Astrid Kousholt

Shape from Surface Tensors

Joint with Markus Kiderlen

The set of all surface tensors of a convex body $K \subseteq \mathbb{R}^n$ (Minkowski tensors derived from the surface area measure of K) determines K up to translation, so the surface tensors of K contain full information about the shape of K. Here, shape means the equivalence class of all convex bodies that are translates of each other. In this talk, we investigate how much information about a convex body in $\mathbb{R}^n$ can be retrieved from a finite number of surface tensors. It turns out that a certain class of convex bodies, namely convex polytopes, are uniquely determined by a finite number of surface tensors. Polytopes are the only convex bodies with this property. Further, we establish a stability result which yields that the difference between the shapes of two convex bodies with identical surface tensors up to a certain rank becomes arbitrarily small when the number of surface tensors increases. This result is used to ensure consistency of a reconstruction algorithm that approximates the shape of an unknown convex body from a finite number of surface tensors.