R E V I E W

by Prof. DSc Ivan Ganchev Garvanov

University of Library Studies and Information Technologies

of a dissertation for awarding the educational and scientific degree "doctor"
by: field of higher education 4. Natural sciences, mathematics and informatics
professional field 4.6 Informatics and computer sciences
doctoral program "Informatics"

Author: Nikolay Georgiev Handzhiyski

Topic: An iterative parsing algorithm with application in the profiling of parsers

Research supervisor: Prof. PhD Elena Petrova Somova - University of Plovdiv "Paisii Hilendarski"

1. General description of the presented materials

By order № PD-21-654 from 21.03.2024 of the Rector of the Plovdiv University "Paisii Hilendarski", I have been appointed as a member of the scientific jury to ensure a procedure for the defense of a dissertation work on the topic "An iterative parsing algorithm with application in the profiling of parsers" for the acquisition of the educational and scientific degree "doctor" in the field of higher education 4. "Natural sciences, mathematics and informatics", professional field 4.6 "Informatics and computer sciences", doctoral program "Informatics". The author of the dissertation is Nikolay Georgiev Handzhiyski - a full-time doctoral student at the Department of Computer Informatics with scientific supervisor Prof. PhD Elena Petrova Somova from Paisii Hilendarski University of Plovdiv.

The set of electronic materials presented by Nikolay Georgiev Handzhiyski is in accordance with Article 36 (1) of the Regulations for the Development of the Academic Staff of the University of Plovdiv (UP), includes the following documents:

- a request to the Rector of the UP to disclose the procedure for the defense of a dissertation work;
– curriculum vitae in European format;
– minutes from the department council related to reporting the readiness to open the procedure and preliminary discussion of the dissertation work;
– dissertation work in Bulgarian;
– abstract in Bulgarian and English;

– a list of scientific publications on the subject of the dissertation;

– copies of scientific publications;

– list of noticed citations;

– declaration of originality and authenticity of the attached documents;

The PhD student has attached six publications, all indexed in Scopus and WoS., and five of them have SJR and three have IF.

2. Biographical data for the doctoral student

Doctoral student Nikolay Handzhiyski obtained a bachelor's degree in "Informatics" and a master's degree in "Software Technologies" at Paisii Hilendarski University of Plovdiv in 2010 and 2012. During his studies, he specialized for 5 months at Johannes Kepler University, Linz, Austria in 2009 under the Cepus program and five months at Koblenz-Landau University, Koblenz, Germany in 2010 under the Erasmus program.

Throughout his life, the doctoral student has been connected with information technologies, working consistently over time as: programmer, part-time SQL assistant; research assistant, company manager, etc. From January 2018 until now, he has been working at Software Systems - Bulgaria as a programmer responsible for software support.

3. Relevance of the topic and appropriateness of the set goals and tasks

The topic of the dissertation work is extremely current and explores issues related to the design of a data parsing machine. The benefits of this parsing engine are that it will bring together different analysis methods and algorithms.

The aim of the dissertation research is to investigate, propose, design, develop, experimentally implement and test tools (machines, algorithms, models, languages and tools) that are suitable for linear data translation based on some multi-valued context-free grammars.

To achieve the set goal, the following tasks have been formulated:

To make a thorough overview and analysis of theories, approaches, methods, algorithms, models, architectures, machines and systems related to data translation;

To design a parser architecture that combines different approaches and algorithms for lexical and syntactic analysis with some added new capabilities;

To define a new type of context-free grammars according to the proposed parsing machine architecture;

To design a parsing algorithm embedded in the parsing engine that can parse data based on the new kind of grammars;

To design and implement a prototype of a tool for measuring and comparing the resources used by different parsers;

To conduct experiments using the created tool.

4. Knowing the problem

The doctoral student knows very well the topic of the researched problem. He made a thorough review and analysis of 191 literary sources on the problem and correctly defined the purpose and tasks of his research. In the consistent development of the dissertation - from the introduction, before the four chapters to the conclusion, one can see the good knowledge of the scientific problem - both theoretically and practically. Thanks to the skills of the doctoral student and his supervisor, significant initial and practically applied results were obtained, which were approved in six scientific publications.

5. Research methodology

The chosen research methodology allowed the doctoral student to achieve the goal he set and to obtain significant scientific and scientifically applied results. Adequate research methods are applied, based mostly on synthesis and analysis of theoretical statements and results of real research. The chosen research approach to the formulated goals and tasks of the dissertation work is based on analyzing the algorithms for extracting necessary information from some data and, in particular, from textual data.

6. Characterization and evaluation of the dissertation work

The dissertation submitted to me for review consists of 174 pages organized into an introduction, four chapters, conclusions, contributions and appendices, and references.

In the first chapter, an in-depth overview and analysis of finite state machines, stack machines, Turing machines, Markov algorithms, etc. is made. The overview includes well-known recognition and parsing algorithms based on context-free grammars.

Chapter two defines different types of syntax trees and the construction commands that can be used to create trees.

The third chapter describes the Tunnel Parsing algorithm and looks at an example of the defined objects that are used by the algorithm, and demonstrates an example implementation of the algorithm for a selected input string.

The fourth chapter discusses a purpose-built tool called the profiler, which can be used to generate a large number of context-free grammars and inputs, and to perform experiments on

parsers that are generated by various parser generators based on of these grammars. The chapter concludes with the interpretation of the results of four different experiments that were conducted using the profiler.

The conclusion summarizes the obtained scientific results, draws conclusions from the research and gives directions for future research.

The results are presented in 56 figures and 8 tables. 191 literary sources were used.

7. Contributions and significance of the development for science and practice

The dissertation contains contributions that I would classify as both scientific and scientific-applied. In the research of Nikolay Handzhiyski, some known facts are confirmed, an existing scientific field is enriched with new knowledge, and some of the newly obtained scientific results are proposed to be applied in practice.

From the attached declaration of originality of the presented results, as well as from the presented publications on the dissertation work, it can be judged that the described results are original and personal work of the doctoral student. The protocol of the anti-plagiarism system StrikePlagiarism has shown conclusively that the dissertation is original and authentic.

8. Assessment of dissertation publications

Doctoral student Nikolay Handzhiyski has approved parts of her dissertation work in six scientific publications in English. The six publications are indexed in world-renowned databases: 4 (four) in Web of Science and 5 (five) in Scopus. Five of the publications are in issues with SJR. Three of them have IF but no quartiles.

According to the minimum national requirements for receiving the educational and scientific degree "Doctor" in professional field 4.6. "Informatics and computer science", defined in art. 2b, para. 2 and 3 of the Law on the Development of the Academic Staff in the Republic of Bulgaria and, respectively, according to Art. 24, para. 1 of the Regulations for the implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria require the presence of at least 30 points for the Group G indicators. The presented publications on the dissertation form a total sum of points for the indicators from Group G equal to 168 points, which repeatedly exceeds the required minimum of 30 points. All publications on the competition are co-authored with the scientific supervisor, and in all publications he is the first author.

One citation to one of the PhD student's publications is noted.

9. Personal participation of the doctoral student

The personal participation of the doctoral student in the conducted dissertation research is visible both in the dissertation work and in the attached publications. The doctoral student's ability to analyze results from other authors makes a very good impression, which is visible from the theoretical analyzes and discussions in the first chapter of the dissertation work. I also highly appreciate his ability to work with algorithms and programs, as well as his research skills for analyzing the results obtained. From the places of publication of the scientific results obtained by the doctoral student, I am fully convinced that the results are original and have a significant scientific contribution.

10. Abstract

The presented author's abstract in Bulgarian and English by the doctoral student Nikolay Handzhiyski corresponds to the dissertation work and presents the researched problems in a synthesized form. It is in sufficient volume and faithfully reflects the main and most essential ideas, conclusions and contributing points of the dissertation work, as it corresponds to the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and, respectively his Regulations for the implementation.

11. Critical remarks and recommendations

Some of the presented results in the dissertation work were not reflected in the dissertation publications, and my recommendation is that they be published.

12. Personal impressions

I do not know the PhD student and have no publications in common with him, but from the documents provided to me I can express my positive impression of the obtained scientific results and of his career development.

13. Recommendations for future use of dissertation contributions and results

I recommend the PhD student to work with students and PhD students in the future to pass on his knowledge and skills to the young and talented children of Bulgaria.

C**ONCLUSION**

The dissertation contains scientific, scientific-applied and applied results, which represent an original contribution to science and meet all the requirements of the Law on the Development of the

Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of Law and the relevant Regulations of University of Plovdiv "Paisii Hilendarski ".

The dissertation shows that the doctoral student Nikolay Georgiev Handzhiyski possesses in-depth theoretical knowledge and professional skills in scientific specialty 4.6 "Informatics and computer sciences" by demonstrating qualities and skills for independent conduct of scientific research.

Due to the above, I confidently give my positive assessment of the conducted research, presented by the above-reviewed dissertation work, abstract, achieved results and contributions, and I propose to the honorable scientific jury to award the educational and scientific degree "doctor" to Nikolay Georgiev Handzhiyski in the field of higher education: 4. "Natural sciences, mathematics and informatics", professional field 4.6 "Informatics and computer sciences" doctoral program "Informatics".

06.05.2024 Reviewer: .....

Prof. DSc Ivan Garvanov