GASSO Algorithm

Sait Cakmak (Georgia Tech)

March 1, 2019

This is an implementation of Gradient-Based Adaptive Stochastic Search for Simulation Optimization (GASSO) algorithm developed in [1]. The implementation works on unconstrained problems with continuous variables.

Parameters:

The performance of the algorithm is dependent on the specific parameter choice. We set the defaults to the values that seem to perform well in general on the problems in the current problem library. However, it is recommended to tune the parameters to problem specifics to get the best performance. Below, we provide some guideline on parameter tuning. Please refer to [1] and section 5.3 therein for further discussion.

- N - # of candidate solutions: It is recommended that $N \in [500, 1000]$ for problems with dimension less than 100. Larger values are recommended as the dimension increases. The default is set to $50 * \sqrt{dim}$.
- M - # of function evaluations per candidate: Larger values are recommended for problems with larger noise. We set the default at 10.
- K - # of iterations: This is determined based on the budget, N, and M.
  Budget = N*M*K.
  If the budget is too small for an iteration, the initial solution is returned.
- $\alpha_k = \frac{\alpha_0}{(k+\alpha_c)^{\alpha_p}}$ - step size: The algorithm performance depends profoundly on the step size. The optimal step size is very much problem specific. The defaults are set based on the average performance across a selection of SimOpt problems. In general, large step sizes lead to faster convergence, but a too large of an initial step size often causes "unstable" performance. A fast decreasing step size sequence also leads to faster convergence, however, it makes the algorithm more prone to getting stuck at local optimal solutions.
  - α_0: along with α_c, it determines the initial step size. It is the easiest one for tuning the step size, and it is recommended to tune this parameter first. The default is set at 50.

- α_c: besides determining the initial step size, it determines the speed at which the step size decreases. It is recommended that $\alpha_c \in [1000, 20000]$. The default is set at 1500, and it is recommended to tune this parameter second.
- α_p: along with α_c it determines the rate at which the step size gets smaller. It is recommended that $\alpha_p \in [0.5, 0.65]$. The default is set at 0.6, and usually performs well.

References

[1] E. Zhou and S. Bhatnagar, "Gradient-based adaptive stochastic search for simulation optimization over continuous space," *INFORMS Journal on Computing*, vol. 30, no. 1, pp. 154–167, 2018.