Abstract

Behavior-based control architecture has successfully demonstrated their competence in mobile robot development. There is a key issue in behavior-based mobile robot namely the behavior design problems. Fuzzy logic system characteristics are suitable to address the problems. However, there are difficulties encountered when setting fuzzy parameters manually. Therefore, most of the works in the field generate certain interest for the study of fuzzy systems with added learning capabilities. This paper presents the development of fuzzy behavior-based control architecture using Particle Swarm Optimization (PSO). Then, goal-seeking behaviors based on Particle Swarm Fuzzy Controller (PSFC) are developed using the modified PSO with two stages of the PSFC process. A new nonlinear function of modulated inertia weight adaptation with time, named as Sigmoid Decreasing Inertia Weight (SDIW), is designed for improving the performance of PSO. Several simulations and experiments with MagellanPro mobile robot have been performed to analyze the performance of the algorithm. The promising results have proved that the proposed control architecture for mobile robot has better capability to accomplish useful task in real office-like environment.

Keywords: behavior-based robot; fuzzy logic; PSO; PSFC;