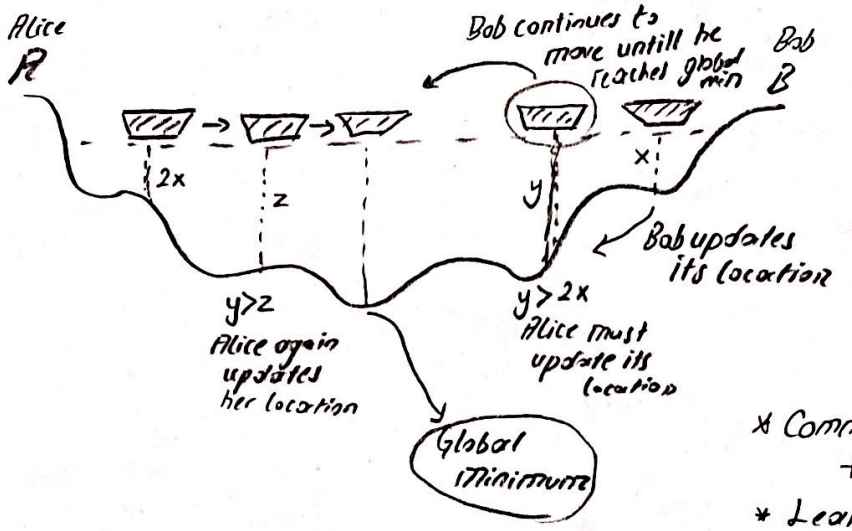
Particle Swarm Optimization (PSO) > Meta Heuristics

~ simplicity



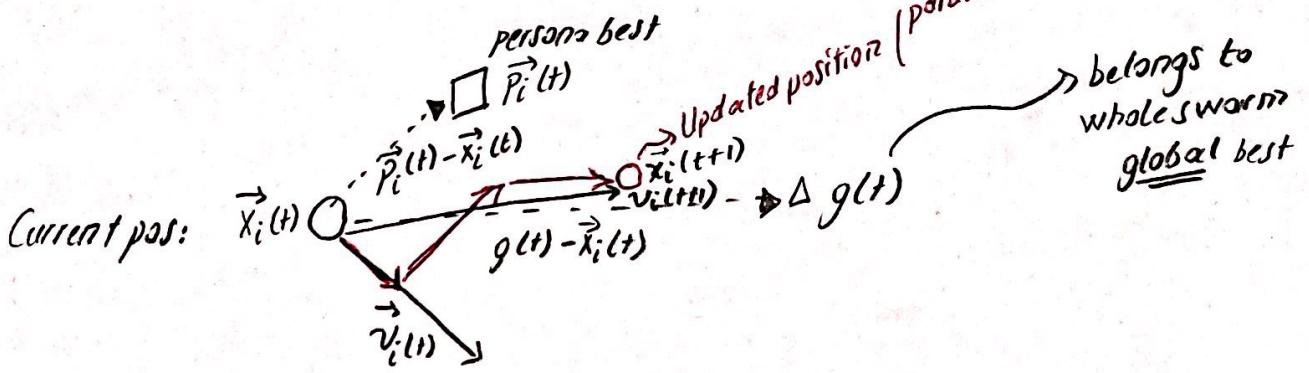
* Communication
+
* Learning

Swarm of Particles

Particle i → $\vec{x}_i(t) \in X$ (position vector) ; i index of particle] Position

→ $\vec{v}_i(t)$] Velocity

Position & velocity is updated !



* update position according to the three components

$$\begin{cases} \vec{x}_i(t+1) = \vec{x}_i(t) + v_i(t+1) \\ v_i(t+1) = w\, v_i(t) + c_1 (p_i(t) - x_i(t)) + c_2 (g(t) - x_i(t)) \end{cases}$$

Inertia term — cognitive component — social component

$$v_{ij}(t+1) = w\, v_{ij}(t) + r_1 c_1 (p_{ij}(t) - x_{ij}(t)) + r_2 c_2 (g_j(t) - x_{ij}(t))$$

$r_1, r_2 \sim U(0,1)$

$$x_{ij}(t+1) = x_{ij}(t) + v_{ij}(t+1)$$

acceleration coeff.

Clerc and Kennedy, 2002

Constriction Coefficients

$$\chi = \frac{2k}{12 - \phi - \sqrt{\phi^2 - 4\phi}}$$

$$\begin{cases} k = 1 \\ \phi_1 = 2.05 \\ \phi_2 = 2.05 \end{cases} \quad \Bigg| \quad \begin{aligned} w &= \chi \\ c_1 &= \chi \phi_1 \\ c_2 &= \chi \phi_2 \end{aligned}$$

$0 \leq k \leq 1$

$$\phi = \phi_1 + \phi_2 \geq 4$$