Title:

A random synchronous-asynchronous particle swarm optimization algorithm with a new iteration strategy

Author/Authors:

Nor Azlina Ab Aziz, Shahdan Sudin, Marizan Mubin, Sophan Wahyudi Nawawi, Zuwairie Ibrahim

Abstract:

Particle swarm optimisation (PSO) is a population-based stochastic optimisation algorithm. Traditionally the particles update sequence for PSO can be categorized into two groups, synchronous (S-PSO) or asynchronous (A-PSO) update. In S-PSO, the particles' performances are evaluated before their velocity and position are updated, while in A-PSO, each particle's velocity and position is updated immediately after individual performance is evaluated. Recently, a random asynchronous PSO (RA-PSO) has been proposed. In RA-PSO, particles are randomly chosen to be updated asynchronously, the randomness improves swarm's exploration. RA-PSO belongs to the asynchronous group. In this paper, a new category; hybrid update sequence is proposed. The new update sequence exploits the advantages of synchronous, asynchronous, and random update methods. The proposed sequence is termed as, random synchronous-asynchronous PSO (RSA-PSO). RSA-PSO divides the particles into groups. The groups are subjected to random asynchronous update, while the particles within a chosen group are updated synchronously. The performance of RSA-PSO is compared with the existing S-PSO, A-PSO, and RA-PSO using CEC2014's benchmark functions. The results show that RSA-PSO has a superior performance compared to both A-PSO and RA-PSO, and as good as S-PSO.