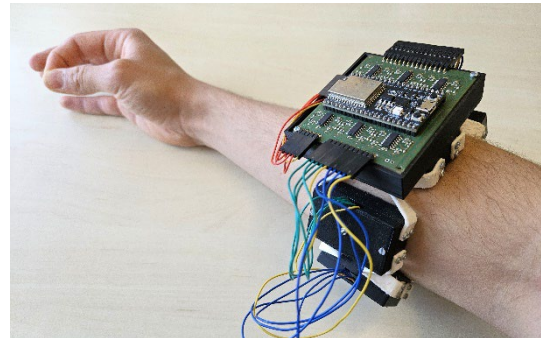


Master Thesis

Data collection and evaluation of muscle activity and hand kinematics during daily life activities

There are already a large number of data sets that contain EMG and hand kinematics data to enable decoding for the control of hand prostheses via neural networks. Some of these datasets have been summarized under the Ninapro database (Atzori & Muller, 2015), (Ninapro, 2024). While the datasets include a large number of people and different movement patterns, they do not reflect realistic everyday situations due to the controlled laboratory



conditions and are therefore only of limited significance. In our study, however, the test subjects should be able to move freely. When performing the tasks, body movements away from the hand should also take place in order to recognize possible interference and thus make the control systems more robust for everyday use. Another innovation relates to the sensors used. In addition to the EMG sensors, force sensors are to be used to record muscle activity. Our hope is to use the additional force myography to counteract the strong noise behavior of the EMG sensors and thus make the control of hand prostheses more robust.

Task Description

1. Software Setup
 - a. Improve the framework for offline data collection of the multimodal bracelet
2. Hardware Setup
 - a. Prepare a test bench for the user study
3. Evaluation
 - a. Collect data from participants
 - b. Test the data with at least one neural network, by decoding the data into into continuous hand motions
4. Documentation and presentation of results.

Prerequisites

- Studying mechatronics, medical engineering, computational engineering or electrical engineering
- Good python skills and experience with deep learning
- Proficient in German and English

References

Atzori, M., & Muller, H. (2015). The Ninapro database: A resource for sEMG naturally controlled robotic hand prosthetics. *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS*, S. 7151-7154.

Ninapro. (4. 1 2024). Von <https://ninapro.hevs.ch/index.html> abgerufen

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