Parallel Computation for Time-Consuming Multicriterial Optimization Problems

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In the paper, an efficient method of solving the time-consuming multicriterial optimization problems, where the optimality criteria can be multiextremal and computing the criteria values can require a large amount of computations has been proposed. The proposed approach is based on the reduction of the multicriterial problems to the global optimization ones using the minimax convolution of the partial criteria, the dimensionality reduction with the use of the Peano space-filling curves, and the application of the efficient parallel information-statistical global optimization methods [1, 2]. The key aspect of the developed approach consists in the overcoming of the high computational complexity of the global search of the set of the efficient solutions in solving the multicriterial optimization problems. A considerable improvement of the efficiency and an essential reduction of the amount of computations have been provided by means of the maximal possible utilization of the whole search information obtained in the course of computations. Within the framework of the developed approach, the methods for reducing the whole available search information to the values of current scalar nonlinear programming problem being solved have been proposed. The search information is used by the optimization methods for the adaptive planning of the executed global search iter-ations.

The results of the numerical experiments have demonstrated such an approach to allow reducing the computation costs of solving the multicriterial optimization problems considerably tens and hundreds times.

References

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