

Striking the Balance: Long Term Groundwater Monitoring Design for Multiple Objectives

Dr. Patrick Reed
Department of Civil & Environmental Engineering
The Pennsylvania State University

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12:15* -1:15 pm, 202 Hammond Building

Tools such as multiobjective genetic algorithms that are capable of high order Pareto optimization (i.e., optimizing a system for more than 2 objectives) can serve as an interface between the physical system being designed and the human decision process. This study demonstrates the use of high order Pareto optimization in a highly adaptable optimization methodology. The methodology is implemented on a long-term monitoring (LTM) application that combines quantile kriging and the Nondominated Sorted Genetic Algorithm-II (NSGA-II) to successfully balance four objectives: (1) minimizing sampling costs, (2) maximizing the accuracy of interpolated plume maps, (3) maximizing the relative accuracy of contaminant mass estimates, and (4) minimizing estimation uncertainty. Optimizing the LTM application with respect to these objectives reduced the decision space of the problem from a total of 500 million designs to the set of 1156 designs identified on the Pareto or tradeoff surface. Visualization of a total of 8 designs aided in understanding and balancing the application's objectives en route to a single compromise solution. This study shows that high order Pareto optimization holds significant potential as a tool that can be used in the balanced design of water resources systems.

* Note that this is a 'brown bag' seminar series. 202 Hammond will be open at 12:00pm and you are encouraged to bring a lunch, show up early, and socialize with your colleagues.