CONTRIBUTIONS ON DEVELOPMENT OF MECHANISM SCIENCE WITH APPLICATIONS IN ROBOTICS, MECHATRONICS AND MECHANICAL ENGINEERING

Author: Erwin-Christian LOVASZ

Abstract

The present habilitation thesis was structured in five sections and covered the scientific, academic and professional achievements from the period 1998 to 2015.
Section (I) give an overview of the thesis content and shows the highlighted papers which were published by the author in prestigious Journals and Conferences.
The Section (II) described some of the scientific achievements within the author´s research directions and was organized in four chapters. The first chapter "Scientific achievements regarding the design of the mechanisms using profiled wheels" shows the contributions on computing of the base circle radius and evaluating of the wear susceptibility of the cam mechanisms with translating or oscillating flat-face follower, and on the designing of different non-circular wheels of belt mechanisms for self-balancing applications. The second chapter "Scientific achievements regarding the design of complex mechanisms structures" laid out contributions in designing of geared linkages with non-circular gears and with linear actuation, respectively of 5-link belt mechanisms. The third chapter "Scientific achievements regarding of mechanism development for mechatronics, robotics and mechanical applications" presents some mechanism design and control applications for haptic exoskeleton used in space telerobotics, for a new class of planar parallel manipulators and for a fishing reel spool mechanisms. The last chapter "Scientific achievements regarding the analysis of compliant mechanisms" shows the research of the compliant mechanisms, which use elastic connections, focused on the structural analysis of the compliant mechanisms with elastic connections, simulation and dynamic analysis of the compliant mechanisms with or without integrated piezo-actuators.
The Section (III) of the habilitation thesis mentions the main academic achievements on national and international level of the candidate within the last 17 years after defending the PhD thesis in co-advisorship between University Politehnica Timişoara and Technical University Dresden, defended on 27th of February 1998 at TU Dresden and on 03 of June 1998 at UP Timişoara.

The Section (IV) shows the career evolution and development plans organized in the following systematization: Key research directions, Objectives, Planned activities and Financial, human and infrastructure resources.
The Section (V) contains the references used in the section "Scientific achievements".

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/lovasz/Abstract_Lovasz_Erwin.pdf

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SANITATION CONSTRUCTIONS AND THEIR IMPACT ON THE ENVIRONMENT

Author: Constantin FLORESCU

Abstract

Experimental research results were made on a laboratory plant within the Department of Hydrotechnical Engineering, with water from Bega river and highlighted, efficiencies achieved with upward and downward filtration plants equipped with multiple layers, consisting of homogeneous material (quartz sand - for upward filtration) and inhomogeneous (polystyrene, anthracite, quartz sand, garnet and magnetite - for downward filtration) .

The experimental research has shown upward filtration performance equipped with structures of homogeneous materials compared to those of the downward filtration. These results were obtained while the Bega water, used in the experiments, was made up of the colloidal suspensions obtained after a preliminary settling in the suction basin of the supply pumps from laboratory.

The main results of the thesis were presented at several national and international conferences and published in national scientific journals. The candidate has also been involved as a member or coordinator on several contracts and research projects at national and international projects and also with partners in production.

Habilitation thesis summarizes some of the research work of the candidate after obtaining doctoral thesis from the Politehnica University of Timisoara, in October 2005.

Selected activity proves original achievements and relevance of academic, scientific and professional contributions for an independent development of future career on the academic and research line.

The presentation of post-doctoral work it was conducted in two main directions: "Sanitation constructions", presented in Chapter 2, and "Environmental impact of sanitation constructions", presented in Chapter 3.

Scientific research results are materialized mainly through publications of scientific specialist articles and books, textbooks and laboratory and design guidance.

In recent years, the candidate was that the main priority, publishing scientific articles in journals and various scientific journals indexed in the Web of Knowledge (ISI), or in magazines and books of different scientific manifestations indexed in other relevant international BDI databases.

The candidate has published over 70 scientific papers, of which 13 in journals indexed in the Web of Knowledge (ISI) and 12 in other journals indexed in international databases BDI. Main achievements and results are presented in detail in Chapter: B. Scientific achievements, academic and professional.

Another important component of the candidate in Activity Research consists of worldwide documentation for scientific activities in civil engineering field. By engaging in specialized scientific committees, international events or publications, also the activity of scientific reviewer of publications, the candidate aims his training and development from professional and scientific point of view.

The research activity on main direction: "Sanitation constructions" presented in Chapter 2, refers to the centralized systems of water supply and sewerage in populated centers.

In the country, of the 13,842 localities, approx. 10% of them are equipped to European standards as regards the centralized systems of water supply and sewerage in populated centers. The most important European funds are currently allocated to this work.

A second direction for research activity refers to:

"The impact of sanitation constructions on the environment", presented in Chapter 3.

In general, sanitation works are constructions that ensure the protection of the environment.

The full abstract at:

http://www.upt.ro/img/files/2014-2015/doctorat/abilitare/florescu/Rezumat_teza_abilitare_FLORESCU_en.pdf

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SOLUTIONS FOR IMPROVED SEISMIC PERFORMANCE OF NEW AND EXISTING STRUCTURES

Author: Aurel STRATAN

Abstract

Habilitation thesis of Aurel Stratan presents his main scientific, professional and academic achievements following the defence of the PhD thesis at the Politehnica University of Timisoara, as well as the future development plan. The main research area of the author fits into the broad and multi-disciplinary area of earthquake engineering, with particular emphasis on seismic performance of steel structures and rehabilitation of existing buildings using metal-based solutions. The most important and relevant research directions pursued by the author are: "Re-centring eccentrically braced frames", "Cold-formed steel pitched-roof portal frames with bolted joints", "High strength steel in seismic resistant structures", "Seismic rehabilitation of existing reinforced concrete and masonry buildings with steel-based solutions", "Validation of the technical solution for braces with true pin connections", "Seismic performance of multi-storey steel structures with friction dampers" and "Prequalification of bolted beam to column joints with haunches". Experimental investigation methods represent the main tool of the research, supported at the same time by advanced numerical simulations and analytical tools. The habilitation thesis summarises the evolution of the research performed by the author following the defence of the PhD thesis, as well as the main outcomes, outlining also the context in which the research was performed, i.e. funding scheme, dissemination of results, and associated PhD theses. There were 12 grants supporting the research: 4 national grants, 7 international grants and 1 research contract with industry. The results were disseminated in 92 publications (journal and conference papers, and book chapters). Six PhD students were involved in the research (5 PhD theses were successfully defended and 1 is currently under development). Aurel Stratan had an active role in guiding the PhD candidates. Professional development of Aurel Stratan followed a wide pallet of activities, including participation to training courses, structural design, industry-oriented research, involvement in professional organisations and technical committees, code drafting, development of the research infrastructure, organisation of scientific events, short-term scientific missions, involvement in administrative duties and peer-review of scientific publications.

Aurel Stratan is member in several national professional organisations: AICPS, APCMR, AGIR-SBIS. He is also an active member in several national and international technical committees: Technical Committee TC13 "Seismic Design" of the European Convention for Constructional Steelwork (ECCS), CEN/TC 250/SC 8 "Eurocode 8: Earthquake resistance design of structures", CEN/TC 340/WG 5 "Revision of EN 15129 – Anti-seismic devices", ASRO CT 343 "Basis of design and structural eurocodes", CTS4 " Actions on structures", Ministry of Regional Development and Public Administration (MDRAP). He was member of the scientific committee of three conferences, member in the organizing committee of two conferences and chaired two sessions within international conferences.

The full abstract at:
http://www.upt.ro/img/files/2014-2015/doctorat/abilitare/stratan/Abstract_teza_abilitare_Stratan_en.pdf

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TEMPERATURE AND ATMOSPHERE INFLUENCE DURING COMBUSTION SYNTHESIS OF METAL OXIDE (NANO)POWDERS

Author: Robert IANOȘ

Abstract

The habilitation thesis titled "Temperature and atmosphere influence during combustion synthesis of metal oxide (nano)powders" summarizes the most important scientific achievements published by the candidate after defending his PhD thesis in 2008. The research activity conducted by the candidate is mainly focused on the preparation of metal oxide (nano)powders via solution combustion synthesis.

Within this research field, the candidate has opened new perspectives by suggesting a number of innovative solutions to adjust and control the temperature and the atmosphere during combustion reactions, but also to remove the residual carbon by hydrogen peroxide, H_2O_2, treatment. The feasibility and the efficiency of these approaches, presented in this habilitation thesis, have been recognized and validated by the international scientific community, as the obtained results have been published in prestigious ISI-ranked journals.

The superiority of the solutions suggested by the candidate enabled the combustion synthesis of a wide variety of materials, such as metal oxides, oxide compounds, oxide solid solutions and even composite materials: γ-Fe_2O_3 (maghemite), Fe_3O_4 (magnetite), $LaAlO_3$ (lanthanum aluminate), $CaZrO_3$ (calcium zirconate), $ZnAl_2O_4$ (zinc aluminate), $CoFe_2O_4$ (cobalt ferrite), $BaAl_2O_4$: Eu^{2+}, Dy^{3+} (barium aluminate doped with europium and dysprosium), Fe_3O_4/C (magnetite/carbon composites).

Unlike many of the synthesis methods, which require an annealing step in order to obtain the desired crystalline compound, combustion synthesis has several advantages: it doesn't require annealing, is time and energy efficient, and last but not least is environmentally friendly. An additional advantage is that powder characteristics (surface area, crystallite size and grain size) prepared by combustion synthesis can be properly adjusted by changing the synthesis conditions.

From this point of view, the candidate points out that the most important parameters, namely temperature (higher or lower) and atmosphere (oxidizing or reducing) during the exothermic combustion reactions can be controlled, which is of vital importance especially in the case of metal oxides containing cations which may adopt several numbers of oxidation.

The major role of temperature developed during the combustion reaction is discussed in the case of $LaAlO_3$, $CaZrO_3$, $ZnAl_2O_4$ and $CoFe_2O_4$ powder preparation. The importance of carrying out combustion reactions under reducing atmosphere is a major key in the case of Fe_3O_4 and $BaAl_2O_4$: Eu^{2+}, Dy^{3+} powders. The final part of the main section presents an efficient solution to remove the carbon impurities from $ZnAl_2O_4$ or γ-Fe_2O_3 samples prepared by combustion synthesis, namely chemical oxidation with hydrogen peroxide, H_2O_2. From the point of view of the influence of the procedure followed for residual carbon elimination on the main characteristics of $ZnAl_2O_4$ and γ-Fe_2O_3 powders, namely particle size and specific surface area, the removal of the residual carbon by hydrogen peroxide treatment is a superior technique to the conventional annealing.

The full abstract at:
http://www.upt.ro/img/files/2014-2015/doctorat/abilitare/ianos/Rezumat_teza_Robert_Ianos_RO.pdf

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ASSESSMENT OF STRUCTURAL RETROFITTING AND ENERGY EFFICIENCY THROUGH TESTING, MODELLING AND MONITORING

Author: Tamás NAGY-GYÖRGY

Abstract

The present thesis briefly summarizes the most important scientific, professional and academic achievements of the candidate after defending his PhD thesis at the Politehnica University Timisoara. The candidate was member in 11 national and 5 international research grant or program, in 4 as coordinator. The main area of the researches was in the field of Structural Strengthening using FRP Composites (13 grants), while in the last 3 years interest was shifted towards to the Structural Health Monitoring and Energy Efficiency of structures.

The research performed on FRP Composites was focused on the development of new and innovative anchorage systems and strengthening technologies for reinforced concrete beams, on the study of the confining effect of carbon and glass fiber reinforced polymers (FRP) and their superposition with the application of innovative near surface mounted (NSM) steel and FRP bars were studied. Another subject was the investigation of the influence of various sized cut out openings created in structural walls and slabs retrofitted using externally bonded and NSM FRP composites. In parallel, the subject of advanced techniques used for structural strengthening of masonry elements was also performed. The efficiency of solutions was categorized in terms of resistance, ductility and costs, and a new strengthening solution was proposed and investigated, based on a new concept of steel wire mesh applied with epoxy resins. Use and application of FRP strengthening methods in the field of steel-concrete composite walls was also considered. One of the most promising results of the experimental program was a further development of an anchorage system used for FRP lamelas subjected to bending superposed with a confinement FRP fabric. Later on, full scale precast prestressed concrete element support zone was studied and the strengthening possibilities were analysed. Based on the initial nonlinear modelling, the strengthening strategy was determined and experimentally tested, than was followed by a numerical calibration and by an extension of the strengthening matrix.

The second subject of research covered by the candidate is related to the Structural Health Monitoring of Energy Efficient Buildings, in order to validate design principles, to evaluate real energy demands and to optimize and reduce energy consumptions. This field is time dependent, because it is based on recorded parameters throughout several years. In these on-going projects the objectives were to conceive, realize and put in function a complex monitoring system, to collect data from internal and external parameters and finally to provide a practice guide based on the results.

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/nagy-gyorgy/3_Abstract_Nagy-Gyorgy_Tamas_en.pdf

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GRAPHICAL PROGRAMMING IN MEDICINE, POWER ELECTRONICS AND MODERN EDUCATION

Author: Mihaela-Ruxandra LASCU

Abstract

Structurally, the habilitation thesis consists of a technical presentation regarding four main research topics:

◊ Electromagnetic compatibility - First a very powerful tool developed by the author for studying the magnetic field of shaped slotted screens is described. The next chapter is concerned with predicting the electrical behavior of metallisation patterns printed onto dielectric substrates. The last chapter presents a new test procedure for measuring the shielding effectiveness (SE) of shielded coaxial cables.

◊ Graphical programming in biomedical signal and image processing - The first part of this chapter will describe a computer based signal acquisition, processing and analysis system using LabVIEW. Peak detection in electrocardiogram (ECG) is one of the solved problems using LabVIEW and filtering biomedical signals in different ways is a challenge that has to be solved. The next topic presented is graphical programming in event detection using Pan-Tompkins algorithm. Then the design of an optimal Wiener filter is implemented to remove noise from a signal. Two programs for compression and Wiener optimal filtering are developed in MATLAB. Two algorithms were implemented in LabVIEW. In the last part a real-time 3D echocardiography and the corresponding algorithms that improve the quality of the image are presented. The second image application concerns the compression and noise removal of mammography images because these realize a preprocessing for the identification of microcalcification clusters in mammograms. A nonlinear method is implemented in LabVIEW for performing image enhancement. The final chapter reviews ultrasound segmentation methods, in a broad sense, focusing on techniques developed for medical ultrasound images.

◊ Solar Energy and Power Electronics - The first chapter introduces the first station in Romania (Eastern Europe) outfitted for systematic monitoring of solar irradiance on tilted surfaces. The second chapter concerns Power Electronics. It is related to small signal transfer functions derivation in quasiresonant converters (QRCs). A matrix

method based on state-space averaging of the PWM parent converter and switch cell conversion ratio is proposed.

◊ E-learning techniques - The first part presents a comparison between classical hands-on laboratories and remote laboratories. The second part describes aspects regarding an E-learning approach of resonant ac inverters. The learning process is based on "Learning by Doing" paradigm supported by several learning tools: electronic course materials, interactive simulation, laboratory plants and real experiments accessed by Web Publishing Tools under LabVIEW.

The ful abstract at:

http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/lascu/Rezumat_teza_abilitare_Mihaela_Lascu_en.pdf

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Universitatea Transilvania din Brașov.

CRYPTOGRAPHIC SECURITY FOR AUTOMOTIVE SYSTEMS

Author: Bogdan GROZA

Abstract

The thesis addresses the design of cryptographic protocols for assuring security on in-vehicle buses (e.g., the CAN bus) and various automotive components or functionalities (e.g., tire pressure monitoring sensors, vehicle access control by smart-phones). In the recent years, it has become increasingly obvious that vehicle evolution brings many similarities to that of modern computers. Not more than a century ago, computers were mere mechanical machines, then they turned into complex electronics and today they are loaded with complex software that (arguably) surpasses the complexity of the electronics behind it. Similarly, in the past decades, cars turned from mechanical devices into complex electronic devices and now they are loaded with hundreds of functionalities that are implemented in software. As an immediate consequence, the number of reported attacks has drastically ascended in the past years, with recent reports showing how one can lock the engine, steering wheels or brakes, etc. Our work is focused on the design of efficient broadcast authentication protocols taking into account the three most promising techniques: TESLA-like protocols based on key chains and time synchronization, group keying protocols where keys are shared between groups of nodes and one-time signatures. While some of these protocols proved highly efficient in sensor networks, this does not seem to be the case for in-vehicle networks that require extremely small authentication delays for preserving the real-time nature of the system. To assess efficiency, the proposed protocols were tested on automotive-grade micro-controllers as well as via simulation with industry standard tools. By the use of the CANoe tool we were able to simulate bandwidth allocation for the proposed protocols on state-of-art buses such as CAN-FD and FlexRay. The practical results proved our intuitions from the synthetic comparison of the protocols, i.e., group keying (LiBrA-CAN) is the preferred protocol design. Finally, our results also address the security of several in-vehicle subsystems starting from the generation of random numbers on embedded devices, smart-phone based vehicle access and security for wireless sensors. We do present our

most recent contributions in the security of wireless communication interfaces used in Tire Pressure Monitoring Systems (TPMS). Our work starts from designing an efficient authentication protocol based on lightweight cryptographic designs and block cipher based message authentication codes. The experimental results show that the proposed solution can be handled by real world sensors and is more efficient than alternative proposals. The works on smart-phone based car access and on randomness for automotive grade controllers, are recent developments and joint works with the industry.

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/groza/j_summary_en_BGroza.pdf

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RESEARCH AND CONTRIBUTIONS IN ENERGY EFFICIENCY AND CONTEXT AWARENESS OF MOBILE SYSTEMS AND APPLICATIONS

Author: Marius George MARCU

Abstract

This habilitation thesis describes the achievements I have obtained since when I received the PhD scientific title of Politehnica University of Timisoara back in 2005, in the field of Computer and Information Technology. An overview of my activity and the main research work and topics is presented in the first section of the thesis. My recent activity addressed several research topics: energy-efficient and power-aware applications and systems, energy profiling of virtualization solutions, device and workload characterization using power signatures, indoor positioning techniques based on wireless infrastructures, component level energy profiling and runtime threadlevel energy accounting.

In these fields of expertise, I have published over 70 scientific and academic works as single author (9), first author (34) or co-author, 4 ISI journal with cumulative impact factor 2,74, 22 ISI proceedings papers, and 41 BDI journals and proceedings papers. I was also involved in more than 10 national and international projects obtained by competition, 4 of them as a project manager or local partner manager.

In Chapter 2 I describe the contribution to an execution framework for power-aware applications running on battery powered devices. This research direction has been supported by two national grants I have managed between 2006 and 2011. Power-aware applications are software applications that implement application specific power management algorithms in order to reduce and optimize the energy consumption of the system while running them. The main goal of this research effort was to promote power consumption management and optimization of mobile and embedded systems at higher abstraction layers of such systems. The main outcome of these projects was to establish a general theoretical background and applicative rules and patterns in order to obtain efficient mobile systems and applications from the point of view of the consumption and the prototype implementation of the framework.

In Chapter 3 I describe the contribution to energy efficiency profiling and evaluating of virtual machines. This work has been carried out during implementation of an FP7-ICT project eMuCo – Embedded Multi-Core Processing for Mobile Communication. Our research effort explores how virtualization influences the power consumption of both physical systems and virtual systems and which is the most efficient way to implement such applications. The main goal of this work has been the study on the power consumption impact of virtualization solutions for common desktop and laptop computers. This work explored how virtualization influences the power consumption of both physical systems and virtual systems and which is the most efficient way to implement such applications. The main contribution to the project is the study on energy and thermal efficiency of virtualization solutions implemented on the two OS used today: Windows and Linux. In order to achieve this result the evaluation methodology and measurement setup have been proposed and implemented.

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The full abstract at:

http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/marcu/Abstract_Marcu.pdf

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RESEARCH-BASED MODELING, SIMULATION AND INTELLIGENT TECHNIQUES IN ELECTRICAL ENGINEERING

Author: Manuela PANOIU

Abstract

The habilitation thesis is divided into three parts. After a brief introduction, presented in chapter 1, Chapter 2 presents the results of the candidate research with specific references to publications. Chapter 3 presents a proposal for the development of the candidate future academic career.

Chapter 2 contains technical presentation of the research results and it is also structured into four parts. The first part contains an overview of the research activities after receiving by the candidate the PhD title. The second part of the technical presentation contains a presentation of the candidate research contributions in the field of modelling, simulation and control of some processes from electrical engineering. This area of research is a continuation of the research conducted by the candidate after obtaining her PhD degree. The candidate has studied the modelling of the electric arc in the arc furnace installation. The first paragraph presents some new electric arc models which candidate has studied. All simulations accomplished with these models are compared with experimental measurements. Based on these simulations, solutions for active power control and for positioning the electrodes were proposed. Many of the presented papers in this paragraph are the result of a project obtained after a competition, project on which the candidate was the project manager.

The third part of the technical presentation contains the candidate contribution in artificial intelligence field applied in Electrical Engineering. At the beginning, some of the results of modelling the electric arc using neural networks are presented, these being continuing her PhD research. Then, a neuro-fuzzy system used to predict the current in the electric arc is presented. This is followed by the presentation of some researches regarding the implementation of systems based on fuzzy logic using digital signal processors. In this part, the candidate contribution to the programming of signal processors in a system based on fuzzy logic, was presented, research implemented with the use of a TMS 320 series signal processor. There are two such systems to which the candidate has contributed, particularly to the fuzzy system programming. One of the applications was implemented as a result of a research contract with an economic agent.

The fourth part summarizes some of the results obtained by the candidate as a member of a team that investigated the implementation of educational software systems. The team of which the candidate was member has implemented a series of practical educational systems that are used by the students as learning support. Those systems were implemented mostly in Java and can be included in an e-learning platform as a laboratory or course applications.

The last chapter, the third one, summarizes the candidate personal contributions and establishes a future development plan for the candidate.

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/panoiu/Abstract_teza_MPanoiu.pdf

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LAND RECLAMATION AND IMPROVEMENT WORKS AND SUSTAINABLE LAND MANAGEMENT IN THE CONTEXT OF CLIMATIC CHANGES

Author: Rareș HĂLBAC-COTOARĂ-ZAMFIR

Abstract

The present thesis includes the results of research activities conducted by the candidate after he sustained his PhD thesis in 2010, thesis having the following title „Technical and economical efficient drainage studies for fields with humidity excess". This PhD thesis engaged a very important and actual research theme for land reclamation and improvement and environment protection domains being focused on the necessity of land drainage studies in the perspective of implementing a sustainable agriculture considering the necessity of conserving soil and water resources and the challenges generated by climatic changes.

Because drainage is a vital component of water resources integrated management, process which promotes the coordination of water, soil and other natural resources management and which relates with those for maximizing the economical and social sectors in an equitable manner and without compromising the sustainability of vital ecosystems, this work supposed an interdisciplinary research comprising problems connected with soil science, climatology, drainage, mathematics, informatics, modeling. For realizing some technical and economical efficient drainage studies, IT component become in the last years extremely important, modeling programs being those which can offer the best information referring to the evolution of ecosystem components and services provided by those ecosystems following the implementations of a land drainage system.

In a first stage, as a follow of previous activities conducted by the candidate for his PhD thesis, the candidate activity focused on issues referring to IT products used in land reclamation and improvement technique, especially in studying land drainage systems. Research activity was mainly dedicated to the study of using different software in land drainage systems design and operation, the study of head losses in conditions of using (or not) filtering materials. Strongly connected with the first stage are two other major themes of research covered by the candidate: Natural resources integrated management using technical measures from civil engineering domain and Sustainable development, climatology, climatic changes. Currently, worldwide there is an extraordinary pressure on farmers for

maximizing their social and economical benefits from their lands facing at the same time land degradation and desertification. Sustainable land management is the key answer for these challenges and represents land management through which human society strive to agricultural production living conditions and ecosystems improvement. For including irrigation and drainage arrangements in a natural resources integrated management there are necessary the establishing of a set of factors consisting in coordination and support measures dedicated to the final users.

The candidate also granted a special attention to drought study by analyzing some climatic indicators for monitoring climatic changes in western Romania.

All these studies were correlated with research conducted at international level on climate changes, climate changes effects and management measures practiced at local, regional, national and international levels.

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/halbac/Summary_habilitation_thesis_Halbac.pdf

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CONTRIBUTIONS TO IMPROVE THE STEEL QUALITY

Author: Ana Virginia SOCALICI

Abstract

The habilitation thesis is a summary of the scientific concerns and activities carried out after sustaining the PhD Thesis at Politehnica University of Timişoara.
The results of scientific work falls in the field of materials engineering, being approached the following research directions:

- Modern methods and technologies applied in steelmaking;
- Technologies used to recover the ferrous waste and scrap for greening the industrial environment.

The development of a solid research grounding in the field of materials engineering, supported by the teaching foundation of the modern technologies applied for materials making and processing, is a very topical issue in the contemporary society, and this could be primarily achieved through the professional and academic experience of the professors involved in this field.
The scientific work carried out led to the development of competencies in: technologies used for making and casting metal alloys, optimization of steel making and casting, modelling and simulation of steel solidification processes, application of greening technologies on bulk ferrous waste recovery and processing and interpretation of the research results. Given the results obtained so far, the research will continue in the areas of research presented above, this research being intended to complement the existing achievements and focusing on two strategic approaches, i.e. *education* and *research*.
Here is the summary of the strategies adopted to implement each objective: developing new research topics related to obtaining composite materials and advanced materials applicable in the industrial practice and development of new collaborations.

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/socalici/Rezumat_teza_en_A_Socalici.pdf

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ADVANCED MEASUREMENT, COMMAND, CONTROL AND PROTECTION EQUIPMENT FOR POWER SYSTEMS

Author: Flaviu Mihai FRIGURĂ - ILIASA

Abstract

The habilitation thesis is structured in three parts: the abstract, the technical presentation and the bibliographic references.
The habilitation thesis starts with an abstract that includes the synthesis of the habilitation thesis typed in English, as well as in Romanian language.
The second part of the thesis named „Technical Presentation" and includes ten sections.
In the first section are presented briefly the remarkable achievements obtained through research and educational activities (list with publications and grants classified on three research directions, new disciplines introduced in the education plans, taught courses, contributions brought to the development of the syllabus, invited professor, practice activities with students, conducting license and dissertation theses, endowed laboratories and library, international cooperation, management activities, etc.). It has to be mentioned that in the period of time 2001 - 2016 I´ve published a number of 83 scientific articles, I´ve participated in the frame of 14 research grants / contracts won through competition (at 5 of them I was project director) and I´ve elaborated 7 books in the fields connected to the present thesis.
The main research directions are:
A. Measurement, Command, Control and Automation Equipment;
B. Materials, Equipment, Methods and Work Techniques for Power Commutation;
C. Devices, Apparatus and Techniques for Power Systems Protection.
The second section presents the contributions adequate to all research directions. The most important scientific achievements are classified in 10 chapters, all three domains being mixed.
The first chapter is related to automation issues based on PLCs. This kind of particular embedded system is replacing traditional electric equipment based on relays and similar devices. Some applications, developed on the Low Voltage Apparatus Laboratory are presented as well.
The second chapter is describing some SCADA systems applied in district heating and power plant facilities. They are result of a project with COLTERM S.A. Timisoara and ELSACO Electronic S.R.L. Some of

these software applications are already in use at the Freidorf District Power Plant, in Timisoara or other similar companies.
The third part presents some issues about ferromagnetic forces in computational apparatus which are computed based on a new theory related to Maxwell's tensors. All theoretical aspects are verified by some practical measurements.
The fourth chapter presents some mathematical models applied in order to obtain an excellent interpolation of measured signals which are submitted to DSP's inside digital measurement systems. The B-Spline functions taken in consideration offer an excellent response, mostly to sinusoidal functions, belonging to standard power measurements. This response is certified by a set of experiments.
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The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/frigura/Rezumat_teza_ro_en_F_Frigura.pdf

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TOWARD NEW FRONTIERS FOR COMPOSITE MATERIALS

Author: Mircea NICOARĂ

Abstract

Scientific contributions that are presented follow the latest evolutions from the classic concept of composite material with light metallic matrix discontinuously reinforced with micron-sized particles, produced by mean of conventional casting or powder metallurgy techniques, toward new scientific frontiers.

In this respect, the *1st Chapter* of the thesis syntheses the scientific contributions for development of Ti-based composites with amorphous matrix and crystalline secondary phases for biomedical applications. The first direction is represented by the development of a new Ni-free titanium alloy with composite amorphous/crystalline structure, containing minor addition of Ga. The new $Ti_{41.5}Zr_{2.5}Hf_5Cu_{37.5}Ga_{7.5}Si_1Sn_5$ alloy fabricated by mean of suction casting method has a very complex structure of an amorphous/nano-crystalline composite. The second direction that was followed was represented by development of new Ti-based composites without any Cu-content, for applications as orthopedic implants, considering the well-established cytotoxic effect of this element, which was replaced with Ag. The newly designed alloy $Ti_{42}Zr_{10}Pd_{14}Ag_{26}Sn_8$ fabricated by ultra-rapid melt cooling shows a complex microcrystalline structure, with residual amorphous matrix. The new alloy has some promising features for use as biomaterial, considering the bactericidal effect of metallic Ag and the composite amorphous – crystalline character with potential for high mechanical properties.

The *2nd Chapter* presents the scientific contributions that resulted in development of new porous materials, considered to be composite materials by some leading opinions. A new biomaterial with Ti-based amorphous matrix was fabricated using an advanced technique that combines melt-spinning of amorphous ribbons followed by powder metallurgy processing. Resulting $Ti_{42}Zr_{40}Ta_3Si_{15}$ amorphous material has some outstanding properties, having mechanical properties close to human bone.

New processing frontiers for fabrication of Al-based composites reinforced with ceramic particles are summarized in the *3rd Chapter.* Researches in this field have been focused mainly on new hybrid Al-based composites produced by mean of innovative fabrication methods. The new composites have two types of reinforcements, the first one is embedded alumina, while a second fraction of alumina particles is produced in-situ.

The *4th Chapter* illustrates with examples the application of computerized image processing to the analysis of reinforcement distribution for some discontinuously reinforced aluminum matrix composites. This advanced investigation technique allows objective interpretation of microstructural images obtain by light or electronic microscopy, as well the use of statistical methods for characterization and optimization of particle distribution.

The scientific achievements in the field of materials science and engineering were published in prestigious journals with large impact on the research community, such as *Intermetallics, Acta Biomaterialia, Acta Materialia, Materials, Journal of Thermal Analysis and Calorimetry, Metall, Journal of Magnetism and Magnetic Materials*, or included in the proceedings of international conferences.

The full abstract at:
http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/nicoara/Abstract_thesis_Mircea_Nicoara_EN.pdf

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TRANSLATION AND LANGUAGES PROBLEMATICS IN-BETWEEN THEORY, PRACTICE AND DIDACTICS

Author: Mirela-Cristina POP

Abstract

Written in French, according to the methodological dispositions effective in 2016, the habilitation thesis presents the *scientific, academic* and *professional* paths undertaken after 2007, the year of the doctoral thesis' defense, as well as the significant results achieved in the field of *Translation* and *Languages (French and Romanian as Foreign Languages)*. These objectives lead the two parts of the thesis that is structured into five chapters.

The first chapter outlines the *Scientific Path* followed into three directions of research: applied linguistics, translation studies, language teaching and learning. Research in applied linguistics has led us to sketch out the foundations of an enunciative approach to translation problems. The results achieved in translation studies were classified according to the addressed issues: theoretical, practical and didactic issues; ethical and deontological issues. The third direction – language teaching and learning – is based on our experience teaching French and Romanian as foreign languages and it pertains to the following aspects: a modular vision of language teaching and learning at university level, based on the concept of "progression of skills", curriculum design, integration of new technologies, resource design.

The *Academic Path* is the outlined subject of the second chapter, dedicated to the presentation of the results achieved in the whole academic career: the evolution of didactic grades since 1995, the subjects taught, the didactic materials elaborated and a summary of the undertaken activities.

The third chapter entitled *Professional Path* outlines the results achieved in the professional career, especially the following: member of editorial and scientific committees, professional translation and interpretation activities, keynote speaker, session chair, expert evaluator in the field of applied modern languages, short-term expert, etc.

The fourth chapter frameworks the results obtained by the research groups that we have been directing since 2009 along the lines that led to the recognition of our scientific, academic and professional path: applied linguistics, translation studies, language teaching and learning.

The fifth chapter illustrates our academic concerns regarding the organization and management of didactic activities for professional and institutional purposes in the field of translation and languages (French and Romanian), as follows: member of thesis committees in the humanities (since 2013); management of translation memories (since 1996); organization of scientific and academic activities; academic functions (dean, vice-dean, faculty's quality manager, departmental quality manager, curriculum developer and director, etc.); activities dedicated to students. For activities carried out for the benefit of students, the Romanian National Association of Student Organizations (ANOSR) awarded us in 2010 the "Profesor Bologna" distinction.

As research perspectives, our intention is to carry on towards new directions the problematics described above with regards to translation and languages, taking into account the theoretical, practical and didactic approaches outlined in our *scientific, academic and professional* paths.

The full abstract at:

http://dev.doctorat.uvt.ro/wp-content/uploads/2015/12/10-Rezumat_RO_teza_de_abilitare_Pop_Mirela_Cristina.pdf

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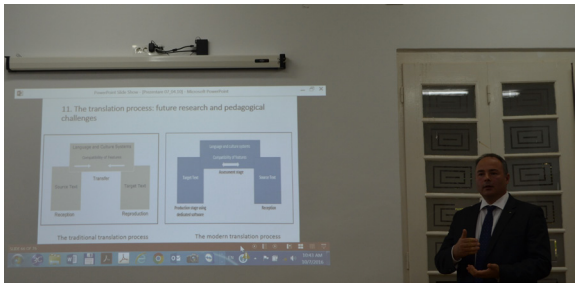
TRANSLATION METHODS AND TRANSLATION PROCESSES: PAST, PRESENT AND FUTURE

Author: Daniel DEJICA-CARȚIȘ

Abstract

The Habilitation thesis *Translation methods and translation processes: past, present and future* presents my didactic and scientific achievements related to the field of Translation Studies (TS). The three main parts of the thesis, divided into 12 chapters, focus on the period since the completion of doctoral studies (2009) to date, and present my vision on the development of translation studies in Romania and in the European area of research in the next period. The first part, *Investigating Translation Studies*, presents the early stages of my research activities and the structural-functional translation method that I developed in my PhD thesis. The next part details the ways in which I furthered my research in TS after my PhD defense. The research findings are grouped in source text analysis and understanding, transfer, reproduction and miscellaneous. This part of the thesis also includes a summary of the national and international research and development projects in TS in which I was involved. An important part of the thesis is also devoted to the editing and reviewing activities in TS in which I am involved. Two more chapters complete this part, namely teaching and applying TS. I detail the courses I have been developing in my teaching career and the translation projects I managed in the language industry. The last part of the thesis presents a series of research and didactic challenges in the field of TS and the ways in which I want to address these challenges and contribute thus to the development of this field in Romania. In an increasingly pragmatic society, in which the academia is also included, in a time in which we are witnessing the closure of translation and interpretation departments or the exclusion of certain humanities' disciplines in higher education, TS should redefine and reconsider its priorities, mainly as a support discipline with a defining role in promoting science in the knowledge society. In the era of technology, translation is and must remain an important object of study aimed at meeting the market requirements and challenges on performing a growing volume of quality translations in a shorter period of time. Some of the answers to these challenges can be generated in terms of research, by rethinking traditional translation processes and in terms of didactics, by updating the translation curricula and by introducing new disciplines, such translation assessment, computer-assisted translation, machine translation, management of translation projects and processes etc., all of these aspects being detailed in the final chapter of the thesis.



The full abstract at:
http://dev.doctorat.uvt.ro/wp-content/uploads/2016/05/11-Rezumat-teza-abilitare.pdf

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