

Evaluation Review of the Ph.D. Thesis

Thesis author: Ayca Kirimtat, M.Sc.

Thesis title: Multi-objective Optimization for Smart City Concepts: Smart Floating Cities (SFC)

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The reviewed thesis is oriented on actual problems of smart cities. All of this is related mainly to the concept of Internet of Things (IoT), and focused on rather attractive, yet up to now rarely published topics of Smart Floating Cities. The main focus of the dissertation seems to be on multi-objective optimization of the floating cities layout problem, represented in a form of three case studies, each of them being optimized using a sophisticated selection of evolutionary algorithms.

Miss Ayca Kirimtat has composed her Ph.D. thesis from nine numbered chapters, using 136 pages totally, including all what should be in a Ph.D. thesis. I consider the dissertation structure to be well designed and logical. At the end of the dissertation there is an impressive list of author's publications, consisting of 6 publications in journals with an IF, 3 book chapters, and 14 publications mainly at prestigious conferences. The list of used references consists of 161 items, mostly relevant and well chosen. Among them, five references are publications with Ms. Kirimtat's co-authorship. All these data are impressive and show very deep orientation of the author in the problematics of smart cities and in a number of closely relevant topics.

As I had an opportunity to be the reviewer of the pre-thesis of Ms. Kirimtat, I can certainly say that all my suggestions and comments have been taken into account. The final version of the reviewed thesis achieved rather high scientific level and I consider it to be both interesting and valuable.

The first chapter is devoted to explaining the reasons and motivation why the work is focused on the selected issue. The issue itself – smart floating cities – seems to be attractive and could be also useful sometimes in future.

The goals of the dissertation are formulated in the second chapter. The main goal and its two sub-goals are clearly formulated, but they also have good research potential and are controllable.

The third chapter is devoted to the specification of the used research methods and procedures, especially the graphical representation of methodological procedures in achieving and presenting the results of the dissertation can be appreciated.

Quite an extensive fourth chapter is focused on the analysis of the current state of research and the solutions achieved in the field of research. The doctoral student made considerable efforts to map all possible definitions of the term smart city, while explaining in detail the methodologies of selecting the analysed publications. The results are then summarized in a bit confusing, but useful tables. The use of the VOS tool can be especially appreciated, although I feel that it was possible to extract more information from it.

Chapter five is devoted to the definition of the researched problem. Using three case studies, three possible configurations of floating cities are defined, while they are researched as three multicriteria optimization problems. I consider the chosen approach to be quite appropriate, although it can be criticized for a stronger simplification of the problems solved than would be desirable.

The sixth chapter is devoted to the description of the used evolutionary algorithms and a fairly detailed explanation of their selection. Here it is necessary to appreciate the author's deep knowledge in the field of evolutionary algorithms and calculations. But perhaps it was possible to explain in more detail here or in the following chapter why these algorithms were chosen.

In the seventh chapter, the achieved results are presented using a number of illustrative pictures, which, however, did not always help to better understand what the achieved result is. On the other hand, it is necessary to appreciate the author's invention with which she approached the presentation of results. In any case, the achieved results fulfilled the set goal in a very solid way, they are interesting and in the future they will hopefully be used in practice.

In the eighth chapter, the author evaluates the level of achievement of results, referring to the individual parts of the work where the results can be found. It also refers to several of its own publications, which must also be appreciated.

The short ninth chapter forms the conclusion of the work; the author briefly summarizes the results and suggests possible directions for further research in the field of smart floating cities.

Summarizing my overall impression of the dissertation, the doctoral student has a considerable amount of research work on a very interesting topic. She achieved interesting results by using non-trivial procedures; in the meantime, she has already published some of the results in journals with IF. All this testifies to her deep enthusiasm for research work and their deep knowledge of the issue.

As part of the defense, she could answer the following questions, which shed more light on the issues examined:

1. What was the selection of the evolutionary algorithms you used based on?
2. What do you see as the further development of smart floating cities? What directions of research would you expect here?

Conclusion:

Miss Ayca Kirimtut in her Ph.D. thesis clearly demonstrated her capability to the independent, substantive scientific work and brought new original results, which certainly enriched the

theory and practice. She therefore satisfied the basic requirement laid at the successful doctoral work. Therefore

I recommend the Ph.D. thesis of Ms. Ayca Kiritat to its defence.

In Hradec Králové, August 12, 2021

Prof. RNDr. Peter Mikulecký, PhD.