Crashworthiness optimization of an automotive front bumper

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ABSTRACT

In automotive industry, structural optimization for crashworthiness criteria is of special importance in the early design stage. Crashing performance of structures under dynamic impact can be investigated using finite element codes. By coupling FE simulation tools with nonlinear mathematical programming procedure and statistical techniques, it is possible to optimize the design with reduced number of analytical evaluations [1]. Optimization methods using statistical techniques are widely used in engineering applications to utilize estimated models which are often referred to meta-models. Meta-modeling optimization is performed through construction of objective functions, design of experiment (DOE) and modeling. Various types of meta-modeling techniques were used for crashworthiness optimization [2-5].

In this study the comparative study of Kriging and Radial Basis Function Network (RBFN) was performed in order to improve the crashworthiness effects of a front bumper subjected to impact. The objective function is the minimization of the mass and the design variables are geometrical parameters subjected to some design contraints. The optimized solution was achieved interfacing LS-DYNA codes with LS-OPT and using a domain reduction strategy.

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