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PERFORMANCE-DEPENDENT ADAPTIVE PARTICLE SWARM OPTIMIZATION

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Abstract. *The swarm collective behaviors, such as birds flocking and fish schooling, are complex, dynamic and adaptive processes, in which the differences among individuals play an important role. As a new swarm intelligent technique, the standard particle swarm optimization only provides a simple uniform control, omitting the above mentioned phenomenon entirely. Thus, a new modified version: performance-dependent adaptive particle swarm optimization incorporated with personal differences, is designed. It uses each particle's adaptation score – fitness value of the current position to represent the effect dominated by differences, and guides the inertia weight of each particle to adjust its' value adaptively. Furthermore, three adaptive adjustment strategies are discussed. Simulation results show the new version is effective and efficient, although the improved performance is problem-dependent.*
Keywords: Particle swarm optimization, Personal differences, Adaptive adjustment strategy, Inertia weight

1. **Introduction.** Inspired by birds flocking and fish schooling, Eberhart and Kennedy proposed the particle swarm optimization (PSO) in 1995 [1-2]. Due to the ease of implementation and fast convergence speed, it has been widely applied into many areas [3-6].

Since particle swarm optimization is a new swarm intelligent technique, many researchers focus their attention to this new area. One famous improvement is the introduction of the inertia weight [7], similarly with temperature schedule in the simulated annealing algorithm. Empirical results showed the linearly decreased setting of inertia weight can give a better performance, such as from 1.4 to 0 [7], 0.9 to 0.4 [8,9], and 0.95 to 0.2 [10], although Y. L. Zheng et al [11] proposed a contrary opinion that the increased setting may be better in some cases. Combined with the fuzzy system, Y. Shi [12] provided a fuzzy dynamical adjustment of inertia weight, however, there was no simple way to design a proper appendix function.