Towards the simulation of grinding processes – a thermoplastic single grain approach

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- 74F05 (Mechanics of deformable solids, coupling with thermal effects)
- 74R99 (Mechanics of deformable solids, fracture and damage, None of the above, but in this section)

Abstract

The current work aims at modelling and simulation of metal grinding processes with focus on the thermal behaviour resulting from the interaction of tool and workpiece. Starting from a two-dimensional model of a single grain, representative numerical experiments are carried out based on the variation of grain geometry and its spatial position relative to the workpiece to predict the resulting load-displacement-behaviour.

Here, a thermoelastic viscoplastic constitutive model is used to capture thermal softening of the material taken into account. Referring to previous research [1,2], an adaptive remeshing scheme, based on a combination of error estimation and refinement indication, is used to overcome mesh dependence, allowing to resolve the complex deformation patterns and to predict a realistic thermomechanical state of the resulting workpiece surface.

As a long term goal, we aim at developing an extension towards a three-dimensional single grain model which in the next stage will be able to reflect statistically distributed multigrain interaction and the prediction of grinding process parameter dependent thermomechanical results.