

Task-oriented semantic classification of cloth configuration states using topological and geometrical indices

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Abstract

Robotic manipulation of cloth (folding, dressing) is a highly complex task because of its infinite-dimensional shape-state space. In order to manipulate textiles with a robot as autonomously as possible, the robot needs to recognize in which state the piece of cloth is both at the high level (understanding what tasks can be applied to it) and at the low level (to know specific locations of elements that need to be manipulated). The aim of this project is to set a mathematical framework of low-complexity cloth representation in the context of its robotic manipulation (more specifically, folding or unfolding). Following preliminary results from the group, it will focus on the definition and study of topological or geometrical invariants that are able to distinguish between different folded states of a piece of cloth.

The project has a duration of 9 months that will allow the student to work in close collaboration with our team to study how the defined measure can be applied to divide the infinite-dimensional cloth state space into task-dependent macro-states that simplify the understanding of the space.

Keywords— semantic classification, cloth manipulation, state estimation