

Design optimization techniques for industrial applications: challenges and progress

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Current industrial applications of design optimization exhibit several features that are not yet adequately addressed by commercially available optimization tools:

- Large scale (1000+ design variables) optimization problems with expensive (10+ hours) response function evaluations that are polluted by numerical noise
- Discrete optimization with even moderately expensive response functions
- Multidisciplinary optimization in an industrial setting
- Optimization with non-deterministic responses.

The presentation discusses recent progress towards addressing these issues by identifying general trends and appropriate methods for solving large scale optimization problems focusing on the trust region-based metamodeling techniques [1], specifically addressing the issues of numerical noise and uncertainty and occasional failures of the solvers to produce responses [2,3]. The use of variable fidelity responses is identified as a highly beneficial approach as it allows to establish high accuracy metamodels using only small-scale sampling of the high fidelity responses. The presentation is illustrated by examples of industrial optimization problems with a focus on the aerospace sector [4].

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