Swarm and Evolutionary Computation

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mNAFSA: A novel approach for optimization in dynamic environments with global changes

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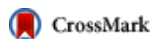
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Abstract

Artificial fish swarm algorithm (AFSA) is one of the state-of-the-art swarm intelligence algorithms that is widely used for optimization purposes in static environments. However, numerous real-world problems are dynamic and uncertain, which could not be solved using static approaches. The contribution of this paper is twofold. First, a novel AFSA algorithm, so called NAFSA, has been proposed in order to eliminate weak points of standard AFSA and increase convergence speed of the algorithm. Second, a multi-swarm algorithm based on NAFSA (mNAFSA) was presented to conquer particular challenges of dynamic environment by proposing several novel mechanisms including particularly modified multi-swarm mechanism for finding and covering potential optimum peaks and diversity increase mechanism which is applied after detecting an environment change. The proposed approaches have been evaluated on moving peak benchmark, which is the most prominent benchmark in this domain. This benchmark involves several parameters in order to simulate different configurations of dynamic environments. Extensive experiments show that the proposed algorithm significantly outperforms previous algorithms in most of the tested dynamic environments modeled by moving peaks benchmark.

Keywords

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