An new swarm intelligent algorithm to solve the efficiency Nash equilibrium of single-leader-multi-follower game

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September 4, 2020

Abstract

This paper presents the particle swarm optimization algorithm and immune particle swarm optimization algorithm (PSO-IPSO) to solve the single-leader-multi-follower game (SLMFG). The PSO-IPSO algorithm is designed by combining particle swarm algorithm and immune memory mechanism, and the diversity of the population is maintained by using probability density selection function. Meanwhile, we define the efficiency Nash equilibrium by using the idea of efficiency, which is more beneficial to all players and greatly refine Nash equilibrium. Finally, numerical experiments show that this algorithm not only does not rely on the choice of an initial point, but also increases the diversity of swarm to keep global convergence, and the PSO-IPSO algorithm is fast convergence speed and effective.

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Input

Initialize swarm

Compare the fitness function of the followers

Is it stop condition of the follower?

No → Update particle by (6) and (7)   Generate new particle populations p_1

Selected particles by probability density function (9)

Particles in memory library replace particles of poor fitness

Update newly generated particle swarm by (6) and (7)

Yes

Output y^*, return the leader's objective function value

Update particles' position and velocity by (6) and (7)

Compare the fitness function of the leader

Is it stop condition of the leader?

No

Yes

Output (x^*, y^*)

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