O P I N I O N

by Assoc. Prof. Delyan Georgiev Genkov, PhD from Technical University – Gabrovo

for dissertation
of M.Eng. Ilian Tsvyatkov Varbov
Topic:

“ Modeling and simulation of components of computer systems**”**

for the awarding of the educational and scientific degree "doctor"
doctoral program „Automation of engineering activities and automatic design systems“
in Research area 5.3. Communication and computer technology

1. Topic and relevance of the dissertation

The dissertation has a volume of 120 pages of notes and 62 pages of appendices. It is structured in an introduction, four chapters, conclusion, scientific and applied scientific contributions, a list of publications and a literature review, including 47 titles.

The dissertation is aimed at modeling and simulating basic components of computer systems.

Modeling and simulating components of computer systems is a current problem, raised in some of the scientific research on this topic.

The main goal of the dissertation is to develop and analyze models of basic components of computer systems using modern languages for describing hardware and simulation environments and to create and implement a model of a microprocessor with AVR architecture on an FPGA platform. The object of the research is the processes of modeling and simulating hardware components of computer systems. The subject of the research is the methods, language tools used to create models of functional blocks and microprocessor architectures, as well as their practical implementation on FPGA platforms.

I believe that the topic of the dissertation is relevant and important for practice.

2. Research methodology

When developing the dissertation, a correct choice of approaches, methods and tools was made to solve the tasks set. Models have been created and studied. The results obtained have been systematized and analyzed. On their basis, the conclusions and conclusions have been formulated.

A complex approach has been adopted to realize the stated goal of the dissertation. The tasks set in the dissertation work have been solved and presented in the individual chapters of the presentation.

3. Contributions of the dissertation work

The proposed contributions are defined by the author as scientific and scientifically applied.

I accept the following contributions, and I recommend that the first two be refined and their description shortened:

- Models of basic digital components of computer systems have been created – arithmetic-logic devices, random access memory, multiplexers, demultiplexers, encoders, decoders, counters, registers and comparators – implemented using the hardware description languages VHDL and Verilog.
- Models of microprocessors with RISC architecture have been developed based on the hardware description languages TL-Verilog, Verilog and VHDL. Through these models, the organization and interaction between the main blocks – arithmetic logic unit, register file, memory and control block – has been studied.
- A model of a microprocessor with AVR architecture at the register level has been developed.
- A model of a microprocessor with AVR architecture has been implemented on an FPGA platform.
- An assessment of the performance and resource efficiency of HDL models when implemented on FPGA has been made, which can be used for optimization of future projects.
- A comparative analysis of existing developments and proposed models of microprocessors with RISC and AVR architectures has been made.

4. Publications and citations of publications on the dissertation work

A list of 7 publications is presented, one of which is independent, the rest are co-authored. Two of the publications are in English, and the rest are in Bulgarian. In all joint publications, the doctoral student is in first place in the list of authors.

The main parts of the dissertation work have been presented at international scientific conferences and conferences with international participation. One of the publications is in an IEEE conference and is indexed in the global database – Scopus.

The publications presented in the dissertation work in number and in points exceed the minimum requirements for the number of scientific works when opening a procedure for acquiring the educational and scientific degree “Doctor”, according to the regulatory documents of the Technical University-Gabrovo.

I believe that the publications correspond to the topic of the dissertation work and reflect the results obtained.

There is no information presented about the citations of the doctoral student’s publications, but this is not a requirement for obtaining the educational and scientific degree “Doctor”.

5. Authorship of the results obtained

I personally know the author of the dissertation work. I am confident in the authorship of its development, as well as the results obtained.

6. Opinions, recommendations and remarks on the dissertation

My opinion on the presented dissertation is positive. The tasks set have been fulfilled.

I recommend that the author continue his scientific work and direct his publications to specialized forums and scientific journals.

7. Conclusion

The dissertation meets the requirements for relevance, required volume, structure, publications and contains scientific and scientific-applied applied contributions.
I believe that the presented dissertation meets the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for the Acquisition of Scientific Degrees and Holding of Academic Positions at the Technical University - Gabrovo. The achieved results give me reason to propose that the educational and scientific degree "Doctor" be acquired by M. Eng. Ilian Tsvyatkov Varbov in:
the field of higher education 5. Technical Sciences,
professional field - 5.3. Communication and Computer Engineering,
doctoral program - Automation of engineering activities and automatic design systems.

04.05.2026 г. Signature:

/assoc. prof. D. Genkov, PhD/