



Einladung zum Vortrag

Smoothed Particle Hydrodynamics: Fundamentals, Challenges and Applications in Melt Pool Simulation for 3D Printing

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Zusammenfassung: Meshfree particle methods – especially Smoothed Particle Hydrodynamics (SPH) – are considered an attractive alternative in numerical simulation due to their ability to solve boundary value problems even for large deformations with free surfaces on arbitrary distributions of evaluation points. An example of such a case is the virtual reproduction of additive manufacturing processes. For this reason, the SPH is increasingly used in this context for the spatial discretization of the underlying differential equations. However, in order to achieve physically plausible results, stabilization techniques are often used in SPH. In the presentation, the SPH is first analyzed as a method of spatial discretization and then examined for strengths and weaknesses in direct comparison with the established Finite-Element-Method. Based on this, an alternative SPH approach is presented and its effects on accuracy and computational efficiency are explained. The paper concludes with a virtual case study on laser deposition processes, in which the weld pool is modeled using SPH, taking into account the powder feed. In addition, relevant physical effects are examined in depth and further research needs are outlined.

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