Abstract

In this thesis, we study strong symplectic fold (SSF) structures on manifolds, i.e. decompositions of manifolds into exact symplectic pieces convex along boundaries such that the contact structures induced on the boundaries agree.

We study the existence question for SSF structures. We present two ways of constructing an SSF structure: using surgery technique and via the notion of convex hypersurfaces in contact manifolds.

What is more, we consider possible modifications of the definition of SSF structures. We examine SSF structures on manifolds with boundary and we use this notion to define and study SSF cobordisms between contact manifolds. Moreover, we consider SSF structures, where symplectic pieces are allowed to have both convex and concave boundaries. We prove the existence of such structures in dimension 4.

Finally, we examine properties of SSF-contact structures - contact structures induced on products of SSF manifolds with S^1. We classify SSF-contact structures in dimension 3 up to homotopy of the corresponding 2-distributions and we prove that for a given oriented surface Σ there exists an SSF-contact structure on $\Sigma \times S^1$ in every homotopy type of S^1-invariant cooriented 2-distributions. Moreover, we study fillability of SSF-contact structures. We give examples of both fillable and non-fillable classes of SSF-contact manifolds.