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ADAPTIVE LIMIT ANALYSIS USING DEVIATORIC FIELDS

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Abstract. Accurate estimates of limit loads for difficult stability problems in geotechnical engineering can rarely be obtained from a single finite element limit analysis without using an excessive number of elements. Therefore, efficient adaptive strategies which maximize the solution accuracy using minimum number of elements in the mesh are of great interest. The key to obtaining accurate solutions lies in accurately capturing the areas of plasticity within the problem domain, as their pattern and intensity characterize the solution. Several approaches have been practiced so far including those based on plastic multipliers, strain and power dissipation fields employed as control variables. All these schemes work quite well for cohesive or cohesive-frictional materials, but for purely frictional soils their performance stalls as e.g. plastic multipliers have substantially high values for all zero stress points on the surface of soil domain, therefore cannot indicate reliably plastic areas. Similar conclusion can be made about performance of schemes based on power dissipation or strain rates. This study explores the possibility of using the internal dissipation calculated from deviatoric stresses and strain rates as suitable control field for purely frictional materials. The performance observed for considered set of problematic for other adaptive schemes geotechnical examples is very promising. Moreover, the proposed approach works very well also for cohesive and cohesive frictional materials, suggesting its use as general engine for adaptive mesh refinement.