



universität  
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Fakultät für Mathematik

## Mathematisches Kolloquium

Mittwoch, 11. Oktober 2017

Sky Lounge

### EINLADUNG

**Daniel Ševčovič**

(Comenius University in Bratislava)

**"Construction of the optimal anisotropy function for the inverse Wulff problem by means of the enhanced semidefinite relaxation method"**

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#### **Abstract:**

*The classical isoperimetric inequality is related to the ratio between the square of the length of a Jordan curve in the plane and the area enclosed by this curve. It was already known in Ancient Greece that the minimizer of the isoperimetric ratio is a circle. Later crystallographer Georg Wulff generalized the isoperimetric inequality in the framework of the so-called relative Finsler geometry in which the geometric length of a curve is replaced by the length weighted by a given anisotropy function depending on the orientation of a curve and characterizing the Finsler geometry. He also showed that the minimum of the anisoperimetric ratio is attained by a curve which is known as the Wulff shape corresponding to the given anisotropy function. In this talk we focus our attention on the inverse Wulff problem which consists in construction of the underlying anisotropy function minimizing the anisoperimetric ratio for a given Jordan curve in the plane. The problem can be formulated in terms of minimization of a non-convex variational functional. It can be approximated by a sequence of finite dimensional non-convex quadratic optimization problems with linear matrix inequalities. We solve this nonlinear programming problem by means of the so-called enhanced semidefinite relaxation method. It is based on solving a convex semidefinite problem obtained by a convex relaxation of the original problem. We show that the sequence of finite dimensional approximations of the anisotropy function converges to a solution of the inverse Wulff problem. We present several computational examples, including those corresponding to construction of a nearly hexagonal anisotropy function for curves representing real snowflake boundaries. The presentation is based on the joint work with Mária Trnovská: Solution to the Inverse Wulff Problem by Means of the Enhanced Semidefinite Relaxation Method, *Journal of Inverse and Ill-posed Problems* 23(3) 2015, 263-285.*

**15.45 Uhr: Kaffeejause**

**16.15 Uhr: Vortrag**

**vinum cum pane im Anschluss**

Otmar Scherzer  
Christian Krattenthaler