

Supplementary materials for

Luda ZHAO, Bin WANG, Xiaoping JIANG, Yicheng LU, Yihua HU, 2022. DIP-MOEA: a double-grid interactive preference based multi-objective evolutionary algorithm for formalizing preferences of decision makers. *Front Inform Technol Electron Eng*, 23(11):1714-1732. <https://doi.org/10.1631/FITEE.2100508>

Comparative results of Fig. 6

The results of the algorithms compared with DIP-MOEA on the test functions are shown in Fig. S1.

For g-NSGA-II, when the reference point is located in the setting region, the solution set obtained converges to the reference point, but the solution set is widely distributed and cannot meet the DM's preference requirements. This shows that g-NSGA-II is seriously affected by the position of the reference point, and the algorithm has poor stability. The seven algorithms intuitively show that the performance of solving the preferred solution set in the final result is inferior to that of DIP-MOEA. From Fig. S1, it can be seen that DIP-MOEA has a better population distribution near the DM preference area for the 7-dimensional

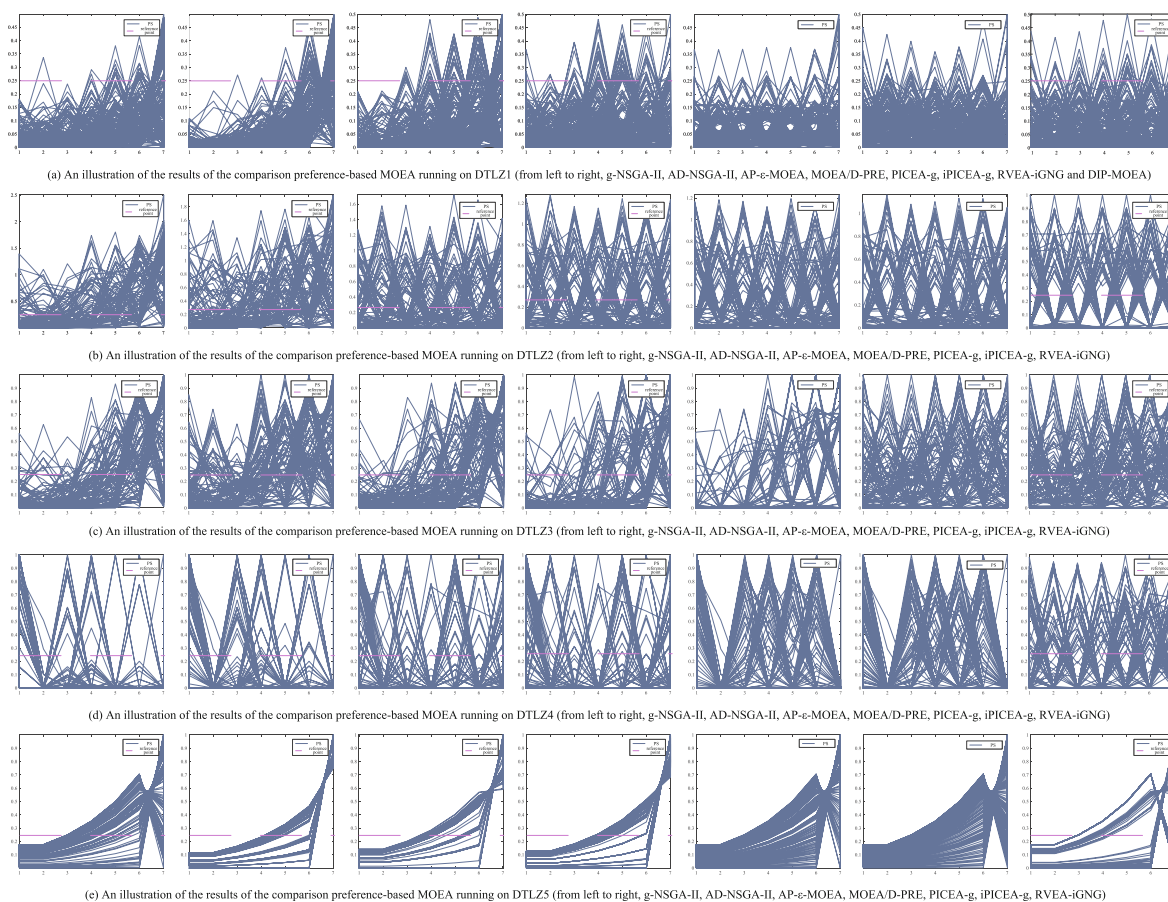


Fig. S1 Illustration of the results of the comparison preference-based MOEAs running on DTLZ 1 (a), DTLZ 2 (b), DTLZ 3 (c), DTLZ 4 (d), and DTLZ 5 (e) test functions (from left to right, g-NSGA-II, AD-NSGA-II, AP- ϵ -MOEA, MOEA/D-PRE, PICEA-g, iPICEA-g, and RVEA-iGNG)

DTLZ 1–5 test functions compared with the seven comparison algorithms. The above results show that the preference transformation strategy, population updating strategy, and distributivity-preserving strategy of DIP-MOEA are well verified and are very effective in solving preference-based MOEA test functions.

Comparison of runtime among several algorithms on the test function boxplot

In addition, to fully reflect the strengths and weaknesses of the algorithm, we put the first five local preference-based MOEAs with the preference information in the feasible domain, and the last two global preference-based MOEAs are carried out on the DTLZ 1–7 test functions (at three different dimensions) and DDMOP 1–3 test functions for 20 independent iterations. We create boxplots based on the operation results. The obtained runtime and memory usage are shown in Fig. S2.



Fig. S2 An illustration of the algorithm runtime and memory usage boxplots obtained from 20 independent iterations of the preference information of seven local preference MOEAs (g-NSGA-II, AD-NSGA-II, AP- ϵ -MOEA, MOEA/D-PRE, RVEA-iGNG, PICEA-g, and iPICEA-g) with DIP-MOEA on DTLZ 1–7 test functions (three different dimensions, S2a–S2v) when the preference information is in the feasible domain and DDMOP 1–3 test functions (S2w–S2y): (a) DTLZ 1 (3-dimension); (b) DTLZ 1 (5-dimension); (c) DTLZ 1 (7-dimension); (d) DTLZ 2 (3-dimension); (e) DTLZ 2 (5-dimension); (f) DTLZ 2 (7-dimension); (g) DTLZ 3 (3-dimension); (h) DTLZ 3 (5-dimension); (j) DTLZ 3 (7-dimension); (k) DTLZ 4 (3-dimension); (l) DTLZ 4 (5-dimension); (m) DTLZ 4 (7-dimension); (n) DTLZ 5 (3-dimension); (o) DTLZ 5 (5-dimension); (p) DTLZ 5 (7-dimension); (q) DTLZ 6 (3-dimension); (r) DTLZ 6 (5-dimension); (s) DTLZ 6 (7-dimension); (t) DTLZ 7 (3-dimension); (u) DTLZ 7 (5-dimension); (v) DTLZ 7 (7-dimension); (w) DDMOP 1; (x) DDMOP 2; (y) DDMOP 3

The upper plot in each subplot of the figure indicates the runtime, and the lower plot indicates the memory usage of several comparison algorithms. The polyline in the figure indicates the concatenation of the average runtime (average memory usage) of each algorithm after 20 runs. As can be seen from Fig. S2, DIP-MOEA is basically able to maintain a shorter runtime and lower level of memory consumption after several independent repetitions of the simulations, and the overall performance is good except that it is not optimal in some cases (Figs. S2r, S2x, and S2v), where the dimension of the tested functions is high.

Fig. S3 shows the results after 20 independent runs of each algorithm. From this figure, it can be seen that DIP-MOEA can basically maintain a shorter runtime and lower level of memory consumption for the MOKP problem at three different dimensions after several independent iterations, and the overall performance is good, except that the average memory consumption value at $m = 4$ is not optimal (Fig. S3c).

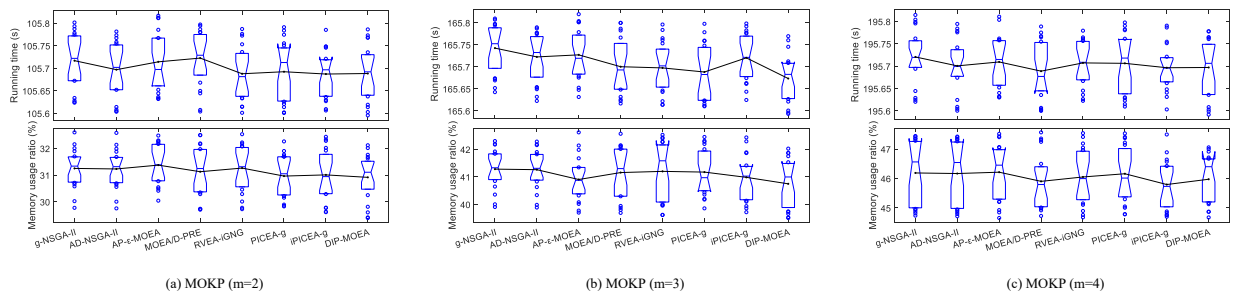


Fig. S3 An illustration of the algorithm runtime and memory usage boxplots obtained from 20 independent iterations of the preference information of seven local preference MOEAs (g-NSGA-II, AD-NSGA-II, AP- ϵ -MOEA, MOEA/D-PRE, RVEA-iGNG, PICEA-g, and iPICEA-g) with DIP-MOEA on MOKP test problems at three different dimensions: (a) $m = 2$; (b) $m = 3$; (c) $m = 4$