THE SUMMARY OF THE HABILITATION THESIS

SOLUTIONS WITH A BROAD SPECTRUM OF APPLICABILITY IN THE FIELD OF ECONOMIC INFORMATICS

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The main scientific activities that I have conducted in the recent years represent a development of the researches achieved during my doctoral stage and within my PhD thesis, having as a main motivation the need to develop solutions with a broad spectrum of applicability in the field of Economic Informatics. Even during the development of my PhD thesis, defended successfully in 2012, "Solutions for optimizing data processing", scientific coordinator: Professor Ion Lungu, PhD, I was focused on developing solutions for optimizing data processing algorithms, targeting their adjustment in order to parallelize the execution of certain steps. After having identified possible applications of the solutions that enable the parallel execution of computations, in order to harness the huge parallel processing power offered by the Compute Unified Device Architecture (CUDA) and the features offered by its development environment, I have studied the possibility of developing and implementing software applications within this architecture.

The research addressed in the habilitation thesis has represented for me a constant target, even before the doctoral stage, continuing during it and afterwards, after having defended successfully the PhD thesis, when I have continued, developed, extended, refined and disseminated the researches towards this direction. Thus, over the years, my researches in the field of Economic Informatics, regarding the solutions for optimizing data processing, have resulted in the publication of 5 books by recognized publishing houses, of 6 articles that bring original scientific contributions, published in ISI journals (5 of them having a positive impact factor), of 20 articles in journals indexed by at least 2 of the internationally recognized databases, of 16 articles in the Proceedings of specialized conferences, including 3 articles indexed in Thomson Reuters ISI Scientific Proceedings. I am a member of the research team of an international research project; I have participated in six national research projects and in a business environment project. I have participated in the development of 6 models, prototypes, standards, procedures, plans, methods and in the development of 4 products, technologies, studies and services. I have identified 27 citations of my published articles in the scientific literature, out of which 16 citations are in ISI journals having a positive impact factor or indexed in internationally recognized databases and 11 citations are in the Proceedings of specialized conferences, indexed in Thomson Reuters ISI Scientific Proceedings, in international dissertation papers and PhD theses.

I have structured my habilitation thesis in two parts. In the first part, "The main academic, scientific and professional achievements", I have presented the most important original scientific results that I have achieved and disseminated in my scientific research activity, after being conferred the academic title of PhD in the field of Economic Informatics, in 2012, highlighting the way in which the researches and topics subsequent to the PhD thesis continue, develop, extend and refine the researches within it, influencing my research career development.

First, I have analyzed the current state of knowledge regarding the parallel processing of data and the Compute Unified Device Architecture. Then, I have developed and implemented solutions for improving the parallel programming in the Compute Unified Device Architecture, using the unified memory feature. Afterwards, based on the results of this research, I have developed solutions for implementing the Legendre spectral-collocation method using the Compute Unified Device Architecture.

I have developed and implemented solutions for improving the software performance of the basic algorithmic functions on the Kepler (2012) and Maxwell (2014) CUDA architectures. Afterwards I have conducted a study regarding the economic benefits of implementing the solutions for improving the software performance of the parallel processing of data on the Kepler and Maxwell CUDA architectures.

Afterwards, I have developed and implemented solutions for improving the software performance in solving problems that imply large datasets, having extensive applications in economy. First, I have developed and implemented solutions for improving the performance of the Mersenne Twister random number generator using parallel data processing architectures. Afterwards, I have developed and implemented solutions for improving the performance of the Sobol random number generator using parallel data processing architectures. Afterwards, I have developed solutions for optimizing the Monte Carlo option pricing method’s implementation using the basic algorithmic
functions. I have also developed solutions for optimizing the computation of eigenvalues using parallel data processing architectures.

Then, I have developed and implemented solutions for estimating, analyzing and monitoring the performance indicators in the field of renewable energy by developing intelligent systems. First, I have analyzed the need of developing an intelligent system for predicting, analyzing and monitoring the performance indicators of the technologic and business processes in the field of renewable energies. Then, I have analyzed a series of comparative aspects regarding the algorithms used for developing the neural networks for predicting, analyzing and monitoring the performance indicators in the field of renewable energies in Romania. I have developed and implemented a series of solutions for predicting, analyzing and monitoring the performance indicators in the field of solar and wind energies by developing neural networks.

Afterwards, I have developed and implemented solutions regarding the computer based office information systems and the automation of their associated tasks. In the beginning, I have analyzed the research motivation regarding the development of the solutions for the computer based office information systems, I have analyzed the evolution and the main features of the Visual Studio Tools for Office (VSTO) development environment. Then, I have developed and implemented solutions for data binding the Ribbon Control objects and for programatically controlling their actions by developing custom task panes that incorporate Language-Integrated Query (LINQ) instructions. I have developed and implemented solutions for repurposing the default actions and states of the Ribbon Controls through Component Object Model Add-Ins.

Afterwards, I have identified and analyzed a series of solutions for problems regarding key areas of the daily economic and social life. I have first analyzed the impact of the 3D printing technology on the society and economy. Afterwards, I have analyzed a series of issues regarding the decentralized Bitcoin system, the Bitcoin and Alternative Coins digital currencies. Then, I have developed solutions for implementing the k-anonymity approach in preserving the privacy of e-services, using the CUDA parallel processing architecture.

At the end of the first part of the habilitation thesis I have presented the way of disseminating my main original scientific results by publishing them in books, in articles that bring original scientific contributions indexed in internationally recognized databases, in articles published in ISI journals, ISI journals having a positive impact factor, ISI journals having relative influence score, in the Proceedings of national and international conferences, in identifying citations of my published articles in the scientific literature, by participating at national and international research projects, by developing models, prototypes, standards, procedures, plans, methods, products, technologies, studies and services.

In the second part of the habilitation thesis, "The academic, scientific and professional development plan", I have first presented a series of important elements regarding my academic, scientific and professional activity up to the present, highlighting a series of elements regarding my preuniversity, universitary and postuniversity studies and also a summary of academic, scientific and professional activity. Afterwards, I have presented the most important elements regarding the evolution of my academic, scientific and professional career in the future, in terms of the didactic-educational activity, the scientific research activity, the correlation between the didactic-educational activity and the scientific research activity and also its main developing path in the global context of the most significant and novel scientific achievements in the field of Economic Informatics. In the end, I have presented the most important elements regarding the achievement framework and the development methods of my career.

The plan for developing my scientific, didactic and research career for the upcoming years includes: publishing scientific books and articles; participating in national and international conferences in the field of Economic Informatics in order to disseminate the results of the research; participating in research projects; submitting new research projects proposals within the European Union research and innovation framework program, that represents an economic tool for ensuring global competitiveness of the European space, Horizon 2020, and also in other national or international competitions; attracting students in the research activity; implementing the research results in the didactic activities.