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PRECONDITIONERS IN DOMAIN DECOMPOSITION ANALYSIS FOR MAGNETOSTATIC PROBLEMS

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An iterative domain decomposition method is proposed for numerical analysis of three-dimensional linear magnetostatic problems taking the magnetic vector potential as an unknown function. The iterative domain decomposition method is combined with the Preconditioned Conjugate Gradient (PCG) procedure and the Hierarchical Domain Decomposition Method (HDDM) which is adopted in parallel computing. Our previously employed preconditioner was the Neumann-Neumann preconditioner. Numerical results showed that the method was only effective for smaller problems. In this talk, we consider its improvement with the Balancing Domain Decomposition (BDD) preconditioner [1].

We proposed an approach for the construction of the coarse space (the $Z^{(i)}$ construction) in [2], which is a little improved in this talk. Details will be mentioned in the conference with numerical results.

Recently, Tagami [3] gave a similar idea for the $Z^{(i)}$ construction with his successful numerical results. His idea effectively uses macro-elements. In the western countries, the BDD preconditioner in this talk is called the Balancing Neumann-Neumann preconditioner (BNN) [4]. From the above situation, for magnetostatic problems, the present approach is expected to be also effective.

Finally, as a preliminary result, Figure 1 compares convergence histories with the diagonal scaling (diag) and without preconditioning (no) for a simple shaft perturbed problem by one core computation on the first author's PC .

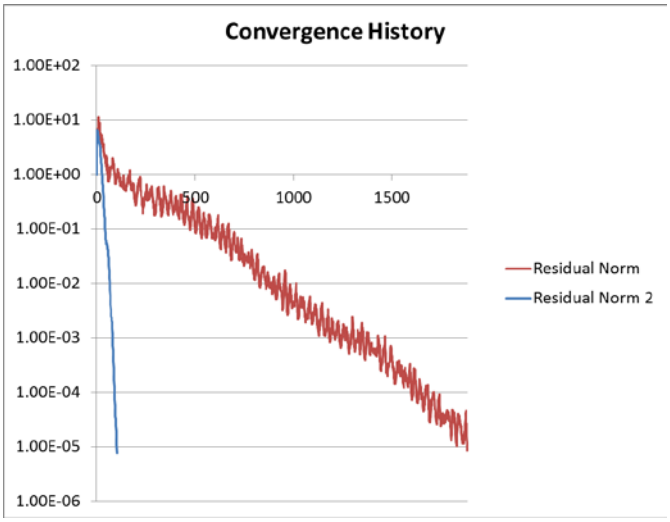

Fig.1 Comparison of convergence histories (left: diag; right:no)

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