



Elmer Circuit Builder - Progress

A Python Prototype



Elmer Circuits: Association between Source Input File (SIF) and Circuit Definition (CKT) Matrix Form $Ax' + Bx = f$

- Under Circuit File in Matrix Form

Source

Electrical Components (e.g: R, L, C, V, I)

[FEM] Component (Associated to SIF)

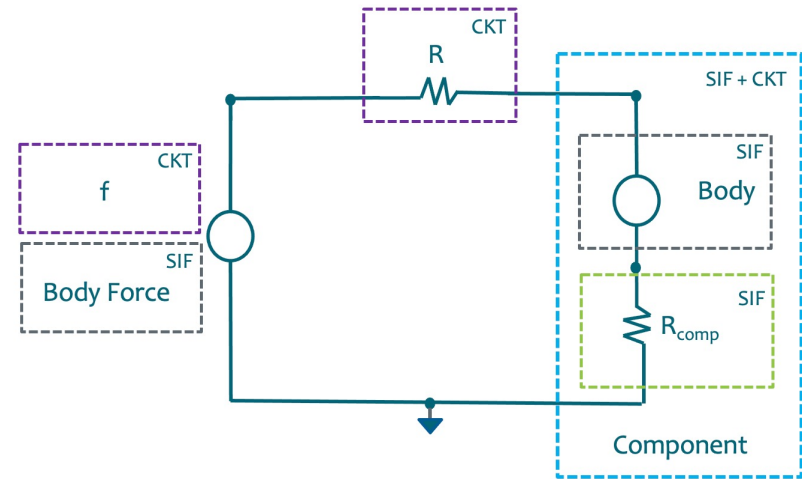
- Define in SIF

[FEM] Component

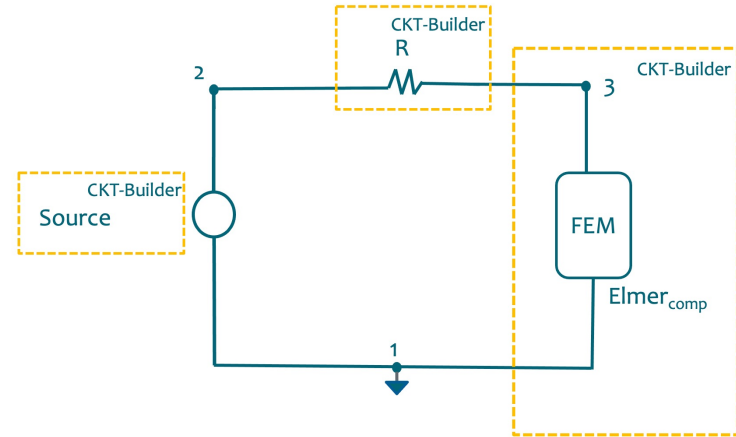
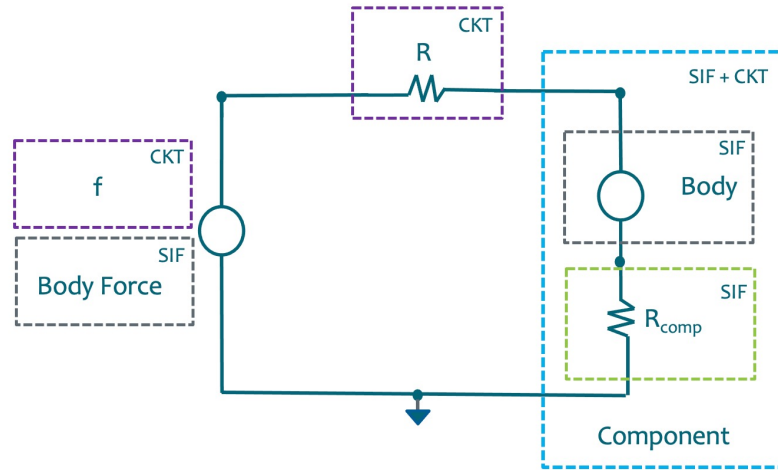
- R_{comp}

Body Force 1

- Voltage or Current

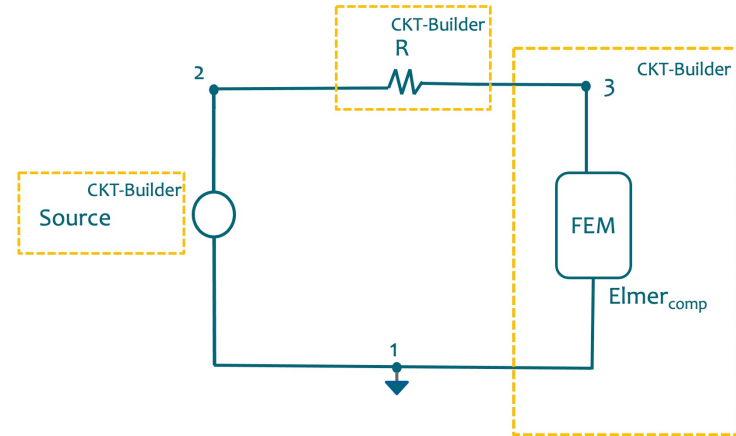


Elmer Circuits and Elmer Circuit Builder:



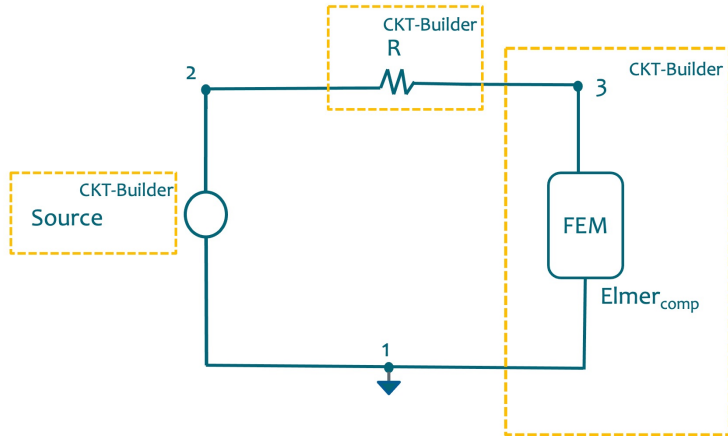
Elmer Circuit Builder

- (Python) Tool to automate circuit-matrix creation based on circuit connections (Spice-type convention)
- Electrical Components Available:
 - Voltage Sources (V)
 - Current Sources (I)
 - Resistors (R)
 - Inductors (L)
 - Capacitors (C)

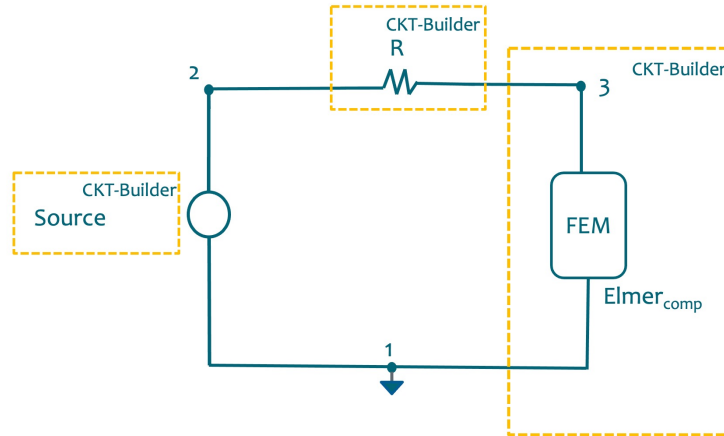


Elmer Circuit Builder: How to use it?

- What do you need?
 - Python 3 and appropriate editor
 - IDE not needed but encouraged
- How to set it up:
 - Import circuit_builder library
 - Setup output file name
 - Set number of circuits
 - Populate circuit with ground/ref node and needed electrical components
 - Add components to circuit
 - Generate Elmer Circuit
 - Don't forget to add output file in .sif



Elmer Circuit Builder Demo



Source Time Dependencies (SIF Modifications)

- The Circuit Builder is NOT a simulation tool. All simulation tweaks must be done within the .sif
- Harmonic

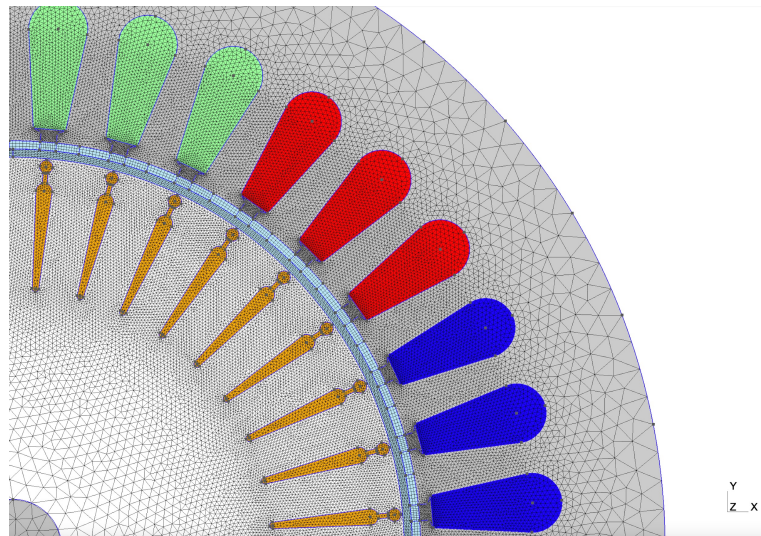
```
Simulation
...
Angular Frequency = Real $ 2*pi*f
...
End
```

- Transient

```
Body Force 1
Source = Variable "time"
Real MATC "amplitude*sin(omega*tx(0))"
End
```

Elmer Circuit Builder: Current Work and Extensions

- Semi-automatic preprocessing for quick prototyping of electrical machines:
 - (semi) Automatic source and cage circuits
 - Circuit connection options? Wye or Delta
 - Multi-phase
 - 2D/3D
 - Simple slot types library
 - Fractional Winding
 - Targeted mesh refinement
 - Output shell run script
- Temporary prototype on Onelab. Ideally fully integrated in ElmerGUI





facebook.com/CSCfi



twitter.com/CSCfi



linkedin.com/company/csc---it-center-for-science



github.com/CSCfi