QUANTIFYING EFFECTS OF MEASUREMENT ERRORS ON CONDUCTIVITY IMAGE RECONSTRUCTION IN ELECTRICAL IMPEDANCE TOMOGRAPHY

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ABSTRACT

Electrical impedance tomography (EIT) is a boundary measurement inverse method which aims to reconstruct the conductivity inside a physical body from boundary measurement data. However, measurement data are in practice uncertain due to various error sources, such as position error and device error, which will lead to the uncertainty of the image reconstruction. Therefore, it is very important to study the effects of the measurement errors on the conductivity reconstruction in EIT. To this end, we propose an approach to quantify these effects by means of the uncertainty quantification methods. Further, a shape detection index of the anomaly is developed to resolve the epistemic uncertainty in the measurement errors. Under the constraint of this index, a polynomial chaos expansion based surrogate model is built for the conductivity. Finally, statistical analysis and sensitivity analysis are performed on the basis of this surrogate. The results show that the position error is the most influential factor in the image reconstruction. And the device error at the electrode that most near the anomaly has a more contribution to the uncertainty of the conductivity reconstruction than others. More detailed results will be shown in the final poster presentation.

ACKNOWLEDGEMENT

This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(Ministry of Science and ICT) (NRF-2017R1E1A1A0-3070161 and NRF-20151009350).