

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: Georgi Kostadinov Kostadinov

Topic: "Research for the development of an ambient-oriented route generator"

Scientific supervisor: Prof. Dr. Asya Georgieva Stoyanova-Doycheva

Plovdiv University "Paisiy Hilendarski"

1. General description of the submitted materials

By order No. ПД-22-1309 of 29.06.2026 of the Rector of Plovdiv University "Paisiy 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 "Research for the development of an ambient-oriented route generator" 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". The author of the dissertation is M.Sc. Georgi Kostadinov Kostadinov - a full-time doctoral student at the Department of Computer Systems with scientific supervisor Prof. Dr. Asya Stoyanova-Doycheva from the Paisiy Hilendarski University.

The set of materials presented by Georgi Kostadinov 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 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 results and contributions;
- 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 the Academic Staff of the Republic of Bulgaria and the Regulations for its implementation for the acquisition of the educational and scientific degree "doctor".

2. Brief biographical data of the doctoral student

The attached CV shows that the doctoral student has acquired a bachelor's degree in computer science and a master's degree in software technologies at the Paisiy Hilendarski University, respectively in 2012 and 2014. In the period from 2011 to the present, he has worked in the field of information technologies in Bulgarian software and business companies as a software developer, development and maintenance of websites and platforms, senior software engineer and team leader. He is studying in a full-time doctoral program at the Department of Computer Systems, and his main research interests are in the field of artificial intelligence, machine learning, ambient intelligence and ontologies. The professional qualification and active work of the candidate in the field of information technologies and computer systems fully correspond to the topic and requirements of the present procedure.

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

The set goal and tasks of the dissertation are aimed at the development of an ambient-oriented intelligent tourist guide, using ontological knowledge and ambient assessment for a justified selection of tourist, cultural and historical sites and generating practically feasible routes to them. It is planned to design and argue a two-stage model of the tourist guide and to develop a prototype of a recommender system, implementing the model in a working software package. The main functions of the prototype system are search by ontological concepts and an algorithm for ambient reassessment of candidate sites, as well as explanation and management of recommendations. The set goal and objectives of the dissertation are well motivated and in line with the increasingly widespread penetration of information technologies and computer systems in the tourism industry, which undoubtedly determines the topical nature of the research conducted and the practical usefulness of the results obtained in the dissertation.

4. Knowledge of the problem

The introduction and literature review made in Chapter 1 of the dissertation are presented on 30 pages. The current state of research in contemporary tourism and the proposed tourist services is outlined, considering and analyzing both classical approaches and their limitations, as well as models and systems for context-dependent recommendation of objects, generation of tourist routes, the development of interactive tourist guides, the use of ontologies, context and personalization in tourist systems. A systematic comparative analysis of existing approaches and recommender systems in tourism has been made, on the basis of which the place of the intelligent tourist guide proposed in the dissertation is determined as an innovative hybrid solution with a context-dependent mechanism for ranking tourist objects and practically oriented ambient evaluation and generation of routes.

The literature review and analysis of the current state, achievements and modern trends in the problem area of the dissertation demonstrate in-depth knowledge of the subject and current problems, as well as potential opportunities for solving them.

5. Research Methodology

The methodological approach applied in the dissertation includes an analytical overview of the achievements and challenges in the research area, justification of the relevance of the problem being solved, a reasoned formulation of the main goal, sub-goals and tasks of the work. The theoretical basis of the research, the developed model, architecture and main functionalities, their software implementation, experimental research, analysis and summary of the results are presented sequentially and step by step. The implemented methodological approach fully meets the set goal and tasks of the dissertation research.

6. Characteristics and evaluation of the dissertation work

The dissertation is 157 pages long and consists of an Introduction, 4 chapters and a Conclusion with a summary of the results obtained. The text uses 10 figures and 21 tables. 6 appendices are added to the dissertation, describing respectively the interface of the developed prototype, validation scenarios, guidelines for implementation and development of the system, quality of the data used, error and failure processing and terminological notes and definitions. The list of bibliographical sources includes 83 titles, and the list of author publications on the dissertation topic contains 4 publications. According to the requirements, a Declaration of originality and authenticity of the results obtained is attached to the set of materials.

Chapter 1 provides a literature review and comparative analysis of contemporary recommender systems in tourism, on the basis of which the present work is motivated and the place and specific features of the model proposed in the dissertation are determined.

Chapter 2 develops the main functionalities and multilayer architecture of an ambient-oriented intelligent tourist guide with a presentation, application, integration layer and knowledge base.

Chapter 3 presents the developed prototype of an intelligent tour guide, describing the technical platform for the implementation of the prototype, the data model, the user profile and the ambient characteristics of the objects used (location, accessibility, exposure, working hours).

Chapter 4 presents the experimental validation of the developed prototype, with experiments carried out on two bodies of tourist objects: 100 objects in the city of Plovdiv and 143 objects in the region of the city of Gabrovo. Methodically conducted experiments and comparative analysis of the results demonstrate the advantages of the ambient-oriented model in the implemented test scenarios and assigned user profiles.

In the final part of the dissertation, the results obtained are summarized and the contributions, which are defined as scientifically applied, applied and methodological, are listed. Directions for future research and development of the obtained results are outlined.

The dissertation work is characterized by in-depth knowledge of information technologies and computer systems in tourism and the provision of modern and effective tourist services. In this area, an original author's approach is proposed for developing an intelligent ambient-oriented tourist guide based on ontological knowledge and ambient assessment of tourist sites. A software prototype of the model has been developed, systematized and methodical experimental tests have been carried out, data analysis shows the advantages of the chosen approach and the applicability of the obtained results. The appendices added to the dissertation contribute to the overall and complete appearance of the dissertation research.

7. Contributions and significance of the work for science and practice

I accept and positively evaluate the results of the dissertation work. The doctoral student has classified them into three categories as conceptual and applied scientific, applied and methodological results. According to Art. 27 (1) of the Regulations for the Implementation of the Law on the Development of the Academic Staff of the Republic of Bulgaria "The dissertation must contain scientific or applied scientific results that constitute an original contribution to science." In accordance with this provision, I assume that, in general, the results in the dissertation are of an applied scientific nature and can be summarized as follows.

- A two-stage architecture of an intelligent tourist guide is proposed, including a mechanism for semantic extraction of tourist objects and subsequent assessment of the objects by ambient indicators.
- A multidimensional accessibility model has been developed, taking into account both motor, visual and auditory limitations on the ranking, as well as meteorological limitations as an external dynamic factor in assessing the exposure.
- A mechanism for supplementing missing ambient data through a language model (GPT-5.4) with controlled use of artificial intelligence without automatic acceptance of inferred data has been implemented.
- A modular server prototype of an intelligent ambient-oriented tourist guide with a user interface, database, ontology layer, ambient characteristics, integration with a meteorological service and controlled AI-inference has been developed.

- A methodology for testing and validating ambient-oriented route recommendations has been developed and implemented.

The listed results relate to the development of new and improvement of existing methods and approaches in the construction and practical application of tourist recommender systems. They also have potential for future development using artificial intelligence, route optimization and multi-criteria route suggestion.

8. Assessment of publications on the dissertation work

Four publications on the dissertation topic are presented, which are co-authored, in English and were published in the period 2020-2022. Three of the publications are in issues that are referenced and indexed in the global databases IEEE, Scopus, Web of Science. In two 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 obtaining the educational and scientific degree "doctor". The publications provided the necessary publicity for the doctoral student's scientific research activities on the dissertation topic.

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

11. Critical remarks and recommendations

I have no critical remarks on the substance of the dissertation and the presented results. Minor inaccuracies and omissions in the text of an editorial and technical nature may be pointed out. For example, according to the requirements for the design of the dissertation work, the list of used literature sources should be entitled "Bibliography". Also, some of the figures in the text are poorly visible. 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 the research activity in accordance with the guidelines for future work outlined in the dissertation.

CONCLUSION

I positively assess the work done and the results obtained in the dissertation. The dissertation contains applied scientific results that represent an original contribution to science and meet all 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 University of Paisiy Hilendarski. 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. Georgi Kostadinov Kostadinov in the field of higher education: 4. “Natural Sciences, Mathematics and Informatics”, professional direction 4.6. “Informatics and Computer Sciences”, doctoral program “Informatics”.

04/08/2026

Reviewer:

/Prof. Dr. Vladimir Monov/