

Optimal Blocking of 2^{n-p} and 3^{n-p} Fractional Factorial Designs

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Systematic sources of variations in experiments can be effectively eliminated by properly grouping the runs into blocks. This motivates people to study blocked fractional factorial designs. In this paper, firstly, by further exploring the minimum aberration criterion of fractional factorial (FF, for short) designs and analysing relationships between two wordlength patterns W_t (for treatments) and $W_{t \otimes b}$ (for blocks), we introduce a concept of alias number pattern for both FF designs and blocked FF designs and give formulas for calculating the alias pattern matrix. Secondly, according to the assumptions of hierarchical principle of effects for both FF designs and blocked FF designs, we deduce a new more reasonable criterion for choosing minimum aberration blocked FF designs. Finally, we construct and tabulate optimal 2^{n-p} and 3^{n-p} blocked FF designs with some parameters, and make comparisons with other approaches.