Numerical Approach Based on Extended Boundary Node Method for Solving Grad-Shafranov Equation

A. Saitoh, T. Itoh[a], N. Matsui, A. Kamitani[b] and H. Nakamura[c]

University of Hyogo, 2167, Shosha, Himeji, Hyogo 671-2280, Japan
[a] *Tokyo University of Technology, 1404-1 Katakuramachi, Hachioji, Tokyo 192-0982, Japan*
[b] *Yamagata University, 4-3-16, Johnan, Yonezawa, Yamagata 992-8510, Japan*
[c] *National Institute for Fusion Science, 322-6 Oroshi-cho, Toki, Gifu 509-5292, Japan*

saitoh@eng.u-hyogo.ac.jp

The boundary element method (BEM) is one of numerical methods for the boundary-value problem of partial differential equations and has been so far used in the fields of plasma and fusion science. For example, the BEM has been adopted for solving the Grad-Shafranov (G-S) equation which describes the magnetohydrodynamics equilibrium in an axisymmetric plasma [1].

On the other hand, Mukherjee *et al.* proposed the boundary node method (BNM) [2]. Since the BNM is one of meshless methods, a boundary does not need to be divided into a set of elements. Hence, input data can be more simplified than the BEM. Recently, the BNM has been reformulated without using integration cells. This method is called the extended BNM (X-BNM) [3–5]. The results of computations have shown that the accuracy of the X-BNM is much higher than that of the dual reciprocity BEM (DRM) [4]. In addition, we have improved the calculation speed by applying the shape function used in the radial point interpolation method to the X-BNM [5]. From these results, the X-BNM might become a powerful tool for solving the G-S equation.

The purpose of the present study is to develop the numerical approach for solving the G-S equation on the basis of the X-BNM and to numerically investigate its performance. The numerical results will be shown in the conference.

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