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Conductivity reconstruction using electric impedance tomography: a finite element implementation

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SUMMARY

In the context of imaging in cardiology (and especially in cardiac electrophysiology), it is important to have a good knowledge of the tissue conductivity in the torso, see e.g. [1]. This knowledge can be acquired from an EIT (electrical impedance tomography) protocol. Precisely, the patient torso is equipped with electrodes, that are both able to measure the torso surface potential and to apply a surface current source. The torso conductivity can be reconstructed from EIT measurements by solving an inverse problem. The EIT inverse problem is based on an EIT model formulated in terms of partial differential equations: basically a Laplace equation in the torso volume coupled to surface electrode models (with a formulation close to the *Calderón problem* [2]).

In this talk, the EIT complete electrode model will be presented, together with a finite element formulation. Objective functions for the inverse problem will be defined and differentiated relatively to the domain conductivity, allowing a gradient definition. Thus, minimisation algorithms will be compared to numerically solve the EIT inverse problem. Numerical results will be presented for 2D test cases.

References

[1] J. Dardé, N. Nasr, and L. Weynans. Immersed boundary method for the complete electrode model in electrical impedance tomography. *Journal of Computational Physics.* **487**, 112-150, 2023.

[2] A.P. Calderón. On an inverse boundary value problem. *Computational & Applied Mathematics* **23**, 133-138, 1980.

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