

# HABILITATION THESIS

## 3D Modeling of the Real World – Cadastre, Real Estate Registration and GIS for Sustainable Development

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### PART A – ABSTRACT

This thesis is constituted from the main achievements in the domains of my research activity. My PhD Thesis (*“Contributions to the Achievement of an Information System for Integrating Cadastre and Land Book”*) at Technical University of Civil Engineering in Bucharest, Faculty of Geodesy had been confirmed by the Ministry of National Education, on the basis of Order no. 5837, dated 04.11.2008.

Based on this Order, I obtained the PhD. Diploma as Doctor in Civil Engineering Domain and I was rewarded with *“CUM LAUDE” Distinction*.

This habilitation thesis is based on the IT and technological developments, which created high opportunities for GIS softwares, data integration and distributed databases, especially in integrating of the legal informations from the land book with technical cadastral ones.

In this manner the premises for the best use of my background’s training were created by the interference of geodetic engineering and law on one side, and the project management, on the other side.

My multidisciplinary background (geodetic engineering, law and project management) made me able to create this paper in the framework of various fields’ interference and also permitted the integration of my academic and professional expertise, not only the scientific one.

The research activity and achievements presented here had been developed in the following directions:

- 1. 3D Representations and 3D Modeling** - My academic activity started by teaching lessons of “Cadastre”, “Surveying Instruments and Methods” and “Surveying” and my first academic taught course was “Geometric Representations of the Topographic Surfaces”. The training and learning on 2D and 3D representations were the basis for my next development. I continued to write books and papers, directioning my research activities to GIS specific methods and softwares which offer modern possibilities for this domain.
- 2. Cadastre and Real Estate Registration as Land Information Systems** - This direction continues and diversify with new subjects, the topic of the PhD Thesis. It should be noted that my activity in this field is in line with the fields of research of the national and international policies in the domain, so it is connected also to European trends– these aspects could be proved also by the topic of the published papers. The main aspects about previous directions were linked with the implementation of new technologies and techniques



for Real Estate and Cadastral Applications with geo-spatial support in relationship with sustainable development, which continue, develop and grow with new subjects, the topic of the PhD Thesis. The results of my scientific research are materialized mainly in scientific articles and books and specialized rules and regulations, developed also in NACL (National Agency of Cadastre and Land Registration) teams. It can be seen in the list of the scientific papers attached that I have also collaborated with specialists from other Romanian universities on the papers conception. The evolution of my own research-development activity can be seen by comparing it with similar national and international activities. An important component of the management of my research activity was the dissemination of the results. I always considered very important the results obtained in the scientific community as well as the feedback. I also was concerned to forward my knowledge to my students, elaborating dedicated books and papers.

3. **From 3D Representations and Land Information Systems to Sustainable Development** - Another important component of my personal research activity consisted in the research documentation work on the subject of the international scientific activity in the geodetic domain. Before my PhD thesis I was interested on the 3D spatial component of cadastral data. In fact, the final result of any geo-spatial dataset is the sustainable development of our world. The results of our domain are used in all activities which need a spatial component. So I considered that designing a new master direction based on data achievement, spatial analysis, spatial planning and GIS for sustainable development can be a good result for our activity.
4. **Added Value - Dissemination of Knowledge through Coordinating Dissertation Theses, co-tutorship of PhD Theses and Blended-Learning Methods** - I always had been interested to disseminate the knowledge, so I was involved and I worked with pleasure in the activities of coordinating students to elaborate their Dissertation Thesis and later as co-tutor of PhD Theses (having the great honour to work in co-tutorship of PhD Theses with Professor Petre Iuliu Dragomir and Professor Dumitru Onose – two of the great teachers and PhD coordinators of Doctoral Geodetic School of Romania). Nowadays, another modern way to disseminate the knowledge to the students is by using e-learning teaching methods combined with classic teaching methods, that so-called blended-learning. This kind of teaching is the most appropriate modern teaching method in our domain, having a practical component which need to be taught in a classic way. For the e-learning component I was involved as coordinator in an European project in Geodetic domain, for providing better skills to the students.

A main priority in the last years was the publication of scientific articles in journals and proceedings of scientific events, indexed in Web of Knowledge (ISI) or in other relevant International Data Bases (IDB – BDI), attending many scientific conferences and symposiums where I had the chance to receive a direct feedback on my research activity. I have always focused on the research quality aspect, respecting the value of the published papers.

I was directly involved in efforts for the enrollment of Faculty of Geodesy, TUCEB, as FIG Academic Member, being in present the FIG Representative for our institution and having the great honour to receive the FIG Certificate, in 2015, at FIG Working Week in Sofia, Bulgaria. (<http://fig.net/members/academic/index.asp#R>)

My ISI already indexed papers can be found at <http://www.researcherid.com/rid/G-5288-2013>, **ISI h-index = 2**.

The main papers (BDI, ISI and other works), as well as the citations, can be found at <https://scholar.google.ro/citations?hl=ro&user=0r39C8kAAAAJ>, having a **Google Scholar h-index = 5**.

A real challenge was the decision of choosing the correct research directions in correlation with the existent financial, materials and mainly human resources.



My research activity tends to be multidisciplinary, due to the evolution of society and also due to my educational background, trying to correlate my educational achievements with this trend.

This multidisciplinary component and obviously the contact with specialists from different research fields had a big impact on the research development, from the professional and scientific viewpoint.

My PhD Thesis gave me the enthusiasm to start and fulfill my professional training in Law, being now also a BSc and MSc graduate in Law – Judicial Career. The judicial subjects like real estate provisions are linked with real estate registration, in the Land Book being included the technical features of the property, as well as the judicial ones.

I fulfilled also a Project Management specific training at MSc level at State University of Political and Administrative Studies (SUPAS - SNSPA), including subjects as Project Management, Globalization, Strategies and Techniques to Attract European Funds, Projects Implementing, Preparation and Implementation of Research Proposals, Evaluation and Monitoring of Projects, Project Team Management, Financial Analysis of Projects, IT Applications for Project Management - Dissertation Thesis: "Specific Project Management in the Surveying and Cadastral Works". The reason for this advanced professional training was the increasing requirement of managerial skills in a raising number of activities and projects.

This multidisciplinary training and the contact with different research fields had represented for me an important qualitative improvement and a real development from the professional and scientific point of view.

The research documentation work on the subject of the international scientific activity in the geodetic engineering field is another important component of my personal research activity.

Especially in the last years I have become more involved in taking part in different scientific committees of various scientific events or international publications, as well as acting as scientific referent of these publications.

These activities were highly demanding, being a volunteer work, but I had the great satisfaction of being recognized and useful in my professional field, at the national and international level.

Another main scientific step in my career was to be selected - and working in the last years - as **project proposals evaluator** for European Commission (EC – CE), National Agency for Scientific Research and Innovation (NASRI – ANCSI) and Executive Unit for Funding of High Education, Research Development and Innovation (EUFHERD – UEFISCDI).

In what concerns my **future research and development plans**, linked with the fields of research presented above, I would like to continue developing the following research topics:

- Elaboration of the normatives and of a database for integrating the cadastral geospatial information with urban management workflow;
- Harmonizing and implementing the LADM (Land Administration Domain Model) in the Romanian context;
- Developing GIS applications for risk mitigation;
- Developing GIS applications for Cultural Landscape & Heritage;
- Developing a WebGIS approach for National Heritage;
- Crowdsourcing approach in WebGIS applications;
- Application of the terrestrial laser scanning for environmental processes and changes;
- Applications on integration of the Photogrammetric data achieved by using UAV in GIS;
- Sustaining Stereo 2010 Cartographic Projection as a support for modern cadastre implementation;
- Development of Geographic Information Systems as efficient support for urban planning;
- Integration of valuation data with 3D cadastral data;
- WebGIS approach for National Heritage;
- Using geographic information system analysis in the management of flood risk areas.



For these applicative research problems, many prerequisites have been already studied.

The main achievements and results are presented in detail in Chapter B: Scientific, professional and academic achievements.

The development plan for the scientific issues consists of a few phases: a short, a medium and a long term development plan.

In order to improve and develop the research activity, on a short and medium term I plan to do the following:

- closer collaboration with research institutions and high education institutions in Romania on specific subjects, materialized by project proposals – activity sustained through my position of Director of “Engineering Surveying and Spatial Data Infrastructures” (ESSDI – MGIIDS) Research Center;
- setting up a multidisciplinary research team in the purpose to be able to fulfill better the complex call requirements for scientific competitions;
- identifying and promoting several common research themes with other institutes and faculties, based on the similar or complementary activities developed;

Finally, it have to be underlined that I will try to have an active role increased by participation with new research topics to international conferences and papers published in specialized journals and conferences. Also, as member in different associations and committiees, I will continue the collaborative work with other researchers in the field.

