Modelling instrument admittances with EIDORS

EIT 2021, Galway, Ireland
14 June 2021

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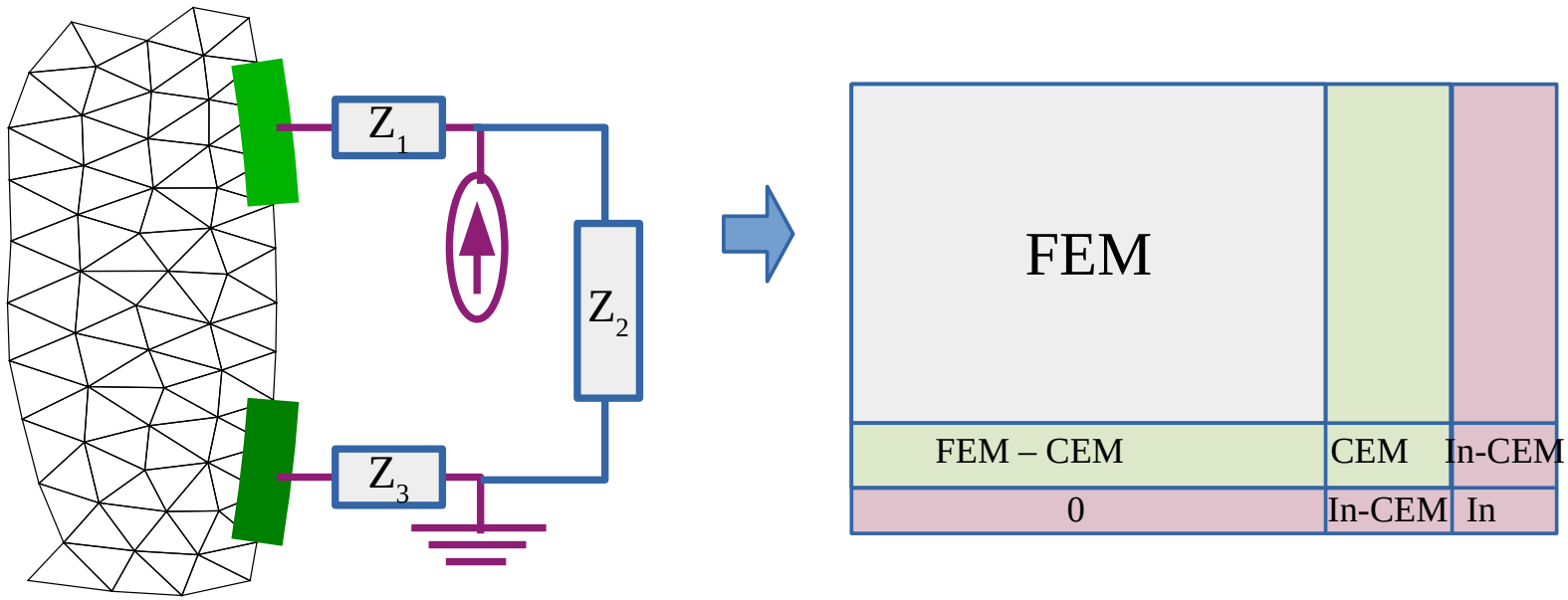
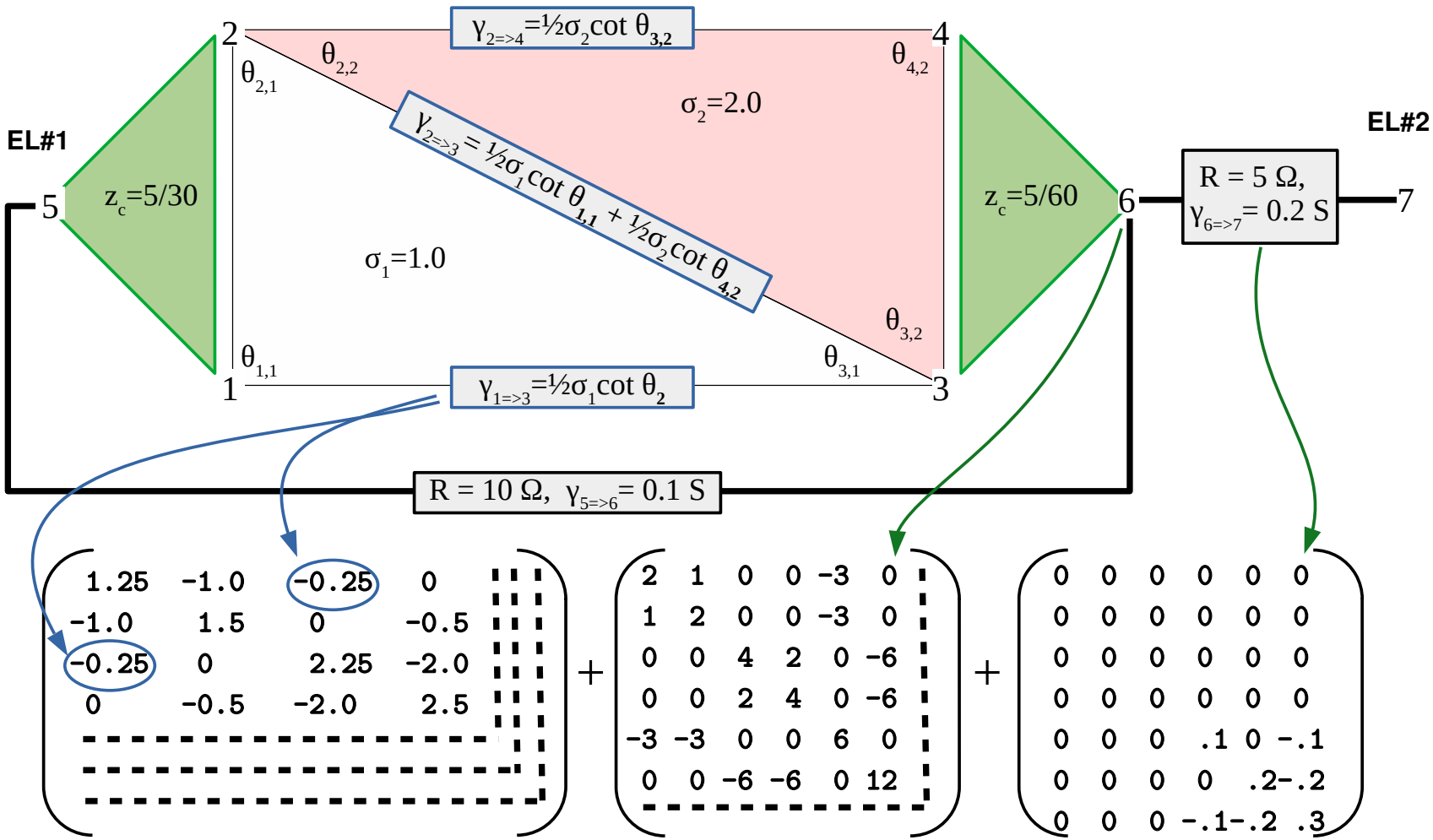
Motivation:

- Modelling of EIT instruments is important
- Systems have offsets, mismatched gains and crosstalk
- Linear circuit characteristics can be included into a FEM
- Functions to do this have been added to EIDORS

FEM Models, Electrodes and Instrumentation



FEM Models, Electrodes and Instrumentation



$$\begin{pmatrix} 1.25 & -1.0 & -0.25 & 0 \\ -1.0 & 1.5 & 0 & -0.5 \\ -0.25 & 0 & 2.25 & -2.0 \\ 0 & -0.5 & -2.0 & 2.5 \end{pmatrix} + \begin{pmatrix} 2 & 1 & 0 & 0 & -3 & 0 \\ 1 & 2 & 0 & 0 & -3 & 0 \\ 0 & 0 & 4 & 2 & 0 & -6 \\ 0 & 0 & 2 & 4 & 0 & -6 \\ -3 & -3 & 0 & 0 & 6 & 0 \\ 0 & 0 & -6 & -6 & 0 & 12 \end{pmatrix} + \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & .1 & 0 & -.1 \\ 0 & 0 & 0 & 0 & .2 & -.2 \\ 0 & 0 & 0 & -.1 & -.2 & .3 \end{pmatrix}$$

New function: `system_mat_instrument`

```
img = fem_model( ... );
NewElectrode = 3; % add new electrode
img.fwd_model.stimulation = ...
   stim_meas_list([1,NewElectrode,1,NewElectrode]);
Y12 = 1/10; % Y=1/10Ohms between E#1 and E#2
Y13 = 1/10; % Y=1/ 5Ohms between E#1 and new elec
c_list = [ 1,2,Y12;
           2,3,Y13];
img.fwd_model.system_mat = @system_mat_instrument;
img.fwd_model.system_mat_instrument.connect_list = c_list;

volts = fwd_solve( ... )
```

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