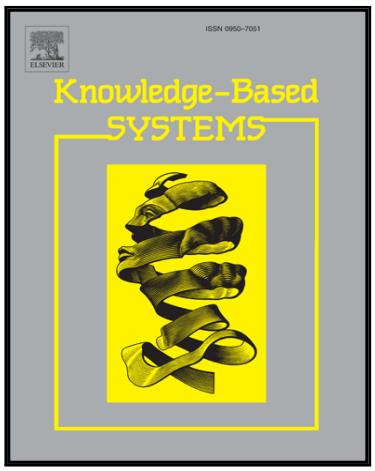

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A New Binary Hybrid Particle Swarm Optimization with Wavelet Mutation

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Abstract

Particle swarm optimization (PSO) is a population-based stochastic optimization algorithm, where individual elements, termed as particles, move around a multi-dimensional problem space at different directions (i.e., trajectories) and speeds (i.e., velocities) to find the best solution for non-deterministic polynomial time. The movement for a particle is determined by its previous best result and the previous best result of the entire population. In one of the current PSO variants called Hybrid Particle Swarm Optimisation (HPSOWM), where a mutation process based on wavelet theory was added to the original PSO to prevent premature conclusion of the best solution. This hybridisation with PSO has improved both solution stability and quality over the original algorithm as well as many other hybrid PSO algorithms. However, this solution is not practicable and very limited to work on a continuous problem space. As such, in this research, we propose a discrete binary HPSOWM which operates on binary-based problem space, and termed as "Binary Hybrid Particle Swarm Optimization with Wavelet Mutation" (BHPSOWM). In this work, the movement mechanism of particles as well as the mutation process are modified and transformed to work with binary elements. We conduct a series of experiments to compare the performance of the binary versions of three algorithms: Genetic Algorithm (GA), Particle Swarm Optimization (BPSO) against our proposed algorithm - BHPSOWM. The experiment results show that our proposed model delivers better performance in terms of the mean cost value, standard deviation and the convergence rate under the same settings.

Keywords: particle swarm optimization, genetic algorithms, binary optimization

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