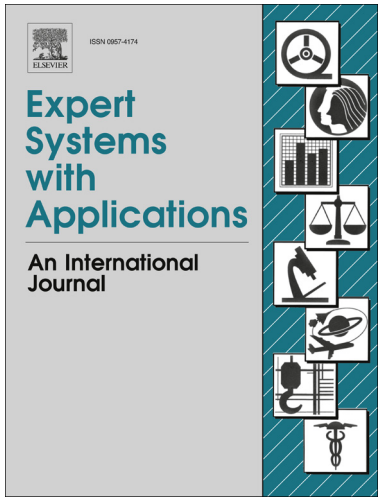

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An interactive decision-support system for multi-objective optimization of nonlinear dynamic processes with uncertainty

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Abstract

The manufacturing industry is faced with the challenge to constantly improve its processes, e.g., due to lower profit margins, more strict environmental policies and increased societal awareness. These three aspects are considered as the pillars of *sustainable development* and typically give rise to multiple and conflicting objectives. Hence, any decision made will require trade-offs to be evaluated and compromises to be made. To support decision making an interactive multi-objective framework is presented to optimize dynamic processes based on mathematical models. The framework includes a numerically efficient strategy to account for parametric uncertainty in the models and it allows to directly minimize the operational risks arising from this uncertainty. Hence, for the first time expert knowledge on the trade-offs between traditional objective functions and operational risks is readily and interactively available for the practitioners in the field of dynamic systems. The introduced interactive framework for multi-objective dynamic optimization under uncertainty is successfully tested for a three and five-objective fed-batch reactor case study with uncertain feed temperature and heat transfer parameters.

Keywords: multi-objective optimization, dynamic optimization, optimal control, robust optimization, nonlinear optimization, interactive tool

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