

Science and Engineering Research Program

Project Description

Institute: Institute of Mechatronic Systems

Project title: Vision-Based Shape Reconstruction of Slender Structures

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This research initiative is an integral component of multiple ongoing projects at the Institute of Mechatronic Systems (imes). Within the robotics research group, our focus is on developing modeling strategies for continuum robots, characterized by flexible, slender structures and actuators capable of inducing significant deformations.

Accurate models are crucial for enabling controlled movements of these systems. However, the validation of these models necessitates measurements of the complete three-dimensional shape, a challenging task without access to expensive measurement equipment. A parallel challenge arises in the context of reconstructing the shape of deformed surgical needles from images, making this project relevant to both robotics and medical applications.

The primary objective of this project is to explore vision-based algorithms capable of reconstructing the shape of these robots from 2D images. To achieve this, a series of experiments will be conducted, involving the setup of a camera system at the test bench and the generation of a comprehensive dataset. Subsequently, algorithms for shape reconstruction, based on existing methodologies, will be implemented, extended if necessary, and ultimately validated using external measurements obtained through additional equipment.

Required skills: General programming skills (pref. languages are Python and C++)

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