Universitatea Politehnica Timișoara

Projects supported by public funds

Projects supported by public funds

Fields	Total number of projects	Source of financing	Number of projects by source of financing	Number of projects presented
Systems Engineering & Computers and Information Technology	15	National Funds* International Programs** Cross-border Cooperation RO-SR Cross-border Cooperation HU-RO	12 1 1 1	4
Electrical and Power Engineering	2	National Funds*	1	1
Electronic Engineering and Telecommunications	5	National Funds* International Programs** POSDRU***	1 2 2	3
Civil Engineering and Building Services	9	National Funds* International Programs**	6 3	8
Industrial Engineering	3	National Funds*	3	1
Mechanical Engineering	14	National Funds* International Programs** POSDRU***	8 2 4	9
Materials Engineering	5	National Funds* International Programs**	4 1	1
Engineering and Management	4	National Funds* International Programs**	2 2	3
Chemical Engineering	11	National Funds*	11	5
Mathematics	2	National Funds* International Programs**	1 1	2

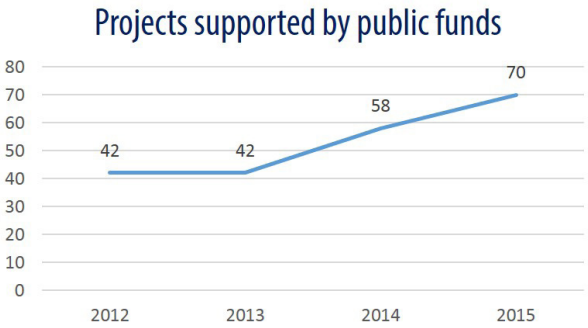
** National Funds - funds awarded by the Romanian govern through UEFISCDI*

*** International Programs - EU 7th Framework Program, Research Fund for Coal and Steel or the Information and Communication Technologies Policy Support Program - The European Space Agency (ESA), Leonardo da Vinci, Transfer of Innovation project (LDV-TOI)*

**** Structural Funds - European Regional Development Fund, European Social Fund and the Romanian National Authority for Scientific Research-*

NOTE: *For presentation we have chosen the most relevant projects for our research capacity. The projects are arranged by doctoral studies fields of IOSUD - UPT.*

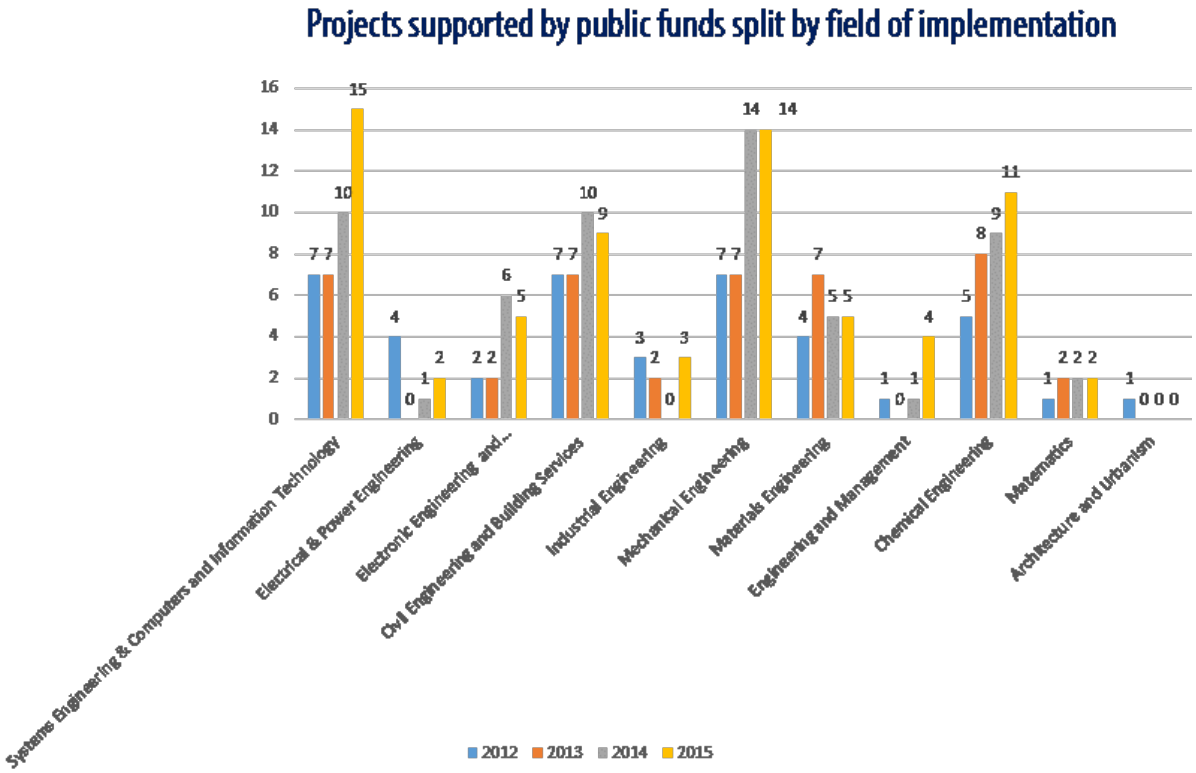
EVOLUTION OF PROJECTS SUPPORTED BY PUBLIC FUNDS IMPLEMENTED BY UPT 2012-2015



UPT considers that scientific research is a priority of the university mission, conferring personality and distinction to the university, and that reaching excellence in scientific research is a target on medium and long term.

Most of the research activity carried out by our institution is financed through external sources, obtained either from national and international calls for projects. This represents a confirmation of the superior quality of the research, but also of the prestige and professional deontology of the researchers affiliated to our institution.

We have presented the evolution of projects implemented by UPT between 2012 and 2015, total number of projects and projects split by field of implementation (cumulated by doctoral studies fields of IOSUD-UPT).



GREENER MOBILE SYSTEMS BY CROSS LAYER INTEGRATED ENERGY MANAGEMENT (GEMSCLAIM)

Goal of the project

The GEMSCLAIM project aims at introducing novel approaches for reducing the "greed for energy" of modern battery powered systems, thereby improving the user experience and enabling new opportunities for mobile computing

Mobile terminals and consumer devices are among the fastest growing markets in computing. In the long term, further growth is endangered by the "power/ energy wall". The purpose of GEMSCLAIM is to explore new techniques in energy optimization via an interdisciplinary vertical approach: a novel combined optimization across the major HW/SW system layers (compiler/OS/HW platform).

Short description of the project

- The ever-growing need for energy efficient computation requires adequate support for energy-aware thread scheduling that offers insight into a systems behavior for improved application energy/ performance optimizations. Runtime accurate monitoring of energy consumed by every component of a multi-core embedded system is an important feature to be considered for future designs. Although, important steps have been made in this direction, the problem of distributing energy consumption among threads executed on different cores for shared components remains an ongoing struggle.
- We aim at designing a generic low-cost and energy efficient hardware infrastructure which supports thread level energy consumption monitoring of hardware components in a multi-core system.
- The proposed infrastructure provides upper layers (operating system and application threads) with per thread and per component energy accounting API (Application Programming Interface), similar with performance profiling functions. Implementation results indicate that the proposed LEM (Load and Energy Monitor) adds around 10% resource overhead to the monitored system. Regarding the power estimates, the one derived by LEM achieve a correlation degree of more than 95% with the ones obtained from physical power measurements.

Project implemented by

Mobile Computing, Sensors Network and Embedded Systems Research Laboratory, Computer and Software Engineering Department, Faculty of Automation an Computers

Implementation period

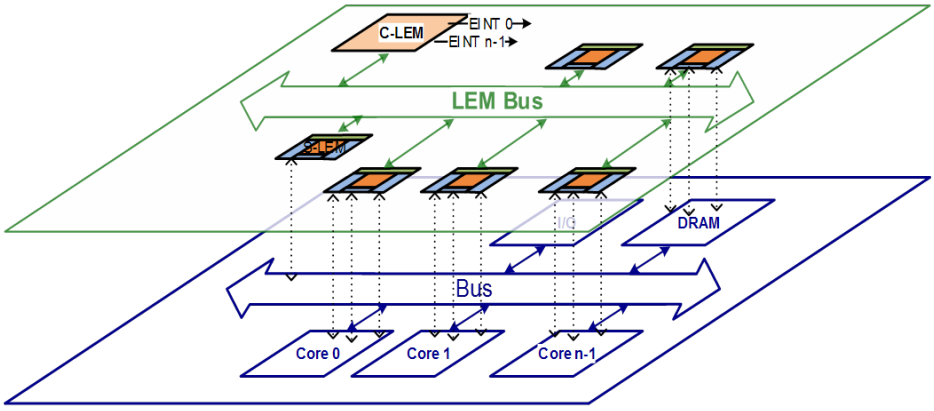
Sep. 2012-Aug.2015

Main activities

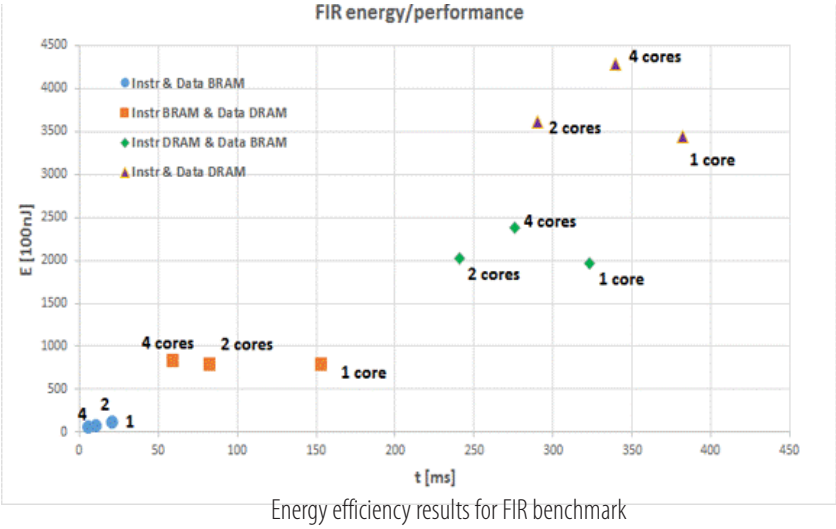
In a world of de-facto standards as well as huge amounts of legacy HW and SW, it is very difficult to achieve real breakthrough in system-wide energy savings beyond fragmented point solutions, e.g. at the HW or OS level.

GEMSCLAIM´s mission is to overcome this hurdle by a novel cross layer energy optimization approach that combines the following major research activities:

- Development of an energy-aware optimizing and parallelizing compiler;
- Component aware energy-efficient operating system and
- Customizable HW modelling with energy monitoring facilities.



Overall solution architecture



Energy efficiency results for FIR benchmark

Results

The contributions of this work are as follows: (1) hardware infrastructure for dynamic energy consumption monitoring in a heterogeneous multi-core system with per-thread energy accounting; (2) energy interrupt specification and design; (3) a use case on the software side (OS and drivers) for run-time per-thread energy accounting implementation on FPGA; and (4) validation of proposed infrastructure on a high-end FPGA board with physical energy measurements.

Per-thread energy accounting (PTEA) can be achieved by splitting the whole energy into processing energy (energy consumed by processing cores), data movement energy (energy consumed by interconnects to read and store data) and data storage energy (energy consumed by memories to store task data). The proposed infrastructure addresses all of these energy consumers: processing energy accounting, data movement energy accounting, and data storage accounting. Both processing and data movement accounting are performed per thread

In this project, we have introduced a cost effective LEM infrastructure for component level power and energy monitoring by providing adequate hardware and software support for PTEA and energy interrupt. The monitoring infrastructure implements two levels of energy accounting: processing energy and data movement energy. Per core energy accounting can be done using the LEM hardware infrastructure. The infrastructure can be further used in conjunction with OS drivers in order to, to implement thread-level energy accounting at OS level.

We have validated our infrastructure on a Zynq ZC702 evaluation board. We have developed systems consisting of 1 MB core, 2 MB cores, 4 MB cores and 8 MB cores. The results from the execution of WCET benchmarks has indicated a strong correlation between the LEM based energy estimates and the physical power board measurements of more than 95%.

The implementation results indicated that the overall overhead of the proposed infrastructure is around 10%, for 14 sensors attached to 4-cores reference design. The proposed LEM has lower cost with respect to the Xilinx based performance counters, while having increased flexibility and accuracy.

Applicability and transferability of the results

A number of hardware components described in Verilog have been developed and provided as IPs to FPGA community

Financed through/by

CHIST-ERA partnership projects, PNII-IDEI – 1/CHIST-ERA/01.10.2012

Research Centre

Research Center in Computer and Information Technology

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TIME AND ENERGY EFFICIENT FRAMEWORK FOR INTER-OPERATION OF SMART DEVICES (TEEFIOS)

Goal of the project

Development of an integrated real-time and energy efficient inter-operation framework for networks of smart sensors and devices - TEEFIOS.

Short description of the project

- Wireless networks of sensors and smart devices (WSN) are an extremely interesting topic, at the confluence of engineering fields with enormous impact on worldwide society: digital networks, wireless communications, and miniature embedded digital devices.
- Aware of the severe requirements and challenges raised by current applications in this area, we propose a new paradigm - Time and Energy Efficiency (T: or TEE).

The main proposed objectives focus on three distinct layers:

- (a) T:Node, a hardware-software environment and methodology for designing and assessing real-time behavior and efficient energy consumption of embedded devices,
- (b) T:YNet, a system for the development and analysis of TEE communication in wireless ad-hoc networks, and
- (c) T:PIlot, a methodology for the power management of the entire network. An integrated set of tools, benchmarks and databases will also be created to help advanced developers and researchers in the WSN area apply the TEE paradigm to applications with high impact.

Project implemented by

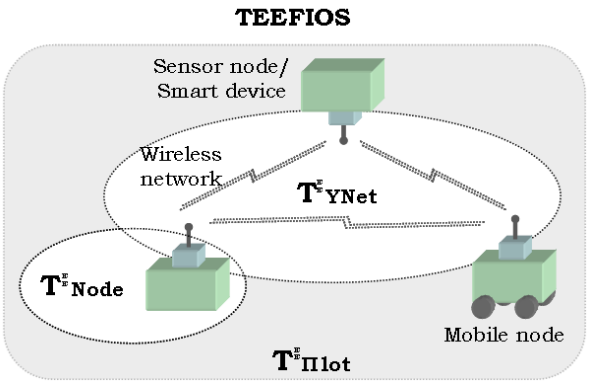
- DSPLabs - Digital Signal Laboratories Timisoara, Department of Computer and Software Engineering, Politehnica University of Timisoara.

Implementation period

01.10.2015 - 30.09.2017 (24 months)

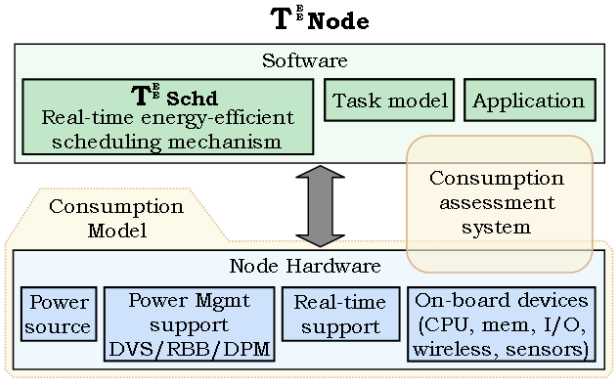
Grant value

548850 RON (~123337 EUR)



Main activities

- Energy consumption model and taxonomy for smart devices;
- Energy optimization real-time scheduling mechanism for smart devices;
- Methodology for node-level energy consumption assessment;
- Real-Time MAC protocol for ad-hoc wireless networks;
- Flexible real-time wireless module for smart devices;
- Framework for real-time communication in WSNs;
- Global power management methodology for networks of smart devices;
- Case studies to validate the TEEFIOS framework;
- Integrated set of databases and web-based tools;
- Information exchange, results dissemination and publication.



Results

- Integrated set of consumption models for smart devices;
- T:Schd, a real-time scheduling technique which optimizes energy consumption;
- Hardware/software methodology for the consumption evaluation of smart devices;
- Database with the energy efficiency evaluation and classification results for different types of smart devices;
- Real-time MAC protocol for ad-hoc wireless networks;
- Functional prototype of a flexible real-time wireless module for smart devices;
- A framework and a set of metrics for the evaluation of real-time wireless communication applications;
- A simulation testbed to evaluate the scalability of time and energy efficient WSN applications;
- T:Πlot, a global power management methodology for networks of smart devices;
- A collection of case studies that demonstrate the validity of the proposed framework and its individual components;
- An integrated set of web and database tools for public-level information and access to the TEEFIOS framework services.

Applicability and transferability of the results

- The real-time and energy efficient interoperation framework, along with the associated tool set and databases, will be of valuable use to the advanced developers and researchers in the field of wireless sensor/smart device networks.
- The results of this project will help them apply the TEE paradigm to applications with high impact in scientific, social, economic and environmental areas, such as: disaster recovery, smart buildings and structures, environment monitoring, smart energy grids and metering, robotic collectives, industrial process control, smart vehicles and transportation, security and surveillance.

Fields of interest

- Real-time systems;
- Energy efficiency;
- Sensors and smart devices;
- Wireless communication;
- Ad-hoc networks.

Financed through/by

UEFISCDI, Romanian Ministry of Education and Research, Bucharest, Romania.

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R&D team:
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CONTROL ALGORITHMS AND OPTIMAL TUNING OF FUZZY MODELS FOR AUTOMOTIVE, MECHATRONICS APPLICATIONS AND MOBILE ROBOTS

Goal of the project

Development of control structures and algorithms and optimal tuning of fuzzy models for a wide range of industrial processes, mechatronics, mobile robots and automotive applications.

Short description of the project

The project aims:

- Advanced control structures for automotive and mechatronics applications.
- Improvement and development of new Takagi-Sugeno (T-S) fuzzy models and control solutions for a wide range of industrial processes.
- Optimal tuning of fuzzy models for automotive and mechatronics applications.
- Improvement and development of control algorithms for mobile robots.

Project implemented by

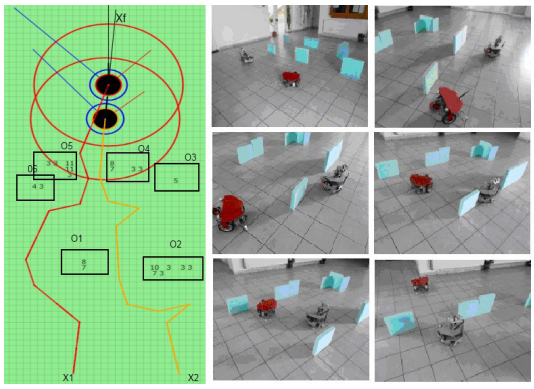
"Gheorghe Asachi"Technical University of Iasi (TUIASI) - Coordinator;
Politehnica University of Timisoara, Department of Automation and Applied Informatics - Project Partner P1;
S.C. ROMUS Trading & Development SRL - Project Partner P2.

Implementation period

2012-2016

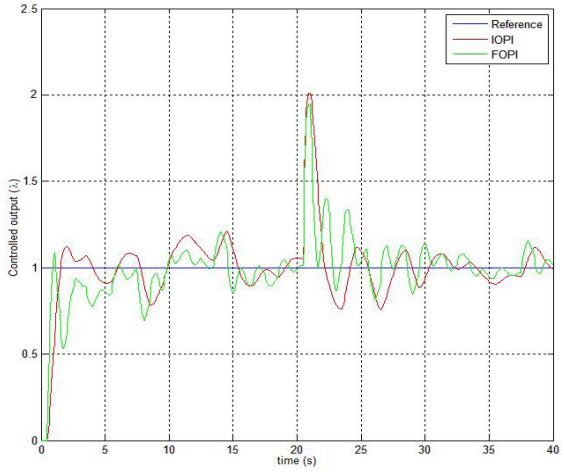
Main activities

- Design of low-cost T-S state feedback fuzzy controllers for the position control of a class of nonlinear servo systems.
- Sensitivity analysis with respect to the process parametric variations in the low-cost controller designs for vehicle power train systems with spark-ignition engine and continuously variable transmission.
- Modelling, simulation, analysis and design of linear, fuzzy and variable structure control solutions for direct current electric drive systems with continuously variable reference input, variable moment of inertia and variable load disturbance input, applicable to rolling mills and to strip winding systems.
- Development and experimental validation of simple T-S fuzzy models for several processes in automotive and mechatronics: anti-lock braking systems, nonlinear DC drive servo systems, magnetic levitation systems, electromagnetic actuated clutch systems, inverted pendulums.
- Fuzzy logic control algorithms that stabilize chaotic dynamical systems.
- Frequency domain design of fractional order proportional-integral controllers for lambda control in the framework of automotive engine control systems.
- Development of two-degree-of-freedom linear and fuzzy controllers, of hybrid T-S fuzzy controllers, of hybrid PI neuro-fuzzy controllers and of adaptive sliding mode fuzzy controllers for speed and position control of brushless DC drives with variable parameters – continuously variable reference input (speed), variable moment of inertia and variable load disturbance.
- Optimal tuning of parameters of T-S fuzzy models using nature-inspired algorithms (simulated annealing, particle swarm optimization and gravitational search algorithms) and evolving fuzzy modelling.
- Continuous development of the nRobotic platform in the framework of path planning and collision avoidance for mobile robots in missions.
- Development and testing of path planning algorithms for mobile robots using nature-inspired optimization algorithms.



Results

- 20 papers published in ISI journals with impact factors.
- 3 papers published in journals indexed by international databases.
- 7 book chapters published in Springer-Verlag volumes.
- 20 papers published in conference proceedings indexed by international databases (IEEE Xplore, INSPEC, DBLP, Scopus).
- more than 50 independent citations in 2014.



Applicability and transferability of the results

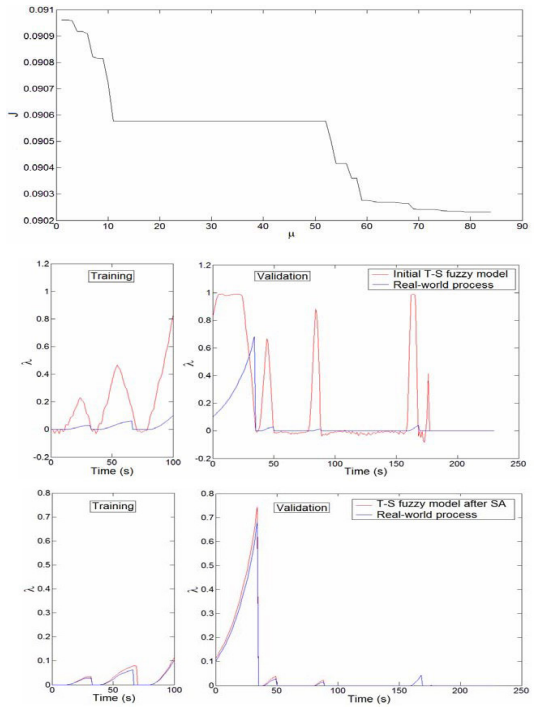
Nature-inspired optimization algorithms in modelling and control design, low-cost solutions for control problems in mechatronics, electrical drives, automotive and robotics, tools for the modelling, optimization and design of fuzzy control systems, real-time programming and operating systems for control and robotics.

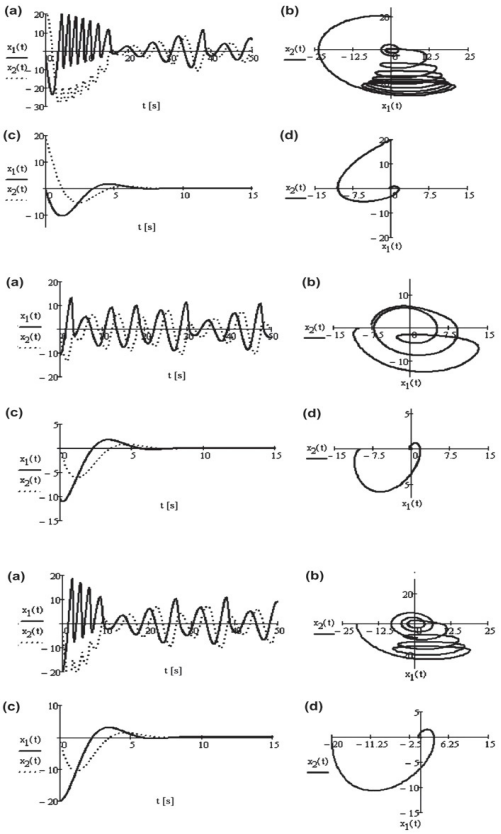
Financed through/by

Executive Agency for Higher Education, Research, Development and Innovation Funding – UEFISCDI, Bucharest, Romania.

Research Centre

CCISA - Research Centre for Automatic Systems Engineering





Research team

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Prof. Dr. Ing. Ioan Filip
Assoc. Prof. Dr. Ing. Florin Drăgan
Lect. Dr. Ing. Adriana Albu
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NEW PERFORMANCE IMPROVEMENT TECHNIQUES OF CONTROL SYSTEMS USING EXPERIMENT-BASED TUNING

Goal of the project

Enhance the existing techniques and develop new techniques dedicated to the improvement of control system performance using experimental data

Short description of the project

The project aims:

- Enhancement and development of data-based (data-driven) techniques and algorithms for improving control system performances using experimental data.
- Enhancement and development of nature-inspired algorithms n optimization of control system performance.
- Development of optical character recognition (OCR) applications.
- Development of new fuzzy control solutions for a wide range of industrial processes

Project implemented by

Department of Automation and Applied Informatics

Implementation period

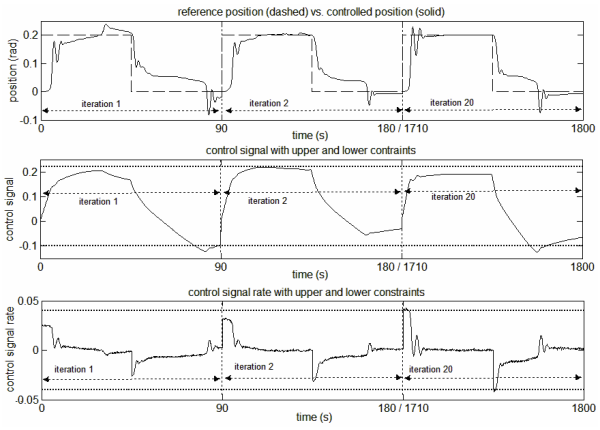
2011-2016

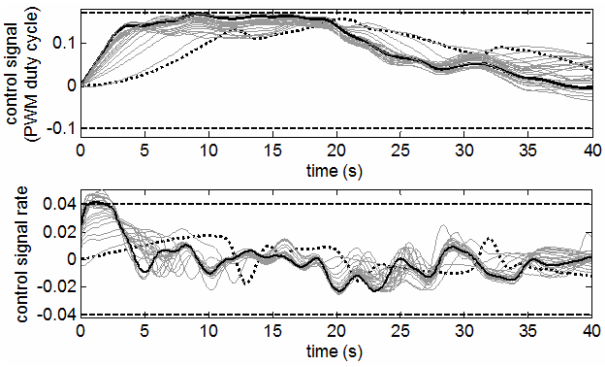
Main activities

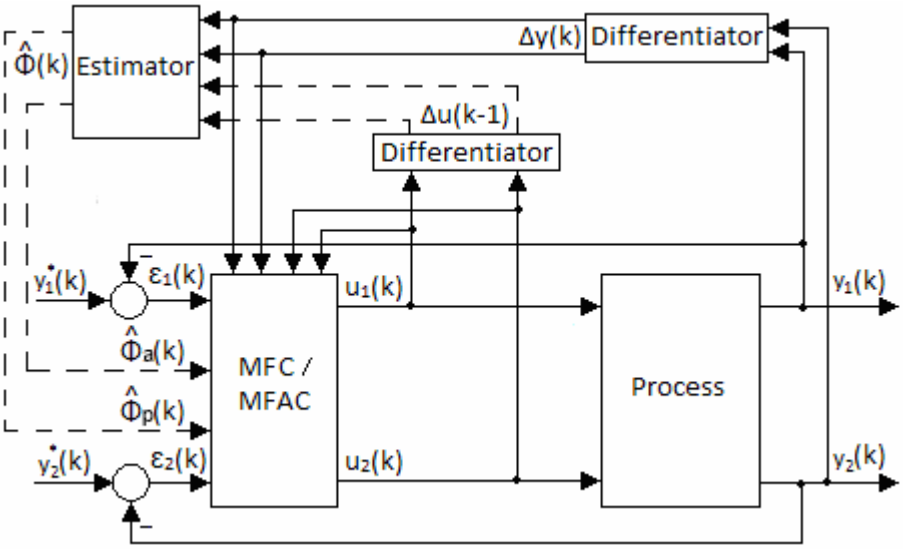
- Application of Iterative Feedback Tuning (IFT) to controller tuning for nonlinear control systems with constraints.
- Model-Free Adaptive Control strategies applied to multivariable (MIMO) aerodynamic systems.
- An experiment-based approach to Reference Trajectory Tracking optimal control problem with constraints.
- Validation of iterative techniques on laboratory equipment: liquid level control, motion control systems with motor actuation (speed and position control).
- Enhancement of control systems performance by fuzzy control, IFT and nature-inspired optimization algorithms (Charged System Search, Gravitational Search Algorithms).
- PI and fuzzy controller tuning to ensure a reduced sensitivity with respect to the parametric variations of processes.
- Enhancement of the training algorithm of Convolutional Neural Networks using a mixed approach of Back-Propagation and Gravitational Search Algorithm.

Results

- 7 papers published in Thomson Reuters Web of Science (formerly ISI Web of Knowledge) journals with impact factors in 2014.
- 7 papers published in conference proceedings and book chapters indexed in Thomson Reuters Web of Science (formerly ISI Web of Knowledge or ISI Proceedings) in 2014.
- 2 papers published in conference proceedings indexed in international databases (IEEE Xplore, INSPEC, Scopus) in 2014.
- 1 book chapter published in a Springer-Verlag volume.







Applicability and transferability of the results

Control systems with a reduced parametric sensitivity, tools for the computer-aided design of controllers, computer-aided techniques in iterative data-based control, nature-inspired optimization algorithms in control design and image processing, tools for the systematic development of fuzzy control systems.

Financed through/by

Executive Agency for Higher Education, Research, Development and Innovation Funding – UEFISCDI, Bucharest, Romania.

Research Centre

CCISA - Research Centre for Automatic Systems Engineering

Research team

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Lect. Dr. Ing. Daniel Iercan
Lect. Dr. Ing. Mircea-Bogdan Rădac
Lect. Dr. Ing. Claudia-Adina Bojan-Dragoş
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HYBRID SYSTEMS FOR CONVERTING RENEWABLE ENERGY OF SMALL VOLTAGE INTEGRATED INTO A MICROGRID

Goal of the project

The project is focused on the research, development and testing of an intelligent and flexible (configurable) small scale power system based on integration of three renewable energy sources: wind, hydro, and solar (photovoltaic) power, adapted to the available resources in Romania, in various regions of the country, working independently or connected to the grid.

Short description of the project

The project will cover the entire power conversion structure, including the design of adequate prime movers and new types of generators and power electronic converters, storage devices, power flow management system and load control. Some configurable structures (wind, micro-hydro and PV, all or a part of them, including their integration in a microgrid) will be proposed as experimental models, ready to be transferred to industry. There are proposed novelty elements regarding: low power wind turbine with integrated overspeed protection system, new generators configurations, and new topologies for power electronic converters and microgrid structures, optimal local control strategies and intelligent power system management.

Project implemented by

Politehnica University of Timisoara – Project coordinator
Technical University of Cluj-Napoca – Project partner
SC EETIM SA – Project partner

Implementation period

2012-2016

Main activities

- Microgrid components modeling, simulation and design.
- Microgrid components manufacturing, individual testing and integration in the experimental setup.
- Design, implementation and validation of the control strategies for microgrid components.
- Design, implementation and validation of the microgrid control strategy.
- Results dissemination and know-how exchange

Results

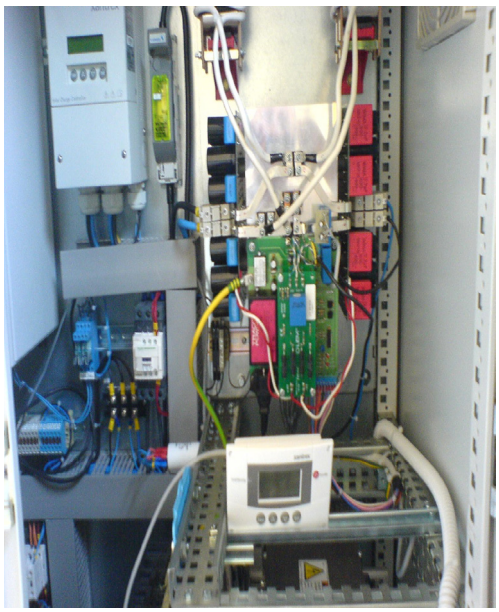
- A new over-speed protection system for wind turbines.
- A new electrical reactive brushless dc generator with performances comparable with high energy PM generator, at low cost.
- A new RF-IPMSG with high efficiency, maintenance-free operation, and high-controllability.
- A new AF-PMSG optimized for modular design. A new multiphase inverter with adequate control for the proposed generators.
- New multi-input dc-dc converters with high efficiency.
- High power tandem inverters for load management.
- Hardware and software package for power management, power flow control, individual converter control, and MPPT and other control strategies.
- Experimental microgrid system with integrated photovoltaic, wind and hydro generation.
- Technical papers will be published in top international journals and conference proceedings.

Applicability and transferability of the results

All the research results are the property of the project coordinator and its partners.

Financed through/by

Joint Applied Research Projects - Partnership in S&T priority domains financed by the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI).



Research centre

Research Centre for Automatic Systems Engineering.

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Iosif Szeidert-Subert
Lucian Tutelea
Cristian Lascu
Sorin Deaconu
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Dan Ungureanu
Andreea Robu
Adrian Bej
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EXPERIMENTAL MODEL FOR AN AUTOMATIC CAPACITIVE COMPENSATOR DESIGNED FOR IMPROVING THE POWER FACTOR AND FOR LOAD BALANCING IN LOW-VOLTAGE ELECTRICITY DISTRIBUTION NETWORKS - CAEREDJT

Goal of the project

The project is intended to finance industrial research activities, needed to put in practice under the form of an experimental model of research findings of a group of academics from UPT, concerning the network load balancing electric phase through cross unbalanced capacitive compensation. In electrical networks, inductive load variation implies variation of the capacitive compensation, thus the need for building an unbalanced capacitive automatic compensator, to track the load variation

Short description of the project

The automatically unbalanced capacitive compensator proposed by this project is an innovative product, so achieving a functional experimental model involves overcoming a number of scientific and technical challenges, the most important being: control and single-phase switching of the capacitor batteries steps, the construction algorithm and implementation of a programming language for PLC process control, process optimization for automatic compensation.

Project implemented by

- Politehnica University of Timisoara– Lead partner
- S.C. ICPE S.A. Bucharest – Project partner

Implementation period

01.07.2014 - 31.12.2016

Main activities

1. Conducting studies and analysis on the alternative constructive solutions and developing the technical documentation for the construction of the experimental model.
2. Manufacturing of the experimental model and the analysis, control and monitoring systems.
3. Testing the model and proving its functionality and its utility
4. Dissemination of results and protect the intellectual property rights.

Financed through/by

Executive Unit for Financing Higher Education, Research, Development and Innovation - UEFISCDI

Applicability and transferability of the results

The results of the project are useful for unbalanced electrical loads supplied at low voltage level, and also for the Distribution system operator (DSO).

Results

- The main outcome of the project will be a functional experimental model and its documentation of implementation for a capacitive compensator designed to improve power factor and load balancing in networks of low voltage power distribution.
- It will underpin the design and construction in a later stage, of a prototype of a capacitive automatically balance high power compensator (tens of kVA) for increasing network performance of low-voltage power distribution and utilization facilities connected to it, by reducing reactive power flow and load balancing.
- The results of the research will be disseminated in scientific papers in professional journals or communication conferences.
- New technical solutions brought by this automatic capacitive compensator, as regard to the structure, order, sizing, automatic control algorithm, will be the subject of intellectual property protection activities.

Research Centre

Analysis and Optimization of the Electrical Power Systems Regimes

Research team

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Prof. Ștefan Preitl, PhD
As. Florin Molnar-Matei, PhD
As. Alexandru Băloi, PhD
Lecturer Ilie Mihai Tăcucean, PhD
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IONOSPHERIC PROPAGATION PREDICTIONS AND WIDEBAND COMMUNICATIONS USING HF SDR SENSORS FOR INFORMATIONAL SUPPORT IN EMERGENCY SITUATIONS IN ROMANIA

Goal of the project

The project aims to implement software and hardware solutions that integrate ionospheric sounding algorithms in a network of SDR (Software Defined Radio) sensors in order to develop and validate a HF (High Frequency) ionospheric prediction model for the territory of Romania.

Short description of the project

The project targets a systemic approach of the communication network through the
implementation, development and integration of recent technological solutions from the
perspective of providing information support for the management of interventions in disaster areas where communication infrastructure does not exist or is damaged. Project results can be applied not only in the rapid resolution of remote communications in emergency situations, but also can be extended to other applications in the HF communications range, such as encrypted data communication links for the government or the military.

Project implemented by:

- Land Forces Academy "Nicolae Bălcescu", Sibiu - Coordinator
- Interactive Systems & Business Consulting, Bucharest - Partner
- Politehnica University of Timişoara - Partner
- Technical University of Cluj-Napoca - Partner

Implementation period

21.11.2014 - 30.06.2016

Main activities

- Building a SDR sensor network for ionospheric sounding
- Elaboration of an application for HF propagation predictions in Romania.
- Development of broadband HF communications by the implementation of adaptive systems

Results

- an ionospheric model which is specific for Eastern Europe;
- algorithms for the automatic identification and classification of waveforms in order to increase the transfer rate and to implement techniques for dynamically accessing the HF resources;
- SDR solutions for local monitoring and collaborative spectrum sensing in the HF range;
- a HF radio network on the territory of Romania which allows high transfer rates in collaborative environments, by automatically adapting to specific conditions of ionospheric propagation at high angles of elevation.

Applicability and transferability of the results

- creating an integrated software application for HF propagation predictions adapted to the propagation particularities of our country
- developing localization algorithms used in OTH (Over-The-Horizon) radar systems
- establishing a tracking system in the HF range using SSL (Single Site Location) technology
- implementing the ionospheric measurement capability for HF radio stations with SDR architecture
- implementing algorithms for the adaptation of broadband waveforms to the ionospheric channel status
- developing a HF radio tranceiver with cognitive capabilities
- implementing an integrated system for monitoring the ionosphere

Financed through/by

PN-II-PT-PCCA-2013-4

Research team

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IMAGE FUSING TECHNIQUES (IMFUSING)

Goal of the project

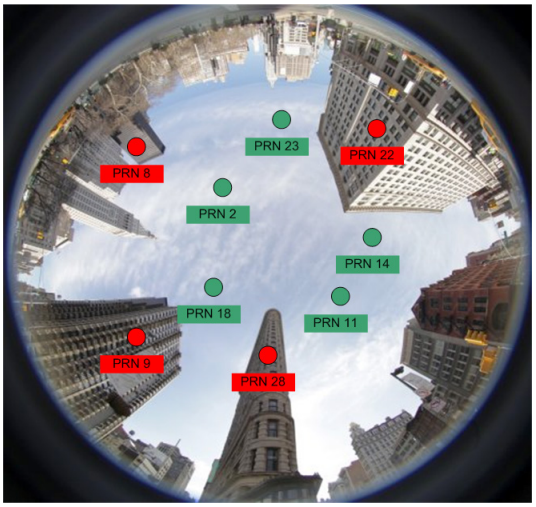
The Line of Sight (LoS) of a satellite could be disrupted by obstacles, reducing the accuracy of the information provided to a Global Navigation Satellite System (GNSS) receiver. The first objective of the project is to eliminate or weight the signals coming from these satellites. To simplify the identification of satellites having a direct LoS with the GNSS receiver, this project proposes, as a supplementary sensor, to use a fish eye camera.

Short description of the project

To provide sufficient information to the GNSS receiver, at the image processing level, the algorithms conceived will include the calibration of the camera sensor, image segmentation techniques, and distance and angle measurements deduced from calibrated image analysis. The algorithms at user sensor level will use camera information to discard measurements, will estimate boundaries of accuracy, will build a Quality of Service (QoS) indicator on the computed position and will authenticate the position.

The algorithms at tracking loop level will use camera information to adjust the GNSS receiver correlator.

The segmentation of the image provided by the fish eye camera permits to identify the satellites that are not on the LoS of the GNSS receiver.



Original image. The satellites were marked at Thales-Alenia.

Project implemented by

- UPT as contractor
- Thales-Alenia Toulouse France as subcontractor

Implementation period

October 1 2014 – March 30 2017

Main activities

Phase I 01/10/2014–31/08/2015: State of the art analysis (already validated),
Phase II September 1 2015 – March 31 2017

- 01/09/2015–30/11/2015: Core technical development
- 01/12/2015-31/01/2016: Test campaign
- 01/12/2015-31/05/2016: Performance analysis
- 01/06/2016-30/09/2016: Dissemination and exploitation.

Segmentation result (the non sky region is colored in black) obtained applying an original segmentation method developed in our research team

Results

Deliverables:

- Report on the State of the art in Image-GNSS fusion, Preliminary Design Review Report, Test Review Board Report, MATLAB codes for developed algorithms.

Dissemination:

- Scientific paper in a scientific journal, Technical Note on synthesis of the study.

A first dissemination result:

- Naforniță C., David C., Isar A., Preliminary results on sky segmentation, Proceedings of 2015 International Symposium Signals Circuits and Systems, 9-10 July 2015, Iasi, Romania, pp. 1-4, 10.1109/ISSCS.2015.7203933, Print ISBN: 978-1-4673-7487-3

Applicability and transferability of the results

The subject is evaluated today at technology maturity level 1 (Scientific Research), and it is aimed to conclude the project at technology readiness level (TRL) 3 (Laboratory Experiments).

Financed through/by

- European Space Agency (ESA), contract number 10031/02.08.2013
  - UPT: 128.234 EURO,
  - Thales Alenia: 70.000 EURO

Research centre

Research Centre for Intelligent Signal Processing (ISPRC)

Research team

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Prof. Andrei Câmpeanu, PhD
Prof. Ioan Naforniță, PhD,
Prof. Marius Oteșteanu, PhD
Prof. Vasile Gui, PhD,
Prof. Alexandru Isar PhD
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SY4SCI SYNERGY STUDY: OCEAN VIRTUAL LABORATORY

Goal of the project

The project will allow oceanography experts to discover the existence and then to handle jointly, in a convenient, flexible and intuitive way, the various co-located Earth Observed (EO) datasets and related model/in-situ datasets over dedicated regions of interest with a different multi facet point of view. The developed tools shall foster the emergence and prototype of new methods and products making use of the complementarity between sensors to study ocean related processes. The tool shall also provide the best possible visibility on the upcoming Sentinel1/2/3 data takes to help plan and coordinate with field campaign. The Ocean Virtual Laboratory (OVL) is filling the gap between Space agencies data portals that distributes specific EO data and analysis software dataset.

Short description of the project

The project aims to implement new software putting together two types of tools: a mathematical programming environment (as Matlab) and a geographical programming environment (as Google Earth). The raw data, as for example: Synthetic Aperture Radar (SAR) images, "temperature" images, "salinity" images, "altimetry" images; will be provided by satellites recently launched by the European Space Agency (ESA). The new software will have a multi-layer structure, each type of raw data representing a layer. The aim of new software is to exploit the information furnished by each layer and the difference of information obtained from different layers by hybridization (fusion), to characterize the phenomena at the ocean's surface (as the ocean currents for example). The tasks of the project are the following.

- Undertake an extensive scientific review to refine the project requirements and produce a consolidated Reference Baseline document.
- Implementation the SY-4Sci OVL novel synergy algorithms and the OVL platform, perform validation of new synergy products and access Sentinel1 and Sentinel3 products suitability for synergy studies.
- Write recommendation for further scientific research exploiting the synergy between ocean satellite sensors with a special focus on Sentinel1 and Sentinel3.
- Perform cross-cutting management and promotion of the SY-4Sci OVL project and open tools.

Implementation period

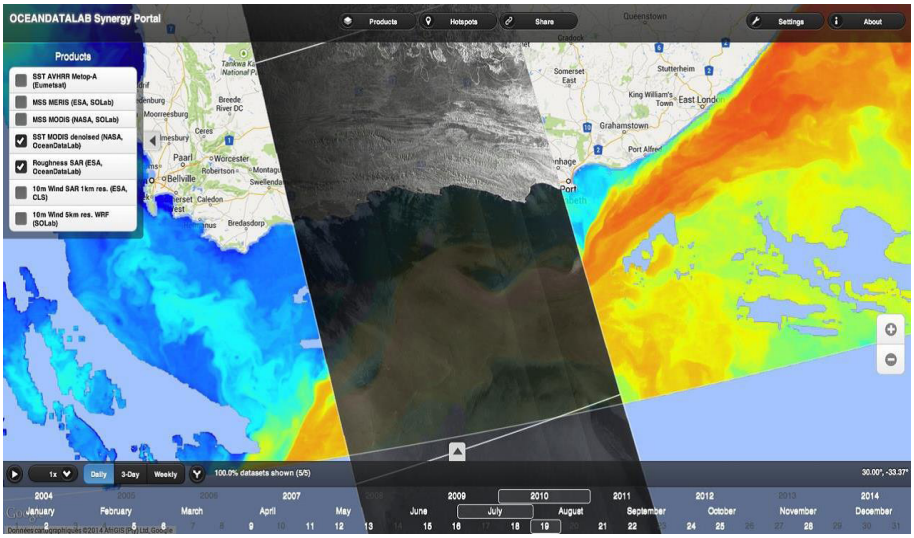
24 October 24 2014 – 24 October 2016.

Project implemented by

- OceanDataLab, Brest, France - Coordinator
- Institut Francais de Recherche pour l'Exploitation de la MER (IFREMER), Brest, France - Partner
- Nansen Environmental and Remote Sensing Center (NERSC), Bergen, Norway - Partner
- Politehnica University of Timisoara (UPT), Romania - Partner
- Institute of Oceanology of the Polish Academy of Sciences (IO PAN), Sopot, Poland and Plymouth Marine Laboratory (PML), Plymouth, UK - Partner

Main activities

- Review of existing synergy methods and consolidation of requirements,
- Define new methods and algorithm to be developed,
- Selection and preparation of EO products database,
- Specification and implementation of the prototype platform and processing modules,
- Specification and implementation of the prototype synergy processing modules,
- Validation of the developed tools and products,
- Recommendations for further scientific research.



Results

- Deliverables
  - Requirements Baseline,
  - Algorithm Theoretical Basis document,
  - Product Specification document,
  - Product Validation Report,
  - Software User Manual.
- Dissemination
  - Publications,
  - Presentations

Applicability and transferability of the results

The subject is evaluated today at technology maturity level 1 (Scientific Research), and it is aimed to conclude the project at technology readiness level (TRL) 3 (Laboratory Experiments).

Financed through/by

- European Space Agency (ESA), ESRIN/Contract N° 4000112389/14/I-NB – consortium 250000 EURO,
- UPT: 24713 EURO.

Research centre

Research Centre for Intelligent Signal Processing (ISPRC)

Research team

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INTEGRATED PLATFORM OF RESEARCH AND DEVELOPMENT FOR THE BEHAVIOUR OF STRUCTURES UNDER EXTREME ACTION

Goal of the project

The framework goal of the project is the development of the research capacity of the departments within the Faculty of Civil Engineering from the Politehnica University of Timisoara, through the increase of the performances and the capacity of laboratories, and by integrating them into a multidisciplinary platform that should cover theme directions regarding the behaviour of structures subjected to extreme action: natural hazard – earthquakes and effects of climate changes, respectively human actions – explosions, fire, errors of construction and operation, etc

Project implemented by

The Politehnica University of Timisoara
Faculty of Civil Engineering

Implementation period

02.09.2013-30.09.2016

Main activities

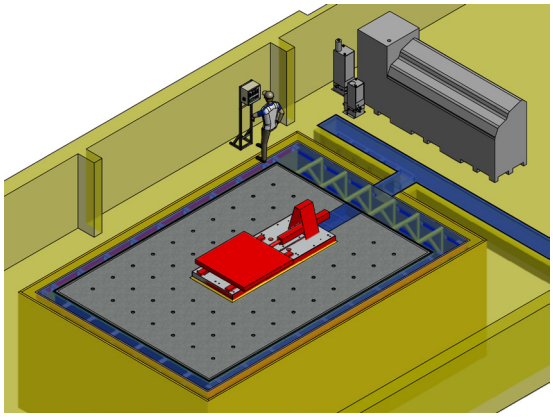
The Research platform integrates the four departments within the Faculty of Civil Engineering from the Politehnica University of Timisoara, namely: Department of Steel Structures and Structural Mechanics, Department of Overland Communication Ways, Foundations and Cadastral Survey, Civil Engineering and Equipments, and Hydrotechnical Engineering. The projects aims at updating laboratories by adding equipments / stands / systems, on one hand, and at achieving new laboratories, by the acquisition of equipments / stands / systems, in view to achieving the goals of the project.

The following laboratories are updated, at the Department of Steel Structures and Structural Mechanics:

- Laboratory for the study of materials;
- Laboratory for the testing of structures and structural elements under static and dynamic actions, under ambient temperature and under low / high temperatures;
- Laboratory for advanced numerical analysis of structures

The following laboratories are updated, at the Department of Overland Communication Ways, Foundations and Cadastral Survey:

- Laboratory of geomatics;
- Laboratory for the testing and assessment of the quality of materials for road covering;
- Laboratory for the testing and assessment of physical and mechanical parameters of the foundation terrain;
- Laboratory for the macroscopic modelling of the road traffic and for the assessment of the environmental impact.



The following laboratories are updated, at the Department of Civil Engineering and Equipments:

- Laboratory for the testing and assessment of physical and mechanical properties and of the behaviour of materials, components and structural elements, under the action of extreme climate;
- Laboratory for the advanced numerical analysis of structures made of masonry, concrete, composite materials or wood, under the action of climatic effects and in case of natural or induced hazard.

The following laboratories are updated at the Department of Hydrotechnical Engineering:

- Laboratory for the assessment and monitoring of the quality of the environmental elements (water, air, soil), under normal operation and under the effect of weather changes;
- Numerical laboratory for the modelling, assessment and the optimization of water resources exploitation, in natural or developed environment.

The four departments are connected at the level of the Faculty of Civil Engineering, by means of an HPC cluster with data storage system.

Applicability and transferability of the results

The development of the project is in line with the priority axis 2 of POS CCE (Competitiveness through research, technological development and innovation), particularly with the goals of the operation 2.2.1. (development of the existing RD infrastructure and creation of new RD infrastructures) through:

- The achievement of a multidisciplinary axis of research, that satisfies various RD requirements with direct impact on the economic environment, or coming from the economic environment;
- The improvement of the basis of knowledge within priority themes of the construction sector;
- The training of the human resource, in particular of doctoral students, post-doctoral students and young teaching staff;
- The increase of the participation to the RD circuit, within large cooperation and projects, nationwide and worldwide;
- Technological transfer activities, including the support and promotion of innovative solutions regarding the economic environment

Financed through/by

The total value of the project is 21.000.000 lei, out of which 21.000.000 lei is non-refundable financial assistance.

The project is co-financed through the European Regional Development Fund, based on the financial agreement signed with the Ministry of National Education, as Intermediary Institution, on behalf of the Ministry of European Funds, as Management Authority for the Sectoral Operational Programme „Increase of Economic Competitiveness", co-financed by the European Regional Development Fund Axis 2, Operation 2.2.1.

Research Center

The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timisoara.

Research team

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Assoc. Prof. Aurel Stratan, PhD

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EUROPEAN PRE-QUALIFIED STEEL JOINTS (EQUALJOINTS)

Goal of the project:

The goal of the project is to introduce in the European practice a qualification procedure for the design of moment resisting connection in seismic resistant steel frames, in compliance with EC8 requirements.
Particular objectives of the project are to qualify a set of standard all-steel beam-to-column joints, develop pre-qualification charts and design tools that can be easily used by designers. The project is also intended as a pre-normative research aimed at proposing relevant design criteria to be included in the next version of EC8. Besides it would contribute to the advancement of knowledge in the field of seismic behavior of steel moment resisting joints usually adopted in moment resisting frames (MR), in un-braced bays of dual moment-resisting/concentrically braced frames (MR+CB) and in moment-resisting/eccentrically-braced frames (MR+EB).

Short description of the project:

The project is the first attempt in Europe to produce qualification tools for seismic-resistant joints. Novel design methodologies and details for beam-to-column connections that are reliable, feasible and economical, solving also the open issue of design by testing required by EC8 for partial strength/stiffness connections will be provided. The cyclic behavior of beam-to-column joints has a crucial role on the overall seismic response of both MR and dual frames. Recent studies highlighted the influence of joint rotation capacity on the seismic response of mid-rise MR frames designed according to EC8.
The innovative content of the project is represented by:

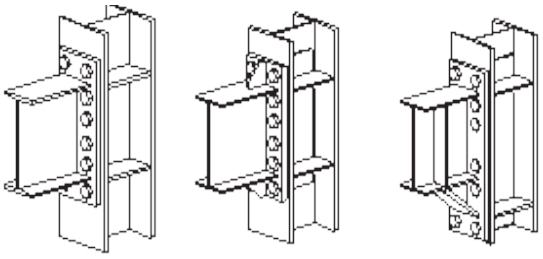
- Experimental investigations on 96 beam-to-column joint specimens covering: three typical European typologies and one US dog-bone joint typology made of heavy cross sections;
- Evaluation of the influence of different parameters (e.g. axial force, loading protocol and member sizes) on the joint performance;
- Development of codified pre-qualification charts of typical beam-to-column joints used in EU practice.
- In Europe these tools do not exist in design codes. Hence, this project was intended as pre-normative research aiming to propose design guidelines for the future version of EC8.

Project implemented by

- University of Naples "Federico II", Department of Structures for Engineering and Architecture.
- Poitehnica University of Timisoara, Department of Steel Structures and Structural Mechanics

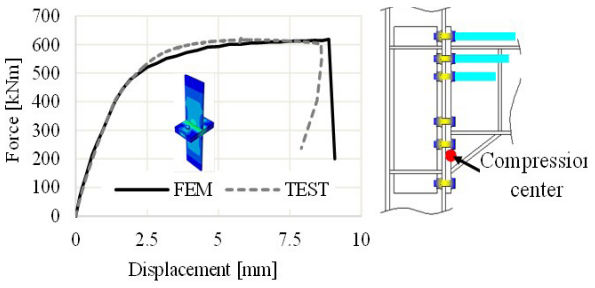
Implementation period:

01.07.2013 – 31.06.2016



Main activities:

Regarding the aim and objectives of the project, a design procedure for joints was established according to the provisions of EC3, EC8 and AISC 358. Extensive pre-test finite element (FE) numerical simulations were carried out with the purpose of evaluating the designed beam-to-column joint assemblies, and the influence of several parameters. The pre-test numerical simulation comprised the calibration of a T-stub model, including the material model for bolts. Based on the outcomes of the FE simulations, the design procedure of the joints was adjusted considering the actual position of the compression center and the active bolt rows.

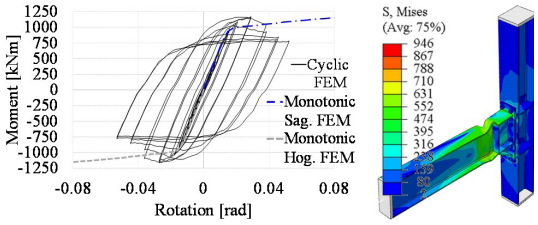


The cyclic response of a joint was evaluated as well. Future activities will be devoted to the experimental investigation of material samples, and 24 large-scale joint assemblies.

Particular results are represented by the selection of members (beams & columns) from the analyzed frames, and the development of a design procedure for bolted beam-to-column haunched connections. The pre-test numerical simulations lead to some adjustments of the joint design procedure and joint configurations. As a result, the joint configurations were established and the experimental test set-up was designed. Finally, the shop drawings for joint specimen and test set-up were completed.

Results:

- Particular results are represented by the development of a design procedure for bolted beam-to-column haunched connections. The pre-test numerical simulations lead to several adjustments of the joint design procedure and joint configurations. As a result, the joint configurations were established. The parametric study allowed investigating the influence of: member size, haunch geometry, web panel strength, and cyclic loading.



Applicability and transferability of the results:

- The project provides easy-to-use design tools for engineers and promotes saving cost solutions. Particular outcomes of the project are intended to be introduced within the new version of European seismic design code EN 1998-1.
- In addition, the outcomes of the project will be largely beneficial for the EU industry. Because the US joints examined within EQUALJOINTS will be made of heavy sections, which are produced only in Europe, this will be an important opportunity to get on the US Market, consolidating the gain of EU economy and having beneficial impact to exportation of EU products.
- The impact and transferability of the project is by no means restricted to the selected joint configurations and this project will open the door for other joints to be included in future updates of the guidelines.

Financed through/by

Research Fund for Coal and Steel, grant agreement RFSR-CT-2013 – 00021.

Fields of interest:

Seismic resistant structures for multi-storey building frames.

Research Center

The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timisoara.

Research team

- University of Naples "Federico II" (UNINA) - Coordinator
- Imperial College (IC)
- University of Coimbra (UC)
- University of Liege (ULg)
- Politehnica University of Timisoara (UPT)
- European Convention for Constructional Steelwork (ECCS)
- ArcelorMittal Belval & Differdange S.A. (AM)
- CORDIOLI & C

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SEISMIC PROTECTION OF ENGINEERING STRUCTURES THROUGH DISSIPATIVE BRACES OF NANO-MICRO MAGNETO-RHEOLOGICAL FLUID DAMPERS – SEMNAL-MRD

Goal of the project:

The goal of the project is to develop a seismic protection system, which uses magneto-rheological fluid (MRF) dampers, acting as semi-active structural control system. Particular objectives are:

- To develop nano-micro MRF compatible with application in seismic MR dampers;
- To design and built a 10tf capacity MR damper;
- To provide type tests, based on EN 15129-2009: Anti-seismic devices, aimed to validate, calibrate and model the damper;
- To design, execute and test a brace-damper assembly in order to validate the integration of damper and brace, including connections;
- To propose structural application schemes for implementation in practice of semi-active control brace-MRD systems.

Short description of the project:

There are three strategies for the seismic protection of structures: (i) reduce seismic demands, (ii) enhance structural damping, and (iii) use active or semi-active structural control. The current project involves the third approach focusing on semi-active systems. Semi-active devices have properties that can be adjusted in real time but cannot inject energy into the controlled system. Many of them can operate on battery power alone, proving advantageous during seismic events when the main power source to the structure may fail. The most promising devices suitable for implementation into a semi-active control appear to be magneto-rheological (MR) dampers, which succeed in overcoming many of the expenses and technical difficulties associated with other types of semi-active devices.

Response characteristics of MR devices can be changed by varying the magnetic field through different current inputs. In addition to its small power requirement, the MR damper can transfer large forces at low velocities. Currently there are MR dampers with capacities up to 200 kN and research results proved the possibility to obtain capacities up to 400-500 kN.

Project implemented by

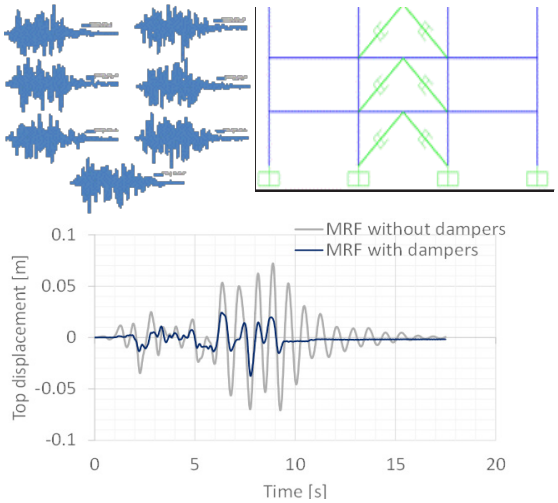
- The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timişoara.

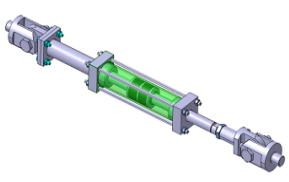
Implementation period:

01.07.2014 – 30.06.2016

Main activities:

The activities of the project are divided in three stages (I/2014, II/2015, III/2016), of which the first was completed. The second stage is in progress, covering several main activities: (i) preparation and characterization of nano-micro composite magneto-rheological (MR) fluid for seismic semi-active dampers, (ii) testing of a MR damper model containing the MR fluid, (iii) development of the technical solution for the 10t MR damper.





Further, the MR damper will be fabricated and tested under different loading conditions (triangular, sinusoidal, random excitations). In addition, numerical hysteretic models will be calibrated based on the tested MR damper enabling the modeling of structural response. Since the dampers in structural systems will be coupled with braces, both single damper and brace-damper assembly tests will be performed. With a numerically simulated control unit, structural systems equipped with brace-damper assemblies will be numerically tested in order to observe and characterize their behavior.

Results:

The results of the second stage comprise nano-micro composite MR fluid recipes for seismic semi-active dampers, and the technical solution for the MR damper.
Besides, the main outcomes of the project will be:

- The prototype of the MR damper;
- Validation tests of brace-damper systems;
- Numerical evaluation of effectiveness of MR dampers in reducing seismic effects in structural applications.
- Design and numerical testing of the control algorithm on single degree of freedom systems

Applicability and transferability of the results:

- The target of the project is the pilot solution for the MR damper, which will represent the basis for the mass production by the industrial partners.
- Considering the seismicity of Romanian territory and the effectiveness of the dissipative devices targeted in the project (once under fabrication, the implementation in new and existing structures would be quite easy), the national market potential is very large. On the other hand, this market can comprise all the Balkan's area, including Turkey and Greece, with development potential towards neighboring Asian Countries.

Financed through/by

The project is supported by a grant of the Romanian National Authority for Scientific Research, CNDI–UEFISCDI, project Nr. 77/ 2014 (PN-II-PT-PCCA-2013-4-1656).

Fields of interest:

Seismic resistant structures for multi-storey building frames

Research Center

The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timisoara.

Research team

- Politehnica University of Timişoara
  CMMC – Department of Steel Structures and Structural Mechanics
  CNISFC – Research Centre for Complex Fluid Systems Engineering
- S.C. ROSEAL S.A.
- IMS-AR - Institute of Solid Mechanics of the Romanian Academy
- AR-FT - Timişoara Branch of the Romanian Academy
- S.C. TITAN S.A.

Based on the above listed research team, the interdisciplinary character should be emphasized, as well as the cooperation between the Civil Engineering branch, the Mechanics branch, the Romanian Academy, and the industrial partners.

There are no secrets to success. It is the result of preparation, hard work, and learning from failure.
Colin Powell

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STEEL-EARTH - STEEL-BASED APPLICATIONS IN EARTHQUAKE-PRONE AREAS

Goal of the project:

- Steel-earth project aim to develop practical tools and documents for engineers, standardization bodies and construction companies in order to exploit at best the results obtained in previous RFCS research projects dealing with different open problems of seismic design, i.e. OPUS, STEELRETRO and PRECASTEEL.

Short description of the project:

Steel-earth disseminate the results obtained in OPUS (Optimizing the seismic performance of steel and steel-concrete structures by standardizing material quality control), STEELRETRO (Steel solutions for seismic retrofit and upgrade of existing constructions) and PRECASTEEL (Prefabricated steel structures for low-rise buildings in seismic areas).

Project implemented by

- The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timişoara.

Implementation period:

01.07.2011 – 31.12.2015

Main activities:

- Harmonization of design and production standards (i.e. Eurocodes and Euronorms on steel products like EN 10025, EN 210210 and EN 10219) in order to optimize steel performance for structural ductile design overcoming the actual contradictions of available standards.
- Seismic rehabilitation of existing masonry and reinforced concrete buildings by means of steel-based solutions including innovative solutions based on enhanced dissipative systems.

- Seismic design of steel and steel-concrete industrial and commercial buildings for which suitable pre-designed solutions where individuated, including innovative solutions using enhanced dissipative systems or using alternative bracing system as precast double-slab wall, and collected in a properly developed software available online.

Results:

- Technical sheets and working examples describing the related prefabricated steel or steel-concrete composite solutions for realizing single-storey industrial and low-rise commercial buildings in seismic prone areas and concerning the rehabilitation of existing buildings have been prepared. Pre-normative documents related to harmonization of design and production standards and some contributions for Eurocodes are available.

- In order to make available aforementioned results to engineers and construction companies and to national and European standardization bodies of relevant commissions and working groups of CEN/TC250, ECCS and CEN-ECISS, all documents will be disseminated all over Europe together with the software developed in PRECASTEEL project, translated in different European languages.

Applicability and transferability of the results:

- Two training courses, five conferences and several workshops in locations cover both high and medium seismicity areas (Italy, Finland, Slovenia, Spain, Germany, Belgium, Romania, Portugal and Greece) are organized in order to disseminate the results.

- Particular attention will be paid to the exploitation of innovative constructional solutions and design rules for the design of new industrial and commercial buildings and for the seismic retrofit of existing ones.

Financed through/by

Research Fund for Coal and Steel (RFCS) - total budget of "Steel-Earth" project: 1.045.186 € and budget of the Politehnica University of Timisoara: 35.314 €

Research Center

The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timisoara.

Research team

The partnership is composed by industries, companies, research and academic institutions:

- University of Pisa
- RIVA Acciaio SpA
- University of Camerino
- Ferriere Nord S.p.A
- University of Rome
- University of Parma
- Coordinamento Sismico Regione Toscana
- Centro Europeo di Formazione e Ricerca in Ingegneria Sismica (Italy)
- Hasselt University
- European Convention for Constructional Steelwork (Belgium),
- University of Thessaly,
- Shelter S.A. (Greece)
- Rheinisch-Westfälische
- Technische Hochschule Aachen (Germany),
- INSAR- INSA deâ
- Rennes (France),
- VTT - Technical Research Centre (Finland)
- Politechnic University of Timisoara (Romania).

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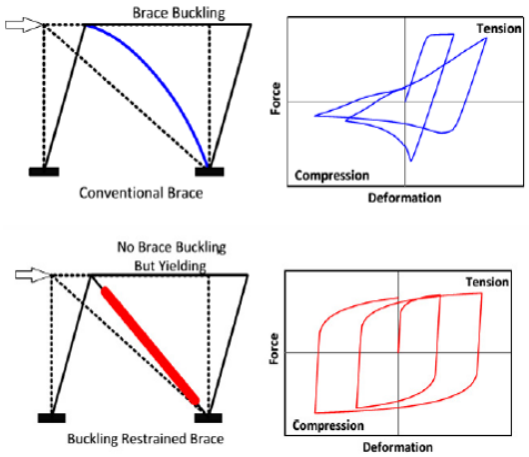
IMPLEMENTATION INTO ROMANIAN SEISMIC RESISTANT DESIGN PRACTICE OF BUCKLING RESTRAINED BRACES (IMSER)

Goal of the project:

Goal of the project: The goal of the project is to create the background for quick implementation of the steel frames with buckling-restrained braces (BRB) into Romanian practice design.

Short description of the project:

The latest version of the Romanian seismic design provisions (P100-1/2013) have introduced, for the first time in Europe, design provisions for buckling restrained braced frames (BRBF). Buckling restrained braces have a great potential in the field of seismic design of structures due to their large ductility and symmetrical cyclic response, as compared with conventional braces.



BRBF can be used both for new construction, as well as for strengthening of existing reinforced concrete, steel or masonry structures. BRB frames are able to provide two key properties of a seismic resistant structure: stiffness (for reducing interstorey drifts under moderate earthquakes) and ductility (for energy dissipation capacity under large earthquakes). BRBs were studied extensively worldwide over the past 30 years and have many practical applications especially in Japan and United States. Though researched in Europe as well, BRBs were applied in a very few applications here. The main reasons for lack of application into practice are believed to be the absence of design provisions in EN 1998-1, not enough acquaintance with the system by practicing structural engineers, need for experimental validation, and proprietary character of most BRB devices.

Project implemented by

- Project implemented by: CEMSIG - The Research Center for Mechanics of Materials and Structural Safety, Research and Technical Development unit of Politehnica University Timisoara, at the Faculty of Civil Engineering, Department of Steel Structures and Structural Mechanics.

Implementation period:

01.07.2014 – 30.06.2016

Main activities:

- Development of two different types of BRB prototypes: "conventional" (steel core / mortar / steel casing) and "dry" (without mortar), followed by a prequalification testing program on a set of BRBs of different capacity. This will provide an initial database on prequalified BRBs, rendering project-specific experimental programs unnecessary, at least for most common design situations;
- Transfer of the "know-how" on design and production of two types of BRBs to the industrial partner, who will be able to set up quantity production of these devices;
- Development of design guidelines for buckling restrained braces (at the device level). It will allow production of generic BRBs by local producers at more competitive prices than imported ones. "Dry" (or "steel-only") BRBs are believed to be especially suited for this purpose, as they can be easily adopted by steel fabricators;
- Development of design guidelines and design examples for steel BRB frames (at system level).
- Dissemination of the project outcomes to practising engineers, through presentations in annual conferences of the Association of Structural Engineers (AICPS) and through two workshops organised in Bucharest and Timisoara.

Results:

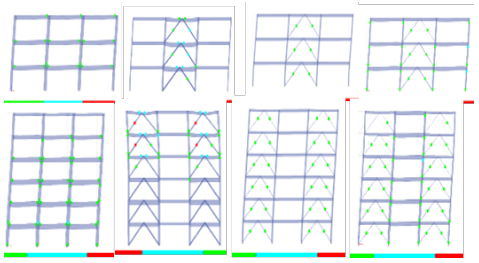
The following results were achieved up to the present date:

- Design of prototype structures for two building typologies (low-rise and mid-rise), which are located in two different seismic zones (Bucharest, TC = 1.6 s and Timisoara, TC = 0.7 s). There were designed 16 structures: MRFs, BRBFs, D-BRBFs, and CBFs according to Eurocode 3, Eurocode 4 and P100-1 /2013. The low-rise structures were 3 storey-high (H = 10.50 m) and the plan layout was 3 spans of 7.5 m by 5 bays of 7.5 m. The mid-rise structures were 6 storey-high (H = 21.00 m) and had the same plan layout. BRBs were disposed in chevron configuration. MRF structure will be used for comparative assessment of analysed structures from the economic and technical point of views

- Selection of typical capacities of BRBs. Two typical BRB capacities were selected (300 kN, respectively 700 kN), which together can cover a range of demands in BRBs ranging from 136 kN to 839 kN.

- Synthesis of existing information on performance and design of BRBs. A comprehensive literature review was performed identifying options for component materials, technology and design methods. These will serve as a starting point for developing a set of "dry" and "conventional" BRBs to be prequalified through an extensive numerical and experimental program.

- Seismic performance evaluation of structures was accomplished using nonlinear static analyses for three seismic performance levels: serviceability (SLS), ultimate (ULS) and collapse prevention (CP), corresponding to seismic hazard levels characterised by 42, 224 and 975 years return period.



Applicability and transferability of the results:

- A Design Guide for both "dry" and "conventional" BRBs for manufacturers, as well as a Design Guide (including examples) for steel BRB frames for practising engineers will be produced within the project. Moreover, a set of BRBs will be prequalified, eliminating the need of project-specific testing. The design guidelines and the prequalification will facilitate the use of BRBs in the Romanian design practice.

Financed through/by

The project is supported by a grant of the Romanian National Authority for Scientific Research, CNDI–UEFISCDI, project Nr. 99/ 2014 (PN-II-PT-PCCA-2013-4-2091).

Research Center

The Research Centre for Mechanics of Materials and Structural Safety – CEMSIG, Politehnica University of Timisoara.

Research team

- Politehnica University of Timisoara, (coordinator);
- SC Popp & Asociaţii SRL, Bucharest;
- SC HYDOMATIC SISTEM SRL, Timisoara.

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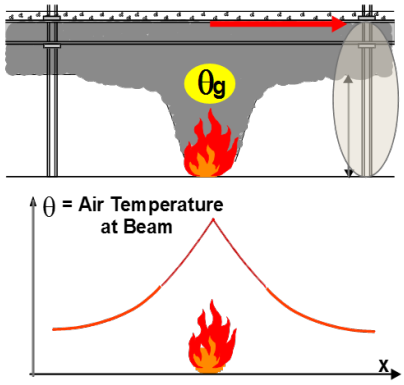
TEMPERATURE ASSESSMENT OF A VERTICAL STEEL MEMBER SUBJECTED TO LOCALISED FIRE PROJECT (LocaFi)

Goal of the project

The main goal of the project, ended in 2015, was to improve the existing knowledge on the effects of the localized fires in a building compartment. With the actual methodology included in the Eurocodes for the fire design of buildings, it is only possible to assess the temperature of a steel element in the vertical axis of the localised fire. It is impossible to assess the temperature or the flux received by a vertical member at a given distance of the fire source.

Short description of the project

The project is devoted to the development of an analytical model for the calculation of the temperatures in the vertical structural steel elements of a building, subjected to localised fires.
The new method, developed by means of experimental and numerical research, will provide the fluxes received in any point of a building compartment subjected to a localised fire.



Project implemented by

- ArcelorMittal Luxembourg (coordinator)
- Centre Technique et Industriel de la Construction Métallique, France
- Politehnica University of Timisoara, Romania
- Universite de Liege, Belgium
- University of Ulster, Ireland

Implementation period

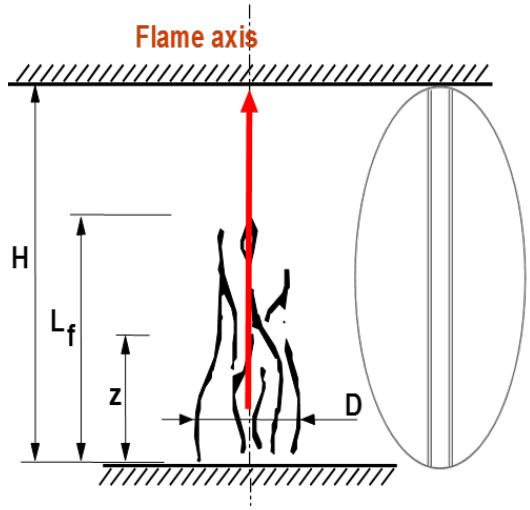
01.07.2012- 30.06.2015

Main activities

- Collection of the different national annexes and national parameters for the application of the Natural Fire Models in different European countries and implementation of theses parameters in a Software
- Definition and realisation of laboratory tests assessing the effect of the real flame emissivity for element engulfed into the fire
- Definition and realisation of laboratory tests assessing the fluxes received by an element subjected to localised fire but not engulfed in the fire
- Development and validation using CFD models of simplified analytical model for the evaluation of the fluxes received by an element in any point of a compartment
- Implementation of the developed analytical model in a user-friendly tool
- Redaction of a design guide for the application of the new methodology including design examples

Results

The design procedures based on the analytical models developed within the project are proposed to be implemented in the Eurocodes.



Applicability and transferability of the results

The analytical models developed within the project were introduced in a user friendly software and in an advanced calculation model for fire design, in order to offer a large utilization of the procedure for the construction market.

Research team

Assoc. Prof. Raul Zaharia, PhD
Prof. Acad. Dan Dubină, PhD
Lecturer Dan Pintea

Fields of interest

Design of buildings in fire situation.

Education is not the filling of a pail, but the lighting of a fire"
William Butler Yeats

Financed through/by

EUROPEAN COMMISSION DIRECTORATE-GENERAL FOR RESEARCH AND INNOVATION
Research Fund for Coal and Steel - RFCS

Research centre

Research Center for Mechanics of Materials and Structural Safety - CEMSIG

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STRUCTURAL CONCEPTION AND COLLAPSE CONTROL PERFORMANCE BASED DESIGN OF MULTISTORY STRUCTURES UNDER ACCIDENTAL ACTIONS (CODEC)

Goal of the project

The main goal of the project is the development of a performance based robustness design methodology for mitigation of progressive collapse of multi-story frame buildings against extreme load events coming from both natural and man-made hazards.

Short description of the project

Safety and operability of steel buildings can be endangered by accidental actions. Today codes give general information only and lack much information that are required if robustness is envisaged. The project aims at evaluating those structural components and materials properties that can reduce the consequences, thus saving lives and reducing the costs in the aftermath of an extreme event. Different structural systems and details were tested experimentally under static and dynamic actions (blast), at room and elevated temperatures (fire), and the main response parameters were quantified. Afterwards, numerical models were validated, as a first step to perform extensive parametric studies. When all completed, these studies will allow the development of a collapse control design methodology for reducing the consequences associated with the extreme loading events .

Project implemented by

- Coordinator (CO) – Politehnica University of Timisoara
- Partner 1 (P1) - Technical University of Cluj-Napoca
- Partner 2 (P2) - URBAN-INCERC (Cluj Branch)
- Partner 3 (P3) - INSEMEX Petrosani
- Partner 4 (P4) - SC ACI SA Cluj-Napoca

Implementation period

July 2012 - June 2016

Fig. 1a. Joint specimen after the test

Fig. 2a. Experimental T-stub

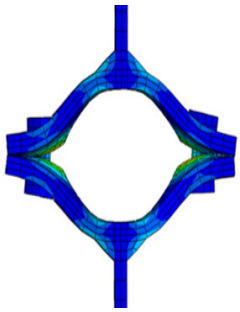

Fig. 2b. Numerical simulation T-stub

Main activities

- Preliminary investigations (Review of existing methods, identification of research needs; Preliminary analysis and selection of case study structures)
- Design of experimental and numerical simulation programs
- Experimental program on materials, weld details and connection macro-components
- Experimental program on joints (column loss scenarios and blast conditions)
- Experimental program on sub-assemblies
- Validation of numerical models against experimental tests
- Numerical simulation program
- Design guidelines and recommendations

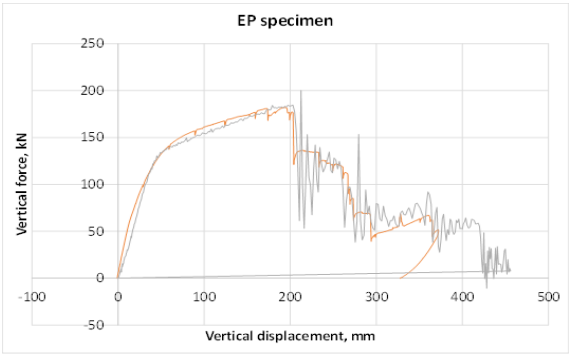

Fig. 1b. Experimental vs. numerical force-displacement curve

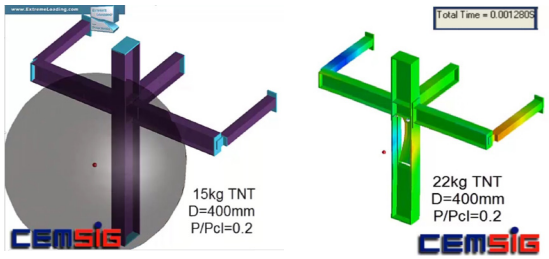

Fig. 3a (left) and 3B (right) Direct blast effect on steel assemblies

Results

- Experimental results (characteristic curves, failure modes, robustness) on T-stubs and weld detail tested in extreme conditions (loading rate, temperature)
- Experimental results on steel joints under column loss scenarios (characteristic curves, failure modes, robustness)
- Experimental results on steel and composite frame systems under column loss scenarios (characteristic curves, failure modes, robustness)
- Direct blast effects on steel elements and connections (influence of stand-off distances, charge size, charge characteristics).
- Numerical models validated against experimental tests.

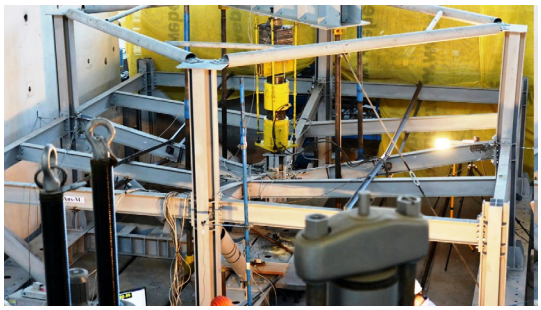

Fig. 4a. Experimental test on 3D steel frame system

Applicability and transferability of the results

• Construction and design practice, code and primer manuals drafting

Fig. 5. Experimental test on 3D composite frame system

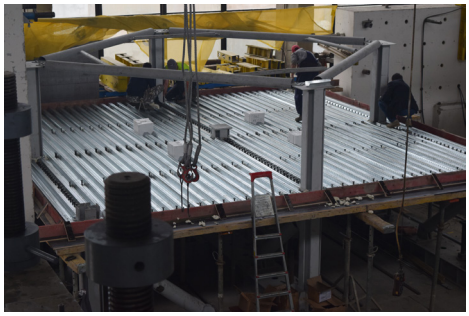

Fig. 6. Composite slab system during construction

Financed through/by

the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Romania, under grant PN II PCCA 55/2012.

Research Centre

• The Research Center for Mechanics of Materials and Structural Safety – CEMSIG (www.ct.upt.ro/ centre/cemsig/index.htm)

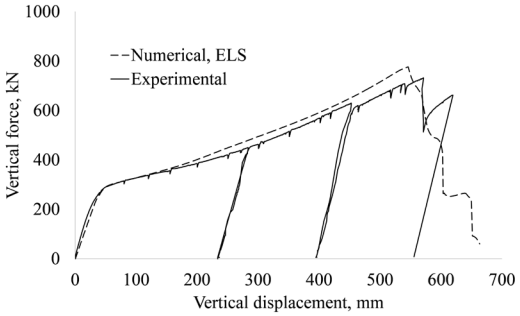

Fig. 4b. Experimental vs. numerical force displacement curve for 3D steel frame system

Research Team

Prof. Florea Dinu, PhD (Project coordinator)
Prof. Dan Dubină, PhD
Prof. Raul Zaharia, PhD
Assoc. Prof. Adrian Ciutina, PhD
Assist.prof. Ioan Both, PhD
Assist.prof. Calin Neagu, PhD
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NEARLY ZERO ENERGY BUILDING AND PASSIVE HOUSE – SUSTAINABLE SOLUTIONS FOR RESIDENTIAL BUILDINGS

Goal of the project

The idea of this project arose from the need to develop energy efficient solutions that reduce the energy consumption in the Romanian residential building sector. The main goal of the NEZEBUILD research project is related to the design and detailing of technical solutions in order to achieve the nearly zero energy building standard, resulting in the validation of such designs through extensive monitoring. Design, detailing and execution include the construction elements, finishes and installations system.

Short description of the project

The research project deals with a topic of great importance regarding the design and execution of energy efficient buildings in the Romanian climatic and economic conditions. A pilot project was developed consisting in a residential building composed of two detached houses. The two houses were designed and built so that one house will achieve the passive house (PH) standard and the other house the nearly zero energy building standard (NZEB). Building such types of houses implies the necessity to implement a monitoring system with a good quality - price balance, necessary in order to validate the theoretical design. The PH and NZEB are equipped with monitoring systems. Through the monitoring process of the two houses, the energy consumption is measured and thermal comfort parameters are kept under observation. The data registered by the monitoring system is uploaded to a web server making the data available on the internet. All project activities aim at developing a recommendation design guide regarding PH an NZEB based on experimental research.

Project implemented by

- Project Partnership comprising Politehnica University of Timisoara - CCI Department and Arhitim.

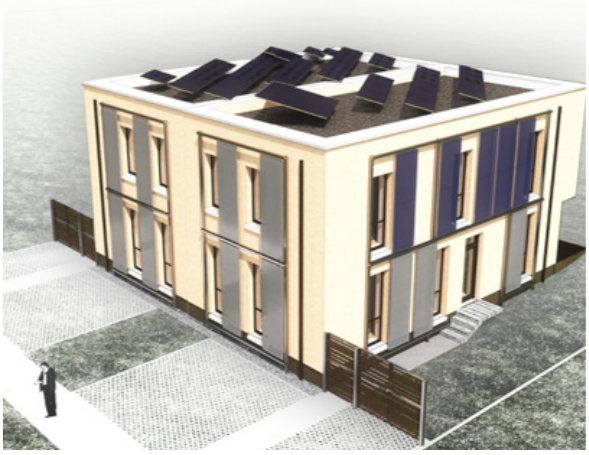

Fig. 1 General view of house

Implementation period

2012 – 2016

Main activities

- Design and detailing of NZEB system including procurement of materials, equipment and elaboration of energy performance certificate for NZEB.
- Design of the monitoring system and set-up of equipment and accessories for NZEB.
- Evaluation of monthly energy consumption for the two houses. Evaluation of main consumption, energy produced and consumed from renewable sources.
- Overall investment cost assessment and lifetime of the building. Analysis of the overall cost of the investment, cost benefit analysis damping coefficient for NZEB investment, optimized investment payback.
- Evaluation of elements with significant impact in terms of environmental protection.
- Lifecycle assessment using specialized software SimaPro - LCA with different scenarios Simapro program, materials recovery and waste management.
- Elaborating a comparative PH vs. NZEB study on energy efficiency.
- Dissemination of recommendations and general rules for implementing energy efficient residential houses in the Romanian temperate climate.

Results

The actual status of the project consist in the continuous processing and interpretation of the data obtained through the monitoring activity of the two houses. The passive house is monitored for more than three years and so far we have collected the registered data and established a strategy for processing. The amount of data is considerable taking in consideration that the measurements were taken at every minute. The monitoring process for NZEB started in 2014 but since the house is inhabited only from the beginning of 2015, relevant registered data is starting with 2015. Throughout the year, the results are published in scientific papers. The monitoring process of the two houses along with real time monitoring graphs can be viewed online at the address http://www.sdac.ro/site/archives/category/monitoring

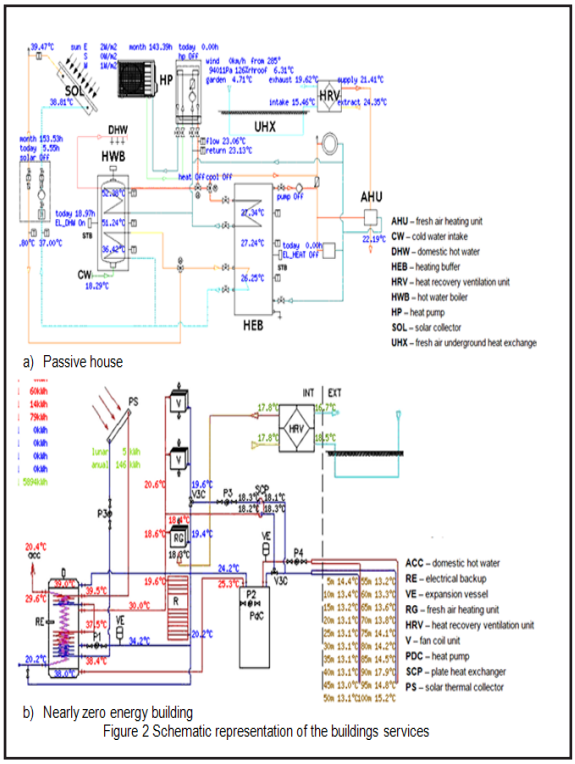

Figure 2 Schematic representation of the buildings services

Applicability and transferability of the results

The topic of the project is closely related with the increasing concern of nowadays society on reducing the energy consumption in buildings. The targeted groups of the project are scientist, specialists in the energy efficiency field and stakeholders. The project deliverables will assure the transfer of knowledge, generating further „know-how" for scientific community and for practicing specialists (civil and environmental engineers, electrical and energy engineers, architects, technicians).

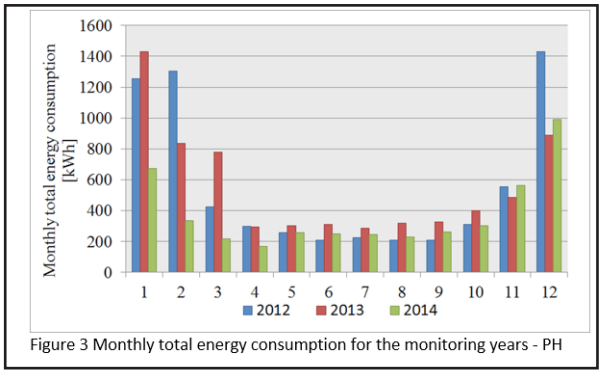

Figure 3 Monthly total energy consumption for the monitoring years - PH

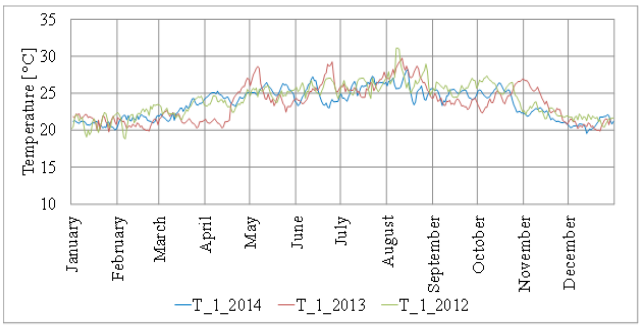

Figure 4 Interior temperature measurement during the monitoring years – PH

Financed through/by

UEFISCDI, project number PN-II-PT-PCCA-2011-3.2-1214-Contract 74/2012.

Research Centre

- Research Centre for Retrofitting of Constructions – RECO
- CCI Department

Research Team

Prof. Daniel Dan, PhD - Project Manager

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As. Sorin-Codrut Floruț, PhD
As. Eng. Cosmin Daescu, PhD
Eng. Simon Pescari, PhD student
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ARHITIM TEAM MEMBERS

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NUTRITIONAL LABELING STUDY IN BLACK SEA REGION COUNTRIES - NUTRILAB

Goal of the project

- Bring together, review and analyze current research on consumer understanding of claims, and also labeling where this would inform our knowledge of consumer understanding of claims.
- Gather information on how consumer understanding of claims varies across different population groups, to gain insight into the understanding of the 'average consumer'.
- Draw conclusions from existing research to see whether there are areas where further information would be useful, and to inform the direction that any additional research conducted in future could take. A strong component in this framework will be the capacity building. It will explicitly aim to identify and integrate the different and overlapping conceptual understandings of scientists from the different disciplines carrying out joined research in this project.

Short description of the project

This multidisciplinary and comparative Joint Exchange programme will identify and examine how nutritional labeling in European countries and out of Europe can influence on health and welfare of population. Health professionals agree that the relationship between diet and health is important. Our eating habits can help or hurt our overall health and well-being. Good eating habits include being a smart shopper and selecting foods that reflect the Dietary Guidelines. The food label was designed to help people choose foods for a healthful diet. By using the food label, we can compare the nutrient content of similar foods, see how foods fit into our overall diets, and understand the relationship between certain nutrients and diseases.

Project implemented by

- Institute of Microbiology and Biotechnology, Academy of Sciences of Moldova (IMB), Moldova
- Politehnica UIniversity of timisoara (UPT), Romania
- University of Food Technologies (UFT), Bulgaria
- Fundatia pentru Cultura si Invatamant "Ioan Slavici", Romania
- Lucian Balaga University of Sibiu (ULBS),Romania
- University of Rousse Angel Kanchev (UR), Bulgaria
- Transilvania University of Brasov (UNITBV), Romania
- Technical university of moldova (TUM) Moldova
- Donetsk National University Economics and Trade named after M. Tugan-Baranovsky (DONNUET), Ukraine
- Kharkiv State University for Food Technologies and Trade (KSUFT), Ukraine
- National University of Food Technologies, (NUFT), Ukraine
- St. Petersburg State Institute of Technology (Technical University) (SIT), Russian Federation

Implementation period

01.01.2013 – 31.12.2015

Main activities

1. Integrate experiences from consortium countries into NUTRILAB project development;
2. Provide guidelines for sampling and administration;
3. Translate the NUTRILAB results and questioners from English to the language instruction in the respective countries;
4. Coordinate the NUTRILAB data collection for all consortium countries and partners and other participating countries;
5. Relevant theories, findings and methodology, and provide an overview of previous similar surveys to aid instrument development;
6. Collect data in each NUTRILAB consortium country.
7. data collection will be defined in different steps:
   - definition of keywords for search engines;
   - Web-browsing;
   - Compile a report/book towards the end of the project.

Results

- NUTRILAB seasonal schools which provide within a reasonably compact timeframe as a thorough and exhaustive treatment as possible of various topics in food labeling, but from a particular angle in each case
- Second North and East European Congress on Food (NEEFood-2013) which was held on May 26-29 2013 on the premises of the National University of Food Technologies

Applicability and transferability of the results

- Review of EU and national action plans, papers surveys;
- Review of EU and national R&D projects and programmes;
- Code and clean the national data files (all partners);
- Merge the national data files into the international data file, and clean it;
- Conduct general overall comparative data analysis and sum up findings from the project at large;

Financed through/by

Project number: 318946 - FP7-PEOPLE - 2012 - IRSES

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Dumitru Mnerie
Titus Slavici
Petru Andea
Hannelore Filipescu
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CH4LLENGE – ADDRESSING THE FOUR KEY CHALLENGES OF SUSTAINABLE URBAN MOBILITY PLANNING

Goal of the project

Achieving sustainable, energy-efficient and environmentally friendly transport systems is one of the European key aims. Sustainable Urban Mobility Plans (SUMPs) are an instrument that contributes to reaching the climate and energy targets set by EU leaders and is promoted by the European Commission in relevant documents such as the Transport White Paper and Action Plan on Urban Mobility. Cities frequently face major barriers while creating their own Sustainable Urban Mobility Plans.

Short description of the project

In CH4LLENGE (2013-2016), nine European cities, and eight supporting organisations have teamed up for overcoming the four most pressing challenges in sustainable urban mobility planning:

- Stakeholder participation and citizen involvement
- Institutional cooperation between sectors and disciplines
- Identification of the most effective policy measures
- Monitoring and evaluation of progress in SUMP development

For each challenge, the project cities analyze their local mobility situation, develop new strategies how to tackle their urban mobility problems and test solutions to overcome barriers in participation, cooperation, measure selection as well as monitoring and evaluation in more than forty pilot schemes.

Based on the lessons learned from the pilot schemes in the nine participating project cities, on the experience from the Follower Cities and on the results from the training activities, four CH4LLENGE Kits will be developed as the main outputs of the project. Each kit will address one challenge and will consist of a comprehensive manual, a brochure and the relevant e-learning modules. The kits will be available in English, Czech, Croatian, Dutch, French, German, Hungarian, Polish and Romanian.

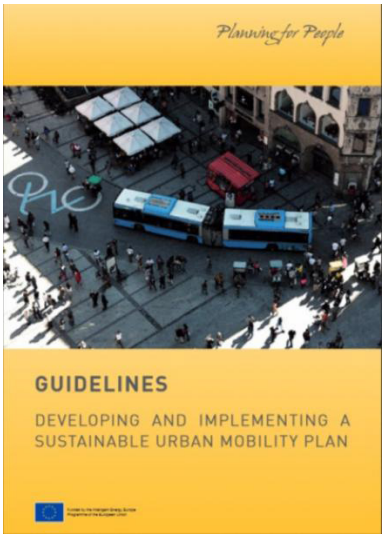
Both, cities with a lot of experience with integrated planning approaches and cities initiating the SUMP process will benefit from the results of CH4LLENGE.

Implementation period

2013-2016

Main activities

- CH4LLENGE will produce four practical CH4LLENGE kits covering the identified SUMP challenges: participation of stakeholders, institutional cooperation, Identification of most effective measures and monitoring and evaluation. The kits will consist of a comprehensive manual, a quick-facts brochure and the relevant e-learning modules aimed at local practitioners and will guide you through participation processes,institutional cooperation, measure selection as well as monitoring and evaluation procedures;
- Four interactive SUMP Challenge Training Workshops are held for local planners and decision-makers. In addition, National SUMP Seminars and Summer Schools are organized in the Czech Republic, Croatia, Hungary, Poland and Romania.
- Learn with us online by registering for our free Online Learning Courses and benefit from the results of the workshops and seminars as well as the experiences from the CH4LLENGE cities.



Financed through/by

IEE – Intelligent Energy Europe Programme of the European Union.

Research team

Associate Prof. Dumitru Iancului, PhD
Senior Lecturer Attila Gonczi, PhD

Project implemented by

The CH4LLENGE cities:

- Amiens (France)
- BKK Centre for Budapest Transport (Hungary)
- Brno (Czech Republic)
- Dresden (Germany)
- Ghent (Belgium)
- Krakow (Poland)
- Timisoara (Romania)
- West Yorkshire Passenger Transport Executive, WYPTE (METRO) – Leeds (UK)
- Zagreb (Croatia)

SUMP Knowledge Partners:

1. Rupprecht Consult, Forschung & Beratung GmbH (Lead Partner) – Cologne (Germany)
2. The Association for Urban Transition, ATU – Bucharest (Romania)
3. Forschungsgesellschaft Mobilität - Austrian Mobility Research FGM – AMOR – Graz (Austria)
4. Institute for Transport Studies (ITS)
5. University of Leeds (UK)
6. Polis – European Cities and Regions Networking for Innovative Solutions – Brussels (Belgium)
7. Politehnica University of Timisoara (Romania)
8. Union of the Baltic Cities Commission on Environment UBC – Turku (Finland)
9. Urban Planning Institute of the Republic of Slovenia, UIRS – Ljubljana (Slovenia)

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NOVEL TECHNIQUE TO ENHANCE THE SECURING LEVEL OF SECURITY PAPER USING THE SUPERPARAMAGNETIC FINGERPRINT OF MAGNETIC NANOPARTICLE DISPERSIONS ¬- NANOMAG-SECURITYPAPER

Goal of the project

The continuous diversification of the paper securing techniques is one of the most important ways to erect fences against forgery attempts. The project aims to expand the diversity of high tech means for paper securing. The general objective of the project is to elaborate a new paper securing technique based on the superparamagnetic fingerprint of magnetic nanoparticles made of oxide compounds.

Short description of the project

The objective **is to elaborate a new paper securing technique** based on the superparamagnetic fingerprint of the magnetic nanoparticles.

Project implemented by

- Romanian Academy – Timisoara Branch (CO)
- SC CEPROHART SA (P1)
- SC ROSEAL SA Odorheiu Secuiesc (P2)
- SC Datronic – NCIP SRL (P3)
- National Institute of R&D for Izotopic and Molecular Technologies Cluj-Napoca (P4)
- Politehnica University of Timisoara (P5).

Implementation period

01.07. 2014 – 30.06.2016

Main activities

- elaboration of superparamagnetic paper assortments with
  - low security level, using poly-disperse magnetic nanoparticles
  - high security level, using bi-disperse magnetic nanoparticles
  - white color, using core-shell (core/magnetic, shell/polymer) particles
- elaboration and testing the authentication method by static and dynamic magnetometry

Results

- methods for synthesis and characterization of oxide magnetic nanocomposites
- methods for elaboration and validation of magnetic loaded papers
- first instance validation of magnetic loaded papers

Financed through/by

Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI

Applicability and transferability of the results

The new method of securing paper using the superparamagnetic nanoparticles can be transferred to SC Ceprohart SA Braila. The transfer will contribute to:

- diversification of the product made in the national paper industry with simple brown paper secure and secure complex white paper,
- orientation of national industry to obtain a special paper grade with high complexity,
- increase the security level of specialty papers, difficult to fake on the internal market
- reduce the imports of security paper
- increase output and thus sales of security paper from Ceprohart.

Research centre

Research Centre for Engineering of Systems with Complex Fluids – Laboratory of Rheology and Magnetometry, from Politehnica University of Timisoara.

Research team

Dr. Vlad Socoliuc
Phys. Oana Marinica
Dr. Phys. Aurel Ercuta
Dr. Phys. Catalin Marin
Res. Assist. Florica Bălănean
Res. Assist. George Giula

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Dr. Vlad SOCOLIUC
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MAGNETIC NANOFLUID ROTATING SEAL SYSTEMS FOR HIGH PERIPHERAL SPEEDS HISPEED NANO MAG SEAL

Goal of the project

The project technical objective is to achieve at experimental model scale new leakage-free MNF sealing systems for high peripheral speeds (up to 30 – 70 m•s-1) in the sealing area, designed to equip gas turbo-compressors.

Short description of the project

The project proposes the development of magnetic nanofluid (MNF) seals, which has significant advantages compared to conventional mechanical seals: hermetic sealing, exceptionally long lasting operation without intervention (5 years), minimal wear (only viscous friction), virtually zero contamination, optimal torque transmission, wide operating range (10-8 mbar - 10 bar), relatively simple and cost efficient execution

Project implemented by

- SC ROSEAL SA Odorheiu Secuiesc (CO)
- Romanian Academy – Timisoara Branch (P1)
- National Institute of R&D for Izotopic and Molecular Technologies Cluj-Napoca (P2)
- Politehnica University of Timisoara (P3)
- Romanina Research and Development Institue for Gas Turbines – COMOTI Bucharest (P4).

Implementation period

01. 07. 2014 – 30. 06. 2016

Main activities:

1. Laboratory and micropilot scale synthesis of magnetic nanofluids with carboxylic stabilizers and magnetizations between 400-1000 G. Samples characterization.
2. Conception, design and implementation of new experimental models of sealing systems with magnetic nanofluid, for high peripheral speeds
3. Testing and performance evaluation of new experimental models sealing systems with magnetic nanofluid, designed for high peripheral speeds

Results

- methods for synthesis and characterization of high magnetization nanofluids with carboxylic stabilizers
- experimental models for new sealing systems
- experimental models for sealing systems – innovative version with magnetic nanofluids with carboxylic stabilization

Applicability and transferability of the results

The expected results will facilitate design and low cost industrial scale production of an original sealing system with stable MNF at high temperatures (160 – 180 °C), for high peripheral speeds (up to 30 – 70 m•s-1) in the sealing gap. They have some important advantages compared to conventional mechanical seals: hermetic sealing, high reliability, relatively simple construction, low execution cost. These performances indicate the market towards ROSEAL Co. is heading, namely the gas turbo-compressors in fertilizer and petroleum refining industry.

Financed through/by

the Ministry of Education, Research, Youth and Sports (MECTS) - Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI) through the PN II Program Partnerships in Priority Areas, Collaborative applied research projects.

Research Centre

Research Centre for Engineering of Systems with Complex Fluids – Laboratory of Rheology and Magnetometry, from Politehnica University of Timisoara.

Research team

Tunde Borbath, PhD - Romanian Academy - Timisoara Branch
Phys. Oana Marinica
Assoc. Prof. Floriana D. Stoian, PhD
Assoc. Prof. Nicolae Crainic, PhD
Dr. Sorin Holotescu
Res. Assist. Florica Balanean
Res. Assist. George Giula

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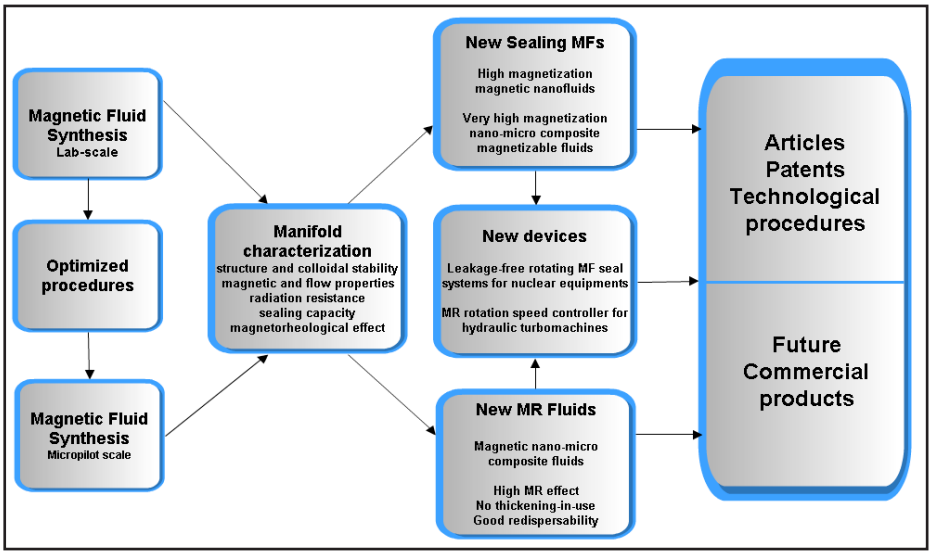
HIGH MAGNETIZATION MAGNETIC NANOFLUIDS AND NAO-MICRO-COMPOSITE MAGNETIZABLE FLUIDS: APPLICATIONS IN HEAVY DUTY ROTATING SEALS AND MAGNETORHEOLOGICAL DEVICES

Goal of the project

The project is oriented to the extension of the performances of rotating seals and adaptive motion control devices to meet the requirements of several well-defined new applications, by high and very high magnetization sealing fluids and new types of magnetorheological fluids to be synthesized.

Short description of the project

The project concept and objectives are illustrated schematically in figure the below:



Project implemented by

- Romanian Academy – Timisoara Branch (Project coordinator),
- Politehnica University of Timisoara (Partner 1),
- S.C. ROSEAL S.A. Odorheiu Secuiesc (Partner 2)
- National Institute for R&D in Electrical Engineering ICPE-CA Bucharest (Partner 3).

Implementation period

23.07.2012 - 23.07. 2016.

Main activities

The main activities of the MagNanoMicroSeal project are:

- Synthesis and manifold characterization of magnetizable fluids for high pressure and heavy duty rotating seals and magnetorheological devices and, respectively,
- Design, fabrication and testing of leakage – free magnetofluidic rotating seal and magnetorheological (MR) control devices for well-defined applications/exploitation conditions.

Results

The main results of this project refer to the elaboration of the following **technological procedures:**

- synthesis of high magnetization sealing fluids;
- synthesis of nano-micro structured magnetorheological fluids;

and **qualification procedures:**

- magnetic nanofluids for sealing applications in nuclear equipments;
- magnetic nanofluids for rotating seals for nuclear equipments.

The project results will be disseminated through publications in leading scientific journals, through presentations at national and international scientific meetings. Also, the involved procedures, technologies, devices and know-how are favourable for patent applications, as well as for development and exploitation by the industrial partner from the project. .

The contributions of Politehnica University of Timisoara to this project refer mainly to complex magnetic, rheological and magneto-rheological analyses of the magnetic sealing fluids and nano-micro structured magnetorheological fluids. During the current year the Politehnica University team is in charge of the characterisation of the magnetic nanofluids to be used for seals submitted to heating and radiation.

Applicability and transferability of the results

The technological progress is strongly evidenced by future commercial products planned for the industrial partner S.C. ROSEAL S.A.: 16 new types of magnetically controllable fluids, 1 prototype and 3 functional models of magnetofluidic devices for nuclear and hydraulic power engineering.

Financed through/by

Ministry of National Education through the Executive Agency for Higher Education, Research, Development and Innovation Funding, Partnerships in priority S& T domains Programm PN II, Collaborative Applied Research Projects PCCA 2011 - UEFISCDI

Research centre

- Research Center for Engineering of Systems with Complex Fluids, Politehnica University of Timisoara
- Magnetometry Laboratory, Rheology Laboratory, Numerical Simulation and Parallel Computing Laboratory
  URL: http://mh.mec.upt.ro/ccisfc/

Research team

The project research team consists of 42 researchers, engineers and technicians
Dr. Ladislau Vekas - the project manager
Assoc.Prof. Floriana D. Stoian, PhD
Phys. Oana Marinica
Lect. Sorin Holotescu, PhD
Assoc. Prof. Nicolae Crainic, PhD
Lect. Andreea Dobra, PhD
Lect. Adelina Han, PhD
Res. Assist. Florica Balanean
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ENVIRONMENTAL ENERGY HARVESTING HYBRID SYSTEM BY PHOTOVOLTAIC AND PIEZOELECTRIC CONVERSION, DC/DC TRANSFORMATION WITH MEMS INTEGRATION AND ADAPTIVE STORAGE

Goal of the project

The design, building and testing of the prototype of a hybrid system for energy harvesting from the ambient through photovoltaic conversion, DC/DC transformation with MEMS integration and adaptive storage, will be carried out. A key novel component is the planar power micro-transformer for high frequency, with hybrid magnetic nanofluid/ferrite core and windings fabricated in MEMS technology, a part of the DC/DC converter. A second key component is the photovoltaic cell, which relies on novel solutions.

Short description of the project

A prototype with wireless sensors powered by the harvesting system will be designed, built and tested. In this endeavour, there will be prepared a dedicated mangetic fluid to be used as core of a micro-transformer, which will be designed accordingly and tested. Further, an experimental model of the energy harvesting hybrid system will be elaborated, designed and tested. Finally, a prototype for the harvesting device will be designed and tested for a particular application.

The current year research is targeting to accomplish the second activity listed above. The Politehnica University team, together with the Romanian Academy – Timisoara Branch (P2), is responsible for the preparation and characterization (in terms of magnetic, rheological, electrical, thermal and structural properties) of the magnetic fluid used as magnetic fluid core of the power micro-transformer.

Project implemented by

- National Institute for R&D in Electrical Engineering ICPE-CA Bucharest (Coordinator)
- Politehnica University of Timisoara (Partner 1)
- Romanian Academy – Timisoara Branch (Partner 2)
- Politehnica University of Bucharest (Partner 3)
- SYSCOM PROCESS CONTROL LTD (Partner 4).

Implementation period

01.07.2014 – 30.06.2016

Main activities

- elaboration of the experimental model of the energy harvesting hybrid system by photovoltaic conversion and DC/DC transformation with MEMS integration;
- design and testing of the experimental model of the energy harvesting hybrid system by photovoltaic conversion and DC/DC transformation with MEMS integration;
- design and testing of the prototype of the energy harvesting hybrid system by photovoltaic conversion and DC/DC transformation with MEMS integration.

Results

- The main result of the project will be the integration of an innovative photovoltaic conversion system and an original DC/DC converter, which utilizes a planar, spiral, MEMS, hybrid (magnetic nanofluid/ferrite) cored micro-transformer in an efficient device for energy harvesting.
- Regarding the use of a magnetic nanofluid core micro-transformer for the DC/DC converter, from the manufacturing point of view, it is expected that once the appropriate magnetic nanofluid characteristics are established, it will offer an easier way of obtaining the transformer core compared to a solid one.
- From the operating point of view, it is expected that by replacing the solid core with a liquid core will result in a better heat dissipation and reduction of the thermal stresses in the micro-transformer, leading to a longer life-cycle, maintaining or even improving the electric characteristics.

Applicability and transferability of the results

- The product can bring added value for further development as an end-product to the industrial partner.
- Possible applications are characterized by their placement in hard to reach places, isolated and without local and/or conventional sources.
- Among these are applications for industrial automation, monitoring of various parameters in industry, agriculture, surveillance and monitoring of perimeters.

Financed through/by

Financed through/by: Ministry of National Education through the Executive Agency for Higher Education, Research, Development and Innovation Funding, Partnerships in priority S&T domains Programm PN II, Joint Applied Research Projects PCCA 2013.

Research centre

Research Center for Engineering of Systems with Complex Fluids, Politehnica University of Timisoara,
URL: http://mh.mec.upt.ro/ccisfc/

Research team

The research team of Politehnica University of Timisoara is consists of three senior researchers, one PhD student and two research assistants

Assoc. Prof. Floriana D. Stoian, PhD
Lect. Sorin Holotescu, PhD
Phys. Oana Marinica
Assoc.Prof. Nicolae Crainic, PhD
Res. Assist. Florica Balanean
Res. Assist. George Giula

Contact information

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MICRO-MECHANICAL MODELLING OF CELLULAR MATERIALS WITH REFINEMENTS ON FRACTURE AND DAMAGE

Goal of the project

Cellular materials are widely used as cores in sandwich composites, for packing and cushioning. The main characteristics of foams are light weight, high porosity, high crushability and good energy absorption capacity. Present project propose to develop micro-mechanical models in order to predict the mechanical properties of cellular materials with a focus on modeling the fracture and the influence of damage on the mechanical response

Short description of the project

Project combines analytical methods, with numerical micro-mechanical finite element analysis and experimental investigations: materials testing and investigating the damage mechanisms by Digital Image Correlation and Thermoelastic Stress Analysis. The novelty of the project will be highlighted by the size and notch effect for cellular materials, and by investigating the effect of microstructural damage on the mechanical response of cellular materials.

Project implemented by

- Politehnica University of Timisoara
- Lublin University of Technology, Lublin, Poland
- Slovak Academy of Science, Bratislava, Slovakia
- Polymer Competence Center Leoben, Austria
- ILK, TU Dresden, Germany

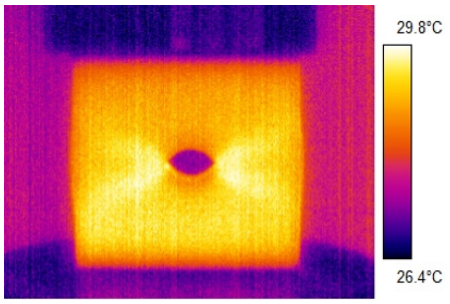
Implementation period

05.10.2011 – 04.10. 2015

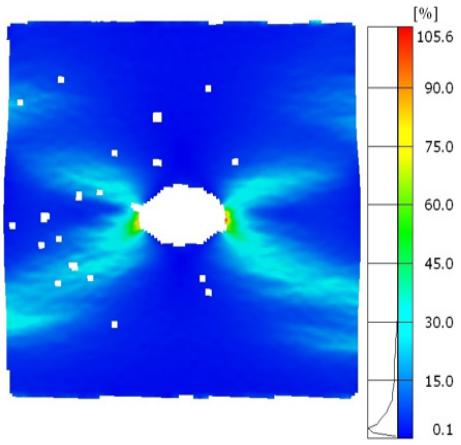
Main activities

- Better understanding of mechanical behavior of cellular materials.
- Develop micro-mechanical models to estimate mechanical properties of cellular materials.
- Implementation of constitutive material models in Finite Element Analysis.
- Investigating the size effect and notch effect on cellular materials Evaluating the behavior of cellular materials under dynamic (impact and fatigue) loading.
- dentification of damage mechanisms in cellular materials using Digital Image Correlation and Thermography.
- Investigating the effect of microstructural damage on the mechanical properties of cellular materials.

Damage identification



by thermography



by Digital Image Correlation

Financed through/by

Grant PN-II-ID-PCE-2011-3-0456, Contract Nr. 172/2011, by Romanian Ministry of National Education, through UEFISCDI

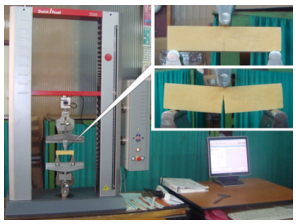
Results

Our results provide a complete characterization of cellular materials, with enhancement on fracture and damage mechanisms. The main results of the project were published in ISI high impact journals:

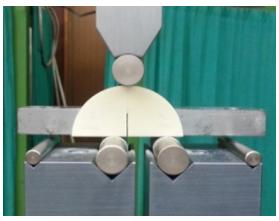
- L. Marsavina, E. Linul, T. Voiconi, T. Sadowski, A comparison between dynamic and static fracture toughness of polyurethane foams, Polymer Testing 32 (2013) 673–680;
- L. Marsavina, D.M. Constantinescu, E. Linul, D.A. Apostol, T. Voiconi, T. Sadowski, Refinements on fracture toughness of PUR foams, Engineering Fracture Mechanics, 129 (2014) 54-66;
- D. Serban, E. Linul, L. Marsavina, N. Modler, Numerical evaluation of two-dimensional micromechanical structures of anisotropic cellular materials: case study for polyurethane rigid foams, Iranian Polymer Journal 24 (2015) 515-529;
- D. Serban, L. Marsavina, N. Modler, Low-cycle fatigue behavior of polyamides, Fatigue and Fracture of Engineering Materials & Structures (Published OnLine);
- L. Marsavina, D.M. Constantinescu, E. Linul, T. Voiconi, D.A. Apostol, Shear and mode II fracture of PUR foams, Engineering Failure Analysis (Published OnLine);
- R. Negru, L. Marsavina, D, T. Voiconi, H. Filipescu, G. Belgiu, Application of TCD for brittle fracture of notched PUR materials, Theoretical and Applied Fracture Mechanics (Published OnLine);

but also in other BDI journals and conference proceedings: Vth ICEAF 2015, Crack Path 2015 .

Testing of PUR foams for fracture toughness determination



Three point bending



Asymmetric Semicircular Bending

Single Edge Crack

Compact Shear

Applicability and transferability of the results

- Results will be used by foams manufacturers Necumer and Spumotim to improve their technologies. Also, companies using foam components like TRW Automotive and Adidas will benefit by our developed micro-mechanical models to characterize their components and in the product design.

Fields of interest:

- Composite and cellular materials
- Mechanical testing
- Finite Element Analysis
- Fracture and Damage Mechanics

Research team

Prof. Liviu Marșavina, PhD – Project Manager
Prof. Dan M. Constantinescu, PhD – Senior Researcher
Emanoil Linul, PhD – Postdoc Researcher
Cristian Neș, PhD- Postdoc Researcher
Dragos A. Apostol, PhD– Postdoc Researcher
Dan A. Șerban, PhD – Postdoc Researcher
Eng. Tudor Voiconi, PhD student
Eng. Florin Stuparu, PhD student

"There are no secrets to success. It is the result of preparation, hard work, and learning from failure."
Colin Powell

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HIGH PERFORMANCE LIGHTWEIGHT PANELS WITH A NEW OPTIMIZED DESIGN FOR ADVANCED AIRCRAFT STRUCTURES

Goal of the project

Design of aircraft panels, made of metal and composite material, flat and curved, with improved performances.

Short description of the project

Evaluation of the properties of some sandwich panels having an ultra light core, spatially folded. An increase of their performances with respect to the honeycomb core sandwiches is expected.

Project implemented by

- University Politehnica Bucuresti - Coordinator
- Straero S.A - Partner 1
- University Politehnica Timisoara - Partner 2
- INAS S.A. - Partner 3
- MART Mechanics S.R.L. - Partner 4

Main activities

- Characterization of three types of structural adhesives: Araldit AV138 M1 + HV 998, Araldit AW 106 + HV 953U and Bison using tensile tests and vibration excitation technique.
- Characterization of mechanical properties of metallic materials used for faces and cores in sandwich structures
- Static tests on single and double lap joints for the characterization for the characterization of the behavior of structural adhesives at ambient temperature.
- Numerical simulations of the behavior of doubler adhesive joints.
- Numerical simulation of the adhesive joints under four point bending

Implementation period

02.07.2012 - 30.06.2016

Results

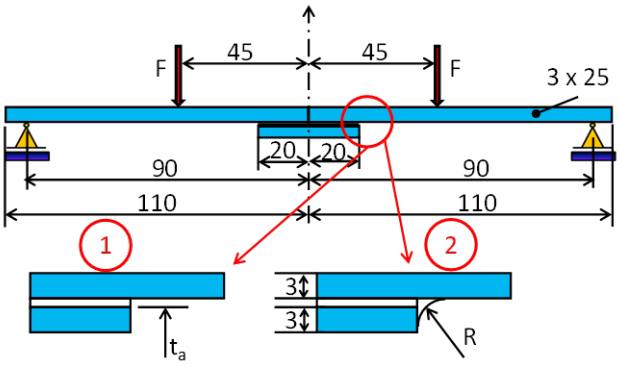
Identification of new mechanical interconnection solutions for the skins, using elements that cross the core of the sandwich, which are simpler, more efficient and cheaper than those currently in use.

Skins interconnection is more convenient in the case of rigid polymeric foam core. Thus, the risk of delamination is reduced and this procedure is expected to increase the rigidity and resistance of the designed panels. Designing a new auxetic core structure.

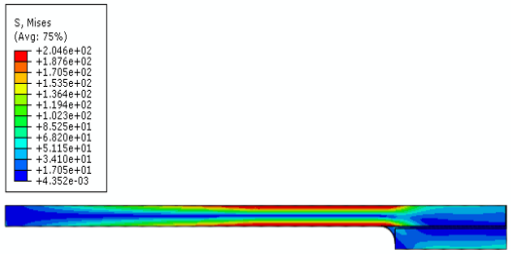
The main results were published in:

- R. Negru, L. Marsavina L.,C. Caplescu, H. Filipescu, Assessment of brittle mixed -mode fracture using the theory of critical distances, Proceedings of International Conference on Innovative Technology, IN-TECH 2013, Budapest 10-13.09.2013, p. 313-316

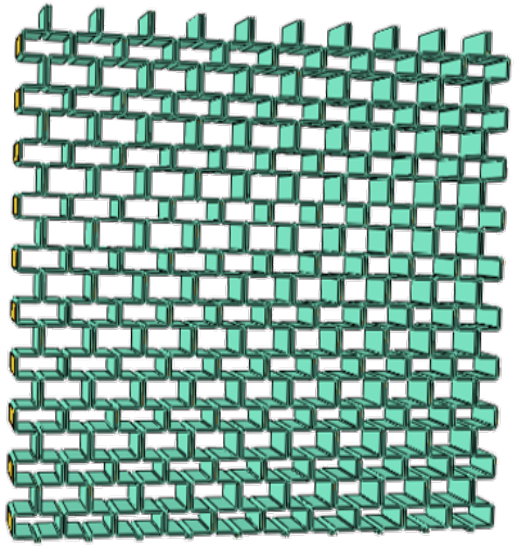
- R. Negru, L. Marsavina, H. Filipescu, C. Căplescu, T. Voiconi, Assessment of brittle fracture for PUR materials using local Strain Energy Density and Theory of Critical Distances, Theoretical and Applied Fracture Mechanics, (OnLine First)



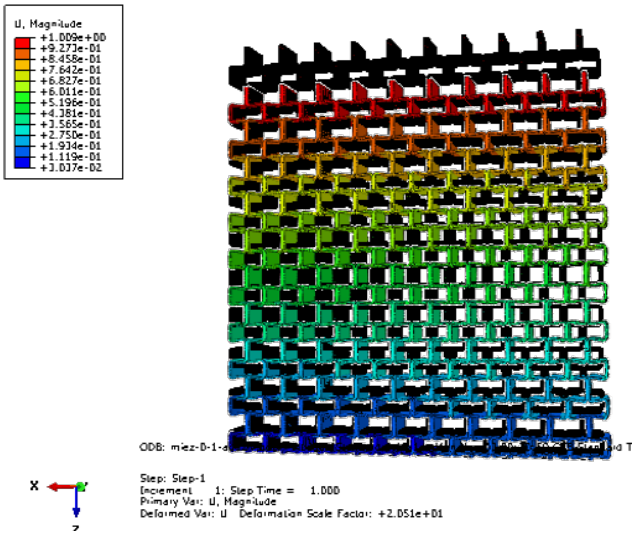
Geometry of the adhesive joint under four point bending



Equivalent stress distribution for the adhesive joint under four point bending



Auxetic core structure



Total displacement of the structure

Applicability and transferability of the results

Results and design solutions will be transferred to sandwich structure manufacturers to improve their technologies.

Also, companies involved on design of aircraft will benefit by our developed sandwich structures and hybrid assembly solutions.

Financed through/by

PN-II-PT-PCCA-2011-3.2-0068 CONTRACT 206/2012, Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI)

Research centre

ICER - Research Institute for Renewable Energy

Research team

at University Politehnica Timișoara, ROMANIA

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"There are no secrets to success. It is the result of preparation, hard work, and learning from failure."
Colin Powell

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NEW HAPTIC ARM EXOSKELETONS FOR ROBOTICS AND AUTOMATION IN SPACE (EXORAS)

Goal of the project

The project seeks to develop in Romania the capacity to design and manufacture special assemblies meant to work in the field of Robotic Exploration. The overall goal is to stimulate Romania's participation to international space missions and programs, in collaboration with ESA (European Space Agency), as its 19th member. The practical task is to develop a new haptic arm exoskeleton designed to enable in-space force-feedback telemanipulation with redundant robotic arms.

Short description of the project

EXORAS will provide a new haptic arm exoskeleton for robotic exploration. The exoskeleton is desired to explore future ways of commanding a manipulator arm in space. It will be created a prototype with special features of design, namely several shortcomings of previous telemanipulation systems will be removed. The new system pursues requirements regarding weight, ease of wearing and comfort of the human operator. The project assumes the full design, assembling and testing of the prototype. All aspects are taken into account: kinematics, dynamics, sensorics, wireless control, haptic feed-back, actuation, materials and so on.

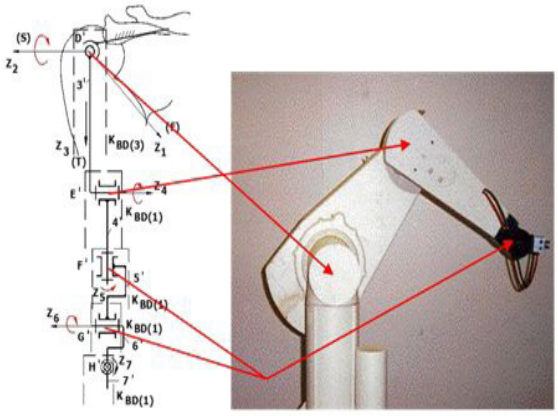

Fig. 1 Corresponding joints of exoskeleton and robot

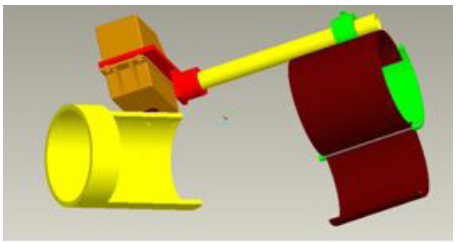

Fig. 2 CAD model of the exoskeleton with servo rotary drive

Project implemented by

- Technical University of Cluj-Napoca – Coordinator
- University "Transilvania" Brasov – Partner 1
- Politehnica University of Timisoara – Partner 2 (146)

Implementation period

2012 – 2015

Main activities

- Research on the development of exoskeleton haptic systems for robotic exploration (existing solutions and development of new solutions; establishment of basic components with functional and technical specifications)
- Concept, design and assembly (mechanical design, kinematic analysis, development of control software, simulation)
- Testing and optimizing of prototypes (assembling, testing and optimizing of prototypes).

Results

At this stage, the research work lead to the design and partial implementation of new six solutions of exoskeleton arm. A generic scheme of the general concept from kinematic point of view is given in figure 1.

The design and practical solutions developed until now focused on the elbow and wrist joints. The six variants of exoskeleton under study use:

- servo rotary drive mounted directly on the shaft of the joint (fig. 2)
- linear actuation and transformation of motion (fig. 3)
- free motion and electromagnetic brake (movement transmission via a wire mechanism)
- free motion and electromagnetic brake
- haptic feedback generated by myostimulation
- haptic feedback generated by vibration modules.

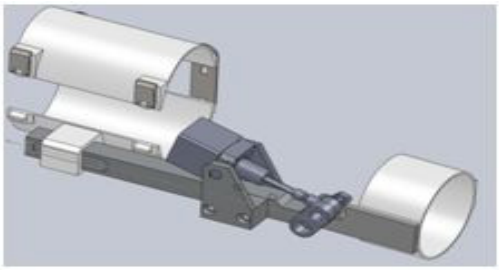

Fig. 3 CAD model of the exoskeleton with linear actuation

From the solutions above, the most convenient alternative proved to be the one using electromagnetic brakes. The CAD model of the assembly (5 degrees of freedom) is shown in figure 4.

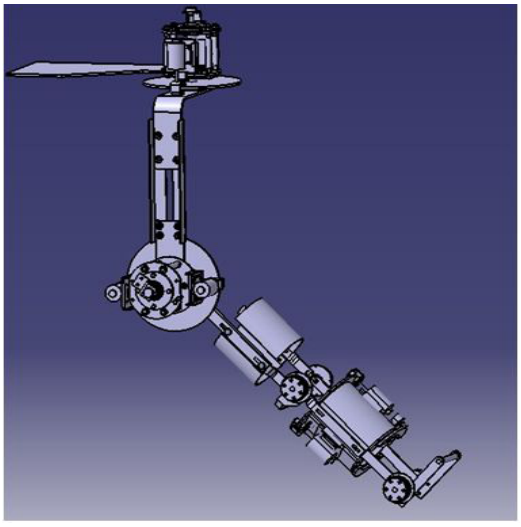

Fig. 4 CAD model of the exoskeleton (5 degrees of freedom) with free motion and electromagnetic brake

Research centre

Mechatronics&Robotics Research Center

Applicability and transferability of the results

- EXORAS fulfills entirely the goal of STAR program (of Romanian Space Agency) that aims the increasing of the research competitiveness for participation of academic entities to activities of ESA, included in the law no. 262/2011 regarding the membership status to ESA.
- This project is going to produce clear benefits to the consortium partners and beyond, regarding the competitiveness of the market for hi-tech mechatronics and robotics. In addition, the gain in knowledge is going to be transferred into higher-education support.

Financed through/by

Funded by the Romanian Space Agency (ROSA) through Contract nr. 13/19.11.2012 within the program STAR 2012 – Projects of RDI, Research direction: S1 Research

Research team

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IMPROVEMENT OF THE TITANIUM WEAR RESISTANCE BY ELECTRON BEAM REMELTING OF THE PRE-DEPOSITED THERMAL

Goal of the project

Improvement of the exploitation performance of the titanium, especially wear behavior, without influencing its good corrosion resistance.

Short description of the project

Titanium is one of the most promising metals in field of high specific strength engineering. Although it offers attractive mechanical, chemical and physical properties, its surface properties are deficient, possessing poor fretting fatigue resistance and poor wear resistance properties. Thermal spray coatings is one of the most common ways to improve the surface characteristics of the materials being used in a wide range of industries to improve the abrasive, erosive, and sliding wear of machine components.

The proposed theme focuses on the improving of the titanium wear resistance by electron beam (EB) remelting of the pre-deposited oxidic powder Al2O3-TiO2 using the high velocity oxygen fuel (HVOF) and atmospheric plasma spraying (APS) methods. The EB treatment may lead to the elimination of porosity, enhancement of the coating strength and chemical homogeneity, and the development of metallurgical bonding at the coating-substrate interface producing strengthened coatings adhesion.

Project implemented by

Politehnica University of Timisoara

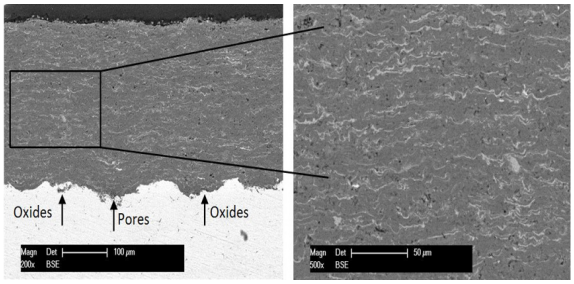
Implementation period

02.09.2013-30.09.2016

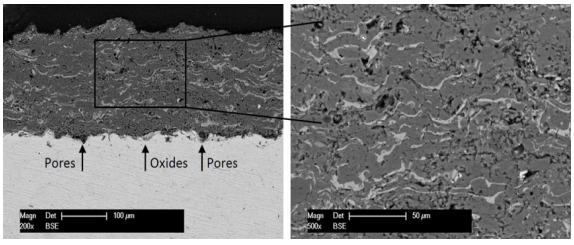
Main activities

1. State of the art and perspectives evaluation in surface coatings technique used as a method in order to improve the wear behavior of the titanium;
2. Development of HVOF and APS sprayed Al2O3-TiO2 coatings on the surface of titanium and their remelting using the electron beam (EB) method;
3. Analysis and characterization of the obtained HVOF sprayed Al2O3-TiO2 coatings before and after the electron beam remelting treatment;
4. Study of the wear and corrosion behavior of the coatings before and after the electron beam remelting;

Results



a) SEM micrographs of the deposited Al2O3-TiO2 coatings using HVOF



b) spraying process

Results

For the third stage of the project it has been obtained the following results:

- characterization of the predeposited Al2O3-TiO2 coatings using the HVOF and APS spraying processes before and after the electron beam remelting treatment;

Applicability and transferability of the results

- The results which will be obtained in frame of the project will be transferred to companies in the field of automotive industry and not only. A
- Iso they will be presented to national and international conferences and published in scientific journals.

Research Centre

Research Centre for Processing and Characterization of Advanced Materials

Financed through/by

UEFISCDI - Executive Unit For Financing Education Higher Research Development And Innovation

Research team

Ion-Dragos Uțu - Project manager
Viorel-Aurel Șerban– senior researcher
Cosmin Codrean – senior researcher
Carmen Opriș – senior researcher
Iosif Hulka– postdoc researcher

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TECHNICAL CHARACTERISTICS RESEARCHING OF MODERN PRODUCTS IN MACHINE INDUSTRY (MACHINE DESIGN, FLUID TECHNICS AND CALCULATIONS) WITH THE PURPOSE OF IMPROVEMENT THEIR MARKET CHARACTERISTICS AND BETTER PLACEMENT ON THE MARKET

Goal of the project

The overall goal of the project are to increase the inter-university research cooperation in the fields of advanced methods of manufacturing, industry logistics and production engineering and the integration of research results in industry, trough students, doctoral students, professors and researchers, by facilitating the contacts with companies functioning in the influence areas of the partner universities.

Short description of the project

- The network project is designed to stimulate academic mobility within Central, Eastern and South- Eastern Europe and to promote the university cooperation.
- The activities are carried out predominantly during the academic mobilities, planned for undergraduate students, PhD students and teachers, through specific actions: exchanging of information, knowledge and experience, participating to the common research projects, assisting with work on M.Sc. and Ph.D. thesis.
- Detailed description of the project and of activities are available on the CEEPUS web page : https://www.ceepus.info/public/network/network.aspx

Implementation period

01.09.2014 - 2015

Project implemented by

27 universities from 11 countries
Lead partner:

- University of Novi Sad, Faculty of Technical Sciences, Department of Mechanism and Machine Design

Project partners:

- POLITEHNICA UNIVERSITY OF TIMISOARA, Faculty of Engineering Hunedoara
- University of Sarajevo
- University of Banja Luka
- University of East Sarajevo
- Angel Kanchev University of Rousse
- University of Chemical Technology and Metallurgy
- Technical University of Liberec
- Jan Evangelista Purkyne Univ. in Ústí nad Labem
- Budapest University of Technology and Economics
- College of Nyíregyháza
- University of Montenegro
- University Sts. Cyril and Methodius - Skopje
- Poznan University of Technology
- "Politehnica" University of Bucharest
- Technical University of Cluj-Napoca, MB Faculty
- Technical University of Cluj-Napoca, Dep. ETM
- "Transilvania" University of Brasov
- "Eftimie Murgu" University of Resita
- "Lucian Blaga" University of Sibiu
- Belgrade University
- University of Nis
- University of Kragujevac
- University of Ljubljana
- Slovak Univ. of Technology in Bratislava, Fac. Mechanical Engineering
- Slovak Univ. of Technology in Bratislava, Fac. STU, Trnava
- Technical University in Košice

Main activities

- Courses, lectures, laboratory work and seminars.
- Joint Program, common elaboration of PhD and master thesis.
- Project activities combined with activities of Balkan Association of Power Transmissions–BAPT (Workshops, Summer courses and Scientific conferences, in cooperation with network partners, dedicated to special topics in machine design and fluid techniques).
- The network supports also the journal Machine Design (ISSN 1821-1259) and all CEEPUS local coordinators of partners are members of Scientific Editorial Board of the journal.

Index of main activities fields:

Teaching and training. Design. Marketing and advertising. Engineering, Manufacturing and Construction. Engineering and engineering trades. Computing and Computer use.

Milestones for the main activities:

- Designation of criteria, rules, schedules for students mobilities.
- Selection of supervisors on the host universities.
- Preparation of experimental investigation stands for research connected with the PhD thesis.
- Permanent professional e-discussions with the network partners. Project Management. Evaluation reports.
- Conclusion from final valuation meeting organized on the end of the academic year.

Results

- Joint Program: Optimization of Gear Transmissions. Design of Products and Machines
- Experimental investigation stands
- Professionals Visits of partner institutions: for the Politehnica University of Timisoara/Faculty of Engineering Hunedoara, 17 mobilities (10 incoming, 7 outgoing).
- Achievement of the requirements for teaching staff in teaching hours and and for students in obtained ECTS Credits, at the partner institutions.
- Final Report and valuation meeting, organized on the end of the CEEPUS academic year.

Financed through/by

- CEEPUS - "Central European Exchange Program for University Studies"

Applicability and transferability of the results

- Common criteria, rules, schedule for outgoing and incoming students, applicable in future students CEEPUS mobilities.
- Ensuring of possibility to develop future joint programs and joint thesis supervision.
- Stimulation of academic mobilities, in particular regional students and teachers mobilities within Central, Eastern and South - Eastern Europe

Research Team

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Assoc. Prof. Eng. Carmen Inge Alic, PhD
Lecturer Eng. Ec. Vasile Alexa, PhD
Lecturer Marius Călin Benea, PhD
Lecturer Eng. Maria Laura Benea, PhD
Lecturer Eng. Vasile George Cioată, PhD
Assoc. Prof. Eng. Imre Kiss, PhD
Lecturer Eng. Cristina Carmen Miklos, PhD
Lecturer Eng. Imre Zsolt Miklos, PhD
Lecturer Eng. Sorin Aurel Rațiu, PhD
Lecturer Eng. Ovidiu Gelu Tirian, PhD
Local CEEPUS Project coordinators from the 25 partner universities

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KNOWLEDGE MANAGEMENT-BASED RESEARCH CONCERNING INDUSTRY-UNIVERSITY COLLABORATION IN AN OPEN INNOVATION CONTEXT- UNIINOI

Goal of the project

In the present competitive climate, research knowledge and innovation are seen as the main distinguishing factors of firm success and as the basis of competitive advantages. Following a long tradition of research in the field of innovation, Open Innovation is an approach in which the boundaries of innovation are shifting from a situation where firms conduct research and development activities mainly internally, to a widespread collaboration and external knowledge source, to help them in achieving and sustain innovation. Although universities are seen among the most important partners with whom firms can cooperate, quantitative empirical evidence with regards to the development, evolution and sustainability of Industry-University relations in Open Innovation is still very scarce.

Short description of the project

- The general objective of the project is to sustain the research and development activities, based on knowledge management and carried out in collaboration by the consortium partners, for the development of an environment that promote Industry-University collaboration in Open Innovation.

Project implemented by

- University of Oradea
- Politehnica University of Timisoara
- Technical University of Cluj-Napoca
- S.C. EMSIL TECHTRANS S.R.L.

Implementation period

2014-2016

Main activities

1. The development of the collaborative research environment
2. The development of an Open Innovation environment between Industry-University
3. The development of a model for performance measurementof Industry-University collaboration in Open Innovation

Financed through/by

Ministry of National Education
The Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI)

Research Team

Anca Draghici
Larisa Ivașcu
Călin Florin Băban
Laura Bacali
Silviu Dan Mînzat

Results

Articles in ISI Journals

- Baban, C.F., Baban, M., Suteu, M.D. (2015). Using a fuzzy logic approach for the predictive maintenance of textile machines, Journal of Intelligent & Fuzzy Systems, vol. Preprint, no. Preprint, pp. 1-8, 10.3233/IFS-151822 (Impact factor 2015=1.812).
- Oana, D., Suteu, M.D., Oana, I.P. (2016). The thinness degree study of wool yarnsof different origins using the Ustermachine, Industria Textila (accepted for publication, Impact factor 2015=0.475).

Articles in journals indexed în International Database

- Lakatos, E.S., Bercea, O.B., Moldovan, A., Bacali, L.(2015). Partnership between industry and university from an Open Innovation perspective, Review of Management and Economic Engineering, 14(1), pp. 173-182.
- Vaida, R., Bacali, L., Lakatos, E.S., Drăghici, A. (2015). Applications of knowledge management in social enterprises, Review of Management and Economic Engineering, 14(3), pp. 516-527.
- Baban, M., Baban, C.F., Buidos, T., Stanasel, I. (2015). A reverse engineering approach for the products development, Nonconventional Technologies Review, 19(1), pp.12-17.
- Pancu, R., Mihăilă, S. (2015). The actuation mechanism concept used at the modular fixture system for TMA-AL 550 horizontal milling centre, Nonconventional Technologies Review, 19(3), pp.32-36.
- Baban, M., Baban, C.F., Pele, A.V. (2015). A perspective on the usefulness of knowledge aquired within a simulated enterprise in reverse engineering, ANNALS OF THE ORADEA UNIVERSITY. Fascicle of Management and Technological Engineering, Volume XXIV (XIV), Issue 3, pp.9-12.
- Draghici A., Cirtan M. A., Florea C. (2015). Some Consideration on Knowledge Management Implication on Organization's Competitiveness, ACTA UNIVERSITATIS CIBINIENSIS – TECHNICAL SERIES, Vol. LXVI, issue 1 (July 2015), DOI: 10.1515/aucts-2015-0024, pp. 41-46.

- Dragomir, G., Pancu, R., Mitran, T.A., Georgescu, L., Moca, S. (2015). Study regarding the car brake disc temperature variation during the lengthy braking, ANNALS OF THE ORADEA UNIVERSITY. Fascicle of Management and Technological Engineering, Volume XXIV (XIV), Issue 3, pp.57-60.
- Draghici A., Brad S. (2016). The Lean Agile Technology Transfer Model: Revisiting University-Industry Collaboration through the Gate of Innovation Process, International Journal of Sustainable Economy (accepted for publication)
- Cantor, A., Bacali, L., Muresan, M.C. (2015). About the role of marketing research, Review of Management and Economic Engineering, 14(4) (accepted for publication)
- Naghiu, M.O. (2015). Panmarketing – Towards a New Marketing!?, Review of Management and Economic Engineering, 14(4) (accepted for publication)
- 11. Branduşan, R., Bacali, L., Mureşan, C.M., Lakatos, E.S. (2014). Exploratory research regarding knowledge management, Review of Management and Economic Engineering, 13(4), pp. 789-796
- Draghici, A., Baban, C., Gogan, M., Ivascu, L. (2014). A knowledge management approach for the university – industry collaboration in open innovation context Procedia Economics and Finance, Elsevier (accepted for publication)
- Branduşan, R., Bacali, L., Mureşan, C.M., (2014). Exploratory research regarding knowledge management, Review of Management and Economic Engineering, 4, 789-796
- Lakatos, E.S., Bercea, O.B., Moldovan, A., Bacali, L.(2015). Partnership between industry and university from an Open Innovation perspective, Review of Management and Economic Engineering, nr 1.

Participations at conferences

- Draghici A., Baban C. F., Gogan M. L., Ivascu V. L. (2015). A Knowledge Management Approach for The University-Industry Collaboration in Open Innovation, Procedia Economics and Finance, vol. 23/2015, pp. 23-32, 2nd GLOBAL CONFERENCE on BUSINESS, ECONOMICS, MANAGEMENT and TOURISM, 30-31 October 2014, Prague, Czech Republic, doi:10.1016/S2212-5671(15)00377-9
- Draghici, A., Ivascu, L.V., Baban, C.F., L. Bacali, L. (2015). University-industry collaboration in open innovation, INTED2015 Proceedings, 9th International Technology, Education and Development Conference, Madrid, Spain 2-4 March 2015, pp. 6278-6287 (submitted to ISI Thomson for indexing)
- Draghici, A., Baban, C.F., Ivascu, L.V., Sarca, I. (2015). Key success factors for university–industry collaboration in open innovation, ICERI2015 Proceedings, 8th International Conference of Education, Research and Innovation, Seville, Spain 18-20 November 2015, pp. 7357-7365 (submitted to ISI Thomson for indexing)
- Draghici A., Foldvary-Schramko H. K., Baban C. F. (2015). Comparative Study on Knowledge Management Dimensions That Support Education and New Learning Technologies in Romanian Universities, EDULEARN15 Proceedings, 7th International Conference on Education and New Learning Technologies, Barcelona, Spain, 6th-8th July 2015, pp. 6726 – 6735 (submitted to ISI Thomson for indexing)
- Ivascu L., Mocan M., Draghici A., Turi A., Rus S. (2015). Modeling the Green Supply Chain in the Context of Sustainable Development, 4th World Conference on Business, Economics and Management (BEM-2015), Procedia Economics and Finance, Volume 26, ISBN 2212-5671, pp. 702–708 (submitted to ISI Thomson for indexing)
- Ivascu L., Cirjaliu B., Draghici A. (2015). Business model for the university-industry collaboration in open innovation, 3rd GLOBAL CONFERENCE on BUSINESS, ECONOMICS, MANAGEMENT and TOURISM, 26-28 November 2015, Rome, Italy (submitted to ISI Thomson for indexing)
- Lakatos, E.S. (2015). The benefits of IT tools in innovation process for SME Sustainability, Third International Conference on Advances in Management, Economics and Social Science – MES 2015, Rome, Italy, 10-11 December (acceptat spre publicare)

Products

- The Portal of Knowledge Management - KM Portal
- (http://imtuoradea.ro/PNII_337_platforma/ platforma.php)

Others

- The model survey questionnaire to identify the main dimensions of the Industry- Universities collaboration in Open Innovation
- Report on the ontology of the Industry- Universities collaboration in Open Innovation
- Knowledge maps of the Industry- Universities collaboration in Open Innovation

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THE IMPACT OF THE ECONOMIC AND FINANCIAL STABILITY ON INVESTMENTS, INNOVATION PROCESS AND ENTREPRENEURIAL ACTIVITY IN THE EU

Goal of the project

The project has three general objectives. First, it is about the setup of a young research team that will approach an interdisciplinary subject, of European interest, and that will enhance the capacity of Romanian researchers to successfully apply for European financing instruments. Second, the project intends to increase the number of full time researchers as well as to augment the quality of publications of the young researchers who will be part of the team. Third, the project allows to increase the integration of the project leader (with macroeconomic background), in the research activity of the management school where he acts.

Short description of the projects

The investment, innovation and entrepreneurial activities are mainly analyzed at microeconomic level. Their macroeconomic determinants advanced by researchers refer to the market size, productivity, trade openness and R&D expenditure. However, the economic and financial stability plays an important role in promoting investments, in influencing the entrepreneurs' decisions and in affecting the national innovativeness capacity. These aspects, extremely important for the European strategy for economic recovery and job creation, are not sufficiently explored in the literature, while their empirical investigation is practically inexistent, especially at a sectorial level.

Against this background, using a panel approach, different cointegration models with structural breaks and the Amadeus statistics, the aim of the project is to analyze the relationship between stability and investments, innovation and entrepreneurship in EU countries, following three research directions.

First, we analyze the link between stability and investments, considering the sectorial particularities of the investments' determinants. Next, we investigate the role of the stability in enhancing the innovativeness capacity. Finally, we explore the relationship between the economic stability and the entrepreneurial activity, to investigate the economic sectors where the entrepreneurial decision is sensitive to the evolution of the macroeconomic fundamentals.

Implementation period

01.10.2015 – 30.09.2017

Financed through/by

- Executive Agency for Higher Education, Research, Development and Innovation Funding – UEFISCDI, Bucharest, Romania.

Research Centre

Research Centre for Engineering and Management

Project implemented by

Politehnica University of Timisoara, Management Department

Main activities

- Research deployed on three axes: stability and investments, stability and entrepreneurial activity, stability and innovation process
- Manipulation of AMADEUS database
- Generation of results using EViews software
- Creation of research networks
- Participation to research traineeships/stages and summer schools
- Dissemination of results in journals and conference proceedings.

Results

- 15 papers published
- 12 conference participation
- 4 research stages
- 1 workshop organization

Applicability and transferability of the results

- The results will allow a deep understanding of the role financial stability plays on investment, entrepreneurship and innovation
- The results will underline the main drivers of firms' performances across Europe
- The results will support economic policy decisions and investment decisions in different EU countries and economic sectors.

Research Team

Assoc. Prof. Claudiu Tiberiu ALBULESCU, PhD – Project Manager
Assoc. Prof. Matei TAMASILA, PhD – Senior researcher
Lecturer Ilie Mihai TAUCEAN, PhD – Senior researcher
Assist. Prof. Serban MICLEA, PhD - Postdoc Researcher

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NEW APPROACH OF USING IONIC LIQUIDS (ILS) AS GREEN EXTRACTANTS IN THE ADSORPTION PROCESS OF RADIONUCLIDES FROM WASTE AQUEOUS SOLUTIONS

Goal of the project:

The overall goal of the proposed project is to investigate a new approach of using the room temperature ionic liquid (RT IL) as extractants impregnated onto various solid supports in the adsorption process of radionuclides from waste aqueous solutions. The project has an interdisciplinary character presenting an integrated concept of waters depollution with radionuclides content

Short description of the project

Various ionic liquid impregnated materials are obtained and after a complex characterization they are used in the adsorption process of different radionuclides from synthetic and real aqueous solutions.

Project implemented by

Faculty of Industrial Chemistry and Environmental Engineering

Implementation period

01.05.2013-30.09.2016

Main activities

1. Impregnation of various ILs onto various solid supports using various methods of impregnation (2013);
2. Characterization of the obtained ionic liquid impregnated materials (2013);
3. Removal of various radionuclides from aqueous solutions through adsorption onto obtained ionic liquids impregnated materials: batch studies - equilibrium, kinetic and thermodynamic studies. (2013, 2014);
4. Removal of various radionuclides from aqueous solutions through adsorption onto obtained ionic liquids impregnated materials: Column studies (2015);
5. he influence of competitive cations (eg. Na, K and Be) and the concomitant extraction of various radionuclides (2015, 2016);
6. Desorption of the radionuclides and recycle of ionic liquid impregnated material. Use of various cycle adsorption-desorption (2015; 2016).

Applicability and transferability of the results

The project topic is answering a well-defined problem/question with practical relevance – in the waters depollution with radionuclides content, opening and establishing the new science based on both adsorption technology and ionic liquids. The results may also be transferred to the students as part of their training in the field of water and waste water treatment, adsorption process and obtaining of new functionalized materials field.

Results

The use of ionic liquid impregnated materials as adsorbents in the removal process of radionuclides from aqueous solutions presented very good performance in the removal process of radionuclides from waste aqueous solutions because the adsorbent properties of the solid supports and the advantageous properties of ILs were combined. All results were validated by publication in scientific journals and presentation at scientific conferences: 6 articles published in ISI indexed journals, 5 articles published in BDI indexed journals, and 19 articles presented at international conferences, one patent application.

Financed through/by

UEFISCDI/Human Resources - Research projects to stimulate the establishment of young independent research - TE

Research Centre

Research Institute for Renewable Energy

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NANO-ENHANCED ELECTROCHEMICAL GREEN TECHNOLOGY FOR ADVANCED INTEGRATED WATER TREATMENT AND QUALITY CONTROL

Goal of the project:

The main goal of this project is to develop a green electrochemical technology aimed at the use of electrochemical electrode materials based on nanostructured carbon for both destroying priority hazardous organic pollutants from water and to monitor them before / after application of electrochemical processes of destruction, envisaging the exploitation of the dual character of the electrode materials and electrochemical techniques, by creating the right framework for achieving the high research level.

This project aims to explore potential use of nano-enhanced electrochemical dual green technology to improve access to clean water.

Short description of the project

Based on the results obtained in our previous studies for the oxidation of pollutants in aqueous solutions for their degradation and/or their detection on the carbon-based electrodes, specific objectives have been set in this project:

1. Elaboration and manufacturing of some new electrodes types based on nanostructured carbon and Ag/Cu/TiO2 modified zeolite with enhanced electro(photo)-catalytic activity;
2. Manufacturing, design and geometry conditions of electrodes for degradation and monitoring applications;
3. Setting-up the optimal conditions for the degradation and mineralization of priority organic pollutants (POPs) from water;
4. Elaboration of the electrochemical detection scheme;
5. Integration of the electrochemical detection methods within the control of the degradation and mineralization of POPs in aqueous solutions.
6. Development of a new nano-enhanced electrochemical green dual technology for integrated water treatment and control.

Continuous development of nanomaterials and nanotechnology offers more effective and sustainable solutions for the environmental protection.Based on the well-known potential of theelectrochemical processesinenvironmentalremediationand quality monitoring, integration of nanomaterials in chemical composition of the electrode, which represents the key of these processes performances, gives them superior characteristics suitable for the practical applications. Also, the development of pulsed electrochemical techniques was not sufficiently explored and exploited to improve process efficiency.

Project implemented by

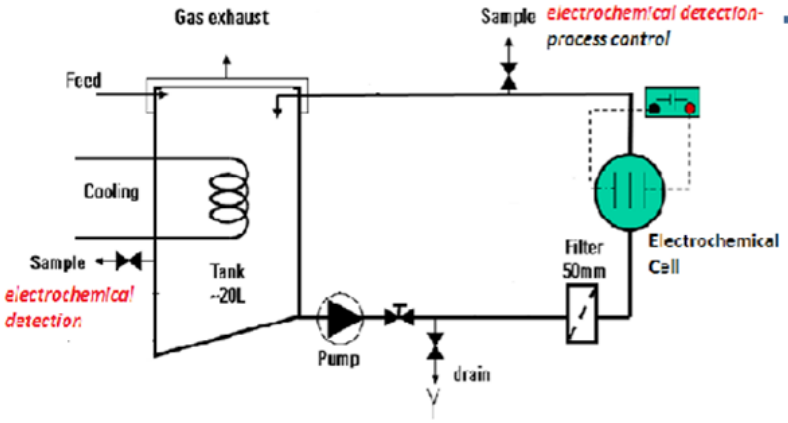
Faculty of Industrial Chemistry and Environmental Engineering

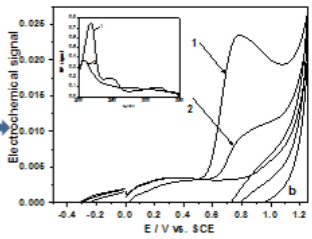
Implementation period

2011 - 2016

Main activities

1. Elaboration of new composite materials based on carbon nanotubes (CNT)/carbon nanofibers (CNF) in epoxy matrix as electrode materials for oxidation of POPs from water;
2. Characterization of new composite materials based on CNT/CNF in epoxy matrix and electrode design;
3. Composite electrode obtaining and selection for application in degradation and/or detection of POPs from water;
4. Assessment of electro(photo)catalytic performance of the selected electrodes in advanced degradation/mineralization of POPs;
5. Assessment of the electroanalytical performance of the electrode in detection of POPs from water. Optimization of the electroanalytical method;
6. Integration and optimization of the electrode materials and electrochemical techniques in advanced wastewater treatment and process control.
7. Dissemination of the project relevant results to the scientific community through publication in peer-reviewed national and international journals, and also to the stakeholders in water treatment technologies (industrial agents, authorities in the field of water, water-sewage operators.





Electrochemical signal in comparison with UV signal (inset) recorded on Ag-TiO2-CNF composite electrode before (1) and after (2) pentachlorophenol degradation

Results

- Comparative monitoring of optimized electrochemical treatment of priority organic pollutants from water using the electrochemical detection and conventional methods.
- Optimization of the composition of the electrode material and the electrochemical technique for integrative electrochemical degradation and process control. Published papers .

Applicability and transferability of the results

The nano-enhanced electrochemical green dual technology which will be elaborated at the end of this project could be scaled and tested for application at pilot level in water treatment.

Financed through/by

Executive Unit for Financing Higher Education, Research, Development and Innovation - UEFISCDI

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INTEGRATED SYSTEM FOR REDUCING ENVIRONMENTAL AND HUMAN-RELATED IMPACTS AND RISKS IN THE WATER USE CYCLE

Goal of the project:

The main goal of the project is to develop and implement an integrated system of innovative technologies and management instruments for reducing environmental impacts and associated human health risks caused by water quality aspects in the entire water use cycle: water abstraction, treatment, distribution, use, wastewater collection, wastewater treatment and discharge and reuse.

Short description of the project

The specific objectives were defined at the level of whole water usage cycle:

1. Development of specific instruments for the identification, quantification and control of environmental impacts and risks, over the water use cycle, applied to regional water operators;
2. Development of the capacity of collaboration and knowledge transfer between the universities and the regional water operators in Iasi and Timis counties for the control of the environmental impacts and human health risks in the water use cycle;
3. Development of the research and institutional capacities of the universities and water regional operators in Iasi and Timis counties for facilitation of the further cooperation at national and international scale;
4. Development of capacities and competitiveness of Romanian researchers and staff of regional water operator, as well as of the national partnerships contributing to environmental sustainability.
5. Dissemination of relevant results of the project to the scientific community through publication in peer reviewed international journals, ISI ranked, participation in international conferences, workshops, trainings/research stages, as well as to interested stakeholders (industrial agents, water authorities, waterworks companies, agriculture and services, EPAs, local and regional development agencies and authorities, NGO's and societal organizations).

Project implemented by

- Tehnical University "Gheorghe Asachi" Iaşi - Lead partner
- Politehnica University of Timisoara - P1
- SC AQUATIM SA Timişoara - P2
- SC APAVITAL SA Iaşi - P3

Implementation period

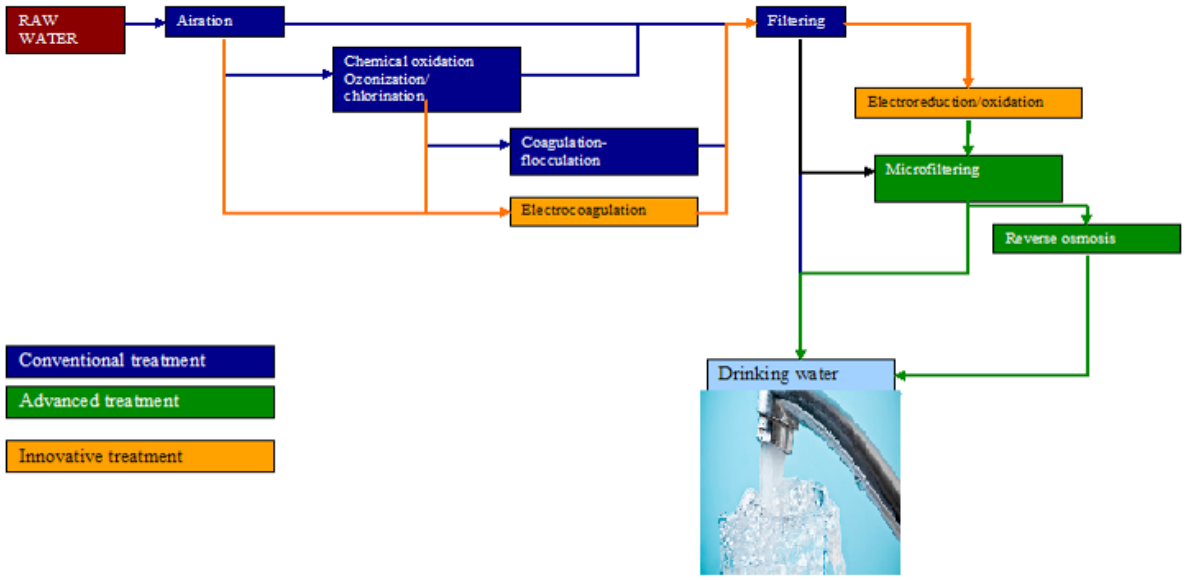
2012 - 2016

Main activities

1. Integrated evaluation of the water use cycle;
2. Studies on impact and risk minimization through innovative water treatment process (removal of nitrate, nitrite and natural organic matter);
3. Studies on impact and risk minimization through innovative wastewater treatment processes (removal of priority organic pollutants);
4. Pilot-scale studies on impact and risk minimization in water and wastewater treatment for reuse.
5. Development and testing of integrated management instruments for impact and risk prediction and minimization over the water use cycle;

Results

- Assessment of electrocoagulation, electrooxidation and electroreduction processes in drinking water treatment;
- Schematic flow for the flexible pilot plant for the drinking water treatment
- Design and elaboration of the flexible pilot plant for the drinking water treatment



Applicability and transferability of the results

Two regional water operators, i.e. Aquatim and Apavital are involved in this project in order to test and apply innovative technologies for water and wastewater treatment in direct relation with specific water quality problems.

Financed through/by

Executive Unit for Financing Higher Education, Research, Development and Innovation - UEFISCDI

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NEW FABRICATION CONCEPT OF SILVER NANOWIREPOLYANILINE TRANSPARENT, CONDUCTIVE AND FLEXIBLE ELECTRODES FOR SOLAR CELLS

Goal of the project

The aim of the project is to develop transparent, conductive and flexible electrodes for solar cells based on silver nanowire/polyaniline hybrid materials and to offer a new technical solution to decrease the sheet resistance of the silver nanowires embedded in the polymer matrix. Low melting point metallic nanoparticles (In and Sn) will be deposited on the surface of silver nanowires, allowing to weld the nanowires and to obtain a network with high electrical conduction paths.

Short description of the project

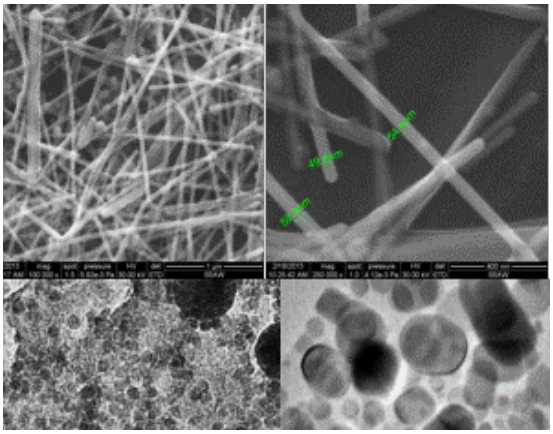
A great challenge in the actual research of solar-to-electricity conversion is the construction of flexible solar cells. Although indium tin oxide (ITO) deposited on plastic is traditionally used for organic solar cells and light emitting diodes, solutions are searched to replace the IT O layer and to manufacture cheap transparent conducting electrodes. Silver nanowires (AgNWs) are a promising candidate to replace ITO due to their high electric conductivity and corrosion resistance, but there is still the issue of increased resistance on wire contacts. The proposed solution involves the modification of the AgNWs by deposition on their surface of metallic nanoparticles with low melting temperatures like tin and indium. The modified nanowires will be suspended in a proper medium to form an electroconductive ink that will be deposited on flexible polymeric sheets. The nanowires will be welded by thermal treatment, with and without the application of static pressure

Project implemented by

Politehnica University Timisoara
Department of Applied Chemistry and Inorganic Compounds and Environmental Engineering

Implementation period

02.09.2013-30.09.2016



Main activities

Research activities:

- Synthesis and characterization of silver nanowires with controlled aspect ratio (2013).
- Synthesis and characterization of indium and tin nanoparticles (2014).
- Development and characterization of transparent conductive electrodes on flexible substrates using silver nanowires and assessment of their electrical and optical properties (2014)
- Synthesis and characterization of silver nanowires modified with tin and indium nanoparticles and preparation of electroconductive inks based on modified Ag nanowires (2015)
- Manufacturing of modified Ag nanowires-based flexible, transparent and conducting electrodes, with high diffuse transmittance and low sheet resistivity by coating the electro-inks on flexible substrates (2015)
- Deposition of a conducting polymer on previously manufactured electrodes and their use in the construction of dye-sensitized solar cells (2016).

Results

- Samples of silver nanowires
- Samples of indium and tin nanoparticles
- Samples of transparent and conductive electrodes

ISI publications:

- R. Banica, D. Ursu, C. Sarvas, S. F. Rus, S. Novaconi, A. Kellenberger, A.V. Racu, T. Nyari, Electrical properties optimization of silver

International conferences

- R. Banica, R. Baies, R. Bucur, C. Locovei, A. Kellenberger, T. Nyari, Study of liquid phase synthesis of silver nanowires for solar cell applications, 3rd European Energy Conference – E2C 2013, October 27-30, 2013 – Budapest, Hungary.
- R. Banica, R. Baies, D. Ursu. M. Poienar, T. Nyari, Silver nanowires synthesis in the PVP-silver-chloride system, ECO IMPULS 2013, November 7-8, Timisoara, Romania.

- R. Banica, C. Sarvas, S.F. Rus, S. Novaconi, A. Kellenberger, T. Nyari, Optimization of the electrical and mechanical properties of transparent electrodes based on silver nanowires supporrted on polyethylene terephtalate, International Symposium on Flexible Organic Electronics ISFOE 14, 7-10 July, 2014 – Thessaloniki, Greece.
- R. Banica, C. Sarvas, S.F. Rus, D. Ursu, S. Novaconi, A. Kellenberger, T. Nyari, Manufacture of ultrathin transparent electrodes based on silver nanowires with application to three-dimensional solar cells, International Symposium on Flexible Organic Electronics ISFOE 14, 7-10 July, 2014 – Thessaloniki, Greece.
- L. Cseh , C. Locovei, O. Marinica, A. Kellenberger, T. Nyari, R. Banica, Synthesis and characterization of indium nanoparticles as precursor for solar cells, New trends and strategies in the chemistry of advanced materials with relevance in biological systems, technique and environmental protection. New trends and strategies in the chemistry of advanced materials, 5-6 June, 2014 – Timisoara, Romania

Applicability and transferability of the results

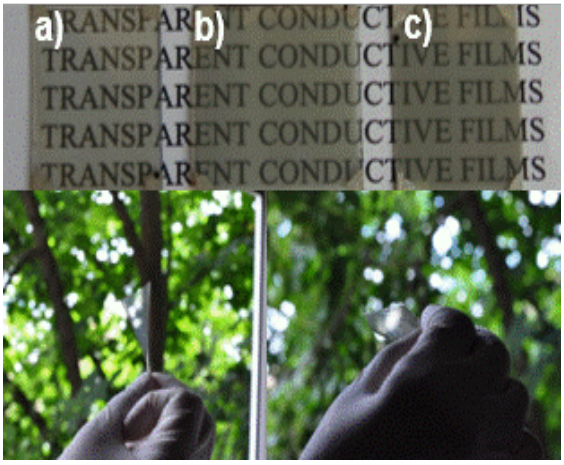
The manufacture of electroconductive inks based on silver nanowires covered with metal nanoparticles with low melting points is expected to have wide technological applications and an important economic impact. This type of conductive inks may be used not only for flexible solar cells but also for other optoelectronic devices, such as flexible LEDs, organic thin film transistors, organic lasers and photo detectors, electronic paper, disposable sensors, low-cost smart cards and RF identification tags, or flexible arrays of plastic microphones.

Financed through/by

UEFISCDI - Executive Agency for Higher Education, Research, Development and Innovation Funding,
Programme IDEAS, Exploratory Research Projects.

Research centre

Research Centre for Environmental Science and Engineering



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BIOCATALYST- CLICK CHEMISTRY DOWNSTREAMING TANDEM BASED INNOVATIVE KIT FOR OPTICALLY PURE FINE CHEMICALS SYNTHESIS

Goal of the project:

The project main objective is to develop an innovative kit for efficient and cost-effective sequential continuous flow large-scale (multigram) preparation of optically pure chiral building blocks useful for synthesis of pharmaceutical compounds and agricultural chemicals, based on the tailor-made immobilized lipases mediated kinetic resolution of various racemic substrates and a subsequent click chemistry like efficient downstreaming of the reaction mixture. Such an innovative approach of coupling kinetic resolution of a broad range of racemic substrates with click chemistry type downstreaming was not yet carried out.

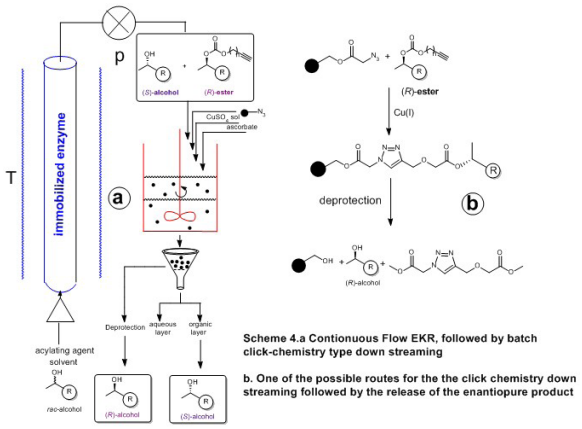
Short description of the project

Biocatalysis is an important tool to implement new, efficient, selective, cost effective and greener technologies, defining a new strategy in the industry of the future. For industrial applications, the stability and reusability of the biocatalysts are important requirements which can be achieved by immobilization, improving also their activity and selectivity. Optimization of the biocatalytic function, as well as the biocatalytic process design became essential topics in industrial biotechnology.

In this project a chemo-enzymatic process which integrates several innovative steps in both biocatalytic and down streaming parts will be set up. The utilization of tailor-made biocatalysts in industrial processes is an innovative approach, technically comparable to the synthetic solutions but with higher economic benefits. The use of immobilized biocatalysts-click chemistry tandem will permit to design easily scaled-up continuous flow procedures for industrial manufacturing of the target compounds, underlining the economic relevance of the proposal.

Project implemented by

- Politehnica University of Timişoara - Project leader
- University "Babes-Bolyai" Cluj Napoca - Partner 1
- Natural INGREDIENTS R&D S.R.L - Partner 2



Scheme 4.a Contionuous Flow EKR, followed by batch click-chemistry type down streaming

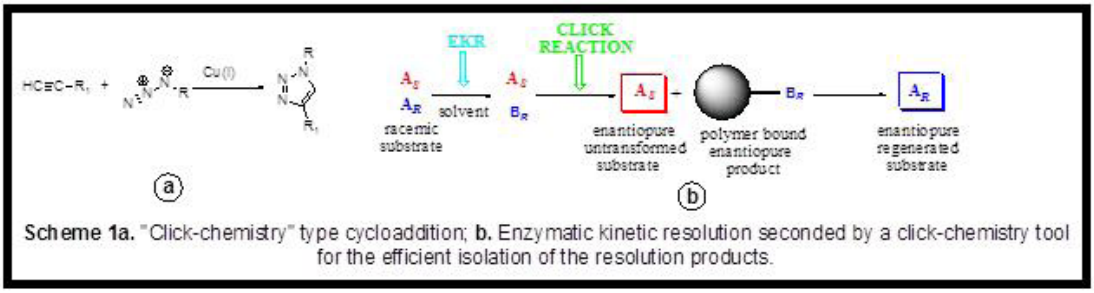
b. One of the possible routes for the the click chemistry down streaming followed by the release of the enantiopure product

Implementation period

01.07.2014-30.06.2016

Main activities

1. Preparation of various precursors: (hetero)aryl-ethanols, hydroxy- and amino acids and synthesis of various propargylic esters as O- and N-acylating agents used in enzymatic kinetic resolution (EKR).
2. Development of optimal EKR and click-chemistry type down streaming procedures.
3. Immobilization of lipases.
4. Development of the continuous flow procedure



Scheme 1a. "Click-chemistry" type cycloaddition; **b.** Enzymatic kinetic resolution seconded by a click-chemistry tool for the efficient isolation of the resolution products.

Results

1. Multi-gram amounts of various racemic compounds and various propargylic esters as acyl donors for the EKR;
2. Enantiomeric separation protocol for previously synthesized racemates, chromatographic protocols for testing the enantioselectivity of the enzymatic reactions;
3. Scientific article submitted to an ISI quoted journal;
4. Scientific presentation, published in the abstract book of an international conference;
5. Experimental protocol of down streaming procedures;
6. Immobilization protocols and analysis procedures for tailor-made immobilized lipases;
7. Integrated EKR-click-chemistry type down streaming procedure;

Applicability and transferability of the results

The obtained kit, as well as the high-value products, will be marketable, but the process will be appropriate for further scaling-up, depending on the customer demands.

In the forthcoming period, a strong impact of industrial biotechnology can be expected in the fine chemicals sector. As lipases demonstrated the highest application capability among industrial enzymes, the efforts to improve their operational stability and catalytic efficiency led to a remarkable development of the immobilization methods. Certainly, the manufacturing of high value optically active compounds represents the main large-scale process where biocatalysis with lipases will replace the presently employed procedures.

Enzymatic kinetic resolution (EKR) of the racemic mixtures represents the most efficient way to obtain high optical purity compounds. However, in large scale EKR an important challenge remains the isolation and purification of the products, which generally involves expensive and laborious physical procedures, decreasing the global process yields and the optical purities of the isolated compounds.

To the best of our knowledge the use of click chemistry involving large carriers, as a tool for easy EKR product separation is still unknown and it could be a practical solution for the efficient large scale isolation and purification of the enzymatic resolution products. Performing the click reaction between a preactivated polymer and one of the appropriate functionalized reaction products in the enzyme free reaction mixture obtained by EKR, would circumvent the tedious isolation and purification procedures.

Financed through/by

Executive Agency for Higher Education, Research, Development and Innovation Funding, UEFISCDI

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DYNAMICAL SYSTEMS AND THEIR APPLICATIONS

Goal of the project

The main objective of this project is to create fundamental knowledge in dynamical systems theory and to apply this knowledge in formulating and analyzing real world models.

Short description of the project

The specific objectives, tasks and methodology of the project are contained in 5 WPs.

- In WP1 we develop new methods for the center and isochronicity problems for analytic and non-analytic systems, study bifurcations of limit cycles and critical periods.
- In WP2 we deal with the problem of integrability for some differential systems with invariant algebraic curves, study global attractors of almost periodic dynamical systems, Levitan/Bohr almost periodic motions of differential/difference equations.
- The main objective of WP3 is to study dynamics of some classes of continuous and discontinuous vector fields.
- WP4 deals with Hamiltonian systems in Plasma Physics, twist and non-twist area preserving maps, numerical methods, and the study of symmetries of certain kinds of k-cosymplectic Hamiltonians.
- The last WP tackles mathematical models in Neuroscience and Medicine.

Project implemented by

1. Politehnica University of Timisoara
2. West University of Timisoara
3. University of Craiova
4. Center for Applied Mathematics and Theoretical Physics, Slovenia
5. University of Maribor, Slovenia
6. Universitat Autonoma de Barcelona
7. Moldova State University
8. The Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova
9. Tiraspol State University

Implementation period

01.10.2012 - 30.09. 2016

Main activities

- Develop new methods and algorithms for studying center and isochronicity problems.
- Investigations of reaction-diffusion equations.
- Study of differential and integral operators of non-integer order.
- Study dynamics of certain classes of continuous and discontinuous vector fields.
- Study Hamiltonian systems with 1 ½ degrees of freedom and their discrete correspondents, namely systems generated by area-preserving maps.
- Investigations of ODE-based and map-based neuronal models.
- Study integrability for cubic differential systems

Financed through/by

FP7

Results

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RANDOM MATRIX TEHNIQUES IN QUANTUM INFORMATION THEORY (RMTQIT)

Goal of the project

The field of Quantum Information Theory (QIT) attracted lately the interest of scientific community due to the its ambitious goals meant to create new technologic systems (quantum computers) and new more secured methods to transmit the information. Nowadays, QIT is a multi-faceted field, with large connections in the subfields of Mathematics, such as Functional Analysis, Operator Theory, Linear Algebra, Probability Theory. The project RMTQIT purposes to give answers to open questions from QIT, using techniques from random matrix theory.

Short description of the project

The project RMTQIT focuses on a systematic exploration of theoretical questions in QIT about random quantum states and random quantum channels. These problems have attracted the attention lately in a very naturally connection to fundamental issues of QIT theory, such as entanglement theory and classical (or quantum) capacities for channels.

Project implemented by

1. The Department of Mathematics, Politehnica University of Timişoara.
2. Laboratoire de Physique Théorique de Toulouse, Université Paul Sabatier Toulouse III, France.

Implementation period

01.03.2013 - 29.02.2016

Main activities

- In 2015 the project RMTQIT reached the third year of intensives
- research activities. It mainly focused on completing the tasks proposed initially, but also to expend the expertise developed along all these years of existence.
- It worth to mention that the team of the project published a joint paper with new results related to the derivation of thresholds points for reduction criterion and its absolutely version. This paper also succeeds to collect all the results about thresholds for entanglement criteria from similar papers, for making comparisons between the criteria and to give a complete picture of the subject under scrutiny. These results have been presented with several occasions at international conferences and workshops, such as Central European Workshop on Quantum Optics, Warsow, 6-10 July 2015 (talk presented by M.A. Jivulescu), Quantum Thermodynamics and Quantum Information Theory, Toulouse, 9-11 September 2015 ((talk presented by M.A. Jivulescu)) and International Conference on Theory and Applications in Mathematics and Informatics, Alba-Iulia, 17-20 September 2015 (talk presented by N. Lupa).
- On November 2015 it took place the Workshop On the Mathematical Methods in Quantum Information Theory, workshop within the project RMTQIT, as satellite event of the 14th edition of International Conference in Mathematics and its Applications, organized by the Department of Mathematics, Politehnica University Timisoara. The workshop aimed to gather participants to discuss the latest themes in Quantum Information Theory , as well to establish new possible collaborations. We were happy to welcome here at Timisoara heigh-level scientists from well-know groups from Europe and to facilitate their interactions with the local research environment.

Results

The results of our research activity were resumed in the papers listed below:

1. Maria Anastasia Jivulescu, Nicolae Lupa, Ion Nechita-Thresholds for reduction-related entanglement criteria in quantum information theory, Quantum Information and Computation, Vol. 15, No 13&14, 2015, pp 1165-1184
2. Benoit Collins, Ion Nechita, Random matrix techniques in quantum information theory, (arXiv:1509.04689)
3. Maria Anastasia Jivulescu, Nicolae Lupa, Ion Nechita - On the reduction criterion for random quantum states - JOURNAL OF MATHEMATICAL PHYSICS, Vol. 55, Issue 11, Article Number: 112203-1-27, NOV 2014
4. Maria Anastasia Jivulescu, Pasc Gavruta-Indices of sharpness for Parseval frames, quantum effects and observables, submitted to Buletinul Stiintific al Universitatii Politehnica Timisoara, seria Matematica -Fizica, 2015
5. Laura Gavruta, Pasc Gavruta, Some properties of operator-valued frames, submitted to Acta Mathematica Scientia, 2015 (arXiv:1504.06504)
6. António J. G. Bento, Nicolae Lupa, Mihail Megan, César M. Silva - Integral conditions for nonuniform μ-dichotomy - arXiv:1405.2946
7. Maria Anastasia Jivulescu, Nicolae Lupa, Ion Nechita, David Reeb - Positive reduction from spectra -LINEAR ALGEBRA and its APPLICATIONS, Volume 469, NOV 2014, Pag. 276–304, doi:10.1016/j.laa.2014.11.031 (arXiv:1406.1277)
8. M.R. Abdollahpour, A. Najati, P. Gavruta - Multipliers of pg-Bessel sequences in Banach spaces - arXiv:1501.01146v1

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