# Evaluation of a clustering algorithm for texture data via viscoplastic self-consistent model

Alois Ott*[1], Johannes Kronsteiner[1], and Nikolaus Papenberg[1]

[1]Austrian Institute of Technology – Austria

**Abstract**

In forming simulations, considering material texture represents a challenge due to the necessity of handling extensive datasets. This is a crucial aspect when analyzing complex part designs. Data reduction can be achieved through the use of meso-scale approaches, e.g. the viscoplastic self-consistent (VPSC) model. The VPSC model calculates individual grain responses within a deformed matrix, therefore the total number of grains has a substantial impact on the computation time. In this work an algorithm is presented, that cumulatively reduces the number of grains without causing significant deviations in the simulation results. Our approach is based on the principle of a k-means algorithm. The grain orientations are depicted as unit quaternions, and the Euclidean metric defined within this set is used to determine their distance from each other. Instead of setting the number of k clusters, a fixed radius is used, allowing for a variable number. The size of this cluster radius is responsible for the degree of data reduction. The impact of clustering-induced errors is determined via comparison of experimental flow curves of an AA6082 alloy and simulated tensile tests using VPSC Standalone, providing an upper limit for data reduction.

**Keywords:** clustering algorithm, texture, VPSC

*Speaker