Dynamic acceleration coefficient of particle swarm optimization in robotics motion coordination

ABSTRACT

This paper focuses on improving an optimization process for swarm robots using Particle Swarm Optimization (PSO) by altering the acceleration coefficient from static to dynamic. In swarm robotic, motion coordination addresses the issue of avoiding a group of robots interfere with each other in a limited workspace, while achieving the global motion objective. PSO is commonly suggested in the literature to optimize path trajectory in robotic field. However, the typical PSO tends to be trapped in local optima. Therefore, a dynamic acceleration coefficient is proposed to optimize the cognitive and social coefficients of PSO in order to improve its exploration ability in seeking the global optimum solution. With this novel feature, PSO becomes less dependent on the chain of its past experience that it had explored in a certain region within the solution space. The effectiveness of the proposed method is tested on a simulated swarm robotic platform. Results show the proposed PSO with Dynamic Coefficient (DCPSO) is 1.09 seconds and 3.58 seconds faster than the typical PSO under dynamic and extreme conditions respectively.