

Development of a soft robot arm

Abstract

Masterthesis at IRS-VSA.

During this thesis, the concept of a soft robot arm should be developed and realized.

Start: 08.01

Tags: *Robotics, Soft Robotics*



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Motivation

Human-robot collaboration is increasingly becoming a crucial area of research within the context of Industry 4.0. It promises to combine the repeatability and precision of robots with the flexibility and decision-making skills of humans. Therefore, robots are being developed that are small, light and have torque sensors implemented to make them safe for close physical coupling with humans. But the safety is only guaranteed through the sensors and software. In a fail-state, the robot can still harm the human. As a result, a completely new kind of robot emerged, the soft robot. These robots are developed with the safety by design concept in mind. Mostly, they consist of soft materials like cloth or silicon and are actuated pneumatically instead of with motors. Such robots are inherently safe for direct human-robot coupling. An example of a soft robot can be seen in Figure 1.

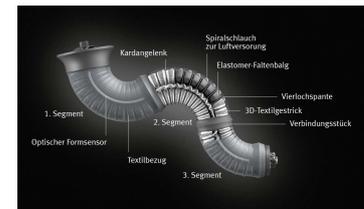


Figure 1: Soft robot @Festo

Goal

The goal of the thesis is the development and realization of a concept for a soft robot. The soft robot should consist of only flexible material and be actuated pneumatically. As a basis, the piece-wise constant curvature model of soft robot arms can be used. The robot must be designed to be modular, such that an arbitrary number of segments can be combined to build the robot arm. Also, a main focus of the robot is the sensor used to measure the curvature of each segment.

Helpful prior knowledge

The subsequent prior knowledge is advantageous for the completion of the final thesis:

- CAD Modelling
- Robotics
- Sensor technology
- Control theory

Work packages

Work package 1: Research

- Research in soft robotics
 - Materials used
 - Hardware used
 - Sensors used
- WP-Results:
 - Detailed report of existing soft robots

Work package 2: Concept

- Development of the concept for a soft robot arm
- 3 Segments
- Modular
- Piece-wise constant curvature
- WP-Results:
 - Detailed report about soft robot concept
 - Detailed report about control strategy
 - List of all material used

Work package 3: Realisation

- Obtain quotes for all parts used in the robot
- Constructing the soft robot arm
- WP-Results:
 - Constructed soft robot arm
 - Realisation of a usage scenario