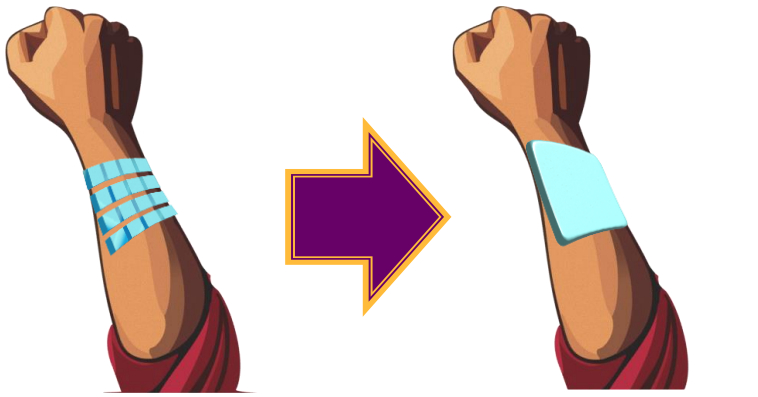
University of Stuttgart
Institute for Adaptive Mechanical Systems

Bachelor's thesis

Thesis Title:
Development of an experimental apparatus for a multidirectional strain measurement of a soft deformation sensor

Description:

Intelligent soft systems are a new class of robotic devices that derive their function from the properties of functional soft materials—in contrast to traditional robotic devices, which consist of hard metallic parts and are driven by electromagnetic motors. These materials are inherently soft and can react to external stimuli such as temperature and electric fields. Soft sensors are ideally suited to measure the deformation of human skin for medical and VR applications. Existing soft sensors are limited to sensing the deformation only in one location. We propose a new sensing principle that allows a single sensor to detect deformation at multiple locations. For training a machine learning model, we require an experimental apparatus that can stretch the sensor in multiple directions while reading the sensor data. The task of this bachelor's thesis is to develop this experimental setup, characterize a sensor, and compare the data with a theoretical model.



Spatial deformation measurement with sensor array

Spatial deformation measurements with a single sensor

Key objectives of this thesis include:

1. Designing and fabricating an automated multi-directional deformation measurement apparatus for a soft sensor.
2. Characterizing a sensor with the setup under different deformations.
3. Comparing the measured data with a model of the sensor.

This project combines design, fabrication, experimental validation, and simple modeling.

[This thesis can also be worked on as a master's thesis, in which the tasks will be extended with more complex modeling, and implementation of a machine learning algorithm]

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