

Master's Thesis

Numerical modeling of excavations in clay

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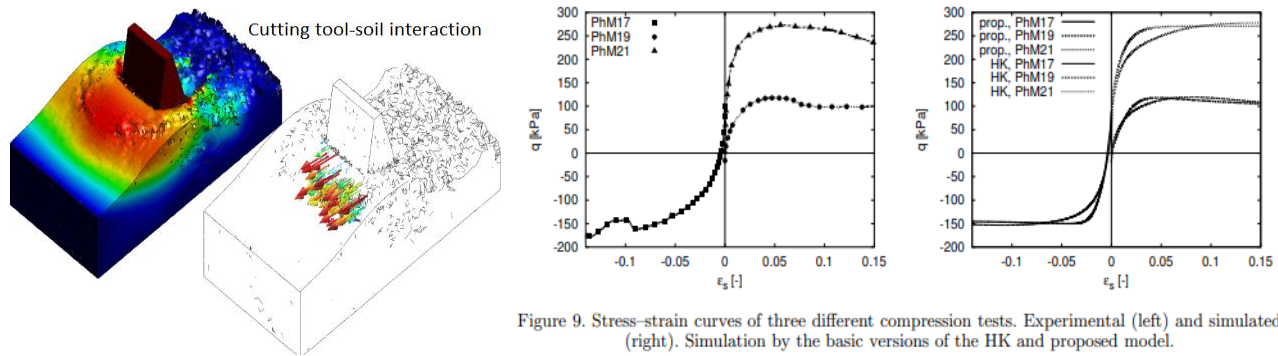


Figure 9. Stress-strain curves of three different compression tests. Experimental (left) and simulated (right). Simulation by the basic versions of the HK and proposed model.

Background: Mechanized excavations in clay are of primary interest in the agricultural industry and tunneling construction, where a detailed investigation of stresses and deformations induced in the clay by the excavation tool, is still required. Clayey soils, which exhibit significant cohesive strength and viscous effects sensitivity as compared to granular materials, can be adequately modeled by means of hypoplastic constitutive models. In Hypoplasticity, the non-linear behavior of clays is captured via a single tensorial equation without resorting to the use of a yield surface, thus greatly simplifying the computational implementation in standard Finite Elements codes.

Task: Within this master thesis the following tasks are to be completed:

- Study of the theory of Hypoplasticity and clay hypoplastic models
- Implementation of a clay hypoplastic model into the KRATOS code
- Validation of the implemented subroutine via typical soil element tests
- Computational excavation analysis using a single cutting tool, considering different soil, water saturation and operational conditions

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