Phantom Limb Trajectory Estimation for EMG Based Control

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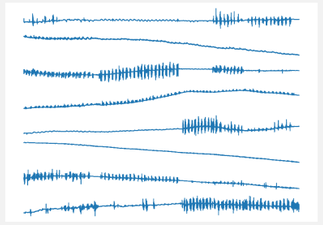

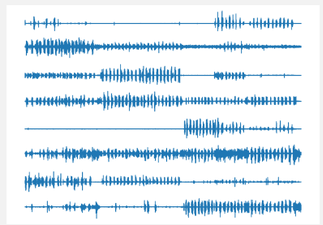

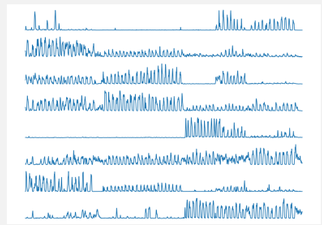

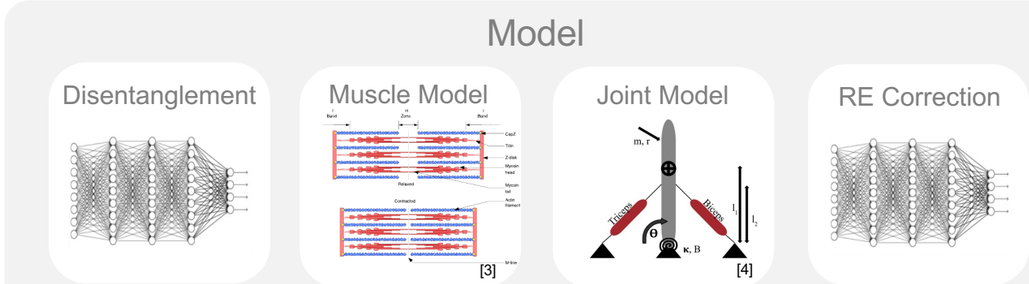

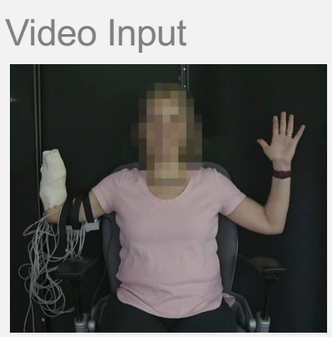

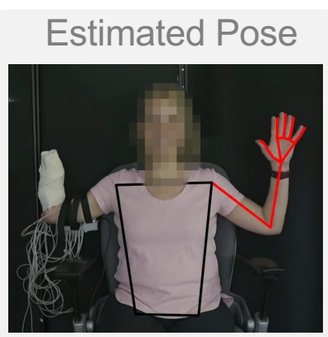

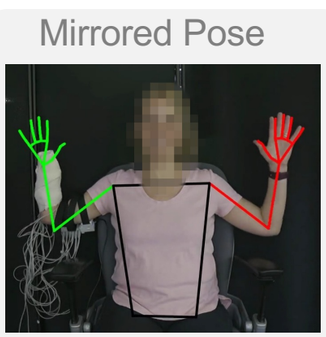

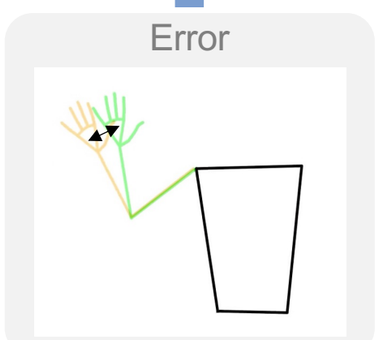

Introduction

Any kind of modeling including learned parameters is heavily dependent on data availability and quality. This is especially true for models with a big representation space like neural networks [1]. Predictive performance as evaluated in the lab space can often not be replicated in at home settings due to changing environmental variables such as socket fit and movements that are not represented in the training distribution.

Methods

The user is sitting in front of a camera, performing synchronous movements with both the intact and affected limb. The pose of the intact limb is estimated using MediaPipe [2], the area around the detected wrist is cropped and the hand pose is extracted and attached to the wrist. The pose of the intact limb is mirrored on the affected limb and used as a target in the training of the prosthesis controller pipeline.

Initially, a broad range of movements is recorded, trying to cover the whole range of motion. After initial training, the prosthesis can be used in daily tasks to evaluate performance. Movements with unsatisfactory performance are integrated in a new set of recordings and the prosthesis controller is trained again on the augmented dataset. This iterative process is repeated as often as necessary.

Outlook

With a simplified interface and setup, users will be able to use this system independently at home, greatly reducing cost and improving usability.

References

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