Assignment4

"Particle Swarm Optimization"

1) The first step is to initialize the Population of particles on D dimensions with random positions and velocities, after which we will apply other operators.

2) The second step is using the Optimization algorithm, we will solve this problem in order to maximize the objective function.

3) Next, we will use the above function to calculate the fitness of each particle.

4) Then we will find the maximum fitness and compare it to the best fitness found; if it is better, we will set the best fitness founded to the maximum fitness in the population and set the particle's location to the maximum fitness in the population.

5) Then, using the set of equations, we will update the velocities and positions of the particles.

$$v_{ij}(t+1) = v_{ij}(t) + c_1 r_{1j}(t)[y_{ij}(t) - x_{ij}(t)] \\ c_2 r_{2j}(t)[\hat{y}_{ij}(t) - x_{ij}(t)]$$

The velocities were updated using the equation above.

$$x_i(t+1) = x_i(t) + v_i(t+1)$$

This equation is used to update the particle positions.

6) This algorithm's stopping criteria Stopping multiple times:

• A limit on the number of iterations or fitness evaluations has been reached.

• When an appropriate solution has been identified, call it a day.

• Stop iterating if no progress is shown after a certain number of iterations.

• When the normalized swarm radius approaches 0, stop.

• Stop when the slope of the objective function is close to zero.

The first one, "A maximum number of iterations = 200, or the number of fitness evaluations has been surpassed," will be used in this code.

Input:

i → number of iterations,

nPop → Population Size,

x_min → x minimum vector,

x_max → x maximum vector,

v_max → velocity maximum vector,

dim → dimensions,

cCog → cognitive component acceleration constant

cSoc → social component acceleration constant

Output:

pg → best position in the population

globBestFit → fitness value associated to the pg