PARALLEL COMPUTATIONS FOR MANY FLOATING OBJECTS TRANSPORTED BY TSUNAMI FLOWS

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ABSTRACT

The Great East Japan Earthquake was one of the most powerful in world history. The huge tsunami that followed caused massive damage to coastal areas especially in the Tohoku region. According to survey reports, it is important to predict the behavior of various many drifts for disaster mitigation.

To deal with the free-surface flows including complicated-shaped solid objects, the MICS[1], a computational method for incompressible multiphase fields, is employed in this study. In this method, the arbitrarily-shaped solid objects are treated as the multiphase phenomena, consisting of gas, liquid and solid phases. In particular, since the fluid-solid interactions are adequately taken into account, no empirical constants are needed. The principal governing equations are described with conservative forms, which are discretized with finite volume method (FVM) on a collocated grid system. The employed implicit method (C-ISMAC method[2]) enables us to utilize the higher-order TVD schemes and to use larger time increment than explicit methods.

In order to solve large-scale problems efficiently, the computations were parallelized by flat MPI on the basis of a domain decomposition method. A numerical experiment has been conducted for predicting the behavior of 240 vehicle and 40 structure models, which collide with other moving and static objects, transported by free-surface flows.

REFERENCES

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