

Luxembourg, September 16, 2017

Thesis Review of Mr Jakub Marszałkowski

To Whom It Might Concern

« Combinatorial optimization problems in Internet applications »
Jakub Marszałkowski

Reviewer's opinion on Ph.D. dissertation authored by Jakub Marszałkowski entitled "Combinatorial optimization problems in Internet applications"

1. Problem and its impact

In his dissertation, Jakub Marszałkowski is considering three optimization problems related to the area of web applications. The three analyzed problems are: 1) choosing the width of columns on a web page, taking into account convenience of placing advertisements in the future, 2) automatic generation of given tags into tag clouds, that would be aesthetical and provide good readability and usability, 3) automatic solution generating CSS-sprites to optimize web page load time. The problems are connected by their nature that includes a 2D packing component

2. Contribution

The main original contributions of the author in the presented thesis are:

- The formulation of three research problems of which:
 - . the first one is completely new and has never been considered before,
 - . the second one is extending the existing research in the field by a new approach,
 - . the third is going far beyond the state of the art by considering the practical problem and including some additional factors from the real world,
- An analysis of the computational complexity of the problems where necessary,
- The proposal of new algorithms for solving of each of problems, within its limitations, especially on runtime,
- A practical analysis of all of the algorithms with respect to their tuning and efficiency in real-world scenarios,
- Interesting connection of the packing algorithms to provide the solution and scheduling algorithm to test its quality in the CSS-sprite packing.

Each of the separate problems has been successfully published as a research paper in international scientific journals with high impact factors, accordingly European Journal of Operational Research, Engineering Applications of Artificial Intelligence and ACM Transactions on the Web (TWEB). Additionally, according to Google Scholar, the author has been cited 38 times in total. Finally, all three of the solutions have also a practical aspect, their implementations is publicly available at least at the level of proof of concept. From the three problems and solutions, I would point the software suite for CSS-sprite packing as the most advanced and finite. The web-page layout problem, although scientifically and technically sound is more difficult to apply, as it goes against users' habits. The tag clouds problem as a new research branch, opens new perspectives for future researches.

3. Correctness

The research presented in the thesis in question is scientifically correct. The mathematical models for the given problems are sound. The theoretical analysis of the computational complexity of the problems is defensible. Regarding the algorithms validation, the author put particular emphasis on obtaining all of the results on real-world data and these results confirm the correctness of the proposed solution methods for all three considered problems. The extensive tests provided in the dissertation are taking into account properties of the real cases. The testing methodology is properly described as well. The design of the experiments is accurate to the outlined problems and the presented good results were feasible to obtain.

4. Other remarks

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5. Conclusions

Summing up, the Ph.D. thesis presented by Jakub Marszalkowski is written technically correct and with due care. The thesis is covering three current and relevant scientific problems offering original solutions for them. The author demonstrated a proper knowledge and adequate skills in formulating and solving difficult problems in computer science, and particularly in combinatorial optimization. The extensive work and results provided by the author are very good and provide a substantial contribution to the field of research. This claim is strengthened by the publication results of Jakub Marszalkowski.

As a result of the opinion expressed above, I conclude that the thesis "Combinatorial optimization problems in Internet applications" has met the high standards defined by Polish law concerning doctoral dissertation.

A. Does the dissertation present an original solution to a scientific problem?

Definitely YES

B. After reading the dissertation, would you agree that the candidate has general theoretical knowledge and understanding of the discipline of Computing, and particularly the area of Combinatorial Optimization?

Definitely YES

C. Does the dissertation support the claim that the candidate is able to conduct scientific work?
Definitely YES

I also recommend to provide a distinction to the thesis award.

Sincerely yours,



Prof. Dr Pascal Bouvry
University of Luxembourg