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

MASTER'S THESIS:

THUMBS UP – CONSTRUCTION OF A TENDON-DRIVEN BIONIC THUMB

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. State-of-the-art myoelectric prostheses use classification algorithms to recognize a set of discrete movement patterns in surface EMG signals. This control approach has the disadvantage that users can only access a limited repertoire of movements and do not regain their full range of motion. To enable a direct continuous control without the need for intermediate task classification, control signals are derived from surface EMG (sEMG) measurements.

The goal of this thesis is to develop a tendon-based design for a myoelectric thumb prosthesis and its control unit. The mechanical design with a 3D printed bone structure and artificial tendons and ligaments should closely mimic the human kinematics. To enable a versatile control, the motor unit activation should be directly mapped to the corresponding actuator. The design of the thumb and its control unit can be based on previous work, in which a bionic index finger was designed and controlled using solemnly sEMG signals.

Tasks:

- Design and construction of a tendon-driven and anatomically correct thumb
- Implementation of a control unit with the same number of actuators as its biological role model

Requirements:

- Prototyping / hardware skills (3D-printing, CAD-design, soldering, microcontroller programming)
- Solid Python skills

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

Charlotte Pradel
Machine Learning and Data Analytics Lab
In collaboration with the Neuromuscular Physiology and Neural Interfacing Lab
charlotte.pradel@fau.de