

Karlstad Applied Analysis Seminar (2022)

Alexander Mörter, University of Stuttgart, Germany

January 26, Wednesday 11:30

Optimization on manifolds: methods and applications { an engineering perspective

Abstract

Numerical optimization for infeasible constraints. This constraint can be satisfied by, for example, the penalty method or the Lagrange multiplier method. These methods often induce artifacts in the optimization process, e.g., the dependence on a penalty parameter or the transformation of a minimization problem into a saddle-point problem. Locally, constraints can sometimes be interpreted as a set in the design space. As a new example, if the optimization problem is to find a point P in \mathbb{R}^2 to be the object of minimizing the distance to a given point A and the constraint that the distance to a given point B should have a distance larger than a given value, the combined optimization problem of finding a point P on a circle and B to minimize the distance to A is equivalent to the combined optimization problem of finding a point P on a circle and B to minimize the distance to A .

able problem. The main can combined optimization problem in a combined space. For example, it includes the generalization of the incremental path of design variables. If they lie on a manifold (instead of a linear vector space), simple addition of the incremental path and the design variable is not defined and alternative concepts are needed, like addition in tangent spaces and exponential mapping. Similar concepts apply to the components of an optimization chain for the nonlinear manifold. This talk exemplarily presents concepts of differential geometry for genetic optimization algorithms from an engineering perspective. Additionally applications in simulation of physical processes e.g., elastic deformation of bells and micromagnetics are presented.