1. SUMMARY

1.1. ABSTRACT

The habilitation thesis summarizes the research and the results obtained by the candidate after receiving her doctoral degree at Polytechnic University of Timisoara, confirmed by the *Ministerial Order no. 5285 of December 28, 2001.*

Due to the fact that the candidate was in the past a part of a multidisciplinary research team and still is in present as well and also due to the fact that she graduated the specialization Automation and Computer Science and the field in which she obtained her Ph.D. is Electrical Engineering, the candidate has been assimilated interdisciplinary skills. Thus, these skills allowed her to develop research in three main areas:

- Modeling, simulation and identification applied in electrical engineering and in other fields as well;
- Artificial and computational intelligence applied in electrical engineering and in other fields;
- Contributions on developing of interactive educational software

The majority of the candidate research activitivity is concentrated on the first two research areas. These two research areas are not totally independent of one another. Much of the candidate's research fits into two or in all three research areas. It can be said that within the first two research areas, the candidate continued, at least partially, her doctoral thesis research, but new research topics were also addressed. The third research direction was developed by the candidate from the desired to bring some contributions to the educational field by implementing educational applications that are using in laboratory and as well in the course activity.

The habilitation thesis summarizes the candidate research, especially within the first two research areas, with specific references to publications resulting from this research. Some of her published papers are the results of research projects in which the candidate was either project manager or team leader or part of the research team.

The habilitation thesis is divided into three parts. After a brief introduction, presented in chapter 1, Chapter 2 is following, this one being the most extended chapter, which presents the results of the candidate research with specific references to publications, especially the ones indexed in ISI Web of Knowledge and in other international databases, but in other publications as well. 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 and the obtained results during 2002 – 2015 periods that followed after receiving by the candidate the doctor engineer title. This part summarizes the results of the research conducted by the candidate during this period. The candidate has published over 130 papers of which 41 are indexed in the ISI Web of Knowledge database. From these 41 papers, the candidate is the first author in 13 of them. A number of 73 of the candidate papers are indexed in other international databases, especially Scopus, Engineering Village 2, IEEExplore, ACM, Inspec and Google Scholar. Some published papers by the candidate have been cited, so the candidate has 28 ISI Web of Knowledge citations and 77 citations in other international databases. This part also presents the projects in which the candidate has participated, either as project manager or as a team leader or team member. The journals and conferences to which the candidate was a reviewer and a member of the international committee of the program are also presented. The candidate has been invited to 4 conferences as a plenary speaker, one of them was ISI Web of Knowledge indexed, and 2 were indexed in international databases and another one in a national conference. At the final of this part, a review of the management and organizational skills of the candidate was made, with specific references to the positions held by the candidate during each period.

The second part of the technical presentation contains a detailed 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. doctoral thesis. Specifically, the candidate has studied the modelling of the electric arc in the electric 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. In this paragraph, simulations of the entire system of the electric arc furnace were also presented. Based on these simulations, solutions for active power control and for positioning the electrodes were proposed. The flicker effect, which is widespread in the case of high power electric arc furnaces, was also simulated. Many of the presented papers in this paragraph are the result of a project obtained after winning a competition, project on which the candidate was the project manager. This paragraph ends with presentation of other modelling and simulation-based researches, in which the candidate participated as co-author.

The third part of the technical presentation contains the candidate contribution in artificial intelligence field, especially in computational intelligence applied in Electrical Enginnering and also in other engineering fields. This is the main area in which the candidate has conducted research lately. At the beginning of the third part, 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 the economic environment. As in the previous case, the third part concludes with a presentation of other achievements in the artificial intelligence field by teams of which the candidate was a member, not necessarily as main researcher.

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.