Master's Thesis

Implementation of a material-point-based approach in the Finite Cell Method for numerical simulation of landslide disasters

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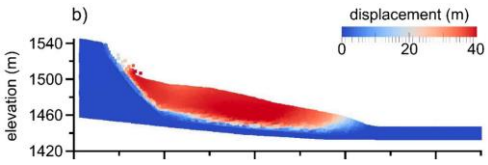
Background:

Landslides refer to sliding of larger soil and rock masses mostly caused by rainfall or earthquakes. These events can cause severe damage to infrastructure and buildings and can even claim human lives. Understanding the pre- and post-failure mechanisms of the rock or soil masses is of great importance to prevent such phenomena from happening and keeping the damage at a minimum level. Numerical tools to analyse these scenarios need to account for large deformations and require advanced simulation technologies.

[https://crosscut.com/2020/02/landslides-close-roads-washingtons-remote-towns-deal-isolation]



[A. Troncone et al., 2020, doi:10.3390/w12102817]

Task:

- Literature review about Particle-in-Cell Methods (e.g. Material Point Method).
- Implementation of a Lagrangian-based particle integration approach in a framework based on the Finite Cell Method accounting for large deformation.
- Implementation of a proper material model for flow simulations of landslide s.
- Numerical analysis of mechanical benchmark problems.
- Numerical analysis of landslide examples.

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