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Fuzzy Adaptive Artificial Fish Swarm Algorithm

Danial Yazdani, Adel Nadjaran Toosi and Mohammad Reza Meybodi

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ABOUT

Abstract

Artificial Fish Swarm Algorithm (AFSA) is a kind of swarm intelligence algorithms which is usually employed in optimization problems. There are many parameters to adjust in AFSA like *visual* and *step*. Through constant initializing of visual and step parameters, algorithm is only able to do local searching or global searching. In this paper, two new adaptive methods based on fuzzy systems are proposed to control the visual and step parameters during the AFSA execution in order to control the capability of global and local searching adaptively. First method uniformly adjusts the visual and step of all fish whereas in the second method, each artificial fish has its own fuzzy controller for adjusting its visual and step parameters. Evaluations of the proposed methods were performed on eight well known benchmark functions in comparison with standard AFSA and Particle Swarm Optimization (PSO). The overall results show that proposed algorithm can be effective surprisingly.

Keywords Artificial Fish Swarm Algorithm (AFSA) - particle Swarm Optimization (PSO) - fuzzy system - global search - local search

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Fuzzy Adaptive Artificial Fish Swarm Algorithm

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Abstract. Artificial Fish Swarm Algorithm (AFSA) is a kind of swarm intelligence algorithms which is usually employed in optimization problems. There are many parameters to adjust in AFSA like *visual* and *step*. Through constant initializing of visual and step parameters, algorithm is only able to do local searching or global searching. In this paper, two new adaptive methods based on fuzzy systems are proposed to control the visual and step parameters during the AFSA execution in order to control the capability of global and local searching adaptively. First method uniformly adjusts the visual and step of all fish whereas in the second method, each artificial fish has its own fuzzy controller for adjusting its visual and step parameters. Evaluations of the proposed methods were performed on eight well known benchmark functions in comparison with standard AFSA and Particle Swarm Optimization (PSO). The overall results show that proposed algorithm can be effective surprisingly.

Keywords: Artificial Fish Swarm Algorithm (AFSA), particle Swarm Optimization (PSO), fuzzy system, global search, local search.

1 Introduction

Solving the optimization problems is one of the challenging issues that computer scientists always grapple with. Among the algorithms, swarm intelligence algorithms have been proved their capabilities in solving such problems. Among them Particle Swarm Optimization (PSO) [1] and Ant Colony Optimization (ACO) [2] are the most well-known algorithms that have been ever proposed. These algorithms have some characteristics that make them suitable for solving optimization problems, like scalability, fault tolerance, consistency, higher speed, flexibility, parallelism, etc.

Artificial fish swarm algorithm (AFSA) [3], proposed by Li Xiao Lei in 2002, is a stochastic population-based algorithm motivated by intelligent collective behavior of

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