

Limit analysis problem and its penalizations

Stanislav Sysala*

* Institute of Geonics, Czech Academy of Sciences (IGN)
Department IT4Innovations (IT4I)
Studentska 1768, 708 00 Ostrava, Czech Republic
e-mail: stanislav.sysala@ugn.cas.cz, web page: <http://www.ugn.cas.cz>

ABSTRACT

The contribution is focused on a solution of the limit analysis problem in perfect plasticity formulated in terms of displacements (kinematic approach). It is a specific constrained minimization problem describing a collapse state of the investigated body. We consider two different penalizations of the problem introduced in [1]-[4] which can be solved by simple numerical techniques.

The first penalization leads to a smooth convex program containing only a simple constraint on the load, and it is closely related to the original elastic-perfectly plastic problem. The method can be also interpreted as an indirect method of incremental limit analysis and the penalization parameter represents the work of external forces. Unlike current methods of incremental limit analysis, convergence results with respect to the discretization parameter are available. The method mimics the acr-lenght methods.

The second penalization method can be interpreted as the truncation method where unbounded yield surfaces are approximated by bounded ones. For bounded yield surfaces, the limit analysis problem also contains only the load constraint and there are stronger theoretical and convergence results in comparison to unbounded ones. Such a penalization leads to a lower bound of the limit load.

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