

Particle Swarm Optimisation

Consider an illustrative example of a particle swarm optimisation system composed of three particles and $V_{max} = 10$. To facilitate calculation, we will ignore the fact that r_1 and r_2 are random numbers and fix them to 0.5 for this exercise. The space of solutions is the two dimensional real valued space R^2 and the current state of the swarm is as follows:

- Position of particles: $x_1 = (5,5)$; $x_2 = (8,3)$; $x_3 = (6,7)$;
- Individual best positions: $x^*_1 = (5,5)$; $x^*_2 = (7,3)$; $x^*_3 = (5,6)$;
- Social best position: $x^* = (5,5)$;
- Velocities: $v_1 = (2,2)$; $v_2 = (3,3)$; $v_3 = (4,4)$.

Please answer the following questions:

1. What would be the next position of each particle after one iteration of the PSO algorithm explained in the lecture using inertia $\omega = 1$?
2. And using $\omega = 0.1$?
3. Explain why the parameter ω is called inertia.
4. Give an advantage and a disadvantage of a high inertia value.