Friedrich-Alexander-Universität
Department Artificial Intelligence
in Biomedical Engineering | AIBE

MASTER'S THESIS:

CAN'T TOUCH THIS – DESIGN OF A SENTIENT ARTIFICIAL SKIN

Background:

Our hands, the most dexterous part of our body, play a crucial role in our everyday interaction with the environment. Loosing this functionality, either through amputation or paralysis, has a severe impact on the affected person, both in terms of independence and psychological well-being. In addition to hand transplantation, neuromechanically controlled prostheses are a common option for restoring the person's independence. In order to give patients not only the ability to grasp, but also to feel the shape and texture of objects, an artificial skin is required. In addition, the sense of touch contributes greatly to the patient's perception and acceptance of the artificial hand as his or her own. This requires the skin to enable a firm grip when lifting objects, but also to contain a variety of sensors to provide haptic feedback to the user.

In this master's thesis, an artificial skin should be designed and constructed. On the one hand, it should protect the finger prostheses and their wires and tendons, and on the other hand, it should enable a firm grip by eliminating the risk of objects slipping out of the hand. Furthermore, the skin should be equipped with a variety of sensors to provide haptic feedback to the user. Force sensing should be based on the fiber bragg grating approach proposed by [1].

Tasks:

- Design of a custom-made artificial skin for a bionic hand prosthesis
- Integration of fiber bragg grating technology to enable a haptic sense

Requirements:

- Prototyping / hardware skills (3D-printing, CAD-design, soldering)
- Material science background is beneficial
- Solid Python and signal processing skills are beneficial

In case you are interested, please send your CV, your transcript of records and a brief description of one of your recent projects to:

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[1] Massari, Luca, et al. "A machine-learning-based approach to solve both contact location and force in soft material tactile sensors." Soft robotics 7.4 (2020): 409-420.