Influence of Geometric Modelling Errors on EIT Inverse solutions using MRI-based Patient Specific Meshes of the Human Head

R Shindmes, L Horesh and D Holder
Math and Computer Science, Emory University, GA, USA

Recent advances in the modelling field include finer and more accurate representation of the domain of interest. For domains of complex geometry, as in medical applications, analytical solutions are not applicable and numerical methods are advisable. Among these methods, the Finite Element method, which offers high flexibility, is most broadly used. However, this approach requires the generation of Finite Element meshes, which for complex structures as the human head, was a labour intensive task which required the services of CAD expert. There is a nontrivial correlation between the accuracy of the geometric representation for the forward model and the inverse solution. Previous studies demonstrated that the impact of small changes in the geometry predominates any possible physiological conductivity change within the volume for absolute data. The purpose of this work was to quantify the reconstruction error using prototype human head model vs patient specific one. A generic method for generation of Finite Element meshes based on anatomical images was developed. EIT simulated data was generated and then inverse solutions were computed for both model types. The proposed method is generic and therefore could be advantageous for other modelling techniques.