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УНИВЕРСИТЕТ
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OPINION

by Assoc. Prof. Dr. Eng. Silvia Marinova
Department of Photogrammetry and Cartography,
Faculty of Geodesy, UACEG

on the doctoral dissertation and the accompanying documents submitted for the acquisition of the educational and scientific degree "Doctor" in the scientific specialty "Cartography and GIS", within professional field 5.7. Architecture, Construction and Geodesy

Candidate: Eng. Nikoleta Nikolova, full-time PhD student in the doctoral programme "Cartography and GIS" at the Department of Photogrammetry and Cartography, Faculty of Geodesy, University of Architecture, Civil Engineering and Geodesy (UACEG)
Title of the doctoral dissertation: Analysis of the Symbol System and Content of WEB Maps
Scientific supervisor: Prof. DSc Eng. Stanislav Vasilev

The present opinion has been prepared based on Order No. 299 dated 27 March 2026 issued by the Rector of the University of Architecture, Civil Engineering and Geodesy (UACEG), the Regulations for the Implementation of the Development of Academic Staff Act at the University of Architecture, Civil Engineering and Geodesy, and the decisions adopted at the first meeting of the scientific jury.

1. Brief Biographical Information

Eng. Nikoleta Nikolova graduated with a degree in Geodesy from the University of Architecture, Civil Engineering and Geodesy (UACEG) in 2022. In 2023, she was enrolled as a full-time PhD student at the Department of Photogrammetry and Cartography, UACEG. During her doctoral studies, she completed a short-term Erasmus+ mobility programme at Masaryk University in Brno, Czech Republic. Her main research interests are in the fields of geoinformation technologies, geographic databases and web design.

2. General Description of the Submitted Materials

As part of the procedure for the defence of the doctoral dissertation, Eng. Nikoleta Nikolova has submitted the following documents:

- Curriculum vitae (CV);
- Order for the enrolment of the PhD student;
- Order for completion of the doctoral studies with the right to defend the dissertation;
- Scientific publications related to the doctoral dissertation;
- Doctoral dissertation;

- Extended abstract of the doctoral dissertation;
- Declaration of originality and authenticity of the doctoral dissertation, as well as other documents whose submission is not required for the present procedure.

The submitted **doctoral dissertation** comprises 171 pages of main text and 27 appendices. It consists of an introduction, nine chapters, a list of references, lists of tables, figures and appendices, a statement of contributions, and a list of the author's publications. The dissertation contains 132 figures and 19 tables.

The topic of the doctoral dissertation is both relevant and significant, with web maps being the subject of the research. In the introduction, the candidate formulates the main objective of the research, namely to provide a better understanding of how the design of symbols and their interactivity influence the overall effectiveness and use of the cartographic product.

The first four chapters are theoretical and examine the fundamental principles of cartographic design, the role of symbols and symbol systems in web cartography, the nature of the symbol, and cartosemiotics. Particular attention is paid to eye-tracking systems and their application in cartography, as well as to methods for evaluating the quality and effectiveness of web maps.

The subsequent three chapters present the empirical research conducted. They comprise an experimental analysis of the effectiveness of cartographic symbols in relation to their structure, a comparative assessment of the current state of Bulgarian geoportals and web maps based on predefined criteria, and an experimental evaluation of the effectiveness of map legends for double-articulated symbols using an eye-tracking system.

The experimental work conducted using modern eye-tracking technologies is highly commendable. The studies were carried out at UACEG and Masaryk University in Brno, involving more than 130 participants in total. The specific recommendations proposed for improving the cartographic design, functionality, and structure of web maps demonstrate the practical applicability of the research.

The extended abstract of the doctoral dissertation consists of 75 pages and provides a comprehensive and consistent presentation of the dissertation content. It includes the relevance of the research problem, the research tasks, the theoretical foundations of the study, the experiments performed, the results obtained, as well as a summary of the contributions and the author's publications related to the dissertation.

A total of six **scientific publications** have been submitted, three of which are in Bulgarian and three in English. All publications are single-authored and directly related to the doctoral dissertation. The examination of the submitted publications identifies an overlap between Publication 1 and Publication 3.

3. Impact of the Candidate's Scientific Publications in the Literature (known citations)

No known citations of the submitted publications by the doctoral student have been identified.

4. Contributions

Based on the objectives and the results achieved in the doctoral dissertation, ten scientific, scientific-applied and applied contributions have been formulated, which I generally accept. It should be noted that Contributions 4 and 8 primarily contain descriptions of the activities performed and analyses conducted. It would be more appropriate to formulate these contributions more clearly in order to highlight the specific results achieved explicitly.

The contributions identified by the author are significant for the development of web cartography and have practical applicability in the design of effective web cartographic products.

5. Evaluation of the Candidate's Personal Contribution

I consider that Eng. Nikoleta Nikolova has made a significant personal contribution to the research conducted, the synthesis of the obtained results, and the overall preparation of the doctoral dissertation.

6. Critical Remarks

Several spelling and technical errors have been identified in the doctoral dissertation and the extended abstract, including an incorrect indication of the name of the scientific specialty on the title pages of both documents.

In the extended abstract, within the "Introduction" section, a subsection entitled "Main Objective and Research Tasks" is included; however, the main objective of the doctoral dissertation is not clearly and independently formulated, which represents a significant omission.

Although the author provides clarification regarding the meaning assigned to the term "content", I consider its use to be insufficiently precise. In the present context, the term refers to the elements of the web map located outside the map frame (scale, legend, coordinate system information, projection, etc.). It is recommended to use a more accurate term that clearly reflects this meaning and avoids the possibility of different interpretations.

Some of the figures included in the doctoral dissertation (e.g., Figure 2.11) are not the author's own, while their sources are not properly acknowledged.

The cited literature sources are incompletely and, in some cases, inaccurately presented in the reference list. For some sources, essential bibliographic information, such as publisher, page numbers, and other required elements, is missing, while in some cases only the names of the first authors are provided. These deficiencies also lead to incorrect referencing of certain sources within the main text of the doctoral dissertation.

7. Personal impressions

I have known Eng. Nikoleta Nikolova since her student years, when she stood out for her perseverance and determination. Throughout the years, she has developed her professional competencies, demonstrating ambition and a commitment to achieving scientific results with practical applicability and relevance to contemporary challenges.

8. Conclusion

Taking into consideration the above, I express my positive assessment and recommend that the Scientific Jury support the awarding of the educational and scientific degree "Doctor" to Eng. Nikoleta Nikolova in the professional field 5.7 Architecture, Construction and Geodesy, scientific specialty "Cartography and GIS".

30.07.2026 г.

Member of the Scientific Jury:
Assoc. Prof. Dr. Eng. Silvia Marinova