Modelling instrument admittances with EIDORS

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Abstract: Modelling of EIT instruments is important for accurate image reconstruction. This abstract explains how this can be done with EIDORS.

1 Introduction

Modelling of hardware imperfections in EIT has seen relatively little work. Systems have offsets, mismatched gains and crosstalk between channels. Many of these can be expressed as a linear correction to the sensitivity, **J**. When a good model of the specific hardware is available the corrected **J** can be used to improve reconstructing images [2].

2 Methods

Since the finite-element method's (FEM) system matrix represents the admittivity between nodes, additional admittances can be added directy to the system matrix (Fig 1). A new EIDORS[1] function `system_mat_instrument` is available to help form such a system matrix, and used as follows:

```
fmdl = fem_model( ... );
fmdl.system_mat = @system_mat_instrument;
fmdl.system_mat_instrument.connect_list = c_list;
```

where `c_list` describes additional admittances and nodes. It is hoped that this decription and new function helps users build improved models of EIT systems.

References

[1] A Adler, WRB Lionheart, *Physiol Meas*, 27:S25–S42, 2006
[2] AE Hartinger *et al* IEEE T Biomed Eng 56:369–377, 2008

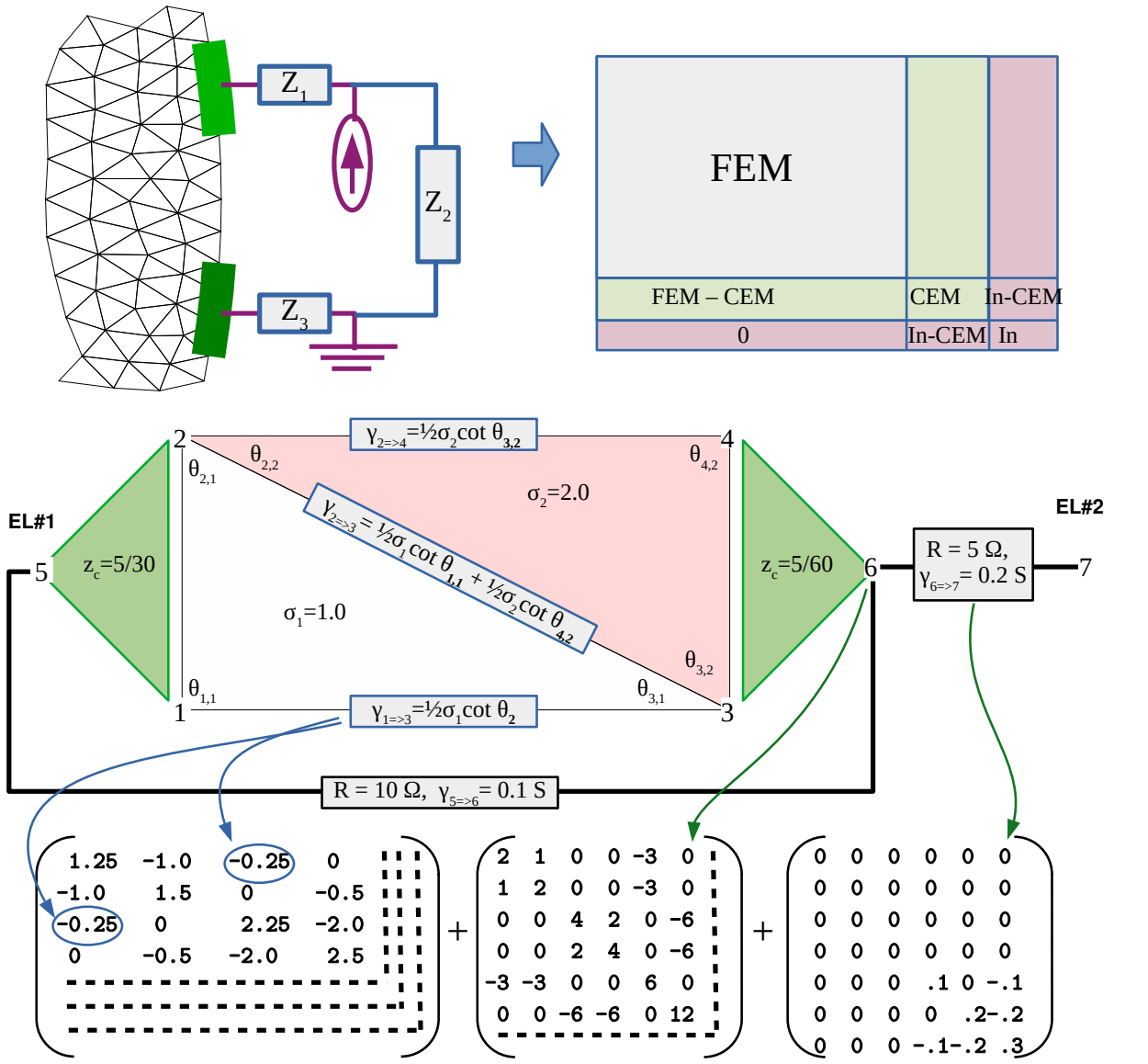

Figure 1: Incorporation of instrument models into a FEM, where the stiffness matrix (upper right) has additional nodes for complete electrode models (CEM) and instrument admittances. The lower figure shows a two-element FEM with two CEM electrodes and two additional admittances, and the formulation of the system matrix as a function of each component.