B. Multiple Crossover Operators and the Selfadaptive Selection Mechanism

As mentioned before, we use multiple crossover operators in our HMOEA, which is inspired by the ideas of [51] and [52]. In addition to the four crossover operators mentioned above, the DE operator used in [16] is also incorporated in our algorithm. These operators are described in Appendix A. To select the operators whose performances are more suitable for a given MOP, a selfadaptive selection mechanism is developed. To simplify the calculation of the selection probability of each operator, we memorize the type of operator that is adopted by each solution in the population. After the initial population is generated, we assign each operator type to $n_{pop}/5$ solutions in the population so that each operator has an equal selection probability. During the evolution process, when an operator is selected to generate a new solution, the type (or index) of this operator will be assigned to the new solution. Let *pi* denote the selection probability of each operator i (in the following of this paper we use the index $i = 1$ for BLX-α, $i = 2$ for SBX, $i = 3$ for SPX, $i = 4$ for PCX, and $i = 5$ for *DE*), and the selfadaptive selection mechanism can be described as follows.

Step 1: Step 1) If the *EXA* is updated, then calculate the selection probability of each operator i $(i = 1, \ldots, 5)$ as $p_i = a_i/|EXA|$, where a_i is the number of solutions in the *EXA* whose assigned operator index is i and $|EXA|$ denotes the current size of the *EXA*.