Approximate average head models for EEG source imaging.


Author information

1 Neuroimaging Department, Cuban Neuroscience Center, Havana, Cuba. multivac@cneuro.edu.cu

Abstract

We examine the performance of approximate models (AM) of the head in solving the EEG inverse problem. The AM are needed when the individual's MRI is not available. We simulate the electric potential distribution generated by cortical sources for a large sample of 305 subjects, and solve the inverse problem with AM. Statistical comparisons are carried out with the distribution of the localization errors. We propose several new AM. These are the average of many individual realistic MRI-based models, such as surface-based models or lead fields. We demonstrate that the lead fields of the AM should be calculated considering source moments not constrained to be normal to the cortex. We also show that the imperfect anatomical correspondence between all cortices is the most important cause of localization errors. Our average models perform better than a random individual model or the usual average model in the MNI space. We also show that a classification based on race and gender or head size before averaging does not significantly improve the results. Our average models are slightly better than an existing AM with shape guided by measured individual electrode positions, and have the advantage of not requiring such measurements. Among the studied models, the Average Lead Field seems the most convenient tool in large and systematical clinical and research studies demanding EEG source localization, when MRI are unavailable. This AM does not need a strict alignment between head models, and can therefore be easily achieved for any type of head modeling approach.