Building Location and Dispersion Models for Experiments with Nested Plot Structure

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Over the past two decades, robust parameter design has been extensively studied and developed. The aim of robust parameter design is to bring the mean of response to the target value and also minimize the variation of the process. For experiments with nested plot structure, because of multiple sources of error, the variation may be caused by different plot factors. The purpose of our research is to develop new approaches based on location and dispersion modeling and response modeling in order to build one location model and several dispersion models. We consider using a nested random effects model to describe the plot structure at each level of control factor which allows us to estimate the variation caused by each plot factor. If we could estimate the variance caused by each plot factor and build dispersion models for each plot factor, the relationship between control factors and plot factors could be understood. Our approaches provide more useful plot variation information especially in how plot variation affected by control factors. By each dispersion model, we can choose the optimal setting of control factors to minimize the variation caused by the most important plot factors not merely reduce the total variation.

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