14th Int'l CSI Computer Conference
(CSICC'09)
Amirkabir University of Technology
Tehran, IRAN
October 20-21, 2009

A Multi-Role Cellular PSO for Dynamic Environments

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Abstract

In real world, optimization problems are usually dynamic in which local optima of the problem change. Hence, in these optimization problems goal is not only to find global optimum but also to track its changes. In this paper, we propose a variant of cellular PSO, a new hybrid model of particle swarm optimization and cellular automata, which addresses dynamic optimization. In the proposed model, population is split among cells of cellular automata embedded in the search space. Each cell of cellular automata can contain a specified number of particles in order to keep the diversity of swarm. Moreover, we utilize the exploration capability of quantum particles in order to find position of new local optima quickly. To do so, after a change in environment is detected, some of the particles in the cell change their role from standard particles to quantum for few iterations. Experimental results on moving peaks benchmark show that the proposed algorithm outperforms mQSO, a well-known multi swarm model for dynamic optimization, in many environments.