OPINION

от Prof. Evdokia Nikolaeva Sotirova, PhD,

Burgas State University "Prof. Dr. Asen Zlatarov"

of a dissertation thesis for awarding the educational and scientific degree of "Doctor"

in the field of higher education: 4. Natural Sciences, Mathematics and Informatics,
Professional field 4.6. "Informatics and Computer Science",
Doctoral Program "Informatics"

PhD student: Ilia Iliev Nedelchev

Topic: Development of intelligent tools for working with virtualized cultural and historical sites

Scientific supervisor: Prof. Stanimir Stoyanov, Phd

1. General presentation of the procedure and PhD student

The opinion was drawn up on the basis of order No. RD-22-2527 / 15.12.2025 of the Plovdiv University „Paisii Hilendarski" Prof. Rumen Mladenov, PhD and Protocol 1, by which I have been appointed as a member of the scientific jury and entrusted with the task of preparing an opinion within the procedure for the defense of a dissertation entitled: „Development of intelligent tools for working with virtualized cultural and historical sites" with author Ilia Iliev Nedelchev, for the acquisition of the educational and scientific degree "Doctor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, Professional field 4.6. Informatics and Computer Science, Doctoral program "Informatics" at the Department of Computer Systems, Faculty of Mathematics and Informatics (FMI).

The materials presented by Ilia Iliev Nedelchev are in accordance with the Regulations for the Development of the Academic Staff of Plovdiv University "Paisii Hilendarski".

Ilia Iliev Nedelchev was born on 10.10.1984. On 01 March 2023, the doctoral candidate was enrolled as a full-time PhD student in the doctoral programme "Informatics" at Paisii Hilendarski University of Plovdiv. By a decision of the Departmental Council of the Department of Computer Informatics (Minutes No. 3/07.11.2025), the candidate was deregistered with the right to defend the doctoral dissertation.

2. General assessment of the dissertation research

Actuality of the topic

The topic of the dissertation is aligned with global trends in the digitalisation of cultural heritage, as well as with the growing need for intelligent, personalised and context-oriented systems for the presentation, analysis and use of cultural and historical information. Considering that Bulgaria possesses an exceptionally rich and diverse cultural heritage that is still not sufficiently effectively presented and promoted through contemporary digital means, the topic can be regarded as having high scientific and practical relevance. The development of intelligent

platforms based on knowledge, ontologies and technologies from the field of artificial intelligence represents a topical research direction, while the architecture proposed in the dissertation demonstrates an interdisciplinary approach and the potential applicability of the results in other applied domains.

Knowing the problem

The presented dissertation demonstrates a very good understanding of the research problem. The author has carried out a focused analysis of existing approaches, technologies and methods related to the digitalisation and intelligent processing of cultural and historical information. The main concepts and theoretical foundations from the fields of information and communication technologies, artificial intelligence and ontological modelling have been systematically reviewed, forming the scientific framework of the study. The doctoral candidate shows good awareness of contemporary solutions and the limitations of existing systems, and clearly identifies problematic areas and the need for an integrated, intelligent and context-oriented approach. The analysis of relevant scientific publications and research projects is adequate and critically oriented.

Research methodology

The methodology employed by the doctoral candidate is appropriate and consistent with the stated aims and objectives of the dissertation. It includes analysis and systematisation of existing scientific research, modelling of conceptual architectures, as well as development and validation of the proposed solutions in an applied environment. Appropriate methods for ontological modelling, development of intelligent agents and integration of heterogeneous data have been applied. The systematic transition from theoretical analysis to practical implementation enables an assessment of the applicability and effectiveness of the proposed solutions, thereby confirming the scientific soundness of the methodology.

Characterization and evaluation of the dissertation thesis

The dissertation of Iliya Iliev Nedelchev comprises 144 pages. It consists of a list of figures, an introduction, four chapters, a conclusion, a declaration, a list of the author's publications, publications cited in the dissertation, and a bibliography. The bibliography includes 116 references, of which 87 are in Latin script and 29 are in Bulgarian.

In the *Introduction*, the relevance of the research problem is convincingly justified, the aim and main objectives of the study are clearly formulated, and the applied research methodology is outlined. *Chapter One* presents a critical and competent analysis of existing approaches, technologies and models for the digitalisation and intelligent processing of cultural and historical information, which provides the necessary theoretical foundation for the dissertation. *Chapter Two* develops and substantiates the conceptual model and architectural solution of the proposed platform, with a coherent and well-argued justification of the selection of the main components and personalisation mechanisms. *Chapter Three* presents the implementation and detailed analysis of a prototype of a personalised virtual tourist guide based on the Jason multi-agent system; the software implementation and architectural solutions are competently described and demonstrate the practical applicability of the proposed concept. *Chapter Four* demonstrates the adaptation of the developed platform to a different application domain: air quality monitoring, where experimental validation is used to assess its potential for decision support, as well as to identify limitations and directions for further improvement with regard to data exchange structuring. In the *Conclusion*, the main results of the research are summarised, conclusions regarding the achievement of the stated aims and objectives are drawn, and opportunities for future development and extension of the proposed solution are outlined.

The dissertation is well structured and complies with established academic standards. The stated aim and objectives have been achieved. The obtained results are convincing and are presented at both scientific and practical levels.

3. Assessment of the publications and personal contribution of the PhD student

The results of the dissertation research have been validated and published in two scientific publications - one in the journal Future Internet (Q2 quartile) and one presented at the ICAI conference. The publications are fully aligned with the topic of the dissertation and reflect the doctoral candidate's personal contribution. According to the submitted report on the fulfilment of the national minimum requirements, Iliya Nedelchev has achieved a total of 78 points, exceeding the minimum required threshold of 30 points, thereby fully meeting the regulatory requirements.

4. Contributions and significance of the development

I consider that the contributions of the dissertation by Iliya Iliev Nedelchev are of a scientific-applied and applied nature, and they can be summarised as follows:

1) A model and architecture of a platform for the digitalisation of cultural heritage based on a personalised virtual tourist guide have been proposed.
2) A multi-agent approach for personalisation has been developed, taking into account contextual information and individual user characteristics.
3) A functional prototype of a personalised virtual tourist guide has been implemented.
4) The applicability of the proposed platform has been demonstrated through experimental validation in a different application domain.

The obtained scientific-applied and applied results are original, have high practical significance, and propose viable solutions with potential for real-world implementation. They are fully consistent with the stated aim of the dissertation research.

5. Abstract of dissertation thesis

The abstract has a length of 36 pages, is well structured, and accurately and comprehensively reflects the content of the dissertation, the obtained results, and the conclusions drawn from the research.

6. Critical remarks and questions

I have no critical remarks regarding the doctoral candidate. For future research, it is recommended that the experimental evaluation of the platform be extended to include a larger number of scenarios and user profiles, which would contribute to a more comprehensive assessment of its adaptability and scalability.

7. Conclusion

My assessment of the dissertation thesis, the author's abstract, the publications, and the scientific activity of Iliya Iliev Nedelchev is entirely positive. The dissertation contains scientific-applied and applied results that represent an original contribution to the field and demonstrate that the doctoral candidate possesses solid theoretical knowledge, the ability for critical analysis, and the capacity to conduct independent scientific research.

The dissertation fully complies with the requirements of the Academic Staff Development Act of the Republic of Bulgaria, its Implementing Regulations, as well as the criteria set out in the Regulations for the Development of Academic Staff at Paisii Hilendarski University of Plovdiv.

This provides sufficient grounds for me to confidently recommend that the esteemed members of the Scientific Jury award Iliya Iliev Nedelchev the educational and scientific degree "Doctor" in professional field 4.6 "Informatics and Computer Science".

21.01.2026 Prepared the opinion:.....
Burgas (Prof. Evdokia Sotirova, PhD)