Large-Scale Fluid-Structure Analysis for Tsunami Inundation into the

Interior of a Building using MPS-FEM Coupling Method

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Abstract

Huge facilities are often built along coastal regions, such as petrochemical and nuclear power plants. However, these plants near to the sea are vulnerable to water-related disasters, especially when the tsunami occurred by great earthquake. An objective of our research is to estimate the effect of tsunami inside building.

We apply the approach of MPS-FE method [1] to solve the fluid-structure interaction problems This method adopts the Moving Particle Simulation (MPS) method for fluid computation and the Finite Element Method (FEM) for structure computation.

In past research [1], the large-scale tsunami analysis on urban area for ground structures and floating objects was done. In this research, the tsunami inundation analysis into the interior of a building is done. Furthermore, the fluid-structure behavior is analyzed to estimate the damage inside the building caused by tsunami.

We use the ADVENTURE_Solid ver.2.0 [2] for the structure computation and the LexADV_EMPS ver.0.1.2b [3] for the fluid computation. In this research, the Japan's petaflops supercomputer, K computer is used as computational platform.

Keywords: Tsunami, Fluid-Structure Interaction, Moving Particle Simulation (MPS), Finite Element Method (FEM), K computer, ADVENTURE.

References

- [1] Murotani K, Koshizuka S, Tamai T, Shibata K, Mitsume N, Yoshimura S, Tanaka S, Hasegawa K, Nagai E and Fujisawa T (2014): Development of Hierarchical Domain Decomposition Explicit MPS Method and Application to Large-scale Tsunami Analysis with Floating Objects, Journal of Advanced Simulation in Science and Engineering (JASSE), Vol. 1, No. 1, October 31, 16-35.
- [2] ADVENTURE project home page, <u>http://adventure.sys.t.u-tokyo.ac.jp/</u>
- [3] LexADV Library, http://adventure.sys.t.u-tokyo.ac.jp/lexadv/

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