Supplementary File of "Evolutionary Many-Objective Optimization Based on Adversarial Decomposition"

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***Abstract*—The paper entitled "Evolutionary Many-Objective Optimization Based on Adversarial Decomposition" develops an adversarial decomposition method that leverages the complementary characteristics of two different scalarizing functions within a single paradigm. More specifically, we maintain two co-evolving populations simultaneously by using different scalarizing functions. In order to avoid allocating redundant computational resources to the same region of the Pareto front, we stably match these two co-evolving populations into one-one solution pairs according to their working regions upon the Pareto front. Then, each solution pair can at most contribute one principal mating parent during the mating selection process. Due to the page limits of the paper, we present the mating selection algorithm for the variant MOEA/AD-$v2$ in this supplementary file.**

I. A Variant of Mating Selection Algorithm

The mating selection algorithm for the variant MOEA/AD-$v2$ is presented in Algorithm 6.

Algorithm 6: MatingSelectionV2$(S_c, S_d, i, M, R, C, W, B)$

Input: S_c, S_d, W, matching array M and the subproblem index i, sentinel array R, neighborhood structure B

Output: mating parents $\overline{S}$

$pop \leftarrow$ PopSelection(S_c, S_d, i, M, W);
if $rand < \delta$ **then**
  $S_p \leftarrow \emptyset$;
  if $pop == 1$ **then**
    for $j \leftarrow 1$ **to** T **do**
      $S_p \leftarrow S_p \cup \{\mathbf{x}_d^{B[i][j]}\}$;
    $\mathbf{x}^r \leftarrow$ Randomly select a solution from S_p;
    $\overline{S} \leftarrow \{\mathbf{x}_d^i, \mathbf{x}^r\}$;
  else
    for $j \leftarrow 1$ **to** T **do**
      $S_p \leftarrow S_p \cup \{\mathbf{x}_c^{B[M[i]][j]}\}$;
    $\mathbf{x}^r \leftarrow$ Randomly select a solution from S_p;
    $\overline{S} \leftarrow \{\mathbf{x}_c^{M[i]}, \mathbf{x}^r\}$;
else
  if $pop == 1$ **then**
    $\mathbf{x}^r \leftarrow$ Randomly select a solution from S_d;
    $\overline{S} \leftarrow \{\mathbf{x}_d^i, \mathbf{x}^r\}$;
  else
    $\mathbf{x}^r \leftarrow$ Randomly select a solution from S_c;
    $\overline{S} \leftarrow \{\mathbf{x}_c^{M[i]}, \mathbf{x}^r\}$;
return $\overline{S}$

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