Development of Parallel Fluid-Structure Coupled Analysis Method using Enriched Free Mesh Method and Its Effectiveness.

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ABSTRACT

Fluid-Structure interaction phenomenon is very important issue in recent numerical analysis field. Therefore, a lot of new analysis methods are proposed by many researchers. These methods have some strongpoints but crucial analysis method is not proposed yet. To solve fluid-structure interaction problem, we have been already propose the new method [1]. The method is using the SUPG/PSPG stabilized finite element method (FEM) [2] as a fluid analysis method. On the other hand, in the structure analysis field, the Enriched Free Mesh Method (EFMM) [3] is using. Both methods are using the same type element. For example, linear triangular elements are used for two dimensional analysis. In the three dimensional problem, linear tetrahedral elements are used. In short, both methods are using only linear element. Therefore, the handling of the fluid-structure interface becomes simple and accurate. Moreover, these method can be obtained fine analysis result compared with conventional method. Accuracy and parallel efficiency of the FEM has been already proven by many analysis results so on. However, analysis accuracy of the EFMM has been already proven by some analysis result by us, but parallel efficiency of the EFMM has never been proven because the EFMM was not suitable for parallel computing by some reasons. As main reason, domain decomposition method for parallel EFMM is more complicate than conventional FEM. Therefore, process to make communication table for parallel EFMM becomes difficult. However, the new parallelization method for EFMM is introduced by us. As a result, parallel efficiency can be obtained very good performance. In this study, we describe about parallel EFMM and an accuracy comparison between experiment and numerical result computed by the our proposed fluid-structure interaction analysis method.

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