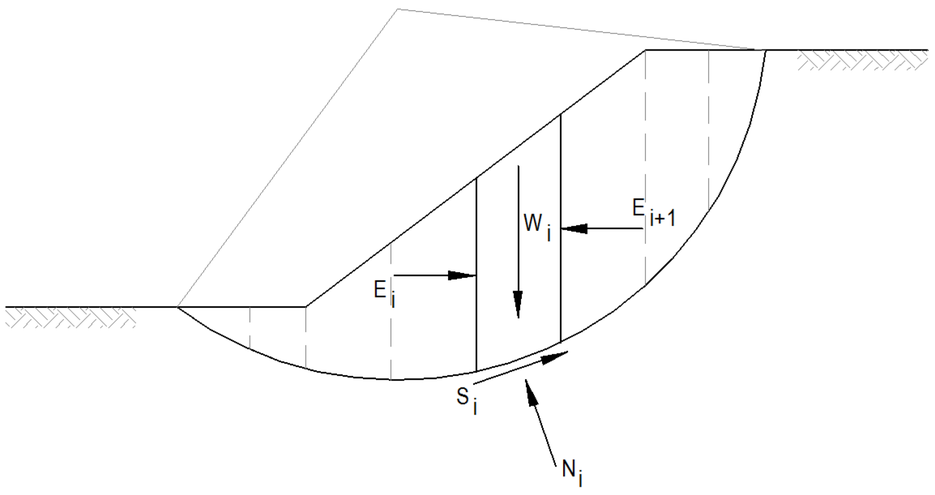
TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Civil Engineering Chair of Soil Mechanics and Foundation Engineering

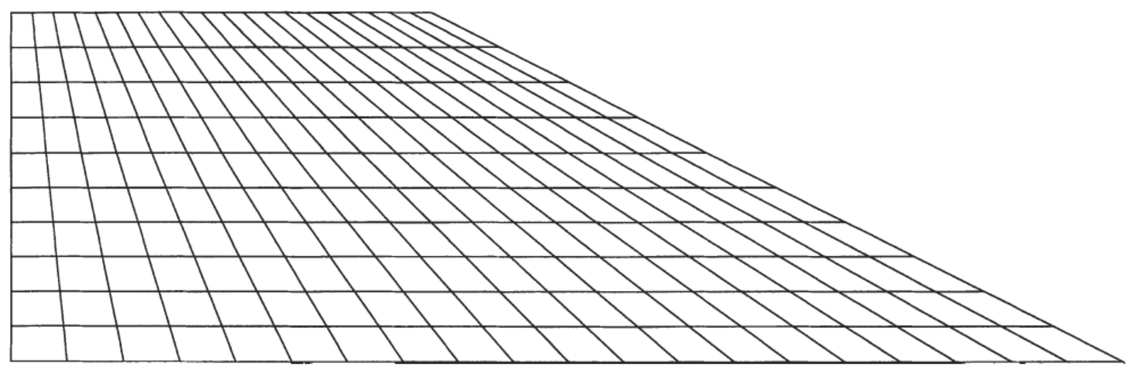
Master thesis

Application of the Method of Strain-dependent Slope Stability

In the field of Geotechnical engineering, the analysis of slope stability play a significant role. There are many methods which have been invented and which are currently still under research. Being developed before the era of computer machines, Limit Equibrium Methods, e.g. method of slices, have been studied and applied in engineering practice and are therfore well-known. The strongest ability of Limit Equibrium Methods is the simplicity which is its inherent characteristic. The methods are also developed to adapt to the improvement of computer machines. However, the methods can not avoid its natural weakness in portray the stress-strain behavior.



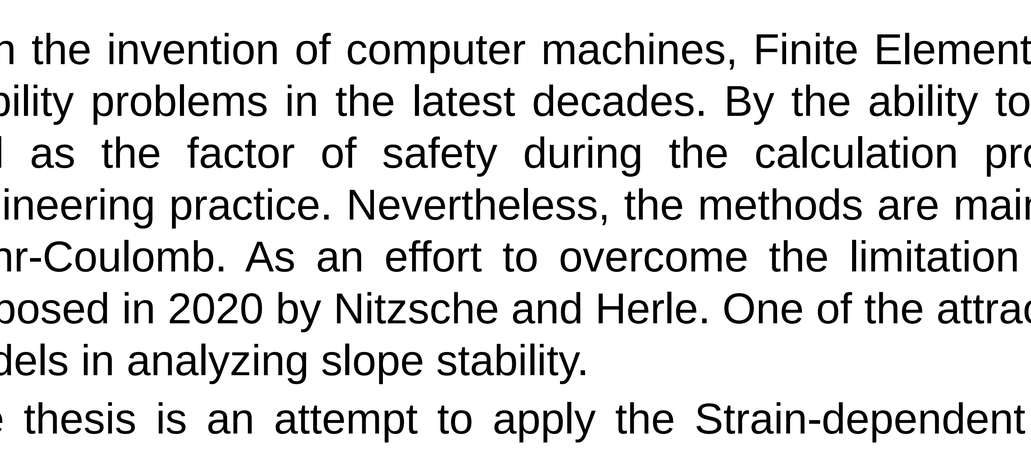
Limit Equilibrium Methods (Simplified Bishop Method)



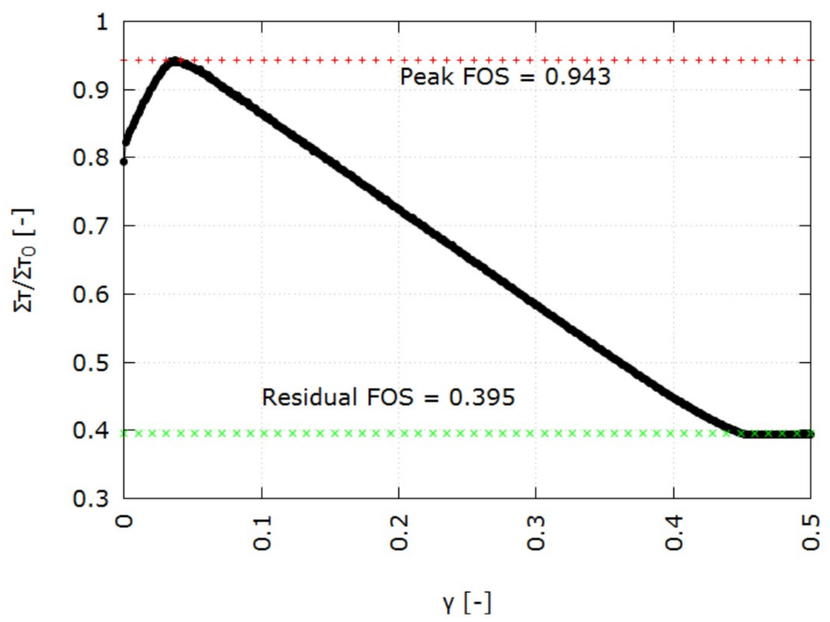
Mesh for Finite Element calculations

With the invention of computer machines, Finite Element Methods (φ-c-reduction) have been studied and applied to stability problems in the latest decades. By the ability to generate automatically stresses and the failure surface as well as the factor of safety during the calculation process, Finite Element Methods become more popular in engineering practice. Nevertheless, the methods are mainly limited in the application of simple failure criteria such as Mohr-Coulomb. As an effort to overcome the limitation of the above methods, the Strain-dependent Method was proposed in 2020 by Nitzsche and Herle. One of the attractive features is the ability to apply advanced soil constitutive models in analyzing slope stability.

The thesis is an attempt to apply the Strain-dependent Method into a real case study of landslide. The landslide occurred in Norway in 2015 where sensitive clay and thus a decrease in shear strength play an important role. The results of the calculation were compared with calculation results obtained by the application of the Limit Equilibrium Method and Finite Element calculations to help improve the understanding Strain-dependent Method.



Model of the case study of Strain-dependent Method



Development of factor of safety when applying Strain-dependent Method

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Date of submission: 28.07.2020