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Multi-Criteria Evaluation and Selection of Experimental Designs from a Catalog

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In recent years, several researchers have published catalogs of experimental plans. First, there are several catalogs of orthogonal arrays, which allow experimenting with two-level factors as well as multi-level factors. The catalogs of orthogonal arrays with two-level factors include alternatives to the well-known Plackett-Burman designs. Second, recently, a catalog of orthogonal minimally aliased response surface designs (or OMARS designs) appeared. OMARS designs bridge the gap between the small definitive screening designs and the large central composite designs, and they are economical designs for response surface modeling. The catalogs contain dozens, thousands or millions of experimental designs, depending on the number of runs and the number of factors, and choosing the best design for a particular problem is not a trivial matter. In this presentation, we introduce a multi-objective method based on graphical tools to select a design. Our method analyzes the trade-offs between the different experimental quality criteria and the design size, using techniques from multi-objective optimization. Our procedure presents an advantage compared to the optimal design methodology, which usually considers only one criterion for generating an experimental design. Additionally, we will show how our methodology can be used for both screening and optimization experimental design problems. Finally, we will demonstrate a novel software solution, illustrating its application for a few industrial experiments.

Keywords

Design of experiments, OMARS design, software

Classification

Both methodology and application

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