

Aliasing in random field model for qualitative factors with symmetric levels

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Factorial designs are often used in scientific investigations when the interest of experimenters lies in the study of factorial effects. Fractional factorial designs are commonly used in practice for the economic reasons. Effect aliasing is a consequence of using fractional factorial designs. Under the fixed effect approach, in which the unknown magnitudes of factorial effects are treated as fixed parameters, effect aliasing has been extensively studied and well understood. An alternative modeling framework for experimental data is the Gaussian random field model which is commonly adopted in the literature of Bayesian designs and computer experiments. For the Gaussian random field model, the issue of effect aliasing under fractional factorial designs has not received sufficient attention in the literature. Part of the reason for this lack of attention is that the Gaussian random field model is usually not characterized by a linear model structure that is inherent in the fixed effect model. In the work, we introduce the concept of factorial effects and establish a kind of linear model structure for the Gaussian random field model, and discuss effect aliasing under the structure for p -level fractional factorial designs, where p is a prime number.