Bachelor Thesis Review

Faculty of Mathematics and Physics, Charles University

Thesis author	Maksym Huk
Thesis title	Algorithms for indoor wireless sensor system placement
Year submitted	2018
Study program	Computer Science
Study branch	General Computer Science
Review author	Mgr. Martin Pilát, Ph.D. Opponent
Department	Department of Theoretical Computer Science and Mathematical Logic

Overall

	good	OK	poor	insufficient
Assignment difficulty		X		
Assignment fulfilled			X	
Total size *... text and code, overall workload*		X		

The thesis deals with the task of wireless sensor placement inside building. The problem is well-defined and solved using genetic algorithms. I am not sure that genetic algorithms (with binary encoding) are the best evolutionary technique for the problem at hand, I would prefer a floating-point encoding – the encoded individuals would have lower dimension and the implementation of genetic operators would also be more natural. The author does not explain this choice in the thesis.

Regarding the assignment fulfillment, the proposed algorithm is compared only indirectly to one algorithm from literature. Only the numbers reported in the paper are compared to the results from the thesis, while it is not clear, whether the objective of the paper and, more importantly, the problem parameters, were the same as in the thesis. I also miss any information on the number of independent runs in the evolution or any statistical evaluation (I am well-aware that evolutionary techniques can take a lot of time to run and evaluate, but the runtime is also not mentioned in the work, therefore it is not clear if this is the cause of this issue).

On a more positive note, the problem is well-defined and analyzed, the fitness function models the signal strength in the interior with respect to the walls. The floor plan can be simply changed. Therefore, the simulation/implementation part is quite general and could be re-used for the development of other types of algorithms and in other projects dealing with a similar problem.

Thesis Text

	good	OK	poor	insufficient
Form *... language, typography, references*		X		
Structure *... context, goals, analysis, design, evaluation, level of detail*			X	
Problem analysis		X		
Developer documentation			X	
User Documentation		X		

The text of the thesis itself is written in a relatively good English without any serious mistakes. There are only a few typographical problems (variables in text are not set in math font but with the normal font, e.g. page 19 bottom). In some cases, the meaning of the variables could be explained better (e.g. τ_{pd} on page 23, what is d?).

While the author evaluates the algorithms with different settings, it is not clear, whether the algorithms were run multiple times or just once. The comparison of different population sizes is flawed – the author compares the different sizes with the same number of generations, but that means that the algorithm with population of 500 individuals makes 10 times more fitness evaluations (and probably also runs 10 times longer) than the algorithm with 50 individuals. The correct way to compare the settings would be to use, for example, 1000 generations with population of 50 individuals and 100 generations with the population of 500 individuals. Also, from Figure 5.1, it seems that the convergence of the population with 100 individuals is the fastest, but the author claims that setting 500 individuals is better, why?

The definition and analysis of the problem in the text is quite detailed – the problem (and a fitness function) quite well defined. There are some problems in the mathematical notation, however, the main ideas are clear. The biggest problem with the thesis is that there is no developer documentation. The implementation is described very briefly in the text itself, and the attachment contains only the source codes – these are properly commented, but at least some overview text describing the implementation should be included.

Thesis Code

	good	OK	poor	insufficient
Design *... architecture, algorithms, data structures, used technologies*			X	
Implementation *... naming conventions, formatting, comments, testing*		X		
Stability		X		

The whole project is implemented in C#. There are some minor problems with naming conventions (the names of classes start with lowercase letter), but this is at least consistent in the whole project for the author-defined classes.

There is also a problem with the architecture of the application – the implementation of the genetic algorithm uses a reference to the GUI form to pass the parameters. Many of the methods (i.e. the genetic operators) then check the state of the form directly. It would be much better to process this in the GUI and pass some configuration class to the genetic algorithm. With the current implementation, any change of the GUI form requires a change of the implementation of the genetic algorithm.

The most serious problem is that the fitness function used in the implementation is different from the one described in the text, and this is not even mentioned.

Overall grade Good

Award level thesis No

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