

Scalable TFETI/TBETI algorithms for contact problems with variationally consistent discretization and optional preconditioning

Zdenek Dostal¹ Tomas Kozubek² Tomas Brzobohaty³

The results related to the development of theoretically supported scalable algorithms for the solution of large scale transient contact problems of elasticity will be reviewed. The algorithms combine the Total FETI/BETI based domain decomposition methods adapted to the solution of 2D and 3D multibody contact problems of elasticity with optional preconditioning by conjugate projector or dual scaling with our in a sense optimal algorithms for the solution of resulting quadratic programming problems. Rather surprisingly, the theoretical results are qualitatively the same as the classical results on scalability of FETI/BETI for linear elliptic problems, i.e., the inequality constraints are treated in a sense for free. We also discuss the effect of implementation of the nonpenetration condition by the variationally consistent discretization introduced recently by B. I. Wohlmuth. The numerical and parallel scalability of the method is demonstrated by the results of numerical experiments with parallel solution of 2D and 3D contact problems of elasticity discretized by millions of nodal variables.

¹ VSB-Technical University Ostrava, Applied Mathematics, Ostrava, Czech Republic,
zdenek.dostal@vsb.cz

² VSB-TUO Ostrava,
tomas.kozubek@vsb.cz

³ VSB-TUO Ostrava,
tomas.brzobohaty@vsb.cz