# Masterarbeit:

Mixed Element formulation (u-p element) for the Material Point Method (MPM)

Mixed element formulations are often used to calculate incompressible or nearly incompressible materials. But also for hyperelastic material law, the consideration of the additional unknown improves the accuracy of the calculation. The consideration of the additional unknown in the governing equations, lead to a saddle point problem to be solved. Usually, a linear distribution of the pressure field is assumed within the elements, resulting in shape functions which are the same as for the displacement field. That distribution does not fulfill the inf-sub condition, leading to the necessity of stabilizing the calculation accordingly.
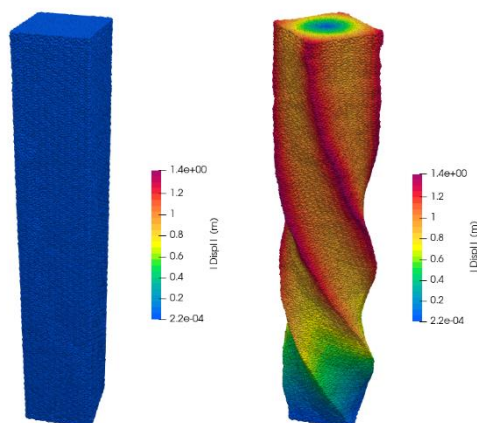
As an alternative, in this work a constant pressure distribution within the elements should be considered, whereas a linear displacement field should be assumed. Considering that constraint, the mixed element formulation should be derived theoretically, first starting with a literature review for mixed element formulations in MPM. Then the additional element type should be implemented into the open source Multiphysics platform KRATOS and the element formulation should be tested and validated for several examples.

Basic programming experience in C++ and Python are essential for the proposed topic.

Betreuer und Kontakt:

Veronika Singer
Veronika.singer@tum.de
089/289-28686

Bearbeitungs-
sprache: Deutsch oder Englisch
Starttermin: variabel