An approach for modelling quasi-stationary magnetic circuits

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For the design of electrical machines the magnetic circuit has to be modeled. If only the winding layout or the stack length of the motor is changed a complete FEA analysis mostly is not necessary. In this case Modelica is well suited to model the magnetic circuit for quasi-stationary simulations. A new library `MagneticQS` based on existing standard libraries is presented. It is based on existing libraries but introduces complex variables. An induction motor example [1] (figure 1) under no-load conditions shows the basic concept of this library. The simulation results show that the new library is well suited to assist the design process for electrical machines.

The next step for developing the library is to test different types of machines under load conditions and compare the results with analytical algorithms and FEA. Once this goal is achieved an integral electrical machine magnetic circuit model can be implemented that can be used independently from the state of the machine (no-load, load) which is a great advantage in comparison with existing analytical models.
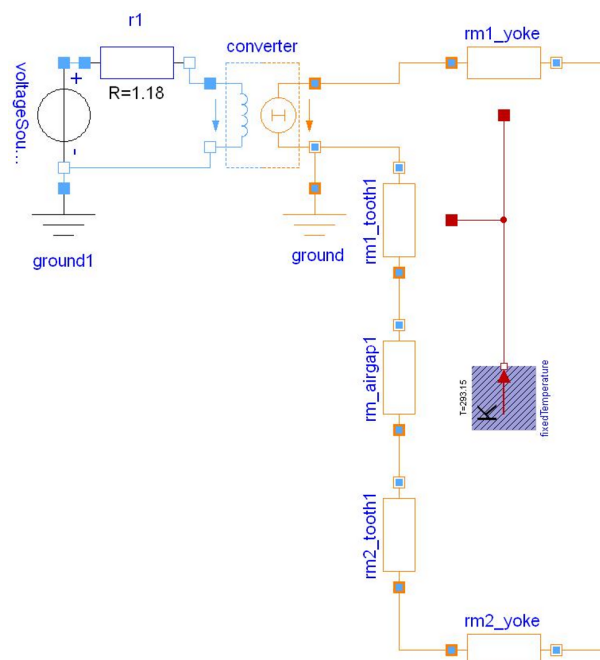

Figure 1: Induction machine no-load example

References

[1] Vaske P, Riggert J-H. Elektrische Maschinen und Umformer Teil 2: Berechnung elektrischer Maschinen (*Calculation of electrical machines*). 1974.