Parallel Computations for Various Scalarization Schemes in Multicriteria Optimization Problems

Victor Gergel and Evgeny Kozinov

REVIEW 1	
I appreciate that the Authors use a foreign language and sometimes make mistakes. Some of the sentences have rather convoluted structure and occasionally fail to convey the ideas clearly enough. Ideally, the paper should be proof-read by a native English speaker.	Done
page 1, lines 8-12 in the abstract: The sentence starting from "The overcoming ..." should be rewritten to make it simpler and clearer.	The sentence is replaced “To reduce the computational complexity of multicriteria problems, the methods developed feature an extensive use of all the computed optimization information and are well parallelized for effective performance on high-performance computing systems.”
page 6, line -3: replace "algorithms are defined by defining the expressions" with "algorithms are distinguished by expressions applied"	Done
page 8, lines 12-16 below Table 1: The sentence starting from "First, the averaged ..." in this one-sentence paragraph is too long and its sense is lost.	The sentence has been rewritten “In the first experiment, multicriteria problems were solved using all the considered scalarization schemes (4)-(6), for which a set of different scalarization coefficients was taken. The calculations were performed without using the accumulated search information A_k from (11).”
page 8, line -8: replace "averaged numbers" with "average numbers" There are several other occurrences of "averaged" in a discussion of computational results.	Done
page 9, line 1 above Conclusion: replace "only was not less 100 times" with "always exceeded 100"	Done
page 9, line -3: replace "was not less 100 times" with "always exceeded 100"	Done
REVIEW 2	
Section 5, however, although develops the implementation using the proposed technique, the generic parameters introduced in Section 4 are not quantified in Section 5 in the experiments. For example, what is epsilon in their experiments? A link between the theory and practice would give a coherent analysis of the problem studied.	In Section 5 the sentence is added “The parameter values in the executed experiments were taken as follows: the reliability parameter r=2,3, the required accuracy ε=0,01.”
Section 5 attempts to show that parallel computing is important in solving the 100 multi-criteria example. The authors mention that the most time consuming task of the optimization is done using parallel computing. This is repeated several times on the paper. In the experimental results, they fail to show this.	As it is mentioned in Introduction it is supposed that computing the criteria values can be hard-consuming. In this case the most computational part of the multicriteria problem solving is criteria computations. As a result we measure the cost of the optimization problems by the number of executed iterations but not by the processor time.
For 100 multi-criteria problem, how are the	In Section 5 the sentence is added “ The values of

coefficients alpha selected?	the coefficient α are uniformly distributed within the interval [0,1].”
In the experimental section, besides the speedup results, a bit more detail is needed, such as quantifying the parameters.	See the sentence added for the first remark
REVIEW 3	
The results are encouraging, but it would be useful to discuss them more thoroughly. Especially speedups of 100 times on 16 cores sound strange and need wider explanation. Surely, part of this speedup is due to the enhancement of the algorithm instead of the parallelization and then it would be better to use the fastest sequential version in the computation of the speedup.	The title of Table 3 are replaced by “Overall reduction of executed iterations provided by using the developed approach for solving a MCO problem”. Also the last paragraph has been replaced by “ The efficiency of the developed approach becomes more evident when the obtained reduction of executed optimization iterations is shown in comparison with the initial sequential algorithm, which does not use the search information (Table 3). As follows from the results of performed experiments, the overall reduction when using 16 computation cores always exceeded 100.”
Some kind of comparison with other non-convex multi-objective optimization algorithms would be useful, e.g. presented in [4]. Or at least a discussion about them showing that such algorithms exist.	As a matter of fact, non-convex optimization is not equivalent with Lipschezian global optimization. The following sentences are added in Section 5 “In [9], the proposed approach using the min-max scalarization scheme was compared with the well-known multicriteria optimization methods: • The Monte-Carlo (MC) method, where the trial points are selected within the search domain D randomly and uniformly, • The genetic algorithm SEMO from the PISA library, • The non-uniform coverage (NUC) method, • The bi-objective Lipschitz optimization (BLO) method. In this paper, the efficiency of the proposed approach is compared with other scalarization schemes: the method of successive concessions and the reference point method.”