Short Letter

Corrections on the Box Plots of the Coverage Metric in "Multiobjective Immune Algorithm with Nondominated Neighbor-based Selection"

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Abstract

In this study, we analyze the experimental results in Gong et al. (2008), and find that the box plots of the coverage metric in solving the five three-objective problems are wrong. The corresponding corrected box plots are presented. The corrected results are still consistent with the original conclusions.

Keywords

Multiobjective optimization, coverage of the two sets, nondominated neighbor immune algorithm.

1 Introduction

Recently, we proposed the Nondominated Neighbor Immune Algorithm (NNIA) for multiobjective optimization in Gong et al. (2008). By using the nondominated neighbor-based selection and proportional cloning, NNIA realized the enhanced local search in the less-crowded regions of the current trade-off front. In Gong et al. (2008), NNIA was validated by comparing with NSGA-II, SPEA2, PESA-II, and MISA in solving three low-dimensional problems, five ZDT problems, and five DTLZ problems.

2 The Errors

By checking the experimental results seriously and thoroughly, to our regret, we have to admit that the obtained statistical values of the coverage of the two sets in solving the five DTLZ problems are wrong.

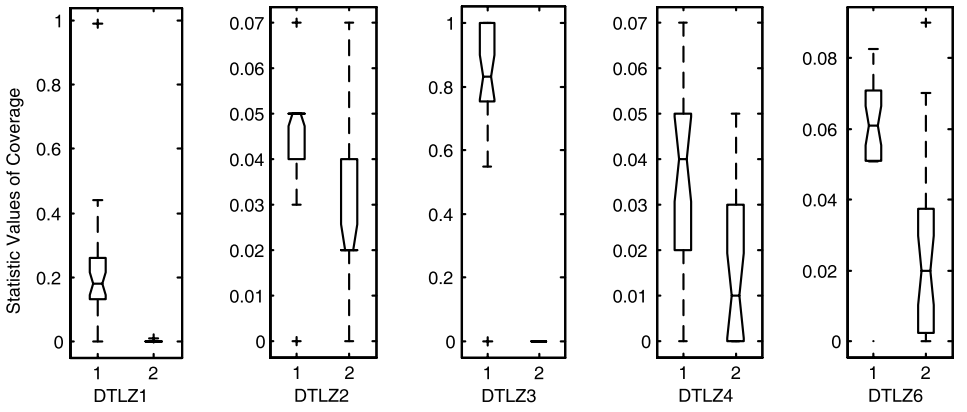

Figure 1: Statistical values of the coverage of the two sets obtained by NNIA and PESA-II in solving the five DTLZ problems. The five plots denote the results of the five problems, respectively. In each plot, the left box represents the distribution of $I_C(\mathbf{I}, \mathbf{P})$ and the right box represents the distribution of $I_C(\mathbf{P}, \mathbf{I})$.

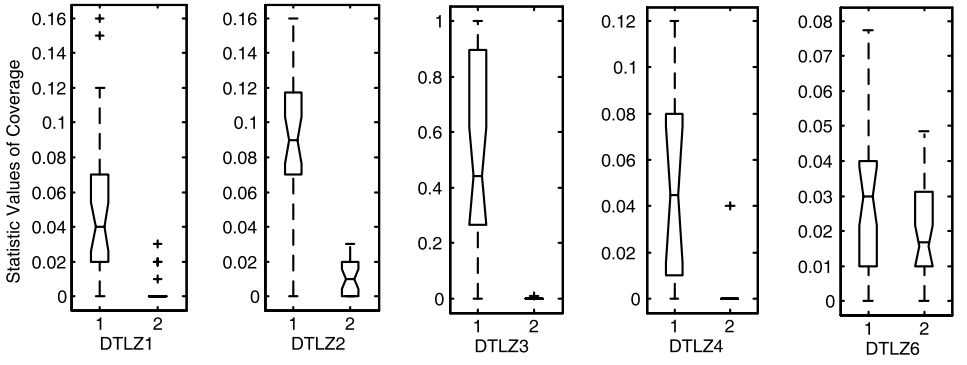

Figure 2: Statistical values of the coverage of the two sets obtained by NNIA and NSGA-II in solving the five DTLZ problems. The five plots denote the results of the five problems, respectively. In each plot, the left box represents the distribution of $I_C(\mathbf{I}, \mathbf{N})$ and the right box represents the distribution of $I_C(\mathbf{N}, \mathbf{I})$.

From Figure 4 of Gong et al. (2008), we can see that most of the values of $I_C(\mathbf{I}, \mathbf{P})$ and $I_C(\mathbf{P}, \mathbf{I})$ for the five DTLZ problems are greater than 0.5. Therefore, the majority solutions obtained by PESA-II are weakly dominated by the solutions obtained by NNIA, while the majority solutions obtained by NNIA are also weakly dominated by the solutions obtained by PESA-II. Obviously, this could not be true unless most solutions obtained by NNIA are equal to the solutions obtained by PESA-II. But after examining the solution sets obtained by NNIA and PESA-II for each trial, we found that identical solution in both sets is rare. The same situation exists in Figures 5, 6, 7, and 12. We have examined our original codes for calculating the coverage metric in solving the five three-objective problems, and an inadvertent error is found in them. However, for the two-objective problems, the code is correct.

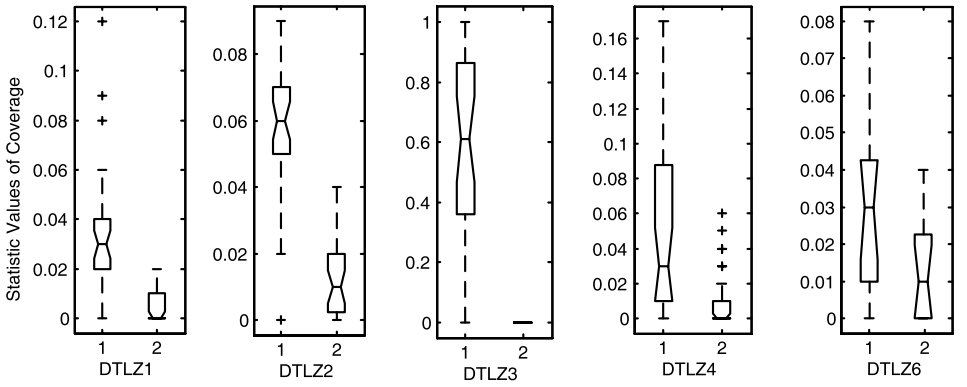

Figure 3: Statistical values of the coverage of the two sets obtained by NNIA and SPEA2 in solving the five DTLZ problems. The five plots denote the results of the five problems, respectively. In each plot, the left box represents the distribution of $I_C(\mathbf{I}, \mathbf{S})$ and the right box represents the distribution of $I_C(\mathbf{S}, \mathbf{I})$.

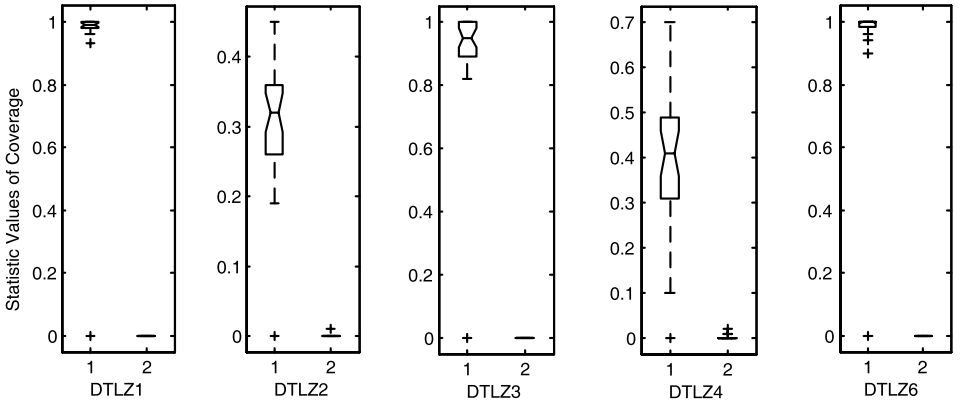

Figure 4: Statistical values of the coverage of the two sets obtained by NNIA and MISA in solving the five DTLZ problems. The five plots denote the results of the five problems, respectively. In each plot, the left box represents the distribution of $I_C(\mathbf{I}, \mathbf{M})$ and the right box represents the distribution of $I_C(\mathbf{M}, \mathbf{I})$.

3 Corrections on the Box Plots

We have corrected our code and the correct box plots are presented in the following figures. Note that the errors are only in the five DTLZ problems in terms of the coverage of the two sets. The corrected five figures in this study correspond to the results of DTLZ problems in Figures 4, 5, 6, 7, and 12 of Gong et al. (2008), respectively.

The corrected figures show that the box plots of $I_C(\mathbf{I}, \mathbf{P})$, $I_C(\mathbf{I}, \mathbf{N})$, $I_C(\mathbf{I}, \mathbf{S})$, $I_C(\mathbf{I}, \mathbf{M})$, and $I_C(\mathbf{I}, \mathbf{I}^{\mathbf{X}})$ are higher than the corresponding box plots of $I_C(\mathbf{P}, \mathbf{I})$, $I_C(\mathbf{N}, \mathbf{I})$, $I_C(\mathbf{S}, \mathbf{I})$, $I_C(\mathbf{M}, \mathbf{I})$ and $I_C(\mathbf{I}^{\mathbf{X}}, \mathbf{I})$ in all five DTLZ problems, respectively. They are consistent with the original conclusions.

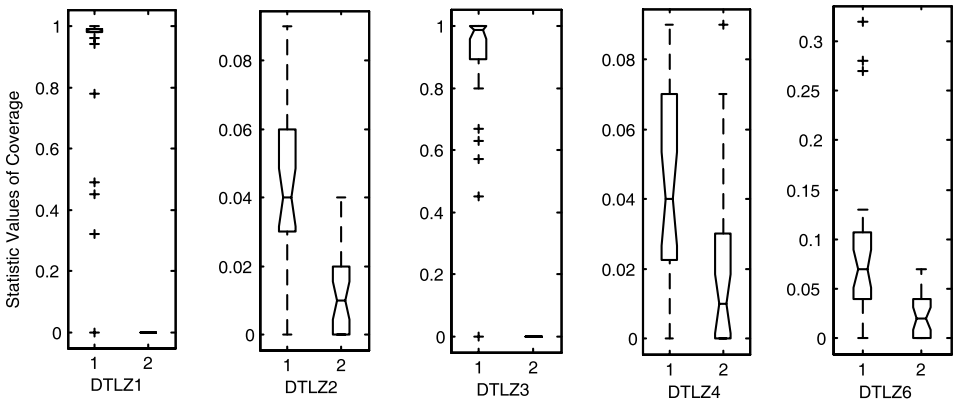

Figure 5: Statistical values of the coverage of the two sets obtained by NNIA with and without SBX in solving the five DTLZ problems. The five plots denote the results of the five problems, respectively. In each plot, the left box represents the distribution of $I_C(\mathbf{I}, \mathbf{I}^{-\mathbf{X}})$ and the right box represents the distribution of $I_C(\mathbf{I}^{-\mathbf{X}}, \mathbf{I})$.

4 Conclusion

In this study, we have corrected some experimental results in evaluating the Nondominated Neighbor Immune Algorithm. By the corrected results, we can still obtain the original conclusions.

Acknowledgments

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Reference

Gong, M., Jiao, L., Du, H., and Bo, L. (2008). Multiobjective immune algorithm with nondominated neighbor-based selection. *Evolutionary Computation*, 16(2):225–255.