# Material Point Method:
# Overview, Challenges and the Road Ahead

by Wojtek Sołowski

**Friday 5 July, 10.00-11.00, Room 02.110, Faculty CEG**

**Abstract:**

The Material Point Method is a method for numerical calculations where very large displacements and deformations are present. The initial formulation of the method has been gradually improved leading to greater stability and better accuracy. However, typical formulations of the material point method are still technically first order accurate, which means that achieving accurate results requires many material points and is very time consuming. Therefore, the talk discusses how to achieve and maintain the second order convergence rate.

Later, the talk concentrates on the most recent developments in Material Point Method algorithms increasing the stability and accuracy of the method. Furthermore, the presentation discusses challenges related to granular flow simulations. Finally, the conclusions contain some speculations related to the Material Point Method future and suggestions for the areas in which the method may become the method of choice in research and engineering practice.

**Bio:**

Dr Wojtek Sołowski obtained his PhD degree in Durham, UK, working on algorithms related to implementation of constitutive models for unsaturated soils into the Finite Element Method codes. In particular, he investigated stress integration algorithms for Barcelona Basic Model, a popular model for unsaturated soils. Afterwards, he moved to Newcastle, Australia, where he continued his research on stress integration algorithms, as well as gained interest in Material Point Method. Since 2014 he works as a professor at Aalto University, Finland. His group research is currently concentrated on Material Point Method and on THMC coupled Finite Element Method modelling of geomaterials. Both research areas require development of novel algorithms and improvements in currently existing codes. Sołowski is also interested in constitutive modelling of soils, both saturated and unsaturated, soil microstructure and how it affects macroscopic soil behaviour, as well as processes affecting soils freezing and thawing.