

Preface

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Abstract

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Introduction & Literature

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Brain-Computer Interfaces

1.1 Rationale

1.2 Overview & state-of-the-art

different recording technologies and level of invasiveness + infographic active/reactive/passive + infographic

1.3 Visual Event-Related Potential based BCIs

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Chapter 2

Linear ERP decoding

2.1 LCMV-beamforming

proof equivalent to LDA

2.2 Toeplitz-LDA

2.3 Other methods

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Gaze-independent BCIs

- 3.1 Oculomotor deficits in Locked-in Syndrome
- 3.2 Gaze-independent visual BCIs
- 3.3 Benefits & drawbacks of covert attention in BCI operation
- 3.4 Electrophysiological correlates of covert attention
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Chapter 4

Problem statement & rationale

Goal: Enable communication for eye-motor impaired patients

Method: Design a comfortable interface that allows them to maximally exploit their residual gaze capabilities, by leveraging a non-invasive high-ITR visuospatial ERP-based BCI and improving ERP decoding performance (in general and specifically in gaze-independent settings).

Novelty:

Part II

Algorithms & Decoders

Chapter 5

Kronecker-structured discriminant analysis

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- 5.1 The spatiotemporal EEG covariance
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Interface design & experimental setup

8.1 The Hex-o-Spell interface

8.2 Visuospatial attention conditions

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Compensating jitter for gaze-independent decoding

9.1 Data collection & preprocessing

9.2 Results

9.3 Discussion

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Chapter 10

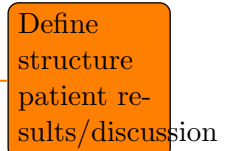
Patient cases

10.1 Patient presentation

10.2 Data collection & preprocessing

10.3 Outcomes

10.4 Discussion



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Chapter 11

Integrating gaze-tracking data

Chapter 12

Conclusions & recommendations

- 12.1 General discussion
- 12.2 Limitations
- 12.3 Future directions
- 12.4 Working with patients
- 12.5 Conclusion

Curriculum vitae

Publications

Funding & acknowledgments

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Personal contribution

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Conflict of interest

The authors declare no conflict of interest.