

FACULTY OF AUTOMATION AND COMPUTERS



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RESEARCH CENTER IN AUTOMATION AND COMPUTERS C.C.S.-A.C.

GENERAL PRESENTATION

The main aim of the centre is to develop high-level research in the fields of automatic control, computer and software engineering, and information technology. It offers the research results in these fields to interested companies and organizations all over the world.

The head of the Research Centre is **Prof. dr. eng. Stefan PREITL**.

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The Centre is organised in two research divisions:

- *Research Division in Automation and Industrial Informatics*

Head of the division: Prof. dr. eng. Radu Precup

- *Research Division in Computer Science and Engineering*

Head of the division: Prof. dr. eng. Marius Crişan

RESEARCH DIVISION IN AUTOMATION AND INDUSTRIAL INFORMATICS

Contact:

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Researches in *PROCESS CONTROL*

RESEARCH FIELDS

- Control systems with conventional controllers
- Advanced control systems.

KEYWORDS

Fuzzy logic control; sliding mode control; intelligent systems; stability analysis; sensitivity analysis; mobile robots; 2-DOF controllers; servo systems.

MAIN ACTIVITIES

- Development of conventional and advanced control systems
- Development of adaptive control systems
- Soft computing in industrial applications

- Development of control systems for servo systems
- Development of control systems for mobile robots.

RESULTS

PUBLISHED PAPERS

1. Precup, R.-E., Preitl, St. - *Optimisation Criteria in Development of Fuzzy Controllers with Dynamics*, Engineering Applications of Artificial Intelligence, Elsevier Science, ISSN 0952-1976, vol. 17, no. 6, pp. 661 – 674, 2004
2. Precup, R.-E., Preitl, St., Korondi, P. - *Development of Fuzzy Controllers with Dynamics Regarding Stability Conditions and Sensitivity Analysis*, Journal of Advanced Computational Intelligence and Intelligent Informatics, Fuji Technology Press, vol. 8, no. 5, pp. 499 – 506, 2004
3. Precup, R.-E., Preitl, St., Balas, M., Balas, V. - *Fuzzy Controllers for Tire Slip Control in Anti-lock Braking Systems*, IEEE International Conference on Fuzzy Systems – FUZZ – IEEE 2004, Budapest (Hungary), Proceedings, ISBN 0-7803-8354-0, CD-ROM, paper index 1311, 6 pp., 2004
4. Precup, R.-E., Preitl, St., Szabo, Cs., Korondi, P., Szemes, P. - *On the Development of Mamdani PI-Fuzzy Controllers for a Class of Mobile Robots*, IEEE 4th International Conference on Intelligent Systems Design and Application – ISDA 2004, Budapest (Hungary), Proceedings, ISBN 963-7154-29-9, vol. 1, pp. 277 – 282, 2004
5. Precup, R.-E., Preitl, St. - *Sensitivity Analysis of a Class of Fuzzy Controlled Mobile Robots*, 2nd IFAC Workshop on Advanced Fuzzy/Neural Control – AFNC'04, Oulu (Finland), Proceedings, editor: K. Leiviska, Finnish Society of Automation, Publication No IFAC WS 2004 0005 FI, Painoporssi Oy, ISBN 952-5183-22-X, pp. 115 – 120, 2004
6. Precup, R.-E., Preitl, St., Szabo, Cs., Korondi, P., Szemes, P. - *A Low Cost Solution for the Navigation Problem of Wheeled Mobile Robots*, Scientific Bulletin of the "Politehnica" University of Timișoara, Transactions on Automatic Control and Computer Science, ISSN 1224-600X, vol. 49(63), no. 1, pp. 77 – 82, 2004

7. Preitl, St., Precup, R.-E., Ursache, I.-B., Gheju, S., Preitl, Zs. - *Methodical Aspects Concerning the Study of Control Solutions for Plants with Slow Responses*, Scientific Bulletin of the "Politehnica" University of Timișoara, Transactions on Automatic Control and Computer Science, ISSN 1224-600X, vol. 49 (63), no. 1, pp. 127 – 132, 2004
8. Precup, R.-E., Preitl, St. - *On the Stable Development of Fuzzy Controllers for Electro-Hydraulic Systems*, Scientific Bulletin of the "Politehnica" University of Timișoara, Transactions on Mechanics, ISSN 1224-6077, Special Issue, Proceedings of 6th International Conference on Hydraulic Machinery and Hydrodynamics – HMMH2004, Tom 49 (63), pp. 387 – 392, 2004
9. Precup, R.-E., Preitl, St. - *Fuzzy Logic Decision Rules in Two Input-Single Output Linear Time-varying Systems Control*, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence – SACI 2004, Timisoara, Proceedings, ISBN 963-7154-26-4, pp. 70 – 69, 2004

RESEARCH GRANTS AND PROJECTS

National grants and projects

1. Research Grant of the National University Research Council (CNCSIS), Type A, no. 20/2004, CNCSIS code 190, Title: *Development of Control Structures and Controllers for Positioning Systems*. Director: Prof. dr. eng. Stefan Preitl (Financed value 150,000,000 ROL)

The development of design and tuning methods for conventional PI and PID controllers applicable to variable parameter plants is actually by taking into account the large use of controllers with dynamics when coping with this type of applications. The 2-DOF controllers are also widely used due to the good control system performance they can achieve with respect to both the reference and the disturbance inputs. A combination within 2-DOF and fuzzy control represents a relatively new domain of automatic control with exquisite potential applications in the control of servosystems that are subject to difficult analytical modeling. The Youla parameterization (also the Q – parametrization) is a modern control design method suitable for both stable and unstable plants. In the design phase systems with electrical drives can be well approximated through low order linear models called benchmarks. For such system it can be advantageous to use control design based on modulus optimum criterion

The main referred applications are in field of mobile robots and electro-hydraulic servosystems. For example, the control of nonholonomic mobile

robots is of interest due to the implications of nonholonomic constraints. The majority of controllers for nonholonomic mobile robots are based on either kinematic models, or dynamic models. But, the dynamic models do not exploit the dynamics of the actuators, of the measuring devices and of the control equipment. Since the development of tracking controllers based on the current approaches is rather complex, it is necessary to simplify the controller development for the further implementation. The development methodologies must be systematic and based on the sensitivity analysis of the control systems involved.

2. Research Grant of the National University Research Council (CNCSIS), Type A, no. 19/2004, CNCSIS code 189, Title: *Development of New Fuzzy Controller Structures Based on Sensitivity Theory*. Director: Prof. dr. eng. Radu-Emil Precup (Financed value 210,600,000 ROL)

The sensitivity analysis of fuzzy control systems (FCSs) with respect to the parametric variations of the controlled plant is necessary because the behaviour of these systems is generally reported as 'robust' or 'insensitive' without offering systematic analysis tools. The sensitivity analysis performed in the project is based on the idea of approximate equivalence between the FCSs and the linear control systems, in certain conditions.

Fuzzy control represents a relatively new domain of automatic control with exquisite potential applications in the control of plants that are subject to difficult analytical modeling. This is the case of anti-lock braking systems and of mobile robots. Sliding mode control systems represent a particular case of variable structure systems, and they have advantages such as relatively high robustness and good dynamic performance. In the framework of this project: CNCSIS grant code 189, type A, Development of new fuzzy controller structures based on sensitivity theory.

International grants and projects

1. *Bilateral research contract, 2003-2005, with Budapest University of Technology and Economics (B.U.T.E.), Hungary; Theme: "Nonlinear systems and control in the field of power electronics";* Directors Prof. Ștefan PREITL (U.P.T., Romanian partner) and Acad. Istvan NAGY (B.U.T.E., Hungarian partner) (*The Agreement of the Second Romanian-Hungarian Session of Scientific and Technologic Co-operation, signed in Budapest, 07.03.2003, Appendix 2, pos. 16 Ro-18/2002, MCT no. C-18015 / 26.03.2003*)

Nowadays nonlinear dynamic systems are in the focus of research interest of scientists. The co-operation during 2004 has embraced and oriented

on three topics in the broad field of the Application of Nonlinear Dynamics in Emerging Technologies. They are as follows: Servo systems; Feedback controlled nonlinear dynamic variable structure systems with single and multi loops in power electronics and motion control; Intelligent Space; Development of nonlinear controllers for mobile robots.

Research fields in this framework:

- Prof. dr. eng. Ștefan Preitl, Prof. dr. eng. Radu-Emil Precup, Lect. Florin Drăgan, Assist. eng. Emil Voișan, Assist. eng. Zsuzsa Preitl, Acad. Istvan Nagy, Prof. Ruth Bars: *Structures and algorithms for linear and nonlinear control algorithms. Control algorithms for power electronic circuits.*
 - Prof. dr. eng. Ștefan Preitl, Prof. dr. eng. Radu-Emil Precup, Assist. eng. Levente Kovacs, Prof. Zoltan Benyo: *Study of multivariable systems with applications in bio-systems and bio-medical systems.*
 - Prof. dr. eng. Radu-Emil Precup, Prof. dr. eng. Ștefan Preitl, Assist. eng. Simona Gheju, Assoc. Prof. Peter Baranyi, Assoc. Prof. Peter Korondi: *Analysis and development of fuzzy controllers.*
2. *Submitted project proposal* as part of the Sixth European Framework in control of new electrical machines applied to robot control: "Entwicklung eines Modells und eines Regelalgorithmus für die Transverse Flux Machine", partners: University of Bremen and companies from Germany and Romania.



PERSPECTIVE DOMAINS

- New methods for the algorithmic design of conventional and intelligent controllers (fuzzy, neural, sliding mode)
- Methods for computer-aided design of control systems
- Control solutions in the field of: power systems, electrical drives, general industrial automation, mobile robots

STRATEGIC PRIORITIES

- Control systems ensuring low sensitivity
- Tools for computer-aided design of 2-DOF controllers
- Low cost solutions for control problems dedicated to mobile robots
- Methods and tools to enable the systematic development of fuzzy control systems.

RESEARCH TEAM

- Prof. dr. eng. Stefan Preitl, head of the team
- Prof. dr. eng. Radu-Emil Precup
- Assist. eng. Levente Kovacs, PhD student
- Assist. eng. Zsuzsa Preitl, PhD student
- Assist. eng. Simona Gheju

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Researches in APPLIED INFORMATICS

RESEARCH FIELDS

- Health Information Systems
- E-Health
- Embedded Systems
- Real-time Systems.

KEYWORDS

Distributed medical informatics; applied informatics; telemedicine; e-administration.

MAIN ACTIVITIES

- Study and development of alternative solutions for integrated healthcare networks based on Microsoft.NET and JAVA platforms
- Development of mobile applications in medical informatics
- Development of distributed document flow-based software for the Timis County Council administration.

RESULTS

PUBLISHED PAPERS

1. Stoicu-Tivadar, L., Stoicu-Tivadar, V., Kormos, C., Oprean, S., *Contributions of Medical Informatics to Health*, EFMI, IOS Press, June 2004, ISBN 1-58603-435-9, pg. 49-51

2. Stoicu-Tivadar, L., Stoicu-Tivadar, V., *Human-Computer Interaction Reflected in the Design of User Interfaces for General Practitioners*, Satellite Workshop on RTD Potential in Central and Eastern Europe for Building Information Society in Healthcare, Euromise 2004, Prague, April 2004
3. Stoicu-Tivadar, V., Oprean, S., Miron, A., Minciună, C., *Several aspects of the migration toward the Microsoft.NET technology for an integrated healthcare information system*, Scientific Bulletin of the „Politehnica” University of Timișoara, Transactions on Automatic Control and Computer Science, Vol.49 (63), 2004, ISSN 1224-600X
4. Berian, D., *Technical Aspects in Development of a Software Application Used in the Framework of a GPs National Level Network*, Scientific Bulletin of the „Politehnica” University of Timișoara, Transactions on Automatic Control and Computer Science, Vol. 49(63) 2004, No. 2, ISSN 1224-600X, pp. 87-92
5. Stoicu-Tivadar, L., Kormos, C., *Solution for Health Care Information System Architecture*, Scientific Bulletin of the „Politehnica” University of Timișoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), No.2, 2004, ISSN 1224-600X, pg. 81-86
6. Robu, N., Stoicu-Tivadar, V., Silea, I., Stoicu-Tivadar, L., Berian, D., Albu, A., *Incremental Development of a Regional E-administration Network with Academic Expertise*, Proceedings of the European Conference E_COMM_LINE 2004, Gh. M. Sandulescu et al. (Editors), ISBN 973-0-03671-3, Bucharest
7. Stoicu-Tivadar, L., Kormos, C., *Java Based Technologies for Communication Between Health Information Systems*, New IT Tools in Medicine and Life Sciences, MEDINF2004, 27-th Medical Informatics Conference, Tg. Mures, 15-16 Oct. 2004, pp. 15-16
8. Stoicu-Tivadar, V., Stoicu-Tivadar, L., Berian, D., *Perspectivă tehnologică asupra dezvoltării sistemului informatic integrat MedINS / MediNET pentru medici de familie*, MediNET Seminar, Bucharest, April 2004, ISBN 973-602-051-7, pg. 147-161

PERSPECTIVE DOMAINS

- Distributed architectures and appropriate technological solutions
- Mobile applications and related technologies
- Interoperability standards in distributed medical informatics

- Tools for statistical processing of the medical data and for rapid development of embedded applications
- Solutions for integrated healthcare networks and interoperability and for e-administration (document flow and data collecting).

STRATEGIC PRIORITIES

It should be encouraged at strategic level the directions specified in the domain by the European Community:

- The Education and Training of high level healthcare managers and policy makers on the strategic role of ICT in Healthcare and change management
- To implement programmes on education and training, and other actions to promote awareness and to reduce resistance to change of healthcare professionals
- To set up specific awareness actions addressing sensitive groups, such as: academic circles, high reputation specialists at university hospitals and other local medical opinion leaders, clinical research groups, medicine and nursing students
- To improve mutual learning for the transferring part too, particularly to avoid cultural mismatches

RESEARCH TEAM

- Prof. dr. eng. Vasile Stoicu-Tivadar, head of the team
- Prof. dr. eng. Lăcrămioara Stoicu-Tivadar
- Assist. eng. Dorin Berian, PhD Student
- Assist. eng. Bogdan Solga
- Assist. eng. Ioan-Daniel Ardelian

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Research in REAL-TIME CONTROL SYSTEMS

RESEARCH FIELDS

- Advanced control of AC drives: Sensorless control of IPMSM
- Applications to Electric and Hybrid Vehicles.

KEYWORDS

Sensorless direct torque and flux control; State and disturbance observers; Variable structure flux-observer, Fuzzy-interpolating implementation, Signal injection; Real-time implementation;

Interior permanent magnet synchronous machines (IPMSM); Electric and hybrid vehicles (EHV).

MAIN ACTIVITIES

- Development of Sensorless control system from zero speed for starter-generator with IPMSM for EHV
- Development of Integrated sensors of rotor position and speed based on signal injection for IPMSM drives
- Real-time implementation and testing using dSpace for Sensorless control system of PMSM drive.

RESULTS

PUBLISHED PAPERS

1. Andreescu, G. D., Popa A., *Dynamic Estimation of Speed, Acceleration and Equivalent Load Torque in Servo-Motion Control with only Position Sensor*, Revue Roumaine des Sciences Techniques, Serie Electrotechnique et Energetique, Romanian Academy, Publishing House of the Romanian Academy, ISSN 0035-4066, tome 49, no. 3, pp. 395 – 404, 2004
2. Andreescu, G. D., *Model Reference Adaptive Observer for Sensorless Control of Permanent Magnet Synchronous Motor Drives*, Revue Roumaine des Sciences Techniques, Serie Electrotechnique et Energetique, Romanian Academy, Publishing House of the Romanian Academy, ISSN 0035-4066, tome 49, no. 1, pp. 85 – 98, 2004
3. Andreescu, G. D., Rabinovici, R., *Torque-Speed Adaptive Observer and Inertia Identification without Current Transducers for Control of Electric Drives*, Proceedings of the Romanian Academy Series A: Mathematics, Physics, Technical Sciences, Information Science, Romanian Academy, Publishing House of the Romanian Academy, ISSN 1454-8267(e), 1454-9069(p), vol. 5, no. 1, pp. 89 – 95, 2004
4. Andreescu, G. D., Boldea, I., *Integrated Sensors of Rotor Position and Speed based on Signal Injection for IPM-Synchronous Motor Drives*, Proceedings of 8th IEEE Int. Conf. on Intelligent Engineering Systems INES 2004, Eds.: S. Nedevschi, I.J. Rudas, Ed. U.T.Press, Cluj-Napoca, ISBN 973-662-120-0, pp. 371 – 375, 2004

RESEARCH GRANTS AND PROJECTS

National grants and projects

1. Research Grant of the National University Research Council (CNCSIS), no. 143A/2004:
Title: Sensorless control system from zero

speed with direct torque and flux control (DTFC) for starter-generator with IPMSM for EHV (EHV-Sensorless). Director, Prof. dr. eng. G. D. Andreescu.

Results: A prototype of IPMSM at 42 Vdc for EHV has been designed, simulated and manufactured. A new EHV-Sensorless control system has been proposed, including: 1) Development of DTFC with space vector modulation using sliding mode. 2) New rotor position observer with signal injection and phase-sensitive vector- filter including zero speed, with initial position identification. 3) New intelligent observer for flux, torque and speed, starting from zero speed, with combined structure: using signal injection at low speed, and respectively, based on induced voltage at medium-high speed, with a smooth transition. This sensorless control system has been elaborated and validated by digital simulation. In advance, good preliminary experimental results in complex regimes have been obtained using a dSpace real-time platform within cooperation program between UPT (Prof. Ioan Boldea) and the Institute of Energy Technology, Aalborg University, Denmark (Prof. Fred Blaabjerg). The research results have been published in international journals and conference proceedings as ISI, INSPEC, IEEE papers.

PERSPECTIVE DOMAINS

- Real-time control using LabView (LabWindowsCVI)
- Applications with FPGA using VHDL, Xilinx
- Automotive control
- Advanced control of electric drives, Robotics.

STRATEGIC PRIORITIES

- Control of EHV and Automotive Electric Actuator Technologies
- dSpace platform, LabView real-time platform
- Advanced control of electric drives, Automotive, Robotics, Mechatronic systems.

RESEARCH TEAM

- Prof. dr. eng. Nicolae Robu, head of the team
- Prof. dr. eng. Toma-Leonida Dragomir
- Prof. dr. eng. Gheorghe-Daniel Andreescu
- Assist. eng. Tiberiu Ionică
- Dipl.. eng. Adrian Popa

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Researches in *SYSTEM IDENTIFICATION. ADAPTIVE SYSTEMS*

RESEARCH FIELDS

- System's modeling, identification and simulation
- Unconventional energetic
- Neural networks and fuzzy systems
- Adaptive control systems.

KEYWORDS

Modeling, identification and simulation of systems, neural networks and fuzzy systems, wind energy conversion systems, unconventional energetic, adaptive control, self-tuning.

MAIN ACTIVITIES

- Modeling, simulation and development of wind energy conversion systems (WECS)
- Identification and parameter estimation of electrical machines (asynchronous and synchronous)
- Development of new enhanced electrical machines types
- Development of control systems for WECS
- Control software development in industrial applications
- Modeling and simulation of systems with neural networks
- Development of WECS software
- Development of adaptive control structures.

PUBLICATIONS

BOOKS

Prostean, O., *Adaptive control systems. Application to the adaptive control of hydro generators excitation system*, Orizonturi Universitare Publishing House, Timisoara, 2004, ISBN 973-638-154-4, 163 pages, Published in Romanian

PUBLISHED PAPERS

1. Budisan, N., Gyulai, F., Prostean, O., Hentea, T., *Speed Control Strategies for Fixed Blade Turbine Windmills*, Global Windpower 2004, Conference Proceedings, March 29-31, 2004, Chicago, Illinois, USA, pp.159-166
2. Filip, I., Szeidert, I., Vasar, C., *Secure Web Access Control Algorithm*, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence, May 25-56, 2004, ISBN 963-71-54-26-4, Timisoara, Romania, pp. 159-166
3. Vasar, C., Prostean, O., Filip, I., Szeidert, I., *Electrical Energy Prediction Study Case Based on Neural Networks*, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence, May 25-56, 2004,

ISBN 963-71-54-26-4, Timisoara, Romania, pp. 89-96

4. Prostean, O., Szeidert, I., Filip, I., Vasar, C., *Wind Energy Conversion Systems – Modeling in Simulink Environment*, International Symposium – ConTI'2004, 18-19 May, 2004, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, vol. 1, Tome 47(61), ISSN 1224-600X, Timisoara, Romania, pp. 169-174

RESEARCH GRANTS AND PROJECTS

National grants and projects

Submitted and approved proposal: National University Research Council CNCIS, Romania, research grant “Researches regarding new electromechanical energy conversion automatic systems, with induction machines, with application to wind aggregates”, project manager: Prof. Octavian Prostean, PhD. (head of the research and development team). The proposed grant has the aim, goal and objectives related to the CNCIS priority research domain, researches regarding increasing the rate of WECS usage as a environmental friendly energy resource leading to the reduction of carbon emissions a of the pollution, due the usage of non-ecological resources, highly polluting, conform to the global ecological tendency of energy production. The aim will be fulfilled by novel renewable resources energy electromechanical conversion automatic systems based on squirrel cage induction machines, with physical decoupling of the active and reactive current components, used in variable speed wind energy conversion systems (WECS) with advanced control. The factors that determine the WECS performances are at windmills are the type, construction, generator's usage method and the control system of the WECS. The proposed project will contribute to the scientific development in this field, reported to the most competitive solutions resulted from the technical literature. Grant CNCIS Type A, Theme no.26, code 628 (Financed value 200,000,000 ROL)

PERSPECTIVE DOMAINS

- Real time control of induction machines using LabView (LabWindowsCVI) using the National Instruments Data Acquisition Systems
- Advanced control of wind aggregates
- Neural network control systems.

STRATEGIC PRIORITIES

- Study of innovative control systems for wind aggregates: improved adaptive step Hill climbing method (HCC)

- Tools for statistical wind measurement related data, for short-term forecasting used in wind speed prediction based windmill's control systems and for simulation of autonomous/wind farms aggregates (development of new Matlab tools).

RESEARCH TEAM

- Prof. dr. eng. Octavian Proștean, head of the team
- Prof. dr. eng. Nicolae Budișan
- Assoc. prof. dr. eng. Ioan Filip
- Assist. eng. Iosif Szeidert, PhD student
- Assist. eng. Cristian Vașar, PhD student

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RESEARCH DIVISION IN COMPUTER SCIENCE AND ENGINEERING

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Researches in COMPUTER SYSTEMS ARCHITECTURE

MAIN ACTIVITIES

- Methods of Temperature and Power Reduction in Embedded Systems and their Applications.
- Development of unconventional computer architectures.
- New interfaces based on image and speech recognition.

PUBLISHED PAPERS

1. Popa, M., Marcu, M., Fuicu, S., Jucu, A., *Microcontroller Based Programmable Logic Controller*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 5-8, 2004
2. Popa, M., Icret, R., Lupu, C., Stanescu, D., *Webpic – An Embedded Internet Solution*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 9-12, 2004
3. Popa, M., Marcu, M., Popa, A., *A Microcontroller Based Data Acquisition System with USB Interface*, Proceedings of ICEEC'04, The IEEE International Conference on Electrical, Electronic and Computer Engineering, Cairo, Egypt, pp. 206-209, 5-7 Sept. 2004
4. Popa, A., Gruescu, C., Popa, M., Uscatescu, M., *Remote Controlled Autonomous Mobile Robot Equipped with Optoelectronic Devices*, Romanian Journal of Optoelectronics, Vol. 12, Issue 3, pp.1-12, 2004
5. Popa, M., *16 Bit Microcontroller Solutions for Controlling DC Motors*, Proceedings of ICC'04, The 5th International Carpathian Conference Control, Zakopane, Poland, pp. 237-242, 25-28 May 2004
6. Popa, M., Stanescu, D., *A Node for Serial Communications in Microcontroller Networks*, Proceedings of ECI 2004, The 6th International Scientific Conference on Electronic Computers and Informatics, Kosice, Slovakia, pp. 223-228, 22–24 September, 2004
7. Popa, M., *A Flexible and General Solution for Reconfiguring Pipeline Computing Systems*, Proceedings of the International Conference on Computer Systems and Technologies, COMPSYTECH'04, Rousse, Bulgaria, pp. I.1-1-I.1-6, 17–18 June, 2004
8. Popa, M., *Solutions for Increasing the Number of PC Parallel Port Control and Selecting Lines*, Proceedings of the International Conference on Computer Systems and Technologies, COMPSYTECH'04, Rousse, Bulgaria, pp I.1-7 – I.1-12, 17–18 June, 2004
9. Mihu, I., Stratulat, M., Mihu, I., *EKG Signal Processing*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 13-18, 2004
10. Stratulat, M., Mihu, I., Mihu, I., Stanescu, D., Mastei, D., *Digital Signal Processing for ECG Signal*, International Conference on Computers Communications, ICC'04, Oradea, ISBN 973-613-542-X, pp. 394-400, 2004

RESEARCH TEAM

- Prof. dr. eng. Crişan Strugaru, head of team
- Prof. dr. eng. Mircea Stratulat
- Prof. dr. eng. Mircea Popa
- Lecturer Marius Marcu
- Assist. Daniela Stanescu

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Researches in DISTRIBUTED AND REAL-TIME SYSTEMS**MAIN ACTIVITIES**

- Programming and distributed processing media.
- Network protocols.
- Designing, implementing and testing real-time executives for systems based on various microprocessors.
- Implementing and testing real-time executives for dedicated applications.
- Extending real-time concepts in distributed applications.
- Integrating Enterprise Applications into GRID-Type Networks Using Service-Oriented Software Architectures.
- Methods, Techniques and Structures for Adaptive Computing Applications in Data Communications Field.

BOOKS

1. Holotescu, C., *eLearning Guide*, Solness Publishing House, Timisoara, ISBN 973-8472-92-X, 2004, 122 pages

PUBLISHED PAPERS

1. Ciocarlie, H., *The Characteristic Features of a Concurrent Language Implementation in a Distributed Environment*, International Conference on Computational Intelligence, ISBN 975-98458-1-4, pp. 121-124, Istanbul, 2004
2. Ciocarlie, H., *A Mechanism of Visibility Control*, International Conference on Signal Processing, ISBN 975-98458-0-6, pp. 103-105, Istanbul, 2004
3. Ciocarlie, H., *Informatizarea Administratiei Publice. Perspective si Solutii*, International Workshop "Europe between those 15 and 25", organized by the Romanian Academy Timisoara and the University of West, Timisoara, ISSN 1453-9101, pp. 36-40, 2004

4. Cosma, D., *Towards Building Feature-Oriented Distributed Systems*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 201-206, 2004
5. Borlea, S., Cosma, D., *A Framework for Feature Migration*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 87-90, 2004
6. Cosma, D., Cirstea, C., Stefanut, L., *SOLIST – A Java-Based Application for Educational Internet Polls*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 91-94, 2004
7. Holotescu, C., *Developing a Program for Training the eTrainers*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 169-174

RESEARCH TEAM

- Prof. dr. eng. Ioan Jurcă, head of team
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- Prof. dr. eng. Horia Ciocârlie
- Assist. eng. Carmen Holotescu
- Assist. eng. Sorin Șerău
- Assist. eng. Dan Cosma
- Assist. eng. Stejărel Vereș
- Assist. eng. Adrian Petru Mierluțiu
- Assist. eng. Ciprian-Bogdan Chirilă

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Researches in COMPUTER SYSTEMS RELIABILITY**MAIN ACTIVITIES**

- Watchdog processor for reliability increasing of computers
- Selftesting development concepts.
- Selfchecking development tools.
- Digital system testing based on data compression (transitions counting syndrome, linear feedback shift register).
- Equipment structures with fault tolerant capability (error detecting and correcting codes, triple modular redundancy).

- Bio-Inspired Design of Applications on Reconfigurable Platforms

PUBLISHED PAPERS

1. Prodan, L, Udrescu, M., Vladutiu, M., *Self-Repairing Embryonic Memory Arrays*, IEEE NASA/DoD Conference on Evolvable Hardware, Seattle, Wa, USA, ISBN 0-7695-2145-2, pp. 130-137, 2004
2. Udrescu, M., Prodan, L, Vladutiu, M, *Using HDLS for Describing Quantum Circuits: A Framework for Efficient Quantum Algorithm Simulation*, 1st ACM Conference on Computing Frontiers, Ischia, Italy, ISBN 1-58113-741-9, pp. 96-110, 2004
3. Marcu, M., Vladutiu, M., *A Genetic Algorithm for Thermal Image Deconvolution*, Iranian Journal of Electrical and Computer Engineering, Summer-Fall 2004, Vol 3, No 2, IJECE, ISSN 1682-0053, pp. 138-143, 2004
4. Vladutiu, M., Marcu, M., *Printed Circuit Boards Testing Using Thermal Signatures*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 33-36, 2004

RESEARCH TEAM

- Prof. dr. eng. Mircea Vladutiu
- Assist. Lucian Prodan
- Assist. Mihai Udrescu

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Researches in DISTRIBUTED DATA BASES AND ARTIFICIAL INTELLIGENCE

MAIN ACTIVITIES

- Designing and implementing relational databases with complex network structures.
- Pattern recognition in medicine and chemistry.
- Development of a hybrid expert system (rules + neural network) for research in infectious diseases.
- Implementing complex distributed databases and Internet access to databases in companies, banks, and local administration.
- Interdisciplinary cooperation for expert and cognitive systems development.
- E-Learning Application-Oriented Intelligent Agent with Pedagogic Functions.

PUBLISHED PAPERS

1. Chirila, C. B., Crescenzo, P., Lahire, P., Pescaru, D., Tundrea, E., *Factoring Mechanism of Reverse Inheritance*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 131-136, 2004
2. Tundrea, E., Lahire, P., Parigot, D., Chirila, C. B., Pescaru, D., *Smartfactory - An Implementation of the Domain Driven Development Approach*, SACI 2004, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence, Timisoara, Romania, ISBN 963 7154 26 4, pp. 231-240, 2004
3. Pescaru, D., Lahire, P., Chirila, C. B., Tundrea, E., *A Better Representation for Class Relationships in UML Using OFL Meta-Information*, 2004 IEEE-TTTC International Conference on Automation, Quality & Testing, Robotics AQTR 2004 (Theta 14), Cluj-Napoca, Romania, ISBN 973-713-047-2, pp. 269-274, 2004
4. Pescaru, D., Mocofan, M., *Efficient Implementation for Image Processing Algorithms*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 217-222, 2004
5. Pescaru, D., Mocofan, M., *An Easy-to-Use Distributed Framework for Image Processing*, Facta Universitatis, Series: Electronics and Energetics, Volume 17, Issue No. 3, Nis, Yugoslavia, pp. 453-464, December 2004
6. Cernazanu, C., Ciresan, D., Holban, S., *EKG Signal Recognition with Neural Networks*, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence Timisoara, ISBN 963 7154 26 4, pp. 39-48, 2004
7. Gyorodi, C., Gyorodi, R., Holban, S., *A Comparative Study of Association Rules Mining Algorithms*, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence, Timisoara, ISBN 963 7154 26 4, pp. 213-222, 2004
8. Ciresan, D., Cernazanu, C., *Linguistic Modeling for Automatic Speech in Romanian Language*, Development and Application Systems, Suceava, ISBN 973-666-106-7, pp. 490-497, 2004
9. Ciresan, D., *Image Segmentation Methods Based on Natural Clustering Algorithms, Usable for Unconstrained Handwriting*

- Recognition*, 6th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing, Timisoara, ISBN 973-661-441-7, pp. 131-140, 2004
10. Todinca, D., *Applying Fuzzy Logic to Admission Control In GPRS/EGPRS Networks*, Proceedings of 1st Romanian - Hungarian Joint Symposium on Applied Computational Intelligence, ISBN 963 7154 26 4, pp. 133-142, Timisoara, Romania, May 2004
 11. Todinca, D., Graja, H., Perry, P., Murphy, J., *Novel Admission Control Algorithm For GPRS/EGPRS Based on Fuzzy Logic*, Proceedings of IEE 5th International Conference on 3G Mobile Communications Technologies 3G3004, Londra, UK, ISBN 0 86341 388 9, pp. 342-346, 2004
 12. Todinca, D., Holban, S., Perry, P., Murphy, J., *Fuzzy logic based admission control for GPRS/EGPRS networks*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 205-210, 2004
 13. Mitea, A. C., Jian, I., *A Physical Design Methodology For Databases*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 11-16, 2004
 14. Borza, S., Jian, I., *Objectual Implementation for Relational Database in the Object-Relational Software*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 45-50, 2004
 15. Borza, S., Jian, I., *Objectual Schemas and Derived Classes in the Design of Object-Relational Databases for Mechanical System*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 51-56, 2004
 16. Pater, M., Jian, I., *Object Oriented Representation of Relational Database*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 65-70, 2004
 17. Jian, L., Jian, L., *About Object-Relational Database Implementations Using Oracle*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 57-61, 2004
 18. Crisan, M., *On Shannon, Fisher and Algorithmic Entropy in Cognitive Systems*, 1st Romanian-Hungarian Joint Symposium on Applied Computational Intelligence, Timisoara, ISBN 963 7154 26 4, pp. 49-56, 2004

RESEARCH TEAM

- Prof. dr. eng. Ionel Jian
- Prof. dr. eng. Ștefan Holban
- Prof. dr. eng. Marius Crișan
- Lect. dr. eng. Dan Pescaru
- Lect. dr. eng. Sorin Babii
- Lect. dr. eng. Doru Todinca
- Assist. eng. Liliana Jian
- Assist. eng. Cosmin Cernazanu

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Researches in ELECTRICAL MACHINES TESTING AND DIGITAL SIGNAL PROCESSING

MAIN ACTIVITIES

- Testing, modeling and monitoring in the domain of electric machines and equipments using data acquisition and processing systems.
- Design and implementation of digital signal conditioning, acquisition and data processing systems.
- Data recording and processing programs for transient regime analysis of electrical machines.
- Optimal design of electrical machines.
- Virtual instrumentation systems.
- Modeling, Design and Development of Real-Time Systems for Critical Applications of Data Acquisition, Signal Processing and Embedded Control.

BOOKS

1. Sora, I., Todinca, D., *Introduction to Computer Programming*, Politehnica Publishing House, ISBN 973-625-163-2, 2004, published in Romanian

PUBLISHED PAPERS

1. Micea, M., Cretu, V., Patcas, L., *Program Modeling and Analysis of Real-Time and Embedded Applications*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 207-212, 2004
2. Micea, M., Cretu, V., *Non-Preemptive Execution Support for Critical and Hard Real-Time Applications on Embedded Platforms*, Proceedings of the 2004 International Symposium on Signal, System and Electronics, ISSSE'04, Linz, Austria, CD-ROM, ISBN 3-9501491-3-9, Aug. 2004
3. Micea, M., *A Real-Time Compact Kernel for Critical Applications on Embedded Platforms*, Proceedings of the 7th International Conference on Development and Application Systems, DAS2004, Suceava, Romania, pp. 16-23, 2004
4. Sora, I., *Defining Composable Components in Multi-Flow Architectures Through Structural Constraints*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 101-106, 2004
5. Cretu, V., Bocan, V., *Security and Denial of Services Threats in GSM Networks*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 165-170, 2004
6. Cretu, V., Muscalagiu, I., *Asynchronous Searching Algorithms Seen from the Perspective of Algorithms' Ending Detection Technique*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 219-222, 2004
7. Babii, S., Cretu, V., *A Distributed Algorithm for Neural Network Training in a Network of Computers*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 233-236, 2004
8. Sora, I., Cretu, V., Verbaeten, P., Berbers, Y., *Automating Decisions in Component Composition Based on Propagation of Requirements*, Computer Science (LNCS) No. 2984, Springer Verlag, pp. 374-388, 2004

**PHD THESIS**

Mihai V. Micea, *Design and implementation of real-time systems for critical data acquisitions and processing applications*

RESEARCH TEAM

- Prof. dr. eng. Vladimir Crețu
- Prof. dr. eng. Marius Biriescu
- Lect. dr. eng. Mihai Micea
- Lect. dr. eng. Ioana Șora
- Dr. eng. Gheorghe Madescu
- Dr. eng. Marțian Moț
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AUTONOMOUS RESEARCH GROUPS

MAIN RESEARCH FIELDS

- System theory applications in fault detection and diagnosis
- System analysis using sensitivities
- Development of control system devices
- Fuzzy and neural systems
- Virtual instrumentation in control
- Control of electrical drives

Research group in APPLIED SYSTEMS THEORY

RESEARCH FIELDS

- Linear and non-linear systems
- Knowledge based systems, artificial intelligence
- DSP and μP – applications
- Quality engineering
- Reliability of control system
- Fuzzy logic
- Neural networks
- Control of electrical drives
- Fault detection and diagnosis
- Virtual instrumentation in control
- Modeling and simulation

KEYWORDS

Fault detection, identification and diagnosis, mathematical modelling, system safety and availability, controller design, process control, interpolating strategies, fuzzy logic, neural networks, control of electrical drives, virtual instruments.

RESULTS

RESEARCH PROJECTS

1. CNCSIS Grant, No. 309/33062, Research theme in cooperation with the University of Craiova, *The development of automated structures for increase the dependability of the control systems with applications in industrial systems* (energetics, chemistry, aviation, robotics), 2004
2. CNCSIS Grant, Code 205, theme no. 25, contract no. 32940/22.06.2004, *Researches to implement strategies based on fuzzy logic and neural networks for fault detection and diagnosis, with application at the electrical drives*, Director: Assoc. prof. dr. eng. Constantin Voloşencu

3. Leonardo da Vinci project, contract no. RO/2004/93019/EX, *Exchanges of specialists in the field of maintenance of production systems*, Director: Assoc. prof. dr. eng. Constantin Voloşencu
4. International research contract, *Computational intelligence in control*, "Politehnica" University of Timisoara and World Scientific and Engineering Academy and Society, Athens, Assoc. prof. dr. eng. Constantin Voloşencu, 2004

BOOKS

1. Dragomir, T.L., *Elements of System Theory*, vol 1. Politehnica Publishing House, 2004, ISBN 973-625-183-7, 451 pp.

PAPERS

1. Dragomir, T.L., Gabor, G., Korodi, A., *Some aspects Regarding Availability of Repairable Structures*, Scientific Bulletin of the "Politehnica" University of Timisoara, Transactions on Automatic Control and Computer Science, vol. 49(63), 2004, nr. 2, ISSN 1224-600X, pag. 159-166
2. Dragomir, T.L., Roth, H., Roesch, O.J., *Control Loop Adjustment of Plant Uncertainties*, Scientific Bulletin of the "Politehnica" University of Timisoara, Transactions on Automatic Control and Computer Science, vol. 49(63), 2004, nr. 2, ISSN 1224-600X, pag. 227-234
3. Popescu, D., *Comparison Study of Sensitivities of Nonlinear and Linear Mathematical Models of the Same Plant*, Scientific Bulletin of the "Politehnica" University of Timisoara, Transactions on Automatic Control and Computer Science, vol. 49(63), 2004, nr. 2, ISSN 1224-600
4. Dragomir, T.L., Gabor, G., Korodi, A., *On an Active Redundant Structure with K Identically Repairable Components*, the 12th International Symposium on Modeling, Simulation and Systems' Identification SIMSIS 12 - Galati 2004, Proceedings, pp. 54-60
5. Vladu, E., Dragomir, T.L., *Controller tuning Using Genetic Algorithms*, SACI – Symposium on Applied Computational Intelligence, 24-25 mai 2004, Timisoara, Proceedings, pp. 29-38, ISBN 963-7154-26-4

6. Voloşencu, C., *Deteția și diagnosticarea defectelor sistemelor de conducere a acționărilor electrice bazată pe logică fuzzy*, Annals of the Aurel Vlaicu University in Arad, 2004
7. Voloşencu, C., *Deteția și diagnosticarea cu logică fuzzy a defectelor unui sistem de reglare a turației unui motor sincron cu magneți permanenți*, Annals of the Aurel Vlaicu University in Arad, 2004
8. Voloşencu, C., *Fault Detection and Diagnosis in Industrial Systems, Based on Fuzzy Logic*, Summer School in Soft Computing, Arad, August, 2004

PATENTS

Trica, R. Al., Dragomir, T. L., *Bang-bang control devices for chopper driving of a magnetically wheel*, No. 94967, 2004

Research group in PROCESS CONTROL

RESEARCH FIELDS

- Chaotic systems
- Programmable Logic Controllers
- Remote control
- Operating Systems.

KEYWORDS

Chaotic systems, programmable logic controllers, remote control.

ACTIVITIES

- camera virtual with COIN 3D
- haptic device control
- analysis and synthesis of the electronic converters with chaotic behaviour

PUBLISHED PAPERS

1. Drăgan, F., Iercan, D., *Analyze of a Chaotic Behaviour via Period-Doubling at the Current-mode Controlled Boost Converter*, Scientific Bulletin of the "Politehnica" University of Timișoara, Transactions on Automatic Control and Computer Science
2. Szemes, P., Hashimoto, H., Voișan, E., Drăgan, F., *Evaluation of Inhabitant's Walking Habit in Intelligent Space*, IECON
3. Szabo, C., Korondi, P., Drăgan, F., Hashimoto, H., *Sliding Mode Navigation Control in Intelligent Space*, CEAI

STRATEGIC PRIORITIES

- Control of chaotic systems

RESEARCH TEAM

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- Assist. eng. Onuț Lungu
- Assist. eng. Emil Voișan

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Research group in KNOWLEDGE ENGINEERING. APPLICATIONS IN MEDICINE

RESEARCH FIELDS

- knowledge based systems
- artificial intelligence
- medical expert systems
- cryptographic techniques, security.

KEYWORDS

Inference strategies, knowledge representation, knowledge processing, medical diagnosis, neural networks, medical decision-making process, entity authentication, applied cryptography.

ACTIVITIES

- Development of medical expert systems and other applications for medical diagnosis
- Authentication protocols

PUBLISHED PAPERS

1. Petrică D., *Structure of Models for Medical Knowledge Processing*, Scientific Bulletin of the "Politehnica" University of Timișoara, Transactions on Automatic Control and Computer Science, vol. 49(63), 2004, nr. 2, ISSN 1224-600X, pp. 103-106

PERSPECTIVE DOMAINS

- The use of artificial intelligence methods for medical diagnosis.
- Building rules-based medical expert systems.

RESEARCH TEAM

- Lecturer dr. eng. Dorina Petrică, head of the team
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- Assist. eng. Raul Robu
- Eng. Bogdan Groza, PhD student

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Research group in *OBJECT-ORIENTED SOFTWARE ENGINEERING*

RESEARCH FIELDS

- Evolution and re-engineering of object-oriented software systems
- Software quality assurance
- Analysis and formal verification of software

KEYWORDS

object-oriented software evolution, re-engineering, design faults, detection strategies, quality metrics, quality assurance, analysis tools, formal verification

PUBLISHED PAPERS

1. Marinescu, R., *Detection Strategies: Metrics-Based Rules for Detecting Design Flaws*, Proc. of the 20th IEEE International Conference on Software Maintenance, IEEE Computer Society Press, pp. 350-359, 2004
2. Marinescu, R., Mihancea, P., *Towards the Optimization of Automatic Detection of Design Flaws in Object-Oriented Software Systems*, Proc. 9th European Conference on Software Maintenance and Reengineering, IEEE Computer Society Press, pp. 92-101, 2004
3. Marinescu, R., Ratiu, D., *Quantifying the Quality of Object-Oriented Design*, Proceedings of the 11th IEEE Working Conference on Reverse Engineering, IEEE Computer Society Press, pp. 192-201, 2004
4. Ratiu, D., Girba, T., Ducasse, S., Marinescu, R., *Using History Information to Improve Design Flaws Detection*, Proc. 8th European Conf. on Software Maintenance and Reengineering, IEEE Computer Society Press, pp. 223-232, 2004
5. Girba, T., Ducasse, S., Marinescu, R., Ratiu, D., *Identifying Entities That Change Together*,

Proceedings of 9th IEEE Workshop on Empirical Studies of Software Maintenance (WESS 2004), Chicago 2004

6. Genest, B., Minea, M., Muscholl, A., Peled, D., *Specifying and Verifying Partial Order Properties Using Template MSCs.*, Proc. 7th International Conference on Foundations of Software Science and Computation Structures, LNCS vol. 2987, pp. 195-210, Springer, 2004
7. Jebelean, C., *Automatic Detection of Missing Abstract Factory Design Pattern in Object-Oriented Code*, Scientific Bulletin of the „Politehnica” University of Timisoara, Transactions on Automatic Control and Computer Science, Vol. 49(63), ISSN 1224-600X, pp. 137-142, 2004

RESEARCH CONTRACTS

1. *Modeling, analysis and verification of software systems*, CNCSIS AT contract nr. 23/2004; Value: 130,000,000 ROL.

Research team: Marius Minea, Radu Marinescu, Dan Pescaru, Ioana Sora, Cristina Marinescu.

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- Assoc. prof. dr. eng. Marius Minea
- Assist. eng. Călin Jebeleanu
- Assist. eng. Cristina Marinescu
- Assist. eng. Petru Florin Mihancea

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