

Simulation optimization =
death of the single long run experiment

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(don't hate me I'm only the messenger)
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Simio recognizes that my laptop has a dual core and therefore distributes replications across processors. And since all that has to be retained to extend runs is the ending random number seed, incrementally adding replications is seamless. They are setting up to make cloud computing (reps and instances) just as seamless.

The screenshot displays the Simio University Edition interface. The main window shows a table of experiment scenarios and their progress. A black circle highlights the 'Completed' column for the 'BaseCase' scenario, which shows '4 of 20' replications completed. The 'PlusMH' scenario shows '5 of 20' completed. Other scenarios like 'PlusL/UL', 'PlusOxDev', and 'PlusOx' are in a 'Pending' state with '0 of 20' completed.

Scenario	Replications		Controls									
	Name	Status	Required	Completed	Cleaners	Loaders	Oxidizers	Unloaders	Coaters	Steppers	Developers	Initial Number Transport
BaseCase	Running	20	4 of 20	9	2	10	2	6	5	3	2	2
PlusMH	Running	20	5 of 20	9	2	10	2	6	5	3	3	3
PlusL/UL	Pending	20	0 of 20	9	3	10	3	6	5	3	2	2
PlusOxDev	Pending	20	0 of 20	9	2	11	2	6	5	5	2	2
PlusOx	Pending	20	0 of 20	9	2	11	2	6	5	3	2	2

The right-hand panel shows the 'Properties: Experiment1 (Experiment)' section. Under the 'Analysis' tab, the 'Warm-up Period' is set to 200. Other analysis parameters include 'Default Replicati...' (10), 'Confidence Level' (95%), 'Upper Percentile' (75%), 'Lower Percentile' (25%), and 'Primary Response' (CycleTimeC). The 'General' tab shows the 'Name' as 'Experiment1'.

At the bottom of the window, a log shows the following entries:

- Experiment Experiment1, Scenario PlusMH, replication 3 completed at simulation time 2200. Actual run time: 7.2072126 seconds.
- Experiment Experiment1, Scenario BaseCase, replication 3 completed at simulation time 2200. Actual run time: 7.4880132 seconds.
- Experiment Experiment1, Scenario PlusMH, replication 4 completed at simulation time 2200. Actual run time: 7.363213 seconds.
- Experiment Experiment1, Scenario BaseCase, replication 4 completed at simulation time 2200. Actual run time: 7.7688136 seconds.
- Experiment Experiment1, Scenario PlusMH, replication 5 completed at simulation time 2200. Actual run time: 7.6284134 seconds.

The status bar at the bottom left indicates 'Running' with a green progress indicator. The system tray at the bottom right shows the time as 4:17 PM on 12/1/2010.

Characteristics of OvS problems worth solving

- Moderate to high dimensional decision variables
- Lots of feasible solutions (maybe uncountably infinitely many)
- A nontrivial amount of stochastic noise that may vary across the feasible space
- This implies we need to simulate a lot of solutions a lot and we don't know how much until we simulate them

Characteristics of (many) OvS algorithms

- Work with sets of solutions simultaneously
 - R&S, COMPASS, Nested Partitions, Stochastic Branch & Bound, Stochastic Model Reference Adaptive Search,...
- Refine/estimate more precisely as the algorithm progresses
 - All of the above plus sample path optimization, response surface methods, stochastic approximation

Single-run killers

- For all practical purposes, one processor per instance
 - Your error reduction rate is limited by processor speed rather than the number of processors available
- Extending runs requires retaining the entire system state and the overhead of reinitializing
- Single-run error analysis is hard to automate