

論文 / 著書情報  
Article / Book Information

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| 題目(和文)            |   |
| Title(English)    | Investigating the Neural Representation of Finger-Movement Directions Based on Decoding Approach Using Electroencephalography   |
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Thesis title: Investigating the Neural Representation of Finger-Movement Directions Based on Decoding Approach Using Electroencephalography

## I. Chapter 1 Introduction

Chapter 1 covers the background necessary to understand this work and talks about the purpose of this research.

- A. Brain signals acquisition
- B. Brain-Computer Interface (BCI)
- C. Independent Component Analysis (ICA)
- D. Spatial Localization of EEG Brain Activity
- E. Classification of Brain Signals
- F. Intrinsic and Extrinsic Coordinate Frames
- G. The Purpose of The Research

## II. Chapter 2 Materials and Methods

Chapter 2 explains in details the experimental design, data acquisition and pre-processing.

- A. Participants
- B. Experiment
- C. Data Acquisition
  - 1) EEG
  - 2) MRI
- D. EEG pre-processing

## III. Chapter 3 Investigating the neural representation of finger movement

Chapter 3 explains the methodology to investigate the neural representation of finger movement. The results are shown and discussed.

- A. Methodology
  - 1) Independent Component Analysis
  - 2) Spatial localization of ICs
  - 3) IC selection
  - 4) Finger Movement Classification
  - 5) Statistical significance of the classification results
  - 6) Evaluation of the importance of ICs to the classification
  - 7) Clustering Analysis of the ICs
  - 8) Temporal Evaluation of the Contribution of Brain Regions to the Classification

## B. Results

- 1) Selected ICs
- 2) Removal of Eye Movement Artifacts
- 3) Eight-Class Motion-Direction Classification Results Using Individually Selected ICs
- 4) Temporal Contribution of ICs to the Classification
- 5) Clustering Results
- 6) Temporal transition of classification importance

## C. Discussion

# IV. Chapter 4 Comparison of the Neural Representation of Finger Movement Direction Between Group and Individual Level Sets

Chapter 4 explores the common neural representation of finger movement between several participants. The methodology is explained in details and the results are presented and discussed.

## A. Methodology

- 1) Single-participant ICA
- 2) Group-level ICA
- 3) Clustering of ICs
- 4) Spatial and temporal properties of the clusters

## B. Results

- 1) Selected ICs
- 2) Eight Finger-Movement classification
- 3) Clustering Results
- 4) Temporal Transition of Classification Importance

## C. Discussion

# V. Chapter 5 Conclusion

# VI. Future works

# VII. References

# VIII. Appendix A Supplementary Materials of Chapter 3

# IX. Appendix B Supplementary Material for Chapter 4