

**Creating a technique for obtaining a conservative
lower bound on the area of brain activation
estimates provided by beamformers with the use of
40 Hz visual stimulation data.**

Master's Thesis in Bioinformatics (30 ECTS)

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Abstract

A study in 2016 showed that visual stimulation at 40 Hz in the form of a flickering light, resulted in a reduction of the effects of Alzheimer's disease in mice. Naturally it would be useful to infer if such a treatment could carry over to humans. To this end a similar study was done on healthy humans by Hokland et al. in 2018 [11]. One of the goals of this study was to calculate the brain activation volume and activation locations of participants who were subjected to 40 Hz visual stimulation of varying duty cycles. To reconstruct the brain activity of the participants a linearly constrained minimum variance beamformer was used. Due to how beamformers work they tend to provide inflated activation area estimates. For cases like this, where a potential steady state visual evoked response treatment is being examined it would be valuable to come up with a more accurate brain activation volume estimate. Here we used the same dataset and parts of the code as the study by Hokland et al. to provide a more conservative estimate of the brain activation volume. This was done by using the delay in phase between the signal from an electrode placed on the eye of the participants and the signal from the beamformer reconstructed brain sources, instead of the raw activation data of these brain sources. The locations of the activated brain locations we observed were similar to the ones in the study by Hokland et al. However, the actual volume was smaller, meaning the resulting estimate was indeed more conservative.

Abbreviations

MEG: Magnetoencephalography

ERG: Electroretinography

LCMV: Linearly constrained minimum variance

SSVER: Steady state visual evoked responses

MRI: Magnetic resonance imaging

SNR: Signal to noise ratio

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