

Connectedness of complete block designs under an interference model

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Abstract

We consider an experiment with fixed number of blocks, in which a response to a treatment can be affected by treatments from neighboring units. For such an experiment the interference model with neighbor effects is studied. The aim of experiment is to compare treatments under such a model, and it can be done by estimating treatment contrasts. Our goal is to design such experiment in which all treatment contrasts are estimable. Such designs of experiments are called connected designs, and the condition for connectedness may be expressed by the rank of information matrix of the design.

Assuming the circular interference model with one-side neighbor effects we give the condition for minimal number of blocks necessary to obtain connected design and we present the sufficient and necessary conditions of connectedness of designs with arbitrary, fixed number of blocks. We show the relationship between characterization of connected designs under considered model and under the standard block model.

Keywords

Interference model, Information matrix, Treatment contrast, Estimability, Connected design, Permutation matrix, Irreducible matrix, Circulant matrix.