Multi-Agent Sistems

3rd Assignement – Concurrent PSO

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Updated: March 21, 2017

Introduction

In computer science, particle swarm optimization (PSO) is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. It solves a problem by having a population of candidate solutions, here dubbed particles, and moving these particles around in the search-space according to simple mathematical formulae over the particle's position and velocity. Each particle's movement is influenced by its local best known position, but is also guided toward the best known positions in the search-space, which are updated as better positions are found by other particles. This is expected to move the swarm toward the best solutions.

https://en.wikipedia.org/wiki/Particle_swarm_optimization

Assignement

Implement a concurrent version of the following PSO variants for parametric optimization problem:

- Ring topology
- Island topology in which islands follow also a ring topology between them (each island has an agent responsible for the communications between islands).

Choose your concurrent technology (Threads, Processes or Threds + Processes), justify it in your report. As a bonus you can present different combinations.

Tests

apply to functions De Jong's function 1, Rotated hyper-ellipsoid function, Rosenbrock's valley (De Jong's function 2), Rastrigin's function 6, Schwefel's function 7, and Griewangk's function 8 (with dimensions $n = 2, 10$).

(more info: http://www.geatbx.com/docu/fcnindex-01.html).

Stopping criteria

Elapsed time lower than $30 \times n$ seconds, e.i, each agent works for at most $30 \times n$ seconds (obs: this can easily be achieved with a timeout behavior).

To deliver...

A small report with:

- Brief description of the implemented methods.
- parameters tunning process comparing the results between distinct parameters and the optimal solutions; note that for each set of parameters you should run at least 5 times the methods and present statistical results.
- Explanation of the results.
- Code (attached or bitbucket repository)

Delivery date

Although you can deliver your work up to the exams dates, we advise you to deliver it earlier. A good date would May, 30th.

Final remarks

If you have any doubts, please contact the professor directly or by email – pcardoso@ualg.pt