

Distributed Intelligent Systems

Lab 7 Tutorial

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Lab Structure

1. Multi-robot PSO for obstacle avoidance:
 - Same fitness function as single-robot PSO
 - Differences in performance and evaluation time
2. Budget allocation
 - Comparing standard PSO, PSO-pbest, PSO OCBA
3. Multi-robot PSO for collaborative tasks:
 - Coordinated motion: move as far as possible while staying together

Code Structure

Pso_sup.c

• Main()

-Initialize world

-Best=psos()

-Evaluate best

• Calc_fitness()

-Reposition robots
randomly

-Send candidate
solutions to robots

-Evaluate fitness

-Return fitness

Pso.c

Pso()

Initialize swarm

For each iteration

Move particles

Evaluate particles

Return best particle

Obs_con.c

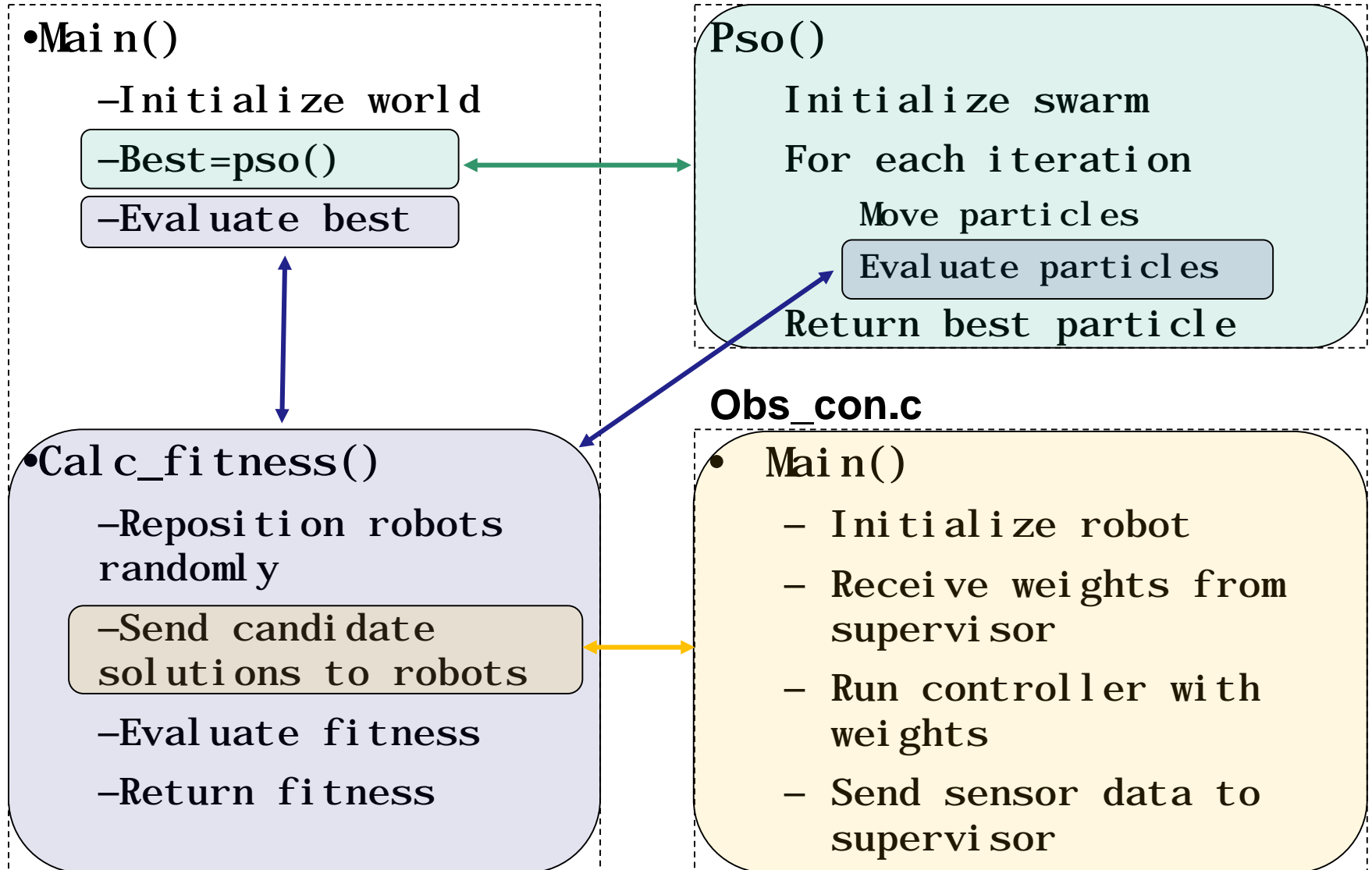
• Main()

- Initialize robot

- Receive weights from
supervisor

- Run controller with
weights

- Send sensor data to
supervisor

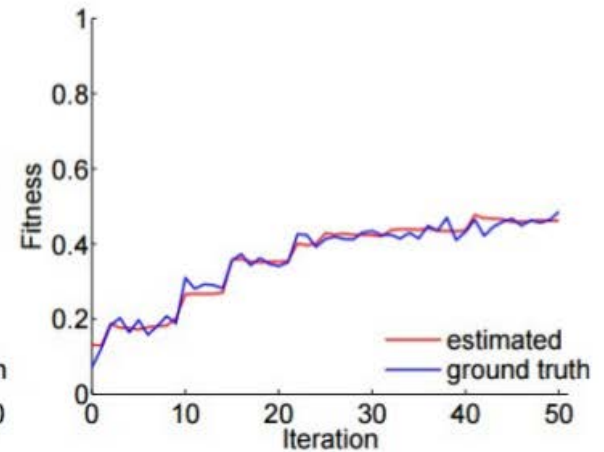
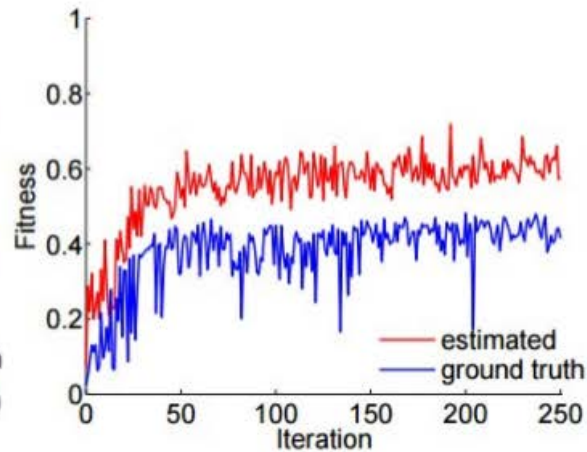
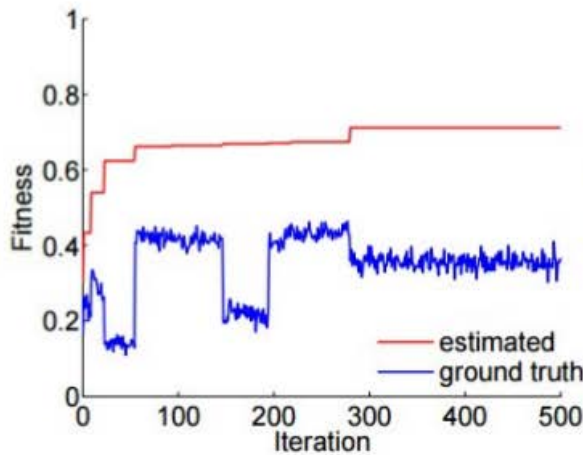


Noise-resistant PSO

- Setting `NOISY=1` triggers two changes
 - Half the number of iterations
 - Reevaluate performance for `lbest` (with flag `EVOLVE_AVG`)
- You need to implement the behavior for `EVOLVE_AVG`
 - Modified moving average (MMA) with `age` as the number of periods.
 - Remember to increase `age`.

PSO-OCBA

- Optimal allocation of computation budget
- Very effective in the presence of noise



PSO for a collaborative task

- Fitness value to be calculated in the supervisor
- Copy-paste the noise resistant PSO
- More difficult task than obstacle avoidance
- New sources of uncertainties

Notes and Clarifications

- Simulations take longer with complex tasks, read ahead and answer questions while the simulation runs.
- Performance evaluations have a high variance, you may need additional runs to establish clear trends
- **Remember to fill the feedback form**