Michael Hinze (Universität Koblenz-Landau, Germany)

"New perspectives in fluid mechanic shape optimization"

We sketch two approaches for PDE constrained shape optimization of domains. In the first approach we consider a phasefield method for fluid mechanic shape optimization, where the shape of the sought domain is approximated by the zero level set of a phasefield function. This turns the shape optimization problem into a PDE constrained optimization problem where the phasefield enters as control in the coefficients of the PDE. The second approach uses the method of mappings, where we propose a new minimization approach using steepest descent in the $W^{1,\infty}-$ topology. The numerical example indicates that minimization in the $W^{1,\infty}-$ topology seems to be superior over the classical minimization in Hilbert spaces, in particular when the optimal shape has sharp corners.

Joint work with Niklas Kühl, Peter Marwin Müller, Thomas Rung, Martin Siebenborn (Fluid dynamic shape optimization), Klaus Deckelnick and Philip Herbert ($W^{1,\infty}-$ shape optimization}, and Harald Garcke, Christian Kahle and Andrew Lam (phasefield based shape optimization).