REVIEW

On the dissertation of Georgi Evtimov Evtimov on the topic

"METAHEURISTIC METHODS FOR SOLVING CUTTING PROBLEMS"

submitted in fulfillment of the requirements for the educational and scientific degree doctor (PhD) in professional field 4.6. Informatics and Computer Science

1. Georgi Evtimov was born on February 24 1975 in the town of Zlatograd. He has completed his university education at the University of Architecture, Civil Engineering and Geodesy – Sofia, where he obtained a master degree in "Industrial and Civil Engineering" in 2000. He was enrolled as a PhD candidate in correspondence at the Institute of Information and Communication Technologies – BAS on 01.01.2020. The preliminary dissertation defence of Georgi Evtimov took place on 05.10.2021.

   I was approved as a member of the scientific jury by order № 252/28.10.2021 of the Director of the Institute of Information and Communication Technologies – BAS.

2. The dissertation of Georgi Evtimov has a total volume of 141 pages and consists of an introduction, five chapters, conclusion, list of publications on the topic of the dissertation, contributions in the dissertation, a bibliography with 114 references, as well as something which is rarely seen, namely lists of figures, tables, the algorithms used and the abbreviations.

3. The dissertation is devoted to an actual problem on the border between the Informatics and the Mathematical optimization and more precisely: the combinatorial optimization – metaheuristic methods for solving cutting problems. To my knowledge, no one in Bulgaria has worked in this field up to now.

   Without going into details about the content of the dissertation, I will outline the most important contributions according to me, as well as some recommendations for future research of the PhD candidate. I must mention that all of my critical remarks about the initial version of the dissertation were taken into account. While reading the dissertation I found some spelling mistakes and minor technical omissions such as "Section ??" (on pages 39, 51 etc.) which I had missed during my initial acquisition with it. These mistakes and omissions in no way darken my excellent impressions from the work – it is written very precisely. My only remark which was not taken into account is about the term "polygon" which should be replaced by its Bulgarian equivalent. This remark is however insignificant with regard to the

sense of the work. Also, I acknowledge the fact the term "polygon" has already become popular in Bulgaria and I will also use it below.

In Chapter 2, based on some well-known sources in the field, a very detail analysis is made of the mathematical objects needed in the next chapters of the dissertation. This chapter however can not be described as an overview because it consists of original critical analysis of the existing results. For example, while discussing an idea of J. O'Rourke (page 34), a justified disagreement with the publication cited as [9]. In this case and in similar cases, in future, the candidate could consider using the apparatus of the fuzzy sets which could give him another possibility for evaluation of the situation. Besides discussing the algorithms existing the literature, their extensions and modificiations, as well as new algorithms improving the work of the old ones, are also described. They are illustrated with the help of examples from the professional activity of the candidate in a company producing products of steel. It is shown that the evaluation of the complexity of some of the new algorithms (page 51) is not higher, an in many cases – lower - from the existing evaluation.

Chapter 3 consists of an algorithm and results of its program implementation for 1D-Guilotine cutting, based on the ant colony optimization method which gives better result from the existing commercial products.

Chapter 4 is the main chapter of the dissertation. The much more complex 2D cutting is discussed there. The accent is on strategies for finding of possible and valid placement of a plank in a polygon for filling and for selection of suitable polygon. In my opinion, the most significant part of the chapter and of the whole dissertation is in section 4.5 in which original ideas and algorithms are discussed for removing of the real waste in 2D cutting. This is indeed a very important problem from a practical point of view.

I accept the contributions of Georgi Evtimov pointed out on page 131.

4. The author's summary of the dissertation reflects the content of the dissertation work and meets the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria.

5. From the attached reference, it is clear that Georgi Evtimov is author of 8 publications related to his dissertation. Of them: three are publications in Springer, which were previously reported at international conferences; two are proceedings of international conferences of the European Study Group with Industry. These publications are printed in issues related to the topic of the dissertation. The PhD candidate has not presented any citations but I know of 6 citations of his publications: four citations of publication 1 in the list and two citations of publication 4 in the list.

6. Before the preliminary dissertation defence I had not known Georgi Evtimov. In my opinion, he works very purposefully and very precisely. I would like to recommend that in future he get acquainted with the following monographs:

Стоян, Ю., Н. Гиль. Методы и алгоритмы размещения плоских геометрических объектов. Киев, Наукова думка, 1976.

Стоян, Ю., А. Панасенко. Периодическое размещение геометрических объектов. Киев, Наукова думка, 1978.

7. Taking into account the fact that the dissertation fully meets the requirements of the Regulations for the Implementation of the Law for Development of the Academic Staff in the Republic of Bulgaria, the Regulations of the Institute of Information and Communication Technologies – BAS, I give my **positive evaluation** and recommend to the honorable members of the Scientific jury to vote for awarding to **Georgi Evtimov Evtimov** the educational and scientific degree **"Doctor"** in professional field **4.6 Informatics and computer science"**.

November 14, 2021.   **Member** of the Scientific jury..................