Monday, October 08th, 2018

10:00 - 10:45		**Registration and coffee/tea**
10:45 - 11:00		**Welcome Address**
11:00 - 12:00		**Discrete conformal geometry of polyhedral surfaces** **Feng Luo, Rutgers University**
12:00 - 13:00		**Lunch**
13:30-14:15		**SFB-Talk: Tri-partition of a simplicial complex** **Herbert Edelsbrunner, IST Austria, Joint work with Katharina Oelsboeck**
14:15-15:00		**SFB-Talk: Numerical Tracking of Ellipsoids in Stochastic Dynamics** **Christian Kühn, , TU München**
15:00 - 15:30		**Coffee Break**
15:30 - 17:00 **Parallel workshops**	**Plenary Room**	**Polytopes and realizations with Sage and SCI** **Project A03 "Geometric Constraints for Polytopes" (Part 1)** In this workshop we will explore the many methods that the mathematical software Sage provides for dealing with polytopes. A focus will be on the realizability of abstract polytopes. We will discuss methods from non-linear optimization (e.g. SCIP) for proving *non-realizability* as well as finding *(inscribed/circumscribed) realizations*.
	Room 2	**Topological simplification problems** **Ulrich Bauer, TU München; Günter Rote, FU Berlin** We plan to investigate problems asking for structure-preserving simplification of topological and algebraic structures, such as simplicial complexes, chain complexes, Morse decompositions, arising from a combinatorial description of a space or a filtered space, for example, sublevel sets of a function. In particular, we plan to discuss obstructions to simplification, hardness results for finding optimal solutions, and approximability as well as inapproximability of the corresponding optimization problems.
	Room 3	**Numerics of divergent series, with applications to dynamical systems** **Folkmar Bornemann, TU München; Yuri Suris, TU Berlin** work in groups
17:00 - 18:30 **Parallel workshops**	**Plenary Room**	**Assembly of Surfaces from Parts (Part 1)** **Peter Schröder, Caltech; Ulrich Pinkall, TU Berlin** A common theme in the discrete differential geometry of surfaces is their assembly from parts. These may be as small as individual triangles or cover large parts of a surface with partial overlaps. Questions of how to accomplish this, how to accommodate constraints, or how to best deal with noisy data are common across different applications and we will discuss these using a number of different scenarios from virus shells to architectural geometry and computer vision based acquisition or real world surfaces.
	Room 2	**Topological simplification problems** **Ulrich Bauer, TU München; Günter Rote, FU Berlin** work in groups
19:00		**Dinner**

Tuesday, October 09th, 2018

09:00 - 10:00		**Noether's Theorem, one hundred years later** **Elizabeth Mansfield, University of Kent**
10:00 - 10:30		**Coffee Break**
10:30 - 11:30		**Elliptic bipartite dimers on isoradial graphs** **Cédric Boutillier, Sorbonne University**
11.30 - 12.00		**Time for Discussion**
12:00 - 13:30		**Lunch**
13:30-14:15		**SFB-Talk: Recent advances on variational theory of integrable systems** **Yuri Suris, TU Berlin**
14:15-15:00		**SFB-Talk: Periodic Tangled Filaments** **Myfanwy E. Evans, TU Berlin**
15:00 - 15:30		**Coffee Break**
15:30 - 17:00 **Parallel workshops**	**Plenary Room**	**Polytopes and realizations with Sage and SCI (Part 2)** **Project A03 "Geometric Constraints for Polytopes"**
	Room 2	**Self-assembly in biophysics** **Gero Friesecke, TU München: Self-assembly of tobacco mosaic virus** **Rhoslyn Coles, TU Berlin: Tangled tubes in liquid environments** **Myf Evans, TU Berlin: Periodic minimal surfaces in biology** **Presentations are open-ended, leaving plenty of time for discussion.** Many assembly and growth processes in biology are driven by geometry. On the molecular scale a beautiful example which is mathematically not well understood is self-assembly of viruses. For example, in tobacco mosaic virus identical copies of a single coat protein - a highly unsymmetrical shape - self-assemble into a unique highly symmetric shape. Questions include: - what are the geometric constraints on protein shapes for unique self-assembly? - how does knotting and tangling affect self-assembly of nucleic acids and proteins? - are there natural geometric interaction models allowing to emulate the dynamic assembly process? - what is the function of self-assembled geometric structures in biological systems?
	Room 3	**Exhaustive reduction in persistent homology** **Ulrich Bauer, TU München; Herbert Edelbrunner, IST Wien** This is a work in groups exploring different aspects of ?exhaustive reduction?, a variant of the standard matrix reduction algorithm, which performs all possible pivot eliminations. We plan to discuss experimental results related to a generalized tree/cotree decomposition, a (further) variant of the algorithm with improved worst-case complexity, and possible uses for manifold reconstruction.
17:00 - 18:30	**Plenary Room**	**Young Investigator Workshop** **organised by Thilo Rörig, TU Berlin and Daniel Karrasch, TU München** In our workshop you will have the opportunity to hear about the experience of scientists at different stages of diverse career paths. We encourage you to contribute to a lively discussion and use the opportunity to ask questions.
17:00 - 18:30	**Room 2**	**Board meeting of the SFB/Transregio 109**
19:00		**Dinner**

Wednesday, October 10th, 2018	
09:00 - 10:00	**Energies for shape comparison and alignment** **Joel Hass, University of California, Davies**
10:00 - 10:30	**Coffee Break**
10:30 - 11:30	**Dynamics on lattices** **Hermen Jan Hupkes, University of Leiden**
11:30 - 12:00	**Time for Discussion**
12:00 - 13:30	**Lunch**
13:30 - 14:30	**General Assembly of the members of the SFB/Transregio 109**
14:30 - 15:00	**Coffee Break**
15:00 - 19:00	**Accompanying program** **(on self-payment basis)** The following activities are available: 1. The hotel has 15 bicycles, 4 row boats and 4 canoes reserved for us (cost: 6 euros per 2 hours). If you want to rent a bike or boat sign up at the hotel reception. 2. Hiking and bicycles maps are also available at the reception. 3. In addition, the hotel offers a 1-hour forest walk with a forester. The hotel has also a swimming pool and a sauna.
19:00	**BBQ evening**

Thursday, October 11th, 2018

09:00 - 10:00		**Embeddings of Simplicial Complexes: Some New Algorithmic Undecidability Results** **Uli Wagner, IST Austria**
10:00 - 10:30		**Coffee Break**
10:30 - 11:30		**Shape from Metric** **Albert Chern, TU Berlin**
11.30 - 12.00		**Time for Discussion**
12:00 - 13:30		**Lunch**
13:30-14:15		**SFB-Talk: Conformally equivalent triangular lattices: C^\infty convergence, conformal symmetry and a generalization** **Ulricke Bücking, TU Berlin**
14:15-15:00		**SFB-Talk: The maximal fluctuation estimate of Wulff shapes on lattices** **Marco Cicalese, TU München**
15:00 - 15:30		**Coffee Break**
15:30 - 17:00 Parallel workshops	**Plenary Room**	**Assembly of Surfaces from Parts (Part 2)** **Peter, Schröder, Caltech; Ulrich Pinkall, TU Berlin**
	Room 2	**A Lagrangian perspective on advection–diffusion and related geometric aspects** **Daniel Karrasch, TU München** This workshop is a gentle and extended introduction into my field of research, the analysis of (finite-time) dynamical systems from a geometric point of view. An essential aspect of the approach taken is to study a dynamical process by translating it to an associated geometry.To this end we look at transport of scalar quantities by the combined action of advection and diffusion. The diffusion induces a Riemannian geometry on space, which we study from a Lagrangian perspective (i.e., from the perspective of the initial conditions for the pure-advection problem). I will discuss relations to discretization approaches such as the popular diffusion map methodology.The workshop primarily aims at exposing the audience to an exciting field of research in applied mathematics and invites to discover relations to own expertise/research interests.
	Room 3	**Structure Preservation in Discrete Dynamics** **Christian Kuehn, TU München; Yuri Suris, TU Berlin; Matteo Petrera, TU Berlin; Maximilian Engel, TU München** The mini-workshop discusses recent progress in the discretization of dynamical systems. In particular, the focus will be on the interplay between integrable and dissipative problems. Numerical schemes for both classes of problems can be analyzed from a geometric viewpoint in phase space and this shows the role of given, or a-priori hidden, conserved quantities.
17:00 - 18:30 Parallel workshops	**Plenary Room**	**Assembly of Surfaces from Parts (Part 3)** **Peter Schröder, Caltech; Ulrich Pinkall, TU Berlin**
	Room 2	**Discrete optimaltransport and gradient flows** **Daniel Matthes, TU München; Oliver Junge, TU München** work in groups
	Room 3	**Topological signatures under random projections** **Sara Krause Solberg, TU München; Ulrich Bauer, TU München, Felix Krahmer, TU München** work in groups
19:00		**Dinner**

Friday, October 12th, 2018	
09:00 - 10:00	**Commuting Hamiltonian Flows on Space Curves** **Franz Pedit, University of Massachusetts Amherst**
10:00 - 10:30	**Coffee Break**
10:30 - 11:30	**Weak-average case computational complexity, with applications in geometry and numerical algorithms** **Martin Lotz, University of Warwick**
11:30 - 12:15	**Lunch**
	Departure at 12:30

Information about the technical equipment in the conference rooms
plenary room (capacity 90 participants): a chalkboard (width 2 meters), a projector (VGA, HDMI) and a projection screen
room 2 and 3 (both capacity 25 participants): a chalkboard (width 1,20 meters), a whiteboard, a projector (VGA) and a white wall