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BALANCING DOMAIN DECOMPOSITON METHOD WITH ADDTIVE SCHWARTZ FRAMEWORK AND DIAGONAL SCALING FOR PETA SCALE COMPUTING

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The computing performance of the balancing domain decomposition(BDD)[1] method with additive Schwartz framework for peta scale computing is investigated in this research. An iterative substructuring method with the coarse grid correction, such as BDD, is one of the most effective methods for parallel computing of large scale structural finite element analyses. However, the coarse grid correction, which is generally treated with the direct sparse solution approach, is the bottleneck for peta scale computing because the computation cost for coarse grid correction becomes large and parallel efficiency is very much limited.

In the balancing domain decomposition by constraints(BDDC)[2], the coarse problem is applied in an additive manner, while in BDD, it is applied multiplicatively. Hence the BDDC can be implemented in multi-levels easily, and this fact promises the high parallel efficiency of BDDC for peta and further exa scale computing.

On the other hand, BDDC requires *a priori* definition of the corner nodes and face nodes. This user-dependent input sometimes results in the poor convergence while the BDD does not requires such user-dependent input for the definition of coarse problems because its coarse problem is automatically given by the rigid body motion of each subdomains.

Here, the BDD method with additive Schwartz framework with two independent local preconditioners, Neumann-Neumann[3] and diagonal scaling[4], is implemented and their computing performance is evaluated with numerical examples. While the coupling of Neumann-Neumann preconditioner and BDD with additive Schwartz framework results in poor convergence, that of the diagonal scaling preconditioner with additive Schwartz framework performs good convergence.

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