

# Localization of Myo Armband Electrodes for Stable Classification

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**Abstract**—The Myo Armband is a typical 8-electrode device for externally recording EMG signals from the arm of a typical subject or amputee. One of the most difficult challenges of using a Myo Armband is the need to train and classify movements each time it is worn, due to the shift in positions and electrode location around the arm. The Myo Armband is typically worn within an inch of the elbow of an intact patient of an amputated limb, which allows enough similarity for correct classification by most algorithms. However, the rotation of electrodes around the arm causes entirely new features to be extracted for classification. In this experiment, the Myo Armband was rotated around the upper arm of a patient with an intact limb as she performed six commonly used movements. The mean absolute value of each electrode was calculated and used to characterize response at each electrode site. The root mean-squared error was then used at each site while rotating through all possible rotations of electrodes in single electrode-width intervals (eight positions). Across all motions made, the correct position was identified 93.3% of the time. The ability to classify using the training data for one position (taken as the canonical position) was measured by using the feature vectors of that original training set. Classification error increased by  $26.5 \pm YY\%$ .

## I. INTRODUCTION

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## II. MATERIALS AND METHODS

### A. EMG signal measurement

The subject wore the Myo Armband with the electrode with the logo initially centered at the inner elbow and approximately half an inch up the upper arm. Five gestures that required use of unidirectional hand motion, or a distinct pattern of muscle groups were tested: open, power, pronate, supinate, and tripod grip. The subject was asked to perform each grip twice for a 5 second period. The electrode was rotated by one full electrode position (45 degrees) until it returned to the starting location. At each position, EMG signals were recorded while performing the five grips. Subjects typically performed each grip after a delayed onset. So, only the window of recordings from two seconds in to four seconds after the cue was used for feature extraction.

### B. Electrode Displacement Prediction

The raw EMG signal was recorded from each of the eight electrodes on the Myo Armband. The timing and strength of gestures could vary from replication to replication, so the EMG signal was compressed to represent the overall muscle activity from each electrode site. The Mean Absolute Value (MAV) was used.

## III. DISCUSSION

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August 26, 2015

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## IV. CONCLUSION

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## ACKNOWLEDGMENT

The authors would like to thank...

## REFERENCES

- [1] H. Kopka and P. W. Daly, *A Guide to L<sup>A</sup>T<sub>E</sub>X*, 3rd ed. Harlow, England: Addison-Wesley, 1999.