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A COMPREHENSIVE STUDY ON THE BENEFITS OF A MULTISCALE APPROACH IN MODEL-ORDER REDUCTION FOR FRICTIONAL CONTACT PROBLEMS

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Structural mechanical problems with multiple frictional contact interfaces are frequent in the industry, e.g., helically wounded steel wires in offshore engineering cables and power transmission lines. Their simulation requires effective computational and modeling strategies [1, 2]. The multiscale mixed domain decomposition strategy based on the LATIN method [3] is used here. This work is intended to highlight how and to what extent a multiscale approach may be helpful in efficiently solving problems including a high number of frictional contacts when coupled to a model reduction approach based on the Proper Generalized Decomposition. The approach allows to create reduced bases per substructure to better track sliding fronts and propagating phenomena. The multiscale aspect leads to a significant gain in convergence, taking advantage of the multiscale nature of the phenomenon itself. The local stage at the contact interfaces still remains a bottleneck as it is integrated in full format and the potentiality offered by a reduced integration will be considered. Moreover, the need to control the local error with an appropriate convergence indicator is crucial for specific applications like fretting fatigue between cable wires. Two-dimensional problems with complex loadings and a large number of frictional interfaces will be tested to comprehend the potentiality of the proposed approach.

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