OPINION

by **Prof. Tania Koleva Pencheva, PhD**
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Regarding a procedure of promotion to the **educational and scientific degree "Doctor of Philosophy"**
Area of Higher Education: **4. Natural Sciences, Mathematics and Informatics**
Professional Field: **4.6. Informatics and Computer Sciences**
Doctoral Programme: **Informatics**

Author of the dissertation thesis: **Angel Ivanov Dimitriev**
Title: **Software Product for the Implementation of Generalized Net Models and Its Applications**

According to Order No. 231/24.03.2026 of the Director of the Institute of Biophysics and Biomedical Engineering (IBPhBME) at the Bulgarian Academy of Sciences, I was appointed a member of the Scientific Jury for the defence of the dissertation thesis by the PhD student **Angel Ivanov Dimitriev** for the acquisition of the educational and scientific degree "Doctor of Philosophy".

As a member of the Scientific Jury, I have been provided with:

1. A dissertation thesis for acquisition of the educational and scientific degree "Doctor of Philosophy".
2. A synopsis of the dissertation thesis.
3. Copies of the publications which the thesis is based on.
4. Other procedure-related documents.

The dissertation thesis of **Angel Dimitriev** is 182 pages long, submitted in Bulgarian, and comprises an Introduction, four chapters, formulated contributions, a list of 5 publications on the thesis, a bibliography of 104 literature sources and a declaration for the results' originality. The thesis has been illustrated by 85 figures and 25 code fragments. In the provided form, the dissertation thesis corresponds to the specific requirements defined in Art. 27(2) from the Council of Ministers' Regulations for the Implementation of the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA).

The relevance of the presented dissertation thesis stems from the fact that it is entirely focused on solving key problems in the field of practical applications of generalized nets (GNs). On the one hand, the currently existing software solutions for simulation of GN models lack tools that allow for work in an online environment and automated generation of graphical representations. On the other hand, the growing complexity of GN models also determines the need for accessible and highly efficient software tools for their description and study.

The **aim** of the dissertation thesis is to develop a web-based simulator for GN which provides an interactive environment for creating, visualizing, editing, sharing and simulating models, and to validate its applicability through the development, simulation, and verification of real GN models.

In order to accomplish the **aim** of the dissertation thesis, the following particular **tasks** have been outlined:

1. Development and implementation of an algorithm for automatic drawing of GNs from their description in a structured textual format.
2. Development and implementation of an algorithm for converting an *SVG* image of a GN into *TeX* format, for easy inclusion of visualizations in scientific publications.
3. Formulation of requirements for a web-based solution.
4. Design of the architecture of the ***OnlineGN*** system and definition of the main modules (net storage, visualization, editing, simulation, import/export, *API*).
5. Implementation of a web-based graphical interface for visualization, editing, and personalization of the generated image (places, transitions, connections, and visual parameters).
6. Implementation of a convenient interface for editing predicates in the indexed matrix and the characteristic functions of the places.
7. Implementation of a mechanism for online storage and sharing of nets via a unique hyperlink (link), based on centralized database storage.
8. Creation and formalization of new GN models of real processes that have not so far been described by means of GNs.
9. Simulation and verification of the developed models in ***OnlineGN*** through scenarios and experiments.

The presented list of publications on the topic of the dissertation thesis by **Angel Dimitriev** includes 5 publications – 4 of which in scientific journals, and 1 conference communication in full text in conference proceedings. Four of the publications are refereed in globally renowned databases, where 2 of them are published in Impact Factor journals with Q1 quartiles, and 2 are in journals with SJR, in Q4 quartile. In one of the publications **Angel Dimitriev** is a single author, in other 2 he is the first author, and in the remaining 2 – the second author (out of a total of 4 co-authors), which clearly shows his contribution to the obtained and presented results. The publications on the dissertation thesis reflect the main results presented therein, and the provided Reference for 7 citations of these publications is another indisputable and independent indicator of the relevance of the topic and the achieved results.

The presented synopsis of the dissertation thesis is 59 pages long in both Bulgarian and English. It fully covers the essence and contents of the dissertation thesis, including the aim and the tasks set, as well as their execution and the achieved results. Just as a technical note, I would like to point out that the page numbers in the table of contents in the English version do not correspond to the text.

The dissertation thesis of **Angel Dimitriev** is presented in a very logical and analytical form and very well illustrated with 85 figures and 25 code fragments. Upon careful reading, some inaccuracies,

rather of a technical nature, are noticeable, but they do not in any way affect the quality of the achieved and appropriately presented results in fulfilling the aim and tasks.

On the basis of the research elaborated in the dissertation thesis, **Angel Dimitriev** articulated **7 contributions**: **3 scientific contributions**, each of which has 2 sub-contributions, and **4 contributions of scientific-applied nature**, one of which has 3 sub-contributions. I accept the contributions in the form in which they are defined by the PhD student, while I would like to pay **special attention to the exceptional practical focus of the results achieved** in the presented dissertation thesis. The algorithms for automation and visualization of GN and for parallel solution of an exponential problem (Towers of Hanoi) developed as scientific contributions were subsequently implemented and/or validated in the ***OnlineGN*** programming environment, which is the main contribution of scientific-applied nature in the dissertation thesis. As contributions of scientific-applied nature, a new method for representing finite state machines through GNs, as well as GN models of real technological processes in an oil refinery, including for the production of gas, polymer and heavy oil products, were developed. All newly created GN models in the dissertation thesis have been simulated in ***OnlineGN***, which verifies both the correctness of the models and the capabilities of the software system. In summary, the presented dissertation thesis is of an extremely high level, both in scientific and applied aspects.

I personally know **Angel Dimitriev** from his training process in the doctoral programme in Informatics, in which he emerged as an extremely motivated young colleague. Getting familiar with her dissertation thesis reinforced my impression that he is an already established and highly prospective young researcher. I sincerely hope that his potential, as demonstrated in the presented high quality dissertation thesis, will allow him a fast track in his academic career.

In forming the overall assessment of the dissertation thesis, one should render account of the requirements formulated in the DASRBA and the IBPhBME's Regulations for its implementation. PhD student **Angel Dimitriev** not only covers but certainly exceeds the requirements for acquisition of the educational and scientific degree "Doctor of Philosophy", as indicated in the Regulations of IBPhBME for implementation of the DASRBA.

With respect to all of the above, I certify that **the requirements for awarding the educational and scientific degree "Doctor of Philosophy" (PhD) set in the DASRBA and in the Regulations of IBPhBME-BAS for Implementation of the Act have been fulfilled**. After getting familiar with the presented dissertation thesis and the publications it is based on, which give visibility of the results achieved, and after analysis of the significance of these publications and the contributions of scientific and scientific-applied nature contained therein, I justifiably give my **positive evaluation** and recommend the respected members of the Scientific Jury to vote for awarding **Angel Ivanov Dimitriev** with the **educational and scientific degree "Doctor of Philosophy"** in Professional Field **4.6. Informatics and Computer Sciences**, *Doctoral Programme* **Informatics**.

June 16, 2026
Sofia

Signature: .....
(Prof. Tania Pencheva, PhD)