IETI-DP Solvers in Simulation and Optimization of Electrical Machines

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ABSTRACT

Highly efficient electric motors will play a decisive role in future e-mobility. In [2], multipatch continuous Galerkin Isogeometric Analysis (IgA) discretization was used for the simulation and shape optimization of electrical machines in a fixed position. We mention that IgA allows an exact representation of the geometry of an electric motor. In order to get fast simulation and optimization results, the large-scale systems of algebraic equations arising from the IgA discretization of underlying partial differential equations were solved by Dual-Primal Isogeometric Tearing and Interconnecting (IETI-DP) methods This class of domain decomposition (DD) methods is naturally related to the multipatch representation of the computational domain, and provides an excellent framework for the parallelization of the DD solvers.

In order to handle moving interfaces, and, in particular, the rotation of an electrical machine, we use discontinuous Galerkin (dG) IgA discretization, at least, along the moving interfaces. Furthermore, we generalize the dG IETI-DP solver introduced in [1] to the case of non-conformely matching patches. In particular, we cannot use the patch vertices as primal unknows. Instead of that, we use only edge averages. The numerical results confirme the efficiency of the dG IgA discretization and dG IETI-DP solution techniques.

REFERENCES

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