The Influence of Experimental Designs on the Performance of Surrogate Model Based Costly Global Optimization Solvers

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Dedicated to Dr. N. Andrei on the occasion of his 60th birthday

Abstract: When dealing with costly objective functions in optimization, one good alternative is to use a surrogate model approach. A common feature for all such methods is the need of an initial set of points, or "experimental design", in order to start the algorithm. Since the behavior of the algorithms often depends heavily on this set, the question is how to choose a good experimental design. We investigate this by solving a number of problems using different designs, and compare the outcome with respect to function evaluations and a root mean square error test of the true function versus the surrogate model produced. Each combination of problem and design is solved by 3 different solvers available in the TOMLAB optimization environment. Results indicate two designs as superior.

Keywords: Black-box, Surrogate model, Costly functions, Latin Hypercube Designs, Experimental Design