

## OPINION

on a PhD Thesis

in the professional field 4.6. Informatics and Computer Science, PhD program in  
Informatics

Author of the thesis: **Stefan Kostadinov Stefanov**

PhD Thesis topic: **Innovative methods to support decision-making in wildland fires or floods**

Member of the scientific jury: **Assoc. Prof. Lian Nedelchev, PhD (IOMT – BAS)**

### **1. Relevance of the problem developed in the dissertation – degree and levels of relevance of the problem and the specific tasks developed in the dissertation**

In the context of climate changes in recent decades, caused by global warming, the topic of wildland fires and floods is extremely relevant, both globally and in Bulgaria. These natural disasters not only cause enormous material losses, but also pose a serious risk to human health and life. Therefore, any research directed to the more rapid control and thereby aimed to limit material damage and loss of life related with wildland fires and floods is undoubtedly relevant. Moreover, the dissertation uses interdisciplinary approach including various software applications, Geographic Information Systems (GIS) and other databases, integrating and facilitating access to them, in order to support decision-making in cases of forest fires and floods. The topicality of the problem is also well substantiated in the dissertation itself, based on statistics on forest fires and floods from reports of the European Commission and the National Statistical Institute.

In this regard, I believe that the goal of the thesis is very precisely chosen and allows to achieve significant new scientific and applied results. The specific research tasks are clearly structured and aimed at achieving the goal of the dissertation, covering the consecutive stages of research – analysis of basic concepts and methodology in the field, development of information system and finally its testing in cases of real wildland fires and floods in Bulgaria and Armenia.

### **2. Level of knowledge of the state of the art of the problem and creative interpretation of the references**

The dissertation submitted for evaluation consists of 122 pages and contains an introduction, a presentation of four chapters, a conclusion, a declaration of originality of the results, a list of publications on the dissertation and a bibliography. A total of 107 references were cited, including scientific publications in English, Bulgarian, as well as Internet links. The work contains a total of 57 figures, 5 tables and 6 appendices.

In the introduction, the PhD candidate outlines the actuality of the problem and presents the methodological parameters of the thesis, its structure, subject, goals and research tasks.



In Chapter 1 a description is given of the concepts included in the PhD thesis: wildland fires, floods, and the underlying information systems used (IS) - EFFIS, AFIS and EFAS. Statistics on fires in the period from 2009 to 2018 and floods in the period from 2010 to 2019 in Bulgaria are also presented.

Chapter 2 introduces a methodology for development of IS to support decision-making in forest fires or floods. Two basic models are discussed used to develop web-based GIS application and "Open-source architecture for development of web GIS application" and "Conceptual model of IS, supporting decision-making in forest fires or floods" are suggested.

In Chapter 3 the PhD candidate presents architecture and software implementation of a web GIS application - part of IS, supporting decision-making in forest fires or floods.

In Chapter 4 are presented and tested IS for decision support in forest fires in the region of DGS "Zlatograd" and at risk of flooding in the region Syunik, Armenia.

As can be seen from the reference list, the PhD candidate shows a thorough knowledge of the latest achievements in the field of the PhD thesis.

### **3. Scientific and scientific-applied contributions of the thesis. Significance of contributions to science and practice. Correspondence between the set goal and tasks and the achieved contributions.**

The contributions of the present dissertation can be divided into scientific and scientific-applied. Scientific contributions include the analysis of existing Geographic Information Systems (GIS), in particular the comparative analysis of open source and commercial software, and the development of an algorithm for building open source IS, for decision support in forest fires or floods.

Scientific-applied contributions, as indicated by the PhD candidate, include: a) development and testing of methodology for working with real data to visualize parameters as topography, meteorology, plant species and water resources; b) architecture of web GIS application implemented by open-source software tools; c) development and testing of Information Systems to support decision-making in wildland fires and floods.

I believe that the contributions formulated in this way adequately summarize the most important results in the dissertation, and also correspond to the set goal and objectives.

### **4. Evaluation of the publications on the dissertation: number, nature of the editions in which they are printed. Citations and acknowledgements by other authors in other laboratories, countries, etc.**

The results of the research in the thesis are presented in 4 publications. Two of them are in journals/book series with impact rank, and the other two are in peer-reviewed conference proceedings. Three of the publications are co-authored with the supervisor, one is independent. No citations are reported, which can be explained by the fact that the impact rank publications are from the last year – 2020.

According to the minimum requirements of IICT-BAS for the acquisition of PhD degree at least 30 points are required for a group of indicators D. According to the attached reference, Stefan Stefanov has 40 points (2 x 20 points for both publications in editions with SJR without IF), which satisfies the above minimum requirements.

#### 5. Comments, recommendations and remarks

I consider as a positive fact that in preparing his PhD thesis, Stefan Stefanov has taken into account the comments and recommendations made during the preliminary presentation of the dissertation materials. The text is clear and well-structured, some occasional misspellings do not reduce its value.

#### 6. Conclusion

The PhD thesis complies with the requirements of the Law on the development of academic staff in the Republic of Bulgaria, the Regulations for its implementation, and the Regulations and specific conditions for acquiring scientific degrees and academic positions at IICT - BAS in the professional field 4.6. Informatics and Computer Science, Doctoral program in Informatics. Therefore, I give a **positive assessment** and propose to the scientific jury to award a PhD degree to Stefan Kostadinov Stefanov.

Date: 16.08.2021



Assoc. Prof. Lian Nedelchev