Warsaw, 27.12.2024

Dr. hab. inż. arch. Cezary Głuszek, prof. of Warsaw University of Technology

REVIEW of doctoral dissertation:

Ontology-based semantic database for parametric modelling of complex architectures in their enhancement process.

The case of fortified system along the ancient border between the Kingdom of Two Sicillies and the Papal State, in Italy

Author: MSc Arch. Virginia Miele

Supervisors:

prof. arch. Magdalena Żmudzińska-Nowak, SUT

prof. arch. Assunta Pelliccio, UNICAS

Scientific discipline: architecture and urban planning.

Silesian University of Technology,

Faculty of Architecture.

It fell to me the difficult task of evaluating a very ambitious doctoral thesis in the area of historic preservation in close connection with the application of the latest digital tools and techniques.

With satisfaction to find that this is another important doctoral dissertation addressing these issues, now probably the most important in the modern understanding of the protection and conservation of monuments - probably innovative in Polish realities. Led by the same promoters, in a way continuing and significantly developing the subject matter.

Doctoral student summarizes the work as follows *“The dissertation makes a significant contribution both in the scientific research and heritage conservation by*

ensuring that historic buildings are documented, studied and protected in the future. By overcoming certain methodological limitations that have implied research until now and providing an operational tool applicable to other European referencis".

The way in which the doctoral student took up the topic and conducted her own research demonstrates her previous good substantive preparation, making it possible to carry out the presented dissertation dissertation. At the same time, it should be emphasized the maturity of the decision to undertake this dissertation, in the context of the great shortage of historical and field research from the area of the Kingdom of the Two Sicilies and the Papal State, as well as proven methods for this kind of activity. Also worth emphasizing is the the fact that the doctoral student formulated them and then developed them - which is the most important value of the work with regard to the analyzed cases.

To summarize the preliminary reflections of the review, it should be noted that the dissertation is related with the author's previous interests. The doctoral student refers to previous research of her own, which demonstrates both her conviction to pursue the topic and her and passion for research.

1. GENERAL DATA ABOUT THE DISSERTATION

Selected formal features of the dissertation:

- the dissertation is distinguished, which should be emphasized, by the large scope of the developed problematic (methodology) and scientific independence of the doctoral student.

- The work has 305 pages, 83 Illustrations are included, including numerous studies of their own, with many diagrams and tables.In addition, there are many illustrations and photos taken using 3D scanning techniques.u Particularly relevant are: "Workflow steps for the enhancement of the neglected architectural heritage. (Author's elaboration)"; "Ontology-based semantic database procedure for parametric modeling Way of complex architectures" (p.98); "Definition of a hierarchical structure carrying out the breakdown (WBS)". (p.109); "Procedure scheme for the narration of the historical evolution of architecture. [Pelliccio, A., Saccucci, M. and Miele, V. (2022).

The thematic bibliography counts 326 publications (a significant number of recent ones) - constituting a comprehensive overview, however, it would be advisable to their numbering. In doing so, it should be noted that the endings of chapters as and their relevant parts, relevant lists of publications are also included (references). The following information was also used posted on websites. Add to this should be added numerous author's graphic elaborations of the doctoral student, especially in the the field of illustrations and analyses based on scanning materials. The literaturę has been selected according to the nature of the issues related to the developed issues: conservation theory and practice, cultural issues, historical, art, sociological and digital technologies.

Together with a rich bibliography, illustrations the work is fully understandable. The level of scientific language of the dissertation, is stylistically high: despite the difficult and substantively extensive subject matter. An important help in the perception of the content is the compiled index of illustrations.

2. STRUCTURE OF THE DISSERTATION

"Semantic ontology-based database for parametric modeling of complex architectures in their improvement/maintenance process. An example of a fortification system along the former border between the Kingdom of Sicily and the Church State in Italy," proposes a comprehensive research methodology - in terms of digital documentation, analysis and valorization of defense architecture.

The structure of the dissertation was developed in a correct, classical scientific form, and meets the basic formal requirements of a of a standard doctoral dissertation. It should be emphasized that the author has fulfilled her task at a high level. Very extensive research author's own research was contained in chapters with distinctive thematic issues, logically organized and necessary for the formulation of later aluations and indications. formulation of subsequent evaluations and indications. This is a very strong element of the of the dissertation presented. The substantive part of the dissertation was summarized in: considerations and final reflections, verification of research on the subject matter issues, and conclusions and recommendations.

At the close there were biliography, list of illustrations and tables , as necessary elements of the dissertation and supplement the base for consideration.

The adopted structure of the work made it possible to take a comprehensive look at the essence of the studied issue, difficult, strongly developed and multithreaded. This demonstrates maturity in the author's onstruction of the dissertation scientific dissertation.

The general scheme of the layout of the doctoral dissertation:

I. Introduction - characteristics of the problem and topics of the dissertation.
II. State of knowledge about Italian fortifications.
III. General research.
IV. Ontology-based semantic database for parametric moAn ontology-based semantic database for parametric modeling of architecture assemblies.
V. Detailed research. Study cases.
VI. Case studies.
VII. Conclusions and recommendations. Reflections and final thoughts.
VIII. Bibliography.
IX. Indexes.

Detailed content of the chapters shows a logical arrangement of the structure, clearly integrated with the specificity of the subject matter. In total, the dissertation contains eight main chapters.

Chapter I: *Topics, justification of the topic, subject and structure of the dissertation* – contains standard elements of dissertations: from the genesis and motivation for taking up the topic, to stating the purpose, scope, thesis of the research work, to defining the methods of the research.

The doctoral student correctly realizes in the work the completion and organization of broader knowledge about fortification referring, among other things, to the ideas of other authors [e.g., Villa, 2015], *protection and development of heritage at the level of spatial - as a network of fortified structures, requires a general understanding of its historical context. Such an understanding should include not only the history of military defense and architectural language, but also the also the interaction with the environment, the urban context and the physical elements-which constitute the cultural heritage as a whole*.

In Chapter II. “The state of knowledge of Italian fortifications.”

In accordance with the common rules of a scientific dissertation, the author characterized the the current state of knowledge related to the research problem to the extent necessary for the work. Numerous examples of fortifications from the area of southern Lazio have been analized - as a basis for subsequent, author's considerations.

In the context of history, the author performed the necessary scope for the dissertation of research on fortification in the adopted historical period.

Chapter III.

In *Current state of knowledge* in the field of research of the fortification heritage of Southern Lazio, the author addressed the basic aspects of this issue: the formal structure of fortification sites, the contemporary approach to their protection and use, applied in this methodological process. The issues she exhaustively illustrated with numerous examples of existing solutions – Italian and Lazio in particular. Examples of the broader context are relevant, as they they are characterized by certain distinctions of cultural heritage growing out of the different fortification experiences. They therefore provide a useful knowledge base comparative knowledge of the heritage of the Kingdom of Sicily versus the Church State.

An essential and indispensable in any scientific discourse is to establish a definitions of the terms we use. In accordance with this unwritten standard the doctoral student quoted the definitions of ontologies and fortification terms used in the dissertation - which undoubtedly facilitated further reading and prevented unintentional misunderstandings. These were included on pp. 86 - 95, in with reference to the types of fortification facilities. In the above context it would definitely be advisable to to cite the publication by Prof. Janusz Bogdanowski “Defensive architecture in the Landscape of Poland. From Biskupin to Westerplatte” (1996) with richly illustrated examples of the development of fortifications. In the above context context, it would definitely be advisable to To cite the publication of Prof. Janusz Bogdanowski *“Defensive architecture in the Landscape of Poland. From Biskupin to Westerplatte”* (1996) with richly illustrated examples of the development of fortifications.

In later chapters, the doctoral student clearly introduces and applies the underlying principle that ***“objects and their surroundings should be digitized -***

as one of the most appropriate method of preservation." *The changes that will occur at these sites over the past few years are significant and weighty. By incorporating digitization technologies, it is possible to conduct continuous monitoring of ongoing work and documentation of all modifications and changes....*

Chapter IV. "*Semantic database based based ontology for parametric modeling"*.

The author presented the characteristics of extensive, comprehensive own research – an important element of the presented dissertation - primarily in three main aspects: methodological, scientific and operational. This is illustrated by the diagram on p. 98.The detailed scope primarily includes field research, which is very extensive and thorough. This and subsequent analyses constitute perhaps the greatest scientific contribution of its own to the doctorate. The work required, first of all, the **creation** of their thoughtful methodology, and then to perform painstaking work and record the results accordingly. The doctoral student used such as performing 3D scanning of selected objects and illustrating the results graphically and textually.

In conclusion: the presented methodology of research of South Lazio's heritage sites is based on the basis of own field research and on field and scientific being, in the opinion of the reviewer, an appropriate basis for further independent scientific considerations.

In Chapter V, *"Detailed research. Study Cases."*

The author examined the conditions strategic terrain of South Lacium, among others, geographical realities, historical development and management frameworks operating in the Middle Ages - at the scale of the complex historical region. And also the interaction between the former settlement of Roman origin and the new locations, which was noted as early as the 19th century. In result of the research, the doctoral student proposed a division into 3 zones of fortified structures: Western Shore Zone, Intermediate Zone, Eastern Land Zone - with their characteristics, connections between zones (e.g., roads) and demarcations. Also presented are selected study cases of medieval fortifications from different areas of the Peninsula.

Chapter VI

Then The doctoral student presented extensively and exhaustively 5 examples of fortification complexes in the order of the 3 basic aspects of the work - textually and graphically. She presented the final results very extensively, with detailed

semantic-digital notations, in the form of cards, developed ontologically in color technique. The cards include, among other things, 3D scans of objects, surrounding terrain, data analysis, etc. - in a form that allows make additions to surveys, results of ongoing monitoring, etc.

Chapter VII. *Conclusions and recommendations. Reflections and final thoughts, summary of the whole.*

An important chapter, in which the author discusses her work, presenting her ideas, implementation and achievements. She tries to be objective, factual and certain - which marks a thoroughly executed research. She states among other things, "*This work contributes to the fields of digital heritage preservation and research on fortification architecture by developing an innovative ontology-based methodology for documenting and analyzing fortifications. It bridges the gap between historical documentation and modern digital techniques, providing a valuable tool for both researchers and practitioners. The operational model created as part of this research has the potential to strengthen decision-making processes decision-making on preservation and valorization activities, ensuring that these historic structures are preserved for future generations."*

The reviewer agrees with these words - but with the observation that this is a model with preliminary potential. It is optimistic, however, that the doctoral student, a young researcher sets a goal (hopefully to be realized) to develop a universal methodology that could be applied to other regions and historical periods. Referring to the above statements, the following questions arise regarding the use of the the presented model:

- How to relate it to other groups of monuments?
- How to link the developed base ontologies to the BIM, for simple application, e.g. in the field of design?
- Is it possible to remodel the procedures handling of rather complex programs, in order to simplify the use of research results by users such as designers?

4. FINAL CONCLUSIONS

- Summarizing the whole, the dissertation provides a clear and logical record of the author's approach to the topic *"Semantic database based on an Ontology for*

parametric modeling of complex architectures in the process of their rovement/maintenance. An example of a fortification system along the former border between the Kingdom of Both Sicily and the Church State in Italy."

- Among **the most significant achievements** of the dissertation include taking up ontological themes in the modern sense (issues in digital information) - on the subject of historic preservation.
- The stated goals were achieved and the hypothesis(s) were confirmed.
- The doctoral student has demonstrated a **distinguished** ability use of the scientific apparatus.
- The independence of the doctoral student deserves to be emphasized, expressed in a significant number of own elaborations in the dissertation - especially author's illustrations, diagrams and tables, with regard to summarizing the various stages of consideration. In the reviewer's opinion, this work is particularly outstanding in this respect **distinctive**.

Taking the above into account, I believe that

The dissertation by M.Sc. arch. Virginia Miele entitled: "Ontology-based semantic database for parametric modelling of complex architectures in their enhancement process. The case of fortified system along the ancient border between the Kingdom of Two Sicillies and the Papal State, in Italy." prepared under the direction of Prof. arch. Magdalena Żmudzinska, at the Faculty of Architecture, Silesian University of Technology, and Prof. arch. Assunta Pelliccio, UNICAS in 2023, meets the conditions specified in Article 187 of the Law of July 20, 2018. - Law on Higher Education and Science and recognized standards of quality dissertations and may be subject to further proceedings on the way to the granting of the degree of Doctor of Technical Sciences.