R E V I E W

by **Corresponding Member Lyubka Doukovska, DSc**
from the Institute of Information and Communication Technologies,
at the Bulgarian Academy of Sciences,
on the Thesis for awarding educational and scientific degree **PhD**, under the Scientific field: **4. Natural Sciences, Mathematics and Informatics,**
the Professional area: **4.6. Informatics and Computer Sciences,**
the Scientific specialty: **Informatics**

Author of the PhD thesis: **Kristian Nedelchev Milev**

Thesis title: **Intelligent Personal Tour Guide**

In accordance with Order No. RD-21-906/26.04.2024 of the Rector of the Plovdiv University "Paisii Hilendarski", I have been appointed as a member of the Scientific Jury regarding the PhD thesis of **Kristian Nedelchev Milev** for awarding the educational and scientific degree "Doctor of Philosophy" (PhD) in the Scientific Field **4. Natural Sciences, Mathematics and Informatics**, the Professional Area **4.6. Informatics and Computer Sciences**, the Scientific Specialty: **Informatics**. The scientific advisor is Prof. Asya Stoyanova-Doycheva, PhD.

As a member of the Scientific Jury I have received:

1. Order No. RD-21-906/26.04.2024 of the Rector of the Plovdiv University "Paisii Hilendarski";

2. Application for opening a procedure for acquiring the educational and scientific degree PhD;

3. European Curriculum Vitae;

4. Protocol No. 9-23/24 from 12.04.2024 of the preliminary discussion of the PhD thesis in the Computer systems department at the Plovdiv University “Paisii Hilendarski”;

5. Opinion of the scientific supervisor on the readiness of the PhD thesis for defense;

6. Reference to the implementation of the minimum requirements of the of the Faculty of Mathematics and Informatics at the Plovdiv University “Paisii Hilendarski” for obtaining the educational and scientific degree PhD;

7. Abstract of the PhD thesis;

8. PhD thesis;

9. Declaration for the original scientific and applied scientific contributions;

10. List of the publications included in the PhD thesis;

11. Copies of the publications included in the PhD thesis.

In order to form the final evaluation of the dissertation, the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* are implemented the specific requirements in the Act’s Institutional Regulation shall be taken into consideration, where the respective norms are:

1. Pursuant to Art. 6 (3) of the *Development of Academic Staff Act in the Republic of Bulgaria,* PhD thesis should contain scientific or scientific-applied results, which represent an original contribution in science. The PhD thesis must indicate that the candidate has in-depth theoretical knowledge of the relevant specialty and ability for independent research.

2. According to Art. 27 (2) of the specific requirements in the Act’s Institutional Regulation, PhD thesis should be presented in a form and volume corresponding to the specific requirements of the primary unit. The PhD thesis should contain: a cover page; content; introduction; exhibition; conclusion - a summary of the results obtained with a declaration of originality; bibliography.

I. Actuality and significance of the PhD thesis.

The relevance of the PhD thesis is determined by the field of research presented, namely Artificial Intelligence. Artificial Intelligence is the science of the

concepts, methods and means of creating intelligent models for the study of natural intelligence.

The PhD thesis submitted for review is devoted to the creation of intelligent assistants to assist tourists in their choice of tourist routes. Generating virtual routes using the location of historical or ethnographic sites is an opportunity to increase the tourist's interest and enrich his knowledge.

The objectives of the PhD thesis are "to develop an intelligent tour guide architecture" and "to develop a prototype of the presentation layer of a tour guide".

To achieve these goals, the following scientific tasks have been formulated:

1. Develop the architecture as a cyber-physical space according to the ViPS reference architecture.

2. Defining intelligent services in the tourist guide architecture.

3. Development of a mobile application for the functionalities of the tourist guide.

4. Development of questionnaires and user profiles.

II. Summary of the PhD thesis.

The PhD thesis consists of 112 pages. Its structure includes an introduction, three chapters, a conclusion, future development, references and a declaration of originality of the results.

In the "Introduction" of the PhD thesis, the subject and scope of the PhD thesis research are presented. The objectives of the PhD thesis are formulated and the main tasks that will be followed in order to realize the objectives are described.

In the first chapter, "Current State in the Field", an overview of existing developments and research related to travel guide applications and recommender systems in the field of tourism is reviewed. A classification of existing developments is presented to support the process of systematizing information and summarizing the various approaches and methods in the field of research.

In the second chapter, "Architecture of the Intelligent Tour Guide", the tour guide architecture is presented, focusing on the adaptation to the ViPS (Virtual Physical Space) architecture. Its development was carried out with the need to ensure a high degree of personalization and adaptability, taking into account the different needs

and preferences of users. An important aspect of the architecture development is the creation of mechanisms for providing intelligent services in the form of microservices to meet the specific needs of users.

In the third chapter, “Implementation of a Prototype for an Intelligent Tour Guide”, the design and development of a prototype of the presentation layer of the tour guide is presented. The architectural solutions chosen in the design of the user interface are shown, as well as the choice of appropriate technologies for mobile application development, user interface design, application navigation and visual representation of information.

In the “Conclusion“, a summary of the results obtained from the conducted PhD thesis research is presented, and they are analyzed in relation to the achievement of the scientific goals set in the introduction. Future directions for continuing work on the topic are also discussed.

The relationship between the chapters is ensured by the logic of the exhibition and allows for a thorough understanding of the scientific research.

The cited sources are sufficiently diverse and for the most part they are written by foreign authors. The presence of Bulgarian authors in the literature used also makes a good impression.

III. Evaluation of the PhD thesis's contributions.

During the achievement of the main goal and solving the tasks related to it, the following main results were obtained, and in summary:

1. An architecture for an intelligent tourist guide has been developed, meeting the following criteria:

1.1. the architecture is designed as a cyber-physical space according to the ViPS reference architecture;

1.2. intelligent services have been defined within the tourist guide architecture, including route generation and traditional costume recognition.

2. Aprototype of the presentation layer of the tourist guide has been developed, which includes:

2.1. development of a mobile application for the functionalities of the tourist guide;

2.2. development of questionnaires and user profiles.

I accept that the contributions so formulated could be considered to have scientific and common application. This separation would allow detailing the results obtained in accordance with the specificity of their significance.

IV. Assessment of the submitted publications.

The presented list of publications of the PhD student on the PhD thesis includes four publications, three of which are referenced in WoS and/or SCOPUS. The published results are original and I am not aware of any plagiarism.

The qualities of the presented papers have been proven by being published in papers at national and international conferences and in journals. The data thus presented give me reason to conclude that the research has been provided with the necessary publicity among the scientific community.

V. Evaluation of the PhD abstract.

The PhD abstract is consisting of 32 pages. It reflects the essence and content of the dissertation, including the purpose, subject, object and tasks of dissertation research and the ways of their realization.

VI. Remarks and recommendations.

In order to form the final evaluation of the PhD thesis, the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* and its Implementation Rules are to be taken into account, according to which I have the following remarks and recommendations:

1. The content of the dissertation does not meet the requirements of Art. 27 (2) of the *Development of Academic Staff Act in the Republic of Bulgaria*. The PhD thesis should contain a conclusion - summary of the obtained results and end with a bibliography.

2. Style errors are noted in the text of the PhD thesis.

3. The formulation of the PhD thesis results does not allow emphasizing the individual contribution of the PhD student.

4. The PhD student should focus his efforts on publishing his results in refereed scientific publications.

VII. Conclusion.

I accept that the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* and the specific requirements in the Act's Institutional Regulations for its implementation, the Rules for the conditions and the order for acquiring academic degrees and the Rules for the specific conditions for acquisition of academic degrees and occupation of academic positions at the Plovdiv University "Paisii Hilendarski" are accomplished.

After my introduction to the PhD thesis and its publications, an analysis of their significance and the contributions they make, I give my positive assessment and I recommend to the Honorable Jury to award the educational and scientific degree "Doctor of Philosophy" (PhD) to **Kristian Nedelchev Milev** in the Scientific Field **4. Natural Sciences, Mathematics and Informatics**, the Professional Area **4.6. Informatics and Computer Sciences**, the Scientific Specialty **Informatics**.

23.05.2024 Signature: ……..……..

Sofia /Corr. Member Lyubka Doukovska/