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Characterization of Balanced Fractional 2^m Factorial Designs of Resolution $R^*(\{1\}|3)$ and GA-optimal Designs

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Abstract: In this paper, based on the assumption that the four-factor and higher-order interactions are to be negligible, we consider a balanced fractional 2^m factorial design derived from a simple array such that all the main effects are estimable, i.e., resolution $R^*(\{1\}|3)$. In this situation, using the algebraic structure of the triangular multidimensional partially balanced association scheme and a matrix equation, we can get designs of four types of resolutions: the first is of resolution $R(\{1\}|3)$, the second is of resolution $R(\{0,1\}|3)$, the third is of resolution $R(\{1,2\}|3)$, i.e., resolution VI, and the last is of resolution $R(\{0,1,2\}|3)$, i.e., resolution VI. This paper gives the characterization of designs mentioned above, and also it gives optimal designs with respect to the generalized A-optimality criterion for $6 \leq m \leq 8$ when the number of assemblies is less than the number of non-negligible factorial effects.

Key words: association algebra, BFF designs, estimable parametric functions, GA-optimality criterion, resolution, simple arrays