Université
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1 SCIENCES
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— Comparison of different projection techniques in magneto-mechanical coupled problems —

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Context

In order to well understand and study the vibrations of electrical machine like power transformer, the finite element method is widely used in the magneto-mechanical coupled problems. In the most cases, we use a FEM simulation scheme including two parts, namely magnetic part and mechanical part. The magnetic part normally gives the sources due to magnetic force, as well as magnetostriction induced forces to feed the mechanical part, which leads structure deformations and vibrations. Therefore, it is important to chose a good way to transfer the data from magnetic part to mechanical part, called projection, to ensure the accuracy of the multi-physics modelling.

Objective

The objective of the study is to understand and compare different existing methods of projection, and to develop new methods which have cheaper computational cost and are also adapted to improve the quality of simulation in magneto-mechanical couplings. Physical interpretations are expected.

Work steps

1 Bibliography on the subject
2 Understand the simulation scheme for magneto-mechanical couplings
3 Understand the different methods of projections
4 Implement different projections in code
5 Comparer the performance of different method with different applications

Key word

Multi-physics, magneto-mechanical coupled problem, source projection techniques

References

[1] G. Parent, P. Dular, F. Piriou, A. Abakar, "Accurate Projection Method of Source Quantities in Coupled Finite-Element Problems", Magnetics IEEE Transactions on, vol. 45, pp. 1132-1135, 2009.
[2] A. A. Journeaux, F. Bouillault, J.-Y. Roger, "Magneto-Mechanical Dynamic System Modeling Using Computer Code Chaining and Field Projections", Magnetics IEEE Transactions on, vol. 49, pp. 1757-1760, 2013.
[3] Z. Wang, Z. Tang, T. Henneron, F. Piriou, J.C. Mipo, "Energetic Galerkin Projection of Electromagnetic Fields Between Different Meshes", Magnetics IEEE Transactions on, vol. 50, pp. 613-616, 2014.
[4] Z. Wang, T. Henneron, F. Piriou, J.C. Mipo, "Energetic Mesh-to-Mesh Projection of Magnetic Fields With Respect to Nonlinear B-H Curves", Magnetics IEEE Transactions on, vol. 51, pp. 1-4, 2015.
[5] M. Liu, Z. Tang, X. Mininger, F. Bouillault, O. Hubert, L. Bernard, "Modeling of Magnetic-Induced Deformation Using Computer Code Chaining and Source-Tensor Projection", Magnetics IEEE Transactions on, vol. 53, pp. 1-4, 2017.