

# A new Modelica Electric and Hybrid Power Trains library

Massimo Ceraolo - DESTEC Department, University of Pisa, Italy.  
massimo.ceraolo@unipi.it

The paper describes a new library, devoted to simulation of electric and drive vehicle power trains.

This library is fully compatible with both Dymola 2015 and OpenModelica 1.9.2. It is available under the Modelica License 2, and presented at the 11<sup>th</sup> Modelica International Conference.

The library is a collection of models whose level of detail is adequate for electric and hybrid vehicle power trains simulations. In particular:

- the AC sinusoidal variation of voltages and currents is not followed, but substituted by RMS equivalents;
- in case of brushless motors the optimal choice of direct and quadrature-axis currents ( $I_d$  and  $I_q$ ) is directly implemented in the code, both at low speeds and in the flux weakening region;
- a collection of even simpler models (map based) is supplied as well. These models have as the unique dynamics the one induced by the mechanical inertia, but implement efficiency maps and torque and power limits.

The paper shows that the simplifications introduced do not produce too large errors, but allow fast and effective simulations in large timespans.

The library contains testing models to show how individual models operate, and some full vehicles examples.

It is made available open-source to the general public.

