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## Taxonomy of statistical models for investigating order picking systems

Order picking systems are known as complex logistics systems, where uncertainties, e.g., caused by randomness of incoming orders or delay of supplies, are present. Investigating the relationship between input variables and key performance indicators (KPIs) in common types of order picking systems, described by reference models, is aimed. Input variables are for example system load, batch size or picking strategy and typical KPIs are throughput or utilization rate.

Design and Analysis of Computer Experiments (DACE) is applied in the following steps: A discrete-event simulation model of a reference model is generating simulation output data based on a design of experiment (DoE). The data is used to build statistical models, i.e., metamodels, with uncertainty bands for depicting the influence of the input variables on the KPIs.

A taxonomy of classes of statistical models is developed to be used for fitting statistical models to reference models. Goal is the assignment of specific classes of statistical models to reference models taking different requirements from both the simulation model and the type of order picking system into account. Aspects to be kept in mind are the types of input variables (continuous, discrete, categorical), the distributional assumptions of the KPIs, the types of dependencies (linear, curvilinear, exponential, interactions, ...), the possibility to calculate a prediction interval with specific characteristics as well as dependencies between observations in case of replications. First statistical analysis of some reference models are presented.

### Special/ Invited session

#### Classification

Mainly application

#### Keywords

Design and Analysis of Computer Experiments, order picking system, statistical metamodeling

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