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Utilizing Individual Clear Effects for Intelligent Factor Allocations and Design Selections

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Extensive studies have been conducted on how to select efficient designs with respect to a criterion. Most design criteria aim to capture the overall efficiency of the design across all columns. When prior information indicated that a small number of factors and their two-factor interactions (2fi's) are likely to be more significant than other effects, commonly used minimum aberration designs may no longer be the best choice. Motivated by a real-life experiment, we propose a new class of regular fractional factorial designs that focus on estimating a subset of columns and their corresponding 2fi's clear of other important effects. After introducing the concept of individual clear effects (iCE) to describe clear 2fi's involving a specific factor, we define the clear effect pattern criterion to characterize the distribution of iCE's over all columns. We then obtain a new class of designs that sequentially maximize the clear effect pattern. These newly constructed designs are often different from existing optimal designs. We develop a series of theoretical results that can be particularly useful for constructing designs with large run sizes, for which algorithmic construction becomes computationally challenging. We also provide some practical guidelines on how to choose appropriate designs with respect to different run size, the number of factors, and the number of 2fi's that need to be clear.

Classification

Mainly methodology

Keywords

clear effects, fractional factorial design, iWLP

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