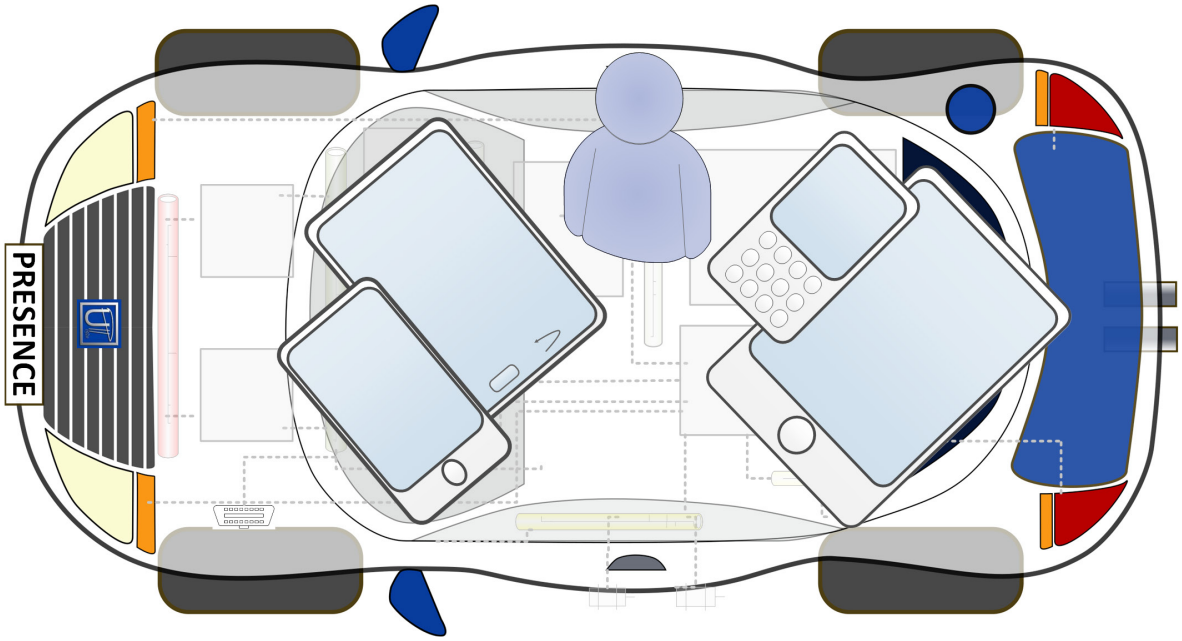
PRESENCE - PRIVACY-ENABLED, SECURED INTERACTIONS BETWEEN VEHICLES AND SMART ELECTRONIC DEVICES

Goal of the project:

The main target of the project is the design, analysis and implementation of security and privacy mechanisms for mediating access to in-vehicle functionalities by using intelligent mobile devices instead of classical RF and/or mechanical vehicle keys that are rigid and are lacking in terms of configurability and functionalities. The design of such security solutions is challenged by limitations on computational capabilities of existing components, e.g., in-vehicle controllers, as well as by the potential insecurity of smartphones.



Short description of the project:

PRESENCE addresses the security of the newly emerged ecosystem of modern vehicles that interact with intelligent mobile devices, e.g., smart-phones.

Project implemented by

Politehnica University Timişoara

Implementation period:

2018-2020

Main activities:

Our project calls for the use of security enforcing technologies (e.g., NFC security cards) and modern device pairing techniques by harvesting environmental data (e.g., accelerometer data) to provide a secure and usable solution. Privacy enhancing technologies also need to be put in place in order to protect the users in front of corrupted cloud owners. As deployment platform we target Android, the mobile OS with the largest installed base. We also test the computational feasibility of the proposed solutions on a commonly employed controller for car BCMs. Main project objectives:

1. Design, analysis and implementation of security protocols.
2. Security enforcing technologies (e.g., NFC cards).
3. Ecosystem-based device association (e.g., accelerometer data).
4. Cloud-based access control.
5. Connectivity to in-vehicle control units.

Results:

We expect 5-10 research papers in relevant workshops and journals in the field addressing new concepts in vehicle access control supported by practical deployments on real-world components. PRESENCE is still in its first year of run, the publication list will be updated on the project website.

[1] Tudor Andreica, Bogdan Groza, Stefan Murvay, Applications of Pairing-Based Cryptography on Automotive-Grade Microcontrollers, 1st International Workshop on Safety, securiTy, and pRivacy In automotiVe systEms (STRIVE 2018, SAFECOMP 2018 Workshops), Vasteras, Sweeden.

[2] Camil Jichici, Bogdan Groza, Stefan Murvay, Examining the Use of Neural Networks for Intrusion Detection in Controller Area Networks, 11th International Conference on Innovative Security Solutions for Information Technology and Communications, SecITC 2018, Bucharest, Romania, 2018

Applicability and transferability of the results:

Replacing traditional keys with smartphones appears like a natural step for achieving increased usability and an improved user experience. Industry application of the designed protocols and implemented functionalities for car access control by modern smartphones is immediate.

Financed through/by

CNCS-UEFISCDI PN-III-P1-1.1-TE-2016-1317, 2018-2020

Research Centre

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SECURITY ENHANCEMENTS AND VULNERABILITY ASSESSMENT FOR INDUSTRY-STANDARD NETWORKS (SEVEN)

Goal of the project

Most attacks on industry-standard networks rely on vulnerabilities. In this context, the SEVEN project aims to assess vulnerabilities in protocols not yet analyzed and to increase the security of industrial networks by proposing mechanisms to assure basic security objectives (e.g. authenticity, confidentiality or key management). The project also focuses on the design of intrusion detection systems. Finally, we also consider a performance impact evaluation of the introduction of the designed security solutions.

Short description of the project

Vulnerability evaluation and development of protection mechanisms for in industry-standard networks.

Project implemented by

Pal-Ștefan MURVAY (Project leader)
Bogdan GROZA (Mentor)

Implementation period

02/05/2018-30/04/2020

Main activities

The project is structured around three main activities.

1. The first main activity focuses on vulnerability assessment of industry-standard communication protocols. Our goal is to identify industry-standard communication-protocols that were not analyzed from a security perspective and identify potential vulnerabilities.Our first approach for enhancing the security of industry-standard communication protocols is the development of mechanisms for assuring basic security objectives such as: authenticity, confidentiality or key management.

2. A second approach focuses on designing intrusion detection mechanisms for the early identification of attack attempts.

3. Finally, we intend to provide an evaluation of the performance impact of the proposed mechanisms.

Results

The first phase of the SEVEN project focused on the identification of vulnerabilities in two industry-standard protocols, i.e., FlexRay and DeviceNet. The findings have been published as part of two conference papers:

[1] Pal-Stefan Murvay, Bogdan Groza, Practical security exploits of the FlexRay in-vehicle communication protocol, presented at The 13th International Conference on Risks and Security of Internet and Systems (CRISIS 2018), 2018.

[2] Pal-Stefan Murvay, Bogdan Groza, A brief look at the security of DeviceNet communication in industrial control systems, presented at The second Central European Cybersecurity Conference (CECC 2018), 2018.

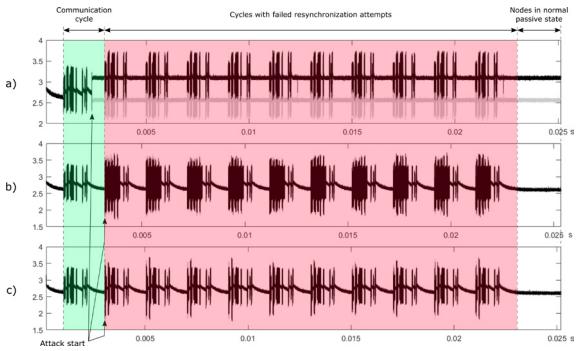

Figure 1. Three variants of the DoS attack for the entire communication.

We dedicated several lines of work to designing security mechanisms for enhancing the security of industry-standard protocols. The results obtained cover both secure communication mechanisms and intrusion detection systems for the Controller Area Network and FlexRay protocols. Papers presenting these results have been published in conference proceedings or journals:

[3] Pal-Stefan Murvay, Bogdan Groza, Accommodating Time-Triggered Authentication to FlexRay Demands, presented at The third Central European Cybersecurity Conference (CECC 2019), 2019.

[4] Camil Jichici, Bogdan Groza, Pal-Stefan Murvay, Integrating Adversary Models and Intrusion Detection Systems for In-Vehicle Networks in CANoe, presented at The 12th International Conference on Security for Information Technology and Communications (SECITC 2019), 2019.

[5] Pal-Stefan Murvay, Bogdan Groza, TIDAL-CAN: differential Timing based Intrusion Detection And Localization for Controller Area Network, accepted for publication in IEEE Access, 2020.

Applicability and transferability of the results

Our results add to the already known vulnerabilities of communication protocols used in industrial applications. Knowledge of the vulnerabilities is an important building block of designing proper security mechanisms for these communication protocols.

The proposed security mechanisms are efficient in preventing a series of spoofing and replay attacks as well as in the detection of attack attempts. These mechanisms focus on FlexRay, which was developed for the automotive industry and Controller Area Network, a communication protocol widely used both in the automotive domain and industrial control systems.

Financed through/by

This work was supported by a grant of the Romanian Ministry of Research and Innovation, CNCS - UEFISCDI, project number PN-III-P1-1.1-PD-2016-1198, within PNCDI III

Research Centre

Department of Automation and Applied Informatics

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NONLINEAR OBSERVERS-BASED CONTROL STRUCTURES APPLIED TO MECHATRONICS SYSTEMS

Goal of the project

The main objective of this project is to develop the necessary tools, modern control solutions and theoretical framework for later multi-purpose applications related to mechatronics systems.
The following objectives are defined:
01. Analysis, design and implementation of modern control solutions.
02. The validation of the proposed modeling and control approaches using simulations and experiments.
03. The dissemination of results.
04. Solving the project management issues.

Short description of the project

It is focused on the analysis, synthesis, modeling and development of modern control solutions.

Project implemented by

The construction of nonlinear observers still provides an open research field, efforts being made to broaden and adapt the proposed techniques in order to widen the classes of nonlinear systems to which they may apply.

Implementation period

10/10/2018 - 09/10/2020

Main activities

The main activities are as follows:
1. The elaboration of the synthesis on the operation and modelling of the proposed approaches.
2. The development and verification through simulation and experiments of the proposed control solutions for several classes of processes including those in mechatronics applications and laboratory control systems.
3. The development of Matlab / Simulink programs to test the proposed nonlinear observers.
4. The elaboration of comparative analyses to prove the validity of the approaches.

The potential impact to the scientific field may be significant because through new concepts and employed approaches, a new way for the use of highly advanced control designs in mechatronics applications is open.

Results

The targeted deliverables of this project are: 1 journal paper (e.g. IEEE Transactions on Industrial Informatics, IEE Transactions on Control Systems Technology, IET Control Theory & Applications, International Journal of General Systems, International Journal of Computers, Communications & Control, Acta Polytechnica Hungarica) and 3 conference papers published in the volumes of visible international conferences.
It is possible that more publications in this area of research will follow after the project has ended but it is very risky, due to the fact that the whole cycle of research - validation - writing manuscript - submission -revisions - acceptance lasts for at least 2 years for high quality publications.

Applicability and transferability of the results

The potential impact of the project in the scientific, social, economic or cultural environment is straightforward since the investigated topics can lead to automated tools for controller design and tuning. Although there is a wide range of possibilities for creating new themes for state-of-the-art research, noteworthy is also the impact in the socio-economic environment with directly applicative directions. In the project all mechatronics applications are focused on those applicable cost-effective training systems in the fields of robotics, automation and process control.

Financed through/by

The state budget / UEFISCDI

Research Centre

Politehnica University Timișoara (UPT)
Department of Automation and Applied Informatics

Research team

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Prof. Radu-Emil PRECUP, PhD

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IMPROVING THE PREDICTION OF OPINION DYNAMICS IN TEMPORAL SOCIAL NETWORKS: MATHEMATICAL MODELING AND SIMULATION FRAMEWORK

Goal of the project

Improving the prediction of opinion distribution in a target society by means of topological analysis, temporal and spatial distribution of opinion sources, and real-time simulation on empirically gathered data. As such, we define the following individual objectives:
1) Topological analysis of empirical social network data to understand how interconnection patterns of individuals and communities influence the spread of opinion.
2) Development of an innovative social interaction model, inspired by previous original work, considering the temporal aspect of opinion sources.
3) Definition of a strategy for real-time opinion seed selection by means of node and edge centrality distribution.
4) Synergy of results from objectives 1-3 with direct applicative socio-economic impact by developing a crowdsourcing web-platform for voting and gathering anonymized empirical data from citizens.

Short description of the project

In the wake of big data analytics, this project sets out to push the boundaries of scientific understanding of opinion dynamics in social networks by analyzing how the underlying network topology influences communication patterns and the polarization of opinion.

Project implemented by

Assist. Prof. Alexandru TOPÎRCEANU – responsible for outlining the research goals, modeling of experiments, simulation and data validation, writing scientific manuscripts, overall project management.
Prof. Radu-Emil PRECUP – mentor for the project director, research goals, experiment modeling, revising scientific manuscripts.
Denis Nuțiu (4th year student) – web platform implementation.

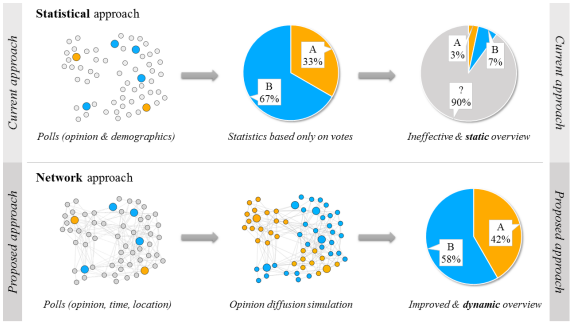
Implementation period

02.05.2018 – 30.11.2019 (19 months)

Main activities

This project comes to improve our understanding of opinion diffusion in emergent social networks. Consequently, to build models that are aware of these phenomena, we propose a topological analysis of empirical data using network motifs, community detection algorithms and statistics to understand the behavioral patterns and centralities which have an impact on the spatial and temporal distribution of opinion.

As opposed to most existing opinion interaction models, we propose a temporal opinion injection model which evolves over time according to basic human traits and underlying social topology.
Below is a schematic exemplifying the two different approaches considered.

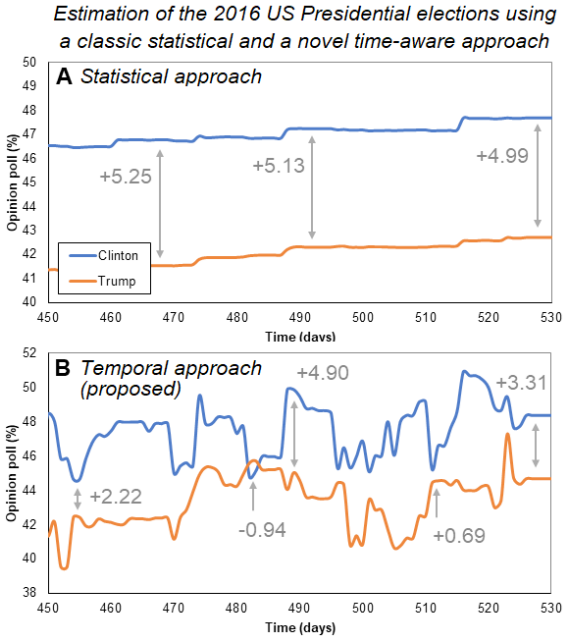


In the above figure we showcase the impact of the proposed project methodology in perspective to the current statistical approaches in opinion poll analysis and prediction. The statistical method relies solely on a small subset of individuals from which it tries to extrapolate overall opinion distribution; however, most of the opinion remains unknown (see gray pie chart in upper panel). Our proposed approach implies simulation of opinion propagation using more reliable scientific models and thus yields a more accurate perspective of opinion distribution (lower panel).

Results

We make use of temporal microscopic diffusion models to predict the macroscopic response of a target society being targeted by opinion injection. Our results pinpoint to the fact that time-awareness is more significant in poll prediction performance than previously considered.

Below, we exemplify a snapshot of the poll evolution calculated for the 2016 US presidential pre-election period. We provide snapshots of the final period before elections using cumulative counting (A), and our time-aware method (B) to estimate polls. Here, we exemplify the relative differences (Clinton--Trump) in polls at several time points.



For the 2012 US elections we can approximate the final poll results within a 2% margin, while current approaches produce much greater offsets of about 7%. Similarly, for the 2016 elections, our method (TA) manages to come within 1.5% of the real election results, while the current statistical approach (SA) remains outside the 4% margin. In terms of quantifying the overall performance boost of our method, compared to the benchmark methods, TA proves to be 75% more accurate for the 2012 elections, respectively 74% for estimating the 2016 elections.

As an explanation to why our TA method has a superior prediction capability is that, by taking into consideration the timing of pre-election opinion injection, TA captures the momentum of candidate popularity.

Applicability and transferability of the results

Current state of the art solutions for prediction, employed by respectable institutions in the US, like the *Huffington Post, Real Clear Politics, or Five Thirty Eight*, employ poll counting and combining polls with economic indices. Nevertheless, we have not seen any time-aware method that is similar to the one proposed by us in this project.

Consequently, we consider the framework developed in this project as very encouraging, and possibly opening a new line of research to further perfect our initial proposed method, which, to the best of our knowledge, is original and new. We hope to pave a new path of research targeting dynamic and temporal social network analysis, with immediate applicability in real-world systems where the needs for predictability and control are paramount.

Financed through/by

Romanian National Authority for Scientific Research and Innovation (UEFISCDI), project number PN-III-P1-1.1-PD-2016-0193

Research centre

- CCCTI: Research Centre for Computers and Information Technology (UPT)
- ACSA: Advanced computing systems and architectures research group

Research team

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Project website: staff.cs.upt.ro/~alext/projects/impress/site/

COMPREHENSIVE MONITORING METHODOLOGY FOR AGRICULTURAL LAND USE DYNAMIC CHANGES USING MULTISOURCE REMOTE SENSING DATA – AGRITELD

Goal of the project

The scientific study of agricultural lands is found in the specialty literature since the 1930s. These studies gradually turn from traditional studies (field investigations, field studies and then laboratory) to 3s spatially-based technology. The Integrated Approach to 3s Technology represents trends in precision farming. In this respect, in Europe and beyond, the factors responsible for the rational and sustainable management of agricultural land (governments) gradually achieve the importance of "remote" monitoring of agricultural lands and the importance of studying them globally.

Short description of the project

Information acquisitioned by remote sensing facilitate rapid and effective quantification of changes or advances a plant or several plants have encountered, their development phases and the basis for a new perception of research into precision farming.
Research and agricultural land monitoring using the benefits of remote sensing has developed a lot in recent years, but there are still unresolved issues related to: remote monitoring of a wide range of species (high variety), high accuracy, quasi-reality is still at the operating stage etc.

Information acquisitioned by remote sensing facilitate rapid and effective quantification of changes or advances a plant or several plants have encountered, their development phases and the basis for a new perception of research into precision farming.
Research and agricultural land monitoring using the benefits of remote sensing has developed a lot in recent years, but there are still unresolved issues related to: remote monitoring of a wide range of species (high variety), high accuracy, quasi-reality is still at the operating stage etc.

Project implemented by

Beneficiary:
Politehnica University Timișoara
Department: Overland Communication Ways, Foundations and Cadastral Survey
Partner:
Chinese Academy of Science
Institute of Remote Sensing and Digital Earth

Implementation period

June 2018 – December 2019

Main activities

Through the cooperation, we wish to form a systematic method to monitor the agricultural land use quickly and accurately, build up the remote sensing model of agricultural land use change assessment, prediction and spatial optimization. This could support centralized and orderly management of agricultural land, which provides scientific basis for agricultural land.
As originality and innovation elements following objective can be specified:
1. Developing multi-source remote sensing data fusion technology, and increasing the accuracy of land field determinations;
2. Developing a comprehensive monitoring technology based on multi-source remote sensing analysis of dynamic change of agricultural land use;
3. Establishing and validating an assessment, prediction and spatial optimization model of agricultural land use change using GIS facilities (Vilceanu, Herban and Meng 2017);

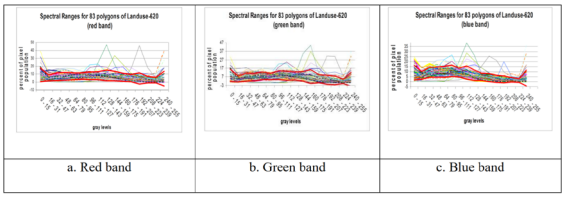

Fig. 1 GIS-Driven – Detectarea schimbărilor

There are several objectives standing before us. The cooperation in itself is a very positive goal as it opens each team to: other regions; different angles, view and facets of agricultural management; and different ways of thinking. More specifically, the cooperation proposed here between China and Romania is envisaged to help with introducing each other with the technology of monitoring and of land classification with high precision, as done at the other country.

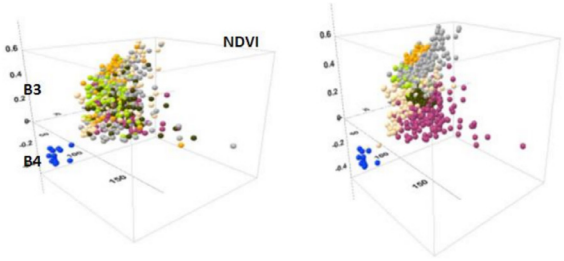

Fig. 2 IDA change detection and classification (left-before, right- after)

A secondary objective would be realizing better the usage of the spatial information embedded in the satellite images for the advancement of agricultural technology. The concept of GIS-Driven / GIS-support, mentioned above, is clearly one of the clear cut tools for such endeavour. In addition, both teams set some more specific goals:

- To learn the special characteristics of the satellite images provided by the Chinese cartographic satellite and any other products that will be provided for parallel processing.
- To establish the minimal resolution needed for the change detection and agricultural related classification at hand.
- To develop a modular concept of methodology that will support future adaptation to new satellite sources.

Results

- Developing a fusion technology of remote sensing data acquired from multiple sources;
- Developing a smart monitoring method based on dynamic changes of agricultural lands analysis from multiple sources of remote sensing;
- Establishing and validating an assessment, prediction and spatial optimization model of agricultural land use changes;
- Integrating spatial information in GIS platforms.

Applicability and transferability of the results

Applicability of the study its very various and useful for:

- Governments - implementing agricultural smart polities;
- small and large agricultural farms;
- another areas of research like forestry;
- etc..

Financed through/by

PN-III- Program: European and International Cooperation

Research Centre

Infrastructure for Construction and Transportation

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ADVANCED MATERIALS BASED ON COMBUSTION-SYNTHESIZED MAGNETIC IRON OXIDES NANOPARTICLES AND THEIR CYTOTOXICITY DESIGNED FOR CANCER TREATMENT

Goal of the project:

- Obtaining of magnetic iron oxides nanoparticles using the combustion synthesis method and monitoring the influence of several working parameters: fuel type (EDTA, citric acid, glucose), oxidant/fuel molar ratio (fuel-rich compositions), ignition procedure (heating mantle, microwave field), working atmosphere (in air/no air), carbon and organic residues presence.
- Preparation of colloidal suspensions.
- The assessment of the toxicological profile/biological activity of the iron oxide colloidal suspensions on normal/tumour liver and kidney cell lines.

Short description of the project

The project presents the preparation of iron oxides with via combustion synthesis and testing their selective cytotoxicity.

Project implemented by

Department of Applied Chemistry and Engineering of Inorganic Compounds and Environment,
Faculty of Industrial Chemistry and Environmental Engineering, Politehnica University Timişoara

Implementation period

July 2017-December 2019

Main activities

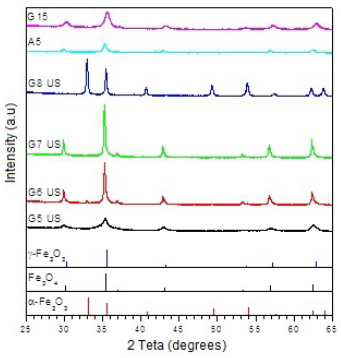
Combustion synthesis of magnetic iron oxides nanoparticles.
The influence of several parameters on the powders characteristics were pursued:

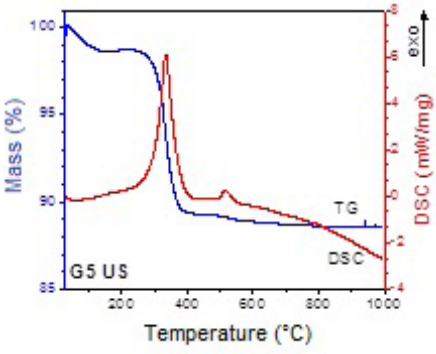
- nature of the fuel: glucose, citric acid, EDTA, TWEEN 80, hexamethylenetetramine
- reaction conditions: presence and absence of air
- carbon and organic residues presence and chemical oxidation removal using H_2O_2

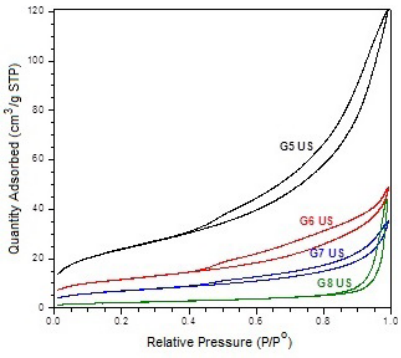
Characterization of magnetic iron oxides nanoparticles:

- combustion reactions evolution was assessed by TG-DSC thermal investigations
- the phase composition of the synthesized compounds was investigated by XRD
- specific surface area (BET)
- FTIR spectroscopy

The obtained results were centralized and interpreted for recipes optimization.







Results:

Synthesis protocols and recipes for 31 samples prepared by combustion synthesis. It was established the influence of different fuels (glucose, citric acid, EDTA, TWEEN 80, hexamethylenetetramine) and of the reaction conditions on the synthesis of iron oxides with magnetic properties.

Applicability and transferability of the results

These researches open an entirely new perspective on the potential use of combustion-synthesized iron oxide nanoparticles in cancer therapy by selective cytotoxicity.
The results will be subjected to a patent application.

Financed through/by

Ministery of Research and Innovation, CNCS - UEFISCDI,
project number
PN-III-P4-ID-PCE-2016-0765, within PNCDI III

Research Center

Research Centre for Inorganic Materials and Alternative Energies

Research team

1. Cornelia Pacurariu - project leader
2. Cristina Dehelean - experienced researcher
3. Robert Ianos - experienced researcher
4. Radu Lazau - experienced researcher
5. Dorina Coricovac - postdoc researcher
6. Alina Moaca - postdoc researcher
7. Roxana Babuta (Racoviceanu) - postdoc researcher
8. Eliza Muntean - PhD student
9. Aylin Capraru - PhD student

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INTEGRATED AND SUSTAINABLE PROCESSES FOR ENVIRONMENTAL CLEAN-UP, WASTEWATER REUSE AND WASTE VALORIZATION – SUSTENVPRO

Goal of the project

The goal of complex project SUSTENVPRO is to increase the institutional performance in the ENVIRONMENT field of a consortium of 5 public research organizations with recognized research performances and one R&D National Institute under consolidation, through an integrative approach which supports/develop the existent research competencies of each partner and transfer capacities of results with applicative and innovative potential envisaging the elimination of priority pollutants from water using innovative advanced water/ wastewater treatment processes and waste recovery.

Short description of the project

The complex project **SUSTENVPRO** consisted of 5 research component projects (PC):
PC 1. Complex evaluations of priority pollutants present in various water matrixes and risk identification on the ecosystems and human health;
PC 2. Water treatment processes optimization and development of innovative materials for the priority pollutants removal;
PC 3. Valorization of biomass resources for the development of innovative processes for wastewater treatment and priority pollutants removal;
PC 4. Metallic waste valorization for innovative wastewater treatment process development and removal of priority pollutants;
PC 5. Sustainability assessments of water/ wastewater treatment and waste valorization processes based on life cycle assessment.

Project implemented by

The project is implemented by 4 universities and two national R&D institutes:
Coordinator: "Gheorghe Asachi"Tehnical University of Iasi;
Partners: Politehnica University of Bucharest; "Alexandru Iona Cuza" University of Iasi; Politehnica University Timişoara; "Petru Poni" Institute of Macromolecular Chemistry Iasi; National Research and Development Institute for Environmental Protection, Bucharest.

Implementation period

2018 - 2020

Main activities

-Developing and validating an innovative approach oriented to analysis, preventing and correcting the environmental risks associated with the presence of priority pollutants in various matrices of water use;
-Development of efficient innovative water treatment and advanced wastewater treatment processes in order to eliminate priority organic and inorganic pollutants in the anthropic water cycle;
-Development of new innovative materials (polymeric or composite materials) with properties designed according to the characteristics of the priority pollutants;
-Utilization of materials from organic (biomass) and inorganic waste (metallic waste) in innovative wastewater treatment processes for removing priority pollutants and recirculating / reusing water;
-Sustainability assessment of processes and products through Life Cycle Assessment tool.

Results

-Research workplaces;
-New/significantly improved technologies /procedures;
-New/significantly improved research services;
-New research and technology consultancy services (uploaded on the ERRIS platform);
-Research services by sharing the research infrastructure among project partners (A1 and A2 research vouchers);
-Knowledge transfer to water operator through C voucher;
-Research papers published in ISI-ranked journals;
-Communications at national and international scientific events (conferences, exhibitions);
-Dissemination and technology transfer workshops;
-(Initiation /Intermediary /Final) Project workshops;
-RDI common program (in agreement with the institutional development plan of every partner).

Applicability and transferability of the results

- Transferability of research results between consortium partners;
- Technological transfer of advanced water/wastewater treatment technologies/procedures to public and private economic environment (regional water operators, environmental companies, private companies in the water/waste field etc.); knowledge transfer to regional water operator through C voucher within the project framework tested at pilot scale as treatability study for concrete applications in drinking water treatment;
- Good practice guide for circular economy in water field for sustainability consulting company, non-profit organization, environmental agencies.

Financed through/by

Executive Agency for Higher Education, Development and Innovation Funding (UEFISCDI)

Research centre

Research Centre in Environmental Science and Engineering

Research team

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Scientific Researcher, level III: POP Aniela
Scientific Researcher, level III: VODA Raluca
Scientific Researcher, level III: BACIU Anamaria
Development engineer: IGHIAN Lacrima-Crysty
Development engineer: DELCIOIU Claudia

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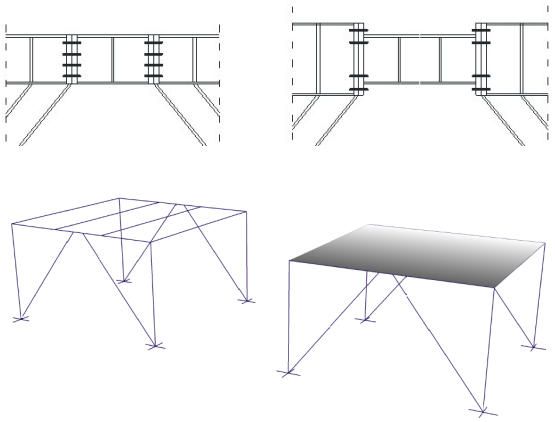
ADVANCING RE-CENTRING ECCENTRICALLY BRACED FRAMES: NEW LINK TYPOLOGIES AND INFLUENCE OF REINFORCED CONCRETE SLAB (ARNIS)

Goal of the project

To reduce the costs and downtime of a structure hit by an earthquake, removable links and re-centering capacity concepts may be implemented in a dual eccentrically braced structure. The project aims at extending the validation of re-centering capability and link replacement feasibility on extended end-plate typologies and also investigate more detailed the global and local influence of three-dimensional reinforced concrete slab panels, as well as reinforced concrete slab repair.

Short description of the project

It studies the re-centering capability using new link typologies and the concrete slab influence.



Project implemented by

Politehnica University Timişoara (UPT) – Civil Engineering Faculty – Steel Structures and Structural Mechanics Department

Implementation period

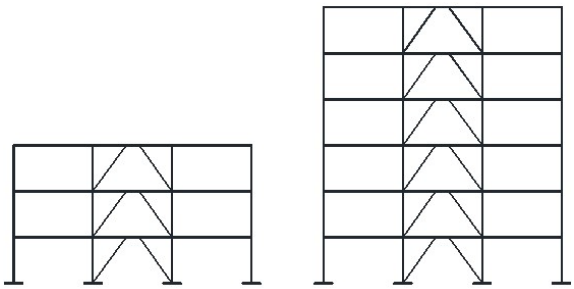
10.10.2018 – 09.10.2020

Main activities

- Designing prototype structures with two height levels: medium rise (P+2E) and higher rise (P+5E), with differently connected links (flush/extended end-plate), extending the bolted links removal procedure and re-centering capability – done in 2018;
- Experimentally testing isolated links assemblies in two solutions: flush end-plate bolted link and extended end-plate bolted link, at natural scale (1:1), both of them with and without concrete slab above the link (8 tests) – proposed for 2019;
- Experimentally testing a 3D portal frame, with/without concrete, with damaged/repaired slab (4 tests) – proposed for 2020;
- Calibrating numerical models post-test – proposed for 2019 and 2020;
- Seismic performance and behavior factors numerical assessment – proposed for 2020.

Results

In 2018 – prototype structures design, re-centering capability validation and link removal procedure description.



Proposed for 2019 and 2020:
- Design of experimental specimens;
- Material behavior curves;
- Links experimental results – describe local behavior;
- Frames experimental results – describe global behavior;
- Calibrated numerical models for links;
- Values of behavior factors for structures.

Obtained results will be presented in project deliverables and scientific papers at international conferences/journals.

Applicability and transferability of the results

Increase the application potential of the system both at national and international levels: by improved connections (larger behavior factor obtained), improved knowledge on the effect of reinforced concrete slab and repair of the slab.
Solutions providing self-centering of the structure are technically demanded and require specialized knowledge, careful maintenance and high initial cost. Alternatively, a conventional design can be employed, but with the dissipative members realized to be removable allowing their replacement when damaged and reducing the repair costs.

Financed through/by

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

Research centre

Research Centre for Mechanics of Materials and Structural Safety - CEMSIG

Research team

Assist. Mirela Adriana CHESOAN, PhD (project manager)
Assoc. prof. Aurel STRATAN, PhD

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DUAL STATOR WINDING INDUCTION GENERATOR SYSTEM FOR WIDE-VARIABLE SPEED WIND POWER APPLICATION (DSWIG)

Goal of the project:

For wind power plants, the cage-type induction generator (IG), as a competent option, has many advantages for wind power applications, such as innate brushless construction, low maintenance demand, good overload protection ability, and so on. The most significant advantages of this machine lie in its ability to output good performance electric power at variable rotor speeds. To adapt the wide variation of wind speed and capture much more wind energy, the wind power system should have the variable-speed operation ability in a wide speed range.

Short description of the project:

The subject of the bilateral project, which relates to a wind power system with a dual stator-winding induction generator.

Project implemented by

Politehnica University Timisoara (UPT) - România
Nanjing University of Aeronautics and Astronautics (NUAA) - China

Implementation period:

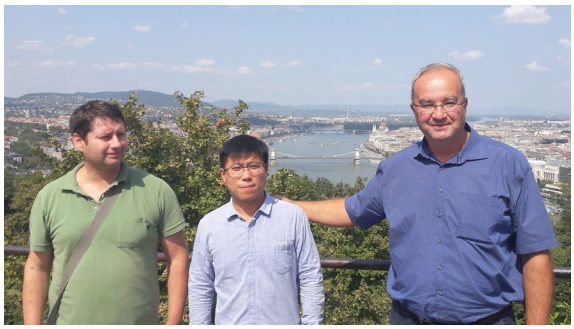
02.07.2018-31.12.2019

Main activities:

The basic priority of the collaboration is the development of a scientific project for participation in competitions announced by Horizon 2020 and other international programs. The work plan proposed is based on regular meetings of the members of both teams alternately in Romania and China; a) a first visit will be in China, by a team from Romania. On this occasion the Romanian members will meet all the team members from China, will visit research labs; b) the next meeting will take place in Romania, at Timișoara at the Faculty of Electrical and Power Engineering, at the Romanian Academy Branch Timișoara and at the Hunedoara Engineering Faculty. On this occasion contact will be established with all members of the project team from Romania, visits will be carried out to the research laboratories of the two faculties, and there will be group discussions between members of both teams according to scientific areas of joint research.

Results:

The results for the Year 2018 are:
Between July 2 and December 31, 2018, was carried out on the topic of DSWIG Generator Design. At this stage, the Romanian team carried out the following activities: dimensioning of the experimental model, analytical design, optimal design, finite element validation, design of the electric drive system and the experimental test bench. Between August 26 and 30, 2018, a team (Deaconu Sorin Ioan, Topor Marcel and Hulea Dan Cornel) from the Politehnica University Timisoara (UPT), made a trip to Budapest where he attended the IEEE International Conference on Power Electronics and Motion Control (PEMC), where they met a team from the Nanjing University of Aeronautics and Astronautics, China, led by BU Feifei, project director from the Chinese team.



Applicability and transferability of the results:

The results obtained through this project are of interest to the industry of the construction of electrical machinery, renewable energy converters, wind systems, hydro systems, and producers of autonomous generators for vehicles, boats, river and sea vessels, and aircrafts. Based on the project developed by the team in Romania, the Chinese team will realize the experimental model and its control system. Following experimental testing, parameters and features will be obtained, and based on them, a Chinese producer will be identified to introduce these systems into production.

Financed through/by

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

Research Center

Inteligent Control of Energy Conversion and Storage

Research team

The research team of UPT consists in coordinator,
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Nicolae MUNTEAN,
Lucian Nicolae TUTELEA,
Marcel TOPOR,
Ana-Adela MOLDOVAN-POPA,
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THE RELATIONSHIP BETWEEN ENERGY INVESTMENTS, SHOCKS IN ENERGY PRICES AND THE MACROECONOMY IN THE EU COUNTRIES (EIP-MACRO)

Goal of the project:

Energy prices record high fluctuations increasing market uncertainty. The central role of oil prices in influencing consumption, investments and macroeconomic policies requires special attention. In this context, the main goals of the project are: (i) to analyse the investment behaviour and TFP of energy sector companies using firm-level data; (ii) to investigate the non-liner interactions between oil prices and the macroeconomy; (iii) to assess the environmental impact of energy policies, EU regulations and renewable energy consumption.

Short description of the project:

The project aims to provide a deeper understanding of the energy and environmental economics issues, analyzing the interactions between energy prices and the macroeconomy.

Project implemented by

Politehnica University Timişoara

Implementation period:

02.05.2018 – 30.04.2020

Main activities:

a) Development of research on three directions:
- determinants of investments and TFP of energy companies
- macroeconomic impact of oil price shocks
- environmental impact of energy policies.

b) Econometric analyses and generation of results

c) Dissemination of results in conferences and high-ranked journals.

Results:

a) 3 Research stages for young researchers
- University of Poitiers, University of Augsburg, International School for Social and Business Studies

b) 11 Conference participations

c) 1 organized research workshop

d) 10 ISI journal papers:

1. Grecu, E., Aceleanu, M.I. and Albulescu, C.T. (2018). The economic, social and environmental impact of shale gas exploitation in Romania: A cost-benefit analysis, Renewable and Sustainable Energy Reviews, 93, 691-700. (Q1)

2. Albulescu, C.T. and Pépin, D. (2018). Monetary integration, money demand stability and the role of monetary overhang in forecasting inflation in CEE countries, Journal of Economic Integration, 33(4), 841-879 (EMCI).

3. Albulescu, C.T., Kang, S.H., Tiwari, A.K. and Yoon, S-M. (2019). FDI, income, and environmental pollution in Latin America: Replication and extension using panel quantiles regression analysis, Energy Economics, 84, Article 104504. (Q1).

4. Kang, S.H., Tiwari, A.K., Albulescu, C.T. and Yoon, S-M. (2019). Exploring the time-frequency connectedness and network among crude oil and agriculture commodities V1, Energy Economics, 84, Article 104543. (Q1).

5. Albulescu, C.T., Riza, D., Raheem, I.D. and Tiwari, A.K. (2019). Does economic policy uncertainty connect financial markets? Evidence from oil and commodity currencies, Energy Economics, 83, 375-388. (Q1).

6. Tiwari, A.K., Adewuyi, A.O., Albulescu, C.T. and Wohar, M.E. (2020). Empirical evidence of extreme dependence and contagion risk between main cryptocurrencies, The North American Journal of Economics and Finance, 51, 101083. (Q3).

7. Grecu, E., Albulescu, C.T., Pârţachi, I.P., Stancu, S. and Trașcă, D.L. (2020). Output, uncertainty and fuel prices in the EU countries, Economic Computation and Economic Cybernetics Studies and Research, 1, 15-30. (Q3).

8. Albulescu, C.T., Artene, A.E., Luminosu, C.T. and Tamasila, M. (2019). CO2 emissions, renewable energy production and environmental regulation in the EU countries, Environmental Science and Pollution Research, https://doi.org/10.1007/s11356-019-06155-1 (Q2).

9. Albulescu, C.T., Bouri, E., Roubaud, D. and Tiwari A.K. (2020). Quantile causality between banking, stock and real estate securities returns in the US, The Quarterly Review of Economics and Finance, https://doi.org/10.1016/j.qref. 2020.03.005 (Q3)

10. Albulescu, C.T., Tiwari, A.K., Ji, Q. (2020). Copula-based local dependence between energy, agriculture and metal commodity markets, Energy, https://doi.org/10.1016/j.energy.2020.117762 (Q1).

Applicability and transferability of the results:

The results of the project have both a micro- and a macro-level applicability. In the first case, the strategic management of companies activating in the energy field will benefit from a deeper understanding of elements influencing the level of investment in the industry. In the second case, national and international regulators and policy makers receive information about the impact of shocks in energy prices on inflation and exchange rate, but also about the effectiveness of environmental regulation and the role of renewable sources in reducing CO2 emissions at EU level.

Financed through/by

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

Research Center

Research Center in Engineering and Management

Research team

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Assoc. Prof. Caius LUMINOSU, PhD
Assist. Prof. Şerban MICLEA, PhD
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Roxana SÎRBU, PhD student

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INCREASING THE INSTITUTIONAL PERFORMANCE OF THE POLITEHNICA UNIVERSITY TIMIȘOARA BY STRENGTHENING THE R & D AND TECHNOLOGICAL TRANSFER CAPACITY IN THE FIELD OF "ENERGY, ENVIRONMENT AND CLIMATE CHANGE"

Goal of the project

The overall objective of the PERFORM-TECH-UPT project is to increase the institutional performance of the Politehnica University Timisoara (UPT), by developing the R & D capacity of the Research Institute for Renewable Energy, a structure of UPT, by expanding and consolidating its activities in the field of intelligent specialization Energy, Environment and Climate Change, to serve the innovation requirements of economic operators from Romania West Development Region, respectively by intensifying the collaboration and visibility at national and international level.

Short description of the project

The PERFORM-TECH-UTP project is dedicated to the institutional development of UPT through targeted activities on human resources, research and development infrastructure and international visibility.

Project implemented by

Politehnica University Timişoara

Implementation period

October 16th, 2018 - December 10th, 2020 (26 months)

Main activities

- Project management and coordination
- Acquisition of significant R&D equipment and services
- Financial support for attending prestigious international conferences
- Stimulate the publication of articles in WOS indexed journal, located in the Q1
- Stimulation of the doctoral research activity of the last year of internship for the successful completion of the experimental part of the thesis
- Identifying funding opportunities for research and the development of successful applications
- Development of a portfolio of new products / technologies / methods / systems / services or significantly improved
- Selection of postdoctoral researchers in the field of the project
- Integration and testing of purchased equipment within research centers / laboratories
- Creating the site www.research.at.upt.ro

Results

- Ensuring an efficient project management
- Hiring 3 scientific researchers
- Supporting participation in over 15 international prestigious conferences
- Publication of 5 articles in ISI journals indexed in the first 2 quartiles
- Development of www.research.upt.ro web page
- Financing of 2 doctoral internships
- Ensuring access to various databases and archives (MathSciNet, WoS, Scopus etc.)
- Testing and integrating the equipment purchased in the first 2 stages
- Improving RDI infrastructure
- Acquisition of specific maintenance and repair services for equipment / devices, respectively for repairs and arrangement of university spaces

Financed through/by

Ministry of Education, "Program 1 - Development of the National Research and Development System, Subprogram 1.2 - Institutional Performance", National Plan for Research, Development and Innovation for the period 2015-2020 (PNCDI III), Institutional Development Project - CD Excellence Funding Project.

Research team

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Prof. Eng. Viorel UNGUREANU, PhD
Prof. Eng. Nicolae MUNTEAN, PhD
Prof. Eng. Liviu MARȘAVINA, PhD
Prof. Eng. Petru NEGREA, PhD
Assoc. Prof. Eng Bogdan RADU, PhD

Research centre

1. Research Institute for Renewable Energy
2. Research Centre for Smart Energy Conversion and Storage
3. Research Centre for Mechanics of Materials and Structural Safety
4. Research Centre for Processing and Characterization of Advanced Materials
5. "Ștefan Nădăsan" Research Laboratory for Strength, Integrity and Durability of materials, structures and conductors.

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INOVATIVE METHOD FOR LANDFILLING OF MUNICIPAL SOLID WASTE INCINERATION RESIDUES BY STABILIZATION/SOLIDIFICATION INTO COAL FLY ASH ROCK MATRIX RESULTED FROM DENSE SLURRY TECHNOLOGY

Goal of the project

The project goal is treatment of MSWI residues by stabilization/solidification by means of using a binder matrix. The aim of this process is to create new compounds in a stabilized form that encompassing the harmful elements, which are non-hazardous or less hazardous than the raw (initial) material.
Project includes a series of experiments for embedding the MSWI residues into the coal fly ash rock matrix with the support of the preview research results. There will be done a small scale landfill disposal, in order to investigate the leaching behavior on environmental conditions for tracking the pollutants concentrations migration into environment.

Short description of the project

The project concept is based on using fly ash and desulphurization products related to coal incineration as a binder material to stabilize through solidification process the pollutants (heavy metals mostly) contained in MSWI residues.

Project implemented by

Politehnica University Timişoara

Implementation period

01.05.2018 - 30.04.2020

Main activities

The main activity of the project is to assess the discharge behavior of the experimental landfill disposal exposed into environmental conditions.
In this demand the following activity were foreseen:

- Construction of the experimental demonstrator.
- Evaluate the waste characteristics.
- Construction of the experimental landfill disposal according to the proposed technology.
- Leaching and percolation sampling.
- Lab analyses of experimental samples. Data recording.
- Processing and analyses of the experimental data.
- Interpretation of experimental data.
- Model the environmental behavior of the waste.
- Validate the model by calibration with the results from laboratory tests and field experiments and by comparing it to natural analogues.

Results

Stage I (2018) – Up-grading the existing lab demonstrator. Technical design. Purchasing of equipment.

1.1 Preparation of design documents.
1.2 Designing installations for upgrading the experimental demonstrator in accordance with the proposed technology.
1.3 Elaboration of technical datasheets for equipment purchasing.
1.4 Launch of the public procurement procedure in accordance with the legislation in force.
1.5 Reception of purchased equipment. Equipment payment.

Stage II (2019) – Construction of experimental demonstrator (upgrade). First run. Testing. Lab analyses

2.1 Integration on technological assembly

Applicability and transferability of the results

The solidification/stabilization method of different types of toxic residues consists of using a binder matrix, which is non-pollutant for the environment with the aim to encapsulate the harmful chemical compounds.

In this regard most of the applied technologies are using cement based binder matrix material which is an expensive material in comparison with coal fly ash and associated flue gas desulphurization (FGD) by-products related to coal power plants.

In fact the coal fly ash and FGD by-products are residues that end into open landfill disposal, which means that are costs free.
More than that is well known that cement factory worldwide are using coal fly ash as material basis for different types of cements, for their cementitious properties given by the pozzolanic compounds like silica (SiO_2), alumina (Al_2O_3), and iron oxide (Fe_2O_3) that exceeds over 80% of the fly ash composition.

The new proposed technology based on using fly ash and desulphurization by-products related to coal incineration as a binder material according to solidification/stabilization method, will eliminate the costs with the cement, which could bring considerable economical savings.

From environmental point of view the incineration residues (fly ash and FGD by-products) related to coal incineration can be used as binder material according to the proposed concept of solidification/stabilization method, with the aim to prevent ground water pollution by leaching phenomenon developed on open landfill disposals by dense slurry technology.

Financed through/by

Executive Agency for Higher Education, Research, Development and Innovation Funding – UEFISCDI /
PN-III-P1-1.1-PD-2016-1093

Research centre

Research Institute for Renewable Energies – ICER

Research team

Research contract director /Coordinator:

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Mentor:
Prof. Daniel DAN, PhD

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RESEARCH CONCERNING CHARACTERIZATION AND IMPROVEMENT OF THE ELECTROMAGNETIC ENVIRONMENT IN MODERN CARS

Goal of the project

- Assessment of the electromagnetic environment in modern vehicles: technical and legal aspects;
- Assessment and analysis of measuring and testing methods and of equipment involved in Automotive EMC;
- Implementation of novel test and measurement methods in Automotive EMC and improvement of the testing repeatability
- Applications of metamaterials to Automotive EMC.

Short description of the project

This project is component of the complex project *Hybrid Platform for Communication in Visible Light and Augmented Reality for the Development of Intelligent Systems for Assistance and Active Security of Vehicles*, 21PCCDI / 2018.

Project implemented by

Politehnica University Timişoara,
Faculty of Electronics, Communications and Information Technology,
Department of Measurements and Optical Electronics

Implementation period

18.05.2018 - 16.11.2020

Main activities

1. Characterization of the electromagnetic environment in vehicles:
   - Near field and far field measurement;
   - Spectral occupancy measurement.
2. Improvement of repeatability of Automotive MC tests
   - Assessment of devices and equipment involved;
   - Interlaboratory testing and comparisons
   - Far-field prediction from near-field measurements data;
   - Prediction of far-field radiation from current measurement.
3. Methods of reduction of conducted and radiated emissions;
   - Resonance analysis of systems that fail EMC tests;
   - Applications of metamaterials: filtering, suppressing of cavity oscillations, screening with frequency selective surfaces.

Results

2018-2019

- Documentations and reports concerning assessment of electromagnetic field in modern cars;
- Documentations and reports concerning EMC Automotivex inter-laboratory comparisons, chamber validation and equipment assessment;
- Documentation adn reports concerning applications of periodic structures in the Automotive EMC field;

21 published papers on:

- Application of Frequency Selective Surfaces (Fig. 1);
- Interlaboratory comparison of radiated emissions;
- ALSE chamber validation (Fig. 2);
- Stripline measurements in Automotive EMC;
- Near field measurements and applications to emission reduction (Fig. 3);
- Frequency selective surfaces;
- Spectrum occupancy measurement in the HF domain;
- Application of Rasberry Pi.

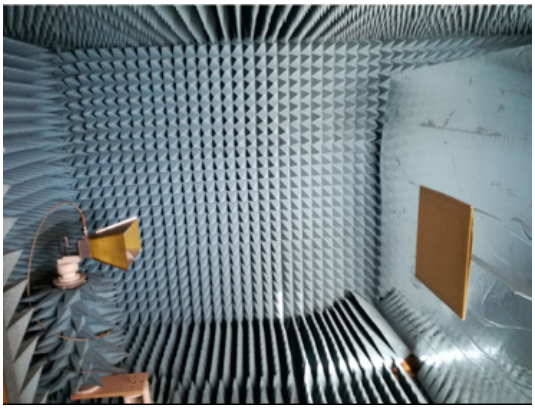

Fig. 1. Spatial filter based on a frequency selective surface tested in anechoic room

Fig. 2. Testing setup for chamber validation with biconic antenna in semi-anechoic room

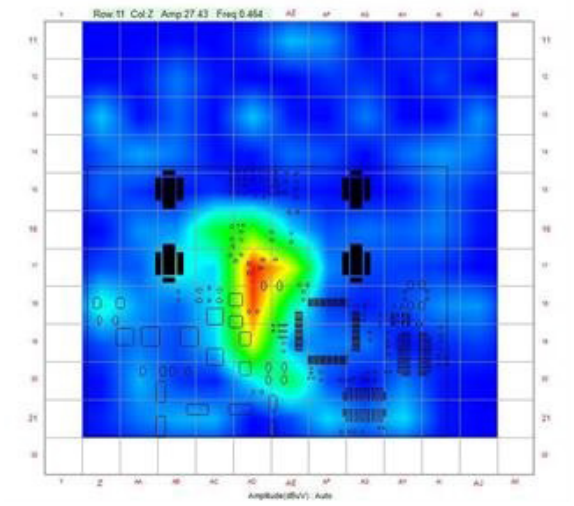

Fig. 3. Near-field scanning result

Applicability and transferability of the results

Results obtained in this research might be useful to:

- EMC laboratories, mainly related to Automotive industry;
- EMC professionals;
- EMC research community;
- EMC standards elaboration;
- Legal authorities that regulate spectrum occupancy;
- Professionals working in Automotive design.

Financed through/by

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

Research centre

ICER - Research Institute for Renewable Energy

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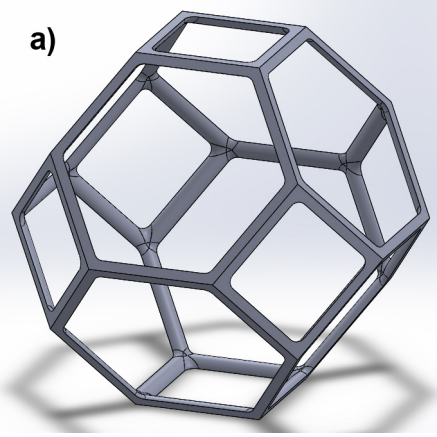
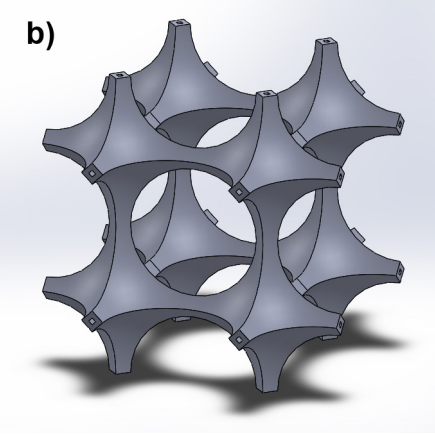
INTELLIGENT CONTROL SYSTEM FOR CONTINUOUS CASTING BASED ON WATER FLOW CONTROL IN THE SECONDARY COOLING

Goal of the project:

This project deals with the development of metamaterial structures composed tessellations of mainly two types of open cells: truncated hexahedron tessellation (the Kelvin structure, a) and hollow sphere tessellation (b). The structures will be modelled using computer aided design software and their mechanical properties will be evaluated using finite element analysis software. When the desired geometries will be developed, the CAD file will be exported to a rapid prototyping machine for manufacturing.





Short description of the project:

This project addresses a subject in the field of innovative materials and it deals with the design and manufacturing of structures composed of engineered materials whose properties are not found in nature (metamaterials). The metamaterials proposed for this project will consist of cellular polymeric lattices, whose properties will be controlled through geometric parameter manipulation (strut thickness, cell size and shape). The main applications of these structures will be as cushioning and protective layers meant to absorb the deformations and impact energy of personal protective equipment. The project has two main stages. The first stage consists of the design and simulation of the structures in order to determine the optimal parameters in terms of mechanical properties. The second stage of the project will deal with the manufacturing of the structures through rapid prototyping and the experimental determination of their mechanical characteristics. The comparison between the estimated and experimentally determined properties will validate the designs of the structures, allowing for complex geometry modelling for actual safety equipment applications.

Project implemented by

Politehnica University Timișoara

Implementation period:

1.5.2018 – 30.4.2020

Main activities:

O1. Literature survey concerning metamaterial structures and additive rapid prototyping techniques.
- A1.1. Literature study concerning mechanical metamaterial structures
- A1.2. Literature study concerning rapid prototyping techniques for polymers

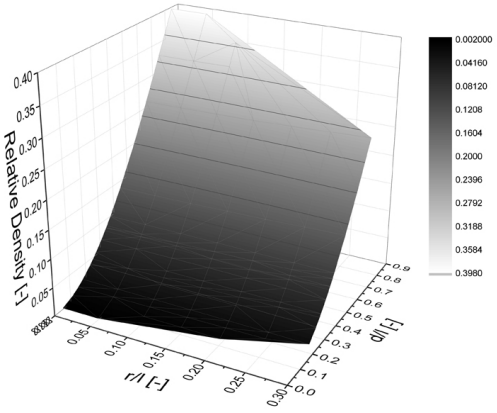
O2. Development of parametrical metamaterial structures
- A2.1. Design of metamaterial structures based on Kelvin cells
- A2.2. Design of metamaterial structures with hollow sphere cells

O3. Numerical evaluation of the mechanical properties of the developed metamaterial structures
- A3.1. Determination of the mechanical properties of the polymers used in rapid prototyping
- A3.2. Evaluation of the static mechanical properties of the developed structures
- A3.3. Evaluation of the impact and energy absorption properties of the developed structures
- A3.4. Optimization of metamaterial structures

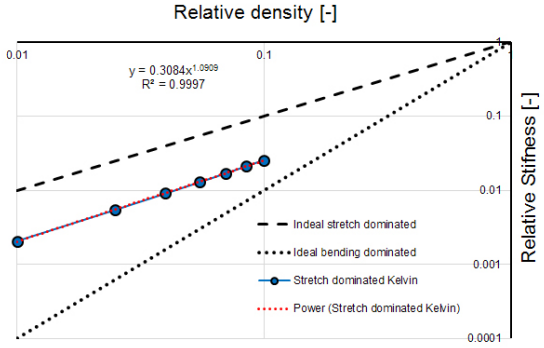
04. Manufacturing of metamaterial structures
    A4.1. Parameter adjustment for structure manufacturing through rapid prototyping
    A4.2. Manufacturing of designed structures through additive rapid prototyping
05. Experimental determination of the mechanical characteristics of the manufactured structures
    A5.1. Elaboration of static tests in compression on the manufactured structures
    A5.2. Elaboration of static tests in bending on the manufactured structures
    A5.3. Elaboration of fatigue tests in compression on the manufactured structures
    A5.4. Elaboration of impact tests on the manufactured structures
06. Structure validation and product component design
    A6.1. Comparison of results and simulation optimization
    A6.2. Design of safety equipment components based on metamaterial structures
    A6.3. Numerical analysis of the designed components' behavior in impact applications

Results:

After the first year of implementation, several structures were generated, and the variation of relative stiffness with the structure parameters was investigated.



The geometries were imported into a finite element analysis software and the relative stiffness and relative strength variation with relative density was determined.
Partial results were published in an article entitled " A parametric study of the mechanical properties of open-cell Kelvin structures" and presented at the international conference AMS18



Applicability and transferability of the results:

The results obtained from this project can be implemented in safety equipment, for various types of industries, such as civil engineering (helmets), sports (protective equipment such as helmets, shin guards, padding), automotive (motorcycle suits) and defense (body and vehicle armor)

Financed through/by

UEFISCDI
Programul 1 - Dezvoltarea sistemului național de cercetare-dezvoltare

Research Center

1. Laboratorul Ștefan Nădășan, Politehnica University Timișoara
2. Medical Engineering Research Center, Politehnica University Timișoara
3. ICER - Research Institute for Renewable Energy, Politehnica University Timișoara

Research team

Eng. Dan-Andrei ȘERBAN, PhD
Prof. Eng. Nicolae FAUR, PhD

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SMART BUILDINGS ADAPTABLE TO THE CLIMATE CHANGE EFFECTS (CIA_CLIM)

Goal of the project

The specific objective of the project is centred on the increase of energy efficiency of buildings, by using smart facades with low-thermal transfer and smart energy efficiency through building automatization and solar energy collectors, through a modular laboratory demonstrative application. The resulted system, the smart house, is conceived thus to minimize the input energy for maintenance.

Short description of the project

The four component projects are focusing on two principal research directions:

(i) use of smart facades with the low-thermal transfer, actively integrated for the enhancement of internal comfort and possessing a passive control of energy and

(ii) smart energy efficiency through building automatization and solar energy collectors.

CIA.CLIM
clădiri inteligente adaptabile la efectele schimbărilor climatice

Project implemented by

Politehnica University Timișoara as coordinator (CO),
in collaboration with

- Technical University of Civil Engineering of Bucharest (UTCB, P1),
- Technical University of Cluj-Napoca (UTCN, P2),
- National Institute for R & D in Electrical Engineering Bucharest (ICPE – CA, P3) and
- National Institute of R & D for Electrochemistry and Condensed Matter Timișoara (INCEMC, P4)

Implementation period

01.03.2018 - 30.06.2021

Main activities

Project 1 investigates the mechanical properties of cellular materials used as thermal insulations in smart façade systems, through mechanical compression, bending and toughness fracture testing.

Project 2 is focused on obtaining, characterizing and testing of high-property materials used for smart facades as thermal insulation materials and as support for special property layers: photo-catalytic layers and with reduced absorption/reflexion of UV-VIS-IR radiation.

Project 3 investigates the implementation of the electric power distribution in direct current for individual households or in small communities (smart-grid), with renewable energy sources integration.

Project 4 implements the knowledge and data resulted from projects no. 1-3 through a modular laboratory demonstrative application. The project will perform an integrated study on the influence of the facades and the energetic contribution to the internal comfort of the building.

Results

- Determination of mechanical proper-ties of cellular materials used as thermal insulations in smart façade systems;
- Production, characterization and testing of high-property materials used for smart facades as thermal insulation materials and as support for special property layers;
- Implementation of the electric power distribution in direct current for individual households or in small communities (smart-grid), with renewable energy sources integration, finalizing with an experimental platform;
- Modular laboratory demonstrative application for the implementation of project results, performing a global study regarding the influence of the facades and the energetic contribution to the internal comfort of the building.

Applicability and transferability of the results

In the construction domain, the energy represents the key-point in achieving efficient buildings. All the results obtained in the frame of the project are expected to be of interest for the economic environment, from manufacturers to contractors. Design guidelines and recommendations will be provided.

Financed through/by

The project is supported by a grant of the Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI), project number PN-III-P1-1.2-PCCDI-2017-0391 / grant agreement 30PCCDI/2018.

Research Centre

- ICER - The Research Institute for Renewable Energy, UPT (CO);
- "St. Nadasan" Research Laboratory for Strength, Integrity and Durability of materials, structures and conductors, UPT (CO);
- Research Center of Environmental Science and Engineering, UPT (CO);
- Intelligent Control of Energy Conversion and Storage Research Center, UPT (CO);
- ACTEX - Integrated Platform of Research and Development for the Behaviour of Structures under Extreme Actions, UPT (CO);
- CAMBI - Advanced Research Center for Ambiental Quality and Building Physics, UTCB (P1);
- EEC - Energy Efficiency in Buildings, UTCB (P1);
- RLSDEPE - Research Laboratory and Sustainable Development in Electronics and Power Electronics, UTCN (P2);
- Department for Efficiency in Conversion and Consumption of Energy, ICPE - CA (P3);
- Renewable Energies – Photovoltaics – Laboratory, INCEMC (P4);
- Chemical and Electrochemical Synthesis Department, INCEMC (P4).

Research team

The research team is composed by 90 researchers of the five institutions.

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SINTERIZATION OF NOVEL STRUCTURES FOR ALLOYS WITH INCREASED FUNCTIONALITY (SINS), PN-III-P3-3.1-PM-RO-CN-2018-0027

Goal of the project

The SINS collaborative research project was based on the complementary experience of the two groups aims to design and manufacture sintered materials (including porous or with gradient) belonging to the intelligent materials class of materials, with the primary focus on NiTi based alloys.

Short description of the project

- The objectives of the project are related to the fabrication and characterization of complex metallic powders and to the production of sintered materials by spark plasma and by laser additive method.
- The collaboration used both the experience of the research groups in Romania and China, as well as the scientific research infrastructure in the partner's institutions for the development of new technologies in order to manufacture high-performance intelligent materials, with wide potential use, ranging from the biomedical to the automotive industry.

Project implemented by

- Politehnica Universitiy Timisoara
- University of Science and Technology Beijing

Implementation period

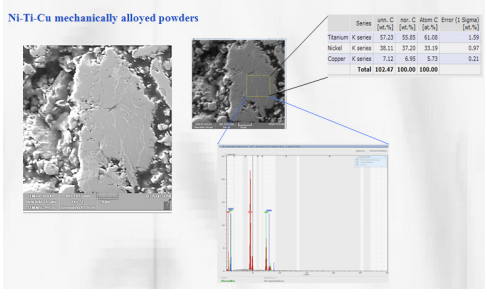
2018-2019

Main activities

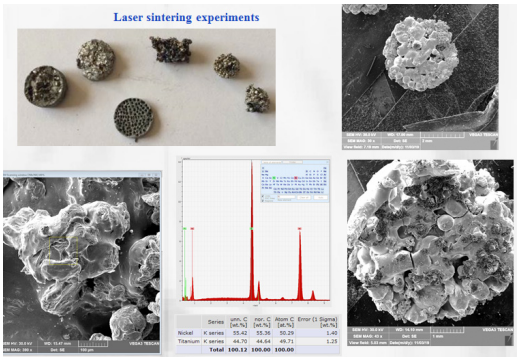
- Preparation and characterization of complex metal powders
- Identification of the compatibility between components for porous structures
- Design of technologies for producing the sintered materials
- Fabrication and characterization of sintered materials
- Dissemination

Results

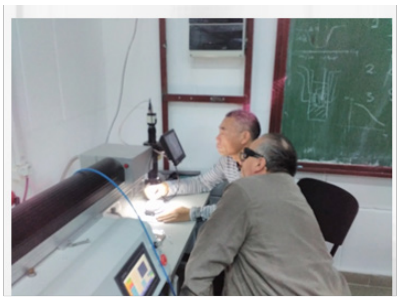
- Mechanical alloying experiments

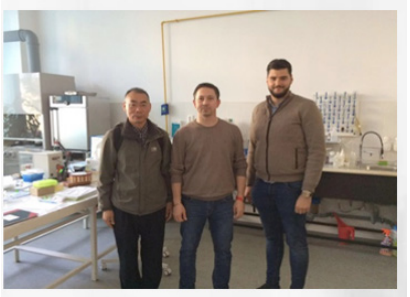


Laser sintering experiments



Collaborations





Applicability and transferability of the results

- The materials developed have the potential to be used in medical applications.
- A solid transfer of knowledge occurred during the collaboration between the partners involved in the research.

Financed through/by

The project is supported by a grant of the Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI), project number PN-III-P3-3.1-PM-RO-CN-2018-0027

Research Centre

- Smart Materials and Structures Laboratory

Research team

Politehnica University Timisoara:

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Ph.D. student Roxana SPRINCENATU
Ph D. student Andrei NOVAC
Ph D. student Vlad BOLOCAN
Ph.D. student Vlad NICOLAESCU

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NATURE-INSPIRED MODELING AND OPTIMIZATION TECHNIQUES OF FUZZY CONTROL SYSTEMS WITH MECHATRONICS APPLICATIONS

Goal of the project

The aim of this project is to demonstrate efficiency and prove the viability of an innovative tuning approach for fuzzy control systems using nature-inspired algorithms in control structures modeling and optimization stages. In this framework, combining nature-inspired optimization algorithms with fuzzy control structures, will have a significant impact on the performance of fuzzy control systems.

Short description of the project

The nature-inspired optimization algorithms will be employed in solving optimization problems that minimize discrete-time objective functions expressed as integral or sum-type quadratic performance indices.

Project implemented by

Politehnica University Timișoara

Implementation period

19.10.2018 - 18.10.2020

Main activities:

The main activities are:

1. Development of efficient control solutions for different processes by bypassing the higher derivative calculations;
2. Takagi-Sugeno fuzzy controllers' optimization through minimization of several objective functions;
3. Development of performant solutions with a reduced implementation cost;
4. Experimental validation of proposed control solutions;
5. Achievements dissemination in high visibility journals and conferences;
6. Successful project management administration.

Results

The main results are related to development of nature inspired algorithm-based solutions for solving optimization problems of fuzzy systems will be disseminated at national and international levels as: four papers published in Thomson Reuters Web of Science (formerly known as ISI Web of Knowledge) publications and four presentations at international conferences.

Applicability and transferability of the results

The results obtained during this contract belong exclusively to Politehnica University Timișoara.

Financed through/by

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

Research Centre

Faculty of Automation and Computers

Research team

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Prof. eng. Stefan PREITL, PhD

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DEVELOPMENT OF ECO-FRIENDLY COMPOSITE MATERIALS BASED ON GEOPOLYMER MATRIX AND REINFORCED WITH WASTE FIBRES

Goal of the project

The project is an answer for a specific challenge regarding waste management, recycling and urban mining. The goal of the project is to prepare a broad spectra of advanced and progressive new composite materials based geopolymer matrices and reinforced with natural waste fibres. The application of these new materials will be the construction industry with a high potential of commercial utilization and potential replacement of conventional materials.

Short description of the project

This project deals with the development of new composite materials for construction industry, based on waste products.

Project implemented by:

Project coordinator: Cracow University of Technology.
Partners: Nigde University Turkey, Pontificia Universidad Católica del Peru, Riga Technical University Latvia, Babeș-Bolyai University, Catholic University of Uruguay Damas Antonio Larrañaga, Politehnica University Timișoara.

Implementation period

02/01/2017 – 31/12/2019

Main activities

- WP1. The selection of waste materials for hydrothermal alkalization and therefore to be turned into new materials based on geopolymer matrix for construction applications
- WP2. The selection of waste materials (natural fibres) as a fillers and therefore turned into new composites for construction application
- WP3. Optimization of properties using computer methods for the new materials and structural elements
- WP4. The research into the application of new materials – comparison of the functional properties of the materials
- WP5. Analysis of practical applications of new materials for construction application and testing prototype components in laboratory as well as validated it in relevant environment

Results

The year 2017 had deadlines for the first two Work Packages.
WP1, coordinated by Nigde University, dealt with the identification of waste materials for the composite material matrices. Each participating partner performed a survey of possible waste material candidates available in their region (recycled clay bricks and volcanic ash in Peru, fly ash in Turkey, Argentina and Romania, paper mill sludge and rice husk ash in Uruguay and granulated rubber from waste tyres in Poland).

WP2, coordinated by Babeș-Bolyai University, dealt with the identification of waste natural fibres as reinforcements for the composites. As with WP1, each participating partner proposed waste materials available in their region (mostly hemp and flax fibres).

Applicability and transferability of the results:

The new composite materials that will be developed in this project will be tested and their properties compared with conventional construction materials. If the mechanical and thermal behaviour is comparable between the two categories, the newly developed materials will be proposed for replacing traditional materials in each specific region where the waste products are available.

Financed through/by

Horizon 2020 - ERA Net Latin America and Caribbean Countries/ UEFISCDI

Research Center

Ștefan Nădășan Laboratory

Research team

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Prof. Eng. Liviu MARȘAVINA, PhD
Eng. Radu NEGRU, PhD
Eng. Emanoil LINUL, PhD

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