Swarm Intelligence

Class Exercises 4

March 19, 2020

1. What is the inertia coefficient, and how is it related to exploration and exploitation?

2. What happens if we set $\psi_1 = 0$ and $\psi_2 = 1$? What happens if we instead set $\psi_1 = 1$ and $\psi_2 = 0$?

3. What is the purpose of the U_1 and U_2 matrices?

4. What is the role of topologies? What happens if a particle can communicate with all the rest of the swarm? What happens if it can instead communicate with only few other particles?

5. Assume you want to minimize the Rosenbrock function in $N = 4$ dimensions

$$\sum_{i=1}^{N-1} 100 \times (x_{i+1} - x_i^2)^2 + (1 - x_i)^2 \tag{1}$$

when $\omega = 1$, $\psi_1 = 1$ and $\psi_2 = 2$. At the current iteration, particle P_1 has position $[0.43, 1.25, -3.2, 2.4]$ with value 8546.17, and velocity $[-0.8, 0.2, -1.2, 0.1]$; the personal best is $[1.2, 2.5, -2.1, 2.2]$ with value 7584.92 and the global best known by P_1 in its neighbourhood is $[1.4, 1.1, -0.4, 3.1]$ with value 1199.66. The diagonals of the matrices U_1 and U_2 are respectively $[0.21, 0.43, 0.12, 0.84]$ and $[0.63, 0.12, 0.92, 0.43]$. Update velocity and position of P_1. What is the value of the solution now?