

## Shape Calculus and Large Scale Shape Optimization

Shape optimisation is a special sub-class of PDE constrained optimisation problems where the geometry is the unknown to be found. The technique to differentiate objective functions with respect to input geometries is called "shape sensitivity analysis" and exploiting this type of calculus enables the construction of very fast and efficient algorithms for gradient based shape optimisation. The main structure exploitation is given by the Hadamard-Theorem which states that shape optimisation problems of sufficient regularity can be solved using boundary quantities alone, which offers tremendous potential when compared with discrete approaches.

As such, numerical shape optimisation based on shape calculus is a fascinating research area within the rare overlap of numerical analysis, PDE constrained optimisation, differential geometry and possibly high performance computing. The talk will feature several applicational examples such as acoustics, thermo-elasticity, CFD, and aircraft design.