JOHANNES KEPLER UNIVERSITY LINZ

Johannes Kepler Universität Linz
Institut für Numerische Mathematik

Univ.-Prof. Dr. Herbert Egger

Talk announcement

Alessio Cesarano
(RICAM)

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Space-time optimization of rotating electric machines

Electric machines can often be modeled by the magneto-quasi-static approximation of Maxwell's equations in two space dimensions. We consider the simulation of a rotating electric machine by means of a space-time finite element method where the rotation is captured by the tetrahedral space-time mesh. In our approach, the material distribution is described by a level set function and an intelligent refinement of the original mesh is used to assign each tetrahedron to one material or the other. We then derive the shape derivative for a given cost function with respect to a perturbation of the (spatial) geometry and present a shape optimization algorithm for moving domains in space- time. Here, it is important to note that the optimized geometry is moving, but must not change its shape over time. To better explain our method and the related concepts, we first deal with an academic unconstrained optimization problem and show four scenarios one could consider, then we apply it to the time-dependent model of a rotating electric machine.