

## REVIEW

by **Dr. Vladimir Vassilev Monov**,

**Professor at the Institute of Information and Communication Technologies - BAS**

of a dissertation for the award of the educational and scientific degree "**Doctor**"

in: field of higher education: 4. *"Natural Sciences Mathematics and Informatics"*

professional field 4.6. *"Informatics and Computer Sciences"*

doctoral program *"Informatics"*

**Author:** Iliya Iliev Nedelchev

**Topic:** "Development of intelligent tools for working with virtualized cultural and historical objects"

**Scientific supervisor:** Prof. Dr. Stanimir Nedyalkov Stoyanov, Plovdiv University "Paisii Hilendarski"

### 1. General description of the submitted materials

By order No. ПД-22-2527 of 15.12.2025 of the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the scientific jury for conducting a procedure for the defense of a dissertation on the topic "Development of intelligent tools for working with virtualized cultural and historical objects" for the acquisition of the educational and scientific degree "doctor" in the field of higher education 4. "Natural Sciences Mathematics and Informatics", professional direction 4.6. "Informatics and Computer Sciences", doctoral program "Informatics". Author of the dissertation is M.Sc. Iliya Iliev Nedelchev - a doctoral student in full-time education at the Department of "Computer Systems" with scientific supervisor Prof. Dr. Stanimir Nedyalkov Stoyanov from PU "Paisii Hilendarski".

The set of materials presented by Iliya Nedelchev is in accordance with Art. 36 (1) of the Regulations for the Development of the Academic Staff of the University of Plovdiv and includes the following documents:

- application to the Rector of the University of Plovdiv for the opening of the procedure for the defense of a dissertation;
- curriculum vitae in European format;
- protocol of preliminary discussion of the dissertation in the department and the opinion of the scientific supervisor on the readiness to open the procedure;

- dissertation;
- abstract in Bulgarian and English;
- list of scientific publications on the topic of the dissertation;
- copies of the scientific publications;
- declaration of originality and authenticity of the attached documents;
- reference of compliance with the minimum national requirements.

The attached documents comply with the regulatory requirements set forth by the Law on the Development of Academic Staff in the Republic of Bulgaria and the Regulations for its implementation for the acquisition of the ONS "doctor".

## **2. Brief biographical data of the doctoral student**

The attached CV shows that the doctoral student obtained a master's degree in psychology in 2017 at the University of Veliko Tarnovo "St. Cyril and Methodius". Since 2023, he has been studying in a full-time doctoral program at the Department of Computer Systems, with his main activities and acquired skills in the field of artificial intelligence and intelligent agents. He has worked in a Bulgarian company as a team leader for the development of software solutions. His scientific research interests and professional activities are in the field of information technology and computer systems, software development using modern programming languages.

## **3. Relevance of the topic and appropriateness of the set goals and tasks**

The dissertation is dedicated to the development of information technologies and intelligent methods related to the construction and development of a platform for the digitization of cultural and historical heritage. The development of a concept, model and architecture of a personalized tourist guide is envisaged as the main component of the platform. The dissertation topic is in line with modern trends for the ever-wider penetration of digital technologies, intelligent methods and tools for the purposes of studying cultural and historical sites, their presentation as structured knowledge in the form of ontologies, their storage and use in an accessible digital format. The set goal and tasks of the dissertation are specifically aimed at the creation of intelligent tools (software agents and a virtual tourist guide) for the provision of personalized tourist information for sites of cultural and historical heritage. In this context, the topic of the dissertation research is distinguished by its current nature, as well as the potential for contributions in scientific and scientific-applied terms.

## **4. Understanding the problem**

The introduction and literature review made in Chapter 1 of the dissertation are presented on 45 pages. The main and specific aspects of modern tourism and the offered tourist services are ana-

lyzed, the features of the virtual tourist guide as a tourist product, as well as the role of artificial intelligence in the development of intelligent software agents are discussed. The main types of intelligent agents and their basic functions are considered, such as: analyzing dynamic environmental conditions, using reasoning to interpret events, solving problems, drawing conclusions and choosing actions. The conclusions to Chapter 1 emphasize the need to develop a virtual tourist guide with the ability to provide tourists with access to all tourist services, using tools for real-time analysis of all information in the tourist destination and offering personalized tourist solutions.

The analytical review conducted in the problem area of the dissertation shows in-depth knowledge of the subject and current problems, as well as the potential opportunities for finding new solutions with scientific and applied contribution.

## **5. Research Methodology**

The methodological plan for conducting the research and achieving the set results includes the phased creation of a concept, model and architecture of a basic tourist guide, development of a prototype, determination of parameters for personalization of the basic tourist guide, testing and demonstration of the applicability of the development in various application areas. The implemented methodological approach fully meets the set goal and objectives of the dissertation research.

## **6. Characteristics and evaluation of the dissertation work**

The dissertation is 144 pages long and consists of an Introduction, 4 chapters, Conclusion, Lists of figures, publications on the dissertation work and used literature. In accordance with the requirements, a Declaration of originality and reliability of the results obtained is attached to the materials. The list of literature sources includes 116 titles, including sources from Bulgarian and foreign authors and Internet sites. The list of publications on the dissertation topic contains 2 titles. Additionally, a complete list of the doctoral student's publications, containing 7 titles, is presented.

In Chapter 1, an analytical overview of the state and problems in the development of modern tourism supply is made. The trends for the use of intelligent software agents and virtual reality technology in the tourism industry are emphasized. The need for conducting the dissertation research is justified.

In Chapter 2, a model and architecture of a personal tourist guide are developed, the main agents and functionalities of the model are defined. The tourist region of the city of Gabrovo was chosen for its testing and validation.

In Chapter 3, the developed prototype of the virtual tourist guide is presented. For the program implementation of the prototype, a software tool (Jason - an open source interpreter) for building multi-agent systems was used, with the software agents described in Prolog.

In Chapter 4, a version of the developed prototype is presented, adapted for the purposes of monitoring air quality in the city of Plovdiv. The development is in the form of a personal assistant, designed to identify and localize various anomalies related to the state of the air, based on measurements.

The results obtained in the individual chapters of the dissertation are convincingly presented and analyzed, the conclusions drawn are indicated for each chapter. In general, the dissertation work is characterized by a thorough knowledge of software technologies for the construction of multi-agent systems, the development and integration of intelligent software tools in the virtual physical space platform ViPS, as well as their practical application in the fields of tourism and environmental monitoring. The obtained author's solutions and results are tested and analyzed and meet the set goals and objectives.

In the final part of the dissertation, the results of the dissertation work are summarized and directions for future research are outlined.

## **7. Contributions and significance of the development for science and practice**

I accept and positively evaluate the contributions formulated in the dissertation and the abstract. They are mainly of a scientifically applied nature and can be summarized as follows.

- A concept, model and architecture of a basic tourist guide have been developed.
- A working prototype of the tourist guide for the tourist region of the city of Gabrovo has been created.
- The possibilities for the developed prototype to work in two different application areas have been demonstrated:
  - ✓ in the field of tourism as a personal tourist guide;
  - ✓ in the field of ecology as a personal assistant for environmental monitoring.

The listed contributions relate to the development of new and improvement of existing methods and approaches in the field of multi-agent systems, the creation of personalized solutions for working with virtualized objects in the fields of cultural and historical heritage and ecology. The results obtained have useful practical applications, as well as potential for future development with

the use of machine learning and artificial intelligence methods in order to improve and expand the capabilities of the developed prototypes.

## **8. Assessment of publications on the dissertation work**

Two publications on the dissertation topic are presented, which are co-authored, in English and were published in the period 2024-2025. They are in editions that are referenced and indexed in the databases of Scopus and Web of Science, respectively, and in one of the publications the doctoral student is the first co-author. The publications reflect essential parts and main results of the research conducted and meet the requirements for acquiring the educational and scientific degree "doctor". A complete list of the doctoral student's publications presenting his results in the field of the dissertation topic is additionally presented to the dissertation work. This ensures the necessary publicity of the doctoral student's scientific research activity and the results of the dissertation research.

## **9. Personal involvement of the doctoral student**

I do not know the doctoral student personally and have no direct impressions of his work. My acquaintance with the dissertation, the abstract and the publications made gives me reason to believe that the dissertation work and its contributions are the personal work of the doctoral student, obtained under the direct supervision of his scientific supervisor. I am not aware of any evidence of plagiarism.

## **10. Abstract**

The abstract is 36 pages long and meets the requirements for its formatting. Its content corresponds to the content of the dissertation and presents the main results of the dissertation work. An abstract of the dissertation in English is also presented in a volume of 33 pages.

## **11. Critical remarks and recommendations**

I have no critical remarks on the substance of the dissertation and the presented results. In connection with the content of chapters 3 and 4 of the dissertation, I have the following question:

What are the similarities and differences from a systematic point of view between the prototype of a tourist guide developed in chapter 3 and its adapted version of a personal assistant for environmental monitoring, presented in chapter 4?

Some inaccuracies and omissions of an editorial and technical nature can be pointed out. For example, in some places in the text the term "guide" is used, in others "tourist guide", without indicating a difference between the two concepts. In this regard, unified terminology should be used.

Also, according to the regulatory requirements for the formatting of the dissertation work, the list of used literature sources should be titled “Bibliography”, not “Referred literature”.

These remarks are not on the substance of the work and do not reduce the value of the contributions in the dissertation work.

My recommendation to the doctoral student is to continue research activities in accordance with the guidelines for future work outlined in the dissertation, as well as the preparation and publication of self-authored publications.

## **CONCLUSION**

I positively assess the scientific research work carried out and the results obtained in the dissertation. The dissertation contains original scientific and applied results that meet the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law and the relevant Regulations of the Plovdiv University "Paisii Hilendarski". The dissertation shows that the doctoral student possesses in-depth theoretical knowledge and professional skills in the scientific specialty "Informatics", demonstrating qualities and skills for independent conduct of scientific research.

I strongly propose to the esteemed Scientific Jury to award the educational and scientific degree "doctor" to M.Sc. Iliya Iliev Nedelchev in the field of higher education: 4. "Natural Sciences, Mathematics and Informatics", professional field 4.6. "Informatics and Computer Sciences", doctoral program "Informatics".

06.01. 2026

Reviewer: .....

/prof. dr. Vladimir Monov/