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LACAIS: Learning Automata Based Cooperative Artificial Immune System for Function Optimization

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Artificial Immune System (AIS) is taken into account from evolutionary algorithms that have been inspired from defensive mechanism of complex natural immune system. For using this algorithm like other evolutionary algorithms, it should be regulated many parameters, which usually they confront researchers with difficulties. Also another weakness of AIS especially in multimodal problems is trapping in local minima. In basic method, mutation rate changes as only and most important factor results in convergence rate changes and falling in local optima. This paper presented two hybrid algorithm using learning automata to improve the performance of AIS. In the first algorithm entitled LA-AIS has been used one learning automata for tuning the hypermutation rate of AIS and also creating a balance between the process of global and local search. In the second algorithm entitled LA-CAIS has been used two learning automata for cooperative antibodies in the evolution process. Experimental results on several standard functions have shown that the two proposed method are superior to some AIS versions.

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LACAIS: Learning Automata Based Cooperative Artificial Immune System for Function Optimization

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Keywords: Artificial Immune System, Hypermutation, Learning Automata, Cooperative, Function Optimization.

1 Introduction

Global optimization problems are used in continuous spaces in various problems of communication, commerce, engineering design and biological sciences. Optimization in nonlinear, non-convex and non-differential functions remained as investigative challenge for researchers on solving of optimization problems [1]. According to applications of these problems from many years ago, several methods have been developed for solving them that can be classified them in two groups: traditional and heuristics (stochastic) methods. In most traditional methods that usually including of numerical methods such as linear programming, gradient based method or analytical methods like differential calculus and lagrange multiplies [12] meantime have answer and enough time, there is limitation like derivation on function. Also, there are other methods that find all of local minimums, finally among which global minimum are

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