

3D Forging applications with Recurrent Boundary Contact Conditions

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Abstract. The present work reviews the development of a technique to reduce the computation time of three-dimensional numerical simulations of forming processes with repetitive symmetry conditions. The method has been implemented into the 3D finite element simulation software Forge3® with non-standard symmetry conditions named Recurrent Boundary Conditions. We remind the theoretical framework of the method based on miscellaneous master-slave contact penalized techniques and its extension to simulations with deformable bodies. The thermo-mechanical problem is reduced according to boundary conditions on both velocity and temperature fields applied on the auto-detected periodic contact surface. The resolution method coupled with high-performance parallel computing and advanced remeshing techniques makes it possible to quickly and accurately solve complex thermo-mechanical forming problems such as gear forming and forging applications processes with helical cyclic geometries.

Keywords. Recurrent Boundary Conditions, Master-slave contact algorithms, Deformable bodies, Penalty formulation, Parallel computing, Helical gear forging