

Block Low-Rank approximations in LS-DYNA

Bob Lucas

Livermore Software Technology Corporation, USA

Abstract

Solving large sparse linear systems of equations is often the computational bottleneck for implicit calculations. Solvers at LSTC are continuously improved and extended with new technologies. In particular, the work done to implement low-rank technologies in LSTC's multifrontal solver is presented in this talk. Our presentation is divided into three steps. We will first focus on how to define clusters within separators and boundaries in order to allow for an efficient low-rank representation of fronts. In the context of inherited clustering, we will show how to deal with separator intersections in order to avoid small clusters. Then, our implementation of the low-rank factorization and solve is described and compared to MUMPS. Finally, the numerical impact of the low-rank approximations in various application of Mechanical Computer Aided Engineering is showed, through the study of the convergence of the non-linear solver in LS-DYNA.