ADEO2

Training work : Particle Swarm Optimization, PSO

EISTI

Subject : **Metaheuristics**	*Due date* : **December 7, 2017**
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1 Particle Swarm Optimization PSO - Continuous case

1.1 Neighborhood understanding

We will first test the algorithm in a continuous case (sphere and griewank functions)

Exercise 1.

a. Add Rosenbrock functions[1] and Schwefel[2].

b. Write a `limiting` function that manage the problems at the boundaries of the search space when moving. Choose one or more strategies.

c. Test the algorithm with its different parameter values.

d. To simplify its parametrization, try to find a suitable relation between the number of particles, the number of cycles and the dimension.

e. The equation of velocity takes into account the global neighborhood (all particles are informants and the best individual for a particle is the best individual of the swarm). Write the function `localUpdate` that allows to select *nbn* neighbors as informers. To simplify, we will choose informants close to the particle according to their position in the list, it is a social neighborhood.

2 Particle Swarm Optimization - Discrete Case

We come back to the problem of the TSP.

2.1 Speed and operators

We make the arbitrary choice (according to M. Clerc) that the velocity represents the transformations of a particle in order to create a new one and that the operations are defined as follows:

Exercise 2.

[1] `http://www.sfu.ca/~ssurjano/rosen.html`

[2] http://www.sfu.ca/ ssurjano/schwef.html

a. `velocity + velocity = velocity` : `sum` of two speeds is the concatenation of permutations. Ẃrite the function `add`.

b. `coefficient * velocity = velocity`: We return k% of the permutations of the velocity. If $k > 1$, we add to the result all the permutations of the initial velocity, we subtract 1 to k and we start again. Write such a function `times`.

c. `particle - particle = velocity` : The distance between two particles is the set of permutations allowing to move from one list to another. Write the function `minus` which returns a velocity as defined.

d. Deduce that in the program, the equations of velocity and displacement.

e. With the file `14.tsp`, test the algorithm with global and local neighborhoods.