Author
Sartori, Massiomo (Enschede NL) | Dr.
University of Twente - Department of Biomechanical Engineering

Title
Model-based control of upper-limb myoelectric prostheses

Coauthors
Durandau G, Dosen S, Farina D

Summary
We have developed a subject-specific, computationally efficient model of the human neuromusculoskeletal systems. We have demonstrated that this can accurately simulate amputees' phantom limb function and enable prosthesis control.

Introduction
Mind controlled robotic limbs promise to replace mechanical function of lost biological extremities and restore amputees' capacity of interacting with the environment. However, current solutions are still hampered by the lack of intuitive and robust human-machine interfaces. We have developed an interface that synthetizes the musculoskeletal function of an individual's phantom limb as controlled by neural surrogates. Our results show that this approach is robust to noise, movement artefacts, and time scales post-calibration.

Methods
-

Results
-

Conclusion
State of the art approaches to the control of artificial limbs are based on machine learning for establishing a single mapping function between EMG and joint kinematics. However, this requires frequent recalibration and lack of robustness to arm postures, thus providing control paradigms that are highly sensitive to external conditions. We propose an alternative idea based on a biomimetic model-based decoder, i.e. a computational model that explicitly synthesizes the dynamics of the musculo-skeletal system as controlled by EMG-derived muscle activation signals. The development and translation of man-machine interfaces that

account for an individual's neuromusculoskeletal system creates unprecedented opportunities to understand how disrupted neuro-mechanical processes can be restored or replaced via biomimetic wearable assistive technologies.

References

-