Title:

**Scaling Out Alternating Direction Isogeometric L2 Projections Solver**

Description:

The idea of Alternating Direction Solver initially proposed by Victor Calo [1] can be a subject to massive parallelization as we proved in our work presented at 2016 IGA-MF conference held in La Jolla, California [2]. While this CUDA-based approach displays outstanding performance when compared to CPU-based implementations, it has some flaws. First, it can only scale up meaning that larger problems which cannot fit in the physical memory of the machine it runs at cannot be solved. Second, it has very limited portability being tied to a certain technology which is available only on certain hardware. Third, it is implemented at very low-level making it hard to introduce any changes and solve another problem in particular. This is why we decided to create a new implementation of Alternating Direction Solver, designed to run on In-Memory Data Grids such as Hazelcast clusters. This makes such solver scale out meaning that the maximum size of the problems solved and the minimum time to solve such problems is the function of the number of worker nodes used. We investigate this feature solving a series of huge time-dependent problems of elasticity […]. In addition to this unbounded scalability we also focus on portability, testability and general feasibility. We achieve portability by using platform-independent Java language. We also ensured that the solver being primarily meant to be run in a cloud environment such as Amazon Web Services can also be run seamlessly in any local environment or virtualized Docker-based cloud-like environment. This feature and the fact that the Solver coding style conforms to object-oriented programming paradigm makes it easy to test and to understand. What follows is that a scientist can prepare to solve his problem in a local environment and being certain all assumptions are correct he would pay a service provider just for the cycles used to solve that real without paying for any failed tries. The solver can also be easily adjusted the to solve any other similar problem of any size and for any time step count.