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DOCTORAL DISSERTATION REVIEW

„Ontology-based semantic database for parametric modelling of complex architectures in their enhancement process. The case of the fortified system along the ancient border between the Kingdom of Two Sicilies and the Papal State, in Italy."

by:
M.Sc. Arch. Virginia Miele

written under the supervision of:
Prof. DSc, PhD, Eng, Arch. Magdalena Żmudzińska-Nowak - Supervisor;
and
Prof. DSc, PhD, Arch. Assunta Pelliccio - Associate Supervisor.

1 Formal basis of the review

- The Act of March 14, 2003 on Scientific Degrees and Academic Title and on Degrees and Title in the Field of Art, Journal of Laws of 2017, item 1789, in conjunction with Article 179 paragraphs 1 and 4 of the Act of July 3, 2018. Regulations introducing the Act - Act on Higher Education and Science, Journal of Laws of 30.08.2018, item 1669, as amended;
- Regulation of the Minister of Science and Higher Education of January 19, 2018 on the detailed procedure and conditions for conducting activities in doctoral dissertation proceedings, in habilitation proceedings and in proceedings for the conferment of the title of professor, Dz.U. 2017 item 1789 as amended;
- Resolution of the Council of the Scientific Discipline Architecture and Urban Planning of the Silesian University of Technology dated 14.11.2024;
- Letter from Ms. Chairman of the Council of the Scientific Discipline Architecture and Urban Planning of the Silesian University of Technology DSc, PhD, Eng, Arch. Alina Pancewicz, Prof. of Silesian University of Technology, dated 16.10.2024.

2 Formal characteristics of the dissertation

The reviewed dissertation was written in English. It consists of seven chapters. The bibliography is divided into: State of knowledge on fortified architecture and conservation practice and State of knowledge on digital techniques and tools for conservation, as well as an index of illustrations. The dissertation is a one-volume study of 303 pages.

The scope of the dissertation and the issues are presented in a logical and orderly manner. The dissertation begins with an introduction with an outline of the subject matter, the state of research, a discussion of the history of fortifications with special attention to Italy and the turn of the Middle Ages and the Renaissance, through a presentation of the adopted method of model construction, and an analysis of the results based on five research examples (so-called case studies). Dissertation title "Ontology-based semantic database for parametric modelling of complex architectures in their enhancement process. The case of the fortified system along the ancient border between the Kingdom of Two Sicilies and the Papal State, in Italy." fully corresponds to the content presented in it.

As required by the Act, the paper includes abstracts in Polish and English.

3 Substantive evaluation of the text and illustrations

The dissertation begins with Chapter I, in which the author introduces the problem of the work. It includes the characteristics of the problem and the justification of the topic. The author clearly presents the scientific problem and accurately formulates the hypotheses and research questions. The purpose and scope of the research are also properly outlined. The proposed timeframe and scope of the research have been properly outlined. The author's adopted research methodology is not questionable, as is the order of the research procedure. The research techniques and tools have been illustrated with diagrams, making them easy to understand. Similarly, the structure of the work - which is clear and transparent - is presented. The presentation of definitions of terms used in the work is valuable. At this point, it is worth noting that each subsection is provided with a literature list, which significantly facilitates reading.

In the next chapter, the author outlines the general state of knowledge about fortifications in Italy. In addition, she also presents the state of knowledge on the use of digital survey methods and tools in conservation.

Chapter III presents an overview of Italian fortification. Author has placed particular emphasis on presenting the heritage of Italian defensive architecture in the period from the Middle Ages to the Renaissance - which is apt given the scope of the work. Author discusses in detail the so-called "transition period" associated with significant changes in the art of fortification and the development of artillery (from the fall of Constantinople in 1453, to the construction of Fortezza da Basso in Florence in 1534). He deliberates on appropriate examples with aptly chosen striking photos and drawings. He also discusses the work of Francesco di Giorgio Martinita one of the most prominent architects working on fortifications. She supplements her discussion with on his Treatise on Architecture (the so-called Ashburnham 361) held in the Biblioteca Laurenziana in Florence. Author also discusses the development of bastion fortresses in the area of central Italy (including

the work of Giuliano da Sangallo). The chapter is supplemented by two appendices: Catalog of codices and treatises and Nomenclature for fortified architecture.

Author presents the research procedure in Chapter IV (FORTdigiTALE). She discusses the methods of data acquisition and the procedure illustrating them in graphical diagrams. She presents the digital techniques used, the definition of the ontology, the digital database and the graphical models. She subjects selected structures to metric-geometric analysis and draws attention to the deformation of fortress towers. The method is discussed and illustrated in great detail and comprehensively.

The next two chapters present the area selected for the study and the structures. In Chapter V, author presented the research area - southern Lazio. Author presented the historical framework of fortifications, the state of knowledge about forts and geographical conditions. She briefly discussed the areas located along the former border between the Kingdom of Sicily and the Church State (Terra Sancti Banedicti (the area around the Benedictine monastery on Monte Cassino), the Duchy of Sora, and the Duchy of Gaeta). She presented the transformation of medieval fortification in the area, from the time of Emperor Frederick II on Terra di Lavoro, through the modernization of defense systems during the Andegavian reign, and the fortifications of the Counts of Aquino and Cantelmo. She also presented the decline in importance of medieval fortifications due to the advent of artillery. Based on the above research, she developed a classification of castles in the southern Lazio area (Strong military connotation and reduced residential vocation; Fortifications located at the highest point of the town, No altimetric hierarchy between the fortress and the town; Fortress integrated into the town without discontinuity) and indicated their most important types.

The scope of Chapter VI includes presentations of the Author's research results on the five examples indicated: San Casto Castle in Sora, Vicalvi Castle, Alvito Castle, Rocca Janula Castle in Cassino and Angevin Castle in Gaeta. Each was discussed according to an identical scheme. This scheme included: Historical documentary survey; Evolutionary hypothesis; Georeferenced cataloging in gis; Geometric-material survey;HBIM for three-dimensional ontological modeling and Further analysis.Literature discussing the selected site was included at the end of each subsection.

A summary of the entire procedure is shown in detailed tables, or rather, a series of tables, as there are 9 of them. Each presents a complete scheme of the adopted research procedure (Generalities/Historical board/GIS to BIM process/Digital Survey/HBIM model/HBIM Ontology/ Deformation analysis/Analysis). The information acquired during the author's research is very clearly shown on them. The material collected is impressive.

The last chapter contains a summary. Their conclusions provide a precise answer to the research problem posed in the introduction. The method proposed by the author provides valuable material in interdisciplinary research of castles, not only along the border between the Papal State and the Kingdom of the Two Sicilies, but in Italy. What is worth emphasizing is that it is very universal and can be used in other countries as well. The author also points out the possibilities of using the digital model: from conservation issues, through the research aspect to educational issues. The huge potential of BIM is an extremely valuable tool for conservation practitioners. The method proposed by the author is non-invasive and, in addition, offers the possibility of monitoring the state of preservation of historic buildings over longer periods of time. It also opens up new

research perspectives for scientists of various disciplines related to the preservation of cultural heritage in the broadest sense. It can also be used in cognitive and popularization aspects.

4 Notes on the text and illustrations

The very interesting Chapter III, containing an outline of the state of research on Italian fortifications, is richly illustrated. Unfortunately, due to the editorial form adopted, some of the drawings especially from Francesco di Giorgio Martinita's treatise are not very legible.

The detailed glossary at the end of Chapter III in Apedndix II is a valuable and valuable addition to the text. The entries it contains are unfortunately not illustrated with illustrations. The introduction here of photographs of the elements or drawings of them would have significantly improved the reading of each definition. It would also be valuable to add footnotes to each of the entries.

The tables of five objects present rich historical, illustrative material along with a digital spatial model. In the solids depicting the development and transformation of buildings (HBIM Ontology), it would be useful to differentiate existing and reconstructed parts by color. The method of graphical representation of transformations of historical buildings is discussed, among others:

Harris, E. Principles of Archaeological Stratigraphy. London: Academic Press, 1997.

Parenti, R. Le tecniche di documentazione per una lettura stratigrafica dell'elevato. In *Archeologia e restauro dei monumenti*, Edited by Riccardo Francovich and Roberto Parenti. Firenze: All'Insegna del Giglio, 1988. 249–79.

Parenti, R. Dalla stratigrafia all'archeologia dell'architettura. Alcune recenti esperienze del laboratorio senese. *Archeologia dell'architettura* 7: 2002, 73–82.

Such a display of objects would be valuable especially for cognitive and educational reasons.

The list of bibliographic items was compiled in alphabetical order by author's surname. Several items are arranged by authors' first names.

The above comments are irrelevant to the substantive evaluation of the work, which is high in the Reviewer's opinion

5. Evaluation of the formal and graphic side of the work

The dissertation submitted for review is readable, with a correct structure. Attention is drawn to the very careful and impressive editorial development. Figures and author's graphic elaborations presented in the dissertation are prepared in great detail. The reviewer considers the illustrative material to be very valuable and relevant to the deliberations. It allows an in-depth analysis of the proposed method and the selected five objects adopted to illustrate it.

The method of modeling integrated with structural ontology adopted by the Author should be one of the methods in interdisciplinary research of monuments. The detailed digital model significantly increases the knowledge not only of castles and fortifications, as presented in the work, but also of other historical objects. A detailed digital model is very valuable not only for conservation issues but also for research.

6 Final Conclusion

The dissertation proves that the Doctoral Student has acquired the ability to conduct scientific work independently. Taking into account the evaluation of the considered dissertation of M.Sc.

arch. Virginia Miele entitled. "*Ontology-based semantic database for parametric modelling of complex architectures in their enhancement process. The case of the fortified system along the ancient border between the Kingdom of Two Sicilies and the Papal State, in Italy.*" I conclude that it meets the requirements for a doctoral thesis in the discipline of Architecture and Urban Planning. I therefore apply for admission of the thesis to oral defense at the Faculty of Architecture of the Silesian University of Technology. At the same time, I apply for its the dissertation be awarded.

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Podpisano odręcznie przez autora