- Initialize each particle $\vec{x} \in \mathbb{R}^n$ with a random position in the search-space:

$$\vec{x} \sim U(\vec{b}_{lo}, \vec{b}_{up})$$

  where $\vec{b}_{lo}$ and $\vec{b}_{up}$ are the lower and upper boundaries of the search-space.
- Set each particle's best known position to its initial position:

$$\vec{p} \leftarrow \vec{x}$$

- Initialize each particle's velocity $\vec{v} \in \mathbb{R}^n$ to random values:

$$\vec{v} \sim U(-\vec{d}, \vec{d})$$

  where $\vec{d} = |\vec{b}_{up} - \vec{b}_{lo}|$
- Initialize the swarm's best known position $\vec{g}$ to the $\vec{x}$ for which $f(\vec{x})$ is lowest.
- Until a termination criterion is met, repeat the following:
  - For each particle $\vec{x}$ in the swarm do the following:
    * Pick two random numbers: r_p, $r_g \sim U(0, 1)$
    * Update the particle's velocity $\vec{v}$ as follows:

$$\vec{v} \leftarrow \omega\vec{v} + \phi_p r_p(\vec{p} - \vec{x}) + \phi_g r_g(\vec{g} - \vec{x})$$

      where ω, ϕ_p, and ϕ_g are user-defined behavioural parameters.
    * Bound the velocity, that is, for all dimensions i update v_i:

$$v_i \leftarrow \text{Bound}(v_i, -d_i, d_i)$$

      See figure 2 for the definition of Bound()
    * Move the particle to its new position by adding its velocity:

$$\vec{x} \leftarrow \vec{x} + \vec{v}$$

    * Bound the position, that is, for all dimensions i update x_i:

$$x_i \leftarrow \text{Bound}(x_i, b_{lo_i}, b_{up_i})$$

    * If $(f(\vec{x}) < f(\vec{p}))$ then update the particle's best known position:

$$\vec{p} \leftarrow \vec{x}$$

    * If $(f(\vec{x}) < f(\vec{g}))$ then update the swarm's best known position:

$$\vec{g} \leftarrow \vec{x}$$

- Now $\vec{g}$ holds the best found position in the search-space.

Figure 1: PSO pseudo-code.