

OPINION

from professor D.Sc. Ivan Garvanov
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Member of the Scientific Jury appointed by the Director of IICT-BAS via
Order № 112/09.06.2020

SUBJECT: Dissertation of Boris Atanasov Staykov with title "METHODS, ALGORHYTHMS AND SOFTWARE SYSTEMS FOR DECISION SUPPORT", presented for the acquisition of educational and scientific degree "doctor" in a doctoral program "Informatics", Professional field 4.6. "Informatics and computer science".

1. General description

As a member of the Scientific Jury I have received:

- Dissertation
- Abstract in Bulgarian and abstract in English
- a list of printed scientific publications on the dissertation topic
- information about the fulfillment of the minimum requirements of IICT

2. Actuality, purpose and tasks of PhD dissertation

The essence of decision-making process includes booth of quantitative and qualitative indicators that define this multi-criteria problem non-trivial and complex. Consequently, conducting of scientific research related with development of models and algorithms to support decision-making and in particular, group decision-making, is a current research area.

The purpose of this dissertation is to design and implement Decision Support Systems based on selected methods for solving different classes of multicriteria optimization problems.

To achieve the goal of the dissertation, the following research tasks are formulated:

1. Selection of methods for solving problems for multicriteria optimization, which will be the basis of the built systems.
2. Algorithmic and software of the selected methods, which will represent the core of the developed systems.
3. Development of syntax for defining tasks for multicriteria optimization and its software for the purposes of the developed systems.
4. Implementation of SPVR for use in a working environment under the WINDOWS operating system.
5. Implementation of web-based SPVR.

6. Development of communication modules allowing data exchange with external systems.

3. Analytical characterization of PhD dissertation

The dissertation consists of 174 pages, structured in an introduction, four chapters, a conclusion, a list of publications on the dissertation, a list of observed citations on the dissertation, a summary of the results achieved and a bibliography.

The chapter one describes scalarizing tasks and algorithms for solving multicriteria optimization problems, developed in cooperation with a team of scientists at BAS. As a result, an interactive algorithm based on the GENS-IM method was developed and implemented, and serves as the basis for the computational modules in the developed multicriteria optimization application systems MKO-2.1. and WebOptim. Some of the results are presented in publication № 5.

The chapter two describes the development of the MKO-2.1. This includes a syntax for defining multicriteria optimization problems; control module and optimization module. A detailed description of the system operations has also been made. The results are presented in publications №7 and №8.

The chapter three describes the development of the web-based decision support system WebOptim. This includes: the overall software architecture of the system; database architecture; interface modules; control module; module security and user management; module for management and maintenance of computing sub-modules (solvers); Intermodal communication system; public API module for connection and data exchange with third party systems. The results are presented in publications №2, №4 and №6.

Purpose of chapter four is to test and validate the developed software systems and their multicriteria optimization algorithms. Systems performance is proven by solving a real-world example of multicriteria optimization problem and comparing results with those obtained by solving the same problem with another independent similar system. The results of the experimental design are described in publication №3.

4. Contributions

I accept all the doctoral student's contributions, namely:

1. Multiple methods for solving multicriteria optimization problems have been systematized and some of them have been selected for algorithmic and software implementation.

2. A syntax and corresponding software parser have been developed for defining linear and linear-integer problems for multicriteria optimization.

3. Control and calculation modules of the MKO-21 system have been designed and developed for operating under WINDOWS operating system.

4. The common architecture, functional abilities and user interface of the web-based system WebOptim have been designed and implemented.

5. Communication modules for electronic information exchange with third party systems have been developed for the purposes of the web-based system WebOptim.

6. Experimental studies have been conducted in order to prove the operability of the developed systems.

5. Abstract and author' declaration

The presented two versions of the abstracts in Bulgarian and English correctly reflect the content of the dissertation and correspond to the requirements of Bulgarian legislation. From the presented declaration of originality, as well as from the presented papers on the dissertation theme, it can be judged that the described results are a personal work of the author.

6. Assessment of compliance with the minimum national requirements

The PhD student Boris Staykov has tested parts of his dissertation in eight scientific publications, all in English. Two of the publications are with Q3, one is with Q4 and one is a chapter from a book.

According to the minimum national requirements for obtaining of the educational and scientific degree „Doctor in the professional field 4.6 " Informatics and computer science ", the required scores are to be at least 30 for the group of indicators G. The same number of scores is required by the Regulations on the Conditions and Procedures for Acquisition of Academic Degrees and Occupation of Academic Positions in BAS and the Regulations on Specific Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions in IICT-BAS. The presented publications on the dissertation form a total 111 scores for the indicators from G group, which is significantly higher than the required minimum of 30 scores. Three of the publications are cited in 11 scientific publications.

7. Critical remarks and recommendations

The formulas in the dissertation are not numbered and it is difficult to cite them in the text.

Some of the described results in the dissertation are not reflected in publications and it is recommended to be published.

8. Conclusion

The presented dissertation meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation, the Rules for the conditions for the acquisition of academic degrees and for the occupation of academic positions in the Bulgarian Academy of Sciences and the Rules for the specific conditions for the acquisition of scientific degrees and for academic positions at IICT-BAS.

The described results in the dissertation, along with the fulfillment of the national minimum requirements, give me enough reason to give a positive assessment of the dissertation work and **I suggest to the honorable scientific jury**

to award to Boris Atanasov Staykov the educational and scientific degree „Doctor” in doctoral program "Informatics", professional field 4.6 "Informatics and computer science".

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PUBLIC RELEASE**

22.06.2020

/Prof. DSc Ivan Garvanov/

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