

# Exact Solution Set Hull

## by Proven Monotonicity/Combinatorial Properties

Consider a truss cantilever after Benchmark problem 2 by R. Muhanna

(see <http://www.gtsav.gatech.edu/rec/ifem/benchmarks.html>)

where all parameters have 2% uncertainty that is  $E_i \in [0.99, 1.01]$ ,  $i = 1, \dots, 101$ .

The exact interval hull of the system response can be rigorously found if knowing which parameter bounds determine the extremal values of the solution components. Such information can be rigorously proven by a methodology presented in

E. Popova: Computer-Assisted Proofs in Solving Linear Parametric Problems, to appear in the Proceedings of SCAN'06, IEEE Computer Society Press, 2007. (for a preprint see <http://www.math.bas.bg/~epopova/papers/06scanEPopova.pdf>)

For each solution component an ASCII file

(<http://www.math.bas.bg/~epopova/papers/trussMonotonicity.txt>)

contains proven monotonicity or combinatorial properties with respect to each of the uncertain parameters. Therein -1 means antitone dependence, 1 means monotone dependence,  $\{\lambda, \mu\}$ ,  $\lambda, \mu \in \{-1, 1\}$  specifies the exact combinatorial dependence, and 0 means that the type of the dependence was not proven.