EngOpt2018 - 6th International Conference on Engineering Optimization
Instituto Superior Técnico, Lisbon Portugal • 17-19 September, 2018
Editors: H.C. Rodrigues, J. Herskovits, C.M. Mota Soares, et al.

Abstract ID 1130

ON COMPARISON OF SOLUTION METHODS FOR 3D CONTACT SHAPE OPTIMIZATION PROBLEMS WITH FRICTION

Petr Beremlijski

VŠB-Technical University of Ostrava, Czech Republic
petr.beremlijski@vsb.cz

Keywords: shape optimization,contact problem,Coulomb friction,nonsmooth optimization,bundle methods

Abstract: The shape optimization of 3D elastic body in contact with rigid obstacle with Coulomb friction can be modelled as minimization of composite function generated by the objective and the control-state mapping. It has been shown that for small coefficients of friction the discretized contact problem with Coulomb friction has a unique solution and this solution is Lipschitzian as a function of a control variable describing the shape of the elastic body. It means that the control-state mapping is single-valued and the 3D contact shape optimization problem with Coulomb friction leads to a minimization of nondifferentiable (nonsmooth) single-valued function. There are several possibilities how to solve the problem. The easiest one is to neglect the friction and find the optimal shape of the optimized body as the solution of the shape optimization problem of 3D elastic body in contact without friction. The advantage is that we solve the optimization problem with differentiable function. Unfortunately, we find the optimized shape which does not solve the original problem exactly. Another possibility is to solve the whole problem with Coulomb friction. This leads to optimization of nonsmooth function. For this case we have to use methods which are working with calculus of Clarke. The most reliable of the nonsmooth methods for this kind of problem are bundle methods. We use bundle trust method proposed by Schramm and Zowe and proximal bundle method proposed by Mäkelä and Neittaanmäki. In each step of the iteration process, we must be able to find the solution of the state problem (contact problem with Coulomb friction) and to compute one arbitrary Clarke subgradient. To get subgradient information needed in the used numerical method we use the differential calculus of Mordukhovich. The aim of the contribution is to compute the optimized shape of 3D elastic body in contact with rigid obstacle by all previous mentioned solution methods and their comparison.