Silesian University of Technology
Faculty of Automatic Control, Electronics and Computer Science

Annual Review 2011

Institute of Electronics

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Edited by
Edyta Suszek

Institute of Electronics, March 2012

FOREWORD

The Institute of Electronics is a part of the Faculty of Automatic Control, Electronics and Computer Science, one of the 13 faculties of the Silesian University of Technology, founded in 1945. The University is located in Gliwice and has almost 29,000 students at present. The Faculty of Automatic Control was founded in 1964, and after a few reorganisations it changed its name to the Faculty of Automatic Control, Electronics and Computer Science. The total number of students is about 3,200 now. Since its creation in 1974 the Institute of Electronics has undergone a number of reorganisations. It has over 70 members of academic staff and consists of six divisions:

- ***Division of Electronics Fundamentals and Radio Engineering***
- ***Division of Digital and Microprocessor Systems***
- ***Division of Circuit and Signal Theory***
- ***Division of Telecommunication***
- ***Division of Biomedical Electronics***
- ***Division of Microelectronics and Nanotechnology***

Until September 2011 the Biomedical Engineering Group existed within the Division of Biomedical Electronics. In October 2011 its staff was transferred to the newly created thirteenth faculty of the university, namely the Faculty of Biomedical Engineering. For the same reason, a few staff members left the former Division of Microelectronics and Biotechnology, which changed its name to the Division of Microelectronics and Nanotechnology.

The Institute specialises in such advanced fields of engineering as analogue and digital electronic systems, including biomedical systems, production of telecommunication and electronic systems etc. Research in these areas ranges from component to system level, encompassing practical and theoretical investigations with the application of both hardware and software techniques. Research groups are supported by a wide range of test and instrumentation equipment together with computer facilities, which can run with programming languages of all levels and offer various application software. Many of the Institute's research programmes are carried out in close co-operation with industry in order to satisfy the needs of the region, which is the main industrial centre of Poland.

The Institute offers 3.5-year courses leading to the degree of BSc in the general field of Electronics and Telecommunication and 1.5-year MSc courses in the following specialisations:

- Electronic Apparatus
- Biomedical Electronics
- Microelectronics
- Radio Engineering
- Telecommunication

Both degrees are obtained on the basis of a project and a report, presented during a final examination. In addition, the Institute participates in a joint macro-course in Automatic Control, Electronics and Computer Science, run by the Faculty, in which all teaching is

in the English language. The courses normally consist of lectures, laboratories, seminars and projects, and are followed by examinations. Apart from this, the Institute offers four-year courses at evening studies, leading to the degree of BSc. The curricula of the courses run by the Institute are designed for people who want to achieve both theoretical knowledge and practical skills in electronics. Other didactic activities include postgraduate and PhD studies.

The following pages provide detailed information regarding the research carried out as well as the subjects taught in each division.

CONTENTS

DIRECTORS OF THE INSTITUTE

Director of the Institute:
Prof. Edward HRYNKIEWICZ

Vice Director of the Institute for Research:
Prof. Zdzisław FILUS

Vice Director of the Institute for Teaching:
Asst. Prof. Jacek KONOPACKI

DIVISION OF ELECTRONICS FUNDAMENTALS AND RADIO ENGINEERING

Head of Division: Prof. Zdzisław Filus, PhD, DSc

Research staff

Prof. Zdzisław FILUS, PhD, DSc

Prof. Andrzej KARWOWSKI, PhD, DSc
Zbigniew RYMARSKI, PhD, DSc
Andrzej BŁONAROWICZ, PhD
Jacek CHĘCIŃSKI, PhD
Jerzy FIOŁKA, PhD
Zenon KIDOŃ, PhD
Adam KRISTOF, PhD
Sławomir LASOTA, PhD
Mirosław MAGNUSKI, PhD
Andrzej MALCHER, PhD
Artur NOGA, PhD
Wojciech OLIWA, PhD
Maciej SURMA, PhD
Włodzimierz SZMELCER, PhD
Tomasz TOPA, PhD
Grzegorz WIECZOREK, PhD
Dariusz WÓJCIK, PhD

PhD Students

Adam POPOWICZ, MSc
Piotr FALKOWSKI, MSc

Research fields

- Electronic circuits synthesis
- Symbolic methods of electronic circuits analysis
- Electronic circuits for automotive applications
- Power electronic circuits
- Microprocessor-based measurement systems
- Computational electromagnetics
- Numerical modelling of radiating and scattering wire objects
- Linear antenna theory
- Electromagnetic compatibility
- Optoelectronics, Fiberoptics

Courses

- Semiconductor Devices
- Analogue Electronic Circuits
- Analogue Circuits Design
- Electronic Measurement Techniques
- Switching Circuits
- Special Semiconductor Devices and Circuits
- Materials Technology and Electronic Equipment Design
- Field and Wave Electromagnetics
- Introduction to Radiocommunication
- Radio Engineering Systems
- Fields, Waves and Antennas
- Wireless Computer Networks
- Design of Radio Electronic Devices
- High-Frequency Engineering Fundamentals
- Electromagnetic Compatibility

DIVISION OF DIGITAL AND MICROPROCESSOR SYSTEMS

Head of Division: Prof. Edward Hrynkiewicz, PhD, DSc

Research staff

Prof. Edward HRYNKIEWICZ, PhD, DSc

Prof. Andrzej HŁAWICZKA, PhD, DSc
Mirosław CHMIEL, PhD
Robert CZERWIŃSKI, PhD
Tomasz GARBOLINO, PhD
Krzysztof GUCWA, PhD
Józef KULISZ, PhD
Adam MILIK, PhD
Adam PAWLAK, PhD
Krzysztof PUCHER, PhD
Tomasz RUDNICKI, PhD
Wojciech SAKOWSKI, PhD
Dariusz STACHAŃCZYK, PhD
Krzysztof TABOREK, PhD
Bernard WYRWOŁ, PhD
Dariusz POLOK, MSc

PhD Students

Jan MOCHA, MSc
Danuta PAMUŁA, MSc

Research fields

- Testing and testability of digital systems
  - Generation of test patterns
  - IDDQ testing
  - Design for testability
  - Built-in self-tests and concurrent testing
  - Pseudorandom techniques for built-in tests for VLSI circuits and design of standard P1149 compatible chips
  - Microcomputer signature analysis
- Design of systems with programmable devices and controllers
  - Design of support software
  - Logic synthesis
  - Technology mapping in CPLDs, FPGAs and PSoCs
  - Fast operating CPU structures of programmable controllers and methods of PLC programming
  - Distributed structures of PLCs
  - PLC applications

- Embedded control system design
- Frequency multipliers based on digital techniques
- Laboratory and industrial data acquisition and control systems
  - Signal conditioning
  - Analogue-to-digital and digital-to-analogue converters with optical isolation and fibre optic transmission systems
- Multiprocessor systems
  - Pipelining and parallel processing
  - Systems with global memory and arbitration
  - Statistical analysis of performance for pipelining processing
- ASIC design
  - High level design methodologies
  - System modelling and simulation (using VHDL and Verilog)
  - IP-core design
  - Distributed design methodologies based on Internet

Courses

- Digital Systems Fundamentals
- Design of Digital Devices
- Microprocessors Fundamentals
- Microprocessor Systems
- Reliability and Testing of Electronic Devices
- Computer Aided Design of Integrated Circuits
- Programmable Logic Devices
- Programmable Controllers

DIVISION OF CIRCUIT AND SIGNAL THEORY

Head of Division: Prof. Jerzy Rutkowski, PhD, DSc

Research staff

Prof. Jerzy RUTKOWSKI, PhD, DSc

Jacek KONOPACKI, PhD, DSc
Tomasz GOLONEK, PhD
Tadeusz GRABOWIECKI, PhD
Damian GRZECHCA, PhD
Jan MACHNIEWSKI, PhD
Katarzyna MOŚCIŃSKA, PhD
Andrzej PUŁKA, PhD
Łukasz CHRUSZCZYK, PhD
Piotr JANTOS, PhD

PhD Students
Piotr KYZIOŁ, MSc

Research fields

- Computer-aided electronic circuits analysis and design
  - Test and diagnosis for analogue and mixed-signal electronic circuits
  - Application of sensitivity methods to the analysis and synthesis of electronic circuits
  - Modelling and simulation of digital and mixed analog-digital circuits in VHDL language
  - System level design in SystemC
  - Application of artificial intelligence methods and genetic algorithms to circuit theory and electronics
  - Common-sense reasoning modelling and application of AI techniques to circuits models generation and verification
- Digital signal processing focused on digital filters design and application
- Signal processing and basic research into neural networks (analysis, synthesis and optimisation) and their application to engineering practice
  - Application of neural networks to image processing and recognition, including texture images
  - Application of wavelet techniques to signal processing
- Web – based education

Courses

- Circuit Theory
- Signal Theory
- Fundamentals of Electrical Engineering
- Information Theory and Coding
- Computer-Aided Design of Electronic Circuits
- Digital Signal Processing
- Biomedical Digital Signal Processing
- Neural Networks

DIVISION OF TELECOMMUNICATION

Head of Division: Asst. Prof. Jacek Izydorczyk, PhD, DSc

Research staff

Asst. Prof. Jacek IZYDORCZYK, PhD, DSc
Prof. Dariusz KANIA, PhD, DSc
Adam DUSTOR, PhD
Maria DZICZKOWSKA, PhD
Leszek DZICZKOWSKI, PhD
Grzegorz DZIWOKI, PhD
Piotr KŁOSOWSKI, PhD
Marcin KUCHARCZYK, PhD
Andrzej KUKIEŁKA, PhD
Wojciech SUŁEK, PhD
Jerzy WOJTUSZEK, PhD
Piotr ZAWADZKI, PhD

Research fields

- Digital commutation in modern telecommunication systems
  - Construction of telephone exchanges
  - Supervisory software for telephone exchanges
  - Special services (e.g. teleconferences)
  - Implementation of digital networks with integrated services (ISDN, B-ISDN, ATM)
- Application of digital signal processing to telecommunication
  - Compression of speech signal with the application of DSPs
  - Speech synthesis
  - Speech and speaker recognition
  - Application of artificial neural networks to signal processing
  - Design, testing and implementation of error correcting and modulating codes
  - Design of modern local area networks
  - Implementation and testing of new services in the Internet
  - xDSL technology
  - Efficient hardware implementation of decoder of LDPC code.
- Electromagnetic field engineering
  - Radiation and scattering of electromagnetic waves
  - Lightning protection
- Modems

Courses

- Fundamentals of Analogue and Digital Communication
- Fundamentals of Commutation
- Switching Nodes and Exchanges
- Principles of Transmission
- Communication Systems
- Signal Theory
- Information Theory and Coding
- Digital Signal Processing
- Computer-Aided Analysis of Electronic Circuits
- Digital Signal Processors (DSP)
- Neural Networks
- Computer Networks
- Internet
- Modems
- Introduction to Cryptography

DIVISION OF BIOMEDICAL ELECTRONICS

Head of Division: Prof. Jacek Łęski, PhD, DSc

Research staff

Prof. Jacek ŁĘSKI, PhD, DSc

Ewa STRASZECKA, PhD, DSc
Robert CZABAŃSKI, PhD
Norbert HENZEL, PhD
Jerzy IHNATOWICZ, PhD
Marian KOTAS, PhD
Tomasz PANDER, PhD
Stanisław PIETRASZEK, PhD
Tomasz PRZYBYŁA, PhD

PhD Students

Michał JEŻEWSKI, MSc

BIOMEDICAL ENGINEERING TEAM

(until September 2011)

Head of Team: Prof. Ewa Piętka, PhD, DSc

Research staff

Prof. Ewa PIĘTKA, PhD, DSc

Paweł BADURA, PhD
Jacek KAWA, PhD
Sylwia POŚPIECH-KURKOWSKA, PhD
Dominik SPINCZYK, PhD
Wojciech WIĘCŁAWEK, PhD
Piotr ZARYCHTA, PhD

PhD Students

Joanna CZAJKOWSKA MSc
Jan JUSZCZYK, MSc
Marcin RUDZKI, MSc
Bartłomiej PYCIŃSKI, MD, MSc

Research fields

- Biocybernetics and biomedical engineering - processing of information in medicine
  - Processing of biomedical signals
  - Image processing and analysis
  - Fuzzy sets and systems, neuro-fuzzy systems
  - Pattern recognition
  - Cybernetics
  - Computer assisted medical diagnosis
  - Hospital information systems
  - Picture archiving and communications systems
  - Medical information systems integration
  - Expert systems in medicine
  - Time-frequency analysis of biomedical signals
  - Multirate signal processing
  - Evolutionary computations
  - Artificial neural networks
  - Data mining
  - Artificial intelligence
- Design, construction and testing of electronic medical apparatus
  - Design and construction of amplifiers for biological signals and data acquisition systems co-operating with computers
  - Testing of electromedical apparatus
  - Design of electronic devices for data acquisition

Courses

- Electromedical Metrology
- X-ray and Nuclear Imaging
- Medical Information Systems
- Cybernetics
- Artificial Intelligence
- Electromedical Equipment
- Pattern Recognition
- Principles of Knowledge Engineering
- Diagnostic Imaging Systems
- Biocybernetics
- Computers in Medicine
- Diagnostic Cardiological Systems

- Computer Aided Medical Diagnosis
- Probability Theory and Mathematical Statistics
- Optimization Methods
- Bionics
- Principles of Digital Signal Processing
- Numerical Methods
- Biomedical Information Processing

DIVISION OF MICROELECTRONICS AND NANOTECHNOLOGY

(from October 2011, formerly DIVISION OF MICROELECTRONICS AND BIOTECHNOLOGY)

Head of Division: Prof. Jacek Szuber, PhD, DSc

Research staff

Prof. Jacek SZUBER, PhD, DSc

Prof. Ewaryst TKACZ, PhD, DSc
Asst. Prof. Zbigniew PRUSZOWSKI, PhD
Wojciech FILIPOWSKI, PhD
Weronika IZYDORCZYK, PhD
Dariusz KOMOROWSKI, PhD
Paweł KOSTKA, PhD
Piotr KOWALIK, PhD
Monika KWOKA, PhD
Jerzy ULJANOW, PhD
Krzysztof WACZYŃSKI, PhD
Edyta WRÓBEL, PhD

PhD Students

Artur GINTROWSKI, MSc
Michał SITARZ, MSc

Research fields

- Biotechnology and bioinformatics
  - Analysis of gene expressions
  - Computer assisted medical diagnosis
  - Time-frequency analysis of biomedical signals
  - Multirate signal processing
  - Evolutionary computations
- Design of electronic devices for data acquisition
- Technology of doped semiconductor glasses based on organosilicon compounds
- Special hybrid circuits made in thick (thin) film technology
- Solar cells and photovoltaic systems
- Passivation of semiconductor surfaces for application in microelectronics
- Nanotechnology of transparent conductive oxides and organic semiconductors for application in photovoltaics and gas sensorics

Courses

- Materials Science and Principles of Construction of Electronic Equipment
- Electromedical Metrology
- Bionics
- Computers in Medicine
- Biotechnology in Medicine
- Computer Assisted Diagnostics in Medical Care
- Artificial Organs
- Physics in Medicine
- Physics
- Solid-State Physics
- Physics of Microfabrication
- Principles of Electron Technology
- Microelectronics
- Electronic Devices, Semiconductor Structures and Circuits
- Sensors and Actuators
- Semiconductor Devices
- Thick-Film Technology
- Design of Thick/Thin-Film Circuits
- Hybrid Circuit Technology
- Hermetic Sealing
- Thin-Film Technology
- Nanotechnology in Microelectronics

STATUTORY ACTIVITIES OF THE INSTITUTE OF ELECTRONICS

DSC DEGREES CONFERRED ON STAFF MEMBERS OF THE INSTITUTE OF ELECTRONICS

1. **Straszecka E**. – DSc examination on the basis of the monograph entitled "Measures of uncertainty and imprecision in medical diagnosis " took place at the Faculty of Automatic Control, Electronics and Computer Science, Silesian University of Technology, on 10 May 2011.
2. **Izydorczyk J**. - DSc examination on the basis of the monograph entitled "Modelling nonuniform transmission line for Spice transient analyses" took place at the Faculty of Automatic Control, Electronics and Computer Science, Silesian University of Technology, on 14 June 2011.

PHD DEGREES CONFERRED ON STAFF MEMBERS AND PHD STUDENTS OF THE INSTITUTE OF ELECTRONICS

1. **Zbigniew Krajewski,** Structural classification of proteins using support vector machines (SVM), PhD advisor: Prof. Ewaryst Tkacz, 11 July 2011
2. **Michał Jeżewski,** Prediction of newborn condition using fuzzy clustering and classification methods, PhD advisor: Prof. Jacek Łęski, 20 September 2011
3. **Joanna Czajkowska,** Parameterisation and 3D segmentation of bone tumours in magnetic resonance images, PhD advisor: Prof. Ewa Piętka, 22 September 2011
4. **Marcin Rudzki,** Multiscale filter in detection of liver vasculature in computed tomography images, PhD advisor: Prof. Ewa Piętka, 22 September 2011

5. **Piotr Kyzioł,** Testing and diagnostics of analog electronic circuits using multidimensional search space and swarm intelligence algorithms, PhD advisor: Prof. Jerzy Rutkowski, 06 December 2011

RESEARCH GRANTS

Research activities of the Institute of Electronics are mainly financed by the Ministry of Science and Higher Education within the frames of a general research programme:

- ***Development of new research areas in electronics, telecommunication and signal processing***

Apart from this, each division of the Institute carries out its own research in the following general areas, which are further subdivided into individual research projects:

Division of Electronics Fundamentals and Radio Engineering:

- *Electronic components, circuits and systems - development of measurement methods, analysis and synthesis*

Division of Digital and Microprocessor Systems:

- *Multiprocessor systems, application specific integrated circuits programmable logic devices and systems - analysis, design and testing*

Division of Circuit and Signal Theory:

- *Computer-aided methods of analysis, synthesis and testing of electronic systems and their selected applications*

Division of Telecommunication:

- *Development of methods and applications of digital channel commutation and transmission of digital signals, theoretical and experimental methods of examination of bodies radiating and dissipating electromagnetic waves*

Division of Biomedical Electronics:

- *Acquisition and processing of biomedical information*

Division of Microelectronics and Nanotechnology:

- *Application methods of microelectronic technologies and biotechnologies*

In total, forty seven individual research projects were completed in 2011.

GRANTS AWARDED BY THE COMMISSION OF EUROPEAN COMMUNITIES

VII Framework Programme of European Union

Structural Project – Operational Programme of Innovative Economy

Innovation Technology of Multifunctional Materials and Structures for Nanoelectronics, Photonics, Spintronics and Sensoric Techniques (InTechFun), Period: 2009-2013, Role in project: Prof. J. Szuber - Head of the group PSl-2

The project deals with the development of a new innovative technology of multifunctional materials and structures for nanoelectronics, photonics, spintronics and sensoric techniques. It has a form of a national network with the contribution of 6 Polish partners from academia and industry. The Institute of Electronics is responsible for 5 Workpackages dealing with technology and characterization of novel materials, structures and prototypes. Moreover, one Workpackage is devoted to the modernization of experimental systems for nanotechnological application. The project started on May 2009 and within this year the general organizational scheme for research and development was developed together with the implementation of experimental systems for future studies. In 2011 several scientific tasks were realized within the new materials and new technological modules, together with the development of infrastructures for new materials characterization.

INDIVIDUAL RESEARCH GRANTS AWARDED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION TO STAFF MEMBERS OF THE INSTITUTE

1. **Prof. E. Piętka**, Photodynamic image archiving, analysis and communication system in cancer diseases (duration: 1.05.2008 – 31.05.2011)
2. **Prof. A. Karwowski**, Fast hybrid methods of computational electromagnetics, (duration: 18.05.2008 - 18.05.2011)
3. **Prof. A. Karwowski**, Antennas for modern wireless systems for information society technologies - new structures, models, and methods of analysis and design (2009-2011)
4. **Dr. T. Rudnicki**, Control algorithms for mechatronic systems of mechanical vehicles) (duration: 18.03.2010 – 17.03.2013)
5. **Prof. E. Hrynkiewicz, Dr A. Milik**, Fast reconfigurable logic controllers (duration: 13.04.2010 – 12.04.2012)
6. **P. Kyzioł**, MSc, (PhD grant, advisor: Prof. J. Rutkowski), Testing analog electronic circuits using multidimensional search space and swarm intelligence algorithms
7. **Dr. D. Grzechca**, (DSc grant), Modern testing and diagnosis methods for analog electronic circuits (duration: 21.04.2010 – 31.12.2011)
8. **Dr. W. Sułek**, Nonbinary LDPC codes over GF(q) and their effective hardware decoder implementation (duration: 2011-2013)

INTERNATIONAL CO-OPERATION

1. Technical University of Ostrava, Department of Measurements and Control, Czech Republic (Prof. E. Hrynkiewicz)
2. University of Southern California (Prof. E. Piętka)
3. Chemnitz University of Technology, Germany (Prof. J. Szuber)
4. University of Tübingen, Germany, (Prof. J. Szuber)
5. Ecole Centrale de Lyon, Ecully, France, (Prof. J. Szuber)
6. University of Clermont-Ferrand, France, (Prof. J. Szuber)

7. Graz University of Technology, Austria, (Prof. J. Szuber)
8. Hokkaido University, Sapporo, Japan, (Prof. J. Szuber)
9. Kyushu University, Fukuoka, Japan, (Prof. J. Szuber)
10. Technical University of Prague, Institute of Bioengineering, Czech Republic (Prof. E. Tkacz)
11. Technical University of Stuttgart, Institute of Bioengineering, Germany (Prof. E. Tkacz)
12. California University, Department of Electrical Engineering and Computer Science, Berkeley, USA (Dr. A. Pułka)
13. Université Henri Poincaré, Nancy, France (Dr. N. Henzel)

SCIENTIFIC CONFERENCES ORGANISED AND CO-ORGANISED BY THE INSTITUTE OF ELECTRONICS

VII International Workshop on Semiconductor Surface Passivation – SSP 2011, Cracow, 11-15 September 2011 (Prof. J. Szuber, Dr. M. Kwoka)

18th International Conference Mixed Design of Integrated Circuits and Systems, Gliwice, 16-18 June 2011 (Dr. D. Grzechca)

14th IEEE Symposium on Design and Diagnostics of Electronic Circuits and Systems, Cottbus, Germany, 13-15 April 2011(Dr. A. Pawlak)

17th National Conference Biocybernetics and Biomedical Engineering, Tarnowskie Góry, Poland, 11-14 October 2011(Prof. E. Tkacz)

STAFF MEMBERS PARTICIPATING IN SCIENTIFIC AND ORGANISING COMMITTEES OF CONFERENCES AND SYMPOSIA

International

1. **Dr. T. Garbolino**, Steering Committee and Program Committee, 14th IEEE Workshop on Design and Diagnostics of Electronic Circuits and Systems, DDECS 2011, 13-15 April 2011, Cottbus, Germany
2. **Dr. K. Gucwa**, Program Committee, 14th IEEE Workshop on Design and Diagnostics of Electronic Circuits and Systems, DDECS 2011, 13-15 April 2011, Cottbus, Germany

3. **Prof. E. Hrynkiewicz**, Steering Committee and Program Committee, 14th IEEE Workshop on Design and Diagnostics of Electronic Circuits and Systems, DDECS 2011, 13-15 April 2011, Cottbus, Germany
4. **Prof. E. Hrynkiewicz**, Scientific Committee, 35th International Microelectronics and Packaging IMAPS-CPMT Poland Conference, Gdańsk-Sobieszewo, 21-24 September 2011
5. **Prof. E. Hrynkiewicz**, Organising Committee, 18th International Conference Mixed Design of Integrated Circuits and Systems, Gliwice, 16-18 June 2011
6. **Dr. J. Izydorczyk**, Poland Section Chapter Chair, coordinator of the IEEE technical cosponsoring, The International Science Conference: Computer Networks - CN`10, Ustroń, 14-18 June 2011
7. **Prof. A. Karwowski**, Steering Committee, EMC Europe 2011, York, UK, 26-30 September 2011
8. **Prof. A. Karwowski**, Program Committee, XXI International Conference on Electromagnetic Disturbances, Białystok, 28-30 September, 2011
9. **Dr. A. Pawlak**, PRO-VE11, Program Committee member, 12th IFIP Working Conference on Virtual Enterprises, São Paulo, Brazil, 17 - 19 October 2011
10. **Dr. A. Pawlak**, CENICS2011 Program Committee member, the Fourth International Conference on Advances in Circuits, Electronics and Microelectronics, CENICS 2011, French Riviera, Nice/Saint Laurent du Var, France, August 21-27, 2011
11. **Dr. A. Pawlak**, DDECS11, Program Committee chair, 14th IEEE workshop on Design and Diagnostics of Electronic Circuits and Systems, Cottbus, Germany, 13-15 April 2011
12. **Dr. A. Pawlak**, DSD11, Program Committee member, 14th EUROMICRO Conference on Digital System Design (DSD), Oulu Finland, 31 August – 2 September 2011
13. **Dr A. Pawlak,** International Advisory Board member, 13th International Conference on Advances in Design Sciences and Technology, Department of Civil, Building and Environmental Engineering, Sapienza University of Rome, Italy, 8 - 10 June 2011
14. **Prof. J. Rutkowski**, Honorary Member, The International Science Conference: Computer Networks - CN`10, Ustroń, 15-19 June 2011

15. **Prof. J. Rutkowski**, Scientific Committee 18th International Conference Mixed Design of Integrated Circuits and Systems, Gliwice, 16-18 June 2011
16. **Prof. J. Szuber**, Chairman, VII International Workshop on Semiconductor Gas Sensors – SSP 2011, Cracow, 11-15 September 2011
17. **Prof. J. Szuber**, VI Symposium on Vacuum Based Science and Technology VBS 2011, Kołobrzeg, 21-23 September 2011
18. **Dr. K. Waczyński**, 36th International Microelectronics and Packaging IMAPS-CPMT Poland Conference, Gdańsk, 21-24 September 2011

National

1. **Prof. Z. Filus**, 10th National Electronics Conference, 5-9 June 2011, Darłówko Wschodnie
2. **Prof. E. Hrynkiewicz**, 10th National Electronics Conference, 5-9 June 2011, Darłówko Wschodnie
3. **Prof. E. Hrynkiewicz**, 14th National Conference Reprogrammable Digital Circuits, RUC 2011, 26-27 May 2011, Szczecin
4. **Prof. E. Hrynkiewicz**, Scientific Conference „Informatics – Art or Craft?" and Training Workshop of the Institute of Computer Science and Electronics of the Zielona Góra University, 7-10 June 2011
5. **Prof. D. Kania**, 14th National Conference Reprogrammable Digital Circuits, RUC 2011, 26-27 May 2011, Szczecin
6. **Prof. D. Kania**, Scientific Conference „Informatics – Art or Craft?" and Training Workshop of the Institute of Computer Science and Electronics of the Zielona Góra University, 7-10 June 2011, Karpacz
7. **Prof. A. Karwowski**, National Conference on Radiocommunications, Broadcasting and Television, 8-11June 2011, Poznań
8. **Prof. E. Piętka**, Conference Databases – Applications and Systems, 31 May-3 June 2011, Ustroń
9. **Prof. J. Rutkowski**, 10th National Electronics Conference, 5-9 June 2011, Darłówko Wschodnie
10. **Prof. J. Rutkowski**, Conference Databases – Applications and Systems, 31 May-3 June 2011, Ustroń

11. **Prof. J. Szuber**, 5th National Conference on Nanotechnology - NANO 2011, 3 June – 7 July 2011, Gdańsk

REVIEWERS

1. **Dr. R. Czabański**, International Journal of Applied Mathematics and Computer Science
2. **Prof. Z. Filus**, International Journal of Electronics, National Electronics Conference, national project proposals (Ministry of Science and Higher Education, National Science Centre)
3. **Dr. T. Golonek**, IEEE Transactions on Circuits and Systems II
4. **Dr. D. Grzechca**, Microelectronics Reliability, IET Circuits, Devices & Systems, Journal of the International Measurement Confederation, IEEE Transactions on Circuits and Systems-Part I (TCAS-I) Conferences: ECCTD 11, projects in the EU Operational Programme Innovative Economy 2.3, Metrology and Measurement Systems
5. **Prof. E. Hrynkiewicz**, International Journal on Applied Mathematics and Computer Science; IMAPS, MIXDES, IEEE DDECS Symposium, Metrology and Measurement Systems, International Conference on Artifficial Innteligence and Soft Computing, National Science Center, National Center of Research and Development, Conference on Reprogrammable Digital Devices, Scientific Conference „Informatics – Art or Craft?", National Electronics Conference, Pomiary Automatyka Kontrola, Elektronika - Konstrukcje Technologie Zastosowania, Bulletin of the Polish Academy of Sciences
6. **Dr. J. Izydorczyk**, Physica B - Condensed Matter ; PIER & JEMVA (Progress In Electromagnetics Research, Journal of Electromagnetic Waves and Applications) Micro & Nano Letters from the Institution of Engineering and Technology (IET), IEEE Transactions on Circuit and Systems I, Central European Journal of Engineering; International Journal of Electronics and Telecommunications
7. **Prof. D. Kania**, Computers and Electrical Engineering, Bulletin of the Polish Academy of Sciences – Technical Sciences, International Journal of Applied Mathematics and Computer Science, Microprocessors and Microsystems, Elektronika - Konstrukcje Technologie Zastosowania, Pomiary Automatyka Kontrola,

Conference on Reprogrammable Digital Devices, International Conference Information Technology Interfaces

8. **Prof. A. Karwowski**, Journals: IET Proceedings Microwaves, Antennas & Propagation (London), Electronics Letters; IEEE Transactions on Antennas and Propagation; IEEE Transactions on Microwave Theory and Techniques; Progress in Electromagnetics Research, International Journal of Microwave and Wireless Technologies. Conferences: European Microwave Conference, EMC Europe, International Conference on Microwaves, Radar & Wireless Communications (MIKON)

9. **Dr. P. Kłosowski**, 3rd International Symposium on Engineering Education and Educational Technologies EEET 2011

10. **Dr. D. Komorowski**, 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society "Merging Medical Humanism and Technology"

11. **Dr. J. Konopacki**, IEEE International Conference on Signals and Electronic Systems

12. **Dr. M. Kotas**, Biomedical Signal Processing and Control

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14. **Dr. A. Noga**, Progress in Electromagnetics Research, Journal of Electromagnetic Waves and Applications

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16. **Dr. A. Pawlak**, special issue of the International Journal on Production Planning & Control (about Engagement in Collaborative Networks), PRO-VE08; EU projects and project proposals concerning embedded systems; nanoelectronics, collaborative networks; Internet of Things & Enterprise environments, grant proposals in the Operational Program Innovative Economy 2007-2013 (Ministry of Science and Higher Education), International Journal of Applied Mathematics and Computer Science, International Journal of Computer Integrated Manufacturing

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PATENTS AND PATENT APPLICATIONS

Grzegorz Wieczorek (PhD), Patent No. P-209736 of 6 May 2011, "A method and device for the transmission and reception of dispersed spectrum pulses"

Adam Kristof (PhD), Patent No. 210557 of 24 August 2011, "A final stage of the push-pull power amplifier"

Grzegorz Wieczorek (PhD), Patent No. 211645 of 28 December 2011, A method and device for measurement of the effective value of white noise"

Zenon Kidoń (PhD), Prof. Dariusz Kania, K. Pethe-Kania, Patent application No. P-394052 of 28 February 2011, "A procedure for rehabilitation of the persons after a hip replacement surgery"

Mirosław Magnuski (PhD), Patent application No. P-397073 of 22 November 2011, "A test set for microwave power measurements"

Mirosław Magnuski (PhD), Pattent application No. P-397074 of 22 November 2011, "A method and test set for microwave power measurements

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LIST OF PUBLICATIONS - 2011

1. **Badura P.,** Automated segmentation and computer-aided therapy of the patellofemoral joint structures, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, summary p. 22 (full text on CD)
2. **Badura P., Kawa J., Czajkowska J., Rudzki M., Piętka E**., Fuzzy Connectedness in Segmentation of Medical Images. A Look At the Pros and Cons, International Conference on Fuzzy Computation Theory and Applications, FCTA 2011, Paris, France, 24-26 October 2011, pp. 486-492
3. **Bugdol M.N., Czajkowska J.,** Liver Surface Deformation Model for Minimally Invasive Surgery, 18th International Conference Mixed Design of Integrated Circuits and Systems, 2011, Gliwice, Poland, 16-18 June 2011
4. **Chęciński J., Filus Z.,** A microcontroller controlled LED lamp for emergency lighting, Wiadomości Elektrotechniczne, No. 10, October 2011, pp. 22-25
5. **Chmiel M., Mocha J.,** Usability of FPGA devices' specific properties for building a PLC central processing unit, Elektronika - Konstrukcje Technologie Zastosowania, No. 9, 2011, pp. 167-170
6. **Chmiel M., Mocha J., Hrynkiewicz E**., An Object Simulator for PLC Software Testing, Pomiary Automatyka Kontrola, No. 1, 2011, pp. 55-57
7. **Chmiel M., Mocha J., Hrynkiewicz E., Milk A..,** Central Processing Units for PLC implementation in Virtex-4 FPGA, Proceedings of the 18th IFAC World Congress, Milano, Italy, August 28-September 2, 2011
8. **Chruszczyk Ł**., Fault diagnosis of analog electronic circuits with tolerances in mind, Elektronika - Konstrukcje Technologie Zastosowania, No. 12, 2011, pp. 42–47
9. **Chruszczyk Ł., Rutkowski J.,** Tolerance Maximisation in Fault Diagnosis of Analogue Electronic Circuits, Przegląd Elektrotechniczny, No. 10, 2011, pp. 159–163

10. **Czabański R**., **Jeżewski M.,** Wróbel J., Jeżewski J., Horoba K., Classification of the fetal monitoring signals using fuzzy scoring system, IFMBE Proceedings of the V Latin American Congress on Biomedical Engineering CLAIB, Havana, Cuba, 16-21 May 2011, Vol. 33, pp. 1-4 (CD)

11. **Czabański R**., Roj D., Jeżewski J., Horoba K., **Jeżewski M.,** Fuzzy prediction of fetal acidemia, Journal of Medical Informatics and Technologies, University of Silesia, Katowice, Vol. 17, 2011, pp. 81-87

12. **Czajkowska J., Bugdol M.N., Badura P., Piętka E**., Evaluation methods for medical image segmentation results, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (full text on CD)

13. **Czajkowska J., Piętka E**., CAD Station for 3-D Semi-Automated Segmentation of Bone Lesions in MR Images, European Congress of Radiology ECR 2011, Vienna, Austria, 3-7 March 2011, Poster No. C-2250

14. **Czerwiński R., Kania D**., State Minimization by means of Incompatibility Graph Coloring, Elektronika - Konstrukcje Technologie Zastosowania, No. 3, 2011, pp. 160-162

15. **Dustor A**., Problems of errors in biometric systems for voice recognition, 34th International Conference on Fundamentals of Electrotechnics and Circuit Theory, IC-SPETO, Ustroń, Poland, 18-21 May 2011, pp. 133-134

16. **Dustor A**., Application of Fuzzy Kernel Ho-Kashyap Classifier to Speaker Verification, Proceedings of the International Conference Mixed Design of Integrated Circuits and Systems MIXDES 2011, Gliwice, Poland, 16-18 June 2011, pp. 581-586

17. **Dziczkowski L**., Thickness measurements with the use of the eddy-current method, Przegląd Elektrotechniczny, Vol. 87, No. 11, 2011, pp. 178-182

18. **Dziczkowski L.**, Buchacz A., Modification of calibration method for conductometers, Eksploatacja i Niezawodność - Maintenance and Reliability, No. 4, 2011, pp. 45-40

19. **Dziwoki G**., Undesirable minima of the reduced constellation blind phase correction, 34th International Conference on Fundamentals of

Electrotechnics and Circuit Theory, IC-SPETO, Gliwice-Ustroń, Poland, 18-21 May 2011, pp. 107-108

20. **Dziwoki G.**, An algorithm for the computation of undesirable phase offsets in the blind phase correction method, 18th International Conference Mixed Design of Integrated Circuits and Systems, MIXDES, Gliwice, Poland, 16-18 June 2011, pp. 572-575

21. **Dziwoki G**., A cost function analysis of a blind phase acquisition method, IEEE International Symposium on Industrial Electronics, ISIE, Gdańsk, Poland, 27-30 June 2011, pp. 775-778

22. **Filipowski W**., Caban M., Software testing in projects of biomedical engineering, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (full text on CD)

23. **Filipowski W**., Caban M., Managing the source code of medical information systems, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (full text on CD)

24. **Filipowski W., Waczyński K., Wróbel E**., Skwarek A., Drabczyk K., Effective values of diffusion coefficient for the model of diffusion doping of the solar cell emitter layer, Elektronika - Konstrukcje Technologie Zastosowania, No. 4, 2011, pp. 57-59

25. **Fiołka J., Kidoń Z**., Center of Pressure Trajectory Segmentation for Postural Stability Analysis, International Conference Mixed Design of Integrated Circuits and Systems MIXDES 2011, Gliwice, Poland, 16-18 June 2011, pp. 39-43 (CD edition)

26. **Fiołka J., Kidoń Z.,** Method for stabilogram characterization using angular-segment function, 10th National Electronics Conference, Darłówko Wschodnie, 05-09 June 2011, pp. 944-949 (CD edition)

27. Folta Ł., **Chmiel M., Mocha J**., A Compact Programmable Controller with A Touch Panel, Wiadomości Elektrotechniczne, No. 11, 2011, pp. 44-49

28. Gacek A., **Henzel N., Łęski J**., Time sequence of fuzzy sets in description and analysis of electrocardiographic signals. 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (full text on CD)

29. **Garbolino T., Gucwa K., Hławiczka A**., Small-size signature-based diagnostic dictionary for testing of interconnections, Pomiary Automatyka Kontrola, No. 1, 2011, pp. 52-54

30. **Golonek T., Jantos P., Grzechca D**., The use of specialized multi-band stimuli for analog circuits testing, Elektronika - Konstrukcje Technologie Zastosowania, No. 12, 2011, pp. 47-50

31. Grządziel L., Krzywiecki M., Peisert H., Chasse Th., **Szuber J**., Influence of ambient air exposure on surface chemistry and electronic properties of thin copper phthalocyanine sensing layers, Thin Solid Films, 519 (2011), pp. 2187-2192

32. **Grzechca D.,** People detection in the smoke area based on image taken by infrared camera, Przegląd Elektrotechniczny, No. 10, 2011, pp. 56-59

33. **Grzechca D.,** Simulated Annealing with Artificial Neural Network Fitness Function for ECG Amplifier Testing, European Conference on Circuit Theory and Design, ECCTD 2011, Linkoping, Sweden, 29-31 August 2011, pp. 49-52

34. **Grzechca D.,** Soft Fault Clustering in Analog Electronic Circuits with the Use of Self Organizing Neural Network, Metrology and Measurement Systems, Vol. 17, No. 4, 2011, pp. 555-568

35. **Gucwa K., Garbolino T., Hławiczka A.**, Analysis of operation of ring LFSR used for testing of unidirectional interleaved interconnections, Elektronika - Konstrukcje Technologie Zastosowania, No. 12, 2011, pp. 50-52

36. **Henzel N.,** Gacek A., **Łęski J.,** Time series of fuzzy sets in description and analysis of electrocardiographic signals, Acta Bio-Optica et Informatica Medica, Vol. 17, No. 4, 2011, pp. 313-316

37. **Hrynkiewicz E.,** A/D Converter for Sensor Characteristics Linearization, Elektronika - Konstrukcje Technologie Zastosowania, No. 3, 2011, pp. 81-83

38. **Hrynkiewicz E**., A Digital Approach to Nonlinearity Measurement of Voltage Ramp, IEEE/CPMT International Symposium on Design and Technology of Electronic Packaging, Timisoara, Romania, 20-23 October 2011, pp. 198-199

39. **Hrynkiewicz E**., Kołodziński S., Decomposition of Multioutput Logic Function in Reed-Muller Spectral Domain, IEEE Symposium on

Design and Diagnostics of Electronic Circuits and Systems, Cottbus, Germany, 13-15 April 2011, pp. 179-182

40. **Hrynkiewicz E., Polok D.**, Logic function variables permutation in Ashenhurst decomposition searching, Elektronika - Konstrukcje Technologie Zastosowania, No. 10, 2011, pp. 124-127

41. **Izydorczyk W**., Numerical analysis of an influence of oxygen adsorption at a SnO2 surface on the electronic parameters of the induced depletionlayer, Phys. Status Solidi, B Basic Res., Vol. 248, Issue 3, 2011, pp. 694-699

42. **Jantos P., Golonek T., Rutkowski J.,** An Analogue Electronic Circuits Specification Driven Testing with the use of Time Domain Response's Features, Elektronika - Konstrukcje Technologie Zastosowania, Vol. 52, No. 12, 2011, pp. 65-67 (reprint from the 18th International Conference Mixed Design of Integrated Circuits and Systems, Gliwice, Poland, 16-18 June 2011)

43. **Jantos P., Golonek T., Rutkowski J.,** A functional testing of analogue electronic circuits with the use of specification approximation in the time-domain response features space, Przegląd Elektrotechniczny, Vol. 87, No. 10, 2011, pp. 110-113

44. **Jeżewski M.,** Application of modified fuzzy clustering to medical data classification, Journal of Medical Informatics and Technologies, University of Silesia, Katowice Vol. 17, 2011, pp. 51-57

45. Jeżewski J., Roj D., Wróbel J., Horoba K., **Czabański R., Kotas M.,** Comparison of visual and computer method of accelerations and decelerations detection in the fetal heart rate signal, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice, 11-14 October 2011, pp. 1-7 (CD proceedings)

46. **Juszczyk J.** Quality of experts contours in verification of segmentation, 13th International PhD Workshop, Wisła, 22–25 October 2011, Vol. 29, pp. 241-244

47. **Juszczyk J.,** Semiautomatic three-dimensional segmentation of the liver and spleen on the CT images, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (CD edition)

48. Kajstura K., **Kania D.,** A decomposition state assignment method of finite state machines oriented towards minimization of power, Przegląd Elektrotechniczny, Vol. 87, No. 6, 2011, pp. 146-150

49. **Kawa J., Szwarc P**., Symmetry Detection in Brain Tumour Diagnosis, 17th National Conference Biocybernetics and Biomedical Engineering, 11-14 October 2011, (CD edition)

50. **Karwowski A., Noga A., Topa T.,** GPU-Accelerated MoM-Based Broadband Simulations Using Stoer-Bulirsch Algorithm, Proceedings of 21st International Conference Radioelektronika 2011, Brno, Czech Republic, 19-20 April 2011, pp. 317-318

51. **Karwowski A., Noga A.,** Interpolating broadband shielding behaviour of wire-grid cages from full-wave electromagnetic simulation, 21st International Conference on Electromagnetic Disturbances, Białystok, Poland, 28-30 September 2011, pp. 121-123

52. **Kłosowski P**., Development of Distance Education at Silesian University of Technology, Proceedings of EDULEARN11 3rd International Conference on Education and New Learning Technologies, Barcelona, Spain, 4-6 July 2011

53. Koczor A., **Sakowski W.,** SystemC library supporting OVM compliant verification methodology, IP-Embedded Systems Conference (IP-SoC 2011), Grenoble, France, 7-8 December 2011

54. **Komorowski D., Pietraszek S.,** Application of multi-channel A/D converter for direct recording of biomedical signals, Przegląd Elektrotechniczny, No. 10, 2011, pp. 118–121 (reprint from the 10th National Electronics Conference, Darłówko Wschodnie, 05-09 May 2011)

55. **Komorowski D., Pietraszek S**. Application of adaptive filtering in the DCT transform domain to attenuation noise in EGG signals, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (CD edition)

56. Kościelniak P., Mazur J., Henek J., **Kwoka M.,** Pawela L., **Szuber J.,** XPS and AFM studies of surface chemistry and morphology of In2O3 ultrathin films deposited by rheotaxial growth and vacuum oxidation, Thin Solid Films 520 (2011), pp. 927-931

57. **Kotas M.,** Jeżewski J., Horoba K., Matonia A., Application of spatio-temporal filtering to fetal electrocardiogram enhancement, Computer Methods and Programs in Biomedicine, 104(1), 2011, pp. 1-9

58. **Kotas M.,** Jeżewski J., Matonia A., Kupka T., Application of nonlinear projective filtering in direct fetal electrocardiography, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (CD edition)

59. Kubica M., **Kania D**., The Logic Synthesis of the Multi-Output Boolean Function Directed to Minimization of the Number of the PAL Logic Blocks Based on a Modified Graph's Nodes, Pomiary Automatyka Kontrola, Vol. 57, No. 7, 2011, pp. 737-740

60. Kubica M., **Sułek W., Kania D.,** The modification of a graph's nodes improving the efficiency of terms usage in a programmable structure, Elektronika – Konstrukcje Technologie Zastosowania, No. 4, 2011, pp. 122-126

61. **Kulisz J., Czerwiński R., Mocha J., Chmiel M.**, A PC-Based Object Simulator for Supporting PLC Software Development, Pomiary Automatyka Kontrola, No. 1, 2011, pp. 3-5

62. **Kwoka M., Waczynska N., Szuber J.,** Optimization of technology L-CVD SnO2 nanolayers for photovoltaics application, 2nd National Photovoltaics Conference, Krynica, 12-15 May 2011, pp. 100-103

63. **Kwoka M., Waczyńska N., Kościelniak P., Sitarz M., Szuber J**., XPS and TDS comparative studies of L-CVD SnO2 ultra thin films, Thin Solid Films 520 (2011), pp. 913-917

64. Ławrocki Ł., **Kania D.,** The XOR oriented logic decomposition, Elektronika – Konstrukcje Technologie Zastosowania, No. 2, 2011, pp. 174-180

65. **Malcher A., Falkowski P.,** Dynamically Programmable Analog Arrays in Acoustic Frequency Range Signal Processing, Metrology and Measurement Systems, PAN 2011, Vol. 43, No. 1, pp. 77-90

66. **Malcher A.,** Dynamically reconfigurable analog array as amplitude regulation circuit in capacitance to frequency converter, Elektronika – Konstrukcje Technologie Zastosowania, No. 10, 2011, pp. 109-112

67. **Milik A., Pułka A.,** On Effective Implementation of Search Algorithm for Genome Patterns, Pomiary Automatyka Kontrola, Vol. 57, No. 1, 2011, pp. 15–18

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69. **Mocha J., Kania D.,** A Method of Hardware Implementation of LD Programs in FPGA Devices, 8th Scientific Conference "Informatics – Art or Craft", Karpacz, 7-10 June 2011, pp. 37-42

70. **Moscinska K., Rutkowski J, Jantos P**., How to encourage Digital Natives to „Analog Courses"?, International Conference on Engineering Education, Belfast, Northern Ireland, 21-26 August 2011, (CD edition)

71. **Noga A.,** Physical Optics Approximation for PEC Objects Coated with Lossy Material, Proceedings of 21st International Conference Radioelektronika 2011, Brno, Czech Republic, 19-20 April 2011, pp. 319-322

72. **Noga A. Wójcik D**., Kołodziej Ł., The circuit for demonstration of emission from printed boards, 7th National Symposium: Electromagnetic Compatibility in Electrotechnics and Electronics, Łódź, 20-21 October 2011, pp. 26-28

73. Opara A., **Kania D.,** Enhancing logic synthesis based on two-stage BDD decomposition by using two-level optimization, Pomiary Automatyka Kontrola, Vol. 57, No. 8, 2011, pp. 864-867

74. **Pamuła D., Hrynkiewicz E.,** Tisserand A., Direct multiplication over GF(2m) - analysis , Pomiary Automatyka Kontrola, Vol. 57 No. 1, 2011, pp. 58-60

75. **Pander T., Przybyła T.,** Wróbel J., Jeżewski J., Roj D., Application of Generalized Filters for Estimation of Fetal Heart Rate Baseline, Journal of Medical Informatics & Technologies, 16th International Conference, Zakopane, Poland, October 20-22, 2011, Vol. 15, pp. 73-79

76. Papa G., **Garbolino T.,** Optimal on-line built-in self-test structure for system-reliability improvement, 2011 IEEE Congress on Evolutionary Computation (CEC), New Orleans, USA, 5-8 June 2011, pp. 222–229

77. **Pietraszek S., Komorowski D.,** Application of adaptive filtering to selective attenuation of respiratory influences in EGG signals, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, summary p. 71, (CD edition)

78. **Popowicz A.,** CCD dark current analysis, Przegląd Elektrotechniczny, Vol. 87, No. 4, 2011, pp. 260-263

79. **Popowicz A.,** Alignment of periods in periodic signals, Przegląd Elektrotechniczny, Vol. 87, No. 6, 2011, pp. 164-168

80. **Popowicz A.,** Improvement in astronomical pictures shifts estimation, Przegląd Elektrotechniczny, Vol. 87, No. 8, 2011, pp. 233-235

81. **Popowicz A.,** A correction algorithm for dark current in CCDs, Przegląd Elektrotechniczny, Vol. 87, No. 11, 2011, pp. 318-320

82. **Pruszowski Z., Kowalik P., Filipowski W**., Effect of basic parameters of the alloying process of formation Ni-P resistive layer on the resistance and TCR deposited on the substrate aluminosilicate, Przegląd Elektrotechniczny, Vol. 87, No. 7, 2011, pp. 136-9

83. **Przybyła T**., Methods of unsupervised classification, 14th Symposium Basic Problems of Power Electronics, Electrotechnics and Mechatronics, Wisła, 9-12 December 2011, pp. 190-193

84. **Przybyła T**., Jeżewski J., Horoba K., Roj D., Hybrid Fuzzy Clustering Using Lp Norms, Intelligent Information and Database Systems, LNAI 6591, Daegu, Korea, 20-22 April 2011, pp. 187-196

85. **Przybyła T., Pander T.,** Horoba K., Kupka T., Matonia A., An Approach to Unsupervised Classification, Journal of Medical Informatics & Technologies, Vol. 17, 2011, pp. 105-111

86. **Pułka A**., An Effective SAT-Solving Mechanism with Backtrack Controlled by FDL, Elektronika - Konstrukcje Technologie Zastosowania, No. 12, 2011, pp. 21–24

87. **Pułka A.,** Two Heuristic Algorithms for Test Point Selection in Analog Circuits Diagnoses, Metrology and Measurement Systems, 2011, 18(1), pp. 115–128

88. **Pułka A., Milik A.,** An Efficient Hardware Implementation of Smith-Waterman Algorithm Based on the Incremental Approach, International Journal of Electronics and Telecommunication, Vol. 57, No. 4, 2011, pp. 489–496

89. **Pułka A., Milik A.,** Considerations on Incremental Approach to Hardware Implementation of Smith-Waterman Algorithm, The 18th International Conference on Mixed Design of Integrated Circuits and Systems MIXDES 2011, Gliwice, Poland, June 16-18, 2011, pp. 283–288

90. **Pułka A.,** Golly Ł., **Milik A.,** SystemC Hardware-Software Design and Simulation Platform Based on AMBA Bus, The 18th International Conference on Mixed Design of Integrated Circuits and Systems MIXDES 2011, Gliwice, Poland, June 16-18, 2011, pp. 664–652

91. Roj D., Kupka T., **Czabański R., Pander T.,** Jeżewski J., Improvement in fetal hart periodicity measurement using doppler ultrasound signal, IFMBE Proceedings of 5th European Conference of the International Federation for Medical and Biological Engineering, Budapest, Hungary, 14-18 September 2011, pp. 133-136

92. **Rudnicki T.,** Digital voltmeter with 24 bit converter AD7767, Wiadomości Elektrotechniczne, No. 9, 2011, pp. 74-76

93. **Rudnicki T., Czerwiński R**., Fręchowicz A., Control drivers for PMSM motor, Zeszyty Problemowe – Maszyny Elektryczne, No. 90, 2011, pp. 51-55

94. **Rudnicki T., Czerwiński R**., Controlling the Permanent Magnet Synchronous Motor, Elektronika - Konstrukcje Technologie Zastosowania, No. 11, 2011, pp. 120-123

95. **Rudnicki T., Czerwiński R**., Fręchowicz A., PMSM motor: analysis, control drivers, 8th Scientific Conference „Informatics – Art. Or Craft", KNWS'11, Karpacz, 7-10 June 2011, p. 98

96. **Rudzki M**., Automatic Liver Vasculature Segmentation Method Using a Modified Multiscale Vesselness Filter, 13th International PhD Workshop OWD 2011, Wisła, 22–25 October 2011, Conference Archives PTETiS, Vol. 29, pp. 300-305

97. **Rudzki M**., Automatic Image Contrast Enhancement Method for Liver Vasculature Detection, 18th International Conference on Mixed Design of Integrated Circuits and Systems, Gliwice, 16-18 June 2011, pp. 23

98. **Rudzki M**., Automatic Segmentation of Liver Vascular Structures using Region Growing Algorithm Guided by Vesselness Filter Response, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (CD edition)

99. **Rutkowski J., Moscinska K**., Blended engineering course – Electric Circuit Theory case study, 2011 IEEE International Symposium on Circuits and Systems (ISCAS), Rio de Janeiro, Brazil, 15-18 May 2011, pp. 333-336

100. **Rutkowski J., .Moscinska K**., Barriers to Introduction of e-learning: a Case Study, IEEE Conference on Engineering Education EDUCON 2011, Amman, Jordan, 4-6 April 2011, pp. 460-465

101. **Rutkowski J., Moscinska K**., Links between technology-based education and engineering education research – electric circuit theory case study, Proceedings of the IASTED International Conference Computers and Advanced Technology in Education (CATE 2011), Cambridge, United Kingdom, July 11-13, 2011, pp. 152-159

102. **Rymarski Z.,** Alternative control methods in the voltage source inverters for UPS, Elektronika - Konstrukcje Technologie Zastosowania, No. 1, 2011, pp. 70-74

103. **Rymarski Z**., The influence of the output filter parameters tolerance and the load on the PID/CDM control of the single phase VSI, Przegląd Elektrotechniczny, Vol. 87, No. 10, 2011, pp. 114-118

104. **Rymarski Z**., The discrete model of the power stage of the voltage source inverter for UPS, International Journal of Electronics, Vol. 98, No. 10, October 2011, pp. 1291–1304

105. Sikora J., Matonia A., **Czabański R.,** Horoba K., Jeżewski J., Kupka T., Recognition of premature threatening labour symptoms from bioelectrical uterine activity signals, Archives of Perinatal Medicine, Vol. 17, No. 2, 2011, pp. 97-103

106. **Spinczyk D.,** Rigid registration abdominal and patient reference system, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (CD edition)

107. **Sułek W.,** Simulation environment for modern correcting coding systems, Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne, No. 8-9, 2011, pp. 795-801

108. **Sułek W.,** Banyan switch in FPGA implementation of LDPC decoder, Pomiary Automatyka Kontrola, No. 1, 2011, pp. 36–38

109. **Sułek W**., Pipeline processing in low-density parity-check codes hardware decoder, Bulletin of the Polish Academy of Sciences Technical Sciences, Vol. 59, No. 2, 2011, pp. 149–155

110. **Surma M.,** Combination of Structure Decomposition Technique and Impedance Matrix Interpolation For Efficient Wideband Analysis based on Method of Moments, 21st Conference Radioelektronika 2011, Brno, Czech Republic, 19-20 April 2011, pp. 323-325

111. **Surma M., Mocha J**., Woźnica T., **Wójcik D., Noga A.,** The impact of electromagnetic disturbances on the medical device, 7th National Symposium: Electromagnetic Compatibility in Electrotechnics and Electronics, Łódź, 20-21 October 2011, pp. 53-55

112. **Szuber J., Kwoka M.,** Koscielniak P., Optimization of technology of rheotaxial deposition of nanolayers of the selective transparent conductive oxides, 5th National Conference on Nanotechnology, Gdańsk, 3-7 July 2011, pp. 89-90

113. **Szuber J., Kwoka M.,** Koscielniak P., Optimization of RGTO technology of deposition of ultrathin selected transparent conductive oxides, 10th National Electronics Conference, Darłówko Wschodnie, 5-9 June 2011, pp. 520-523

114. **Szwarc P., Kawa J., Piętka E.,** Quantitative Tumour Tissue Measurements in Subjects with High-Grade Gliomas, Proceedings of the 18th International Conference on Mixed Design of Integrated Circuits and Systems, Gliwice, Poland, 16-18 June 2011, pp. 56-61

115. **Taborek K.,** Analytical method of performance prediction of multiprocessor systems, Przegląd Elektrotechniczny, Vol. 87, No. 10, 2011, pp. 72-75

116. **Topa T., Karwowski A., Noga A.,** Using GPU With CUDA to Accelerate MoM-Based Electromagnetic Simulation of Wire-Grid Models, IEEE Antennas and Wireless Propagation Letters, Vol. 10, 2011, pp. 342-345

117. **Topa T., Noga A., Karwowski A.,** FDTD/PO Hybrid Method for Analysis of Planar Antennas Radiating Near Large Conducting Objects, Proceedings of 21st International Conference Radioelektronika 2011, Brno, Czech Republic, 19-20 April 2011, pp. 85-88

118. **Topa T., Noga A., Karwowski A.,** Adapting MoM With RWG Basis Functions to GPU Technology Using CUDA, IEEE Antennas and Wireless Propagation Letters, Vol. 10, 2011, pp. 480-483

119. **Waczyński K., Filipowski W**., Drabczyk K., The investigation of TiO2 antireflection thin films of solar cells, Elektronika - Konstrukcje Technologie Zastosowania, No. 4, 2011, pp. 77-79

120. **Więcławek W.,** OCT Image Filtering Technique Preserving Edge Sharpness, 17th National Conference Biocybernetics and Biomedical Engineering, Gliwice/Tarnowskie Góry, 11-14 October 2011, (CD edition)

121. **Wróbel E., Waczyńska N.,** Drabczyk K., **Filipowski W.,** Properties studies of thin SiO2 passivates films in a photovoltaic cell structure, Elektronika - Konstrukcje Technologie Zastosowania, No. 4, 2011, pp. 55-57

122. Wróbel J., Roj D., Horoba K., **Jeżewski J., Czabański R**., Analysis of FHR variability extracted from mechanical and electrical fetal heart activity signals, IFMBE Proceedings of the V Latin American Congress on Biomedical Engineering CLAIB, Havana, Cuba, 16-21 May 2011, Vol. 33, pp. 1-4 (CD)

123. Wróbel J., Matonia A., **Kotas M., Przybyła T.,** Horoba K., Wireless Fetal Monitoring at Home with on-line Signal Analysis, IFMBE Proc. of the 5th European Conference of the International Federation for Medical and Biological Engineering, Budapest, Hungary, 2011, Vol. 37, pp. 906-909

124. **Wójcik D., Noga A.,** Power integrity problems of printed circuit board, EMC'11 – 7th National Symposium: Electromagnetic Compatibility in Electrotechnics and Electronics, Łódź, 20-21 October 2011

125. **Wyrwoł B.,** AVR-FPGA-FIS Fuzzy Logic Development System, Przegląd Elektrotechniczny, Vol. 87, No. 10, 2011, pp. 60-63

126. **Wyrwoł B.,** Using graph greedy coloring algorithms in the hardware implementation of the HFIS fuzzy inference system, Przegląd Elektrotechniczny, Vol. 87, No. 10, 2011, pp. 64-67

127. **Zarychta P., Kawa J.,** CT Image Processing as One of the Stages in Knee Joint Alloarthroplasty, 18th International Conference on Mixed Design of Integrated Circuits and Systems, MIXDES 2011, Gliwice, Poland, 16-18 June 2011, pp. 48-51

128. **Zawadzki P.,** Security of ping-pong protocol based on pairs of completely entangled qudits, Quantum Information Processing, 2011. pp. 1–12

129. **Zawadzki P**., Numerical estimation of efficiency of the algorithms assisting quantum factorization, International Journal of Applied Research on Information Technology and Computing (IJARITAC), Vol. 2, No. 1, 2011, pp. 1–8

130. **Zawadzki P**., Confidential deterministic quantum communication using three quantum states, International Journal of Advanced Computer Science and Applications (IJACSA), Vol. 2, No. 11, 2011, pp. 17–20

CHAPTERS IN BOOKS

1. **Filipowski W.**, Caban M., Software testing in systems of large scale, in Kapczynski A. et al. (Eds.): Internet - Technical Development and Applications 2, Series: Advances in Intelligent and Soft Computing, Vol. 118/2011, Springer-Verlag Berlin Heidelberg 2011, pp. 113-119

2. **Filipowski W.,** Caban M, Selected aspects of the implementation management in multi-domain system environment, in Kapczynski A. et al. (Eds.): Internet - Technical Development and Applications 2, Series: Advances in Intelligent and Soft Computing, Vol. 118/2011, Springer-Verlag Berlin Heidelberg 2011, pp. 131-140

3. **Hrynkiewicz E**., Rectangular Function Π(x) and Its Application for Description of Some Logical Devices Operation, in Adamski M. et al. (Eds.): "Design of Digital Systems and Devices", Springer-Verlag Berlin Heidelberg 2011, pp. 43-57

4. **Hrynkiewicz E.,** Modern digital circuits, in Łuczak S., Bączek M. (Eds.): „Selected Problems of Contemporary Electronics", Wyd. Uczelniane Politechniki Koszalińskiej, Koszalin 2011, pp. 261-291

5. **Jeżewski M., Łęski J**., An application of fuzzy clustering method to cardiotocographic signals classification, in Czachórski T., Kozielski S., Stańczyk U. (Eds.): „Man-Machine Interactions 2", Advances in Intelligent and Soft Computing Vol. 103, Springer-Verlag Berlin Heidelberg 2011, pp. 315-322

6. **Jeżewski M., Łęski J.,** Fuzzy clustering finding prototypes on classes boundary, in Burduk R., Kurzyński M., Woźniak M., Żołnierek A. (Eds.): „Computer Recognition Systems 4", Advances in Intelligent and Soft Computing, Vol. 95, Springer-Verlag Berlin Heidelberg 2011, pp. 177-186

7. **Kania D.,** Design of Digital Systems and Devices, Chapter 6, Efficient technology mapping method for PAL-based devices, Lecture Notes in Electrical Engineering, vol. 79, Springer, 2011, pp.145-164

PUBLICATIONS EDITED BY STAFF MEMBERS OF THE INSTITUTE OF ELECTRONICS

1. **Pawlak A.,** Proceedings of the 2011 IEEE Design and Diagnostics of Electronic Circuits and Systems, Editors: Heinrich T. Vierhaus, Andreas Steininger, Adam Pawlak, Rolf Kraemer, Mario Schölzel, Jaan Raik, 13-15 April 2011, Cottbus, Germany, IEEE Catalog Number: CFP11DDE-ART, ISBN: 978-1-4244-9756-0

2. **Szuber J.,** Guest Editor of Special Section: Proceedings of 7th International Workshop on Semiconductor Gas Sensors – SGS 2010, in Thin Solid Films, Elsevier, Vol. 520 (2011), pp. 897-994

PUBLICATIONS OF THE INSTITUTE OF ELECTRONICS

1. **Filus Z**., Hrynkiewicz E., Annual Review 2010 – Institute of Electronics, Gliwice, March 2011, 71pages

ABSTRACTS OF SELECTED RESEARCH PROJECTS

DIVISION OF ELECTRONICS FUNDAMENTALS AND RADIO ENGINEERING

T. Topa (PhD), A. Noga (PhD), Prof. A. Karwowski, *Hardware acceleration of electromagnetic simulations based upon the method of moments*

Real-life electromagnetic engineering problems arising in wireless communications, antennas, electromagnetic compatibility, microwaves, etc., are usually hardly tractable by analytical methods and therefore their solution heavily depends on skilful numerical modelling and efficient electromagnetic simulation. The method of moments (MoM) is perhaps the most powerful numerical approach to the solution of electromagnetic problems involving radiating/scattering structures composed of conducting bodies and wires. Unfortunately, the advantages of MoM are spoiled by its well-known high demands of computer resources in terms of memory and CPU time needed to perform computations. This limitation can be partially overcome by hardware acceleration involving the use of stream-based General-Purpose Graphics Processing Units (GPGPUs). Despite intense research efforts on employing the relatively new GPGPU computing paradigm in computational electromagnetics, the MoM has still received rather little attention in this framework compared to the FDTD method. This probably follows from the fact that MoM, in contrast to FDTD, does not exhibit inherent parallelism and, therefore, developing GPU kernels for MoM requires a great deal of programming effort.

Within this research a CUDA-enabled GPU accelerated implementation of the method of moments for solving three dimensional conducting body-wire problems has been developed. The solution is based on the Mixed Potential Integral Equation (MPIE) discretized using Rao-Wilton-Glisson (RWG) basis functions. The CUDA environment is employed to port a single-CPU sequential code to the parallel GPU platform. The implementation is complete in the sense that (a) it includes surface and line current densities, thus offering a possibility of handling arbitrary configurations of conducting bodies and wires including wire-body junctions, and (b) a GPU is employed to accelerate both the MoM matrix fill process and the solution of the matrix equation. Numerical experiments employing the GeForce GTX 275 CUDA-capable device show that GPU version of MoM code offers a speedup of about x8 compared to the reference CPU single-core implementation. The results provide a solid base for further development of multi-core CPU+GPU-oriented MoM-based applications.

P. Falkowski (MSc), A. Malcher (PhD), *The dynamically programmable analog arrays in acoustic frequency range signal processing*

Field programmable analog arrays (FPAA), thanks to their flexibility and reconfigurability, give the designers quite new possibilities in analog circuit design. The number of both academic projects on the FPAA and applications of commercially available programmable devices is still growing. In our project we explored the properties and parameters of two most popular FPAA circuits: the AnadigmVortex AN221E04 and AnadigmApex AN231E04 from the Anadigm company. The research led to the discovery of some undocumented features of these devices. It was noticed that the built-in tunable anti-aliasing filters in AnadigmVortex family introduce a rather high level of distortion. The only way to avoid this problem is to use external filters, resulting in additional costs. The AnadigmApex family allows to implement much better filters, but they require additional passive components.

Another class of problems is caused by the variable gain amplifier block implemented in both families. This block is controlled by 8-bit analog to digital converter and the gain value can have only discrete values. During the slow change of the control value we can observe the step changes of the gain which lead to noise in the output signal.

Several applications for audio processing were built and tested – automatic gain control circuit, tremolo effect, overdrive effect and the de-esser circuit. The results show that these circuits can be used in medium demanding audio applications. Thanks to dynamic reconfigurability, they also allow to build a universal analog audio signal processor. This feature allows to change the parameters of the circuit or even the whole structure on-the-fly – without breaking the signal path.

These circuits can also act as a versatile platform for rapid prototyping and educational purposes.

A. Popowicz (MSc), *Analysis and correction of dark current nonlinearities in CCD sensors for astronomical imaging*

The mainstream of research involves analysis and correction of nonstandard dark current behavior in CCD matrices to improve astronomical imaging. The current, widely used method of minimizing thermal noise in long exposure pictures uses a dark frame (image taken with the closed shutter) which is subtracted from a light frame. This technique assumes the dark current generation is constant over the exposition and it does not depend on the light induced charge in a pixel. However, the author's research proved that both mentioned assumptions appeared to be false for a specific group of pixels.

Thanks to cooperation with the ScopeDome producer – Jacek Pala – experiments were carried on with the professional cooled astronomical camera SBIG STL 11000M (Santa Barbara Instruments Group) equipped with the Kodak KAI 11000 sensor. To detect nonlinear dark current pixels a series of dark frames were taken with exposure times up to an hour. With the use of astronomical images taken in the observatory in Słupsk, it was proven that the standard reduction method does not work for detected pixels introducing systematic errors. The analysis of the processes in the pixel's structure allowed to identify the reason of the above mentioned problems which appeared to be

connected with a specific location of a generation centers. The active area of the pixel shrinks with the charge collection so if the centre is located at the edge of this area, it stops its generation which causes nonlinear time dependencies of dark current and faulty dark frame reduction. Finally, a new method of dark current correction was introduced which was based on dependencies between the collected charge and the dark current generation rate. The method was successfully verified on astronomical images taken with the examined camera. However, it is not proved that all types of nonlinearities have been recognized yet and there is still a need to research on more types of CCD sensors to find universal methods of dark current correction.

DIVISION OF DIGITAL AND MICROPROCESSOR SYSTEMS

Prof. E. Hrynkiewicz, M. Chmiel (PhD), A. Milik (PhD), J. Mocha (MSc), *Fast operating programmable logic controllers (PLCs)*

The work presents usability of Field Programmable Gate Arrays' specific properties for implementing a bit-word central processing unit (CPU) for a Programmable Logic Controller (PLC). The implementation of bit and word processors is discussed in detail. The CPU was optimized for a minimum response and throughput time. The problems related to the information exchange between processors, input/output signals access as well as effective algorithms for multiplying and dividing were discussed. A special solution was elaborated for timers and counters which are implemented in FPGA as hardware modules. Additionally, the implementation results are presented that show how many resources of the FPGA device have been used to build the presented units.

From the point of view of PLC applications an exemplary control system consisting of a PLC and a commercially available operating panel, MT-505 TV, was designed. The system performs basic tasks typical for nanocontrollers. The controller communicates with the panel using the Modbus communication protocol what gives possibility for simple modification of the controller's program. The project has been completed with the use of Field Programmable Gate Array (FPGA) with the implemented PicoBlaze soft processor, what gives a great degree of flexibility in the design phase. The used approach makes the device easy to extend and increases its capabilities. In the work it has been proved that it is possible to develop a cheap and simple-to-use programmable logic controller that could meet the needs of the market.

D. Pamuła (MSc), Prof. E. Hrynkiewicz, Prof. A. Tisserand (CNRS Lannion, France), *The analysis of multiplication algorithms in the Galois Field GF(2^m)*

Cryptographic systems are based on mathematical theories, thus they strongly depend on the performance of the arithmetic units comprising them. If the arithmetic operator does not take a considerable amount of resources or is time non efficient, it negatively impacts the performance of the whole cryptosystem. This work is intended to analyse the hardware possibilities of the algorithms performing multiplication in GF(2^m), which are used in elliptic curve cryptography (ECC) applications. There are only two operations defined in the field: addition, which is considered as a trivial one – it is a simple bitwise xor and multiplication - a very complex operation. To conform to the requirements of ECC systems arithmetic operators should be fast, area efficient and, what is the most important, perform multiplication of big numbers (100 – 600 bit). The paper presents an analysis of GF(2^m) two-step modular multiplication algorithms. It considers classical (school) multiplication, matrix-vector approach and Karatsuba - Ofman algorithm, exploring thoroughly their advantages and disadvantages.

K. Gucwa (PhD), T. Garbolino (PhD), Prof. A. Hławiczka, *Application of ring registers for testing of arbitrary unidirectional connections*

The work deals with an idea how to use a Ring Linear Feedback Shift Register (R-LFSR) to test unidirectional interleaved, overlapped and slanting connections that make up n feedback lines of that register. Due to the fact that the layout of these lines looks like the 'X' letter that register is referred to as the XR-LFSR structure. To verify its efficiency for identification and localization of faults, the method of state diagram identification was applied with the assumption that the fault-free XR-LFSR can be reflected by an automaton with the G_0 cyclic state diagram and each physical defect f transforms that G_0 state diagram into another state diagram $G_f \neq G_0$. For the G_0 state diagram a cycle with the length of c is sought for any randomly selected initial state S_0, where the cycle should incorporate a sequence of m states ($m \leq c$) and the final state $S_{m,0}$ of the sequence would be different from each $S_{m,f}$ final state associated with the defective set of connections X. The same authors in previous studies dedicated to bus-type connections observed that the sequence of m states, where $m > 2n$ and $n > 16$, is sufficient to detect a substantial number of static and delay faults for such buses. The present work comprises the observation that any randomly selected state of the state diagram for the XR-LFSR belongs, with a pretty high level of probability, exceeding 70%, to the cycle with the maximum length c_{max}. It was also noticed that for $n \geq 6$ the number of various XR-LFSR structures leading to sufficiently long cycles $c_{max} > 1000$ can be approximately expressed as $\alpha = (100\text{-}2^{11-n})\%$, which means that $\alpha > 98{,}4\%$ for $n>16$. Both observations confirmed usefulness of XR-LFSRs for testing of unidirectional interleaved and overlapped connections by means of the state diagram identification method.

T. Golonek (PhD), D. Grzechca (PhD), *The use of specialized multi-band stimuli for analog circuits testing*

The testing method can be classified as belonging to either the SDT or the SBT group and it is designed for the production test. The proposed technique allows to design an optimal pair of testing excitations specialized for an analog circuit diagnosis. The presented concept can be included into the group of functional testing methods and it allows to check whether the considered specification of the circuit under test is proper or not. A pair of stimuli is optimised at the before testing stage. The shapes of their multi-band amplitude densities are determined evolutionarily. A population consists of genotypes that collect approximation coefficients of the Fourier series with the Walsh base functions. During evolutionary cycles, the difference between the energies of two excitations (positive and negative ones), calculated in the frequency domain, is maximized in order to assure the possibly highest faults coverage. After an evolutionary optimisation, a pair of stimuli is obtained with the IDFT transformation which is calculated for both the positive and negative part of a function defined by the best found individual. At the test stage, the circuit under test is supplied with these excitations and two responses are recorded. Next, the signature is calculated (the difference of response's energies) and a circuit diagnostic state is classified. In practice, this signature can be obtained after the FFT analysis of the measured response. Alternatively, the necessary components can be determined from an observed signal in the time domain by means of convolution calculating with the masks designed for special digital filters with amplitude responses adequate to the filtering functions $W_p(f)$ and $W_n(f)$. This concept is especially suitable for a quick production test for which the testing time has to be minimal. The described approach needs only one response analysis recorded on the CUT output after its excitation where the selected CUT specifications correctness are verified by controlling energy levels of components extracted from the time response.

A. Pułka (PhD), A. Milik (PhD)), *Application of fuzzy default logic in the process of decision making in testing and verification of electronic systems*

The topic is a continuation of research work conducted in the last few years. The hardware implementation of the fuzzy default logic system in FPGA structures has been refined and the concept of the application of FDL mechanism in analog circuit testing has been presented.

The default logic mechanism enriched with some elements of uncertain information processing has been added into COSMO and SALTO algorithms. These algorithms search optima sets of testing points that allow identifying and diagnosing faults in analog circuits. Many experiments and simulations have showed the efficiency of the proposed solution and proved usefulness of the application of FDL logic in supporting the process of making decisions.

Another result of the research is the software implementation of FUDASAT system. The system checks satisfiability of Boolean formulas expressed in the canonical form (CNF). This problem belongs to one of the most important issues in the field of formal verification and modern digital circuits design. It is called SAT-Solving. The proposed FUDASAT system is based on the classical DPLL algorithm with further modifications. The process of decisions about a variable selection, searching strategies and revision of conclusions is supported by the FDL based inference engine and controlled linear resolution (PROLOG).

DIVISION OF TELECOMMUNICATION

P. Zawadzki (PhD), *Security of ping-pong protocol based on pairs of completely entangled qudits*

The research in quantum cryptography, mainly motivated by the promise of provable security based on the laws of physics, is intensively continued for two decades. The first proposals addressed the problem of quantum key distribution (QKD). However, QKD protocols have low efficiency and must be combined with classic cryptography. Quantum secure direct communication (QSDC) protocols are designed for classic information transfer over a quantum channel. Contrary to QKD, they provide unidirectional communication in which information content is specified by the sender. The Ping-Pong protocol is one of not too many protocols of that kind that have been implemented in laboratory scale.

The Ping-Pong protocol operates in two modes. The message mode serves for exchange of information and in the control mode legitimate parties detect eavesdropping. In the seminal version of the protocol information encoding and eavesdropping detection are performed only on a computational basis. As a result, the protocol is able to transmit one classic bit per cycle and offers only asymptotic security i.e. an eavesdropper is detected with the probability close to one only after execution of a sufficiently large number of control cycles.

A profound analysis of the Ping-Pong protocol based on N-dimensional signal particles has been carried out within this research. It has been confirmed that independent on the signal particle dimension, information encoding and control cycles executed in a single basis can provide only asymptotic security. An eavesdropper can intercept all the information at the risk of being detected with the probability of 1/2. He can trade the probability of detection at a price of decrease of information gain but it is impossible to mount an undetectable attack that gives nonzero information gain. Moreover, it has been shown that superdense information encoding and the control mode executed only in the computational basis lead to the possibility of mounting an undetectable attack intercepting a half of a message content. An idea of multiple bases utilization in the control mode to sacrifice the protocol's security has been investigated. A dual basis obtained with the help of Quantum Fourier Transform (QFT) was used as the second one. It has been shown that it is impossible to mount an attack undetectable in both

bases. As a result the capacity of the modified protocol is doubled compared to the seminal version, while asymptotic security is retained. It has been demonstrated that the protocol's security is improved with the increase of the signal particle dimension.

W. Sułek (PhD), *Pipeline Processing in LDPC codec implementation*

Low-Density Parity-Check (LDPC) codes are one of the best known error correcting coding methods. They have been recently adapted to a variety of industrial standards. Besides all their desirable properties, one characteristic of LDPC codes, namely the randomness of the parity-check matrix structure, makes implementation of LDPC decoders a difficult task as it leads to complex interconnect wiring for practical codes, and hence to large demands for hardware resources in a decoder implementation. Thus the implementation of high performance decoders is still a demanding task.

The research project concerns the hardware iterative decoder for a subclass of LDPC codes that are implementation oriented, known also as Architecture Aware LDPC. The decoder has been implemented in a form of synthesizable VHDL description. To achieve high clock frequency of the decoder hardware implementation – and in consequence high data-throughput, a large number of pipeline registers have been used in the processing chain. However, the registers increase the processing path delay, since the number of clock cycles required for data propagating is increased. Thus, in general, the idle cycles must be introduced between decoding subiterations. Our contribution is a study of the conditions for necessity of idle cycles and a method for calculation the exact number of required idle cycles on the basis of parity check matrix of the code. We have also developed a parity check matrix optimization method to minimize the total number of required idle cycles and hence maximize the decoder throughput. The proposed matrix optimization by sorting rows and columns does not change the code properties. Experimental results that have been obtained show that the decoder throughput can be significantly increased with the developed optimization method.

DIVISION OF BIOMEDICAL ELECTRONICS

M. Jeżewski (PhD), Prof. J. Łęski, *Prediction of newborn condition using fuzzy clustering and classification methods*

In this work, a fuzzy clustering method dedicated to classification algorithms was proposed. It is based on minimization of a criterion which takes into consideration assignment of objects to one of two classes. Its goal is to find prototypes located near the boundary between two classes of objects. The method provides good results, but situations when not all of the obtained prototypes are located appropriately, are observed. Thus the proposed clustering is applied to obtain intermediate prototypes. Using these prototypes and two introduced additional sub-methods (clustering of intermediate prototypes or choice from intermediate prototypes), final prototypes determining classifier fuzzy if-then rules are obtained. The sub-methods were

developed to be different in three important aspects concerning the initial prototype matrix, prototypes creating and their assignment to learning subsets. Fuzzy if-then rules in the Takagi-Sugeno-Kang form were chosen. Parameters of rules antecedents were determined directly basing on the final prototypes, consequents parameters were determined with the help of modified Ho-Kashyap algorithm.

The main goal of work was classification of a mainly cardiotocographic signals database for prediction of the newborn condition. Cardiotocographic monitoring is a primary method for assessment of fetal state and prediction of the newborn condition. It consists in acquisition and analysis of three signals: fetal heart rate, fetal movements, uterine contractions. Visual analysis of cardiotocographic signals is difficult and is not objective. Computerized fetal monitoring systems, which provide parameters of quantitative description of signals, are very popular nowadays, but new methods for diagnosis support based on them are searched. Beside cardiotocographic signals, seven benchmark databases were also applied to verify the obtained classification quality. They represented various types and structures of data. For six from all eight databases a lower classification error in comparison to the Lagrangian SVM method was obtained.

T. Przybyła (PhD), *Hybrid clustering method*

The goal of clustering is to find existing subsets in a set of objects. The objects set consists of unlabeled data i.e. labels are not assigned to objects. Objects from one group have a high degree of similarity, while they have a high degree of dissimilarity with objects from other groups. Subsets that are found among the objects from the object set are called clusters. In most cases each object from the object set is represented by a vector of features.

One of the most popular clustering method is the fuzzy c-means (FCM) method. In this method, cluster prototypes are computed as fuzzy means. However, one of the most important inconvenience of the FCM is its sensitivity to outliers i.e. there are feature vectors of which components have quite different values compared to other feature vectors. So, clustering methods should be robust for data corrupted by outliers and (or) heavy tailed distributed noise. The heavy tailed distribution is more suitable to model the impulsive noise than the Gaussian distribution. One of the heavy tailed distribution is the Cauchy distribution, where the location parameter is called the (sample) myriad. Another example of such a kind of distributions is the Meridian distribution, where the location parameter is called the (sample) meridian. The myriad is the maximum likelihood estimator for the Cauchy distribution as well as the meridian is for the Meridian distribution. The form of the cost function for a sample myriad is very similar to the sample meridian cost function. The main difference is the applied norm, for the myriad the L2 is used while for the meridian the used norm is L_1. In our approach, the general cost function is proposed, where the L_p norm is used. The generalized cost function can be regarded as a hybrid cost function.

Our current work concentrates on the hybrid clustering method. The word hybrid stands for different cluster estimation which is dependent on two parameters. The

proposed method can be considered as a generalization of two clustering methods: the fuzzy c-means method and the fuzzy c-medians method.

The proposed generalization of the cost function allows the application of the L_p norm, where $1 < p < 2$ or $p < 1$. In such cases, it is difficult to interpret and identify the cluster prototype values.

J. Ihnatowicz (PhD), *Quantitative image analysis applied to researches of similarities of evolutionary strategy in mammals and amphibians*

Because of lack of empirical studies, the time and mode of formation of several generations of oocytes produced by a female amphibian during her life span is left open. Two alternative hypotheses were discussed: 1) oogenesis is unlimited and a new population of oocytes is generated every season (classical model - the source of new oocytes is "open"), and 2) all oocytes are recruited from the limited pool (mammalian model – the source of new oocytes is "closed").

For the verification of hypotheses the complex 3D quantitative image analysis of the microscopic serial slices was necessary. However, the border lines of oocytes were possible to be detected by intuitive human operator (expert) processing, the automatic detection was totally impossible because of grey level distribution in the oocytes areas. The aim was to reconstruct the true structure of ovaries and oocytes. The method based on single points ("seed" points) centered inside oocytes was effecitively applied. The regular sphere model of each reconstructed oocyte was used, thus the anisotropic grey binary morphology operators could be used for an ultimate dilation process. The final result of oocytes shape and border lines reconstruction well fitted the original data (slice images). A large amount of data was automatically processed based on specialized software designed exactly for the described above 3D reconstruction task. Finally, the reconstructed border lines of oocytes on each slice were used for the 3D measurements of both field and object geometric features (area, equivalent diameters, shape factor, etc.) of oocytes. The number of oocytes in ovaries was estimated based on Soltykov distribution of individually reconstructed profiles (slices of oocytes) on analyzed slices.

As the described study shows in Anura (tested Amphibians) the model of evolutionary strategy is closed and similar to the mammalian one. This is a very new and interesting conclusion. The whole study, which was realized in close cooperation with the Zoological Institute in Wrocław University, was documented with details and prepared for publication.

DIVISION OF MICROELECTRONICS AND NANOTECHNOLOGY

W. Izydorczyk (PhD), *Numerical analysis of an influence of oxygen adsorption at the SnO_2 surface on the electronic parameters of the induced depletion layer*

Operation of SnO_2 resistive gas sensors is mainly governed by the surface space charge region, which is formed due to both adsorption of gas molecules and ionization of surface states related to the oxygen vacancies at the surface. The surface-related phenomena become particularly important for nanostructures, which exhibit a much higher surface-to-volume ratio when compared with micro-grains or dense films. Therefore, the understanding and control of the surface and near-surface electronic properties and their relationship with materials ones are key factors for technology optimization, and thus improvement of the sensitivity and selectivity of SnO_2-based sensor devices. In addition, the modelling of sensor structures based on nanolayers needs to consider size and shape of grains, which decide about the layer conductance.

The purpose of this work was a theoretical analysis of an influence of oxygen adsorption at the SnO_2 surface on the electronic parameters of the induced depletion layer. The surface potential value and in-depth potential profiles were obtained by solving the Poisson-Boltzmann equation in the case of finite grains (partially or total depleted) with slab geometry. This solution has not been reported in the literature yet.

It was found that the development of near-surface depletion region and thus modification of the layer electronic parameters are strongly dependent on the density of electrons trapped in the surface states, layer thickness, bulk donor concentration, and temperature.

M. Kwoka (PhD), K. Waczyński (PhD), M. Sitarz (MSc), N. Waczyńska-Niemiec (MSc), Prof. J. Szuber, *The comparative studies of surface morphology and surface chemistry of the differently prepared SnO_2 thin films*

In this work comparative studies by Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM) and X-ray Photoelectron spectroscopy (XPS) on the surface morphology and surface chemistry of the SnO_2 thin films prepared by Rheotaxial Growth and Thermal Oxidation (RGTO), Magnetron Sputtering (MS) and Spin Coating (SC) methods were made. Our SEM and AFM studies showed that for the RGTO and MS SnO_2 samples a fractal like morphology agglomerated in clusters of crystallites with a bimodal size distribution is observed, whereas for SC layers partly connected irregular structures with the interconnected single grains of more longitudinal shape and size were observed, resulting in the most flat morphology, as additionally confirmed by AFM.

XPS studies confirmed that for all the SnO_2 samples a slight nonstoichiometry in the range 1,8-1,9 was determined, what was a in a small contradiction to the recently published XRD data. Moreover, XPS experiments showed that there is a different

amount of carbon contamination at the surface of internal grains than for differently prepared SnO_2 thin films.

P. Kowalik (PhD), Z. Pruszowski (PhD), *The influence of the basic parameters of the technological process used to obtain Ni-P resistive alloy on the resistance and TCR of the resistive layer deposited onto the aluminosilicate substrate*

The purpose of this study was to correlate the values of basic electrical parameters of the resistive alloy Ni-P, such as resistance and TCR, with the duration of the technological process, acidity of the technological bath and concentrations of primary substrata. On the basis of this work it will be possible to predict the resistance and its temperature coefficient in order to optimise the process parameters in a way ensuring minimization of the TCR of the alloy within the surface resistance range of 0,3 ÷ 5,0 Ω.

The following conclusions can be drawn on the basis of the obtained results:

1. Minimum TCR of the Ni-P alloy is obtained for the acidic bath of pH equal to2,0 ÷ 2,1 and for high concentrations of the main substrata of the technological solution reaching 75 ÷ 90 g/dm^3.
2. The correlation coefficient "R" is higher for the dependencies relating the resistance of the alloy to the parameters of its production. The TCR of the alloy additionally depends on the speed of the deposition reaction, which is not included in the derived relationships.
3. A correlation of resistance and its temperature coefficient of the Ni-P alloy allows to minimize the TCR for resistance values below 2Ω, what is a problem difficult to solve due to the large thickness of the resistive layer.