaskie Voivdship for years 2007–2013. ("Active noise control in ventilation systems", other participants: Plum Ltd., Silesian University of Technology Gliwice).

[PR12] NCBiR Grant No. DOB-BIO7/18/02/2015 **Design and construction of a system for recognition of persons (offenders) based on face images captured on photograph or video material.**

Granting period: 20-12-2015 20-06-2017.

Principal investigator: Andrzej Pacut.

Investigators from WUT: Włodzimierz Kasprzak, Władysław Skarbek.

The goal of this project is to build a system for biometric identification of perpetrators of offences or criminals based on photographs and/or video materials. The biometric part of the system will consist of integrated modules, including face detection module, surveillance module, "biometric engines" for face and silhouette recognition, and fusion module generating biometric profiles. Biometric modules will be integrated with a database, which will integrate the biometric data with the police records. The system is thought as an interactive tool and will be operating in various application scenarios, including face detection, isolation of video frames containing faces, surveillance in video materials and identification of persons marked on photo and video materials using the biometric profiles. Modular construction enables for easy supplementing the scenario list

and actualization of biometric techniques. The system will be an indispensable tool for personal identification tasks.

Keywords: biometrics, identity identification, face detection, tracking, silhouette recognition.

[PR13] Rector's Grant No. 5040020200082 **Organization of nationwide robotic competition "Bionikalia 2015"**.

Granting period: 27-05-2015 31-12-2015.

Principal Investigator: Tomasz Winiarski.

Investigators: Konrad Banachowicz, Wojciech Dudek, Jan Figat, Maksym Figat, Dawid Seredyński, Maciej Stefańczyk.

Investigators: Konrad Banachowicz, Karolina Borkowska, Wojciech Dudek, Izabela Dusza,Tomasz Ferens, Jan Figat, Maksym Figat, Piotr Frysz, Daniel Giełdowski, Piotr Łukaszewicz, Bartosz Kaczor, Aleksandra Karbarczyk, Łukasz Korpal, Adam Kowalewski, Przemysław Krajewski, Kamila Lis, Karol Niedzielewski, Katarzyna Olszewska, Dawid Seredyński, Kinga Staszkiewicz, Maciej Stefańczyk, Bartosz Świstak, Michał Walęcki, Maciej Węgierek, Anna Wujek, Maciej Bogusz, Wojciech Węgierek, Rafał Jagielski, Piotr Sykulski, Jakub Pankiewicz, Adrian Terwiński, Kamil Foryszewski, Michał Dębski WMEiL, Michał Kowalewski WMEiL.

Aim of the project: The aim of the project was an organization of nationwide robotics competition. The event had to allow students from different stage of education to rival in different tournament competitions as: Lego Line Follower, Lego Sumo and Lego Sumo Extreme. Moreover, the project was to develop new constructions of two mobile robots and to present them during the event. Simultaneously to the main activities, students aimed to build a few small test constructions during training meetings.

Expected results: The result of the project was expected to be integration of club members and improvement of their organizations skills. Young and inexperienced students participation was treated as a very important issue. The project aimed to promote Warsaw University of Technology, Faculty of Electronics and Information Technology and Students Robotics Interest Club „Bionik". Moreover the increase of students robot constructions and programming competences was expected.

Keywords: robot competitions, sport robot, students robotics interest club

[PR14] Dean's Grant No. 504/02061/1031. **Coordination of reinforcement learning algorithms in cooperative, multi-agent systems**

Granting period: 06-05-2015 30-06-2016.

Principal investigator: Pałka Piotr.

Aim of the project: The aim of the project is to analyse algorithms for coordination in multi-agent systems using reinforcement learning methods. The precise formulation of generic reinforcement learning algorithm, that is used for coordination of Individual Learners (IL) by the Coalition Learner (CL) is done. On the base of literature review, five methods for Q function (and other parameters) modification was proposed: Distributed Q-learning, Dynamic Q-learning, Hysteretic and lenient learners, Win-or-learn fast policy hill climbing and Recursive frequency maximum Q-value. The methods are used in generic reinforcement learning algorithm for Q function of Individual Learner and Coalition Learner modification. The set of games for testing the algorithms is completed. The games are: Deterministic / Stochastic Game, Deterministic / Partially Stochastic / Fully Stochastic Climbing Game. Those games characterizes with different problems of individual learners coordination i.e.: Pareto-selection, non-stationarity, stochasticity, alter-exploration and shadowed equilibrium. Moreover, the simple auction game (double auction game) and complex auction game (optimal power flow auction game) are proposed. We developed the application for simulation of Individual Learners behaviour in the different cases, games and Q function of the

Individual and Coalition Learner modification methods situation. The experiments for different games, and methods are developed.

Expected results: implementation of cooperative games (state-of-the-art, auction), analysis of the reinforcement learning algorithms for coordination in multi-agent systems for state-of-the-art games, analysis of the reinforcement learning algorithms for coordination in multi-agent systems for simple auction games, analysis of the reinforcement learning algorithms for coordination in multi-agent systems for complex auction games.

Keywords: multi-agent systems, agents coordination, agents cooperation, reinforcement learning.

[PR15] Dean's Grant No. 504/02060/1031 **System percepcji siły w opuszkach palców robotów usługowych.**

Granting period: 06-05-2015 31-12-2015.

Principal investigator: Seredyński Dawid.

Aim of the project: The extension of the perception system of upper-body humanoid robot 'Velma' and Irp6 robots.

Expected results: New sensors added to robots in IAiIS laboratory should improve their sensing capabilities for a vast group of tasks.

Keywords: service robot, perception system, gripper, force sensing

[PR16] Dean's Grant No. 504/02062/1031 System szybkiego sprzężenia w regulacji napędów protypowego robota usługowego IRp6. Granting period: 06-05-2015 31-12-2015.

Principal investigator: Walęcki Michał.

Aim of the project: The aim of the project was to modernize IRp6 robots by employing state-of-the-art motor controllers with EtherCAT interface.

Expected results: IRp6 robots modification was a part of modernization strategy of Robot Control and Pattern Recognition Group laboratories equipment and a preparation for "Protazy" service robot development program. The implementation of EtherCAT provided a reliable high-bandwidth communication with robot drives that is essential in real-time motion control with regulators running on an external computer system.

Keywords: robot motion control, motor controllers, EtherCAT

[PR17] Research agreement No. 501210101128 with SORTER: **Elaboration of kinematic models of modified SUR15 and SUR35 robots.**

Granting period: 20-04-2015 15-05-2015.

Principal investigator: Tomasz Winiarski.

Aim of the project: At the beginning of the work it was decided to use the Denavit – Hartenberg notation to describe the kinematic chains of manipulators. The work was carried out sequentially for each of the two manipulators. At first, the homogeneous matrices that relates the coordinate systems of neighboring links were determined. Then, by appropriate multiplication of particular matrices, the final relation of manipulator end-effector and base system was calculated. It constitutes the direct kinematics algorithm. Further, the problem of inverse kinematics was solved, by determination of subsequent joints angles according to desired end-effector pose. The considerations take into account the kinematic singularities. The compatibility of algorithms that solve direct and inverse kinematics has been confirmed in MATLAB simulations. Both algorithms were implemented as the OROCOS system components and are ready to be integrated into the real robot controllers.

Expected results: As a result, it was possible to integrate the new algorithms that solve direct and inverse kinematics of modified SUR15 and SUR35 robots into existing robot controllers.

Keywords: robot, manipulator, kinematics.

[PR18] Research agreement No. 501230102314 with Fortimimus: **The study on the innovativness of a system proposed for DVDMAX LLC. Company.**

Granting period: 23.01.2015 04.12.2015.

Principal investigator: Andrzej Zalewski.

[PR19] Research agreement No. 501210101067 with Sąd Okręgowy w W-wie I Wydział Cywilny: **Expert opinion explaining the reasons of project delay, prepared on the commission of Regional Court in Warsaw, case signature I C 864/10.**

Granting period: 01.03.2015 11.03.2015.

Principal investigator: Andrzej Zalewski.

[PR20] Research agreement No. 501230102139 with Sąd Okręgowy w W-wie I Wydział Cywilny: **Supplement to the expert opinion in I C 864/10 case.**

Granting period: 01.10.2015 19.10.2015.

Principal investigator: Andrzej Zalewski.

5 Degrees Awarded

5.1 Ph.D. Degrees

Advisor: **Prof. Andrzej Pacut**

Marcin Chochowski
Template protection mechanisms for iris binary codes
Thesis defended on December 8, 2015

Bartosz Papis
State abstraction in reinforcement learning
Thesis defended on November 17, 2015

Advisor: **Prof. Ewa Niewiadomska-Szynkiewicz**

Andrzej Sikora
Modelowanie i symulacja rozproszona mobilnych sieci ad-hoc
Thesis defended on November 23, 2015

Michał Marks
System lokalizacji urządzeń tworzących bezprzewodowe sieci sensorów
Thesis defended on November 10, 2015

Advisor: **Prof. Włodzimierz Ogryczak**

Paweł Olender
Zagadnienia lokalizacyjne ze złożonymi modelami preferencji
Thesis defended on June 11, 2015

5.2 M.Sc. Degrees

Advisor: **Piotr Arabas**

W. Gruszczyński
Analiza sieci społecznościowej jako narzędzie redukcji odejść użytkowników z sieci telekomunikacyjnej
Degree awarded on May 2015

D. Latocha
Przydział węzłów oraz grupowanie użytkowników systemów rzeczywistości wirtualnej
Degree awarded on September 2015

Advisor: **Włodzimierz Dąbrowski (Wydział Elektryczny)**

P. Schab (OKNO)
Analityka biznesowa jako narzędzie wsparcia procesów biznesowych w organizacjach
Degree awarded on October 2015

Advisor: **Paweł Domański**

K. Koniuszewski
Modelowanie i identyfikacja obiektu rzeczywistego na podstawie danych historycznych
Degree awarded on October 2015

Advisor: **Janusz Granat**

J. Tyburski
Integracja hurtowni danych z oprogramowaniem Apache Hadoop
Degree awarded on March 2015

Advisor: **Mariusz Kaleta**

A. Ramatowski
Analiza możliwości integracji M3 z CXML
Degree awarded on March 2015

D. Pogrebniak
Rozwój programu Modgraf do rozwiązywania problemów grafowych
Degree awarded on March 2015

K. Sadowski (OKNO)
Wykorzystanie architektury CQRS do tworzenia wysokowydajnych i skalowalnych systemów klasy enterprise
Degree awarded on June 2015

Advisor: **Tomasz Kornuta**

Ł. Żmuda
Narzędzia do akwizycji i zarządzania bazą wiedzy robota usługowego
Degree awarded on March 2015

M. Laszkowki
Porównanie metod rozpoznawania obiektów trójwymiarowych w obrazach RGB-D
Degree awarded on September 2015

Advisor: **Włodzimierz Kasprzak**

K. Przerwa
Zastosowanie algorytmu Shape from Shading do rekonstrukcji powierzchni obiektów na obrazach IR
Degree awarded on March 2015

Advisor: **Adam Kozakiewicz**

P. Szynkiewicz
Wytwarzanie off – line sygnatur zagrożeń aktywnych
Degree awarded on March 2015 (with honors)

Advisor: **Tomasz Kruk**

M. Gładki
Zastosowanie reguł biznesowych w motoryzacji
Degree awarded on March 2015

P. Cebulski
Sieci neuronowe do wykrywania robaków sieciowych
Degree awarded on September 2015

Advisor: **Bartłomiej Kubica**

M. Owsianka (OKNO)
Ocena i porównanie Canvas z SUG w użyciu HTML5 w aplikacji internetowej
Degree awarded on April 2015

Ł. Cymerman (OKNO)
Bezpieczeństwo systemów cloud computing
Degree awarded on April 2015

B. Owczarek
Równoległe algorytmy obliczania wartości własnych macierzy przedziałowych
Degree awarded on September 2015

Advisor: **Adam Krzemienowski**

Ł. Gajownik
Warunkowanie rozkładu najgorszego przypadku stóp zwrotu modelami wyceny aktywów kapitałowych
Degree awarded on March 2015

M. Szewczyk
Walidacja, weryfikacja i testowanie symulatora gry rynkowej
Degree awarded on April 2015

Advisor: **Maciej Ławryńczuk**

Ł. Woźniak
Zastosowanie algorytmów inteligencji roju do uczenia sieci neuronowych
Degree awarded on March 2015

Advisor: **Tomasz Martyn (II)**

J. Tyszka
Analiza zastosowania uproszczonego modelu dynamiki do animowania szkieletowego obiektów humanoidalnych
Degree awarded on March 2015

Advisor: **Piotr Marusak**

Ł. Jendrzejek
Zastosowanie rozmytych modeli Takagi-Sugeno w strukturach sterowania nieliniowych obiektów regulacji z optymalizacją punktów pracy kooperującą z algorytmami regulacji predykcyjnej
Degree awarded on June 2015 (with honors)

Advisor: **Jan Mulawka (ISE)**

R. Kaczmarek
System czyszczenia danych adresowych z wykorzystaniem słowników referencyjnych i algorytmów odległości edycyjnej
Degree awarded on March 2015

Advisor: **Julian Myrcha (II)**

M. Włodarczyk
Wykorzystanie biblioteki OpenCl we wspomaganiu obliczeń w widzeniu stereoskopowym
Degree awarded on March 2015

Advisor: **Ewa Niewiadomska- Szynkiewicz**

J. Śmietanka
Lokalizacja węzłów heterogenicznej sieci ad-hoc
Degree awarded on May 2015

A.Śleszyński
Energooszczędne algorytmy agregacji I transmisji danych w bezprzewodowych sieciach sensorowych
Degree awarded on June 2015

A.Antoniuk
Energooszczędne algorytmy agregacji danych w bezprzewodowych sieciach sensorowych
Degree awarded on September 2015

K. Werys
Profilownie złożonych aplikacji obliczeniowych realizowanych w środowisku rozproszonym
Degree awarded on September 2015

Advisor: **Piotr Pałka**

E. Leśniewski
Wykorzystanie modeli równowagowych w problemach regulacyjnych
Degree awarded on June 2015

Advisor: **Krzysztof Pieńkosz**

M. Woźniak
Algorytmy dekompozycji przepływu sieciowego na zbiór ścieżki o ograniczonej długości
Degree awarded on March 2015

Advisor: **Grzegorz Protaziuk (II)**

J. Plebanek (OKNO)
Wyszukiwanie semantyczne w wielozródłowym repozytorium dokumentów tekstowych
Degree awarded on March 2015

Advisor: **Andrzej Ratkowski**

P. Raczkowski
Wykorzystanie kontekstu w systemach Internetu rzeczy
Degree awarded on October 2015

E. Świątek
Badania nad architekturą systemów Internetu rzeczy w inteligentnych sieciach zdrowia
Degree awarded on October 2015

Advisor: **Przemysław Rokita (II)**

D. Olędzki
Rekonstrukcja trójwymiarowa sceny z wykorzystaniem czujnika głębi – implementacja algorytmów NARF i FPFH w technologii CUDA
Degree awarded on October 2015

Advisor: **Krzysztof Sacha**

D. Załuga
Zbieranie danych procesowych w chmurze obliczeniowej
Degree awarded on October 2015

Advisor: **Jerzy Sobczyk**

J. Such
System analizy wydajności aplikacji WWW
Degree awarded on June 2015

Advisor: **Janusz Sosnowski (II)**

K. Zakrzewski
System nadzoru procesu produkcji i serwisu urządzeń pomiarowych
Degree awarded on March 2015

Advisor: **Tomasz Śliwiński**

A.Cieśliński (OKNO)
Lokalizacja punktów usługowych dla ruchomych klientów
Degree awarded on June 2015

Advisor: **Eugeniusz Toczyłowski**

D. Góralczyk
Planowanie produkcji z uwzględnieniem dostaw w równoległych okresach zagregowanych
Degree awarded on March 2015

J. Lewandowska
Wpływ warunków kontraktu na jakość współpracy w łańcuchach dostaw
Degree awarded on March 2015

P. Kalinowski
Indywidualizacja nauczania w systemach e-Learningowych
Degree awarded on October 2015

Advisor: **Tomasz Traczyk**

A.Kurdo
Analiza możliwości zastosowania ontologii w metadanych zasobów cyfrowych
Degree awarded on March 2015 (with honors)

Advisor: **Paweł Wawrzyński**

M. Rosiewicz
Sprzężenie haptyczne w oparciu o serwomechanizm
Degree awarded on March 2015

M. Gawkowski
System wizyjny do obserwacji ruchu robotów mobilnych
Degree awarded on October 2015

Advisor: **Tomasz Winiarski**

P. Krajewski
System robotyczny na bazie ROS/OROCOS układający kostkę Rubika
Degree awarded on October 2015

Advisor: **Paweł Wnuk (Wydział Mechatroniki)**

P. Olejniczak (OKNO)
Środowisko programistyczne do optymalizacji przy wykorzystaniu algorytmów inteligencji masowej
Degree awarded on March 2015

Advisor: **Adam Woźniak**

R. Golcz
Projektowanie odpornych (robust) systemów sterowania
Degree awarded on February 2015

Advisor: **Andrzej Zalewski**

G. Bondyra
Model architektury oprogramowania w technologii Java zgodny ze standardem opisu architektury
Degree awarded on October 2015

Advisor: **Izabela Żółtowska**

K. Szmit
Biznesowe gry strategiczne w procesie edukacyjnym – analiza i projektowanie
Degree awarded on March 2015

5.3 B.Sc. Degrees

Advisor: **Janusz Granat**

B. Lesiak
Algorytmy routing w sieciach świadomych treści
Degree awarded on February 2015

T. Pęksa
Algorytm wykrywania anomalii w systemach zdalnego monitorowania stanu zdrowia pacjenta
Degree awarded on February 2015

Advisor: **Jerzy Gustowski**

K. Saienko
Zdalny nadzór I sterowanie procesem przez Internet
Degree awarded on February 2015

W. Kaczmar
Sterowanie I nadzorowanie procesu z wykorzystaniem urządzenia mobilnego
Degree awarded on June 2015

S. Zieliński
System wizualizacji danych układu Open -Hardware na urządzeniu mobilnym z systemem Android
Degree awarded on September 2015

P. Tymiński
Narzędzie informatyczne wspomagające debaty tekstowe w procesie deliberacji
Degree awarded on September 2015

Advisor: **Mariusz Kamola**

M. Cybulski
Mapa miejsc ciekawych
Degree awarded on February 2015

M.Pawluczuk
Analizator sieci społecznościowej w aspekcie kwalifikacji zawodowych
Degree awarded on September 2015

W. Ślęczka
Analizator pojęć zawartych w nazwach DNS
Degree awarded on September 2015

Advisor: **Tomasz Kornuta**

M. Kamionka
Porównanie metod domykania pętli w procesie generacji modeli obiektów
Degree awarded on February 2015

Advisor: **Adam Kozakiewicz**

D. Danielewicz
Bezpieczeństwo przekierowań w systemie Android wykorzystujących NFC i/lub QR
Degree awarded on February 2015

J. Modzelewski
Defacement honeypot – symulacja włamań na serwery WWW
Degree awarded on February 2015

Advisor: **Bartosz Kozłowski**

P. Stiasny
Aplikacja Web i Mobilna do Interaktywnego rejestrowania zdarzeń w obserwacji zachowań
Degree awarded on March 2015

M. Trojanowski
Autorska metoda analizy pola akustycznego
Degree awarded on September 2015

B. Lemiec
Aplikacja internetowa realizująca system wspomagania procesów biznesowych
Degree awarded on September 2015

M. Chilczuk
Rozszerzenia implementacji serwera git w języku Java o obsługę centralnego systemu uwierzytelniania
Degree awarded on September 2015

P. Banasiak
Aplikacja do wspomagania interaktywnego rejestrowania zdarzeń w obserwacji zachowań
Degree awarded on September 2015

Advisor: **Tomasz Jordan Kruk**

Ł. Gadawski
Testy jednostkowe Clojure z wykorzystaniem Apache Maven
Degree awarded on February 2015

G. Piwowarek
Wykorzystanie reguł biznesowych w kontekście gry giełdowej
Degree awarded on February 2015

Advisor: **Piotr Pałka**

B. Frączak
Porównanie narzędzi służących do implementacji systemów wieloagentowych
Degree awarded on February 2015

Ch. Regliński
Zastosowanie mechanizmów aukcyjnych do zarządzania zasobami lotniskowymi
Degree awarded on February 2015

M. Proc
Rozproszone podejmowanie decyzji o trasie pakietu danych w sieci DTN
Degree awarded on February 2015

Advisor: **Andrzej Ratkowski**

P. Stępień
Aplikacja w infrastrukturze Google App Engine umożliwiająca biegającym wzajemną rywalizację z wrażeniem czasu rzeczywistego
Degree awarded on September 2015

J. Elznerowicz
Aplikacja mobilna wspomagająca działalność aeroklubu wykorzystująca platformę Google App Engine
Degree awarded on September 2015

Advisor: **Ryszard Romaniuk**

T. Szleter
Oprogramowanie systemu akwizycji danych do eksperymentu NA61
Degree awarded on February 2015

Advisor: **Jerzy Sobczyk**

M. Browarski
Modyfikacja protokołu DNS
Degree awarded on February 2015

Advisor: **Andrzej Stachurski**

M. Kobuszewski
Monitorowanie prób uzyskiwania dostępu I zmiany ustawień na komputerze
Degree awarded on April 2015

P. Dybka
Dane EXIF w zdjęciach cyfrowych
Degree awarded on September 2015

Advisor: **Marcin Szlenk**

M. Malesa
Internetowy system dokumentowania decyzji architektonicznych
Degree awarded on September 2015

Advisor: **Tomasz Śliwiński**

R. Niewczas
System bezpiecznego i trwałego przechowywania danych
Degree awarded on October 2015

Advisor: **Eugeniusz Toczyłowski**

V. Kopchak
Aplikacja mobilna wspierająca świadome zakupy produktów spożywczych
Degree awarded on April 2015

Advisor: **Tomasz Traczyk**

M. Kucharski
Generator raportów z baz danych w technologii XSL-FO bazujący na wzorcach
Degree awarded on September 2015

Advisor: **Paweł Wawrzyński**

M. Majczak
Zdalnie sterowany Segway
Degree awarded on February 2015

M. Kraluk
Projekt I model małego modularnego manipulatora
Degree awarded on February 2015

Advisor: **Tomasz Winiarski**

A. Karbarczyk
Robot IRp-6 grający w warcaby
Degree awarded on February 2015

B. Kaczor
Budowa platform mobilnej o napędzie różnicowym
Degree awarded on February 2015

A.Wujek
Robot IRp-6 w zadaniu rysowania
Degree awarded on June 2015

Ł. Korpal
Budowa ściany z klocków Lego za pomocą robota IRP-6
Degree awarded on September 2015

K.Olszewska
Robot Elektron w zadaniu zbierania piłeczek tenisa stołowego
Degree awarded on September 2015

P. Rzeczyca
Robot IRp-6 grający w wilka i zająca
Degree awarded on October 2015

6 Publications

6.1 Scientific or Technical Books

[B1] R. Mansini, W. Ogryczak, and G. M. Speranza, *Linear and Mixed Integer Programming for Portfolio Optimization*. Springer, 2015.

[B2] K. Malinowski, J. Józefczyk, and J. Swiętoń, eds., *Aktualne problemy automatyki i robotyki*. Akademicka Oficyna Wydawnicza EXIT, 2015.

[B3] R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds., *Progress in Automation, Robotics and Measuring Techniques. vol. 1 Control and Automation*, vol. 350 of *Advances in Intelligent Systems and Computing*. Springer, 2015.

[B4] R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds., *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics*, vol. 351 of *Advances in Intelligent Systems and Computing*. Springer, 2015.

[B5] R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds., *Progress in Automation, Robotics and Measuring Techniques Volume 3 Measuring Techniques and Systems*, vol. 352 of *Advances in Intelligent Systems and Computing*. Springer, 2015.

6.2 Scientific and Technical Papers in Journals

[J1] A. Czajka, "Pupil dynamics for iris liveness detection", *IEEE Transactions on Information Forensics and Security*, vol. 10, no. 4, pp. 726–735, 2015.

[J2] M. Janiak and C. Zieliński, "Control system architecture for the investigation of motion control algorithms on an example of the mobile platform rex", *Bulletin of the Polish Academy of Sciences, Technical Sciences*, vol. 63, no. 3, pp. 667–678, 2015.

[J3] M. Kamola, S. Plamowski, C. Godlejewski, K. Antoniewicz, and A. Gromnicki, "Problem optymalnego tłoczenia gazu w sieci wysokiego ciśnienia", *Nafta-Gaz*, no. 1/2015, pp. 24–32, 2015.

[J4] A. Karbowski, "Uogólniona metoda Bendersa dekompozycji mieszanych, nieliniowych zadań optymalizacji", *Przegląd Elektrotechniczny*, vol. 91, no. 9/2015, pp. 226–234, 2015.

[J5] M. Karpowicz, P. Arabas, and E. Niewiadomska-Szynkiewicz, "Energy-aware multilevel control system for a network of linux software routers: Design and implementation", *IEEE Systems Journal*, vol. PP, no. 99, pp. 1–12, 2015.

[J6] T. M. Kornuta and C. Zieliński, "Robot control system design exemplified by multi-camera visual servoing", *Journal of Intelligent & Robotic Systems*, vol. 77, no. 3-4, pp. 499–523, 2015.

[J7] A. Kozakiewicz and K. Lasota, "Adaptacja mechanizmu DRM do ochrony dokumentów niepublicznych", *Przegląd Telekomunikacyjny - Wiadomości Telekomunikacyjne*, no. 8-9, pp. 938–945, 2015.

[J8] A. Kozakiewicz, K. Lasota, and M. Marks, "Intrusion detection in heterogeneous networks of resource-limited things", *Journal of Telecommunications and Information Technology*, vol. 2015, no. 4, pp. 10–14, 2015.

[J9] L. Kruś and E. Toczyłowski, "Remarks on designing iteractive multicriteria procurement auctions", *Multiple Criteria Decision Making*, vol. 2014, no. 9, pp. 32–47, 2015.

[J10] B. J. Kubica, "Presentation of a highly tuned multithreaded interval solver for underdetermined and well-determined nonlinear systems", *Numerical Algorithms*, pp. 1–35, 2015.

[J11] M. Ławryńczuk, "Nonlinear predictive control Forhammerstein-Wiener systems", *ISA Transactions*, vol. 55, pp. 49–62, 2015.

[J12] M. Ławryńczuk, "Nonlinear state-space predictive control with on-line linearisation and state estimation", *International Journal of Applied Mathematics & Computer Science*, vol. 25, no. 4, pp. 833–847, 2015.

[J13] P. Malec, A. Piwowar, A. A. Kozakiewicz, and K. Lasota, "Detecting security violations based on multilayered eventlog processing", *Journal of Telecommunications and Information Technology*, vol. 2015, no. 4, pp. 30–36, 2015.

[J14] P. Marusak and S. Kuntanapreeda, "Output constrained IMC controllers in control systems of electromechanical actuators", *Control Theory and Technology*, vol. 13, no. 3, pp. 245–255, 2015.

[J15] A. Mościcka and W. Ogryczak, "Ranking uczelni wyższych w oparciu o metody punktu odniesienia", *Metody ilościowe w badaniach ekonomicznych*, vol. XVI/4, pp. 44–53, 2015.

[J16] E. Niewiadomska-Szynkiewicz, A. Sikora, P. P. Arabas, and K. Malinowski, "Energy-saving management in computer networks", *Australian Journal of Electric and Electronic Engineering*, vol. 12, no. 3, pp. 242–152, 2015.

[J17] W. Ogryczak and P. Olender, "Ordered median problem with demand distribution weights", *Optimization Letters*, pp. 1–16, 2015.

[J18] K. Pieńkosz and K. Kołtyś, "Integral flow decomposition with minimum longest path length", *European Journal of Operational Research*, vol. 247, no. 2, pp. 414–420, 2015.

[J19] J. M. Putz-Leszczyńska, "Signature verification: A comprehensive study of the hidden signature method", *International Journal of Applied Mathematics & Computer Science*, vol. 25, no. 3, pp. 659–674, 2015.

[J20] P. Szynkiewicz and A. A. Kozakiewicz, "System wytwarzania off-line sygnatur zagrożeń aktywnych", *Przegląd Telekomunikacyjny - Wiadomości Telekomunikacyjne*, no. 8-9/2015, pp. 1–9, 2015.

[J21] W. Szynkiewicz, "Robot grasp synthesis under object pose uncertainty", *Journal of Automation, Mobile Robotics and Intelligent Systems*, vol. 9, no. 1, pp. 53–61, 2015.

[J22] P. Tatjewski, M. Ławryńczuk, P. Marusak, M. Rubik, P. Ziętek, Maciej Szumski, and Michał Szumski, "Opracowanie i konstrukcja regulatora pompy ciepła typu powietrze-woda: modelowanie obiektu", *Pomiary Automatyka Robotyka*, vol. 19, no. 1/2015, pp. 20–28, 2015.

[J23] J. Wasilewski, M. Kaleta, and D. Baczyński, "Wybrane zagadnienia rozwoju mikrosieci energetycznych w polsce", *Polityka Energetyczna / Energy Policy Journal*, vol. 18, no. 1, pp. 45–57, 2015.

[J24] P. Wawrzyński, "Control policy with autocorrelated noise in reinforcement learning for robotics", *International Journal of Machine Learning and Computing*, vol. 5, no. 2, pp. 91–95, 2015.

[J25] P. Wawrzyński, J. Możaryn, and J. Klimaszewski, "Robust estimation of walking robots velocity and tilt using proprioceptive sensors data fusion", *Robotics and Autonomous Systems*, vol. 66, pp. 44–54, 2015.

[J26] M. Węgierek, B. Świstak, and T. Winiarski, "Modularne środowisko do rywalizacji robotów sportowych śledzących linię", *Pomiary Automatyka Robotyka*, vol. 19, no. 3/2015, pp. 61–66, 2015.

[J27] A. Wierzbicki, M. Makowski, and J. Granat, "Robustness testing of model based multiple criteria decisions: Fundamentals and applications", *International Journal of Information Technology & Decision Making*, vol. 14, no. 5, pp. 1035–1062, 2015.

[J28] A. Wojtulewicz, P. Chaber, M. Ławryńczuk, "Stanowisko laboratoryjne do badania wielowymiarowych algorytmów regulacji", *Pomiary Automatyka Robotyka*, no 4, pp. 15–20, 2015.

[J29] G. Zalewski and W. Ogryczak, "Szacowanie kosztu sprawiedliwości alokacji obciążeń w sieci dla metody optymalizacji uporządkowanej średniej ważonej", *Metody ilościowe w badaniach ekonomicznych*, vol. XVI/4, pp. 230–241, 2015.

[J30] C. Zieliński and K. Tchoń, "Editorial: Robot perception", *Journal of Automation, Mobile Robotics and Intelligent Systems*, vol. 9, no. 1, pp. 3–4, 2015.

[J31] C. Zieliński and T. M. Kornuta, "Programowe struktury ramowe do tworzenia sterowników robotów", *Pomiary Automatyka Robotyka*, vol. 19, no. 1, pp. 5–14, 2015.

[J32] I. Żółtowska, "Direct minimum-uplift model for pricing pool-based auction with network constraints", *IEEE Transactions on Power Systems*, no. 99, pp. 1–8, 2015.

6.3 Scientific and Technical Papers in Books and Conference Proceedings

[P1] P. Chaber and M. Ławryńczuk, "Recurrent polynomial and neural structures in modelling of a neutralisation process," in *Progress in Automation, Robotics and Measuring Techniques. vol. 1 Control and Automation* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 350 of *Advances in Intelligent Systems and Computing*, pp. 23–32, Springer, 2015.

[P2] P. Domański and M. Więcławski, "Memory-based prediction of district heating temperature using GPGPU," in *Progress in Automation, Robotics and Measuring Techniques. vol. 1 Control and Automation* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 350 of *Advances in Intelligent Systems and Computing*, pp. 33–42, Springer, 2015.

[P3] J. Figat and W. Kasprzak, "Nao-mark vs qr-code recognition by Nao robot vision," in *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 351 of *Advances in Intelligent Systems and Computing*, pp. 55–64, Springer, 2015.

[P4] W. Gutfeter and A. Pacut, "Człowiek w systemie biometrycznym," in *Dokumenty a prawo. Prawne oraz praktyczne aspekty korzystania z dokumentów i e-dokumentów* (M. Tomaszewska-Michalak and T. Tomaszewski, eds.), pp. 79–88, Stowarzyszenie Absolwentów Wydziału Prawa i Administracji UW, 2015.

[P5] A. Karbowski, "Decomposition and parallelization of linear programming algorithms," in *Progress in Automation, Robotics and Measuring Techniques. vol. 1 Control and Automation* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 350 of *Advances in Intelligent Systems and Computing*, pp. 113–126, Springer, 2015.

[P6] T. M. Kornuta, T. Winiarski, and C. Zieliński, "Specification of abstract robot skills in terms of control system behaviours," in *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 351 of *Advances in Intelligent Systems and Computing*, pp. 139–152, Springer, 2015.

[P7] R. Mansini, W. Ogryczak, and M. Grazia Speranza, "Portfolio optimization and transaction costs," in *Quantitative Financial Risk Management: Theory and Practice* (C. Zopounidis and E. Galariotis, eds.), pp. 212–241, Wiley Online Library, 2015.

[P8] E. Niewiadomska-Szynkiewicz and A. Sikora, "Simulation-based evaluation of robot-assisted wireless sensors positioning," in *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 351 of *Advances in Intelligent Systems and Computing*, pp. 181–190, Springer, 2015.

[P9] M. Szlenk, C. Zieliński, M. Figat, and T. M. Kornuta, "Reconfigurable agent architecture for robots utilising cloud computing," in *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 351 of *Advances in Intelligent Systems and Computing*, pp. 253–264, Springer, 2015.

[P10] E. G. Tsardoulias, C. Zieliński, W. Kasprzak, S. Reppou, A. L. Symeonidis, P. A. Mitkas, and G. Karagiannis, "Merging robotics and aal ontologies: The RAPP methodology," in *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 351 of *Advances in Intelligent Systems and Computing*, pp. 285–297, Springer, 2015.

[P11] T. Winiarski, K. Banachowicz, and D. Seredyński, "Two mode impedance control of Velma service robot redundant ARM," in *Progress in Automation, Robotics and Measuring Techniques. vol. 2 Robotics* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 351 of *Advances in Intelligent Systems and Computing*, pp. 319–328, Springer, 2015.

[P12] A. Wysocki and M. Ławryńczuk, "Predictive control of a multivariable neutralisation process using Elman neural networks," in *Progress in Automation, Robotics and Measuring Techniques. vol. 1 Control and Automation* (R. Szewczyk, C. Zieliński, and M. Kaliczyńska, eds.), vol. 350 of *Advances in Intelligent Systems and Computing*, pp. 335–344, Springer, 2015.

[P13] P. Chaber and M. Ławryńczuk, "RBF neural networks for modelling and predictive control: An application to a neutralisation process," in *Methods and Models in Automation and Robotics (MMAR), 2015 20th International Conference on*, pp. 776–781, ZAPOL Sobczyk Sp.j., 2015.

[P14] A. Czajka and K. Bowyer, "Statistical analysis of multiple presentation attempts in iris recognition," in *Cybernetics (CYBCONF), 2015 IEEE 2nd International Conference on* (P. Jedrzejowicz, N. T. Nguyen, T.-p. Hong, and I. Czarnowski, eds.), pp. 483 – 488, IEEE, 2015.

[P15] A. Czajka and K. Bowyer, "Statistical evaluation of up-to-three-attempt iris recognition," in *2015 IEEE 7th International Conference on Biometrics Theory, Applications and Systems (BTAS 2015)*, pp. 1–6, IEEE, 2015.

[P16] P. Domański, "Non-gaussian properties of the real industrial control error in siso loops," in *System Theory, Control and Computing (ICSTCC), 2015 19th International Conference on*, pp. 877–882, IEEE, 2015.

[P17] M. Figat, T. M. Kornuta, M. Szlenk, and C. Zieliński, "Distributed, reconfigurable architecture for robot companions exemplified by a voice-mail application," in *Methods and Models in Automation and Robotics (MMAR), 2015 20th International Conference on*, pp. 1092–1097, ZAPOL Sobczyk Sp.j., 2015.

[P18] W. Gutfeter and A. Pacut, "Face 3d biometrics goes mobile: Searching for applications of portable depth sensor in face recognition," in *Cybernetics (CYBCONF), 2015 IEEE 2nd International Conference on* (P. Jedrzejowicz, N. T. Nguyen, T.-p. Hong, and I. Czarnowski, eds.), pp. 489 – 494, IEEE, 2015.

[P19] X. He, C. Zieliński, S. Davy, and L. Shi, "A constrained guess-check approach for resource allocation in the robot control system design," in *Advances in Reconfigurable Mechanisms and Robots II* (X. Ding, X. Kong, and J. Dai, eds.), pp. 1–10, Springer International Publishing, 2015.

[P20] M. Kamola, "Estimation of correlated flows from link measurements," in *Proceedings of the 20th International Conference on Methods and Models in Automation and Robotics*, pp. 272–277, 2015. ZAPOL Sobczyk s.j.

[P21] M. Kamola, "Protecting privacy of gps trails by anonymization of the road graph," in *The First International Workshop on Smart Cities and Urban Analytics*, pp. 1–4, Springer, 2015.

[P22] A. Karbowski, M. Majchrowski, T. Pokorski, P. Trojanek, and D. Załuga, "JPAR – a simple, free and lightweight tool for parallelizing matlab calculations on multicores and in clusters," in *Position Papers of the 2015 Federated Conference on Computer Science and Information Systems* (M. Ganzha, L. A. Maciaszek, and M. Paprzycki, eds.), vol. 6 of *Annals of Computer Science and Information Systems*, pp. 91–96, PTI, 2015.

[P23] A. Karbowski and P. Jaskóła, "Two approaches to dynamic power management in energy-aware computer networks – methodological considerations," in *Proceedings of the Federated Conference on Computer Science and Information Systems – FedCSIS'2015* (M. Ganzha, L. A. Maciaszek, and M. Paprzycki, eds.), vol. 5 of *Annals of Computer Science and Information Systems*, pp. 1177–1181, PTI, 2015.

[P24] W. Kasprzak, R. Pietruch, K. Bojar, A. Wilkowski, and T. M. Kornuta, "Integrating data- and model-driven analysis of rgb-d images," in *Intelligent Systems'2014 Proceedings of the 7th IEEE International Conference Intelligent Systems IS'2014 Vol 2: Tools, Architectures, Systems, Applications* (D. Filev, J. Jabłkowski, J. Kacprzyk, M. Krawczak, and I. Popchev, eds.), vol. 323 of *Advances in Intelligent Systems and Computing*, pp. 605–616, Springer, 2015.

[P25] W. Kasprzak, M. Stefańczyk, and A. Wilkowski, "Printed steganography applied for the authentication of identity photos in face verification," in *Cybernetics (CYBCONF), 2015 IEEE 2nd International Conference on* (P. Jedrzejowicz, N. T. Nguyen, T.-p. Hong, and I. Czarnowski, eds.), pp. 512 – 517, IEEE, 2015.

[P26] A. Kozakiewicz and K. Lasota, "Secure drm mechanism for offline applications," in *Proceedings of International Conference on Military Communications and Information Systems (ICMCIS 2015)*, vol. CD-ROM, pp. 1–8, IEEE, 2015.

[P27] M. Kruczkowski, E. Niewiadomska-Szynkiewicz, and A. Kozakiewicz, "Cross-layer analysis of malware datasets for malicious campaigns identification," in *Proceedings of International Conference on Military Communications and Information Systems (ICMCIS 2015)*, vol. CD-ROM, pp. 1–7, IEEE, 2015.

[P28] M. Kruczkowski, E. Niewiadomska-Szynkiewicz, and A. A. Kozakiewicz, "Fp-tree and svm for malicious web campaign detection," in *Intelligent Information and Database Systems. Proceeding of 7th Asian Conference, ACIIDS 2015. Part II* (N. T. Nguyen, B. Trawiński, and R. Kosala, eds.), vol. 9012 of *Lecture Notes In Computer Science*, pp. 193–201, Springer, 2015.

[P29] M. Krzysztoń and B. Śnieżyński, "Combining machine learning and multi-agent approach for controlling traffic at intersections," in *Computational Collective Intelligence 7th International Conference, ICCCI 2015, Madrid, Spain, September 21-23, 2015, Proceedings, Part I* (M. Núñez, N. T. Nguyen, D. Camacho, and B. Trawiński, eds.), vol. 9329 of *Lecture Notes in Artificial Intelligence*, pp. 57–66, Springer, 2015.

[P30] M. Ławryńczuk, "Approximate state-space model predictive control," in *Proceedings of the 20th International Conference on Methods and Models in Automation and Robotics*, pp. 770–775, 2015. ZAPOL Sobczyk s.j.

[P31] M. Majczak and P. Wawrzyński, "Comparison of two efficient control strategies for two-wheeled balancing robot," in *Proceedings of the 20th International Conference on Methods and Models in Automation and Robotics*, pp. 744–749, 2015. ZAPOL Sobczyk s.j.

[P32] W. Ogryczak and J. Hurkała, "Determining owa operator weights by maximum deviation minimization," in *Pattern Recognition and Machine Intelligence. Proceedings* (M. Kryszkiewicz, S. Bandyopadhy, H. Rybiński, and K. Sankar, eds.), vol. 9124 of *Lecture Notes In Computer Science*, pp. 335–344, Springer International Publishing, 2015.

[P33] W. Ogryczak, J. Hurkała, and T. Śliwiński, "Importance weighted max-min fairness and related compensatory models for network resource allocation," in *Proceedings of the 7th International Network Optimzation Conference - INOC 2015* (M. Pióro, J. Rak, and A. Tomaszewski, eds.), pp. 1–6, 2015.

[P34] W. Ogryczak, M. Przyłuski, and T. Śliwiński, "Portfolio optimization with reward-risk ratio measure based on the conditional value-at-risk," in *World Congress on Engineering and Computer Science* (S. Ao, C. Douglas, W. Grundfest, and J. Burgstone, eds.), vol. II, pp. 913–918, Newswood Limited, 2015.

[P35] P. Pałka, J. Stańczak, W. Radziszewska, and Z. Nahorski, "Multi-agent auction simulation of the GHG international emission permit trading," in *4th International Workshop on Uncertainty in Atmospheric Emissions Proceedings*, pp. 159–176, IBS PAN, 2015.

[P36] K. Pieńkosz and A. Prus, "Task scheduling with restricted preemptions on two parallel processors," in *Methods and Models in Automation and Robotics (MMAR), 2015 20th International Conference on*, pp. 58–61.

[P37] W. Pikulski and K. Sacha, "Freshness constraints semantics of rt framework credentials," in *Theory and Engineering of Complex Systems and Dependability. Proceedings of the Tenth International Conference on Dependability and Complex Systems DepCoS-RELCOMEX* (W. Zamojski, J. Mazurkiewicz, J. Sugier, T. Walkowiak, and J. Kacprzyk, eds.), vol. 365 of *Advances in Intelligent Systems and Computing*, pp. 359–368, Springer International Publishing, 2015.

[P38] J. M. Putz-Leszczyńska, "Writer identification – clustering letters with unknown authors," in *Drawing, Handwriting Processing Analysis: New Advances and Challenges. Proceedings of the 17th Biennial Conference of the International Graphonomics Society* (C. Remi, L. Prévost, and E. Anquetil, eds.), pp. 131–134, International Graphonomics Society, 2015.

[P39] D. Seredyński, T. Winiarski, K. Banachowicz, and C. Zieliński, "Grasp planning taking into account the external wrenches acting on the grasped object," in *Proceedings of the 10th International Workshop on Robot Motion and Control* (K. Kozłowski, ed.), pp. 40–45, Poznan University of Technology, 2015.

[P40] A. Sikora, E. Niewiadomska-Szynkiewicz, and M. Krzysztoń, "Simulation of mobile wireless ad hoc networks for emergency situation awareness," in *Proceedings of the Federated Conference on Computer Science and Information Systems – FedCSIS'2015* (M. Ganzha, L. A. Maciaszek, and M. Paprzycki, eds.), vol. 5 of *Annals of Computer Science and Information Systems*, pp. 1087–1095, PTI, 2015.

[P41] M. Trokielewicz, A. Czajka, and P. Maciejewicz, "Assessment of iris recognition reliability for eyes affected by ocular pathologies," in *2015 IEEE 7th International Conference on Biometrics Theory, Applications and Systems (BTAS 2015)*, pp. 1–6, IEEE, 2015.

[P42] M. Trokielewicz, A. Czajka, and P. Maciejewicz, "Database of iris images acquired in the presence of ocular pathologies and assessment of iris recognition reliability for disease-affected eyes," in

Cybernetics (CYBCONF), 2015 IEEE 2nd International Conference on (P. Jedrzejowicz, N. T. Nguyen, T.-p. Hong, and I. Czarnowski, eds.), pp. 495 – 500, IEEE, 2015.

[P43] M. Trokielewicz, E. Bartuzi, K. Michowska, A. Andrzejewska, and M. Selegrat, "Exploring the feasibility of iris recognition for visible spectrum iris images obtained using smartphone camera," in *Proceedings of SPIE, Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments* (R. Romaniuk, ed.), vol. 9662, pp. 1–8, SPIE, 2015.

[P44] P. Wawrzyński, "Robot's velocity and tilt estimation through computationally efficient fusion of proprioceptive sensors readouts," in *Methods and Models in Automation and Robotics (MMAR), 2015 20th International Conference on*, pp. 738–743, ZAPOL Sobczyk Sp.j., 2015.

[P45] A. Wilkowski, T. M. Kornuta, and W. Kasprzak, "Point-based object recognition in rgb-d images," in *Intelligent Systems'2014 Proceedings of the 7th IEEE International Conference Intelligent Systems IS'2014 Vol 2: Tools, Architectures, Systems, Applications* (D. Filev, J. Jabłkowski, J. Kacprzyk, M. Krawczak, and I. Popchev, eds.), vol. 323 of *Advances in Intelligent Systems and Computing*, pp. 593–604, Springer, 2015.

[P46] T. Winiarski and K. Banachowicz, "Automated generation of component system for the calibration of the service robot kinematic parameters," in *Methods and Models in Automation and Robotics (MMAR), 2015 20th International Conference on*, pp. 1098–1103, ZAPOL Sobczyk Sp.j., 2015.

[P47] T. Winiarski, K. Banachowicz, and D. Seredyński, "Multi-sensory feedback control in door approaching and opening," in *Intelligent Systems'2014 Proceedings of the 7th IEEE International Conference Intelligent Systems IS'2014 Vol 2: Tools, Architectures, Systems, Applications* (D. Filev, J. Jabłkowski, J. Kacprzyk, M. Krawczak, and I. Popchev, eds.), vol. 323 of *Advances in Intelligent Systems and Computing*, pp. 57–70, Springer, 2015.

[P48] A. Wysocki and M. Ławryńczuk, "Jordan neural network for modelling and predictive control of dynamic systems," in *Methods and Models in Automation and Robotics (MMAR), 2015 20th International Conference on*, pp. 145–150, ZAPOL Sobczyk Sp.j., 2015.

[P49] C. Zieliński and T. M. Kornuta, "An object-based robot ontology," in *Intelligent Systems'2014 Proceedings of the 7th IEEE International Conference Intelligent Systems IS'2014 Vol 2: Tools, Architectures, Systems, Applications* (D. Filev, J. Jabłkowski, J. Kacprzyk, M. Krawczak, and I. Popchev, eds.), vol. 323 of *Advances in Intelligent Systems and Computing*, pp. 3–14, Springer, 2015.

[P50] C. Zieliński, W. Szynkiewicz, M. Figat, M. Szlenk, T. M. Kornuta, W. Kasprzak, M. Stefańczyk, T. Zielińska, and J. Figat, "Reconfigurable control architecture for exploratory robots," in *Proceedings of the 10th International Workshop on Robot Motion and Control* (K. Kozłowski, ed.), pp. 130–135, Poznan University of Technology, 2015.

6.4 Reports and Other Papers

[R1] P. P. Arabas, "Wizualizacja sieci złożonych: metody i narzędzia", research report 2015-16, 2015.

[R2] M. Kamola, "Możliwości tworzenia aplikacji analizujących dane z wielu publicznie dostępnych źródeł", research report 2015-17, 2015.

[R3] J. Król and A. Krzemienowski, "Portfolio optimization based on the worst-case distribution and the capital asset pricing model", research report 2015-13, 2015.

[R4] A. Krzemienowski, "A comparative analysis of portfolio optimization based on the robust conditional value-at-risk and the worst-case distribution", research report 2015-20, 2015.

[R5] A. Krzemienowski, “Portfolio optimization with a copula-based extension of conditional value-at-risk applied to the worst-case distribution of asset returns”, research report 2015-09, 2015.

[R6] M. Krzysztoń, “Śledzenie i wykrywanie kształtu chmury gazów ciężkich przy pomocy sieci manet”, research report 2015-11, 2015.

[R7] M. Laszkowski, “Porównanie działania wybranych algorytmów rozpoznawania obiektów w chmurach punktów”, research report 2015-10, 2015.

[R8] W. Ogryczak and P. Olender, “Mathematical programming models for general weighted OWA criteria”, research report 2015-03, 2015.

[R9] P. Pałka and A. Smoleń, “Coordination of reinforcement learning algorithms in cooperative, multi-agent systems”, research report 2015-21, 2015.

[R10] D. Seredyński and K. Banachowicz, “System percepcji siły w opuszkach palców robotów usługowych”, research report 2015-14, 2015.

[R11] M. Szlenk and C. Zieliński, “(D2.2.1) rapp stare-care behaviours interaction specyfication and initial implementation. rapp robotic applications for delivering smart user empowering applications.fp7-itc-2013-10, grant. agreement: 610947, collaborative project”, research report 2015-06, 2015.

[R12] W. Szynkiewicz, C. Zieliński, T. M. Kornuta, M. Figat, T. Zielińska, and T. Winiarski, “(D2.3.1) rapp navigation and motion planning module. rapp-robotic applications for delivering smart user empowering applications. fp7-itc-2013-10. grant agreement 610947”, research report 2015-07, 2015.

[R13] T. Traczyk, “Cyfrowe repozytorium dokumentów credo. badania mające na celu dostosowanie repozytorium do funkcji archiwum długoterminowego”, research report 2015-19, 2015.

[R14] M. Walęcki, K. Banachowicz, and D. Seredyński, “System percepcji siły uogólnionej dla robota usługowego velma”, research report 2015-12, 2015.

[R15] T. Winiarski and D. Seredyński, “Analiza chwytów klucza w zadaniu manipulacji kluczem w zamku”, research report 2015-02, 2015.

[R16] T. Winiarski, “Przygotowanie i przeprowadzenie zawodów robotów sportowych ”bionikalia 2014””, research report 2015-01, 2015.

[R17] T. Winiarski, “Rozwiązanie prostego i odwrotnego zagadnienia kinematyki ze względu na pozycję dla zmodyfikowanych robotów sorter sur-15 i sur-35”, research report 2015-05, 2015.

[R18] T. Winiarski, “Uruchomienie oprogramowania sterującego na robotach prototypowych rodziny sur”, research report 2015-04, 2015.