The Bayesian Power Imaging (BPI) test for task/control experiments

Conference or Workshop Item

The Bayesian Power Imaging (BPI) test for task/control experiments

R. Hasson[1] and J.A. James[2] and S.J. Swithenby[2]

[1] *Department of Applied Mathematics, The Open University, Milton Keynes, United Kingdom;*
[2] *Department of Physics, The Open University, Milton Keynes, United Kingdom*

1 Introduction

The Bayesian power imaging (BPI) method is a new approach to the biomagnetic inverse problem that is introduced in [1]. In this paper the method is extended to analyze not one but two sets of experimental data in order to highlight the differences between them.

2 Methods

The BPI method as described in [1] is a fusion of the Bayesian approach detailed in [2] and the direct power dissipated algorithm derived in [3]. We extend the method as follows. We start with a joint a-priori probability distribution for the task and control experiments based on the null hypothesis that the experiments have the same underlying sources. Then we calculate the a-posteriori distribution from this a-priori probability distribution and the two sets of measurements. Using this a-posteriori distribution we can calculate the probability that the null hypothesis is false in a region of interest. This allows spatial probability maps of the differences between the task and control experiments to be constructed.

3 Results

The usefulness of the method is illustrated by applying it to both simulated and real data. The simulated data consists of a small number of current dipoles in a realistic geometry plus uncorrelated Gaussian noise. The real data is a visually evoked response experiment involving face and object processing carried out on a whole head measurement system. This experiment addresses response specificity and it is for this purpose that the BPI test method was designed.

4 Discussion

There is considerable interest in the comparison of biomagnetic images with the results obtained by other functional imaging methods, for example fMRI. The BPI method is used here in a directly analogous way to the subtraction techniques employed in fMRI. This enables easier comparison between the modalities. In summary, the BPI method produces maps that are robust and easy to interpret.

References

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